



Data Replication

Setup Notes for Replications in SQL Always On AG Environment

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<https://support.hitsw.com>

Document History

Version	Author	Date	Reviewer	Date	Comments
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Syniti Data Replication

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Overview

This document gives detailed steps on setting up transactional replications on a Microsoft SQL Server database that is part of an Always On Availability Group (AG) and the distribution database is also part of an availability group. It uses the environment described in next section as an example.

SQL Server 2017 CU6 and SQL Server 2016 SP2-CU3 introduced support for replication distribution database in an AG. When the publisher DB is part of an AG and the distribution DB is a remote stand-alone instance, please refer to the document named [MSSQLServer-AlwaysOn-DBMoto9.pdf in the Help Center](#) to correctly configure publisher and distributor.

Here is a brief overview as it relates to setting up Always On Availability Groups with Syniti DR. In a Microsoft SQL Server environment, an availability group can provide a failover environment for a set of user databases by supporting a set of primary databases and one to eight sets of secondary databases. Each set of availability databases is hosted by an availability replica. A single primary replica hosts the primary databases, and one to eight secondary replicas, which host a set of secondary databases that serve as a potential failover targets for the availability group.

The use of Always On Availability Groups requires the establishment of a Windows Server Failover Clustering (WSFC) cluster. Each availability replica within an availability group resides on a different node of the same WSFC cluster.

Environment

The example used to explain how to set up and use an Always On Availability Group with Syniti Data Replication is described below.

Distribution Database	Publisher Database
Cluster Name: WS19DISTRCLSTR1	Cluster Name: WS19ALWONCLSTR1
Nodes: WS19-ALWON-MAC1 (Primary Replica) WS19-ALWON-MAC2 (Secondary Replica)	Nodes: WS19-ALWON-SQL1 (Primary Replica) WS19-ALWON-SQL2 (Secondary Replica)
AG Name: Distributor_AG	AG Name: SyniAG
AG Listener: DistAGListener	AG Listener: SyniAGListener
DB Name: DBRS_distribution	DB Name: syni

Configuring the Publisher DB in Availability Group

The Publisher DB can be any source database that contains the data which needs to be replicated. This document uses **syni** as an example of a Publisher database. The Availability Group for the Publisher DB can be created via the Availability Group Wizard in SQL Server Management Studio.

Before starting with the wizard, make sure endpoints for database mirroring and login accounts on the server instances of primary and replicas are created.

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1. Create endpoints on primary and secondary replicas for database mirroring.

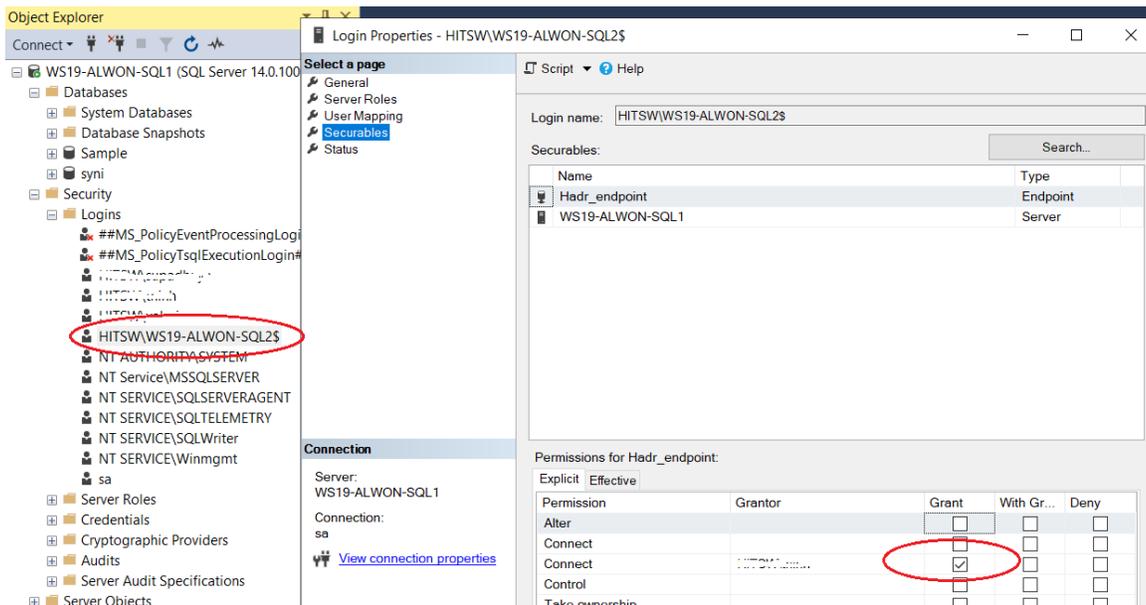
```
-- Run below script on WS19-ALWON-SQL1 and WS19-ALWON-SQL2
CREATE ENDPOINT [Hadr_endpoint]
STATE=STARTED
AS TCP (LISTENER_PORT = 5022, LISTENER_IP = ALL)
FOR DATA_MIRRORING (ROLE = ALL, AUTHENTICATION = WINDOWS NEGOTIATE
, ENCRYPTION = REQUIRED ALGORITHM AES)
Go
```

