Syniti Data Replication

User's Guide

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Welcome to Syniti Data Replication 9.8.2

What do you want to do?

- Install Syniti Data Replication (Syniti DR) and Set Up Your Environment for Replication
- Review name changes in the Syniti Data Replication Environment
- Check Supported Data Providers in the Help Center
- Create Database Connections
- Set up a Replication
- Upgrade from DBMoto 8 or 9 to Syniti DR 9.8.x
- View a summary of new features and changes in Syniti DR 9.8.2
- Tour the Management Center

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Setting Up a Replication

With Syniti Data Replication, there are just a few steps involved in setting up a quick test replication. When you have tried everything out, you can explore the different options that Syniti DR has to offer, including setting up multiple replications simultaneously, performing synchronization between two or more systems, customizing replications with mapping and/or scripts and so on.

Here's how to get started.

1. Decide what type of data replication you want to perform.

Refresh	Copy entire data set from source to target once only
Continuous Refresh	Copy entire data set from source to target according to a schedule
One-way mirroring (with or without initial refresh)	Initially copy entire data set from source to target, then copy only changes to the source database according to a schedule. This approach is also known as Change Data Capture.
Synchronization (with or without initial refresh)	Initially copy entire data set from one system to the other, then keep changes to the two databases synchronized according to a schedule

Click on one of the links above for detailed steps on how to create a replication, or use the overview below to guide you.

2. Using the Management Center, create a connection to the source database table(s).
3. Create a connection to the target database table(s).
4. For mirroring or synchronization, use the Enable Transactional Replication wizard to set up access to the database log.
5. Set replication properties using the Replication wizard or the Multiple Replications wizard.
6. Enable the replication(s).
7. Start the Replication Agent using the Service Monitor in the Windows Notification Area.

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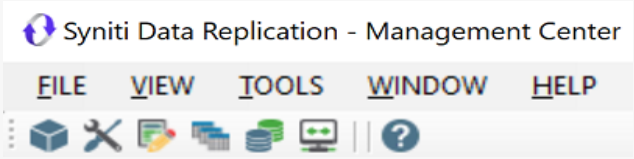
Tour of the Management Center

Main Toolbar and Menu Bar



Use these menus and icons to access tools and options to manage your working environment.

	Metadata Explorer Adds a new Metadata Explorer pane to the Management Center window, if one is not already open.
	Property Window Opens a new Property Window, if one is not already open.
	Object Browser Adds a new Object Browser tab to the Management Center window, if one is not already open. The Object Browser displays information related to the item selected in the Metadata Explorer. For example, if you select a source table in the database tree, you can see the table column names and column information.
	Replication Browser Adds a new Replication Browser tab to the Management Center window, if one is not already open. The Replication Browser displays replications for the selected metadata together with summary information for the replications.
	Replication Monitor Adds a new Replication Monitor tab to the Management Center window, if one is not already open. The Replication Monitor provides current status information for all replications defined in the metadata that is selected in the Metadata Explorer.
	Toolbox Adds an expandable tab to the Management Center, for easy access to wizards to create source and target connections, tables, replications and replication groups.
	Help Opens a separate Help window with access to help topics in the User's Guide.

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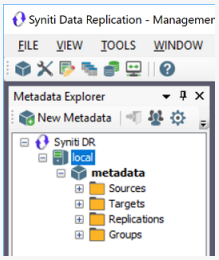
Metadata Explorer



Use this area of the Management Center to:

- Set up user access to Syniti DR
- Add and remove views of remote Syniti DR installations (servers)
- Manage properties of each server listed in the Metadata Explorer
- Create Syniti DR metadata as a way of managing replication projects
- Add connections for source and target tables
- Create replications and groups

In a standard installation of Syniti DR, you will always see a tree structure that looks like the one here, with an entry for the "local" installation of Syniti DR. In addition, Syniti DR creates a default metadata for you using the Microsoft SQL Server CE DBMS that is distributed with Syniti DR. In most cases, you will start adding source and target connections to this metadata, then create and run replications. However, you can choose to create metadata in an alternative RDBMS.

Toolbar

	New Metadata Opens the Metadata Connection wizard, allowing you to create a connection for a new metadata database.
	Connect Opens the Login dialog, allowing you to enter login information to connect to a Syniti DR server.
	Manage Users Opens the User Settings dialog, allowing you to establish access control for users.
	Replication Agent Options Opens the Replication Agent Options dialog, allowing you to set options that affect how the Rep-

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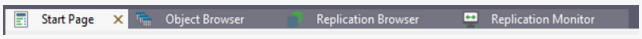
	lication Agent runs, including options for logs, traces and email notifications.
	New SQL Command Opens a SQL Query tab with a connection to the item that is selected in the Metadata Explorer. For example, if you have selected a source connection, the tab opens ready to execute a query for that connection.
	Global Script Opens the Global Script Editor, allowing you to write a script that is available to all replications in the metadata.
	View Log Opens the Log Viewer tab, allowing you to review the contents of the Syniti DR log. The log contains useful information regarding replication progress, results and issues. Note that it is not possible to view a file-based log if the selected metadata is on a remote installation of Syniti DR. The View Log option only opens the log file on the local file system.

Tools in the Tabbed Pane



The tabs in the Management Center include the main tools and viewer that you will use as you create and monitor replicatiions. The default tabs are:

Start Page

Provides access to help topics and useful information you will need to get started with Syniti Data Replication.

Object Browser

Displays information related to the item selected in the Metadata Explorer. For example, if you select a source table in the database tree, you can see the table column names and column information.

Replication Browser

Displays replications for the selected metadata together with summary information for the replications.

Managing Tabs

The tab headings are fixed width, so if you open several additional tabs, you need to use the View All Tabs icon in the tab area to display all tabs.

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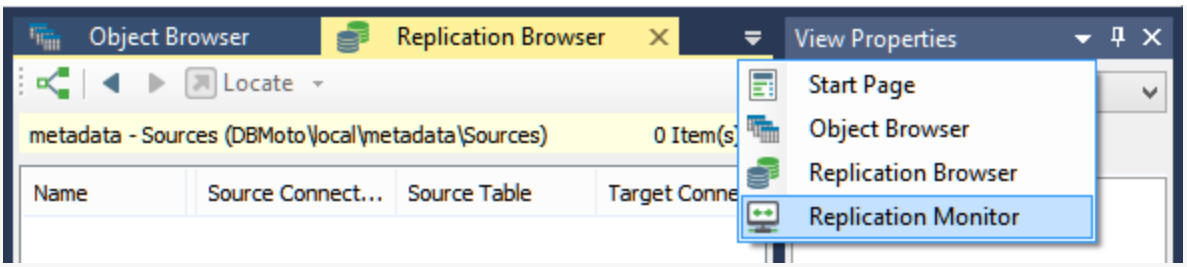
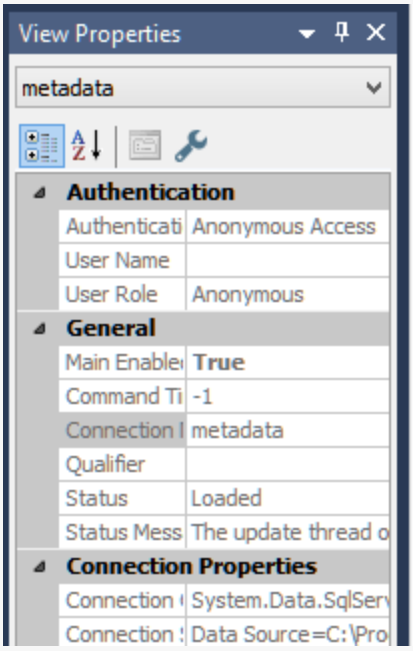


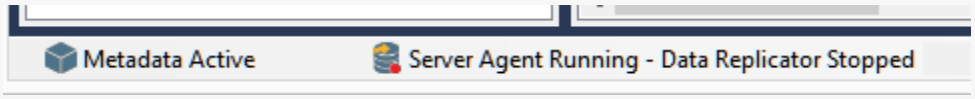
Properties Pane



The Properties pane displays properties for whichever item is selected in the Metadata Explorer. If you select a property in the list, a description of the property is displayed below the list. Note that you cannot edit properties in this pane.

Click **Show Properties** in the toolbar to open a separate, editable Properties Window.

Status Bar



The Status Bar displays the current status of the Metadata, the Server Agent and the Replication Agent.

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Steps for Replicating a Table Using Refresh

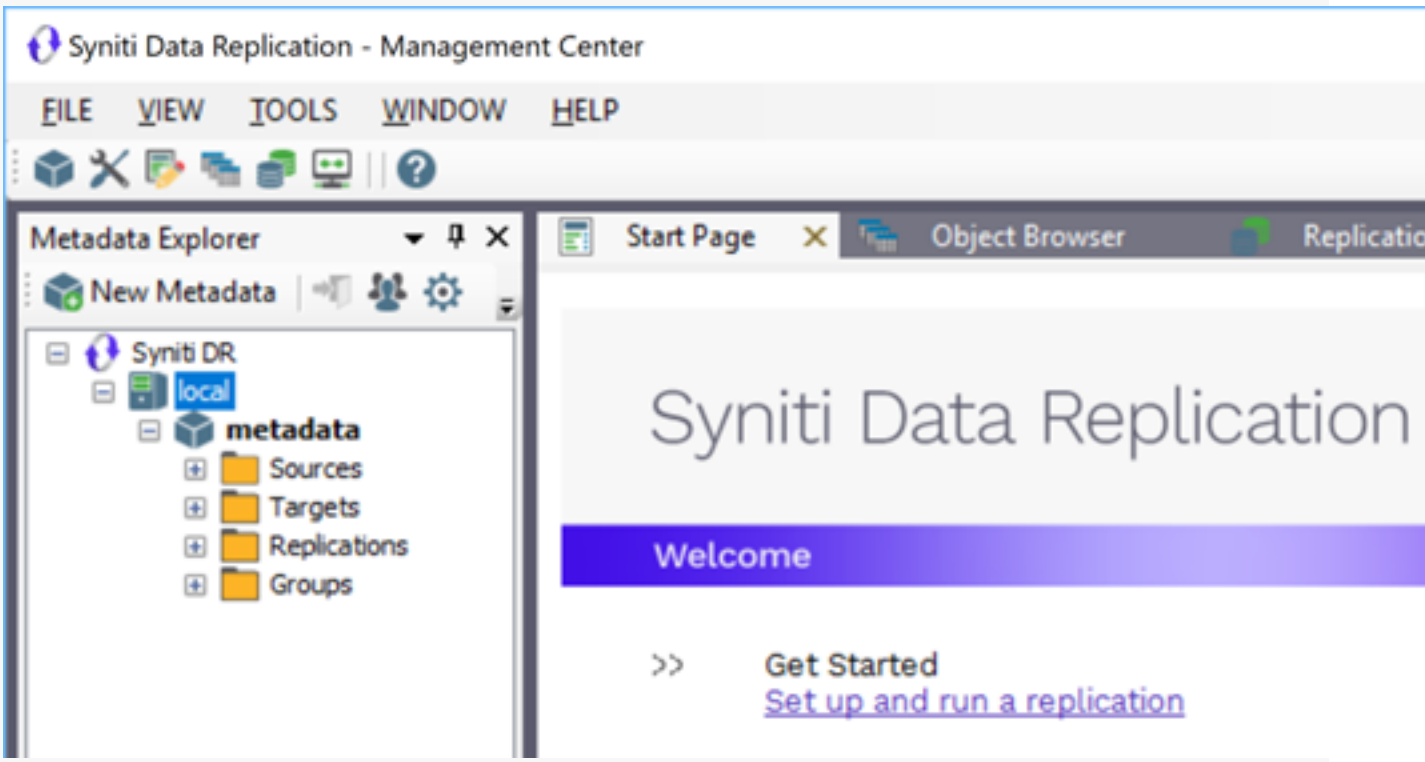
Set up database connections>Create a target table>Define the Replication>Run the Replication

A refresh is a one time complete replication from source to target table, according to replication settings and scripts. You can control the timing of the replication, identify the columns to be replicated and add scripts to transform data during replication. The source and target databases can be on the same or different database servers and platforms. For example, you can replicate an IBM Db2 for i table to an Oracle database or a Microsoft SQL Server table to Db2 for i.

1. Set Up Database Connections

1. Make sure you have database connections via a .NET data provider to the supported databases for source database tables and target database tables.
2. Start the Management Center.

   A default database (Microsoft SQL Server CE) is provided for your metadata, to contain all the information needed for your replication setup.



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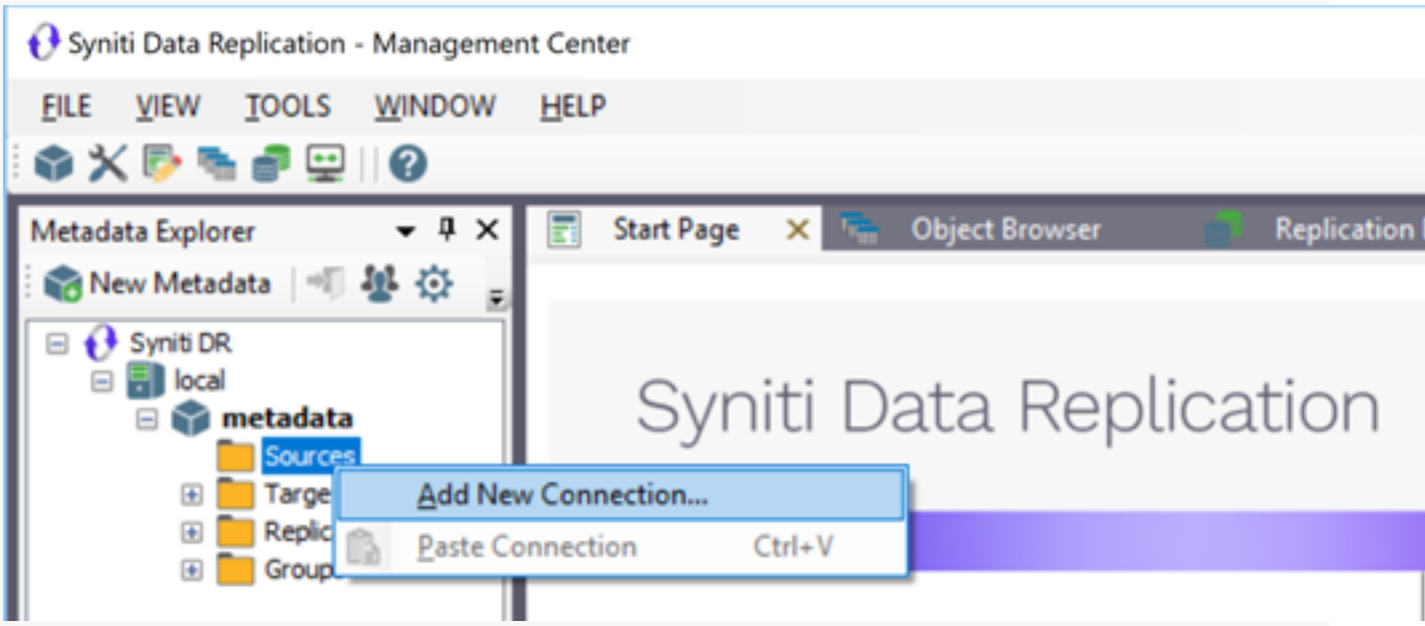
3. In the Metadata Explorer, expand the **metadata** node to view the **Sources** and **Targets** nodes.
4. Select the **Sources** node.
5. From the right mouse button menu, choose **Add New Connection**.



6. In the Add Source Connection Wizard, follow steps to add a connection string and test the connection to the database. Check the Supported Provider List in the Help Center before entering a value in the **Assembly** field.

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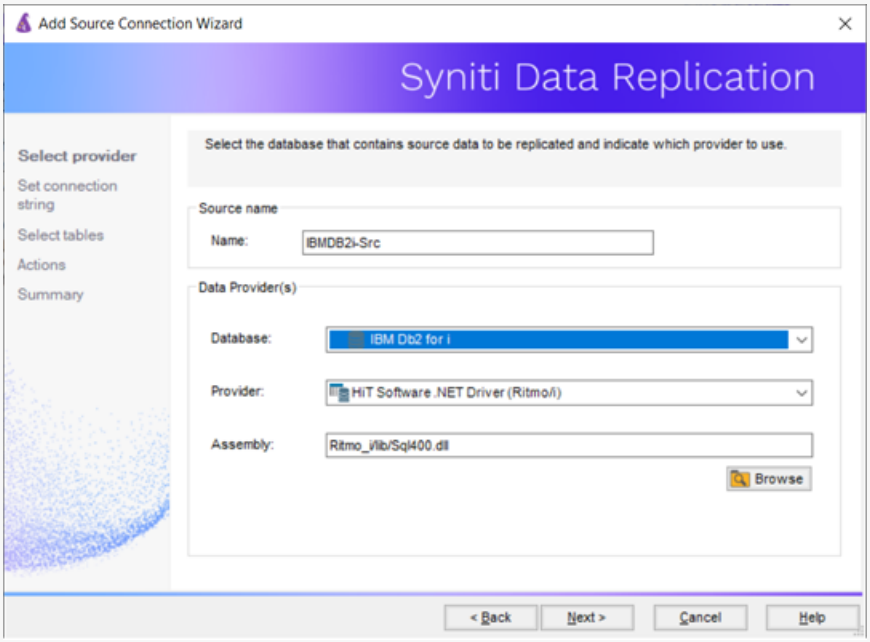

7. In the **Select Tables** screen, choose the tables that you plan to replicate.

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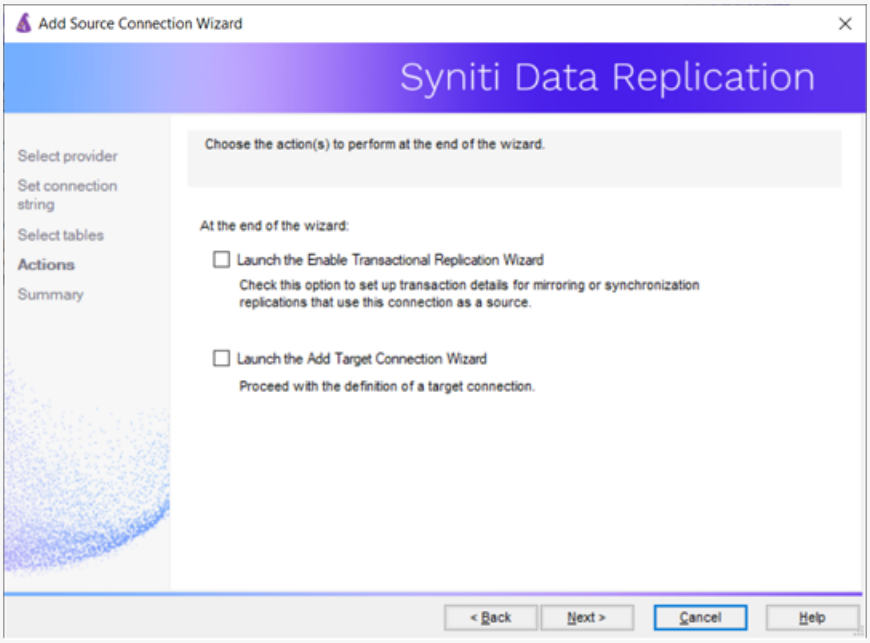
8. In the **Actions** screen, check the option **Launch the Target Connection Wizard**.



9. Complete the wizard.

10. In the Target Connection Wizard, follow steps to add a connection string and test the connection to the database. Check the Supported Provider List in the Help Center before entering a value in the **Assembly** field.

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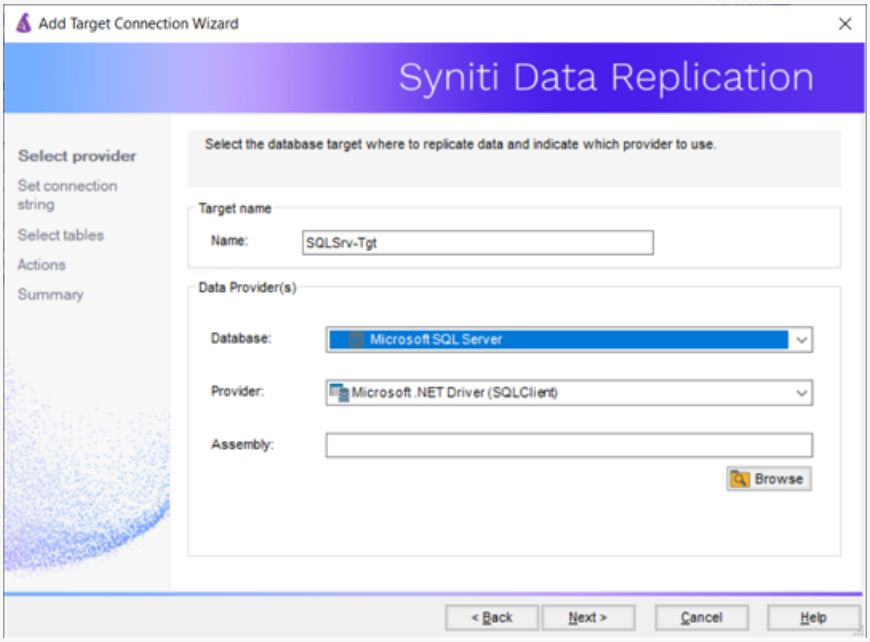

11. Choose the tables to which you plan to replicate.
    If a table does not exist, continue to the next screen without selecting a table. Create a target table once the wizard is complete.
12. In the **Actions** screen, click **Next** without checking any options if you need to create a target table, or check the option **Launch the Create Replication Wizard** to begin creating a replication.
13. Complete the wizard.

2. Create a Target Table

If you are replicating to a database where no target table exists, you need to create the target table before defining the replication. If the target table already exists in the database to which you are replicating, go to Defining the Replication.

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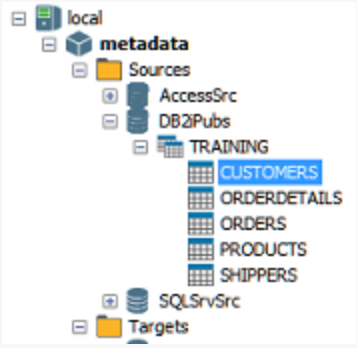
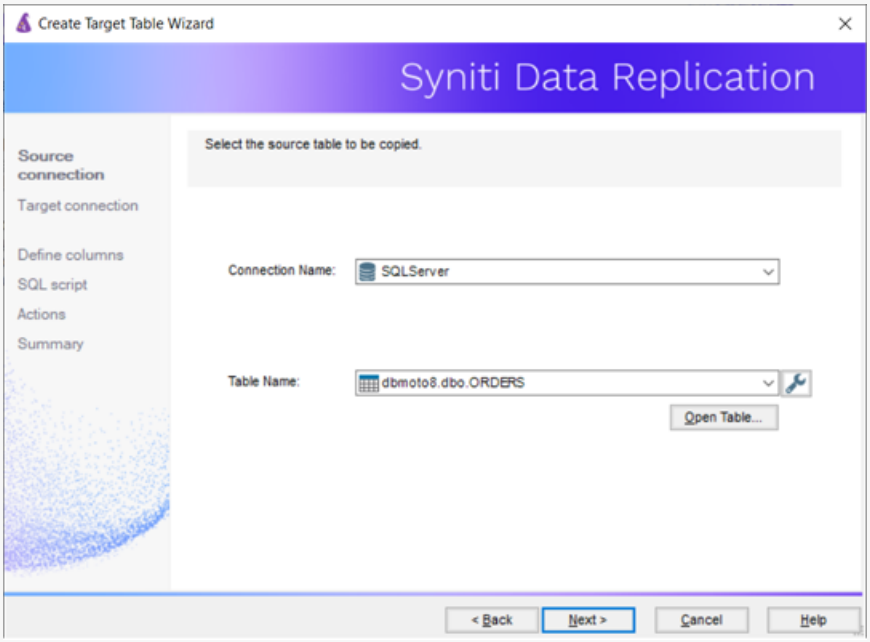
1. Expand the Metadata Explorer tree to display the table that contains the data you want to replicate.
2. Select the table and drag it to the target connection name to open the Create Target Table wizard.



3. In the **Select Source Connection** screen, verify that the correct connection is displayed. You can modify the source connection and table names using the drop-down lists.



4. If you want more information about the table before proceeding, click **Open Table...**.

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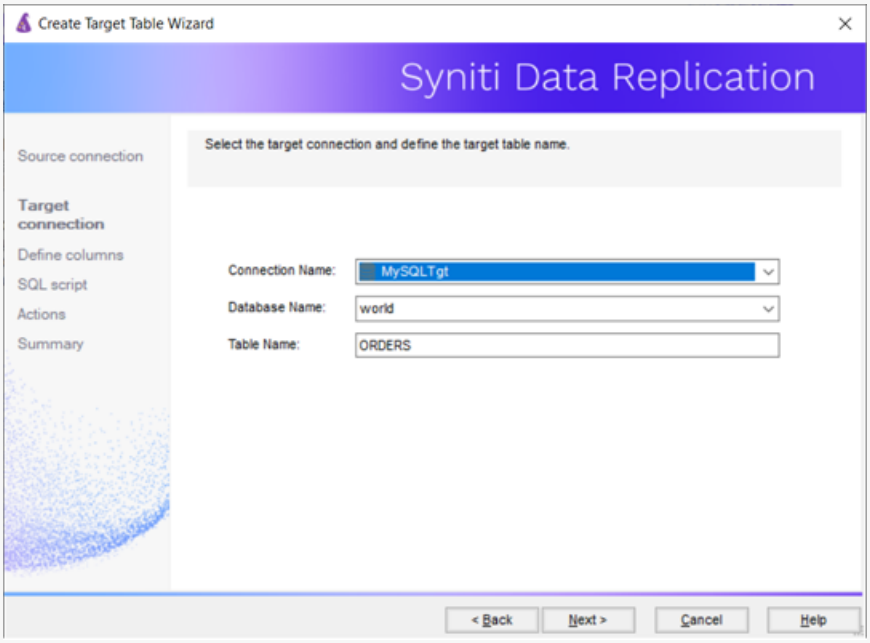
5. Click **Next** to go to the **Target Connection** screen.



6. Choose a target connection name from the drop-down list that includes all the target connections you have created.
7. Select the appropriate qualifiers for your target database.
8. As needed, edit the name for the table you wish to create in the target database. This table will contain the replicated data.

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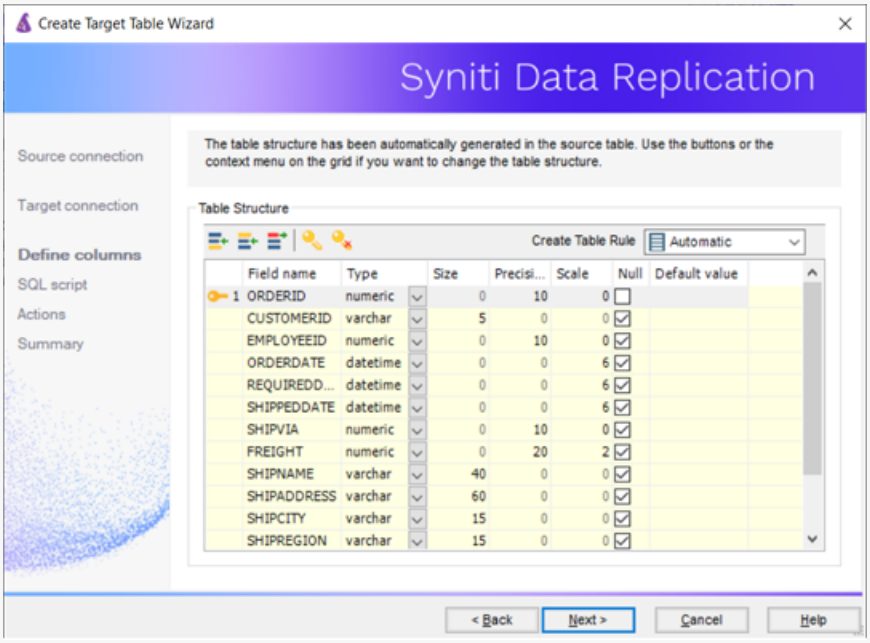
9. Click **Next** to go to the **Define Columns** screen.



10. Review the columns that will be created in the target table. You can add or remove columns as well as designate one or more columns as a primary key.

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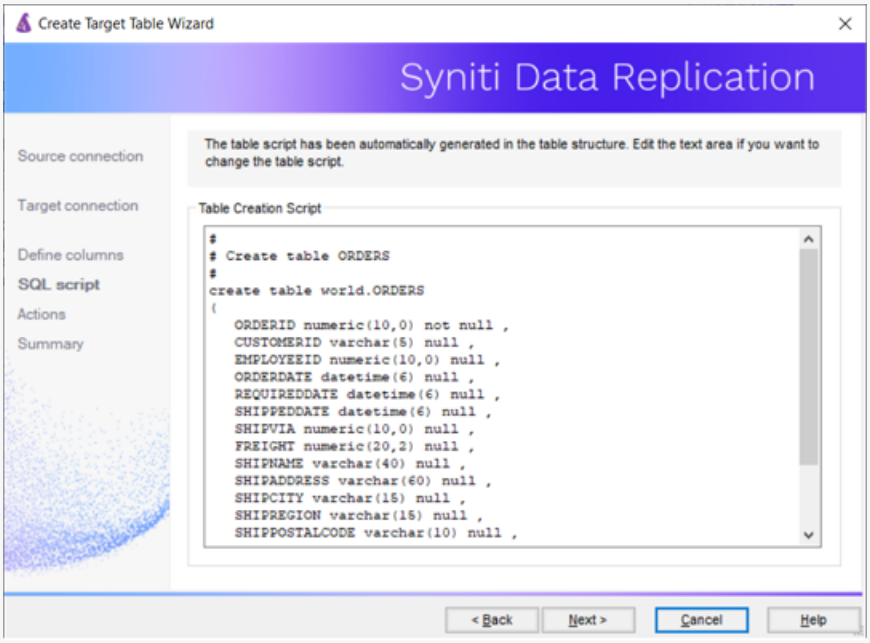
11. When you have finished editing the target table columns, click **Next** to go to the **SQL Script** screen.



12. If necessary, edit the SQL script that generates the table.
13. Click **Next** to review the wizard settings in the **Summary** screen.
14. To create additional tables, check the option **Create another table**.
    This opens another Create Target Table wizard when this wizard is complete.
15. To go directly to creating a replication once this wizard is complete, check the option **Proceed with the Definition of a Replication**.
    This opens the Replication wizard when the Create Target Table wizard is complete.
16. Click **Finish** to create the target table.
17. Note that the new table is not automatically displayed in the Metadata Explorer. Click **Yes** to add the newly created table to the list of target tables in the Metadata Explorer.

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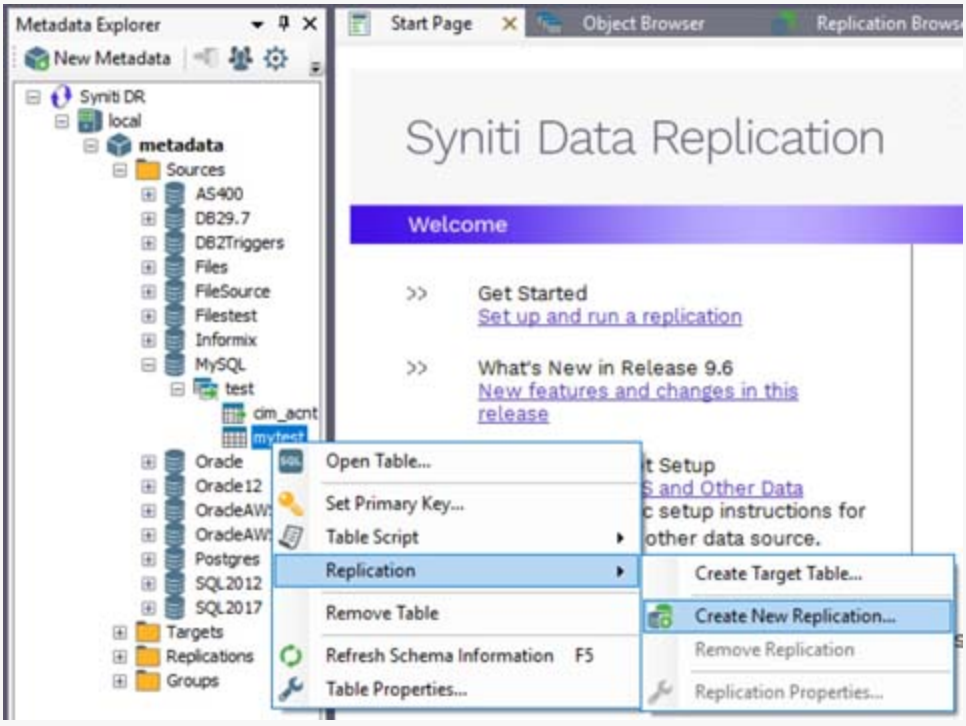
3. Define the Replication

1. Expand the Metadata Explorer to display the table that contains the data you want to replicate.
2. Select the table.
3. From the right mouse button menu, choose **Replication** then **Create New Replicaton...**.



4. In the **Define Replication Type** screen, type a name to identify the replication.
5. Optionally provide a description of the replication.

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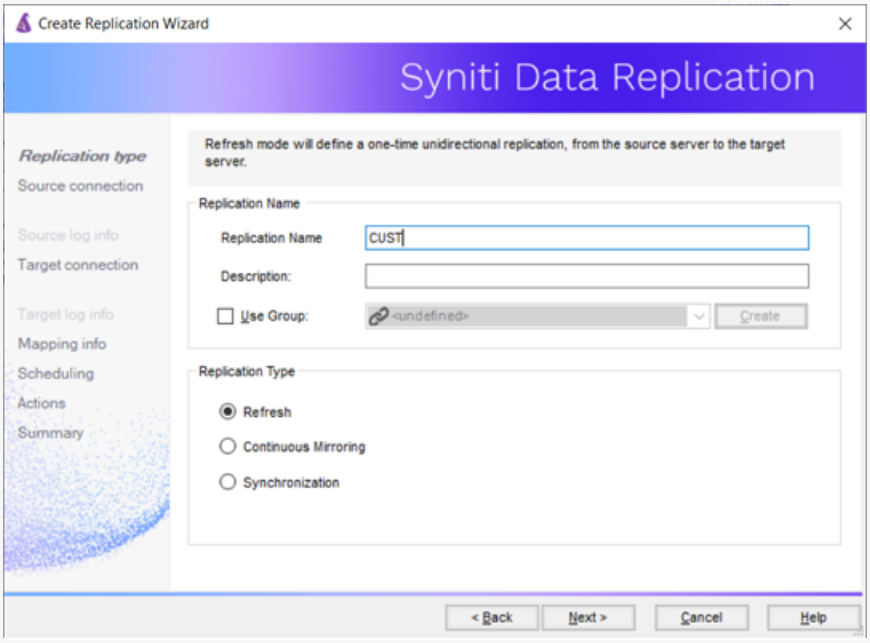
6. In the Replication Mode area, choose Refresh (a once-only, one-way replication).



7. Click **Next** to go to the Select Source Connection screen.

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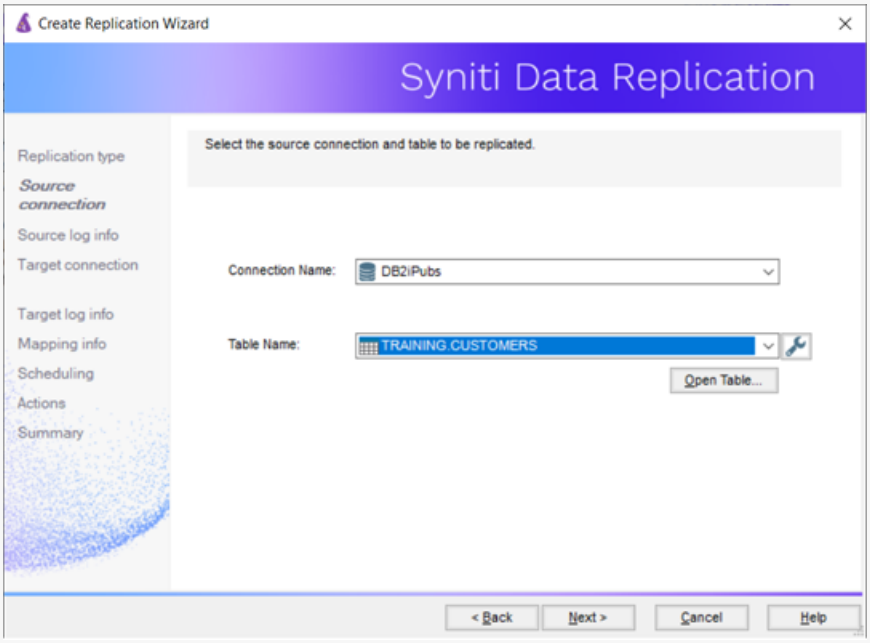
8. Choose the source name from the drop-down list that includes all the source connections you have created.



9. Choose the table that you want to replicate from the drop-down list.
10. If you want more information about the table before proceeding, click **Open Table...**.
11. Click **Next** to go to the **Select Target Connection** screen.

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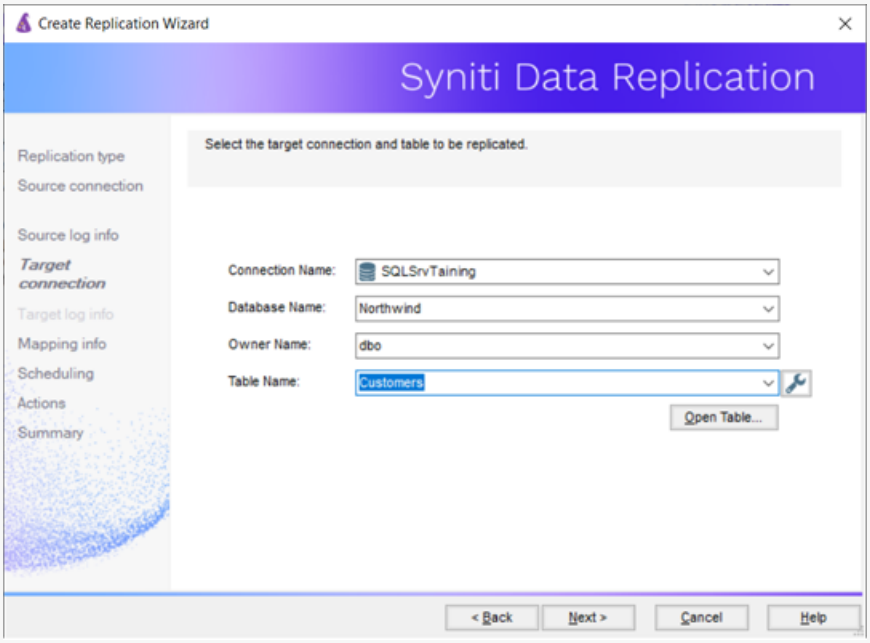
12. Choose a target name from the drop-down list that includes all the target connections you have created.



13. Choose the table to which you want to replicate from the drop-down list.

    If no tables are listed, you need to exit the wizard and add or create a target table.

14. If you want more information about the table before proceeding, click **Open Table...**.

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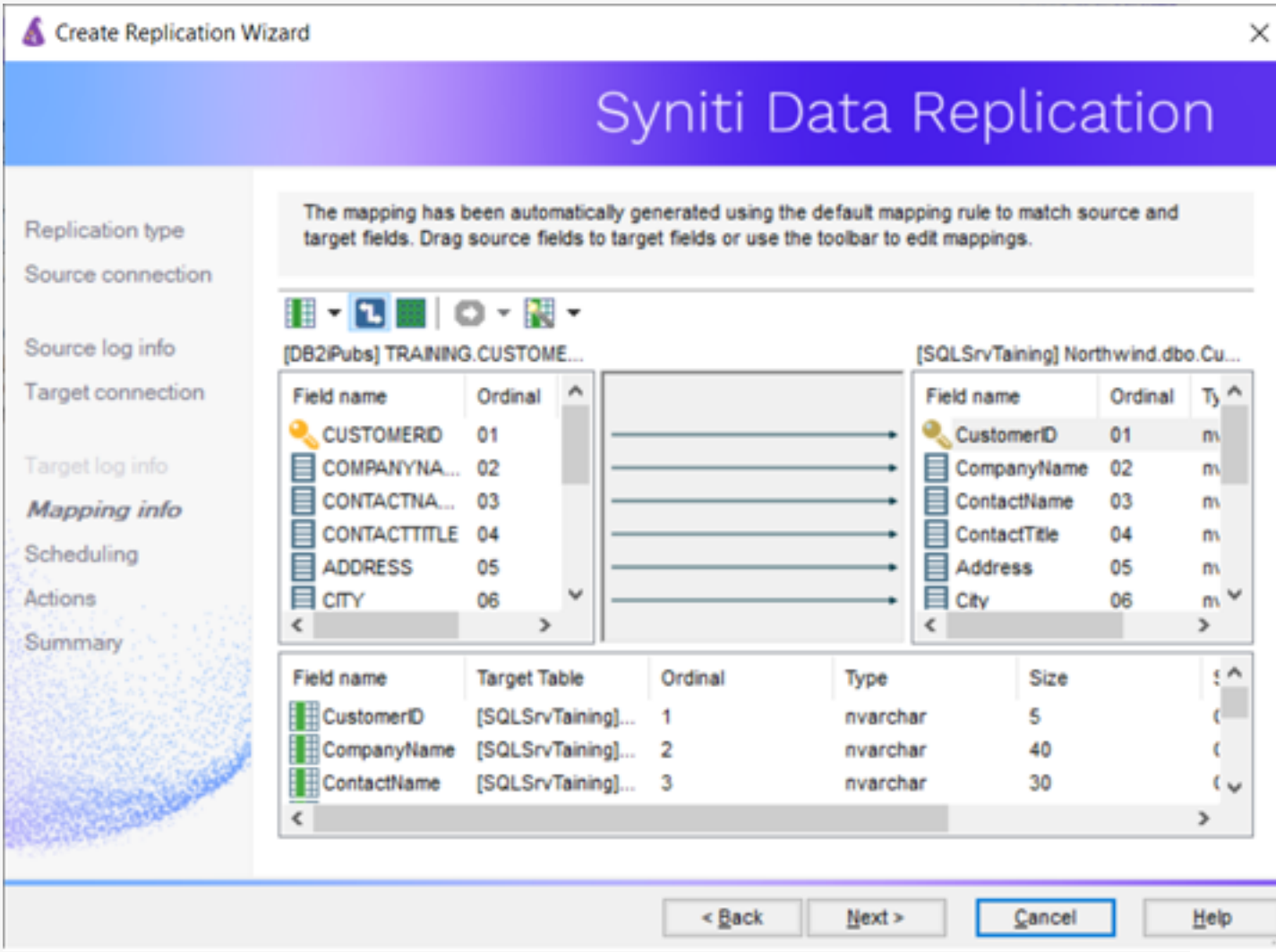
15. Click **Next** to go to the **Set Mapping Info** screen.



Source and target columns with the same name are automatically mapped. You can also map columns by dragging the target column and dropping it on the source column, or you can map a column to an expression. For more information about mapping, check the Replication Wizard help topic. An alternative is to write a script to set mappings at runtime.

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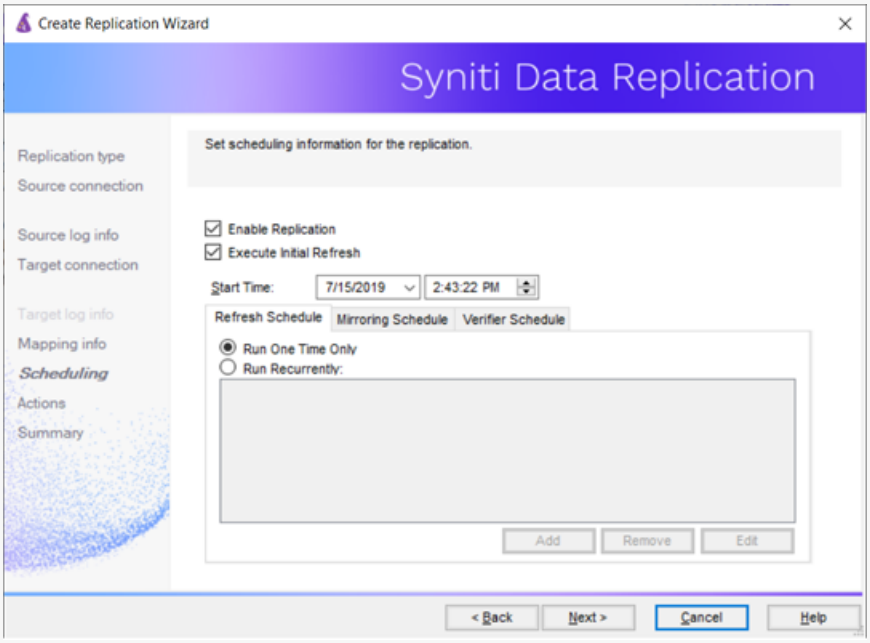
16. Click **Next** to go to the **Scheduling** screen.



17. Make sure the **Enable Replication** option is checked. This is required for the replication to run.
18. Set a start time for the replication. The **Start Time** field indicates the time at which the Replication Agent will begin considering the replication for execution.
19. Select how you want to run the replication:
    - Once only: the replication will run once at the time specified in **Start Time**.
    - Recurrently: the replication will run according to the schedule you set by clicking the Schedule button to open the Scheduler dialog.
20. Click **Next** to go to the **Summary** screen.
21. Click **Finish** to complete the wizard.

4. Run the Replication

If you installed the Replication Agent as a service during setup, you just need to start the service using the Service Monitor program in the Windows Notification Area.

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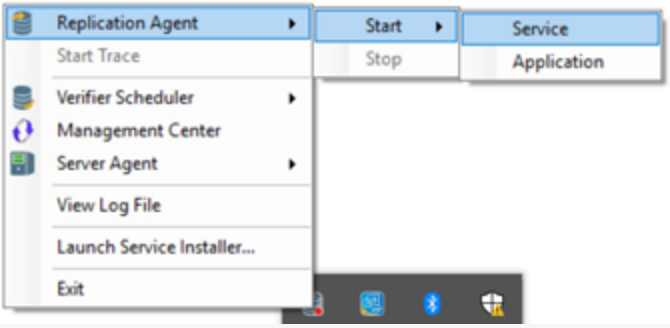

The replication that you have scheduled should start at the specified time. Use the Replication Monitor tab in the Management Center to track the progress of the replication.

If you would like to install the Replication Agent as a service:

- From the Windows Desktop menu, choose **Syniti Data Replication**, then **Service Installer**.
- Manage the service from the Service Monitor program (located in the Windows Notification Area, or on the Windows menu under **Syniti Data Replication**).
- Use the Replication Monitor tab in the Management Center to track the progress of the replication.

To run the Replication Agent interactively:

- In the Windows Notification Area, select the Service Monitor icon.
- From the right mouse button menu, choose **Replication Agent**, then **Start** then **Application**.
  The replication that you have scheduled should start at the specified time.
- Use the Replication Monitor tab in the Management Center to track the progress of the replication.

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Steps for Replicating Using One-way Mirroring

Set up source database connection>Enable transactional replication>Set up target database connection>Create a target table>Define the Replication>Run the Replication

One-way mirroring provides a continuous update of a replicated table based on changes to the source database that have been recorded in the database server log. Typically, this involves an initial refresh operation, as described above, to set up the target table. Then you can define the replication settings to check the transaction log on the source database at regular intervals. Any changes found in the log are applied to the target database.

1. Set Up Source Database Connection

1. Make sure you have database connections via a .NET data provider to the supported databases for source database tables and target database tables.
2. Start the Management Center.

   Syniti Data Replication provides a default database (Microsoft SQL Server CE) for your metadata, all the

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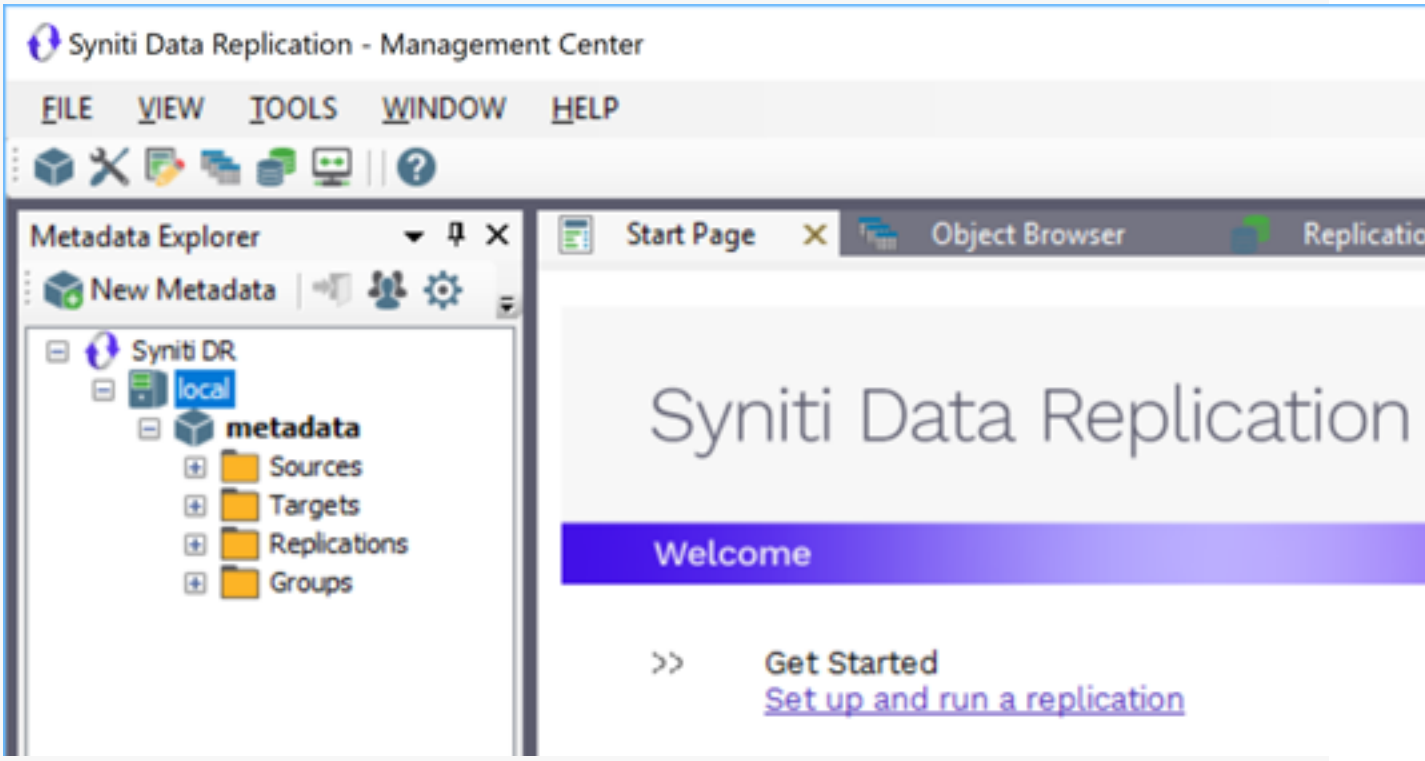
information that Syniti DR needs to store about your replication setup.



3. In the Metadata Explorer, expand the metadata node to view the **Sources** and **Targets** nodes.
4. Select the **Sources** node.

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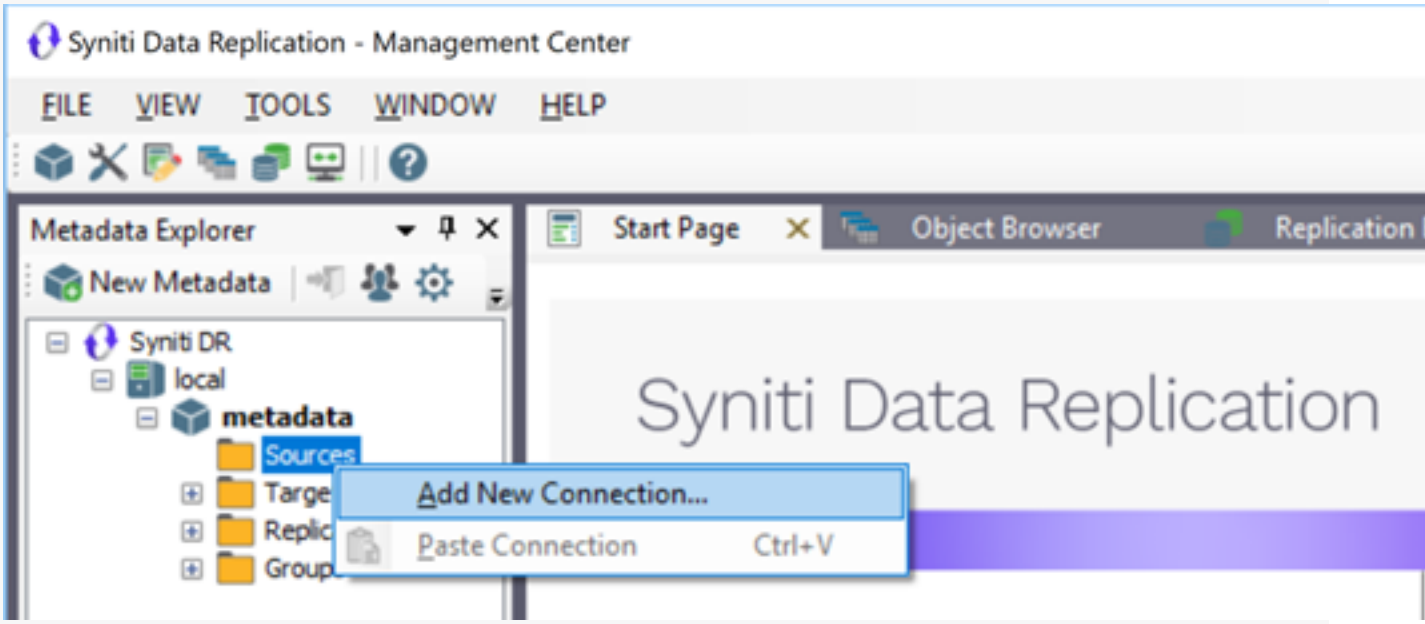
5. From the right mouse button menu, choose **Add New Connection**.



6. In the Add Source Connection Wizard, follow steps to add a connection string and test the connection to the database.

   Check the Supported Provider List in the Help Center before entering a value in the **Assembly** field.

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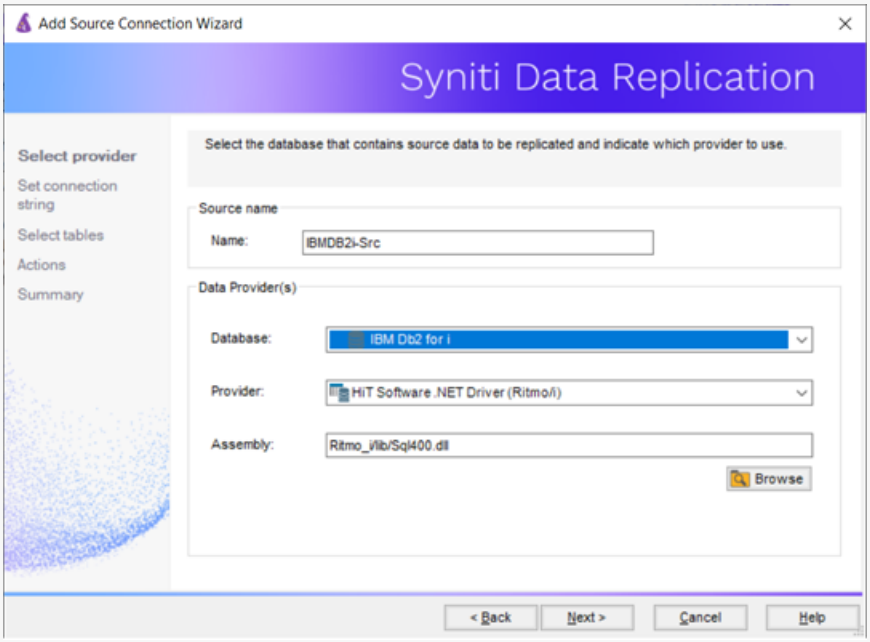

7. In the **Select Tables** screen, choose the tables that you plan to replicate.

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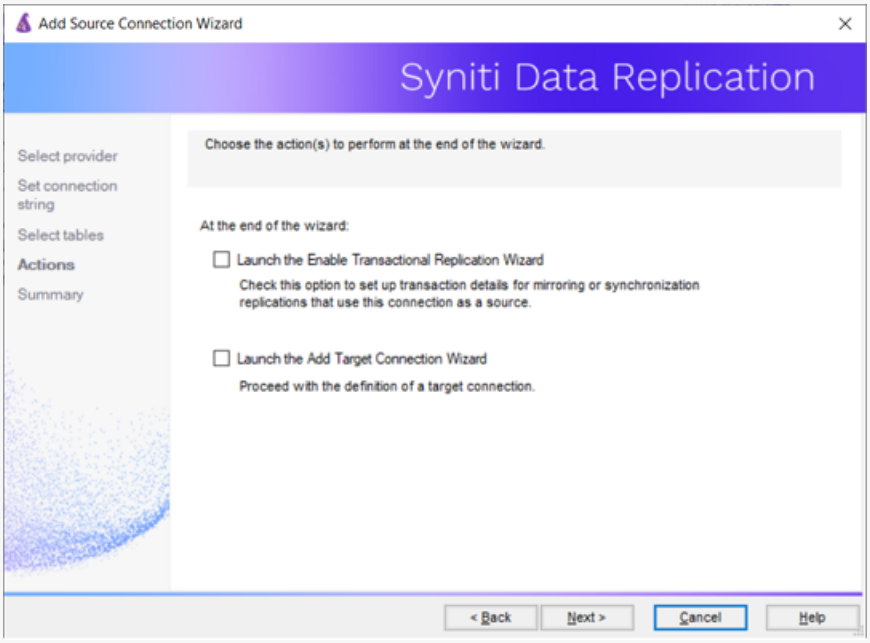
8. In the **Actions** screen, check the option **Launch the Enable Transactional Setup Wizard**.



9. Complete the wizard.

2. Enable Transactional Replication

This section assumes you have checked the Source Connection wizard option to launch the Enable Transactional Replication wizard. To open the wizard from the Management Center, choose the connection in the Metadata Explorer, then right-click to choose Transactonal Setup > Enable...

In the Enable Transactional Replication wizard:

1. Select the type of transactional replication to use. The options depend on the source database and can include log reader, log server agent, triggers, plus log reader API (for IBM Db2 for i only)

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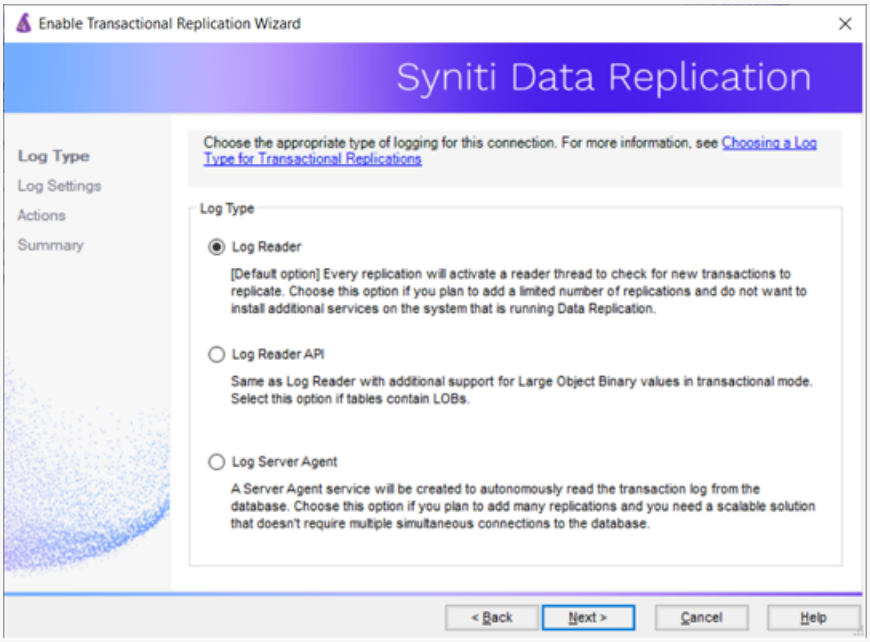
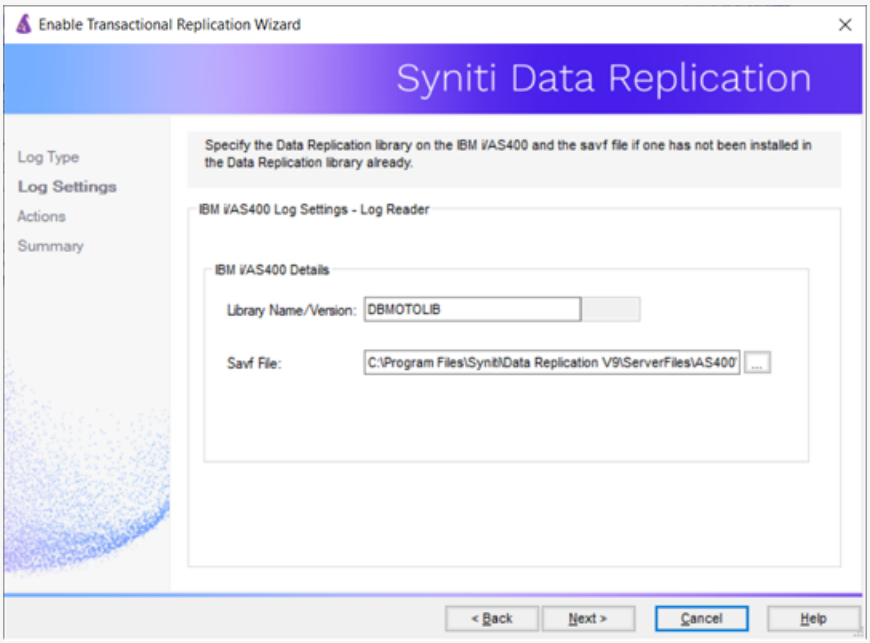


2. Click **Next** to enter the log settings. The fields and appropriate values depend on the database and log type.



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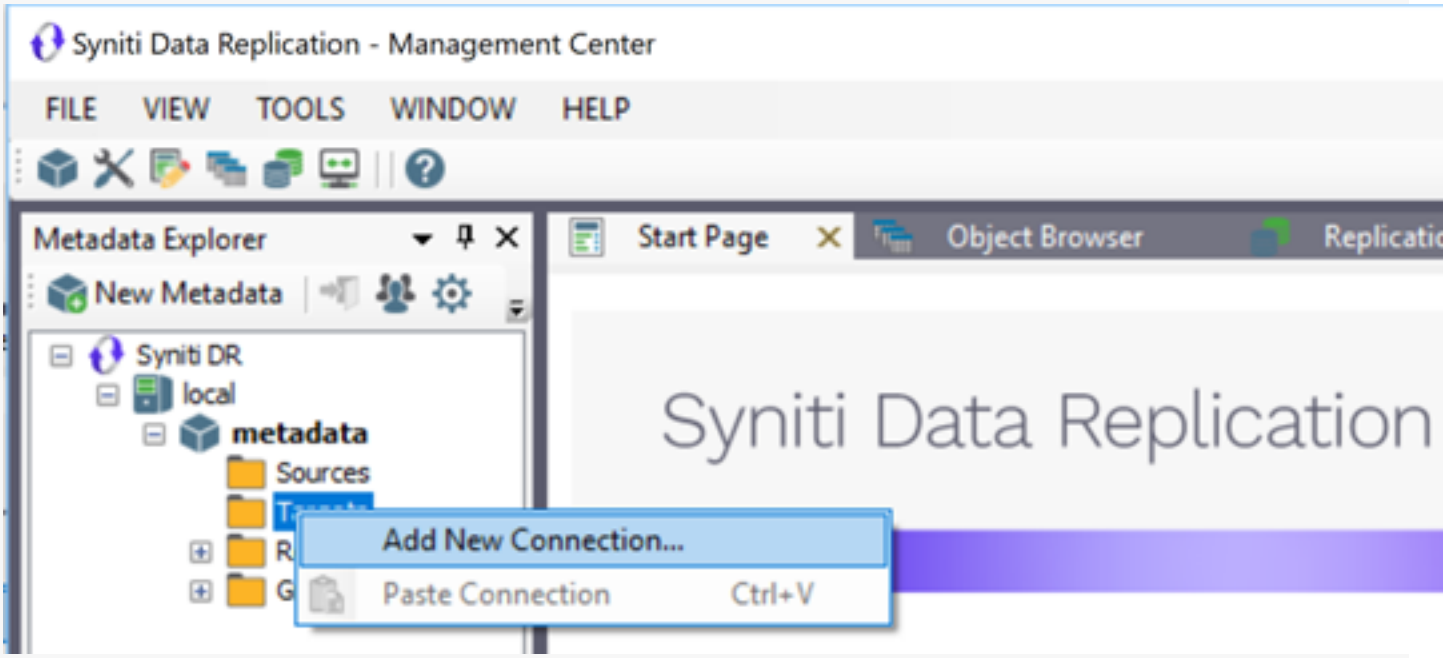
3. Click **Next** to verify your settings against the source connection to the database. If any information is missing, you will not be able to proceed.
4. In the Actions screen, check the option to launch the **Add Target Connection wizard**.
5. Click **Next** to review your changes.
6. Click **Finish** to complete the wizard.

The source connection is now set up for transactional replications.

3. Set Up Target Database Connection

This section assumes you have checked the **Enable Transactional Replication wizard** option to launch the Add Target Connection wizard. If not, to open the wizard from the Management Center, choose **Targets** in the Metadata Explorer, then right-click to choose **Add New Connection...**



1. In the Target Connection Wizard, follow steps to add a connection string and test the connection to the database. Check the Supported Provider List in the Help Center before entering a value in the **Assembly** field.

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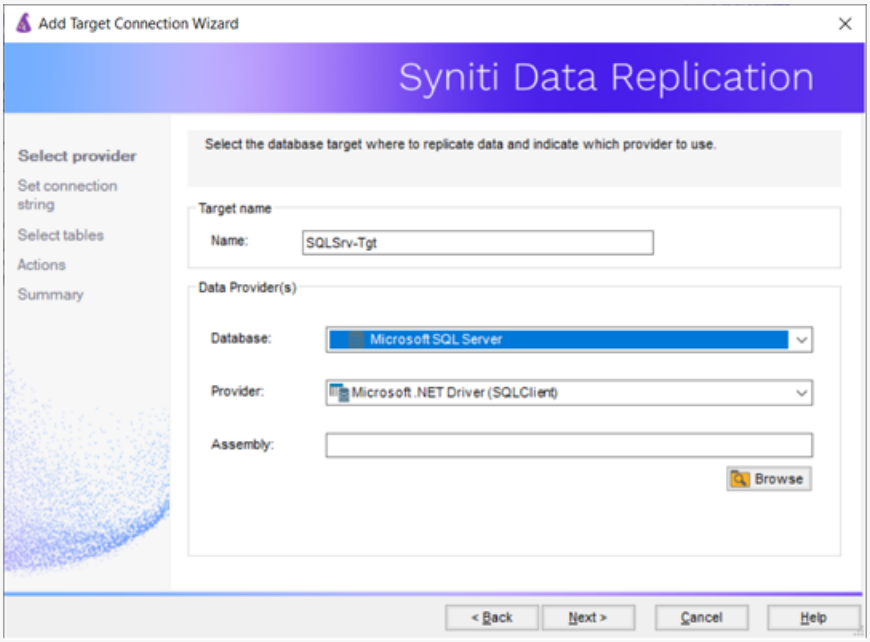

2. Choose the tables to which you plan to replicate.
   If the table does not exist, continue to the next screen without selecting a table. Create a target table once the wizard is complete.
3. Complete the wizard.

4. Create a Target Table

If the target table does not exist, use the Create Target Table wizard to create the table.

1. In the Metadata Explorer, drag the source table to the target connection to open the Create Target Table wizard.
   The **Select Source Connection** screen is already filled out with the table you selected.

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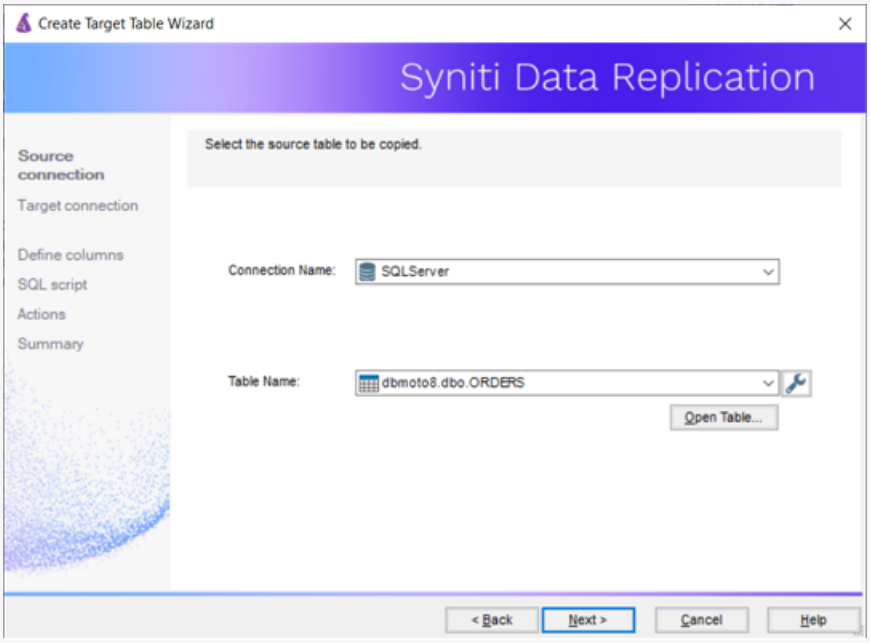
2. In the **Select Source Connection** screen, the source table information has already been provided.



3. If you want more information about the table before proceeding, click **Open Table...**.

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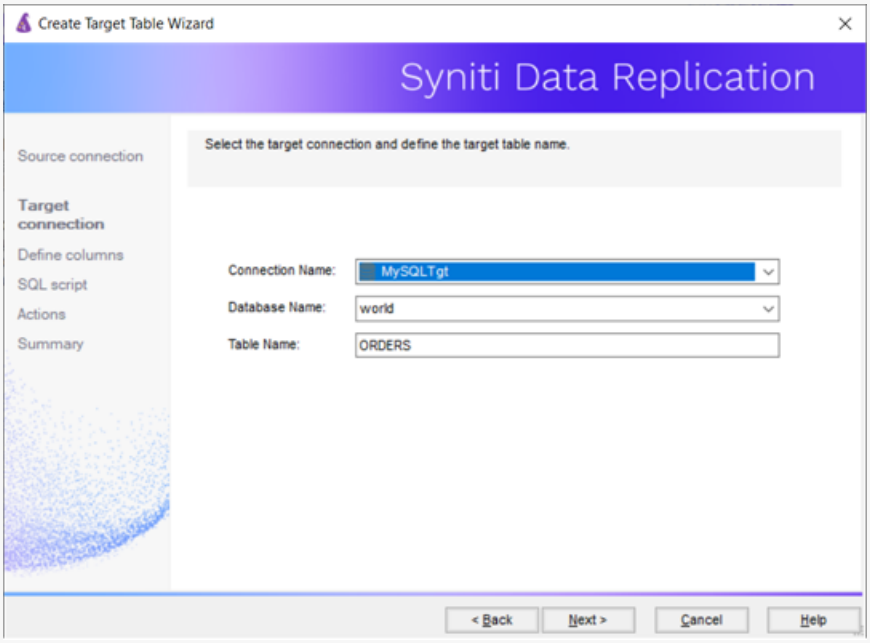
4. Click **Next** to go to the **Select Target Connection** screen.



5. The target connection details have been provided. Change the table name if needed.

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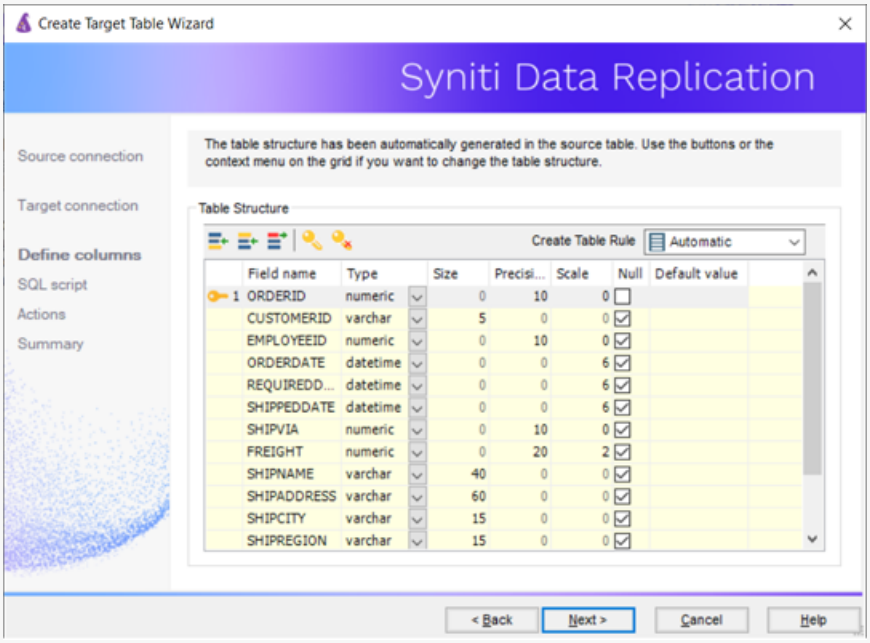
6. Click **Next** to go to the **Define Columns** screen.



7. Review the columns that will be created in the target table. You can add or remove columns as well as designate one or more columns as a primary key.

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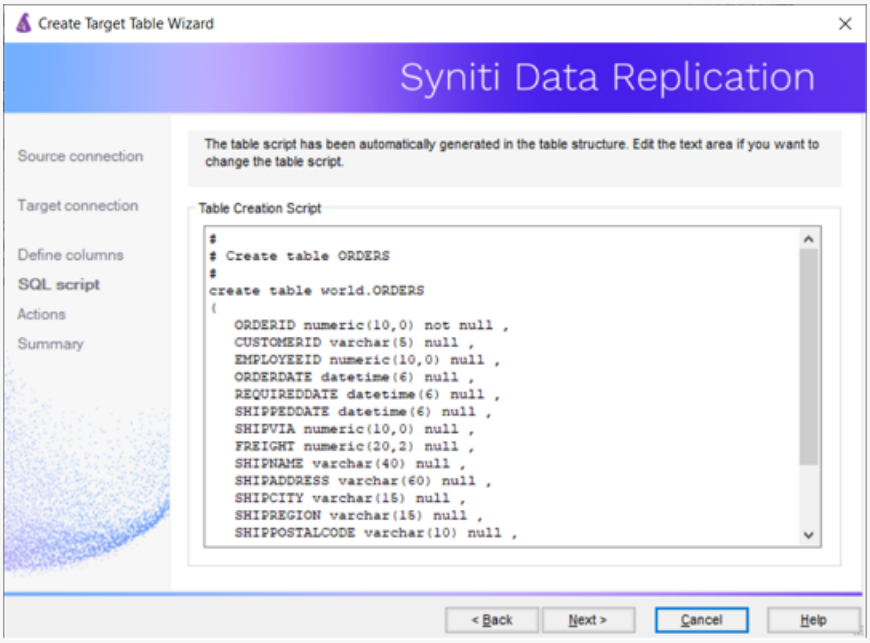
8. When you have finished editing the target table columns, click **Next** to go to the **SQL Script** screen.



9. If necessary, edit the SQL script that generates the table.
10. Click **Next** to display the Actions screen.
11. To create additional tables, check the **Launch Create Target Table wizard** option.
    This opens another Create Target Table wizard when this wizard is complete.
12. To go directly to creating a replication once this wizard is complete, check **Launch Create Replication wizard** option.
    This opens the Replication wizard when the Create Target Table wizard is complete.
13. Click **Next** to view a summary.
14. Click **Finish** to create the target table.
15. Note that the new table is not automatically displayed in the Metadata Explorer. Click **Yes** to add the newly created table to the list of target tables in the Metadata Explorer.

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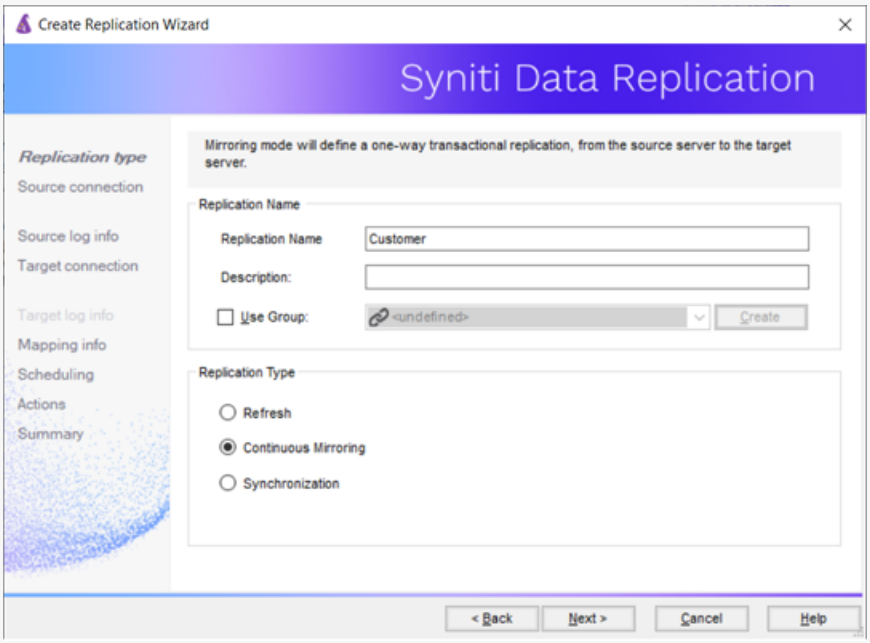
5. Define the Replication

This section assumes you have checked the Create Replication wizard option to launch the Create Replication wizard. If not, to open the wizard from the Management Center, choose the table you want to replicate in the Metadata Explorer, then right-click to choose **Replication > Create New Replication...**

1. In the **Define Replication Type** screen, type a name to identify the replication.
2. Optionally provide a description of the replication.
3. In the Replication Mode area, choose **Continuous Mirroring**.



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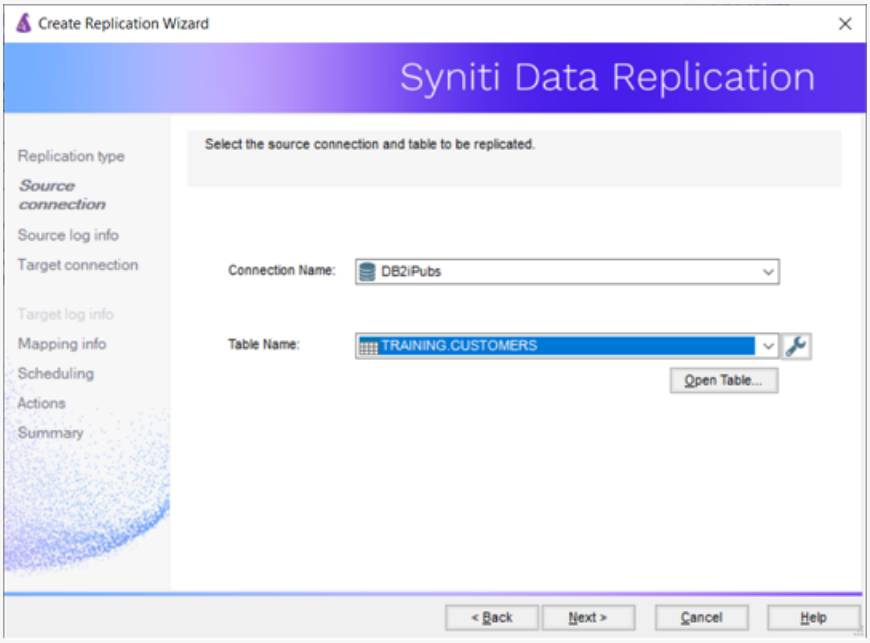
4. Click **Next** to go to the Select Source Connection screen.



5. Choose the source name from the drop-down list that includes all the source connections you have created.
6. Choose the table that you want to replicate from the drop-down list.
7. If you want more information about the table before proceeding, click **Open Table...**.

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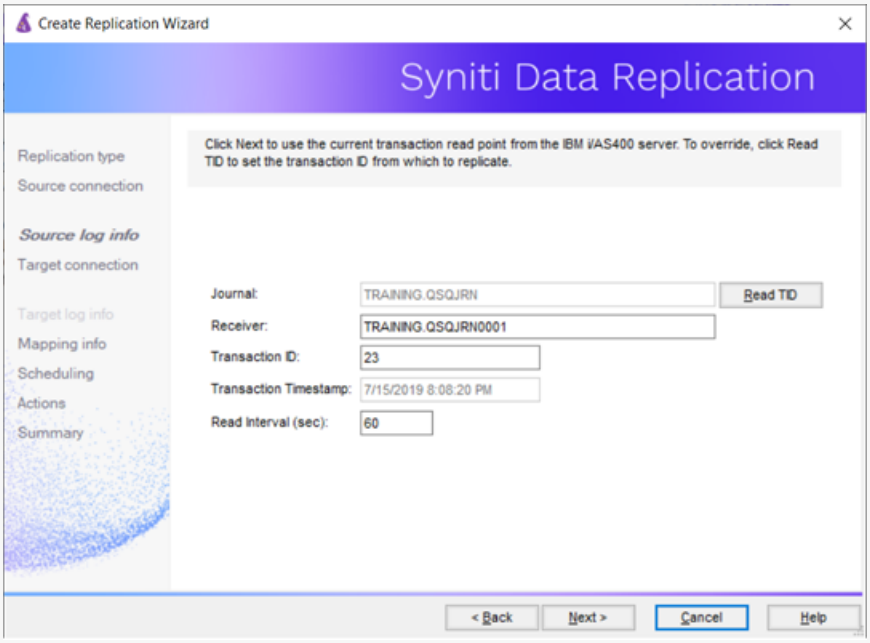
8. Click **Next** to go to the **Source Log Info** screen.



The first two fields on this screen depend on the source database you are using. In this explanation, we assume you are using IBM Db2 for i (iSeries or AS/400). Check the help for the Replication Wizard for details on the other databases.

The Journal field is automatically filled in by retrieving the information from Db2 for i. The Receiver field will be automatically filled in after setting the Transaction ID. You do not need to modify these fields. However, if the library that you have specified as a source is not journaled, you will need to ask your system administrator to journal the library.

9. In the Transaction ID field, click **Read** to open the Read Point dialog.
10. Choose either the current transaction or a transaction ID based on a time and date.
11. Click **OK** to add the value to the **Source Log Info** screen.
12. Set the value of the **Read Interval** field to the frequency with which you want Syniti DR to check the transaction log for new events to mirror.

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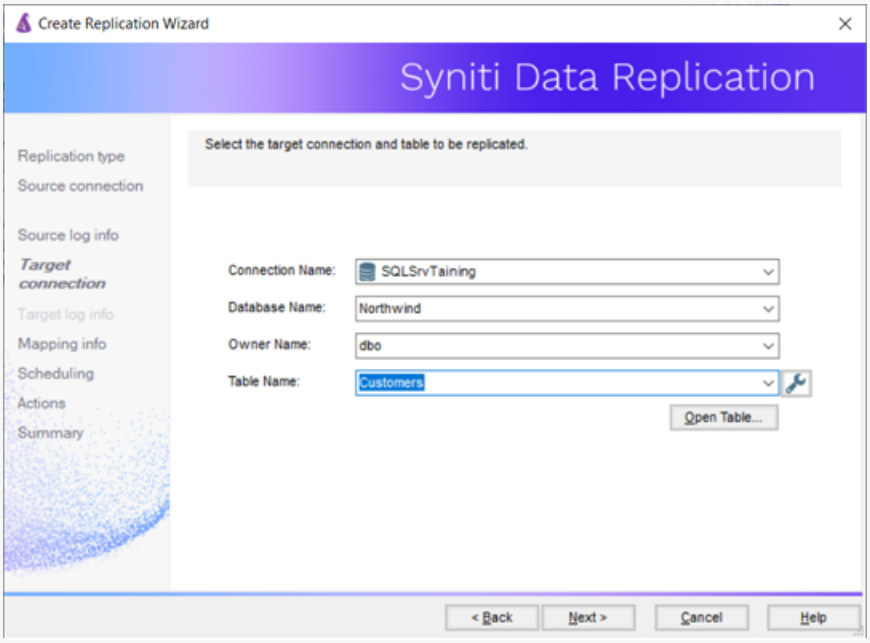
13. Click **Next** to go to the **Select Target Connection** screen.



14. Choose a target source name from the drop-down list that includes all the target connections you have created.
15. Choose the table to which you want to replicate from the drop-down list.

    If no tables are listed, you need to exit the wizard and add or create a target table.
16. If you want more information about the table before proceeding, click **Open Table...**.

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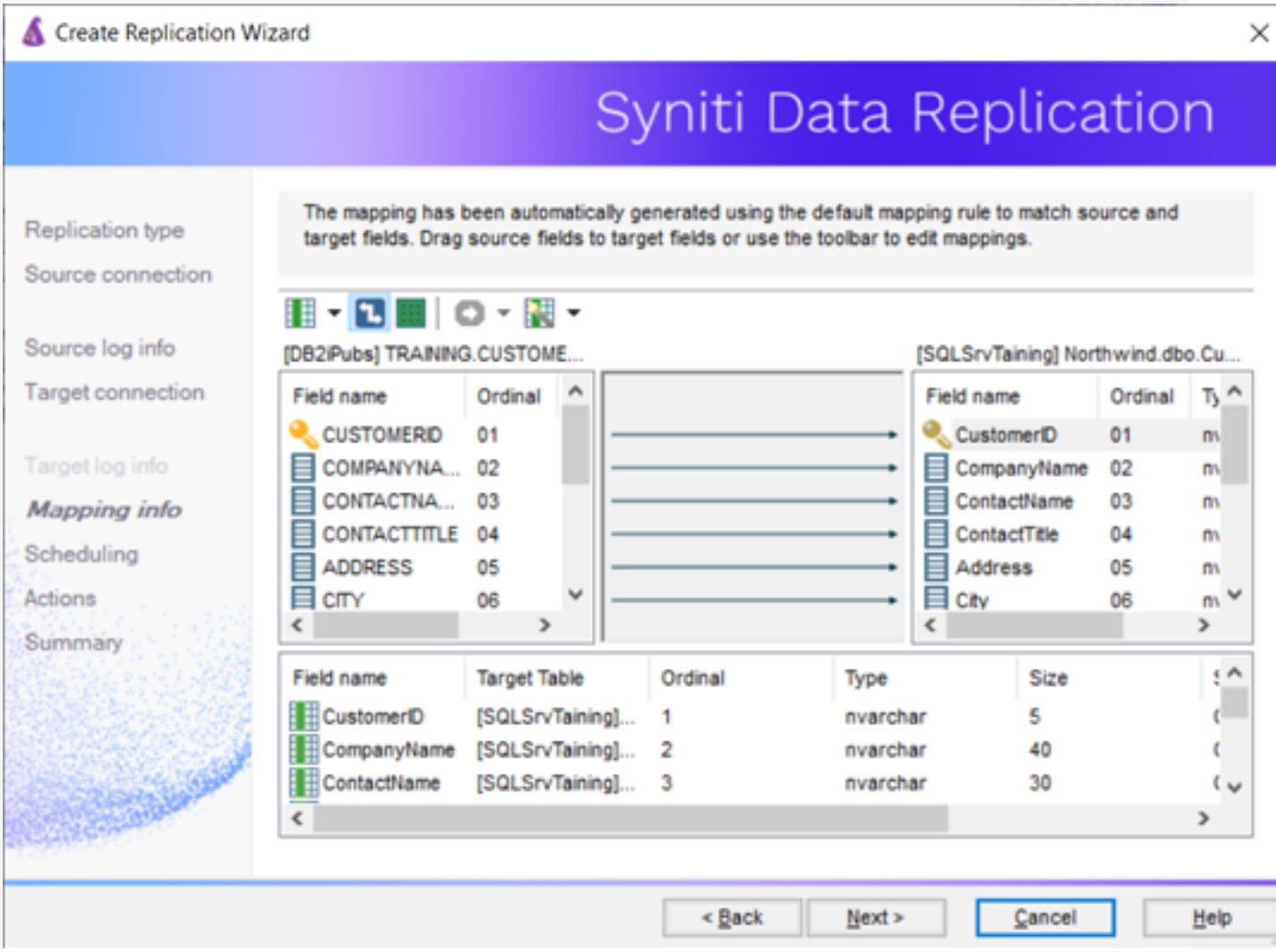
17. Click **Next** to go to the **Set Mapping Info** screen.



Source and target columns with the same name are automatically mapped. You can also map columns by dragging the target column and dropping it on the source column, or you can map a column to an expression. For more information about mapping, check the Replication Wizard help topic. An alternative is to write a script to set mappings at runtime.

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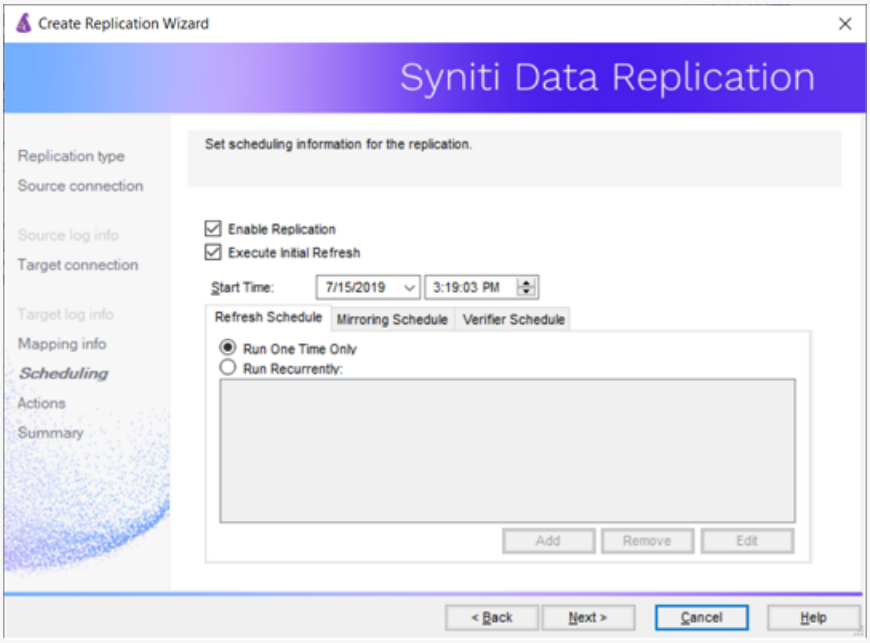
18. Click **Next** to go to the **Scheduling** screen.



19. Make sure the **Enable Replication** option is checked. This is required for the replication to run.
20. Set a start time for the replication. The **Start Time** field indicates the time at which the Replication Agent will begin considering the replication for execution.
21. Check the option to **Execute Initial Refresh** if needed.
    If you check this option, a full replication will be performed from the source to the target table, prior to starting the mirroring process where only incremental changes will be replicated.
22. Go to the **Mirroring Schedule** tab.
23. Select how you want to run the replication:
    - Run Continuously: the transaction log will be checked for changes to the table using the frequency that you specified on the Set Log Info tab. Any changes will be replicated to the target table.
    - Schedule Interruptions: the replication process will run as above, except for interruptions specified when you click the Schedule button in the Scheduler dialog.
20. Click **Next** to go to the **Summary** screen.
21. Click **Finish** to complete the wizard.

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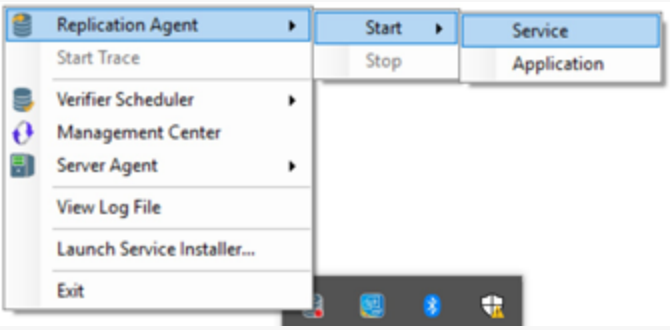
4. Run the Replication

If you installed The Replication Agent as a service during setup, you just need to start the service using the Service Monitor program in the Windows Notification Area.



The replication that you have scheduled should start at the specified time. Use the Replication Monitor tab in the Management Center to track the progress of the replication.

If you would like to install the Replication Agent as a service:

- From the Windows Desktop menu, choose **Syniti Data Replication**, then **Service Installer**.
- Manage the service from the Service Monitor program (located in the Windows Notification Area, or on the Windows menu under **Syniti Data Replication**).
- Use the Replication Monitor tab in the Management Center to track the progress of the replication.

To run the Replication Agent interactively:

- In the Windows Notification Area, select the Service Monitor icon.
- From the right mouse button menu, choose **Replication Agent**, then **Start** then **Application**.
  The replication that you have scheduled should start at the specified time.
- Use the Replication Monitor tab in the Management Center to track the progress of the replication.

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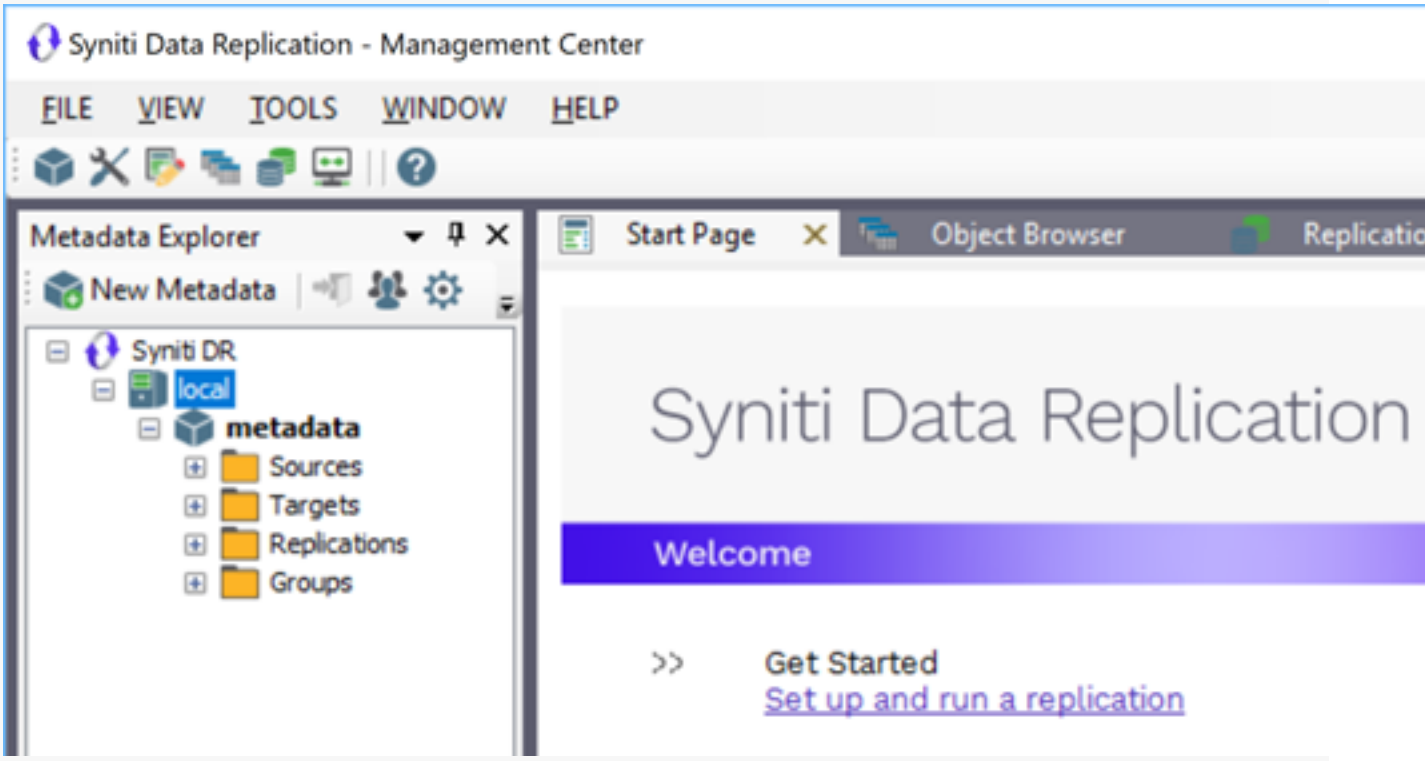
Steps for Replicating with Synchronization

Set up source database connection>Enable transactional replication>Set up target database connection>Create a target table>Enable target transactional replication>Define the Replication>Run the Replication

1. Set Up Database Connections

1. Make sure you have database connections via a .NET data provider to the supported databases for source database tables and target database tables.
2. Start the Management Center.

   Syniti Data Replication provides a default database (Microsoft SQL Server CE) for your metadata, all the information that Syniti DR needs to store about your replication setup.



3. In the Metadata Explorer, expand the metadata node to view the **Sources** and **Targets** nodes.

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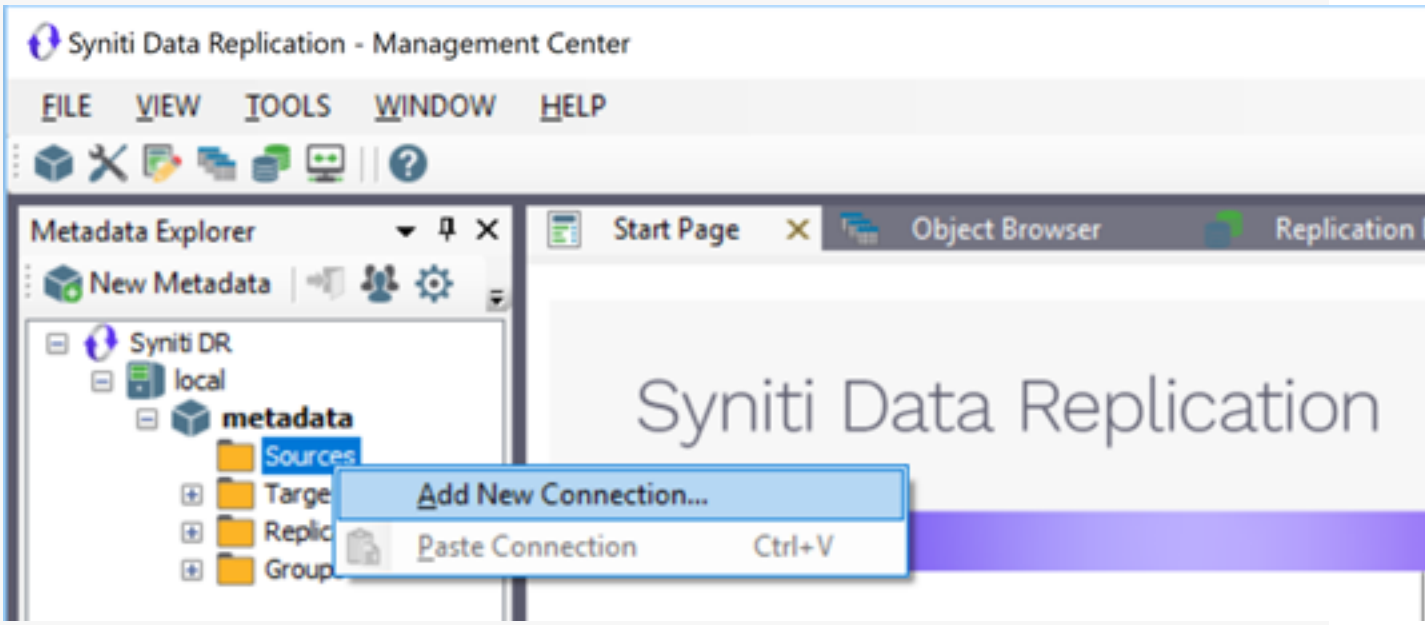
For tables involved in a synchronization, both tables serve as source and target tables. Changes to Table A (source) can cause Table B to be updated (target), but changes to Table B (source) can also cause Table A (target) to be updated. When defining a synchronization in Syniti DR, you need to specify one connection as the source connection and one connection as the target connection although they will both be used for source and target operations. Note that if the replication involves tables that have not yet been created, you should set the connection for the new tables as the target connection so that you can use Syniti DR to create the tables based on tables defined in the source connection.

4. Select the **Sources** node.
5. From the right mouse button menu, choose **Add New Connection**.



6. In the Add Source Connection Wizard, follow steps to add a connection string and test the connection to the database.
   Check the Supported Provider List in the Help Center before entering a value in the **Assembly** field.

   Note that the login/user ID that you provide must be unique to Syniti DR. It should not be used for any transactions occurring in either database involved in the synchronization. Syniti DR does not replicate transactions by the user you specify in this connection. This user ID is used by Syniti DR during synchronization to read the

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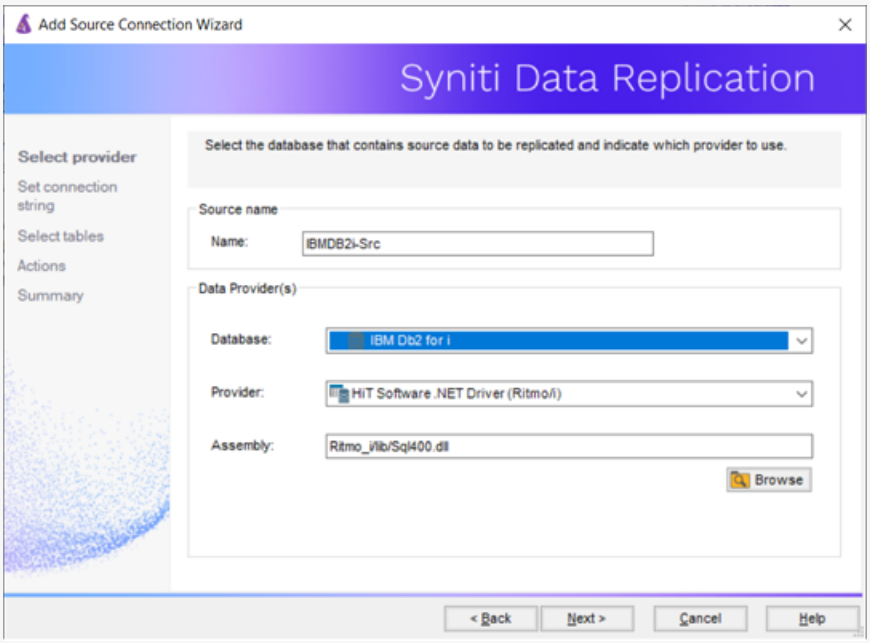
database logs and perform the synchronization operations. Therefore, any transactions found in the logs with this user ID are not replicated as part of the synchronization data.



7. In the **Select Tables** screen, choose the tables that you plan to replicate.

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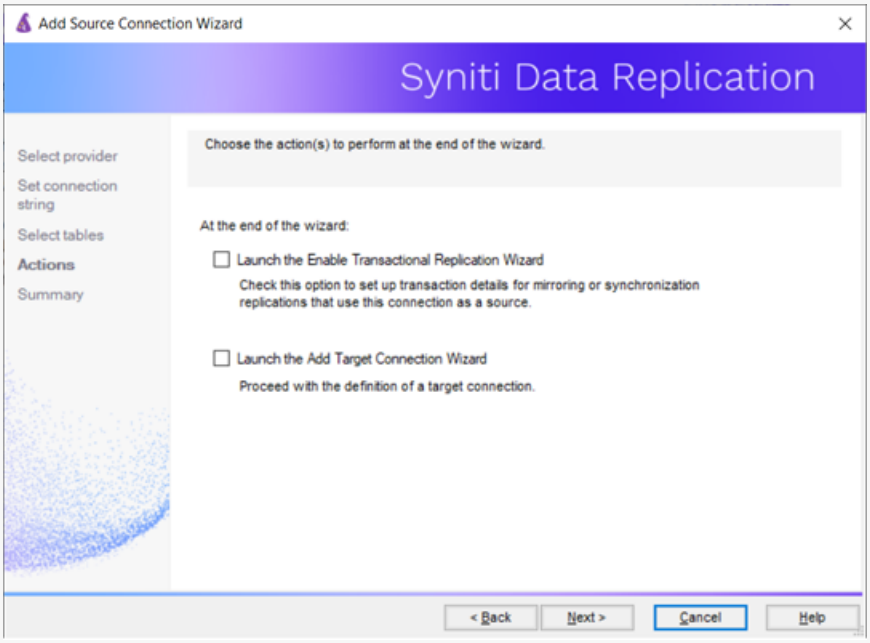
8. In the **Actions** screen, check the option **Launch the Enable Transactional Setup Wizard**.



9. Complete the wizard.

2. Enable Transactional Replication

This section assumes you have checked the Source Connection wizard option to launch the Enable Transactional Replication wizard. If not, to open the wizard from the Management Center, choose the connection in the Metadata Explorer, then right-click to choose **Transactonal Setup > Enable...**

In the Enable Transactional Replication wizard:

1. Select the type of transactional replication to use. The options depend on the source database and can include log reader, log server agent, triggers, plus log reader API (for IBM Db2 for i only)

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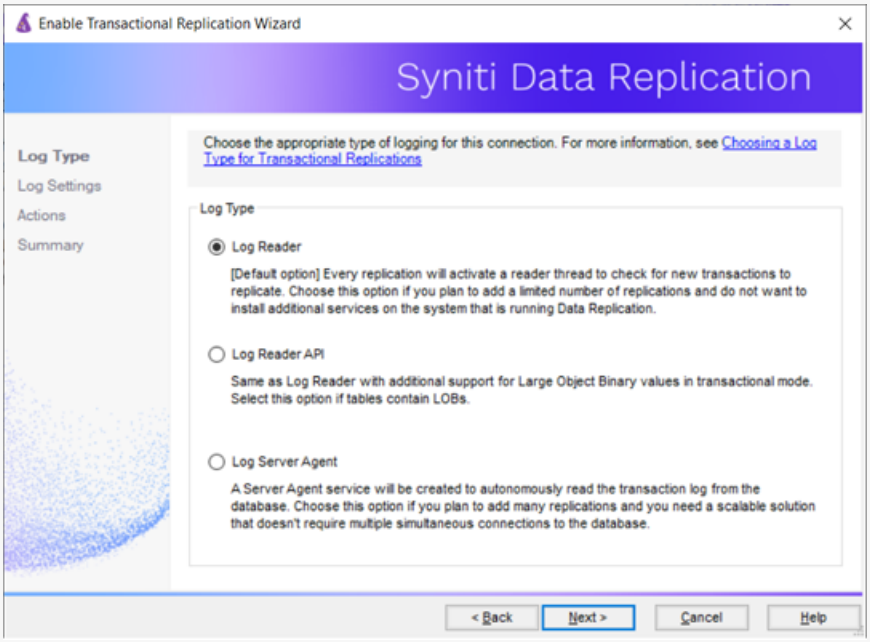
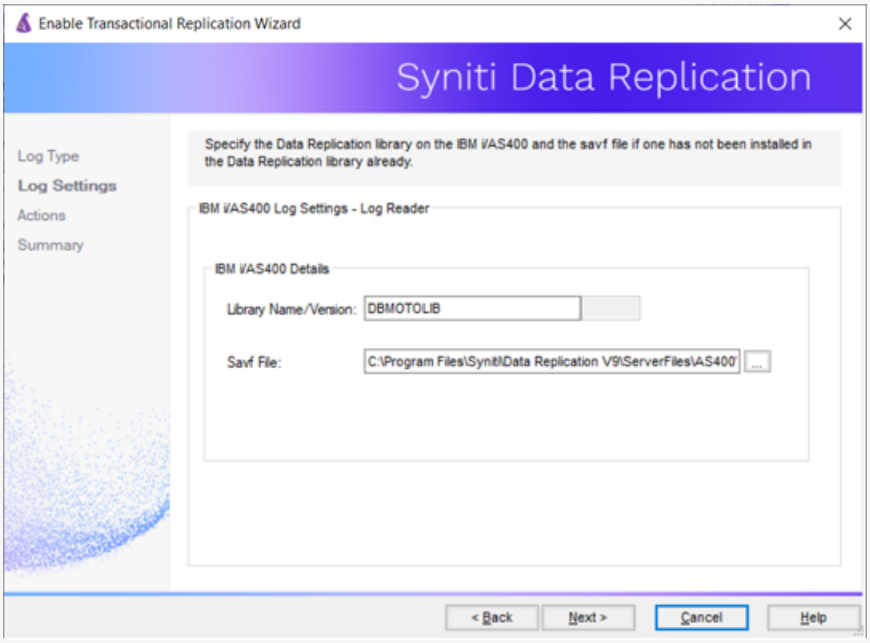


2. Click **Next** to enter the log settings. The fields and appropriate values depend on the database and log type.



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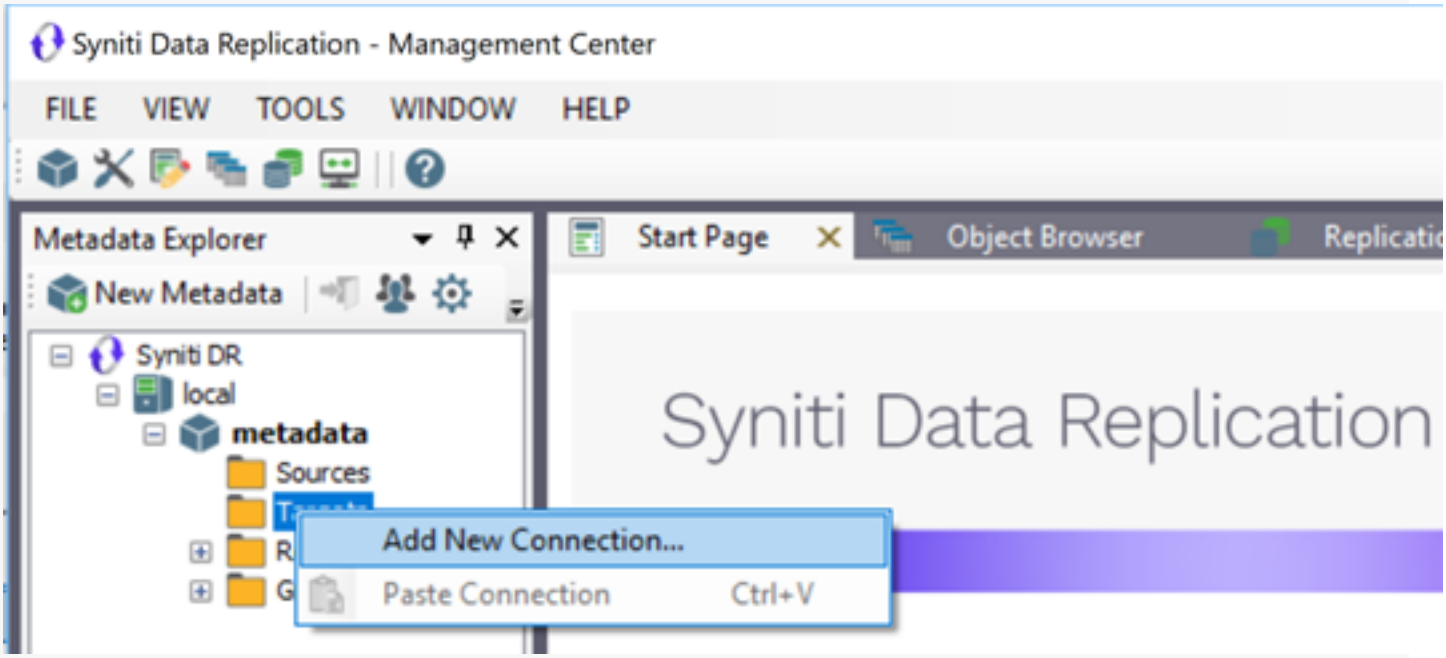
3. Click **Next** to verify your settings against the source connection to the database. If any information is missing, you will not be able to proceed.
4. In the Actions screen, check the option **Launch Add Target Connection wizard**.
5. Click **Next** to review your changes.
6. Click **Finish** to complete the wizard.

The source connection is now set up for transactional replications.

3. Set Up Target Database Connection

This section assumes you have checked the Add Target Connection wizard option to launch the Add Target Connection wizard. If not, to open the wizard from the Management Center, choose **Targets** in the Metadata Explorer, then right-click to choose **Add New Connection...**.



1. In the Add Target Connection Wizard, follow steps to add a connection string and test the connection to the database. Check the Supported Provider List in the Help Center before entering a value in the **Assembly** field.

   Note that the login/user ID that you provide must be unique to Syniti DR. It should not be used for any

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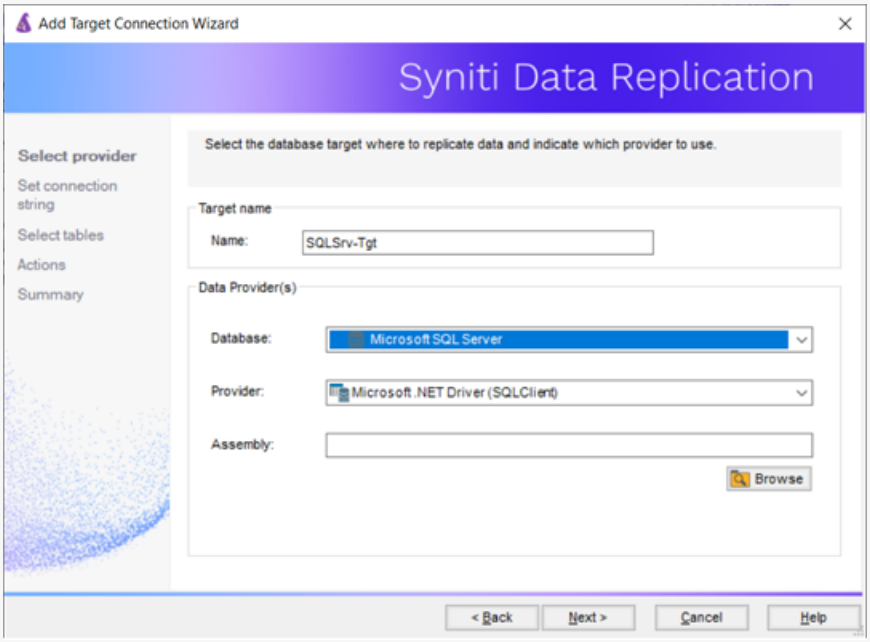
transactions occurring in either database involved in the synchronization. Syniti DR does not replicate transactions by the user you specify in this connection. This user ID is used by Syniti DR during synchronization to read the database logs and perform the synchronization operations. Therefore, any transactions found in the logs with this user ID are not replicated as part of the synchronization data.



2. Choose the tables to which you plan to replicate.
   If the table does not exist, continue to the next screen without selecting a table.
3. Complete the wizard.

4. Create a Target Table

If the target table does not exist, use the Create Target Table wizard to create the table.

1. In the Metadata Explorer, drag the source table to the target connection to open the Create Target Table wizard.
   The **Select Source Connection** screen is already filled out with the table you selected.,

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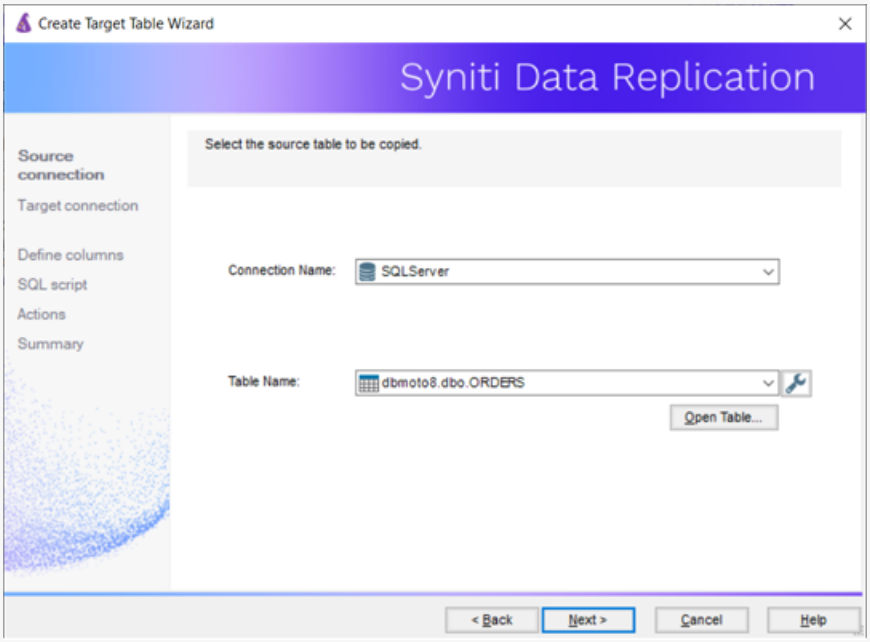

2. If you want more information about the table before proceeding, click **Open Table...**.
3. Click **Next** to go to the **Select Target Connection** screen.

   The screen fields have already been completed with the target connection details.