2. Create a login account in the primary replica's server instance for the secondary replica to connect. Then, that login must be granted CONNECT permissions to connect to the database mirroring endpoint of that server instance.

```
-- Run below script on WS19-ALWON-SQL1(primary replica)
USE [master]
Go

CREATE LOGIN [HITSW\WS19-ALWON-SQL2$] FROM WINDOWS WITH
DEFAULT_DATABASE=[master], DEFAULT_LANGUAGE=[us_english]
Go

GRANT CONNECT on ENDPOINT::[Hadr_Endpoint] TO [HITSW\WS19-ALWON-SQL2$];
```



3. Create a login account in the secondary replica's server instance for the primary replica to connect. Then, that login must be granted CONNECT permissions to connect to the database mirroring endpoint of that server instance.

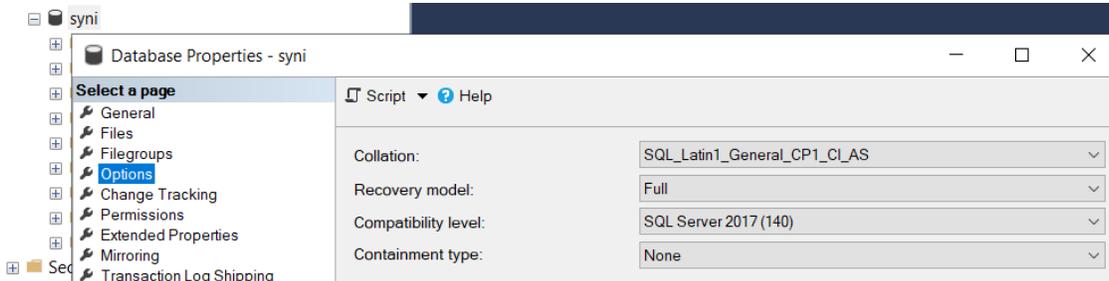
```
-- Run below script on WS19-ALWON-SQL2(secondary replica)
USE [master]
```

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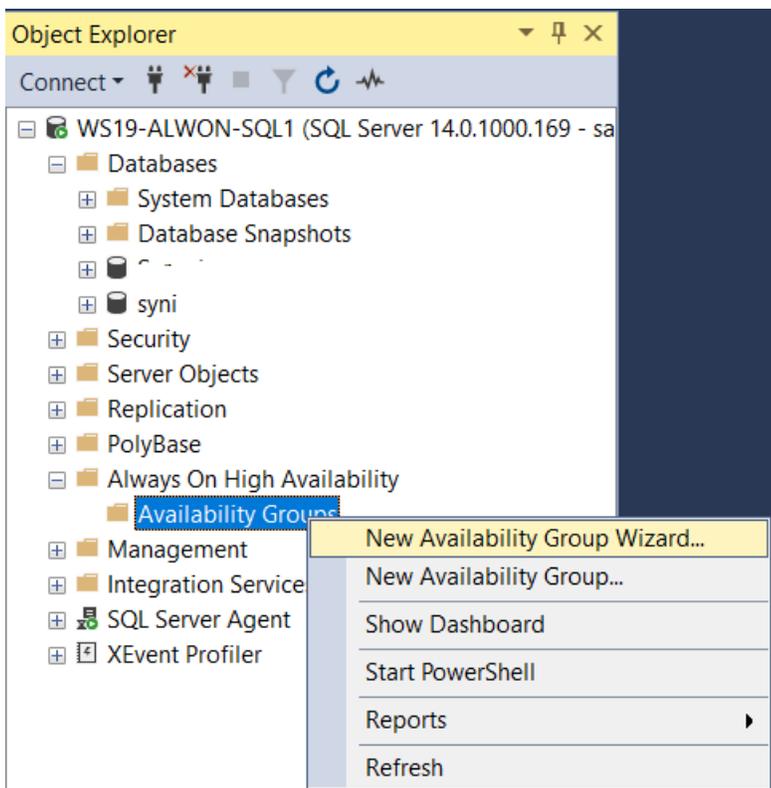
Go

```
CREATE LOGIN [HITSW\WS19-ALWON-SQL1$] FROM WINDOWS WITH  
DEFAULT_DATABASE=[master], DEFAULT_LANGUAGE=[us_english]  
Go  
GRANT CONNECT on ENDPOINT::[Hadr_Endpoint] TO [HITSW\WS19-ALWON-SQL1$];
```

- The Publisher DB **syni** is only present in the primary replica, with recovery set to “Full”.



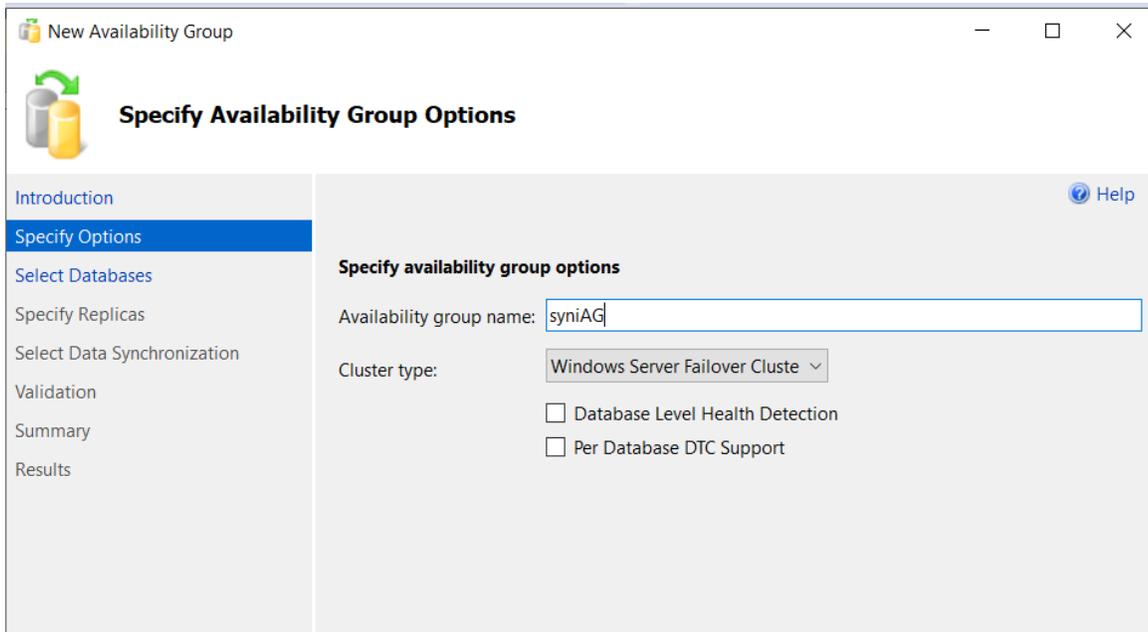
- Start the wizard to create the availability group.



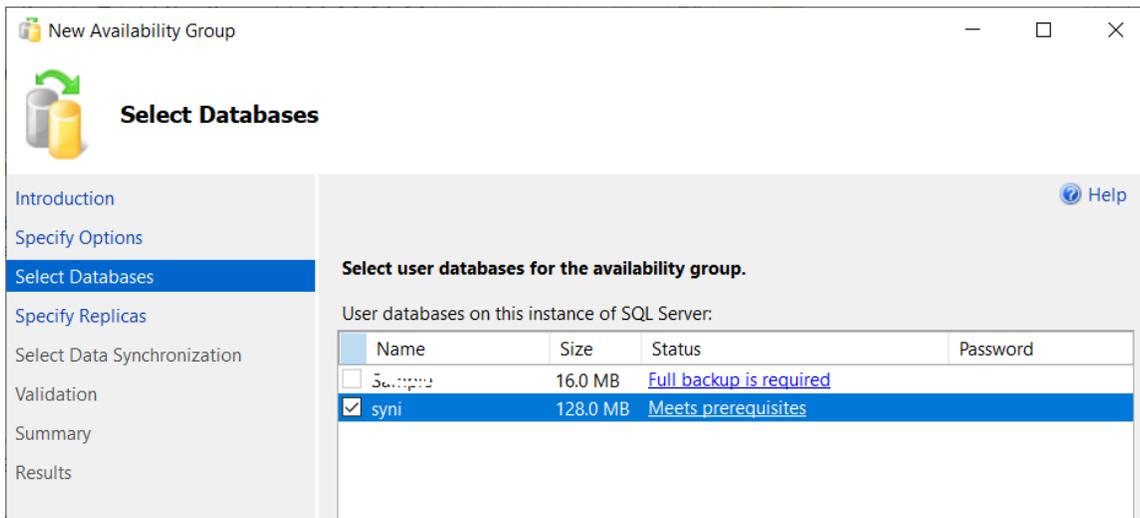
- Provide the AG name and click **Next**.