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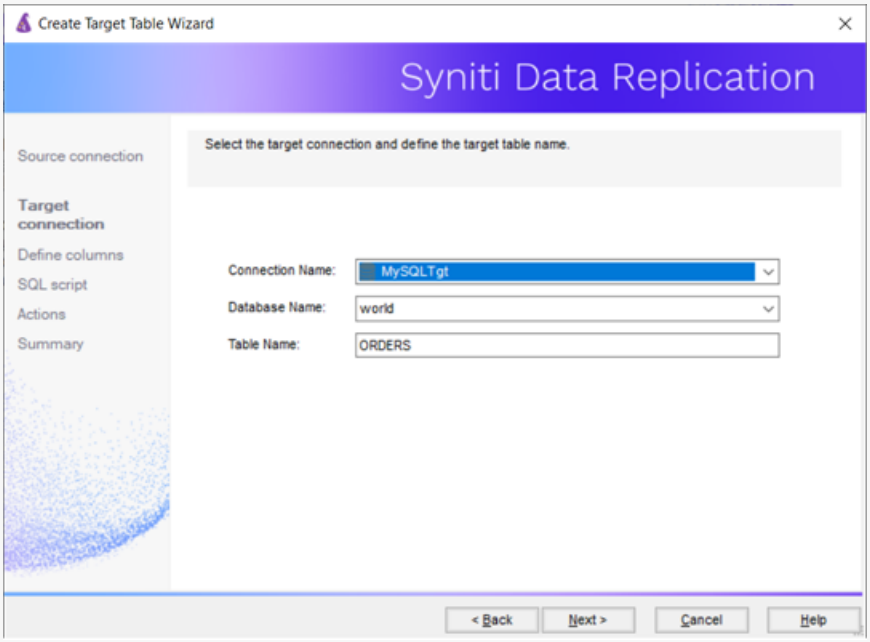
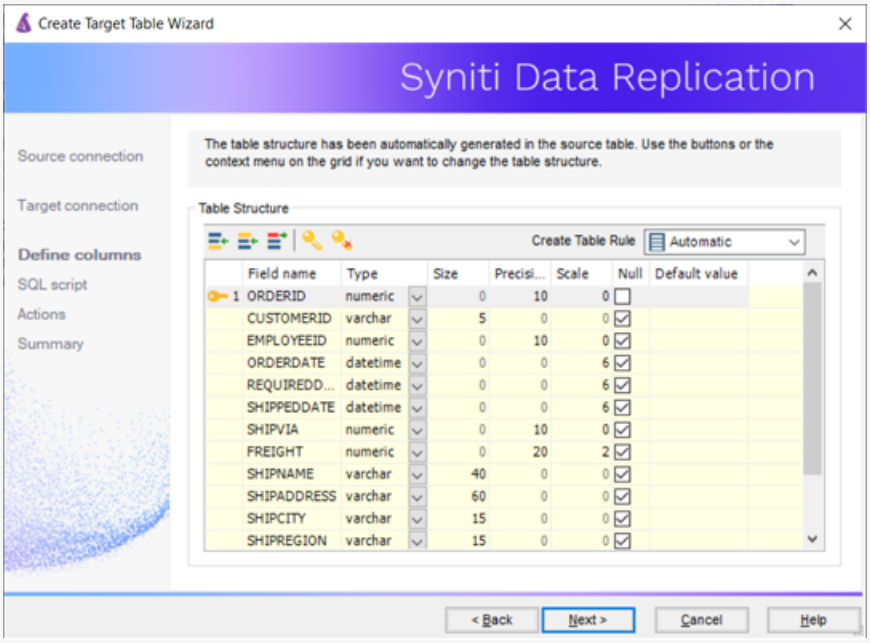


4. Click **Next** to go to the **Define Columns** screen.



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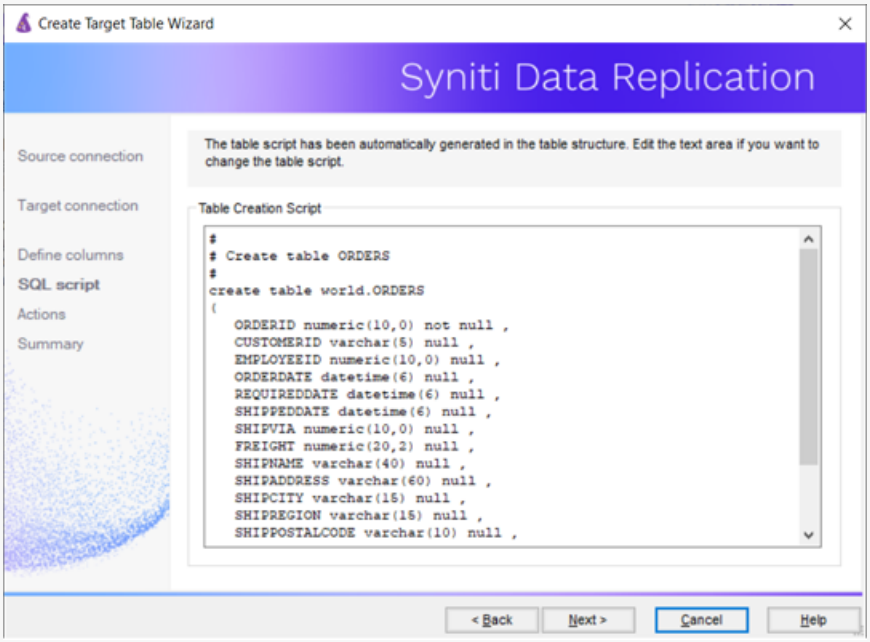
5. Review the columns that will be created in the target table. You can add or remove columns as well as designate one or more columns as a primary key.
6. When you have finished editing the target table columns, click **Next** to go to the **SQL Script** screen.



7. If necessary, edit the SQL script that generates the table.
8. Click **Next** to display the Actions screen.
9. To create additional tables, check the **Launch Create Target Table wizard** option.
   This opens another Create Target Table wizard when this wizard is complete.
10. To go directly to creating a replication once this wizard is complete, check **Launch Create Replication wizard** option.
    This opens the Replication wizard when the Create Target Table wizard is complete.
11. Click **Next** to view a summary.
12. Click **Finish** to create the target table.
13. Note that the new table is not automatically displayed in the Metadata Explorer. Click **Yes** to add the newly created table to the list of target tables in the Metadata Explorer.

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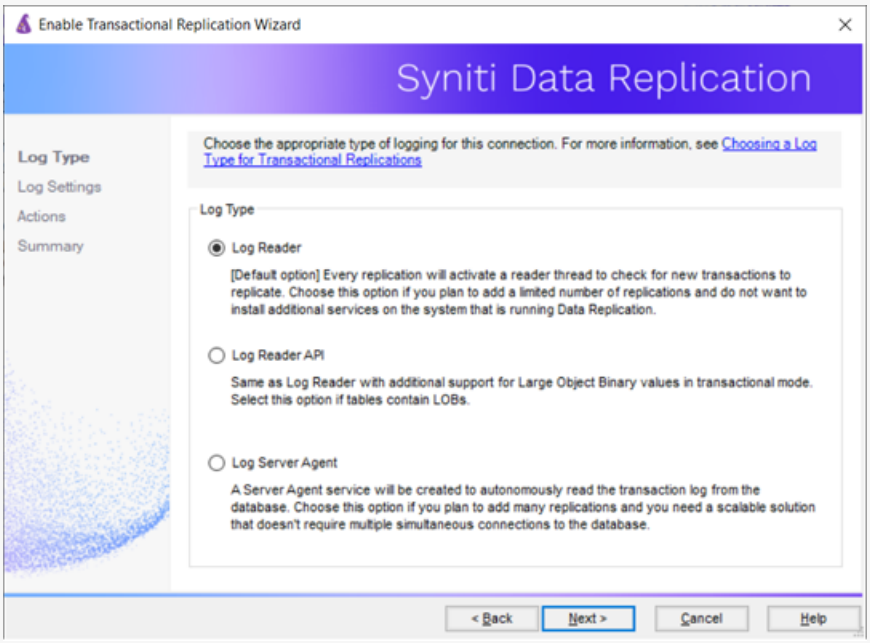
5. Enable Target Transactional Replication

1. Choose the target connection in the Metadata Explorer, then right-click to choose **Transactional Setup > Enable...**
2. In the Enable Transactional Replication wizard, select the type of transactional replication to use. The options depend on the source database and can include log reader, log server agent, triggers, plus log reader API (for IBM Db2 for i only)



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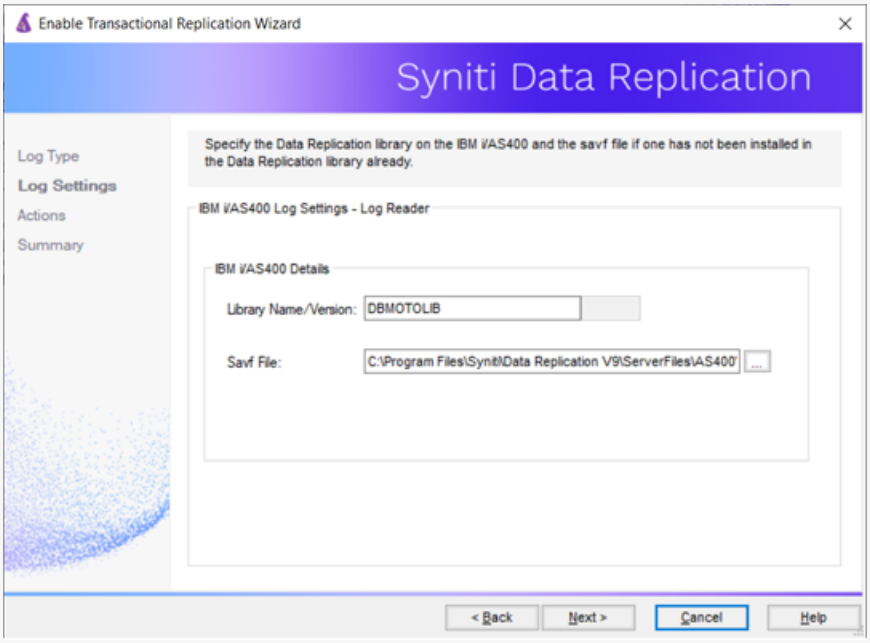
3. Click **Next** to enter the log settings. The fields and appropriate values depend on the database and log type.



4. Click **Next** to verify your settings against the source connection to the database. If any information is missing, you will not be able to proceed.
5. In the Actions screen, check the option **Launch Create Replication wizard**.
6. Click **Next** to review your changes.
7. Click **Finish** to complete the wizard.

The target connection is now set up for synchronization with the source database.

6. Define the Replication

This section assumes you have checked the Create Replication wizard option to launch the Create Replication wizard. If not, to open the wizard from the Management Center, choose the table you want to replicate in the Metadata Explorer, then right-click to choose **Replication > Create New Replication...**

1. In the **Define Replication Type** screen, type a name to identify the replication.
2. Optionally provide a description of the replication.

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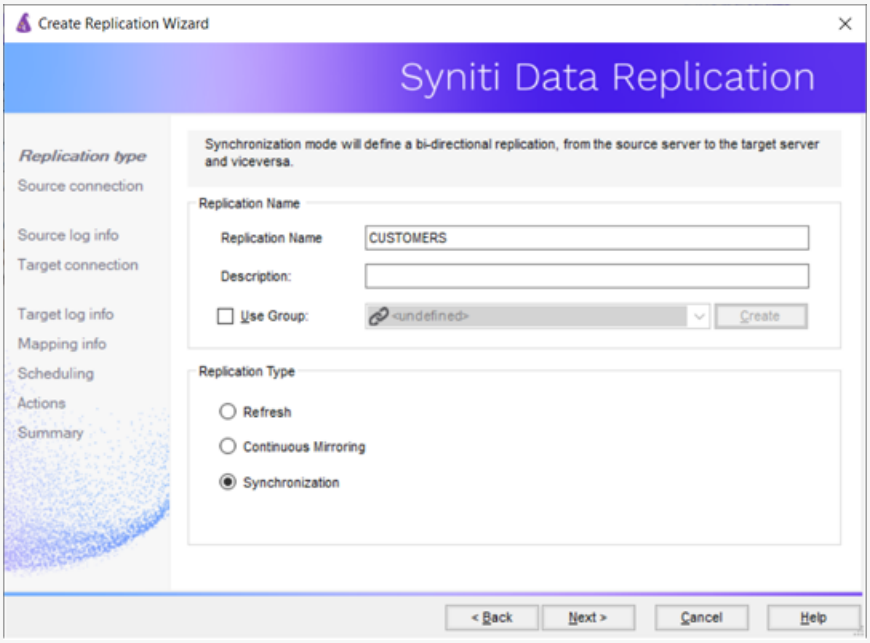
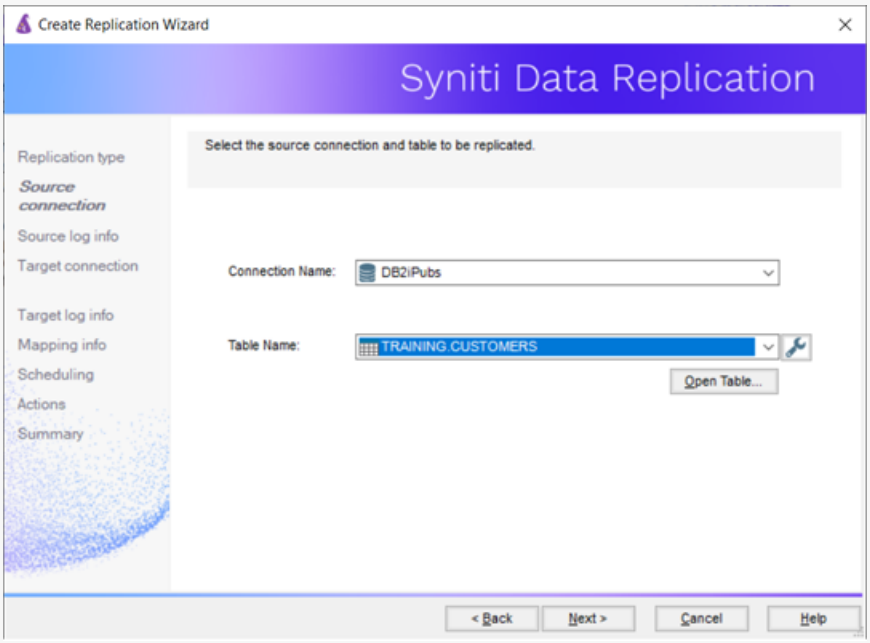
3. In the Replication Mode area, choose **Synchronization**.



4. Click **Next** to go to the **Select Source Connection** screen.



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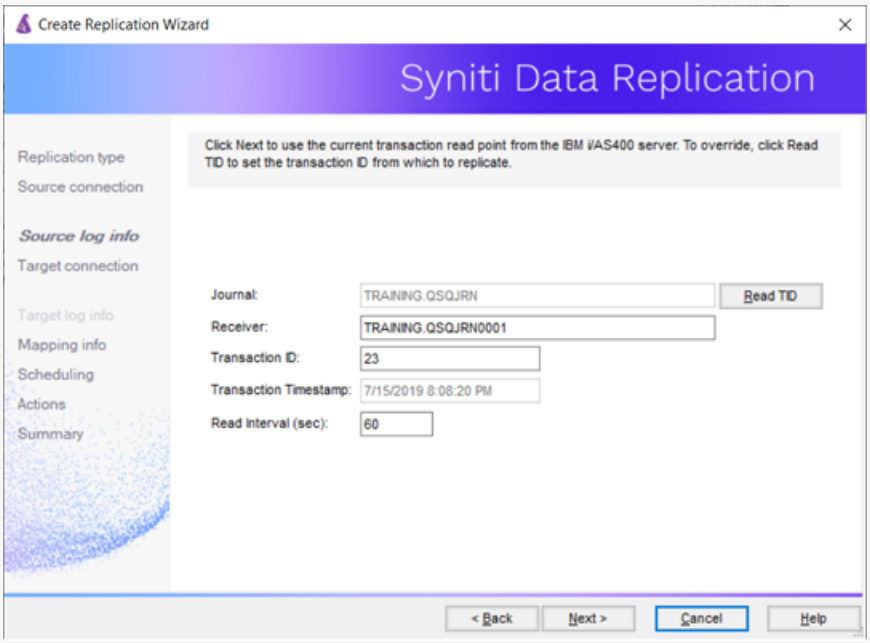
5. Choose the source name from the drop-down list that includes all the source connections you have created.
6. Choose the table that you want to replicate from the drop-down list.
7. If you want more information about the table before proceeding, click **Open Table...**.
8. Click **Next** to go to the **Source Log Info** screen.



The first two fields on this screen depend on the source database you are using. In this explanation, we assume you are using IBM Db2 for i (iSeries or AS/400). Check the help for the Replication Wizard for details on the other databases.

The Journal field is automatically filled in by retrieving the information from Db2 for i. The Receiver field will be automatically filled in after setting the Transaction ID. You do not need to modify these fields. However, if the library that you have specified as a source is not journaled, you will need to ask your system administrator to journal the library.

9. In the **Transaction ID** field, click **Read** to open the Read Point dialog.
10. Choose either the current transaction or a transaction ID based on a time and date.
11. Click **OK** to add the value to the **Source Log Info** screen.

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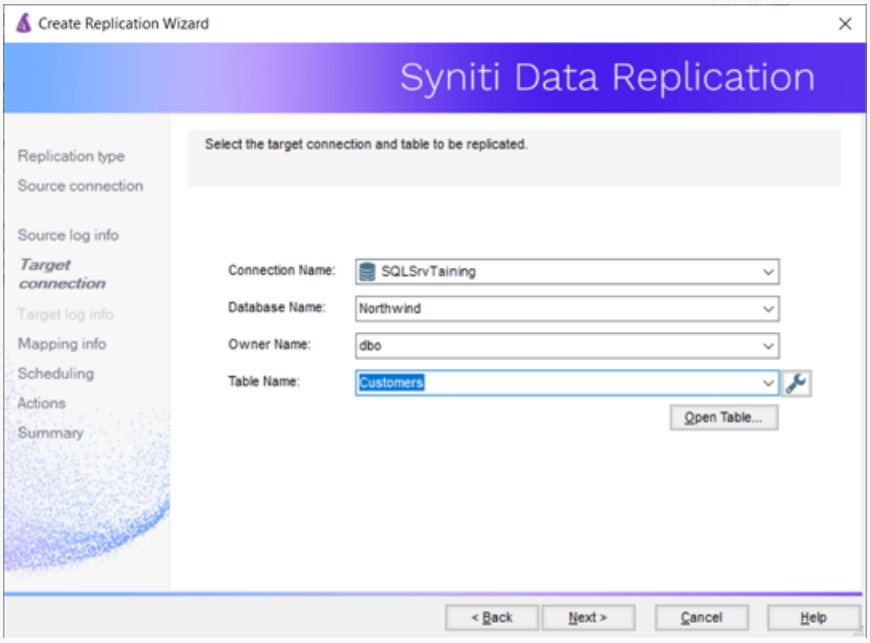
12. Set the value of the **Read Interval** field to the frequency with which you want Syniti DR to check the transaction log for new events to mirror.
13. Click **Next** to go to the **Select Target Connection** screen.



14. Choose a target source name from the drop-down list that includes all the target connections you have created in Syniti DR.
15. Choose the table to which you want to replicate from the drop-down list.
    If no tables are listed, you need to exit the wizard and add or create a target table.
16. If you want more information about the table before proceeding, click **Open Table...**.

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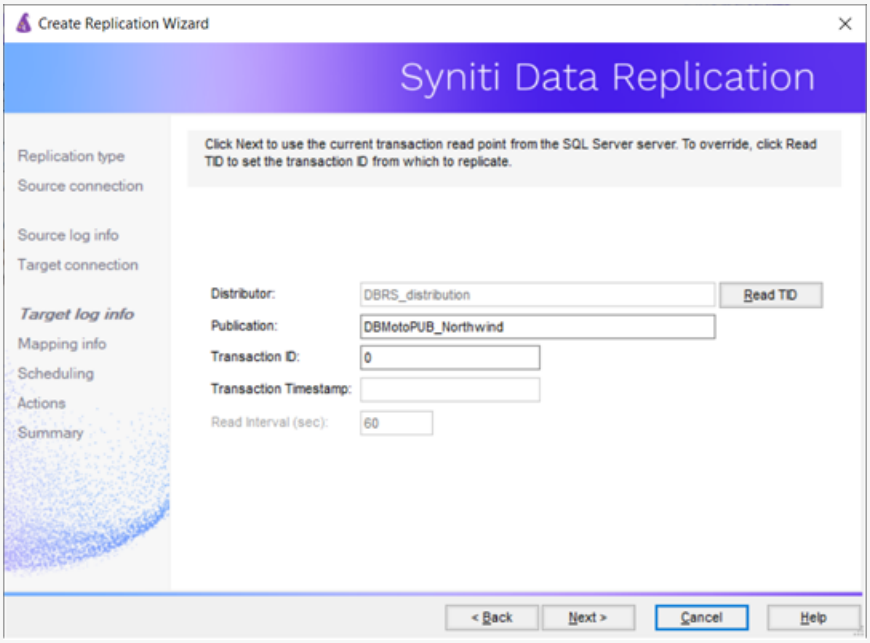
17. Click **Next** to go to the **Target Log Info** screen.



Note: If you encounter a connection error at this stage, check that you have used the appropriate IDs for your connections by going to the Connection Properties dialog for your source and target connections. For SQL Server, you need a non system administrator login for replication and a system administrator login for accessing the transaction log.

18. In the **Transaction ID** field, click **Read** to open the Read Point dialog.
19. Choose either the current transaction or a transaction ID based on a time and date.
20. Click **OK** to add the value to the **Target Log Info** screen.
21. Set the value of the **Read Interval** field to the frequency with which you want Syniti DR to check the transaction log for new events to mirror.

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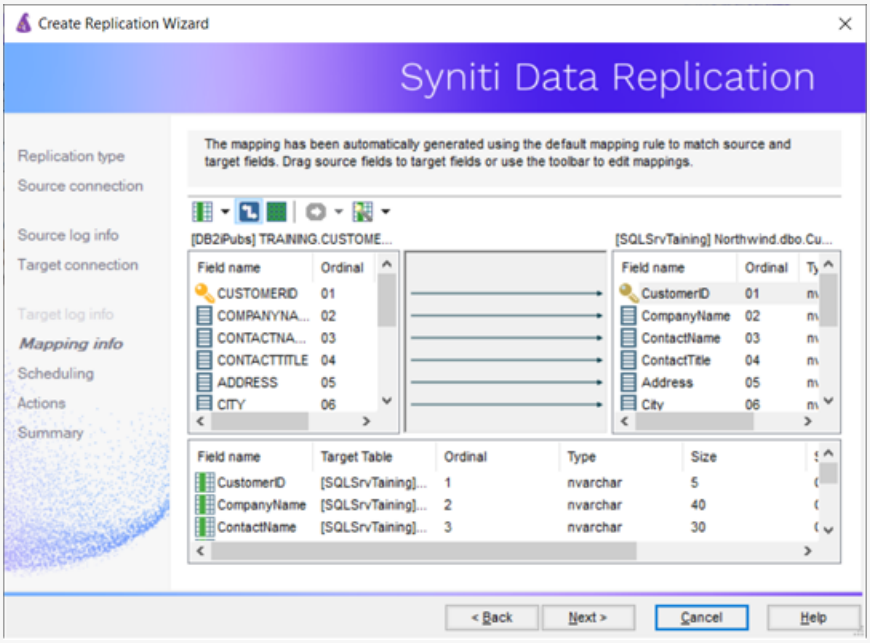
22. Click **Next** to go to the **Set Mapping Info** screen.



Source and target columns with the same name are automatically mapped. You can also map columns by dragging the target column and dropping it on the source column, or you can map a column to an expression. For more information about mapping, check the Replication Wizard help topic. An alternative is to write a script to set mappings at runtime.

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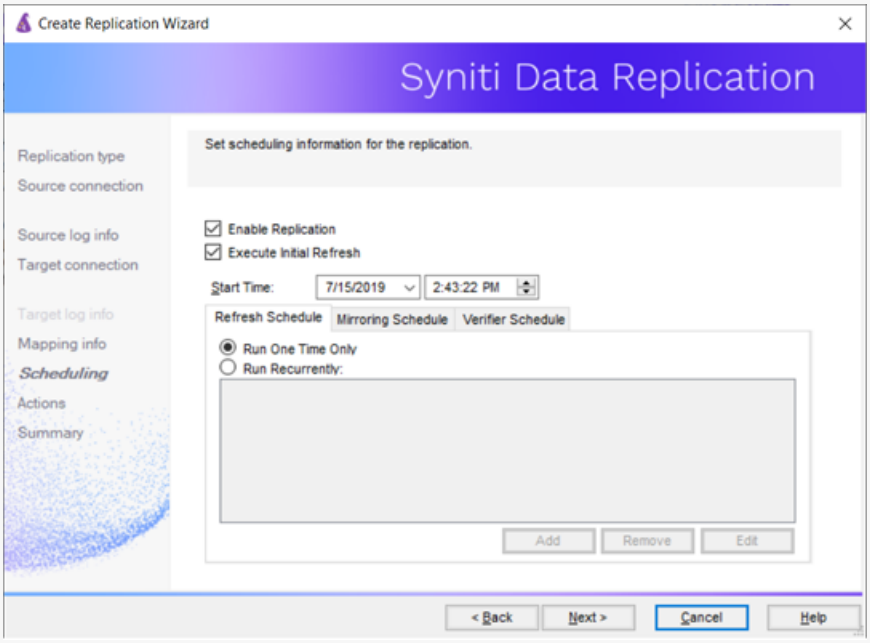
23. Click **Next** to go to the **Scheduling** screen.



24. Make sure the **Enable Replication** option is checked. This is required for the replication to run.

25. Set a start time for the replication. The **Start Time** field indicates the time at which the Replication Agent will begin considering the replication for execution.

26. Check the option to **Execute Initial Refresh** if needed.
    If you check this option, a full replication will be performed from the source to the target table, prior to starting the sychronization process where only incremental changes will be replicated. The initial refresh is always performed from the source connection to the target connection. Note that any transaction submitted during the time that the refresh is running might not be replicated. It is strongly suggested that you avoid updating the designated source and target tables until the refresh is done.

27. Go to the **Mirroring Schedule** tab.

28. Select how you want to run the replication:

    - Run Continuously: the transaction log will be checked for changes to the table using the frequency that you specified on the Set Log Info tab. Any changes will be replicated to the target table.

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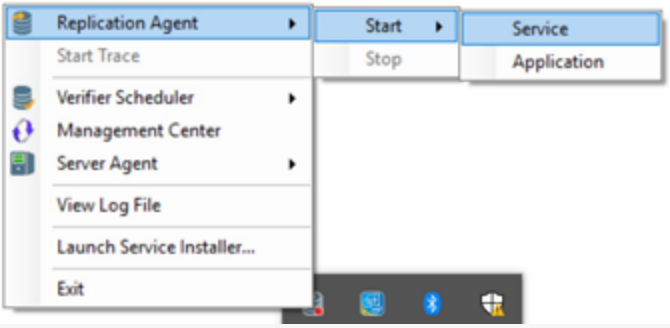
- Schedule Interruptions: the replication process will run as above, except for interruptions specified when you click the Schedule button in the Scheduler dialog.

20. Click **Next** to go to the **Summary** screen.
21. Click **Finish** to complete the wizard.

4. Run the Replication

If you installed The Replication Agent as a service during setup, you just need to start the service using the Service Monitor program in the Windows Notification Area.



The replication that you have scheduled should start at the specified time. Use the Replication Monitor tab in the Management Center to track the progress of the replication.

If you would like to install the Replication Agent as a service:

- From the Windows Desktop menu, choose **Syniti Data Replication**, then **Service Installer**.
- Manage the service from the Service Monitor program (located in the Windows Notification Area, or on the Windows menu under **Syniti Data Replication**).
- Use the Replication Monitor tab in the Management Center to track the progress of the replication.

To run the Replication Agent interactively:

- In the Windows Notification Area, select the Service Monitor icon.
- From the right mouse button menu, choose **Replication Agent**, then **Start** then **Application**.

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The replication that you have scheduled should start at the specified time.

- Use the Replication Monitor tab in the Management Center to track the progress of the replication.

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What's New in Release 9.8.2

Here are highlights of the significant changes you will find in Syniti Data Replication 9.8.2.

- [ALL] Removed vulnerability caused by Avro.dll (v. 1.10.2) and Newtonsoft.Json.dll (v. 10.0.3), by upgrading their version.
- [ALL] Allow multiple triggers to be defined on same tables using different master tables.
- [ALL] Fixed bug in Replication Agent, null reference exception when adding a replication to a group.
- [All] Fixed an error when executing Verify Replication of a table in which the "time without time zone" data type exists on PostgresSQL
- [ALL] Connection to Azure SQL Server was saved to use SqlServer database and not SQLAzure.
- [All] Added Parquet support for Azure Data Lake.
- [All] Added tracking info ("created_by", "created_at", "modified_by", "modified_at") to connections, replications, groups, schedulers, alerts, and objects.
- [MC] Fixed error when running Custom Restore on metadata that contained partition refresh items.

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Upgrading to the Latest Version of Syniti Data Replication

If you have DBMoto V8 or V9 installed, the upgrade process involves running a new setup and applying a new license key. For earlier versions of DBMoto, contact our technical support team via the Help Center.

1. Download the latest Syniti DR version as directed by the support staff.
2. Make sure that you obtain your new license key (if needed) before starting the installation process. Contact your account manager if you encounter issues with your license key.

   NOTE: **Before upgrading to Syniti Data Replication 9.7.0.24 or later from any earlier version**, take the following steps

   - Stop the Replication Agent/Data Replicator of the current version of Syniti DR (DBMoto).
   - Open the Management Center and select the **metadata** node.
   - Back up the metadata.
     Metadata backup is not only important to keep a copy of the current metadata settings: it also commits any pending changes that are waiting to be saved in the metadata database that may be lost when a product upgrade is performed.
   - Close the Management Center.
   - Stop the Server Agent.
3. Run the setup.exe.
4. If you are installing Syniti DR over an existing installation of DBMoto or Syniti DR, a dialog is displayed with the following text.
   ```
   An older version of Syniti Data Replication has been detected on this computer.
   Click YES to Upgrade to the latest version.
   ```
5. Click **Yes** to proceed with the installation. Click **No** to exit the installation.
6. If you are installing V9.5 or above over V9.0, and you have set up replications using the Log Server Agent, you will see a dialog notifying you that services are running. Log Server Agent services are typically named with the prefix DBMoto_LSA_.

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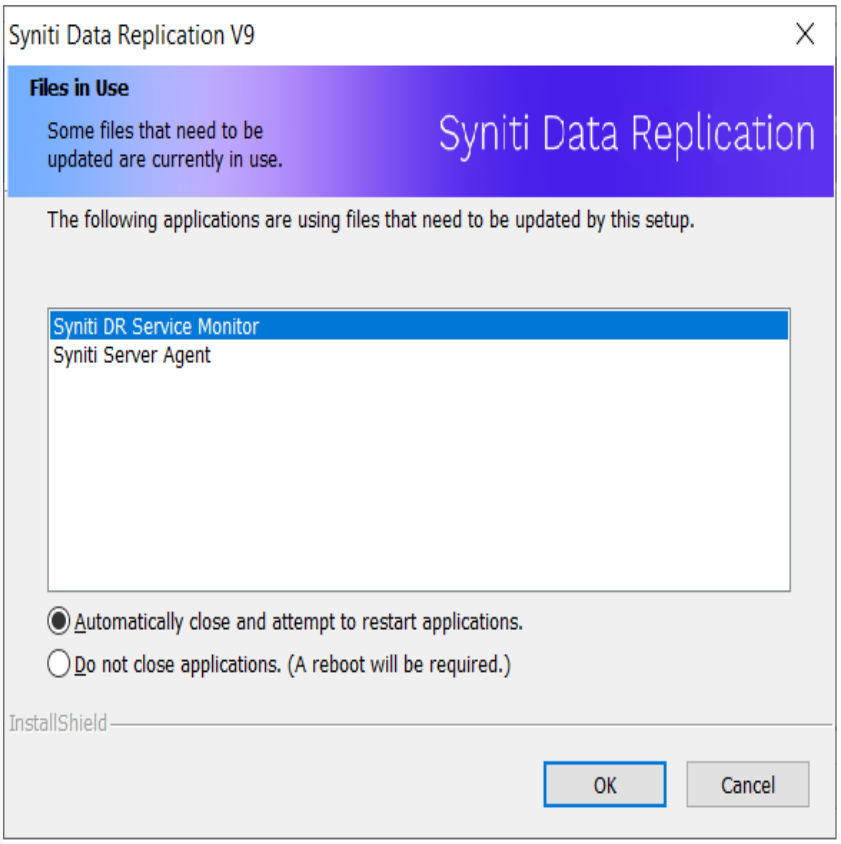

7. Click **OK** to stop the services.

   IMPORTANT: The services created for the Log Server Agent are not started automatically following installation of Syniti DR 9.6. You must start these services manually.

8. There are two installation options:

   Standard Installation: Installs Management Center, Server Agent and Replication Agent

   Management Center Only: Installs only the Management Center component, used for managing and monitoring remote installations of Syniti DR.

   Select the **Standard Installation** option.

9. If a dialog like the following is displayed, check the option to **Run a metadata backup before upgrading**, unless you have already made an up-to-date backup of your metadata.

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10. Click **Yes** to continue with installation.
11. Enter the pathname to your Syniti DR license file when requested.
12. Complete the installation.
13. You are now ready to run the Management Center and explore features in the new release.
14. If you were using Log Server Agent services in DBMoto V9, go to the Windows Task Manager Services tab to restart the services that were created during Log Server Agent setup.
15. If you are using IBM Db2 for i as one of your source connections, you may also see a dialog about updating the DBMOTOLIB. Take the following steps after installation is complete.
    - Start the Management Center, then view the Connection Properties for your IBM Db2 for i connection.
    - In the Transactional Setup field, right click and choose Manage... from the menu.

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Setting Up Your Environment

This section contains topics that describe:

Syniti Data Replication Installation and Architecture

- Installing Syniti Data Replication
- Syniti DR Requirements
- Adding a Server to the Management Center
- Managing a License
- Upgrading from Earlier Versions
- Installing Syniti DR from a Windows Command Line

Database connections

- Creating Database Connections
- Available Source and Target Options
- Choosing a Log Type for Transactional Replications
- Log Server Agent Settings
- Trigger-based Transactional Replication Settings

Security

- Security Options
- Setting Up Users
- Installing a Certificate

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Requirements

The following are suggested minimum requirements for the environment where you will run the Syniti DR Replication Agent. The actual requirements depend very much on your environment and your data replication needs. For more information, contact technical support via the Help Center.

- The system where the Replication Agent is running should have at least a quad-core processor, 8 GB memory and 200GB hard disk space.
- .NET Framework 4.8 or higher must be installed.
- You need a .NET connection to the database(s) that you want to use in replication (except in cases where an ODBC driver is supported.) Check the Database Access Provider List in the Help Center, the appropriate setup guide for your database in the Help Center, or the Database-Specific Settings section in this guide.

Supported Windows Versions

- Windows 8
- Windows 10
- Windows 11
- Windows Server 2012
- Windows Server 2019

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Recommendations for Installation Location

Syniti Data Replication has been designed to run over a network using client/server technology. Here are some recommendations about the location of the Syniti DR installation.

Install Syniti DR on the source database system when:

- Data to be replicated represents a small portion of the total source data. If you are using filters and performing mapping to only a small number of fields, executing filters and mapping locally (on the same system, or within the same local network) will add minimal load to the network.
- The actual time to extract data from the database is particularly long (as can happen with IBM Db2 for i, for instance.) In this case, having Syniti DR local to the source will not add network overhead to the already slow reader thread.
- There are security concerns. If the source database contains critical data that should not be sent to the target, limiting access to applications from an external network and preventing this data from traveling across the network is advisable.
- Using the Log Server Agent approach for transactional replications (mirroring and synchronization.) In general, if connections use the Log Server Agent, it is better to install Syniti DR local to the source database. It is more efficient to move the Log Server Agent data files across the netwrok than to access and run the Log Server Agent remotely.

Install Syniti DR on the target database system when:

- The replication process uses several lookup functions on the target database (e.g. when running scripts.) It is more efficient to access target data locally (on the same system, or within the same local network.)
- The actual time to write data from the database is particularly long (as can happen with IBM Db2 for i, for instance.) In this case, having Syniti DR local to the target will not add network overhead to the already slow writer thread.

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Installing Syniti Data Replication

Syniti Data Replication is distributed as a setup file and must be installed on a Microsoft Windows system that meets the configuration requirements. It can be installed as a **standard installation** (entire Syniti DR environment including Management Center, Replication Agent and Server Agent) or as a **client** (Management Center only for managing replications remotely.) You can choose to install Syniti DR on the system running the source database, or the system running the target database, or an independent system that has network access to the source and target database systems. Check Recommendations for Installation Locations for recommendations.

In addition to installing the Syniti DR files, you need to:

- Install and test .NET Data Providers for your source and target databases. For a list of all supported databases, check the Database Access Provider List in the Help Center.
- Check to see if there is a Setup Guide for your source database in the Help Center.

Follow the steps below to install and set up Syniti DR server.

1. Check that the system where you are installing the server meets the Syniti DR requirements
2. Make sure that you have a Syniti DR 9.x license key file available.
3. Run the setup.
4. When you reach the **Setup Type** screen, click the **Standard Installation** option.
5. In the **Customer Information and Setup Options** screen, click **Import**, then supply the path name to the license file that you received via email.
6. If you want to install the Replication Agent as a Windows service, check the option, but note that the service does not start automatically by default.
   The advantage of installing the data replicator as a service is that you can set it to run automatically when your server starts up again after failing. Without the Replication Agent service, you will need to run the Replication Agent manually each time your system restarts.
   In addition to installation of Syniti DR files, the setup program:
   - Creates an entry under **Syniti Data Replication V9** on the **Start** menu on the Windows desktop.
   - Starts the Server Agent

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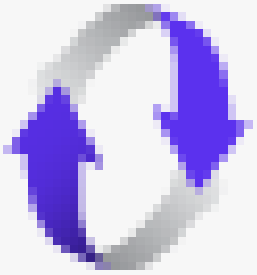
- Adds the local server (the system on which you installed Syniti DR) to the Management Center list of servers
- Places the Service Monitor program in the Windows Notification area (System Tray.) You can use this program to start the Replication Agent service after creating metadata tables in the Management Center.

7. On your Windows desktop, start the Management Center in one of the following ways:

   - On your Windows desktop, double-click the Management Center icon.

   - In the Windows Notification area (System Tray), right click **Syniti DR Service Monitor** and choose **Management Center** from the right mouse button menu**.**

9. In the Management Center, you can:

   - Add other Syniti DR servers to monitor/manage
   - Establish accounts and security permissions for Syniti DR users
   - Create a replication. Use the following help topics to guide you:
     Steps for Replicating a Table Using Refresh Mode
     Steps for Replicating with One-Way Mirroring
     Steps for Replicating with Synchronization

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Managing a Syniti DR License

When you first download Syniti DR, you should receive your Syniti DR evaluation license via email. The email consists of a text message with your company name and license key. A license file called dbmotolicense_*company*.txt is attached to the email.

During installation of Syniti DR, you are required to supply the pathname to the license file.

If at any time you need to update your license (typically when you purchase Syniti DR and receive a permanent license), you can use the License Information dialog in the Management Center. Note that you must always have a single valid license file for Syniti DR. New license files should contain ALL your license details. Therefore, when you import a new license file, it will replace the previous license file.

1. In the Management Center Metadata Explorer, select the server for which you want to modify the license.
2. From the right mouse button menu, choose **Manage Licenses**.
3. In the License Information dialog, click **Import License**.
4. In the new dialog, provide the pathname to the license file (dbmotolicense_*company*.txt) you received via email.
5. Click **OK** to close the dialog.
6. Verify your new license in the License Information dialog.
7. If the license key is not valid, double-check that you have entered all information correctly. Contact the support team via the Help Center if you encounter further problems.

To view existing license information at any time:

1. In the Management Center Metadata Explorer, select the server for which you want to modify the license.
2. From the right mouse button menu, choose **Manage Licenses**.
3. Click **Export** to print all license information to a file.

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Creating Database Connections

With Syniti Data Replication, you can use a .NET data provider, an OLE DB Provider or an ODBC driver to connect to the databases used in your replication. Check the Available Source and Target Options and the Help Center for a list of supported databases and drivers/providers.

You will need connections to the following databases:

- Metadata database (Default connection to Microsoft SQL Server CE provided)
  The database you use to store tables containing information and settings for the replication process. Syniti DR provides a default database connection to SQL Server CE (included with Syniti DR) so you do not need to create a connection for your metadata. However, you can choose to store metadata in a different database by creating a metadata connection to the database. To use a different database for your metadata, in the Metadata Explorer, choose and complete the Metadata Connection wizard.
- Source database
  The database that contains the tables you want to replicate.
- Target database
  The database that will contain the replicated tables.

Follow the steps below to set up Syniti DR for replication.

1. For each database you are planning to use in your replication project:
   - Install and configure one of the third-party supported data access providers. (See a list of providers in the Help Center)
   - From the data access product, test the connection to the database.
   - Create a connection string for the data access product/database you are using. Check the documentation for the data access product for information on how to do this.
2. In the Management Center Metadata Explorer, expand the node for your metadata to view the **Sources** and **Targets** nodes.
3. Check to see if there is a Setup Guide in the Help Center for your source database to learn all the steps involved in setting up the connection correctly.
4. Select the **Sources** node.

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5. From the right mouse button menu, choose **Add New Connection**.
6. In the Source Connection Wizard, follow steps to add a connection string and test the connection to the database.
7. Choose the tables that you plan to replicate.
8. Complete the wizard.
9. Select the **Targets** node.
10. From the right mouse button menu, choose **Add New Connection**.
11. In the Target Connection Wizard, follow steps to add a connection string and test the connection to the database.
12. Choose the tables to which you plan to replicate.
13. Complete the wizard.
14. You are now ready to create target tables, set up for transactional replications or create a replication.

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Source and Target Options

This section contains topics that describe settings needed for specific replication sources and targets.

- Relational Databases
- Non-relational Databases and Other Targets

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

Relational Databases	Refresh		Mirroring		Synchronization
	Source	Target	Source	Target	
Actian Vector	×	×		×	
Amazon Aurora MySQL	×	×	×	×	×
Amazon Aurora PostgreSQL	×	×	×	×	×
Amazon Redshift	×	×		×	
Greenplum		×		×	
Gupta SQLBase	×	×	×	×	×
IBM Db2 LUW	×	×	×	×	×
IBM Db2 for i	×	×	×	×	×
IBM Db2 for z/OS	×	×	×	×	×
IBM Informix	×	×	×	×	×
IBM PureData	×	×	×	×	

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Ingres	×	×		×	
MariaDB	×	×	×	×	×
Microsoft Access	×	×		×	
Microsoft Azure SQL Database	×	×	×	×	×
Microsoft Azure Synapse Ana-lytics		×		×	
Microsoft SQL Server	×	×	×	×	×
Microsoft SQL Server CE	×	×	×	×	×
MySQL	×	×	×	×	×
Oracle	×	×	×	×	×
PostgreSQL	×	×	×	×	×
Progress OpenEdge	×	×	×	×	
SAP HANA	×	×	×	×	×
SAP Sybase ASE	×	×	×	×	×
SAP Sybase IQ	×	×	×	×	×
SAP Sybase SQL Anywhere	×	×	×	×	×
Snowflake	×	×		×	
solidDB	×	×		×	
Teradata	×	×		×	

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Tibero	×	×		×	
Vertica	×	×		×	

Non-relational DBs & Other Targets	Refresh		Mirroring	
	Source	Target	Source	Target
Amazon DocumentDB		×		×
Amazon S3		×		×
Apache Cassandra	×	×		×
Apache Kafka		×		×
Apache Parquet				
Confluent Cloud (Kafka)		×		×
CSV (Flat file)	×	×		×
Google BigQuery		×		×
Hadoop		×		×
JSON		×		×
Microsoft Azure Data Lake Storage		×		×
Microsoft Azure Event Hubs		×		×
MongoDB Atlas		×		×
XML		×		×

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Choosing a Log Type for Transactional Replications

The Enable Transactional Replication wizard allows you to configure access to data changes on a source database (for mirroring and synchronization) or a target database (for synchronization). Depending on the source database, available options for identifying data changes are:

Log Reader

Reads the native database transaction log using a Syniti DR reader thread for each replication. This option is the default choice and works well if you have a limited number of replications and do not want to install additional services on the system that is running the Server Agent component.

Log Server Agent

Creates a Windows service on the system running the Server Agent that makes only a single connection to the database to read the binary log for all replications in a source connection. The service autonomously reads the native database transaction log and writes all changes from the tables being replicated into intermediate binary log files (a Syniti proprietary format) in a specified folder. The Replication Agent reads the changes from the intermediate binary log files.

Choose this option if you plan to add many replications and you need a scalable solution that optimizes access to the native database transaction log.

Below is a summary of the advantages and disadvantages of replicating the Log Reader transactional replication mode versus using the Log Server Agent transactional replication mode:

	Log Reader	**Log Server Agent**
Advantages	**Simple to configure** **Standalone configuration** Each replication connects directly to the source database and does not rely on other components – which at times may be stopped or in error or in any other state.	**Performance** The Log Server only uses ONE instance of the native database log reader to query for data changes – regardless of the number of replications and groups. The Log Server queries the database for all changes in a data source at the same time and then stores them in

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		intermediate log files. The replications and groups then read changes from the intermediate log files (very efficient.) **Less physical log file retention required** Because the Log Server runs continuously in the background, it can capture data changes more rapidly, and it stays running independently even when Syniti DR goes down. It requires the database to retain physical log files for shorter periods.
Disadvantages	• Query performance decreases as the number of replications or groups increases because each replication or group requires Syniti DR to create a reader thread to query the database for changes. For example, if a data source has 2 single replications and 10 group replications, Syniti DR would need to create 12 threads to query the database for data changes. • As performance decreases, the database has to retain physical log files longer until all changes are returned to	• Additional file management: an extra application, the Log Server Folder, and Log Files Folder. However, the application management tasks are not complex.

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	Syniti DR. · If Syniti DR goes off line, the database also has to retain physical log files until Syniti DRrestarts and queries all the changes.	

Triggers

Creates a trigger on the database for each replication to log data from committed transactions. This option is useful when neither the Log Reader or the Log Server Agent meet the needs of your environment. For example, use triggers when:

- There are no primary keys and the source is Microsoft SQL Server.
- All column data (before and after image) is needed. Some standard log readers only return record changed values
- Performance is better because only relevant information is logged and Syniti DR does not read the entire database log
- The source database is MySQL versions prior to 5.1.5 or you are preforming MySQL synchronization replications

Log Reader API

This option is available only when replicating from IBM Db2 for i, and is specifically designed for replications that include Large Object Binaries.

Remote Log Server Agent

This option is available only when replicating from Oracle situations where the standard Log Server Agent approach does not meet the performance requirements for your environment. It involves installing a Java application on the Oracle server which communicates directly with the Log Server Agent, bypassing the Oracle Log Miner.

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Copying Database Connections

Once you have created a source or target connection in the Management Center, you can copy that connection, then edit its properties as needed. This option can save you time when you have multiple similar connections to create.

To copy a database connection:

1. Expand the Metadata Explorer to display source and/or target connections.
2. Select a connection in the list (connections are displayed with a icon.)
3. From the right mouse button menu, choose **Copy Connection**.
4. Select the location where you want to paste the new connection (either **Sources** or **Targets**.)
5. From the right mouse button menu, choose **Paste Connection**.
6. Modify the connection name by choosing **Rename Connection** from the right mouse button menu.
7. Add tables to the connection by choosing **Select Tables** from the right mouse button menu.
8. Modify other properties of the connection by choosing **Connection Properties** from the right mouse button menu.

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Setting Up Users

NOTE: To establish or modify user profiles, you must be running the Management Center for a local installation of the server. It is not possible to modify user profiles for remote servers.

You can secure your Syniti DR environment by creating user profiles with appropriate access permissions to create, manage and modify connections and replications. When you first install and run the Management Center, a Windows service called Server Agent is started automatically and a connection is made between the Syniti DR Management Center and the local server (where both Syniti DRcomponents were installed.) The default name for this server appears as "local" in the Management Center. From the Management Center, you can set up restricted access to the server via user login IDs and user roles. Initially, Syniti DR is set up with security disabled, thereby avoiding the security mechanism altogether. To enable security and set up user profiles for the local server:

1. In the Management Center Metadata Explorer, select the **local** entry, and, from the right mouse button menu, choose **Manage Users...**.
2. In the User Settings dialog, select the type of security you want to use.

Anonymous Access	Leave this option if you do not want to restrict access to Syniti DR in any way.
UserName Authentication	Allows you to establish login IDs and passwords for users, but also requires the installation of an X.509 certificate on the client system (where the Management Center is running).
Windows Authentication	Syniti DR uses your Microsoft Windows login and ID to control access to the Management Center and server agent.
Certificate Authentication	Requires the installation of an X.509 certificate but does not allow specific user login IDs.

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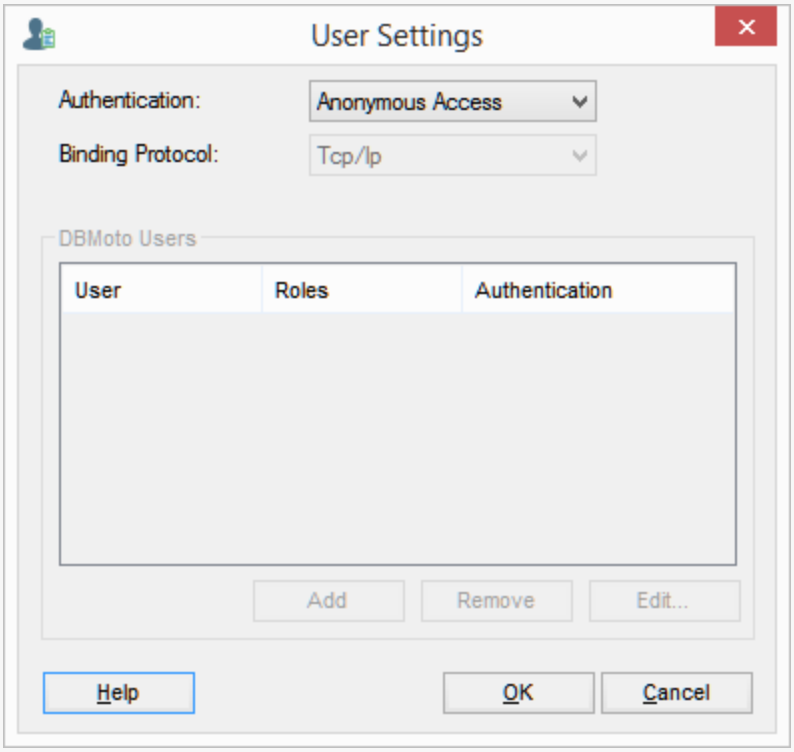

For more information on security options in Syniti DR, see Server Client Security Options.

NOTE: If you set up a user ID with UserName Authentication, or Certificate Authentication, you will not be able to use Syniti DR until the certificate is correctly installed. Generate and install the certificate before setting up authentication.

3. Select the type of Binding Protocol to use.. For more information on appropriate binding protocols for use with Syniti DR, see Server Client Security Options.

Authentication	Binding Protocol Options
Anonymous Access	Inactive. Uses TCP/IP binding protocol
UserName Authentication	TCP/IP or HTTP binding protocol. TCP/IP is suitable for intranet access, HTTP is recommended for internet access.
Windows Authentication	Inactive. Uses TCP/IP binding protocol
Certificate Authentication	TCP/IP or HTTP binding protocol. TCP/IP is suitable for intranet access, HTTP is recommended for internet access.

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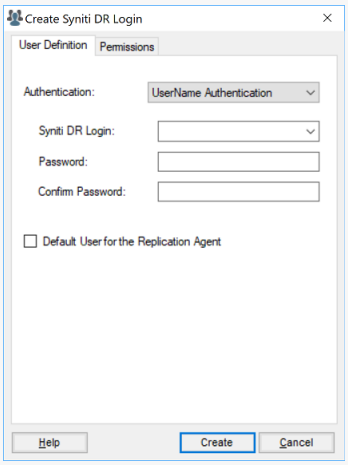
4. Click **Add** to open the Create Login dialog.



5. In the User Definition tab, check the Authentication type in the drop-down menu.

   Windows Authentication

   This option sets authority for a domain user. The default value in the Login field is the current Windows user login. This value can be edited. The password field is disabled in the dialog because the existing Windows password is expected.

   UserName Authentication

   This option allows you to set a user name and password that will subsequently be managed by Syniti DR.

6. In the Permissions tab, select a User Role from the drop-down list.

   The pre-defined roles set permissions for the types of operations that user would typically perform. You can customize the permissions for a user by selecting the value for the permission in the list, then choosing True or False from the drop-down list of values. Note that the role automatically becomes Custom in this case.

   Administrator

   Permission for all operations.

   Auditor

   Permission to audit and monitor replications.

   Custom

   Permissions selected manually.

   NOTE: For security purposes, you may wish to set the **Execute SQL Commands** permission to **False** so that users are not able to run SQL commands other than SELECT from the SQL Query tab.

   Operator

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Permission to set up and change replication settings but cannot work on administrative tasks (such as change license, change user permissions)

Public

Permission to audit and monitor replications, back up metadatas and change metadata settings (such as starting/stopping traces or changing email parameters for email notification).

SecurityAdmin

Permission to manage security, Does not normally need to change replication settings or work on creating new metadata.

See Create Login Dialog for more information about specific permissions and a comparison of the user roles.

7. Click **Create** to create the new user.

Related Topics

User Settings Dialog

Create Login Dialog

Installing a Certificate

Client and Server Security Options

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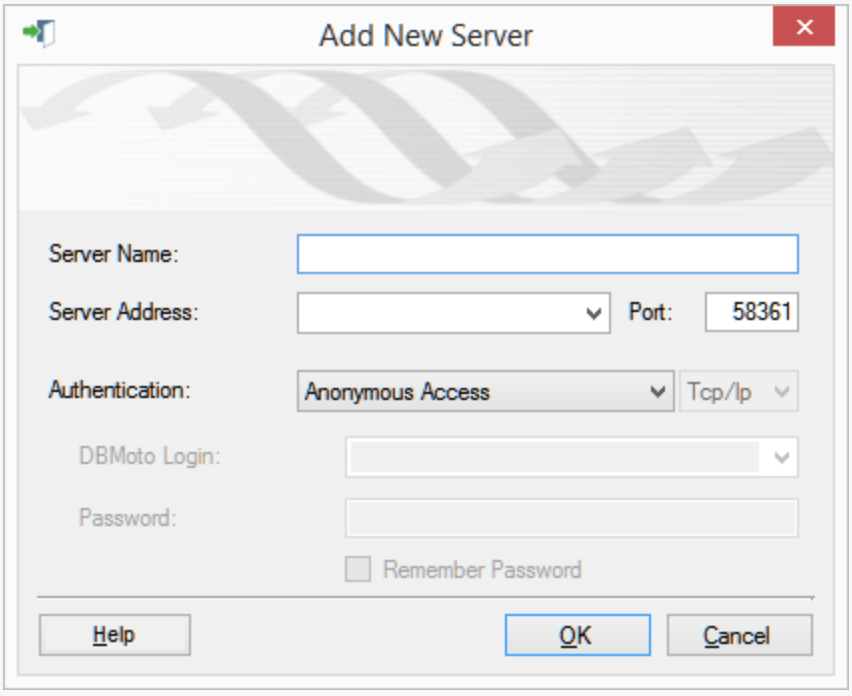
Adding a Syniti DR Server to the Management Center

When you first install Syniti DRServer, the Management Center already has a connection to the local server, the system where you are running the Management Center and the Replication Agent. However, you can view and manage multiple Syniti DR installations from the Management Center, as long as you have a user profile which allows you to access remote Syniti DR servers. The user profile must be established on the remote servers before you attempt to connect from the Management Center.

In the Management Center Metadata Explorer:

1. Select the root entry Syniti DR.
2. From the right mouse button menu, choose **Add New Server...**.
3. In the **Add New Server** dialog, type the server name.



4. In the Server Address field, type the IP address for the server.
5. In the Port field, set the port number for Syniti DR to use in contacting the server.
6. Choose the Authentication type from the drop-down list.
   The authentication type, login and password must match a user profile already established on the server to

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which you are trying to connect.

NOTE: If you set up a user ID with UserName Authentication, or Certificate Authentication, you will not be able to use Syniti DR until the certificate is correctly installed. Generate and install the certificate before setting up authentication.

7. Choose the protocol.

   Choose TCP/IP for intranet communication with a Syniti DR client, or HTTP for Internet communication with a client. For more information, check Server Client Security Options.

8. Enter login and password information if needed (active for UserName and Windows Authentication only).

9. Click **OK** to add the server to the Metadata Explorer

Related Topics

Add New Server Dialog

Server Client Security Options

Setting Up Syniti DR Users

Reviewing Server Activity

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Client and Server Security Options

Syniti Data Replication can be used in several different configurations, and each configuration has different data security needs. In the descriptions below, Syniti DR client can be either an installation of the Management Center or an application using the Syniti DR API to control the Replication Agent.

Syniti DR Client and Server Agent on a Single System

Security threats are typically not present, so Anonymous Authentication is appropriate, unless you want to define user IDs control access to Syniti DR tools. In this case, Windows authentication may be appropriate because it does not require the installation of an X.509 certificate. Syniti DR uses TCP/IP as a protocol for both Anonymous Authentication and Windows Authentication.

Syniti DR Client and Server Agent in an Intranet Trusted Environment

This type of environment would include the situation where an additional Management Center is installed on a second system within a secure intranet for monitoring or use by a second user. Security threats are typically not present, so Anonymous Authentication is appropriate, unless you want to define user IDs control access to Syniti DR tools. In this case, Windows authentication may be appropriate because it does not require the installation of an X.509 certificate. Syniti DR uses TCP/IP as a protocol for both Anonymous Authentication and Windows Authentication.

It is also possible to establish UserName Authentication, setting up user IDs and passwords specific to Syniti DR. However, UserName authentication also requires the installation of a X.509 security certificate on the system where the Server Agent is installed. Choose TCP/IP as the protocol in this scenario.

Syniti DR Client and Server Agent in an Internet Environment

The Server Agent and the Syniti DR client application, a custom application using the Syniti DR API, for example, run on different servers over the internet. In this case, communication occurs over a firewall and messages may be redirected over channels which are not securable. The recommended authentication modes are UserName or Certificate Authentication, using the HTTP protocol to cross the firewall.

UserrName authentication requires the installation of a X.509 security certificate in the server environment.

Certificate Authentication requires the installation of a X.509 security certificate in the client and server environments.

Related Topics

Installing a Certificate

User Settings Dialog

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Installing a Certificate

X.509 certificates are required for certain authentication options when setting up user access to Syniti Data Replicationvia the User Settings dialog. When choosing either the UserName Authentication or the Certificate Authentication options, you need to generate and install a security certificate. Typically, certificates are obtained from a trusted external commercial certificate authority. Identify an X.509 certificate provider through your company's IT department or using a web search.

Installing a Certificate for UserName Authentication
Installing Certificates for Certificate Authentication

NOTE: If you set up a user ID with UserName Authentication, or Certificate Authentication, you will not be able to use Syniti DR until the certificate is correctly installed. Generate and install the certificate before setting up authentication.

Certificate Requirements

The certificate must come from a trusted certificate authority and be compatible with X.509 standards. The certificate name must be DBMoto.

Installing a Certificate for UserName Authentication

1. On the system where the Server Agent is running, open a Microsoft Management Console (MMC) from the Windows Command tool by typing mmc.exe at the command line.
2. In the MMC console, from the **File** menu, select **Add/Remove Snap In**.

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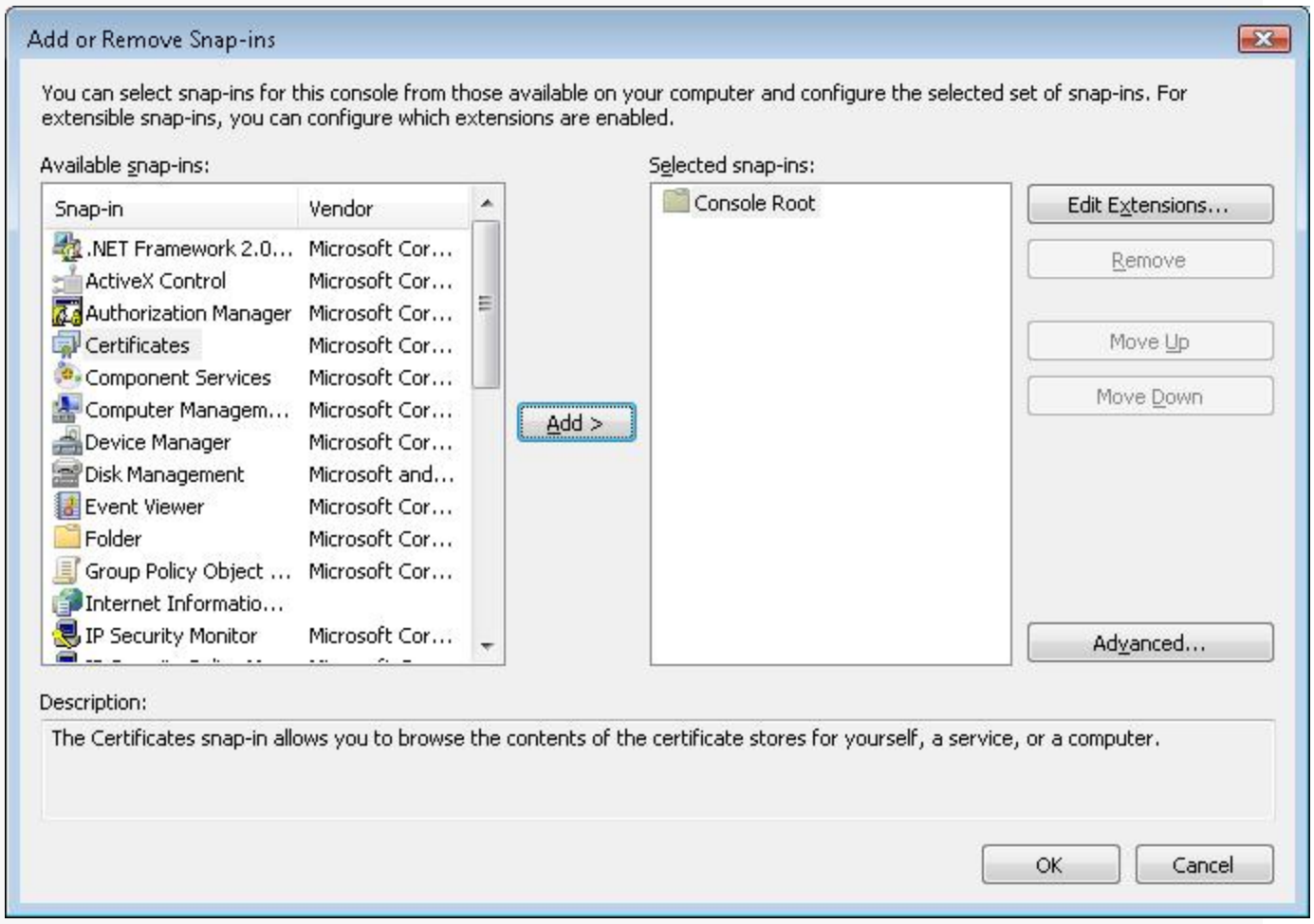
3. In the **Add or Remove Snap-ins** dialog, select **Certificates** in the left column.



4. Click **Add**.

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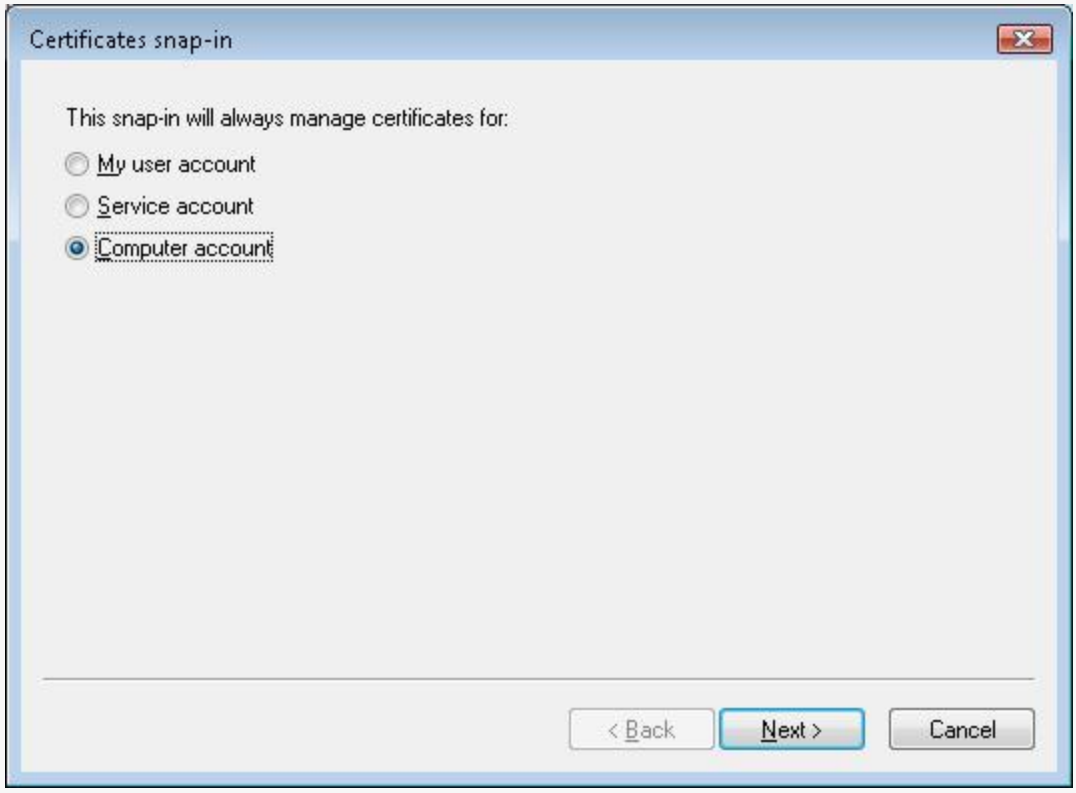
5. In the **Certificates Snap-in** step, select **Computer account**.



6. Click **Next**.

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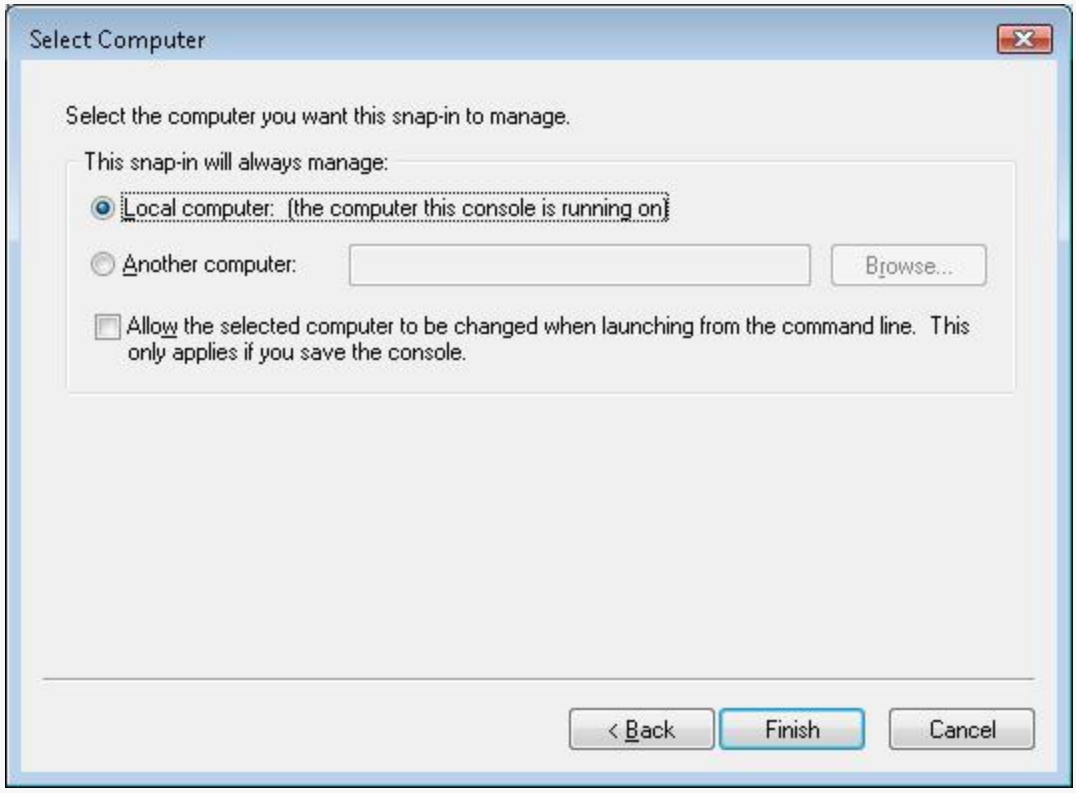
7. In the **Select Computer** step, select **Local Computer**.



8. Click **Finish**.
9. Click **OK** in the **Add or Remove Snap-ins** dialog.
10. In the MMC Console, expand the **Certificates** node under **Console Root**.
11. Expand the **Trusted People** node.
12. Select **Certificates** and, from the right mouse button menu, choose **All Tasks** then **Import**.

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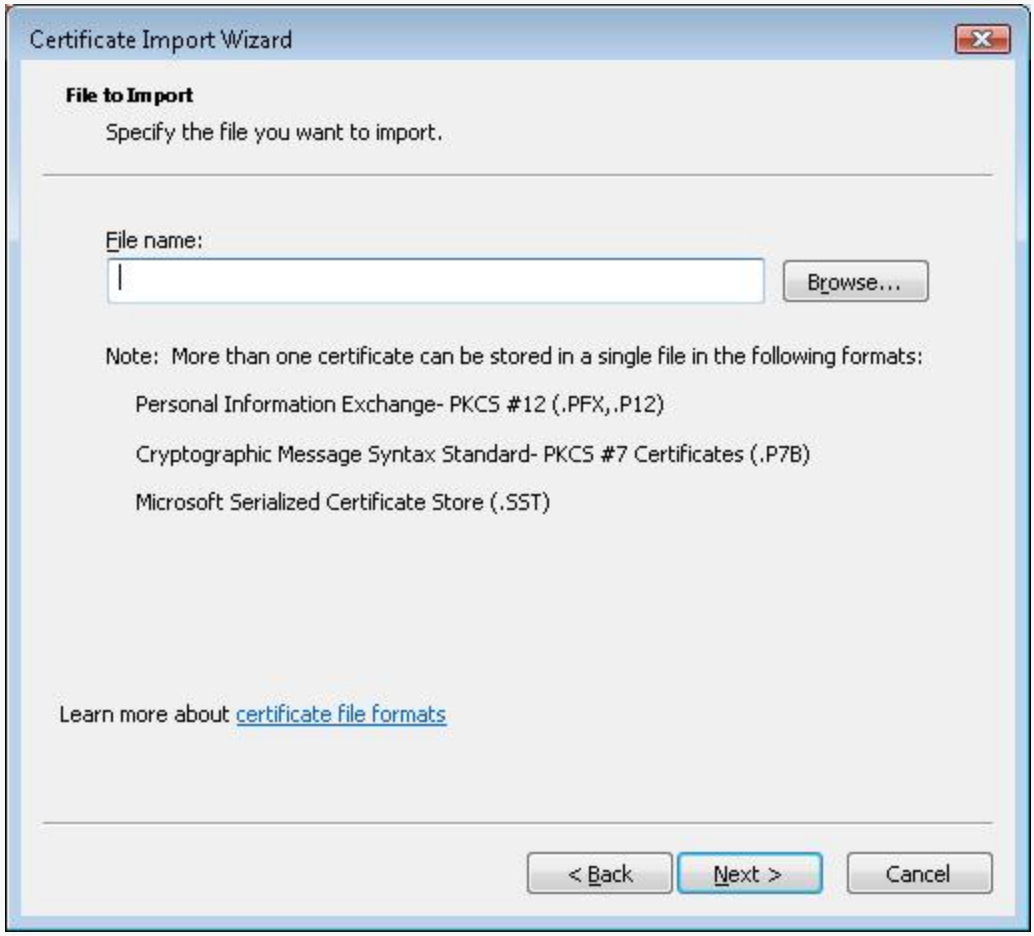
13. In the **Certificate Import Wizard**, select the X.509 certificate file you generated for Syniti DR.



14. Click **Next**.

15. Enter the password for the certificate.

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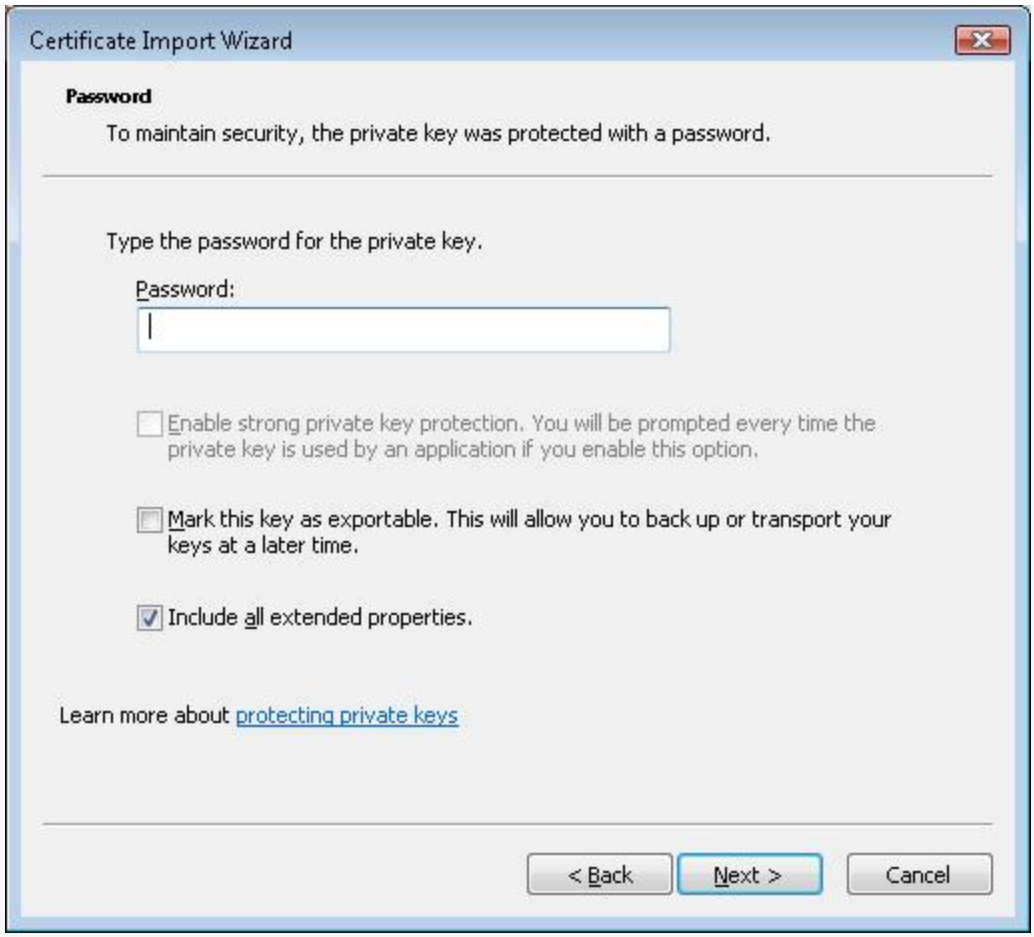

16. Click **Next**.
17. As needed, select the certificate store location.
18. Click **Finish** to complete the wizard.
19. To view the certificates installed, expand the Certificates node in the MMC and expand the Trusted People node.

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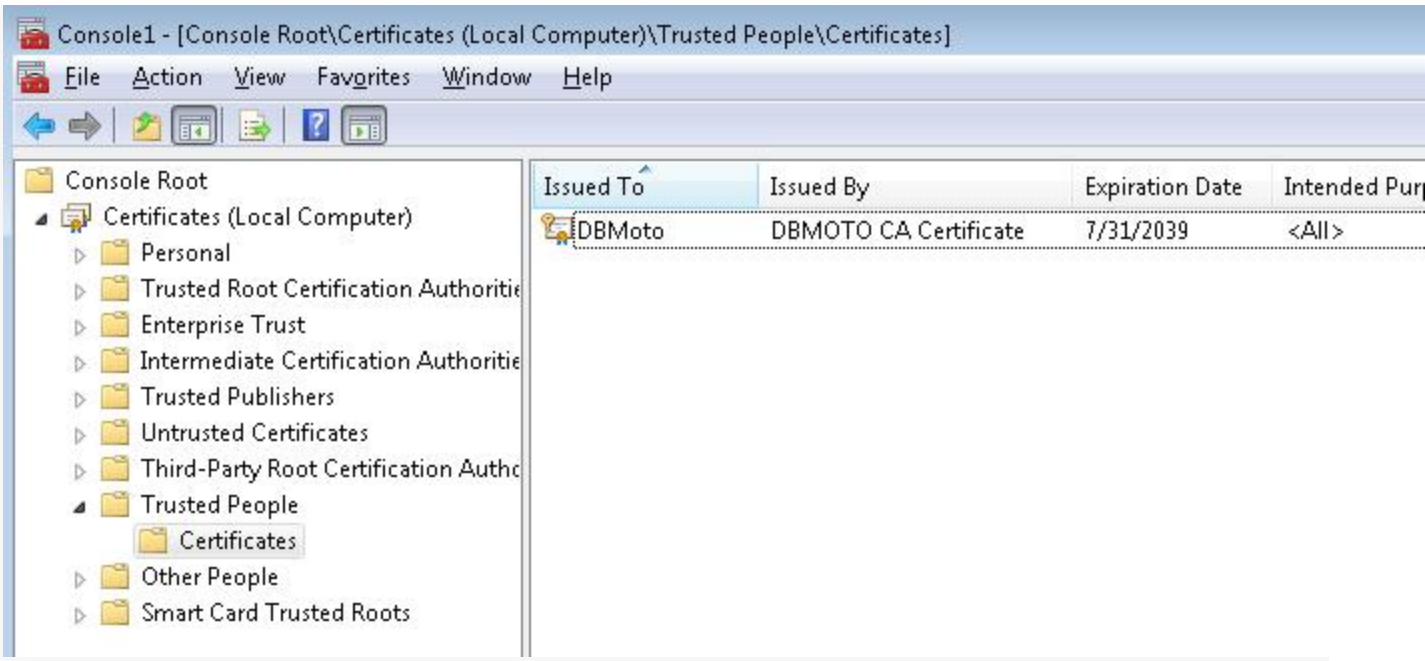

Installing Certificates for Certificate Authentication

1. On the system where the Server Agent is running, open a Microsoft Management Console (MMC) from the Windows Command tool by typing mmc.exe at the command line.
2. In the MMC console, from the **File** menu, select **Add/Remove Snap In**.

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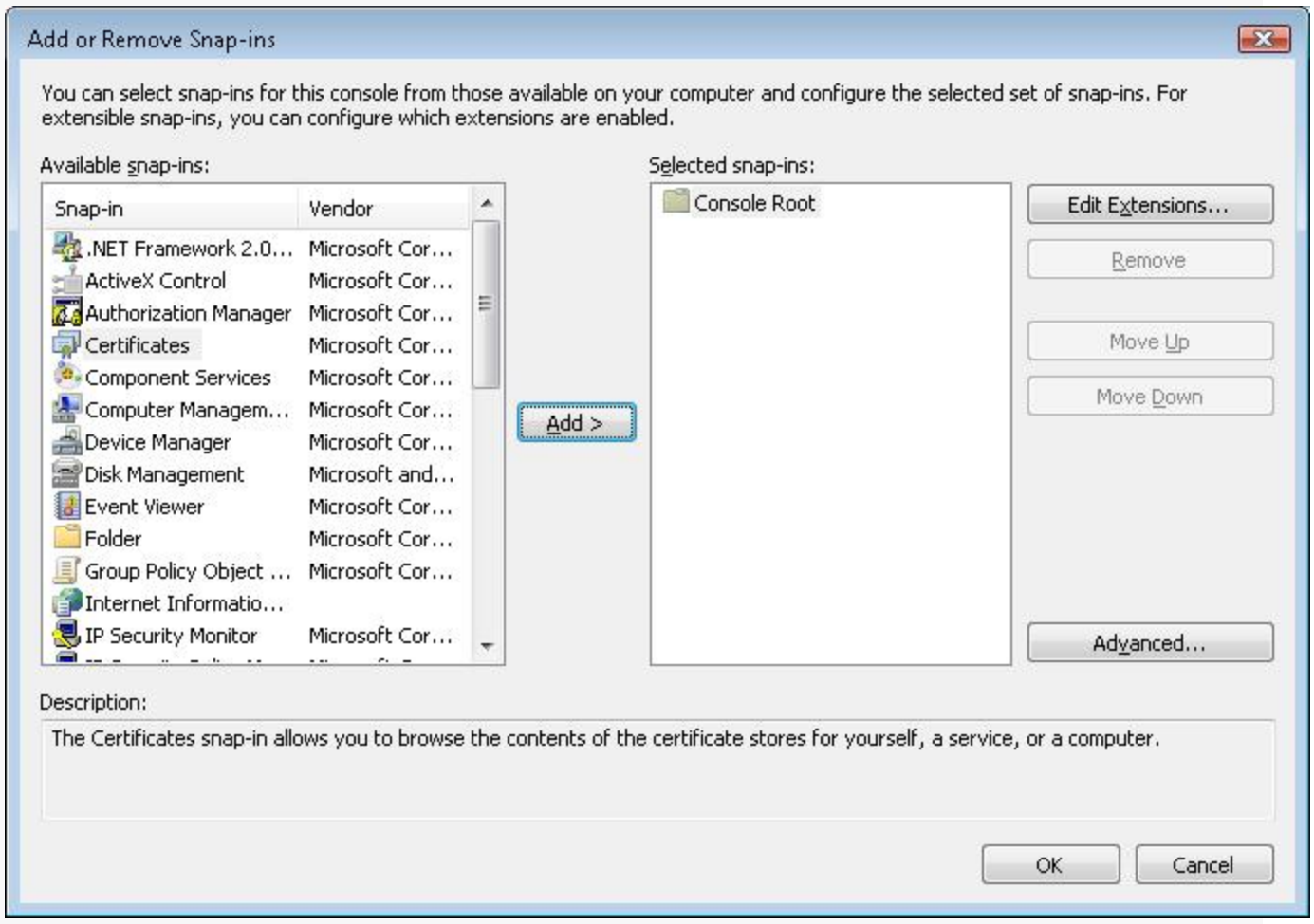
3. In the **Add or Remove Snap-ins** dialog, select **Certificates** in the left column.



4. Click **Add**.

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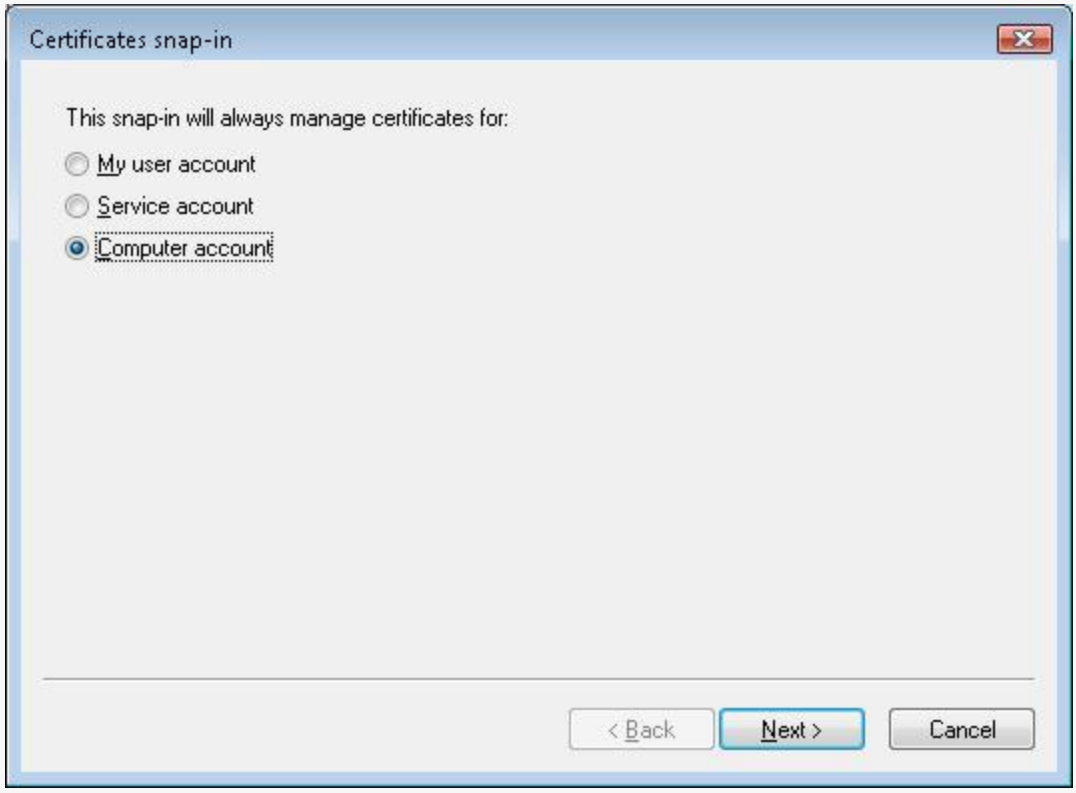
5. In the **Certificates Snap-in** step, select **Computer account**.



6. Click **Next**.

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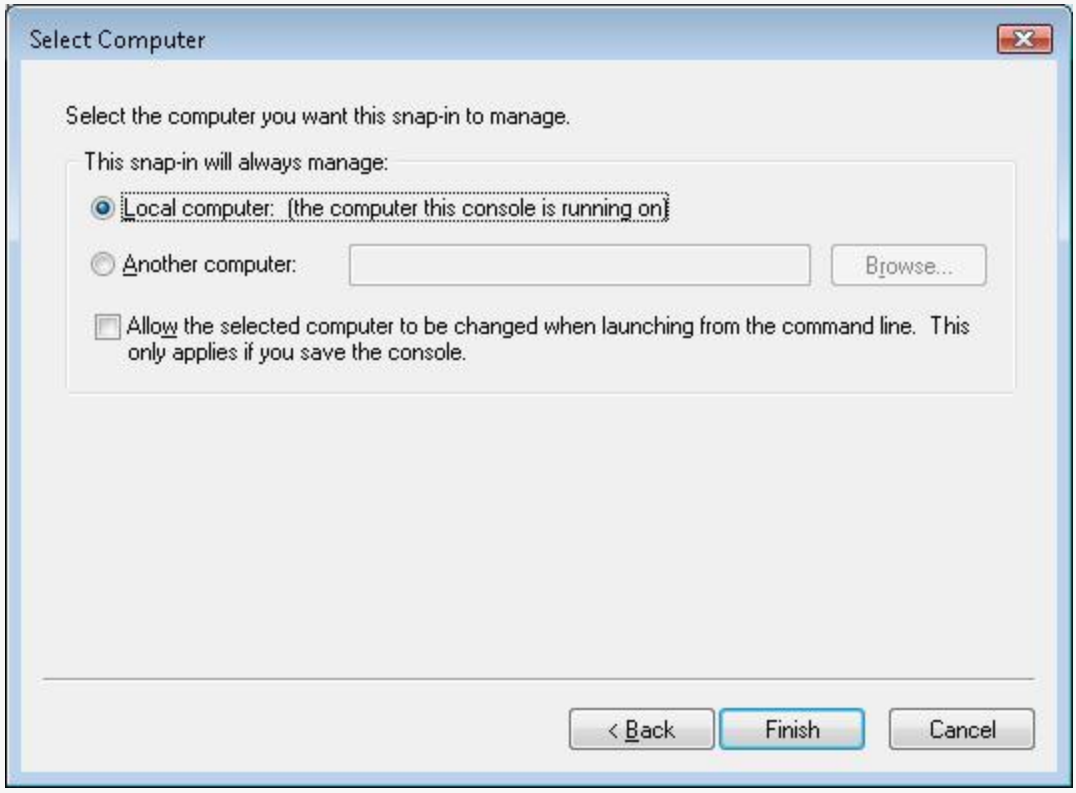
7. In the **Select Computer** step, select **Local Computer**.



8. Click **Finish**.
9. Click **OK** to close the **Add or Remove Snap-ins** dialog.
10. In the MMC Console, expand the **Certificates** node under **Console Root**.
11. Expand the **Trusted People** node.
12. Select **Certificates** and, from the right mouse button menu, choose **All Tasks** then **Import**.

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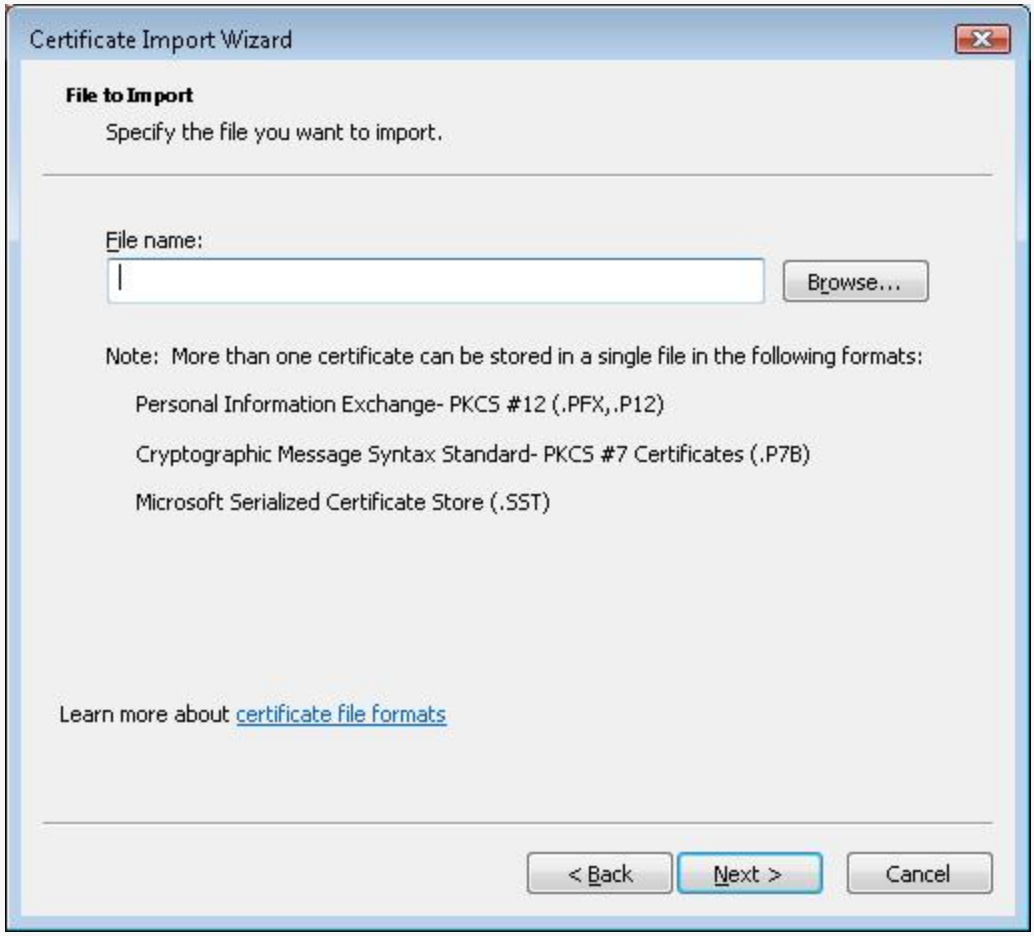
13. In the **Certificate Import Wizard**, select the X.509 certificate file you generated for Syniti DR.



14. Click **Next**.

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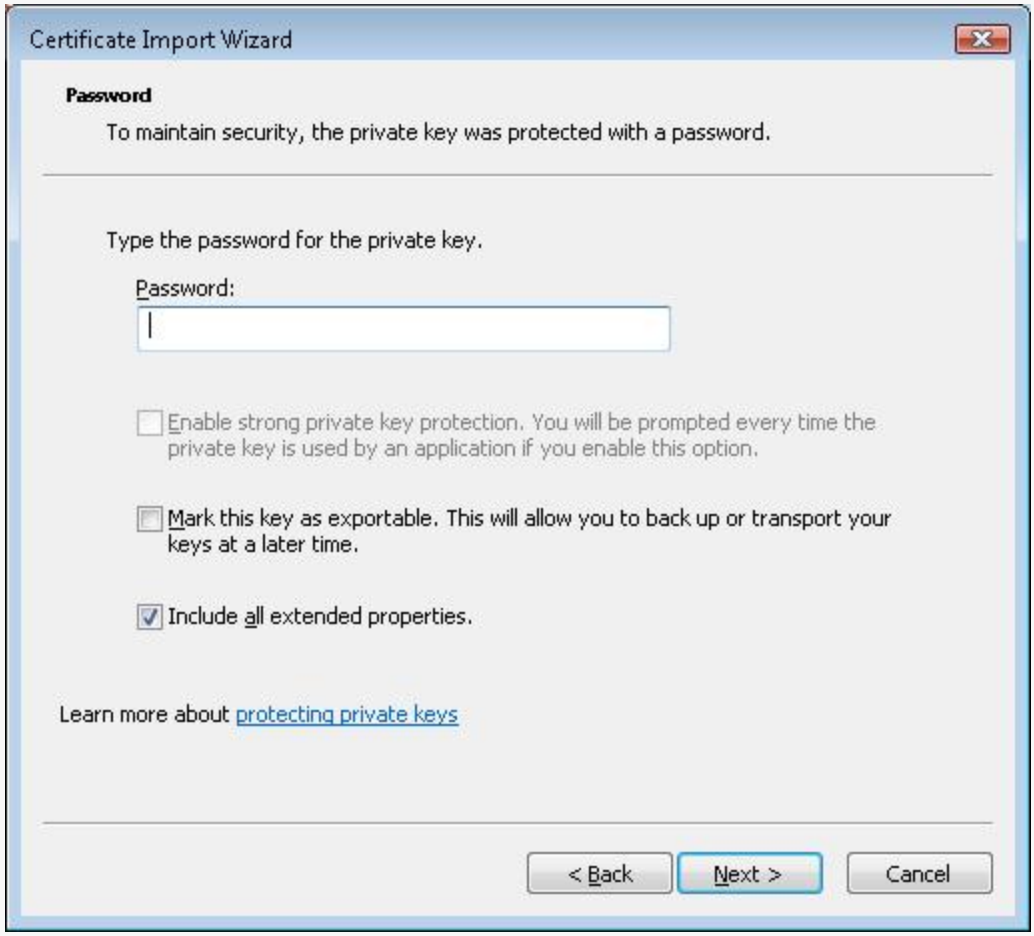
15. Enter the password for the certificate.



16. Click **Next**.
17. As needed, select the certificate store location.
18. Click **Finish** to complete the wizard.

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19. To view the installed certificate, expand the Certificates node in the MMC and expand the Trusted People node.

20. On the system where the Syniti DR Client (Management Center or custom application), open a Microsoft Management Console (MMC) from the Windows Command tool by typing mmc.exe at the command line.

21. In the MMC console, from the **File** menu, select **Add/Remove Snap In**.

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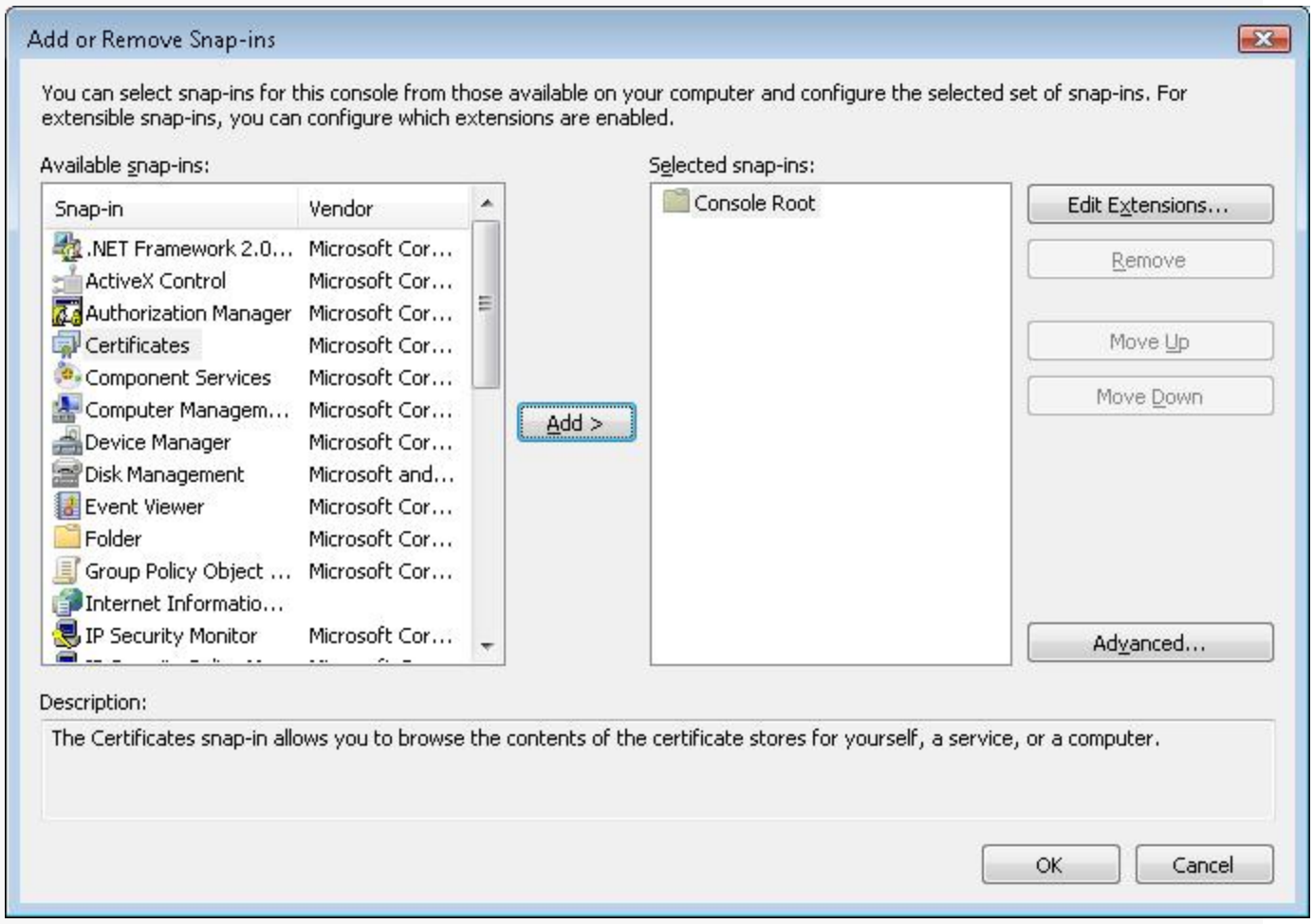
22. In the **Add or Remove Snap-ins** dialog, select **Certificates** in the left column.



23. Click **Add**.

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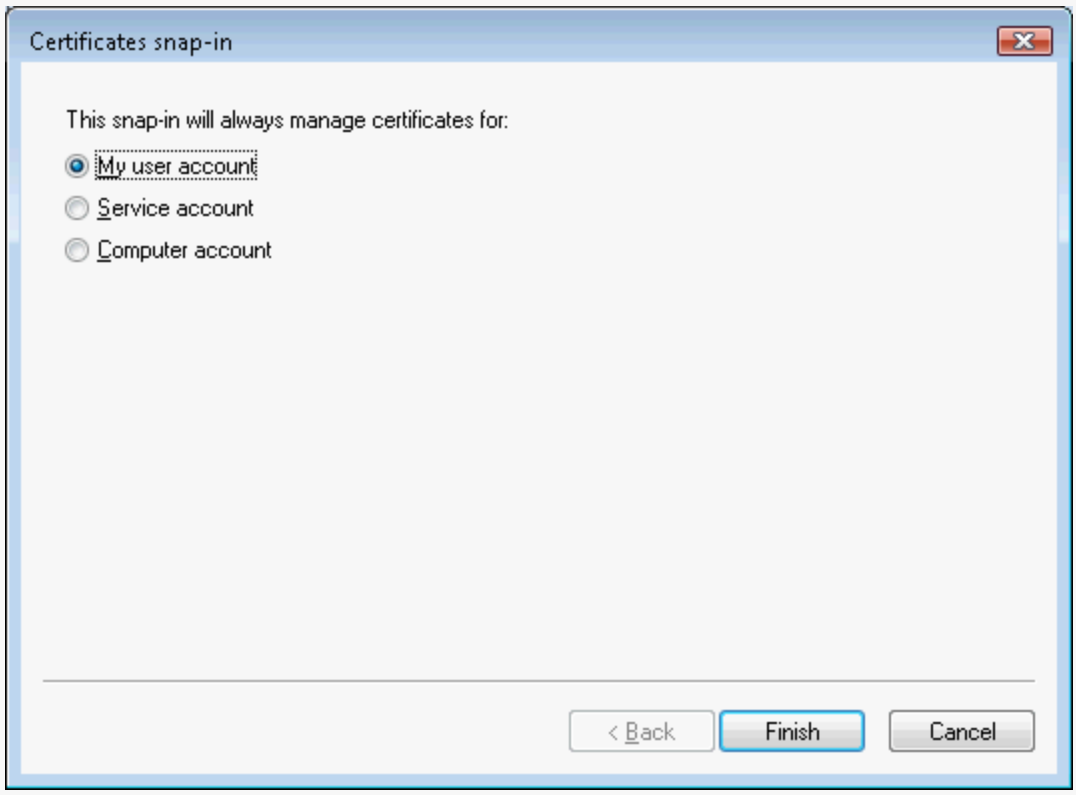
24. In the **Certificates Snap-in** step, select **My user account**.



25. Click **Finish**.
26. Click **OK** to close the **Add or Remove Snap-ins** dialog.
27. In the MMC Console, expand the **Certificates** node under **Console Root**.
28. Expand the **Trusted People** node.
29. Select **Certificates** and, from the right mouse button menu, choose **All Tasks** then **Import**.

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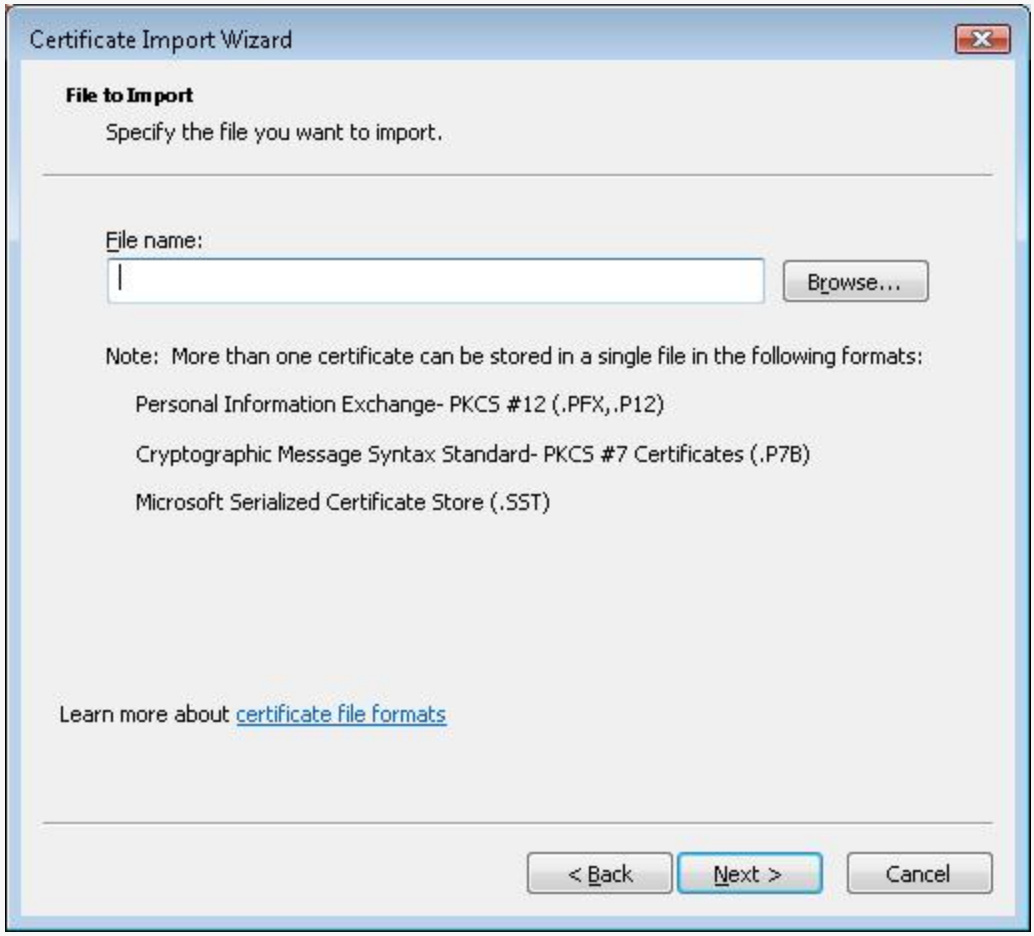
30. In the **Certificate Import Wizard**, select the X.509 certificate file you generated for Syniti DR.



31. Click **Next**.

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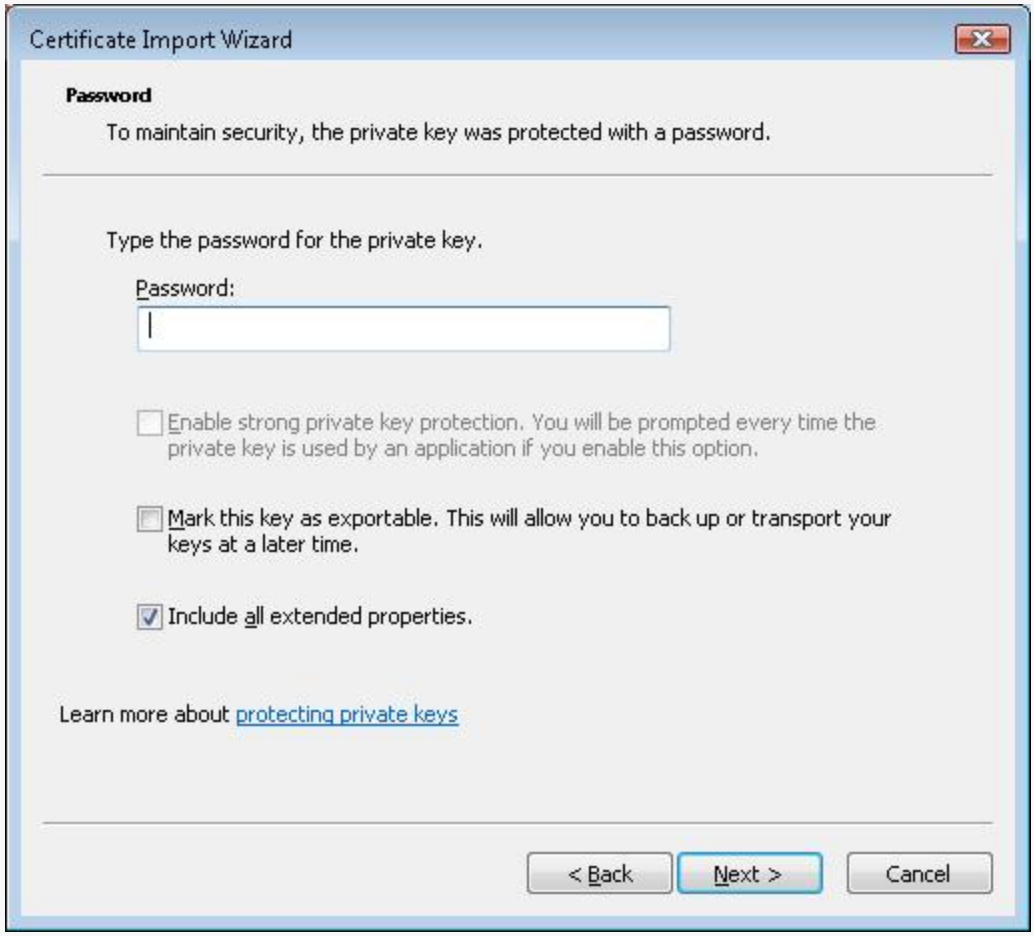
32. Enter the password for the certificate.



33. Click **Next**.
34. As needed, select the certificate store location.
35. Click **Finish** to complete the wizard.

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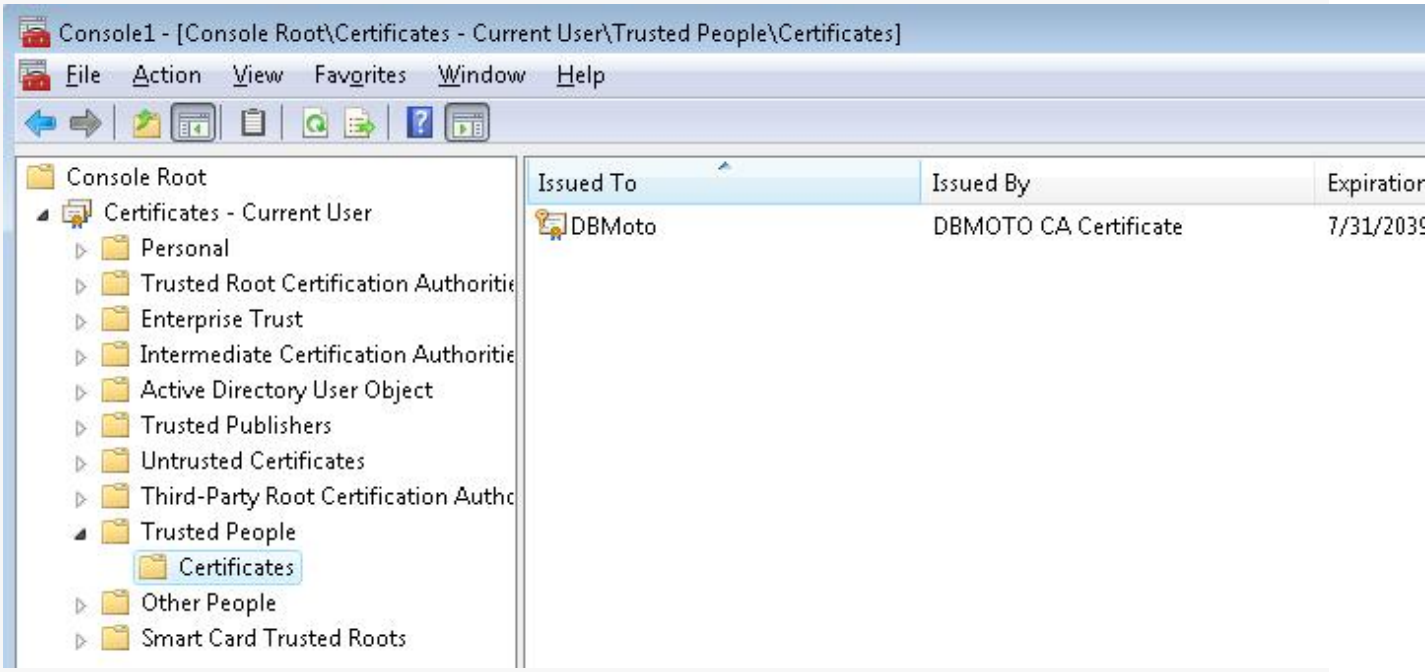
36. To view the installed certificate, expand the Certificates node in the MMC and expand the Trusted People node.



Related Topics

User Settings Dialog

Client and Server Security Options

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Source and Target Options

This section contains topics that describe settings needed for specific replication sources and targets.

- Relational Databases
- Non-relational Databases and Other Targets

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

Relational Databases	Refresh		Mirroring		Synchronization
	Source	Target	Source	Target	
Actian Vector	×	×		×	
Amazon Aurora MySQL	×	×	×	×	×
Amazon Aurora PostgreSQL	×	×	×	×	×
Amazon Redshift	×	×		×	
Greenplum		×		×	
Gupta SQLBase	×	×	×	×	×
IBM Db2 LUW	×	×	×	×	×
IBM Db2 for i	×	×	×	×	×
IBM Db2 for z/OS	×	×	×	×	×
IBM Informix	×	×	×	×	×
IBM PureData	×	×	×	×	

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Ingres	×	×		×	
MariaDB	×	×	×	×	×
Microsoft Access	×	×		×	
Microsoft Azure SQL Database	×	×	×	×	×
Microsoft Azure Synapse Ana-lytics		×		×	
Microsoft SQL Server	×	×	×	×	×
Microsoft SQL Server CE	×	×	×	×	×
MySQL	×	×	×	×	×
Oracle	×	×	×	×	×
PostgreSQL	×	×	×	×	×
Progress OpenEdge	×	×	×	×	
SAP HANA	×	×	×	×	×
SAP Sybase ASE	×	×	×	×	×
SAP Sybase IQ	×	×	×	×	×
SAP Sybase SQL Anywhere	×	×	×	×	×
Snowflake	×	×		×	
solidDB	×	×		×	
Teradata	×	×		×	

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Tibero	×	×		×	
Vertica	×	×		×	

Non-relational DBs & Other Targets	Refresh		Mirroring	
	Source	Target	Source	Target
Amazon DocumentDB		×		×
Amazon S3		×		×
Apache Cassandra	×	×		×
Apache Kafka		×		×
Apache Parquet				
Confluent Cloud (Kafka)		×		×
CSV (Flat file)	×	×		×
Google BigQuery		×		×
Hadoop		×		×
JSON		×		×
Microsoft Azure Data Lake Storage		×		×
Microsoft Azure Event Hubs		×		×
MongoDB Atlas		×		×
XML		×		×

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Source and Target Options

This section contains topics that describe settings needed for specific replication sources and targets.

- Relational Databases
- Non-relational Databases and Other Targets

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

Relational Databases	Refresh		Mirroring		Synchronization
	Source	Target	Source	Target	
Actian Vector	×	×		×	
Amazon Aurora MySQL	×	×	×	×	×
Amazon Aurora PostgreSQL	×	×	×	×	×
Amazon Redshift	×	×		×	
Greenplum		×		×	
Gupta SQLBase	×	×	×	×	×
IBM Db2 LUW	×	×	×	×	×
IBM Db2 for i	×	×	×	×	×
IBM Db2 for z/OS	×	×	×	×	×
IBM Informix	×	×	×	×	×
IBM PureData	×	×	×	×	

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Ingres	×	×		×	
MariaDB	×	×	×	×	×
Microsoft Access	×	×		×	
Microsoft Azure SQL Database	×	×	×	×	×
Microsoft Azure Synapse Ana-lytics		×		×	
Microsoft SQL Server	×	×	×	×	×
Microsoft SQL Server CE	×	×	×	×	×
MySQL	×	×	×	×	×
Oracle	×	×	×	×	×
PostgreSQL	×	×	×	×	×
Progress OpenEdge	×	×	×	×	
SAP HANA	×	×	×	×	×
SAP Sybase ASE	×	×	×	×	×
SAP Sybase IQ	×	×	×	×	×
SAP Sybase SQL Anywhere	×	×	×	×	×
Snowflake	×	×		×	
solidDB	×	×		×	
Teradata	×	×		×	

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Tibero	×	×		×	
Vertica	×	×		×	

Non-relational DBs & Other Targets	Refresh		Mirroring	
	Source	Target	Source	Target
Amazon DocumentDB		×		×
Amazon S3		×		×
Apache Cassandra	×	×		×
Apache Kafka		×		×
Apache Parquet				
Confluent Cloud (Kafka)		×		×
CSV (Flat file)	×	×		×
Google BigQuery		×		×
Hadoop		×		×
JSON		×		×
Microsoft Azure Data Lake Storage		×		×
Microsoft Azure Event Hubs		×		×
MongoDB Atlas		×		×
XML		×		×

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Actian Vector Topics

Syniti Data Replicationsupports use of Actian Vector for:

- Refresh replications, both source and target
- Mirroring replications, target only.

When setting up Actian Vector for use with Syniti Data Replication, connection strings for the Actian driver should be :

Server=100.111.1.2:VW7;UID=admin;PWD=********;Database=hitsw;

where VW7 is the default port for Actian.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Actian Vector Topics

Syniti Data Replicationsupports use of Actian Vector for:

- Refresh replications, both source and target
- Mirroring replications, target only.

When setting up Actian Vector for use with Syniti Data Replication, connection strings for the Actian driver should be :

Server=100.111.1.2:VW7;UID=admin;PWD=********;Database=hitsw;

where VW7 is the default port for Actian.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Amazon Aurora MySQL Topics

Syniti Data Replication supports use of Amazon Aurora MySQL for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers the Log Server Agent, transaction log support and triggers
- Synchronization

When setting up Aurora MySQL for use with the Log Server Agent:

- Configure Log Server Agent (Windows Service) settings in the Connection wizard, providing file locations for log details.

When setting up Aurora MySQL for use with the transaction log:

- Create a new DB parameter group and associate it to your DB instance.
- Set the binlog_format cluster-level parameter to ROW.

When setting up Aurora MySQL for use with triggers:

- Create or assign tables for Master Table and Log Table (DBMS tools)
- Assign a tablespace for the Master table and Log Tables (DBMS tools)

This section contains topics that describe:

- Aurora MySQL Cluster Setup
- MySQL Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)
- MySQL Log Information (in the Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen)

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Amazon Aurora MySQL Topics

Syniti Data Replication supports use of Amazon Aurora MySQL for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers the Log Server Agent, transaction log support and triggers
- Synchronization

When setting up Aurora MySQL for use with the Log Server Agent:

- Configure Log Server Agent (Windows Service) settings in the Connection wizard, providing file locations for log details.

When setting up Aurora MySQL for use with the transaction log:

- Create a new DB parameter group and associate it to your DB instance.
- Set the binlog_format cluster-level parameter to ROW.

When setting up Aurora MySQL for use with triggers:

- Create or assign tables for Master Table and Log Table (DBMS tools)
- Assign a tablespace for the Master table and Log Tables (DBMS tools)

This section contains topics that describe:

- Aurora MySQL Cluster Setup
- MySQL Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)
- MySQL Log Information (in the Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen)

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Amazon Aurora MySQL Cluster Setup

If you are planning to use Aurora MySQL as your source database for mirroring using a transaction log, you need to perform an additional installation step on the MySQL server: configure MySQL so that Syniti DR can read the database's binary log and set the binary logging to ROW.

To enable binary logging on an Aurora MySQL DB cluster:

1. Create a new DB parameter group and associate it to your DB instance.
2. Set the binlog_format parameter to ROW.
   The binlog_format parameter is a cluster-level parameter that is in the default cluster parameter group.
   If you are changing the binlog_format parameter from OFF to another value, you need to reboot your Aurora DB cluster for the change to take effect.
3. Restart the cluster.

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Amazon Aurora PostgreSQL Topics

Syniti Data Replication supports use of Aurora PostgreSQL for:

- Refresh replications, both source and target
- Mirroring replications, , both source and target. For source connections, Syniti Data Replication offers the Log Server Agent, Transaction Log support and triggers.
- Synchronization

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Amazon Aurora PostgreSQL Topics

Syniti Data Replication supports use of Aurora PostgreSQL for:

- Refresh replications, both source and target
- Mirroring replications, , both source and target. For source connections, Syniti Data Replication offers the Log Server Agent, Transaction Log support and triggers.
- Synchronization

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Replicating Data to Amazon Redshift

Syniti Data Replication supports use of Amazon Redshift for:

- Refresh replications, both source and target
- Mirroring replications as a target.

With Syniti Data Replication, you can replicate relational data to Amazon Redshift.

To define a target connection for Amazon Redshift:

1. Make sure that you have downloaded and installed the Amazon Redshift ODBC driver. For information on where to obtain the ODBC driver, check the Supported .NET Providers article in the Help Center. The Help Center also provides database-specific setup notes in PDF format..
2. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
3. In the Add Target Connection wizard, type a name for the connection and choose **Amazon Redshift** in the **Database** field.
4. In the Set Connection String screen, click in the **Connection String** value field, and then on the ellipsis, to open the ODBC Driver Connection Dialog.
   Values entered in this dialog should reflect those needed to make a successful connection to an Amazon Redshift cluster via an ODBC connection string, with or without Syniti Data Replication. There are no fields specific to Syniti DR.
5. Choose values for the following fields:

   Server Specify the Amazon Redshift cluster endpoint, as defined in the Amazon Redshift console.

   Port Type the port number for the database. The default is 5439..

   Database Type the name of the Amazon Redshift database.

   Auth Type Syniti DR has been tested using the Standard authentication type, with an AWS user and password. However, Syniti DR uses the values entered here as part of an ODBC connection string passed to the server. Therefore, any set of values that can connect to the server are supported. Check the AWS documentation for all the connection options.

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6. In the Set Staging Connection String screen, enter the connection information for Amazon S3 used to bulk insert data into Redshift.

   NOTE: Use the Connection Properties dialog to change the bulk insert settings, if needed.

Output Folder	Local path to temporarily store replication output files
Output folder Archive	(Optional) Set a path to archive files that are generated and uploaded.
Use IAM Role	Set to False by default. Set to True to use an IAM role for connections instead of the Access Key/Secret Key approach. For more information about using IAM roles, see https://-docs.aws.amazon.com/IAM/latest/UserGuide/id_roles.html. Note that IAM roles work only for access between AWS services (such as when using S3 as a staging connection for bulk uploads to Redshift.)
IAM Role Parameter	The IAM role parameter should be configured as follows to access S3: arn:aws:iam:<aws-account-id>:role/<role-name> The parameter information is required when using S3 in conjunction with Redshift. It is used in the COPY from statement to access files you imported from S3 to Redshift. For more information about using IAM roles with Redshift, see https://-docs.aws.amazon.com/redshift/latest/mgmt/authorizing-redshift-service.html
S3 Access Key	The Access Key from your AWS login ID. Not required if **Use IAM Role** is set to true.
S3 Secret Key	The Secret Access Key from your AWS login ID. Not required if **Use IAM Role** is set to true.
S3 Bucket Name	The bucket must already exist. It can either be a bucket that you are already using, or one you have created for this purpose.
AWS SDK S3 Assembly Path	The pathname to AWSSDK.S3.dll installed with the AWS .NET SDK.

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AWS SDK Core Assembly Path	The pathname to the AWSSDK.Core.dll installed with the AWS .NET SDK.
Create Manifest File	When set to true, creates a JSON manifest file which is sometimes required by data-sharing applications.

7. Complete the fields in the Target Connection wizard. Use the Syniti Data ReplicationUser Guide available from the Management Center Help menu or the Setup Guide, available for download in the Help Center as needed.
8. Click **OK** to close the ODBC Driver Connection dialog.
9. In the **Select Tables** screen, if tables already exist, choose the tables to use in replication. Note that you can also create tables, or add them at a later time.
10. Click **Next** to display the **Actions** screen.
11. Optional. Select the next wizard that you would like to run.
12. Click **Next** to display the summary, then click **Finish** to create the connection.

Now you can set up replications from whichever source connection you have defined.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Replicating Data to Amazon Redshift

Syniti Data Replication supports use of Amazon Redshift for:

- Refresh replications, both source and target
- Mirroring replications as a target.

With Syniti Data Replication, you can replicate relational data to Amazon Redshift.

To define a target connection for Amazon Redshift:

1. Make sure that you have downloaded and installed the Amazon Redshift ODBC driver. For information on where to obtain the ODBC driver, check the Supported .NET Providers article in the Help Center. The Help Center also provides database-specific setup notes in PDF format..
2. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
3. In the Add Target Connection wizard, type a name for the connection and choose **Amazon Redshift** in the **Database** field.
4. In the Set Connection String screen, click in the **Connection String** value field, and then on the ellipsis, to open the ODBC Driver Connection Dialog.
   Values entered in this dialog should reflect those needed to make a successful connection to an Amazon Redshift cluster via an ODBC connection string, with or without Syniti Data Replication. There are no fields specific to Syniti DR.
5. Choose values for the following fields:

   Server Specify the Amazon Redshift cluster endpoint, as defined in the Amazon Redshift console.

   Port Type the port number for the database. The default is 5439..

   Database Type the name of the Amazon Redshift database.

   Auth Type Syniti DR has been tested using the Standard authentication type, with an AWS user and password. However, Syniti DR uses the values entered here as part of an ODBC connection string passed to the server. Therefore, any set of values that can connect to the server are supported. Check the AWS documentation for all the connection options.

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6. In the Set Staging Connection String screen, enter the connection information for Amazon S3 used to bulk insert data into Redshift.

   NOTE: Use the Connection Properties dialog to change the bulk insert settings, if needed.

Output Folder	Local path to temporarily store replication output files
Output folder Archive	(Optional) Set a path to archive files that are generated and uploaded.
Use IAM Role	Set to False by default. Set to True to use an IAM role for connections instead of the Access Key/Secret Key approach. For more information about using IAM roles, see https://-docs.aws.amazon.com/IAM/latest/UserGuide/id_roles.html. Note that IAM roles work only for access between AWS services (such as when using S3 as a staging connection for bulk uploads to Redshift.)
IAM Role Parameter	The IAM role parameter should be configured as follows to access S3: arn:aws:iam:<aws-account-id>:role/<role-name> The parameter information is required when using S3 in conjunction with Redshift. It is used in the COPY from statement to access files you imported from S3 to Redshift. For more information about using IAM roles with Redshift, see https://-docs.aws.amazon.com/redshift/latest/mgmt/authorizing-redshift-service.html
S3 Access Key	The Access Key from your AWS login ID. Not required if **Use IAM Role** is set to true.
S3 Secret Key	The Secret Access Key from your AWS login ID. Not required if **Use IAM Role** is set to true.
S3 Bucket Name	The bucket must already exist. It can either be a bucket that you are already using, or one you have created for this purpose.
AWS SDK S3 Assembly Path	The pathname to AWSSDK.S3.dll installed with the AWS .NET SDK.

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AWS SDK Core Assembly Path	The pathname to the AWSSDK.Core.dll installed with the AWS .NET SDK.
Create Manifest File	When set to true, creates a JSON manifest file which is sometimes required by data-sharing applications.

7. Complete the fields in the Target Connection wizard. Use the Syniti Data ReplicationUser Guide available from the Management Center Help menu or the Setup Guide, available for download in the Help Center as needed.
8. Click **OK** to close the ODBC Driver Connection dialog.
9. In the **Select Tables** screen, if tables already exist, choose the tables to use in replication. Note that you can also create tables, or add them at a later time.
10. Click **Next** to display the **Actions** screen.
11. Optional. Select the next wizard that you would like to run.
12. Click **Next** to display the summary, then click **Finish** to create the connection.

Now you can set up replications from whichever source connection you have defined.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Greenplum Topics

Syniti Data Replication supports use of Greenplum for:

- Refresh replications, target only.
- Mirroring replications, target only.

There are no specific settings required for transactional replications to Greenplum, other than the installation and configuration of the .NET provider.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Greenplum Topics

Syniti Data Replication supports use of Greenplum for:

- Refresh replications, target only.
- Mirroring replications, target only.

There are no specific settings required for transactional replications to Greenplum, other than the installation and configuration of the .NET provider.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Gupta SQLBaseTopics

Syniti Data Replication supports use of Gupta SQLBase for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replicationoffers triggers
- Synchronization

For mirroring replications using triggers, set up your Gupta SQLBase environment as follows:

- Create or assign tables for Master Table and Log Table (DBMS tools)
- Assign a tablespace for the Master table and Log Tables (DBMS tools)

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Gupta SQLBaseTopics

Syniti Data Replication supports use of Gupta SQLBase for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replicationoffers triggers
- Synchronization

For mirroring replications using triggers, set up your Gupta SQLBase environment as follows:

- Create or assign tables for Master Table and Log Table (DBMS tools)
- Assign a tablespace for the Master table and Log Tables (DBMS tools)

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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IBM DB2 for i Topics

Syniti Data Replication supports use of IBM Db2 for i for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replicationoffers the use of the transaction log/journal, and the Log Server Agent
- Synchronization

When setting up IBM DB2 for i for use with Syniti Data Replication:

- Set user ID authorities appropriately (DBMS tools)
- Make sure tables are journaled and receivers are set up appropriately (DBMS tools)
- Create a library on Db2 (Management Center)

This section contains topics that describe:

- IBM Db2 for i Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)
- IBM Db2 for i Journal Information (in the Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen)
- IBM Db2 for i Connection Recommendations
- Creating the Db2 Library Manually
- Journals and Receivers
- Customizing Character Data by Overriding the CCSID Setting
- Replicating from Multi-Member Tables
- Setting the CCSID for Tables and Columns
- Synchronization Limitation with IBM Db2 for i
- Using a Relative Record Number to Identify a Record
- Using the Ritmo/i .NET Provider
- Writing a Script to Determine Receiver Use

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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IBM DB2 for i Topics

Syniti Data Replication supports use of IBM Db2 for i for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replicationoffers the use of the transaction log/journal, and the Log Server Agent
- Synchronization

When setting up IBM DB2 for i for use with Syniti Data Replication:

- Set user ID authorities appropriately (DBMS tools)
- Make sure tables are journaled and receivers are set up appropriately (DBMS tools)
- Create a library on Db2 (Management Center)

This section contains topics that describe:

- IBM Db2 for i Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)
- IBM Db2 for i Journal Information (in the Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen)
- IBM Db2 for i Connection Recommendations
- Creating the Db2 Library Manually
- Journals and Receivers
- Customizing Character Data by Overriding the CCSID Setting
- Replicating from Multi-Member Tables
- Setting the CCSID for Tables and Columns
- Synchronization Limitation with IBM Db2 for i
- Using a Relative Record Number to Identify a Record
- Using the Ritmo/i .NET Provider
- Writing a Script to Determine Receiver Use

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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IBM Db2 for i (iSeries/AS400) Transactional Replication Settings

Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog

The information below explains how to configure the transactional replication settings for IBM Db2 for i in the Enable Transactional Replication wizard or the Transactional Log Settings dialog available from the **Transactional Setup > Manage** option on the connection in the Metadata Explorer.

When replicating from IBM Db2 for i using mirroring or synchronization, three transactional modes are available: Log Reader, Log Server Agent and Log Reader API. The Log Reader API is required when replicating tables with LOB values. Note that the Log Reader API option is available for Db2 for i V6R1 and above.

For all three modes, you first need to set up a library on your Db2 system. This step sets up the library by transferring a savf file to the Db2 server and creating the DBMOTOLIB library (or a library name of your choosing). You can also perform this procedure manually for more complete control over operations or in case the automatic process does not work.

Library Name

The library name, DBMOTOLIB, is supplied. This field can be modified to supply a different library name. This is the name of the library that will be created on the Db2 system. It can be useful to change the default library name when, for example, you have two Syniti DR installations using the same database server, and you wish to keep separate libraries for each installation.

Savf File

The location of the savf file in the installation directory. This file is run to create a stored procedure on the Db2 system, and the version of the file should match the operating system that you are using. Modify this path to point to a different file version if needed, or if you move the savf file to a different location. If you are using operating system V5R4 or above, and choose either the DBMLIB54.SAVF file or the DBMLIBAPI61.SAVF file, a checkbox is displayed to allow you to install the procedure JRNSQMAPI. The box should be checked if you are planning to create more than 30 replications from a Db2 for i source database.

Verify (appears only in the Transactional Log Settings dialog)

Click **Verify** first to see if the library that Syniti Data Replicationwill use (specified in **Library Name**) is already installed on the server. Depending on the results of this operation, the **Install** button will become active. Click **Install** to create the library on the Db2 system. To later remove the library from the server, use the Disable

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Transactional Replication wizard available from available from the **Transactional Setup > Disable** option on the connection in the Metadata Explorer. .

FTP Status

This area reports progress after you have entered all the information above and clicked **Install**.

Errors during Installation

The FTP status area may report errors when attempting to restore the DBMOTOLIB library. Errors usually involve:

- A user ID with read-only permissions on the Db2 server or no QSECOFR privileges. This can be addressed by running the process again with a login that has write permissions and QSECOFR privileges.
- Library or Savefile are already present on the Db2 server, and can not be overwritten or deleted. This can usually be addressed by using a login that has privileges to delete/overwrite existing files.

In general, if errors occur during the process of automatically restoring the savf file, you can restore the DBMOTOLIB library manually.

Log Server Agent Settings

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IBM Db2 for i Journal Information

Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen

Journal

This field displays the journal that has been set for the source table on the IBM Db2 for i (iSeries/AS400) system. Typically, you do not need to edit this field.

Any journal specified in this field should usually have the IMAGES parameter set to *BOTH. This option saves the record's image before and after the transaction and makes available the primary key information needed by Syniti Data Replication. However, it is possible to set the IMAGES parameter to *AFTER, but you will need to modify the target table by adding a Relative Record Number (RRN) field and mapping it to the source table !RecordID field. For more information, see IBM i System Journals and Receivers.

This information is available and can be changed in the Table Properties dialog after the wizard is completed.

Receiver

This field displays the receiver that has been set for the source table on the Db2 system. Typically, you do not need to edit this field. However, if you know that you want to begin replication from a specific receiver and transaction ID, you can enter values in this field and the Transaction ID field.

Transaction ID

Enter the sequence number, retrieved from the receiver, from which you want to start monitoring database transactions for replication. If you do not know the sequence number, click **Read** to open the Journal Read Point dialog. In this dialog, you can either retrieve the current sequence number or the sequence number for a specified date and time. If you enter a date and time, Syniti DR retrieves the first sequence number after the time entered. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

Transaction Timestamp

This field is automatically filled in and reports the timestamp for the sequence identified in the Transaction ID field.

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Read Interval (sec)

The frequency (in seconds) with which you want to check the journal during replication. For example, if the setting is 90 seconds, Syniti DR will check the journal every 90 seconds to see if any transactions have occurred that need to be replicated to the target table. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

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Using the Ritmo/i .NET Provider

The Ritmo/i .NET provider is included with your Syniti Data Replication release and installed as part of the setup. The version of Ritmo/i that is provided does not include the Ritmo Toolbox or the developer tools. For more information about the different Ritmo versions available, check the Ritmo page on our web site.

The Ritmo/i files can be found in the Syniti Data Replicationinstallation folder, in a separate folder called **Ritmo_i**.

The following topic may be useful when using Ritmo/i with Syniti DR.

See IBM Db2 for i Connection Recommendations for information on the type of permissions you need to set up a connection to IBM Db2 for i.

Enabling a trace

The file Ritmo_i.xml contains configuration settings for Ritmo and can be found in the folder where Ritmo was installed. You can set a trace file name and enable the trace from this file. Note that the trace will run whenever Ritmo is in use, and you should set <traceflag> to False immediately after completing the operations that you wanted to trace. If you leave the trace running, it can affect performance and build up large trace files.

1. In the Windows Explorer, go to the Syniti Data Replicationinstallation folder, then to the Ritmo_i folder.
2. Open the file Ritmo_i.xml in a text editor.
3. Modify the trace entry (in bold below) as needed:

```
<?xml version="1.0" encoding="utf-8" standalone="yes" ?>
<configuration>
<configSections>
<section name="trace" />
</configSections>
<trace>
<tracefile>C:\Program Files\Syniti...</tracefile>
<traceflag>True</traceflag>
</trace>
</configuration>
```

4. Save the file and exit the text editor.

Related Topics

IBM Db2 for i Connection Recommendations

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Creating the Db2 Library Manually

If you are unable to create the library for your Db2 system automatically, you can access the appropriate savefile in the ServerFiles folder and restore it manually as described below. Use the name of the restored library when configuring your System i connection in the Management Center. The default name provided in the Management Center is DBMOTOLIB, so either use this name in the instructions below, or be sure to change the name in the Management Center.

If more than one Syniti Data Replicationinstallation is sharing the same IBM i server, be sure to set up a different library for each installation.

Note that operating system version V3R2 or higher is required for Syniti Data Replication 6.0.0 or higher.

1. Create a temporary folder on your PC (e.g., C:\DBMLib)
2. Copy the appropriate savefile for your i operating system version from the ServerFiles folder to C:\DBMLib. The savefiles are:

i/iSeries/AS400 Operating System Version	**Syniti DR Savefile**
V3R2 up to and including V4R2	DBMLIB32.SAVF
V4R3 up to and including V5R0	DBMLIB43.SAVF
V5R1 up to and including V5R3	DBMLIB51.SAVF
V5R4 and above. For use with Log Reader transaction mode.	DBMLIB54.SAVF
V6R1 and above. For use with Log Reader API transaction mode.	DBMLIBAPI61.SAVF

3. Run the DOS command prompt and change the working directory to C:\DBMLib.
   ```
   C:>cd C:\DBMLib
   ```
4. Run an FTP session followed by the Db2 system IP address
   ```
   C:\DBMLib> ftp 111.111.111.111
   ```
5. Insert your username and password when prompted. Make sure that your user ID has write permissions and QSECOFR privileges.

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6. Make QGPL the current directory.

   ```
   ftp> quote cwd QGPL
   ```

7. Create an empty Savefile on the Db2 system.

   ```
   ftp> quote rcmd CRTSAVF FILE(QGPL/DBMLIBSAVF) AUT(*ALL)
   ```

8. Switch to BINARY mode.

   ```
   ftp> bin
   ```

9. Transfer the savefile. In the command below, replace DBMLIB.SAVF with the name of the savefile you are using.

   ```
   ftp>  put DBMLIB.SAVF DBMLIBSAVF
   ```

10. Restore the savefile, for example in a library called MYDBMOTOLIB:

    ```
    ftp> quote rcmd RSTLIB SAVLIB(DBMOTOLIB) DEV(*SAVF) SAVF(QGPL/DBMLIBSAVF)
    MBROPT(*ALL) ALWOBJDIF(*ALL) RSTLIB(MYDBMOTOLIB)
    ```

    Note: If using the default library name, DBMOTOLIB, be sure to replace only the library name in the command **RSTLIB(MYDBMOTOLIB). SAVLIB(DBMOTOLIB)** indicates the name of the library as saved in the SAVF file. The `RSTLIB` parameter instead indicates the name of the library where you want to restore the SAVF file which by default is the name of the library saved in the SAVF.

11. Delete the save file.

    ```
    ftp>  quote dele DBMLIBSAVF
    ```

12. Close the ftp session.

    ```
    ftp> quit
    ```

13. Finally, create the stored procedure DBMOTOLIB.JRNSQNM on the Db2 system. This needs to be executed as a SQL command.

    Note: If using the IBM i console to perform this operation, use "/" instead of "." below in "DBMOTOLIB.JRNSQNM" to give you "DBMOTOLIB/JRNSQNM"

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Operating System Versions up to and including V4R1

Use with DBMLIB32.SAVF

```
CREATE PROCEDURE DBMOTOLIB.JRNSQNM
(IN JOUR CHAR(10) ,
 IN JLIB CHAR(10) ,
 IN FNMS CHAR(900) ,
 IN JDAT CHAR(8) ,
 IN JTIM CHAR(6) ,
 INOUT NUMSEQ DECIMAL(10, 0) ,
 INOUT RECVR CHAR(10) ,
 INOUT LIBRCV CHAR(10) ,
 OUT LSTSQN DECIMAL (10, 0) ,
 OUT LSTRECVR CHAR(10) ,
 OUT LSTLIBREC CHAR(10) ,
 OUT FLAG CHAR(1) ,
 OUT CODC CHAR(7) ,
 OUT MSGG CHAR(100) )
EXTERNAL NAME 'DBMOTOLIB/JRNSQNM'
LANGUAGE CL
PARAMETER STYLE GENERAL
```

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Operating System VersionV4R2

Use with DBMLIB32.SAVF

```
CREATE PROCEDURE DBMOTOLIB.JRNSQNM
(IN JOUR CHAR(10),
 IN JLIB CHAR(10),
 IN FNMS CHAR(900),
 IN JDAT CHAR(8),
 IN JTIM CHAR(6),
 INOUT NUMSEQ DECIMAL(10,0),
 INOUT RECVR CHAR(10),
 INOUT LIBRCV CHAR(10),
 OUT LSTSQN DECIMAL(10,0),
 OUT LSTRECVR CHAR(10),
 OUT LSTLIBREC CHAR(10),
 OUT FLAG CHAR(1),
 OUT CODC CHAR(7),
 OUT MSGG CHAR(100))
LANGUAGE CL SPECIFIC DBMOTOLIB.JRNSQNM
NOT DETERMINISTIC
NO SQL
EXTERNAL NAME 'DBMOTOLIB/JRNSQNM'
PARAMETER STYLE GENERAL
```

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Operating System Versions V4R3 up to and including V5R0M0

Use with DBMLIB43.SAVF

```
CREATE PROCEDURE DBMOTOLIB.JRNSQNM
(IN JOUR CHAR(10),
 IN JLIB CHAR(10),
 IN FNMS CHAR(900),
 IN JDAT CHAR(8),
 IN JTIM CHAR(6),
 INOUT NUMSEQ DECIMAL(10,0),
 INOUT RECVR CHAR(10),
 INOUT LIBRCV CHAR(10),
 OUT LSTSQN DECIMAL(10,0),
 OUT LSTRECVR CHAR(10),
 OUT LSTLIBREC CHAR(10),
 OUT FLAG CHAR(1),
 OUT CODC CHAR(7),
 OUT MSGG CHAR(100))
LANGUAGE CL SPECIFIC DBMOTOLIB.JRNSQNM
NOT DETERMINISTIC
NO SQL
EXTERNAL NAME 'DBMOTOLIB/JRNSQNM'
PARAMETER STYLE GENERAL
```

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Operating System Versions V5R1 up to and including V5R3

Use with DBMLIB51.SAVF

```
CREATE PROCEDURE DBMOTOLIB.JRNSQNM
(IN JOUR CHAR(10),
 IN JLIB CHAR(10),
 IN FNMS CHAR(900),
 IN JDAT CHAR(8),
 IN JTIM CHAR(6),
IN JCDE CHAR(100),
 INOUT NUMSEQ DECIMAL(10,0),
 INOUT RECVR CHAR(10),
 INOUT LIBRCV CHAR(10),
 OUT LSTSQN DECIMAL(10,0),
 OUT LSTTMSP CHAR(26),
 OUT LSTRECVR CHAR(10),
 OUT LSTLIBREC CHAR(10),
 OUT FLAG CHAR(1),
 OUT CODC CHAR(7),
 OUT MSGG CHAR(100))
LANGUAGE CL SPECIFIC DBMOTOLIB.JRNSQNM
NOT DETERMINISTIC
NO SQL
CALLED ON NULL INPUT
EXTERNAL NAME 'DBMOTOLIB/JRNSQNM'
PARAMETER STYLE GENERAL
```

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Operating System Version V5R4 and above:

Use with DBMLIB54.SAVF

```
CREATE PROCEDURE DBMOTOLIB.JRNSQNM
(IN JOUR CHAR(10),
IN JLIB CHAR(10),
IN FNMS CHAR(9000),
IN JDAT CHAR(8),
IN JTIM CHAR(6),
IN JCDE CHAR(100),
INOUT NUMSEQ CHAR(20),
INOUT RECVR CHAR(10),
INOUT LIBRCV CHAR(10),
OUT LSTSQN CHAR(20),
OUT LSTTMSP CHAR(26),
OUT LSTRECVR CHAR(10),
OUT LSTLIBREC CHAR(10),
OUT FLAG CHAR(1),
OUT CODC CHAR(7),
OUT MSGG CHAR(100))
LANGUAGE CL SPECIFIC DBMOTOLIB.JRNSQNM
NOT DETERMINISTIC
NO SQL
CALLED ON NULL INPUT
EXTERNAL NAME 'DBMOTOLIB/JRNSQNM'
PARAMETER STYLE GENERAL
```

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Operating Operating System Versions V6R1 and above

Required for transactional replication mode Log Reader API. Use with DBMLIBAPI61.SAVF

```
CREATE PROCEDURE DBMOTOLIB.JRNSQNM
(IN JOUR CHAR(10),
IN JLIB CHAR(10),
IN FNMS CHAR(9000),
IN JDAT CHAR(8),
IN JTIM CHAR(6),
IN JCDE CHAR(100),
INOUT NUMSEQ CHAR(20),
INOUT RECVR CHAR(10),
INOUT LIBRCV CHAR(10),
OUT LSTSQN CHAR(20),
OUT LSTTMSP CHAR(26),
OUT LSTRECVR CHAR(10),
OUT LSTLIBREC CHAR(10),
OUT FLAG CHAR(1),
OUT CODC CHAR(7),
OUT MSGG CHAR(100))
LANGUAGE CL SPECIFIC DBMOTOLIB.JRNSQNM
NOT DETERMINISTIC
NO SQL
CALLED ON NULL INPUT
EXTERNAL NAME 'DBMOTOLIB/JRNSQNM'
PARAMETER STYLE GENERAL
```

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IBM Db2 for i Connection Recommendations

When using Syniti Data Replication with IBM i/iSeries/AS400 systems, your user ID needs the authority to run the following commands:

- DSPOBJD on the schema used for replication

and to access the following system tables:

- QSYS2.SYSTABLES
- QSYS2.SYSCOLUMNS
- QSYS2.SYSCST
- QSYS2.SYSKEYCST
- QSYS2.SYSKEYS
- QSYS2.SYSINDEXES
- QSYS2.SYSPARTITIONSTAT
- SYSIBM.SQLFOREIGNKEYS

Additionally, only if the system is used as source in mirroring or synchronization mode, the user ID needs access to:

- DSPJRN (on the journals/receivers involved in replication)
- DSPFD (on the tables involved in replication)
- DSPFFD (on the tables involved in replication)

For synchronization, the user ID should be used exclusively for Syniti Data Replication so that transactions executed by Syniti DR can be easily identified in the journal.

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IBM i System Journals and Receivers

If you are performing mirroring or synchronization with an Db2 system source table, you need to manage the journals and receivers for your source tables. Typically, your system administrator manages journals and receivers, but it is helpful to know a little about the operations involved.

A journal is a collector of modified data from "journaled" files. The modifications that occurred in the files are detailed and written in a receiver as a log of the operations performed on the physical file.

The terminology is a little misleading: a journal is not, as you would expect, the place where modifications are tracked, but only the reference to write them on a receiver. A receiver is the physical location where traced modifications are written.

When a journal is started, it must be associated with a receiver. Receivers are set to a defined size that can be configured to fit your needs. The receiver is "bound" to the journal.

A physical file cannot be associated with more than one journal at the same time, like a journal cannot be associated with more than one receiver at a time. However, the same journal can track information for many physical files. If you want to change the current journal/receiver setting for a file, you can stop the journaling for that file and associate the file with a different one, but not at the same time.

Logical files (view, indexes, etc.), as well as LOB data types, are not journaled. Because a file must be journaled to be replicated in mirroring or synchronization modes, logical files can only be replicated in refresh mode.

Journal and Receiver Names

Use receiver names in which the last 4 or 5 character of the name are digits, starting with 00001, like

```
DBRSJ00001
```

Then create a new receiver with a command like

```
CRTJRNRCV JRNRCV(DBRSWRK/DBRSJ00001) AUT(*ALL)
```

and the journal with the command

```
CRTJRN JRN(DBRSWRK/DBRSJ) JRNRCV(DBRSWRK/DBRSJ00001) AUT(*ALL)
```

Note the names of journal and receiver: the second the second is the same as the first with a "00001" suffix.

It is possible to create and use journals with minimized entries:

CRTJRN JRN(DBRSWRK/DBRSJ) JRNRCV(DBRSWRK/DBRSJ00001) AUT(*ALL)MINENTDTA(*FLDBDY)

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Adding the MINENTDTA(*FLDBDY) option to the CRTJRN command will decrease the size of journal entries as follows. The Minimized Entry Specific Data (MINENTDTA) parameter for an object type allows entries for that object type, in this case a database physical file, to be minimized. While *FILE, *DTAARA, and *FLDBDY values are allowed the MINENTDTA parameter in the CRTJRN command, Syniti DRsupports only *FLDBDY (field boundaries.) This means that the minimizing will occur on field boundaries. The entry specific data will be viewable and may be used for auditing purposes.

A journal configured with MINENTDTA(*FLDBDY) only saves values for changed columns: changes to primary keys are not logged in the journal. To force one or more columns to be saved in the journal even if not changed, create a journaled index on those columns. Syniti DR requires primary key values to be present for each change, therefore it is necessary to create a journaled index on all the fields mapped to a target key.

Below is an example of how to set a table that Syniti DR can replicate. For the following table and index, assuming that HITTEST2/QSQJRN is the journal name:

```
create table hittest2.test1 (id integer, name char(20),address varchar(50), dbo date)

create index hittest2.test1idx on hittest2.test1 (id)
```

you should journal the index to ensure that the ID values appear in the journal:

```
STRJRNAP FILE(HITTEST2/TEST1) JRN(HITTEST2/QSQJRN)
```

Finally, use the command

```
CHGJRN JRN(DBRSWRK/DBRSJ) JRNRCV(*GEN)
```

The option (*GEN) enables automatic naming for receivers based on last number + 1.

If you need to have "different" names for journal and receivers, you can set the automatic naming management using the following command:

```
CHGJRN JRN(DBRSWRK/DBRSJ) MNGRCV(*SYSTEM)
```

(which is automatically set when using the JRNRCV(*GEN) option)

Using automatic naming management, MNGRCV(*USER), for receivers is useful because when the current receiver ("attached" receiver) becomes full, the system will automatically unbind the attached receiver, then create and bind a new receiver with a name based on last number + 1, i.e.

```
DBRSJ00001 --> DBRSJ00002
```

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Activating a Journal

STRJRNPF FILE(DBRSWRK/TableFILE) JRN(DBRSWRK/DBRSJ) IMAGES(*BOTH) OMTJRNE(*OPNCLO)

The IMAGES parameter can be set to either *BOTH or *AFTER. It is recommended that you set the IMAGES parameter to *BOTH. This option saves the record's image in the log, before and after the update command, and is requested by Syniti DR in order to correctly manage the record's primary key. If you choose to set the IMAGES parameter to *AFTER, you will need to modify the target table by adding a Relative Record Number (RRN) field and mapping it to the source table !RecordID field as follows:

1. Create a Decimal(15) field on the target table and make it the primary key.
2. Create source and target connections for the replication.
3. Define the replication.
4. When mapping source and target fields, right click on the target table field you want to map the RRN to, and choose Map to Expression...
5. In the upper pane of the Expression Editor, type [!RecordID].
   Alternatively, you can expand **Values** in the lower left hand pane, click on **Log Field**, then double click on **!RecordID** in the lower right hand pane.
6. Click **OK** to save the expression.

Notes:

- You should not set the IMAGES parameter to *AFTER if you are planning to perform synchronization (bi-directional mirroring).
- If the source table is reorganized, you need to run a refresh replication on the target table (to update RRN changes) before mirroring can proceed again.
- Syniti DR can report member reorganization in the log:
  In the Log Settings dialog, check the option "Write a warning on member reorganize" to record a warning in the log if RGZPFM (reorganized physical member) is executed on a table.

Receiver Management

When a receiver is unbound for any reason (because it becomes full, manual management, system management), you can choose what to do with it between:

- Unbind it and let it remain on disk
- Unbind and delete it

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This assumes that you have automated the receiver management as described before, and therefore excludes a manual intervention: you are giving the system the appropriate instructions in order to manage receivers by itself.

In order to allow the receiver to be unbound but not deleted, you need to run the following command on your journal object:

```
CHGJRN JRN(DBRSWRK/DBRSJ) DLTRCV(*NO)
```

The default is *YES. Using this setting, the system will unbind old receivers and keep them available on disk. The unbound receivers available on disk are called "online" (their status), while the unique and currently bound receiver is called "attached".

If you need to change the system management to delete old receivers when they're unbound, you need to run

```
CHGJRN JRN(DBRSWRK/DBRSJ) DLTRCV(*YES)
```

Sequence Number for Journal Entries

A receiver is the final container which keeps track of every operation (aka transaction) performed on the physical files with which they are associated via the journal. Every operation tracked is completely described and numbered with a list of details - date, time, kind of operation, etc. - and a numeric progressive value, named "Sequence number".

You can choose to set the sequence number for journal entries to continue among several receivers or to be reset at every receiver change. Run the command

```
CHGJRN JRN(xxx) JRNRCV(*GEN) SEQOPT(*CONT)
```

to allow your journal entry sequence number to continue in the subsequent receivers when the attached receiver is unbound.

Normally, when you change journal receivers, you continue the sequence number for journal entries. When the sequence number becomes very large, you should consider resetting the sequence to start the numbering at 1.

You can reset the sequence number only when all changes are forced to auxiliary storage for all journaled objects and commitment control is not active for the journal. Resetting the sequence number has no effect on how the new journal receiver is named.

If you use system journal-receiver management for a journal, the sequence number for the journal is reset to 1 whenever you restart the system or vary on the independent disk pool containing the journal. When you restart the system or vary on an independent disk pool, the system performs the change journal operation for every journal on the system or disk pool that specifies system journal-receiver management.

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The operation that the system performs is equivalent to

```
CHGJRN JRN(xxx) JRNRCV(*GEN) SEQOPT(*RESET)
```

The sequence number is not reset if journal entries exist that are needed for commitment control IPL recovery.

The maximum sequence number is 2147483136. If you specified RCVSIZOPT(*MAXOPT1) or RCVSIZOPT (*MAXOPT2) for the journal that you attached the receiver to, then the maximum sequence number is 9999999999. If this number is reached, journaling stops for that journal.

When the size limit is reached (or a manual intervention occurs), a system-managed receiver is unbound. If the delete option is disabled, it becomes an "online" receiver, meaning it is not attached but still available.

Sequence Numbers and Mirroring

Syniti DR keeps all the information about the current status of the replication, including the journal entry number and corresponding receiver, in the metadata.

It is important to have the sequence number for journal entries to continue from receiver to receiver because Syniti DR, when replicating in mirroring mode from the i/iSeries/AS400, performs comparisons between the last used (mirrored) journal entry and the current one. If the replicator detects a current value lower than the last managed value (stored in the metadata), it stops replicating and reports a message saying that a potential problem has occurred.

For this reason, it is important to keep old receivers on disk without deleting them (keep them "online".) Syniti DR stores journal entry numbers so that if a change receiver (or more than one) occurs and the last managed entry is now in an unbound receiver but the receiver is still online, the data are retrieved and the mirroring process continue without problems. If, instead, the last managed journal entry is in a deleted receiver, a potential problem is signalled in the log because something unexpected has occurred, and transactions could be missing. Syniti DR also stops replicating the source files associated with that journal,

The information stored in an online receiver is still retrievable using simple i/iSeries/AS400 CL commands. Syniti DR uses these commands. Deleted receivers cannot be used at all, so if they are not yet processed, the information they hold is lost – and, when mirroring, even a potential loss of information is a problem.

Even if a new receiver is created and bound, it does not help. If, for instance, the Replication Agent was stopped BEFORE it had processed all the journal entries in the old receiver, data may already be (potentially) missing. As a general rule, it is appropriate for the Replication Agent to signal an error and stop.

A contextual stop for Syniti DR when an IPL is performed or backup operations are in place on the i/iSeries/AS400 is a very good rule. Journaling and backup at the same time can often lead to problems.

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Writing a Script to Determine Receiver Use

If you are managing replications with IBM Db2 for i (AS400/iSeries) as a source database, you may want to identify which receivers are in use at any time so that unused receivers can be deleted. Syniti Data Replication provides a global script function called GetReceiversInUse so that you can identify all the receivers in use for replications using a specific connection to Db2. There are two ways you might use this function.

1. Receiver Names are Auto-Generated with Sequential Names

The first (and simplest) approach can be applied when receiver names are sequentially autogenerated in the format <rec_prefix>nnn, where nnn is a sequential number. This occurs when the JRNRCV(*GEN) parameter is used in the change journal. If you run the function below, you obtain a list of receivers in use by Syniti DR under that connection.

```
GetReceiversInUse(ConnectionName, True, True)
```

Parameters:
- ConnectionName = Name of the IBM Db2 for i connection for which to retrieve the receivers in use
- IsSource = True if ConnectionName refers to a source connection, false otherwise
- OnlyActiveReplications = If true, retrieve only receivers used by active (Enabled) replications, and skip the disabled ones

The list of receivers returned is sorted by (in order): Journal Library, Journal Name, Receiver Library and Receiver Name. For instance, you could obtain these receivers as output:

JRNLIB1.JOURNAL1 RECLIB1.RECV0003
JRNLIB1.JOURNAL1 RECLIB1.RECV0004
JRNLIB1.JOURNAL1 RECLIB1.RECV0005
JRNLIB1.JOURNAL1 RECLIB1.RECV0006
JRNLIB1.JOURNAL2 RECLIB2.RECV0015
JRNLIB1.JOURNAL2 RECLIB2.RECV0016

Warning: The results from this function show only receivers in use by Syniti DR. Other receivers may be used by other applications. Do not remove receivers unless you have verified that they are not needed.

This result shows that, under JOURNAL1, you can remove RECLIB1.RECV001 and RECLIB1.RECV002 because they are not in use by Syniti DR; under JOURNAL2, you can remove RECLIB2.RECV0001 through RECLIB2.RECV0014 because they are not in use by Syniti DR.

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With this information, you could write a script function using the event LogReader_onReceiverChanged to detect the current list of receivers not in use and the run the command to remove them physically from the i(iSeries/AS400) system.

2. Receiver Names are NOT Sequentially Named

If sequential naming is not guaranteed, there is no way to detect if a receiver, based on its name, is in the receiver chain of one specific receiver. In this case, a script would need to store the receiver chain for each journal in a shared list in memory, but preferably in a file. For instance, the LogReader_onReceiverChanged event might return the previous and the new receiver:

```
JRNLIB1.JOURNAL1    RECLIB1.RECV_A      old receiver
JRNLIB1.JOURNAL1    RECLIB1.RECV_B       new receiver
```

Every time the receiver changes, its name needs to be stored in a list. At some point the list might look like this:

```
JRNLIB1.JOURNAL1    RECLIB1.RECV_A
JRNLIB1.JOURNAL1    RECLIB1.RECV_B
JRNLIB1.JOURNAL1    RECLIB1.RECV_C
JRNLIB1.JOURNAL1    RECLIB1.RECV_D
JRNLIB1.JOURNAL1    RECLIB1.RECV_E
JRNLIB1.JOURNAL1    RECLIB1.RECV_F
```

Notice that letters A through F have been used to simplify the sample, but the receivers could have any names. If at this point you run GetReceiversInUse and you find out that the first receiver in use is RECLIB1.RECV_C, you know that receivers RECLIB1.RECV_A and RECLIB1.RECV_B can be removed because they appear earlier in the list.

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Using a Relative Record Number to Identify a Record (IBM Db2 for i)

For transaction-based replications (mirroring and synchronization), it is critical to be able to uniquely identify records in the source and target databases, before performing UPDATE and DELETE operations during replication. Database applications typically make use of primary keys to uniquely identify records.

Syniti Data Replication can use primary keys that have been previously set in the source and target databases to identify records during replication. It is also possible to create primary keys within the Syniti DR environment for use only during replications with Syniti DR. If, however, you are replicating from IBM Db2 for i (iSeries/AS400) and you do not have a primary key set on the source table, you can use the RRN (relative record number--a hidden column that uniquely identifies the record) to identify records during replication.

To use the RRN to identify each record:

1. In the target table, create an additional column of type DECIMAL(15).
2. If you have not yet created the replication, when you get to the Set Mapping Info screen of the Replication wizard or Multiple Replications wizard, choose to map the newly created column to an expression.
   If you have created the replication, in the Replication Properties dialog, open the Fields Mapping dialog and choose to map the newly created column to an expression.
3. In the Expression Generator, expand the tree to display the Values node.
4. Expand the Values node to display Log Field values.
5. Select the RecordID value.
   The RecordID value represents the Db2 for i (iSeries/AS400) Relative Record Number.
6. Click **OK** in the Expression Generator.

You have now set the value of the column that you created above to the RRN.

Any time you reorganize a source table (to compress deleted rows, etc.), you need to perform a full refresh of all the target tables mapped using the RRN.

Related Topics

Define Primary Key Dialog

Primary Key Settings for Mirroring and Synchronization

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Setting the CCSID for Tables and Columns

Syniti Data Replication allows you to set the CCSID (language) for tables and/or columns using the Table Properties dialog. This is useful if you are working with a table that contains columns with characters in different languages or if you need to change the language setting for the entire table. For example, if a column in a n IBM Db2 for i (iSeries/AS400) table is defined as CCSID 37, but in reality it contains data in Arabic, you can set the CCSID for that column to Arabic.

To set the CCSID for an entire table:

1. Select the source table in the Management Center.
2. Select **Table Properties** from the right mouse button menu.
3. Edit the value of the **Character CCSID** property. You can obtain the CCSID values from your Db2 documentation.
4. Click **OK** to close the dialog.

To set the CCSID for a specific column:

1. Follow the steps above to display the Table Properties dialog.
2. In the Character CCSID field, click to open the Field CCSID Settings dialog.
3. Set the CCSID value for columns as needed.
4. Click **OK** to close the dialog.
5. Click **OK** to close the Table Properties dialog.

Related Topics

Table Properties Dialog

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Synchronization Limitation with IBM Db2 for i

If you are planning a synchronization replication with IBM Db2 for i (iSeries/AS400) as a source or target database, note that any CLRPFM commands which Syniti Data Replication encounters in the journal will not be propagated to the destination table. Synchronization does not support the use of clear on physical members, although clear commands are supported for mirroring replications.

To work around this restriction, avoid calling the CLRPFM command, replacing it with DELETE FROM TABLE without adding a WHERE condition.

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Customizing Character Data by Overriding the CCSID Setting

In certain conditions, when replicating with IBM Db2, you might want to customize the current codepage (CCSID) default values during read operations with user-defined character mapping or override an existing character with a different one. For example, you could have a Db2 table where there are null string values and you want them show up as blank characters in your application.

Syniti Data Replication locates and reads the CCSID configuration file ccsid_properties.xml in the CodePages directory.

To implement customized character data, create your own .ovr file for a specific CCSID with the the mapping overrides, then edit the ccsid_properties.xml to add the mapping. (Note that the **Override CCSID** connection property has been deprecated and that the way to override codepage conversion is now by the use of the xml file. In Syniti DR V 9.7.1 and above, values from the Override CCSID field are placed in Extended Properties, but have no effect. Please delete the property value and create the override using the method described below.)

The sample ccsid_properties.xml file below contains common scenarios:

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<ccsid_properties xmlns="http://www.hitsw.com">
<property ccsid="1114" mapToCcsid="950"/>
<property ccsid="1252" mappingFileName="1252.bin"/>
<property ccsid="933" type="MULTI" mappingFileName="933.bin" over-
rideFileName="933.ovr"/>
<property ccsid="951" type="MULTI NO SHIFT" derivedFromCcsid="950" over-
rideFileName="951.ovr" />
</ccsid_properties>
```

<property ccsid="1114" mapToCcsid="950"/>
Maps 1114 to 950, i.e. whenever 1114 is referenced, CodePage will substitute it with 950.

<property ccsid="1252" mappingFileName="1252.bin"/>
Tells CodePage to use the specified mapping file 1252.bin for 1252

<property ccsid="933" type="MULTI" mappingFileName="933.bin" overrideFileName="933.ovr"/>
Tells CodePage to use 933.bin and 933.ovr, type is used to specify the type of table (MULTI means not single)

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<property ccsid="951" type="MULTI NO SHIFT" derivedFromCcsid="950" overrideFileName="951.ovr" />
Creates a new CCSID derived from an existing CCSID (uses the mapping of an existing CCSID) and then applies overrides to it. Note that the type here is MULTI NO SHIFT - the 950 conversion does not use shift in and shift out.

NOTE: If type is not specified, CodePage will try to figure it out using an internal list.

Override files have an .ovr extension and need to be copied into the same directory as the ccsid_properties.xml file: CodePages.

The .ovr file is a text file that contains mapping overrides.

Example file content:

```
! comment - commenting lines starts with !
! each mapping has 3 tokens: <native value> <operator> <unicode value>
! 1) the operator = or , means 2-way native to unicode to native map-
ping
! 2) the operator > means 1-way native to unicode mapping
! 3) the operator < means 1-way unicode to native mapping (unicode is
always on the right hand side)
```

Example CCSID Overrides:

05 = 5A (equivalent to 05 , 5A)
A7 > 100A
2A00 < 128A

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Replicating from Multi-Member Tables

If you plan to replicate data from a Db2 multi-member table running on i (iSeries/AS400), you have the following options available:

- Replicate the entire table (default members) by setting up a replication to the main table. Follow the Steps for Replicating a Table Using Refresh Mode, or the Steps for One-Way Mirroring Between Tables.
  Note: in most cases replication is successful from a table using a name that matches the default member name.However, when the names do not match, the replication works some operations, such as the table REORG and TRUNCATE are not detected. In such cases, set the **Filter By Member Name** property in the Connection Properties to True, refresh the table schema and verify that the 'Base Member' property of the table is correctly set with the default member name. If the property is set to true, when reading the Journal a filter will be used with the default member of the table. This will prevent "journal entries not found" errors caused by operations executed on non-default members of the table.
- Replicate one or more member tables by creating aliases for each of the member tables you plan to use, then setting up replications using the aliases. The steps below provide more information.

Replicating Member Tables

1. On your System i, create a table alias for each member table from which you want to replicate. The SQL syntax for creating a table alias is as follows:
   CREATE ALIAS EMPLOYEE_EUROPE FOR EMPLOYEE(EMPEUROPE)
   where EMPLOYEE_EUROPE is the alias created for member EMPEUROPE of multi-member table EMPLOYEE.
2. Follow the Steps for Replicating a Table Using Refresh Mode, or the Steps for One-Way Mirroring Between Tables to set up a replication using the alias you have created on the Db2 system and the target table.
   If you are replicating from several member tables, you can set up multiple replications using the Multiple Replications wizard.

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IBM Db2 LUW Topics

Syniti Data Replication supports use of IBM Db2 LUW for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers the transaction log and triggers
- Synchronization

For mirroring replications using the transaction log, set up your IBM Db2 LUW environment as follows:

- DBADM or SYSADM Login ID.
- Db2 Log settings as follows:
  LOGRETAIN: Recovery
  LOGARCHMETH1:LOGRETAIN or DISK
- Copy file from <InstallDir>/ServerFiles/Db2UDB to
  <Db2 Home Directory>/function on Db2 server.
- Rename copied file to Db2udbreadlog02.dll (Db2udbreadlog02 for LINUX/AIX)

For mirroring replications using triggers, set up your IBM Db2 LUW environment as follows:

- Use Db2 UDB v. 7.2 or higher
- Obtain Package creation privileges for the first connection (DBMS tools)
- Set security mechanism in Syniti Data Replication (Management Center)

This section contains topics that describe:

- IBM Db2 LUW Connection Requirements
- IBM Db2 LUW Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)
- Using the Ritmo/DB2 .NET Provider
- Customizing Character Data by Overriding the CCSID Setting

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.

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- The Help Center also provides database-specific setup notes in PDF format.

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- Db2 Log settings as follows:
  LOGRETAIN: Recovery
  LOGARCHMETH1:LOGRETAIN or DISK
- Copy file from <InstallDir>/ServerFiles/Db2UDB to
  <Db2 Home Directory>/function on Db2 server.
- Rename copied file to Db2udbreadlog02.dll (Db2udbreadlog02 for LINUX/AIX)

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IBM Db2 LUW Transactional Replication Settings

Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog

The information below explains how to configure the transactional replication settings for IBM Db2 LUW i in the Enable Transactional Replication wizard or the Transactional Log Settings dialog available from the **Transactional Setup > Manage** option on the connection in the Metadata Explorer.

When replicating from IBM Db2 LUW using mirroring or synchronization, two transactional modes are available: Log Reader and Triggers.

Log Reader Settings

To define a mirroring or synchronization replication, you first need to set up stored procedures to access the log on your Db2 system. Before completing this screen, make sure that you have followed all the requirements for your Db2 connection described in IBM Db2 Connection Requirements.

Stored Procedures Schema Name

The default value provided is the ID of the user specified in the Db2 connection. The value can be edited to reflect whichever schema you want to use for the log reading stored procedures. There are a total of three procedures created:
The library/dll has 3 stored procedures:

- LOGVER03 is used to identify the version of the stored procedures/library so that a mismatched version is not used
- CURLSN03 is used to find and retrieve the current LSN or Transaction ID in the Db2 log
- LOGREC03 is used to read and retrieve changed records from the Db2 log

Log Reader Library Version

A read-only field that displays the version of the file you copied from the ServerFiles/Db2UDB folder to your Db2 Server function folder. See IBM Db2 Connection Requirements for information on the files to copy and additional setup requirements.

Verify (available only in the Manage Transactional Log Settings dlialog)

Click **Verify** to check that:

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- Log-based transactional replication is supported for the Db2 version that you are using
- The stored procedures that Syniti DR will use are installed on the server.

  READDB2UDB_LOGVER03

  READDB2UDB_CURLSN03

  READDB2UDB_LOGREC03

  To later remove the stored procedures from the server, use the Disable Transactional Replication wizard available from the **Transactional Setup** > **Disable** option on the connection in the Metadata Explorer.

Triggers Settings

Related Topics

IBM Db2 Connection Requirements

Trigger-based Setup Info

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Using the Ritmo/Db2 .NET Provider

The Ritmo/Db2 .NET provider is included with your Syniti Data Replication release and installed as part of the setup. The version of Ritmo/Db2 that is provided with Syniti DR does not include the Ritmo Toolbox. For more information about Ritmo features, check the Ritmo page on our web site.

The Ritmo/Db2 files can be found in the installation folder, in a separate folder called **Ritmo Db2**.

The following topic may be useful when using Ritmo/Db2 with Syniti DR.

See IBM Db2 Connection Requirements for information on the type of permissions you need to set up a connection to IBM Db2.

Enabling a trace

The file RitmoDb2.xml contains configuration settings for Ritmo and can be found in the folder where Ritmo was installed. You can set trace file names for high and/or low level traces and enable the traces from this file. Note that the traces will run whenever Ritmo is in use, and you should set <traceflag> to False immediately after completing the operations that you wanted to trace. If you leave the trace running, it can affect performance and build up large trace files.

1. In the Windows Explorer, go to the Syniti DR installation folder, then to the Ritmo_Db2 folder.
2. Open the file RitmoDb2.xml in a text editor.
3. Modify the trace entries in bold below. For easy access to the tracefile, specify a pathname. The default path depends on your version of Windows. Note that the <traceflag> entry should be set to **true** to enable the trace.

```
<?xml version="1.0" encoding="utf-8" ?>
<configuration>
<configSections>
<section name="trace" />
</configSections>
<trace>
<high>
  <tracefile>sqlDb2.trc</tracefile>
   <traceflag>true</traceflag>
</high>
```

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```
</trace>
</configuration>
```

4. Save the file and exit the text editor.

Related Topics

IBM Db2 Connection Requirements

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IBM Db2 Connection Requirements

When using Syniti Data Replication with IBM Db2, you need the following information to set up a connection.

General Requirements

- User and password for the Db2 with appropriate privileges (see below)
- Security Mechanism used on the Db2 server. The value specified in Syniti DR must match whatever setting is specified on the Db2 server. The options available are User Only, User and Password, Encrypted Password and Encrypted User and Password. Select the value from the drop-down list in the Security Mechanism field. If the value you choose does not match the value on the Db2 server, you will see the following error when attempting to connect.

Note: If you need to change this setting at any time, you may need to delete the connection and recreate it for the changed setting to take effect.

- IP address and port to reach Db2
- Name of Db2 catalog (Database Server Name)
- Package collection
  The account used to make a connection the first time requires permissions to create a package where some prepared SQL statements (DECLARE CURSOR) will be stored. The package can be created in a collection specified in the configuration parameter ”r;Package Collection.” The account must have CREATE, BIND and GRANT privileges for objects in the collection. These privileges are needed only for the first connection. Once the package has been created, for all users of that package the privileges are no longer required. (A package can later be dropped using the DROP PACKAGE SQL statement if needed.)
- Host Code Page (CCSID) for the Db2 catalog: the code of the language used in Db2 (ex. 280 Italian, 037 US

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English, 1252 ANSI etc.) In most cases, the appropriate choice is 1208 - Unicode UTF-8. However, you should check with your Db2 administrator.

Requirements for Log-based Mirroring/Synchronization with Db2 LUW

- Either the DBADM or the SYSADM login ID.
  To access the Db2 log, the user ID specified in the Syniti DR Connection dialog/wizard must have Database Administrator privileges.
- Db2 Log settings as follows. See Setting Parameters for the Db2 Log for more information.
  LOGARCHMETH1 parameter should be set to LOGRETAIN or DISK
  NOTE: Be sure to complete a full offline backup of the database after making any changes to the log settings.
- Copy file to Db2 Server.

1. On your Windows desktop, open the Syniti DR install folder, and go to the `ServerFiles/Db2UDB` folder.
2. Locate the appropriate file for your operating system and Db2 version.
   For example, the file `aix53_9010_Db2udbreadlog03` is for the IBM AIX 5.3 operating system, Db2 version 9.1, whereas the file `win_10010_Db2udbreadlog03.dll` is for Microsoft Windows, Db2 version 10.1.
   NOTE: If you do not find a file for your operating system or Db2 version, contact technical support.
3. Copy the appropriate file from the `ServerFiles/Db2UDB` folder in your Syniti Data Replication install directory to:
   `<Db2 Home Directory>/function`
   on your Db2 server (the file contains stored procedures that Syniti DR calls to access the log).
4. Rename the copied file to `Db2udbreadlog03.dll` (`Db2udbreadlog03` for UNIX).

Setting Parameters for the Db2 Log

By default, the IBM Db2 logging type is Circular, which means the log files are written in a circular fashion. To make the log files accessible for reading, Db2 requires the logging type to be Archive.

If the database is not already in Archive mode, you need to:

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1. Change the logging type. To change the database logging type to Archive, change the parameter LOGARCHMETH1 value to either LOGRETAIN or DISK.
2. Perform a full offline backup (required by Db2 right after the logging type is changed.)

It is highly recommended that the above actions are carried out by the Db2 Database Administrator.

Setting Parameter LOGARCHMETH1 examples

Below are examples showing how to change the LOGARCHMETH1 parameter and to perform a backup. Again, it is highly recommend that the operations are carried out by the DBA. Refer to your database documentation for more information on the steps below.

- Set the value of LOGARCHMETH1 to LOGRETAIN.
  CONNECT TO SAMPLE;
  UPDATE DATABASE CONFIGURATION USING LOGARCHMETH1 LOGRETAIN IMMEDIATE;
  CONNECT RESET;
- Set the value of LOGARCHMETH1 to DISK
  CONNECT TO SAMPLE;
  UPDATE DATABASE CONFIGURATION USING LOGARCHMETH1 DISK:f:/logs/ IMMEDIATE;
  CONNECT RESET;
- Back up the database
  Note that, depending on the size of your database, this step can take several hours.
  BACKUP DATABASE SAMPLE TO "/tmp" WITH 2 BUFFERS BUFFER 1034 PARALLELISM 1 COMPRESS WITHOUT PROMPTING;

For more information, see IBM Db2 Version 9.7's 'Configuration parameters summary' on the IBM website:

http://pub-lib.boulder.ibm.com/infocenter/Db2luw/v9r7/index.jsp?topic=/com.ibm.Db2.luw.admin.config.doc/doc/r0005181.html.

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IBM Db2 for z/OS Topics

Syniti Data Replication supports use of IBM Db2 for z/OS for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers triggers
- Synchronization

For mirroring replications using triggers, set up your IBM Db2 for z/OS environment as follows:

- Use Db2 for OS390 v6 or higher
- Obtain package creation privileges for the first connection (DBMS tools)
- Set security mechanism in Syniti DR (Management Center)

This section contains topics that describe:

- IBM Db2 Connection Requirements
- Using the Ritmo/DB2 .NET Provider
- Trigger Transactional Replication Settings
- Customizing Character Data by Overriding the CCSID Setting

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
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3. Modify the trace entries in bold below. For easy access to the tracefile, specify a pathname. The default path depends on your version of Windows. Note that the <traceflag> entry should be set to **true** to enable the trace.

```
<?xml version="1.0" encoding="utf-8" ?>
<configuration>
<configSections>
<section name="trace" />
</configSections>
<trace>
<high>
  <tracefile>sqlDb2.trc</tracefile>
   <traceflag>true</traceflag>
</high>
```

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```
</trace>
</configuration>
```

4. Save the file and exit the text editor.

Related Topics

IBM Db2 Connection Requirements

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IBM Db2 Connection Requirements

When using Syniti Data Replication with IBM Db2, you need the following information to set up a connection.

General Requirements

- User and password for the Db2 with appropriate privileges (see below)
- Security Mechanism used on the Db2 server. The value specified in Syniti DR must match whatever setting is specified on the Db2 server. The options available are User Only, User and Password, Encrypted Password and Encrypted User and Password. Select the value from the drop-down list in the Security Mechanism field. If the value you choose does not match the value on the Db2 server, you will see the following error when attempting to connect.

Note: If you need to change this setting at any time, you may need to delete the connection and recreate it for the changed setting to take effect.

- IP address and port to reach Db2
- Name of Db2 catalog (Database Server Name)
- Package collection
  The account used to make a connection the first time requires permissions to create a package where some prepared SQL statements (DECLARE CURSOR) will be stored. The package can be created in a collection specified in the configuration parameter ”r;Package Collection.” The account must have CREATE, BIND and GRANT privileges for objects in the collection. These privileges are needed only for the first connection. Once the package has been created, for all users of that package the privileges are no longer required. (A package can later be dropped using the DROP PACKAGE SQL statement if needed.)
- Host Code Page (CCSID) for the Db2 catalog: the code of the language used in Db2 (ex. 280 Italian, 037 US

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English, 1252 ANSI etc.) In most cases, the appropriate choice is 1208 - Unicode UTF-8. However, you should check with your Db2 administrator.

Requirements for Log-based Mirroring/Synchronization with Db2 LUW

- Either the DBADM or the SYSADM login ID.
  To access the Db2 log, the user ID specified in the Syniti DR Connection dialog/wizard must have Database Administrator privileges.
- Db2 Log settings as follows. See Setting Parameters for the Db2 Log for more information.
  LOGARCHMETH1 parameter should be set to LOGRETAIN or DISK
  NOTE: Be sure to complete a full offline backup of the database after making any changes to the log settings.
- Copy file to Db2 Server.

1. On your Windows desktop, open the Syniti DR install folder, and go to the `ServerFiles/Db2UDB` folder.
2. Locate the appropriate file for your operating system and Db2 version.
   For example, the file `aix53_9010_Db2udbreadlog03` is for the IBM AIX 5.3 operating system, Db2 version 9.1, whereas the file `win_10010_Db2udbreadlog03.dll` is for Microsoft Windows, Db2 version 10.1.
   NOTE: If you do not find a file for your operating system or Db2 version, contact technical support.
3. Copy the appropriate file from the `ServerFiles/Db2UDB` folder in your Syniti Data Replication install directory to:
   `<Db2 Home Directory>/function`
   on your Db2 server (the file contains stored procedures that Syniti DR calls to access the log).
4. Rename the copied file to `Db2udbreadlog03.dll` (`Db2udbreadlog03` for UNIX).

Setting Parameters for the Db2 Log

By default, the IBM Db2 logging type is Circular, which means the log files are written in a circular fashion. To make the log files accessible for reading, Db2 requires the logging type to be Archive.

If the database is not already in Archive mode, you need to:

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1. Change the logging type. To change the database logging type to Archive, change the parameter LOGARCHMETH1 value to either LOGRETAIN or DISK.
2. Perform a full offline backup (required by Db2 right after the logging type is changed.)

It is highly recommended that the above actions are carried out by the Db2 Database Administrator.

Setting Parameter LOGARCHMETH1 examples

Below are examples showing how to change the LOGARCHMETH1 parameter and to perform a backup. Again, it is highly recommend that the operations are carried out by the DBA. Refer to your database documentation for more information on the steps below.

- Set the value of LOGARCHMETH1 to LOGRETAIN.
  CONNECT TO SAMPLE;
  UPDATE DATABASE CONFIGURATION USING LOGARCHMETH1 LOGRETAIN IMMEDIATE;
  CONNECT RESET;
- Set the value of LOGARCHMETH1 to DISK
  CONNECT TO SAMPLE;
  UPDATE DATABASE CONFIGURATION USING LOGARCHMETH1 DISK:f:/logs/ IMMEDIATE;
  CONNECT RESET;
- Back up the database
  Note that, depending on the size of your database, this step can take several hours.
  BACKUP DATABASE SAMPLE TO "/tmp" WITH 2 BUFFERS BUFFER 1034 PARALLELISM 1 COMPRESS WITHOUT PROMPTING;

For more information, see IBM Db2 Version 9.7's 'Configuration parameters summary' on the IBM website:

http://pub-lib.boulder.ibm.com/infocenter/Db2luw/v9r7/index.jsp?topic=/com.ibm.Db2.luw.admin.config.doc/doc/r0005181.html.

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Trigger Transactional Replication Settings

Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog

The information in this topic applies to **trigger-based replications** supported for databases as described in Source and Target Options. It explains how to configure the transactional replication settings for trigger-based replications in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog available from the **Transactional Setup> Manage** option on the connection in the Metadata Explorer.

Your system administrator needs to create and define appropriate table spaces and databases to hold the log tables. They should be large enough to handle the expected amount of replication data. The login you are using for the source connection should have appropriate authorizations to create tables. More about trigger-based replication.

If using **IBM Db2** as a source database, the following versions are supported:

- Db2 UDB v. 7.2 or higher
- Db2 for OS390 v6 or higher

If using **SQL Server** as a source database, the following restrictions apply for transactional replications with triggers:

- Data types "image", "text" and "ntext" are not supported. If you create a transactional replication on a table with fields where these data types defined, the Management Center warns you that the fields will not be replicated. In SQL Server 2005 and SQL Server Express, these types have been replaced by "varbinary(max)", "varchar (max)", and "nvarchar(max)". Microsoft recommends replacing the old data types with the new ones. The new data types are supported when using the Triggers option.
- The source table does not need a primary key set in SQL Server but it must have a primary key defined in Syniti DR. See Primary Key Settings for Mirroring and Synchronization for an explanation on how to create a primary key in Syniti DR.

If using **SAP Sybase SQL Anywhere triggers** option, and you have triggers already defined on your source table, you can use the **Trigger Order** option to set the value that DBMOTO passes to the ORDER clause in the CREATE TRIGGER statement. In most cases, the default value of 100 works appropriately.

Master Table

Either specify an existing qualified table name, or click **Change** to create a new table to hold general information about replication transactions including user name, timestamp, table name for each transaction.

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There are two tables associated with each replication: a Master table, common to all replications using that connection, and a Log table for each replication source table. The Master table keeps track of all the transactions affecting the source tables and it records general transactional information.

Master and Log tables are created in the schema specified when you set the Master table name. You can choose a Master table name, or use the default _DBM__MASTERLOG. Log tables are automatically generated by Syniti DR and the names are _DBM__LOG_#, where # is a number. The selected schema for the Master and Log tables must not contain other non-Syniti DR tables with names _DBM__LOG_# It is recommended that you create a new schema to use specifically for the Syniti DR Master and Log tables.

Tablespace

It is recommended that you assign a tablespace for the Master table and Log Tables so that it is easier to control log table sizes. If you leave this field blank, the default tablespace value for your login ID will be used. Your system administrator should be able to provide you with the appropriate value for this field.

If you are using SAP HANA, tablespace is not available and schemas are used instead.

If you are using IBM Db2, the value can be entered as dbname.tablespace.

Retention Time

The amount of time in hours that a transaction is kept in the log tables. The default value is 72 hours. When the amount of time a transaction resides in the log exceeds the retention time, the transaction is permanently removed from the log tables. Tuning the retention time provides control over the size of the log tables.

Delete Block Size

Based on the retention time, Syniti DR deletes items from the log. This field specifies the maximum number of records to delete from the Syniti DR log tables with a single SQL statement. The default value is 10,000 records. You do not typically need to edit this value.

Trigger Order

For Sybase SQL Anywhere users only. See note above.

Uncommitted TID Wait Cycle

For SAP HANA users only. This property is used when reading transactions from the master table. The master table is read using read uncommitted, but some databases do not support this isolation level. It is therefore possible that a transaction t2 is committed before t1 (where t1 < t2) and that the transaction ID of the replication is

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moved ahead before t1 has been replicated. To prevent this issue, whenever a gap in the TID column is identified in the master table, the replication holds for the number of mirroring intervals (as set in the Replication Properties dialog) specified in this property.

Lower-case Trigger Identifiers

When checked, Syniti DR creates objects for the trigger-based replications with lower case names. When unchecked, mixed case is used. This option should be checked if the database default case for identifiers is lower-case.

Ucommitted Transactions Recovery Option

For Oracle and SAP HANA trigger-based replications only. This section can be used to indicate how uncommitted transactions should be handled during replication.

None	No gap conditions handled. Uncommitted transactions may cause data to be skipped in replication.
Wait	Set a number of mirroring intervals to hold all replications on the connection to wait when a gap is found due to an uncommitted transaction. All replications in the connection will hold and wait for the number of cycles specified to see if the gap is filled. If after the number of cycles, a transaction is still not committed, it will be skipped.
Continue and Process when Committed	Instead of pausing all replications in case of a gap, replication proceeds with all currently committed transactions. During the next mirroring cycle, the trigger log table is checked for earlier transactions that now have been committed, and any identified transactions are processed.
Skip Uncommitted Transactions Older Than	If wait or continue are selected, this property sets a limit on the amount of time to wait for uncommitted transactions. For instance, a value of 15 minutes means that, no matter which option you choose, transactions opened and not committed for more than 15 minutes will be skipped.

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IBM Informix Topics

Syniti Data Replication supports use of IBM Informix for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers the Log Server Agent and triggers
- Synchronization

When setting up IBM Informix for use with the Log Server Agent:

- Use Informix v 11.5 FC3 or above
- Execute the script **syscdcv1.sql** on the server
- Database should have logging enabled.
- Consider the following option: in the Transactional Log Settings Extra Options field, set TURN_OFF_FULLROWLOGGING=NO. For more information, review this article in the Help Center.
- Syniti DR user should have CONNECT and DBA privileges to source database and syscdcv1 database
- Install and test the latest Informix Client SDK with the ESQL option and the .NET Data Provider

When setting up IBM Informix for use with the Syniti DR triggers:

- Create or assign tables for Master Table and Log Table (DBMS tools)
- Assign a tablespace for the Master table and Log Tables (DBMS tools)

This section contains topics that describe:

- Informix Server Client Setup
- Informix Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)
- Informix Transaction Log Information (in the in the Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen)
- Trigger Transactional Replication Settings

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Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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IBM Informix Topics

Syniti Data Replication supports use of IBM Informix for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers the Log Server Agent and triggers
- Synchronization

When setting up IBM Informix for use with the Log Server Agent:

- Use Informix v 11.5 FC3 or above
- Execute the script **syscdcv1.sql** on the server
- Database should have logging enabled.
- Consider the following option: in the Transactional Log Settings Extra Options field, set TURN_OFF_FULLROWLOGGING=NO. For more information, review this article in the Help Center.
- Syniti DR user should have CONNECT and DBA privileges to source database and syscdcv1 database
- Install and test the latest Informix Client SDK with the ESQL option and the .NET Data Provider

When setting up IBM Informix for use with the Syniti DR triggers:

- Create or assign tables for Master Table and Log Table (DBMS tools)
- Assign a tablespace for the Master table and Log Tables (DBMS tools)

This section contains topics that describe:

- Informix Server Client Setup
- Informix Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)
- Informix Transaction Log Information (in the in the Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen)
- Trigger Transactional Replication Settings

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Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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IBM Informix Transactional Replication Settings

Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog

The information below explains how to configure the transactional replication settings for Informix in the Enable Transactional Replication wizard or the Transactional Log Settings dialog available from the **Transactional Setup > Manage** option on the connection in the Metadata Explorer.

When replicating from Informix using mirroring or synchronization, two transactional modes are available: Log Server Agent and Triggers.

Log Server Agent Settings

Triggers Settings

Additional Step for Synchronization Replications

For synchronization replications only, you also need to obtain the user ID number for the user specified in the source connection. This number will be used to edit the _config.ini file for the Windows service that reads the Informix log. To obtain and use the user ID number:

1. Create the Windows service using the Install button as described above.
2. From the command line, run the program InformixGetUserIDNumber.exe in the Syniti DR Install directory**:**
   InformixGetUserID.exe <informix-server-name> <userid> <password>
   where:
   <informix-server-name> is name of the informix server as defined in the source
   <userid> the name of the user defined in the source connection
   <password> the password for the user ID
   The application outputs a number which must be manually inserted into the _config.ini file in the folder for the Windows service.
3. In the Windows Explorer, from the Syniti DR install directory, go to the Windows service folder.
4. Edit the _config.ini file and locate the field USER_ID_NUMBER.
5. Set the value to the number returned from your call to InformixGetUserIDNumber above.

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6. Save the file.
7. Start the Windows service.

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Informix Transaction Log Information

Create Replication wizard and Create Multiple Replications wizard**Source Log Info** screen

Log File Name

The log file name is provided automatically and cannot be changed. Click **Read** in the Transaction ID field to open the Transaction Read Point dialog. When you select how to set the transaction ID and click **OK**, the log file name is automatically added.

Log File Number

The log file number is provided automatically and cannot be changed. Click **Read** in the Transaction ID field to open the Transaction Read Point dialog. When you select how to set the transaction ID and click **OK**, the log file number is automatically added.

Transaction ID

The ID for the transaction at which you want to start replication. If you want to change the transaction ID, click **Read...** to open the Read Point dialog. In this dialog, you can either retrieve the current transaction or the transaction for a specified date and time. If you enter a date and time, Syniti DR retrieves the first transaction after the time entered. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

Transaction Timestamp

The timestamp for the transaction above.

Read Interval (sec)

The frequency (in seconds) with which you want to check the log during replication. For example, if the setting is 90 seconds, Syniti DR will check the log every 90 seconds to see if any transactions have occurred that need to be replicated to the target table. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

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Informix Server and Client Setup

If you are planning to use Informix version 11.5 FC3 or above as your source database for mirroring or synchronization using a transaction log, you need to perform additional installation steps on the Informix server.

1. Check that you are using Informix IDS database version 11.5 FC3 or above
2. Ask a Database Administrator (DBA) to execute the script **syscdcv1.sql** that comes with the database to create the database syscdcv. The tables are required by Syniti Data Replication.
3. Make sure that The database containing the source data to be replicated was created with logging enabled. In the unlikely event that logging is not enabled, a DBA can use the ondblog utilty to change the logging mode (together with the onbar utility to backup the database after the logging mode is changed,)
4. For the user ID that will be used to connect the database from Syniti DR, grant CONNECT and DBA privileges both to the source database and to the syscdcv1 database. For example:
   grant connect to "dbmotouser1"
   grant dba to "dbmotouser1"
5. Make sure that the user ID is in the informix-admin group.

The following steps should be performed on the client machine where Syniti DR is installed and run.

1. Install the latest Informix Client SDK (currently version 3.70) with the ESQL option and the .NET Data Provider.
2. Use the SetNet32 utility to define the server.
3. Verify the connection to the database using the ILogin.exe demo.
4. Set up the permissions for the Windows user that runs Syniti DR to create and delete Windows services.

Related Topics

Informix Transaction Log Setup Info

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Trigger Transactional Replication Settings

Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog

The information in this topic applies to **trigger-based replications** supported for databases as described in Source and Target Options. It explains how to configure the transactional replication settings for trigger-based replications in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog available from the **Transactional Setup> Manage** option on the connection in the Metadata Explorer.

Your system administrator needs to create and define appropriate table spaces and databases to hold the log tables. They should be large enough to handle the expected amount of replication data. The login you are using for the source connection should have appropriate authorizations to create tables. More about trigger-based replication.

If using **IBM Db2** as a source database, the following versions are supported:

- Db2 UDB v. 7.2 or higher
- Db2 for OS390 v6 or higher

If using **SQL Server** as a source database, the following restrictions apply for transactional replications with triggers:

- Data types "image", "text" and "ntext" are not supported. If you create a transactional replication on a table with fields where these data types defined, the Management Center warns you that the fields will not be replicated. In SQL Server 2005 and SQL Server Express, these types have been replaced by "varbinary(max)", "varchar (max)", and "nvarchar(max)". Microsoft recommends replacing the old data types with the new ones. The new data types are supported when using the Triggers option.
- The source table does not need a primary key set in SQL Server but it must have a primary key defined in Syniti DR. See Primary Key Settings for Mirroring and Synchronization for an explanation on how to create a primary key in Syniti DR.

If using **SAP Sybase SQL Anywhere triggers** option, and you have triggers already defined on your source table, you can use the **Trigger Order** option to set the value that DBMOTO passes to the ORDER clause in the CREATE TRIGGER statement. In most cases, the default value of 100 works appropriately.

Master Table

Either specify an existing qualified table name, or click **Change** to create a new table to hold general information about replication transactions including user name, timestamp, table name for each transaction.

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There are two tables associated with each replication: a Master table, common to all replications using that connection, and a Log table for each replication source table. The Master table keeps track of all the transactions affecting the source tables and it records general transactional information.

Master and Log tables are created in the schema specified when you set the Master table name. You can choose a Master table name, or use the default _DBM__MASTERLOG. Log tables are automatically generated by Syniti DR and the names are _DBM__LOG_#, where # is a number. The selected schema for the Master and Log tables must not contain other non-Syniti DR tables with names _DBM__LOG_# It is recommended that you create a new schema to use specifically for the Syniti DR Master and Log tables.

Tablespace

It is recommended that you assign a tablespace for the Master table and Log Tables so that it is easier to control log table sizes. If you leave this field blank, the default tablespace value for your login ID will be used. Your system administrator should be able to provide you with the appropriate value for this field.

If you are using SAP HANA, tablespace is not available and schemas are used instead.

If you are using IBM Db2, the value can be entered as dbname.tablespace.

Retention Time

The amount of time in hours that a transaction is kept in the log tables. The default value is 72 hours. When the amount of time a transaction resides in the log exceeds the retention time, the transaction is permanently removed from the log tables. Tuning the retention time provides control over the size of the log tables.

Delete Block Size

Based on the retention time, Syniti DR deletes items from the log. This field specifies the maximum number of records to delete from the Syniti DR log tables with a single SQL statement. The default value is 10,000 records. You do not typically need to edit this value.

Trigger Order

For Sybase SQL Anywhere users only. See note above.

Uncommitted TID Wait Cycle

For SAP HANA users only. This property is used when reading transactions from the master table. The master table is read using read uncommitted, but some databases do not support this isolation level. It is therefore possible that a transaction t2 is committed before t1 (where t1 < t2) and that the transaction ID of the replication is

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moved ahead before t1 has been replicated. To prevent this issue, whenever a gap in the TID column is identified in the master table, the replication holds for the number of mirroring intervals (as set in the Replication Properties dialog) specified in this property.

Lower-case Trigger Identifiers

When checked, Syniti DR creates objects for the trigger-based replications with lower case names. When unchecked, mixed case is used. This option should be checked if the database default case for identifiers is lower-case.

Ucommitted Transactions Recovery Option

For Oracle and SAP HANA trigger-based replications only. This section can be used to indicate how uncommitted transactions should be handled during replication.

None	No gap conditions handled. Uncommitted transactions may cause data to be skipped in replication.
Wait	Set a number of mirroring intervals to hold all replications on the connection to wait when a gap is found due to an uncommitted transaction. All replications in the connection will hold and wait for the number of cycles specified to see if the gap is filled. If after the number of cycles, a transaction is still not committed, it will be skipped.
Continue and Process when Committed	Instead of pausing all replications in case of a gap, replication proceeds with all currently committed transactions. During the next mirroring cycle, the trigger log table is checked for earlier transactions that now have been committed, and any identified transactions are processed.
Skip Uncommitted Transactions Older Than	If wait or continue are selected, this property sets a limit on the amount of time to wait for uncommitted transactions. For instance, a value of 15 minutes means that, no matter which option you choose, transactions opened and not committed for more than 15 minutes will be skipped.

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IBM PureData for Analytics Topics

Syniti Data Replication supports use of IBM PureData for Analytics for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers use of the transaction log

When setting up IBM PureData for use with Syniti Data Replication, there are no specific settings required, other than adequate database permissions.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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IBM PureData for Analytics Topics

Syniti Data Replication supports use of IBM PureData for Analytics for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers use of the transaction log

When setting up IBM PureData for use with Syniti Data Replication, there are no specific settings required, other than adequate database permissions.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Ingres Topics

Syniti Data Replication supports use of Ingres for:

- Refresh replications, both source and target
- Mirroring replications, target only.

There are no specific settings required for transactional replications to Ingres, other than the installation and configuration of the .NET provider.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Ingres Topics

Syniti Data Replication supports use of Ingres for:

- Refresh replications, both source and target
- Mirroring replications, target only.

There are no specific settings required for transactional replications to Ingres, other than the installation and configuration of the .NET provider.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Microsoft Access Topics

Syniti Data Replication supports use of Microsoft Access for:

- Refresh replications, both source and target
- Mirroring replications, target only.

When setting up Microsoft Access for use with Syniti Data Replication, there are no specific settings required, other than the configuration of the ODBC driver.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Microsoft Access Topics

Syniti Data Replication supports use of Microsoft Access for:

- Refresh replications, both source and target
- Mirroring replications, target only.

When setting up Microsoft Access for use with Syniti Data Replication, there are no specific settings required, other than the configuration of the ODBC driver.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Microsoft Azure SQL Database Topics

Syniti Data Replication supports use of Azure SQL Database for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers triggers
- Synchronization

When setting up Azure SQL Database for use with Syniti Data Replication, there are no specific settings required, other than the configuration of the .NET provider, and adequate permissions for the Syniti DRuser.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Microsoft Azure SQL Database Topics

Syniti Data Replication supports use of Azure SQL Database for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers triggers
- Synchronization

When setting up Azure SQL Database for use with Syniti Data Replication, there are no specific settings required, other than the configuration of the .NET provider, and adequate permissions for the Syniti DRuser.

Further Resources

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Microsoft SQL Server Topics

Syniti Data Replication supports use of Microsoft SQL Server for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers the Log Server Agent, transaction log support and triggers
- Synchronization

When setting up SQL Server for use with the Log Server Agent or the transaction log:

- Define two connections to the database: a non system administrator connection and a system administrator connection. (DBMS tools)
- Set up the distributor (Management Center)
- Establish primary keys on tables (or use trigger-based replication option.) (Management Center or DBMS tools)

This section contains topics that describe:

- SQL Server Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)
- SQL Server Transaction Log Information (in the Create Replication wizard and Create Multiple Replications **Source Log Info** screen)

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
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Further Resources

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Microsoft SQL Server CE Topics

Syniti Data Replication supports use of Microsoft SQL Server CE for:

- Refresh replications, both source and target
- Mirroring replications, target only.

When setting up SQL Server CE, there are no specific database settings, other than configuring the .NET provider and setting up trigger-based replication.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
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Microsoft SQL Server Transactional Replication Settings

Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog

The information below explains how to configure the transactional replication settings for SQL Server in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog available from the **Transactional Setup > Manage** option on the connection in the Metadata Explorer.

When replicating from SQL Server using mirroring or synchronization, three transactional modes are available: Log Reader, Log Server Agent and Triggers.

Log Reader and Log Server Agent Settings

If you plan to define a mirroring or synchronization replication, you need to define two connections to the database: a non system administrator connection and a system administrator connection. The system administrator connection is used to set up the distributor and access the transaction log. However, a system administrator connection does not provide sufficient user information in the log to identify transactions for replication, so you also need the non system administrator connection.

Notes:

1. When using SQL Server as a source in mirroring (or as a source or target in synchronization replications), SQL Server requires that tables have a primary key defined. If tables do not have a primary key, you can set up trigger-based replication.
2. When using SQL Server for synchronization, the database should be set up with a recovery model other than Simple -- either Full or Bulk-Logged recovery models are acceptable. This is because the Simple recovery model, the transaction log that is used to retrieve user ID information can be truncated, causing the synchronization algorithm to fail.

Publisher

The name of the database server that you are using for the connection.

Distributor

Initially, this field displays the name of the database server you are using for the connection. When you click **Verify** to see if a Distributor is installed for this database server, the value changes as follows:

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- If a distributor exists for the server, the server name is displayed and two buttons are active
  - The ... Ellipsis button to the right of the Distributor field

    Click here to open the Change Distributor dialog and view the distributor values. You cannot edit values in the dialog unless you first exit the dialog, remove the installed distributor, then re-open the dialog.
  - The **Remove** button is active so that you can remove the distributor in cases where you prefer to use a distributor defined for another accessible installation of SQL Server.
- If no distributor exists, the server name is displayed, and two buttons are active:
  - The ... Ellipsis button to the right of the Distributor field

    Click here to open the Change Distributor dialog and set or create a distributor on a different SQL Server installation from the one containing the table(s) to be replicated (remote distributor).
  - The **Install** button is active so that you can install a distributor. If you choose this option to install a distributor in the current SQL Server installation, Syniti DR creates a distributor called DBRS_Distribution.

Be sure to install a distributor before closing the dialog.

Change Distributor Dialog

This dialog can be accessed by clicking ... next to the **Distributor** field.

- If you have a distributor installed in the SQL Server to which you are connecting for replication, the **Use Local Distributor** option is selected and values in the **Server** and **Database** fields reflect the SQL Server installation and distributor database. These values cannot be changed from the dialog. To change the distributor, you need to close the dialog, remove the local distributor using the Microsoft SQL Server console and reopen the dialog.

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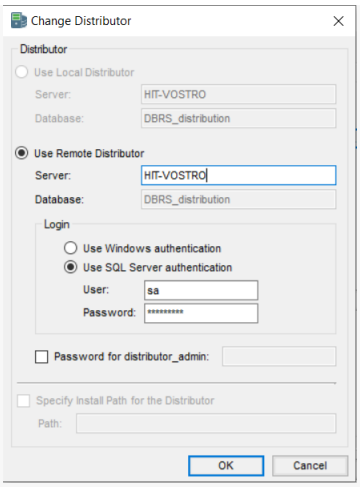

- If you do not have a distributor installed and want to set or create a distributor on a remote installation of SQL Server, select the **Use Remote Distributor** option and enter the SQL Server name (or an established alias for the SQL Server system), then the distributor database name. If the distributor does not exist, one will be created using the specified name. Provide a user name and password with appropriate privileges for creating the distributor in the remote installation of SQL Server.
- When setting up a remote distributor, SQL Server requires an internal distributor_admin password that is shared between the local publisher and the remote distributor. This password is used only when setting up the distributor and can be auto-generated by the application. If you have a specific password policy or wish to set this password explicitly, use the **Password for distributor_admin** field to set a password.

NOTES: The following are limitations on the use of remote distributors:

- If problems arise when Syniti DR attempts to create the remote distributor, you may need to enter the full pathname to the location where the distributor should be created. This is usually in the SQL Server folder that contains the Data and Log folders, for example, "C:\Program Files\Microsoft SQL Server\MSSQL.1\MSSQL." The path has to be the complete path up to the SQL Server folder that contains the Data and Log folders.
- If problems arise because Syniti DR is not able to locate the server name specified for a remote distributor, you can change the value of the Server field to use an established alias for the server.
- While you can set up a distributor on a remote installation of SQL Server, it is not currently possible to set a remote publisher for that distributor using the dialogs available in Syniti DR. For example, if SQL Server

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installation A is used as a remote distributor for SQL Server installation B, it is not possible to set SQL Server installation C as a publisher for the remote distributor in server A. It is possible to configure this situation manually from the SQL Server management console.

- When a distributor is defined as a remote distributor for a SQL Server installation, if an attempt is made to use that distributor in its local installation, the operation will fail.

Use Windows Authentication

Select this option if you (or your system administrator) have set up your environment to use your Windows login ID to access SQL Server.

Use SQL Server Authentication

Select this option to use a SQL Server login ID and password. Provide a system administrator login and password.

Verify (available only in the Manage Transactional Log Settings dlialog)

If you have made changes in the dialog, click Verify to make sure that the distributor is available and set up correctly.

Log Server Agent Settings

Triggers Settings

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SQL Server Transaction Log Information

Back to Replication Wizard Help

Distributor

A distributor, DBRS_Distributor, is created by Syniti Data Replication to manage a log that keeps track of transactions for the source table. This is typically done when setting up the connection in the Enable Transactional Replication wizard, although you can also set or modify the distributor or system administrator login information in the Connection Properties dialog.

To create the distributor, your source connection should have system administrator privileges. If you encounter connection problems at this stage, you need to cancel the Replication Wizard and change the Source Connection Properties by selecting the source connection in the Metadata Explorer and choosing **Connection Properties** from the right mouse button menu.

Publication

If this field is left unedited, Syniti DR creates a publication in SQL Server called DBMotoPUB_ followed by the source database name. The publication is used to identify the tables involved in replication. One publication per database is created, so that several replications may use the same publication. To create the publication, your connection should have system administrator privileges as described above.

You can choose to edit the field and provide an existing SQL Server Publication Name. This approach is useful if you want to reuse replication objects which are already defined in the database and avoid creating additional work for the server in generating log information on specific tables.

Transaction ID

The ID for the transaction at which you want to start replication. If you want to change the transaction ID, click **...** to open the Read Point dialog.

In the Transaction Read Point dialog, you can either retrieve the current transaction or the transaction for a specified date and time. If you enter a date and time, Syniti DR retrieves the first transaction after the time entered. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

Transaction Timestamp

The timestamp for the transaction above.

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Read Interval (sec)

The frequency (in seconds) with which you want to check the log during replication. For example, if the setting is 90 seconds, Syniti DR will check the log every 90 seconds to see if any transactions have occurred that need to be replicated to the target table. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

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MySQL/MariaDB Topics

Syniti Data Replication supports use of MySQL and MariaDB for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers the Log Server Agent, transaction log support and triggers
- Synchronization

When setting up MySQL/MariaDB for use with the Log Server Agent:

- Configure Log Server Agent (Windows Service) settings in the Connection wizard, providing file locations for log details.

When setting up MySQL/MariaDB for use with the transaction log:

- Modify the MySQL Server Instance Configuration file, my.ini (Desktop editor)
- Grant REPLICATION SLAVE privilege to the MySQL user ID that will be used by Syniti DR(DBMS tools)

When setting up MySQL/MariaDB for use with triggers:

- Create or assign tables for Master Table and Log Table (DBMS tools)
- Assign a tablespace for the Master table and Log Tables (DBMS tools)

This section contains topics that describe:

- MySQL/MariaDB Server Setup
- MySQL/MariaDB Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)
- MySQL/MariaDB Log Information (in the Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen)

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
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- Synchronization

When setting up MySQL/MariaDB for use with the Log Server Agent:

- Configure Log Server Agent (Windows Service) settings in the Connection wizard, providing file locations for log details.

When setting up MySQL/MariaDB for use with the transaction log:

- Modify the MySQL Server Instance Configuration file, my.ini (Desktop editor)
- Grant REPLICATION SLAVE privilege to the MySQL user ID that will be used by Syniti DR(DBMS tools)

When setting up MySQL/MariaDB for use with triggers:

- Create or assign tables for Master Table and Log Table (DBMS tools)
- Assign a tablespace for the Master table and Log Tables (DBMS tools)

This section contains topics that describe:

- MySQL/MariaDB Server Setup
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- MySQL/MariaDB Log Information (in the Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen)

Further Resources

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MySQL Transactional Replication Settings

Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog

The information below explains how to configure the transactional replication settings for MySQL in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog available from the **Transactional Setup > Manage** option on the connection in the Metadata Explorer.

When replicating from MySQL using mirroring or synchronization, three transactional modes are available: Log Reader, Log Server Agent and Triggers.

Log Reader Settings

Make sure that you have configured your MySQL server as explained in MySQL Server Setup. You will not be able to complete the transactional setup without these settings.

Case Sensitive Table Names

Check this option if the MySQL database contains case-sensitive table names for tables that you wish to replicate.

Verify (appears only in the Transactional Log Settings dialog)

Click **Verify** first to see that the log options are correctly set up on the MySQL server. The**Verify**button checks to see if the binary log is enabled on the server and if the user has the right permissions to access to it.

Log Server Agent Settings

Triggers Settings

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MySQL Log Information

Create Replication wizard and Create Multiple Replications wizard**Source Log Info** screen

Log File Name

The log file name is provided automatically and cannot be changed. Click **Read** in the Transaction ID field to open the Transaction Read Point dialog. When you select how to set the transaction ID and click **OK**, the log file name is automatically added.

Log File Number

The log file number is provided automatically and cannot be changed. Click **Read** in the Transaction ID field to open the Transaction Read Point dialog. When you select how to set the transaction ID and click **OK**, the log file number is automatically added.

Transaction ID

The ID for the transaction at which you want to start replication. If you want to change the transaction ID, click **Read...** to open the Read Point dialog. In this dialog, you can either retrieve the current transaction or the transaction for a specified date and time. If you enter a date and time, Syniti DR retrieves the first transaction after the time entered. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

Transaction Timestamp

The timestamp for the transaction above.

Read Interval (sec)

The frequency (in seconds) with which you want to check the log during replication. For example, if the setting is 90 seconds, Syniti DR will check the log every 90 seconds to see if any transactions have occurred that need to be replicated to the target table. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

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MySQL Server Setup

If you are planning to use MySQL version 5.1.5 or above as your source database for mirroring using a transaction log, you need to perform an additional installation step on the MySQL server: configure MySQL so that Syniti DR can read the database's binary log.

Before Syniti DR can read the binary log, row-based logging must be enabled for the database. To enable row-based logging, properties must be set in the MySQL Server Instance Configuration file.

1. Find the file "my.ini" which can be found in the directory where MySQL is installed.
   This file is the "MySQL Server Instance Configuration File".
2. Open the my.ini.
3. Scroll to the end of the file and add the following properties:
   #For Syniti DR replication
   log-bin=binlog
   binlog-format=ROW
   server-id=111

- log-bin=binlog
  In case users want to locate them, the binlog files are found in directory specified by "datadir" in "my.ini"
- binlog-format=ROW
  You can force the replication format by starting the MySQL server with --binlog-format=type. When set, all replication slaves connecting to the server will read the events according to this setting. ROW causes replication to be row-based.
- server-id=<*unique_value*>
  For each server participating in replication, you should pick a positive integer in the range from 1 to 232 – 1, and each ID must be different from every other ID in use by any other replication master or slave. For example, you could set the value as 123:
  server-id=123

4. Save the my.ini file.
5. Grant the following privileges to the MySQL user ID that will be used by Syniti DR to connect to the database. For example, if the user ID that is used to replicate data is synitidr:
   GRANT SELECT, PROCESS, REPLICATION CLIENT, REPLICATION SLAVE, RELOAD ON *.* TO

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synitidr@'%';

Flush Privileges;

Note: For versions of MySQL prior to 5.5, the following permissions also need to be granted: FILE, SUPER

6. Restart the server.

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Oracle Topics

Syniti Data Replication supports use of Oracle (on-premise and cloud) for:

- Refresh replications, both source and target
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- Synchronization

When setting up Oracle for use with the Log Server Agent:

- Configure Log Server Agent (Windows Service) settings in the Connection wizard, providing file locations for log details.

When setting up Oracle for use with transaction logs/Log Miner:

- If database is set to ARCHIVELOG mode, check Read Archived Logs options when configuring the source connection (Management Center).

When setting up Oracle for use with a Remote Log Server Agent:

- Install Java component on the Oracle server system. See the specific setup notes for this approach in the Help Center.

This section contains topics that describe:

- Oracle Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)
- Oracle Change Log Settings Dialog
- Oracle Redo Log Information (in the Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen)
- Setup for Different Oracle Versions
- Using a Row ID to Identify a Record
- Oracle Remote Log Server Agent

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
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Setup for Different Oracle Versions

The Oracle client must be installed on the same system as Syniti Data Replication.

Oracle v 8.1.7 and higher can be used as a source for replication in refresh and mirroring modes, and a target for replication in synchronization. Replications are based on Oracle redo log files which require use of a dictionary file. The dictionary file, starting from Oracle 9.0, has become ”online” and it is automatically created and managed by the DBMS, but for previous versions (8.1.7 up to 9.0), it must be created manually. Once created, you need to inform Syniti DR about its name and location to allow the mirroring to take place.

Your Syniti DR user account should be granted permissions to read the Oracle LogMiner (if using Oracle as a source), and write to the target tables (if using Oracle is a target.)

Oracle 9.0 or Higher

When creating a source connection for Oracle (or a source or target connection if you plan to do synchronization), check that the **Use Online Dictionary** option is selected in the Setup Info screen of the Source Connection wizard.

Oracle 8.1.7 to 9.0

1. Create the dictionary in the database. The user ID should have Database Administrator privileges.
   Using PL/SQL, run the following command:

   EXECUTE DBMS_LOGMNR_D.BUILD('<dictionary name>', '<dictionary path>')

2. When creating a source connection for Oracle (or a source or target connection if you plan to do synchronization), check that the **Use Flat File Dictionary** option is selected in the Setup Info screen of the Source Connection wizard.
3. In the **Dictionary File** field, type the name of the dictionary file that you created above.

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Oracle Transactional Replication Settings

Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog

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When replicating from Oracle using mirroring or synchronization, three transactional modes are available: Log Reader, Log Server Agent and Triggers.

Log Reader Settings

Log Settings

The Log Settings field displays the Oracle data source where the log is stored. This field is read-only and by default matches the data source specified in the source connection. If you are using the multitenant database architecture introduced in Oracle 12, and connecting to a pluggable database, you may need to modify the log location to match the Oracle root, or container, database. To modify the log location, click the [...] button.

Click [...] to open the Change Log Settings dialog to:

- Change the Oracle server where the log is stored (for Oracle 12 multitenant database installations).
- Set a path to an Oracle dictionary file (primarily for Oracle versions up to 9)
- Change the archived log settings

Supplemental Log Minimal Level/Supplemental Log Database Level

These fields are inactive until you have clicked **Verify** to check what type of supplemental logging is currently set for your Oracle source connection. For transactional replications where Oracle is a source database, Syniti DR requires supplemental logging to be enabled at least at the minimal level (and later at the table level) to record sufficient information about changes to the data in the table.

Click **Verify** to determine which type of logging is currently set. If you want to make changes to the current setting:

Choose **Minimal Level** to establish minimal supplemental logging at the database level, then, during replication setup, add logging for the specific table(s) involved in the replication.

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Choose **Database Level** to establish supplemental logging for the entire database, including primary key and index information for all tables. If you have a large number of tables in your database, and they are not involved in Syniti DR replications, you should be aware that supplemental logging can add unnecessary processing time/log information.

Click **Install** to make changes to the supplemental log settings.

Verify (appears only in the Transactional Log Settings dialog)

Click **Verify** to see if supplemental logging has been set up either at the database level or at the minimal level. Syniti DR requires supplemental logging to be set at minimum at the table level for the table(s) involved in replication.

If supplemental logging has not been established, or you wish to make changes, select the type of logging then click **Install** to set it. To later remove the log settings from the server, use the Disable Transactional Replication wizard available from the **Transactional Setup > Disable** option on the connection in the Metadata Explorer.

Oracle-Specific Log Server Agent Settings

Use Log Container

If your data source is an Oracle version 12 pluggable non-root database, you also need to complete the root database connection information:

Server, User, Password

The connection string for the root database. This is required because Oracle 12 does not keep redo log records for the entire database instance separately.

Use Remote LSA

This option is available for environments where it is preferable to read the Oracle log directly and involves the installation and configuration of an additional component on the Oracle server. Contact the support team via the Help Center for additional information.

Standard Log Server Agent Settings

Triggers Settings

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Oracle Change Log Settings Dialog

The Oracle Change Log Settings dialog can be used to:

- Change the Oracle server where the log is stored (for Oracle 12 multitenant database installations).
- Set a path to an Oracle dictionary file (primarily for Oracle versions up to 9)
- Change the archived log settings
- Set up a remote log server

Server

Specifies the Oracle data source where the log is stored. If you are using the multitenant database architecture introduced in Oracle 12, and connecting to a pluggable database, you need to modify the log location to match the Oracle root, or container, database.

User

User ID for the Oracle data source where the log is stored.

Password

Password for the Oracle data source where the log is stored.

Use Log Server for Remote Mining

Check this option to

Dictionary

Dictionary File

If the log is stored as a dictionary file (typically only for Oracle versions up to 9), type the path and file name for an Oracle dictionary file. The Oracle dictionary file should already be defined in your Oracle environment. See Setup for Different Oracle Versions for more information.

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Read Archived Logs

When checked, Syniti DR accesses Oracle archived redo logs for transactions in addition to the online redo logs. Check with your Oracle system administrator to see if your database is configured to use ARCHIVELOG mode. If it is, you can check the **Read Archived Logs** option to ensure that all transactions between mirroring intervals are identified by Syniti DR. For example, if your mirroring interval is set for 90 seconds, but within that time the online logs fill with transactions, the online logs are archived as needed to accommodate additional transactions. If you check the **Read Archived Logs** option, Syniti DR will be able to locate the last transaction ID from the archived log. Note that the **Read Archived Logs** option is not useful when using the default setting on Oracle databases, NOARCHIVELOG mode.

Use CONTINUOUS_MINE Option

When **ReadArchivedLogs** is checked, the **Use CONTINUOUS_MINE Option** is checked by default. The CONTINUOUS_MINE option instructs the Oracle log reader to load archived log files continuously as they get created, instead of loading a batch of files statically when the log reader is initially instantiated. Syniti DR can therefore replicate transactions as they are backed up. however, Oracle recommends that the CONTINUOUS_MINE option should not be used in a RAC (Real Application Cluster) environment where RAC nodes are continuously enabled/disabled.

Destination ID

This option allows you to set the locationfrom which Syniti DR will pick up Oracle archived logs for replication. When the value is set to the default, 0, Syniti DR searches for Oracle archived logs in the standard destination, ('FLASH RECOVERY AREA (FRA)'). A value between 1 and 31 specifies an alternative location to retrieve archived logs. Oracle users can retrieve a list of all archive locations by running the query: SELECT * FROM V$ARCHIVE_DEST.

This feature is useful when your environment includes a customized archive setup and you want to instruct Syniti DR to use a specific location for archived logs.

Opening the Change Log Settings Dialog

From the Manage Transactional Log Settings dialog, click ... to the right of the **Log Settings** field.

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Oracle Redo Log Information

Create Replication wizard and Create Multiple Replications wizard**Source Log Info** screen

Service Name

This is a unique identifier for your Oracle Server. The value is obtained automatically from your Oracle database server and cannot be modified.

Transaction ID

The ID for the transaction at which you want to start replication. If you want to change the transaction ID, click **...** to open the Read Point dialog. In this dialog, you can either retrieve the current transaction or the transaction for a specified date and time. If you enter a date and time, Syniti DR retrieves the first transaction after the time entered. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

Transaction Timestamp

The timestamp for the transaction above.

Read Interval (sec)

The frequency (in seconds) with which you want to check the log during replication. For example, if the setting is 90 seconds, Syniti DR will check the log every 90 seconds to see if any transactions have occurred that need to be replicated to the target table. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

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Setup for Different Oracle Versions

The Oracle client must be installed on the same system as Syniti Data Replication.

Oracle v 8.1.7 and higher can be used as a source for replication in refresh and mirroring modes, and a target for replication in synchronization. Replications are based on Oracle redo log files which require use of a dictionary file. The dictionary file, starting from Oracle 9.0, has become ”online” and it is automatically created and managed by the DBMS, but for previous versions (8.1.7 up to 9.0), it must be created manually. Once created, you need to inform Syniti DR about its name and location to allow the mirroring to take place.

Your Syniti DR user account should be granted permissions to read the Oracle LogMiner (if using Oracle as a source), and write to the target tables (if using Oracle is a target.)

Oracle 9.0 or Higher

When creating a source connection for Oracle (or a source or target connection if you plan to do synchronization), check that the **Use Online Dictionary** option is selected in the Setup Info screen of the Source Connection wizard.

Oracle 8.1.7 to 9.0

1. Create the dictionary in the database. The user ID should have Database Administrator privileges.
   Using PL/SQL, run the following command:

   EXECUTE DBMS_LOGMNR_D.BUILD('<dictionary name>', '<dictionary path>')

2. When creating a source connection for Oracle (or a source or target connection if you plan to do synchronization), check that the **Use Flat File Dictionary** option is selected in the Setup Info screen of the Source Connection wizard.
3. In the **Dictionary File** field, type the name of the dictionary file that you created above.

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PostgreSQL Topics

Syniti Data Replication supports use of PostgreSQL for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers the Log Server Agent
-
    - Mirroring replications, both source and target. For source connections, Syniti Data Replication offers the Log Server Agent, and triggers
    - Synchronization using triggers.

When setting up PostgreSQL for use with the Log Server Agent:

- Edit the postgresql.conf file according to directions in PostgreSQL Database Setup.
- Configure Log Server Agent (Windows Service) settings in the Connection wizard, providing file locations for log details.

This section contains topics that describe:

- PostgreSQL Database Setup
- PostgreSQL Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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PostgreSQL Topics

Syniti Data Replication supports use of PostgreSQL for:

- Refresh replications, both source and target
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    - Mirroring replications, both source and target. For source connections, Syniti Data Replication offers the Log Server Agent, and triggers
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When setting up PostgreSQL for use with the Log Server Agent:

- Edit the postgresql.conf file according to directions in PostgreSQL Database Setup.
- Configure Log Server Agent (Windows Service) settings in the Connection wizard, providing file locations for log details.

This section contains topics that describe:

- PostgreSQL Database Setup
- PostgreSQL Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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PostgreSQL Transactional Replication Settings

Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog

The information below explains how to configure the transactional replication settings for PostgreSQL in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog available from the **Transactional Setup > Manage** option on the connection in the Metadata Explorer.

When replicating from PostgreSQL using mirroring or synchronization, one transactional mode is available: Log Server Agent.

Log Settings

Decoding Plugin: Plugin Name

The default plugin is called 'test_decoding' and is normally installed with every PostgreSQL installation. To verify availability, check the location where the decoding plugins are normally installed:

MS Windows	<Postgres installation folder>/lib
Ubuntu	/usr/lib/postgres/9.5/lib
RedHat	/usr/pgsql-9.5/lib

If the plugin is missing, you can either install it using the Postgres installation files, or request a file from the technical support team via the Help Center to install the dbm_decoding plugin. Note that if you are using PostgreSQL as a cloud database, you need to use the test_decoding plugin.

Replication Slot: Use Existing Slot

Replication slots are channels that you open on the database to allow Syniti DR to receive data changes from the log. While the default is to use a new slot specifically for a Syniti DR connection, it is possible to reuse an existing slot if it is not consumed by any other connection. A replication slot has to be uniquely assigned to a single Syniti DR connection.

Replication Slot: Add New Slot

Syniti DR needs to define a "replication_slot" for every connection that it uses to replicate from PostgreSQL. This option allows you to set up a new slot from Syniti DR. However, the new slot will be added only if the maximum number of slots has not been exceeded. This value is set in the postgresql.conf file. Be aware that if slots are created then left unused, they still consume resources, so you should always manage replication slots carefully.

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For more information on replication slots and the settings needed for transactional replications from PostgreSQL, see PostgreSQL Database Setup

Verify (available only in the Manage Transactional Log Settings dlialog)

If you have made changes in the dialog, click **Verify** to make sure that the replication slots are set up correctly.

Log Server Agent Settings

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PostgreSQL Database Setup (On Premise Installations)

Syniti Data Replication supports PostgreSQL versions 9.5 and above as a source database for mirroring. It takes advantage of the PostgreSQL replication slot feature by requiring that every connection to PostgreSQL from Syniti DR use a dedicated replication slot. The PostgreSQL documentation provides an in-depth explanation of replication slots, but briefly, a single slot represents an ordered stream of changes that occur on a specific database on the origin server. Note that if you enable a replication slot from Syniti DR without using it, the slot will consume resources and prevent the database cleanup functionality to purge old records from the transaction log, because they do not appear as consumed by an existing slot. Therefore, it is important to remove replication slots from the database by removing the Syniti DR connection if it is not used in replication.

Your PostgreSQL environment should be set up as follows:

1. Contact the technical support team via the Help Center to request the library files developed for PostgreSQL replications.
2. Extract the files from the zip file to a folder that is accessible to the PostgreSQL lib folder.
3. If using Microsoft Windows, rename the appropriate DLL to dbm_decoding.dll.
   If using LINUX, rename the .so file to dbm_decoding.so.
4. Copy the file to the lib folder in your PostgreSQL installation.
5. Edit the postgresql.conf file to set up the environment for replication using Syniti Data Replication:

   ```
   wal_level = logical

   max_replication_slots = 3

   track_commit_timestamp = on
   ```

   where:

   `wal_level` sets the amount of information that is written to the WAL (Write-Ahead Logging, or Postgres transaction log). The value logical represents the level of detail necessary to support logical decoding, required for using PostgreSQL as a source database for replicating data changes only in Syniti Data Replication. This parameter can only be set at server start.

   `max_replication_slots` sets the maximum number of replication slots available to all applications. Syniti Data Replication requires a “replication_slot” for every connection that it uses to replicate from PostgresSQL. A maximum number of 3 is reasonable if you are defining one single connection to the database. If you require additional connections to the same PostgresSQL database, the maximum number of slots should be raised

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accordingly.

Details on settings in the configuration file can be found in the PostgreSQL documentation.

6. Restart the PostgreSQL database service so that your changes take effect.

Notes and Limitations on Using PostgreSQL as a Source in Mirroring

- PostgreSQL Versions 9.5 and above are supported as a source for mirroring. Synchronization is not supported.
- No DDL (schema changes) operations are logged, only INSERT, UPDATE and DELETE.
- In updates, only the after record of the new changes is logged. No before image is available
- The functions used to create and retrieve changes from the replication slots can only be executed by a super-user or a user with replication role.
- Replicated tables need to have primary keys defined. If a table does not have a primary key, DELETE and UPDATE record operations are ignored.
- There does not seem to be a mechanism to get the replication last id by datetime (even though a datetime is available.)
- Timestamp with a time zone type column is not supported.
- an attempt to update a primary key segment is ignored because the target identifies the update as one without updating any rows. The results of updating a primary key in PostgreSQL are unpredictable, so no records are written to the exceptions table.
- Replication of multiple tables with the same name but where each name has a different case is unsupported.
- TRUNCATE operations are not supported
- The OID LOB data type is not migrated to the target.

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SAP HANA Topics

Syniti Data Replication supports use of SAP HANA for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers triggers
- Synchronization

For mirroring replications using triggers and SAP HANA as a source, there are no specific settings required, other than the installation and configuration of the .NET provider.

For mirroring and refresh replications to SAP HANA (ODBC connection only):

- Set the **FTP Server**, **FTP Port**, **FTP User**, **FTP Password and Import Path** properties for FTP/SFTP of source data to SAP HANA target in the Connection Properties dialog

NOTE: TABLESPACE does not exist for SAP HANA. Instructions referring to creating TABLESPACE can be ignored.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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SAP HANA Topics

Syniti Data Replication supports use of SAP HANA for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers triggers
- Synchronization

For mirroring replications using triggers and SAP HANA as a source, there are no specific settings required, other than the installation and configuration of the .NET provider.

For mirroring and refresh replications to SAP HANA (ODBC connection only):

- Set the **FTP Server**, **FTP Port**, **FTP User**, **FTP Password and Import Path** properties for FTP/SFTP of source data to SAP HANA target in the Connection Properties dialog

NOTE: TABLESPACE does not exist for SAP HANA. Instructions referring to creating TABLESPACE can be ignored.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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SAP Sybase Topics

Syniti Data Replication supports use of the following SAP Sybase versions:

- SAP Sybase ASE
- SAP Sybase IQ
- SAP Sybase SQL Anywhere

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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SAP Sybase ASE Topics

Syniti Data Replication supports use of SAP Sybase ASE for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers triggers.
- Synchronization

For mirroring replications using triggers and SAP Sybase SQL ASE as a source, there are no specific settings required, other than the installation and configuration of the .NET provider.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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SAP Sybase IQ Topics

Syniti Data Replication supports use of SAP Sybase IQ for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers triggers
- Synchronization

For mirroring and refresh replications to SAP Sybase IQ targets:

- Set the **FTP Server**, **FTP Port**, **FTP User**, **FTP Password and Import Path** properties for FTP/SFTP of source data to SAP Sybase IQ target in the Connection Properties dialog

When setting up SAP Sybase IQ for use with Syniti DR:

- Enable the **allow_read_client_file** and **allow_write_client_file** options on the Sybase IQ server. Refer to the Sybase documentation for details on setting the options: http://in-focenter.sybase.com/help/index.jsp?topic=/com.sybase.infocenter.dc00608.0480/html/etl_ug/BABEJIGI.htm

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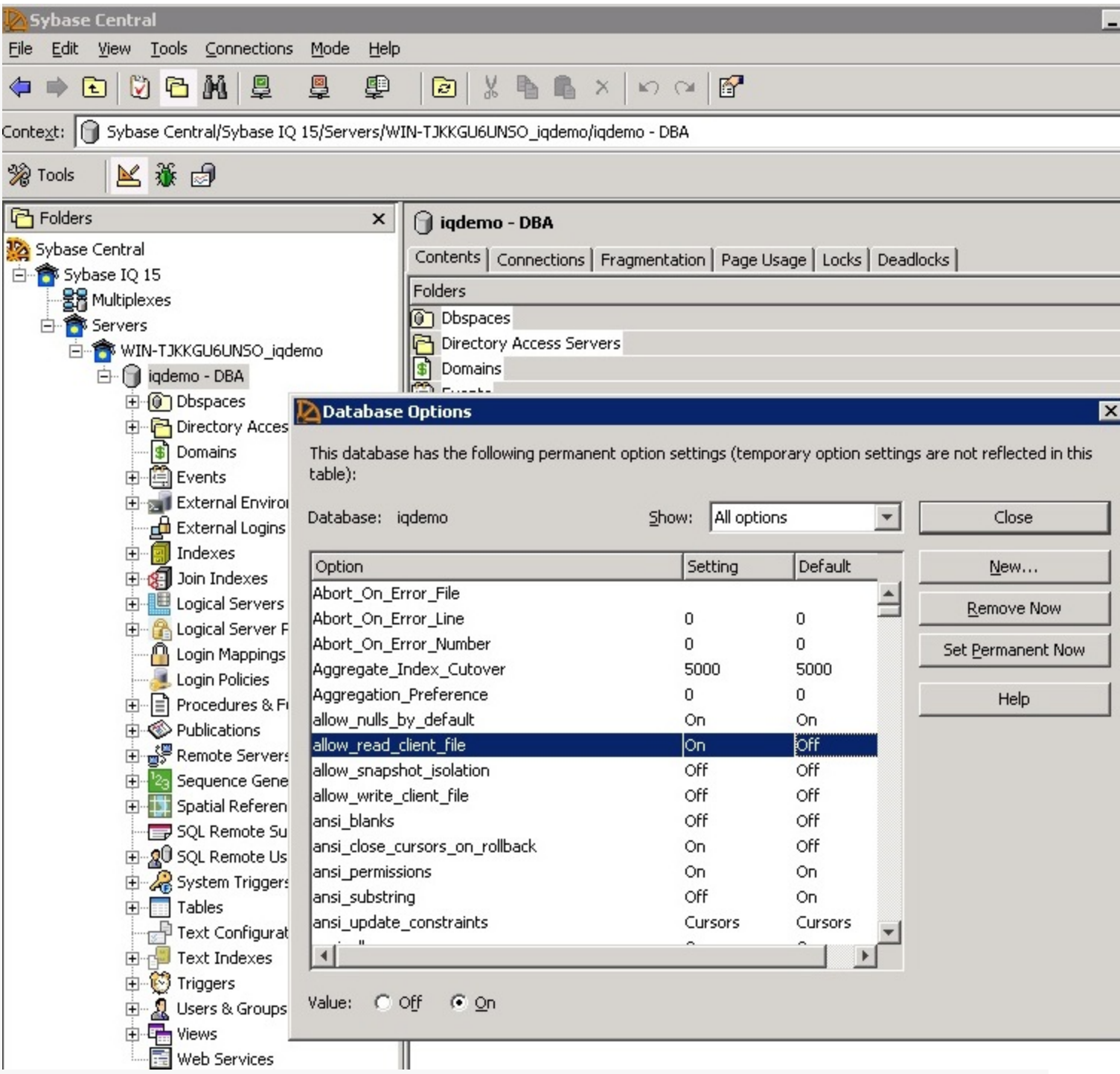

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Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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SAP Sybase SQL Anywhere Topics

Syniti Data Replication supports use of SAP Sybase SQL Anywhere for:

- Refresh replications, both source and target
- Mirroring replications, both source and target. For source connections, Syniti Data Replication offers triggers
- Synchronization

For mirroring replications using triggers and SAP Sybase SQL Anywhere as a source, there are no specific settings required, other than the installation and configuration of the .NET provider.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Teradata Topics

Syniti Data Replication supports use of Teradata for:

- Refresh replications, both source and target
- Mirroring replications, target only.

There are no specific settings required for transactional replications to Teradata, other than the installation and configuration of the .NET provider.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Teradata Topics

Syniti Data Replication supports use of Teradata for:

- Refresh replications, both source and target
- Mirroring replications, target only.

There are no specific settings required for transactional replications to Teradata, other than the installation and configuration of the .NET provider.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Tibero Topics

Syniti Data Replication supports use of Tibero for:

- Refresh replications, both source and target
- Mirroring replications, target only.

There are no specific settings required for transactional replications to Tibero, other than the installation and configuration of the TmaxSoft Tibero ODBC driver. During configuration, be sure to add “TYPE=ODBC” to the connection string. This prevents certain operations (such as SELECT FROM or CREATE TABLE) from randomly generating the following error: "Arithmetic operation resulted in an overflow." A sample connection string is as follows:

```
Driver={Tibero 6 ODBC Driver-
};SERVER-
R=100.111.1.22;PORT=8629;UID=SYS;PWD=********;DB=tibero;TYPE=ODBC
```

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Tibero Topics

Syniti Data Replication supports use of Tibero for:

- Refresh replications, both source and target
- Mirroring replications, target only.

There are no specific settings required for transactional replications to Tibero, other than the installation and configuration of the TmaxSoft Tibero ODBC driver. During configuration, be sure to add “TYPE=ODBC” to the connection string. This prevents certain operations (such as SELECT FROM or CREATE TABLE) from randomly generating the following error: "Arithmetic operation resulted in an overflow." A sample connection string is as follows:

```
Driver={Tibero 6 ODBC Driver-
};SERVER-
R=100.111.1.22;PORT=8629;UID=SYS;PWD=********;DB=tibero;TYPE=ODBC
```

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Vertica Topics

Syniti Data Replication supports use of Vertica for:

- Refresh replications, both source and target
- Mirroring replications, target only.

There are no specific settings required for transactional replications to Vertica, other than the installation and configuration of the .NET provider.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Vertica Topics

Syniti Data Replication supports use of Vertica for:

- Refresh replications, both source and target
- Mirroring replications, target only.

There are no specific settings required for transactional replications to Vertica, other than the installation and configuration of the .NET provider.

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Trigger-based Replication Topics

This section contains topics that describe:

- Overview of Trigger-based Transactional Replications
- Trigger Transactional Replication Settings (in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog)
- Trigger Replication Settings (in the Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen)

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Overview of Trigger-based Transactional Replications

A database trigger is code that is automatically executed in response to certain events on a database table. Syniti Data Replication supports trigger-based transactional replications (mirroring or synchronization) for a number of databases.

If you plan to define a trigger-based replication (mirroring or synchronization), you need to provide information in the Source and/or Target Connection wizards so that triggers can be created to log table changes for replication.

For each table involved in the replication, Syniti DR creates 3 triggers in the source table that fire when a specific event occurs on a record:

- INSERT trigger which fires when a new record is being inserted in the table
- UPDATE trigger which fires when a record is modified
- DELETE trigger which fires when a record is deleted

If the replication is later deleted, the triggers are removed by Syniti DR. However, note that if you change a replication from mirroring to refresh, the triggers on the source table are not deleted. All transactions will continue to be recorded in the log tables. If you are not planning to reset the replication to mirroring, it is better to delete the replication, so that the triggers are removed, and create a new refresh replication.

Data retrieved using the triggers is stored in log tables that are specified in your Source/Target connection. The master log table can be an existing table or one created specifically to hold Syniti DR information. It contains general information about the transactions, like user name, timestamp, table name. A log table (_DBM__LOG_x) is also created for each source table in the replication, and contains the data changes identified by the triggers, as well as trigger objects _DBM__TRG_OBJS.

Note that Syniti DR does not create a tablespace. If you want to have a table space named SYNITIDR, you must create it beforehand using a SQL tool such as the Execute SQL Query dialog in the Management Center. Run a statement like