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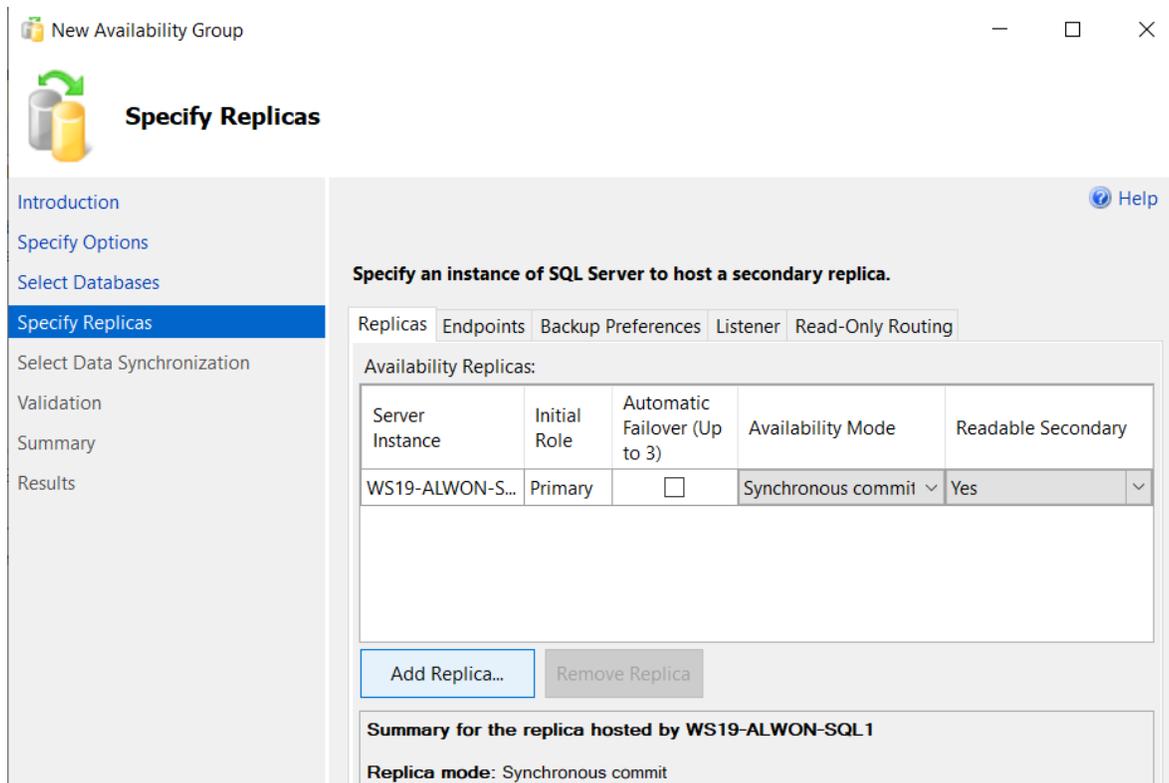


7. Select database “**syni**” from the options and click **Next**.

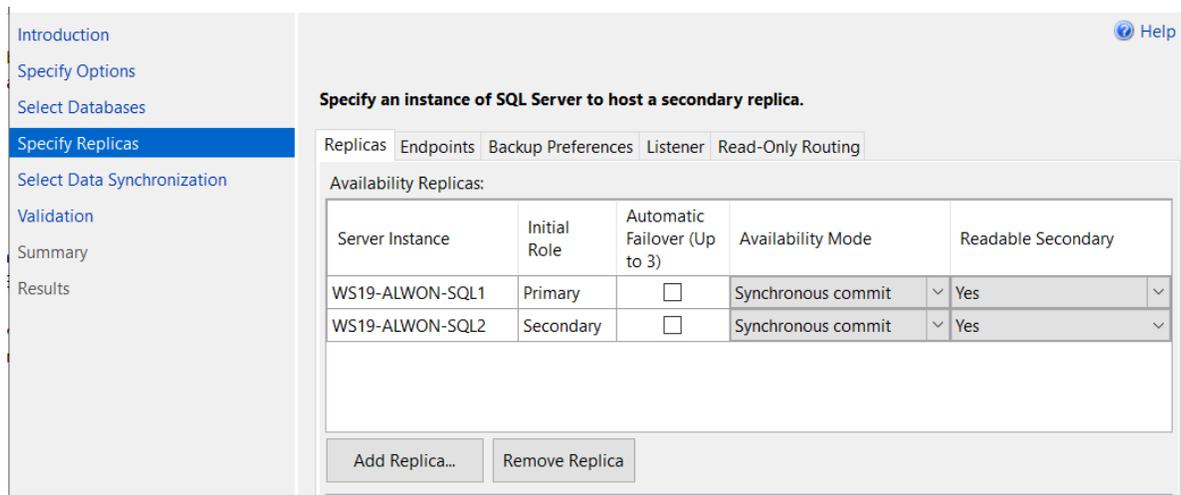


8. Set readable secondary to **yes** and availability mode to **Synchronous commit** and then click **Add Replica**.

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9. Add the secondary replica and set properties as shown in the screenshot below.



10. Select the **Automatic seeding** option in the “Select Data Synchronization” step.

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The screenshot shows the 'Select Data Synchronization' step of the wizard. The left sidebar contains a list of steps: Introduction, Specify Options, Select Databases, Specify Replicas, **Select Data Synchronization**, Validation, Summary, and Results. The main content area is titled 'Select your data synchronization preference.' and contains three radio button options:

- Automatic seeding**
SQL Server automatically creates databases for every selected secondary replica. Automatic seeding requires that the data and log file paths are the same on every SQL Server instance participating in the availability group.
- Full database and log backup**
Starts data synchronization by performing full database and log backups for each selected database. These databases are restored to each secondary and joined to the availability group. Make sure the file share is accessible to all replicas and is mounted to the same directory on all Linux replicas.
Specify the file share path in Windows format:

Specify the file share location in Linux format:
- Join only**
Starts data synchronization where you have already restored database and log backups to each

11. Click **Next** on the validation step.

The screenshot shows the 'Validation' step of the wizard. The left sidebar contains a list of steps: Introduction, Specify Options, Select Databases, Specify Replicas, Select Data Synchronization, **Validation**, Summary, and Results. The main content area is titled 'Results of availability group validation.' and contains a table with the following data:

Name	Result
✓ Checking for free disk space on the server instance that hosts secondary replica ...	Success
✓ Checking if the selected databases already exist on the server instance that host...	Success
✓ Checking for the existence of the database files on the server instance that hosts...	Success
✓ Checking for compatibility of the database file locations on the server instance ...	Success
✓ Checking whether the endpoint is encrypted using a compatible algorithm	Success
✓ Checking replica availability mode	Success
⚠ Checking the listener configuration	Warning

12. Click **Finish** to complete the wizard successfully.

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Introduction Help

Specify Options

Select Databases

Specify Replicas

Select Data Synchronization

Validation

Summary

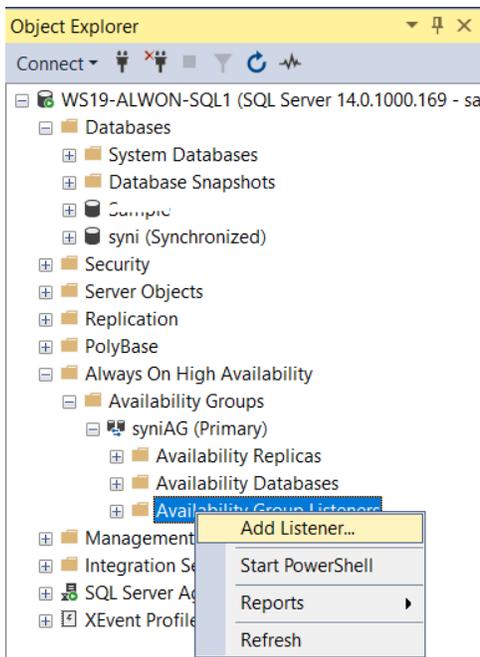
Results

✓ The wizard completed successfully.

Summary:

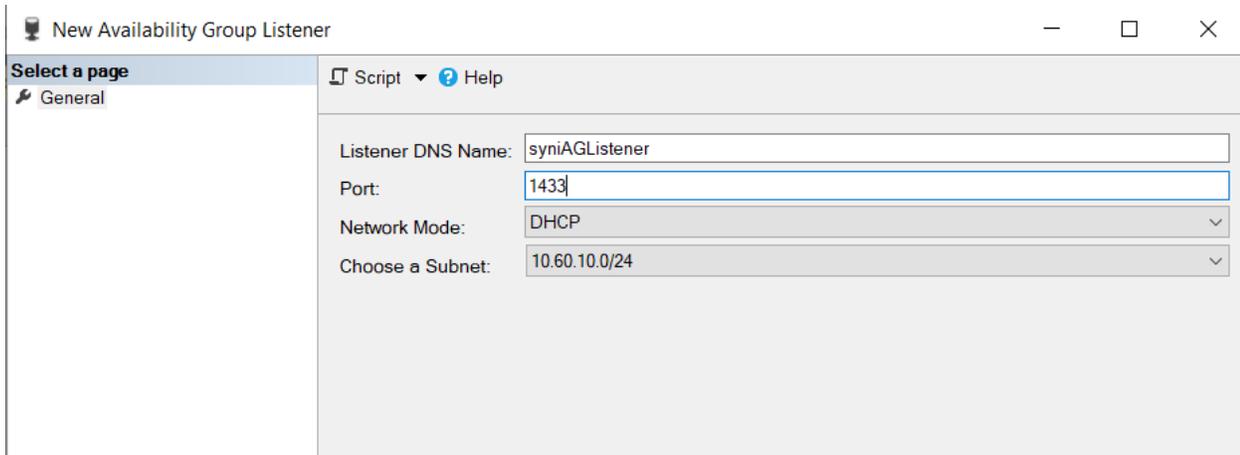
Name	Result
✓ Configuring endpoints.	Success
✓ Starting the 'AlwaysOn_health' extended events session on 'WS19-ALWON-SQL1'.	Success
✓ Configuring endpoints.	Success
✓ Starting the 'AlwaysOn_health' extended events session on 'WS19-ALWON-SQL2'.	Success
✓ Creating availability group 'syniAG'.	Success
✓ Waiting for availability group 'syniAG' to come online.	Success
✓ Joining secondaries to availability group 'syniAG'.	Success
✓ Validating Windows Server Failover Cluster quorum vote configuration.	Success

13. Add the listener to the AG.



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14. The Availability Group's dashboard should look like the screenshot below.

synAG:WS19-ALWON-SQL1

syniAG: hosted by WS19-ALWON-SQL1 (Replica role: Primary)

Availability group state: Healthy
 Primary instance: WS19-ALWON-SQL1
 Failover mode: Manual
 Cluster state: WS19ALWONCLSTR1 (Normal Quorum)
 Cluster type: Windows Server Failover Cluster

Availability replica:

Name	Role	Availability Mode	Failover M...	Seeding M...	Synchronization ...	Issues
WS19-ALWON-SQL1	Primary	Synchronous commit	Manual	Automatic	Synchronized	
WS19-ALWON-SQL2	Secondary	Synchronous commit	Manual	Automatic	Synchronized	

Group by ▾

Name	Replica	Synchronization St...	Failover Re...	Issues
WS19-ALWON-SQL1				
syni	WS19-ALWON-SQL1	Synchronized	No Data Lo...	
WS19-ALWON-SQL2				
syni	WS19-ALWON-SQL2	Synchronized	No Data Lo...	

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Configuring the Distribution DB in Availability Group

The distribution database AG needs to have a listener. When the Publisher adds the Distributor, it uses the listener name as the Distributor name. The log reader agent jobs created on the distribution server get created on all secondary replicas of the AG for Distribution DB. Please refer to below document for detailed information about setting up distribution databases in an AG.

<https://docs.microsoft.com/en-us/sql/relational-databases/replication/configure-distribution-availability-group?view=sql-server-ver15>

1. Create endpoints on primary and secondary replicas for database mirroring.

```
-- Run below script on WS19-ALWON-MAC1 and WS19-ALWON-MAC2
CREATE ENDPOINT [Hadr_endpoint]
    STATE=STARTED
    AS TCP (LISTENER_PORT = 5022, LISTENER_IP = ALL)
    FOR DATA_MIRRORING (ROLE = ALL, AUTHENTICATION = WINDOWS NEGOTIATE
    , ENCRYPTION = REQUIRED ALGORITHM AES)
```