```
CREATE TABLESPACE SYNITIDR
```

When creating a connection, it is important to set the retention time to keep the log table size under control. The higher the value, the more data is kept in the log tables. Try to estimate the number of transactions occurring in all the source tables during a retention period and be sure that the database and table space have enough storage capacity for all those transactions. The Replication Agent cleans up the log tables periodically, based on the retention setting in the connection dialog. If the engine is not running, the log tables are not cleaned up. This might create space problems in

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the database as the logs grow in size. If you stop the engine and you are not planning to run it again, be sure to remove all the mirroring synchronization replications.

In addition, if you have many table replications in a single group, using a single connection, all the replications share a master log table. Access to the log table for each source table can become a bottleneck if there are many transactions using the same master log and log tables. Syniti DR may report errors about locked tables during replication. Although Syniti DR is able to recover from these errors and continue replicating, a better approach is to prevent the errors by splitting the replications into multiple groups with multiple connections and multiple master log tables. First, create multiple source connections to the database. Use the Transactional Setup field in the Connection Properties of each connection to open the Manage Transactional Log Settings dialog and create a new master log table for each connection.

During replication:

- When a record is inserted in the source table, the INSERT trigger fires and inserts one record in the master table and one record in the log table associated with the source table. The record inserted in the log table contains all the original values of the INSERT statement.
- When a record is deleted from a table, the DELETE trigger fires and inserts one record in the master table and one record in the log table associated with the source table. The record inserted in the log table contains the key values of the deleted record.
- When a record is updated, the UPDATE trigger fires and inserts one record in the master table and two records in the log table associated with the source table. The two records inserted in the log table contain all the record values before and all the records after the update.

Your system administrator needs to create and define appropriate table spaces and databases to hold the log tables. They should be large enough to handle the expected amount of replication data.

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Trigger Transactional Replication Settings

Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog

The information in this topic applies to **trigger-based replications** supported for databases as described in Source and Target Options. It explains how to configure the transactional replication settings for trigger-based replications in the Enable Transactional Replication wizard or the Manage Transactional Log Settings dialog available from the **Transactional Setup> Manage** option on the connection in the Metadata Explorer.

Your system administrator needs to create and define appropriate table spaces and databases to hold the log tables. They should be large enough to handle the expected amount of replication data. The login you are using for the source connection should have appropriate authorizations to create tables. More about trigger-based replication.

If using **IBM Db2** as a source database, the following versions are supported:

- Db2 UDB v. 7.2 or higher
- Db2 for OS390 v6 or higher

If using **SQL Server** as a source database, the following restrictions apply for transactional replications with triggers:

- Data types "image", "text" and "ntext" are not supported. If you create a transactional replication on a table with fields where these data types defined, the Management Center warns you that the fields will not be replicated. In SQL Server 2005 and SQL Server Express, these types have been replaced by "varbinary(max)", "varchar (max)", and "nvarchar(max)". Microsoft recommends replacing the old data types with the new ones. The new data types are supported when using the Triggers option.
- The source table does not need a primary key set in SQL Server but it must have a primary key defined in Syniti DR. See Primary Key Settings for Mirroring and Synchronization for an explanation on how to create a primary key in Syniti DR.

If using **SAP Sybase SQL Anywhere triggers** option, and you have triggers already defined on your source table, you can use the **Trigger Order** option to set the value that DBMOTO passes to the ORDER clause in the CREATE TRIGGER statement. In most cases, the default value of 100 works appropriately.

Master Table

Either specify an existing qualified table name, or click **Change** to create a new table to hold general information about replication transactions including user name, timestamp, table name for each transaction.

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There are two tables associated with each replication: a Master table, common to all replications using that connection, and a Log table for each replication source table. The Master table keeps track of all the transactions affecting the source tables and it records general transactional information.

Master and Log tables are created in the schema specified when you set the Master table name. You can choose a Master table name, or use the default _DBM__MASTERLOG. Log tables are automatically generated by Syniti DR and the names are _DBM__LOG_#, where # is a number. The selected schema for the Master and Log tables must not contain other non-Syniti DR tables with names _DBM__LOG_# It is recommended that you create a new schema to use specifically for the Syniti DR Master and Log tables.

Tablespace

It is recommended that you assign a tablespace for the Master table and Log Tables so that it is easier to control log table sizes. If you leave this field blank, the default tablespace value for your login ID will be used. Your system administrator should be able to provide you with the appropriate value for this field.

If you are using SAP HANA, tablespace is not available and schemas are used instead.

If you are using IBM Db2, the value can be entered as dbname.tablespace.

Retention Time

The amount of time in hours that a transaction is kept in the log tables. The default value is 72 hours. When the amount of time a transaction resides in the log exceeds the retention time, the transaction is permanently removed from the log tables. Tuning the retention time provides control over the size of the log tables.

Delete Block Size

Based on the retention time, Syniti DR deletes items from the log. This field specifies the maximum number of records to delete from the Syniti DR log tables with a single SQL statement. The default value is 10,000 records. You do not typically need to edit this value.

Trigger Order

For Sybase SQL Anywhere users only. See note above.

Uncommitted TID Wait Cycle

For SAP HANA users only. This property is used when reading transactions from the master table. The master table is read using read uncommitted, but some databases do not support this isolation level. It is therefore possible that a transaction t2 is committed before t1 (where t1 < t2) and that the transaction ID of the replication is

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moved ahead before t1 has been replicated. To prevent this issue, whenever a gap in the TID column is identified in the master table, the replication holds for the number of mirroring intervals (as set in the Replication Properties dialog) specified in this property.

Lower-case Trigger Identifiers

When checked, Syniti DR creates objects for the trigger-based replications with lower case names. When unchecked, mixed case is used. This option should be checked if the database default case for identifiers is lower-case.

Ucommitted Transactions Recovery Option

For Oracle and SAP HANA trigger-based replications only. This section can be used to indicate how uncommitted transactions should be handled during replication.

None	No gap conditions handled. Uncommitted transactions may cause data to be skipped in replication.
Wait	Set a number of mirroring intervals to hold all replications on the connection to wait when a gap is found due to an uncommitted transaction. All replications in the connection will hold and wait for the number of cycles specified to see if the gap is filled. If after the number of cycles, a transaction is still not committed, it will be skipped.
Continue and Process when Committed	Instead of pausing all replications in case of a gap, replication proceeds with all currently committed transactions. During the next mirroring cycle, the trigger log table is checked for earlier transactions that now have been committed, and any identified transactions are processed.
Skip Uncommitted Transactions Older Than	If wait or continue are selected, this property sets a limit on the amount of time to wait for uncommitted transactions. For instance, a value of 15 minutes means that, no matter which option you choose, transactions opened and not committed for more than 15 minutes will be skipped.

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Trigger Replication Settings

Create Replication wizard and Create Multiple Replications wizard **Source Log Info** Screen

The information in this topic applies to **trigger-based replications** supported for databases as described in Source and Target Options.

For transactional replications using triggers as a source, you need to identify the location and start point of transactions to replicate in the Create Replication wizard and Create Multiple Replications wizard **Source Log Info** screen.

Master Table Qualifier

The qualifier for the master table specified when setting up the connection to the database.

Master Table Name

The name of the master table specified when setting up the connection to the database.

Transaction ID

The ID for the transaction at which you want to start replication. If you want to change the transaction ID, click **Read...** to open the Read Point dialog.

In the Transaction Read Point dialog, you can either retrieve the current transaction or the transaction for a specified date and time. If you enter a date and time, Syniti DR retrieves the first transaction after the time entered. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

Transaction Timestamp

The timestamp for the transaction above.

Read Interval (sec)

The frequency (in seconds) with which you want to check the log during replication. For example, if the setting is 90 seconds, Syniti DR will check the log every 90 seconds to see if any transactions have occurred that need to be replicated to the target table. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

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Source and Target Options

This section contains topics that describe settings needed for specific replication sources and targets.

- Relational Databases
- Non-relational Databases and Other Targets

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

Relational Databases	Refresh		Mirroring		Synchronization
	Source	Target	Source	Target	
Actian Vector	×	×		×	
Amazon Aurora MySQL	×	×	×	×	×
Amazon Aurora PostgreSQL	×	×	×	×	×
Amazon Redshift	×	×		×	
Greenplum		×		×	
Gupta SQLBase	×	×	×	×	×
IBM Db2 LUW	×	×	×	×	×
IBM Db2 for i	×	×	×	×	×
IBM Db2 for z/OS	×	×	×	×	×
IBM Informix	×	×	×	×	×
IBM PureData	×	×	×	×	

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Ingres	×	×		×	
MariaDB	×	×	×	×	×
Microsoft Access	×	×		×	
Microsoft Azure SQL Database	×	×	×	×	×
Microsoft Azure Synapse Ana-lytics		×		×	
Microsoft SQL Server	×	×	×	×	×
Microsoft SQL Server CE	×	×	×	×	×
MySQL	×	×	×	×	×
Oracle	×	×	×	×	×
PostgreSQL	×	×	×	×	×
Progress OpenEdge	×	×	×	×	
SAP HANA	×	×	×	×	×
SAP Sybase ASE	×	×	×	×	×
SAP Sybase IQ	×	×	×	×	×
SAP Sybase SQL Anywhere	×	×	×	×	×
Snowflake	×	×		×	
solidDB	×	×		×	
Teradata	×	×		×	

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Tibero	×	×		×	
Vertica	×	×		×	

Non-relational DBs & Other Targets	Refresh		Mirroring	
	Source	Target	Source	Target
Amazon DocumentDB		×		×
Amazon S3		×		×
Apache Cassandra	×	×		×
Apache Kafka		×		×
Apache Parquet				
Confluent Cloud (Kafka)		×		×
CSV (Flat file)	×	×		×
Google BigQuery		×		×
Hadoop		×		×
JSON		×		×
Microsoft Azure Data Lake Storage		×		×
Microsoft Azure Event Hubs		×		×
MongoDB Atlas		×		×
XML		×		×

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Apache Kafka/Confluent Cloud Topics

Syniti Data Replication supports use of Apache Kafka and Confluent Cloud for:

- Refresh replications, target only.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to Apache Kafka or Confluent Cloud

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Apache Kafka/Confluent Cloud Topics

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Replicating Data to Apache Kafka or Confluent Cloud

With Syniti Data Replication, you can replicate relational data to a Kafka stream using JSON, AVRO, CSV or XML serialization of the entire record. Kafka is currently supported as a target both in refresh and mirroring. Every session creates either a .ref or .mir file with the content of the replication.

To define a target connection for Kafka:

1. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
2. In the Add Target Connection wizard, type a name for the connection and choose **Apache Kafka** in the **Database** field.
3. In the Set Connection String screen **Output Folder** field, enter the path to a directory to contain the output files and schema.
4. Choose values for the following fields:

   Server The server name or IP address of the system running Kafka.

   Port The port number of the server running Kafka.

   Output Folder The schema name and location to hold config files for the Kafka objects.

   Group ID Kafka property not used by Syniti DR. A string that uniquely identifies the group of consumer processes to which this consumer belongs. By setting the same group id multiple processes indicate that they are all part of the same consumer group.

   Connect Timeout Amount of time before the connection will throw an exception.

   Default Topic All Kafka streams need to be targeted to a specific topic. In Syniti DR you can indicate a default topic for all replications in that connection. Alternatively, if the Default Topic is left blank, every replication will need to specify a topic name.

   Serialization Possible types of message serialization.

   Currently supported:

   0 – JSON

   1 – CSV

   2 – XML

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2 – AVRO

Schema Registry URL Used only when AVRO serialization is selected. Because Avro does not include any schema information (column names, types, sizes and format) within the message that is being sent, Kafka producers and consumers use an implicit “contract” to determine how the message is serialized. Schema Registry helps ensure that this contract is met with compatibility checks and it provides centralized schema management and compatibility checks as schemas evolve.

Auto Offset Reset Kafka property not used by Syniti DR. Determines how to proceed when there is no initial offset in ZooKeeper or if an offset is out of range:

* smallest : automatically reset the offset to the smallest offset;

* largest : automatically reset the offset to the largest offset;

* anything else: throw exception to the consumer.

Use One Producer Per Group True by default. If True, the same Producer is used for all streams within the group (this has a better impact on performance).

5. If using Kafka with Kerberos security, there are additional connection values to set. Download the Kafka setup guide in the Help Center for complete details.
6.

   You can leave the **ExtendedProperties** field blank.
7. Click **Next** to view the **Select Tables** screen.
   If this is the first time you have created a connection using the output folder defined above, the table display will be empty.
8. Click **Next** to display the **Actions** screen.
9. Optionally choose to continue with creating replications once the wizard is complete.

   Click **Next** to display the summary, then click **Finish** to create the connection.
10. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

Now set up replications from whichever source connection you have defined to the Kafka stream.

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Apache Parquet Target Topics

Syniti Data Replication supports use of Parquet for:

- Refresh replications, target only.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to Parquet

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Apache Parquet Target Topics

Syniti Data Replication supports use of Parquet for:

- Refresh replications, target only.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to Parquet

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
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Replicating Data to Apache Parquet

With Syniti Data Replication, you can replicate relational data to an Apache Parquet target. Parquet is currently supported as a target both in refresh and mirroring. Every session creates either a .ref or .mir file with the content of the replication. The files are in Parquet format.

To define a target connection for Parquet output:

1. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
2. In the Add Target Connection wizard, type a name for the connection and choose **Files - Parquet** in the **Database** field.
3. In the Set Connection String screen, choose values using the information below.

Output Folder	The schema name and location to the Parquet files. Set an **Output Folder** available to the system where Syniti DR is running.
Add transactional info	Make sure that the **Add Transactional Info** field is set **to Yes, at the beginning**.
Compression	The compression method desired, Currently supported 0 - None, 1 – Gzip, 2 – Snappy • None for no compression. This is the fastest way to write files, however they may end up slightly larger. • Snappy is the default level and is a perfect balance between compression and speed. • Gzip, using gzip compression, is the slowest, but should produce the best results if maximum compression is your top priority.
Use Nullable Fields	Set to 1 - True to allow nullable fields in Parquet files.
Use DateTime Fields	Set to 1 – True to allow datetime fields in Parquet files. If 0 - False is selected, Strings are used instead of datetime values.
Use One File Per Group	True by default. If True, Syniti DR uses the same file for all streams within the group, a better choice for performance.

4. Click **Next** to view the **Select Tables** screen.
   If this is the first time you have created a Parquet connection using the output folder defined above, the table display will be empty. You can add a representation of target tables after completing the wizard.

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5. Click **Next** to display the **Actions** screen,
6. Optionally choose to continue with creating replications once the wizard is complete.
7. Click **Next** to display the summary, then click **Finish** to create the connection.
8. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

Now you can set up replications from whichever source connection you have defined to the Parquet target.

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Amazon DocumentDB Topics

Syniti Data Replication supports use of Amazon DocumentDB for:

- Refresh replications, target only, within the same Virtual Private Cloud environment as the source.
- Mirroring replications, target only, within the same Virtual Private Cloud environment as the source.

This section contains topics that describe:

- Replicating Data to Amazon DocumentDB

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Amazon DocumentDB Topics

Syniti Data Replication supports use of Amazon DocumentDB for:

- Refresh replications, target only, within the same Virtual Private Cloud environment as the source.
- Mirroring replications, target only, within the same Virtual Private Cloud environment as the source.

This section contains topics that describe:

- Replicating Data to Amazon DocumentDB

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
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Replicating Data to Amazon DocumentDB

To define a target connection for DocumentDB:

1. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
2. In the Add Target Connection wizard, type a name for the connection and choose **MongoDB Atlas** in the **Database** field. (Amazon DocumentDB uses the MongoDB .NET provider.)
3. In the Set Connection String screen **Output Folder** field, enter the path to a directory to contain the output files and schema.
4. Choose values for the following fields:

   Server The server name or IP address of the DocumentDB instance.

   Port The port number of the server running DocumentDB.

   Use DNS Seedlist If set to false, the standard connection format is used. If set to true, a DNS-constructed seed list is used. Using DNS to construct the available servers list allows more flexibility of deployment and the ability to change the servers in rotation without reconfiguring clients.

   User ID The user name for DocumentDB.

   Password The password for DocumentDB.

   Database The DocumentDB database name.

   Output Folder The schema name and location to hold config files for the DocumentDB objects.

   Default Collection All DocumentDB replications need to be targeted to a specific collection. Use this field to indicate a default collection for all replications in that connection. Alternatively, if the Default Collection is left blank, every replication will need a collection name.

   Create Collection Per Table If set to true, every new replication will attempt to use the collection named as the target table. If the collection does not exist, it will be created using the Syniti DR table name.
5. Click **Next** to view the **Select Tables** screen.
   If this is the first time you have created a connection using the output folder defined above, the table display will be empty.You can add a representation of target tables after completing the wizard.
6. Click **Next** to display the **Actions** screen,

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7. Optionally choose to continue with creating replications once the wizard is complete.
8. Click **Next** to display the summary, then click **Finish** to create the connection.
9. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

The next step is to set up replications from whichever source connection you have defined to the DocumentDB target database.

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Amazon S3 Topics

Syniti Data Replication supports use of Amazon S3 for:

- Refresh replications, target only.
- Mirroring replications, target only.

When setting up Amazon S3 for use with Syniti Data Replication:

- Install the AWS Toolkit for .NET from
  https://aws.amazon.com/sdk-for-net/
  Syniti DRwill later need the pathnames to two of the DLLs in the SDK. Make sure you have the path available when you configure the target connection to Amazon S3.
- Set up your AWS account. You can use either an IAM role or access keys to manage access to your account from Syniti DR. If using access keys, store both the Access Key and Secret Access Key where you will be able to find them when configuring your target connection to Amazon S3. If using an IAM role, store the details where you will be able to find them when configuring your target connection to Amazon S3. The credentials are needed to access an S3 bucket.

This section contains topics that describe:

- Replicating Data to Amazon S3

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Amazon S3 Topics

Syniti Data Replication supports use of Amazon S3 for:

- Refresh replications, target only.
- Mirroring replications, target only.

When setting up Amazon S3 for use with Syniti Data Replication:

- Install the AWS Toolkit for .NET from
  https://aws.amazon.com/sdk-for-net/
  Syniti DRwill later need the pathnames to two of the DLLs in the SDK. Make sure you have the path available when you configure the target connection to Amazon S3.
- Set up your AWS account. You can use either an IAM role or access keys to manage access to your account from Syniti DR. If using access keys, store both the Access Key and Secret Access Key where you will be able to find them when configuring your target connection to Amazon S3. If using an IAM role, store the details where you will be able to find them when configuring your target connection to Amazon S3. The credentials are needed to access an S3 bucket.

This section contains topics that describe:

- Replicating Data to Amazon S3

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
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Replicating Data to Amazon S3

With Syniti Data Replication, you can replicate relational data to an Amazon S3 bucket as a flat file. Amazon S3 is currently supported as a target both in refresh and mirroring. Before setting up Syniti DRto replicate data to S3, install the AWS Toolkit for .NET and set up IAM role or access keys.

To define a target connection for Amazon S3:

1. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
2. In the Add Target Connection wizard, type a name for the connection and choose **Amazon S3** in the **Database** field.
3. In the Set Connection String screen, enter values for the following properties:

Output Folder	Local path to temporarily store replication output files
Output folder Archive	(Optional) Set a path to archive files that are generated and uploaded.
Use IAM Role	Set to False by default. Set to True to use an IAM role for connections instead of the Access Key/Secret Key approach. For more information about using IAM roles, see https://-docs.aws.amazon.com/IAM/latest/UserGuide/id_roles.html. Note that IAM roles work only for access between AWS services (such as when using S3 as a staging connection for bulk uploads to Redshift.)
IAM Role Parameter	The IAM role parameter should be configured as follows to access S3: arn:aws:iam:<aws-account-id>:role/<role-name> The parameter information is required when using S3 in conjunction with Redshift. It is used in the COPY from statement to access files you imported from S3 to Redshift. For more information about using IAM roles with Redshift, see https://-docs.aws.amazon.com/redshift/latest/mgmt/authorizing-redshift-service.html

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S3 Access Key	The Access Key from your AWS login ID. Not required if **Use IAM Role** is set to true.
S3 Secret Key	The Secret Access Key from your AWS login ID. Not required if **Use IAM Role** is set to true.
S3 Bucket Name	The bucket must already exist. It can either be a bucket that you are already using, or one you have created for this purpose.
AWS SDK S3 Assembly Path	The pathname to AWSSDK.S3.dll installed with the AWS .NET SDK.
AWS SDK Core Assembly Path	The pathname to the AWSSDK.Core.dll installed with the AWS .NET SDK.
Create Manifest File	When set to true, creates a JSON manifest file which is sometimes required by data-sharing applications.

5. Complete the fields in the Target Connection wizard. Use the the User Guide available from the Management Center Help menu or the Setup Guide, available for download in the Help Center as needed.
   In the **Select Tables** screen, if tables already exist, choose the tables to use in replication. Note that you can also create tables, or add them at a later time.
6. Click **Next** to display the **Actions** screen.
7. Optional. Select the next wizard that you would like to run.
8. Click **Next** to display the summary, then click **Finish** to create the connection.
9. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

Now you can set up replications from whichever source connection you have defined.

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Apache Cassandra Topics

Syniti Data Replication supports use of Apache Cassandra for:

- Refresh replications, as a source and target
- Mirroring replications,as a target.

When setting up Apache Cassandra for use with Syniti Data Replication, there are no specific settings required, other than adequate database permissions.

Use of Primary Keys

Syniti Data Replication manages INSERT, UPDATE and DELETE operations using primary keys to identify records. For Cassandra, this works as follows:

- Cassandra partition keys are used as primary keys for inserting/updating/deleting data in the Cassandra target.
- Syniti DR does not store clustering key values for a table in the metadata.
- If an insert is performed on a table with a primary key that already exists in a table, Cassandra does not throw a primary key violation error, rather it overwrites the existing row with the new values.
- If replicating using Refresh with a Refresh Target Filter property in the Replication Properties, you must use a primary key column in the WHERE clause with an “=” or “IN” operator. This is because arbitrary WHERE clauses are not supported in CQL(Cassandra Query Language).

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Flat File Target Topics

Syniti Data Replication supports use of Flat Files for:

- Refresh replications, source and target.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to Flat Files

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
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Flat File Target Topics

Syniti Data Replication supports use of Flat Files for:

- Refresh replications, source and target.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to Flat Files

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Replicating To a CSV Flat File

When replicating from a relational database to a flat file, Syniti Data Replication allows you to replicate data in two different ways, or modes:

- **Refresh**
  A one-time complete replication from source table to CSV format flat file, according to replication settings and scripts. You can control the timing of the replication, identify the columns to be replicated and add scripts to transform data during replication.
- **One-way mirroring**
  A continuous update of a replicated table to a CSV flat file based on changes to the source database that have been recorded in the database server log. You can define the replication settings to check the transaction log on the source database at regular intervals. Any changes found in the log would be applied to the target file.

  To define a target connection for CSV output:

  1. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
  2. In the Add Target Connection wizard, type a name for the connection and choose **Files - CSV** in the **Database** field.
  3. In the Set Connection String screen **Output Folder** field, enter the path to a directory to contain the output files and schema.
  4. Set properties to configure the format of the CSV output files as needed.
  5. Set a value for the **Add Transactional Info** field. Choose **Yes** to include transactional information in the output for each record obtained from the database. This can be useful if replicating using mirroring from the source database.
  6. Optionally set a value for the **Use One File Per Group** field. False generates a single output file for each replicated table. True generates one file for all replicated tables in a group.
  7. You can leave the **ExtendedProperties** field blank.
  8. Click **Next** to view the **Select Tables** screen.
     If this is the first time you have created a File connection using the output folder defined above, the table display will be empty. You can add a representation of target tables after completing the wizard.

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9. Click **Next** to display the **Actions** screen,
10. Optionally choose to continue with creating replications once the wizard is complete.
11. Click **Next** to display the summary, then click **Finish** to create the connection.
12. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

Now you can set up replications from whichever source connection you have defined to the target file.

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Google BigQuery Topics

Syniti Data Replication supports use of Google Big Query for:

- Refresh replications, target only.
- Mirroring replications, target only.

When setting up Google BigQuery for use with Syniti Data Replication:

- Download the nuget package for the Google client library to access the BigQuery API from: https://www.nuget.org/packages/Google.Cloud.BigQuery.V2/.
- Copy the assemblies to the Syniti Data Replication Plugins/BigQuery folder. See below for the list of files.
  BigQueryPlugin.dll
  BigQueryPlugin.pdb
  Google.Api.Gax.dll
  Google.Api.Gax.Rest.dll
  Google.Apis.Auth.dll
  Google.Apis.Auth.PlatformServices.dll
  Google.Apis.Bigquery.v2.dll
  Google.Apis.Core.dll
  Google.Apis.dll
  Google.Apis.PlatformServices.dll
  Google.Cloud.BigQuery.V2.dll
  Newtonsoft.Json.dll
  System.Interactive.Async.dll
- (Optional – only needed if using AVRO serialization.) Download the nuget package for Confluent.Apache.Avro from: https://www.nuget.org/packages/Confluent.Apache.Avro/
- Copy the assemblies to the Syniti Data Replication Plugins/AvroSerializer folder. See below for the list of files.
  AvroSerializer.dll
  Confluent.Apache.Avro.dll
  Confluent.SchemaRegistry.dll
  Confluent.SchemaRegistry.Serdes.dll

This section contains topics that describe:

- Replicating Data to Big Query

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Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Google BigQuery Topics

Syniti Data Replication supports use of Google Big Query for:

- Refresh replications, target only.
- Mirroring replications, target only.

When setting up Google BigQuery for use with Syniti Data Replication:

- Download the nuget package for the Google client library to access the BigQuery API from: https://www.nuget.org/packages/Google.Cloud.BigQuery.V2/.
- Copy the assemblies to the Syniti Data Replication Plugins/BigQuery folder. See below for the list of files.
  BigQueryPlugin.dll
  BigQueryPlugin.pdb
  Google.Api.Gax.dll
  Google.Api.Gax.Rest.dll
  Google.Apis.Auth.dll
  Google.Apis.Auth.PlatformServices.dll
  Google.Apis.Bigquery.v2.dll
  Google.Apis.Core.dll
  Google.Apis.dll
  Google.Apis.PlatformServices.dll
  Google.Cloud.BigQuery.V2.dll
  Newtonsoft.Json.dll
  System.Interactive.Async.dll
- (Optional – only needed if using AVRO serialization.) Download the nuget package for Confluent.Apache.Avro from: https://www.nuget.org/packages/Confluent.Apache.Avro/
- Copy the assemblies to the Syniti Data Replication Plugins/AvroSerializer folder. See below for the list of files.
  AvroSerializer.dll
  Confluent.Apache.Avro.dll
  Confluent.SchemaRegistry.dll
  Confluent.SchemaRegistry.Serdes.dll

This section contains topics that describe:

- Replicating Data to Big Query

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Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Replicating Data to Google BigQuery

With Syniti Data Replication, you can replicate relational data to a BigQuery dataset. BigQuery is currently supported as a target both in refresh and mirroring. Before setting up Syniti DRto replicate data to BigQuery, install the BigQuery and AVRO Serialization libraries.

To define a target connection for BigQuery:

1. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
2. In the Add Target Connection wizard, type a name for the connection and choose **Google BigQuery** in the **Database** field.
3. In the Set Connection String screen, enter values for the following properties:

Project ID	The ID of the BigQuery project under which you want to upload data.
Service Account Key	Path to the local service account key file..
Output folder	Local folder where to create the temporary files before loading them to BigQuery..
Serialization	The type of serialization used to send data to BigQuery. Options available are: 1 - CSV (Comma Separated Values) 2 - JSON 3 – AVRO (Typically recommended for performance and to maintain and support compatibility with different versions of schemas.)

5. Complete the fields in the Target Connection wizard. Use the the User Guide available from the Management Center Help menu or the Setup Guide, available for download in the Help Center as needed.
   In the **Select Tables** screen, if tables already exist, choose the tables to use in replication. Note that you can also create tables, or add them at a later time.
6. Click **Next** to display the **Actions** screen.
7. Optional. Select the next wizard that you would like to run.
8. Click **Next** to display the summary, then click **Finish** to create the connection.

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9. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

Now you can set up replications from whichever source connection you have defined.

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Hadoop Topics

Syniti Data Replication supports use of Flat Files for:

- Refresh replications, target only.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to Hadoop

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Hadoop Topics

Syniti Data Replication supports use of Flat Files for:

- Refresh replications, target only.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to Hadoop

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Replicating Data to Hadoop

Syniti Data Replication allows you to replicate data from relational database tables to the Hadoop Distributive File System (HDFS) using **Refresh** or **Snapshot**, replication: a one-time complete replication from any major relational database source to HDFS as a target, according to replication settings and scripts. You can control the timing of the replication, identify the columns to be replicated and add scripts to transform data during replication. For more specific information about replicating to Hadoop, see the Setup Guide for Hadoop, available from the Help Center.

To set up a target connection for Hadoop:

1. In the Metadata Explorer, select the **Targets** node.
2. From the right mouse button menu, choose **Add New Connection.**
3. In the Target Connection Wizard**Provider**field, select the**Hadoop HDFS**option.
4. In the Set Connection String page, set the following properties:

Output Folder	An existing folder on the system that is running Syniti DR for files associated with replications to Hadoop
Hostname	The server name for the system running Hadoop
Username	The user name for the Hadoop instance
Password_KeyFile	Either a password or more typically a key file (.ppk extension)
Path to Binary	The pathname to the Hadoop executable, including "hadoop". For example, "/home/ubuntu/hadoop-2.7.7/bin/hadoop". To locate the executable, you can run the command "which hadoop" from your SSH session.
Target Directory	HDFS directory where files will be uploaded
Working Directory	Temporary server directory where files will be stored before moving them to HDFS. Files are managed by Syniti DR.
Output Folder Archive	Optional. Provides a local copy of data replicated to Hadoop. Data is not managed by Syniti DR, so the files must be managed manually and could grow quickly.
Add Transactional Info	Set to **Yes** if performing mirroring replications

5. Click **Next** to view the **Select Tables** screen.
   If this is the first time you have created a connection using the output folder defined above, the table display will be empty. However, as the folder is populated with output files, those fie structures are displayed as tables in

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this view. You can then select one or more.

6. Click **Next** to display the **Actions** screen,
7. Optionally choose to continue with creating replications once the wizard is complete.
8. Click **Next** to display the summary, then click **Finish** to create the connection.

The next step is to set up replications from whichever source connection you have defined to the file target for HADOOP.

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JSON Format Target Topics

Syniti Data Replication supports use of JSON format files for:

- Refresh replications, target only.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to JSON Format Files

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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JSON Format Target Topics

Syniti Data Replication supports use of JSON format files for:

- Refresh replications, target only.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to JSON Format Files

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Replicating Data to a JSON Format File

With Syniti Data Replication, you can replicate relational data to a JSON format text file, useful as a data interchange format for integration with Javascript. JSON is currently supported as a target both in refresh and mirroring. Every session creates either a .ref or .mir file with the content of the replication. The files are in JSON format.

NOTE: Syniti DR also supports the JSON datatype when available in the supported relational databases. For example, if you are replicating from Oracle to SQL Server and the source table contains a fiel with a JSON datatype, that type will be correctly mapped and replicated to the SQL Server JSON datatype. If the JSON type does not exist, a VARCHAR type is used.

To define a target connection for JSON output:

1. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
2. In the Add Target Connection wizard, type a name for the connection and choose **Files - JSON** in the **Database** field.
3. In the Set Connection String screen **Output Folder** field, enter the path to a directory to contain the output files and schema.
4. Choose values for the following fields:

   Add Transactional Info: Choose Yes to include transactional information in the output for each record obtained from the database. This can be useful if replicating using mirroring from the source database.

   Use One File Per Group: False generates a single output file for each replicated table. True generates one file for all replicated tables in a group.
5. You can leave the **ExtendedProperties** field blank.
6. Click **Next** to view the **Select Tables** screen.
   If this is the first time you have created a JSON connection using the output folder defined above, the table display will be empty. You can add a representation of target tables after completing the wizard.
7. Click **Next** to display the **Actions** screen,
8. Optionally choose to continue with creating replications once the wizard is complete.
9. Click **Next** to display the summary, then click **Finish** to create the connection.

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10. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

Now you can set up replications from whichever source connection you have defined to the JSON target file.

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MongoDB Atlas Topics

Syniti Data Replication supports use of MongoDB Atlas for:

- Refresh replications, target only.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to MongoDB Atlas

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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MongoDB Atlas Topics

Syniti Data Replication supports use of MongoDB Atlas for:

- Refresh replications, target only.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to MongoDB Atlas

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Replicating Data to MongoDB Atlas

With Syniti Data Replication, you can replicate relational data to MongoDB Atlas document database. MongoDB is currently supported as a target both in refresh and mirroring.

To define a target connection for MongoDB Atlas:

1. Make sure that you have downloaded and installed the MongoDB .NET Provider. For nformation on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center. The Help Center also provides database-specific setup notes in PDF format..
2. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
3. In the Add Target Connection wizard, type a name for the connection and choose **MongoDB Atlas** in the **Database** field.
4. In the Set Connection String screen **Output Folder** field, enter the path to a directory to contain the output files and schema.
5. Choose values for the following fields:

   Server The server name or IP address of the MongoDB instance.

   Port The port number of the server running MongoDB.

   Use DNS Seedlist If set to false, the standard connection format is used. If set to true, a DNS-constructed seed list is used. Using DNS to construct the available servers list allows more flexibility of deployment and the ability to change the servers in rotation without reconfiguring clients.

   User ID The user name for MongoDB Atlas.

   Password The password for MongoDB.

   Database The MongoDB database name.

   Output Folder The schema name and location to hold config files for the MongoDB objects.

   Default Collection All MongoDB replications need to be targeted to a specific collection. Use this field to indicate a default collection for all replications in that connection. Alternatively, if the Default Collection is left blank, every replication will need a collection name.

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Create Collection Per Table If set to true, every new replication will attempt to use the collection named as the target table. If the collection does not exist, it will be created using the Syniti DR table name.

Use One Writer Per Group Default is True. When True, Syniti DR uses a single writer object common to all replications in a group (if groups are used). When False, a new object is created for each replication.

5. Click **Next** to view the **Select Tables** screen.
   If this is the first time you have created a connection using the output folder defined above, the table display will be empty. You can add a representation of target tables after completing the wizard.
6. Click **Next** to display the **Actions** screen,
7. Optionally choose to continue with creating replications once the wizard is complete.
8. Click **Next** to display the summary, then click **Finish** to create the connection.
9. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

Now you can set up replications from whichever source connection you have defined to the JSON target file.

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Microsoft Azure Data LakeTopics

Syniti Data Replication supports use of Microsoft Azure Data Lake Storage (ADLS) Gen 1 and Gen 2 for:

- Refresh replications, target only.
- Mirroring replications, target only.

MS Azure Data Lake Gen 1

When setting up ADLS Gen 1 for use with Syniti Data Replication:

- Install the nuget packages:

  Microsoft.Azure.Management.DataLake.Store

  https://www.nuget.org/packages/Microsoft.Azure.Management.DataLake.Store

  Microsoft.Rest.ClientRuntime.Azure.Authentication

  https://www.nuget.org/packages/Microsoft.Rest.ClientRuntime.Azure.Authentication/

- Install the nuget package below to obtain version 2.28.3 of Microsoft.IdentityModel.Clients.ActiveDirectory.dll:

  https://www.nuget.org/packages/Microsoft.IdentityModel.Clients.ActiveDirectory/2.28.3

- Copy the following assemblies to the DataLake plugin path in Syniti DR: <Syniti DR>/Plugins/DataLake/

  Microsoft.Azure.Management.DataLake.Store.dll

  Microsoft.IdentityModel.Clients.ActiveDirectory.dll (ver 2.28.3)

  Microsoft.Rest.ClientRuntime.dll

  Microsoft.Rest.ClientRuntime.Azure.dll

  Microsoft.Rest.ClientRuntime.Azure.Authentication.dll

- For Syniti DR v9.7.0.24, download version 11.0.0.0 of Newtonsoft.Json.dll from the following link, and add it to the <Syniti DR>/Plugins/DataLake/ folder:
  https://www.nuget.org/packages/Newtonsoft.Json/

MS Azure Data Lake Gen 2

When setting up ADLS Gen 2 for use with Syniti Data Replication:

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- Install the nuget package:

  https://www.nuget.org/packages/Microsoft.IdentityModel.Clients.ActiveDirectory/2.28.3

- Copy the following assembly to theDataLakeGen2 plugin path in Syniti DR: <Syniti DR>/Plugins/DataLakeGen2/

  Microsoft.IdentityModel.Clients.ActiveDirectory.dll

This section contains topics that describe:

- Replicating Data to Azure Data Lake Storage Gen 1
- Replicating Data To Azure Data Lake Storage Gen 2

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Replicating Data to Azure Data Lake Storage Gen 1

With Syniti Data Replication, you can replicate relational data to Microsoft Azure Data Lake storage Gen 1 as a flat file. ADLS is currently supported as a target both in refresh and mirroring. Before setting up Syniti DR to replicate data to ADLS, install the packages for Data Lake.

To define a target connection for ADLS:

1. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
2. In the Add Target Connection wizard, type a name for the connection and choose **Azure Data Lake** in the **Database** field.
3. In the Set Connection String screen, enter values for the following properties:

Output Folder	The location of the schema for config files for the ADLS objects
Domain	The name of the domain associated with the Azure Active Directory App used to upload data to Azure Data Lake
Client Id	Client ID in GUID format that identifies the client application
Client Secret	Client secret token used from the client application
Account Name	The name of the Data Lake Storage Gen1 account used to load data
Target Directory	Target location where to load data in Data Lake

5. Complete the fields in the Target Connection wizard. Use the the User Guide available from the Management Center Help menu or the Setup Guide, available for download in the Help Center as needed.
   In the **Select Tables** screen, if tables already exist, choose the tables to use in replication. Note that you can also create tables, or add them at a later time.
6. Click **Next** to display the **Actions** screen.
7. Optional. Select the next wizard that you would like to run.
8. Click **Next** to display the summary, then click **Finish** to create the connection.
9. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

Now you can set up replications from whichever source connection you have defined.

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Replicating Data to Azure Data Lake Storage Gen 2

With Syniti Data Replication, you can replicate relational data to Microsoft Azure Data Lake storage Gen 2 as a flat file. ADLS is currently supported as a target both in refresh and mirroring. Before setting up Syniti DR to replicate data to ADLS, install the ActiveDirectory package for Data Lake.

To define a target connection for ADLS Gen 2:

1. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
2. In the Add Target Connection wizard, type a name for the connection and choose **Azure Data Lake Gen 2** in the **Database** field.
3. In the Set Connection String screen, enter values for the following properties:

Output Folder	The location of the schema for config files for the ADLS objects
Client Id	Client ID in GUID format that identifies the client application (application added in App registrations in the Active Directory)
Tenant Id	Tenant(Directory) Id in guid format representing the Active Directory Tenant.
Client Secret	Client secret token used from the client application. It can be generated by clicking on **Certificates & Secrets** for the App added in App registrations.
Storage Account Name	The name of the Data Lake Storage Gen2 account used to load data
Target FileSystem Name	Target FileSystem/Container name where to load data in Data Lake.

5. Complete the fields in the Target Connection wizard. Use the the User Guide available from the Management Center Help menu or the Setup Guide, available for download in the Help Center as needed.
   In the **Select Tables** screen, if tables already exist, choose the tables to use in replication. Note that you can also create tables, or add them at a later time.
6. Click **Next** to display the **Actions** screen.
7. Optional. Select the next wizard that you would like to run.

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8. Click **Next** to display the summary, then click **Finish** to create the connection.
9. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

Now you can set up replications from whichever source connection you have defined.

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Microsoft Azure Event Hubs Topics

Syniti Data Replication supports use of Microsoft Azure Event Hubs for:

- Refresh replications, target only.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to MS Azure Event Hubs

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Microsoft Azure Event Hubs Topics

Syniti Data Replication supports use of Microsoft Azure Event Hubs for:

- Refresh replications, target only.
- Mirroring replications, target only.

This section contains topics that describe:

- Replicating Data to MS Azure Event Hubs

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Replicating Data to MS Azure Event Hubs

With Syniti Data Replication, you can replicate relational data to a Microsoft Azure Event Hubs using JSON, CSV or XML serialization of the entire record. Event Hubs are currently supported as a target both in refresh and mirroring. Every session creates either a .ref or .mir file with the content of the replication.

To define a target connection for Azure Event Hubs:

1. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
2. In the Add Target Connection wizard, type a name for the connection and choose **Azure Event Hubs** in the **Database** field.
3. In the Set Connection String screen, choose values using the information below.

Server	The Azure Event Hubs namespace or IP address, i.e., the container for Event Hubs. Typical format: <yournamespace>.servicebus.windows.net
Shared Access Policy Name	The name of your shared access policy. The default value is RootManageSharedAccessKey.
Shared Access Key	Shared access primary key.
Default Hub	The Event Hub name.
Output Folder	Pathname to folder that will contain information related to the replication process.
Port	The port number. The default value is 5671.
Connect Timeout	The connection timeout (in seconds).
Match Hub with Table Name	If set to true, each replicated table will send data to the existing hub with the same table name.
Serialization	Select the type of serialization required for Azure Event Hubs messages. The following types of message serialization are currently supported: 0 – JSON 1 – CSV 2 – XML

4. Click **Next** to view the **Select Tables** screen.
   If this is the first time you have created a connection using the output folder defined above, the table display will

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be empty.

5. Click **Next** to display the **Actions** screen.
6. Optionally choose to continue with creating replications once the wizard is complete.

   Click **Next** to display the summary, then click **Finish** to create the connection.
7. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

Now set up replications from whichever source connection you have defined to the Azure Event Hub.

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XML File Topics

Syniti Data Replication supports replication to XML format files using:

- Refresh replications, target only.
- Mirroring replications, target only.

NOTE: Syniti DR also supports the XML datatype when available in the supported relational databases. For example, if you are replicating from Oracle to SQL Server and the source table contains a field with an XML datatype, that type will be correctly mapped and replicated to the SQL Server XML datatype. If the XML type does not exist, a VARCHAR type is used.

This section contains topics that describe:

- Replicating Data to an XML File

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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XML File Topics

Syniti Data Replication supports replication to XML format files using:

- Refresh replications, target only.
- Mirroring replications, target only.

NOTE: Syniti DR also supports the XML datatype when available in the supported relational databases. For example, if you are replicating from Oracle to SQL Server and the source table contains a field with an XML datatype, that type will be correctly mapped and replicated to the SQL Server XML datatype. If the XML type does not exist, a VARCHAR type is used.

This section contains topics that describe:

- Replicating Data to an XML File

Further Resources

- For a complete up-to-date list of supported sources and targets, and information on where to obtain a .NET provider, check the Supported .NET Providers article in the Help Center.
- The Help Center also provides database-specific setup notes in PDF format.

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Replicating Data to an XML File

With Syniti Data Replication, you can replicate relational data to an XML file. This type of replication is currently supported as a target both in refresh and mirroring.

To define a target connection for XML:

1. In the Metadata Explorer, choose **Targets**, then **Add New Connection** from the right mouse button.
2. In the Add Target Connection wizard, type a name for the connection and choose **Files - XML** in the **Database** field.
3. In the Set Connection String screen, enter values for the following properties:

Output Folder	Local path to store replication output files
Catalog Folder	The path to a directory to contain the XSD schema files
Root XML Schema Element Name	The name of the root element of the output XML file
Represent Database Columns As	Choose Element or Attribute to determine how source table columns will be organized in the output XML files. This field sets the default value that will be applied to all the columns of each table in this target connection. When completing the Create Target Table Wizard (Define Columns screen), you can change the value for each column.

5. Complete the fields in the Target Connection wizard. Use the the User Guide available from the Management Center Help menu or the Setup Guide, available for download in the Help Center as needed.
   In the **Select Tables** screen, if tables already exist, choose the tables to use in replication. Note that you can also create tables, or add them at a later time.
6. Click **Next** to display the **Actions** screen.
7. Optional. Select the next wizard that you would like to run.
8. Click **Next** to display the summary, then click **Finish** to create the connection.
9. The next step is to add target output representation to the Metadata Explorer. This will be represented as relational tables.

Now you can set up replications from whichever source connection you have defined.

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Designing Replications

This section contains topics that describe:

- Replication Types
- Planning the Replication Process
- Table Replication Scenarios
- Database Replication Scenarios
- Primary Key Settings for Mirroring and Synchronization
- Recommendations for Installation Location
- Trigger-based Transactional Replications
- Resolving Conflicts during Synchronization
- Using Bulk Insert for Mirroring Replications

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Recommendations for Installation Location

Syniti Data Replication has been designed to run over a network using client/server technology. Here are some recommendations about the location of the Syniti DR installation.

Install Syniti DR on the source database system when:

- Data to be replicated represents a small portion of the total source data. If you are using filters and performing mapping to only a small number of fields, executing filters and mapping locally (on the same system, or within the same local network) will add minimal load to the network.
- The actual time to extract data from the database is particularly long (as can happen with IBM Db2 for i, for instance.) In this case, having Syniti DR local to the source will not add network overhead to the already slow reader thread.
- There are security concerns. If the source database contains critical data that should not be sent to the target, limiting access to applications from an external network and preventing this data from traveling across the network is advisable.
- Using the Log Server Agent approach for transactional replications (mirroring and synchronization.) In general, if connections use the Log Server Agent, it is better to install Syniti DR local to the source database. It is more efficient to move the Log Server Agent data files across the netwrok than to access and run the Log Server Agent remotely.

Install Syniti DR on the target database system when:

- The replication process uses several lookup functions on the target database (e.g. when running scripts.) It is more efficient to access target data locally (on the same system, or within the same local network.)
- The actual time to write data from the database is particularly long (as can happen with IBM Db2 for i, for instance.) In this case, having Syniti DR local to the target will not add network overhead to the already slow writer thread.

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Replication Types

Syniti Data Replication allows you to replicate data between database tables in the following ways:

- Refresh

  A one time complete replication from source to target table, according to replication settings and scripts. You can control the timing of the replication, identify the columns to be replicated and add scripts to transform data during replication. The source and target databases can be on the same or different database servers and platforms. For example, you can replicate a Db2 table to an Oracle database or a SQL Server table to IBM Db2 for i (iSeries/AS400).

  Note that when performing a refresh replication, Syniti DR deletes all target records before inserting records from the source table. To avoid truncation of all records from the target table, you can write a script for the Refresh_onBeforeTruncate event.

  Steps for Replicating a Table Using Refresh Mode

- Continuous refresh

  A regularly scheduled refresh replication as described above. The schedule is defined in the replication settings.

  Steps for Replicating a Table Using Refresh Mode

- One-way mirroring

  A continuous update of a replicated table based on changes to the source database that have been recorded in the database server log. Typically, this involves an initial refresh operation, as described above, to set up the target table. Then you can define the replication settings to check the transaction log on the source database at regular intervals. Any changes found in the log would be applied to the target database.

  Steps for Replicating with One-Way Mirroring

- Synchronization **or two-way mirroring**

  Syncronization is appropriate when changes occur in both tables involved in the replication. Your replication settings ensure that both tables maintain the same state by checking the logs on each table and performing updates on each table as needed.

  Steps for Replicating with Synchronization

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Planning the Replication Process

During the planning phase of a replication project, you should gather all the business requirements that Syniti Data Replicationwill need to fulfill, and precisely determine how the target tables will be derived from the source tables.

The Syniti Administrator and the Database Administrator (whether it is one person who does both or two different persons) will need to ask the following questions before developing a plan for the replication process:

Business Requirements Questions

- Is Syniti Data Replicationbeing used for system backup? Data sharing? Data propagation?
- Will the users need current data, or will they be able to work with data that is not current up to the second?
- What is an acceptable level of latency for the replicated data? (1 hour, 1 day, 1 week?)
- How often do replications need to be scheduled for?
- Which data should be blocked (from users, groups of users)?
- Will the users need to be able to update the replicated data, or will they only need to read the data?
- Will all the users and user groups need the same data, or will they need different subsets of the data?
- How will the users access the data? (OS, Hardware, Network)
- Are there periods when insert/delete/update activity on source tables is more frequent?

Configuration Questions

- How many tables will need to be replicated? How many databases? Use the Database Replication Scenarios and Table Replication Scenarios to help you determine your needs.
- What types of replication are needed? (Refresh, Mirroring, Synchronization)
- If the users must be able to update the replicated data, is it a problem if someone else updates another copy of the data (same row), elsewhere, at the same time? If it is a problem, how can you prevent such a conflict from occurring, or deal with update conflicts if you cannot prevent them?
- If users need different subsets of rows, do you have a subsetting criteria present in all the tables? Is this criteria contained in a column that can be updated in place by an existing application? Will some users need different

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subsets of columns?

- How much data has to be replicated? What is the level of volatility (number of updates/inserts/deletes per hour or per day)?
- Are the existing tables normalized, and do you always follow the relational model recommendations?
- Will the headquarters of your organization need consolidated data from geographically dispersed data?
- Are there special filtering needs?

Related Topics

Replication Types

Database Replication Scenarios

Table Replication Scenarios

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Table Replication Scenarios

Replication in Syniti Data Replicationis defined at the table level, so there is a replication definition for each source-target table pair. To replicate an entire database, see Database Replication Scenarios.

One to One Table Replication

This is the simplest case where a source table is replicated to a target table that may be on the same or a different database server. For this type of replication, you need to define a source database connection and a target database connection. Then you need to specify replication details that include the type of replication, the scheduling and the mapping between source and target fields in the table. You can also write a script to transform values in the source table for the target table.

Source Connections	Target Connections
SourceDB1	TargetDB1

One to Many Table Replication

In this scenario, a source table is replicated to more than one target table where the target tables may be on the same or a different database server. For this type of replication, you need to define a source database connection and one or more target database connections. You will need a connection for each database server. Then you need to specify replication details for each source-target pair that include the type of replication, the scheduling and the mapping between source and target fields in the table. You can also write a script to transform values in the source table for the target table. For example, in the Customers source table, you might replicate all the customer data to target table A, but just the customer ID and the fields containing financial information to target B. In this example, you would need the following source and target connections:

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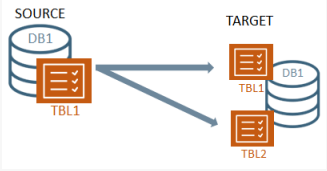
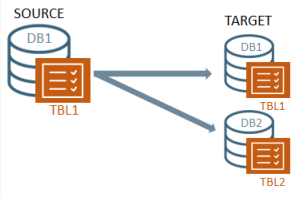
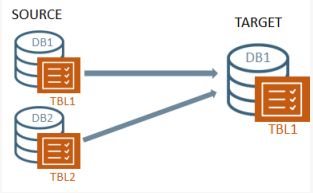
One-to-Many Same Target Database		One-to-Many Different Target Database	
			
Replications: **SourceT1 - TargetT1** **SourceT1 - TargetT2**		**Replications:** **SourceT1 - TargetT1** **SourceT1 - TargetT2**	
Source Connections	**Target Connections**	**Source Connections**	**Target Connections**
SourceDB1	TargetDB1	SourceDB1	TargetDB1 TargetDb2

Many to One Table Replication

In this scenario, multiple source tables are replicated to a single target table. For this type of replication, you need to define source database connections and a target database connection. You need to specify replication details for each source-target pair that include the type of replication, the scheduling and the mapping between source and target fields in the table. You can also write a script to transform values in the source table for the target table. Syniti DR does not provide tools to manage possible conflicts when replicating to a table from different sources. When planning the replications, you need to avoid possible conflicts. For example, if performing a Refresh, you may want to skip the truncation step by writing a script for the Refresh_onBeforeTruncate event.

In replicating two different source tables to a single target table, you would need the following source and target connections:

Many-to-One Same Source Database	Many-to-One Different Source Database
	

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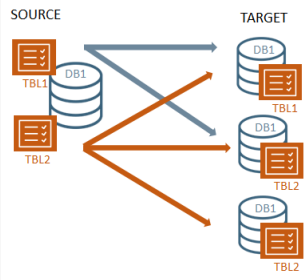
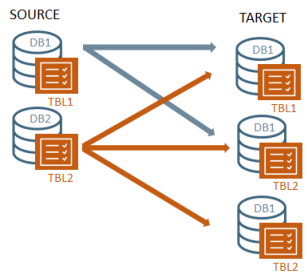
Replications: **SourceT1 - TargetT1** **SourceT2 - TargetT1**		**Replications:** **SourceT1 - TargetT1** **SourceT2 - TargetT1**	
Source Connections	**Target Connections**	**Source Connections**	**Target Connections**
SourceDB1	TargetDB1	SourceDB1 SourceDb2	TargetDB1

Many to Many Table Replications

In this scenario, multiple source tables are each replicated to one or more target tables. Carefully analyze the relationships for each source-target pair and create source and target connections based on the descriptions above in Many to One Table Replication and One to Many Table Replication. Syniti Data Replication does not provide any specific features for handling this type of scenario. In this example, you would need the following source and target connections:

Many-to-Many Same Source and Same Target Databases		**Many-to-Many Different Source and Same Target Database**	
			
Replications: **SourceT1 - TargetT1** **SourceT1 - TargetT2** **SourceT2 - TargetT1** **SourceT2 - TargetT2** **SourceT2 - TargetT3**		**Replications:** **SourceT1 - TargetT1** **SourceT1 - TargetT2** **SourceT2 - TargetT1** **SourceT2 - TargetT2** **SourceT2 - TargetT3**	
Source Connections	**Target Connections**	**Source Connections**	**Target Connections**

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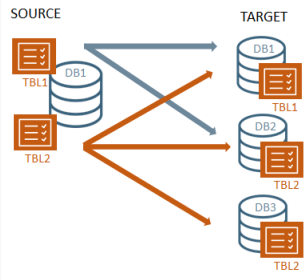
SourceDB1	TargetDB1 TargetDB1 TargetDb2 TargetDb2 TargetDB3	SourceDB1 SourceDb2	TargetDB1 TargetDB1 TargetDb2 TargetDb2 TargetDB3

Many-to-Many Same Source and Different Target Databases	
	
Replications: **SourceT1 - TargetT1** **SourceT1 - TargetT2** **SourceT2 - TargetT1** **SourceT2 - TargetT2** **SourceT2 - TargetT3**	
Source Con-nections	**Target Connections**
SourceDB1	TargetDB1 TargetDB1 TargetDb2 TargetDb2 TargetDB3

Related Topics

Planning the Replication Process

Database Replication Scenarios

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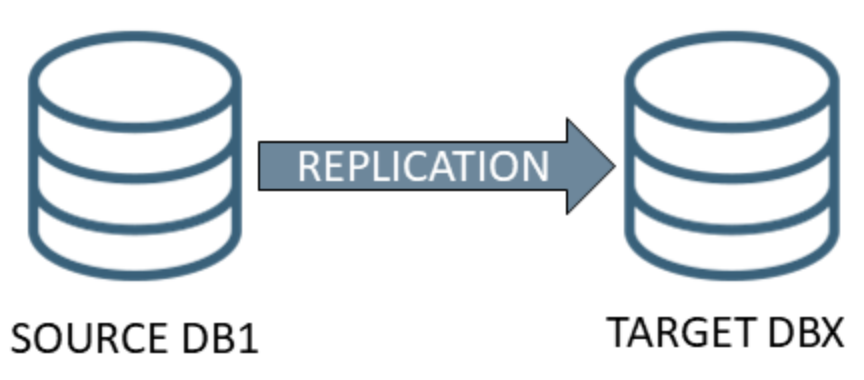
Database Replication Scenarios

Database replications typically fall into one of the following categories.

One to One Database Replication

The easiest and most common scenario involves one source database and one target database, where Syniti Data Replicationreads data from the source database or log/journal, and writes to the target database. The replication may involve one table or several tables. If the replication involves more than one table, you can set up replications for each table quickly and efficiently using the Multiple Replications wizard. See also Table Replication Scenarios for additional scenarios.



For this type of replication, you will need to define one source connection and one target connection before defining replication details for each table involved in the replication. Replication details depend on whether you intend to perform a refresh replication, perform synchronization, or set up mirroring from the source to the target database.

One to Many Database Replication

In this scenario, data from a single source database must be replicated to multiple target databases. The replication may involve one table or several tables on the source and target sides. See Table Replication Scenarios for more information.

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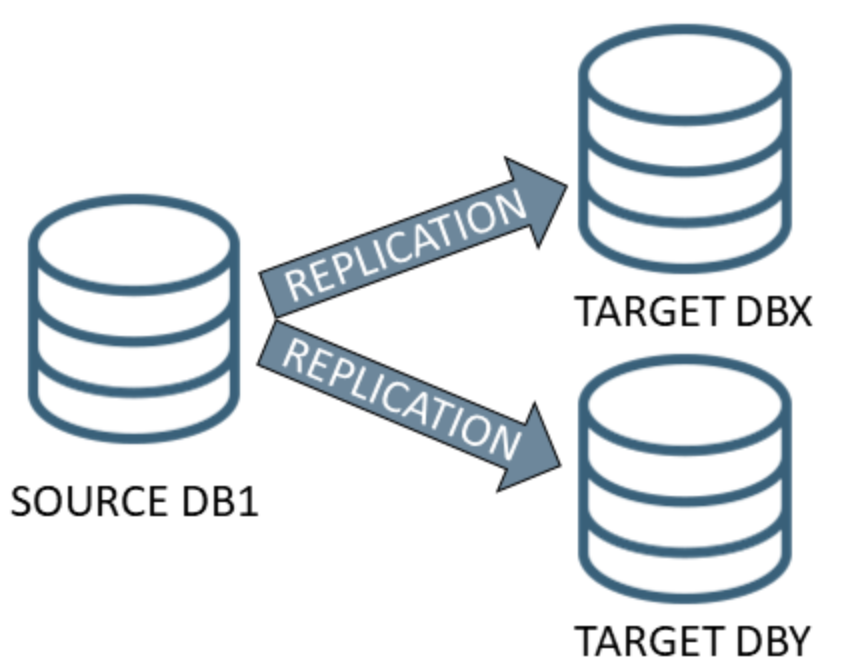

For this type of replication, you will need to define one source connection and one target connection for each database to which you are replicating data. You will also need to define replication details for each table involved in the replication. For example, if you have two tables on the source database, one of which needs to be replicated to a SQL Server target database, and the other to an Oracle target database, you will need to set up two replications. Replication details depend on whether you intend to perform a refresh replication, perform synchronization, or set up mirroring from the source to the target database.

This approach could be useful in the following conditions:

- Department databases are present
- Security policies require several target databases
- You need to reduce network traffic by replicating data only where necessary

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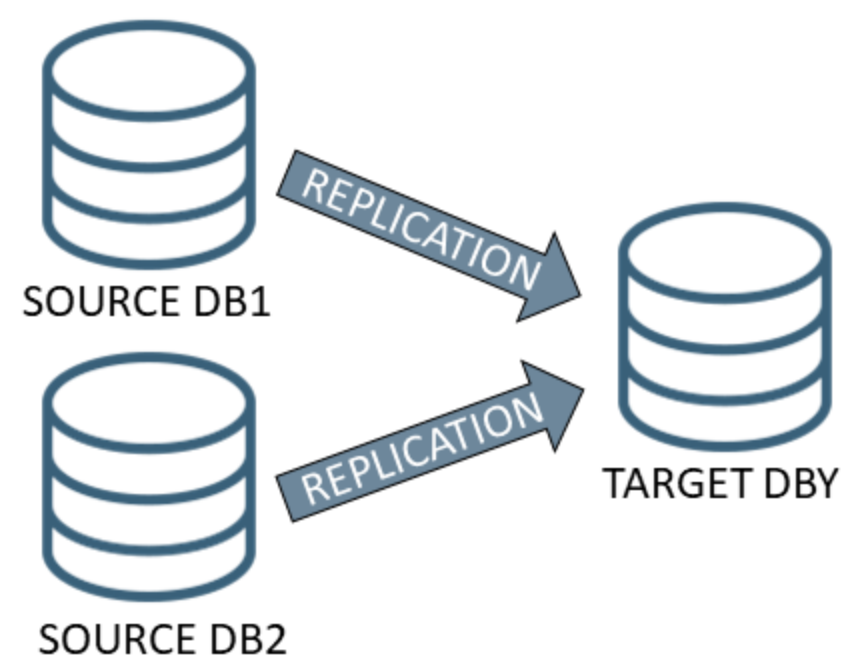
Many to One Database Replication



This scenario often occurs when consolidating enterprise data. You will need to define one source connection for each database from which you are replicating. If you are replicating to different tables in the target database, you can set up a single target database connection and define the tables to replicate in the Replication wizard. If you are replicating from tables in multiple source databases to a single table in the target database, a restriction applies. Even though you are targeting a single database, connections to the same table cannot be shared so you will need to set up a target connection that matches each source connection using the same table. The replication requires a unique target connection. You will also need to define replication details for each table involved in the replication. For example, if you have two tables on two source databases that both need to be replicated to the target database, you will need to set up two replications. Replication details depend on whether you intend to perform a refresh replication, perform synchronization, or set up mirroring from the source to the target database.

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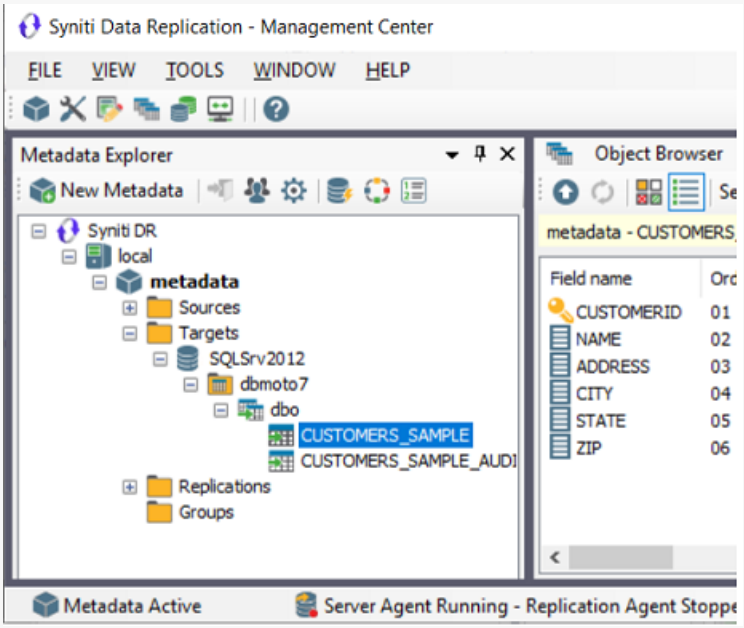
Primary Key Settings for Mirroring and Synchronization

For transaction-based replications (mirroring and synchronization), it is critical to be able to uniquely identify records in the source and target databases, before performing UPDATE and DELETE operations during replication. Database applications typically make use of primary keys to uniquely identify records.

Syniti Data Replicationcan use primary keys that have been previously set in the source and target databases to identify records during replication. It is also possible to create primary keys within the Syniti DRenvironment for use only during replications. Therefore, if you have no primary key set in the database, you can create one within Syniti DR, or, if you have set a primary key in the database, you can override the primary key setting by creating a key within Syniti DR.

NOTE: If you choose to set one or more table columns as primary key in Syniti DR, it is critical that each record contains a **unique value**. If the values are not unique for each record, the results of any replication using the table are unpredictable. The primary key columns defined in Syniti DRare used to match source and target records based on their values. Syniti DRdoes not enforce primary key constraints internally, and is not able to determine whether a transaction will be applied to multiple records or whether it will generate duplicate values.

When you create a source or target connection and display a table in the Management Center, any primary key that is defined in the database is displayed with a key icon to the left of the row name. In the example below, the **Customers** table has a primary key set on the **CustomerID** column.



To create a primary key:

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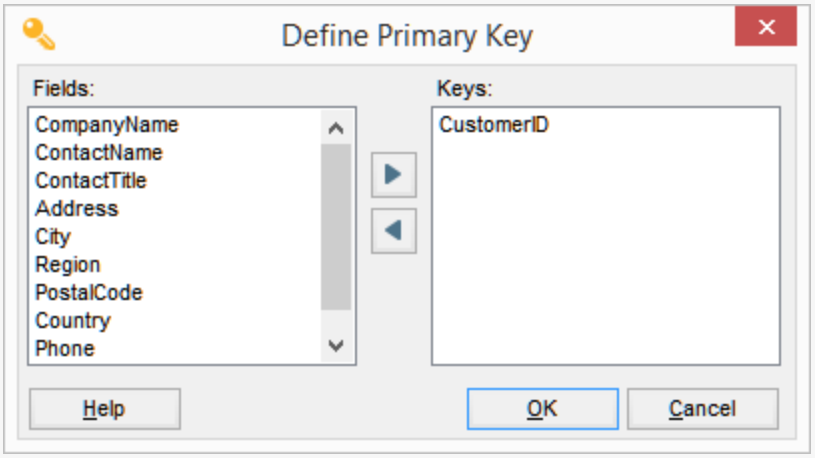
1. In the Metadata Explorer, select the source or target table for which you want to create a key.
2. From the right mouse button menu, choose Set Primary Key to open the Define Primary Key dialog.



In the Fields column of the Define Primary Key dialog, there is a list of fields eligible to be primary keys. The Keys column of the dialog shows any primary keys that have already been set. If a primary key is set in the database, it is displayed in the Keys column of the dialog.

3. To add a new primary key, select a field name in the Fields column, then click the right-facing arrow to move the field into the Keys column of the dialog. You can use any number of fields (to the limit set by the database you are using) to create a primary key, **as long as they can uniquely identify any record.**
4. To remove an existing primary key, select the field name in the Keys column, then click the left-facing arrow to move the field into the Fields column of the dialog.
5. When you have set the primary key to your liking, click **OK** in the Define Primary Key dialog.

Related Topics

Define Primary Key Dialog

Using a Relative Record Number to Identify a Record

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Overview of Trigger-based Transactional Replications

A database trigger is code that is automatically executed in response to certain events on a database table. Syniti Data Replication supports trigger-based transactional replications (mirroring or synchronization) for a number of databases.

If you plan to define a trigger-based replication (mirroring or synchronization), you need to provide information in the Source and/or Target Connection wizards so that triggers can be created to log table changes for replication.

For each table involved in the replication, Syniti DR creates 3 triggers in the source table that fire when a specific event occurs on a record:

- INSERT trigger which fires when a new record is being inserted in the table
- UPDATE trigger which fires when a record is modified
- DELETE trigger which fires when a record is deleted

If the replication is later deleted, the triggers are removed by Syniti DR. However, note that if you change a replication from mirroring to refresh, the triggers on the source table are not deleted. All transactions will continue to be recorded in the log tables. If you are not planning to reset the replication to mirroring, it is better to delete the replication, so that the triggers are removed, and create a new refresh replication.

Data retrieved using the triggers is stored in log tables that are specified in your Source/Target connection. The master log table can be an existing table or one created specifically to hold Syniti DR information. It contains general information about the transactions, like user name, timestamp, table name. A log table (_DBM__LOG_x) is also created for each source table in the replication, and contains the data changes identified by the triggers, as well as trigger objects _DBM__TRG_OBJS.

Note that Syniti DR does not create a tablespace. If you want to have a table space named SYNITIDR, you must create it beforehand using a SQL tool such as the Execute SQL Query dialog in the Management Center. Run a statement like

```
CREATE TABLESPACE SYNITIDR
```

When creating a connection, it is important to set the retention time to keep the log table size under control. The higher the value, the more data is kept in the log tables. Try to estimate the number of transactions occurring in all the source tables during a retention period and be sure that the database and table space have enough storage capacity for all those transactions. The Replication Agent cleans up the log tables periodically, based on the retention setting in the connection dialog. If the engine is not running, the log tables are not cleaned up. This might create space problems in

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the database as the logs grow in size. If you stop the engine and you are not planning to run it again, be sure to remove all the mirroring synchronization replications.

In addition, if you have many table replications in a single group, using a single connection, all the replications share a master log table. Access to the log table for each source table can become a bottleneck if there are many transactions using the same master log and log tables. Syniti DR may report errors about locked tables during replication. Although Syniti DR is able to recover from these errors and continue replicating, a better approach is to prevent the errors by splitting the replications into multiple groups with multiple connections and multiple master log tables. First, create multiple source connections to the database. Use the Transactional Setup field in the Connection Properties of each connection to open the Manage Transactional Log Settings dialog and create a new master log table for each connection.

During replication:

- When a record is inserted in the source table, the INSERT trigger fires and inserts one record in the master table and one record in the log table associated with the source table. The record inserted in the log table contains all the original values of the INSERT statement.
- When a record is deleted from a table, the DELETE trigger fires and inserts one record in the master table and one record in the log table associated with the source table. The record inserted in the log table contains the key values of the deleted record.
- When a record is updated, the UPDATE trigger fires and inserts one record in the master table and two records in the log table associated with the source table. The two records inserted in the log table contain all the record values before and all the records after the update.

Your system administrator needs to create and define appropriate table spaces and databases to hold the log tables. They should be large enough to handle the expected amount of replication data.

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Resolving Conflicts During Synchronization

In synchronization, or two-way mirroring mode, the assumption is that changes will be made to both tables involved in the replication, and the changes may be different in each table. The goal of synchronization, then, is to make sure that both tables are kept up to date with one another by applying changes from table A to table B and changes to table B to table A.

If you choose synchronization, as your replication type, you should be prepared to handle the situation where changes have occurred at the same time on the same record in both tables involved in the replication. For example, if the respective transaction logs show, at the same mirroring interval, that the Price field in a Product record is updated on SQL Server and also updated on Db2/400, you need to decide which update is applied to both tables. By default, the changes made to the table in the database defined as the source connection are propagated to the table in the target database.

After defining your replication using the Replication wizard, or Multiple Replications wizard, go to the Preferences tab in the Replication Properties dialog to specify how conflicts should be handled:

- **SourceServerWins:** This is the default value. Changes applied to the table defined in the source connection are also applied to the table defined in the target connection(s), overriding any changes that have occurred in the target connection table.
- **TargetServerWins:** Changes applied to the tables defined in the target connections are also applied to the table defined in the source connection, overriding any changes that have occurred in the source connection table. This option also requires you to set a priority for the target tables involved so that, if changes occur in more than one target table, Syniti DR can determine which changed value to use. Set the priority for target connections as follows.

1. In the Metadata Explorer, select the group.
2. From the right mouse button menu, choose **Group Properties**.
3. In the Group Properties dialog, go to the **Preferences** tab.
4. Click in the **Conflict Resolver Priority** field to view the target connections.
5. Order the target connections by selecting the connection, then using the up and down arrows to determine its priority.

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- **FirstComeWins:** The timestamps of the changes in the tables designated as source and target are compared and the change that applied earliest is applied to all tables.
- **LastComeWins:** The timestamps of the changes in the tables designated as source and target are compared and the change that applied last is applied to all tables.
- **Use Script**: This option generates an event that can be handled by writing a function Replication_onConflict. The script editor can be accessed from the General Tab Use Script option. You can write a function that handles the values from each table in any way you wish using VB .NET.

NOTE: In the rare case that foreign key values are updated when synchronization has been defined, the synchronization algorithm may not work and may cause foreign key constraint violation issues. Please contact our support team via the Help Center if you need to modify foreign key values for replications with synchronization.

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Managing Replications in the Management Center

This section contains topics that describe:

- Shortcuts to Creating a Replication
- Modifying/Adding Replication Settings
- Copying Replications
- Copying Connections
- Using the Management Center while Replications are Running
- Managing and Monitoring Replications on Remote Servers
- Handling Multiple Replications
- Grouping Replications

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Shortcuts to Creating a Replication

The Management Center window usually offers several ways to accomplish the same goal:

- Via the buttons displayed in the toolbars
- Via the menus displayed when clicking the right mouse button over an item in the Management Center window.
- Via the main toolbar
- Via dragging and dropping items in the Metadata Explorer.

Here are some ways to speed up the process of creating a replication.

Starting Wizards Automatically

The first step in setting up a replication in the Management Center is to create connections to your source and target databases.

Each wizard involved in the creation of a replication provides an option to automatically open the next wizard in the process.

In the Summary screen of the Source Connection wizard, check the option to proceed with the definition of a target connection. Then, in the Summary screen of the Target Connection wizard check the option to open the Replication Wizard.

Using Drag and Drop to Create Tables and Replications

Once you have defined source and target connections, you can use the Metadata Explorer to drag a source table to a target connection to open the Create Target Table wizard, and drag a source table to a target table to open the Replication wizard.

Creating a Target Table

1. In the Metadata Explorer, expand the source and target connections to display both the source table and the target connection.
2. Click and hold the mouse button down on the source table and drag it down to the target connection, then release the mouse button.

The Create Target Table wizard is launched with the source table and target connection information already selected for you.

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Creating a Replication

1. In the Metadata Exploter, expand the source and target connections to display both the source table and the target table.
2. Click and hold the mouse button down on the source table and drag it down to the target table, then release the mouse button.

The Replication wizard is launched with the source table and target table information already selected for you.

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Modifying/Adding Replication Settings

After creating a replication using the Replication wizard or Multiple Replications wizard, you can modify some replication properties as follows. Note that if you have created a replication as part of a group, you cannot modify the replication properties without first removing the replication from the group.

1. Disable the replication.
2. Open the Replication Properties dialog.
3. Modify any of the editable replication properties.
4. Enable the replication.

Disable the Replication

In the Management Center:

1. Display the Replication Browser tab.
2. Select the replication you want to modify.
3. On the right mouse button menu, uncheck the **Enable Replication** option.

Open the Replication Properties Dialog

In the Management Center Metadata Explorer:

1. Expand the Replications folder.
2. Select the replication you want to modify.
3. From the right mouse button menu, choose **Replication Properties**.

Modify/Add Property Values

Edit properties as needed:

- **General tab/Use script**: Add scripts
- **General tab/Mapping**: Change mappings

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- **General tab/Replication Mode**: Change the replication mode. Note that if you change the replication mode from a transactional replication to a refresh replication involving SQL Server, Db2 or SQLBase, you will be asked if you want to remove objects/components that were created on the database server to support your transactional replication. For example, if using SQL Server, a distributor is created for you.
- **Scheduler tab**: Change the replication schedule
- **Preferences tab**: Modify thread settings and command/record pool sizes for performance
- **Preferences tab**: For synchronization replications, set a conflict resolution approach
- **Preferences tab**: Change the isolation level for transactional replications
- **Preferences tab**: Set a SQL WHERE condition for refresh replications to filter the records replicated.

Enable the Replication

In the Management Center:

1. Display the Replication Browser tab.
2. Select the replication you have modified.
3. On the right mouse button menu, check the **Enable Replication** option.

Related Topics

Using the Management Center while Replications are Running

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Copying Replications

If you need to copy a replication (or replications) you have created, you can use one of the following options:

- Copy a replication in the same metadata, but using different connections.
- Copy one or more replications to a different metadata, for example when moving from a test to a production environment

Copying a Replication with New Connections in the Current Metadata

Use the Export Replications wizard to create a new replication based on settings in an existing replication. For example, if you have created a replication that mirrors data from Oracle to SQL Server, and you wish to mirror the same data to a MySQL database, use the Export Replications wizard to define the new target connection and copy the remaining replication information to a new replication.

1. Create the database connections that will be used for the copied replication.
2. Select the replication you want to copy.
   You can also copy a group of replications if they share the same source and the same target connections.
3. From the right mouse button menu, choose Export Replications.
4. Follow steps in the Export Replications wizard to set new source and/or target connections for the replication.

Copying Replications to a Different Metadata

With a backup of the metadata containing the replications you want to copy, you can restore the selected replications in the desired metadata using the Custom Restore option and the Restore Metadata wizard.

1. Back up the metadata containing the replications you want to copy: select the metadata in the Metadata Explorer, then, from the right mouse button menu, choose **Backup Metadata**.
2. Select the metadata into which you want to copy the replications.
   If the metadata does not yet exist, click **New Metadata** in the Metadata Explorer to create a new metadata set.
3. From the right mouse button menu of the selected metadata, choose **Restore Metadata**.

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4. In the Restore Metadata Options dialog, choose the Custom Restore option.
5. Follow steps in the Restore Metadata wizard to select the replications to copy.

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Copying Database Connections

Once you have created a source or target connection in the Management Center, you can copy that connection, then edit its properties as needed. This option can save you time when you have multiple similar connections to create.

To copy a database connection:

1. Expand the Metadata Explorer to display source and/or target connections.
2. Select a connection in the list (connections are displayed with a icon.)
3. From the right mouse button menu, choose **Copy Connection**.
4. Select the location where you want to paste the new connection (either **Sources** or **Targets**.)
5. From the right mouse button menu, choose **Paste Connection**.
6. Modify the connection name by choosing **Rename Connection** from the right mouse button menu.
7. Add tables to the connection by choosing **Select Tables** from the right mouse button menu.
8. Modify other properties of the connection by choosing **Connection Properties** from the right mouse button menu.

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Using the Management Center while Replications are Running

When the Replication Agent is running, possible actions in the Management Center are as follows:

- You can **create and enable new replications** (both transactional and refresh.) The Replication Agent is able to add replications to its tasks without first stopping then restarting the replicator.
- You can **add new source and target connections**
- You can **disable/enable any replication**
- You can **update any disabled replication**
- You **cannot update an enabled replication**. To modify an enabled replication, first disable it, then make changes, then re-enable the replication.

Related Topics

Modifying/Adding Replication Settings

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Managing and Monitoring Replications on Remote Servers

To monitor or manage replications remotely (for example, if you have Syniti Data Replicationinstalled on several systems and want to manage the installations from a single location), it is possible to:

- Add remote servers to any standard installation of Syniti Data Replication.
- Install the Management Center only, then add remote servers to the Management Center.

If you choose to manage replications remotely, there are a few issues to consider:

- When you install Syniti Data Replicationto be run from a remote Management Center, the metadata connection has to be accessible from the remote system and point to a unique server name identifiable in the local network. Local-only connection strings such as those that might be used with Microsoft SQL Server CE or Microsoft Access do not work unless remote access is specifically established (for example, if pointing to a local database file, make sure that the file is shared and accessible from the remote machine).
- Each Management Center component installed remotely connects to one (or more) server agent(s) to retrieve authorization/security information and metadata information for the server. The Management Center application will be able to monitor and partially modify remote Syniti Data Replicationconfigurations. When the Management Center is used for the local system, additional permissions are available, such as the ability to modify server security and server configuration settings, set the default metadata, add or remove metadata, change license, and so on.
- User control over local and remote installations of the server depends on the established user ID and permissions. In a default Syniti Data Replicationinstallation, there are no user restrictions. Users can be defined in the User Settings dialog, available in the Metadata Explorer.

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Handling Multiple Replications

This section contains topics that describe:

- Defining Multiple Table Replications
- Managing Multiple Concurrent Replications
- Setting Priorities for Concurrent Replications
- Creating Replications with Different Connection Settings
- Synchronizing Data Among Multiple Tables

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Defining Multiple Table Replications

If you need to replicate all or many of the tables in one database to another database, you can define the replications using the Multiple Replications wizard. This allows you to set the source database, target database and scheduling details just once for all replications involved. The wizard also creates tables in the target database if necessary. While the replications are scheduled to run together, you can optimize performance by first creating a group for the replications.

Follow the steps below to create a group then create multiple replications.

1. In the Management Center Metadata Explorer, select a metadata.
2. For this metadata, create a source connection and a target connection for the databases you are using in the replication.
3. Select the **Groups** item.
4. From the right mouse button menu, choose **Add New Group**.
5. In the Replication Group Wizard, enter a name and, optionally, a description for the group.
6. Click **Next** to display the **Select Replications** screen.
7. Click **Next** to go to the Summary screen right away.
8. Click **Finish** to create the group.
9. In the Metadata Explorer, select the source connection to the database that you want to replicate.
10. From the right mouse button menu, choose **Create Multiple Replications**.
11. In the Define replication type screen, enter a base replication name to identify the table replications that will be created at the end of the wizard. Each table replication will have the base replication name followed by a sequential number to identify it.
12. Check the **Use Group** option.
13. From the drop-down list, select the group you created above.
14. Choose the type of replication you want to perform.
15. Click **Next** to go to the **Select source connection** screen.
16. Make sure that the correct source connection is selected.

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17. Click **Next** to go to the **Select target connection** screen.
18. Select a target connection.
19. Click **Next** to go to the **Set replications** screen.
    All tables in the database are automatically selected for replication.
20. If you do not want to replicate all tables, double-click in the check box next to each table that you do not wish to replicate. This will remove the check mark.
    By default, source table fields are replicated to fields of the same name in target tables.
21. If you wish to change the source table field - target table field mapping, click in the right column of the table containing the field.
22. In the Fields Mapping dialog, set the mapping to a field, an expression or no corresponding target.
23. Click **OK** in the Fields Mapping Dialog..
24. Click **Next** to go to the **Scheduling** screen.
    Note that if **Enable Replications** is checked and you are running the Replication Agent as a service, the replications will start automatically after they have been created at the time you have specified. If you want to hold off on running the replications, uncheck the **Enable Replications** checkbox.
25. Set the schedule for all replications that have been defined.
26. Click **Next** to go to the **Summary** screen.
27. Review your settings, then click **Start** to create the replications.
28. Click **Finish** to close the wizard.
29. Check that all replications have been created in the Metadata Explorer by expanding the Replications node.

When you have completed the wizard, you will see that a replication has been created for each table that you selected in the wizard. The replication properties are set so that the replications will occur at the same time and within a single group.

Related Topics

Multiple Replications Wizard
Creating a Replication Group
Replication Properties Dialog
Managing Multiple Concurrent Replications

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Managing Multiple Concurrent Replications

To run multiple replications concurrently, you have two options:

- Create a replication group
  The advantage of this option is that you optimize database connections and, if you are mirroring data, optimize access to the transaction log. The transaction log is read only once per group, instead of once per replication where distinct reading threads would be generated that may also be scheduled and executed at different times. All replications in the group must have the same source and target connections. All replications are assigned the same scheduling properties, as well as mirroring/refresh properties, so you do lose some flexibility by grouping replications.
- Set individual replication properties so that the replications are scheduled together
  For each replication, you need to set or edit the scheduling properties so that the replications are scheduled at the same time. This allows you to set separate mirroring/refresh properties for each replication and set a priority for each replication. With this option, you gain in flexibility but lose in performance when replications have a common source and target database connection.

Related Topics

Creating a Replication Group

Defining Multiple Table Replications

Replication Properties Dialog

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Setting Priorities for Concurrent Replications

You can schedule multiple replications to run at the same time because each replication runs as a separate thread. You can also assign a priority to each replication from the Replication Properties dialog.

1. In the Management Center Metadata Explorer, select the replication.
2. From the right mouse button menu, choose **Replication Properties**.
3. In the Replication Properties dialog, go to the Preferences tab.
4. In the **Thread Priority** field, click the down arrow to display a list of priorities.
5. Select the appropriate priority for the replication.
6. Click **OK** to close the Replication Properties dialog.

Related Topics

Managing Multiple Concurrent Replications

Creating a Replication Group

Defining Multiple Table Replications

Replication Properties Dialog

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Creating Replications with Different Connection Settings

In some situations, you may need to create multiple replications using the same replication settings, but changing either the source or target connection . For example, in replicating tables from IBM Db2 for i/iSeries/AS400 to SQL Server, there may be several SQL Server databases that need to be updated with the same information. You can create one replication, then use the Export Replications wizard, to create a copy of the replication settings, changing only the target database information.

1. Create source and target connections for all databases involved in replications.
2. Create a replication: RefreshMirroringSynchronization
3. From the **Source** menu, choose **Export Replications**.
4. Follow instructions in the wizard to supply the new source and/or target connection settings.

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Synchronizing Data Among Multiple Tables

In the simplest cases, replication is between two tables, a source table and a target table. The replication can be achieved via a full snapshot from the source table to the target table, or via change data capture where only changed data is replicated from the source to the target. Replication can also be two-way between source and target, where changes are expected on both systems, and both systems need to stay synchronized.

In more complex cases, data in tables on several systems needs to stay synchronized. Follow the steps below to synchronize data among more than two tables.

1. Set up a synchronization replication between the first two tables.
2. In the Replication wizard, be sure to add the replication to a group, creating a new group as needed.
3. Use the Replication wizard to set up an additional replication in the same group, between the source table you specified above and an additional "target" table.
4. Continue to set up replications as in step 3 for all the remaining tables to be synchronized.
5. Make sure that all replications involved in the multi-table synchronization are in the same group.

Editing Replication Properties

Note that if you edit replication properties for any replication in the group, it is best to do it from the group menu.

1. In the Metadata Explorer, select the group.
2. From the right mouse button menu, choose **Edit Replications**.
3. In the Replication Properties dialog, use the **Replication** drop-down list to select the replication to edit, or choose **All Replications** to make changes that affect all replications in the group.

Resolving Conflicts During Replication

Syniti Data Replicationprovides a default conflict resolution strategy for situations where multiple changes to the same field are detected: SourceServerWins. There are four additional options that can be set in the Replication Properties dialog:

- **TargetServerWins:** Changes applied to the tables defined in the target connections are also applied to the table defined in the source connection, overriding any changes that have occurred in the source connection table. This option also requires you to set a priority for the target tables involved so that, if changes occur in

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more than one target table, Syniti DRcan determine which changed value to use. Set the priority for target connections as follows.

1. In the Metadata Explorer, select the group.
2. From the right mouse button menu, choose Group Properties.
3. In the Group Properties dialog, go to the Preferences tab.
4. Click in the Conflict Resolver Priority field to view the target connections.
5. Order the target connections by selecting the connection, then using the up and down arrows to determine its priority.

- **FirstComeWins:** The timestamps of the changes in the tables designated as source and target are compared and the change that applied earliest is applied to all tables.
- **LastComeWins:** The timestamps of the changes in the tables designated as source and target are compared and the change that applied last is applied to all tables.
- **Use Script**: This option generates an event that can be handled by writing a function Replication_onConflict. The script editor can be accessed from the General Tab Use Script option. You can write a function that handles the values from each table in any way you wish using VB .NET.

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Grouping Replications

This section contains topics that describe:

- Creating a Replication Group
- Adding a Replication to a Group
- Setting Properties for a Group
- Ordering Refresh Replications with Foreign Keys

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Creating a Replication Group

A replication group allows you to set replication properties (scheduling and preferences) for all replications in the group at the same time. All replications in the group must have the same source connection, and may have the same or different target connections (to achieve a "broadcast" replication to multiple locations.) Groups are useful because they optimize database connections and transaction log access (if mirroring.)

When a replication is put into a group, it should be considered as part of a whole. If you believe that a replication is likely to need to be taken out of the group several times to do a full refresh (or for whatever reason) it would probably be better to keep it out of the group, or put it into another group to which it logically belongs. Also, if considering the addition of a huge table to a group, it is probably better to keep it as a single replication to avoid unnecessary replication of the table if a problem should occur during replication of the group.

When constraints exist on tables, all the tables with constraints should be placed in a group to ensure that transactions on those tables occur in the same order they were performed on the system being replicated. If you are setting up a group of refresh replications where tables contain foreign key relations, you need to set the order of replications to maintain integrity across tables.

The recommended approach for using groups is to first create a group, then, as you create replications, create them in the group. This saves time because you only need to set replication properties once for the group. You can also create replications first, then add replications to the group. However, any settings for the replication you are adding will be overridden by the group replication settings.

To create a replication group:

1. In the Metadata Explorer, select the **Groups** item.
2. From the right mouse button menu, choose **Add New Group**.
3. In the Replication Group Wizard, enter a name and, optionally, a description for the group.
4. Click **Next** to display the **Select Replications** screen.
5. Check each replication that you want to include in the group.
   If you have not yet created a replication, click **Next** to go to the Summary screen right away.
6. Click **Next** to go to the Summary screen.
7. Click **Finish** to create the group.

Related Topics

Adding a Replication to a Group

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Setting Properties for a Group

Replication Group Wizard

Group Properties Dialog

Ordering Refresh Replications with Foreign Key Relations

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Adding a Replication to a Group

The recommended approach for using groups is to first create a group, then, as you create replications, create them in the group. This saves time because you only need to set replication properties once for the group. You can also create replications first, then add replications to the group. However, any settings for the replication you are adding will be overridden by the group replication settings.

Certain conditions apply when adding a replication to a group:

- All replications in the group must use the same source connection
- All replications in the group must be the same type (i.e. refresh, mirroring, mirroring with initial refresh, synchronization)
- If replicating from SQL Server using mirroring, all replications in the group must use the same source database.
- If replicating from IBM Db2 for i/iSeries/AS400 using mirroring, all replications in the group must use the same journal for source tables.

To add a replication to a group:

1. In the Metadata Explorer, select the group to which you want to add a replication.
2. From the right mouse button menu, choose **Group Properties**.
3. In the Group Properties dialog, check the replication that you want to include in the group.
4. Click **OK**.
   If the group already contains one or more replications, the properties of the replication you are adding change to match the properties of other replications in the group.

Related Topics

Creating a Replication Group
Changing Replication Properties for a Group
Replication Group Wizard

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Setting Properties for a Group

Groups have two sets of properties:

- Group Properties
  Apply to the group as a whole
- Replication Properties
  Apply to each replication in the group

You can modify both the group properties and the group replication properties.

Setting or Changing Group Properties

Group properties apply to the set of replications within the group. You can edit these properties via the Group Properties dialog.

1. Select the group in the Metadata Explorer.
2. From the right mouse button menu, choose **Group Properties...** .
3. In the Group Properties dialog, modify the properties as needed.
4. Click **OK** to close the dialog.

Setting or Changing Replication Properties for a Group

Grouping replications allows you to set replication properties (scheduling and preferences) for all replications in the group at the same time. If you first create a group then create each replication in the group, you only need to set replication properties once for the group. You can also create replications first, then add replications to the group. However, any settings for the replication you are adding will be overridden by the group replication settings.

To change replication settings for a group:

1. In the Metadata Explorer, select the group.
2. From the right mouse button menu, choose **Edit Replications**.
3. In the Replication Properties dialog, modify the properties as needed.
4. Click **OK**.

Related Topics

Creating a Replication Group

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Adding a Replication to a Group

Replication Group Wizard

Group Properties Dialog

Ordering Refresh Replications with Foreign Key Relations

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Ordering Refresh Replications with Foreign Key Relations

When setting up a replication group to refresh tables with foreign key relations, you need to order replications based on how foreign keys are created because a foreign key record cannot be inserted in the foreign key table before the corresponding key record is inserted in the key table. For example, with Employee and Department tables where a foreign key is defined for an Employee to a Department, you cannot insert an employee record if the employee's department does not exist. The referential integrity of the database does not allow that. During the refresh operation, Syniti DR should insert the departments first and then all the employees. However, when tables are deleted (during the truncation phase, prior to the insertion of records), the rule is reversed: a department record cannot be deleted if there is an employee record that has a reference to the department.

Using the example above, you would need to set up the refresh operation for the Department and Employee tables so that all the tables are first truncated in the reverse order to which they are refreshed:

1. Truncate Employee

2. Truncate Department

3. Insert records in Department

4. Insert records in Employee

However, the default order for truncation and subsequent insertion is as follows:

1. Truncate Table1

2. Insert records in Table1

3. Truncate Table2

4. Insert records in Table2

The Group Properties dialog in the Management Center provides a way for you to set up the correct truncation and insertion order:

1. Create a replication group for all the refresh replications on tables with foreign key relations.
2. Create each replication and add it to the replication group.
3. For each replication with one or more foreign keys, verify that the foreign key relation is visible in the Management Center Object Browser by selecting the table with the foreign key in the Metadata Explorer. Foreign

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key relations are displayed with an icon showing a grey key.

Note that if there is any error retrieving a foreign key, Syniti DR simply does not show the column as a foreign key.

4. Verify that the foreign key relationship has been defined correctly in the target table, because that is where records need to be deleted in the correct order.
5. When you have created all replications in the group, in the Metadata Explorer, select the group.
6. From the right mouse button menu, choose **Group Properties** to open the Group Properties dialog.
7. On the **Preferences** tab, set the **Truncate Inverse field** to **True**.
   This causes related tables to be truncated in the correct order to maintain data integrity.
8. On the **General** tab, click **Reorder Replications**.
   Syniti DR checks the foreign key relations and reorders the replications so that they will execute in an order that maintains data integrity at all times.

Related Topics

Creating a Replication Group
Adding a Replication to a Group
Setting Properties for a Group
Replication Group Wizard
Group Properties Dialog

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Writing Scripts for Customization

This section contains topics that describe:

- Writing Scripts
- Writing a Global Script
- Writing a Replication Script
- Writing an Expression Script
- Writing a Custom Create Table Rule
- Writing a Field Mapping Function
- Global Script Functions
- Global Script Events
- VB.NET Global Script Function Examples
- C# Global Script Function Examples
- Writing a Function to Use in Scripts and Expressions
- Replication Script Events
- Handling Events for INSERT, UPDATE and DELETE Operations
- Replication Script Properties
- IRecord Interface
- Managing Reader and Writer Events in a Script

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Writing Scripts

Syniti Data Replication supports three types of scripts:

- Global scripts
  A global script is a shared module that defines a global class of functions. It can be used to define general user functions that need to be called from inside a replication script or an expression script.
- Replication scripts
  A script that is defined to run when a specific event occurs during replication.
- Expression scripts
  A script used in the Mapping Dialog when a column value needs to be mapped not simply to a source column but to a value retrieved after calculation.

Syniti DR scripts can be written using C# or Visual Basic .NET. C# is the default scripting language for all script types. However, it is possible to change the scripting language for a specific metadata in the Global Script Editor.

Changing the Script Language

To change the script language for all scripts associated with a metadata:

1. In the Metadata Explorer, select the metadata.
2. From the right mouse button menu, choose **Global Script**.
3. In the Global Script Editor, change the language in the Script Language drop down list.

Note that any scripts already saved in a Script Editor will become commented code when the script language is changed.

Visual Basic .NET Tips for Developers

Note that, while there are many similarities between Visual Basic and Visual Basic. NET, there are also some subtle differences. For information about the Visual Basic .NET language, see http://msdn.microsoft.com/vbasic/using/

- Use IsNothing in place of Visual Basic's IsNull
- Always use parentheses for the arguments of a function, even if there are no arguments
- Always use typed parameters. Define the return type of your functions.

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- In a global script, define all custom procedures (Subs and Functions) using the keyword 'Shared', in order to define them as static functions.
- Always compile a script before executing it. The VB.NET compiler is stronger than the old VBA compiler and it is able to find errors at an earlier stage.
- The way Syniti DR numbers the columns of the record is not necessarily the same as the order of the source or target columns. For example, if some fields are not mapped, they are excluded from the RecordBefore or RecordAfter structure and so the columns are not numerically matching their ordinal number.

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Writing a Global Script

A global script is a shared module that defines a global class of functions or defines event handlers for global events. It can be used to define general user functions that need to be called from inside a replication script or an expression script.

Global scripts can use or define the following sets of functions:

- Microsoft C# Libraries
  Based on the scripting language selection in the Global Script Editor, you can use either C# or VB.NET to define scripts and functions for use in scripts.
- Microsoft.VisualBasic Namespace Functions
  A .NET Framework Class Library that makes available Visual Basic 6 functions such as [Strings] Left, Mid, Right, Instr; [Math] Cos, Arc, Power and so on.
- Global Functions
  Functions implemented as part of Syniti Data Replication.
- Global Script Events
  Events that apply to all replications.
- User Functions
  Functions that users define in the Global Script dialog typically for use from within Replication scripts.
- Create Table Rules or Functions
  Functions used to customize how target tables are created.
- Field Mapping Rules or Functions
  Functions used to determine how to map source and target columns when defining a replication.

Use the Global Script Editor to write functions which are then typically used in replication scripts and expressions. For example, you may have a conversion function that you use in several different replication scripts. Instead of repeating the conversion function for each replication script, it can be defined in a global script and then called from each replication script.

1. In the Management Center Metadata Explorer, select the metadata for which you want to write a global script.
2. From the right mouse button menu, choose **Global Script**.
   The Global Script Editor opens to display a stub for the script. The default script language is C#.

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```
using System;
using System.Data;
using DBMotoPublic;
using DBMotoScript;
namespace DBRS
{
    public class GlobalScript : IGlobalScript
    {
    }
    public class MappingRule : IMappingRule
    {
    }
    public class GlobalEvents : IGlobalEvents
    {
    }
}
```

3. In the GlobalScript class, declare functions as in the example below:

```
public static DateTime DateConvert(int intDate)
   int cyy;
   int yyyy;
   int mm;
   int dd;
   cyy = (int)(intDate / 10000);
   mm = (int)((intDate - cyy * 10000) / 100);
   dd = intDate % 100;
   if (cyy < 100)
       yyyy = 1900 + cyy;
   else
       yyyy = 2000 + (cyy % 100);
   DateTime dc = new DateTime(yyyy, mm, dd);
```

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```
    return dc;
}
```

4. Define your functions. If the function is to be used in replication or expression scripts, add the keyword static after public:

   ```
   public static object GetQueryValue(IDbConnection objConnection, String strQuery)
   ```

5. Declare any event handlers as in the following example for the Record_OnExecuteError event. Remember to specify the attribute GlobalEventAttribute.

   ```
   [GlobalEventsAttribute("Record_OnExecuteError", "Define a general event for the event EventName")]
       public void MyErrorHandler(String sReplOrGroupName, DBMotoPublic.IRecord recTarget, Exception e,
          ref Boolean bRetryExecute, ref int iSleep, int iIteration)
           {
          }
   ```

6. If you have added any libraries to the list of imports in the script, click to open the References dialog and add the path to the library.

7. Use the Compile button to check your script syntax.
   Any script problems are displayed in a separate dialog.

8. Correct any syntax errors before attempting to run a replication.

Define mapping rules or functions as needed to be used in mapping source and target fields.

Related Topics

Global Script Functions

Global Script Events

Writing a Function to use in Scripts and Expressions

Global Script Function Examples

Replication Script Events

Handling Events for INSERT, UPDATE and DELETE Operations

Replication Script Properties

IRecord Interface

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Writing a Replication Script

Writing Scripts with Visual Basic .NET

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Writing a Replication Script

A script that is defined to run when a specific event occurs during replication. Replication scripts can use:

- EITHER Standard Visual Basic .NET functions and Microsoft.VisualBasic Namespace Functions OR Standard C# functions
- User functions defined in a global script
- Specific replication script events, methods and properties.

Use the Replication Script Editor to write a script that is run when a specific event occurs during replication. The script should consist of one or more functions selected from the drop-down lists at the top of the Editor.

1. Select the language for the script (C# or VB.NET) in the Global Script Editor available in the Metadata Explorer from the metadata right mouse button menu. The default language for new scripts is C#.
2. In the Metadata Explorer, select the replication for which you want to write a script.
3. From the right mouse button menu, choose **Replication Properties**.
4. On the General tab, check the **Use Script** option.
5. Click the **Script** button.
   The Replication Script Editor opens to display a stub for the script:

```
using System;
using System.Data;
using DBMotoPublic;
using DBMotoScript;
namespace DBRS
public class GlobalScript : IGlobalScript
{
}
public class MappingRule : IMappingRule
{
}
```

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```
    public class GlobalEvents : IGlobalEvents
    {
    }
}
```

6. From the left drop-down list, select a category to specify when the script should be run:

Category	Events	Event Type	Explanation
Refresh	onBeforeTruncate onAfterTruncate onBeforeRefresh onAfterRefresh onPrepareRefresh	Writer Writer Writer Writer Reader	Available events apply to refresh replications only.
LogReader	onPrepareMirroring onBeforeMirroring onAfterMirroring onReceiverChanged	Reader Reader Reader Reader	Available events apply only to mirroring and synchronization replications. onReceiverChanged applies only to replications involving System i/iSeries/AS400.
Record	onBeforeMapping onAfterMapping onBeforeExecute onAfterExecute	Reader Reader Writer Writer	Available events apply to each record that is considered for replication. In the case of refresh replications, the events would apply to every record in the source/target table. In the case of mirroring and synchronization replications, the events would apply to records found in the transaction log.
Replication	onConflict onLateConflict	Reader Reader	onConflict and onLateConflict should be used to resolve conflicts only for synchronization replications.

7. From the right drop-down list, select an event for which you want to write a script.
   This drop-down list displays events appropriate for the function you selected above. If no function was

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selected, the list remains empty.

Events are always added directly below the ReplicationScript class as in the example below.

```
using System;
using System.Data;
using DBMotoPublic;
using DBMotoScript;
namespace DBRS
{
   public class ReplicationScript : IReplicationScript
   {
    public overloads void Record_onAfterMapping(DBMo-
toPublic.IRecord recSource, DBMotoPublic.IRecord recTarget,
                        ref bool AbortRecord)
    }
}
```

5. Type the script in the editor pane.

   The Replication Script Editor provides keyboard shortcuts for most editing needs.

6. If you want the behavior of your script to depend on the type of SQL operation that is being performed during replication (INSERT, UPDATE or DELETE), be sure to specify the operation type as in the example below.

```
using System;
using System.Data;
using DBMotoPublic;
using DBMotoScript;
namespace DBRS
  {
   public class ReplicationScript : IReplicationScript
     {
```

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```
      public override void Record_onAfterMapping(DBMo-
toPublic.IRecord recSource,
              DBMotoPublic.IRecord recTarget, ref bool AbortRecord)
         {
            switch(recTarget.OperationType)
               {
                  case enmOperationType.Insert:
                    if (recTarget.GetValueAfter("SID") == null)
                       {
                          recTarget.SetValueAfter("NAME",
null);
                       }
                    else
                       {
                          //UpdateSTUDENTFields
                          (recTarget);
                       }
                       break;
                 case enmOperationType.Update:
                     if (recTarget.GetValueAfter("SID") ==
null)
                        {
                           recTarget.SetValueAfter("NAME",
null);
                        }
                     else if(recTarget.GetValueBefore("SID") ==
null)
                        {
```

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```
                                    //Field SID was null and now it has
    a value
                                    //UpdateSTUDENTFields
                                    (recTarget);
                                }
                            else if(recTarget.GetValueBefore("SID") !=
    recTarget.GetValueAfter("SID"))
                                {
                                    //Field SID has changed
                                    //UpdateSTUDENTFields
                                    (recTarget);
                                }
                            break;
                        }
                    }
                }
            }
```

8. Use IRecord methods to access values in the source and target records. Be sure to use only those methods which make sense for the operation type (INSERT, UPDATE or DELETE).
9. If you are using C#, to use a function already defined in a global script (or one of the predefined global script functions, precede the function name with "GlobalScript." to identify the class where the function is defined:

```
 GlobalScript.AddLog("The current record has been inserted: " + s,
0);
```

10. Typically, only those columns that have been mapped for replication (during replication setup) are available for use within scripts. However, if you need to access a column value that is not mapped, you can set that column as "Use Unmapped" in the Replication Properties dialog.

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11. Be aware of script objects that need to be accessed by more than one event and be prepared to lock an object that is accessed by both Reader script events and Writer script events. Example.

12. Use the Expression Generator as needed to identify functions and syntax that you can use in the script.
    If you have defined functions in the Global Script Editor, the function names and prototypes will be listed under User Functions in the Expression Generator.

13. If you have added any libraries to the list of imports in the script, click to open the References dialog and add the path to the library.

14. Use the Compile button to check your script syntax.
    Any script problems are displayed in a separate dialog.

15. Correct any syntax errors before attempting to run a replication.

Related Topics

Global Script Functions
Replication Script Events
Handling Events for INSERT, UPDATE and DELETE Operations
Replication Script Properties
IRecord Interface
Writing a Global Script
Writing Scripts with Visual Basic .NET

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Writing an Expression Script

An expression script is used in the Fields Mapping Dialog when a column value needs to be mapped not simply to a source column but to a value retrieved after calculation. Alternatively, Mapping functions, or rules, can be used to define a rule which applies to all source-target pairs which meet the conditions specified in the rule.

Expression scripts can use:

- User functions defined in a global script
- EITHER standard C# library functions or standard Microsoft VB.NET library functions. The default language for new expression scripts is C#, but the language can be changed for all scripts associated with a metadata in the Global Script Editor available from the metadata right mouse button menu in the Metadata Explorer.

To set up a mapping to an expression:

1. In the Replication Properties dialog, or in the Replication wizard, open the Fields Mapping dialog.
2. Select a target field in the list and choose the **Map to Expression** option from the right mouse button menu.
3. In the Expression Generator, type your expression or build it by expanding the tree to select items. The default language for expressions in C#, but you can change the language to VB.NET for ALL scripts associated with the metadata using the Global Script Editor.
   Functions defined in a global script are available from the User Functions node in the tree.
4. If you are using C#, to use a function already defined in a global script (or one of the Predefined global script functions, precede the function name with "GlobalScript." to identify the class where the function is defined:

```
GlobalScript.AddLog("The current record has been inserted: " + s, 0);
```

5. To refer to source fields in an expression script, indicate the field between square brackets, with no quotes. For example, to refer to the field ”EmployeeID” in the source table, use the syntax [EmployeeID].
6. Click **OK** to close the Expression Generator and complete your expression.

Related Topics

Global Script Functions
Global Script Editor
Writing a Global Script
Writing Scripts

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Writing a Custom Create Table Rule

When setting up a replication, it is often the case that the replication source table does not exist on the target table. Syniti Data Replication can be used to create the target table via the Create Target Table wizard which generates the SQL code for the target database environment. While it is possible to modify the way that the table is created in the target database by editing the SQL code in the wizard, this approach is not very convenient in situations where many target tables will be created with the same type of modification (adding a column, for example.) Syniti DR also provides a metadata-level feature to customize the way that target tables are created. Here is a brief overview of the steps involved.

1. Create a global script with a definition for a CreateTableRule class.
   The global script template contains a new class definition:

   ```
   public class CreateTableRule : ICreateTableRule
   ```

2. Compile and save the script.
3. Edit the Target Connection Property CREATE TABLE Custom Rule to specify use of the new class in creating target tables. The default value for this property is 'Automatic.' After a custom rule has been defined in the global script, it can be selected as a value in this field, and used by default for all tables created for the connection. A second property, Default Mapping Rule, can be set if you have also created a mapping rule in the global script (see example below.)
4. In the Create Target Table wizard, or the Multiple Replications wizard select or deselect the new rule as needed for each table.

Step-by-Step Example

Below is a complete example that shows the steps to implement an automatic rule for target table creation together with a field mapping rule to map source to target fields after table creation.

1. In the Management Center Metadata Explorer, select the metadata for which you want to create a global script.
2. From the right mouse button menu, select **Global Script**.
3. In the Global Script Editor, edit the template for CreateTableRule.
4. Write a CreateTableAttribute definition to determine the function name that appears in the Target Connection Properties dialog, the Create Table wizard and the Multiple Replications wizard. The first string contains the text

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that will appear in drop-down menus. The second string contains text that will serve as a tooltip description of the function.

```
   public class CreateTableRule : ICreateTableRule
      {
    [CreateTableRuleAttribute("Audit Table New", "Create columns
for an audit replication")]

       public bool  MyCustomAuditTable (ColumnClass aTargetFields)
       {
           ColumnClass colClass;
           colClass = new ColumnClass();
           colClass.Name = "REC_ID";
           colClass.AllowNull = false;
           colClass.TypeName = "integer";
           colClass.PrimaryKeyPos = 1;
           aTargetFields.Insert(0, colClass);

           colClass = new ColumnClass();
           colClass.Name = "TID";
           colClass.AllowNull = true;
           colClass.TypeName = "varchar";
           colClass.Size = 50;
           aTargetFields.Add(colClass);

           colClass = new ColumnClass();
           colClass.Name = "TTS";
           colClass.AllowNull = true;
           colClass.TypeName = "bigint";
           aTargetFields.Add(colClass);
```

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```
            colClass = new ColumnClass();
            colClass.Name = "UserID";
            colClass.AllowNull = true;
            colClass.TypeName = "varchar";
            colClass.Size = 20;
            aTargetFields.Add(colClass);
            return true;
        }
    }
```

This function takes a list of ColumnClass objects as input. This is the ColumnClass definition:

```
            public class ColumnClass
            {
                    public string Name;
                    public int CCSID;
                    public string TypeName;
                    public int Size;
                    public int Precision;
                    public int Scale;
                    public int PrimaryKeyPos;
                    public bool AllowNull;
                    public string Default;
            }
```

Whenever a target table is to be created, the function will pass columns in the format of a list of ColumnClass objects. Within the function, new columns can be appended at specified positions in relation to existing columns, or columns can be removed or column definitions changed.

In this example, a REC_ID integer column is added at position 0 (notice the Insert at index 0), specifying the PrimaryKeyPos = 1. PrimaryKeyPos is a value which, if other than 0, indicates that the field will be set as part of

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the primary key definition, at the specified position if not taken by other existing fields, or at the first available position.

Three more columns are added at the end of the columns list, TID, TTD and User_ID. For each new column, the datatype, size, precision and scale as requested by the database are specified. This means that every time a specific Create Table Rule is written, it is critical to consider the target database to which the rule is applied.

5. In the Global Script Editor, edit the MappingRule template to add a custom mapping rule that will be used to map columns of the above 'audit' tables:

```
public class MappingRule : IMappingRule
{
[MappingRuleAttribute("Map For Audit Table",
  "Match names considering the additional fields on audit tables")]
 public bool AuditTableMapping (bool bIsForth, string sSourceName,
int iSourceOrdinal,
                        string sSourceType, bool bIsSourcePrimaryKey, bool bIs
lable,
                        int iSourceSize, short sSourcePrecision, short sSource
sTargetName,
                        int iTargetOrdinal, string sTargetType, bool
bIsTargetPrimaryKey, bool bIsTargetNullable,
                        int iTargetSize, short sTargetPrecision, short sTarget
                        ref System.Text.StringBuilder sExpression)
{
    if (String.Compare(sTargetName, "TTS", true) == 0)
    {
      sExpression.Append("[TransactionTS]");
      return true;
    }
    else if (String.Compare(sTargetName, "TID", true) == 0)
    {
```

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```
            sExpression.Append("[TransactionID]");
            return true;
        }
        else if (String.Compare(sTargetName, "UserID", true) == 0)
        {
            sExpression.Append("[UserID]");
            return true;
        }
        else
            return String.Compare(sSourceName, sTargetName, true) == 0
    }
}
```

6. Save and compile the script.
7. In the Metadata Explorer, select the target connection for which you have defined the rules.
8. From the right mouse button menu, choose Connection Properties.
9. In the Target Connection Properties dialog, scroll to the CREATE TABLE Custom Rule property.

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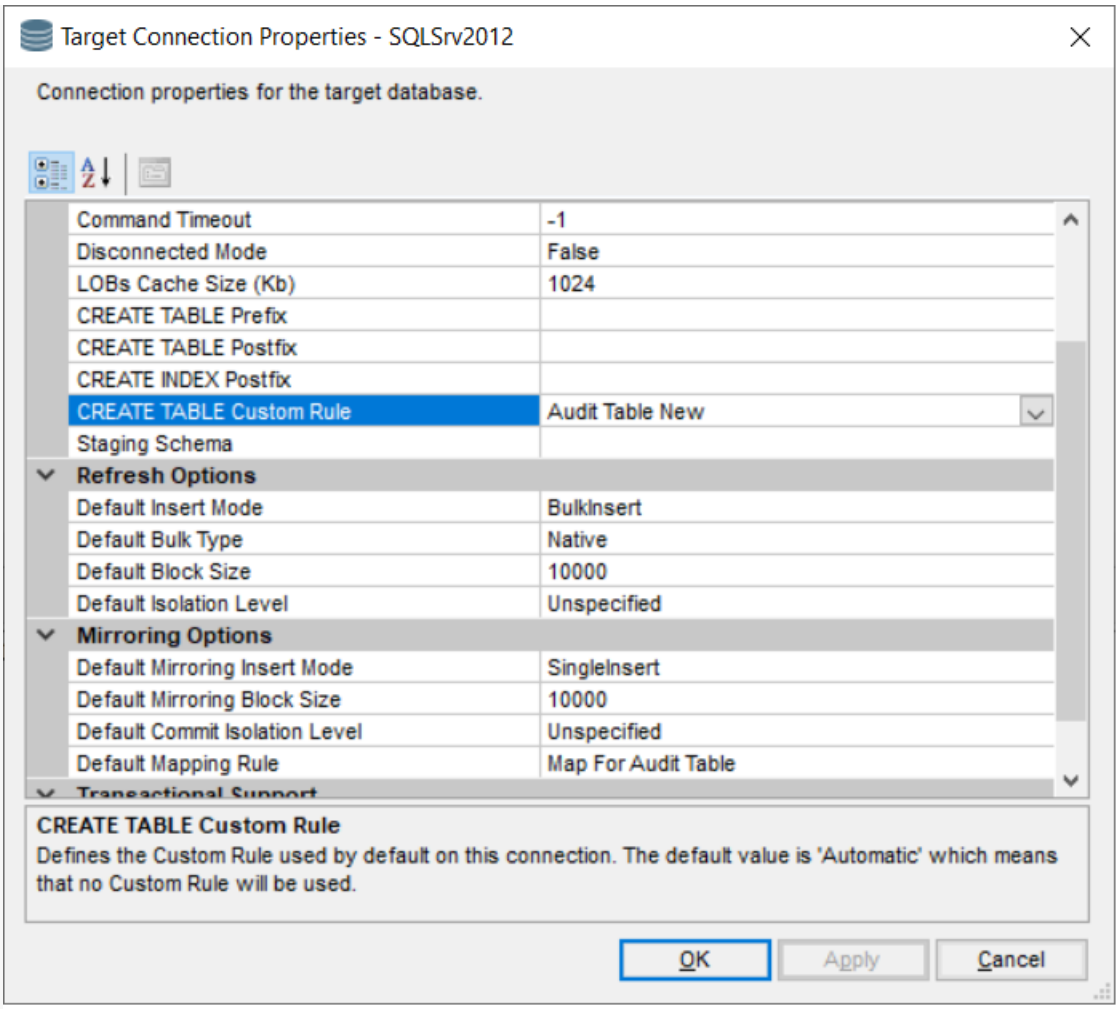

10. The default value of for the property is ‘Automatic’ which means create tables as they are on the source.
11. From the drop-down menu, select the ‘Audit Table New’ rule you created above.
12. In the Default Mapping Rule field, select ‘Map for Audit Table’ created above.
13. Click OK to apply the changes.

The custom functions are applied either when using the Create Target Table Wizard or when creating multiple replications in the Multiple Replications wizard.

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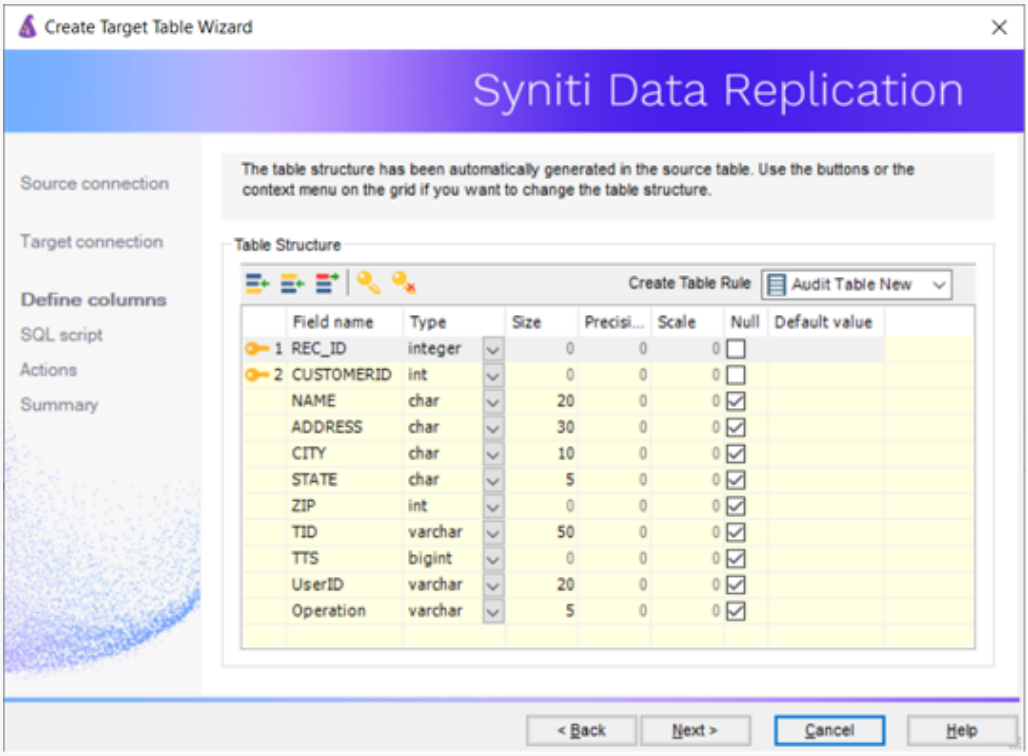
Create Target Table Wizard

In the Create Target Table wizard, the Define columns screen displays a Create Table Rule drop-down menu, with the Audit Table New rule. The list of columns is modified as specified in the rule. You can change the value of Create Table Rule by selecting a different item from the menu.



In the Create New Replication wizard, the Mapping Info step initializes the mappings by adding the custom mapping rule defined in the script function.

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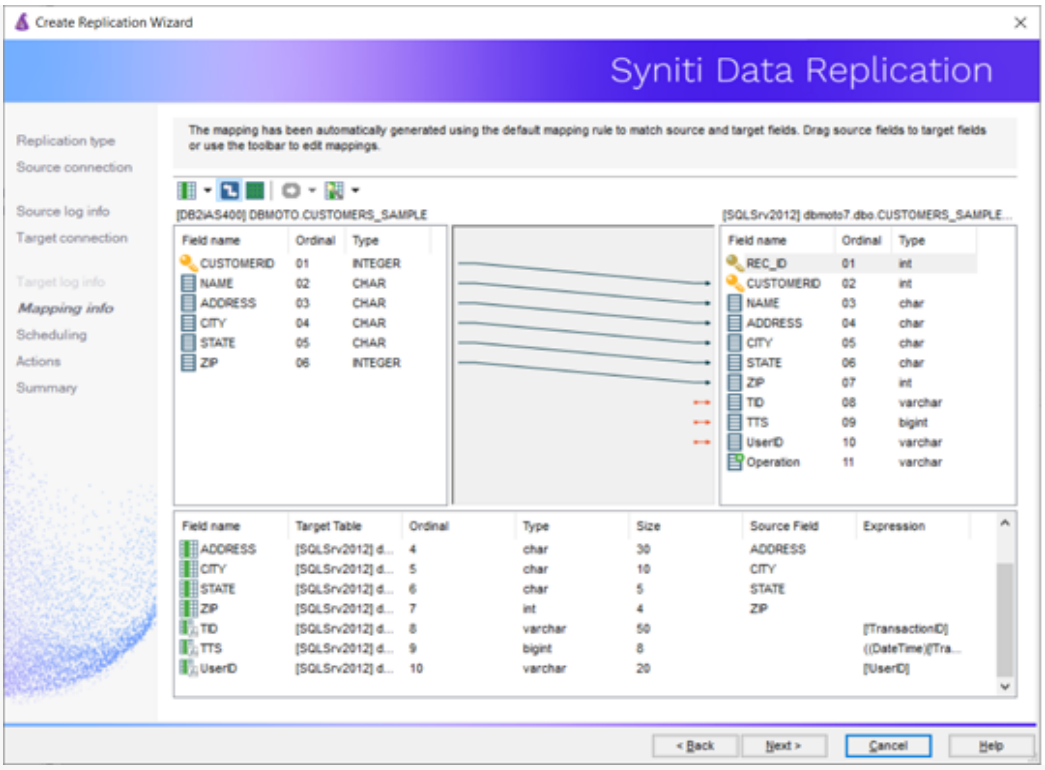

You can modify the mapping either manually or selecting a different mapping function from the right most button in the toolbar.

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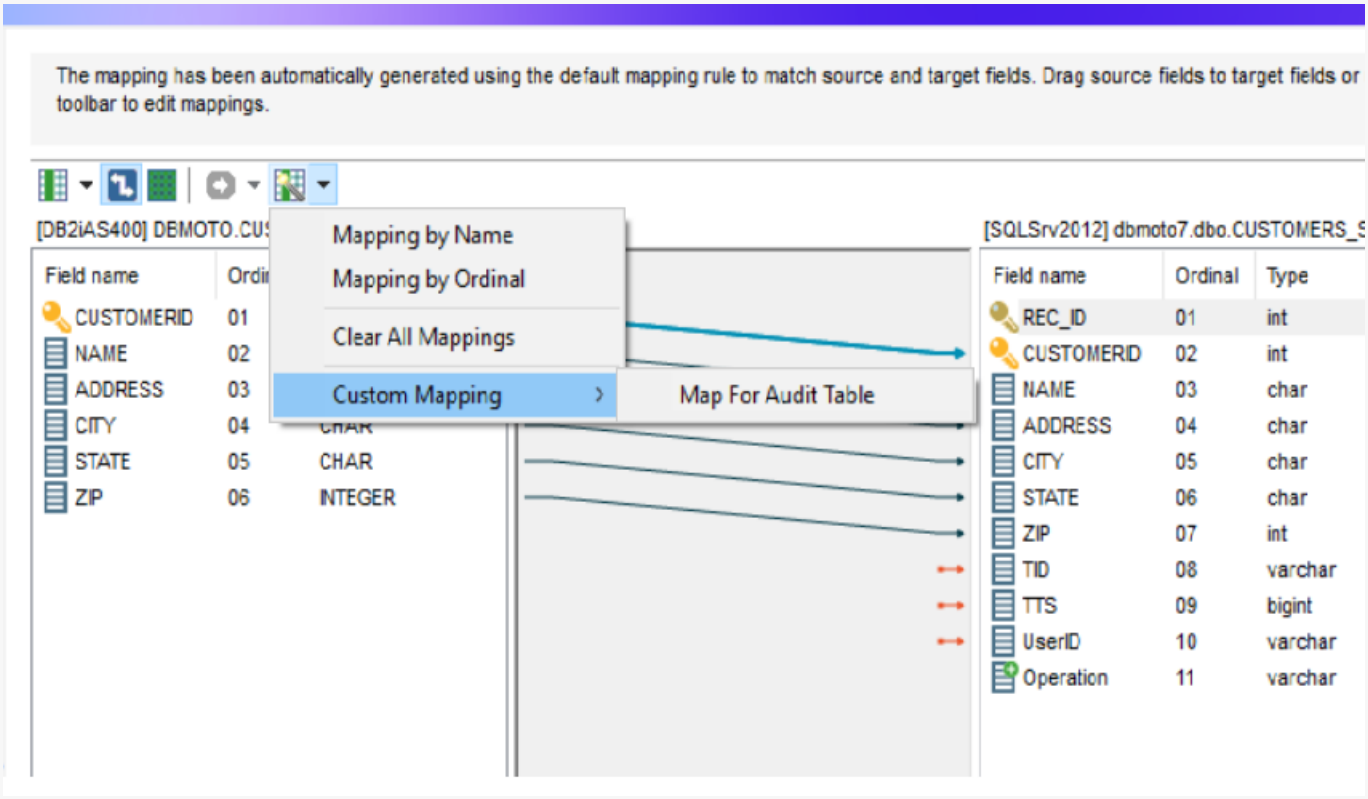

Multiple Replications Wizard

Both the Create Table Rule and the Mapping Rule appear in the Set Replications screen, with the default values for the connection automatically selected.