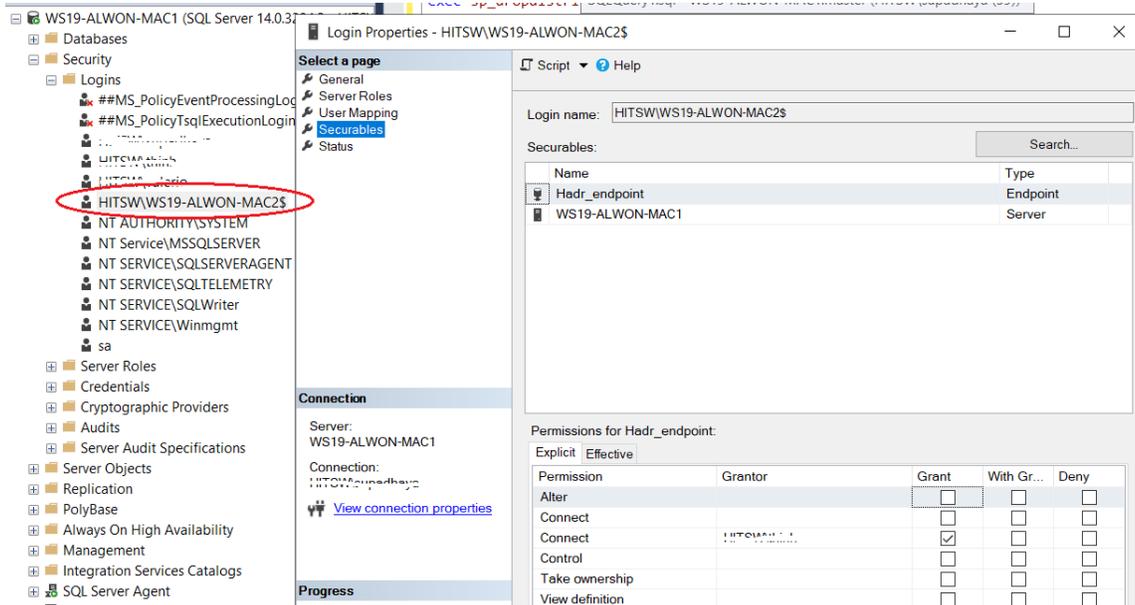
2. Create a login account in the primary replica's server instance for the secondary replica to connect. Then, that login must be granted CONNECT permissions to connect to the database mirroring endpoint of that server instance.

```
-- Run below script on WS19-ALWON-MAC1(primary replica)
USE [master]
Go

CREATE LOGIN [HITSW\WS19-ALWON-MAC2$] FROM WINDOWS WITH
DEFAULT_DATABASE=[master], DEFAULT_LANGUAGE=[us_english]
Go

GRANT CONNECT on ENDPOINT::[Hadr_Endpoint] TO [HITSW\WS19-ALWON-MAC2$];
```

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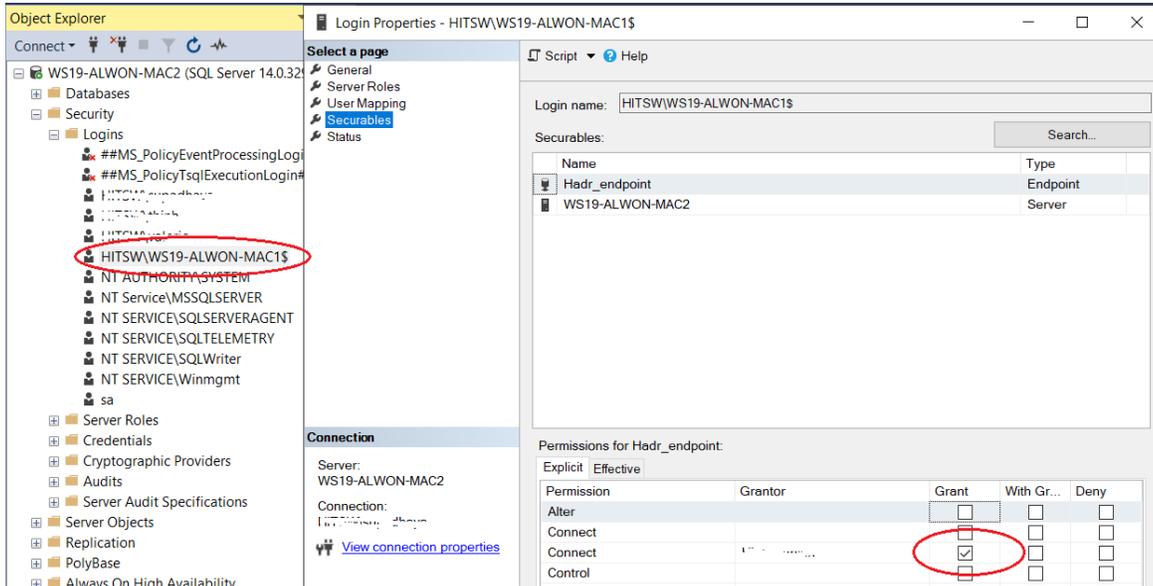
3. Run the script below on the secondary replica to create a login account for the primary replica to connect.

```
-- Run below script on WS19-ALWON-MAC2
USE [master]
Go

CREATE LOGIN [HITSW\WS19-ALWON-MAC1$] FROM WINDOWS WITH
DEFAULT_DATABASE=[master], DEFAULT_LANGUAGE=[us_english]
Go

GRANT CONNECT on ENDPOINT::[Hadr_Endpoint] TO [HITSW\WS19-ALWON-MAC1$];
```