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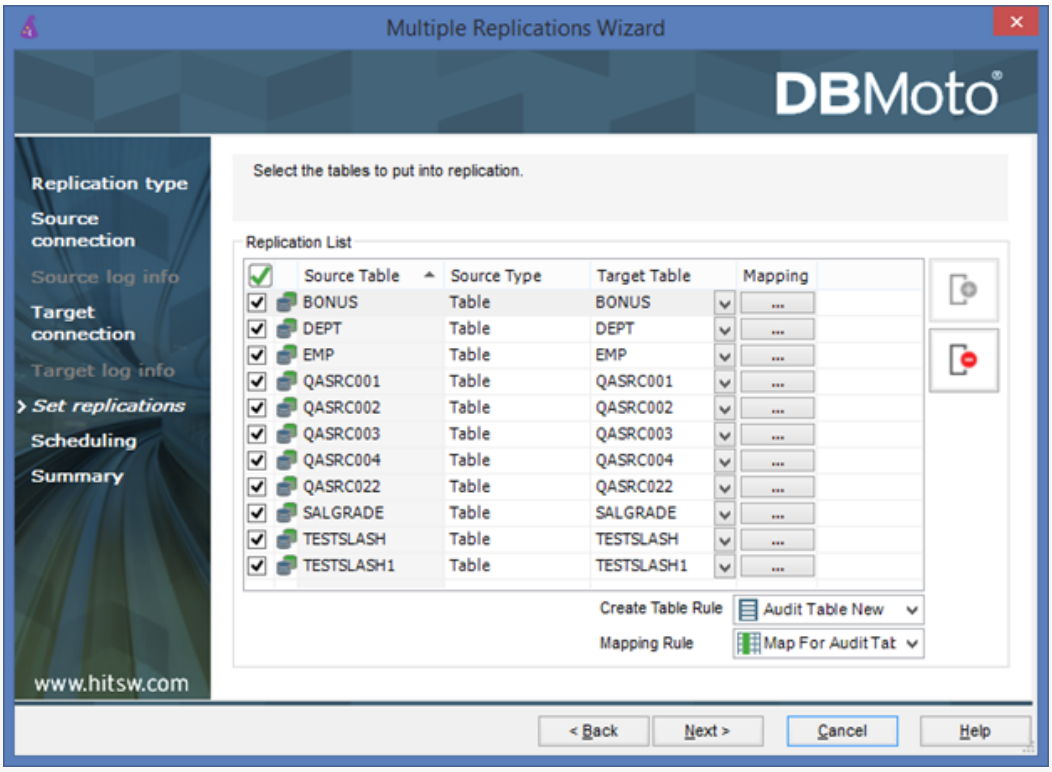

The created tables and replications have the additional fields and custom mappings:

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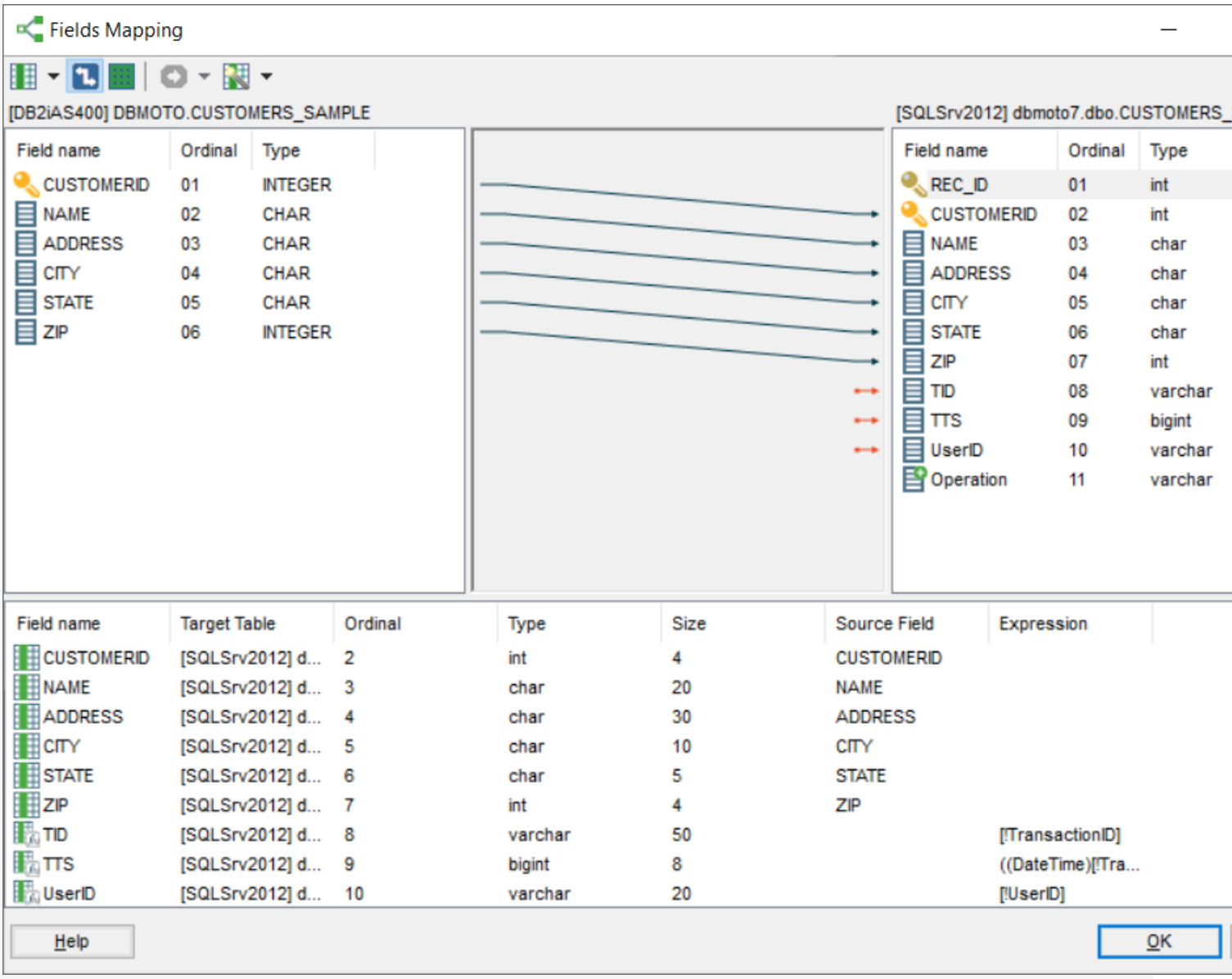

CreateTableRule with Table Name Change

Below is an example of a custom CreateTableRule that can access and modify a target table name.

```
public bool MyCustomTableRule(List<ColumnClass> aTargetFields, ref
StringBuilder sTargetTableName)
{
ColumnClass colClass;
```

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```
colClass = new ColumnClass();
colClass.Name = "REC_ID";
colClass.AllowNull = false;
colClass.TypeName = "integer";
colClass.PrimaryKeyPos = 1;
aTargetFields.Insert(0, colClass);
colClass = new ColumnClass();
colClass.Name = "TID";
colClass.AllowNull = true;
colClass.TypeName = "varchar";
colClass.Size = 50;
aTargetFields.Add(colClass);
colClass = new ColumnClass();
colClass.Name = "TTS";
colClass.AllowNull = true;
colClass.TypeName = "bigint";
aTargetFields.Add(colClass);
colClass = new ColumnClass();
colClass.Name = "UserID";
colClass.AllowNull = true;
colClass.TypeName = "varchar";
colClass.Size = 20;
aTargetFields.Add(colClass);
//Check and change target table name
if (sTargetTableName.ToString().ToLower() == "testtable")
   {
    sTargetTableName.Clear();
    sTargetTableName.Append("NewTestTable");
```

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```
    }
return true;
}
```

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Writing a Field Mapping Function

This type of function, a mapping rule, can be used to identify which source and target columns to map when defining a replication. The default approach is to map source table columns to target table columns with matching names. If, for example, source table column names and target table column names use a different prefix, you could write a function to compare names after skipping the prefix as in the VB.NET and C# example below.

VB.NET Example

```
Public Class MappingRule : Inherits IMappingRule
       <MappingRuleAttribute("Match By Prefix", "Match names considering the
prefix 'fld_'")>
       Public Function CustomMapping_ByNamePrefixed (
                       ByVal sSourceName As String,
                       ByVal iSourceOrdinal As Integer,
                       ByVal sTargetName As String,
                       ByVal iTargetOrdinal As Integer) As Boolean
           If sTargetName.Length >= 4 Then
               Return (String.Compare(sSourceName, sTargetName.SubString(4), T
0)
           Else
               Return False
           End If
       End Function

       <MappingRuleAttribute("Match By Suffix", "Match names considering the
suffix '_fld'")>
       Public Function CustomMapping_ByNameSuffixed (
                       ByVal sSourceName As String,
                       ByVal iSourceOrdinal As Integer,
                       ByVal sTargetName As String,
```

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```
                        ByVal iTargetOrdinal As Integer) As Boolean
          If sSourceName.Length >= 4
               Return (String.Compare(sSourceName.SubString(4), sTargetName, T
0)
          Else
               Return False
          End If
       End Function

       <MappingRuleAttribute("Match Custom", "Match names considering a spe-
cific custom rule")>
       Public Function MyCustomMapping (
                        ByVal bIsForth As Boolean,
                        ByVal sSourceName As String,
                        ByVal iSourceOrdinal As Integer,
                        ByVal sSourceType As String,
                        ByVal sTargetName As String,
                        ByVal iTargetOrdinal As Integer,
                        ByVal sTargetType As String,
                        ByRef sExpression As System.Text.StringBuilder) As Boole
                        ///     ...
       End Function
       <MappingRuleAttribute("Match Custom Extended Params", "Match names con-
sidering a specific custom rule")>
       Public Function MyCustomMapping (
                        ByVal bIsForth As Boolean,
                        ByVal sSourceName As String,
                        ByVal iSourceOrdinal As Integer,
```

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```
                        ByVal sSourceType As String,
                        ByVal bIsSourcePrimaryKey As Boolean,
                        ByVal bIsSourceNullable As Boolean,
                        ByVal iSourceSize As Integer,
                        ByVal sSourcePrecision As Short,
                        ByVal sSourceScale As Short,
                        ByVal sTargetName As String,
                        ByVal iTargetOrdinal As Integer,
                        ByVal sTargetType As String,
                        ByVal bIsTargetPrimaryKey As Boolean,
                        ByVal bIsTargetNullable As Boolean,
                        ByVal iTargetSize As Integer,
                        ByVal sTargetPrecision As Short,
                        ByVal sTargetScale As Short,
                        ByRef sExpression As System.Text.StringBuilder) As Boole
                        ///     ...
       End Function
End Class
```

C# Example

```
using System;
using System.Data;
using DBMotoPublic;
using DBMotoScript;
namespace DBRS
{
   public class GlobalScript : IGlobalScript
   {
   }
```

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```
   public class MappingRule : IMappingRule
   {
     [MappingRuleAttribute("Match By Prefix", "Match names considering
the prefix 'fld_'")]
     public bool CustomMapping_ByNamePrefixed (String sSourceName, int
iSourceOrdinal, String sTargetName, int iTargetOrdinal)
       {
          if (sTargetName.Length >= 4)
             {
               return (String.Compare(sSourceName, sTargetName.Substring(4), t
== 0);
              }
          else
              {
               return false;
               }
       }

       [MappingRuleAttribute("Match By Prefix", "Match names considering the
prefix 'fld_'")]
       public bool CustomMapping_ByNameSuffixed (String sSourceName, int
iSourceOrdinal, String sTargetName, int iTargetOrdinal)
       {
          if (sSourceName.Length >= 4)
               {
                  return (String.Compare(sSourceName.Substring(4), sTargetName
true) == 0);
               }
```

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```
          else
               {
                  return false;
               }
         }
       [MappingRuleAttribute("Match Custom", "Match names considering a spe-
cific custom rule")]
       public bool MyCustomMapping(bool bIsForth, String sSourceName, int
iSourceOrdinal, String sSourceType,
          String sTargetName, int iTargetOrdinal, String sTargetType,
ref System.Text.StringBuilder sExpression)
       {
         //      ...
         return true;
       }
   }
   public class GlobalEvents : IGlobalEvents
   {
   }
}
```

Parameters

The possible parameters for the functions are:

bIsForth - TRUE or FALSE depending on whether mapping is forward or backward direction (for synchronization). This allows you to write a script that handles both directions of mapping. For instance, if bIsForth is True, then apply mapping by name; if bIsForth is False then apply a different rule.

sSourceName - The source>iSourceOrdinal - The source column ordinal position (expressed as an integer)

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sSourceType - The source column type (original database type). This can be used to apply custom mapping rules that work on specific datatypes. For instance, you could write a rule that applies a Trim function to the mapping for all VARCHAR columns.

blsSourcePrimaryKey - Specifies whether the source field is a primary key

blsSourceNullable - Specifies whether the source field is nullable.

iSourceSize - Source field size expressed as an integer

sSourcePrecision - Source field precision expressed as a short

sSourceScale - Source field scale expressed as a short

sTargetName - The target column name

iTargetOrdinal - The target column ordinal position (expressed as an integer)

sTargetType - The target column type (original database type).

blsTargetPrimaryKey - Specifies whether the target field is a primary key

blsTargetNullable - Specifies whether the target field is nullable. Allows you to check if the target field is not nullable, and thereby avoid cases where NULL values are passed to the target.

iTargetSize - Target field size expressed as an integer

sTargetPrecision - Target field precision expressed as a short

sTargetScale - Target field scale expressed as a short

sExpression - A reference parameter that can be returned from the function back to Syniti DR. This allows you to apply specific expressions to the mapping. For example:

```
If sTargetType = "VARCHAR" Then
                sExpression.Append("MyGlobalFunction([" + sSourceName +
"])")
             End If
```

The example above defines an expression that will call the global function MyGlobalFunction for all target columns of type VARCHAR.

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Implementing the Mapping Rule

1. Select the metadata for which you want to create a global script.
2. From the right mouse button menu, select **Global Script**.
3. In the Global Script Editor, insert your mapping rule or rules below the line:
   VB.NET: Public Class MappingRule : Inherits IMappingRule
   C#: public class MappingRule : IMappingRule
4. Write a MappingRuleAttribute definition to determine what appears on the Automatic Mapping menu in the Set Mapping Info screen of the Replication Wizard or the Fields Mapping dialog. The first string contains the text that will appear as a submenu of the Custom Mapping menu item. The second string contains text that will serve as a tooltip description of the function.
5. Write your function using the examples above as a guideline. The parameters of your function must match those in the examples above.
   These parameters can then be used in the function.
6. Compile the global script to see that the function compiles correctly. It will be available in the Automatic Mapping menu only if it compiles correctly.

Related Topics

Global Script Functions

Writing a Global Script

Writing Scripts with Visual Basic .NET

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Global Script Functions (IGlobalScript Class)

The global functions for use in Global scripts are described below. If using these functions from a global script event, call them using the IGlobalScript class (e.g., `IGlobalScript.AddLog`).

AddLog
SendMail
GetRecordInfo
GetJSONRecordInfo
GetReceiversInUse

AddLog (String, enmLogMessageType)

Note: this function supersedes AddLog(str As String, eType As Integer)

Writes a log message in the DBMoto.log file.

VB.NET syntax

```
Public Shared Sub AddLog (str As String, eType As enmLogMessageType)
```

C# syntax

```
public static void AddLog(string str, enmLogMessageType eType)
```

Parameters

- str = message to log

- eType = enumerator enmLogMessageType with the possible values: Information = 0, Warning = 1, Error = 2

Example [VB.NET syntax]

```
AddLog ("The current record has been inserted", 0)
```

Example [C# syntax]

```
AddLog("The current record has been inserted", 0)
```

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AddLog (String, enmLogMessageType, Record, enmRecordImage)

Note: this function supersedes AddLog(String, Int, Record, enmRecordImage)

Writes a log message that includes the specified record information in the DBMoto.log file.

VB.NET Syntax

```
Public Shared Sub AddLog (str As String, eType As enmLogMessageType,
                          record As DBMotoPublic.IRecord, eRecordImage As enmR
```

C# Syntax

```
public static void AddLog(string str, enmLogMessageType  eType, DBMo-
toPublic.IRecord record,
                          enmRecordImage eRecordImage)
```

Parameters

- str = message to log

- eType = enumerator enmLogMessageType with the possible values: Information = 0, Warning = 1, Error = 2

- record = IRecord object to be logged along with the message

- eRecordImage = enumerator enmRecordImage for type of record print required. The record image uses the Values After of the record if it comes from an INSERT operation, otherwise the Values Before. The parameter can have the value 1, 2 or 4:

1 = KeyValues - Print only the primary key columns values
2 = Image - Printthe whole image of the record
4 = LogInfo - Print the log information (Transaction ID, Transaction Timestamp)

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Example [VB.NET syntax]

```
Public Overrides Sub Record_onAfterMapping(recSource As IRecord, recTar-
get As IRecord,
                                           ByRef AbortRecord As Boolean)
        Dim S as String
        AddLog("The current record has been inserted", 0, recSource, 4)
End Sub
```

SendMail (subject, body)

Sends an email using the SMTP settings defined in the Mail tab of the Replication Agent Options dialog.

VB.NET syntax

```
Public Shared Sub SendMail (sSubject As String, sMessageBody As String)
```

C# syntax

```
public static void SendMail(string sSubject, string sMessageBody)
```

Parameters

- sSubject = subject of the email

- sMessageBody = body of the email

Example [VB.NET syntax]

```
SendMail ("Message from Syniti DR",
          "An error occurred that requires intervention by the system admin-
istrator.")
```

Example [C# syntax]

```
SendMail("Message from Syniti DR",
```

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```
        "An error occurred that requires intervention by the system
administrator.")
```

SendMail (subject, body, to)

Sends an email using the SMTP settings defined in the Mail tab of the Replication Agent Options dialog.

VB.NET syntax

```
Public Shared Sub SendMail (sSubject As String, sMessageBody As String,
sRcptTo As String)
```

C# syntax

```
public static void SendMail(string sSubject, string sMessageBody,
string sRcptTo)
```

Parameters

- sSubject = subject of the email

- sMessageBody = body of the email

- sRcptTo = the email address of the intended recipient

Example [VB.NET syntax]

```
SendMail ("Message from Syniti DR",
          "An error occurred that requires intervention by the system
administrator.",
          "somebody@company.com")
```

Example [C# syntax]

```
SendMail("Message from Syniti DR",
         "An error occurred that requires intervention by the system admin-
istrator.",
         "somebody@company.com")
```

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SendMail (sSubject, sMessageBody, sSMTPServer, sSMTPPort, sRcptFrom, sRcptTo, bAuthentication, sUser, sPassword, bUseSSL)

Sends an email using the parameters defined when the function is called. When parameters are not passed, the Mail settings in the Replication Agent Options dialog will be used instead.

VB.NET syntax

```
Public Shared Sub SendMail (sSubject As String, sMessageBody As String,
                            sSMTPServer As String, sRcptFrom As String,
sRcptTo As String)
```

C# syntax

```
public static void SendMail(string sSubject, string sMessageBody,
string sSMTPServer,
                            string sRcptFrom, string sRcptTo)
```

Parameters

- sSubject = subject of the email

- sMessageBody = body of the email

- sSMTPServer = the SMTP server for outgoing mail

- sSMTPPort = the SMTP server port for outgoing mail

- sRcptFrom = the email address from which you want to send the message

- sRcptTo = the email address of the intended recipient.

- bAuthentication = True if authentication should be used, otherwise False

- sUser = If bAuthentication is True, provide a user ID.

- sPassword = f bAuthentication is True, provide a password

- bUseSSL = True if SSL (Secure Sockets Layer) for email encryption should be used, otherwise False.

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Example [VB.NET syntax]

```
SendMail ("Message from Syniti DR",
          "An error occurred that requires intervention by the system admin-
istrator.",
          "www.smtp.com", "DBMoto Notification Agent", "some-
body@company.com")
```

Example [C# syntax]

```
 SendMail("Message from Syniti DR",
          "An error occurred that requires intervention by the system admin-
istrator.",
          "www.smtp.com", "Syniti DR Notification Agent", "some-
body@company.com")
```

GetRecordInfo(Record, enmRecordImage)

Returns a string containing formatted information about the record.

VB.NET syntax

```
Public Shared Function GetRecordInfo (record As DBMotoPublic.IRecord,
eRecordImage As enmRecordImage) As String
```

C# syntax

```
public static string GetRecordInfo(DBMotoPublic.IRecord record, enmRe-
cordImage eRecordImage)
```

Parameters

- record = IRecord object to be logged along with the message

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- eRecordImage = enumerator enmRecordImage for type of record print required. The record image uses the Values After of the record if it comes from an INSERT operation, otherwise the Values Before. The parameter can have the value 1, 2 or 4:

1 = KeyValues - Print only the primary key columns values
2 = Image - Print the whole image of the record
4 = LogInfo - Print the log information (Transaction ID, Transaction Timestamp)

Example [VB.NET syntax]

```
Imports Microsoft.VisualBasic
Imports DBMotoPublic
Imports DBMotoScript
Imports DBRS.GlobalScript
Namespace DBRS
    Public Class ReplicationScript : Inherits IReplicationScript
       Public Overrides Sub Record_onAfterMapping(recSource As IRecord,
recTarget As IRecord,
                                                  ByRef AbortRecord As
Boolean)
          Dim S as String = GetRecordInfo(recSource, enmRe-
cordImage.KeyValues)
          AddLog("The current record has been inserted: " + S, 0)
       End Sub
    End Class
End Namespace
```

Example [C# syntax]

```
using System;
using System.Data;
using DBMotoPublic;
using DBMotoScript;
```

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```
namespace DBRS
{
    public class ReplicationScript : IReplicationScript
    {
       public override void Record_onAfterMapping(DBMotoPublic.IRecord
recSource,
                                                  DBMotoPublic.IRecord recTarge
cord)
       {
           string = GlobalScript.GetRecordInfo(recSource, enmRe-
cordImage.KeyValues);
           GlobalScript.AddLog("The current record has been inserted: "
+ s, 0);
        }
    }
}
```

GetJSONRecordInfo

All four variants of this function below are helper functions that can be useful when mapping a generic structured or unstructured data into a JSON column type.

GetJSONRecordInfo(record,eRecordImage)

Returns a string in JSON format. For example:

```
{
"FIELD1" = "Value1",
"FIELD2" = "Value2",
"FIELD3" = "Value3"
}
```

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Object names and values are picked up from the IRecord object (and use the fields based on the enmRecordImage parameter).

VB.NET syntax

```
Public Shared Function GetJSONRecordInfo(ByVal record As DBMo-
toPublic.IRecord, ByVal eRecordImage As enmRecordImage) As String
```

C# syntax

```
public static string GetJSONRecordInfo(DBMotoPublic.IRecord record,
enmRecordImage eRecordImage)
```

GetJSONRecordInfo(args)

Returns a string in JSON format. For example:

```
{
 "FIELD1" = "Value1",
 "FIELD2" = "Value2",
 "FIELD3" = "Value3"
}
```

Object names and values are picked from a list of generic <propname1, propvalue1, propname2, propvalue2, ...>.

VB.NET syntax

```
Public Shared Function GetJSONRecordInfo(ParamArray ByVal args() As
Object) As String
```

C# syntax

```
public static string GetJSONRecordInfo(params object[] args)
```

GetJSONRecordInfo(T value)

Returns the JSON format for a specific object of type T. This function can be used when the value passed is not a string value but something else (such as a DateTime, a GUID, etc.)

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VB.NET syntax

```
Public Shared Function GetJSONRecordInfo(Of T)(ByVal value As T) As
String
```

C# syntax

```
public static string GetJSONRecordInfo<T>(T value)
```

GetJSONRecordInfo T (jsonString)

The inverse of the function above. Given a certain value in JSON string format, it parses back the string and returns the object (of type T) from which it was generated.

VB.NET syntax

```
Public Shared Function GetJSONRecordInfo(Of T)(ByVal jsonString As
String) As T
```

C# syntax

```
public static T GetJSONRecordInfo<T>(string jsonString)
```

GetReceiversInUse

Returns a list of receivers in use by the replications in a Syniti DR connection as a ReceiversInfo object. The definition of the ReceiverInfo class is given below. For more information on using this function, see Writing a Script to Determine Receiver Use.

VB.NET syntax

```
Public Shared Function GetReceiversInUse (ConnectionName As String,
IsSource As Boolean,
                                          OnlyActiveReplications As Boolean) As
```

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C# syntax

```
public static ReceiverInfo[] GetReceiversInUse(string ConnectionName,
bool IsSource, bool OnlyActiveReplications)
```

Parameters

- ConnectionName = Name of the IBM Db2 for i connection for which to retrieve the receivers in use

- IsSource = True if ConnectionName refers to a source connection, false otherwise

- OnlyActiveReplications = If true, retrieve only receivers used by active (Enabled) replications, and skip the disabled ones

Example [VB.NET syntax]

```
Imports Microsoft.VisualBasic
Imports DBMotoPublic
Imports DBMotoScript
Imports DBRS.GlobalScript
Imports System.Data
Namespace DBRS
   Public Class ReplicationScript : Inherits IReplicationScript
       Public Overrides Sub LogReader_onBeforeMirroring(bSource as Boolean)
          Dim arrReceivers As ReceiverInfo() = GetReceiversInUse
("AS400", True, True)
          Dim recInfo As ReceiverInfo
          For Each recInfo in arrReceivers
               AddLog("Receiver in use: " + recInfo.JournalLibrary + "." +
recInfo.JournalName  +
                    "/" + recInfo.ReceiverLibrary + "." + recInfo.Re-
ceiverName, 0)
          Next
       End Sub
```

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```
   End Class
End Namespace
```

Example [C# syntax]

```
using System;
using System.Data;
using DBMotoPublic;
using DBMotoScript;
namespace DBRS
{
   public class ReplicationScript : IReplicationScript
   {
       public override void LogReader_onBeforeMirroring(bool bSource)
       {
          ReceiverInfo[] arrReceivers = GlobalScript.GetReceiversInUse
("AS400", true, true);
          foreach (ReceiverInfo recInfo in arrReceivers)
          {
               GlobalScript.AddLog("Receiver in use: " + recInfo.JournalLibrar
"." + recInfo.JournalName
                                   + "/" + recInfo.ReceiverLibrary +
"." + recInfo.ReceiverName, 0);
          }
        }
    }
}
```

Other

This function returns a value of type ReceiverInfo. The definition for the class is below.

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```
Public Class ReceiverInfo
       Public JournalLibrary As String
       Public JournalName As String
       Public ReceiverLibrary As String
       Public ReceiverName As String
End Class
```

Related Topics

Replication Script Events

Handling Events for INSERT, UPDATE and DELETE Operations

Replication Script Properties

IRecord Interface

Writing a Global Script

Writing a Replication Script

Writing Scripts with Visual Basic .NET

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Global Script Events

Define global event handlers in the GlobalEvents class in the Global Script. Each global event must have an attribute section called 'GlobalEventsAttribute' specifying the internal event that the function is handling.

GlobalEventsAttribute

An attribute with two parameters, the event name and a help string. This attribute must always be declared when defining an error handler for the Record_OnExecuteError and Replication_OnError events.

Parameter 1: Required. A string containing the event name. The value must match the name of the event being handled.

Parameter 2: Required. A string containing a description or help message for the event handler. This string is not currently used by Syniti DR, but because the parameter is required, you must at least provide an empty string " ".

Record_OnExecuteError

This event occurs whenever an error on execution of a single record occurs. As a writer event, it occurs on target operations, such as INSERT, DELETE, UPDATE. Use the bRetryExecute option to force an attempt to rerun an execute operation on a record when the operation initially fails. For instance, if a single record insert fails with a timeout error, setting bRetryExecute to true and setting values for iSleep and iIteration parameters, might allow the operation to succeed a few milliseconds later. Note that the replication event Record_OnBeforeExecute is generated only once, no matter how many times the record operation is retried using this parameter. Also the replication event Record_OnAfterExecute is generated once only if the record operation succeeds and not at all if the record operation fails.

The GlobalEventsAttribute first parameter must indicate the event name "Record_OnExecuteError".

VB.NET Syntax

```
<GlobalEventsAttribute("Record_OnExecuteError", "Define a general event
for the event OnExecuteError")>
Public Shared Sub MyErrorHandler (ByVal sReplOrGroupName As String,
                                  ByVal recTarget As DBMotoPublic.IRecord,
                                  ByVal e As Exception,
                                  ByRef bRecoverReplication As Boolean,
                                  ByRef bDisableReplication As Boolean,
```

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```
                                        ByRef bRetryExecute As Boolean,
                                        ByRef iSleep As Integer,
                                        ByVal iIteration As Integer)
```

Note: Function name 'MyErrorHandler' can be modified.

C# Syntax

```
[GlobalEventsAttribute("Record_OnExecuteError", "Define a general event
for the event OnExecuteError")]
public static void MyErrorHandler(string sReplOrGroupName,
            DBMotoPublic.IRecord recTarget,
            Exception e,
            ref bool bRecoverReplication,
            ref bool bDisableReplication,
            ref bool bRetryExecute,
            ref int iSleep,
            int iIteration)
```

Parameters

Name	Type	Description
sReplOrGroupName	String	Read only. The name of the replication or group that generated the event.
recTarget	IRecord	Read only. The object that represents the target record for which the error was generated. You can access specific information in the record using the methods available in the IRecord interface.
e	Exception	Read only. The VB .NET Exception object for this error.
bRecoverReplication	Boolean	The default is False. If set to True, the replication is set to recovery mode
bDisableReplication	Boolean	The default is False. If set to True, regardless of the

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		RetryExecute value, the replication exits signaling ser-ror message in the log and disabling the replication.
bRetryExecute	Boolean	The default value is False. Set this parameter to True if you want to try the target record operation again before recording the error in the Syniti DR log. For instance, if a single record insert fails with a timeout error, setting bRetryExecute to True and setting a value for the iSleep parameter might allow the operation to succeed a few milliseconds later. The example below demon-strates how to use this parameter. Note that the rep-lication event Record_OnBeforeExecute is generated only once, no matter how many times the record oper-ation is retried using this parameter. Also the rep-lication event Record_OnAfterExecute is generated once only if the record operation succeeds and not at all if the record operation fails.
iSleep	Integer	When bRetryExecute is set to True, use this parameter to indicate a delay value before retrying the operation. The value should be in milliseconds. The default value is 0. The example below demonstrates how to use this parameter.
iIteration	Integer	Read only. For use in conjunction with the bRetryEx-ecute parameter. iIteration keeps track of the number of times the target record operation is attempted. The start value is 0. When the target record operation is attempted the first time, this value is set to 1. The event handler will continue to retry the operation until bRetryExecute is set to false. The example below demonstrates how you might avoid an infinite loop on an error.

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VB.NET Example

```
<GlobalEventsAttribute("Record_OnExecuteError", "Define a general event
for the event EventName")>
Public Shared Sub MyErrorHandler (ByVal sReplOrGroupName As String,
                                  ByVal recTarget As DBMotoPublic.IRecord,
                                  ByVal e As Exception,
                                  ByRef bRecoverReplication As Boolean,
                                  ByRef bAbortRecord  As Boolean,
                                  ByRef bDisableReplication As Boolean,
                                  ByRef bRetryExecute As Boolean,
                                  ByRef iSleep As Integer,
                                  ByVal iIteration As Integer)
       Dim s As String
       s = s + "-- Called MyErrorHandler to catch the error in rep-
lication or group '"
                  + sReplOrGroupName + "'" + Environment.NewLine
       s = s + "-- Exception: " + e.ToString() + Environment.NewLine
       s = s + "-- Iteration: " + iIteration.ToString()
       bRetryExecute = False
       ' Disable replication if the error is a SQL Server timeout error
       If e.Message.IndexOf("System.Data.SqlClient.SqlException: Timeout
expired.") == 0 Then
          bAbortRecord = True
          bDisableReplication = True
          s = s + " - Replication disabled"
       Else ' retry
          If iIteration = 3 Then
               bRetryExecute = False
```

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```
                s = s + " - No Retry"
          Else
                bRetryExecute = True
                iSleep = 3000
                s = s + " - Try Again after " + (iSleep/1000).ToString() + "
seconds."
          End If
       End If
       IGlobalScript.AddLog (s, 1)
End Sub
```

C# Example

```
public class GlobalEvents : IGlobalEvents
{
  /// <param name="sReplOrGroupName"> </param>
  /// <param name="recTarget"></param>
  /// <param name="e"></param>
  /// <param name="bDisableReplication"></param>
  /// <param name="bRetryExecute"></param>
  /// <param name="iSleep"></param>
  /// <param name="iIteration"></param>
[GlobalEventsAttribute("Record_OnExecuteError", "Define a general event
for the event EventName")]
public static void MyErrorHandler(String sReplOrGroupName, DBMo-
toPublic.IRecord recTarget, Exception e,
                                  ref bool bRecoverReplication, ref bool
bAbortRecord, ref bool bDisableReplication,
                                  ref Boolean bRetryExecute, ref int
iSleep, int iIteration)
```

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```
{
 String s = null;
 s = s + "-- Called MyErrorHandler to catch the error in replication or
group '" + sReplOrGroupName + "'"
         + Environment.NewLine;
 s = s + "-- Exception: " + e.ToString() + Environment.NewLine;
 s = s + "-- Iteration: " + iIteration.ToString();
 bRetryExecute = false;
 // Disable replication if the error is a SQL Server timeout error
 if (e.Message.IndexOf("System.Data.SqlClient.SqlException: Timeout
expired.") = 0) {
    bAbortRecord = true;
    bDisableReplication = true;
    s = s + " - Replication disabled";
 }
 else { // retry
    if (iIteration >= 3) {
        bRetryExecute = false;
        s = s + " - No Retry";
        }
    else {
        bRetryExecute = true;
        iSleep = 3000;
        s = s + " - Try Again after " + (iSleep / 1000).ToString() +
"seconds.";
        }
  }
  IGlobalScript.AddLog(s, 1);
```

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```
}
```

Record_OnMappingError

This event occurs whenever an error on mapping of a single record occurs. As a reader event, it occurs on source when mapping operations, such as INSERT, DELETE, UPDATE. Use the bRetryExecute option to force an attempt to rerun a mapping operation on a record when the operation initially fails. For instance, if a single field map fails with a syntax error, setting bRetryExecute to true, might allow the user to change some values in the field and repeat the operation. Note that the replication event Record_OnBeforeMapping is generated only once, no matter how many times the record operation is retried using this parameter. Also the replication event Record_OnAfterMapping is generated once only if the record operation succeeds and not at all if the record operation fails.

The GlobalEventsAttribute first parameter must indicate the event name "Record_OnMappingError".

VB.NET Syntax

Note: Function name 'MyErrorHandler' can be modified.

```
<GlobalEventsAttribute("Record_OnMappingError", "Define a general event
for the event OnMappingError")>
Public Shared Sub MyErrorHandler (ByVal sReplOrGroupName As String,
                                  ByVal recSource As DBMotoPublic.IRecord,
                                  ByVal recTarget As DBMo-
toPublic.IRecord,
                                  ByVal e As Exception,
                                  ByRef bAbort As Boolean,
                                  ByRef bRecoverReplication As
Boolean,
                                  ByRef bDisableReplication As Boolean,
                                  ByRef bRetryExecute As Boolean,
                                  ByRef iSleep As Integer,
                                  ByVal iIteration As Integer)
```

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C# Syntax

```
[GlobalEventsAttribute("Record_OnMappingError", "Define a general event
for the event OnMappingError")]
public static void MyErrorHandler(string sReplOrGroupName,
            DBMotoPublic.IRecord recSource,
            DBMotoPublic.IRecord recTarget,
            Exception e,
            ref bool bAbort,
            ref bool bRecoverReplication,
            ref bool bDisableReplication,
            ref bool bRetryExecute,
            ref int iSleep,
            int iIteration)
```

Parameters

Name	Type	Description
sReplOrGroupName	String	Read only. The name of the replication or group that generated the event.
recSource	IRecord	Read only. The object that represents the source record for which the error was generated. You can access specific information in the record using the methods available in the IRecord interface.
recTarget	IRecord	Read only. The object that represents the target record for which the error was generated. You can access specific information in the record using the methods available in the IRecord interface.
e	Exception	Read only. The VB .NET Exception object for this error.

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bAbort	Boolean	The default is False. If set to True, the current record is skipped and not replicated. No errors will be shown in the log.
bRecoverReplication	Boolean	The default is False. If set to True, the replication is set to recovery mode
bDisableReplication	Boolean	The default is False. If set to True, regardless of the RetryExecute value, the replication exits signaling ser-ror message in the log and disabling the replication.
bRetryExecute	Boolean	The default value is False. Set this parameter to True if you want to try the target record operation again before recording the error in the Syniti DR log. For instance, if a single record insert fails with a timeout error, setting bRetryExecute to True and setting a value for the iSleep parameter might allow the operation to succeed a few milliseconds later. The example below demon-strates how to use this parameter. Note that the rep-lication event Record_OnBeforeExecute is generated only once, no matter how many times the record oper-ation is retried using this parameter. Also the rep-lication event Record_OnAfterExecute is generated once only if the record operation succeeds and not at all if the record operation fails.
iSleep	Integer	When bRetryExecute is set to True, use this parameter to indicate a delay value before retrying the operation. The value should be in milliseconds. The default value is 0. The example below demonstrates how to use this parameter.
iIteration	Integer	Read only. For use in conjunction with the bRetryEx-ecute parameter. iIteration keeps track of the number of times the target record operation is attempted. The start value is 0. When the target record operation is attempted the first time, this value is set to 1. The event handler will continue to retry the operation until

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		bRetryExecute is set to false. The example below demonstrates how you might avoid an infinite loop on an error.

VB.NET Example

```
<GlobalEventsAttribute("Record_OnMappingError", "Define a general event
for the event EventName")>
Public Shared Sub MyErrorHandler (ByVal sReplOrGroupName As String,
                                  ByVal recSource As DBMo-
toPublic.IRecord,
                                  ByVal recTarget As DBMotoPublic.IRecord,
                                  ByVal e As Exception,
                                  ByRef bAbort As Boolean,
                                  ByRef bRecoverReplication As Boolean,
                                  ByRef bAbortRecord  As Boolean,
                                  ByRef bDisableReplication As Boolean,
                                  ByRef bRetryExecute As Boolean,
                                  ByRef iSleep As Integer,
                                  ByVal iIteration As Integer)
       Dim s As String
       s = s + "-- Called MyErrorHandler to catch the error in rep-
lication or group '"
                  + sReplOrGroupName + "'" + Environment.NewLine
       s = s + "-- Exception: " + e.ToString() + Environment.NewLine
       s = s + "-- Iteration: " + iIteration.ToString()
       bRetryExecute = False
       ' Disable replication if the error is a syntax error
```

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```
       If e.Message.Contains("Error applying the mapping for the target
field") Then
          bAbortRecord = True
          bDisableReplication = True
          s = s + " - Replication disabled"
       Else ' retry
          If iIteration = 3 Then
               bRetryExecute = False
               s = s + " - No Retry"
          Else
               bRetryExecute = True
               iSleep = 3000
               s = s + " - Try Again after " + (iSleep/1000).ToString() + "
seconds."
          End If
       End If
       IGlobalScript.AddLog (s, 1)
End Sub
```

C# Example

```
public class GlobalEvents : IGlobalEvents
{
  /// <param name="sReplOrGroupName"> </param>
  /// <param name="recTarget"></param>
  /// <param name="e"></param>
  /// <param name="bDisableReplication"></param>
  /// <param name="bRetryExecute"></param>
  /// <param name="iSleep"></param>
  /// <param name="iIteration"></param>
```

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```
[GlobalEventsAttribute("Record_MappingError", "Define a general event
for the event EventName")]
public static void MyErrorHandler(String sReplOrGroupName, DBMo-
toPublic.IRecord recSource, DBMotoPublic.IRecord recTarget, Exception
e,
                                  ref bool bAbort, ref bool bRe-
coverReplication, ref bool bAbortRecord, ref bool bDisableReplication,
                                  sref Boolean bRetryExecute, ref int
iSleep, int iIteration)
{
 String s = null;
 s = s + "-- Called MyErrorHandler to catch the error in replication or
group '" + sReplOrGroupName + "'"
         + Environment.NewLine;
 s = s + "-- Exception: " + e.ToString() + Environment.NewLine;
 s = s + "-- Iteration: " + iIteration.ToString();
 bRetryExecute = false;
 // Disable replication if the error is a syntax error
 if (e.Message.Contains("Error applying the mapping for the target
field")) {
    bAbortRecord = true;
    bDisableReplication = true;
    s = s + " - Replication disabled";
 }
 else { // retry
    if (iIteration >= 3) {
        bRetryExecute = false;
        s = s + " - No Retry";
```

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```
        }
    else {
        bRetryExecute = true;
        iSleep = 3000;
        s = s + " - Try Again after " + (iSleep / 1000).ToString() +
"seconds.";
        }
  }
  IGlobalScript.AddLog(s, 1);
}
```

Replication_OnError

This event occurs whenever an error on a replication occurs. Any type of error that is shown in the Replication Monitor as an error or warning icon at the end of the replication operation generates this event. This event is invoked at the end of a refresh or at the end of the mirroring interval, and not at the moment the error happens.

The GlobalEventsAttribute first parameter must indicate the event name "Replication_OnError".

VB.NET Syntax

```
 <GlobalEventsAttribute("Replication_OnError", "Define a general event
for the event Replication_OnError")>
  Public Shared Sub MyErrorHandler (ByVal sReplOrGroupName As String,
ByVal sMessage As String,
                                    ByVal bWillDisable As Boolean, ByVal
eReplStatus As enmReplStatus)
```

Note: Function name 'MyErrorHandler' can be modified.

C# Syntax

```
 [GlobalEventsAttribute("Replication_OnError", "Define a general event
for the event Replication_OnError")]
  public static void MyErrorHandler(string sReplOrGroupName, string
```

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```
sMessage,
                                        bool bWillDisable, enmReplStatus
eReplStatus)
```

Parameters

Name	Type	Description
sReplOrGroupName	String	Read only. The name of the replication or group that generated the event.
sMessage	String	Read only. The error message/exception stack.
bWillDisable	Boolean	Read only. True if the error will disable the replication.
eReplStatus	enmReplStatus	Read only. Specifies the replication status when the event is called using the enmReplStatus enumerator. Possible values for the enumerator are: • **ErrorAndContinue** An error was generated during the replication (refresh or mirroring interval) but the replication was able to continue. An example is when a transaction fails to delete a target record because the record was not found in the target table. In this case, Syniti DR reports the error in the log and continues with the next record. • **Error** An error was generated and the replication stopped executing. The replication will start again at the next interval. An example of this type of error is when a connection to

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		the source or target database is broken. In such cases, Syniti DR cannot continue with the replication and goes into recovery mode. • **Success** Not used in this event. When Replication_OnError is called, the replication is always in an error state.

VB.NET Example

```
<GlobalEventsAttribute("Replication_OnError", "General event for the
event OnError")> _
Public  Shared Sub MyGlobalEvent (ByVal sReplicationName As String,
ByVal sMessage As String,
                                  ByVal bWillBeDisabled As Boolean,
ByVal eReplStatus As enmReplStatus)
   Dim s As String
   s  = DateTime.Now.ToString() + Environment.NewLine + Envir-
onment.NewLine
   s = s + "Error in replication '" + sReplicationName + "'"
       + Environment.NewLine + Environment.NewLine
   s = s + "Replication Status: " + eReplStatus.ToString() + Envir-
onment.NewLine
       + Environment.NewLine
   s = s + sMessage + Environment.NewLine + Environment.NewLine
   If bWillBeDisabled Then
       s = s + "The replication will be disabled." + Environment.NewLine +
```

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```
Environment.NewLine
   End If
   s = s + "-------------------------------------------------------------
------" + Environment.NewLine
   s = s + " This is an automatic message generated by the Syniti DR
script" + Environment.NewLine
   s = s + "-------------------------------------------------------------
------" + Environment.NewLine
   IGlobalScript.SendMail ("Syniti DR Error", s)
End Sub
```

C# Example

```
/// <param name="sReplicationName"></param>
/// <param name="sMessage"></param>
/// <param name="bWillBeDisabled"></param>
/// <param name="eReplStatus"></param>

[GlobalEventsAttribute("Replication_OnError", "General event for the
event OnError")]
public static void MyGlobalEvent(String sReplicationName, String sMes-
sage, Boolean bWillBeDisabled,
                  enmReplStatus eReplStatus)
{
 String s = null;
 s = DateTime.Now.ToString() + Environment.NewLine + Envir-
onment.NewLine;
 s = s + "Error in replication '" + sReplicationName + "'"
     + Environment.NewLine + Environment.NewLine;
 s = s +  "Replication Status: " + eReplStatus.ToString() +
```

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```
Environment.NewLine
     + Environment.NewLine;
 s = s + sMessage + Environment.NewLine + Environment.NewLine;
 if (bWillBeDisabled)
    {
      s = s + "The replication will be disabled." + Environment.NewLine
+ Environment.NewLine;
    }
  s = s + "-----------------------------------------" + Envir-
onment.NewLine;
  s = s + " This automatic message is generated by the Syniti DR
script" + Environment.NewLine;
  s = s + "-----------------------------------------" +
Environment.NewLine;
  IGlobalScript.SendMail("Syniti DR Error", s);
}
```

ReplicationManager_onStart

This event occurs when the Replication Agent is started. It can be used to add a notification message to the Syniti DR log, or to send email to an administrator. To write a handler for the event, position the cursor inside the class header "Public Class GlobalEvents : Inherits IGlobalEvents", then define the handler using the example below as guideline.

The GlobalEventsAttribute first parameter must indicate the event name "ReplicationManager_OnStart".

VB.NET Syntax

```
 <GlobalEventsAttribute("ReplicationManager_OnStart", "Standard event
for the event OnStart")> _
 Public Shared Sub OnStart ()
```

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C# Syntax

```
[GlobalEventsAttribute("ReplicationManager_OnStart", "Standard event
for the event OnStart")]
public static void OnStart()
```

Parameters

None.

VB.NET Example

```
<GlobalEventsAttribute("ReplicationManager_OnStart", "Standard event
for the event OnStart")> _
Public Shared Sub OnStart ()
Dim s As String
s = s + "-- Message from Syniti DR - START"
s = s + "-----------------------------------------------------------
---"
 + Environment.NewLine
s = s + "-  This is an automatic message generated by the Syniti DR
 script  -" + Environment.NewLine
s = s + "-----------------------------------------------------------
---"
 + Environment.NewLine           IGlobalScript.SendMail
 ("Replication Manager Message", s)
End Sub
```

C# Example

```
[GlobalEventsAttribute("ReplicationManager_OnStart",  "Standard event
for the event OnStart")]
public static void OnStart()
```

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```
{
 String s = null;
s = s + "-- Message from Syniti DR - START";
s = s + "-------------------------------------------------------" +
Environment.NewLine;
s = s + "-  This is an automatic message generated by the Syniti DR
script  -" + Environment.NewLine;
s = s + "-------------------------------------------------------"  +
Environment.NewLine;
IGlobalScript.SendMail("Replication Manager Message", s);
}
```

ReplicationManager_onStop

This event occurs when the Data Replicator is started. It can be used to add a notification message to the Syniti DR log, or to send email to an administrator. To write a handler for the event, position the cursor inside the class header "Public Class GlobalEvents : Inherits IGlobalEvents", then define the handler using the example below as a guideline.

The GlobalEventsAttribute first parameter must indicate the event name "ReplicationManager_OnStop".

VB.NET Syntax

```
 <GlobalEventsAttribute("ReplicationManager_OnStop",  "Standard event
for the event OnStop")> _
   Public Shared Sub OnStop ()
```

C# Syntax

```
[GlobalEventsAttribute("ReplicationManager_OnStop", "Standard  event
for the event OnStop")]
public static void OnStop()
```

Parameters

None.

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VB.NET Example

```
<GlobalEventsAttribute("ReplicationManager_OnStop", "Standard event for
the event OnStop")>
Public Shared Sub OnStop ()
Dim s As String
s = s + "-- Message from Syniti DR - STOP"
s = s + "-------------------------------------------------------" +
Environment.NewLine
s = s + "This is an automatic message generated by the Syniti DR script
-" + Environment.NewLine
s = s + "-------------------------------------------------------"
 + Environment.NewLine
IGlobalScript.SendMail ("Replication Manager Message", s)
End Sub
```

C# Example

```
[GlobalEventsAttribute("ReplicationManager_OnStop", "Standard event for
the event OnStop")]
public static void OnStop()
{
  String s = null;
  s = s + "-- Message from Syniti DR  - STOP";
  s = s + "-------------------------------------------------------" +
Environment.NewLine;
  s = s + "-  This is an automatic message generated by the Syniti DR
script  -" + Environment.NewLine;
  s = s + "-------------------------------------------------------" +
Environment.NewLine;
```

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```
  IGlobalScript.SendMail("Replication Manager Message", s);
}
```

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VB.NET Global Script Function Examples

The following VB.NET example functions can be defined in a global script, then used in replication scripts and expressions to modify target field values during replication. For detailed steps on how to define a Global Script function, check Writing a Function to Use in Scripts and Expressions.

Accessing Values Using a Different Database Connection

If your replication needs record values which are accessible only by opening a separate database connection and running a query there, you can write the following script in the Global Script Editor, then call the script as indicated below.

The GetQueryValue function retrieves the first returned value from the passed in connection and query. If the parameters are illegal, the query returns an error or the query does not return a value, the function returns System.DBNull.Value.

```
Public Shared Function GetQueryValue(objConnection as Object, strQuery
as String) as Object
 'If a parameter is null, return a null value
  If objConnection Is Nothing OR strQuery="" Then Return Sys-
tem.DBNull.Value
  'Declare variables that might be used
   Dim cmd As IDbCommand = Nothing
   Dim reader As IDataReader = Nothing
   Dim objValue as Object = System.DBNull.Value
   'Use the Try block to make sure we capture any exceptions that might
be generated
    Try
       'Use a SyncLock to make sure this function is the only user of
the connection since the
       'source or target connection might be in use.
       SyncLock(objConnection)
          'Create and execute the select to get the specified value
          cmd = objConnection.CreateCommand
```

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```
          cmd.CommandText = strQuery
          reader = cmd.ExecuteReader
          'If we can read from the reader, the record is already there. Get
info.
          If reader.Read Then objValue = reader.GetValue(0)
        End SyncLock
       'If there are no exceptions so far, return the value
        reader.Close
        reader = Nothing
        cmd.Dispose
        Return objValue
        'Output exceptions to the log
        Catch ex As Exception
           AddLog("Exception in GetQueryValue: " & ex.ToString,0)
        Finally
           if (not reader is Nothing) Then
                reader.Close
           End If
           if (not cmd is Nothing) Then
                cmd.Dispose
           End If
       End Try
       'Return System.DBNull.Value because an exception has been generated if
this point is reached.
       Return System.DBNull.Value
End Function 'GetQueryValue
```

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Calling the Script from a Mapping Expression

1. If you are using the function in an existing replication, either stop the Replication Agent or disable the replication.
2. For an existing replication, right-click on the replication and choose **Replication Properties**, then click **Mapping** to display the Mapping Editor. For new replications, perform the following steps when you get to the mapping portion of replication creation.
3. Right-click on the target field that will be using the generated value and choose **Map to Expression**.
4. In the Expression Generator window, expand the User Functions folder and click on (all) to see if your function is listed.
   If the function is not displayed, check to make sure that you have used the proper Public Shared qualifier for the function. See Writing a Function to Use in Scripts and Expressions for more information.
5. Type an expression similar to the following in the Expression Editor, modifying the SELECT statement to retrieve the information you need.

```
  GetQueryValue(DBRS.SourceConnection, "SELECT Capital FROM Capitals
WHERE abbrv='" & [ABBRV] & "'")
```

6. Click **OK** to close the Expression Generator window.
7. Click **OK** to close the Mapping window.
8. Click **OK** to close the Replication Properties window.
9. Either start the Replication Agent or enable the replication to test that your function is working.

Date Conversion

Define this function in the Global Script Editor, then call it by mapping the source field to an expression on the target field. The expression would be DateConvert([DT]), where DT is the name of the source field. The DT field should have the **Use Unmapped** option checked.

```
  Public Shared Function DateConvert(intDate)
    Dim cyy
    Dim yyyy
    Dim mm
```

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```
    Dim dd
    cyy = CInt(intDate/10000)
    mm = CInt((intDate - cyy * 10000) / 100)
    dd = intDate Mod 100
    if (cyy < 100)
      yyyy = 1900 + cyy
    else
      yyyy = 2000 + (cyy Mod 100)
    End if
    DateConvert = DateSerial(yyyy, mm, dd)
  End Function
```

Julian Date Conversion

Define this function in the Global Script Editor, then call it by mapping the source field to an expression on the target field. The expression would be JulianToDate(obj), where obj is the name of the source field. The source field should have the **Use Unmapped** option checked. This function takes a numeric Julian date in the format YYYDDD where YYY is the number of years since 1900 and DDD is the day of the year and returns a VB.Net date value or Null if the original value was null.

```
Public Shared Function JulianToDate(obj as Object) as Object
    If obj Is Nothing Then Return Nothing
    If Not IsNumeric(obj) Then Return Nothing
    Dim intYears as Integer
    intYears = Int(obj/1000)
    Dim intDays as Integer
    intDays = (obj - intYears * 1000) - 1
    Dim datDate as Date
    datDate = CDate("1/1/" & Str(1900 + intYears)).AddDays(intDays)
    Return datDate
End Function
```

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Combine Date and Time Fields

Define this function in the Global Script Editor, then call it by mapping the source field to an expression on the target field. The expression would be CombineDateTime(objDate, objTime), where objDate is the name of the date source field and objTime is the name of the time source field. The source fields should have the **Use Unmapped** option checked.

```
 Public Shared Function CombineDateTime(objDate as Object, objTime as
Object) as Object
    'If the date object is nothing return a null value
    If objDate is Nothing Then Return System.DBNull.Value
    'If you want to return a time of midnight for null times, remove
this line
    If objTime is Nothing Then Return System.DBNull.Value
    'If we don't have a legal date return a null value
    If Not IsDate(objDate) Then Return System.DBNull.Value
     Dim intHours as Integer
     intHours = Hour(objTime)
     Dim intMinutes as Integer
     intMinutes = Minute(objTime)
     Dim intSeconds as Integer
     intSeconds = Second(objTime)
     Dim datOutput as Date
     datOutput = DateAdd("h", intHours, objDate)
     datOutput = DateAdd("n", intMinutes, datOutput)
     datOutput = DateAdd("s", intSeconds, datOutput)
     Return datOutput
   End Function
```

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Time Function that Handles Null Values

Define this function in the Global Script Editor, then call it by mapping the source field to an expression on the target field. The expression would be SafeTimeValue(objTime), where objTime is the name of the time source field. The source field should have the **Use Unmapped** option checked. This function can be used to replace the built in TimeValue function because it checks for null values. When a record is deleted on SQL Server, only the primary key is replicated so when an attempt is made to modify the time value, the TimeValue routine fails because it has been passed a null value.

```
Public Shared Function SafeTimeValue(objTime as Object) as Object
  Dim intHours as Integer
  Dim intMinutes as Integer
  Dim intSeconds as Integer
  'Return a time of midnight for null or illegal times
  intHours = 0
  intMinutes = 0
  intSeconds = 0
  If Not objTime is Nothing Then
      If IsDate(objTime) Then
         intHours = Hour(objTime)
         intMinutes = Minute(objTime)
         intSeconds = Second(objTime)
      End If
  End If
  Dim datOutput as Date
  datOutput = DateAdd("h", intHours, datOutput)
  datOutput = DateAdd("n", intMinutes, datOutput)
  datOutput = DateAdd("s", intSeconds, datOutput)
  Return datOutput
End Function
```

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C# Global Script Function Examples

The following C# example functions can be defined in a global script, then used in replication scripts and expressions to modify target field values during replication. For detailed steps on how to define a Global Script function, check Writing a Function to Use in Scripts and Expressions.

Accessing Values Using a Different Database Connection

If your replication needs record values which are accessible only by opening a separate database connection and running a query there, you can write the following script in the Global Script Editor, then call the script as indicated below.

The GetQueryValue function retrieves the first returned value from the passed in connection and query. If the parameters are illegal, the query returns an error or the query does not return a value, the function returns System.DBNull.Value.

```
public object GetQueryValue(IDbConnection objConnection, String
strQuery)
{
   // If a parameter is null, return a null value
   if (objConnection == null || strQuery == "")
       return System.DBNull.Value;
   // Declare variables that might be used
   IDbCommand cmd = null;
   IDataReader reader = null;
   object objValue = System.DBNull.Value;
   // Use the Try block to capture any exceptions that might be gen-
erated
   try
   {
    // Use a SyncLock to make sure this function is the only user of
the
    // connection since the  source or target connection might be in
use.
```

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```
      lock (objConnection)
      {
        // Create and execute the select to get the specified value
        cmd = objConnection.CreateCommand();
        cmd.CommandText = strQuery;
        reader = cmd.ExecuteReader();
        // If we can read from the reader, the record is already there.
        // Get the information
         if (reader.Read()){
            objValue = reader.GetValue(0);
          }
          // If there are no exceptions so far, return the value
          reader.Close();
          reader = null;
          cmd.Dispose();
          return objValue;
       }
       catch (Exception ex)
       {
         // Output exceptions to the log
          IGlobalScript.AddLog("Exception in GetQueryValue: " + ex.ToString(),
0);
       }
       finally
        {
        if (!(reader == null))
            reader.Close();
            if (!(cmd == null))
```

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```
                cmd.Dispose();
            //Return System.DBNull.Value because an exception has been gen-
erated
            //if this point is reached.
        }
  return System.DBNull.Value;
}
```

Calling the Script from a Mapping Expression

1. If you are using the function in an existing replication, either stop the Replication Agent or disable the replication.
2. For an existing replication, right-click on the replication and choose **Replication Properties**, then click **Mapping** to display the Mapping Editor. For new replications, perform the following steps when you get to the mapping portion of replication creation.
3. Right-click on the target field that will be using the generated value and choose **Map to Expression**.
4. In the Expression Generator window, expand the User Functions folder and click on (all) to see if your function is listed.
   If the function is not displayed, check to make sure that you have used the proper Public Shared qualifier for the function. See Writing a Function to Use in Scripts and Expressions for more information.
5. Type an expression similar to the following in the Expression Editor. Modify the SELECT statement to retrieve the information you need.

```
GlobalScript.GetQueryValue(DBRS.SourceConnection, "SELECT Capital FROM
Capitals WHERE abbrv='" + [ABBRV] + "'")
```

6. Click**OK**to close the Expression Generator window.
7. Click **OK** to close the Mapping window.
8. Click **OK** to close the Replication Properties window.
9. Either start the Replication Agent or enable the replication to test that your function is working.

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Date Conversion

Define this function in the Global Script Editor, then call it by mapping the source field to an expression on the target field. The expression would be DateConvert([DT]), where DT is the name of the source field. The DT field should have the **Use Unmapped** option checked.

```
public DateTime DateConvert(int intDate)
{
  int cyy;
  int yyyy;
  int mm;
  int dd;
  cyy = (int)(intDate / 10000);
  mm = (int)((intDate - cyy * 10000) / 100);
  dd = intDate % 100;
  if (cyy < 100)
     yyyy = 1900 + cyy;
   else
     yyyy = 2000 + (cyy % 100);
  DateTime dc = new DateTime(yyyy, mm, dd);
  return dc;
}
```

Julian Date Conversion

Define this function in the Global Script Editor, then call it by mapping the source field to an expression on the target field. The expression would be JulianToDate(obj), where obj is the name of the source field. The source field should have the **Use Unmapped** option checked. This function takes a numeric Julian date in the format YYYDDD where YYY is the number of years since 1900 and DDD is the day of the year and returns a VB.Net date value or Null if the original value was null.

```
public object JulianToDate(object obj)
{
```

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```
if (obj == null)
    return null;
int intObj = Convert.ToInt32(obj);
int intYears;
intYears = intObj / 1000;
int intDays;
intDays = (intObj - intYears * 1000) - 1;
DateTime datDate = new DateTime();
datDate = Convert.ToDateTime("1/1/" + (1900 + intYears)).AddDays
(intDays);
return datDate;
}
```

Combine Date and Time Fields

Define this function in the Global Script Editor, then call it by mapping the source field to an expression on the target field. The expression would be CombineDateTime(objDate, objTime), where objDate is the name of the date source field and objTime is the name of the time source field. The source fields should have the **Use Unmapped** option checked.

```
public object CombineDateTime(String objDate, System.DateTime objTime)
{
  // If the date object is nothing return a null value
  if (objDate == null)
     return System.DBNull.Value;
  // To return a time of midnight for null times, remove this line
  if (objTime == null)
    return System.DBNull.Value;
  // If not a legal date, return a null value
  if (IsDate(objDate))
    return System.DBNull.Value;
```

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```
  int intHours;
  intHours = objTime.Hour;
  int intMinutes;
  intMinutes = objTime.Minute;
  int intSeconds;
  intSeconds = objTime.Second;
  DateTime datOutput;
  datOutput = DateTime.Now.AddDays(intHours);
  datOutput = DateTime.Now.AddDays(intMinutes);
  datOutput = DateTime.Now.AddDays(intSeconds);
  return datOutput;
}
```

Time Function that Handles Null Values

Define this function in the Global Script Editor, then call it by mapping the source field to an expression on the target field. The expression would be SafeTimeValue(objTime), where objTime is the name of the time source field. The source field should have the **Use Unmapped** option checked. This function can be used to replace the built in TimeValue function because it checks for null values. When a record is deleted on SQL Server, only the primary key is replicated so when an attempt is made to modify the time value, the TimeValue routine fails because it has been passed a null value.

```
public object SafeTimeValue(System.DateTime objTime)
{
  int intHours = 0;
  int intMinutes = 0;
  int intSeconds = 0;
  // Return a time of midnight for null or illegal times
  if (objTime != null)
  {
   if (IsDate(objTime.ToString()))
```

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```
    {
      intHours = objTime.Hour;
      intMinutes = objTime.Minute;
      intSeconds = objTime.Second;
    }
  }
  System.DateTime datOutput = default(System.DateTime);
  datOutput = DateTime.Now.AddDays(intHours);
  datOutput = DateTime.Now.AddDays(intMinutes);
  datOutput = DateTime.Now.AddDays(intSeconds);
  return datOutput;
}
```

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Writing a Function to use in Scripts and Expressions

Even though you can use the full range of C# or VB .NET syntax when writing a Syniti DR script, there are times when you need to write a custom function to use in scripts or expressions. You can use the Global Script Editor to write and compile the function, then call it from a replication script or expression. Here is an example in VB.NET of how you might write and use a function that trims values and accepts null values:

```
Public Shared Function SafeTrim(objString as Object) as Object
   'If the parameter is null return a null value
   If objString Is Nothing Then
      Return System.DBNull.Value
   End If
   Return Trim(objString.ToString())
End Function
```

1. In the Management Center Metadata Explorer, select the metadata where you want to use the function.
2. From the right mouse button menu, choose **Global Script**.
   The Global Script Editor opens to display a stub:

```
Imports Microsoft.VisualBasic
Imports DBMotoPublic
Imports DBMotoScript
Namespace DBRS
    Public Class GlobalScript : Inherits IGlobalScript
    End Class
    Public Class MappingRule : Inherits IMappingRule
    End Class
    Public Class GlobalEvents : Inherits IGlobalEvents
    End Class
End Namespace
```

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3. Type your function between the ”Public Class GlobalScript : Inherits IGlobalScript” line and the corresponding ”End Class” line so that it looks as follows:

```
Imports Microsoft.VisualBasic
Imports DBMotoPublic
Imports DBMotoScript
Namespace DBRS
    Public Class GlobalScript : Inherits IGlobalScript
         Public Shared Function SafeTrim(objString as Object) as Object
           'If the parameter is null return a null value
           If objString Is Nothing Then Return System.DBNull.Value
           Return Trim(objString.ToString())
         End Function
    End Class
    Public Class MappingRule : Inherits IMappingRule
    End Class
    Public Class GlobalEvents : Inherits IGlobalEvents
    End Class
End Namespace
```

4. If you have added any libraries to the list of imports in the script, click to open the References dialog and add the path to the library.

5. Click **Compile** to check your script syntax.
   Any script problems are displayed in a separate dialog.

6. Correct any syntax errors.

Now you can use the function from a replication script or expression. The steps below show you how to use a function in an expression.

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1. If you are using the function in an existing replication, either stop the Replication Agent or disable the replication.
2. For an existing replication, right-click on the replication and choose **Replication Properties**, then click **Mapping** to display the Mapping Editor. For new replications, perform the following steps when you get to the mapping portion of replication creation.
3. In the left hand pane of the Mapping Editor, right-click on each field that will be used as a parameter for the function and make sure **Use Unmapped** is checked. If it is not checked, select the menu item to check it.
4. Right-click on the target field that will be using the generated value and choose **Map to Expression**.
5. In the Expression Generator window, expand the User Functions folder and click on (all) to see if your function is listed.
   If the function is not displayed, check to make sure that you have used the proper Public Shared qualifier for the function. See step 3 above for more information.
6. Double-click on the function name to use it in the Expression Editor.
7. Either type in the names of the fields you want to use in the function or expand Values, then Fields and double click on each field name to add it to the Expression Editor. Note that field names should be enclosed in square brackets [] as in the example below. In this case, the value of the field MyText is being passed to the function SafeTrim (defined in step 3 above).

   ```
   SafeTrim([MyText])
   ```

8. Click **OK** to close the Expression Generator window.
9. Click **OK** to close the Mapping window.
10. Click **OK** to close the Replication Properties window.
11. Either start the Replication Agent or enable the replication to test that your function is working.

Related Topics

Global Script Function Examples

Writing a Global Script

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Replication Script Events

The following events can be handled as part of a replication script.

Reader Events	Writer Events
In the order they are called: 1. Refresh_onPrepareRefresh (Refresh only) or LogReader_onPrepareMirroring (Mirroring only) 2. Record_onBeforeMapping 3. Record_onAfterMapping 4. Replication_onConflict (Synchronization only) 5. Replication_onLateConflict (Synchronization only)	In the order they are called: 1. Refresh_onBeforeRefresh (Refresh only) 2. Refresh_onBeforeTruncate (Refresh only) 3. Refresh_onAfterTruncate (Refresh only) 4. LogReader_onBeforeMirroring (Mirroring only) 5. Record_onBeforeExecute 6. Record_onExecuteError (Defined in the global script) 7. Record_onAfterExecute (Not called if record execution failed) 8. LogReader_onReceiverChanged (Mirroring only) 9. Refresh_onAfterRefresh (Refresh only) 10. LogReader_onAfterMirroring (Mirroring only) 11. Replication_onError (Defined in the global script)

For more about reader and writer events, check Managing Reader and Writer Events in a Script.

LogReader_onPrepareMirroring

This event is fired before a mirroring operation is built and allows you to perform such operations as cancel the mirroring, record the mirroring start time and so on.

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VB.NET syntax

```
Public Overrides Sub LogReader_onPrepareMirroring(ByRef CancelMirroring
As Boolean)
```

C# syntax

```
public override void LogReader_onPrepareMirroring(ref bool CancelMir-
roring)
```

Parameters

- CancelMirroring: A flag that allows you to cancel the mirroring operation for which the event is fired. The default value is False. Set the flag to True to cancel mirroring.

Example [VB.NET syntax]

```
Public Overrides Sub LogReader_onPrepareMirroring(ByRef CancelMirroring
As Boolean)
    Dim bNeedCancel As Boolean
    ' TODO:
    ' check some condition by which the mirroring would need to be can-
celed
    ' and applying the result to the bNeedCancel variable
    If bNeedCancel Then
       CancelMirroring = True
    End If
End Sub
```

Example [C# syntax]

```
public override void LogReader_onPrepareMirroring(ref  bool CancelMir-
roring)
{
```

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```
  bool bNeedCancel = false;
  // TODO:
  // check some condition by which the mirroring would need to be can-
celed
  // and applying the result to the bNeedCancel variable
  if (bNeedCancel) {
     CancelMirroring = true;
     }
}
```

LogReader_onBeforeTransactionsRead

Now LogReader_onBeforeMirroring. On installation of v 6.1, all scripts are updated to use the new event name LogReader_onBeforeMirroring

LogReader_onBeforeMirroring

This event will be activated only if you have defined a mirroring or synchronization replication which accesses the database transaction log. The event is fired immediately before attempting to read the transaction log.

VB.NET syntax

```
Public Overrides Sub LogReader_onBeforeMirroring (ByVal bSource As
Boolean)
```

C# syntax

```
public override void LogReader_onBeforeMirroring(bool bSource)
```

Parameters

- bSource : When set to True, the event is related to the source connection. When set to False the event is related to the target

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Example [VB.NET syntax]

```
Public Overrides Sub LogReader_onBeforeMirroring(bSource As Boolean)
     AddLog("BeforeMirroring", 0)
End Sub
```

Example [C# syntax]

```
public override void LogReader_onBeforeMirroring(bool bSource)
{
   GlobalScript.AddLog("BeforeMirroring", 0);
}
```

LogReader_onAfterMirroring

This event will be activated only if you have defined a mirroring or synchronization replication which accesses the database transaction log. The event is fired immediately after reading the transaction log.

VB.NET syntax

```
Public Overrides Sub LogReader_onAfterMirroring (ByVal bSource As
Boolean)
```

C# syntax

```
public override void LogReader_onAfterMirroring(bool bSource)
```

Parameters

- bSource : When set to True, the event is related to the source connection. When set to False the event is related to the target

Example [VB.NET syntax]

```
Public Overrides Sub LogReader_onAfterMirroring(bSource  As Boolean)
    AddLog("AfterMirroring",  0)
End Sub
```

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Example [C# syntax]

```
public override void LogReader_onAfterMirroring(bool bSource)
{
    GlobalScript.AddLog("AfterMirroring", 0);
}
```

LogReader_onReceiverChanged

This event will be activated only if you have defined a mirroring or synchronization replication from Db2/400 which accesses the Db2 journal. Event fired when the iSeries receiver changes. This event could be used to delete an old receiver. However it should be used carefully especially when you have more than one replication sharing the same journal: you don't want to delete a receiver when one replication has changed it if there are other replications still using it. The best approach is to configure the iSeries to delete old receivers, for example, configuring it to keep only the last 2 receivers. Check the Help Center article on Journals and Receivers for more about receivers.

VB.NET syntax

```
Public Overrides Sub LogReader_onReceiverChanged (sOldRecvLib As
String,
                    sOldRecvName As String, sNewRecvLib As String,
sNewRecvName As String)
```

C# syntax

```
public override void LogReader_onReceiverChanged(string sOldRecvLib,
                          string sOldRecvName, string sNewRecvLib,
string sNewRecvName)
```

Parameters

- sOldRecvLib: The old receiver library name

- sOldRecvName: The old receiver name

- sNewRecvLib: The new receiver library name

- sNewRecvName: The new receiver name

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Example [VB.NET syntax]

```
Public Overrides Sub LogReader_onReceiverChanged(sOldRecvLib As String,
sOldRecvName As String,
                            sNewRecvLib As String, sNewRecvName As
String)
    AddLog("Receiver Changed: OLD = " + sOldRecvLib+"/"+sOldRecvName+"
                NEW = "+sNewRecvLib+"/"+sNewRecvName , 0)
End Sub
```

Example [C# syntax]

```
public override void LogReader_onReceiverChanged(string sOldRecvLib,
string sOldRecvName,
                                      string sNewRecvLib, string
sNewRecvName)
{
   GlobalScript.AddLog("Receiver Changed: OLD = " + sOldRecvLib + "/" +
sOldRecvName + "
                            NEW = " + sNewRecvLib + "/" + sNewRecvName,
0);
}
```

Record_onBeforeMapping

Event fired right before applying the mapping on the source table columns.

VB.NET syntax

```
Public Overrides Sub Record_onBeforeMapping (recSource As IRecord,
ByRef  AbortRecord As Boolean,
                                                ByRef Dis-
ableReplication As Boolean)
```

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C# syntax

```
public override void Record_onBeforeMapping(IRecord recSource, ref bool
AbortRecord,
                                                ref bool Dis-
ableReplication)
```

Parameters

- recSource: An IRecord object that provides access to source record data, including the intended operation type (UPDATE, INSERT or DELETE)

- AbortRecord: By default this is set to False. If you set it to True, the record will be skipped during replication.

- DisableReplication: By default this is set to False. If you set it to True, the replication will be disabled.

Example [VB.NET syntax]

```
' For each new inserted record, skip the replication if  COMPANYNAME =
'TEST'
Public Overrides Sub Record_onBeforeMapping(recSource As IRecord, ByRef
AbortRecord As Boolean,
                                                    ByRef Dis-
ableReplication As Boolean)
    Dim obj As Object
    If recSource.OperationType = enmOperationType.Insert Then
         obj = recSource.GetValueAfter("COMPANYNAME")
         If obj Is Nothing OR IsDBNull(obj) Then
            Return
         End If
         If obj.ToString() = "TEST" Then
            AbortRecord = True
         End If
```

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```
    End If
End Sub
```

Example [C# syntax]

```
// For each new inserted record,  skip the replication if COMPANYNAME =
'TEST'
public override void Record_onBeforeMapping(IRecord recSource, ref bool
AbortRecord,
                                                ref bool Dis-
ableReplication)
{
   object obj = null;
   if (recSource.OperationType == enmOperationType.Insert) {
       obj = recSource.GetValueAfter("COMPANYNAME");
       if (obj == null | Information.IsDBNull(obj)) {
          return;
       }
       if (obj.ToString() == "TEST") {
          AbortRecord = true;
       }
   }
}
```

Record_onAfterMapping

Event fired right after applying the mapping on the source table columns.

VB.NET syntax

```
Public Overrides Sub Record_onAfterMapping (recSource As IRecord,
recTarget As IRecord,
```

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```
                    ByRef AbortRecord As Boolean, ByRef Dis-
ableReplication As Boolean)
```

C# syntax

```
public override void Record_onAfterMapping(IRecord recSource, IRecord
recTarget, ref bool AbortRecord,
                                           ref bool Dis-
ableReplication)
```

Parameters

- recSource: An IRecord object that provides access to source record data, including the intended operation type (UPDATE, INSERT or DELETE)

- recTarget: An IRecord object that provides access to target record data, including the intended operation type (UPDATE, INSERT or DELETE)

- AbortRecord: By default this is set to False. If you set it to True, the record will be skipped during replication.

- DisableReplication: By default this is set to False. If you set it to True, the replication will be disabled.

Example [VB.NET syntax]

```
' For each new inserted record, replicate the field in  column 0 upper-
case
Public Overrides Sub Record_onAfterMapping(recSource As IRecord,
recTarget As IRecord,
              ByRef AbortRecord As Boolean, ByRef DisableReplication As
Boolean)
     If recSource.OperationType = enmOperationType.Insert Then
        if Not recTarget.GetValueAfter(0) Is Nothing Then
           recTarget.SetValueAfter(0, recTarget.GetValueAfter(0).ToUp-
per)
        End if
```

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```
    End If
End Sub
```

Example [C# syntax]

```
// For each new inserted record, replicate the field in column 0 upper-
case
public override void Record_onAfterMapping(IRecord recSource, IRecord
recTarget, ref bool AbortRecord,
                                           ref bool Dis-
ableReplication)
{
   if (recSource.OperationType == enmOperationType.Insert) {
       if ((recTarget.GetValueAfter(0) != null)) {
           recTarget.SetValueAfter(0, recTarget.GetValueAfter(0).ToUp-
per);
       }
   }
}
```

Record_onBeforeExecute

Event triggered right before changes to the record are executed at the target site. Note that this event and Record_onAfterExecute no longer have access to the source record values. Therefore, if you need to perform operations using the source value, use the Record_OnAfterMapping event instead.

Events associated with the execution phase of replication are run using a different thread from events associated with the mapping phase of replication. If you want the event to be triggered at the closest possible time to the actual replication of the record, you should use Record_onBeforeExecute or Record_onAfterExecute.

VB.NET syntax

```
Public Overrides Sub Record_onBeforeExecute (recTarget As IRecord,
AbortRecord As Boolean,
```

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```
                                                    ByRef Dis-
ableReplication As Boolean)
```

C# syntax

```
public override void Record_onBeforeExecute(IRecord recTarget, bool
AbortRecord, ref bool DisableReplication)
```

Parameters

- recTarget: An IRecord object that provides access to target record data, including the intended operation type (UPDATE, INSERT or DELETE)

- AbortRecord: By default this is set to False. If you set it to True, the record will be skipped during replication.

- DisableReplication: By default this is set to False. If you set it to True, the replication will be disabled.

Example [VB.NET syntax]

```
' For each inserted and updated record, skip the replication if the new
Value assigned to column 0 is 'TEST'
Public Overrides Sub Record_onBeforeExecute(recTarget As IRecord, ByRef
AbortRecord As Boolean,
                                                ByRef DisableReplication
As Boolean)
   Dim obj As Object
   If recTarget.OperationType = enmOperationType.Insert
      Or recTarget.OperationType = enmOperationType.Update Then
          obj = recTarget.GetValueAfter(0)
          if obj Is Nothing OR IsDBNull(obj) Then
             return
          End if
          if obj.ToString() = "TEST" Then
             AbortRecord = True
```

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```
            End if
    End If
End Sub
```

Example [C# syntax]

```
// For each inserted and updated record, skip the replication if the
new value assigned to column 0 is 'TEST'
public override void Record_onBeforeExecute(IRecord recTarget, ref bool
AbortRecord, ref bool DisableReplication)
{
    object obj = null;
    if (recTarget.OperationType == enmOperationType.Insert | recTar-
get.OperationType == enmOperationType.Update) {
        obj = recTarget.GetValueAfter(0);
        if (obj == System.DBNull.Value) {
            return;
        }
        if (obj.ToString() == "TEST") {
            AbortRecord = true;
        }
    }
}
```

Record_onAfterExecute

Event triggered right after changes to the record are executed at the target site. Note that this event and Record_onBeforeExecute no longer have access to the source record values. Therefore, if you need to perform operations using the source value, use the Record_OnAfterMapping event instead.

Events associated with the execution phase of replication are run using a different thread from events associated with the mapping phase of replication. If you want the event to be triggered at the closest possible time to the actual

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replication of the record, you should use Record_onBeforeExecute or Record_onAfterExecute. Note that this event is generated only if the record operation succeeds and not at all if the record operation fails.

VB.NET syntax

```
Public Overrides Sub Record_onAfterExecute (recTarget As IRecord,
Failed  As Boolean,
                                                ByRef DisableReplication
As Boolean)
```

C# syntax

```
public override void Record_onAfterExecute(IRecord recTarget, bool
Failed, ref bool DisableReplication)
```

Parameters

- recTarget: An IRecord object that provides access to target record data, including the intended operation type (UPDATE, INSERT or DELETE)

- Failed: A read-only input parameter. When True, the record operation failed.

- DisableReplication: By default this is set to False. If you set it to True, the replication will be disabled.

Example [VB.NET syntax]

```
Public Overrides Sub Record_onAfterExecute(recTarget As IRecord, Failed
As Boolean,
                                                ByRef DisableReplication As
Boolean)
   If Not Failed Then
      AddLog("Replication of single record succeeded", 0)   Else
      AddLog("Replication of single record failed", 2)
   End If
End Sub
```

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Example [C# syntax]

```
public override void Record_onAfterExecute(DBMotoPublic.IRecord recTar-
get, bool Failed,
                                           ref bool Dis-
ableReplications)
{
    if (!(Failed)){
        GlobalScript.AddLog("Replication of single record succeeded",
0);
    }
    else {
        GlobalScript.AddLog("Replication of single record failed", 2);
    }
 }
```

Refresh_onBeforeTruncate

Event fired right before the truncation of the target table. If the value of the variable CancelTruncate is set to True, no truncation will occur.

VB.NET syntax

```
Public Overrides Sub Refresh_onBeforeTruncate (ByRef CancelTruncate As
Boolean, ByRef Filter As System.String)
```

C# syntax

```
public override void Refresh_onBeforeTruncate(ref bool CancelTruncate,
ref System.String Filter)
```

Parameters

- CancelTruncate: indicates if the truncation has to be canceled.

- Filter: a string containing a SQL WHERE condition to be used as a filter to determine which records to truncate.

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Example [VB.NET syntax]

```
Public Overrides Sub Refresh_onBeforeTruncate(ByRef CancelTruncate As
Boolean, ByRef Filter As System.String)
   AddLog("Refresh_onBefore Started", 0)
   Filter = " ID < 10 "
   AddLog("Refresh_onBeforeTruncate Finished", 0)
End Sub
```

Example [C# syntax]

```
public override void Refresh_onBeforeTruncate(ref bool CancelTruncate,
ref System.String Filter)
{
   AddLog("Refresh_onBefore Started", 0);
   Filter = " ID < 10 ";
   AddLog("Refresh_onBeforeTruncate Finished", 0);
}
```

Refresh_onAfterTruncate

Event fired right after the truncation of the target table.

VB.NET syntax

```
Public Overrides Sub Refresh_onAfterTruncate ()
```

C# syntax

```
public override void Refresh_onAfterTruncate()
```

Example [VB.NET syntax]

```
Public Overrides Sub Refresh_onAfterTruncate()
    AddLog("Truncate Finished", 0)
```

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```
End Sub
```

Example [C# syntax]

```
public override void Refresh_onAfterTruncate()
{
    GlobalScript.AddLog("Truncate Finished", 0);
}
```

Refresh_onPrepareRefresh

Event fired before refresh operation is built to allow the inclusion of a filter (WHERE condition). This is an alternative to providing a filter in the replication properties and allows you to change the filter each time a refresh is performed.

VB.NET syntax

```
Public Overrides Sub Refresh_onPrepareRefresh(ByRef CancelRefresh As
System.Boolean, ByRef Filter As System.String)
```

C# syntax

```
public override void Refresh_onPrepareRefresh(ref bool CancelRefresh,
ref System.String Filter)
```

Parameters

- Filter: a string containing a SQL WHERE condition to be used as a filter when performing a refresh.

- CancelRefresh: A flag that allows you to cancel the refresh operation for which the event is fired. The default value is False. Set the flag to True to cancel a refresh.

Example [VB.NET syntax]

This example shows how to define an incremental refresh by using the Refresh_onPrepareRefresh event.

NOTE: this sample works only with inserted data. Updated and deleted records are not correctly replicated using the incremental refresh.

1. Define a source table in this way:

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ID integer (incremental)

Name varchar(20)

2. Define a replication in refresh mode, scheduled to run recurrently.

3. Define the following replication script:

```
Namespace DBRS
    Public Class ReplicationScript : Inherits IReplicationScript
        ' create a variable m_LastID to store the last inserted id
        Public m_LastID As Long
        Public Overrides Sub Refresh_onBeforeTruncate(ByRef CancelTrun-
cate As Boolean)
            ' truncate the target table only the first time
            If m_LastID > 0 Then
              CancelTruncate = True
            End If
        End Sub
        Public Overrides Sub Record_onAfterExecute(recTarget As IRe-
cord)
            ' save the last inserted id
            If recTarget.OperationType = enmOperationType.Insert Then
              m_LastID = recTarget.GetValueAfter("ID")
            End If
        End Sub
        Public Overrides Sub Refresh_onPrepareRefresh(ByRef Filter As
String)
          ' prepare the filter for the next refresh
          If m_LastID > 0 Then
            Filter = "ID > " + m_LastID.ToString()
```

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```
          End If
        End Sub
    End Class
End Namespace
```

C# Syntax

```
using System;
using System.Data;
using DBMotoPublic;
using DBMotoScript;
namespace DBRS
{
    public class ReplicationScript : IReplicationScript
    {
        long m_LastID = 0; //create a variable m_LastID to store the
last inserted id
        public override void Refresh_onBeforeTruncate(ref bool
CancelTruncate)
        {
           // truncate the target table only the first time
           if (m_LastID > 0)  {
              CancelTruncate = true;
              }
        }
        public override void Record_onAfterExecute(DBMotoPublic.IRecord
recTarget, bool Failed)
        {
           // save the last inserted id
           if (recTarget.OperationType == enmOperationType.Insert) {
```

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```
                m_LastID = (long) recTarget.GetValueAfter("ID");
            }
        }
        public override void Refresh_onPrepareRefresh(ref bool CancelRe-
fresh, ref string Filter)
        {
           // prepare the filter for the next refresh
           if (m_LastID > 0) {
               Filter = "ID > " + m_LastID.ToString();
           }
       }
   }
}
```

Refresh_onBeforeRefresh

Event fired right before starting the refresh.

VB.NET syntax

```
Public Overrides Sub Refresh_onBeforeRefresh ()
```

C# syntax

```
public override void Refresh_onBeforeRefresh()
```

Example [VB.NET syntax]

```
Public Overrides Sub Refresh_onBeforeRefresh()
    AddLog("Refresh Started", 0)
End Sub
```

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Example [C# syntax]

```
public override void Refresh_onBeforeRefresh()
{
   GlobalScript.AddLog("Refresh  Started", 0);
}
```

Refresh_onAfterRefresh

Event fired right after the execution of the refresh.

VB.NET syntax

```
Public Overrides Sub Refresh_onAfterRefresh ()
```

C# syntax

```
public override void Refresh_onAfterRefresh()
```

Example [VB.NET syntax]

```
Public Overrides Sub Refresh_onAfterRefresh()
    AddLog("Refresh Finished", 0)
End Sub
```

Example [C# syntax]

```
public override void Refresh_onAfterRefresh()
{
   GlobalScript.AddLog("Refresh Finished", 0);
}
```

Replication_onConflict

This event is generated when a collision happens on a record during synchronization. A collision occurs when both the source and target database update/delete/insert the same record at the same time. The two records that generate the collision are passed as parameters to the event. The event function must resolve the collision by returning a new

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record that will be inserted. The record returned could be the source record, in this case the source connection wins the conflict, the target record (target wins), or a new record obtained merging the values of the two records.

VB.NET syntax

```
Public Overrides Function Replication_onConflict (ByRef recSource As
IRecord,
                              ByRef recTarget As IRecord) As IRecord
```

C# syntax

```
public override IRecord Replication_onConflict(IRecord recSource, IRe-
cord recTarget)
```

Parameters

- recSource: A record in the table defined by the source connection

- recTarget: A record in the table defined by the target connection

Returns: The record that will be inserted after executing the event function.

Example [VB.NET syntax]

```
Public Overrides Function Replication_onConflict(recSource As IRecord,
recTarget As IRecord) As IRecord
   AddLog("Conflict", 1)
End Function
```

Example [C# syntax]

```
public override IRecord Replication_onConflict(IRecord recSource, IRe-
cord recTarget)
{
   GlobalScript.AddLog("Conflict", 1);
}
```

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Replication_onLateConflict

This event is generated when a very specific type of collision occurs on a record during synchronization. It may occasionally happen that between the time the log/journal is read in preparation for replication and the changes are recorded in the tables involved, a transaction occurs in one of the tables. If the transaction conflicts with the newly entered changes (as a result of synchronization), this event is triggered so that you can determine how you want to handle the conflict. The event is triggered during the synchronization iteration following the one where the conflict actually occurred.

VB.NET syntax

```
Public Overrides Function Replication_onLateConflict (ByRef rec1 As IRe-
cord, ByRef rec2 As IRecord,
                                                        ByVal
bSource As Boolean) As IRecord
```

C# syntax

```
public override IRecord Replication_onLateConflict(ref IRecord rec1,
ref IRecord rec2, bool bSource)
```

Parameters

- rec1: The transaction that was missed because it occurred at a critical time during synchronization

- rec2: The Syniti DR transaction that occurred as a result of the synchronization replication

Note that rec1 and rec2 signify a conflict on the same table rather than a conflict between the tables involved in the synchronization.

- bSource: Boolean that when set to True means rec1 and rec2 were found to be in conflict in the table designated as a source table for the replication. When set to False, rec1 and rec2 occurred on the table designated as the target table for the replication.

Related Topics

Managing Reader and Writer Events in a Script
IRecord Interface
Replication Script Properties
Handling Events for INSERT, UPDATE and DELETE Operations

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Global Script Functions
Writing a Global Script
Writing a Replication Script
Writing Scripts with Visual Basic .NET
Replication Script Editor

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Handling Events for INSERT, UPDATE and DELETE Operations

When writing an event-handling function for a replication, you often need to consider which type of operation (INSERT, UPDATE, DELETE) is being performed during the replication. In your replication script, use the record's OperationType property to identify the type of operation being performed, as in the following VB.NET example.

```
Public Overrides Sub Record_onAfterMapping(recSource As IRecord, recTarget As IRecord, By Ref AbortRecord As Boolean)
  if (recSource.OperationType = enmOperationType.Update)
      AddLog(recSource.GetValueBefore(0), 0)
  End if
End Sub
```

Depending on the operation type, different functions for accessing source and target values are available.

INSERT Operations

Replication Types: Refresh (all records) and mirroring/synchronization (insert operations obtained from the transaction log)

Record Functions Available:

Source Record	Target Record
GetValueAfter (index)	GetValueAfter(index)
GetValueAfter(col)	GetValueAfter(col)
SetValueAfter(index, value)	SetValueAfter(index, value)
SetValueAfter(col, value)	SetValueAfter(col, value)

Note: Depending on the event function you are using, source or target record objects may not be available. Check the parameters for the event to see which objects you can use.

UPDATE Operations

Replication Types: Mirroring/synchronization (update operations obtained from the transaction log)

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Record Functions Available:

Source Record	Target Record
GetValueBefore (index)*	GetValueBefore (index)*
GetValueBefore (col)*	GetValueBefore(col)*
SetValueBefore(col, value)**	SetValueBefore(col, value)**
SetValueBefore (index, value)**	SetValueBefore (index, value)**
GetValueAfter (index)	GetValueAfter(index)
GetValueAfter(col)	GetValueAfter(col)
SetValueAfter(index, value)	SetValueAfter(index, value)
SetValueAfter(col, value)	SetValueAfter(col, value)

* Values before an operation are not always available in the log and therefore these functions may return Null.

** These functions are rarely used.

Note: Depending on the event function you are using, source or target record objects may not be available. Check the parameters for the event to see which objects you can use.

DELETE Operations

Replication Types: Mirroring/synchronization (delete operations obtained from the transaction log)

Record Functions Available:

Source Record	Target Record
GetValueBefore (index)*	GetValueBefore (index)*
GetValueBefore (col)*	GetValueBefore(col)*

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SetValueBefore(col, value)**	SetValueBefore(col, value)**
SetValueBefore (index, value)**	SetValueBefore (index, value)**

* Values before an operation are not always available in the log and therefore these functions may return Null.

** These functions are rarely used.

Note: Depending on the event function you are using, source or target record objects may not be available. Check the parameters for the event to see which objects you can use.

Related Topics

Global Script Functions

Replication Script Events

Replication Script Properties

IRecord Interface

Writing a Global Script

Writing a Replication Script

Writing Scripts with Visual Basic .NET

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Replication Script Properties

The following properties are for use in any function in a replication script.

SourceConnection
InternalSourceConnection
SourceConnectionName
SourceTableName
TargetConnection
InternalTargetConnection
TargetConnectionName
TargetTableName
GroupName
ReplicationName

SourceConnection

Returns the connection for the source table. A reference to assembly 'System.Data.dll' is required in the Reference dialog.

Syniti DR handles both the opening and the closing of the connection, but there are certain conditions (due to the use of threads in Syniti DR) under which you need to lock the connection. If you are using more than one reader event or more than one writer event in the same replication, and those events use a connection object, that connection object needs to be synchronized to avoid the use of the same object inside different threads. To synchronize objects you can use the command SyncLock in VB.NET or lock in C# as in the following examples:

VB.NET SyncLock Example

```
Dim conn as IDbConnection = Nothing
Dim cmd as IDbCommand = Nothing
Dim reader as IDataReader = Nothing
Try
   conn = SourceConnection
   SyncLock(conn)
      cmd = conn.CreateCommand
```

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```
      cmd.CommandText = "select count(*) from MARCO.dbo.EMP50"
      reader = cmd.ExecuteReader
      Dim iNumRecords = -1
      If reader.Read Then
         iNumRecords = reader.GetInt32(0)
      End If
      AddLog("Reader - Record in EMPNO: " & iNumRecords.ToString, 0)
   End SyncLock
   Catch ex As Exception
   AddLog("Exception in Record_onAfterMapping: " & ex.ToString,0)
   Finally
   if (not reader is Nothing) Then
      reader.Close
   End If
   if (not cmd is Nothing) Then
      cmd.Dispose
   End If
End Try
```

C# lock Example

```
public override void Record_onBeforeMapping(DBMotoPublic.IRecord
recSource, ref bool AbortRecord)
 {
   IDbConnection conn = null;
   IDbCommand cmd = null;
   IDataReader reader = null;
   try
   {
     conn = SourceConnection;
```

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```
      lock ((conn))
      {
         cmd = conn.CreateCommand();
         cmd.CommandText = "select count(*) from HITDB.dbo.EMP50";
         reader = cmd.ExecuteReader();
         int iNumRecords = -1;
         if (reader.Read())
         {
            iNumRecords = reader.GetInt32(0);
         }
         GlobalScript.AddLog("Reader - Record in EMPNO: " + iNumRe-
cords.ToString(), 0);
      }
   }
   catch (Exception ex)
   {
       GlobalScript.AddLog("Exception in Record_onAfterMapping: " +
ex.ToString(), 0);
    }
   finally
    {
      if (((reader != null)))
      {
         reader.Close();
      }
      if (((cmd != null)))
      {
         cmd.Dispose();
```

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```
      }
    }
 }
```

VB.NET syntax

```
Public SourceConnection As System.Data.IDbConnection
```

C# syntax

```
public System.Data.IDbConnection SourceConnection;
```

Example [VB.NET syntax]

```
Public Overrides Sub Record_onBeforeMapping(recSource As IRecord, ByRef
AbortRecord As Boolean)
   AddLog("SC connstring = " + SourceConnection.ConnectionString ,0)
   AddLog("SC timeout = " + SourceConnection.ConnectionTimeout.ToString
() ,0)
   AddLog("SC db = " + SourceConnection.Database ,0)
   AddLog("SC state = " + SourceConnection.State.ToString() ,0)
End Sub
```

Example [C# syntax]

```
public override void Record_onBeforeMapping(IRecord recSource, ref bool
AbortRecord)
{
   GlobalScript.AddLog("SC connstring = " + SourceCon-
nection.ConnectionString, 0);
   GlobalScript.AddLog("SC timeout = " + SourceCon-
nection.ConnectionTimeout.ToString(), 0);
   GlobalScript.AddLog("SC db = " + SourceConnection.Database, 0);
```

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```
   GlobalScript.AddLog("SC state = " + SourceConnection.State.ToString
(), 0);
}
```

InternalSourceConnection

Returns the .NET connection used internally by Syniti DR for accessing to the source and to the target database, unlike SourceConnection which returns as clone of the connection object used by the Replication Agent engine. This property is useful in cases where a statement must be executed using the same connection as the one used by the engine. WARNING: Use this property with great care because improper use may compromise the success of the replication. Any error generated by running a script using this connection will affect the Replication Agent and the replication process. For example if the connection is closed by the script, the engine will fail. Typically it is preferable to use the SourceConnection property.

VB.Net syntax

```
Public InternalSourceConnection As System.Data.IDbConnection
```

C# syntax

```
public System.Data.IDbConnection InternalSourceConnection;
```

Example [VB.NET syntax]

For the replication used in this example, the source database is IBM System i, and the target database is Microsoft SQL Server 2005. The source table contains an integer field which is mapped to a field with datatype Int Identity in SQL Server 2005. The Int Identity field is an auto number field so, without using a script such as the one below, the field in the source table which maps to the Int Identity field in the target will not replicated. Using the following script, the data in the source field will be replicated to the target field correctly.

```
   Public Overrides Sub Refresh_onBeforeRefresh()
     Dim conn as IDbConnection = Nothing
     Dim cmd as IDbCommand = Nothing
     Dim reader as IDataReader = Nothing
     Try
        conn = InternalTargetConnection
        cmd = conn.CreateCommand
```

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```
        cmd.CommandText = "SET IDENTITY_INSERT SAMPLE.dbo.TarEmp ON"
        reader = cmd.ExecuteReader
        Catch ex As Exception
           AddLog("Exception in Internal Target Connection: " &
ex.ToString,0)
        Finally
           if (not reader is Nothing) Then
              reader.Close
           End If
           if (not cmd is Nothing) Then
              cmd.Dispose
          End If
    End Try
  End Sub
```

Example [C# syntax]

For the replication used in this example, the source database is IBM System i, and the target database is Microsoft SQL Server 2005. The source table contains an integer field which is mapped to a field with datatype Int Identity in SQL Server 2005. The Int Identity field is an auto number field so, without using a script such as the one below, the field in the source table which maps to the Int Identity field in the target will not replicated. Using the following script, the data in the source field will be replicated to the target field correctly.

```
public override void Refresh_onBeforeRefresh()
{
  IDbConnection conn = null;
  IDbCommand cmd = null;
  IDataReader reader = null;
  try {
     conn = InternalTargetConnection;
     cmd = conn.CreateCommand;
```

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```
      cmd.CommandText = "SET IDENTITY_INSERT SAMPLE.dbo.TarEmp ON";
      reader = cmd.ExecuteReader;
      } catch (Exception ex) {
          GlobalScript.AddLog("Exception in Internal Target Connection:
" + ex.ToString, 0);
      } finally {
      if (((reader != null))) {
         reader.Close();
         }
      if (((cmd != null))) {
         cmd.Dispose();
         }
     }
}
```

SourceConnectionName

Returns the name of the source connection as specified in Syniti DR.

VB.NET syntax

```
Public SourceConnectionName As String
```

C# syntax

```
public string SourceConnectionName;
```

SourceTableName

Returns the name of the source table used in the replication.

VB.NET syntax

```
Public SourceTableName As String
```

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C# syntax

```
public string SourceConnectionName;
```

TargetConnection

Returns the connection for the Target table. A reference to assembly 'System.Data.dll' is required in the Reference dialog.

Syniti DR handles both the opening and the closing of the connection, but there are certain conditions (due to the use of threads in Syniti DR) under which you need to lock the connection. See the SourceConnection property for more information.

VB.NET syntax

```
Public TargetConnection As System.Data.IDbConnection
```

C# syntax

```
public System.Data.IDbConnection TargetConnection;
```

Example [VB.NET syntax]

```
Public Overrides Sub Record_onBeforeMapping(recSource As IRecord, ByRef
AbortRecord As Boolean)
   AddLog("TC connstring = " + TargetConnection.ConnectionString ,0)
   AddLog("TC timeout = " + TargetConnection.ConnectionTimeout.ToString
() ,0)
   AddLog("TC db = " + TargetConnection.Database ,0)
   AddLog("TC state = " + TargetConnection.State.ToString() ,0)
End Sub
```

Example [C# syntax]

```
public override void Record_onBeforeMapping(IRecord recSource, ref bool
AbortRecord)
```

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```
{
   GlobalScript.AddLog("TC connstring = " + Tar-
getConnection.ConnectionString, 0);
   GlobalScript.AddLog("TC timeout = " + Tar-
getConnection.ConnectionTimeout.ToString(), 0);
   GlobalScript.AddLog("TC db = " + TargetConnection.Database, 0);
   GlobalScript.AddLog("TC state = " + TargetConnection.State.ToString
(), 0);
}
```

InternalTargetConnection

Returns the .NET connection used internally by Syniti DR for accessing to the source and to the target database, unlike TargetConnection which returns as clone of the connection object used by the Replication Agent engine. This property is useful in cases where a statement must be executed using the same connection as the one used by the engine. WARNING: Use this property with great care because improper use may compromise the success of the replication. Any error generated by running a script using this connection will affect the Replication Agent and the replication process. For example if the connection is closed by the script, the engine will fail. Typically it is preferable to use the TargetConnection property.

VB.Net syntax

```
Public InternalTargetConnection As System.Data.IDbConnection
```

C# syntax

```
public System.Data.IDbConnection InternalTargetConnection;
```

Example

See the TargetConnection property.

TargetConnectionName

Returns the name of the target connection as specified in Syniti DR.

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VB.NET syntax

```
Public TargetConnectionName As String
```

C# syntax

```
public string TargetConnectionName;
```

TargetTableName

Returns the name of the target table used in the replication.

VB.NET syntax

```
Public TargetTableName As String
```

C# syntax

```
public string TargetTableName;
```

GroupName

Returns the name, if any, of the group to which the replication belongs.

VB.NET syntax

```
Public GroupName As String
```

C# syntax

```
public string GroupName;
```

ReplicationName

Returns the name of the replication.

VB.NET syntax

```
Public ReplicationName As String
```

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C# syntax

```
public string ReplicationName;
```

Related Topics

Replication Script Events

Handling Events for INSERT, UPDATE and DELETE Operations

IRecord Interface

Global Script Functions

Writing a Global Script

Writing a Replication Script

Writing Scripts with Visual Basic .NET

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IRecord Interface

Used as a parameter when writing scripts to handle certain replication events or the Record_OnExecuteError global event, this interface provides access to records identified for replication either via transaction logs/journals during mirroring and synchronization replications, or via mapped source table records during refresh replications. Using the Get and Set methods, you can access and/or modify column values.

ColumnCount (Property)
OperationType (Property)
IsSource (Property)
IsPrimaryKey
enmLogFields(Enumerator)
enmOperationType (Enumerator)
GetValueBefore
GetValueAfter
SetValueBefore
SetValueAfter
GetLogValue
SetLogValue
GetType
GetDBType
GetPrecision
GetScale
GetLength
GetName

ColumnCount (Property)

The number of columns in the IRecord object, that is, it returns the number of mapped columns (within the current replication) in the table to which the IRecord is related.

VB.NET syntax

```
Public ReadOnly Property ColumnCount As Integer
```

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C# syntax

```
public int ColumnCount { get; }
```

Example [VB.NET syntax]

This example prints a message in the log to show how many mapped columns have been found before applying the mapping.

```
Public Overrides Sub Record_onBeforeMapping(recSource As IRecord, ByRef
AbortRecord As Boolean)
    AddLog("Column Count = " & recSource.ColumnCount, 0)

End Sub
```

Example [C# syntax]

This example prints a message in the log to show how many mapped columns have been found before applying the mapping.

```
public override void Record_onBeforeMapping(IRecord recSource, ref bool
AbortRecord)
{
   GlobalScript.AddLog("Column Count = " + recSource.ColumnCount, 0);
}
```

OperationType (Property)

A list of constants that define the type of SQL operation associated with the transaction represented in the record. This property is typically used when designing mirroring or synchronization replications which use a transaction log. It provides access to the transaction's SQL operation: INSERT, UPDATE, DELETE, CLEAR or Unknown. If setting up a refresh replication, the only operation type is INSERT. The datatype for this property is the enumerator enmOperationType.

VB.NET syntax

```
Public Property OperationType As enmOperationType
```

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C# syntax

```
public enmOperationType OperationType { get; set; }
```

Example [VB.NET syntax]

The example below checks to see if the operation being performed is an update before proceeding to add the value before changes apply to the Syniti DR log.

```
Public Overrides Sub Record_onAfterMapping(recSource As IRecord, recTar-
get As IRecord,
                                           ByRef AbortRecord As
Boolean)
  if (recSource.OperationType = enmOperationType.Update)
      AddLog(recSource.GetValueBefore(0), 0)
  End if
End Sub
```

Example [C# syntax]

The example below checks to see if the operation being performed is an update before proceeding to add the value before changes apply to the Syniti DR log.

```
public override void Record_onAfterMapping(DBMotoPublic.IRecord
recSource, DBMotoPublic.IRecord recTarget,
                                           ref bool AbortRecord)
{
    if (recSource.OperationType == enmOperationType.Update
    {
       GlobalScript.AddLog("" + recSource.GetValueBefore(0), 0);
    }
}
```

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enmOperationType (Enumerator)

The datatype for the OperationType property.

Value	Name	Description
0	Unknown	Not typically used
1	Insert	A SQL INSERT operation
2	Update	A SQL UPDATE operation
3	Delete	A SQL DELETE operation
4	Clear	For Db2/400 only. All values will be cleared from the record. This operation type is supported for mirroring replications only.
5	Internal	For internal use only.

IsSource (Property)

This property returns True when the record object has been generated while replicating a transaction **from** a connection defined under the Source node in the Management Center (often referred to as a source connection) **to** a connection defined under the Target node in the Management Center (target connection). In other words, all records replicated in a refresh or mirroring replication have this property set to True. In synchronization, it is set to True if the direction of the replication is source to target; False otherwise.

VB.NET syntax

```
Public Property IsSource as Boolean
```

C# syntax

```
public bool IsSource { get; set; }
```

Example [VB.NET syntax]

This sample function is defined in a synchronization replication and skips (i.e., doesn't propagate to the target) any Delete operations performed on the source table.

```
Public Overrides Sub Record_onBeforeExecute(recTarget As IRecord, ByRef
AbortRecord As Boolean)
```

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```
   If (recTarget.IsSource And recTarget.OperationType = enmOper-
ationType.Delete)  Then

      AbortRecord = True
   End If
End Sub
```

Example [C# syntax]

This sample function is defined in a synchronization replication and skips (i.e., doesn't propagate to the target) any Delete operations performed on the source table.

```
public override void Record_onBeforeExecute(IRecord recTarget, ref bool
AbortRecord)
{
  if ((recTarget.IsSource & recTarget.OperationType == enmOper-
ationType.Delete)) {
     AbortRecord = true;
  }
}
```

IsPrimaryKey

Provides a way to determine if a field is a primary key or part of a primary key.

VB.NET syntax

```
Public Function IsPrimaryKey (Index As Integer) As Boolean
Public Function IsPrimaryKey (ColumnName As String) As Boolean
```

C# syntax

```
public bool IsPrimaryKey(int Index)
public bool IsPrimaryKey(string ColumnName)
```

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Parameters

- Index: an integer that identifies the column for which you want to retrieve the primary key settings
- ColumnName: a string representing the column name for which you want to retrieve the primary key settings

Return value

Returns true if the field is part of the primary key.

Example [VB.NET syntax]

```
Public Overrides Sub Record_onAfterMapping(recSource As IRecord, recTar-
get As IRecord,
                                           ByRef AbortRecord As
Boolean)
   Dim T As Boolean
   T=recSource.IsPrimaryKey(1)
   AddLog("Is the second column a primary key? True or False:  " +
T.ToString, 0)
End Sub
```

Example [C# syntax]

```
public override void Record_onAfterMapping(IRecord recSource, IRecord
recTarget,
                                           ref bool AbortRecord)
{
   bool T = false;
   T = recSource.IsPrimaryKey(1);
   GlobalScript.AddLog("Is the second column a primary key? True or
False:  " + T.ToString, 0);
}
```

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GetValueBefore

Returns the value of the column indicated in the record before modification. If the value is not available in the transaction log, this function returns Null. Use this function in mirroring/synchronization replications if you want to retrieve a prior source or target value when the transaction log reports an UPDATE or DELETE operation on a record.

VB.NET syntax

```
Public Function GetValueBefore (sColName As String) As Object
Public Function GetValueBefore (iIndex As Integer) As Object
```

C# syntax

```
public object GetValueBefore(string sColName)
public object GetValueBefore(int iIndex)
```

Parameters

- sColName: name of the column to be referred to.
- iIndex: index of the column to be referred to.

Example [VB.NET syntax]

The example below checks to see if the operation being performed is a SQL UPDATE. If it is, the AddLog function is called to add the value of the first column (before any changes are applied) to the Syniti DR log. The column value is identified by calling GetValueBefore with an index of 0.

```
Public Overrides Sub Record_onAfterMapping(recSource As IRecord, recTar-
get As IRecord,
                                           ByRef AbortRecord As
Boolean)
   if (recSource.OperationType = enmOperationType.Update)
       AddLog(recSource.GetValueBefore(0), 0)
   End if
End Sub
```

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Example [C# syntax]

The example below checks to see if the operation being performed is a SQL UPDATE. If it is, the AddLog function is called to add the value of the first column (before any changes are applied) to the Syniti DR log. The column value is identified by calling GetValueBefore with an index of 0.

```
public override void Record_onAfterMapping(IRecord recSource, IRecord
recTarget, ref bool AbortRecord)
{
   if ((recSource.OperationType == enmOperationType.Update)) {
       GlobalScript.AddLog(recSource.GetValueBefore(0), 0);
    }
}
```

GetValueAfter

Returns the value of the column indicated in the record after modification. Use this function in refresh and mirroring/synchronization replications if you want to retrieve a source or target value for an INSERT operation or when the transaction log reports an UPDATE operation on a record.

VB.NET syntax

```
Public Function GetValueAfter (sColName As String) As Object
Public Function GetValueAfter (iIndex As Integer) As Object
```

C# syntax

```
public object GetValueAfter(string sColName)
public object GetValueAfter(int iIndex)
```

Parameters

- sColName: name of the column to be referred to.
- iIndex: index of the column to be referred to.

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Example [VB.NET syntax]

The example below checks to see if the operation being performed is a SQL UPDATE. If it is, the AddLog function is called to add the value of the CUSTOMERID column (after any changes are applied) to the Syniti DR log. The column value is identified by calling GetValueAfter with the column name, and the resulting value is converted to a string.

```
Public Overrides Sub Record_onAfterMapping(recSource As IRecord, recTar-
get As IRecord,
                                           ByRef AbortRecord As
Boolean)
    if (recSource.OperationType = enmOperationType.Update)
        AddLog("Value = " + recTarget.GetValueAfter
("CUSTOMERID").ToString(), 0)
    End if
End Sub
```

Example [C# syntax]

The example below checks to see if the operation being performed is a SQL UPDATE. If it is, the AddLog function is called to add the value of the CUSTOMERID column (after any changes are applied) to the Syniti DR log. The column value is identified by calling GetValueAfter with the column name, and the resulting value is converted to a string.

```
public override void Record_onAfterMapping(IRecord recSource, IRecord
recTarget, ref bool AbortRecord)
{
   if ((recSource.OperationType == enmOperationType.Update)) {
       GlobalScript.AddLog("Value = " + recTarget.GetValueAfter
("CUSTOMERID").ToString(), 0);
       }
}
```

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SetValueBefore

Sets the value of the column indicated in the record before modification. This is an unusual method to use, because setting a value in a record before changes apply may ultimately have no effect. The method is included primarily to provide a complete set of methods.

VB.NET syntax

```
Public Sub SetValueBefore (sColName As String, objValue As Object)
Public Sub SetValueBefore (iIndex As Integer, objValue As Object)
```

C# syntax

```
public void SetValueBefore(string sColName, object objValue)
public void SetValueBefore(int iIndex, object objValue)
```

Parameters

- sColName: name of the column to be referred to.
- iIndex: index of the column to be referred to.
- objValue: the field value to set.

Example [VB.NET syntax]

As mentioned above, it is unlikely that this method will be useful, so the example below demonstrates how to use the method in a fairly unrealistic way. It checks to see if the operation being performed is a SQL UPDATE. If it is, for each updated record, the value before (that is the value to search for in the target table) is set to the first 3 characters concatenated with a blank. The after value is set to the original before value.

```
' For each updated record, set the value before (that is the value to
search into the target table)
' to the first 3 characters concatenated with a blank. Then set the
after value to the original before value.
Public Overrides Sub Record_onBeforeMapping(recSource As IRecord, ByRef
AbortRecord As Boolean)
```

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```
    Dim obj As Object
    If recSource.OperationType = enmOperationType.Update Then
       obj = recSource.GetValueBefore(0)
       if Not obj Is Nothing AND Not IsDBNull(obj) Then
          recSource.SetValueBefore(0 , obj.Substring(0,3) + " ")
          recSource.SetValueAfter(0 , obj)
       End if
    End If
End Sub
```

Example [C# syntax]

As mentioned above, it is unlikely that this method will be useful, so the example below demonstrates how to use the method in a fairly unrealistic way. It checks to see if the operation being performed is a SQL UPDATE. If it is, for each updated record, the value before (that is the value to search for in the target table) is set to the first 3 characters concatenated with a blank. The after value is set to the original before value.

```
// For each updated record, set the value before (that is the value to
search into the target table)
// to the first 3 characters concatenated with a blank. Then set the
after value to the original before value.
public override void Record_onBeforeMapping(IRecord recSource, ref bool
AbortRecord)
{
   object obj = null;
   if (recSource.OperationType == enmOperationType.Update) {
       obj = recSource.GetValueBefore(0);
       if ((obj != null) & !Information.IsDBNull(obj)) {
           recSource.SetValueBefore(0, obj.Substring(0, 3) + " ");
           recSource.SetValueAfter(0, obj);
       }
```

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```
    }
}
```

SetValueAfter

Sets the value of the column indicated in the record after modification. Use this function in refresh and mirroring/synchronization replications if you want to change a source or target value for an INSERT operation or change a value when the transaction log reports an UPDATE operation on a record.

VB.NET syntax

```
Public Sub SetValueAfter (sColName As String, objValue As Object)
Public Sub SetValueAfter (iIndex As Integer, objValue As Object)
```

C# syntax

```
public void SetValueAfter(string sColName, object objValue)
public void SetValueAfter(int iIndex, object objValue)
```

Parameters

- sColName: name of the column to be referred to.
- iIndex: index of the column to be referred to.
- objValue: the field value to set.

Example [VB.NET syntax]

The example below checks to see if the operation being performed is a SQL UPDATE. Then, for each update, it replicates the value of the CITY column in uppercase.

```
' For each update, replicate the value of the column CITY in uppercase.
Public Overrides Sub Record_onAfterMapping(recSource As IRecord, recTar-
get As IRecord, ByRef AbortRecord As Boolean)
    Dim obj As Object
    If recSource.OperationType = enmOperationType.Update Then
        obj = recTarget.GetValueAfter("CITY")
```

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```
        if Not obj Is Nothing AND Not IsDBNull(obj) Then
           recTarget.SetValueAfter("CITY", recTarget.GetValueAfter
("CITY").ToUpper)
        End if
    End If
End Sub
```

Example [C# syntax]

The example below checks to see if the operation being performed is a SQL UPDATE. Then, for each update, it replicates the value of the CITY column in uppercase.

```
// For each update, replicate the value of the column CITY in upper-
case.
public override void Record_onAfterMapping(IRecord recSource, IRecord
recTarget, ref bool AbortRecord)
{
    object obj = null;
    if (recSource.OperationType == enmOperationType.Update) {
        obj = recTarget.GetValueAfter("CITY");
        if ((obj != null) & !Information.IsDBNull(obj)) {
            recTarget.SetValueAfter("CITY", recTarget.GetValueAfter
("CITY").ToUpper);
        }
    }
}
```

GetLogValue

Returns the value of the log field indicated. The parameter should be of type enmLogFields.

VB.NET syntax

```
Public Function GetLogValue (eLogField As enmLogFields) As Object
```

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C# syntax

```
public object GetLogValue(enmLogFields eLogField)
```

Parameters

- eLogField: An enmLogFields datatype, this is the name of the field to be referred to.

Example [VB.NET syntax]

The example below retrieves values from the enmLogFields enumerator and adds them to the Syniti DR log.

```
Public Overrides Sub Record_onBeforeMapping(recSource As IRecord, ByRef
AbortRecord As Boolean)
   AddLog("TransactionID = " + recSource.GetLogValue(enmLo-
gFields.TransactionID).ToString(), 0)
   AddLog("TransactionTS = " + recSource.GetLogValue(enmLo-
gFields.TransactionTS).ToString(), 0)
   AddLog("UserID = " + recSource.GetLogValue(enmLo-
gFields.UserID).ToString(), 0)
   AddLog("RecordID = " + recSource.GetLogValue(enmLo-
gFields.RecordID).ToString(), 0)
   AddLog("ReceiverLibrary = " + recSource.GetLogValue(enmLo-
gFields.ReceiverLibrary).ToString(), 0)
   AddLog("ReceiverName = " + recSource.GetLogValue(enmLo-
gFields.ReceiverName).ToString(), 0)
End Sub
```

Example [C# syntax]

The example below retrieves values from the enmLogFields enumerator and adds them to the Syniti DR log.

```
public override void Record_onBeforeMapping(IRecord recSource, ref bool
AbortRecord)
{
```

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```
   GlobalScript.AddLog("TransactionID = " + recSource.GetLogValue(enmLo-
gFields.TransactionID).ToString(), 0);
   GlobalScript.AddLog("TransactionTS = " + recSource.GetLogValue(enmLo-
gFields.TransactionTS).ToString(), 0);
   GlobalScript.AddLog("UserID = " + recSource.GetLogValue(enmLo-
gFields.UserID).ToString(), 0);
   GlobalScript.AddLog("RecordID = " + recSource.GetLogValue(enmLo-
gFields.RecordID).ToString(), 0);
   GlobalScript.AddLog("ReceiverLibrary = " + recSource.GetLogValue
(enmLogFields.ReceiverLibrary).ToString(), 0);
   GlobalScript.AddLog("ReceiverName = " + recSource.GetLogValue(enmLo-
gFields.ReceiverName).ToString(), 0);
}
```

enmLogFields (Enumerator)

The datatype for the GetLogValue parameter.

Value	Name	Description
0	TransactionID	The transaction ID for the record from the transaction log/journal
1	TransactionTS	The transaction timestamp
2	UserID	The User ID associated with the transaction
3	RecordID	For Db2/400 this is mapped to the RRN. For Oracle, it is mapped to the Row ID and for SQL Server, the value is always Null.
4	ReceiverLibrary	For Db2/400 only. The library containing the receiver for this transaction.
5	ReceiverName	For Db2/400 only. The name of the receiver used for this trans-

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		action.

SetLogValue

Sets a value in the log field indicated. It is strongly recommended not to modify the values of the enmLogFields enumerator because it is used during mirroring and synchronization replications by the Replication Agent.

VB.NET syntax

```
Public Sub SetLogValue (eLogField As enmLogFields, objValue As Object)
```

C# syntax

```
public void SetLogValue(enmLogFields eLogField, object objValue)
```

Parameters

- eLogField: name of the field to be referred to.
- objValue: the field value to set.

GetType

Returns the .NET type associated with the field type.

VB.NET syntax

```
Public Function GetType (Index As Integer) As System.Type
Public Function GetType (ColumnName As String) As System.Type
```

Parameters

- Index: an integer that identifies the column for which you want to retrieve the type
- ColumnName: a string representing the column name for which you want to retrieve the type

Return Value

Returns the System.Type associated with the column, identified either by index or by column name.

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GetDBType

Returns the database type associated with the field type.

VB.NET syntax

```
Public Function GetDBType (Index As Integer) As String
Public Function GetDBType (ColumnName As String) As String
```

C# syntax

```
public string GetDBType(int Index)
public string GetDBType(string ColumnName)
```

Parameters

- Index: an integer that identifies the column for which you want to retrieve the type
- ColumnName: a string representing the column name for which you want to retrieve the type

Return value

Returns the name of the field type associated with the column, identified either by index or by column name.

GetPrecision

Returns the field precision.

VB.NET syntax

```
Public Function GetPrecision (Index As Integer) As Short
Public Function GetPrecision (ColumnName As String) As Short
```

C# syntax

```
public short GetPrecision(int Index)
public short GetPrecision(string ColumnName)
```

Parameters

- Index: an integer that identifies the column for which you want to retrieve the precision

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- ColumnName: a string representing the column name for which you want to retrieve the precision

Return value

Returns the precision of the column identified either by index or by column name

GetScale

Returns the field scale.

VB.NET syntax

```
Public Function GetScale (Index As Integer) As Short
Public Function GetScale (ColumnName As String) As Short
```

C# syntax

```
public short GetScale(int Index)
public short GetScale(string ColumnName)
```

Parameters

- Index: an integer that identifies the column for which you want to retrieve the scale
- ColumnName: a string representing the column name for which you want to retrieve the scale

Return value

Returns the scale of the column identified either by index or by column name.

GetLength

Returns the field defined size

VB.NET syntax

```
Public Function GetLength (Index As Integer) As Integer
Public Function GetLength (ColumnName As String) As Integer
```

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C# syntax

```
public int GetLength(int Index)
public int GetLength(string ColumnName)
```

Parameters

- eLogField: name of the field to be referred to.
- objValue: the field value to set.

Return value

Returns the defined size of the column identified either by index or by column name.

GetName

Returns the column name associated with the field index.

VB.NET syntax

```
Public Function GetName (Index As Integer) As String
```

C# syntax

```
public string GetName(int Index)
```

Parameters

- Index: an integer that identifies the column for which you want to retrieve the name

Return Value

Returns the name associated with the column, identified by index.

Example [VB.NET Syntax]

```
Public Overrides Sub Record_onAfterMapping(recSource As IRecord, recTar-
get As IRecord,
                                           ByRef AbortRecord As
```

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```
Boolean)
   Dim S As String
   S=recSource.GetName(0)
   AddLog("The first column name is:" + S, 0)
End Sub
```

Example [C# Syntax]

```
public override void Record_onAfterMapping(IRecord recSource, IRecord
recTarget, ref bool AbortRecord)
{
   string S = null;
   S = recSource.GetName(0);
   GlobalScript.AddLog("The first column name is:" + S, 0);
}
```

Related Topics

Replication Script Events

Handling Events for INSERT, UPDATE and DELETE Operations

Replication Script Properties

Global Script Functions

Writing a Replication Script

Writing a Global Script

Writing Scripts with Visual Basic .NET

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Managing Reader and Writer Events in a Script

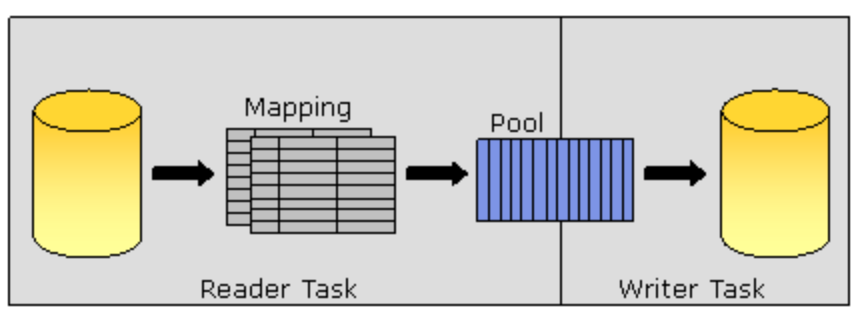
Each Syniti DR replication is executed by two different tasks:

- a Reader task which reads data from the source table in refresh or reads the source transaction log in mirroring/synchronization
- a Writer task which updates the data in the target table

Reader and Writer tasks are executed by a pool of threads which assign to each task a slice of execution time depending on the replication's thread priority setting.

A Reader task reads data from a source table or transaction log and generates an internal Syniti DR record describing the data changes for a source table record. On this source record, the Reader applies the mapping defined for the replication and builds the target record which is finally inserted in a FIFO queue to be processed by the Writer task. The FIFO queue size is by default 1000 records. It can be modified by changing the setting for the Record Pool Size in the Preferences tab of the Replication Properties dialog.

The Writer task extracts a record from the queue and translates it into an INSERT, UPDATE or DELETE SQL operation on the target table.



A record is exposed to a script function through the IRecord interface.

Once the queue, or pool, has reached its maximum size (configurable in the Replication Properties dialog), the Reader task waits until the Writer task has processed some records. When the queue is empty, the Writer waits until the Reader has pushed in some additional records.

All the replications in a group share a single Reader task and a single Writer task. This means that a Reader/Writer task has to process data for all the source/target tables in the group.

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Since Reader and Writer tasks are executed by different threads, particular attention must be paid in writing scripts where some events are called by the Reader and some others by the Writer.

Reader events in the order they are called:

1. Refresh_onPrepareRefresh (Refresh replications only) or LogReader_onPrepareMirroring (Mirroring/Synchronization only)
2. Record_onBeforeMapping
3. Record_onAfterMapping
4. Replication_onConflict (Synchronization replications only)
5. Replication_onLateConflict (Synchronization replications only)

Writer events in the order they are called:

1. Refresh_onBeforeRefresh (Refresh replications only)
2. Refresh_onBeforeTruncate (Refresh replications only)
3. Refresh_onAfterTruncate (Refresh replications only)
4. LogReader_onBeforeMirroring (Mirroring/Synchronization replications only)
5. Record_onBeforeExecute
6. Record_onExecuteError (Defined in the global script)
7. Record_onAfterExecute (Not called if record execution)
8. LogReader_onReceiverChanged (Mirroring/Synchronization replications only)
9. Refresh_onAfterRefresh (Refresh replications only)
10. LogReader_onAfterMirroring (Mirroring/Synchronization replications only)
11. Replication_onCriticalError
12. Replication_onError (Defined in the global script)

If there are objects defined in the replication script which need to be accessed and/or modified from Reader events and Writer events, then access to this object must be protected by a lock. There is no need to protect access to replication objects if they are only used in Reader events or if they are only used in Writer events.

Here is an example showing how to modify a variable defined in the replication script from both the Record_onAfterMapping and Record_onAfterExecute events.

The script sample uses the Reader event Record_onBeforeMapping to write a line in a text file for each record that is read from the source table, and it uses the Writer event Record_onAfterExecute to write a line in the same text file for each record inserted in the target table. Since the StreamWriter object sw, defined in the replication script, is used in both a Reader event and a Writer event, an exclusive lock must be set before using this object.

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VB.NET Example

```
Imports System
Imports System.IO
Imports Microsoft.VisualBasic
Imports DBMotoPublic
Imports DBMotoScript
Imports DBRS.GlobalScript
Namespace DBRS
    Public Class ReplicationScript : Inherits IReplicationScript
        Const sFileName As String = "C:\DBMScrip.txt"
        Dim sw as StreamWriter = Nothing
        Public Overrides Sub Record_onBeforeMapping(recSource As IRe-
cord, ByRef AbortRecord As Boolean)
            Try
              ' write the source record key into the text file
              SyncLock(Me)
                 If sw Is Nothing Then
                    sw = New StreamWriter(sFileName)
                 End If
                 sw.WriteLine("Record_onBeforeMapping - Source Record:
" + recSource.GetValueAfter("ID"))
                 sw.Flush
             End SyncLock
             Catch ex As Exception
                AddLog("Exception in Record_onBeforeMapping: " +
ex.ToString, 0)
           End Try
       End Sub
```

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```
        Public Overrides Sub Record_onAfterExecute(recTarget As IRecord)
            Try
              ' write the target record key into the text file
              SyncLock(Me)
                If sw Is Nothing Then
                    sw = New StreamWriter(sFileName)
                End If
                sw.WriteLine("Record_onAfterExecute - Target Record: " +
recTarget.GetValueAfter("ID"))
                sw.Flush
             End SyncLock
             Catch ex As Exception
               AddLog("Exception in Record_onAfterExecute: " +
ex.ToString, 0)
          End Try
        End Sub

        Public Overrides Sub Refresh_onAfterRefresh()
            Try
             ' close the text file after the refresh
             SyncLock(Me)
                If Not sw Is Nothing Then
                   sw.Close
                   sw = Nothing
                End If
             End SyncLock
             Catch ex As Exception
                AddLog("Exception in Refresh_onAfterRefresh: " +
ex.ToString, 0)
             End Try
```

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```
      End Sub
   End Class
End Namespace
```

C# Example

```
using System;
using System.Data;
using DBMotoPublic;
using DBMotoScript;
using System.IO;
namespace DBRS
{
    public class ReplicationScript : IReplicationScript
    {
       const string sFileName = "C:\\DBMScrip.txt";
       StreamWriter sw = null;
       public override void Refresh_onAfterRefresh()
       {
          lock (this)
          {
             // close the text file after the refresh
             try
             {
                if (sw == null)
                {
                    sw.Close();
                    sw = null;
                }
             }
```

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```
            catch (Exception ex)
            {
               GlobalScript.AddLog("Exception in Refresh_onAfter-
Refresh: " + ex.ToString(), 0);
            }
         }
      }

      public override void Record_onBeforeMapping(DBMotoPublic.IRecord
recSource, ref bool AbortRecord)
      {
          lock (this)
          {
              // write the source record key into the text file
              try
              {
                  if (sw == null)
                   {
                      sw = new StreamWriter(sFileName);
                      sw.WriteLine("Record_onBeforeMapping - Source
Record: " + recSource.GetValueAfter("ID"));
                      sw.Flush();
                   }
               }
               catch (Exception ex)
               {
                  GlobalScript.AddLog("Exception in Record_onBe-
foreMapping: " + ex.ToString(), 0}
               }
```

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```
                }
        }

        public override void Record_onAfterExecute(DBMotoPublic.IRecord
recTarget, bool Failed)
        {
            lock (this)
            {
                // write the target record key into the text file
                try
                {
                   if (sw == null)
                        sw = new StreamWriter(sFileName);
                        sw.WriteLine("Record_onAfterExecute - Target
Record: " + recTarget.GetValueAfter("ID"));
                        sw.Flush();
                 }
                 catch (Exception ex)
                 {
                     GlobalScript.AddLog("Exception in Record_onAfter-
Execute: " + ex.ToString(), 0);
                 }
            }
          }
      }
}
```

Related Topics

IRecord Interface

Replication Script Events

Replication Script Properties

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Handling Events for INSERT, UPDATE and DELETE Operations
Global Script Functions
Writing a Global Script
Writing a Replication Script
Writing Scripts with Visual Basic .NET
Replication Script Editor

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Graphical User Interface Features

This section contains topics that describe:

- A Tour of the Management Center
- Each dialog and window in the Syniti Data Replication interface, organized alphabetically.
- Wizards to:

  Create a source connection

  Create a target connection

  Create a target table

  Create a single replication

  Create multiple replications

  Create a replication group

  Enable a transactional replication

  Disable a transactional replication

  Export replications

  Create a metadata connection

  Restore metadata

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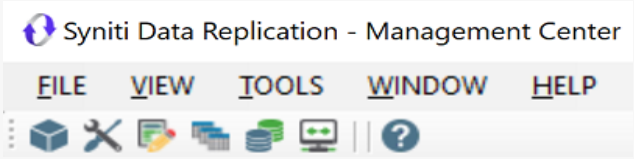
Tour of the Management Center

Main Toolbar and Menu Bar



Use these menus and icons to access tools and options to manage your working environment.

	Metadata Explorer Adds a new Metadata Explorer pane to the Management Center window, if one is not already open.
	Property Window Opens a new Property Window, if one is not already open.
	Object Browser Adds a new Object Browser tab to the Management Center window, if one is not already open. The Object Browser displays information related to the item selected in the Metadata Explorer. For example, if you select a source table in the database tree, you can see the table column names and column information.
	Replication Browser Adds a new Replication Browser tab to the Management Center window, if one is not already open. The Replication Browser displays replications for the selected metadata together with summary information for the replications.
	Replication Monitor Adds a new Replication Monitor tab to the Management Center window, if one is not already open. The Replication Monitor provides current status information for all replications defined in the metadata that is selected in the Metadata Explorer.
	Toolbox Adds an expandable tab to the Management Center, for easy access to wizards to create source and target connections, tables, replications and replication groups.
	Help Opens a separate Help window with access to help topics in the User's Guide.

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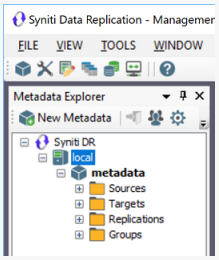
Metadata Explorer



Use this area of the Management Center to:

- Set up user access to Syniti DR
- Add and remove views of remote Syniti DR installations (servers)
- Manage properties of each server listed in the Metadata Explorer
- Create Syniti DR metadata as a way of managing replication projects
- Add connections for source and target tables
- Create replications and groups

In a standard installation of Syniti DR, you will always see a tree structure that looks like the one here, with an entry for the "local" installation of Syniti DR. In addition, Syniti DR creates a default metadata for you using the Microsoft SQL Server CE DBMS that is distributed with Syniti DR. In most cases, you will start adding source and target connections to this metadata, then create and run replications. However, you can choose to create metadata in an alternative RDBMS.

Toolbar

	New Metadata Opens the Metadata Connection wizard, allowing you to create a connection for a new metadata database.
	Connect Opens the Login dialog, allowing you to enter login information to connect to a Syniti DR server.
	Manage Users Opens the User Settings dialog, allowing you to establish access control for users.
	Replication Agent Options Opens the Replication Agent Options dialog, allowing you to set options that affect how the Rep-

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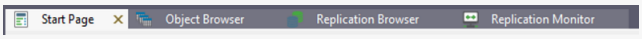
	lication Agent runs, including options for logs, traces and email notifications.
	New SQL Command Opens a SQL Query tab with a connection to the item that is selected in the Metadata Explorer. For example, if you have selected a source connection, the tab opens ready to execute a query for that connection.
	Global Script Opens the Global Script Editor, allowing you to write a script that is available to all replications in the metadata.
	View Log Opens the Log Viewer tab, allowing you to review the contents of the Syniti DR log. The log contains useful information regarding replication progress, results and issues. Note that it is not possible to view a file-based log if the selected metadata is on a remote installation of Syniti DR. The View Log option only opens the log file on the local file system.

Tools in the Tabbed Pane



The tabs in the Management Center include the main tools and viewer that you will use as you create and monitor replicatiions. The default tabs are:

Start Page

Provides access to help topics and useful information you will need to get started with Syniti Data Replication.

Object Browser

Displays information related to the item selected in the Metadata Explorer. For example, if you select a source table in the database tree, you can see the table column names and column information.

Replication Browser

Displays replications for the selected metadata together with summary information for the replications.

Managing Tabs

The tab headings are fixed width, so if you open several additional tabs, you need to use the View All Tabs icon in the tab area to display all tabs.

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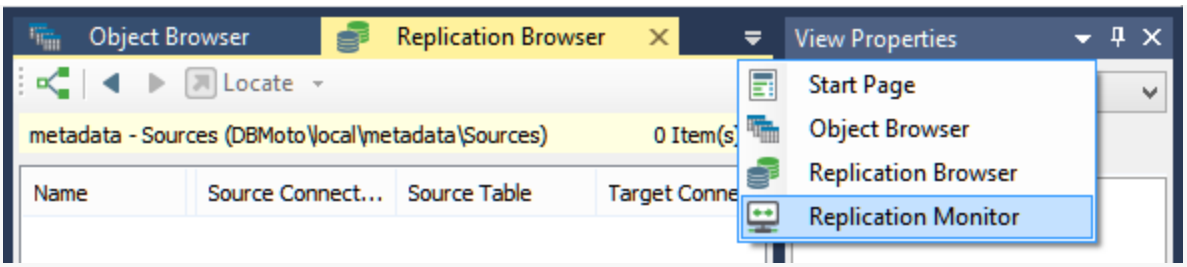
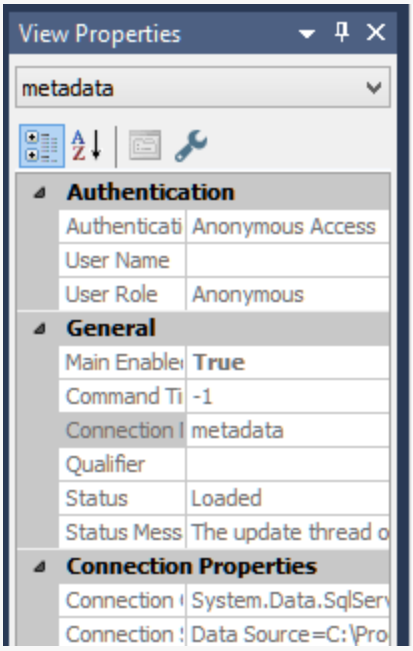


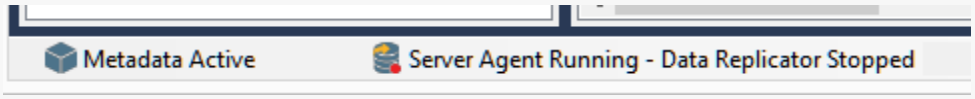
Properties Pane



The Properties pane displays properties for whichever item is selected in the Metadata Explorer. If you select a property in the list, a description of the property is displayed below the list. Note that you cannot edit properties in this pane.

Click **Show Properties** in the toolbar to open a separate, editable Properties Window.

Status Bar



The Status Bar displays the current status of the Metadata, the Server Agent and the Replication Agent.

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Shortcuts to Creating a Replication

The Management Center window usually offers several ways to accomplish the same goal:

- Via the buttons displayed in the toolbars
- Via the menus displayed when clicking the right mouse button over an item in the Management Center window.
- Via the main toolbar
- Via dragging and dropping items in the Metadata Explorer.

Here are some ways to speed up the process of creating a replication.

Starting Wizards Automatically

The first step in setting up a replication in the Management Center is to create connections to your source and target databases.

Each wizard involved in the creation of a replication provides an option to automatically open the next wizard in the process.

In the Summary screen of the Source Connection wizard, check the option to proceed with the definition of a target connection. Then, in the Summary screen of the Target Connection wizard check the option to open the Replication Wizard.

Using Drag and Drop to Create Tables and Replications

Once you have defined source and target connections, you can use the Metadata Explorer to drag a source table to a target connection to open the Create Target Table wizard, and drag a source table to a target table to open the Replication wizard.

Creating a Target Table

1. In the Metadata Explorer, expand the source and target connections to display both the source table and the target connection.
2. Click and hold the mouse button down on the source table and drag it down to the target connection, then release the mouse button.

The Create Target Table wizard is launched with the source table and target connection information already selected for you.

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Creating a Replication

1. In the Metadata Exploter, expand the source and target connections to display both the source table and the target table.
2. Click and hold the mouse button down on the source table and drag it down to the target table, then release the mouse button.

The Replication wizard is launched with the source table and target table information already selected for you.

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Graphical User Interface Features

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  Enable a transactional replication

  Disable a transactional replication

  Export replications

  Create a metadata connection

  Restore metadata

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Add Source Connection Wizard

Select Provider> Set Connection String> Select Tables> Actions>Summary

Use this wizard to create a connection to the database that contains the data you want to replicate, tables that hold all the information needed for your replication.

Select Provider

Source Name

Type a name to identify the source connection. This name appears in the Metadata Explorer as a way to group connections for a specific replication.

Database

Select the database for which you want to create a connection.

Provider

Select a .NET data provider from the list. If no .NET provider is available for the database, select either an OLE DB provider or an ODBC driver. By default, only default providers are listed in this dialog. If you want to see all providers for a specific database, uncheck the **Use Only Default Providers** option in the Options dialog.

.NET providers are preferred over ODBC drivers or OLE DB providers because, with Syniti DR being a .NET application, it can take advantage of the use of native .NET providers based on the same architecture. If you use ODBC or OLE DB connections, the .NET framework will need to add a software layer for every call you make to the driver, adding overhead. Besides, using 100% managed .NET providers, there is no risk of memory leaks because the .NET framework cleans up memory automatically using an internal garbage collector.

Assembly

This field is displayed only if using a .NET data provider, and the provider has not been registered. Provide a path to the .NET data provider DLL. Check the Database Access Provider List in the Help Center before entering a value in the **Assembly** field.

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Set Connection String

Connection Properties

Edit at least the **Required** connection properties by clicking in the property value field and typing a new value.

For Synchronization Replications:
The login/user ID that you provide must be unique to Syniti DR. It should not be used for any transactions occurring in either database involved in the synchronization. Syniti DR does not replicate transactions by the user you specify in this connection. This user ID is used by Syniti DR during synchronization to read the database logs and perform the synchronization operations. Therefore, any transactions found in the logs with this user ID are not replicated as part of the synchronization data.

For SQL Server Replications:
If you are replicating from SQL Server using mirroring or synchronization, for the user ID and password fields, provide a login that does not have system administrator privileges. This login ID should also be used exclusively for Syniti DR(i.e., no other applications should use the login ID that you specify for Syniti DR). You will need to provide a second login with system administrator privileges in the Enable Transactional Replication wizard. The second login is used to create the distributor and to access the transaction log.

For Db2 for i Replications:
If you are connecting to IBM Db2 for i (iSeries/AS400) as your source database, see IBM Db2 for i Connection Recommendations.

For Oracle Replications:
If you are replicating from Oracle using mirroring or synchronization, enter a user ID which will be exclusively used by Syniti DR and has the authority to read the database transaction log (redo log.)

The list of **Optional** properties for .NET and OLE DB providers contains the most commonly used properties for the providers. Edit these as needed. Note that some properties are displayed with default values (no bold text.) Any values that you add or edit are displayed in bold text. Check the documentation for your provider for a complete list of properties. You can set the value of the ExtendedProperties property to define additional property-value pairs. The syntax for defining property-value pairs is: prop1=val1;prop2=val2;....

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If you are using an ODBC driver, click in the ConnectionString value field and then click to open the ODBC Driver Connection dialog. The contents of this dialog depend on the ODBC driver that you are using. Provide values for the dialog fields, then click OK to make a test connection and set the values in the wizard.

Edit

Click **Edit** to open a text entry window where you can paste or type a connection string for your provider. This is offered as an alternative to the Connection Properties grid, but should be used with great care because an error in the connection string can cause a connection to fail or to have unexpected properties. This window displays any connection information that you have already entered in connection string format. Note that default values are not displayed as part of the connection string.

Test

Click **Test** to make sure that the connection correctly opens a database connection.

Select Tables

Choose one or more objects from the tree to associate with the source connection. Objects include tables, views and aliases. When creating a replication, you will be able to select an object for replication from those that you have chosen in this wizard. If you create multiple replications, you can select an object for each replication that you are defining.

Filtering the Table View

Use the filter field to limit the number of tables to view at any time. The field expects standard SQL syntax. Either type in the full name of the object you want to retrieve, or use '%' as search pattern. For example, if you type AB%, all objects beginning with the letters 'AB…' are displayed. To apply the filter, type the filter in the textbox and click . If filtering is not available for a specific node, or connection, the filter icon is inactive.

- You can apply a filter on any node in the tree, as long as you provide the correct SQL syntax.
- If you apply incorrect SQL syntax, the error dialog reports a SQL error. You should be familiar with the SQL syntax for your database to analyze and fix the error.
- Syniti DR stores the filter so that if you select another node, then go back to the previous one, the filter is retrieved.

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- When a node in the tree has been expanded with a filter, its icon is modified to show that the full contents of that node have been filtered:
- Note that some databases, such as IBM Db2 for i, may not support the % symbol on one or more levels in the tree (catalog, schema, etc.).
- If you expand a node applying one filter (for example, A%) and then select/remove some tables, then change the filter to B% and select/remove other tables, when clicking OK the dialog will remember all the chosen tables and will apply all filters.

To remove a filter, either click , or delete the filter text and click . The content for the node is reloaded without filtering information.

Use the **Hide System Tables** checkbox to limit the number of tables displayed.

Use the **Select All Tables** and **Deselect All Tables** buttons to work with multiple tables.

Note: When using SQL Server as a source in mirroring (or as a source or target in synchronization replications), SQL Server requires that tables have a primary key defined.

	Select a database owner/schema, then click this button to check all tables under the owner/schema.
	Select a database owner/schema, then click this button to uncheck all tables under the owner/schema.

Note: For more information about the Load Tables List icon, see Loading Table Selections from a File.

Actions

Choose any actions that you would like to perform after completing the wizard. Note that if you plan to set up mirroring or synchronization replications, you first need to complete the Enable Transactional Replication wizard.

Launch the Enable Transactional Replication wizard

Allows you to choose the appropriate source database log access for mirroring and synchronization replications. This wizard can also be accessed from the Metadata Explorer by selecting the connection, then choos-

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ing Connection Properties from the right mouse button menu. Set the Transactional Setup field to Enable to open the wizard.

Launch the Target Connection wizard

Opens the Target Connection wizard to create a connection to the target database for replication

Summary

Database name

The name of the database server

Database version

The database server version

Provider type

The description of the provider that you selected in the **Select provider** screen.

Provider name

Whatever connection information is available for the provider you have chosen. In some cases, this field will be blank. In other cases, the provider DLL may be displayed.

Proceed with the definition of a target connection

When checked, the Target Connection wizard is displayed on completion of the Source Connection wizard. Use the Target Connection wizard to define a connection to the database that will contains the replicated data.

Opening the Source Connection Wizard

1. In the Management Center Metadata Explorer, select the label **Sources**.
2. From the right mouse button menu, choose **Add New Connection**.

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Add Target Connection Wizard

Select Provider> Set Connection String> Select Tables> Actions> Summary

Use this wizard to create a connection to a target database where replicated data will be stored.

Select Provider

Target Name

Type a name to identify the source connection. This name appears in the Metadata Explorer as a way to group connections for a specific replication.

Database

Select the database or other target for which you want to make a connection.

Provider

Select a data provider from the list. For relational databases, if no .NET provider is available for the database, select an ODBC driver. By default, only default providers are listed in this dialog. If you want to see all providers for a specific database, uncheck the **Use Only Default Providers** option in the Options dialog.

.NET providers are preferred over ODBC drivers because, with Syniti DR being a .NET application, it can take advantage of the use of native .NET providers based on the same architecture. If you use ODBC connections, the .NET framework will need to add a software layer for every call you make to the driver, adding overhead. Besides, using 100% managed .NET providers, there is no risk of memory leaks because the .NET framework cleans up memory automatically using an internal garbage collector.

Assembly

This field is for use only if using a .NET data provider, and the provider has not been registered. Provide a path to the .NET data provider DLL. Check the Database Access Provider List in the Help Center before entering a value in the **Assembly** field.

Set Connection String

Connection Properties

Edit at least the **Required** connection properties by clicking in the property value field and typing a new value.

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If you will be creating target tables via Syniti DR in preparation for replication, make sure that you choose a user ID with sufficient permissions to create tables in the designated target database.

For Replications to SAP HANA:
In the **Server** field, the server name and port number should follow the format <server>:<port>. If you do not specify the port number, the default is used and the default is often not appropriate for standard SQL communications via client access. The format of the port for standard SQL communication via client access is 3<instance-number>15 where <instance number> is the instance number of the SAP HANA database engine. For example, for instance 00, the port number would be 30015.

For Replications to SAP HANA (ODBC Driver only) and SAP Sybase IQ:
After completing the Target Connection wizard, select the new connection and choose Connection Properties from the right mouse button menu. In the Connection Properties dialog, set values for the **FTP Server**, **FTP Port**, **FTP User**, **FTP Password and Import Path** properties.For optimal performance, the Syniti DR connection uses FTP or SFTP to transfer data from the source database to the target SAP HANA or SAP Sybase IQ server, then updates the SAP HANA or SAP Sybase IQ database using Syniti DR's BulkInsert option. For replications to SAP Sybase IQ,make sure that the **allow_read_client_file** and **allow_write_client_file** options are enabled on the Sybase IQ server.

For Synchronization Replications:
The login/user ID that you provide must be unique to Syniti DR. It should not be used for any transactions occurring in either database involved in the synchronization. Syniti DR does not replicate transactions by the user you specify in this connection. This user ID is used by Syniti DR during synchronization to read the database logs and perform the synchronization operations. Therefore, any transactions found in the logs with this user ID are not replicated as part of the synchronization data.

For SQL Server Replications:
If you are replicating from SQL Server using synchronization, for the user ID and password fields, provide a login that does not have system administrator privileges. This login ID should also be used exclusively for Syniti DR (i.e., no other applications should use the login ID that you specify for Syniti DR). You will need to provide a second login with system administrator privileges in the Enable Transactional Replication wizard. The second login is used to create the distributor and to access the transaction log.

For IBM Db2 for i Replications:
If you are connecting to IBM Db2 for i (iSeries/AS400) for synchronization replications, see IBM Db2 for i Connection Recommendations.

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For Oracle Replications:

If you are replicating from Oracle using synchronization, enter a user ID which will be exclusively used by Syniti DR and has the authority to read the database transaction log (redo log.)

The list of **Optional** properties for .NET and OLE DB providers contains the most commonly used properties for the providers. Edit these as needed. Note that some properties are displayed with default values (no bold text.) Any values that you add or edit are displayed in bold text. Check the documentation for your provider for a complete list of properties. You can set the value of the ExtendedProperties property to define additional property-value pairs. The syntax for defining property-value pairs is: prop1=val1;prop2=val2;....

If you are using an ODBC driver, click in the ConnectionString value field and then click to open the ODBC Driver Connection dialog. The contents of this dialog depend on the ODBC driver that you are using. Provide values for the dialog fields, then click OK to make a test connection and set the values in the wizard.

Edit

Click **Edit** to open a text entry window where you can paste or type a connection string for your provider. This is offered as an alternative to the Connection Properties grid, but should be used with great care because an error in the connection string can cause a connection to fail or to have unexpected properties. This window displays any connection information that you have already entered in connection string format. Note that default values are not displayed as part of the connection string.

Test

Click **Test** to make sure that the connection correctly opens a database connection.

Select Tables

Choose one or more objects from the tree to associate with the source connection. Objects include tables, views and aliases. When creating a replication, you will be able to select an object for replication from those that you have chosen in this wizard. If you create multiple replications, you can select an object for each replication that you are defining.

Filtering the Table View

Use the filter field to limit the number of tables to view at any time. The field expects standard SQL syntax. Either type in the full name of the object you want to retrieve, or use '%' as search pattern. For example, if you type AB%, all

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objects beginning with the letters 'AB…' are displayed. To apply the filter, type the filter in the textbox and click . If filtering is not available for a specific node, or connection, the filter icon is inactive.

- You can apply a filter on any node in the tree, as long as you provide the correct SQL syntax.
- If you apply incorrect SQL syntax, the error dialog reports a SQL error. You should be familiar with the SQL syntax for your database to analyze and fix the error.
- Syniti DR stores the filter so that if you select another node, then go back to the previous one, the filter is retrieved.
- When a node in the tree has been expanded with a filter, its icon is modified to show that the full contents of that node have been filtered:
- Note that some databases, such as IBM Db2 for i, may not support the % symbol on one or more levels in the tree (catalog, schema, etc.).
- If you expand a node applying one filter (for example, A%) and then select/remove some tables, then change the filter to B% and select/remove other tables, when clicking OK the dialog will remember all the chosen tables and will apply all filters.

To remove a filter, either click , or delete the filter text and click . The content for the node is reloaded without filtering information.

Use the **Hide System Tables** checkbox to limit the number of tables displayed.

Use the **Select All Tables** and **Deselect All Tables** buttons to work with multiple tables.

	Select a database owner/schema, then click this button to check all tables under the owner/schema.
	Select a database owner/schema, then click this button to uncheck all tables under the owner/schema.

Note: For more information about the Load Tables List icon, see Loading Table Selections from a File.

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Actions

Choose any actions that you would like to perform after completing the wizard. Note that if you plan to set up mirroring or synchronization replications, you first need to complete the Enable Transactional Replication wizard.

Launch the Enable Transactional Replication wizard

For use when setting up a synchronization replication only. Allows you to choose the appropriate target database log access for synchronization replications. This wizard can also be accessed from the Metadata Explorer by selecting the connection, then choosing **Connection Properties** from the right mouse button menu. Set the **Transactional Setup** field to **Enable** to open the wizard.

Launch the Target Connection wizard

Opens the Target Connection wizard to create a connection to the target database for replication

Summary

Database name

The name of the database server

Database version

The database server version

Provider type

The description of the provider that you selected in the **Select provider** screen.

Provider name

Whatever connection information is available for the provider you have chosen. In some cases, this field will be blank. In other cases, the provider DLL may be displayed.

Proceed with the definition of a replication

When checked, the Replication wizard is displayed on completion of the Target Connection wizard. Use the Replication wizard to define a connection to the database that will contains the replicated data.

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Opening the Target Connection Wizard

1. In the Management Center Metadata Explorer, select the label **Targets**.
2. From the right mouse button menu, choose **Add New Connection**.

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Create Target Table Wizard

Select Source Connection> Select Target Connection> Define Columns> SQL Script> Summary

Use this wizard to create a table in the database to which you are replicating if your target database does not already contain a table for the replicated data. Note that if source tables include constraints, and you want those same constraints on target tables, you need to create them manually at the target system once you have created the tables.

Select Source Connection

This screen lists all the source connections that you have created in Syniti Data Replication.

Source Name

Choose a source connection name from the drop-down list.

Source Table

Choose a source table from the drop-down list.

Open Table

Opens the Execute SQL Command dialog that displays the contents of the source table for your review. Note that if you execute a SQL query from this dialog, it does not affect any source, target or replication settings.

Select Target Connection

This screen lists all the target connections that you have created in Syniti Data Replication.

Source Name

Choose a target connection name from the drop-down list.

Source Table

Type a name for the table that will be created.

Open Table

Opens the Execute SQL Command dialog that displays the contents of the source table for your review. Note that if you execute a SQL query from this dialog, it does not affect any source, target or replication settings.

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Define Columns

Displays the column and column information that will be created on wizard completion. Edit column information by clicking on cells.

NOTE: The Identity field should be checked for a row if the source table has this column as an Identity field and the Identity status should be maintained when creating the target table. The Identity field is disabled for non-numeric columns. This behavior is managed in the Target Connection Properties, using the property **CREATE TABLE Keep Identity** which is set to **True** by default. If set to **False**, the Identity fields(if any) in the source table will not be marked as Identity in the target table.

You can add and remove columns and primary keys using either the toolbar icons or the right mouse button menu. The available options are:

Insert Field Before

Select a field and choose this option to create a new field above this one.

Insert Field After

Select a field and choose this option to create a new field after this one.

Delete Field

Select a field and choose this option to remove the column from the table.

Set Primary Key

Select a field and choose this option to make the column a primary key. Note that primary keys can be set only on columns that cannot have a null value.

Delete Primary Key

Select a field and choose this option to delete a primary key setting.

SQL Script

Displays the SQL script that will be used to generate the target table based on the information from the source table and any changes you have made in the Define Columns screen. You can edit the SQL script as needed. Be sure to follow standard SQL syntax that can be used with your database system.

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Summary

Displays the settings for creating a target table.

Create another table

Opens the Create Target Table wizard on completion of the current wizard.

Proceed with the definition of a replication

Opens the Replication wizard on completion of the current wizard.

Opening the Create Target Table Wizard

1. In the Management Center Metadata Explorer, select a source table.
2. From the right mouse button menu, choose **Replication**, then **Create Target Table**.

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Disable Transactional Replication Wizard

Setup Status>Uninstall Options

Use this wizard to remove transactional replication settings either in Syniti Data Replicationalone, or in Syniti DR and the database associated with the connection.

Setup Status

This screen allows you to review the current transactional replication settings for the connection. Use the information to check that you have selected the correct connection before processing to remove settings for the connection.

Uninstall Options

Typically, two uninstall options are offered:

Disable Transactional Replication

If no replications are enabled for this connection, you can disable the transactional replication settings without removing them.

Complete Uninstall

If no replications are enabled for this connection, selecting this option will remove all Syniti DR transactional settings for the connection and any programs that were installed on the system running Syniti DR or the database to support transactional replications.

Click **Finish** to perform the disable and/or uninstall operations.

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Enable Transactional Replication Wizard

Log Type>Log Settings>Agent Settings>Actions>Summary

Use this wizard only if you are performing a mirroring or synchronization replication and you need to set up access to data changes on a source database (for mirroring and synchronization) or a target database (for synchronization).

Log Type

For more information on log type options, see Choosing a Log Type for Transactional Replications. Depending on the source database, available options are:

Log Reader

Reads the native database transaction log using a Syniti DR reader thread for each replication. This option is the default choice and works well if you have a limited number of replications and do not want to install additional services on the system that is running the Server Agent component.

Click **Next** to use this option and display the **Log Settings** page for your database.

NOTE: For IBM i source connections only, a Log Reader API option is also available. This is for use when replicating tables with LOB values for Db2 for i V6R1 and above.

Log Server Agent

Creates a Windows service on the system running the Server Agent. The service autonomously reads the native database transaction log. Choose this option if you plan to add many replications and you need a scalable solution that optimizes access to the native database transaction log.

Select this option and click **Next** to use this option and display the **Log ServerAgent Settings** page for your database.

Triggers

Creates a trigger on the database for each replication to log data from committed transactions. This option is useful when neither the Log Reader or the Log Server Agent meet the needs of your environment. For example, use triggers when:

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- There are no primary keys and the source is Microsoft SQL Server.
- All column data (before and after image) is needed. Some standard log readers only return record changed values
- Performance is better because only relevant information is logged and Syniti DR does not read the entire database log
- The source database is MySQL versions prior to 5.1.5 or you are preforming MySQL synchronization replications

Select this option and click **Next** to use this option and display the **Log Settings** page for trigger-based transactional replications.

Log Settings/Trigger Settings

Select your source database from the options below for specific information on settings in the Log Settings screen:

- Gupta SQLBase
- IBM Db2 for i
- IBM Db2 LUW
- IBM Db2 for z/OS
- IBM PureData (No specific settings needed)
- IBM Informix
- Microsoft SQL Server
- Microsoft Azure SQL Database
- MySQL/MariaDB
- Oracle
- PostgreSQL
- SAP HANA, SAP Sybase SQL Anywhere or SAP Sybase ASE

If you are using triggers to replicate changed data, go directly to the Trigger Settings.

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Agent Settings

Available only if you have selected Log Server Agent as the Log Type.

Log Files Folder

An existing folder where all the intermediate binary logs files are written. The folder is also used to contain trace files.

Prefix

A prefix for all files created in the folder. This provides easy identification and management of files associated with your connection. The primary purpose for the prefix is to support the case when you configure more than one connection to use the same folder. In general, however, it is advisable to use different folders for different connections.

Log File Size

The maximum size of each binary log file in megabytes.

Keep Max Files

The maximum number of binary log files to keep. Combined with the log file size, this number needs to be large enough to make sure that all the files are read by Syniti DR before they get deleted.

Trace

Unchecked by default. When checked, enables tracing for diagnostics and problem reporting. Trace files are saved in the Log Server folder.

Windows Service Name

Prefix:

This value is provided and cannot be changed It allows you to easily identify the service in the Microsoft Windows Services tool.

Name:

Specify a unique name for the Windows service. Each connection runs its own instance of the Syniti DR Log Server as a Windows service.

Start service after completing the wizard:

When checked, starts the service automatically after you click Finish to complete the wizard.

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Agent Scheduling

Available only if you have selected Log Server Agent as the Log Type and you are using a SQL Server, MySQL, IBM Db2 for i, Oracle or PostgreSQL source. Allows you to schedule interruptions to stop the Log Server Agent service from reading data from the database.

Run Continuously

The default setting. No interruptions to reading data.

Schedule Interruptions

Check this option to enable the Scheduler. Click **Add** to open the Scheduler dialog and select a schedule for service interruption. Select a scheduled interruption and click **Edit** or **Remove** to change the interruption.

Actions

Choose any actions that you would like to after completing the wizard.

Launch the Add Target Connection wizard

Opens the Add Target Connection wizard to create a connection to the target database for replication

Launch the Create Replication wizard

Opens the Create Replication wizard to configure a replication between tables identified in the Add Source Connection and Add Target Connection wizards.

Summary

Database name

The name of the database server

Database version

The database server version

Provider type

The description of the provider that you selected in the Select provider screen.

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Provider name

Whatever connection information is available for the provider you have chosen. In some cases, this field will be blank. In other cases, the provider DLL may be displayed.

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Export Replications Wizard

Existing Source Connection> Existing Target Connection> New Source Connection> New Target Connection> Set Replications> Summary

Use this wizard to create a new replication based on settings in an existing replication. The Export Replications wizard provides a way for you to use an existing replication definition with new source and/or target connections. For example, if you have created a replication that mirrors data from Oracle to SQL Server, and you wish to mirror the same data to a MySQL database, use the Export Replications wizard. First create the target connection for MySQL, then run the Export Replications wizard to copy the replication using the new target connection.

Existing Source Connection

This screen lists all the source connections that you have created in Syniti Data Replication.

Connection Name

Choose a source connection name from the drop-down list. This source connection should match the source connection for the replication that you want to export. Fill out any additional fields required to identify the connection (e.g. Schema Name.)

Existing Target Connection

This screen lists all the source connections that you have created in Syniti Data Replication.

Connection Name

Choose a target connection name from the drop-down list. This target connection should match the target connection for the replication that you want to export. Fill out any additional fields required to identify the connection (e.g. Schema Name.)

New Source Connection

This screen lists all the source connections that you have created in Syniti Data Replication.

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Connection Name

Choose a source connection name from the drop-down list. This source connection will be used as the source connection in the new replication that the wizard creates. Supply values for any additional fields required to identify the connection.

New Target Connection

Connection Name

Choose a target connection name from the drop-down list. This target connection will be used as the target connection in the new replication that the wizard creates. Supply values for any additional fields required to identify the connection.

Set Replications

This screen displays all replications matching the source and target connections you specified in the earlier Existing Source Connection and Existing Target Connection fields. Select the replications that you want to export. If the table names in the new replication will be different from the table names in the existing replication, click **Tables** to set the new table names.

Summary

The summary lists the original replication name, the type of replication and the automatically-generated new replication name. You can rename the newly-created replication after the export process is complete by opening the Replication Properties dialog.

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Metadata Connection Wizard

Select Provider> Set Connection String> Select Qualifier> Define Metadata>Summary

This wizard is optional and allows you to specify a connection to create metadata tables that hold all the information needed for your replication. By default, metadata is created in a Microsoft SQL Server CE database that is distributed with Syniti Data Replication.

Select Provider

Metadata Name

Type a name to identify the metadata. This name appears in the Metadata Explorer as a way to group connections for a specific replication.

Database

Select the database for which you want to create a connection.

Provider

Note: Db2 running on mainframe and i (iSeries/AS400) cannot be used for the metadata connection. Choose a different database when defining your metadata connection.

Select a .NET data provider from the list. It is recommended that you use the default Microsoft SQL Server CE provider so that the metadata tables are created for the included SQL Server CE database. However, you are free to use any database you want for metadata, with the exception of IBM Db2 for i or mainframe. If no .NET provider is available for the database, select either an OLE DB provider or an ODBC driver. By default, only default providers are listed in this dialog. If you want to see all providers for a specific database, uncheck the **Use Only Default Providers** option in the Options dialog available from the **Tools** menu.

.NET providers are preferred over ODBC drivers or OLE DB providers because, with Syniti DR being a .NET application, it can take advantage of the use of native .NET providers based on the same architecture. If you use ODBC or OLE DB connections, the .NET framework will need to add a software layer for every call you make to the driver, adding overhead. Besides, using 100% managed .NET providers, there is no risk of memory leaks because the .NET framework cleans up memory automatically using an internal garbage collector.

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Assembly

This field is displayed only if using a .NET data provider, and the provider has not been registered. Provide a path to the .NET data provider DLL.

Set Connection String

Connection Properties

Note: If you are using the default SQL Server CE .NET Provider, the Data Source field provides a drop down list where you can select an existing local SQL Server CE database or create a new local database. SQL Server CE files have a .sdf extension, and you can find a default database in your SqlServerCE folder (metadata.sdf).

For all other providers, edit at least the **Required** connection properties by clicking in the property value field and typing a new value. The list of **Optional** properties for .NET and OLE DB providers contains the most commonly used properties for the providers. Edit these as needed. Note that some properties are displayed with default values (no bold text.) Any values that you add or edit are displayed in bold text. Check the documentation for your provider for a complete list of properties. You can set the value of the ExtendedProperties property to define additional property-value pairs. The syntax for defining property-value pairs is: prop1-1=val1;prop2=val2;....

If you are creating the metadata tables in SQL Server, note that each login has a default initial catalog. For example, the default initial catalog for a system administrator login is "master." If you do not want to use the default catalog, be sure to enter a catalog to use in the **Initial Catalog** field.

If you are using an ODBC driver, click in the ConnectionString value field and then click to open the ODBC Driver Connection dialog. The contents of this dialog depend on the ODBC driver that you are using. Provide values for the dialog fields, then click OK to make a test connection and set the values in the wizard.

Edit

Click **Edit** to open a text entry window where you can paste or type a connection string for your provider. This is offered as an alternative to the Connection Properties grid, but should be used with great care because an error in the connection string can cause a connection to fail or to have unexpected properties. This window displays any connection information that you have already entered in connection string format. Note that default values are not displayed as part of the connection string.

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Test

Click **Test** to make sure that the connection correctly opens a database connection.

Select Qualifer

This screen is not available if the database you have specified does not allow table qualifiers such as catalogs and schemas. If you do not select values for these fields, the default qualifiers will be used based on the connection properties provided in the Set Connection String screen.

Define Metadata

Create a new metadata database

Select this option to create metadata tables using the connection properties specified in the Set Connection String screen,

Restore the metadata set from a backup file

Select this option if you have previously saved a metadata set to a file using the Backup Metadata option.

Open existing metadata database

Select this option to use an existing metadata set available from the connection properties specified in the Set Connection String screen,

Summary

Database name

The name of the database server

Database version

The database server version

Provider type

The description of the provider that you selected in the Select provider screen.

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Provider name

Whatever connection information is available for the provider you have chosen. In some cases, this field will be blank. In other cases, the provider DLL may be displayed.

Selected Qualifier

Qualifier names (if any) selected in the Select Qualifier screen.

Proceed with the definition of a source connection

When checked, the Source Connection wizard is displayed on completion of the Metadata Connection wizard. Use the Source Connection wizard to define a connection to the database that contains the tables or views you want to replicate.

Opening the Metadata Connection Wizard

In the Management Center, from the **Metadata** menu, choose **Add New Metadata**.

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Multiple Replications Wizard

Define Replication Type> Select Source Connection> Source Log Info> Select Target Connection> Target Log Info> Set Replications> Scheduling> Summary> Processing

This wizard is useful when you want to replicate all or many tables in the same database without defining specific replication needs for each table. It allows you to define multiple replications with a common replication type, common source and target connections and common scheduling needs.

Define Replication Type

Replication Name

Type a base name for each replication. This name will be stored in the metadata and used to identify replications in the Replication Browser. For each replication that you create, a sequential number is added to the base name you have chosen. For example, if you type Pubs-SQLSrv-Access as the base name, the first replication that is created at the end of the wizard will be Pubs-SQLSrv-Access0, the second will be Pubs-SQLSrv-Access1, and so on. It is helpful to include information about the source and/or target tables in the replication name.

Description

Optional. Type a description for the replication. This information will be stored in the metadata and can be accessed when you need more information about the replication.

Use Group

Check this option to include the current set of replications as part of a group (recommended). You must create the group before running this wizard. Grouped replications do not have their own properties. Properties are set for the entire group so that all replications in the group are executed together. When using the Multiple Replications wizard to create replications for all or most tables in a database, it is recommended that you include them in a group so that all replications are executed together. This optimizes performance by reusing connections and limiting the need to access a transaction log (for mirroring and synchronization replications).

Replication Mode

Choose a replication mode from the options below.

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Refresh

Mass replication is executed once based on the time setting specified in the Scheduling screen. This type of replication is sometimes referred to as a snapshot replication.

Mirroring

Mass replication (refresh) can be executed once in order to fill the target records. Real-time mirroring based on recorded database transactions begins as soon as the refresh changes have taken place. The incremental replication is executed at user pre-determined intervals.

Synchronization

Mass replication (refresh) can be executed once in order to fill the target records. Real-time bi-directional mirroring begins as soon as the refresh changes have taken place. The incremental replication is executed at user pre-determined intervals.

Select Source Connection

This screen lists all the source connections that you have created in Syniti Data Replication.

Connection Name

Choose a source connection name from the drop-down list.

Database Name

Choose a database from the drop-down list.

Owner Name

Depending on the RDBMS that you are using as a source, this field may display schemas or libraries. Select an owner (or schema or library) from the drop-down list. Note that if you are replicating tables from the same database, but using tables with different owners, you will need to run the wizard multiple times, one for each owner.

Source Log Info

This screen is displayed when you have set mirroring as your replication type. It allows you to specify transaction log information that is specific to the database from which you are replicating. For an explanation of fields in this screen, click on the link for your source database below.

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Microsoft SQL Server

IBM Db2 for i

Oracle

MySQL

Trigger-based Replications

Select Target Connection

Connection Name

Choose a target connection name from the drop-down list. If no target connections are available, you need to exit the wizard and create a target connection.

Target Log Info

This screen is displayed when you have set synchronization as your replication type. It allows you to specify transaction log information that is specific to the database from which you are replicating. For an explanation of fields in this screen, click on the link for your database below.

SQL Server

Db2

Oracle

Trigger-based Replications

Set Replications

Replication List

The Replication List displays a list of possible source table-target table replication pairs, based on information gathered from the source connection. Note that tables in the Target Table column may not yet exist in the target database. By default, all replications in the list are selected for creation. If you proceed from this screen without making any changes, a replication object will be created for each source table-target table replication pair that is displayed. You can:

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- Deselect a pair (i.e. the replication will not be created) by clicking in the checkbox to the left of the Source Table column.
- Deselect all pairs by clicking in the checkbox to the left of the column headings
- Select multiple pairs by holding down the <Control> or <Shift> key, then clicking the mouse on pairs, or a range of pairs. Use the **Check Selected Tables** button to create replications for those pairs.

- Deselect multiple pairs by holding down the <Control> or <Shift> key, then clicking the mouse on pairs, or a range of pairs. Use the **Uncheck Selected Tables** button to remove the pairs from the list of replications.

Source Table Column

The Source Table column lists all the table objects found according to the source connection information you provided (database and owner/schema/library.)

Source Type Column

The Source Type column displays the type of table object for the listed table. For example, if your environment consists of tables and views, this column allows you to distinguish between them, and even sort the list based on the type of table object.

Target Table Column

The Target Table column displays all table names matching the source table names, even when the tables do not yet exist in the database. If tables exist in the target database but do not have names that match source table names, you can access these tables using a drop-down list for each replication pair.

Examine each source table-target table pair to determine if you want to proceed with creating a replication for the pair. Your options are:

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- Deselect the pair so that no replication is created.
- Change the target table by clicking on the target table name and choosing the appropriate table from the drop-down list.
- Modify the field mappings for a source table-target table pair by clicking to open the Fields Mapping dialog. You can specify which fields to replicate, and whether to map values directly from source to target or to create an expression that modifies the target value.

Mapping Column

Provides a button so that you can set up custom mapping for each pair. In cases where a table has not yet been defined on the target database, you are asked if you want to create the table before proceeding. If the target table already exists, click to open the to open the Fields Mapping dialog.

Mapping Rule

The default mapping rule used by Syniti DR when creating replications is to map fields in source and target tables by name. However, you can modify this approach using the options available in the Mapping Rule field. The options are:

Mapping By Name: Maps each source field name to a matching target field name. If the target table exists and field names do not match, no mapping is performed and no replication for these fields will occur.

Mapping By Ordinal: Maps each source field column to a target field column based on its position in the table.

Clear All Mapping: Removes all established mappings, allowing you to create custom mappings for each table.

Scheduling

Enable Replication

Checked by default. When checked, the replication will begin at the scheduled time once the Replicator has been launched. If you uncheck this option, and run the Replicator, the replication will not start at the specified time. A replication must be enable before it can be run.

Start Time

Select a start date and time. When the Replicator is running, this time will be used to determine when to schedule the first replication.

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Selecting a Date

You can select a date either by typing in the month, day and year, or by clicking the down arrow to view a scrollable monthly calendar.

To type in a date, first select the month, then type in a new value, then select the day and type in a new value and finally select the year and type in a new value.

If you click the down arrow, it displays the date that corresponds to the value currently set in the field. Use the left and right arrows to locate the month you want, then select a date by clicking on it. The window closes when you select a date and the date is displayed in the Start Time field.

Selecting a Time

To select a time, first select the hours, minutes or seconds, then type a new number or use the up and down arrows to increase or decrease the number.

Execute Initial Refresh

Check this option to run a complete replication immediately the replication is enabled and the start time has been reached. Subsequent replications occur only as scheduled below.

For a synchronization replication, the initial refresh is always performed from the source connection to the target connection. Note that any transaction submitted during the time that the refresh is running might not be replicated. It is strongly suggested that you avoid updating the designated source and target tables until the refresh is done.

Refresh Schedule

Run One Time Only

Select this option if you want to replicate data only once.

Run Recurrently Select this option if you want to replicate data on a regular schedule. When you select this option, the Schedule button is activated. Click Schedule to open the Scheduler dialog.

Mirroring Schedule

Run Continuously

Select this option to continuously mirror activity between the source and target database. The start of mirroring is determined by settings in the Scheduling screen. If you have enabled replication and set the start time, then mirroring will begin at the start time specified. If you have also checked the option to execute an initial refresh,

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then mirroring will begin once the database refresh is complete. If **Enable Replication** is not checked, neither the initial refresh or continuous mirroring will begin at the time specified in **Start Time**.

Schedule Interruptions

Select this option if you need to schedule one or more interruptions to the mirroring schedule. When you select this option, the Schedule button is activated. Click **Schedule** to open the Scheduler dialog.

Summary

Displays the replication details that you have entered. Click **Back** to go back and change settings. Click **Start** to accept the replication settings and create replications for each selected source table-target table pair. Note that if you have installed the Replication Agent as a service and Enable Replication is checked in the Scheduling screen, replication will begin based on your settings in the Scheduling screen. If you did not install the Repllication Agent as a service, the replication will not run until you start the Replication Agent (and only if the Enable Replication option is checked.)

Processing

This screen allows you to observe the creation of replication objects. When complete, you can review the replications in the Metadata Explorer by expanding the Replications node and selecting the Replication Browser tab. You can also review the progress of running replications in the Replication Monitor tab.

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Replication Wizard

Define Replication Type> Source Connection> Source Log Info> Target Connection> Target Log Info> Set Mapping Info> Scheduling> Summary

Define Replication Type

Replication Name

Type a name for the replication. This name will be stored in the metadata and used to identify the replication in the Replication Browser. It is helpful to include information about the source and/or target tables in the replication name.

Description

Optional. Type a description for the replication. This information will be stored in the metadata and can be accessed when you need more information about the replication.

Use Group

Check this option to include the current replication as part of a group. You must create the group before running this wizard. Grouped replications do not have their own properties. Properties are set for the entire group, allowing you to quickly and easily define replications for multiple tables.

Replication Mode

Choose a replication mode from the options below.

Refresh

Mass replication is executed once based on the time setting specified in the Scheduling screen.

Mirroring

Mass replication (refresh) can be executed once in order to fill the target records. Real-time mirroring begins as soon as the refresh changes have taken place. The incremental replication is executed at user pre-determined intervals.

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Synchronization

Mass replication (refresh) can be executed once in order to fill the target records. Real-time bi-directional mirroring begins as soon as the refresh changes have taken place. The incremental replication is executed at user pre-determined intervals.

Source Connection

This screen lists all the source connections that you have created in Syniti Data Replication.

Source Name

Choose a source connection name from the drop-down list.

Source Table

Choose a source table from the drop-down list.

Open Table

Opens the Execute SQL Command dialog that displays the contents of the source table for your review. Note that if you execute a SQL query from this dialog, it does not affect any source, target or replication settings.

Source Log Info

This screen is displayed when you have set mirroring as your replication type. It allows you to define transaction log information that is specific to the database from which you are replicating. For an explanation of fields in this screen as they apply to your source database, check the list of source databases.

Target Connection

Target Name

Choose a target connection name from the drop-down list. If no target connections are available, you need to exit the wizard and create a target connection.

Target Table

Choose a target table from the drop-down list. If no tables are displayed, you can type in a table name. If the table does not yet exist in the target database, you are asked if you want to create the table. Alternatively, you can exit the wizard and either select tables for the target connection, or create a target table. Creating a target

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as part of the Replication wizard can save time, but creating a table using the Create Target Table wizard gives you more control over the target table.

Open Table

Opens the Execute SQL Command dialog that displays the contents of the target table for your review. Note that if you execute a SQL query from this dialog, it does not affect any source, target or replication settings.

Target Log Info

This screen is displayed when you have set synchronization as your replication type. It allows you to define transaction log information that is specific to the database from which you are replicating. For an explanation of fields in this screen as they apply to your source database, check the list of source databases.

Set Mapping Info

By default, source fields are mapped to target fields with the same column names. Use this screen to modify the mappings, either by removing mappings, setting mappings to different fields, or mapping fields to expressions. You can also leave the default mappings at this stage and edit them later using the Replication Properties dialog.

The top part of the screen shows source and target table fields. Arrows indicate the mappings that have been created automatically. When editing the mappings using the toolbar, you can map a source field to zero, one or more target fields, and map a target field to only one source field. If you select a source column already mapped, the new mapping will be added to the existing mappings. If you select a target column that has already been mapped, that mapping will be overwritten.

The lower part of the screen lists the target fields on the left side, with an icon that shows if the column is mapped to a field (, unmapped or mapped to an expression . Scrolling to the right, you can see the exact mapping for the target field.

The toolbar displays the following icons.

	Define Mapping Select a source or target field in the list and choose one of the following options from the drop-down list: **Map to field**: Opens the Edit Mapping dialog, displaying the current mapping, if any. If you selected a source field, choose the target field from the drop-down list on the right side of the dialog. Note that a source column can be mapped to zero, one or more target columns (see **Remove Mapping**

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	below to unmap a source column.) If you selected a target column, choose the source field from the drop-down list on the left side of the dialog. A target column can be mapped to only one source column. Note that if a target column is already mapped and you select another mapping, the new mapping overwrites the existing mapping. **Map to Expression**: Available when a target field is selected. Opens the Expression Generator so that you can map the selected target field to an expression. **Remove Mapping**: Available when a target field is selected. Removes a mapping to the selected field.
	Show/Hide Arrows Panel A toggle to display or hide the arrows between source and target fields. The arrows provide a graphical representation of mappings between fields. No arrows are displayed when a field is mapped to an expression.
	Show/Hide Extended Columns in Fields Lists A toggle to display or hide column information for source and target fields. The default column information consists of field name, position and type. Additional column information consists of size, precision, scale, description, null values, identity and default value.
	Mapping Direction Active when defining a synchronization replication. Allows you to view the mapping with arrows reversed from target to source, thereby demonstrating mappings that are not necessarily symmetrical with the mappings from source to target.
	Automatic Mapping By default, fields in the source and target tables are mapped according to the field name, where all matching names are matched. Use this menu to select instead to map by column ordinal numbers, or using a custom script function. The Automatic Mapping menu displays 3 entries: Mapping by Name, Mapping by Ordinal and Custom Mapping. The Custom Mapping option is inactive unless you have defined one or more mapping functions as part of a global script.

Scheduling

Enable Replication

Checked by default. When checked, the replication will begin at the scheduled time once the Replicator has been launched. If you uncheck this option, and run the Replicator, the replication will not start at the specified

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time. A replication must be enable before it can be run.

Execute Initial Refresh

Checked by default. When checked, Syniti DR will first perform a complete snapshot replication of the specified source data to the target table. This option is important for situations where the data on the target does not yet exist, or may be out of date. The progress of the Initial Refresh operation can be tracked in the Replication Monitor.

Start Time

Select a start date and time. When the Replicator is running, this time will be used to determine when to schedule the first replication.

Selecting a Date

You can select a date either by typing in the month, day and year, or by clicking the down arrow to view a scrollable monthly calendar.

To type in a date, first select the month, then type in a new value, then select the day and type in a new value and finally select the year and type in a new value.

If you click the down arrow, it displays the date that corresponds to the value currently set in the field. Use the left and right arrows to locate the month you want, then select a date by clicking on it. The window closes when you select a date and the date is displayed in the Start Time field.

Selecting a Time

To select a time, first select the hours, minutes or seconds, then type a new number or use the up and down arrows to increase or decrease the number.

Execute Initial Refresh

Check this option to run a complete replication immediately the replication is enabled and the start time has been reached. Subsequent replications occur only as scheduled below.

For a synchronization replication, the initial refresh is always performed from the source connection to the target connection. Note that any transaction submitted during the time that the refresh is running might not be replicated. It is strongly suggested that you avoid updating the designated source and target tables until the refresh is done.

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Refresh Schedule

Run One Time Only

Select this option if you want to replicate data only once.

Run Recurrently

Select this option if you want to replicate data on a regular schedule. When you select this option, the Schedule button is activated. Click Schedule to open the Scheduler dialog.

Mirroring Schedule

Run Continuously

Select this option to continuously mirror activity between the source and target database. The start of mirroring is determined by settings in the Scheduling screen. If you have enabled replication and set the start time, then mirroring will begin at the start time specified. If you have also checked the option to execute an initial refresh, then mirroring will begin once the database refresh is complete. If **Enable Replication** is not checked, neither the initial refresh or continuous mirroring will begin at the time specified in **Start Time**.

Schedule Interruptions

Select this option if you need to schedule one or more interruptions to the mirroring schedule. When you select this option, the Schedule button is activated. Click **Schedule** to open the Scheduler dialog.

Summary

Displays the replication details that you have entered. Click Back to go back and change settings. Click Finish to accept the replication settings and close the wizard. Note that the replication will not run until you start the Replicator (and only if the Enable Replication option is checked.)

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Replication Group Wizard

Define Group > Select Replications > Summary

Use this wizard to create a group of replications. Groups allow you to set and change properties for all replications in the group from a single dialog. This is useful if you need to run replications for multiple tables at the same time but do not want to enter replication settings for each table involved.

Group replication properties are determined by the first replication that you add to the group. If you need to change the replication properties for a group, select the group then, from the right mouse button menu, choose **Edit Replications**.

Define Group

Name

Type a name for the group. The group name is used in the Replication Wizard for adding a replication to a group.

Description

(Optional) Add a description of the group to help you identify its contents.

Select Replications

Replication List

Displays the list of replications associated with the meta data where the group is being created. Check each replication that you want to include in the group. If you have not yet created any replications, click **Next** to go to the Summary screen. You can include replications in the group as you create them in the Replication wizard.

When you add the first replication to a newly-created group, the properties of the replication become the properties of the group. Any subsequent replications added to the group take on the properties of the group. If you need to change the replication properties for a group, select the group then, from the right mouse button menu, choose **Edit Replications**.

Summary

Displays the group details that you have entered. Click **Back** to go back and change settings. Click **Finish** to accept the settings, create the group and close the wizard.

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Restore Metadata Wizard

Select backup file> Select Replications> Map Connections> Set Replication Details> Map Groups> Summary>Processing

Use this wizard to create a new replication based on settings in an existing replication. The Export Replications wizard provides a way for you to use an existing replication definition with new source and/or target connections. For example, if you have created a replication that mirrors data from Oracle to SQL Server, and you wish to mirror the same data to a MySQL database, use the Export Replications wizard. First create the target connection for MySQL, then run the Export Replications wizard to copy the replication using the new target connection.

Select Backup File

Locate the metadata backup file you previously saved. You can save a metadata backup file using the Backup Metadata option on the Metadata menu in the Management Center. See .Backing Up and Restoring Metadata for more information.

Select Replications

This screen lists all the replications defined in the metadata that you have selected. All replications in the list are checked by default. All checked replications will be restored. You can perform the following operations on the list of replications:

- Click in the checkbox in the title bar to remove the checkmark for all replications (if the box is already checked.)
- Click a checked replication to remove the checkmark for that replication only
- Click in the checkbox in the title bar to check all replications (if the box is not already checked.)
- Click an unchecked replication to set a check mark
- Select a group of unchecked replications using the Control or Shift keys with the mouse, then click the **Check Selected** icon to check all selected replications
- Select a group of checked replications using the Control or Shift keys with the mouse, then click the **Uncheck Selected** icon to remove the checkmark for all selected replications

When you have checked all the replications that you want to restore, click **Next** to set connection details for each one.

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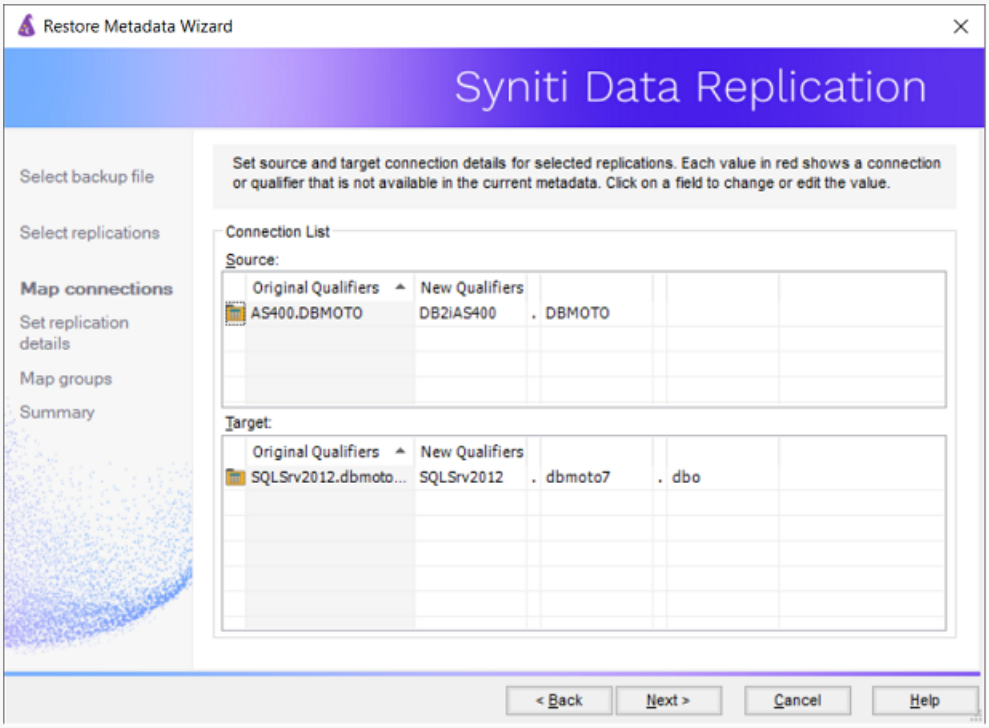
Map Connections

This screen displays a list of all source and target connection details used by the original replications you selected in the Select Replications screen.



All source and target connections used in your selected replications are listed.

Original Qualifiers

This column displays the connection information for the source and target tables obtained from the metadata backup file you identified in the **Select backup file** step. The data in this column cannot be modified.

New Qualifiers

This set of columns initially displays the same information as the **Original Qualifiers** column. However, you can modify values in these columns to identify new connections for the replications. Values in red show that the connection does not exist in the current metadata. You should modify these values to successfully complete the restore operation.

To accommodate the different sets of qualifiers required by each database, the first field shows the name of the connection, and subsequent fields show required qualifiers for that connection, each separated by a period.

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To modify values, click in the field and choose a new value from the drop-down list. In all fields, except for the connection name, you can also type in a new value. If a blank field is preceded by a period, you should supply a qualifier value in that field.

When you have selected new connection details, click **Next** to apply those connection details to the replications you have selected to restore.

Set Replication Details

This screen displays replications with source and target connections modified based on the your changes in the Map connections screen. You can make further changes for each replication in this screen by using the drop-down lists in each field. The Tables button provides access to source and target table qualifier information.

Map Groups

This screen allows you to set groups for restored replications.

Summary

The summary lists all the replications that will be restored, including the original replication name and its replication details as well as the restored replication name and its replication details. Review the summary before clicking **OK** to begin restoring the metadata information to your current metadata.

Processing

Click **Start** to begin restoring metadata information. The progress bar shows the current status of the operation and messages are reported in the text area. When the restore operation is complete, review messages and click **Close** to exit the wizard.

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Add New Server Dialog

In addition to the local installation of Syniti Data Replication, you can view and manage remote installations of Syniti DR from the Management Center. The Add New Server dialog allows you to add a remote Syniti DR server to the Management Center.

Server Name

Type the network name of the server you wish to add. The system should already have an installed copy of Syniti DR with the Server Agent running.

Server Address

Type the IP address for the server.

Port

In most cases, you do not need to change the default setting. If you have specific requirements for a different port number for the Syniti DR Server, enter a new value here. You will also need to edit the Replication Agent Options and set the port number there.

1. In the Metadata Explorer, select the server.
2. From the right mouse button menu, choose Replication Agent Options.
3. In the Replication Agent Options dialog, go to the Advanced Tab.
4. Edit the value for the Agent IP Port field.

Authentication

Select the option below that matches your user settings for the new server. The options are:

AnonymousAccess
No login details are requested from the user. This is the default setting for installations where Syniti DR security has not been enabled. To enable Syniti DR security, go to the User Settings dialog.

Syniti DR Authentication
If Syniti DR security has been enabled via the User Settings dialog, and you have been directed by your administrator to use Syniti DR Authentication, select this option, then type your user name and password in the fields below. Syniti DR authentication requires the use of a X.509 certificate. Verify that a certificate has been

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installed correctly before completing this dialog. If you do not have a correctly installed certificate, you may not be able to use the Management Center.

Windows Authentication

If Syniti DR security has been enabled via the User Settings dialog, and you have been directed by your administrator to use Windows Authentication, select this option. Syniti DR will verify that your Microsoft Windows login and ID are legitimate before allowing you to continue working in the Management Center.

Certificate Authentication

If Certificate has been enabled via the User Settings dialog, and you have been directed by your administrator to use Certificate Authentication, select this option. Certificate authentication requires the use of a X.509 certificate. Verify that a certificate has been installed correctly before completing this dialog. If you do not have a correctly installed certificate, you may not be able to use the Management Center.

User Name

Active only when Syniti DR Authentication has been selected. Enter the user name assigned to you by the administrator. If you do not know your user name, verify login information with your administrator or try setting the Authentication value to AnonymousAccess (no security) or Windows Authentication (uses your Microsoft Windows login and password.)

Password

Active only when Syniti DR Authentication has been selected. Enter the password assigned to you by the administrator. Syniti DR will verify that your Syniti DR login and ID are legitimate before allowing you to continue working in the Management Center.

If you do not know your password, verify login information with your administrator or try setting the Authentication value to AnonymousAccess (no security) or Windows Authentication (uses your Microsoft Windows login and password.)

Server activity can be monitored through the Server Log, available by selecting the server, then choosing **View Server Log** from the right mouse button menu. For more information, see Reviewing Server Activity.

Opening the Add New Server Dialog

In the Metadata Explorer, select the Syniti DR root node, then choose **Add New Server** from the right mouse button menu.

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Connection Properties Dialog

This dialog reports and allows you to edit connection properties for source and target connections. Many of these properties are typically set initially in the Add Source Connection wizard or Add Target Connection wizard when setting up a replication.

NOTE: The Management Center window contains a View Properties pane. If you select a source or target connection in the Metadata Explorer, connection properties are displayed in the View Properties pane. However, to edit properties, you must open the Connection Properties dialog using the **Show Properties** icon in the View Properties toolbar.

Connection Name

The name of the connection that you provided when creating the connection.

Connection

This field displays the current data provider. Click on the ellipsis icon , to open a dialog showing the connection string details as previously defined in the Source Connection wizard or Target Connection wizard. The database, data provider and connection string parameters can be changed in this dialog.

Default Fetch Size

Default value is 1000000. The default read block size for mirroring and refresh replications with connections using Oracle .NET Data Provider. This value can be overridden in the the Replication Properties for each replication.

Relative Time Difference

Shows the time difference between the Syniti DR Server Agent system and the database server. A negative value means the Server Agent system time is behind the database server time.

Source and Target Connection Properties

Dynamic Properties

- **Max Number of Concurrent Connections**
  Restricts the number of connections that Syniti DR can make to the database server. This is a safeguard in situations where you have many replications using the same database server, but do not want to overwhelm the

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database server with concurrent connections from Syniti DR, possibly affecting connections from other applications using the database server.

- **Command Timeout**
  Indicates the amount of time before a command created from this connection times out while waiting for a response from the database server. A default value of -1 indicates that no time has been set and the default timeout determined by the .NET data provider is used. To set a different timeout value, enter a value in seconds.
- **Disconnected Mode**
  Indicates if the connection has to be considered in disconnected mode when used within the wizards. If this property value is set to true, every time it is necessary to list connection objects (catalogs, schemas, tables), only objects already belonging to the metadata will be shown.
- **LOBs Cache Size (Kb)**
  Defines the minimum size of a LOB field, retrieved using this connection as reader, in order to buffer its value on a temporary file instead of loading it in memory in the record queue . Set this property to 0 to diable LOB caching functionality.
- **CREATE TABLE Prefix (Target Connections Only)**
  Allows you to define a CREATE TABLE statement to be used instead of the default. Set the value as a string, and include "CREATE TABLE" . If no value is defined, the default is used.

  Example: "ALTER session SET nls_length_semantics=CHAR; CREATE TABLE"
- **CREATE TABLE Postfix (Target Connections Only)**
  Allows you to define a statement to be executed after creating the table. Set the value as a string.
- **CREATE INDEX Postfix (Target Connections Only)**
  Allows you to define a statement to be executed after creating an index. Set the value as a string.
- **CREATE TABLE Custom Rule (Target Connections Only)**
  Allows you to select a rule from a previously created list of rules to use in creating tables. The default is Automatic, meaning that no custom rule will be used.
- **CREATE TABLE Keep Identity (Target Connections Only)**
  Works in conjunction with the Identity field in the Create Target Table wizard to allow creation of Identity columns on the target when set to **True** for the following target databases: Microsoft SQL Server, Oracle, IBM Db2 for i, MySQL, SAP Hana, MariaDB, Informix, PostgreSQL, SAP ASE, SAP SQL Anywhere. When set to

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False, the Identity marker will not be added in the target table.

- **Staging Schema (Oracle Target Connections Only)**
  If using bulk mirroring, staging tables are required on the target database to hold data temporarily. By default, these tables are created in the target connection schema. However, you can set the schema to use in this field. CREATE TABLE permissions are needed if bulk mirroring is enabled.
- **Get User Name from Session (Oracle Target Connections Only)**
  Retrieves the user name from the session if Syniti DR detects the user as UNKNOWN from the log miner. Note: when set to True, this property executes an additional query which can impact performance.
- **Convert CCSID 65535 (IBM Db2 for i/iSeries/AS400 only)**
  False by default. When True, automatically converts binary field values to varchar type so that they can be processed as strings. See also the Database Specific Settings dialog.
- **CCSID for Conversion (IBM Db2 for i/iSeries/AS400 only)**
  The language code to use in converting binary fields to varchar fields.
- **Service Name (Oracle only)**
  A read-only property that provides the service name of the system where Oracle is installed.
- **Max Size Mirroring Block (all databases that support transactional replications via triggers)**
  IBM Db2 for i/iSeries/AS400
  Set to 10000 by default. This field is useful if you expect a huge number of transactions between mirrorings. Syniti DR reads the journal and stores records that need to be replicated in a temporary file. If the file contains a large number of records or a smaller number of very large records, it can impact performance. In this case, you can set a limit on the number of records to handle at one time. For example, if you set the value of the Block Size field to 250, only 250 records will be replicated at a time.
  SQL Server
  Set to 10000 by default. This field is useful if you expect a huge number of transactions between mirrorings. Syniti DR reads the log and stores records that need to be replicated in a temporary file. If the file contains a large number of records or a smaller number of very large records, it can impact performance. In this case, you can set a limit on the number of records to handle at one time. For example, if you set the value of the Block Size field to 250, only 250 records will be replicated at a time.
  Oracle
  Set to 0 (disabled) by default. This field is useful if you expect a huge number of transactions between

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mirrorings. Syniti DR reads the log and stores records that need to be replicated in a temporary file. If the file contains a large number of records or a smaller number of very large records, it can impact performance. In this case, you can set a limit on the number of records to handle at one time. For example, if you set the value of the Block Size field to 250, only 250 records will be replicated at a time.

Connections for Trigger-based Replications

For trigger-based replications, this property instructs the Syniti DR engine to break the query that reads the transactions into multiple queries, each one returning not more than the specified number of records. For example, if you have 1000 transactions to retrieve and the property is set to 250, Syniti DR runs 4 queries to retrieve all the transactions. This approach reduces the load on the database server and reduces the locks on the log tables which are also used by the triggers. The default value for this property is 1000.

- **Max Number of Log Records in Queue**
  Default value is 200. For transactional replications, defines the maximum number of log records loaded in memory waiting to be committed. Once this number is reached, new log records will be cached to file.

- **Enable Transactional Objects**
  For transactional replications, this property allows you to enable or disable the creation and validation of any transactional objects required by Syniti DR in the source database. For example, triggers and log tables are created for trigger-based replications, and articles and publications are created for Microsoft SQL Server log-based replications. By default, the property is set to true and Syniti DR will attempt to create objects required for transactional replications in the database as needed. In some cases, the Syniti DR user does not have enough permissions to make changes in the DBMS, so the property can be set to false to allow external creation of the needed objects. When the property is set to false, Syniti DR creates the replication definition without altering properties in the database. This property works in conjunction with the Validate Replications feature where it is possible to check if the replication has been set up correctly.

- **Temporary Files Library**
  The default value is DBMOTOLIB. You can modify this value if you prefer to keep temporary files associated with Syniti DR in a different library. Temporary files are automatically created and deleted by Syniti DR. You do not need to maintain these files.

- **Use Primary Key Extended (IBM Db2 for i/iSeries/AS400 only)**
  When set to True, retrieves keys for tables that support this feature such as DDS tables.

- **Verifier Sort Sequence Table (IBM Db2 for i/iSeries/AS400 only)**
  Designate a table that contains ordering rules for the data in the result set to be used by the Verifier to sort

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character values.

- **Default Commit Mode:** Default is AutoCommit where each statement is replicated as a standalone transaction. This means that only statements that fail will not be replicated. The CommitmentControl option applies all the statements associated with a transaction as a whole to the target. CommitmentControl is supported on Oracle (Log Reader and Log Server Agent), Microsoft SQL Server, IBM Db2 for i, IBM Db2 LUW, IBM Informix.
- **Filter By Member Name (IBM Db2 for i/iSeries/AS400 only)**
  For use when replicating with multi-member tables. If set to True, when reading the Journal a filter will be used with the default member of the table. This will prevent "journal entries not found" errors caused by operations executed to non default members of the table. Remember to update the table schema when the default member is changed.

Refresh Options (Target Connection Properties Only)

- **Default Insert Mode**
  Allows you to set a default insert mode for all replications using this target connection. The default setting can be overridden using the Replication Properties for a specific replication. The options are:
  - SingleInsert--inserts record by record using SQL INSERT statements
  - BulkInsert--inserts blocks of records. Block size is determined by the Block Size option. Choose this option for increased performance if using one of the data access providers which currently support bulk inserts:
    Syniti Ritmo/i (IBM Db2 for i) .NET Provider
    SAP HANA ODBC driver
    SAP HANA .NET Provider
    SAP Sybase ASE .NET Provider
    SAP Sybase IQ .NET Data Provider
    Microsoft SQL Server .NET Provider (using SQL Server's SqlBulkCopy)
    MySQL .NET Data Provider (MySQL AllowLoadLocalInfile property must be set to True in the connection string for bulk mirroring with MySQL Connector 8.0 and above)
    PostgreSQL .NET Data Provider
    Oracle .NET provider.
    For SQL Server, note that BulkInsert is the default option.
    Record details are not reported in the log when BulkInsert is set.

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- SimulatedBulk--For databases that do not support bulk insertion, Syniti DR simulates the effect by grouping records into blocks before performing an insert. This is a way to optimize performance.

- **Default Bulk Type**

  Allows you to set a default bulk type for all replications using this target connection. The default setting can be overridden using the Replication Properties for a specific replication. Depending on the database type and provider type, some of the following options may not be available.

  - ArrayBinding--inserts multiple rows at a time using an array of parameters
  - Native--uses the native functionality of the provider, if available
  - FTP--bulk insert implemented through FTP

- **Default Block Size**

  Allows you to set a default block size for all replications using this target connection. The default setting can be overridden using the Replication Properties for a specific replication. Set the value for the number of rows to insert in a single operation using the Bulk option above.

- **Default Isolation Level**

  Allows you to set a default isolation level for all replications using this target connection. The default setting can be overridden using the Replication Properties for a specific replication. This option allows you to choose a specific isolation level on the Refresh operation. Choose from the following options available through your .NET Framework data provider:

Unspecified	No level is determined.
Chaos	The pending changes from more highly isolated transactions cannot be overwritten.
ReadUncommitted	A dirty read is possible, meaning that no shared locks are issued and no exclusive locks are honored.
ReadCommitted	Shared locks are held while the data is being read to avoid dirty reads, but the data can be changed before the end of the transaction, resulting in non-repeatable reads or phantom data.
RepeatableRead	Locks are placed on all data that is used in a query, preventing other users from updating the data. Prevents non-repeatable reads but phantom rows are still possible.
Serializable	A range lock is placed on the DataSet, preventing other users from updating or inserting rows into the dataset until the transaction is complete.

- **Use DELETE instead of TRUNCATE**

  When running a refresh, Syniti Data Replication by default initially truncates the target table before replicating

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new values from the source. Set this field to True to change the default behavior to delete target table values (and retain details of deleted data in the log) before replicating fresh data from the source.

Mirroring Options (Target Connection Properties Only)

- **Default Mirroring Insert Mode**
  Allows you to set a default insert mode for all replications using this target connection. The default setting can be overridden using the Replication Properties for a specific replication. The options are
  - SingleInsert--inserts record by record using SQL INSERT statements
  - BulkInsert--inserts blocks of records. Block size is determined by the Block Size option. Choose this option for increased performance if available
- **Default Mirroring Block Size**
  Allows you to set a default block size for all replications using this target connection. The default setting can be overridden using the Replication Properties for a specific replication. Set the value for the number of rows to insert in a single operation when using the BulkInsert option above.
- **Default Commit Isolation Level**
  Allows you to set a default isolation level when the Commit Mode is set to CommitmentControl for all replications using this target connection. The default setting can be overridden using the Replication Properties for a specific replication. Choose from the following options.

Unspecified	No level is determined.
Chaos	The pending changes from more highly isolated transactions cannot be overwritten.
ReadUncommitted	A dirty read is possible, meaning that no shared locks are issued and no exclusive locks are honored.
ReadCommitted	Shared locks are held while the data is being read to avoid dirty reads, but the data can be changed before the end of the transaction, resulting in non-repeatable reads or phantom data.
RepeatableRead	Locks are placed on all data that is used in a query, preventing other users from updating the data. Prevents non-repeatable reads but phantom rows are still possible.
Serializable	A range lock is placed on the DataSet, preventing other users from updating or inserting rows into the dataset until the transaction is complete.
Snapshot	No locks on underlying data in a snapshot transaction, so other transactions can execute.

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- Allows you to set a default mapping rule for all replications using this target connection. The default setting can be overridden when setting the mapping for a specific replication.

Transactional Support Properties

These properties are relevant when performing transactional replications (mirroring or synchronization). Properties differ depending on the type of database used in the connection. To modify properties in this section, click the value for the Transaction Log Type property and then click ... to open the Setup Info dialog.

- **Transaction Log Type**
  Always set to either the database name, where the database log is used to detect new transactions, or Triggers, where triggers are used to identify transactions in the database. Click the value for the Transaction Log Type property and then click ... to open the Setup Info dialog.

SQL Server Source and Target Connections Only

- **Server Name**
  Always set to the name of the server that you specified in the Source/Target connection. Select this field and click ... to create the distributor required for mirroring and synchronization replications, or modify the user ID and password.
- **Database Name**
  Set to <None> if no distributor has been created. A distributor is required for mirroring and synchronization replications that use the transaction log.
  Set to DBRS_DISTRIBUTION if the distributor has been created. To create the distributor, click in the Server Name field and then click ... to open the Distributor Settings dialog.
- **Use Trusted Connection**
  When False, you need to supply a user ID and password for SQL Server. When False, the connection uses your Windows user ID and password. Set this field to **True** using the Distributor Settings dialog available by clicking ... in the Server Name field.
- **User ID**
  Blank when no distributor has been created. Set this field using the Distributor Settings dialog available by clicking ... in the Server Name field. The user ID should have system administrator privileges to create the distributor and access the transaction log.

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- **Password**
  Blank when no distributor has been created. Set this field using the Distributor Settings dialog available by clicking ... in the Server Name field.

- **Log Options**
  This property allows the user to add options to the query that Syniti DR uses to open the SQL Server Log Reader, and thereby optimize query execution. Use the syntax specified for the SQL Server OPTION clause. For instance, for the following query:
  SELECT …
  FROM …
  WHERE …
  OPTION (HASH GROUP, FAST 10);
  put the value “HASH GROUP, FAST 10” in the Log Options property.

IBM Db2 for i/iSeries/AS400 Source and Target Connections Only

- **Library Name**
  By default, this is set to DBMOTOLIB when this has been installed. Click in the field and then click ... to open the Install i5/AS400 Library dialog and install the library. This library is required when performing mirroring and synchronization replications that access the journal.

- **Version**
  Read-only property. The version of the DBMOTOLIB library installed on the IBM Db2 for i (iSeries/AS400) system. This value is generated by Syniti DR.

- **Apply Journal Order By**
  (Only for use in special circumstances.) If enabled, when reading the journal, an ORDER BY JOSEQN (Journal entry sequence number) clause will be added to the SELECT statement to enforce the sorting, whenever it is not performed by default.

Oracle Source and Target Connections Only

- **Use Online Dictionary**
  Set to **True** if you are planning to run mirroring or synchronization replications for Oracle versions 9i or higher. Set to **False** for Oracle versions 8.1.7 up to 9i. You must also specify a dictionary file name if you set this value to false.

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- **Dictionary File**
  If you are using mirroring or synchronization and set **Use Online Dictionary** to **False**, type the path and file name for an Oracle dictionary file. The Oracle dictionary file should be defined in your Oracle environment. See Setup for Different Oracle Versions for more information.

- **Max Number of Log Files in Mirroring Block**
  This property is used only when **Use CONTINUOUS_MINE Option** is disabled. It sets the number of log files that can be loaded into memory per transaction-log reading session (default is 5). In cases where there is a long list of log files to load, processing them all at the same time would significantly increase system memory consumption. Controlling the number of files in memory reduces the impact on system performance.

- **Default Fetch Size**
  The default read block size for Oracle sources in both refresh and mirroring. The default value is 1000000. However, for replications using the Log Reader, it can be overridden in the **Fetch Size** field of the Replication Properties dialog. For replications using the Log Server Agent, the value should typically be much higher for best performance.

SAP HANA (ODBC connection) and SAP Sybase IQ Target Connection Only

In the Dynamic Properties section, you need to set FTP/SFTP properties to transfer data from the source database to the SAP HANA server. With FTP/SFTP file transfer information, Syniti DR can use BulkInsert mode for replication speed and efficiency.

- **FTP Server, FTP Port, FTP User, FTP Password**
  The FTP/SFTP connection details for the server where SAP HANA is running.

- **Import Path**
  The complete path for the file location on the target machine where SAP HANA is installed.

Netezza/PureData Target Connection Only

- **Max Commit Interval**
  Indicates the maximum waiting time (in seconds) to reach the block size before sending records processed so far to the target, even if records to fill the block size have not been collected yet. Works in conjunctions with the Default Block Size property. The default value is 0, indicating that there is no maximum limit on the time to wait before sending records to the target--only the block size value will be used.
  When processing a mirroring, the records changed are sent to the target in blocks as indicated in the Default

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Block Size field. If the time to process a block reaches the specified value, the records that have been processed so far are sent to the target even if the records count is less than the specified block size.

Trigger-based Log Properties (Source and Target Connections for Db2 UDB, Db2 z/OS or Gupta SQL Base Only)

Use Transactional Replication

Check this option if you are planning to define a mirroring or synchronization replication.

- **Master Table**
  Either specify an existing qualified table name, or click Change to create a new table to hold general information about replication transactions including user name, timestamp, table name for each transaction.
  There are two tables associated with each replication: a Master table, common to all replications using that connection, and a Log table for each replication source table. The Master table keeps track of all the transactions affecting the source tables and it records general transactional information.
  Master and Log tables are created in the schema specified when you set the Master table name. You can choose a Master table name, or use the default _DBM__MASTERLOG. Log tables are automatically generated by Syniti DR and the names are _DBM__LOG_#, where # is a number. The selected schema for the Master and Log tables must not contain other non-Syniti DR tables with names _DBM__LOG_# . It is recommended that you create a new schema to use specifically for the Syniti DR Master and Log tables.
- **Tablespace**
  It is recommended that you assign a tablespace for the Master table and Log Tables so that it is easier to control log table sizes. Your system administrator should be able to provide you with the appropriate value for this field.
- **Retention Time**
  The amount of time in hours that a transaction is kept in the log tables. The default value is 72 hours. When the amount of time a transaction resides in the log exceeds the retention time, the transaction is permanently removed from the log tables. Tuning the retention time provides control over the size of the log tables.
- **Delete Block Size**
  Based on the retention time, Syniti DR deletes items from the log. This field specifies the maximum number of records to delete from the Syniti DR log tables with a single SQL statement. The default value is 10,000 records. You do not typically need to edit this value.

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Opening the Connection Properties Dialog

In the Management Center Metadata Explorer, expand the tree to show a source or target connection. Select the connection. From the right mouse button menu, choose **Connection Properties**.

Related

Metadata Connection Wizard

Source Connection Wizard

Target Connection Wizard

Creating a Connection

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Create Login Dialog

The Create Login dialog allows you to set up login and profile details for a new user.

User Definition Tab

Authentication

Choose one of the following options in the drop-down list:

UserName Authentication
Syniti DR will manage the user ID and password information supplied in the fields below.

NOTE: If you set up a user ID with UserName Authentication, you will not be able to use Syniti DR until the certificate is correctly installed. Generate and install the certificate before setting up authentication.

Windows Authentication
Syniti DR uses your Microsoft Windows login and ID to control access to the Management Center.

Syniti DR Login

Active only when UserName Authentication has been selected. Enter a user name.

Password

Active only when UserName Authentication has been selected. Enter a password for the user.

Confirm Password

Re-enter the password.

Permissions Tab

User Role

Select a user role from the drop-down list. When you select a role, the appropriate permissions are also set. You can modify the permission settings for a specific user by changing the True/False values, but note that the user role changes to **Custom** as soon as you change a permission setting.

Administrator
Permission for all operations.

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Auditor

Permission to audit and monitor replications

Custom

Permissions selected manually.

Operator

Permission to set up and change replication settings but cannot work on administrative tasks (such as change license, change user permissions)

Public

Permission to audit and monitor replications, back up metadatas and change metadata settings (such as starting/stopping traces or changing email parameters for email notification).

SecurityAdmin

Permission to manage security, Does not normally need to change replication settings or work on creating new metadata.

The table below summarizes the different permissions for each user role.

Permission	Description	Admin.	Security Admin.	Auditor	Operator	Public
Connect to Server	Permission to connect to a Syniti DR server	X	X	X	X	X
Set Metadata Default	Permission to set the default metadata. Can only be performed on local installation of Syniti DR.	X			X	
Change License	Permission to change	X	X			

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	product license. Can only be performed on local installation of Syniti DR.					
Add Metadata	Permission to add a metadata connection.	X			X	
Remove Metadata	Permission to remove a metadata connection	X			X	
Change Metadata Properties	Permission to edit metadata properties. Can only be performed on local installation of Syniti DR.	X			X	X
Load Metadata	Permission to load metadata	X		X		X
Browse Metadata	Permission to browse metadata tables through the SQL Command panel	X	X			

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Change Replication Agent Settings	Permission to change Replication Agent Settings	X				
Change Security	Permission to change security settings. Can only be performed on local installation of Syniti DR.	X	X			
Change Global Script	Permission to edit the current metadata global script.	X				
Drop Metadata	Permission to drop the tables of the current metadata when they are removed from Syniti DR metadata.	X				
Backup Metadata	Permission to execute a metadata backup of the	X			X	X

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	current metadata.					
Restore Metadata	Permission to execute a metadata restore of the current metadata from a backup file.	X			X	
Custom Restore Metadata	Permission to execute a custom metadata restore of the current metadata from a backup file.	X			X	
Add Connection	Permission to add a connection to the current metadata.	X			X	
Change Connection	Permission to edit a connection in the current metadata.	X			X	
Remove Connection	Permission to remove a connection in the current metadata	X			X	

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Add Replication	Permission to add a replication in the current metadata	X			X	
Change Replication	Permission to edit a replication in the current metadata	X			X	
Remove Replication	Permission to remove a replication in the current metadata	X			X	
Add Group	Permission to add group in the current metadata	X			X	
Change Group	Permission to edit a group in the current metadata.	X			X	
Remove Group	Permission to remove a group in the current metadata.	X			X	
Move Group Replication	Permission to move replications in and out of a	X			X	

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	group in the current metadata.					

Opening the Create Login Dialog

In the Metadata Explorer:

1. Select the server for which you want to create a user login.
2. Click **Manage Users** in the toolbar or choose **Manage Users** from the right mouse button menu.
3. In the User Settings dialog, check the **Enable Security** option.
4. Click **Add** to open the Create Login dialog.

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Define Primary Key Dialog

This dialog allows you to set a primary key on a table for use during transaction-based replications (mirroring or synchronization.) The primary key is for use within Syniti Data Replication only. It does not affect any primary key settings in your database. You can either set a primary key for a table that has no key, or you can override a primary key that has been set in the database. When you display a table in the Management Center Object Browser, primary key fields are displayed with a key icon . Fields in grey denote a primary key that has been set in the database, but not used in Syniti DR.

NOTE: If you choose to set one or more table columns as primary key in Syniti DR, it is critical that each record contains a **unique value**. If the values are not unique for each record, the results of any replication using the table are unpredictable. The primary key columns defined in Syniti DR are used to match source and target records based on their values. Syniti DR does not enforce primary key constraints internally, and is not able to determine whether a transaction will be applied to multiple records or whether it will generate duplicate values.

Fields

This column displays all fields that are eligible to be a primary key. Fields that are nullable cannot be used as primary keys.

Keys

This column displays fields that are currently set as a primary key.

Select a field and use the arrow keys to move the field between columns.

1. The left column of the Define Primary Key dialog, there is a list of fields eligible to be primary keys. It does not include any nullable fields. The right column of the dialog shows any primary keys that have already been set. If a primary key is set in the database, it is displayed in the right column of the dialog.
2. To add a new primary key, select a field name in the left column, then click the right-facing arrow to move the field into the right column of the dialog. You can use any number of fields (to the limit set by the database you are using) to create a primary key, **as long as they can uniquely identify any record.**
3. To remove an existing primary key, select the field name in the right column, then click the left-facing arrow to move the field into the left column of the dialog.
4. When you have set the primary key to your liking, click **OK** in the Define Primary Key dialog.
   The Management Center table display updates to show your new primary key settings. Note that if you have

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overridden a primary key set in the database, the field is displayed in grey to show the change. In the example below, the primary key set in the database, **au_id**, is displayed in grey to show that it will not be used as a primary key for replication, and the fields **au_lname** and **au_fname** have been set as primary keys.

Opening the Define Primary Key Dialog

1. In the Management Center Metadata Explorer, select a source or target table.
2. From the right mouse button menu, choose **Set Primary Key.**

Related Topics

Primary Key Settings for Mirroring and Synchronization

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Dashboard (Statistics Tab)

The Dashboard allows you to analyze replication data over a period of time based on the contents of a specified Syniti DR Metadata and history file or database. It can provides information for each table in a selected set of tables including:

- Total number of processed records
- Total number of failed records
- Total number of records
- Total number of replication sessions
- Total number of processed records by all replications per unit of time.
- Average time it took to replicate specified records.

If you are interested in obtaining this type of information about your replication environment, and plan to use the Dashboard regularly, set both the log and history to save to a database rather than a file. This speeds up the data loading process. The Dashboard works also when using log and history files, but data is only loaded from the current history file. Additionally, if the history has been enabled only for a short period of time, the results shown in the dashboard are limited and therefore less meaningful.

Steps for Using the Dashboard

Use the following steps to gain a basic understanding of Dashboard functionality. For more information, see the description of each area of the Dashboard below.

1. Select a time interval by expanding the time interval area and using the yellow scroll bar to adjust the default time.

2. Using the Replication Groups and Selected Replications areas, select which replications you would like to examine in the Dashboard.

3. Using the Dashboard Chart menu, or the Overview and Throughput tabs, choose which type of chart to view.

4. In the chart display, expand or reduce the amount of data displayed in the chart using the horizontal scrollbar or mouse wheel.

5. In the Overview Chart, the bar chart displays processed records for each table. Click on one of the options below the chart to change the line chart in the display. Note that the right y-axis scale for the line chart changes depending on the data displayed.

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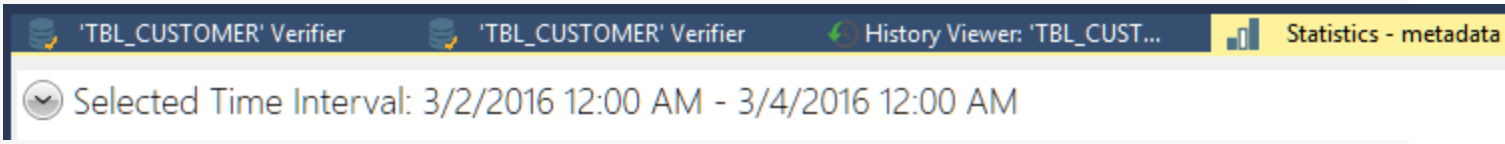
6. In the Throughput Charts, modify the time units displayed using the buttons at the top right of the chart area.

Dashboard Layout

Selected Time Interval

The dashboard automatically loads data from the last week of execution (if available in the history). In the example below, data from 11/1/14 to 11/8/14 because that is the most recent data available from the history.



To change the time interval displayed:

1. Click the down arrow on the left to expand the time selector.
2. Use the horizontal yellow scrollbar to adjust the time period displayed:
    - Use the mouse wheel or drag the end of the scroll bar to change the time period (days, weeks, months) of the whole axis
    - Use the left mouse button on the scrollbar to expand or contract its size

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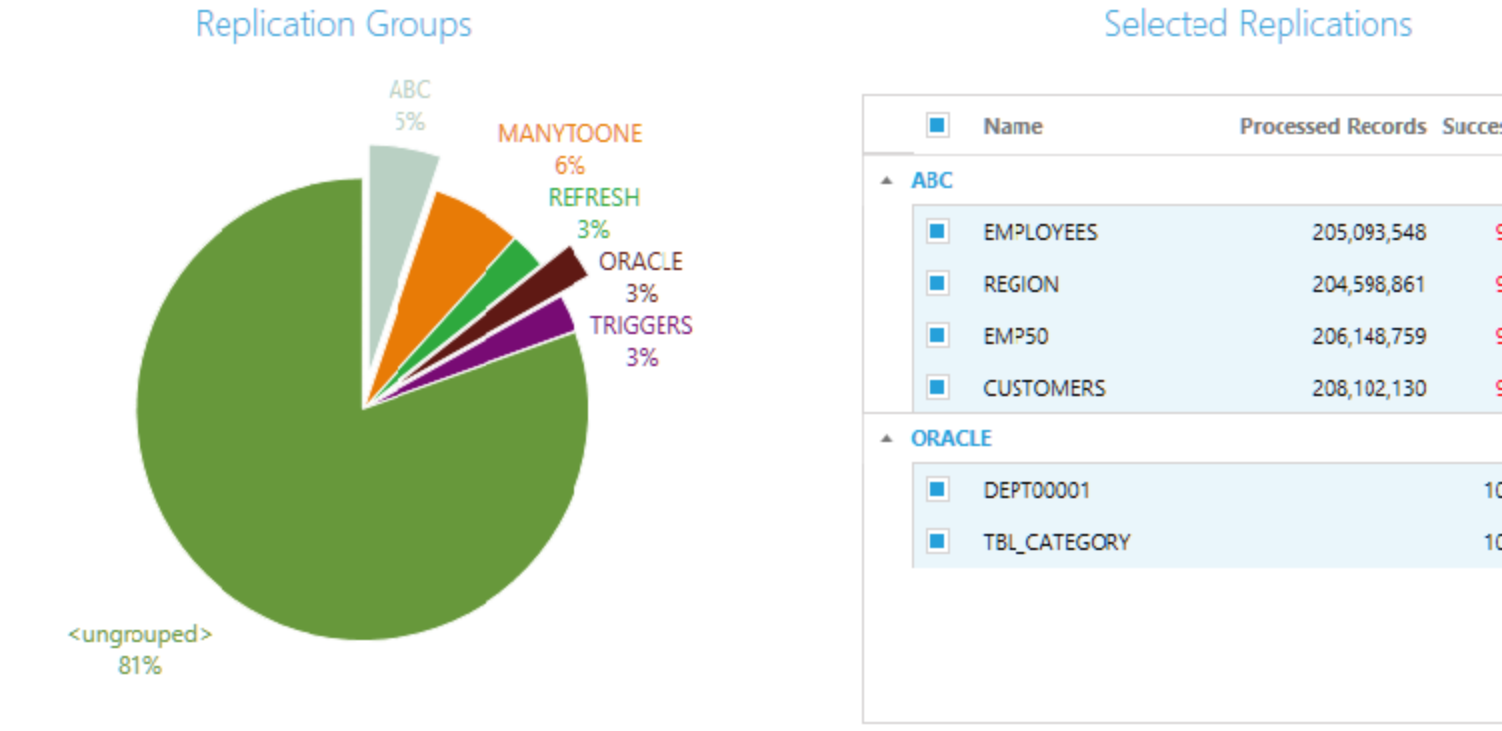
Replication Groups



This area displays a pie chart with all groups belonging to the metadata. The chart legend shows the name of the group and a percent, which is the number of replications belonging to the group in relation to the total number of replications.

If a group has 0 replications, it is not shown in the chart because there is no historic data to analyze. A section of the pie chart called <ungrouped> collects together all replications that are not assigned to a group.

To select a group, click on the portion of the pie that belongs to it. The group section will be raised from the pie area to show selection. When no group is selected, all other charts show empty data. Charts are loaded only when at least one group is selected.

Selected Replications

This area displays the list of replications from groups selected in the pie chart. Use the checkboxes next to each replication to select or deselect specific replications and obtain a more fine grained analysis of the processed data.

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Dashboard Charts

The menu list on the left of the Dashboard tab shows the options available for the performance charts. Select from the following:

- All sessions (both mirroring and refresh sessions)
- Refresh sessions
- Mirroring sessions

You can also choose which type of chart to view:

- Overview Chart
  Shows information on the number of processed records compared to failed records, total records and sessions for a specific time interval
- Throughput Charts
  Shows the processed records not related a replication but to a single time frame inside the selected time interval.

Overview Chart

This is a multi-axis chart that shows multiple sets of data with a different y-axis, depending on the data displayed. The column bar chart displays a single bar for each selected replication. It shows the number of processed records. In addition, the chart can display total records, failed records or sessions in the selected time interval.

- Columns are colored to match the group as shown in the bar chart. If the processed records are different from the total records (i.e. some failed records), the column bar color is faded.
- The Y-axis on the left (green) shows the number of records. To see the actual number of records for table as a tooltip, move the mouse pointer over the column.
- Use the horizontal scrollbar to see replications beyond the current screen area.
- Use the mouse wheel, or drag the scroll bar, to enlarge or reduce the amount of data shown in the screen area.
- Choose an option below the chart to display the line chart (associated with the right side of the Y-axis) that shows the number of total records (in blue), the number of failed records (in red) or the number of sessions (purple) in the selected time interval. Check the scale on the right y-axis to compare data volumes.

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Throughput Charts

The Throughput Charts show the processed records in relation to a single time frame within the selected time interval. This display can be used to evaluate the number of records processed per unit of time and therefore the workload of the Replication Agent for all replications in the current selection.

The display shows two different charts aligned one above the other, but joined by a common X-axis showing the time period. The top chart counts the total number of processed records by all replications per unit of time within the time period. The bottom chart shows the average time it took to replicate all the records shown in the data above.

- Move the mouse over a section of either one of the charts to observe the change in the counters at the top to show the actual values for the section.
- Use the buttons at the top right of the display to select different time units: per hour, day, week or month.
- Use the mouse wheel, or drag the scroll bar to shift the charts horizontally or enlarge/reduce the area displayed.

Opening the Dashboard (Statistics Tab)

In the Management Center Metadata Explorer, expand the tree to show Metadata entries. Select a Metadata name. From the right mouse button menu, choose **Show Dashboard**.

Related Topics

Reviewing Replication Performance Over Time

Replication Agent Options: Log Settings

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Edit Login Dialog

The Edit Login dialog allows you to modify login and profile details for the selected user.

User Definition Tab

Authentication

Choose one of the following options in the drop-down list:

UserName Authentication

Syniti DR will manage the user ID and password information supplied in the fields below.

Windows Authentication

Syniti DR uses your Microsoft Windows login and ID to control access to the Management Center.

Syniti DR Login

Active only when UserName Authentication has been selected. Enter a user name.

Password

Active only when UserName Authentication has been selected. Enter a password for the user.

Confirm Password

Re-enter the password.

Permissions Tab

User Role

Select a user role from the drop-down list. When you select a role, the appropriate permissions are also set. You can modify the permission settings for a specific user by changing the True/False values, but note that the user role changes to **Custom** as soon as you change a permission setting.

Administrator

Permission for all operations.

Auditor

Permission to audit and monitor replications

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Custom

Permissions selected manually.

Operator

Permission to set up and change replication settings but cannot work on administrative tasks (such as change license, change user permissions)

Public

Permission to audit and monitor replications, back up metadatas and change metadata settings (such as starting/stopping traces or changing email parameters for email notification).

SecurityAdmin

Permission to manage security, Does not normally need to change replication settings or work on creating new metadata.

The table below summarizes the different permissions for each user role.

Permission	Description	Admin.	Security Admin.	Auditor	Operator	Public
Connect to Server	Permission to connect to a Syniti DR server	X	X	X	X	X
Set Metadata Default	Permission to set the default metadata. Can only be performed on local installation of Syniti DR.	X			X	
Change License	Permission to change product license. Can	X	X			

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	only be performed on local installation of Syniti DR.					
Add Metadata	Permission to add a metadata connection.	X			X	
Remove Metadata	Permission to remove a metadata connection	X			X	
Change Metadata Properties	Permission to edit metadata properties. Can only be performed on local installation of Syniti DR.	X			X	X
Load Metadata	Permission to load metadata	X		X		X
Browse Metadata	Permission to browse metadata tables through the SQL Command panel	X	X			
Change Rep-	Permission	X				

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lication Agent Set-tings	to change Replication Agent Set-tings					
Change Security	Permission to change security set-tings. Can only be per-formed on local install-ation of Syniti DR.	X	X			
Change Global Script	Permission to edit the current metadata global script	X				
Drop Metadata	Permission to drop the tables of the current metadata when they are removed from the metadata.	X				
Backup Metadata	Permission to execute a metadata backup of the current metadata.	X			X	X

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Restore Metadata	Permission to execute a metadata restore of the current metadata from a backup file.	X			X	
Custom Restore Metadata	Permission to execute a custom metadata restore of the current metadata from a backup file.	X			X	
Add Connection	Permission to add a connection to the current metadata.	X			X	
Change Connection	Permission to edit a connection in the current metadata.	X			X	
Remove Connection	Permission to remove a connection in the current metadata	X			X	
Add Rep-	Permission	X			X	

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lication	to add a replication in the current metadata					
Change Replication	Permission to edit a replication in the current metadata	X			X	
Remove Replication	Permission to remove a replication in the current metadata	X			X	
Add Group	Permission to add group in the current metadata	X			X	
Change Group	Permission to edit a group in the current metadata.	X			X	
Remove Group	Permission to remove a group in the current metadata.	X			X	
Move Group Replication	Permission to move replications in and out of a group in the	X			X	

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	current metadata.					

Opening the Edit Login Dialog

In the Metadata Explorer:

1. Select the server for which you want to edit a user login.
2. Click **Manage Users** in the toolbar or choose **Manage Users** from the right mouse button menu.
3. In the User Settings dialog, select the user name.
4. Click **Edit** to open the Edit Login dialog.

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Event Properties Dialog

This dialog shows details of an event recorded in the Syniti Data Replication log. You can set the log frequency and detail using the Log tab in the Replication Agent Options dialog.

Use the up and down arrows to move from one event to the next.

Opening the Event Properties Dialog

In the Metadata Explorer toolbar, click to open the Log Viewer. Double-click on an event listed in the Viewer, or select an event and, from the right mouse button menu, choose **View Details**.

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Expression Generator

The Expression Generator lets you build an expression to use when mapping a target field. It can also be used from the Global Script Editor and the Replication Script Editor to help write scripts to use during replication. Expressions can be written using Visual Basic (the default) or C# by setting the scripting language in the Global Script Editor, accessible from the right mouse button menu on the metadata.

Using the Expression Generator for Mapping Target Fields

You can map a target field to a source field or an expression when setting up your replication. Only fields that are mapped will be replicated.

You might want to map a target field to an expression when the source table does not contain a column that exactly matches the data you want to see in the target column. For example, in a source table where FirstName and LastName are two separate columns, but in the target table, there is a single column, Name, that should contain both the FirstName and LastName values. Use an expression to concatenate values from the two columns.

Either type in your expression or navigate through the trees to build your expression.

The functions and operators available in the Expression Builder are those typically available for most .NET providers. If you are not sure what functions and operators to use, check your .NET provider documentation. If you use a function or operator that is not supported by your .NET provider, the mapping will fail during replication. Syniti DR additionally provides some predefined values that help you to define an expression quickly.

Using the Expression Generator to Help Write Scripts

In both the Global Script Editor and the Replication Script Editor, the Expression Generator button opens the Expression Generator so that you can use it to find functions and operators to use in the scripts. You can build parts of the script using the Expression Generator. Then, when you close it, the information is displayed in the Script Editor.

Using the Expression Generator for Defining a Refresh Filter

The Replication Properties dialog offers an option to define a filter for Refresh replications. The WHERE condition (on either source or target table) applies during refresh applications to filter the records that are replicated. Click to open the Expression Generator and write an expression to apply during the refresh replication. The expression can contain SQL and/or functions available for your RDBMS.

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Opening the Expression Generator

To write an expression to use when mapping fields from source to target tables:

- In the Replication wizard **Mapping info** screen, click **Define Mapping** and choose **Map to Expression**.to open the Expression Generator.
- On the Replication Properties dialog General tab, click **Mapping** to open the Fields Mapping dialog. Click **Define Mapping** and choose **Map to Expression**.to open the Expression Generator.

To write an expression to use as part of a replication script:

- In the Replication Properties dialog, check the **Use Script** option. Click **Script** to open the Replication Script Editor. Click to open the Expression Generator.

To write an expression to use as part of a global script:

- In the Management Center Metadata Explorer, select the metadata for which you would like to write a script.
- From the right mouse button menu, choose **Global Script**.
- In the Global Script Editor, click .

To write an expression to use as a Refresh filter:

- In the Replication Properties dialog, click in the Refresh Filter Source or Refresh Filter Target field to open the Expression Generator.

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Fields Mapping Dialog

This dialog allows you to set up mappings between target and source tables. During replication, only those fields that have been mapped will be replicated. You can either create mappings using the Replication wizard, the Fields Mapping dialog or via a script that is executed during the replication.

By default, source fields are mapped to target fields with the same column names. Use this screen to modify the mappings, either by removing mappings, setting mappings to different fields, or mapping fields to expressions. You can also leave the default mappings at this stage and edit them later using the Replication Properties dialog.

The top part of the screen shows source and target table fields. Arrows indicate the mappings that have been created automatically. When editing the mappings using the toolbar, you can map a source field to zero, one or more target fields, and map a target field to only one source field. If you select a source column already mapped, the new mapping will be added to the existing mappings. If you select a target column that has already been mapped, that mapping will be overwritten. You can also

- Select a source or target column and set it as **Use Unmapped** from the right mouse button menu. This means that the column values are available for use within scripting even though the column is not mapped.
- Select a source column and set it as **Use Non Critical** from the right mouse button menu. During transactional replications, if only data in columns marked as non-critical have changed, the record will not be replicated. However, if other column values have changed, the record is replicated including the data in columns marked as non-critical.

The lower part of the screen lists the target fields on the left side, with an icon that shows if the column is mapped to a field , unmapped , mapped to an expression . Scrolling to the right, you can see the exact mapping for the target field. Note that if a field appears disabled in the list, it means that the data type for the field is not recognized by Syniti DR (usually a user-defined data type) and the field cannot be mapped or replicated.

The toolbar displays the following icons.

	Define Mapping Select a source or target field in the list and choose one of the following options from the drop-down list: **Map to field**: Opens the Edit Mapping dialog, displaying the current mapping, if any. If you selected a source field, choose the target field from the drop-down list on the right side of the dialog. Note that a source column can be mapped to zero, one or more target columns (see **Remove Mapping**

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	below to unmap a source column.) If you selected a target column, choose the source field from the drop-down list on the left side of the dialog. A target column can be mapped to only one source column. Note that if a target column is already mapped and you select another mapping, the new mapping overwrites the existing mapping. **Map to Expression**: Available when a target field is selected. Opens the Expression Generator so that you can map the selected target field to an expression. **Remove Mapping**: Available when a target field is selected. Removes a mapping to the selected field.
	Show/Hide Arrows Panel A toggle to display or hide the arrows between source and target fields. The arrows provide a graphical representation of mappings between fields. No arrows are displayed when a field is mapped to an expression.
	Show/Hide Extended Columns in Fields Lists A toggle to display or hide column information for source and target fields. The default column information consists of field name, position and type. Additional column information consists of size, precision, scale, description, null values, identity and default value.
	Mapping Direction Active when defining a synchronization replication. Allows you to view the mapping with arrows reversed from target to source, thereby demonstrating mappings that are not necessarily symmetrical with the mappings from source to target.
	Automatic Mapping By default, fields in the source and target tables are mapped according to the field name, where all matching names are matched. Use this menu to select instead to map by column ordinal numbers, or using a custom script function. The Automatic Mapping menu displays 4 entries: Mapping by Name, Mapping by Ordinal, Custom Mapping and Clear All Mappings. The Custom Mapping option is inactive unless you have defined one or more mapping functions as part of a global script.

Opening the Fields Mapping Dialog

1. In the Management Center Metadata Explorer, select the replication.
2. From the right mouse button menu, choose **Replication Properties**.

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3. On the **General** tab, check the **Automatic Mapping** option.
4. Click **Mapping** to open the Fields Mapping dialog.

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Global Script Editor

In this dialog, you can write a script that defines one or more functions. Typically, global scripts define general user functions that need to be called from inside a replication script or an expression script. See Writing a Function to use in Scripts and Expressions for details on how to write and call a global function. For additional examples of useful global script functions, check Global Script Function Examples.

The Global Script Editor provides the following features.

- Choice of languages for all scripts between VB and C# using the Script Language list at the bottom of the editor.
- Editing and formatting features that include automatic indentation, automatic coloring for syntax, numeric values, comments, “code folding”, and keyboard shortcuts.
- Access to the Expression Generator to identify functions and build expressions.
- Script Compiler

To use the Global Script Editor:

1. Select the programming language for the script. The default language is Visual Basic, but you can choose C# using the Script Language list at the bottom of the Script Editor.
2. Type the script into the editor pane.
3. Use the editor formatting and navigation features to aid in writing and correcting the script.
4. Use the Expression Generator as needed to identify functions and syntax that you can use in the script.
5. Use Global Script Functions in your script if needed.
6. Use the Compile button to check your script syntax.
   Any script problems are displayed in a separate dialog.
7. Correct any syntax errors before attempting to run a replication.

Editor Commands

	Checks the script syntax. If you do not do this in the script editor, you may encounter errors when the replication is running.

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	Opens the Expression Generator
	Opens the References dialog so that you can add the location of any dlls that you are using from your script. You typically need to add dlls to the References dialog and to the script Imports when they do not belong to the default Microsoft .NET environment
	Creates a comment for selected text
	Uncomments selected text
Script Language	Provides a drop-down menu to choose between VB and C# as the language for all scripts and expressions using the Global Script Editor, Replication Script Editor and Expression Generator. The selected language is set in the Syniti DR metadata and used for all scripts associated with the metadata.

Editing and Formatting Features

- Automatic indentation based on syntax
- Intelligent code completion options
- Colors to identify specific code elements: syntax in blue, numeric values in pink and comments in green
- Code folding where sections of code can be collapsed or expanded for ease of reading. The editor displays a green bar on the left side with +/- signs. Click - to collapse a section of code, and click + to expand a section of code.
- Common editing operations using keystroke combinations

<SHIFT>Left, Right, Up, Down, Home, End, PageUp, PageDown	Move caret with selection
<CTRL>C <CTRL>V <CTRL>X	Copy, paste, cut
<CTRL>A	Select all text

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<CTRL>Z,, <CTRL>Y	Undo/Redo
Tab <SHIFT>Tab	Increase/decrease left indent of selected range
<CTRL>Home <CTRL>End	Go to first/last char of the text
<SHIFT><CTRL>Home, <SHIFT><CTRL>End	Go to first/last char of the text with selection
<CTRL>U <SHIFT><CTRL>U	Convert selected text to upper/lower case
<INSERT>	Switch between Insert Mode and Overwrite Mode
<CTRL>Backspace <CTRL>Del	Remove word left/right
<ALT>Mouse, <ALT><SHIFT>Up, Down, Right, Left	Enable column selection mode
<ALT>Up <ALT>Down	Move selected lines up/down
<SHIFT>Del	Remove current line
<ESC>	Close all opened tooltips, menus and hints
<CTRL>Wheel	Zoom
<CTRL>Up <CTRL>Down	Scroll Up/Down
<CTRL>NumpadPlus, <CTRL>NumpadMinus <CTRL>0	Zoom in, zoom out, no zoom

Opening the Global Script Editor

- In the Management Center Metadata Explorer, select the metadata for which you want to create a global script.
- From the right mouse button menu, choose **Global Script**.

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Related Topics

Global Script Functions

Writing Scripts with Visual Basic .NET

Writing a Replication Script

Replication Script Events

Replication Script Properties and Methods

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Group Properties Dialog

General Tab

Group Name

Displays the group name. You can edit this field and change the name as needed.

Group Description

(Optional) Displays any information about the group that you choose to enter. You can edit this field as needed.

Available Replications

A list of replications within the current metadata. You can add replications to the group using the right arrow button. Select a replication and click the right arrow button. Note that if you add a replication to a group, the replication settings (scheduling and properties) will be modified to match those of the group. The first replication that is added to a group sets the replication properties for the group.

Note the following restrictions on adding replications to a group.

- All replications in the group must use the same source connection.
- If replicating from SQL Server using mirroring, all replications in the group must use the same source database.
- If replicating from IBM Db2 for i/iSeries/AS400 using mirroring, all replications in the group must use the same journal for source tables.

Selected Replications

Displays a list of replications in the group ordered by priority. Use the right and left arrow keys to add defined replications to this list of replications for the group. Use the up and down arrow keys to set priority for executing replications within the group. Note that this priority applies to Refresh replications only. When transactional replications (mirroring or synchronization) are grouped, Syniti DR uses the database log entries to determine the order of replication. Changes are processed in the order they are found in the log.

Reorder Replications following Foreign Key Relationships

When set to True, this option works in conjunction with the Truncate Inverse property on the Preferences tab to ensure that tables in grouped refresh replications maintain data integrity during the truncation and insertion

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phases of the replication. See Ordering Refresh Replications with Foreign Key Relations for more information.

References Tab

Refresh Recovery

When set to True, this option enables recovery from a problem that occurs while running a set of refresh replications for the group. Recovery starts from the first replication that failed rather than from the first replication in the group.

Truncate Inverse

When set to True, this option works in conjunction with the "Reorder Replications following Foreign Key Relationships" button in the General tab to ensure that tables in grouped refresh replications maintain data integrity during the truncation and insertion phases of the replication. See Ordering Refresh Replications with Foreign Key Relations for more information.

Conflict Resolver Priority

This property is used only for groups of synchronization replications (multi-table synchronization) where the **Conflict Resolver** property in the Replication Properties dialog is set to TargetServerWins. The value is an prioritized list of target connections, represented by connection keys obtained from the Syniti DR metadata. To view the connection names and modify the priority of connections:

1. Click in the values field.
2. Use the down arrow to expand the field and display the editor.
3. Move connections up or down in priority by first selecting them, then using the up and down arrows.

Note that the numeric value associated with the connection name is a key used by the metadata. It does not reflect the priority for that connection. In the example below, the MySQL connection is first in priority but its connection key value is 3.

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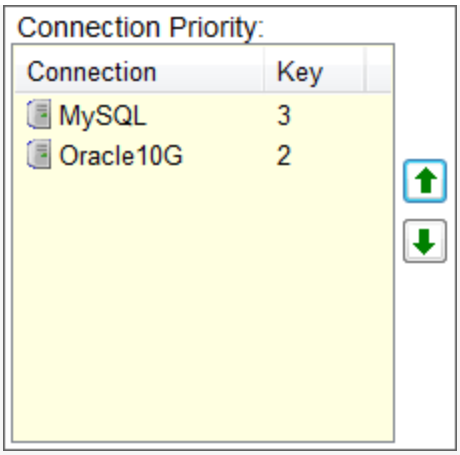

Opening the Group Properties Dialog

In the Management Center Metadata Explorer, select a group and, from the right mouse button menu, choose **Group Properties**.

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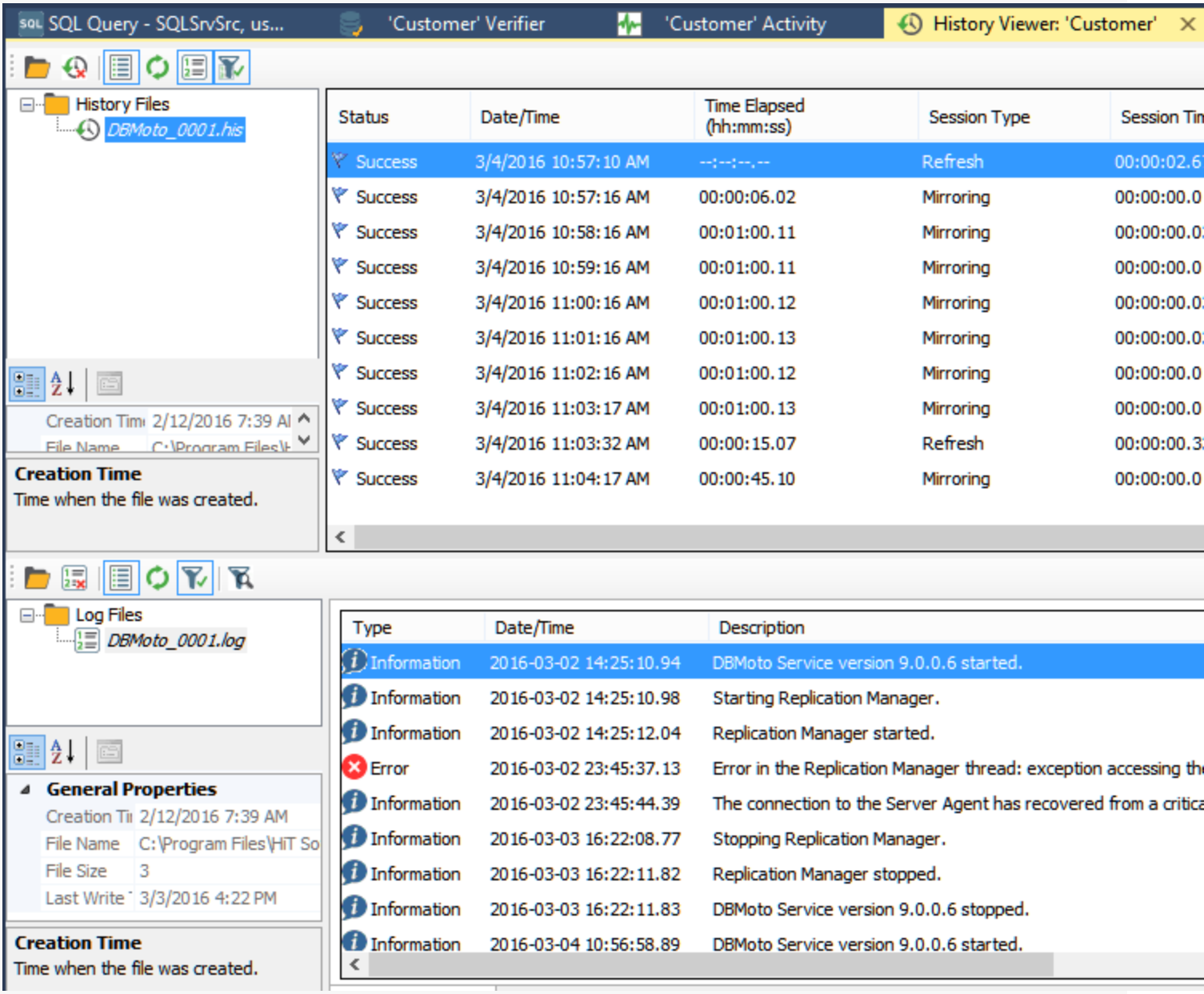
History Viewer

The History Viewer provides a way for you to review the status of past iterations of a replication, whether they succeeded or failed, and the Syniti DR Log messages associated with the replication.



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The top pane of the History Viewer shows past iterations of the selected replication. Select a row to view log details related to that iteration of the replication in the Log Messages tab below.

In the Log Messages tab, you can filter messages by clicking **Show Filter Settings.** This pane provides all the functionality of the Log Viewer window, except that it applies to a single replication at a time.

One or more Replication tabs may also be available if specific records failed to replicate. The Replication tab displays a table containing records that failed to replicate for a specific replication interval.

Opening the History Viewer

In the Management Center Metadata Explorer, Replication Browser, or Replication Monitor, select a replication and, from the right mouse button menu, choose **Show History**.

Related Topics

Monitoring and Reviewing Replications

Log Viewer

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License Information Dialog

This dialog allows you to view current Syniti Data Replication license details, or update your license.

Import License...

Click **Import License** to add your license. You will need to supply the license file (dbmotolicense_*company*.txt) that you receive via email. Note that any license file you supply in this field will replace previous license information.

Export

Click **Export** to print all current license information to a text file.

Show Pairs

Click **Show Pairs** to display the Show Replication Pairs dialog and review the source and target database pairs in the selected metadata.

If your license has expired, or you need to add connections, contact your sales representative by phone at 408 345 4001 or via email at ds.sales@syniti.com. If you obtained your copy of Syniti DRfrom a local distributor or reseller, contact your reseller first. Check www.syniti.com for a current list of resellers and their contact information.

Opening the License Information Dialog

In the Management Center Metadata Explorer, select the server for which you want to view license information. From the right mouse button menu, choose **Manage Licenses**.

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Login Dialog

The Login dialog allows you to change the user login details for a particular server. This dialog is useful only if you have set up user access control for a Syniti Data Replication installation via the User Settings dialog. Note that if you change the login from one user to another in the same Management Center session, all open SQL Query, Log Viewer and History Viewer tabs are automatically closed to avoid leaving open tabs for which the new login may not have appropriate permissions.

Server Name

Inactive. Reports the name of the server that you selected in the Metadata Explorer.

Server Address

Inactive. Reports the IP address of the server you selected in the Metadata Explorer.

Port

Inactive. Reports the port number that is being used for the server you selected in the Metadata Explorer.

Authentication

The options are:

AnonymousAccess
No login details are requested from the user. This is the default setting for installations where security has not been enabled. To enable security, go to the User Settings dialog.

Windows Authentication
If security has been enabled via the User Settings dialog, and you have been directed by your administrator to use Windows Authentication, select this option. Syniti DR will verify that your Microsoft Windows login and ID are legitimate before allowing you to continue working in the Management Center.

UserName Authentication
If security has been enabled via the User Settings dialog, and you have been directed by your administrator to use UserName Authentication, select this option, then type your user name and password in the fields below. UserName authentication requires the use of a X.509 certificate. Verify that a certificate has been installed correctly before completing this dialog. If you do not have a correctly installed certificate, you may not be able to use the Management Center.

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Certificate Authentication

If Certificate has been enabled via the User Settings dialog, and you have been directed by your administrator to use Certificate Authentication, select this option. Certificate authentication requires the use of a X.509 certificate. Verify that a certificate has been installed correctly before completing this dialog. If you do not have a correctly installed certificate, you may not be able to use the Management Center.

User Name

Active only when UserName Authentication has been selected. Enter the user name assigned to you by the administrator. If you do not know your user name, verify login information with your administrator or try setting the Authentication value to AnonymousAccess (no security) or Windows Authentication (uses your Microsoft Windows login and password.)

Password

Active only when UserName Authentication has been selected. Enter the password assigned to you by the administrator. Syniti DR will verify that your login and ID are legitimate before allowing you to continue working in the Management Center.

If you do not know your password, verify login information with your administrator or try setting the Authentication value to AnonymousAccess (no security) or Windows Authentication (uses your Microsoft Windows login and password.)

Opening the Login Dialog

This dialog is displayed automatically when a user attempts to access a Syniti DR server with established access control. In addition, it is possible to change a user login while using the Management Center. In the Metadata Explorer, select the server for which you want to change the login details, then click **Connect** in the toolbar or choose **Connect** from the right mouse button menu.

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Log Settings Dialog

Write a warning on multiple updates/deletes

True by default so that warnings are written to the log for update or delete operations that update more than one field. The warning is useful because it notifies you that there may be issues with primary key field settings which do not uniquely identify records. Disable this warning in cases where a trigger is attached to the field being updated or deleted, and that trigger also updates other fields. In this case, the log could quickly fill with warning messages for a behavior that is intentional.

Write a warning on IBM i/AS400 member operations

Relevant only when using IBM Db2 for i (AS/400) as a source database. False by default. When set to true, any operation performed on members will generate a message in the Replication Agent log.

NOTE: This flag was previously **Write a warning on member reorganize** The earlier behavior is included in the new functionality.

Write a warning on insert attempt

True by default. Adds a warning to the Syniti DR log when an attempt is made to insert a record not found while trying to do an update.

Write a warning on update attempt

False by default. Adds a warning to the Syniti DRlog when an attempt is made to update a record following a duplicate key error

Continual messaging in recovery

True by default. When set to true, error messages are written to the log even during recovery.

Write an error on schema change

True by default. When set to true, an error message is written to the log when an ALTER TABLE has been executed on a replicated table. It is highly recommended that you keep this option enabled so that you can detect table changes and thereby avoid or quickly repair replication errors.

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Opening the Log Settings Dialog

1. In the Management Center **Metadata Explorer**, choose **Replication Agent Options**.
2. In the Replication Agent Options dialog, switch to the **Log** tab.
3. Click **Settings** in the **Log** tab to open the **Log Settings dialog**.

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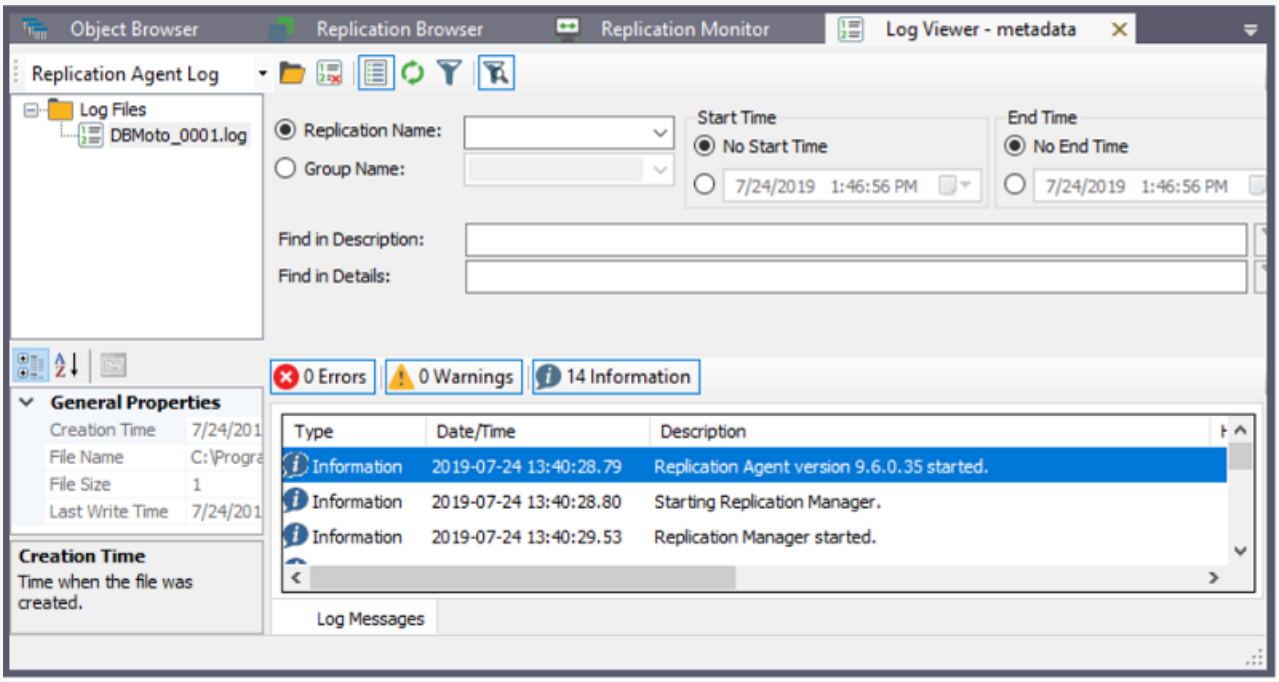
Log Viewer

The Log Viewer tab displays the Syniti DR log. The format depends on settings in the Replication Agent Options dialog. It is possible to save the log to a database, to a file or to the Windows Event Viewer. By default, the log is saved to a text file and contains a list of replication events.

Double-click an event to view the details in the Event Details dialog.

Filtering Log Information

Syniti Data Replication provides tools to filter both text-based and database-based log messages. In the Log Viewer main toolbar, click **Show Filter Settings** to display the options for searching and filtering log data.



Options for filtering log messages are:

- Select or deselect the Errors, Warnings and Information buttons to view any combination of these three categories of messages as they apply to all replications
- Select a specific group or replication to see messages which apply to that group/replication
- Set a specific time interval within which to list messages

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- Apply a text search in either the Description or Details fields of the log to view log messages containing only the string you enter.

Be sure to click **Apply Filter** in the Log Viewer toolbar when you have finished setting up the filter.

Text-based Logs Only

For text files, you can set the log frequency and detail using the Log tab in the Replication Agent Options dialog. If you choose to create multiple log files, note that the Log Viewer always displays the current log file by default. To open other log files, from the File menu, choose **Open File**. Note the following restrictions:

- If you choose to refresh the file, the refresh is performed on whichever file is currently open in the log. If, for example, you open a file other than the current file, the refresh is performed on the file that you specifically opened. The Log Viewer does not update to display the current file. You would need to either specifically open the current file, or exit the Log Viewer and re-run it to get the most recent file.
- If you open the Log Viewer to display the current file and, while the Viewer is open, a new log file is created, the Viewer does not automatically switch to the latest file. You would need to either specifically open the new file, or exit the Log Viewer and re-run it to get the most recent file.

Database Logs Only

For database logs, you can either save the log information to the metadata database, or specify an alternative database connection. Log data is displayed in the Log Viewer, and can be saved in a text file format using the **Export Log Database toFile** button in the Log Viewer toolbar. Note that the entire database contents are saved to the specified file.

Opening the Log Viewer

In the Management Center Metadata Explorer, select the metadata for which you want to see the log.

From the right mouse button menu, choose **View Log**.

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Log Database Connection Properties Dialog

This dialog can be used to set up a database connection for storing Syniti DR log information.

Database

Select the database for which you want to make a connection.

Provider

Select a .NET data provider from the list. If no .NET provider is available for the database, select either an OLE DB provider or an ODBC driver. By default, only default providers are listed in this dialog. If you want to see all providers for a specific database, uncheck the **Use Only Default Providers** option in the Options dialog.

Assembly

This field is displayed only if using a .NET data provider, and the provider has not been registered. Provide a path to the .NET data provider DLL.

Connection String

Edit at least the **Required** connection properties by clicking in the property value field and typing a new value.

The list of **Optional** properties for .NET and OLE DB providers contains the most commonly used properties for the providers. Edit these as needed. Note that some properties are displayed with default values (no bold text.) Any values that you add or edit are displayed in bold text. Check the documentation for your provider for a complete list of properties. You can set the value of the ExtendedProperties property to define additional property-value pairs. The syntax for defining property-value pairs is: prop1=val1;prop2=val2;....

If you are using an ODBC driver, click in the ConnectionString value field and then click to open the ODBC Driver Connection dialog. The contents of this dialog depend on the ODBC driver that you are using. Provide values for the dialog fields, then click **OK** to make a test connection and set the values in the wizard.

Edit

Click **Edit** to open a text entry window where you can paste or type a connection string for your provider. This is offered as an alternative to the Connection Properties grid, but should be used with great care because an error in the connection string can cause a connection to fail or to have unexpected properties. This window displays

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any connection information that you have already entered in connection string format. Note that default values are not displayed as part of the connection string.

Test

Click **Test** to make sure that the connection correctly opens a database connection.

Opening the Connection Properties Dialog

1. In the Management Center Metadata Explorer, click **Replication Agent Options.**
2. In the Log tab, select **Write Log To Database**.
3. Select the **Use Specific Connection** option.
4. Click to open the Connection Properties dialog.

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Metadata Properties Dialog

This dialog reports connection properties for your connection to the database containing your metadata tables. It also provides options for setting up primary and secondary backup metadata databases. Syniti Data Replication automatically keeps metadata synchronized between the main and backup metadata databases so that you can restore metadata tables from the backup in case of main metadata database failure.

Authentication

Authentication Method

Read only property. Reports the type of security used to access the metadata

AnonymousAccess
No access control has been selected.

UserName Authentication
Syniti DR manages the user ID and password information.

Windows Authentication
Syniti DR uses your Microsoft Windows login and ID to control access.

User Name

Read only property. Reports the name of the user logged in at the current time.

User Role

Read only property. Reports the role of the user logged in at the current time.

General

Connection Name

Read only property. The name of the connection that you provided when creating the connection.

Current

Shows which metadata connection is current.

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IsActive

If true indicates that the information with the metadata database are constantly updated.

IsRunning

If true, indicates that the Replication Agent (either locally or remotely) is executing with this set of metadata.

Status

Provides status messages for this set of metadata.

Connection Properties

Displays the connection details for the main metadata database.

Connection

Displays the name of the data provider used to connect to the main metadata database. Click in this field, then click to open the Connection Properties dialog and modify property values as needed. For example, to switch from using the main metadata to a backup metadata database, change the connection using this dialog.

DriverName

Read only property.The name of the data provider used to connect to the database.

DBType

Read only property. The DBMS name from an internal list provided by Syniti DR

DBVersion

Read only property. The database version number retrieved from the provider.

Provider Assembly

Read only property. If using a .NET data provider, and the provider has not been registered, provide a path to the .NET data provider DLL. Otherwise, this field should display the DLL for your registered provider.

Use Local Assembly

Read only property. Default value is false. Set to true if you have not registered your provider and you are providing a pathname to the provider DLL.

Connection Class

Read only property. The class for your provider.

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Connection String

Read only property. Connection string used to connect to the database. The connection string follows the format required by your .NET data provider, ODBC driver or OLE DB Provider.

Main Enabled

Always set to true.

Qualifier

Either reports the catalog and schema where the metadata tables were created (if this information was included in the connection) or allows you to specify a catalog and schema for the metadata tables.

Command Timeout

Default value is -1, which means that no timeout is set for Syniti DR and the default timeout determined by the .NET data provider is used. For example, the default value for Microsoft SQL Server is 15 seconds. To set a different timeout value, enter a value in seconds. This property determines the amount of time before any command from Syniti DR times out while waiting for a response from the database server.

Primary Backup Properties

Connection

Allows you to set connection properties for a backup metadata database. Click in this field, then click to open the Connection Properties dialog and set values as needed.

Backup Enabled

False by default. When set to True, metadata is backed up to this database to keep it synchronized with the main metadata database.

Qualifier

Either reports the catalog and schema where the metadata tables were created (if this information was included in the connection) or allows you to specify a catalog and schema for the metadata tables.

Command Timeout

Default value is -1, which means that no timeout is set for Syniti DR and the default timeout determined by the .NET data provider is used. For example, the default value for Microsoft SQL Server is 15 seconds. To set a

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different timeout value, enter a value in seconds. This property determines the amount of time before any command from Syniti DR times out while waiting for a response from the database server.

Apply to Other Backups

Click in the value field to apply the current backup metadata to main and other secondary backups.

Repair from Main Backup

Click in the value field to apply the main metadata to this backup.

Secondary Backup Properties

Connection

Allows you to set connection properties for a backup metadata database. Click in this field, then click to open the Connection Properties dialog and set values as needed.

Backup Enabled

False by default. When set to True, metadata is backed up to this database to keep it synchronized with the main metadata database.

Qualifier

Either reports the catalog and schema where the metadata tables were created (if this information was included in the connection) or allows you to specify a catalog and schema for the metadata tables.

Command Timeout

Default value is -1, which means that no timeout is set for Syniti DR and the default timeout determined by the .NET data provider is used. For example, the default value for Microsoft SQL Server is 15 seconds. To set a different timeout value, enter a value in seconds. This property determines the amount of time before any command from Syniti DR times out while waiting for a response from the database server.

Apply to Other Backups

Click in the value field to apply the current backup metadata to main and other secondary backups.

Repair from Main Backup

Click in the value field to apply the main metadata to this backup.

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Related Topics

Metadata Connection Wizard

Creating a Connection

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Object Browser

The Object Browser displays information related to the item selected in the Metadata Explorer. For example, if you select a source table in the database tree, you can see the table column names and column information. Primary key and foreign key columns are preceded by icons to identify them:

Primary key column.

Foreign key column. Scroll across the display to view the table/column for which this column is the foreign key.

Opening the Object Browser

This is the default tab when you open the Management Center. You can switch between the Object Browser, Replication Browser and Replication Monitor by clicking on the tab names in the Management Center right pane.

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Options Dialog

General Tab
Preferences Tab
Verifier Tab
Trace Tab

General Tab

Use Only Default Providers

Checked by default. If checked, only .NET providers are displayed in connection wizards whenever possible. This is to guide users in selecting a .NET provider over an OLE DB Provider or ODBC driver for the same database. Typically a .NET provider will give better performance.

Current GDI Charset (Font)

The default value, Ansi, works in most cases for displaying database data in the Management Center. However, if your field values contain Japanese data, for example, you would need to set this field to Japanese.

IMEMode Setting for Script

Select a language to enable entry of complex characters and symbols, such as Japanese Kanji characters, in the Script Editor using a standard keyboard.

Default Read Interval

The default frequency in seconds with which the replicator checks to see if there are transactions to replicate when replication is set in mirroring mode. The **Read Interval** value can be changed for each replication either when creating the replication using the Replication Wizard, or changing the Replication Properties for an existing replication.

Default Set Initial Refresh

When set to True (the default), whenever a new replication is created, the Replication wizard Scheduling screen displays the Execute Initial Refresh option checked, and a refresh replication will be run to ensure all records included in the replication are up to date. If this property is set to False, the Replication wizard Scheduling screen displays the Execute Initial Refresh option unchecked. Independently of the True/False setting, the option can be changed for each replication in the wizard.

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Default Metadata Refresh

When set to False (the default), if another Syniti DRuser modifies the current metadata, the metadata can only be updated manually by right-clicking on the metadata node in the Metadata Explorer and and choosing **Refresh Metadata** from the menu. If this property is set to True, the metadata is updated automatically following changes.

Help Settings

From Syniti Data Replication V9.7.0, access to the User's Guide and API help is via a remote URL. Previous versions stored the help locally in the Syniti DR install folder. If you are unable to access remote help, you can request a zip file to install locally by contacting the technical support team via the Help Center. To install and use local help, unzip the help file into the folder Syniti\Data Replication V9\Docs, then click the **Use Local Help** option.

Preferences Tab

Each preference can have one of the following settings:

- Ask Always
  The default setting for all preferences. This setting always provides a confirmation dialog in the Management Center before proceeding with the operation
- Yes
  Select this option to avoid confirmation dialogs. However, read the description of the preference carefully to ensure that you are setting the desired behavior.
- No
  Select this option to avoid confirmation dialogs. However, read the description of the preference carefully to ensure that you are setting the desired behavior.

Copy Properties from Group

When adding a replication to an existing group, you can decide whether the group properties should override the replication properties. If you select **Ask Always**, you will be prompted each time you add a replication to a group. If you select **Yes**, the replication properties will be set to the group properties without prompting. If you select **No**, the replication is not added to the group. Note that there is no message indicating that the replication has not been added. You can check which replications are in a group in the **Metadata Explorer** by viewing the **Group Properties** from the right mouse button menu on the group name.

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Copy TID from Group

When adding a replication to an existing group, you can decide whether the group transaction ID should be applied to the replication properties. If you select **Ask Always**, you will be prompted each time you add a replication to a group. If you select **Yes**, the transaction ID for the replication will be set to match the transaction ID for the group. If you select **No**, the replication is added to the group, but retains its transaction ID.

Create Target Tables

When creating a replication, and the target tables do not currently exist in the target database, you can use this option to create target tables automatically. If you select **Ask Always**, you will be prompted each time you create a replication. If you select **Yes**, the table is created without prompting. If you select **No**, target tables are not created automatically, but you cannot complete the mapping from source to target table required for the replication.

Add Created Tables

When creating a replication, and the target tables do not currently exist in the target database, you can use this option to add tables to the metadata when they are created. If you select **Ask Always**, you will be prompted each time you create a replication. If you select **Yes**, the tables are added to the metadata without prompting. If you select **No**, target tables are not added to the metadata and you are not offered an option to add them. You can add the tables manually in the Metadata Explorer by selecting the target connection name and using the right mouse button option **Select Tables...**.

Rename Replications with Same Name

If you are using the Custom Restore option for restoring metadata, and you import replications with the same names as existing replications, you can use this option to rename the replications automatically. If you select **Ask Always**, you will be prompted before importing the replications. If you select **Yes**, the replications are renamed without prompting. If you select **No**, and there is a naming conflict, Syniti DR generates an exception.

Create Replications to Same Target

When creating a replication, if a selected target table is already assigned to another replication, this option allows you manage the warning about a potential conflict of replicating from two different sources to a single target table. If you select **Ask Always**, you will be prompted with a warning each time you create a replication. If you select **Yes**, the warning will not be displayed, and the replication(s) will be created even though there may be conflicts when replications are running. If you select **No,** there is no warning, but Syniti DR does not create the replication and generates an exception.

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Verifier Tab

Max Errors Allowed When Reconciling Data

When using the Verifier to reconcile differences in data between source and target tables, you can set a limit on the number of errors encountered before stopping the process. The default value is 5 errors, so if the data reconciliation process encounters more than 5 errors, it stops. This option is useful if, for example, a database connection fails because the option would limit the number of attempts to connect to a database.

Trace Tab

This tab is provided for debug purposes only. It should be enabled only when requested by the technical support staff. Trace files are text files located by default in the Log folder under the Syniti DR install folder, with a .trc extension.

Click **Settings** to open the **Trace Settings** dialog. This dialog provides a "Trace metadata operations" option which traces all commands via the metadata connection. It is set to False by default and should only be set to True on request by the technical support staff.

Activate Management Center Tracing

Select this option only if requested by the technical support staff to trace activity in the Management Center. Use the options described in **File Settings** below to determine the location and size of the text file that is generated when running the trace.

Activate API Tracing

Select this option only if requested by the technical support staff to trace activity by the Syniti DR API. Use the options described in **File Settings** below to determine the location and size of the text file that is generated when running the trace.

Activate Service Monitor Tracing

Select this option only if requested by the technical support staff to trace activity by the Service Monitor. Use the options described in **File Settings** below to determine the location and size of the text file that is generated when running the trace.

Activate Verifier SchedulerTracing

Select this option only if requested by the technical support staff to trace activity by the Verifier Scheduler service. Use the options described in **File Settings** below to determine the location and size of the text file that is generated when

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running the trace.

File Settings

Only one file

If selected, a single file with no size limit is used for traces. This file can quickly become very large and should be monitored on a regular basis.

One file every X days

If selected, and a number entered, generates a new trace file after the number of days specified. All old trace files are kept in the log directory. The convention used to name the Management Center trace files is DBMotoEM_xxxx.trc, where xxxx is a number starting at 0001. If you do not set the "Keep Max X Log Files" option, remember to clean up your log directory regularly.

One file with size limited to X Mb

If selected, and a number entered, creates a new trace file when size X is reached. All old trace files are kept in the log directory. The convention used to name the Management Center trace files is DBMotoEM_xxxx.trc, where xxxx is a number starting at 0001. If you do not set the "Keep Max X Log Files" option, remember to clean up your log directory regularly.

Keep Max X Log Files

If unchecked, all old trace files are kept in the log directory. If checked, keeps only the specified number of old log files in the log directory. Use file dates (not file names) to determine the most recent files.

Trace File Path

The default location for traces is the Log folder in the Syniti DR installation folder. However, you can set a different folder for trace files as needed.

Opening the Options Dialog

In the Management Center, from the **Tools** menu, choose **Options**.

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Oracle Change Log Settings Dialog

The Oracle Change Log Settings dialog can be used to:

- Change the Oracle server where the log is stored (for Oracle 12 multitenant database installations).
- Set a path to an Oracle dictionary file (primarily for Oracle versions up to 9)
- Change the archived log settings
- Set up a remote log server

Server

Specifies the Oracle data source where the log is stored. If you are using the multitenant database architecture introduced in Oracle 12, and connecting to a pluggable database, you need to modify the log location to match the Oracle root, or container, database.

User

User ID for the Oracle data source where the log is stored.

Password

Password for the Oracle data source where the log is stored.

Use Log Server for Remote Mining

Check this option to

Dictionary

Dictionary File

If the log is stored as a dictionary file (typically only for Oracle versions up to 9), type the path and file name for an Oracle dictionary file. The Oracle dictionary file should already be defined in your Oracle environment. See Setup for Different Oracle Versions for more information.

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Read Archived Logs

When checked, Syniti DR accesses Oracle archived redo logs for transactions in addition to the online redo logs. Check with your Oracle system administrator to see if your database is configured to use ARCHIVELOG mode. If it is, you can check the **Read Archived Logs** option to ensure that all transactions between mirroring intervals are identified by Syniti DR. For example, if your mirroring interval is set for 90 seconds, but within that time the online logs fill with transactions, the online logs are archived as needed to accommodate additional transactions. If you check the **Read Archived Logs** option, Syniti DR will be able to locate the last transaction ID from the archived log. Note that the **Read Archived Logs** option is not useful when using the default setting on Oracle databases, NOARCHIVELOG mode.

Use CONTINUOUS_MINE Option

When **ReadArchivedLogs** is checked, the **Use CONTINUOUS_MINE Option** is checked by default. The CONTINUOUS_MINE option instructs the Oracle log reader to load archived log files continuously as they get created, instead of loading a batch of files statically when the log reader is initially instantiated. Syniti DR can therefore replicate transactions as they are backed up. however, Oracle recommends that the CONTINUOUS_MINE option should not be used in a RAC (Real Application Cluster) environment where RAC nodes are continuously enabled/disabled.

Destination ID

This option allows you to set the locationfrom which Syniti DR will pick up Oracle archived logs for replication. When the value is set to the default, 0, Syniti DR searches for Oracle archived logs in the standard destination, ('FLASH RECOVERY AREA (FRA)'). A value between 1 and 31 specifies an alternative location to retrieve archived logs. Oracle users can retrieve a list of all archive locations by running the query: SELECT * FROM V$ARCHIVE_DEST.

This feature is useful when your environment includes a customized archive setup and you want to instruct Syniti DR to use a specific location for archived logs.

Opening the Change Log Settings Dialog

From the Manage Transactional Log Settings dialog, click ... to the right of the **Log Settings** field.

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Partition Properties Dialog

Use this dialog to set up partitions for refresh replications to improve replication efficiency.

- **Partition Name**

  The default value is “Partition ##” with a sequential number within the replication. Edit as needed.
- **Source Filter**

  The filter applied to the source table to identify the subset of records for the partition
- **Target Filter**

  Not used in release 9.8
- **Record ID**

  Not used in release 9.8.

Opening the Partition Properties Dialog

1. In the Metadata Explorer, select the replication.
2. Choose **Replication Properties** from the right mouse button menu.
3. In the **Preferences**, click the **Refresh** option to display Refresh properties.
4. In the Partitions area, check **Use Partitions**.
5. Click **Add Partition**, or select a partition and click **Edit Partition**, to open the Partition Properties dialog.

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Predefined Values in the Expression Generator

The Expression Generator provides a way for you to access certain values related to your replication while writing an expression. Expand the list of expression building blocks below the expression editing area to view the options available under **Values**.

Replication

[FieldName] - Provides a template that shows you how to use a field name in a script. Double-click to insert the template in the script, then edit the text "FieldName". Note that you can also use the field names from the source table by expanding the Field node and double-clicking any one of the listed fields.

DBRS.SourceConnection - Provides the connection for the source table, and allows you to open a connection to the source table. For an example of how to use this value, see Global Script Function Examples.

DBRS.InternalSourceConnection - Returns the .NET connection used internally by Syniti Data Replication for accessing to the source and to the target database, unlike SourceConnection which returns as clone of the connection object used by the Replication Agent engine. This property is useful in cases where a statement must be executed using the same connection as the one used by the engine. WARNING: Use this property with great care because improper use may compromise the success of the replication. Any error generated by running a script using this connection will affect the Replication Agent and the replication process. For example if the connection is closed by the script, the engine will fail. Typically it is preferable to use the SourceConnection property.

DBRS.TargetConnection - Provides the connection for the target table, and allows you to open a connection to the target table.

DBRS.InternalTargetConnection - Returns the .NET connection used internally by Syniti DR for accessing to the source and to the target database, unlike TargetConnection which returns as clone of the connection object used by the Replication Agent engine. This property is useful in cases where a statement must be executed using the same connection as the one used by the engine. WARNING: Use this property with great care because improper use may compromise the success of the replication. Any error generated by running a script using this connection will affect the Replication Agent and the replication process. For example if the connection is closed by the script, the engine will fail. Typically it is preferable to use the TargetConnection property.

Field

Displays the column names from the source table. Double-click a column name to add it to the expression. If you plan to use a column name in an expression, make sure that you have set the column name to **Use Unmapped** in the

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Fields Mapping dialog. To set the **Use Unmapped** option, select the column name in the list of source columns, then choose **Use Unmapped** from the right mouse button menu.

Log Field

The following values represent values retrieved from the source database transaction log

IBM Db2 for i	Oracle	Microsoft SQL Server
TransactionID (STRING)	TransactionID (String)	TransactionID (String)
TransactionTS (DATETIME)	TransactionTS (String)	TransactionTS (String)
RecordID (LONG)	RowID (String)	
UserID (STRING)		
ReceiverLibrary (STRING)		
ReceiverName (STRING)		

Related Topics

Expression Generator

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Replication Activity Viewer

The Replication Activity Viewer provides a graphical representation of records processed during a specific replication instance and over multiple replication instances. It shows mirroring latency and volume history to help analyze the transaction volume, allowing you to adjust settings for maximum performance by the Replication Agent.

The Viewer consists of three tools:

Transaction Latency Chart

This graph compares the current time with the latest processed transaction time (or the last scheduled mirroring time if there are no transactions). If the lag between the two exceeds the **Transaction Latency Threshold** (set in the General tab of the Replication Agent Options dialog), the shaded area in the graph is displayed in red and the **Latency Status column** in the Replication Monitor displays the value **Threshold Warning**. This can indicate that the current settings for the Replication Agent and the replication are not allowing the Replication Agent to keep up with the number of transactions.

The left-hand column of the graph displays values in seconds based on the highest value visible in the displayed area. As the graph is updated, the range in the left-hand column may reset.

The graph is automatically updated every 3 seconds. This parameter is not currently configurable.

Graph interpretation

Grey	Indicates that there have been no new transactions during a period of time greater than the **Transaction Latency Threshold** set in the Options dialog.
Blue	Indicates progress since the last transaction time that was read from the log. The last transaction time is stored in the Replication Properties as a read-only property.
Green	Indicates progress since the last time mirroring was scheduled to start (based on the mirroring interval set for the replication in the Replication Properties dialog.)
Red	Indicates that the limit set in the Options dialog**Transaction Latency Threshold** field has been reached. It shows that the transaction log checking interval cannot keep up with the number of transactions that need to be processed. If you enable a replication after a period of time, the chart will initially show high values in red to indicate the significant difference between the last transaction processed and the current time. As soon as mirroring starts, the display will update.

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Records Processed Dial

Displays the speed of records processed based on the average records processed per interval. Note that the display is updated every three seconds, so the number of transactions processed is averaged over 3 seconds.

History Chart

Displays the number records processed based on the selected time interval. This chart is updated every ten minutes. Note that the information displayed in this chart is obtained from the Syniti DR Log. The chart reads the log every 10 minutes, looking for replication information. Therefore, this chart can affect performance in the Management Center (not in replications.) Performance is typically better if the log is stored in a database rather than in text files. It is recommended that you close the Replication Activity tab if you are not actively using it to avoid affecting response time in the Management Center.

Opening the Replication Activity Viewer

In the Management Center Metadata Explorer, Replication Browser, or Replication Monitor, select a replication and, from the right mouse button menu, choose **Show Replication Activity**.

Related Topics

Monitoring and Reviewing Replications

Replication Monitor

Log Viewer

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Replication Agent Options Dialog

General
Conversion Rules
Log
Trace
Alerts
Mail
Advanced

General

Max Number of Concurrent Threads

Sets the maximum number of replications that can run concurrently. The default is 20. Use the Preferences tab in the Replication Properties dialog to set priorities for the different replications. Use the **Defaults** button to set ALL **Execution Settings** back to the default values. See also Managing Performance Using Thread Settings

Thread Delay

The default value is zero. Use the **Defaults** button to set ALL **Execution Settings** back to the default values. See also Managing Performance Using Thread Settings

Thread Execution Factor

The default value is 10. Use the **Defaults** button to set ALL **Execution Settings** back to the default values. See also Managing Performance Using Thread Settings

Replication Settings: Perform an INSERT if the UPDATE doesn't find the record

Checked by default so that records are inserted in the target table even if the source table log specifies that the operation performed in the source table was an UPDATE.

Transaction Latency Threshold

The default value for this option is 1 minute. It is used with the Transaction Latency Chart in the Replication Activity Viewer. The chart compares the current time with the latest processed transaction time (or the last scheduled mirroring time if there are no transactions). If the lag between the two exceeds the **Transaction Latency Threshold** setting, the shaded area in the graph is displayed in red and the **Latency Status column**

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in the Replication Monitor displays the value **Threshold Warning**. This can indicate that the current settings for the Replication Agent and the replication are not allowing the Replication Agent to keep up with the number of transactions. Adjust the Transaction Latency Threshold value as needed to provide a useful warning for your environment, depending on the number of transactions and the mirroring interval.

Application Paths: Temporary Files Folder

Blank by default. In this case, Syniti DR temporary files are saved to the SyncCache folder. Type a new path to save temporary files to a different location.

Conversion Rules

Date/time conversion errors

Errors may occur when replicating date/time fields from one database to another. The accepted formats for this data type vary from DBMS to DBMS. For instance, IBM Db2 for i allows 1/1/1 as a valid date but Microsoft SQL Server does not. The options below allow you to control how such errors would be handled.

Don't Trap Error

No attempt is made to trap the error in the replication code so an exception is generated and added to the log (DBMoto.log.) No value is entered in the field where the error occurred and replication continues.

Insert NULL Value

NULL will be inserted in fields where the conversion generated an error. No information is reported in the log.

Insert the Minimum/Maximum Allowed

Depending on the database and the column data type, Syniti DR uses the minimum date allowed (if the date value was earlier than the minimum date setting for the database) or maximum date allowed (if the date value was later than maximum date setting for the database.)

Insert this Date

The selected date is inserted in place of the data that is causing an error. In general, the date is substituted, and the time (if any) is left unchanged. For example, if you have 1/1/1 11:30 it becomes 1/1/1900 11:30.

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Log

The settings on this tab apply to the Syniti DR log (.log extension, viewable in the Log Viewer), the Syniti DR history files (.his extension, viewable in the History Viewer), and the Server Log (_SA naming convention.) This tab allows you to specify log type, location (if a database), size and generation frequency.

Log Settings

Click this button to open the Log Settings dialog.

Write Log To

You can save the Syniti DR log and history to one of the following. Your selection will be applied to both the log and history files.

- A text file
- A database
- The Microsoft Windows Event Log
- Apache log4net™

Activate Log History

Check this option to start logging replication status information for each replication session. All information is recorded in a file with a .his extension in the Syniti DR Logs folder. This information can then be displayed and reviewed in the History Viewer.

You may want to leave this option unchecked if you are concerned about disk space and processing load for the Replication Agent. The process stores one record for each replication during each refresh/mirroring session. In the case of mirroring, this typically means that the .his file is updated every 60 seconds.

Activate Log Performance

Unchecked by default, When checked, generates a log file ('TaskTimer_<current_day>.txt) containing information for each replication or replication group regarding execution time, number of records processed and thread priority.

Database Log

Use Default Metadata

Select this option to create the log tables in the default (selected) metadata database.

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Use Specific Connection

Select this option to create the log tables in an alternative specified connection. Click to open the Log Database Connection Properties dialog and set up a connection to the database in which you plan to write the log.

Keep Max Log Messages

Check this option to set a specific number of messages to keep in the log database. This field allows you to control the seize of the log database and ensure that it does not get too large. The default value is 0, which means that all messages are kept in the database. Note that the value is in thousands. So, if you want to keep 5,000 records in the log, set the field value to 5.

Retention Time

Check this option to set a retention time for the number of hours to keep records in the log. Can be used in conjunction with **Keep Max Log Messages**.

Text File Log

Use the Log Viewer to access the log and save it to a file.

Only one file

Generates a single log file that includes all log messages occurring during replications.

One file every X days

If checked, and a number entered, generates a new log file after the number of days specified. All old log files are kept in the log directory. The convention used to name the log files is DBMoto_xxxx, where xxxx is a number starting at 0001. If you do not set the "Keep Max X Log Files" option, remember to clean up your log directory regularly.

One file with size limited to X Mb

If checked, and a number entered, creates a new log file when size X is reached. All old log files are kept in the log directory. The convention used to name the log files is DBMoto_xxxx.log, where xxxx is a number starting at 0001. If you do not set the "Keep Max X Log Files" option, remember to clean up your log directory regularly.

Keep Max X Log Files

If unchecked, all old log files are kept in the log directory. If checked, keeps only the specified number of old log files in the log directory. Use file dates (not file names) to determine the most recent log files.

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Windows Event Log

Events are saved to the Microsoft Windows Event Log and can be viewed using the Windows Event Viewer, available from your Windows desktop by choosing **Start**, then **Settings**, then **Control Panel**. In the Control Panel, double-click **Administrative Tools**, then **Event Viewer**.

log4net

When you select the log4net option, by default Syniti DR writes events to a file using Apache log4net. You can configure log4net features by editing the log4net section in the SynitiDR_ReplicationAgent.exe.config file located in the Syniti DR install folder. It is recommended that you make a backup copy of the SynitiDR_ReplicationAgent.exe.config file before editing. For additional information about log4net features and settings, see http://-logging.apache.org/log4net/release/features.html.

Trace

Activate Server Agent Tracing

For debug purposes only. Should be enabled only when requested by technical support staff. When checked, this option traces all activity related to the selected server. Stop and restart the Server Agent using the Syniti DR Service Monitor in the Windows System Tray to enable tracing.

Activate Replication Agent Tracing

For debug purposes only. Should be enabled only when requested by technical support staff. Click **Settings** to open the Replication Agent Trace Settings dialog. This dialog allows you to select the type of information to include in the trace. The following options are available:

Trace binary info read from the transaction log (selected by default)
Trae diagnostic info
Trace low level database connectivity info (selected by default)
Trace metadata operations
Trace operations during replication refresh phase (selected by default)
Trace replication history info
Trace selected replications only (Click in the values field then on to open the Select Replications to Trace dialog)
Trace threads and tasks info

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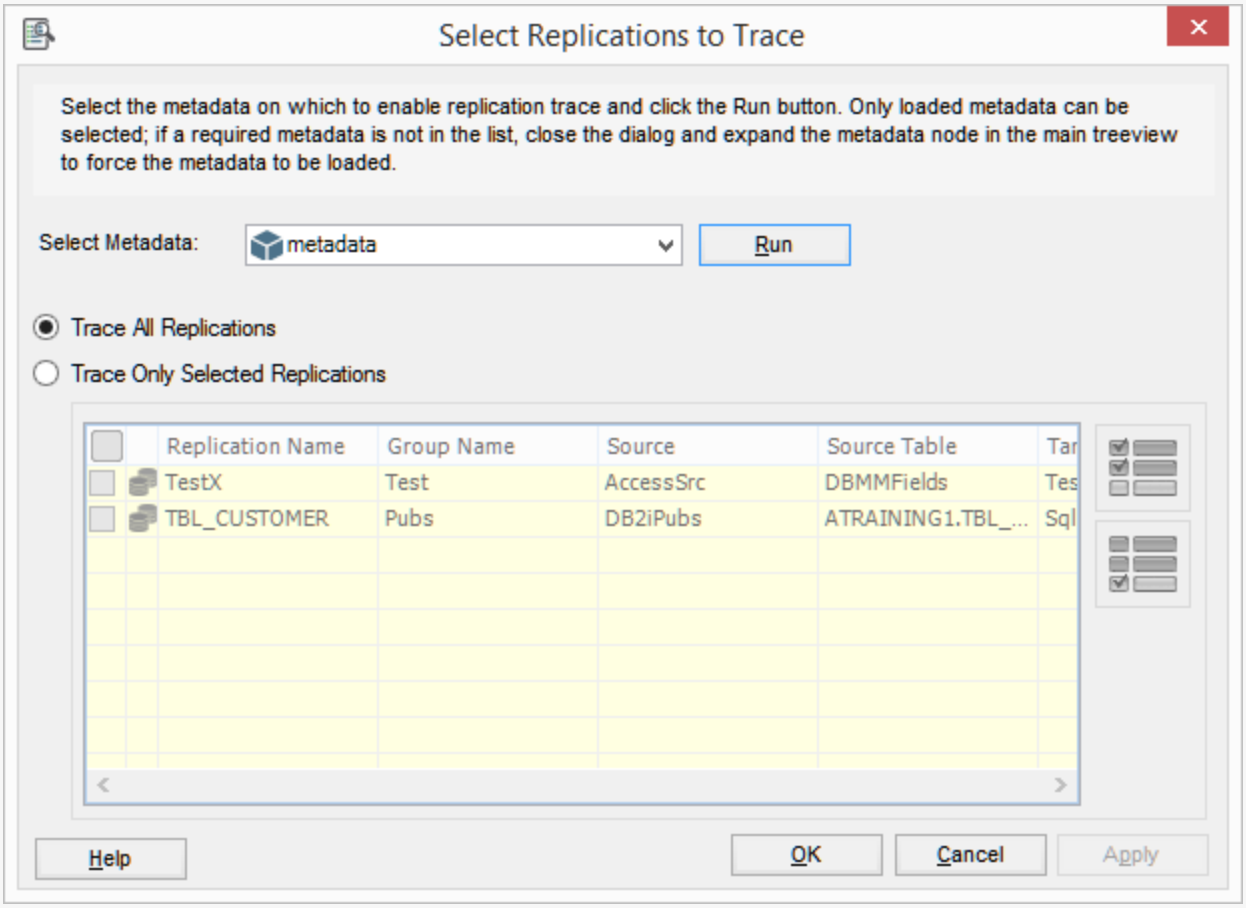
Select Replications to Trace Dialog

The "Trace selected replications only" option, available from the Trace Settings dialog, allows you to limit the number of replications to trace. Click in the values field, then on ... to open the Select Replications to Trace dialog. You can either select specific replications, or select all replications in a group to enable tracing for the group.

If you select all the replications in a group, then the whole group is traced. If you later add replications to the group, those replications will be traced as well. If you remove a replication from the group, the replication will no longer be traced.



Typically, you can leave the default settings. The tecnical support staff will let you know if they need specific settings during tracing.

Only one file

Generates a single trace file that includes all trace messages occurring during replications.

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One file every X days

If checked, and a number entered, generates a new trace file after the number of days specified. All old trace files are kept in the log directory. The convention used to name the Replication Agent trace files is DBMoto_xxxx.trc, where xxxx is a number starting at 0001. If you do not set the "Keep Max X Log Files" option, remember to clean up your log directory regularly.

One file with size limited to X Mb

If checked, and a number entered, creates a new trace file when size X is reached. All old trace files are kept in the log directory. The convention used to name the trace files is DBMoto_xxxx, where xxxx is a number starting at 0001. If you do not set the "Keep Max X Log Files" option, remember to clean up your log directory regularly.

Keep Max X Log Files

If unchecked, all old trace files are kept in the log directory. If checked, keeps only the specified number of old log files in the log directory. Use file dates (not file names) to determine the most recent files.

Alerts

Use this tab to create and manage email alert messages for the selected server (usually **local**). It provides a way to define email messages for specific events that apply to all replications that are enabled and/or to the status of the Replication Agent itself.

Replication Alerts Grid

The grid displays alerts that have been defined using the **Add Alert** button. Select an alert to edit or remove it.

Add Alert

Click **Add Alert**, then choose **AddEvent Alert** to define email message alerts for specific events in the Server Alert Properties dialog. Click **Add Alert**, then choose **AddActivity Report** to create general email message alerts for Replication Agent activity in the Server Alert Properties dialog. Note that newly defined email alert messages will only be sent after stopping and restarting the Replication Agent.

Remove Alert

Select an alert in the grid, then click **Remove Alert** to delete the email alert.

Edit Alert

Select an alert in the grid, then click **Edit Alert** to open the Server Alert Properties dialog and edit the email alert.

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Mail

This tab is used in conjunction with the Alerts tab for server-related email alerts, the Alerts tab in the Replication Properties dialog for a specific replication and the SendMail script function. If you have defined an email alert, or a global or replication script that uses one of the SendMail functions, then you need to configure your SMTP email server and email address coordinates. Use the **Test Email** button to send an email and check your configuration.

SMTP Server

Type the SMTP server for the mail account from which you want to send emails.

SMTP Port

Type the port for the SMTP server.

From

Type your email address, or the email address from which you want to send emails.

To(s)

Type the email address(es) for the recipients of the email. Email addresses should be separated using a semi-colon (;).

Use Authentication

Check this option and provide a user name and password if the email server requires authentication.

Use SSL Encryption

Check this option if you are using SSL encryption.

Test Email

Click to send an email using the email addresses defined in the **From** and **To** fields above. The email will have the subject line "Test email from Syniti DR" and contain the text "This is a test. Ignore."

Advanced

The properties on this tab reflect values used by the Syniti DR configuration file. You do not typically need to edit these values, unless requested to do so by the technical support staff.

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Language	Default value is en-us. This is the selected language for the application.
Enable Console	Default value is False. enables the console to troubleshoot on Replication Agent status.
Agent IP Port	Default value is 58361. IP port for the Server Agent.
Agent Timeout	Default value is 180. Timeout (in seconds) for all commands from the Server Agent.
Agent Long Timeout	Default value is 300. Timeout (in seconds) for some commands in the Server Agent that typically take longer to complete.
Replication Agent IP Port	Default value is 58360. IP port for the Replication Agent.
Save Metadata Interval	Default value is 600. Interval (in seconds) used by the Server Agent to commit metadata changes to the database.
Metadata Path	Folder where pending metadata changes are saved.
Bulk Mirroring Temp Path	Folder for temporary files created by bulk mirroring.
Log DBM Prefix	Default value is _DBM__. The prefix used for log tables when replicating in trigger mode.
AS400 qcmdexc	Default value is qsys.qcmdexc. Syntax for the qcmdexc command to execute CL commands on the IBM I (AS/400)
DB2 UDB Log Version	Default value is 03.
Monitor Timeout	Default value is 15. Timeout in milliseconds for monitoring operations from the Serrver Agent to the Service Monitor.

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Warning on Expiring License	Default value is 3. The number of days before license expiration to display a warning in the Management Center.
Replication Agent Timer Interval	Default value is 3000 (milliseconds). Sleep interval for the main thread of the Replication Agent.
Thread Sleep Length	Default value is 10. Length of time (in seconds) to sleep for the application multi-threading algorithm.
Thread Sleep Increments	Default value is 100. Increments (in seconds) of threads used by the application multi-threading algorithm.
Log Reader Tomeout	Default value is 0. timeout in seconds of the log reading process.

Opening the Replication Agent Options Dialog

In the Management Center **Metadata Explorer**, select the server for which you want to set options. From the right mouse button menu, choose **Replication Agent Option**

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Replication Alert Properties Dialog

This dialog allows you to set up email alerts for specific events that occur when processing the selected replication. Use the **Alert Settings** tab to choose which events to include in an email, and use the **Message Layout** tab to specify email recipients and email content. In addition to defining the email content in this dialog, you must set email server properties in the Mail tab of the Replication Agent Options dialog.

As an alternative, or in addition to email alerts for a specific replication, you can set up email alerts at the server level for all replications defined on the server using the Alerts tab in the Replication Agent Options dialog.

Note: It is also possible to create a custom email alert by writing a script that uses the SendMail function.

Filtering Alerts

Where the alert type allows, it is possible to set a filter to identify specific conditions for an alert. The filter field is displayed to the right of the alert name and can contain logical operators in addition to specific strings. The supported logical operators are AND, OR, NOT (uppercase with precedence as shown). Parentheses can be used to change operator precedence. Substrings to be matched with message content should be enclosed in quotes (') or double quotes(").

Examples:

- All messages for enabled replications except "EMP50" and "EMP51":
  "enabled" AND NOT ("EMP50" OR "EMP51")
- All messages not containing the substring "warning 256":
  NOT "warning 256"
- All messages containing "error" or "warning":
  "error" OR "warning"

Alert Settings Tab

Replication Events	
Replication Info	Reports all comments generated by Syniti DR in the "Information" category for the selected replication. The filter option allows you to set a string to identify a subset of "Information" messages you want to receive.
Replication Errors	Reports all comments generated by Syniti DR in the "Error" category for the

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	selected replication. The filter option allows you to set a string to identify a subset of "Error" messages you want to receive.
Replication Warnings	Reports all comments generated by Syniti DR in the "Warning" category for the selected replication. The filter option allows you to set a string to identify a subset of "Warning" messages you want to receive.
Reached Max Replication Latency	Reports whenthe**Transaction Latency Threshold**setting in the General tab of the Replication Agent Options dialog has been exceededby comparing the current time with the latest processed transaction time (or the last scheduled mirroring time if there are no transactions). If the lag between the two exceeds the **Transaction Latency Threshold** (set in the General tab of the Replication Agent Options dialog), an email message is generated. This can indicate that the current settings for the Replication Agent and the replication are not allowing the Replication Agent to keep up with the number of transactions.
Reached Max Replication Downtime	Sets a maximum number of hours that the selected replication could be stopped before sending an email notification. For example, if the number of hours is set at 3, an email would be send once the down time for the replication reaches 3 hours.

Alert Schedule

Use this option to limit the number of email messages you receive for a defined set of alerts.

Message Layout Tab

Use this tab to define the alert email recipients and the overall layout of the email message

Recipients

A semi-colon separated list of email addresses.

Title

A default email subject line is provided, but you can edit the text to provide your own subject line.

Body

A default email body format is provided, but you can edit the text to customize the email format.

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Html Format

Check this option to send email messages in HTML format.

Attachment

To attach the current Syniti DR text file log to the email, select Log from the drop-down list.

Opening the Replication Alert Properties Dialog

1. In the Management Center **Metadata Explorer**, select a replication.
2. From the right mouse button menu, choose **Replication Properties**.
3. In the **Replication Properties** dialog, go to the Alerts tab.
4. Click **Add Alert** to open the **Replication Alert Properties** dialog.

Related Topics

Email Alerts

Server Alert Properties Dialog

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Replication Browser

Once you have created a replication, it is displayed in the Replication Browser with enough information about the replication so that you can easily identify it. Use the right mouse button menu to edit Replication Properties and to enable or disable the replication.

Select a replication in the upper pane to view details of the columns to be replicated in the lower pane.

Click **Export Current List** to export the current Replication Browser contents to comma-separated value format files in a folder of your choice: Replications.csv and Mappings.csv. These files can then be loaded and managed in Microsoft Excel.

Opening the Replication Browser

In the Management Center right pane, click the Replication Browser tab.

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Replication Monitor

The Replication Monitor tab provides current status information for all replications defined in the metadata that is selected in the Metadata Explorer.

Select a replication in the Replication Monitor tab to view some of its properties in the Properties pane. To view all replication properties, select the replication and, from the right mouse button menu, choose Replication Properties to open the Replication Properties dialog.

Show Summary	Display/hide the summary panel at the bottom of the Replication Monitor to see counts of replications with different status, as well as information about the maximum and average values for transaction latency for replications at any given time.
Show Replication History	Display the history for a selected replication.
Clear Replication Status	Clear status information for selected replication(s).

Further information is available for:

Replication Status Column
Initialization Status Column
Last Replication Status Column
History Status Column
Latency Status Column

Replication Status Column

The **Replication Status** column displays one of the following values:

Idle	The replication is active, or enabled, and ready to run but is not cur-

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	rently running.
Disabled	The replication is disabled. To enable or disable a replication, select the replication and use the right mouse button menu. When a replication is disabled, it cannot run. You must enable the replication so that it can be added to the Replication Agent task list.
Refreshing	The replication is currently running. A refresh operation is being performed.
Mirroring	The replication is currently running. A mirroring operation is being performed.

Initialization Status Column

The **Initialization Status** column is used to display and manage the status of an Initial Refresh replication. It contains one of the following values.

--	Uninitialized -- a Refresh operation has never run.
Requesting	A Refresh request has been submitted, but the Replication Agent is not running, so the request cannot be proccessed.
Pending	A Refresh request has been submitted to the Replication Agent but the refresh operation has not completed.
Executed	A Refresh operation has successfully been executed

When creating a replication in the Replication wizard, it is possible to set an Initial Refresh where all selected data is copied from the source table(s) to the target table(s) prior to running the regular replication schedule. In the Scheduling screen, check the **Execute Initial Refresh** option.

To change the initialization status of a replication, right click on it and select 'Run Initial Refresh'. If the Replication Agent is not running, the status changes immediately, putting the replication into a temporary mode ("Requesting…") until the Replication Agent accepts the request. When the Replication Agent is running, once it has accepted the initialization request, the Initialization Status changes to Pending. The operation can also be performed on disabled replications, where the Refresh operation is executed once the Replication Agent is started and the replication enabled. A Pending status can be removed by selecting the replication and the same Run Initial Refresh menu item.

NOTE: It is possible to set the **Run Initial Refresh** option for an individual replication within a group, or for a whole group. To set **Run Initial Refresh** for a replication within a group, select the replication in the Replication Monitor and

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choose **Run Initial Refresh** from the right mouse button menu. To set **Run Initial Refresh** for a group, in the Metadata Explorer, select the group and choose **Run Initial Refresh** from the right mouse button menu.

Last Replication Status Column

The **Last Replication Status** column can provide information about specific events that have recently occurred.

Success (0)	The replication was executed with no errors.
Warning (1)	The replication was executed through the end but some errors or warning were generated.
Errors (2)	The replication was stopped by the replication engine for some major problem. Check the Log for more information about the error.
Aborted (3)	Not currently implemented.
Stopped (4)	The replication was stopped by the user.

History Status Column

The **History Status column** provides error information for both the most recent replication and for prior replications. When a replication error is flagged, select the replication and, from the right mouse button menu, choose **Show History** to open the History Viewer and explore the error(s). Note that, to record a replication status history, you need to set the **Activate Log History** option in the Log tab of the Replication Agent Options dialog.

	Replication(s) completed successfully without errors.
	One or more errors occurred during the replication(s). Select the replication and, from the right mouse button menu, choose **Show History** to open the History Viewer and explore the error(s).
	The replication status reported by the History flag has been cleared. If the History Status column initially showed an error flag and you have examined the error, you can change the flag to show that the error has been investigated. Select the replication and, from the right mouse button menu, choose **Clear History** to display this flag.

Validation Result

The result of applying the most recent replication validation.

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Last Verifier Status

The result of applying the most recent verification of replication results.

Latency Status Column

The **Latency Status** column provides information on the current status of the replication. It reports a warning when the latency period between the current time and the latest processed transaction time (or the last scheduled mirroring time if there are no transactions) exceeds the **Transaction Latency Threshold** value in the Options dialog. When you see a warning in this column, open the Replication Activity tab by selecting the replication, then choosing **Show Replication Activity** from the right mouse button menu.

Transaction Latency Column

Displays the latency period between the current time and the latest processed transaction time (or the last scheduled mirroring time if there are no transactions.)

Opening the Replication Monitor

In the Management Center toolbar, select **Replication Monitor**.

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Replication Properties Dialog

General Tab
Scheduler Tab
Alerts Tab
Preferences Tab

- Refresh
- Mirroring
- Verifier

Opening the Replication Properties Dialog

General Tab

Replication Name

Type a name for the replication. This name will be stored in the metadata and used to identify the replication in the Replication Browser. It is helpful to include information about the source and/or target tables in the replication name.

Description

Optional. Type a description for the replication. This information will be stored in the metadata and can be accessed when you need more information about the replication.

Source Connection

Choose a source connection name from the drop-down list.

Source Table

Choose a source table from the drop-down list.

Target Connection

Choose a target connection name from the drop-down list.

Target Table

Choose a target table from the drop-down list.

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Replication Mode

Choose a replication mode from the options below.

Refresh

Mass replication is executed once based on the time setting specified in the Scheduling screen. All records in the target table are deleted before performing the refresh operation, although this behavior can be modified by writing a script for the Refresh_onBeforeTruncate event.

Mirroring

Continuous replication based on the source database transaction log, where the transaction log is checked according to the mirroring interval set in the Replication wizard or on the Preferences tab of this dialog.

Mass replication (refresh) can be executed once in order to fill the target records. Real-time mirroring begins as soon as the refresh changes have taken place. The incremental replication is executed at user-determined intervals.

Synchronization

Mass replication (refresh) can be executed once in order to fill the target records. Real-time bi-directional mirroring begins as soon as the refresh changes have taken place. The incremental replication is executed at user-determined intervals.

Automatic Field Mapping

Check this option to define mapping from target to source fields. Mappings created in this way are saved as part of the metadata. If you do not check this option, you will need to define scripts to create mappings when the replication runs.

Click Mapping to open the Fields Mapping dialog. Use this dialog to customize the mapping between source and target tables.

Use Script

Check this option if you want to define a replication script to run during replication. Define the script by clicking **Script** to open the Replication Script Editor.

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Scheduler Tab

Start Time

Select a start date and time. Click **Now** to set the current time and date.

- For the Refresh schedule, when the Replicator is running, this time will be used to determine when to schedule the first replication.
- For the Mirroring schedule, when the Replicator is running, this time will be used to determine when to schedule the first interruption to mirroring.
- For the Verifier schedule, when the Verifier Scheduler service is running, this time will be used to determine the first verification process.

Selecting a Date

You can select a date either by typing in the month, day and year, or by clicking the down arrow to view a scrollable monthly calendar.

To type in a date, first select the month, then type in a new value, then select the day and type in a new value and finally select the year and type in a new value.

If you click the down arrow, it displays the date that corresponds to the value currently set in the field. Use the left and right arrows to locate the month you want, then select a date by clicking on it. The window closes when you select a date and the date is displayed in the Start Time field.

Selecting a Time

To select a time, first select the hours, minutes or seconds, then type a new number or use the up and down arrows to increase or decrease the number.

Refresh Schedule

Run One Time Only

Select this option if you want to replicate data only once.

Run Recurrently

Select this option if you want to replicate data on a regular schedule. When you select this option, the Schedule button is activated. Click **Schedule** to open the Scheduler dialog.

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NOTE: To run a complete refresh replication immediately the replication is enabled and the start time has been reached, check the Run Initial Refresh option on the right mouse button of the replication name in the Metadata Explorer, Replication Browser or Replication Monitor. Subsequent replications occur as scheduled. Target table records are deleted prior to running the initial refresh operation. You can avoid truncation of target tables by writing a script for the Refresh_onBeforeTruncate event.

For mirroring replications which include an initial refresh, Syniti DR handles all transactions which occur while the initial refresh was taking place as part of the first mirroring phase by considering all transactions between the initial refresh start and the initial refresh end as a special case and verifying that all these transactions are handled appropriately.

For a synchronization replication, the initial refresh is always performed from the source connection to the target connection. Note that any transaction submitted during the time that the refresh is running might not be replicated. It is strongly suggested that you avoid updating the designated source and target tables until the refresh is done.

Mirroring Schedule

Run Continuously

Select this option to continuously mirror activity between the source and target database. The start of mirroring is determined by settings in the Scheduling screen. If you have enabled replication and set the start time, then mirroring will begin at the start time specified. If you have also checked the option to execute an initial refresh, then mirroring will begin once the database refresh is complete. If **Enable Replication** is not checked, neither the initial refresh or continuous mirroring will begin at the time specified in **Start Time**.

Schedule Interruptions

Select this option if you need to schedule one or more interruptions to the mirroring schedule. When you select this option, the Schedule button is activated. Click **Schedule** to open the Scheduler dialog.

Verifier Schedule

Run One Time Only

Select this option if you want to perform a verification only once.

Run Recurrently

Select this option if you want to run verifications on a regular schedule. When you select this option, the Schedule button is activated. Click **Schedule** to open the Scheduler dialog.

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Alerts Tab

Use this tab to create and manage email alert messages for the selected replication. It provides a way to define email messages for specific events that occur when the replication is running.

Replication Alerts Grid

The grid displays alerts that have been defined using the **Add Alert** button. Select an alert to edit or remove it.

Add Alert

Click Add Alert to define a an email message alert in the Replication Alert Properties dialog. Note that newly defined email alert messages will only be sent after stopping and restarting the Replication Agent.

Remove Alert

Select an alert in the grid, then click **Remove Alert** to delete the email alert.

Edit Alert

Select an alert in the grid, then click **Edit Alert** to open the Replication Alert Properties dialog and edit the email alert.

Preferences Tab

General

Thread Priority: If running multiple replications concurrently (via the setting in the Replication Agent Options dialog General tab), you can set the priority for the selected replication. See also Managing Performance Using Thread Settings.

Replication Latency: The maximum latency value allowed.

Record Pool Size: This is an optimization feature that allows you to set the size of the buffer used to store records in memory while processing records for replication. The default size is 1000 records. For example, if you are performing a SELECT on a large table, you may need to increase the buffer size. However, the buffer size should only be increased where there is sufficient system memory. In general, increasing this number can enhance performance if the reading task is faster than the writing task, i.e. operations involved in reading records from the source table are faster than operations involved in writing changes to the target table.

Stop on Schema Change: False by default. When set to true, instructs the Replication Agent to disable a replication whenever a schema change operation is detected, either when validating the replication or when the

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Replication Agent finds a schema change record in the log. See Managing Source/Target Database Schema Changes for more detail on how to use this option.

Override Identity Fields: False by default. For use with mapped Identity fields in Microsoft SQL Server and IBM Db2 for i target tables only. When set to True, this allows writing of the source Identity value to the target using extra clauses to “overwrite” the ID. If the property is set to False, but the Identity field is mapped, the database generates an error on attempting to write to a target Identity field.

Fetch Size: The read block size for connections using Oracle .NET Data Provider only. The default value is 1000000 (set using the **Default Fetch Size** property in the Connection Properties dialog.) For versions Syniti DR9.7.1 and above, the value in this field also applies to mirroring fetch size. When the replication type is synchronization, this property is enable if Oracle has been set as target.

Refresh

Refresh Filter Source: Allows you to specify a WHERE condition to apply during refresh applications to filter the records that are replicated. Click to open the Expression Generator and write a SQL expression to apply during the refresh replication.

Order By Clause Source: Provides access to the Expression Generator to create an expression for additional control over processing records.

Skip Target Truncate: The default settings is False and enables the truncation of a target table data before starting a refresh. Set to True to skip the truncation prior to starting the refresh.

Refresh Filter Target: Allows you to specify a WHERE condition to apply during the deletion of records on the target table prior to a refresh operation. Click to open the Expression Generator and write a SQL expression to apply during the refresh replication.

Refresh Interval: Default value is 60 seconds. Allows you to configure how long to wait before retrying a refresh in cases where the refresh replication was unable to start. The value must be expressed in seconds and greater than 0.

Refresh Recovery: When checked, and a refresh replication is interrupted while running, the Replication Agent is able to pick up the replication from the point at which it was interrupted. However, for this option to work, the source table involved in the replication must have one or more primary keys defined. If there are no primary keys, and the option is checked, a warning is printed in the log and recovery from the interruption is not possible. Refresh will begin at the first record. If you are using a replication group, refresh recovery will start at

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the replication where the error occurred rather than starting at the first replication in the group. If you check this option, you may find that the replication runs more slowly. If performance is adversely affected, uncheck the option.

Record ID : Only valid when Refresh Recovery is set to True. Indicates the current record index to which the replication is set. The drop-down menu allows you to reset the index.

Refresh Staging: Not supported for all databases. Default value is False. Set to True to first populate a staging table with records from the source, then merge the content to the target table. This is useful for very large tables when an initial refresh truncate/delete is performed, but reading and writing the target data could leave the target database temporarily without data before the insert is performed. When **Refresh Staging** is set to true, all data is stored in the staging table and the data is merged to the actual target table after processing all source records: the target table is not emptied out and target database users are able to access data during the refresh process. The staging table is truncated after the refresh is complete.

Insert Mode: The options are:

- SingleInsert--inserts record by record using SQL INSERT statements
- BulkInsert--inserts blocks of records. Block size is determined by the Block Size option. Choose this option for increased performance if using one of the data access providers which currently support bulk inserts:
  Syniti Ritmo/i (IBM Db2 for i) .NET Provider
  SAP HANA ODBC driver
  SAP HANA .NET Provider
  SAP Sybase ASE .NET Provider
  SAP Sybase IQ .NET Data Provider
  Microsoft SQL Server .NET Provider (using SQL Server's SqlBulkCopy)
  MySQL .NET Data Provider
  PostgreSQL .NET Data Provider
  Oracle .NET provider.
  For SQL Server, note that BulkInsert is the default option.
  Record details are not reported in the log when BulkInsert is set.
- SimulatedBulk--For databases that do not support bulk insertion, Syniti DR simulates the effect by grouping records into blocks before performing an insert. This is a way to optimize performance.

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Bulk Type: Depending on the database type and provider type, some of the following options may not be available.

- ArrayBinding--inserts multiple rows at a time using an array of parameters
- Native--uses the native functionality of the provider, if available
- FTP--bulk insert implemented through FTP

Block size: Set the value for the number of rows to insert in a single operation using the Bulk option above.

Isolation level: This option allows you to choose a specific isolation level on the Refresh operation. Choose from the following options available through your .NET Framework data provider:

Unspecified	No level is determined.
Chaos	The pending changes from more highly isolated transactions cannot be overwritten.
ReadUncommitted	A dirty read is possible, meaning that no shared locks are issued and no exclusive locks are honored.
ReadCommitted	Shared locks are held while the data is being read to avoid dirty reads, but the data can be changed before the end of the transaction, resulting in non-repeatable reads or phantom data.
RepeatableRead	Locks are placed on all data that is used in a query, preventing other users from updating the data. Prevents non-repeatable reads but phantom rows are still possible.
Serializable	A range lock is placed on the DataSet, preventing other users from updating or inserting rows into the dataset until the transaction is complete.

Skip Record Count: Default is False. Set to true to skip the SELECT COUNT(*) operation during refresh replications. This command is used only to show replication progress in the Replication Monitor, and omitting the operation may improve performance.

Fire Triggers: When the target database is SQL Server and the Insert Mode is set to BulkInsert, this option can be set to True to fire any triggers defined on the target database. The default value is False to provide optimal performance during replication.

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Use Partitions: Check this option to define multiple partitions or subsets within a replication during the refresh operation, so that multiple parallel threads move a specific subset of the data. This is useful to improve performance during refresh operations. Click **Add Partition** or select a partition and click **Edit Partition** to open the Partition Properties dialog.

Mirroring

Mirroring Filter Source: Allows you to specify a WHERE condition to apply during mirroring applications to filter the records that are replicated.

Read Interval: The frequency (in seconds) with which you want to check the log during replication. For example, if the setting is 90 seconds, Syniti DR will check the journal/log every 90 seconds to see if any transactions have occurred that need to be replicated to the target table.

Command Pool Size: The number of prepared SQL commands that are kept ready for execution during mirroring. Commands are added to the pool as they are used the first time on a last in, first out approach. Before executing a command, Syniti DR verifies if the command is already prepared in the pool. If it is, the command from the pool is used (saving time, because it is already prepared), otherwise a new command is created, prepared and executed. After execution the command is moved to the top of the pool. When the pool is full and a new command is needed, the last command in the pool is closed and released to make space for the new command. The default pool size of 10 can be modified up to the number of prepared commands that your database will support. This is an optimization feature and can improve performance.

Conflict Resolver: This property applies only to synchronization replications and determines how conflicts will be resolved. If you have not defined a synchronization replication, the property and value are inactive and cannot be modified. If you have defined a synchronization replication, you can choose from the following values:

- **SourceServerWins:** This is the default value. Changes applied to the table defined in the source connection are also applied to the table defined in the target connection(s), overriding any changes that have occurred in the target connection table.
- **TargetServerWins:**Changes applied to the tables defined in the target connections are also applied to the table defined in the source connection, overriding any changes that have occurred in the source connection table. This option also requires you to set a priority for the target tables involved so that, if changes occur in more than one target table, Syniti DR can determine which changed value to use. Set the priority for target connections as follows.

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1. In the Metadata Explorer, select the group.
2. From the right mouse button menu, choose **Group Properties**.
3. In the Group Properties dialog, go to the **Preferences** tab.
4. Click in the **Conflict Resolver Priority** field to view the target connections.
5. Order the target connections by selecting the connection, then using the up and down arrows to determine its priority.

- **FirstComeWins:** The timestamps of the changes in the tables designated as source and target (s) are compared and the change that applied earliest is applied to all tables.
- **Use Script:** This option generates an event that can be handled by writing a function Replication_onConflict. The script editor can be accessed from the General Tab Use Script option. You can write a function that handles the values from the tables in any way you wish using VB .NET.

NOTE: In the rare case that foreign key values are updated when synchronization has been defined, the synchronization algorithm may not work and may cause foreign key constraint violation issues. Please contact our support team via the Help Center if you need to modify foreign key values for replications with synchronization.

Commit Mode: Default is AutoCommit where each statement is replicated as a standalone transaction. This means that only statements that fail will not be replicated. The CommitmentControl option applies all the statements associated with a transaction as a whole to the target. CommitmentControl is supported on Oracle (Log Reader and Log Server Agent), Microsoft SQL Server, IBM Db2 for i, IBM Db2 LUW, IBM Informix.

Mirroring Options - From Source to Target

Commit Mode: Default is AutoCommit where each statement is replicated as a standalone transaction. This means that only statements that fail will not be replicated. The CommitmentControl option applies all the statements associated with a transaction as a whole to the target. CommitmentControl is supported on Oracle (Log Reader and Log Server Agent), Microsoft SQL Server, IBM Db2 for i, IBM Db2 LUW, IBM Informix.

Mirroring Insert Mode: A default value can be assigned in the Connection Properties dialog for the target connection, but the value can be changed here for each replication. The options are

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- SingleInsert--inserts record by record using SQL INSERT statements
- BulkInsert--inserts blocks of records. Block size is determined by the Block Size option. Choose this option for increased performance if available

Mirroring Block Size: Set the value for the number of rows to insert in a single operation when using the BulkInsert option above.

Commit Isolation Level: This option allows you to choose a specific isolation level when the Commit Mode is set to CommitmentControl. Choose from the following options.

Unspecified	No level is determined.
Chaos	The pending changes from more highly isolated transactions cannot be overwritten.
ReadUncommitted	A dirty read is possible, meaning that no shared locks are issued and no exclusive locks are honored.
ReadCommitted	Shared locks are held while the data is being read to avoid dirty reads, but the data can be changed before the end of the transaction, resulting in non-repeatable reads or phantom data.
RepeatableRead	Locks are placed on all data that is used in a query, preventing other users from updating the data. Prevents non-repeatable reads but phantom rows are still possible.
Serializable	A range lock is placed on the DataSet, preventing other users from updating or inserting rows into the dataset until the transaction is complete.
Snapshot	No locks on underlying data in a snapshot transaction, so other transactions can execute.

Transaction Read Point - Source Connections

This section of the dialog may contain database-specific fields in addition to the ones listed below.

Transaction ID: The ID for the transaction at which you want to start replication. If you want to change the transaction ID, click **...** to open the Read Point dialog.

In the Transaction Read Point dialog, you can either retrieve the current transaction or the transaction for a specified date and time.

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For SQL Server and trigger-based replications, if you choose the **Current Sequence** option, you can also check the **Refresh Transactional Replication Objects** option. This is useful, for example, when you know that SQL Server replication objects (article, publisher) have been manually removed or may need to be repaired or restored. A replication will not run if the database objects used for transactional replications are missing or corrupted.

If you enter a date and time, Syniti DR retrieves the first transaction after the time entered. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

The transaction ID is set and transactional objects are refreshed (if checked) when you close the dialog.

Commit TID: A read-only property that indicates the location in the current command index for the transaction that is being processed.

Transaction Timestamp: The timestamp for the transaction above.

Log Files Folder:The location of the log.

Log File Name: The name of the log file.

Log Catalog: Catalog used for the log tables generated by the triggers (as applicable).

Log Schema: Schema used for the log tables generated by the triggers (as applicable).

Master Table Name: Appears only when replicating from a source database that uses triggers. A read-only property that displays the name of the master table created by Syniti DR in the source database and used to store information for trigger-based replications.

Log Table ID: Appears only when replicating from a source database that uses triggers. A read-only property that displays the ID included in the name of the log table created by Syniti DR in the source database and used to store information for trigger-based replications. The full name of the table would be _DBM__LOG_#, where # is the ID displayed in this field.

Mirroring Options - From Target to Source

NOTE: The settings below are used only when performing synchronization.

Commit Mode: Default is AutoCommit where each statement is replicated as a standalone transaction. This means that only statements that fail will not be replicated. The CommitmentControl option applies all the statements associated with a transaction as a whole to the target. CommitmentControl is supported on Oracle (Log Reader and Log Server Agent), Microsoft SQL Server, IBM Db2 for i, IBM Db2 LUW, IBM Informix.

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Mirroring Insert Mode: A default value can be assigned in the Connection Properties dialog for the target connection, but the value can be changed here for each replication. The options are

- SingleInsert--inserts record by record using SQL INSERT statements
- BulkInsert--inserts blocks of records. Block size is determined by the Block Size option. Choose this option for increased performance if available

Mirroring Block Size: Default 10000. Only valid if the insert mode is BulkInsert.

Commit Isolation Level: This option allows you to choose a specific isolation level when the Commit Mode is set to CommitmentControl. Choose from the following options.

Unspecified	No level is determined.
Chaos	The pending changes from more highly isolated transactions cannot be overwritten.
ReadUncommitted	A dirty read is possible, meaning that no shared locks are issued and no exclusive locks are honored.
ReadCommitted	Shared locks are held while the data is being read to avoid dirty reads, but the data can be changed before the end of the transaction, resulting in non-repeatable reads or phantom data.
RepeatableRead	Locks are placed on all data that is used in a query, preventing other users from updating the data. Prevents non-repeatable reads but phantom rows are still possible.
Serializable	A range lock is placed on the DataSet, preventing other users from updating or inserting rows into the dataset until the transaction is complete.
Snapshot	No locks on underlying data in a snapshot transaction, so other transactions can execute.

Transaction Read Point - Target Connection

Transaction ID: The ID for the transaction at which you want to start replication. If you want to change the transaction ID, click **...** to open the Read Point dialog.

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In the Transaction Read Point dialog, you can either retrieve the current transaction or the transaction for a specified date and time.

For SQL Server and trigger-based replications, if you choose the **Current Sequence** option, you can also check the **Refresh Transactional Replication Objects** option. This is useful, for example, when you know that SQL Server replication objects (article, publisher) have been manually removed or may need to be repaired or restored. A replication will not run if the database objects used for transactional replications are missing or corrupted.

If you enter a date and time, Syniti DR retrieves the first transaction after the time entered. This information is available and can be changed in the Replication Properties dialog after the wizard is completed.

The transaction ID is set and transactional objects are refreshed (if checked) when you close the dialog.

Commit TID: A read-only property that indicates the location in the current command index for the transaction that is being processed.

Transaction Timestamp: The timestamp for the transaction above.

Log Files Folder: The location of the log.

Log File Name: The name of the log file.

Log Catalog: Catalog used for the log tables generated by the triggers (as applicable).

Log Schema: Schema used for the log tables generated by the triggers (as applicable).

Master Table Name: Appears only when replicating from a source database that uses triggers. A read-only property that displays the name of the master table created by Syniti DR in the source database and used to store information for trigger-based replications.

Log Table ID: Appears only when replicating from a source database that uses triggers. A read-only property that displays the ID included in the name of the log table created by Syniti DR in the source database and used to store information for trigger-based replications. The full name of the table would be _DBM__LOG_#, where # is the ID displayed in this field.

Verifier

These options are also available in the Verifier Options dialog. Note that if you set an option below, you need to close and re-open the Verifier tab before the changes are visible in the Verifier Options dialog. Changes you make to Verifier

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settings in the Replication Properties dialog will be saved to the Syniti DR metadata and available to any Verifier activity for the replication.

Records Count Only: False by default. When checked, the verification process compares only the number of records in the source and target tables.

Compare Primary Keys Only: False by default. When checked, the Verifier compares only the primary key field value(s) in source and target tables to determine differences between the tables. Note that **Reconcile Data** is not enabled when Verify Primary Key Only has been selected because differences and column data are not recorded during the operation to compare primary keys only.

Max Number of Comparisons: Set a value for this property to control the default maximum number of records to compare. The default is 10,000.

Compare by Pivot Column: If a column is set, the Verifier compares tables using the column as a pivot to determine the differences. A better approach is to use the Verifier Options dialog to select the column, then click **Apply Settings to Metadata** in the dialog. Values will be updated in the Replication Properties.

Compare Subset of Columns: Enter a comma-separated set of source and target column names, including primary key columns to compare records on this subset of columns. A better approach is to use the Verifier Options dialog to select the columns, then click **Apply Settings to Metadata** in the dialog. Values will be updated in the Replication Properties.

Trim Chars: True by default. This option provides a way for the tool to ignore blank characters in string values. Some databases set string values at a fixed length using blank spaces to fill the string, while others permit strings of different lengths. If you check this option, the DBCompare tool trims all strings with fixed string length, then compares the strings.

Date Time Options: Set to **UseFractionalDigits** by default. Because databases can store date time values in different formats, you can select a value in this field to choose how to deal with date time fields. One of three values is possible:

- **SkipDateTime** - when selected, any Date Time field values will be ignored when comparing source and target tables.
- **SkipTime** - when selected, any Time field values will be ignored when comparing source and target tables.

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- **UseFractionalDigits** - Allows you to compare field values using a selected number of many to the right of the decimal point

Fractional Digits: 0 by default. Specifically for time values, and works in conjunction with the **UseFractionalDigits** value in the **Date Time Options** field. This option allows you to determine how many digits to the right of the decimal point you wish to use in comparing field values.

Skip Clob Blob: False by default. Any BLOB/CLOB field values will be included when comparing source and target tables. This option is unchecked by default, but comparing BLOB/CLOB values can be very time consuming so you may want to change the setting.

Skip Array of Bytes: Unchecked by default. Any Byte Array field values will be included when comparing source and target tables.

WHERE Condition Source Table: Provides a way to specify a condition to narrow the number of rows compared and reported. Click in the value area to open the Expression Generator and write the WHERE condition.

WHERE Condition Target Table: Provides a way to specify a condition to narrow the number of rows compared and reported. Click in the value area to open the Expression Generator and write the WHERE condition.

ORDER BY Clause Source Table: The default ORDER BY clause in the Verifier is to order by primary key. However, this can be problematic when the primary key is a string because database providers can order strings differently. This field allows you to override the default ORDER BY clause by typing a single column name, or a list of comma-separated column names. Click in the value area to open the Expression Generator and write the ORDER BY clause.

ORDER BY Clause Target Table: The default ORDER BY clause in the Verifier is to order by primary key. However, this can be problematic when the primary key is a string because database providers can order strings differently. This field allows you to override the default ORDER BY clause by typing a single column name, or a list of comma-separated column names. Click in the value area to open the Expression Generator and write the ORDER BY clause.

Operation Types to Reconcile: All operation types (Inserts, Deletes, Updates) are selected by default. Click in the values field to select/deselect operation types to include in the verification.

Opening the Replication Properties Dialog

In the Metadata Explorer, select the replication. From the right mouse button menu, choose **Replication Properties.**

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In the Replication Browser or Replication Monitor, select the replication. From the right mouse button menu, choose **Replication Properties**.

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Replication Script Editor

Use this editor to write a script that is run when a specific event occurs during replication. The script should consist of one or more functions selected from the drop-down lists at the top of the Editor. The drop-down list on the left displays the categories for which you can define an event handler. The Editor provides editing and formatting features that include automatic indentation, automatic coloring for syntax, numeric values, comments, “code folding”, and keyboard shortcuts.

Category	Events	Event Type	Explanation
Refresh	onBeforeTruncate onAfterTruncate onBeforeRefresh onAfterRefresh onPrepareRefresh	Writer Writer Writer Writer Reader	Available events apply to refresh replications only.
LogReader	onPrepareMirroring onBeforeMirroring onAfterMirroring onReceiverChanged	Reader Reader Reader Reader	Available events apply only to mirroring and synchronization replications. onReceiverChanged applies only to replications involving System i/iSeries/AS400.
Record	onBeforeMapping onAfterMapping onBeforeExecute onAfterExecute	Reader Reader Writer Writer	Available events apply to each record that is considered for replication. In the case of refresh replications, the events would apply to every record in the source/target table. In the case of mirroring and synchronization replications, the events would apply to records found in the transaction log.
Replication	onConflict onLateConflict	Reader Reader	onConflict and onLateConflict should be used to resolve conflicts only for synchronization replications.

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The right drop-down list displays a list of appropriate events for which you can write a script. If no function was selected from the left side, the list remains empty.

The default Visual Basic template content of the Replication Script Editor looks as follows. However, it is possible to write the script using C# instead of Visual Basic by setting the scripting language in the Global Script Editor, accessible from the right mouse button menu on the metadata.

```
Imports Microsoft.VisualBasic
Imports DBMotoPublic
Imports DBMotoScript
Imports DBRS.GlobalScript
Namespace DBRS
    Public Class ReplicationScript : Inherits IReplicationScript
    End Class
End Namespace
```

When you choose an event to add to the script, it is always added directly below the ReplicationScript class as in the example below.

```
Imports Microsoft.VisualBasic
Imports DBMotoPublic
Imports DBMotoScript
Imports DBRS.GlobalScript
Namespace DBRS
    Public Class ReplicationScript : Inherits IReplicationScript
        Public Overrides Sub Record_onBeforeMapping(recSource As IRe-
cord, ByRef AbortRecord As Boolean)

        End Sub
    End Class
End Namespace
```

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Add code to manage the event. You can include functions from other libraries in the script code, but be sure to add the library to the list of Imports, add the library location using the References dialog and set up a namespace for the library.

You can access the References dialog by clicking in the toolbar below the script.

	Checks the script syntax. If you do not do this in the script editor, you may encounter errors when the replication is running.
	Opens the Expression Generator
	Opens the References dialog so that you can add the location of any dlls that you are using from your script. You typically need to add dlls to the References dialog and to the script Imports when they do not belong to the default Microsoft .NET environment.
	Creates a comment for selected text
	Uncomments selected text

Editing and Formatting Features

- Automatic indentation based on syntax
- Colors to identify specific code elements: syntax in blue, numeric values in pink and comments in green
- Code folding where sections of code can be collapsed or expanded for ease of reading. The editor displays a green bar on the left side with +/- signs. Click - to collapse a section of code, and click + to expand a section of code.
- Common editing operations using keystroke combinations:

<SHIFT>Left, Right, Up, Down, Home, End, PageUp, PageDown	Move caret with selection
<CTRL>C <CTRL>V <CTRL>X	Copy, paste, cut
<CTRL>A	Select all text

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<CTRL>Z, <CTRL>Y	Undo/Redo
Tab <SHIFT>Tab	Increase/decrease left indent of selected range
<CTRL>Home <CTRL>End	Go to first/last char of the text
<SHIFT><CTRL>Home, <SHIFT><CTRL>End	Go to first/last char of the text with selection
<CTRL>U <SHIFT><CTRL>U	Convert selected text to upper/lower case
<INSERT>	Switch between Insert Mode and Overwrite Mode
<CTRL>Backspace <CTRL>Del	Remove word left/right
<ALT>Mouse, <ALT><SHIFT>Up, Down, Right, Left	Enable column selection mode
<ALT>Up <ALT>Down	Move selected lines up/down
<SHIFT>Del	Remove current line
<ESC>	Close all opened tooltips, menus and hints
<CTRL>Wheel	Zoom
<CTRL>Up <CTRL>Down	Scroll Up/Down
<CTRL>NumpadPlus, <CTRL>NumpadMinus <CTRL>0	Zoom in, zoom out, no zoom

Opening the Replication Script Editor

On the Replication Properties dialog General tab, check the Use Script option. Click **Script** to open the Replication Script Editor.

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Related Topics

Writing Scripts with Visual Basic .NET

Writing a Replication Script

Replication Script Events

Replication Script Properties

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Restore Metadata Options Dialog

This dialog provides options for restoring metadata information that has previously been saved (see Backing Up and Restoring Metadata.) The menu option to restore metadata information is available only when an existing metadata is selected in the Metadata Explorer.

The backup metadata information will be restored to the currently selected metadata. No new metadata is created in the Mangement Center. If you wish to restore metadata information to a completely new, or empty, metadata, first create the metadata using the **New Metadata** icon in the toolbar, then make sure that it is selected in the Metadata Explorer.

Standard Restore

Choose this option to restore a complete metadata file, overwriting all information in your currently selected metadata.

Custom Restore

Choose this option to open the Restore Metadata wizard and select information from a metadata backup file and add that information to your currently selected metadata.

Opening the Restore Metadata Options Dialog

In the Management Center Metadata Explorer, select a metadata, and from the right mouse button menu, choose **Restore Metadata**.

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Scheduler Dialog

This dialog displays different information depending on whether you have defined a Refresh, Mirroring or Synchronization replication. It also allows you to set a schedule for running the Verifier:

- **Refresh Schedule**
  Set a schedule for times to run a refresh replication.
- **Mirroring Schedule**
  Set a schedule for interruptions to recurring mirroring replications. Note that you set a start time for the interruption and a duration for the interruption (not an end time.)
- **Verifier Schedule**
  Set a schedule for times to run the verification. Note that you can also choose to have the process reconcile any differences between the source and target data.

Scheduler Times

Recurrence

First select how often you want the operation to occur. Depending on your choice, the right side of the dialog updates to show the different options associated with your choice. For example, if you choose to refresh Weekly, the right side displays the days of the week so that you can choose which day you want to run the refresh.

Schedule Times

Based on your choices in the Recurrence area, this area updates to display checkboxes allowing you to select times for running the operation. Note that you can select multiple times. For example, if you have chosen to run the refresh weekly, you could then set two times so that the refresh runs at 6 a.m. and at 12 midnight once per week on Mondays.

When scheduling mirroring interruptions, select a start time and then enter a duration for the interruption.

Opening the Scheduler Dialog

This dialog is available from the Replication wizard, or from the Schedule tab in the Replication Properties dialog.

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Select Tables Dialog

This dialog allows you to specify the source or target tables, views and aliases to display in the Management Center for use in defining replications. You can either select tables interactively or load tables from information in a previously defined file. Note that when defining a replication, you can specify only one source table/view/alias and one target table for each replication.

Selecting Tables Interactively

Choose one or more objects from the tree to associate with the source connection. Objects include tables, views and aliases. When creating a replication, you will be able to select an object for replication from those that you have chosen in this wizard. If you create multiple replications, you can select an object for each replication that you are defining.

Filtering the Table View

Use the filter field to limit the number of tables to view at any time. The field expects standard SQL syntax. Either type in the full name of the object you want to retrieve, or use '%' as search pattern. For example, if you type AB%, all objects beginning with the letters 'AB…' are displayed. To apply the filter, type the filter in the textbox and click . If filtering is not available for a specific node, or connection, the filter icon is inactive.

- You can apply a filter on any node in the tree, as long as you provide the correct SQL syntax.
- If you apply incorrect SQL syntax, the error dialog reports a SQL error. You should be familiar with the SQL syntax for your database to analyze and fix the error.
- Syniti DR stores the filter so that if you select another node, then go back to the previous one, the filter is retrieved.
- When a node in the tree has been expanded with a filter, its icon is modified to show that the full contents of that node have been filtered:
- Note that some databases, such as IBM Db2 for i, may not support the % symbol on one or more levels in the tree (catalog, schema, etc.).
- If you expand a node applying one filter (for example, A%) and then select/remove some tables, then change the filter to B% and select/remove other tables, when clicking OK the dialog will remember all the chosen tables and will apply all filters.

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To remove a filter, either click , or delete the filter text and click . The content for the node is reloaded without filtering information.

Use the **Hide System Tables** checkbox to limit the number of tables displayed.

Use the **Select All Tables** and **Deselect All Tables** buttons to work with multiple tables.

	Select a database owner/schema, then click this button to check all tables under the owner/schema.
	Select a database owner/schema, then click this button to uncheck all tables under the owner/schema.

Loading Table Selections from a File

If you have large numbers of tables in your environment, this option allows you to build up a text file containing a list of tables and load the information into Syniti DR. To select tables from an external file instead of connecting to the database to scroll the catalog and schema objects, in the toolbar, click then choose **Import From File**.

The file used to store your table selections should consist of comma-separated values as follows:

CATALOG,SCHEMA,TABLE,[KEY1,KEY2,…]

- CATALOG is the catalog name, optionally enclosed by double quotes. Use an empty string if catalog is not supported for this connection type.
- SCHEMA is the schema name, optionally enclosed by double quotes. Use an empty string if schema is not supported for this connection type.
- TABLE is the table name, optionally enclosed by double quotes.
- [KEY1,KEY2,…] is a list of primary keys, each of them optionally enclosed by double quotes. This parameter is used to set a list of primary keys programmatically.

See below for an example CSV file.

```
"","","ADDRESS"
"","","ADDRESS1",["STREET","STATE","ZIP"]
"","","ADDRESS2",["APT"]
"","","ADDRESS3"
```

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```
"","","T1"
"","","T2"
"","","T3"
"","","T4"
```

Note the following constraints.

- If the table structure does not follow the database catalog/schema structure (e.g., a file containing a table with catalog and schema information for a Microsoft Access database), the table will be ignored.
- If the table does not exist in the database, an error occurs and the operation is aborted.
- If any of the primary key fields in the key list do not exist in the table structure, an error occurs and the operation is aborted

Opening the Select Tables Dialog

In the Management Center Metadata Explorer:

- Select a source connection, then choose **Select Tables** from the right mouse button menu.
- Select a target connection, then choose **Select Tables** from the right mouse button menu.

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Server Alert Properties Dialog

This dialog allows you to set up email alerts for specific events that occur at the server level. Use the Alert Settings tab to choose which events to include in an email, and use the Message Layout tab to specify email recipients and email content. In addition to defining the email content in this dialog, you must set email server properties in the Mail tab of the Replication Agent Options dialog.

As an alternative, or in addition to email alerts at the server level, you can set up email alerts for a specific replication using the Alerts tab in the Replication Properties dialog.

Note: It is also possible to create a custom email alert by writing a script that uses the SendMail function.

Event Alerts

To define email alert messages for specific Replication Agent or replication events, on the Replication Agent Options dialog Alerts tab, click **Add Alert**, then **Add Event Alert** to display the **Server Alert Properties - Event Alert** screen. In the **Alert Settings** tab, select the event or events for which you want to receive an email message, then use the **Message Layout** tab to define the email format. Finally, set up the email server details in the Replication Agent Options Mail tab.

Filtering Alerts

Where the alert type allows, it is possible to set a filter to identify specific conditions for an alert. The filter field is displayed to the right of the alert name and can contain logical operators in addition to specific strings. The supported logical operators are AND, OR, NOT (uppercase with precedence as shown). Parentheses can be used to change operator precedence. Substrings to be matched with message content should be enclosed in quotes (') or double quotes(").

Examples:

- All messages for enabled replications except "EMP50" and "EMP51":
  "enabled" AND NOT ("EMP50" OR "EMP51")
- All messages not containing the substring "warning 256":
  NOT "warning 256"
- All messages containing "error" or "warning":
  "error" OR "warning"

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Alert Settings Tab

Server Events	
Start Replication Agent	Reports when the Replication Agent starts.
Stop Replication Agent	Reports when the Replication Agent stops.
Reached Max Quota for Traces	Sets a maximum trace file size after which you want to be notified. For example, if the trace file size is set to 100 MB, an email would be sent once the 100 MB limit is reached.
Reached Max Replication Agent Downtime	Sets a maximum number of hours that the Replication Agent could be stopped before sending an email notification. For example, if the number of hours is set at 3, an email would be send once the down time reaches 3 hours.
Replication Agent Info	Reports all comments generated by Syniti DR in the Replication Agent "Information" category. The filter option allows you to set a string to identify a subset of "Information" messages you want to receive.
Replication Agent Error	Reports all comments generated by Syniti DR in the Replication Agent "Error" category. The filter option allows you to set a string to identify a subset of "Error" messages you want to receive.
Replication Agent Warning	Reports all comments generated by Syniti DR in the Replication Agent "Warning" category. The filter option allows you to set a string to identify a subset of "Warning" messages you want to receive.
Replication Events	
Replication Info	Reports all comments generated by Syniti DR in the "Information" category for each replication. The filter option allows you to set a string to identify a subset of "Information" messages you want to receive.
Replication Errors	Reports all comments generated by Syniti DR in the "Error" category for each replication. The filter option allows you to set a string to identify a subset of "Error" messages you want to receive.

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Replication Warnings	Reports all comments generated by Syniti DR in the "Warning" category for each replication. The filter option allows you to set a string to identify a subset of "Warning" messages you want to receive.
Reached Max Replication Latency	Check this option to report when the **Transaction Latency Threshold**setting in the General tab of the Replication Agent Options dialog has been exceeded by comparing the current time with the latest processed transaction time (or the last scheduled mirroring time if there are no transactions) for the replication. If the lag between the two exceeds the **Transaction Latency Threshold** (set in the General tab of the Replication Agent Options dialog), an email message is generated. This can indicate that the current settings for the Replication Agent and the replication are not allowing the Replication Agent to keep up with the number of transactions. If the filter field is empty, all replications activate an alert. Set a filter of one or more replication names (logic operators such as AND OR NOT are supported) to activate the alert on the filter only.
Reached Max Replication Downtime	Check this option to set a maximum number of hours that the replication can be stopped before sending an email notification. For example, if the number of hours is set at 3, an email would be send once the down time for any replication reaches 3 hours. If the filter field is empty, all replications activate an alert. Set a filter of one or more replication names (logic operators such as AND OR NOT are supported) to activate the alert on the filter only.
Verifier Differences	Check this option to report details of all differences detected when comparing source and target replication results. If the filter field is empty, all replications activate an alert. Set a filter of one or more replication names (logic operators such as AND OR NOT are supported) to activate the alert on the filter only.

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Alert Schedule

Use this option to limit the number of email messages you receive for a defined set of alerts.

Message Layout Tab

Use this tab to define the alert email recipients and the overall layout of the email message

Recipients

A semi-colon separated list of email addresses

Title

A default email subject line is provided, but you can edit the text to provide your own subject line.

Body

A default email body format is provided, but you can edit the text to customize the email format.

Html Format
Check this option to send email messages in HTML format.

Attachment
To attach the current text file log to the email, select Log from the drop-down list.

Activity Report

Use the **AddActivity Report** option to create general email message alerts for Replication Agent activity in the Server Alert Properties dialog. On the Replication Agent Options dialog Alerts tab, click **Add Alert**, then **Add Activity Report** to display the **Server Alert Properties - Activity Report** screen. In the **Alert Settings** tab, choose how often you want to receive an email message, then use the **Message Layout** tab to define the email format. Finally, set up the email server details in the Replication Agent Options Mail tab.

Opening the Server Alert Properties Dialog

In the Management Center **Metadata Explorer**, select a server (usually **local**). From the right mouse button menu, choose **Replication Agent Options**. In the **Replication Agent Options dialog**, go to the Alerts tab. Click **Add Alert** then either **Add Event Alert** or **Add Activity Report** to open the **Server Alert Properties** dialog.

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Related Topics

Email Alerts

Replication Alert Poperties Dialog

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Server Connection Properties Dialog

This dialog provides a way to view settings for a server. Note that properties cannot be edited from this dialog. To change the properties of a server, you would first need to remove the server in the Metadata Explorer, then add a new server with different connection properties.

Authentication

Server Name

The name of the system where the Server Agent is running.

Server Address

The IP address of the system where the Server Agent is running.

Port

The port used by the Server Agent. The default value is 58361.

Authentication Method

The method established by an administrator to authenticate Syniti DR users. The options are Anonymous Access (no access control), Windows Authentication and UserName Authentication.

User Name

The name of the user connected to the server.

User Role

The role associated with the user name. The role represents the set of permissions enabled for the user. For more information, review the user roles and permissions described in the documentation for Create Login Dialog.

Opening the Server Connection Properties Dialog

In the Management Center Metadata Explorer, select the server for which you want to view the properties. From the right mouse button menu, choose **Server Properties**.

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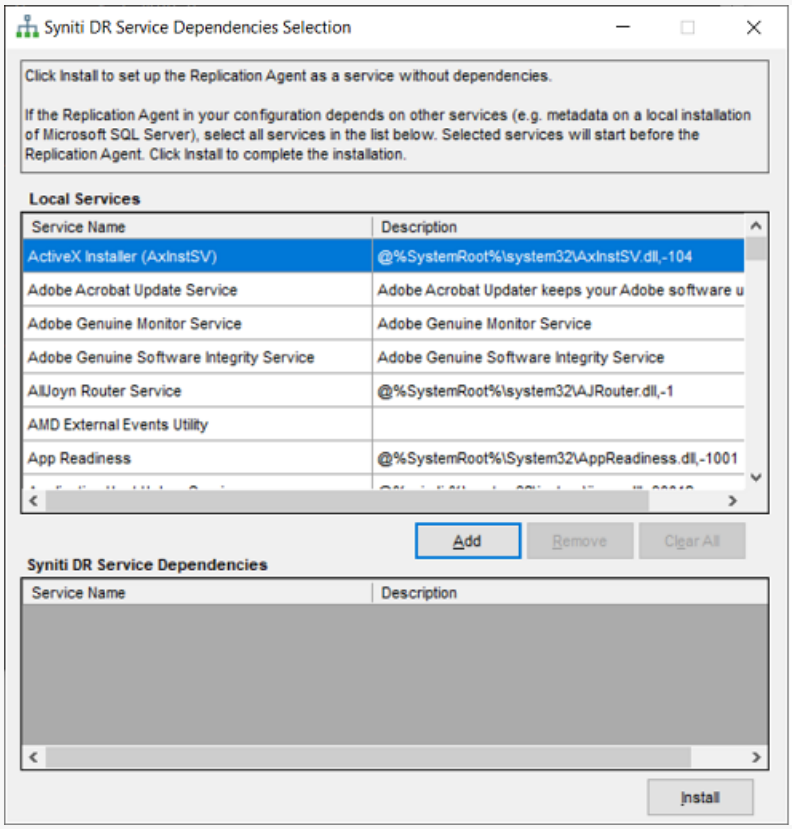
Service Dependencies Window

This window allows you to specify services needed by Syniti Data Replication prior to the Replication Agent Service startup. If you are not running a metadata database locally (on the same system where Syniti DRis installed), you do not need to set dependencies. Click **Done** to close the window.

If you have a local database (installed on the same system as Syniti DR) that is storing your Syniti DR metadata, the database must be running before Syniti DR to avoid errors when the metadata is checked.



- To add a dependency, select the service in the list, then click **Add**.

  The Replication Agent Service will not start until the selected service has started. For example, if you select SQL Server service and click **Add**, SQL Server is added as a dependency: the Syniti DR service does not start until the SQL Server service starts.

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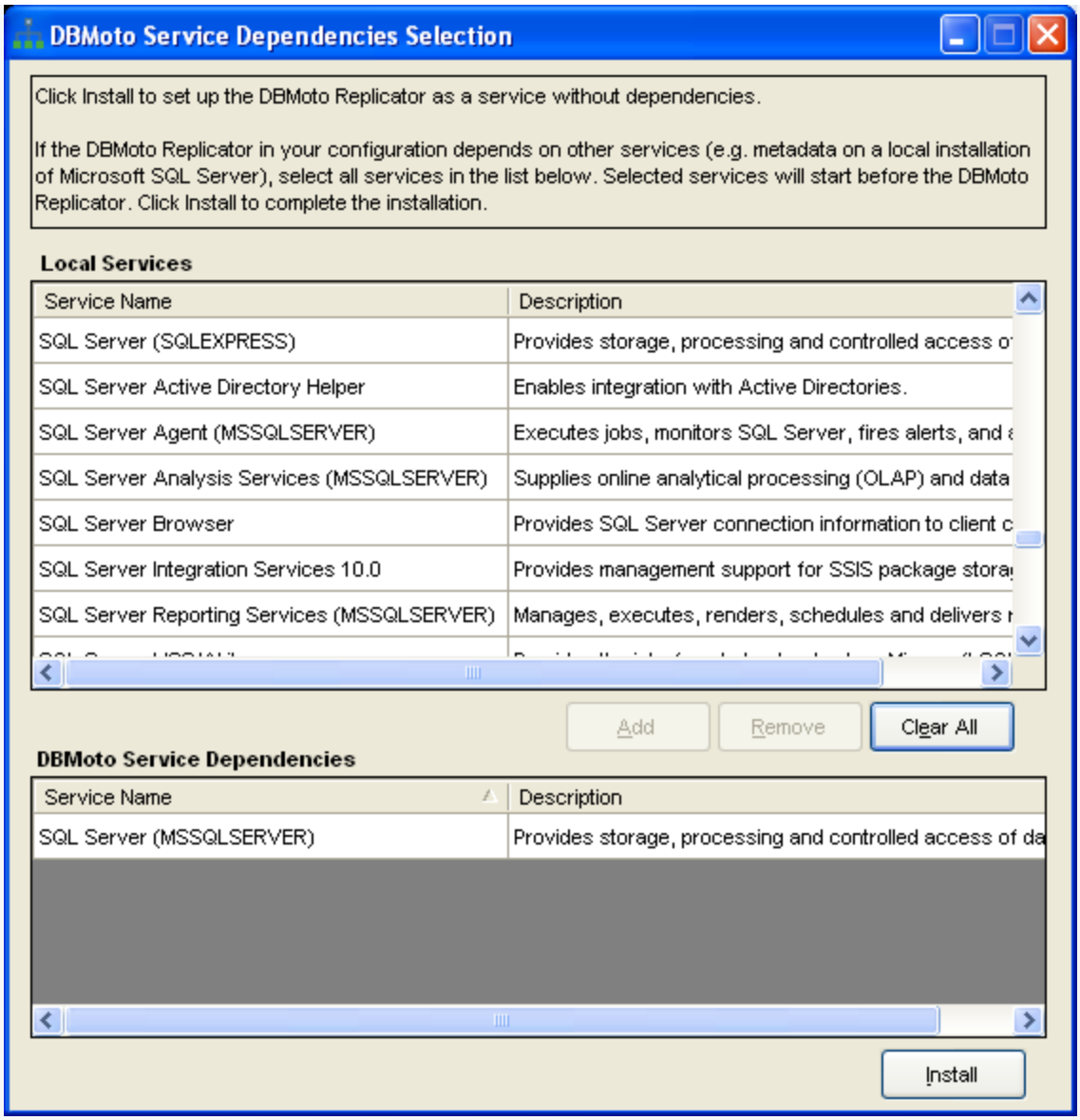

- Select a dependency and click **Remove** if you no longer need that service to start first.
- To remove all dependencies, click **Clear All**.
- Click **Done** when you have finished editing dependencies, or if you have no dependencies

Dependencies are added to the Windows Service Properties for the Replication Agent Service. Access the Windows Service Properties by opening **Control Panel** > **Administrative Tools** > **Services**, selecting the service, then right-clicking to open the properties dialog.

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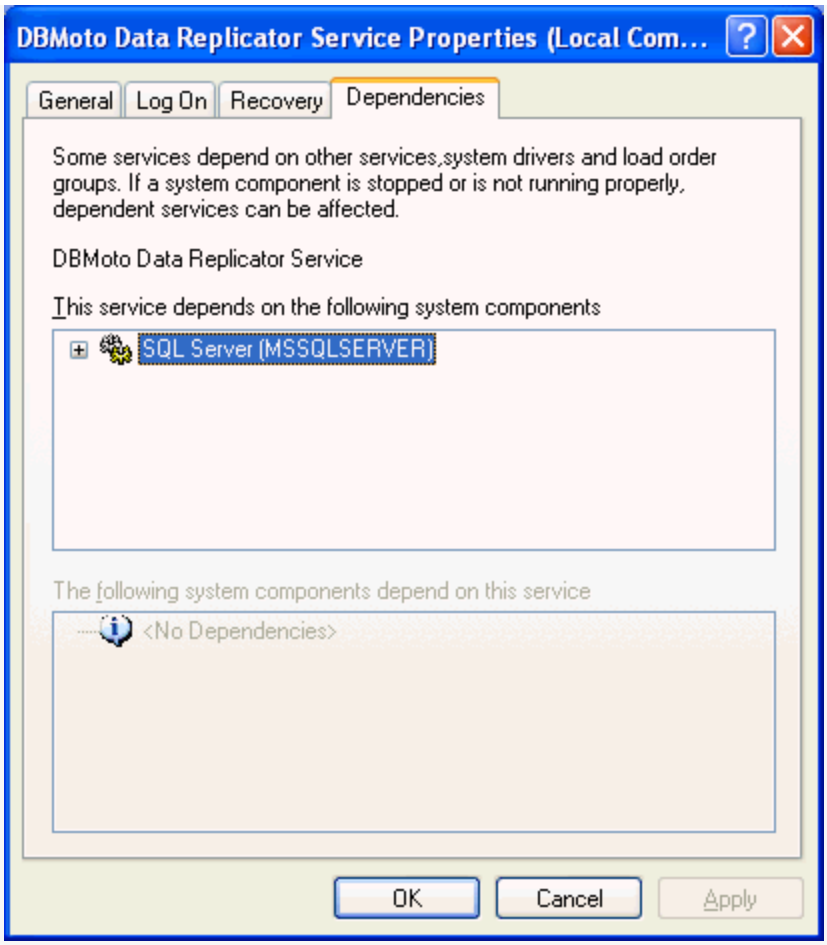

Opening the Service Dependencies Window

The Services Dependencies window opens automatically following installation when you select to install the Replication Agent as a service during the setup. You can also run the Service Installer application from the Syniti DR Service Monitor in the Windows Notification Area. Move the mouse over the Service Monitor icon , then, from the right mouse button menu, choose **Launch Service Installer**.

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Service Installation Utility

Use this window to install or uninstall any of the services associated with Syniti Data Replication. It provides a unique centralized way to access all Syniti DRservices and remove or recover old services that are no longer in use.

The list at the top shows the Syniti DRservices:

Syniti Replication Agent	Replicates data based on enabled replications set up in the Management Center
Syniti Server Agent	Provides support to the Management Center, by managing the server locations of installed Syniti DR components
Syniti Verifier Scheduler	Manages the scheduling for Verifier activity

In the lower section, Log Server Agent services for each of the supported databases are also listed. You can use this window to check and/or change their status. For example, occasionally a LSA service may be set up using an invalid path, particularly on an old LSA service that was created with a previous version of Syniti DR installed on a different path and never removed.

Click on the Ellipsis button to go to the Details window where you can:

- Start/Stop/Pause and Continue the service
- Install/Uninstall the service
- Change the Service Path and the arguments
- Change the Startup Type (Manual, Automatic or Disabled)
- Check the service dependencies

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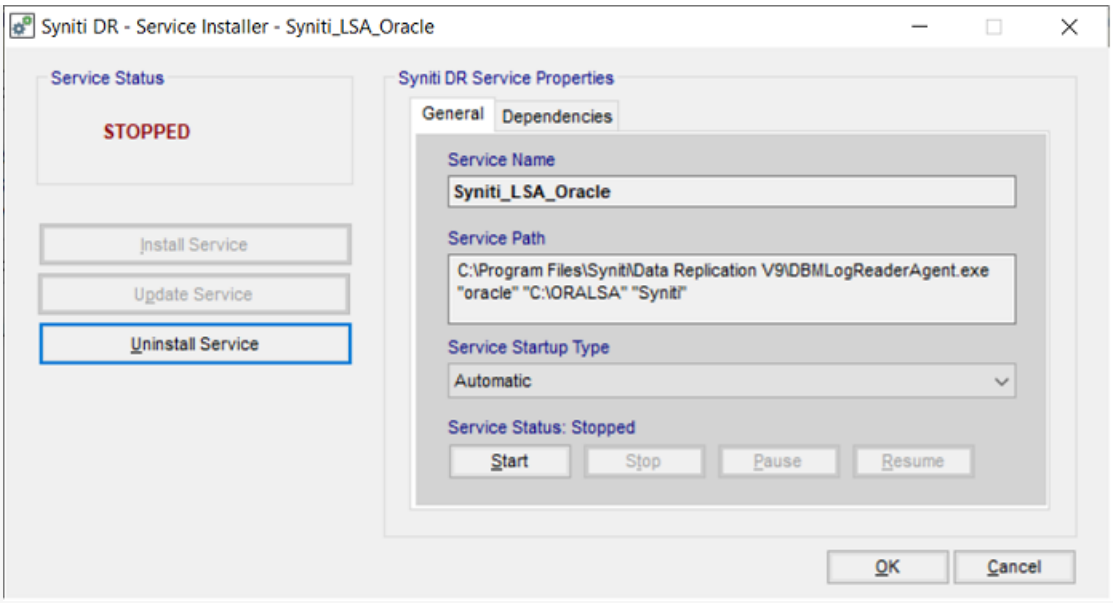

Opening the Service Installation Utility

Run the Service Installer application from the Service Monitor in the Windows Notification Area. Move the mouse over the Service Monitor icon , then, from the right mouse button menu, choose **Launch Service Installer**.

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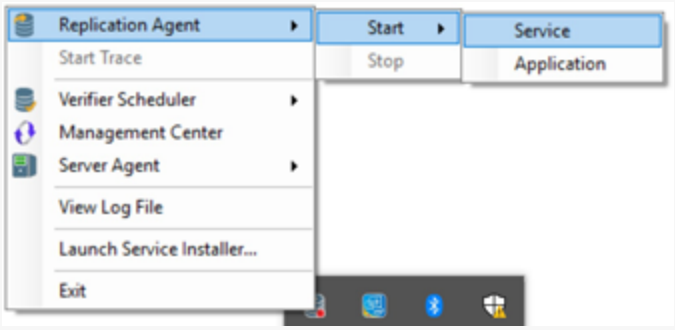
Service Monitor

The Service Monitor allows you to manage Syniti DR applications and services from the Windows System Tray:



The Service Monitor is most commonly used to start and stop the Replication Agent, and start and stop the Server Agent. It can also be used to open the Management Center and run the Verifier Scheduler service.

- **Verifier Scheduler**
  The service uses settings from the Replication Properties dialog to determine when to perform a verification between source and target tables in a replication.
- **Management Center**
  Launches the Management Center where you can set up database connections and create replications between tables.
- **Replication Agent**
  The engine that executes replications as set up in the Management Center or via the Syniti DR APIs. The Replication Agent coordinates activities via the Server Agent and uses the metadata database to obtain replication settings. The Replication Agent can be run as a Microsoft Windows service (set up during Syniti DR installation) or as an application.
- **Server Agent**
  A Microsoft Windows service that acts as a central manager for all operations done by all client applications in a Syniti DR installation. Syniti DR client applications are the Management Center, the Replication Agent, the Log Viewer (when used as standalone application) and any application built using the Syniti DR APIs. These applications interact with the Server Agent to make requests and the Server Agent manages interaction to keep clients synchronized.

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However, the Service Monitor can also be used to quickly start and stop the Replication Agent trace without accessing the Management Center. Changes to the trace settings via the Service Monitor will be reflected in the Trace tab of the Replication Agent Options dialog in the Management Center.

After installing Syniti Data Replication, you can launch the Service Monitor from the Windows **Start** menu (Windows 7 and earlier) or from the Windows Start Page (Windows 8 and later).

Related Topics

Running a Replication

Disabling and Stopping a Replication

Running the Replication Agent as a Service

Installing Syniti Data Replication

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Show Replication Pairs Dialog

This dialog allows you to review the source and target database pairs defined in the selected metadata.

1. In the **Select Metadata** field, choose a metadata set from the drop-down list. Note that only metadata which have been successfully loaded into Syniti Data Replication will be available in the list.
2. Click **Run**.

The resulting grid shows one row per source-target pair with at least one replication defined between the source and target server.

- If one or more replications uses a script, the **Use Script** field is checked.
- If one or more replications is in synchronization mode, the **Use Synch** option is checked.
- If source or target connections exist in the Management Center without any associated replication, they are displayed in the list, using the appropriate source or target columns to describe the connection.

Click **Copy to Clipboard** to copy the list so that you can then paste it into an email or other document.

Click **Cancel** to close the dialog.

Opening the Show Replication Pairs Dialog

1. In the Management Center Metadata Explorer, choose the server for which you want to manage licenses.
2. From the right mouse button menu, choose **Manage Licenses**.
3. In the License Information dialog, click **Show Pairs**.

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SQL Query Tab

This tab can be used to type SQL queries for a specific table and retrieve results. It contains two panes, the Query pane and the Results pane. The toolbar and Query menu offer the following options.

Icon	Menu	Description
	Create New Query	Clears the Query pane in preparation for typing a new query.
	Open Query File	Displays an Open File dialog to open a file containing a query.
	Save Query File	Active only after you have saved a query file using **Save Query File As**. Saves the current contents of the Query pane to the file.
	Save Query File As	Displays a Save File dialog so that you can save the query displayed in the query pane to a file.
	Change Login	Opens the **Change Login** dialog to allow you to set a different login for use in the SQL Query dialog. This is particularly useful when running synchronization replications where you should keep the login used for Syniti DR operations (like reading logs) separate from the login used to perform transactions. See the note below for more information.
	Clear Query Panel	Clears the Query panel.
	Word Wrap	When selected, alters the display of a SQL command so that text which extends beyond the visible display area is automatically split and displayed across two or more lines.
	Execute Query	Executes the query you have typed in the Query pane.
	Stop Execution	Stops execution of the query in the Query pane.

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	Get Next Rows	Based on the value of Returned Rows in the Query Settings dialog, retrieves the next set of rows.
	Export Results	Saves query results to a text file.
	Settings	Opens the Query Settings dialog. This dialog allows you to set how many rows to retrieve each time you choose Get Next Rows, and to set the maximum number of characters per column in the result set.

Query Pane

This is an editable text area that either displays a query that has been generated for you, or allows you to type a query for execution. Once the query has been entered, use the toolbar con to execute the query. Query results are displayed in the Results pane. If the query cannot be executed successfully, check the Messages tab in the Results pane for information.

Note: If you are planning a synchronization replication, be sure to change your user ID before performing insert, update or delete operations on either database involved in the synchronization. If you continue using the same user ID, the SQL operations will be executed using this ID which is also used by Syniti DR during synchronization to read the database logs and perform the synchronization operations. Therefore, any transactions found in the logs with this user ID are not replicated as part of the synchronization data.

Editing and Formatting Features

- Automatic indentation based on syntax
- Colors to identify specific code elements: syntax in blue, numeric values in pink and comments in green
- Code folding where sections of code can be collapsed or expanded for ease of reading. The editor displays a green bar on the left side with +/- signs. Click - to collapse a section of code, and click + to expand a section of code.
- Common editing operations using keystroke combinations:

<SHIFT>Left, Right, Up, Down, Home, End, PageUp, PageDown	Move caret with selection

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<CTRL>F <CTRL>H	Show Find and Replace dialogs
F3	Find next
<CTRL>G	Show GoTo dialog
<CTRL>C <CTRL>V <CTRL>X	Copy, paste, cut
<CTRL>A	Select all text
<CTRL>Z, <ALT>Back-space, <CTRL>R	Undo/Redo
Tab <SHIFT>Tab	Increase/decrease left indent of selected range
<CTRL>Home <CTRL>End	Go to first/last char of the text
<SHIFT><CTRL>Home, <SHIFT><CTRL>End	Go to first/last char of the text with selection
<CTRL>- <SHIFT><CTRL>-	Navigate backward/forward
<CTRL>U <SHIFT><CTRL>U	Convert selected text to upper-/lower case
<CTRL><SHIFT>C	Insert/remove comment prefix in selected lines
<INSERT>	Switch between Insert Mode and Overwrite Mode
<CTRL>Backspace <CTRL>Del	Remove word left/right
<ALT>Mouse, <ALT><SHIFT>Up, Down, Right, Left	Enable column selection mode
<ALT>Up <ALT>Down	Move selected lines up/down

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<SHIFT>Del	Remove current line
<CTRL>B, <CTRL><SHIFT>B, <CTRL>N, <CTRL><SHIFT>N	Add, remove and navigate to bookmark
<ESC>	Close all opened tooltips, menus and hints
<CTRL>Wheel	Zoom
<CTRL>M <CTRL>E	Start/stop macro recording, execution
<ALT>F [char]	Find nearest [char]
<CTRL>Up <CTRL>Down	Scroll Up/Down
<CTRL>NumpadPlus, <CTRL>NumpadMinus <CTRL>0	Zoom in, zoom out, no zoom

Results Pane

The Results pane consists of two tabs:

- **Grid** displays data retrieved. The number of rows retrieved at any time is set using the **Settings** option on the **Query** menu. You can retrieve additional rows by clicking in the toolbar.
- **Messages** displays information, including error messages from the database, if the query could not be executed.

Opening the SQL Query Tab

In the Management Center Metadata Explorer:

- Select a source connection, then from the right mouse button menu, choose **Execute SQL Query**.
- Select a target connection, then from right mouse button menu, choose **Execute SQL Query**.

A SQL Query dialog is also available from the Replication wizard Select Source and Select Table screens by clicking **Open Table**.

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Table Properties Dialog

General Tab

General Settings

Displays information about the table gathered from input in the Source Connection Wizard or Target Connection Wizard. The available information depends on the database type. Listed below are properties for IBM Db2 for i (iSeries/AS400), SQL Server and Oracle.

IBM Db2 for i (iSeries/AS400)

Property	Read/Write	Description
Connection Name	R	The name of the connection that will be used to access this table. The connection name is defined when creating a connection.
Library	R	The name of the library selected when creating the connection.
Table Name	R	The currently selected table.
System Name	R	If an alias is used, original table name is provided. If the selected table has a long table name, both the generated internal name and user-defined name for the table are displayed.
Description	R	A value for this field is displayed if it can be retrieved from the database. This depends on the driver/provider that you are using to access the database.
Type	R	One of Table, Alias, View or System Table. Describes the type of database object that you have selected to use for your source or target connection.
Character CCSID	R/W	The language that is currently set for the table. You can edit this field to set a different CCSID for the table, or you can click ... to open the Field CCSID Settings dialog. In this dialog, you can set

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		the CCSID for each column in the table by clicking in the CCSID column and modifying the value. You will need to know the exact CCSID value for the language that you are using. This information should be available from your Db2 administrator or from the Db2 documentation.

SQL Server

Property	Read/Write	Description
Connection Name	R	The name of the connection that will be used to access this table. The connection name is defined when creating a connection.
Database	R	The name of the library selected when creating the connection.
Owner	R	The owner of the currently selected table.
Table Name	R	The currently selected table.
Type	R	One of Table, Alias, View or System Table. Describes the type of database object that you have selected to use for your source or target connection.
System Name	R	If an alias is used, original table name is provided.
Description	R	A value for this field is displayed if it can be retrieved from the database. This depends on the driver/provider that you are using to access the database.

Oracle

Property	Read/Write	Description
Connection Name	R	The name of the connection that will be used to access this table. The connection name is defined when creating a connection.
Database	R	The name of the library selected when creating the connection.

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Owner	R	The owner of the currently selected table.
Table Name	R	The currently selected table.
Type	R	One of Table, Alias, View or System Table. Describes the type of database object that you have selected to use for your source or target connection.
System Name		If an alias is used, original table name is provided.
Description	R/W	A value for this field is displayed if it can be retrieved from the database. This depends on the driver/provider that you are using to access the database.

Replication Settings

Displays the following information gathered from input in the Replication wizard when the replication type is mirroring or synchronization.

- For IBM Db2 for i/iSeries/AS400 source tables: Journal Library and Journal Name.
- For Oracle: Service Name and Dictionary File.
- For SQL Server: Publication Name and Article ID.

Fields Tab

Displays a grid that shows the table column details.

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Table Script Dialog

This dialog allows you to view and copy a SQL, JSON or XML script to represent the selected table.

When replicating to JSON format text files, this can be useful to set up the file structure for mapping between source table fields and JSON. See Replicating Data to a JSON Format File for more details.

Opening the Table Script Dialog

1. In the Management Center Metadata Explorer, select a table.
2. From the right mouse button menu, choose **Table Script*, then choose* SQL, JSON** or **XML.**

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Manage Transactional Log Settings Dialog

This dialog consists of tabs that depend on the type of transactional replication you chose for the connection: Log Reader, Log Server Agent or Triggers. It allows you to change settings made in the Enable Transactional Replication Wizard. For more information about the fields in this dialog, refer back to details for your database and connection type in the Source and Target Options topic.

Opening the Transactional Log Settings Dialog

1. In the Management Center Metadata Explorer, select a connection.
2. From the right mouse button menu, choose **Transactional Setup**.
3. Choose **Manage** from the drop-down menu.

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User Settings Dialog

Use this dialog to control user access to Syniti Data Replication. You can select a security option, add and remove users, and set specific permissions or user roles for each user.

NOTE: If you set up a user ID with UserName Authentication, or Certificate Authentication, you will not be able to use Syniti Data Replication until the certificate is correctly installed. Generate and install the certificate before setting up authentication.

Authentication

Select an option from the drop-down list. For more information on security options in Syniti DR, see Server Client Security Options.

Anonymous Access	Leave this option if you do not want to restrict access to Syniti DRin any way.
UserName Authentication	Allows you to establish login IDs and passwords for users, but also requires the installation of an X.509 certificate on the client system (where the Management Center is running).
Windows Authentication	Syniti DR uses your Microsoft Windows login and ID to control access to the Management Center and server agent. It is also possible to specify a group name, such as “<domain> Administrators”. This would allow any Windows user that belongs to the group Administrators to log in to Syniti DR using their own Windows credentials. The administrator would not need to provide a list of individual user names for access to the application. Note that Windows users and groups can be either local or domain (ActiveDirectory).
Certificate Authentication	Requires the installation of an X.509 certificate but does not allow specific user login IDs.

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Binding Protocol

Select an option from the drop down list. For more information on appropriate binding protocols for use with Syniti DR, see Server Client Security Options.

Authentication	Binding Protocol Options
Anonymous Access	Inactive. Uses TCP/IP binding protocol
UserName Authentication	TCP/IP or HTTP binding protocol. TCP/IP is suitable for intranet access, HTTP is recommended for internet access.
Windows Authentication	Inactive. Uses TCP/IP binding protocol
Certificate Authentication	TCP/IP or HTTP binding protocol. TCP/IP is suitable for intranet access, HTTP is recommended for internet access.

Add

Enabled only when Windows Authentication or UserName Authentication have been selected. Click **Add** to add a new user. This opens the Create Login dialog. From this dialog, you can add users and set passwords and permissions.

Remove

Select an existing user in the table, and click **Remove** to remove the user.

Edit

Select an existing user in the table and click **Edit** to open the Login Dialog. From this dialog, you can modify the password settings and permissions for the user (as long as you have appropriate authority.)

Opening the User Settings Dialog

1. In the Metadata Explorer, select the server for which you want set up or modify user access.
2. In the toolbar, click **Manage Users**, or choose **Manage Users** from the right mouse button menu.

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Verifier

The Verifier tool can be used to verify replication results and reconcile data differences for replications that have been created and run in Syniti Data Replication. It allows you to check for differences between source and target tables and therefore helps with troubleshooting replication problems during your replication setup and implementation phase.

The Verifier tab consists of three panes:

Source Table
Displays the source table in the replication under verification.

Target Table
Displays the target table in the replication under verification.

Details
Displays a text summary of the verification process.

- In cases where the row appears in both the source and the target database, but one or more field values do not match, the source table row is displayed followed by the target table row. The differences are highlighted in the color selected for differences in the Options dialog (default is red), and you can scroll the rows to identify the fields with different values.
- In cases where the row appears in the source table, but not in the target table, the row is displayed using the color selected for the source table in the Options dialog (default is blue.)
- In cases where the row appears in the target table, but not in the source table, the row is displayed using the color selected for the target table in the Options dialog (default is yellow.

The icon bar offers the following actions.

	Run Verification Compares source and target table to identify differences. Reports the results in table format and as text in the Details area of the tab.
	Stop Halts the verification process. This is useful if verification is taking longer than expected.
	Reconcile Data After confirmation, modifies the target table to match the source table based on information gathered during the verification process. By default, all inserts,

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	updates and deletes are reconciled. However, if you click and hold over the arrow to the right of the icon, you can deselect the items that you do not want to reconcile.
	Save Results Saves information about table differences and messages displayed in the Details section of the tab to a text file.
	Options Displays the Verifier Options dialog, allowing you to set a range of options to control how the verification is run.

Scheduling Verifier Activity

During operation, the Verifier accesses both the source and target tables, and on request also reconciles any mismatched data. This process can impact daily operations on production databases so Syniti DR provides an option to schedule verification. The schedule is set in the Replication Properties dialog and uses a Windows service called Verifier Scheduler. To schedule verifications:

1. Select the replication in the Metadata Explorer.
2. From the right mouse button, choose Replication Properties.
3. In the Replication Properties dialog, go to the Scheduler page.
4. On the Scheduler page, choose the Verifier Schedule tab.
5. Click the option **Run Recurrently.**
6. **C**heck the **Reconcile Data** checkbox if you would like Syniti DR to modify source and/or target tables when needed.
7. Click **Add** to open the Scheduler dialog.
8. Set the frequency in the Scheduler dialog.
9. Click **OK** to close the Scheduler dialog.
10. Click **OK** to close the Replication Properties dialog.
11. In the Windows Notification Area, right click on the Service Monitor .
12. From the menu, choose **Verifier Scheduler**, then **Start**, then **Service**.

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When the Verifier Scheduler is in use, a log file and history file named with the prefix "DBMotoVS" are automatically generated to enable you to track activity. The information can be viewed from the Log Viewer or History Viewer.

Opening the Verifier

In the Management Center Metadata Explorer, Replication Browser, or Replication Monitor, select a replication and, from the right mouse button menu, choose **Verify Replication**.

Note that the verification process, by default, does not start automatically. You need to click **Run Verification**. If you want to stop the process, click **Stop** in the toolbar.

Related Topics

Verifier Options Dialog

Verifying Replication Results

Reconciling Differences in Results

Saving and Reloading Comparisons

Analyzing Results

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Verifier Options Dialog

Use the Verifier Options dialog to determine the number of rows to process and display, and to customize the way that source and target tables are compared. If you make changes to settings in this dialog, they only apply to activity in the current Verifier tab. To retain the settings for all Verifier actions, click **Apply Settings to Metadata** in the dialog. These settings will then also be available in the Preferences tab of the Replication Properties dialog.

General Tab
Comparison Tab
Data Types Tab
Conditions Section

Reconcile Tab

General Tab

Run Verification Automatically

Unchecked by default. Start the verification process using the **Run Verification** button on the Verifier tab. Check this option if you want to start the verification process automatically in the Verifier tab when you select a replication in the Metadata Explorer, and choose Verify Replication from the right mouse button menu.

Show Source and Target Table in the Grid

Checked by default. When checked, the source and target table contents are displayed in the Verifier tab for easy comparison of rows. However, if you know that your table contains large amounts of data, you may want to view only the summary in the Details pane in the Verifier.

Max Number of Comparisons

Unchecked by default. This option allows you to control the maximum number of records to compare. When checked, the default is set to 10,000. The default value can be managed in the Replication Properties dialog.

Max Rows to Manage in Grid

The default value is 10,000. This is the total number of rows to retrieve/view in the Verifier. This number can be modified in accordance with the memory and CPU configuration of your computer.

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Show Differences Only

Checked by Default. This option allows you to control if all records in the source and target tables are displayed in the Verifier tab, or only those records that contain differences. Uncheck the option to display all records.

Colors

Use these three fields to select colors to be used for source table rows, target table rows and conflicts found during the comparison process.

Comparison Tab

Verify Primary Key Only

Unchecked by default. When checked, the Verifier compares only the primary key field value(s) in source and target tables to determine differences between the tables. Note that **Reconcile Data** is not enabled when Verify Primary Key Only has been selected because differences and column data are not recorded during the operation to compare primary keys only.

Verify With Pivot Columns

Unchecked by default. When checked, select a column name (must be a Date, Time or Timestamp type) to use in filtering the rows to be verified. This can be used to reduce the number of records verified. For example, if a Timestamp column is specified, a where condition is created in the verification to extract the rows on source and target that were changed after the most recent timestamp.

Verify Subset of Columns

Unchecked by default. When checked, select one or more column names to use in filtering the rows to be verified. Primary keys are included in the selected columns by default. This can be used to reduce the number of records verified.

Data Types Tab

Record Count Only

Unchecked by default. When checked, the verification process compares only the number of records in the source and target tables.

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Skip/Ignore BLOB/CLOB

Unchecked by default. Any BLOB/CLOB field values will be included when comparing source and target tables. This option is unchecked by default, but comparing BLOB/CLOB values can be very time consuming so you may want to change the setting.

Skip/Ignore Array of Bytes

Unchecked by default. Any Byte Array field values will be included when comparing source and target tables.

Trim Chars

Checked by default. This option provides a way for the tool to ignore blank characters in string values. Some databases set string values at a fixed length using blank spaces to fill the string, while others permit strings of different lengths. If you check this option, the tool trims all strings with fixed string length, then compares the strings.

Skip/Ignore Date Time

When selected, any Date Time field values will be ignored when comparing source and target tables. This is because databases may store these values in different formats, so a verification might show a difference where there is no difference in the actual value, just the format in which it is stored.

Skip/Ignore Time

When selected, any Time field values will be ignored when comparing source and target tables. This is because databases may store these values in different formats, so a comparison might show a difference where there is no difference in the actual value, just the format in which it is stored.

Number of Fractional Digits

Selected by default, with the value 0. Specifically for time values, this option allows you to determine how many digits to the right of the decimal point you wish to use in comparing field values.

Conditions

WHERE Condition

Provides fields for both source and target tables to type in a condition to narrow the number of rows compared and reported. Type the SQL syntax that you would use following the "WHERE" condition in a SQL statement.

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ORDER BY Clause

The default ORDER BY clause in the Verifier is to order by primary key. However, this can be problematic when the primary key is a string because database providers can order strings differently. This field allows you to override the default ORDER BY clause by typing a single column name, or a list of comma-separated column names.

Reconcile Tab

By default, all inserts, updates and deletes are reconciled. On this tab you can check/uncheck Insert, Update and/or Delete operations.

Apply Settings to Metadata Button

Click this button to save these settings for future verification activities. Settings are saved and visible in the Replication Properties Verifier tab.

Opening the Verifier Options Dialog

1. In the Metadata Explorer, select a replication.
2. From the right mouse button menu, choose **Verify Replication**.
3. In the Verifier tab toolbar, click **Options**.

Related Topics

Verifier
Verifying Replication Results
Resolving Differences in Results
Saving and Reloading Comparisons
Analyzing Results

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Running Replications

This section contains topics that describe:

- Running a Replication
- Running the Replication Agent as a Service
- Disabling and Stopping Replications
- Managing Replications Programmatically
- Using the Management Center while Replications are Running
- Recovering from Interruptions to Refresh Replications

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Running a Replication

The Enable Replication option must be checked, either when creating the replication via the Replication wizard, or through the Replication Browser, by selecting the replication then, from the right mouse button menu, choosing **Enable Replication**.

You can run a replication in the following ways:

- Interactively from the Windows Start menu.

  Choose **Start**, then **Programs**, then **Syniti Data Replication**, then **Service Monitor**.

  In the Windows Tool Tray, click the right mouse button over the Replication Agent icon

  Choose **Replication Agent**, then **Start,** then either **Service** or **Application**, depending on how you installed the Replication Agent.

- Interactively, on your Windows desktop by running the program:
  C:\Program Files\Syniti\SynitiDR_ReplicationAgent.exe.
- Programmatically from your .NET environment.
- By setting up the Replication Agent as a service.

Related Topics

Managing Replications Programmatically

Running the Replication Agent as a Service

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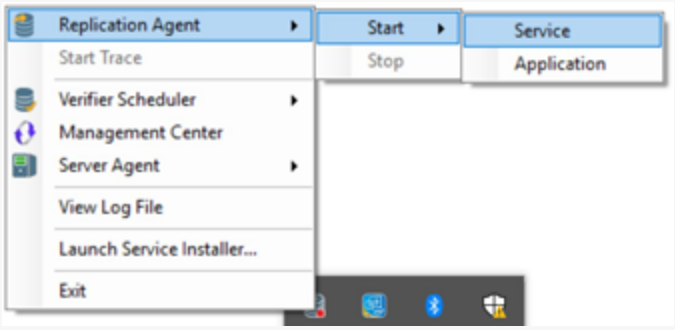
Running the Replication Agent as a Service

Installing the Replication Agent Service During Setup

During installation of Syniti Data Replication, you can specify that you want to install the Replication Agent as a service. If you check this option, the service is installed at the end of the setup, but, because it requires a valid metadata connection to run, the service must be started manually. The Syniti DR Service Monitor tool is added to the Windows **Start** > **Programs** > **Startup** menu, and is available from the Windows Notification Area:



	Replication Agent started
	Replication Agent stopped

Once you have created a metadata connection and metadata tables, start the service from the Service Monitor icon in the Windows Notification Area or from **Control Panel** > **Administrative Tools** > **Services**. Note that if you leave the service on the manual setting, you will need to restart the service each time you reboot your system. You can set the service to start automatically via its properties in the Services window. When the service runs automatically, all scheduled replications will resume on system startup (after failure or reboot, for example.)

The SynitiDR_ReplicationAgent executable is available in your Syniti DR install folder. Make sure that you install the Replication Agent as a service before attempting to run the tool.

Installing the Replication Agent Service After Setup

If you did not install the Replication Agent as a service during setup, you can install it as follows:

1. From the Windows Desktop **Start** menu, **Programs** then **Syniti Data Replication** then **Service Installer**.
2. In the Service Installation Utility window, click **Install Service**.

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3. In the Service Dependencies Selection dialog, click **Done** if Syniti DR is not dependent on any local databases containing Syniti DR metadata.
   If you have metadata in a local database, the database must start before Syniti DR begins replicating (otherwise an error may be generated). You should therefore add the local database service as a dependency. Select the service in the list of local services, then click **Add**. Click **Done** when you have finished managing dependencies.
4. Manage the service from the Windows Control Panel. Choose **Administrative Tools**, then **Services**. You can also manage the service via the Replication Agent application available from the Windows **Start** menu. If you run this application, it adds an icon to the Windows Notification Area to start and stop the Replication Agent service.
5. Use the Replication Monitor tab in the Management Center to track the progress of replications.

Manually Uninstalling the Replication Agent Service

To remove the Replication Agent as a service:

1. From the Windows Desktop **Start** menu, choose **Syniti Data Replication** then **Service Installer**.
2. In the Service Installation Utility window, click **Uninstall Service**.
3. Click **Exit**.

Running Replication Agent Interactively

To run the Replication Agent interactively:

1. From the Windows Desktop **Start** menu, choose **Syniti Data Replication** then **Service Monitor**.
2. In the Windows Notification Area, click the Syniti DR Service Monitor icon and choose **Replication Agent** then **Start,** then **Application** from the right mouse button menu.
3. The replication that you have scheduled should start at the specified time.
4. Use the Replication Monitor tab in the Management Center to track the progress of the replication.

Note that you cannot run the Replication Agent interactively if it is installed and running as a service.

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Disabling and Stopping Replications

Disabling a Replication

To prevent a particular replication from running, in the Management Center:

1. Display the Replication Browser tab.
2. Select the replication you want to modify.
3. On the right mouse button menu, uncheck the **Enable Replication** option.

If the replication is part of a group, all replications in the group are disabled.

Stopping the Replication Agent

To stop all replications from running, on your Windows desktop:

1. Select the Syniti DR Service Monitor icon in the Windows Notification Area.
2. From the right mouse button menu, choose **Replication Agent** then **Stop**.

Alternatively, you can manage the Replication Agent service from the Windows Services dialog. On your Windows desktop, choose **Control Panel** > **Administrative Tools** > **Services**.

Consequences of Disabling or Stopping Replication

If a Refresh replication is interrupted by disabling the replication or stopping the Replication Agent, it will restart from the beginning once the replication is enabled again.

If a transactional replication is interrupted by disabling the replication or stopping the Replication Agent, it will restart from the point at which it was interrupted once the replication is enabled again. The transaction ID for the last transaction executed is stored in the metadata, and retrieved once the replication resumes.

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Managing Replications Programmatically

Note: The API described here is available in Syniti DR/DBMoto version 7.1 and above. If you have an application that contains code for running replications in earlier releases, you should plan to modify your application to use the new API.

The code below provides a simple example of how to start the Replication Agent for a replication in the default metadata running on the "local" Syniti DR server.

The .NET namespace for the Syniti DR API is HitSoftware.DBMoto.Application. This namespace includes the class DBMotoApplication, the main singleton object of the DBOM, which can be instantiated through the static singleton method Instance:

```
using HiTSoftware.DBMoto.ObjectModel; \\APIs
using HiTSoftware.DBMoto.Common; \\ Type Definition for the APIs
...
public void Run(){
    try
    {
     // Static singleton constructor
     dbmApp = DBMotoApplication.Instance;
     // Retrieving the local server from the list available in the DBMo-
toApplication instance
     dbmServer = dbmApp.Servers["local"];
     // Connecting to the server agent using anonymous authentication
     dbmServer.Connect();
     // Define and load the current metadata
     currentMetadata = dbmServer.Metadatas.DefaultMetadata;
     // Set synchronization between metadata and Replication Agent
(TCP/IP)
     currentMetadata.IsSynchronized = true;
     currentMetadata.Load();
```

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```
     if (currentMetadata.IsRunning())
        {
         Console.WriteLine("Data replicator is running on " + cur-
rentMetadata.Name);
         Console.WriteLine("Stopping  now ...");
         // Stopping the Replication Agent after a timeout of 10000 mil-
liseconds
         currentMetadata.Server.StopReplicationManager(10000);
         }
         else
         {
          Console.WriteLine("Data replicator is stopped");
          Console.WriteLine("Starting now (as an application) ...");
          // Starting the Replication Agent as an application
          currentMetadata.Server.StartReplicationManager(false);
          }
      }
      catch(Exception e)
          {
          if (currentMetadata != null)
             currentMetadata.Unload();
          if (dbmServer != null)
             dbmServer.Disconnect();
           Console.WriteLine(e.Message);
           }
       }

...
```

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The DBMotoApplication object has access to a list of IServer objects, which is the list of server agents configured in the Management Center and stored in the local dbmoto.config file. DBMoto users typically define at least a "local" server in the Management Center. It is therefore possible to get a pointer of the local server by calling:

```
dbmServer = dbmApp.Servers["local"];
```

With a pointer to the local server, you can connect to the server:

- Using anonymous authentication (if allowed by the server agent):

```
dbmServer.Connect();
```

- Using DBMoto authentication (by passing an application login):

```
dbmServer.Connect(txtUser.Text.Trim(), txtPassword.Text.Trim(),
false);
```

- Using Windows authentication (the Windows domain credentials):

```
dbmServer.Connect(null, null, true);
```

The IServer class also contains the list of metadata defined for the server, and identifies the default metadata, which will be used by the Replication Agent:

```
currentMetadata = dbmServer.Metadatas.DefaultMetadata;
```

For interaction that involves the Replication Agent and the metadata, the metadata should be 'synchronized' with the Replication Agent, meaning that the application using the DBMoto API should open a TCP/IP connection to the Replication Agent and receive notification from the Replication Agent:

```
currentMetadata.IsSynchronized = true;
```

should be called before loading the metadata.

The IsSynchronized property also allows you to receive monitor information via the API including how many records have been processed and the current transaction ID in a running replication.

Use the IServer StartReplicationManager and StopReplicationManager methods to start and stop the Replication Agent.

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The simple code sample described above provides an introduction to the DBMoto API. Explore the full capabilities of the DBMoto API from Visual Studio, or from the DBMoto API Reference Guide.

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Using the Management Center while Replications are Running

When the Replication Agent is running, possible actions in the Management Center are as follows:

- You can **create and enable new replications** (both transactional and refresh.) The Replication Agent is able to add replications to its tasks without first stopping then restarting the replicator.
- You can **add new source and target connections**
- You can **disable/enable any replication**
- You can **update any disabled replication**
- You **cannot update an enabled replication**. To modify an enabled replication, first disable it, then make changes, then re-enable the replication.

Related Topics

Modifying/Adding Replication Settings

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Recovering from Interruptions to Refresh Replications

Refresh replications can take a significant amount of time, depending on the size of the tables involved in the replication. If a connection problem occurs during the refresh, the point at which the replication was interrupted is recorded by Syniti Data Replication. If the connection is re-established, replication starts automatically from the point at which it stopped. However, if you stop and restart Replication Agent, you will lose the information needed to continue replication and the replication will start from the beginning again.

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Verifying Replication Results

This section contains topics that describe:

- Overview of Verifying Replication Results
- Saving and Reviewing Comparisons
- Analyzing Results
- Reconciling Data Differences in Results
- Monitoring and Reviewing Replications

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Verifying Replication Results

The Verifier tool can be used to verify replication results for replications that have been created and run in Syniti Data Replication. It allows you to check for differences between source and target tables and therefore helps with troubleshooting replication problems during your replication setup and implementation phase.

Here are the steps involved in using the Verifier tool:

1. In the Management Center, select the replication for which you want to compare source and target tables.
2. From the right mouse button menu, choose **Verify Replication**.
   The Verifier tab is displayed in the Management Center. It automatically starts the source and target table comparison.
   If the comparison is taking too long, you need to halt the process for any other reason, click **Stop** at any time.
3. Review results in the Verifier tab.
   The default setting for the table comparison is to display only those records which contain differences between source and target. Differences are highlighted in red.
4. Optionally, click **Options** to set options in the Verifier Options dialog, including the number of rows to view at a time, specific data types to ignore and so on. This dialog also allows you to set WHERE conditions and override the default ORDER BY clause. You can also choose to compare only the number of records in the source and target tables.
5. To run the table comparison process with new options, click **Run Verification** to start the comparison process. If you are comparing an active replication that is in mirroring mode, you should be aware that the results of the comparison process are not reliable because a replication process may run at any time.

Verifying Results for Multiple Replications

You can run Verifier from the Replication Monitor tab in the Management Center. This tab allows you to select multiple replications, then, from the right mouse button menu, choose **Verify Replication**. In the Verifier tab, a text summary is printed for each replication. To view source and target tables for a specific replication, note the name of the replication in the summary, select it in the Metadata Explorer and run the Verifier for just that replication.

If you are verifying multiple replications, you can save the results to a file for easy reference.

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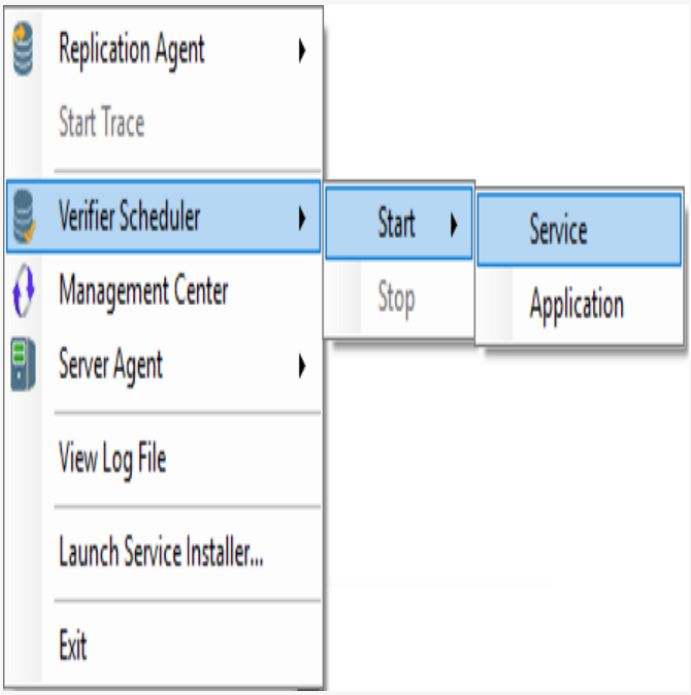
Scheduling Verifier Activity

Syniti DR includes a Windows service to allow you to schedule verification and avoid peak database usage times. The schedule is set in the Replication Properties dialog and uses a a Windows service called Verifier Scheduler. The service is installed with Syniti DR but is not started automatically.

To start the service, use the Service Monitor program in the Windows Notification Area. Note that if the service is stopped, scheduled verifications (and data reconciliations when enabled) will not be performed.



When the Verifier Scheduler is in use, a log file and history file named with the prefix "DBMotoVS" are automatically generated to enable you to track activity. The information can be viewed from the Log Viewer or History Viewer.

Limitations

1. You must have a primary key defined on the target table, and the primary key must be defined as a field. For IBM Db2 for i users using a RRN as a primary key, the comparison fails because the RRN is implemented as an expression instead of a field in Syniti DR.

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2. Sometimes a Float is compared with a Double. Converting one to the other could cause a loss in precision and then the values will appear different. In this case, it is better to skip the comparison.
3. Comparison is not supported for XML data types.
4. Columns which are mapped to expressions that give different results every time they are evaluated (e.g., the DateTime.Now expression): the Verifier shows differences between all source and target records because of such columns.
5. Mapping expressions that contain special log values (log record values) cannot be compared:
   "!TransactionID"
   "!TransactionTS"
   "!UserID"
   "!RecordID"
   “!ReceiverLibrary”
   “!ReceiverName”
6. Fields mapped using user-defined functions or custom scripts defined in the Replication Script Editor will not be included in the data comparison. Note that this limitation could lead to some unexpected Verifier results. However, expression mappings and functions defined in the Global Script are supported.
7. Sources or targets using file connections (CSV, JSON, XML, Apache Kafka, Hadoop, Amazon S3etc.) are not supported because it is not possible to run a SQL query for comparison with a SQL source/target.

Related Topics

Verifier

Verifier Options

Analyzing Results

Reconciling Data Differences in Results

Saving and Reviewing Comparisons

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Saving and Reviewing Comparisons

The Verifier allows you to save out the results of a comparison in a text file format. The file can be viewed and edited from a text editor on your Windows desktop.

To save results:

1. Click **Save Results** in the Toolbar.
2. In the Save As dialog, type a file name.
   There are options to save the file as either .txt or RTF.
3. Click **Save** to save the contents of the grids and the Details section of your results to a file.

Related Topics

Verifier

Verifier Options

Verifying Replication Results

Resolving Differences in Results

Analyzing Results

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Analyzing Results

Results from running a comparison between source and target tables are reported in the Verifier tab. You can use the Verifier Options dialog to specify the information that you want to see, but, by default, only records with differences are displayed.

- In cases where the row appears in both the source and the target database, but one or more field values do not match, the source table row is displayed followed by the target table row. The differences are highlighted in the color selected for differences in the Options dialog (default is red), and you can scroll the rows to identify the fields with different values.
- In cases where the row appears in the source table, but not in the target table, the row is displayed using the color selected for the source table in the Options dialog (default is blue.)
- In cases where the row appears in the target table, but not in the source table, the row is displayed using the color selected for the target table in the Options dialog (default is yellow.)

The Details pane shows a text output summary of the verification operation that has been performed. It includes the following information. The contents of the Details pane can be saved using the Save Results button.

```
Comparing SAMPLES.DBM1 (18 records) to "TestCompare"."dbo".DBM1 (18
records)...


Results:

Number of records only on Source Table: 1

Number of records only on Target Table: 1

Number of different records: 3
```

It is also possible to set a Verifier Differences alert to send an email to a pre-configured address reporting the differences.

Related Topics

Verifier

Verifier Options

Verifying Replication Results

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Resolving Differences in Results

Saving and Reviewing Comparisons

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Reconciling Data Differences in Results

After running the Verifier and identifying differences between source and target tables, you can use the Data Reconciliation feature to update the target table with differences found in the source table. For example, in the screenshot below, the source table does not contain a row with a "Product ID" value of 78. The Reconcile Data feature would modify the target table to remove the row so that source and target tables match. Syniti DR stores differences between source and target tables while running the Verifier and uses that information to modify the target table to match the source.

If the Verifier encounters errors while trying to modify the target table, the data reconciliation process stops after a default of 5 errors. You can change the limit on the number of errors encountered before stopping the process using the Verifier tab in the Options dialog. This feature is useful if, for example, a database connection fails because the option would limit the number of attempts to connect to a database.

It is possible to set which operations to reconcile (Insert, Update, Delete) using the **Reconcile tab** in the Verifier Options dialog.

1. In the Metadata Explorer, select a replication to verify.
2. From the right mouse button menu, choose **Verify Replication**.
3. In the Verifier Tab, click **Run Verification**.

   Following the verficiation, the Reconcile Data icon is active.
4. Click **Reconcile Data**.

   Note that **Reconcile Data** is not enabled when "Verify Primary Key Only" has been selected because differences and column data are not recorded during the oprtation to compare primary keys only.
5. Confirm that you want to modify data in the target table.

Related Topics

Verifier

Verifier Options

Analyzing Results

Saving and Reviewing Comparisons

Options Dialog

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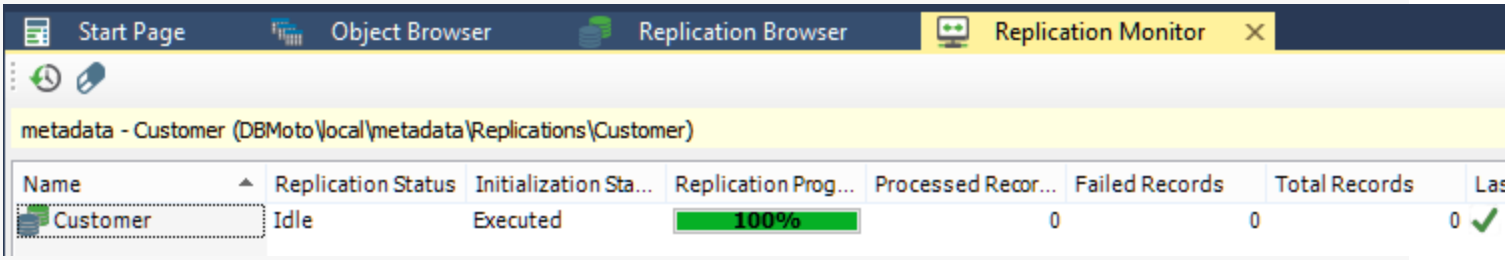
Monitoring and Reviewing Replications

You can monitor the progress of all your replications using the Replication Monitor in the Management Center. Multiple replications can run concurrently so the Replication Monitor is useful in showing which replications are running and how each replication is progressing. For historical data on performance of replications over time, use the Dashboard.



The Replication Monitor provides access to:

- The Replication Activity Viewer for a more detailed view of performance for a specific replication.
- The History Viewer for a detailed account of the replication history for a specific replication.

During replication, the Replication Monitor displays the progress of the replication (percentage of records/transactions already replicated, total number of records/transactions to replicate) and the time left for a replication to be completed. You can:

- Select a replication in the Monitor window to view the replication properties, including a history of past replication attempts.
- Review the Records columns (Processed Records, Failed Records, Total Records) for a quick overview of replication activity
- Scroll to the History Status column to see if the replication succeeded or failed. If it failed, use the right mouse button menu to open the History Viewer and identify errors. Note that the History Viewer only shows information on past replications when the **Activate Log History** option is checked in the Log tab of the Replication Agent Options dialog.
- Review the **Transaction Latency Status** column to check that performance for a specific column is not lagging. A reg flag, with the label **Threshold Warning** indicates that records are not being processed

To identify where a replication failed:

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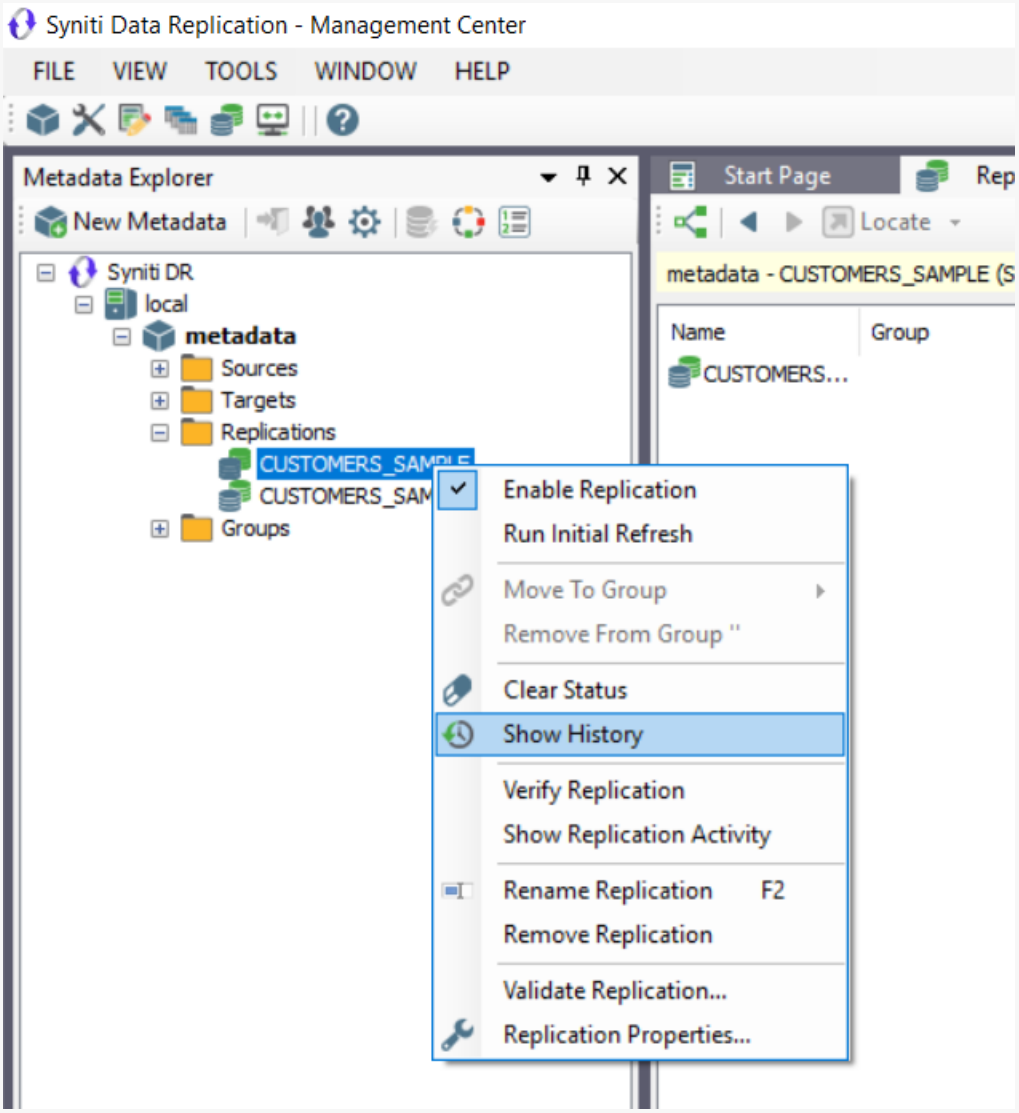
1. Select a replication in the Metadata Explorer, Replication Browser or Replication Monitor.
2. Choose **Show History** from the right mouse button menu.



The History Viewer tab allows you to explore completed replication intervals and even view the log to explore errors and warnings associated with the replication interval.

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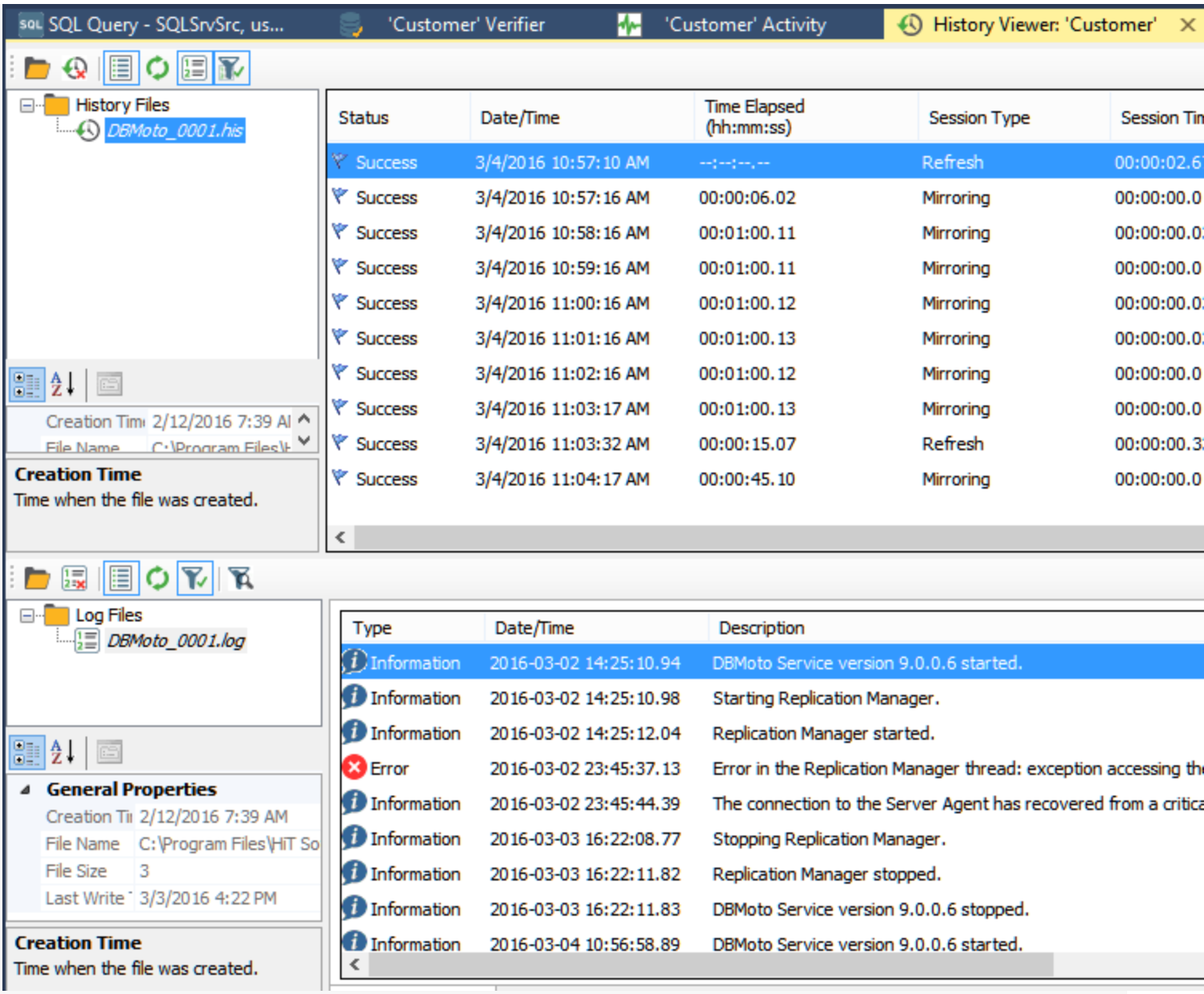

1. Examine the replication intervals for errors in the upper pane of the History Viewer.
2. Select the replication interval that shows errors to display log messages in the lower pane of the History Viewer.

This pane provides the complete functionality of the Log Viewer. You can double-click a specific message to find out more about it, or you can click **Show Filter Settings** to type in a specific search pattern for log

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messages.

3. If available, check the Replication tab for a table with the records which were not replicated.
4. Fix the errors.
   You may need to modify mappings in the Replication Properties dialog, or make changes in the source or target database tables.
5. Go back to the Replication Monitor to clear the History Status flag ready for future replications.
6. Try running the replication again to see that errors have been resolved.

Related Topics

Replication Monitor

Log Viewer

History Viewer

Replication Agent Options Dialog

Replication Activity Viewer

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Performance and Tuning

This section contains topics that describe:

- Performance and Efficiency
- Reviewing Replication Performance Over Time
- Log Check Frequency in Mirroring Mode
- Using Bulk Insert with Mirroring Replications
- Using Partitions for Refresh Replications
- Managing Performance with Thread Settings
- Improving Performance Using Refresh with SQL Server
- Improving Performance Using Mirroring with IBM Db2 for i

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Performance and Efficiency

Processing performance for Syniti Data Replicationvaries widely from one configuration to another. Processing time depends on the resources available:

- Network bandwidth in connection between the DBMS servers and the server where Syniti Data Replicationis running;
- Number of processors for the machines involved;
- Types of processors;
- Memory available;
- CPU usage.

Replication design needs to be carefully balanced to avoid bottlenecks during the replication process. Any measures you take depend on:

- Number of source and target connections;
- Number of tables in replication;
- Record size and record numbers for each table replicated;
- Replication mode (refresh, mirroring, synchronization);
- Number of transactions per second on the source database.
- Grouping of replications to optimize open database connections and query processing

For instance, the size of the table to be replicated and the number of transactions are important to evaluate whether it is more convenient to run continuous refreshes during the specified time, instead of a single full refresh and a continuous mirroring afterwards.

The Management Center provides access to the Dashboard, a tool to analyze replication data and perfoamance over a period of time based on the contents of a specified Metadata and history file or database. It can provides information for each table in a selected set of tables including:

- Total number of processed records
- Total number of failed records
- Total number of records

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- Total number of replication sessions
- Total number of processed records by all replications per unit of time.
- Average time it took to replicate specified records.

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Reviewing Replication Performance over Time

From the Management Center, you can access the Dashboard (Statistics Tab) to analyze performance of replications associated with a specific metadata. The Dashboard uses data stored in the Metadata and history files or database to provide a series of charts with performance information including:

- Total number of processed records
- Total number of failed records
- Total number of records
- Total number of replication sessions
- Total number of processed records by all replications per unit of time.
- Average time it took to replicate specified records.

The Dashboard provides tools for you to select replications to analyze and charts to review data on replication performance.

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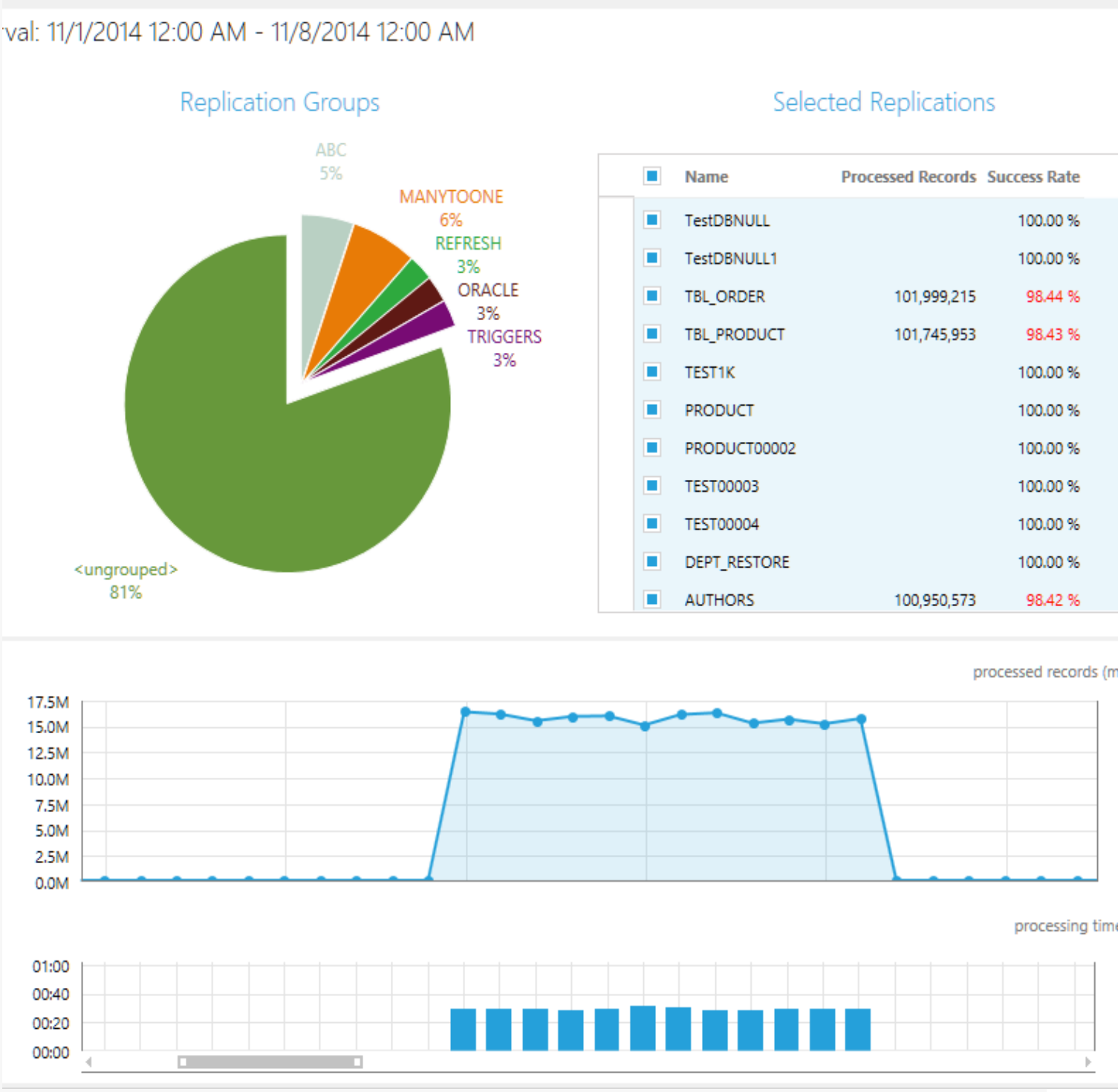

Take the following steps to set up and use the Dashboard.

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1. Enable history logging to a database

Dashboard data is obtained from the history log, which is not enabled by default. Additionally, if you are planning to analyze large amounts of data, it is better to save history data to a database rather than a file (the default.) To set up the history log:

1. In the Management Center Metadata Explorer, select the server containing the metadata and replications you want to analyze. (The default server is called local.)
2. From the right mouse button menu, choose Replication Agent Options.
3. In the Replication Agent Options dialog, click the Log tab.
4. In the **Write Log To** field, from the drop-down list, choose **Database**.
5. Set up a connection to either the metadata database (the default is SQL Server CE, and the data is stored locally) or a database of your choice.
6. Set a limit on the number of messages saved, if desired. Bear in mind that the Dashboard tools show performance over time, so limiting the number of messages reduces the amount of data you will be able to see.
7. Check the **Activate Log History** option.
8. Click **OK** to close the dialog.
9. Stop and restart the Replication Agent to begin logging history data.

2. Run replications for a period of time

With the history log enabled, run replications for enough time to collect a useful amount of data for your needs. The Dashboard charts can show records processed hourly, daily, weekly or monthly. 3. Review performance data in the Dashboard

3. Open the Dashboard and review the data

1. In the Management Center Metadata Explorer, select the metadata containing the replications you want to analyze. (The default metadata is called "metadata".)
2. From the right mouse button menu, choose **Show Dashboard**.
   A new tab named Statistics opens in the Management Center.

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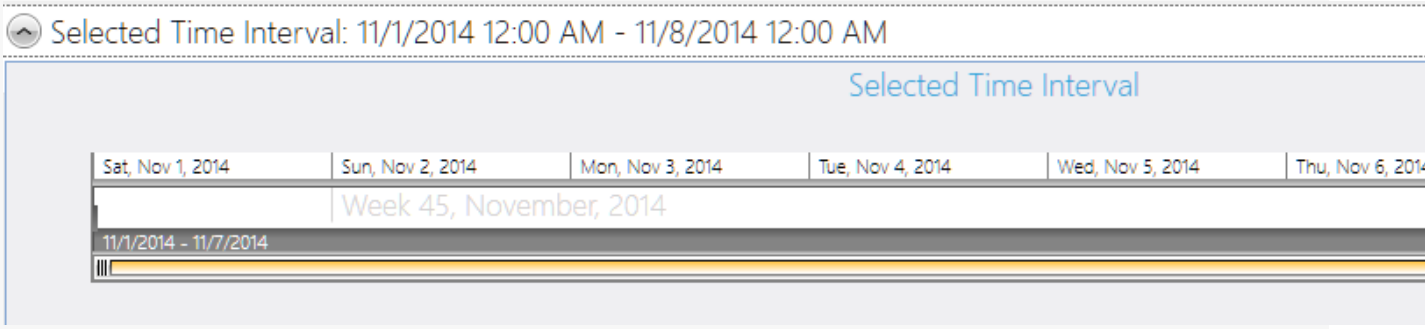
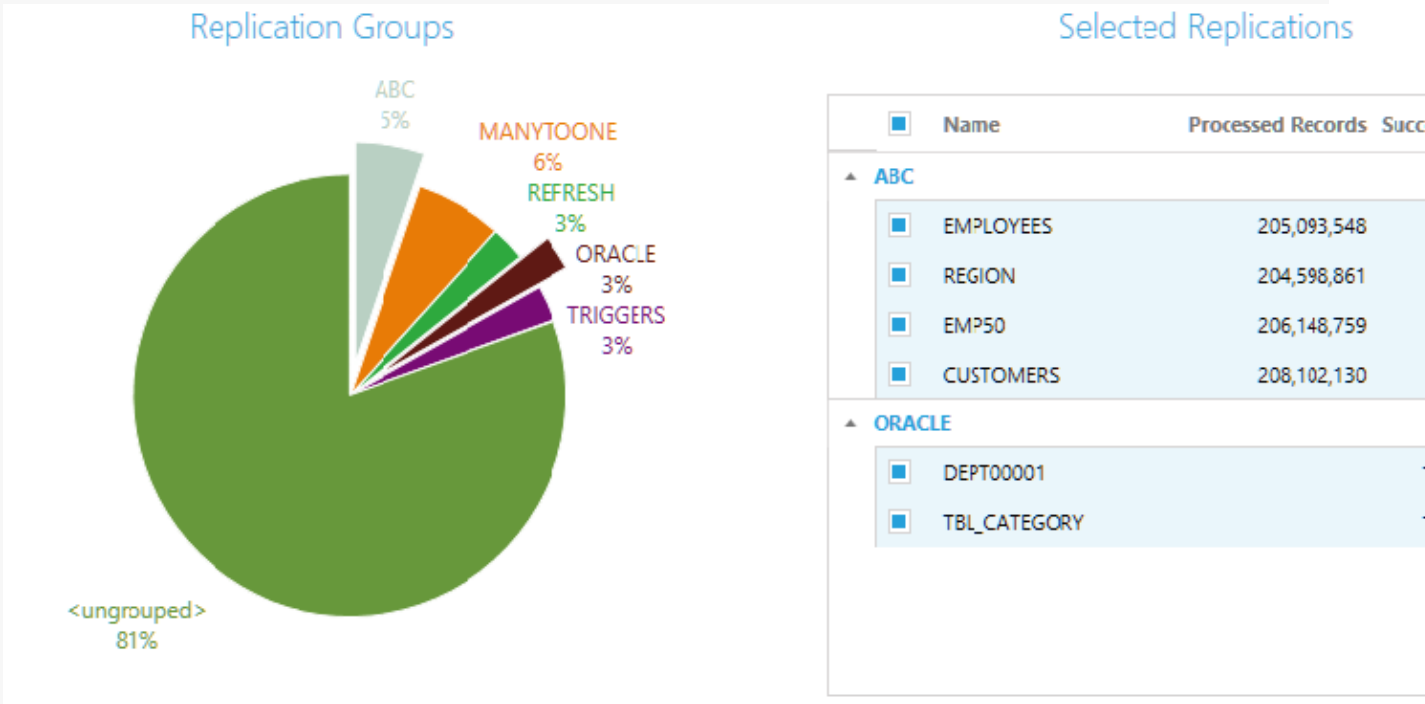
3. In the Selected Time Interval area, use the down arrow button and the horizontal scrollbar to adjust the time period you want to analyze.



4. In the Replication Groups area, click on the sections of the pie chart containing groups with replications you want to analyze. Note that replications not included in a group are in the section <ungrouped>.



5. In the Selected Replications area, use the checkboxes to select all the replications to analyze.
6. Use the Overview and Throughput charts to analyze the replications. For details on these charts see the Dashboard topic.

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Log Check Frequency in Mirroring and Synchronization Modes

If you are running replications in mirroring or sychronization modes, the transaction log on the table from which you are replicating is checked regularly to see if any transactions have occurred. You can modify the interval between log checks to adjust for best performance in your environment. For example, if you are using the default setting of 60 seconds, the source database log will be checked every 60 seconds for new transactions. To keep your source and target tables synchronized as closely as possible, you might change the frequency to every 15 seconds. However, if the number of transactions between checks is very high, setting the frequency to 15 seconds will not help because updates to the target database could take longer than 15 seconds.

To change the frequency of log checks:

1. In the Management Center Metadata Explorer, select the replication.
2. Using the right mouse button menu, make sure that there is no check mark next to **Enable Replication**.
   If **Enable Replication** is checked, select it to remove the checkmark. You have now disabled the replication.
3. From the right mouse button menu, choose **Replication Properties**.
4. In the Replication Properties dialog, go to the **Preferences** tab.
5. Change the value of the **Read Interval** field. The default value is 60 seconds.
6. Click **OK** to close the Replication Properties dialog.
7. From the right mouse button menu, select **Enable Replication**.
   You should see a check mark next to the menu item to show that it is enabled.

If the replication is already running, for this change to take effect, you will need to disable, then re-enable the replication

Related Topics

Resource Load-Levelling

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Using BulkInsert with Mirroring Replications

When replicating using mirroring mode (transactional replications) to Oracle, MySQL, SQL Server, SQL Azure and PostgreSQL targets, you can set up a bulk insert option to enhance performance. This feature inserts blocks of records rather than single records. The size of each block can be adjusted for optimal performance. To configure bulk insert:

1. Create the target connection using the Add Target Connection wizard in the Metadata Explorer.
2. In the Metadata Explorer, select the connection and choose **Connection Properties** from the right mouse button menu.
3. In the Connection Properties dialog, scroll down to the **Mirroring Options** section.
4. Set the **Default Mirroring Insert Mode** value to **BulkInsert.**
5. Set the **Default Mirroring Block Size** value to the number of rows to insert in a single operation. The value you choose depends on your environment and you may need to adjust the value when testing replication performance.
   Note that the default setting can be overridden using the Replication Properties for a specific replication.

   NOTE: If using MYSQL Connector 8.0 or above, also set the **AllowLoadLocalInfile** property to **True** in the connection string. The default value is False, and this prevents bulk operations from succeeding.

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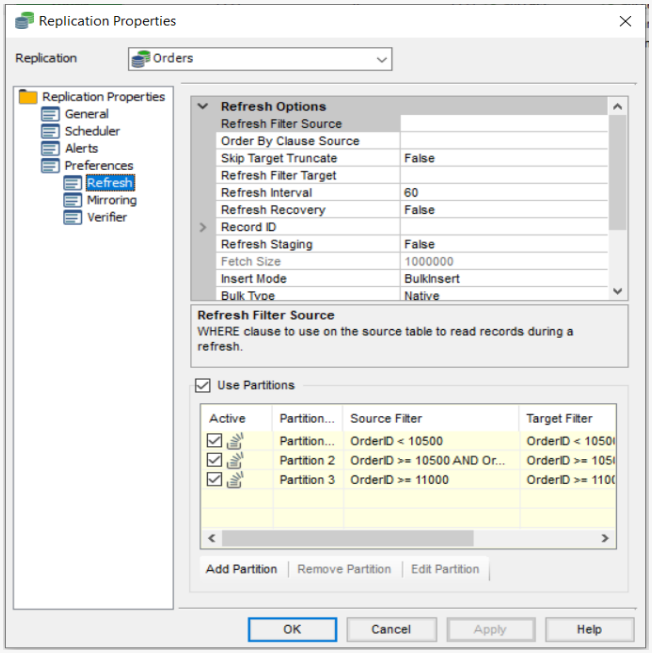
Using Partitions for Refresh Replications

Refresh Partitions allow you to define multiple partitions or subsets within a replication during the refresh operation, so that multiple parallel threads move a specific subset of the data. This approach improves the overall performance of the refresh.

Create a Partition

To set up partitions for a refresh replication:

1. In the Metadata Explorer, select the replication.
2. Choose **Replication Properties** from the right mouse button menu.
3. In the **Preferences**, click the **Refresh** option to display Refresh properties.



4. In the Partitions area, check **Use Partitions**.

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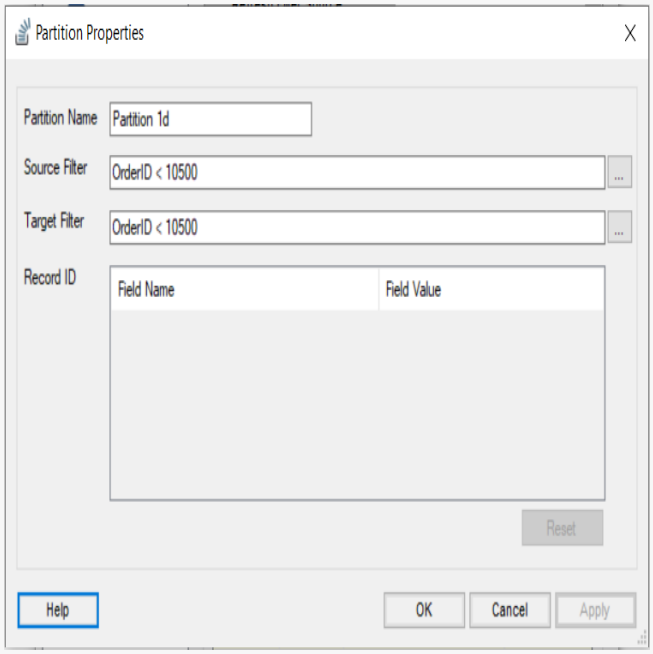
5. Click **Add Partition** to open the Partition Properties dialog.



6. Edit the auto-generated name for the partition as needed.
7. Set a Source and Target Filter to determine the data included in the partition.
8. Click **OK** to create the partition.

Manage Partitions

To manage partitions for a replication:

1. In the Metadata Explorer, select the replication.
2. Choose **Replication Properties** from the right mouse button menu.

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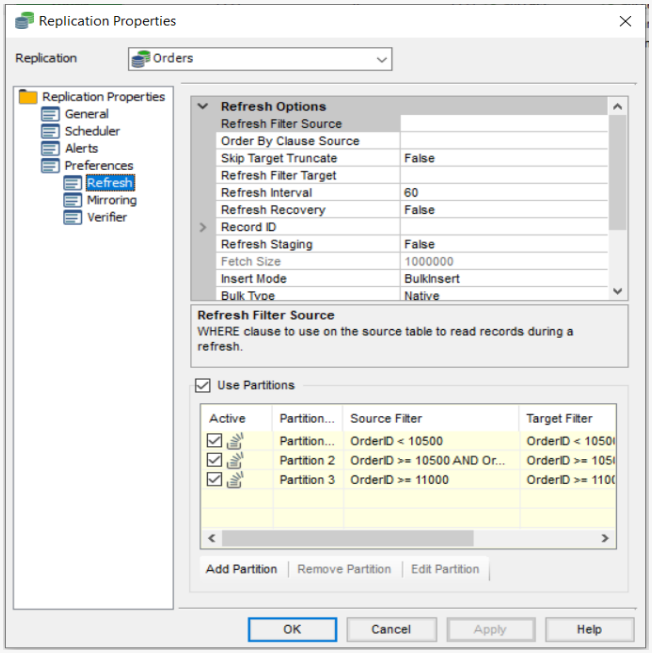
3. In the **Preferences**, click the **Refresh** option to display Refresh properties.



4. In the Partitions area:
    - Check or uncheck **Use Partitions**to switch on/switch off use of partitions.
    - Select one or more partitions by clicking in the checkbox to the left of each partition name, then edit or remove the partition(s).

View Replication Progress

In the Replication Monitor, partitions are by default not visible. Click Show Partition button on the top toolbar to view partitions as subrows of each replication:

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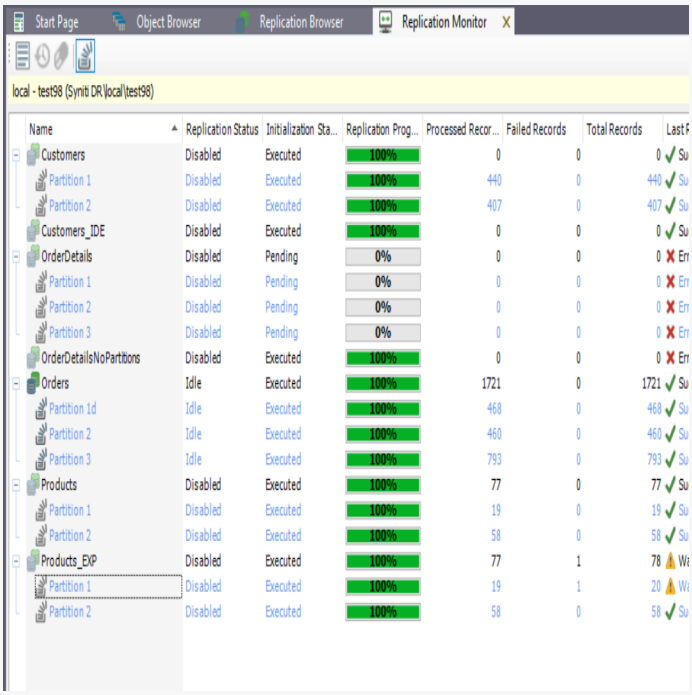

Right-click on a partition to access actions to perform on the partition.

When the refresh is being executed, a specific number of records and replication progress information for each partition is displayed. The top replication row will show cumulative values from each of its partitions.

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Improving Performance Using Refresh with SQL Server, MySQL

If you are replicating to Microsoft SQL Server or MySQL using Refresh mode, you can improve performance by using the bulk insert option during replication. This option is selected by default in the Preferences tab of the Replication Properties dialog.

1. In the Target Connection wizard, when creating a target connection, select the Microsoft SQL Server .NET Data Provider or the MySQL .NET Data Provider.
2. In the Replication wizard, when configuring the replication, choose **Refresh** as the Replication mode.
3. Select the replication in the Metadata Explorer.
4. From the right mouse button menu, choose Replication Properties.
5. In the Preferences tab, check that the **Insert Mode** property is set to BulkInsert.
6. Adjust the **Block Size** property to a value between 50 and 100 for best performance.

If the replication is already running, for this change to take effect, you will need to disable, then re-enable the replication.

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Improving Performance Using Mirroring with IBM Db2 for i

If you are replicating from IBM Db2 for i (iSeries/AS400) using mirroring mode, you can improve performance by setting a block size for reading data from the journal.

The block size setting is useful if you expect a huge number of transactions between mirrorings. Syniti Data Replicationreads the journal and stores records that need to be replicated in a temporary file. If the file contains a large number of records or a smaller number of very large records, it can impact performance. In this case, you can set a limit on the number of records to handle at one time. For example, if you set the value of the **MaxSizeMirroringBlock** property in the Connection Properties to 250, only 250 records will be replicated at a time.

1. In the Management Center, expand the tree to display your Db2 for i (iSeries/AS400) source connection.
2. From the right mouse button menu, choose **Connection Properties**.
3. Scroll down to the **MaxSizeMirroringBlock** property.
4. Set the value of the property according to the size of your records and the number of records you are likely to be mirroring.
5. Click **OK** to close the Connection Properties dialog.

If the replication is already running, for this change to take effect, you will need to disable, then re-enable the replication.

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Managing Performance Using Thread Settings

Here are some hints on how to manage performance using settings found in the Replication Agent Options dialog and Replication Properties dialog.

Replication Agent Options Dialog (General Tab)

Max number of concurrent threads

Increasing this number will boost the performance but the CPU and memory usage will also increase and other applications running on the same PC might be affected.

Thread Delay

When this value is greater than 0, it represents the number of time slices the thread executes before going into a sleep state. The purpose of this parameter is to release some CPU resources if the CPU usage is too high. Setting this value to 1 instructs Syniti Data Replicationto suspend each thread for a fraction of time (Sleep(0)) at every time slice. 1 is the value that releases the maximum of the CPU usage but it's also the value that penalizes performance the most. Setting it to n indicates that a thread will sleep every n slices of time. If the thread delay is 0, the thread is never suspended if there are replications running.

Thread execution factor

This value is a factor indicating how much time a thread spends processing a task (time slice) before switching to the following task in the execution list. It is used to increase the time slice assigned to each task in the following way. The number specified multiplies the slice of time assigned to each task (reader or writer). For example, if you double the value, the time assigned for each task is doubled.

Replication Properties Dialog

Thread Priority

This value affects the time slice assigned to a thread when the thread is running the current replication. It's similar to the "Thread execution factor", but relative to a specific replication. Increasing the thread priority of the replication might increase the performance because it increases the slice of time dedicated for processing the replication. However the performance is also affected by the total number of replications running and the "Max number of concurrent threads" value set in the Replication Agent Options dialog.

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Maintenance and Recovery

This section contains topics that describe:

- Identifying and Recovering from Errors
- Email Error Alerts
- Understanding Log Files
- Creating and Deleting Text Log Files
- Monitoring Log File Size
- Generating Trace Files
- Backing up and Restoring Metadata
- Moving a Metadata Database
- Monitoring and Reviewing Replications
- Managing Source/Target Table Changes
- Recovering from Interruptions to Refresh Replications
- Running a Refresh for Transactional Replications
- Reviewing Server Activity

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Identifying and Recovering From Errors

Syniti Data Replicationis designed to recover from most errors in an automated and efficient manner so that you do not lose data or have unusual delays.

However, on occasion during continuous mirroring, you may encounter an error that requires a complete refresh of the target table. Before taking this step, verify that the errors you have observed in the log apply to the current replication and replication settings:

1. Stop the Replication Agent.
2. Remove the log file. (You might want to copy it to a different location so that you can use it for comparison later.)
3. Start the Replication Agent.
4. Check the log to see if the error(s) occur in the most recent replication.

Depending on the error, you may need to change the source tables to avoid the errors, then do an Initial Refresh of the target tables to match the modified source tables:

1. Stop the Replication Agent.
2. In your database environment, make changes in source tables as necessary to prevent further errors from occurring.
3. In the Management Center, select the replication.
4. From the right mouse button menu, choose **Replication Properties**.
5. On the **General** tab, click **Mapping**.
6. Check the mapping between source and target fields to see that this is not the cause of replication errors. For example, are source and target field data types compatible?
7. On the **Scheduler** tab, check **Execute Initial Refresh**.
8. In the **Start Time** field, click **Now** to set the execution time.
9. Start the Replication Agent.

The refresh replication starts at the last transaction ID in the log and performs a truncation(removal) of the target table, then a complete replication of the source table. Subsequent mirroring operations use the transaction ID stored at the end of the refresh replication

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Email Alerts

You can configure Syniti Data Replication to send email alerts when certain events occur during replication using one of the following three options:

- Define email alert messages for a specific replication using the Replication Alert Properties dialog.
- Define email alert messages for all replications and/or the Data Replicator using the Server Alert Properties dialog.
- Write a script using the SendMail function to generate email alerts on any available replication event

Defining Email Alert Messages for a Specific Replication

This option provides a way to quickly define email alert messages for a selected replication using the Replication Properties dialog and the the Replication Alert Properties dialog.

1. In the Management Center **Metadata Explorer**, select a replication.
2. From the right mouse button menu, choose **Replication Properties**.
3. In the **Replication Properties** dialog, go to the **Alerts** tab.
4. Click **Add Alert** to open the **Replication Alert Properties** dialog.
5. Use the **Alert Settings** tab to choose which events to include in an email.
6. Set the Alert Schedule if you want to limit the number of emails you receive.
7. Go to the **Message Layout** tab.
8. Type recipient email addresses, separated by semi-colons.
9. Edit the email **Title** and **Body** text as needed.
10. Optionally specify HTML format and/or Syniti DR log attachment.
11. Click **OK** to create the alert and close the Replication Alert Properties dialog.
12. Click **OK** to close the Replication Properties dialog.
13. In the Management Center **Metadata Explorer**, select the server (usually **local**), then, from the right mouse button menu, select **Data Replicator Options...** to open the Data Replicator Options dialog.

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1. Go to the **Mail** tab.
2. Enter the SMTP Server and Port Number for your email server.
3. Enter an email address in the **From** field.
4. Enter an email recipients in the **To** field.
5. Set authentication and SSL encryption as needed for your email server.
6. Click **Test Email** to be sure that the email information you have entered is correct.

14. Stop and restart the Data Replicator to enable the email alert(s).

Defining Email Alert Messages for Replications and/or the Data Replicator

This option provides a way to quickly define email alert messages for the Data Replicator and/or all replications associated with the server using the Data Replicator Options dialog and the the Server Alert Properties dialog.

1. In the Management Center **Metadata Explorer**, select a server (usually **local**).
2. From the right mouse button menu, choose **Data Replicator Options**.
3. In the **Data Replicator Options** dialog, go to the **Alerts** tab.
4. Click **Add Alert**, then **Add Event Alert** to open the **Server Alert Properties** dialog.
5. Use the **Alert Settings** tab to choose which events to include in an email.
6. Set the Alert Schedule if you want to limit the number of emails you receive.
7. Go to the **Message Layout** tab.
8. Type recipient email addresses, separated by semi-colons.
9. Edit the email **Title** and **Body** text as needed.
10. Optionally specify HTML format and/or Syniti DR log attachment.
11. Click **OK** to create the alert and close the Server Alert Properties dialog.
12. In the Replication Agent Options dialog:

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1. Go to the **Mail** tab.
2. Enter the SMTP Server and Port Number for your email server.
3. Enter an email address in the **From** field.
4. Enter an email recipients in the **To** field.
5. Set authentication and SSL encryption as needed for your email server.
6. Click **Test Email** to be sure that the email information you have entered is correct.

13. Stop and restart the Data Replicator to enable the email alert(s).

You can also use the Alerts tab in the Data Replicator Options dialog to generate an email Activity Report:

1. In the **Data Replicator Options** dialog, go to the **Alerts** tab.
2. Click **Add Alert**, then **Add Activity Report** to open the **Server Alert Properties - Activity Report** dialog.
3. Complete the dialog and set up your email server using the **Mail** tab.

Writing a Script Using the SendMail Function

This option allows you to build a fully customized email message using any of the replication events made available in Syniti Data Replication.

In the Management Center **Metadata Explorer**, select the server for which you want to set email alerts, then, from the right mouse button menu, select **Data Replicator Options...** to open the Data Replicator Options dialog.

1. Go to the **Mail** tab.
2. Enter the SMTP Server for your email account.
3. Enter your email address in the **From** field.
4. Enter the email recipients in the **To** field.
5. Click **Test Email** to be sure that the email information you have entered is correct.

Use a SendMail function from a script to provide an email alert as in the example below.

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```
SendMail ("Message from Syniti Data Replication",
"An error occurred that requires the intervention of the system admin-
istrator.")
```

Related Topics

Server Alert Properties Dialog

Replication Alert Properties Dialog

Data Replicator Options Dialog

Mail Tab

SendMail Function

Writing Visual Basic .NET Scripts

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Understanding Log Files

The Syniti Data Replicationlog file is an important source of information for details on any replication. Even though a replication process is typically automatic enough to determine choices based on the replication configuration, you sometimes need to examine the log file make adjustments to the replication configuration. For this reason is important to check the DBMoto.log file and understand the difference between:

Information messages	Useful information to follow the replication process as it progresses.
Warning messages	A warning usually indicates an issue that does not typically generate an error in the replication process. However, you should check the source of the message and assess whether it could affect the results of your replication.
Error messages	An error message generally indicates an error in the replication. In some cases, Syniti DR is able to resolve the issue automatically, but the information is still signaled as an error message because it is a source of possible asynchronism between source and target tables. In some cases, the error is an internal error (this is determined by the presence of a single level error message.) In other cases, the error is generated from the .NET, ODBC or OLE DB provider and the native provider error is shown, together with the Syniti DR error message. Sometimes errors appear simply because wrong assumptions are made during the replication setup. For instance, when replicating a table from an IBM Db2 for i source in mirroring mode, if the table is not journalized, an error will indicate the need to create a journal for that table. A duplicate primary key error could occur if inserting a record when the target table already contains that primary key value.

These are some of the entries you may find in your log file.

Warning A replication conflict has occurred during replication (AddNew) of a record.

A synchronization conflict error. For example, the replicator is trying to insert a new record when the target table already contains that record (identified by the primary key value) but there are some differences with the values in the other columns. Verify why the conflict is occurring and if the current values are valid. Often previous errors in the replication can generate synchronization conflict errors.

Warning A replication conflict has occurred during replication (Delete) of a record.

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A synchronization conflict error. For example, the replicator is trying to insert a new record when the target table already contains that record (identified by the primary key value) but there are some differences with the values in the other columns. Verify why the conflict is occurring and if the current values are valid. Often previous errors in the replication can generate synchronization conflict errors.

Replication Complete

You will only see a message in the log file to indicate that a replication has completed for refresh and continuous refresh. For mirroring and synchronization, there is no end to the replication and therefore no such message in the log file.

Date/Time Conversion Errors

These messages are shown when the Replicator reads a null date on the Db2 system(null date set to 01/01/01) because SQL Server doesn't accept the year. The error is only a notification of the forced conversion and in this cases for every forced conversion an error is sent to the log; but replication is not stopped. However is possible manage date/-time conversion errors from the Replication Agent Options dialog, available from the **Metadata** menu.

(-2147217900) ORA-01293: time or SCN range not fully contained in the listed logfiles ORA-06512: at "SYS.DBMS_LOGMNR", line 42 ORA-06512: at line 1

The range requested from the log is not present in the log files used. Because Syniti DR opens the Oracle log based on the last SCN (transaction ID) processed during the last mirroring step (which is the number you see displayed in the "Redo Log" dialog in Management Center), this error might indicate that, at some point, after a certain number of transactions processed, the Oracle log files have reached the maximum size available and are getting over-written from the beginning (in circular way).

If this is the problem, increasing the size of the log files or creating more log files could at least delay the problem if not solve it. Of course all depends on the number of transactions that have to be analyzed, if it is too huge chances are that Syniti DR is not able to keep up with this increasing number.

'OracleEllipsePrd' connection transactions have been deleted. Database will be temporarily removed from replicated databases. (-2147217900) ORA-01293: time or SCN range not fully contained in the listed logfiles. ORA-06512: at "SYS.DBMS_LOGMNR", line 42.

Use the Help Center to research issues or contact customer support for help.

Related Topics

Replication Agent Options dialog

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Creating and Deleting Log Files

Monitoring Log File Size

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Creating and Deleting Text Log Files

When saving the log to a text file, Syniti Data Replicationuses the file DBMoto.log in the **Log** folder to store information about each replication session. This file is created and maintained automatically, however, you can specify how often you want to create a new file and how large each log file should be in the Replication Agent Options dialog in the Management Center.

1. In the **Metadata Explorer**, select the server for which you want to set log options.
2. From the right mouse button menu, choose **Replication Agent Options**, to open the Replication Agent Options dialog.
3. In the Replication Agent Options dialog, go to the **Log** tab.

To delete a log file, you must first stop and exit the Replication Agent so that the log file is no longer used. When you delete the log file, a new file is created next time you run a replication.

Note that, in the Replication Agent Options dialog, you can also choose to save the log to a database or to the Windows Event Viewer.

Related Topics

Replication Agent Options dialog
Monitoring Log File Size
Understanding Log Files

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Monitoring Text Log File Size

When saving the log to a text file, Syniti Data Replicationuses the file DBMoto.log in the Log folder to store information about each replication session. Replication Agent performance decreases with the growth of the log file. To avoid this situation, plan to manage your log file by using the Replication Agent Options dialog in the Management Center.

1. In the **Metadata Explorer**, select the server for which you want to set log options.
2. From the right mouse button menu, choose **Replication Agent Options**, to open the Replication Agent Options dialog.
3. In the Replication Agent Options dialog, go to the **Log** tab.

By default, the log file is a single file with a maximum size of 10MB, but you can change the maximum size or create a new file every certain number of days. If you are creating multiple log files, you can determine how many files you want to keep. Syniti Data Replication then manages that number of files, naming them by date and/or increment number).

Note that, in the Replication Agent Options dialog, you can also choose to save the log to a database or to the Windows Event Viewer.

Related Topics

Replication Agent Options dialog
Creating and Deleting Log Files
Understanding Log Files

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Generating Trace Files

The Syniti technical support staff sometimes request one or more of the following trace files.

Trace Type	Settings	Description
Replication Agent	Replication Agent Options dialog on the right mouse button menu of a server.	Traces all activity associated with the Replication Agent running on a specific server.
Server Agent	Replication Agent Options dialog on the right mouse button menu of a server.	Traces all activity associated with a specific Syniti DR server.
Management Center	Options dialog on the Tools menu.	Traces all activity associated with a specific Management Center installation. Primarily tracks user interaction with the Management Center. Can include traces of commands to the metadata tables via the Settings dialog.
API	Options dialog on the Tools menu.	Traces the activity that occurs when using the API to run Syniti Data Replicationprogrammatically
Service Monitor	Options dialog on the Tools menu.	Traces all application and service activity associated with the Service Monitor located in the Windows System Tray.

Generating a Replication Agent or Server Agent Trace

1. In the Management Center, select the current server (usually local), and, from the right mouse button menu, choose **Replication Agent Options…** to open the Replication Agent Options dialog.
2. Go to the **Trace** tab.
3. Click in the checkbox **Activate Replication Agent Tracing** to enable the trace.

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4. If requested by the support staff, click **Settings** to open the Replication Agent Trace Settings dialog and specify which traces to run, or which replications to include in the trace.
5. In the Replication Agent Options dialog, click **OK** to set the trace(s).
6. Start the Replication Agent.

The default location for generated trace files is in the Logs folder in the Syniti DR. installation path.

NOTE: It is possible to switch tracing on and off via the Service Monitor icon in the Windows Notification area, without restarting the Replication Agent.

Generating a Management Center, API or Service Monitor Trace

1. In the DBoto Management Center menubar, click **Tools**, then **Options**.
2. In the Options dialog, go to the **Trace** tab.
3. Click in the appropriate check box to activate tracing.
4. Modify the trace file folder as needed. The default location for generated trace files is C:\ProgramData\Syniti Data Replication\Logs.
5. Click **OK** to close the dialog.
6. For Service Monitor and API traces, you need to stop and restart the applications before the trace settings take effect. Management Center trace setting take effect immediately after closing the dialog.

Related Topics

Options Dialog (Management Center menu bar)
Replication Agent Options Dialog (Right mouse button menu on the server name)

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Backing Up and Restoring Metadata

Syniti Data Replication offers two approaches to backing up your metadata, each with a different purpose in mind.

- **XML Backup and Restore**
  User-driven backup of metadata to an XML file to record a specific metadata state, or to easily move metadata details from one system to another. This approach is described below.
- **Real-time Metadata Database Backup**
  One or two established alternative databases are kept synchronized with the main metadata so that, in case of metadata corruption or failure, a backup database can be designated as the main metadata, with minimal interruption to the replication cycle. Alternative metadata database connections are established via the Metadata Properties dialog.

Backing Up Metadata to an XML File

It is a good habit to create a backup of your metadata tables every time you change the replication rules and settings. It can prevent loss of data and provide easy recovery of data and application settings, even if a new installation of the application is required.

A metadata backup is an export of the metadata tables in XML format. The backup does not contain any metadata connection details.

To save your existing Metadata database as a backup:

1. Shut down the Replication Agent.
2. In the Management Center, select the metadata for which you want to create a backup.
3. From the main menu bar, choose **Metadata**, then **Backup Metadata...**.
4. In the Save Metadata Backup dialog, choose a folder and type a file name.
5. Click **Save** to save the metadata in an XML file.

Restoring Metadata

Use either the Restore Metadata wizard or the Metadata Connection wizard, depending on your needs:

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- The Restore Metadata wizard allows you to selectively restore saved metadata in the existing metadata, effectively letting you add replications defined in a different metadata to the current metadata. This wizard also allows you to restore an entire metadata set in the existing metadata, thereby overwriting the existing metadata.
- The Metadata Connection wizard allows you to create a new metadata connection and specify an existing metadata backup file to use with the new connection.

Using the Restore Metadata Wizard to Restore a Subset of Replications

Using the Restore Metadata wizard, you can restore selected replications from a metadata backup file. The restored replications will be added to your current metadata.

1. Make sure that you have saved a copy of the metadata containing the replications you want to restore.
2. In the Management Center, select the metadata into which you want to restore replications.
3. From the Metadata menu, choose Restore Metadata.
4. In the **Restore Metadata Options** dialog, choose **Custom Restore**.
5. Follow steps in the Restore Metadata wizard to specify the replications to restore and their associated source and target connections.

Using the Restore Metadata Wizard to Replace the Current Metadata

Using the Restore Metadata wizard, you can restore a metadata backup file using an existing metadata connection, in which case you'll overwrite your existing metadata.

1. Make sure that you have saved a copy of the metadata you want to restore.
2. In the Management Center, select the metadata where you want to restore data.
3. From the Metadata menu, choose Restore Metadata.
4. In the **Restore Metadata Options** dialog, choose **Standard Restore**.
5. In the **Open Metadata Backup** dialog, Select the metadata backup file that contains the metadata you want to restore.
   NOTE: This metadata will replace all existing metadata.
6. Click **Open** to begin the restoration process.

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Using the Metadata Connection Wizard to Restore a Saved Metadata File

Using the Metadata Connection wizard, you can restore a metadata backup using an existing metadata connection, in which case you'll overwrite your existing metadata. You can also create a new metadata and import the metadata backup XML file. It is possible to restore a metadata backup on any database, effectively copying the metadata to another location.

To restore the Metadata backup file:

1. In the Management Center, from the main menu bar, choose **Metadata**, then **Add New Metadata...**.
2. In the Metadata Connection wizard **Select Provider** screen, type a name for the new metadata. This name does not have to match the name of the metadata that you are restoring.
3. Specify the .NET provider that you plan to use for the new database server.
4. In the **Set Connection String** screen, provide the connection information for the database server where the metadata was orginally installed.
5. In the **Define Metadata** screen, select the option **Create a new metadata database**.
6. Check the option **Restore the metadata set from a backup file**.
7. Enter the pathname to the file you saved in step 4 above.
8. Click **Next**, then **Finish** to complete the wizard.
9. Clear out the DBMoto.log file.
10. Start the Replication Agent and monitor the DBMoto.log file for errors.

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Moving a Metadata Database

If you need to move your Metadata database to a different server, you can create a backup of the current metadata using the tools available in the Management Center. The metadata (without the current connection details) is saved to an XML file. You can then create a new metadata connection and use the backup file to create the metadata using the new connection.

To save your existing Metadata database as a backup:

1. Shut down the Replication Agent.
2. In the Management Center, select the metadata for which you want to create a backup.
3. From the main menu bar, choose **Metadata**, then **Backup Metadata...**.
4. In the Save Metadata Backup dialog, choose a folder and type a file name.
5. Click **Save** to save the metadata in an XML file.

To use the Metadata backup file for a new database server:

1. In the Management Center, from the main menu bar, choose **Metadata**, then **Add New Metadata...**.
2. In the Metadata Connection wizard **Select Provider** screen, type a name for the new metadata. This name does not have to match the name of the metadata that you are moving.
3. Specify the .NET provider that you plan to use for the new database server.
4. In the **Set Connection String** screen, provide the connection information for the new database server.
5. In the **Define Metadata** screen, select the option **Create a new metadata database**.
6. Check the option **Restore the metadata set from a backup file**.
7. Enter the pathname to the file you saved in step 4 above.
8. Click **Next**, then **Finish** to complete the wizard.
9. Clear out the DBMoto.log file.
10. Start the Replication Agent and monitor the DBMoto.log file for errors.

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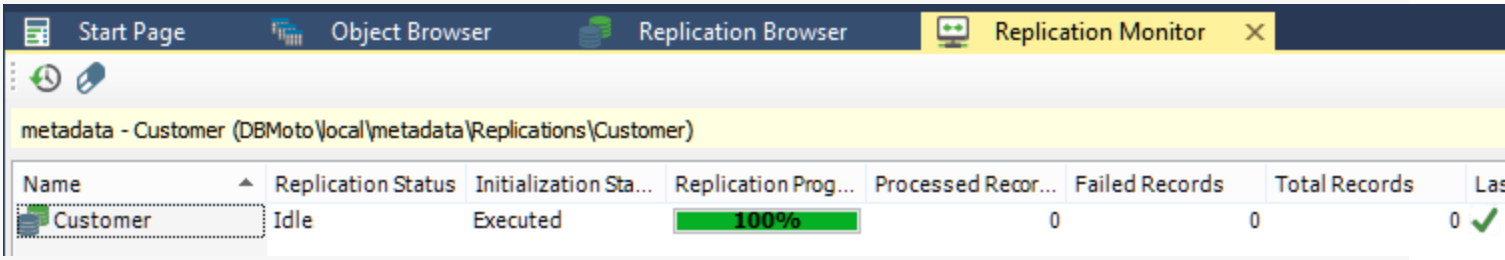
Monitoring and Reviewing Replications

You can monitor the progress of all your replications using the Replication Monitor in the Management Center. Multiple replications can run concurrently so the Replication Monitor is useful in showing which replications are running and how each replication is progressing. For historical data on performance of replications over time, use the Dashboard.



The Replication Monitor provides access to:

- The Replication Activity Viewer for a more detailed view of performance for a specific replication.
- The History Viewer for a detailed account of the replication history for a specific replication.

During replication, the Replication Monitor displays the progress of the replication (percentage of records/transactions already replicated, total number of records/transactions to replicate) and the time left for a replication to be completed. You can:

- Select a replication in the Monitor window to view the replication properties, including a history of past replication attempts.
- Review the Records columns (Processed Records, Failed Records, Total Records) for a quick overview of replication activity
- Scroll to the History Status column to see if the replication succeeded or failed. If it failed, use the right mouse button menu to open the History Viewer and identify errors. Note that the History Viewer only shows information on past replications when the **Activate Log History** option is checked in the Log tab of the Replication Agent Options dialog.
- Review the **Transaction Latency Status** column to check that performance for a specific column is not lagging. A reg flag, with the label **Threshold Warning** indicates that records are not being processed

To identify where a replication failed:

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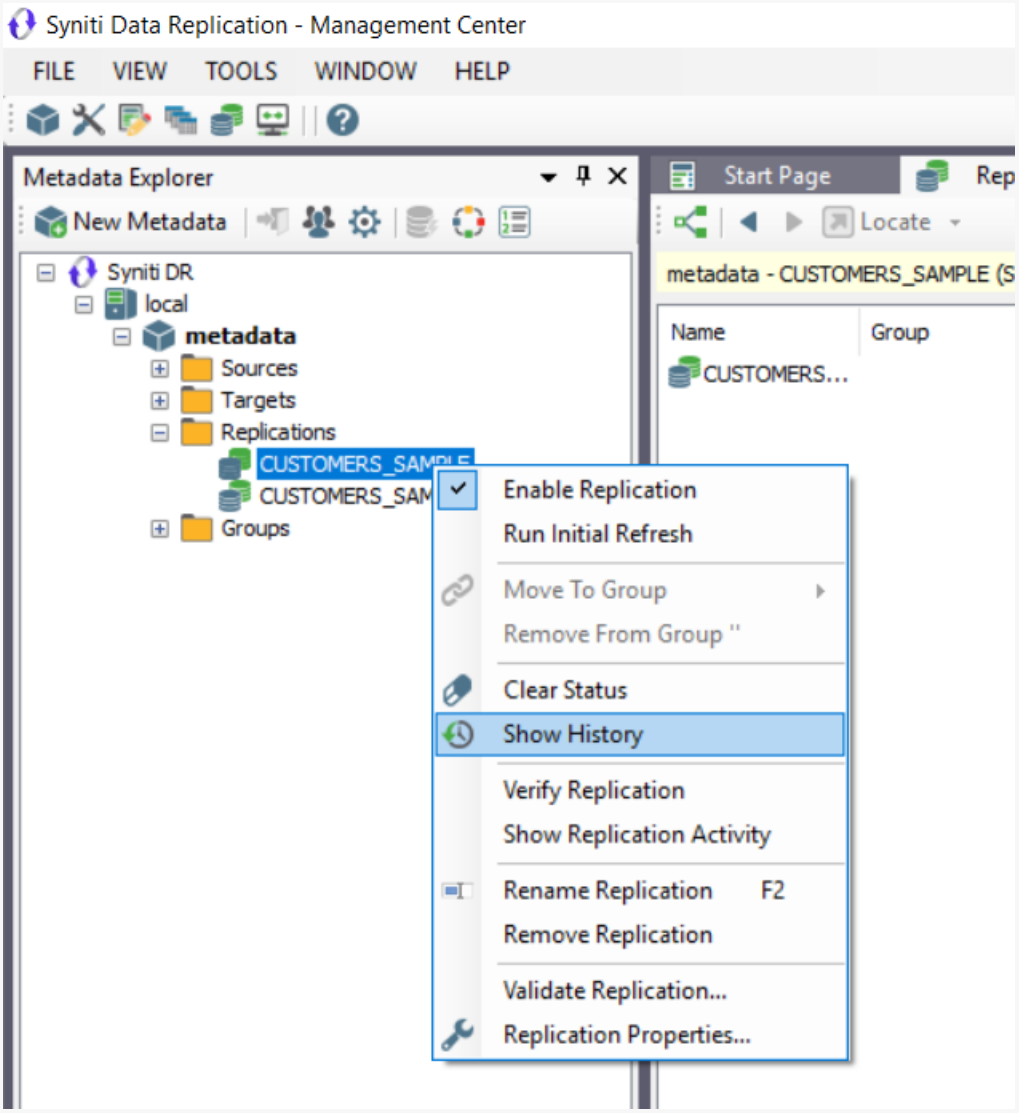
1. Select a replication in the Metadata Explorer, Replication Browser or Replication Monitor.
2. Choose **Show History** from the right mouse button menu.



The History Viewer tab allows you to explore completed replication intervals and even view the log to explore errors and warnings associated with the replication interval.

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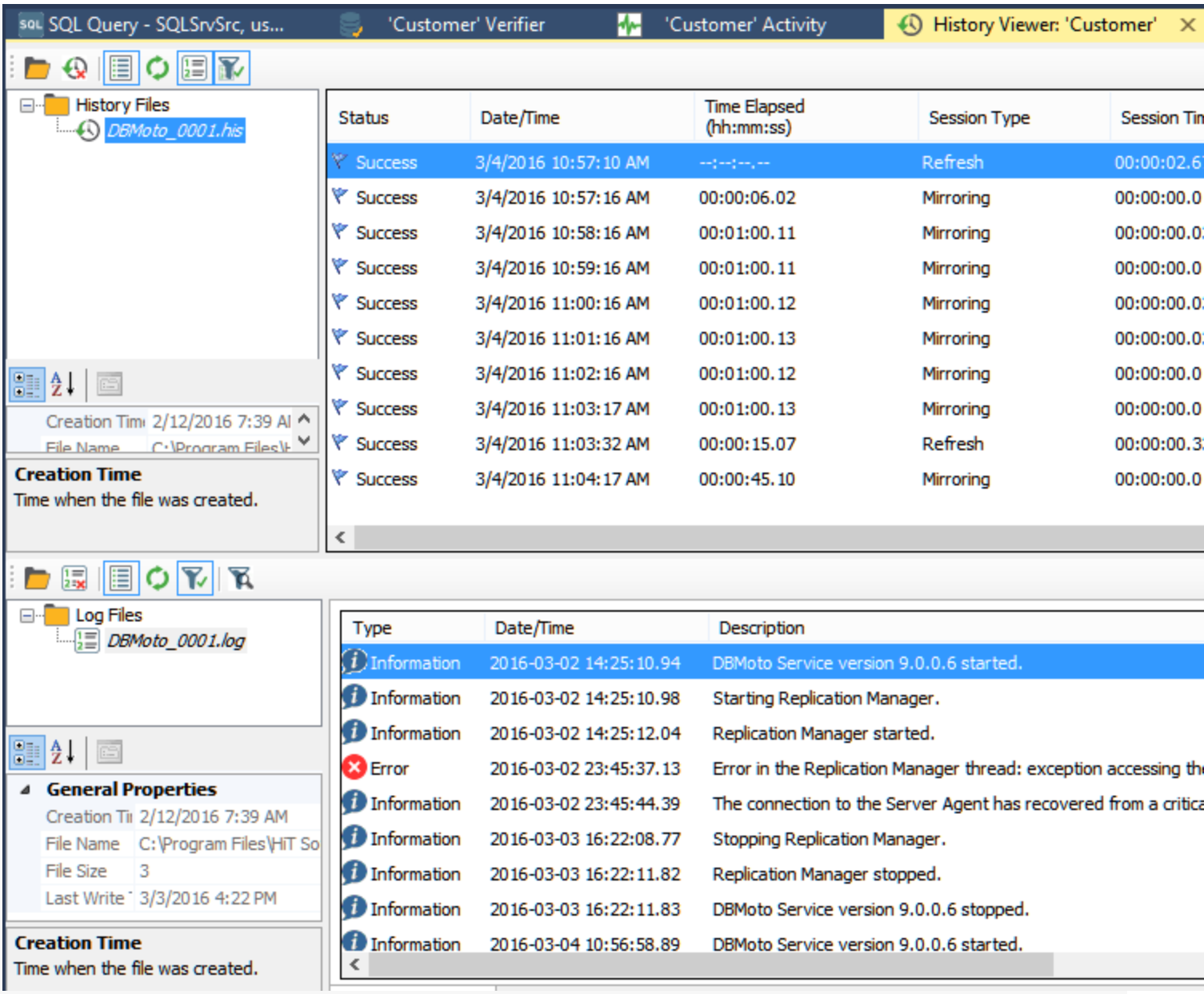

1. Examine the replication intervals for errors in the upper pane of the History Viewer.
2. Select the replication interval that shows errors to display log messages in the lower pane of the History Viewer.

This pane provides the complete functionality of the Log Viewer. You can double-click a specific message to find out more about it, or you can click **Show Filter Settings** to type in a specific search pattern for log

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messages.

3. If available, check the Replication tab for a table with the records which were not replicated.
4. Fix the errors.
   You may need to modify mappings in the Replication Properties dialog, or make changes in the source or target database tables.
5. Go back to the Replication Monitor to clear the History Status flag ready for future replications.
6. Try running the replication again to see that errors have been resolved.

Related Topics

Replication Monitor

Log Viewer

History Viewer

Replication Agent Options Dialog

Replication Activity Viewer

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Managing Source/Target Table Schema Changes

Detection and Repair of Source Table Schema Changes

Syniti Data Replicationis able to detect table schema changes on the source table for transactional replications in two ways:

- When the Replication Agent finds a schema change record (DDL) in the database transaction log
- When validating a schema using the Validate Replication dialog in the Management Center

If the **Stop on Schema Change** property in the Replication Properties dialog Preferences tab is also set to True, the following occurs:

1. The Replication Agent disables a replication when a schema change operation is detected.
2. The replication cannot be enabled or executed by the Replication Agent without updating the schema.
3. The Replication Monitor shows the ValidationResult field as Fail.

To repair the replication status, use the **Rebuild** feature in the Validate Replications dialog. After prompting with details on the steps to be performed, **Rebuild** updates the table schema and sets the replication validation status to Success. Rebuild **does not** re-enable a replication.

NOTE: Following schema updates, it is advisable to check the field mapping between source and target tables using the Fields Mapping dialog available in the Replication Properties.

Proactive Update of Source/Target Schemas

Alternatively, if you are aware of a change in the structure of source or target tables after setting up your connections and any replications, you can update the schema information stored in the metadata using the **Refresh Schema Information** option available on all source and target table, schema and connection nodes in the Metadata Explorer. Please do not confuse this refresh with the replication mode or the initial refresh of a mirroring or synchronization.

1. Stop the Replication Agent or disable the replication(s) accessing the affected table(s) by right clicking on the replications and clicking on the checked **Enable** entry.
2. Right click on the source/target table(s), schema(s) or connection(s) and choose **Refresh Schema Information**.
   If you have changed more than one table in a schema or on a connection you can right click on the schema or

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connection and choose **Refresh Schema Information** rather than separately doing this on each table.

3. Enable the replication(s) again.

Note that this operation only updates metadata information about the table(s). It does not cause another initial refresh replication and does not change any properties for replications which use that table as a source or target table. If you make changes to a source and/or target table already involved in a replication, you must manually change the replication properties to reflect these changes.

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Recovering from Interruptions to Refresh Replications

Refresh replications can take a significant amount of time, depending on the size of the tables involved in the replication. If a connection problem occurs during the refresh, the point at which the replication was interrupted is recorded by Syniti Data Replication. If the connection is re-established, replication starts automatically from the point at which it stopped. However, if you stop and restart Replication Agent, you will lose the information needed to continue replication and the replication will start from the beginning again.

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Running a Refresh Replication with Transactional Replications

If you have set up mirroring or synchronization replications, there may be times when you also want to execute a full refresh (snapshot) replication, as in the following examples:

- If the Replication Agent has been stopped for a period of time that exceeds the length of time that logs are kept available, a refresh replication can capture all the changes that are no longer available in the log.
- If a field value changes in every source record of a large table, it can be more efficient to run a refresh replication instead of capturing the change using mirroring or synchronization.
- When replicating from an IBM Db2 for i table which uses RRN (relative record numbers). If the source table is reorganized, the RRN are modified and the new information needs to be present on the target database for subsequent mirroring replications to work correctly.

The Replication Properties dialog for mirroring and synchronization replications allow you to specify that you want to perform an initial refresh (erase all records from the target database and complete copy from the source database based on the mappings in your replication definition.) You can avoid truncating all records on the target database by writing a script for the Refresh_onBeforeTruncate.

You can either define an initial refresh to occur when setting up the replication (typically using the Replication wizard) or you can pause the replication schedule to add a refresh operation:

1. Disable and/or stop the replication. The replication must be both stopped and disabled before you can modify its properties.
2. In the Management Center, expand the metadata for the replication.
3. Select the replication that you want to refresh.
4. From the right mouse button menu, choose **Replication Properties**.
5. Click **Scheduler** in the left hand pane to view the Scheduler tab.
6. In the Start Time field, click **Now**.
7. Check **Execute Initial Refresh**, if it is not already checked
8. Click **OK** to close the Replication Properties dialog.

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9. Enable the replication or restart the Replication Agent
10. Monitor the refresh operation in the Replication Monitor tab of the Management Center.

If your replication is part of a group, first remove the replication from the group, set the initial refresh, then add the replication back into the group.

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Reviewing Server Activity

Syniti Data Replicationprovides a log of all activity for a specific Server Agent. Use the Replication Agent Options Log tab to set up the log. Note that settings in this dialog apply to all logs, not just the Server Log.

If you set logging to a file, the file is stored in the Log folder, and the naming convention for the log is DBMotoSA.log for a single file or DBMotoSA_0001.log for multiple files. Note that you can view the log only if the Server Agent is local to the Management Center. If you set logging to a database, it is possible to view the logs for remote Server Agents as well as a local Server Agent.

To view the log in the Management Center as follows:

1. In the Metadata Explorer, select the server for which you would like to view the log.
2. From the right mouse button menu, choose **View Server Log**.

The log is displayed in the Log Viewer tab, allowing you to filter results.

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Syniti Data Replication API Options

This section contains topics that describe:

- Syniti Data Replication API Overview
- Syniti Data Replication API Reference
- Installing Syniti DR from a Windows Command Line

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Syniti Data Replication API Overview

View the API Reference Manual

The Syniti Data Replication API, a .NET object model structure called the DBMoto Object Model (DBOM), provides developers with complete control over creating and running replications programmatically.

The code below provides a simple example of how to start the Replication Agent for a replication in the default metadata running on the "local" Syniti DR server.

The .NET namespace for the API is HitSoftware.DBMoto.Application. This namespace includes the class DBMotoApplication, the main singleton object of the DBOM, which can be instantiated through the static singleton method Instance DBMotoApplication.Instance.

When building a client application using the Syniti DR API, be sure to follow directions below for the AppConfig file.

API Sample Code

Note: The API described here is available in Syniti Data Replication version 7.1 and above.

The code below provides a simple example of how to start the Replication Agent for a replication in the default metadata running on the "local" Syniti DR server.

The .NET namespace for the API is HitSoftware.DBMoto.Application. This namespace includes the class DBMotoApplication, the main singleton object of the DBOM, which can be instantiated through the static singleton method Instance:

```
using HiTSoftware.DBMoto.ObjectModel; \\APIs
using HiTSoftware.DBMoto.Common; \\ Type Definition for the APIs
...
public void Run(){
    try
    {
     // Static singleton constructor
     dbmApp = DBMotoApplication.Instance;
     // Retrieving the local server from the list available in the DBMotoApplication instance
```

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```
      dbmServer = dbmApp.Servers["local"];
      // Connecting to the server agent using anonymous authentication
      dbmServer.Connect();
      // Define and load the current metadata
      currentMetadata = dbmServer.Metadatas.DefaultMetadata;
      // Set synchronization between metadata and Data Replicator
(TCP/IP)
      currentMetadata.IsSynchronized = true;
      currentMetadata.Load();
      if (currentMetadata.IsRunning())
         {
          Console.WriteLine("Data replicator is running on " + cur-
rentMetadata.Name);
          Console.WriteLine("Stopping  now ...");
          // Stopping the Data Replicator after a timeout of 10000 mil-
liseconds
          currentMetadata.Server.StopReplicationManager(10000);
          }
          else
          {
           Console.WriteLine("Data replicator is stopped");
           Console.WriteLine("Starting now (as an application) ...");
           // Starting the Data Replicator as an application
           currentMetadata.Server.StartReplicationManager(false);
           }
       }
       catch(Exception e)
           {
           if (currentMetadata != null)
```

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```
            currentMetadata.Unload();
         if (dbmServer != null)
            dbmServer.Disconnect();
          Console.WriteLine(e.Message);
          }
      }

...
```

The DBMotoApplication object has access to a list of IServer objects, which is the list of server agents configured in the Management Center and stored in the local dbmoto.config file. Syniti DR users typically define at least a "local" server in the Management Center. It is therefore possible to get a pointer of the local server by calling:

```
dbmServer = dbmApp.Servers["local"];
```

With a pointer to the local server, you can connect to the server:

- Using anonymous authentication (if allowed by the server agent):

```
dbmServer.Connect();
```

- Using Syniti DR authentication (by passing an application login):

```
dbmServer.Connect(txtUser.Text.Trim(), txtPassword.Text.Trim(),
false);
```

- Using Windows authentication (the Windows domain credentials):

```
dbmServer.Connect(null, null, true);
```

The IServer class also contains the list of metadata defined for the server, and identifies the default metadata, which will be used by the Replication Agent:

```
currentMetadata = dbmServer.Metadatas.DefaultMetadata;
```

For interaction that involves the Replication Agent and the metadata, the metadata should be 'synchronized' with the Replication Agent, meaning that the application using the API should open a TCP/IP connection to the Replication Agent and receive notification from the Replication Agent:

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```
currentMetadata.IsSynchronized = true;
```

should be called before loading the metadata.

The IsSynchronized property also allows you to receive monitor information via the API including how many records have been processed and the current transaction ID in a running replication.

Use the IServer StartReplicationManager and StopReplicationManager methods to start and stop the Replication Agent.

The simple code sample described above provides an introduction to the Syniti DR API. Explore the full capabilities of the API from Visual Studio, or from the Syniti Data Replication API Reference Guide.

AppConfig File References

Add the following references to libraries for the Syniti Data Replication API in your AppConfig file <runtime> section. Replace all items in italics with correct pathnames, cultures and version numbers. To get the correct version number for your Syniti DRinstallation:

1. Open the Management Center.
2. In the main menu bar, from the **Help** menu, choose Syniti Data Replication.
3. Make a note of the exact version number on the right-hand side of the dialog.
4. Click **OK** to close the dialog.

The options for the culture value are en, it or jp.

```
<runtime>
   <assemblyBinding xmlns="urn:schemas-microsoft-com:asm.v1">
     <dependentAssembly>
         <assemblyIdentity name="APILibrary"  culture="neutral" pub-
licKeyToken="ea88625a625249df"/>
         <codeBase version="7.0.0.0" href="FILE://G:/-
products/dbmoto/test/sut/APILibrary.dll"/>
     </dependentAssembly>
     <dependentAssembly>
          <assemblyIdentity name="DBUtil"  culture="neutral"
```

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```
publicKeyToken="ea88625a625249df"/>
          <codeBase version="7.1.0.10" href="FILE://G:/-
products/dbmoto/test/sut/DBUtil.dll"/>
     </dependentAssembly>
     <dependentAssembly>
          <assemblyIdentity name="DBMetadata"  culture="neutral" pub-
licKeyToken="ea88625a625249df"/>
          <codeBase version="7.1.0.10" href="FILE://G:/-
products/dbmoto/test/sut/DBMetadata.dll"/>
    </dependentAssembly>
    <dependentAssembly>
           <assemblyIdentity name="DBConfig"  culture="neutral" pub-
licKeyToken="ea88625a625249df"/>
           <codeBase version="7.1.0.10" href="FILE://G:/-
products/dbmoto/test/sut/DBConfig.dll"/>
     </dependentAssembly>
     <dependentAssembly>
          <assemblyIdentity name="DBGate"  culture="neutral" pub-
licKeyToken="ea88625a625249df"/>
          <codeBase version="7.1.0.10" href="FILE://G:/-
products/dbmoto/test/sut/DBGate.dll"/>
     </dependentAssembly>
     <dependentAssembly>
          <assemblyIdentity name="DBUtil.resources"  culture="en" pub-
licKeyToken="ea88625a625249df"/>
          <codeBase version="7.1.0.10" href="FILE://G:/-
products/dbmoto/test/sut/en/DBUtil.resources.dll"/>
     </dependentAssembly>
     <dependentAssembly>
```

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```
          <assemblyIdentity name="EMUtil.resources"  culture="en" pub-
licKeyToken="ea88625a625249df"/>
          <codeBase version="7.1.0.10" href="FILE://G:/-
products/dbmoto/test/sut/en/EMUtil.resources.dll"/>
     </dependentAssembly>
     <dependentAssembly>
           <assemblyIdentity name="EMUtil"  culture="neutral" pub-
licKeyToken="ea88625a625249df"/>
           <codeBase version="7.1.0.10" href="FILE://G:/-
products/dbmoto/test/sut/EMUtil.dll"/>
     </dependentAssembly>
     <dependentAssembly>
           <assemblyIdentity name="LogHandler"  culture="neutral" pub-
licKeyToken="ea88625a625249df"/>
           <codeBase version="7.1.0.10" href="FILE://G:/-
products/dbmoto/test/sut/LogHandler.dll"/>
     </dependentAssembly>
     <dependentAssembly>
           <assemblyIdentity name="DBMBusinessRules"
 culture="neutral" publicKeyToken="ea88625a625249df"/>
           <codeBase version="7.1.0.10" href="FILE://G:/-
products/dbmoto/test/sut/DBMBusinessRules.dll"/>
     </dependentAssembly>
     <dependentAssembly>
           <assemblyIdentity name="DBLogReader"  culture="neutral" pub-
licKeyToken="ea88625a625249df"/>
           <codeBase version="7.1.0.10" href="FILE://G:/-
products/dbmoto/test/sut/DBLogReader.dll"/>
     </dependentAssembly>
```

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```
    </assemblyBinding>
  </runtime>
```

Object Model Diagram

The diagram below provides a graphical representation of the DBMoto Object Model. Note the one-to-many relations between the parent object and the children; and the one-to-one link from each child class to the parent (for instance, an IMetadata has a pointer to IServer).

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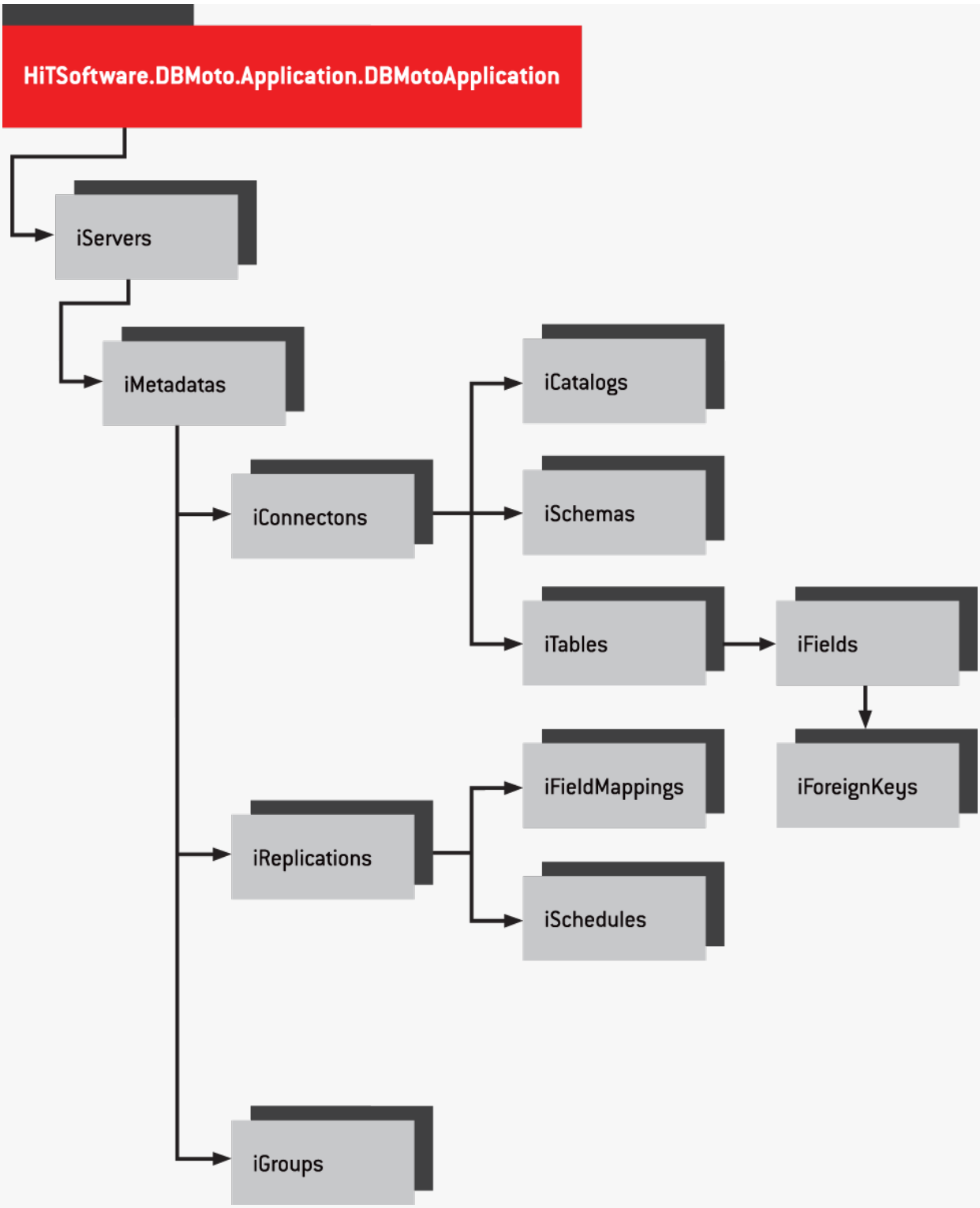

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Installing Syniti DR from a Windows Command Line

You can silently install Syniti DR from a Windows command prompt using the syntax described below. This approach enables you to run the setup without opening any of the install dialogs.

C:\Temp\setup.exe /s /z”LicenseKeyPath” /f1”AnswerFilePath”

where:

C:\Temp\setup.exe	The location of the Syniti DR setup.exe file
/s	The option that runs setup without dialogs
/z”LicenseKeyPath”	The Syniti DR license file name (including the path) Example: /z”C:\Temp\synitidrlicense MYCOMPANY.txt”
/f1”AnswerFilePath”	The name of the answer file needed to run the silent installation (including the path) The answer file is distributed with the setup.exe file and differs depending on whether a new installation (setup.iss) or an upgrade installation (setupUpgrade.iss) is being performed. Examples: /f1”C:\Temp\setup.iss” for CLEAN INSTALLATION /f1”C:\Temp\setupUpgrade.iss” for UPGRADES

By default, after installation, a response file is created in the directory where the setup was run. The default response file name is SETUP.LOG.

Installation is successful when the response file contains the following:

[ResponseResult]

ResultCode=0

For any error that occurs during installation, the response file contains the following. If an error occurs, Syniti DR is not installed.

[ResponseResult]

ResultCode=-3

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To create the response file in a different folder or with a different name, use the option /f2 to specify a path and file name:

C:\Temp\setup.exe /s /z”LicenseKeyPath” /f1”AnswerFilePath” /f2”C:\setup.log”

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