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4. Connect to the system WS19-ALWON-MAC1 (primary replica) from MS SQL Server Management Studio and run the script below.

```
Use master
Go
-- Add distributor.
--Specify the password for distributor_admin through the @password. The
@password should be identical across 'WS19-ALWON-MAC1' and 'WS19-ALWON-MAC2'

exec sp_adddistributor @distributor = 'WS19-ALWON-MAC1', @password =
'Password'
Go

-- Create distribution DB 'DBRS_distribution
exec sp_adddistributiondb @database = 'DBRS_distribution', @data_file =
'DBRS_distribution_Data', @data_file_size = 5, @log_file =
'DBRS_distribution_Log', @log_file_size = 2, @max_distretention = 72,
@security_mode = 1
Go

-- Set Recovery to Full
Alter Database [DBRS_distribution] Set Recovery Full
Go

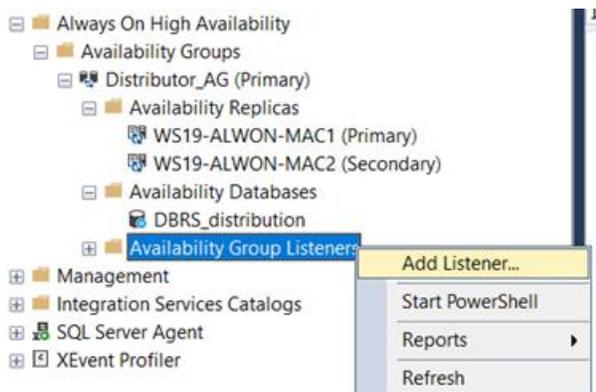
-- Take DB backup
Backup Database [DBRS_distribution] to Disk = 'Nu1'
Go
```

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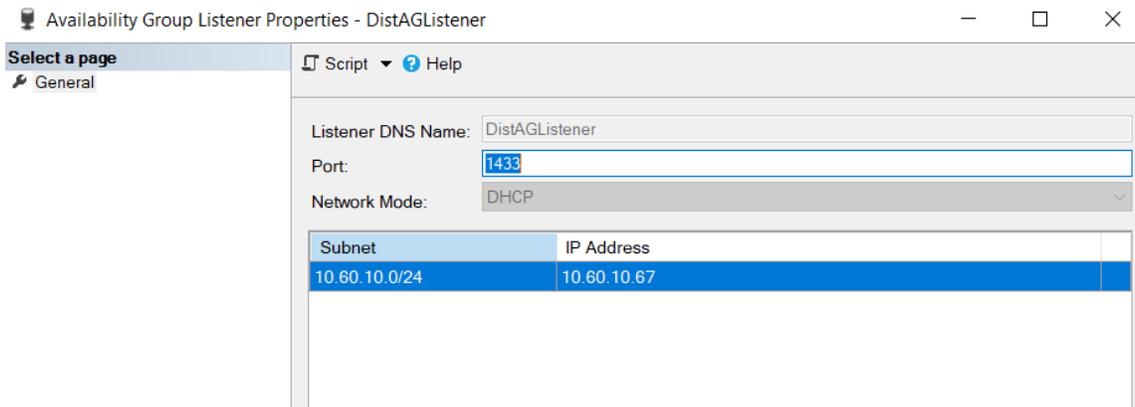
5. Create the Availability Group **Distributor_AG**

```
-- Create availability group for 'DBRS_distribution'.
USE [master]
Go
CREATE AVAILABILITY GROUP [Distributor_AG]
    FOR DATABASE DBRS_distribution
    REPLICA ON N'WS19-ALWON-MAC1'
WITH (
    ENDPOINT_URL = N'TCP://WS19-ALWON-MAC1.hitsw.com:5022',
    FAILOVER_MODE = AUTOMATIC,
    AVAILABILITY_MODE = SYNCHRONOUS_COMMIT,
    SECONDARY_ROLE(ALLOW_CONNECTIONS = ALL),
    SESSION_TIMEOUT = 10
),
    N'WS19-ALWON-MAC2' WITH (
    ENDPOINT_URL = N'TCP://WS19-ALWON-MAC2.hitsw.com:5022',
    FAILOVER_MODE = AUTOMATIC,
    AVAILABILITY_MODE = SYNCHRONOUS_COMMIT,
    SEEDING_MODE = AUTOMATIC,
    SECONDARY_ROLE(ALLOW_CONNECTIONS = ALL),
    SESSION_TIMEOUT = 10);
Go
```

Add a listener to the AG from Object Explorer. Provide the default port 1433 when creating the listener.



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6. Run the script below on the secondary replica (system: WS19-ALWON-MAC2)

```
USE master
Go
--Specify the same password as provided when running the sp on 'WS19-ALWON-
MAC1'
exec sp_adddistributor @distributor = 'WS19-ALWON-MAC2', @password =
'Password'
Go
ALTER AVAILABILITY GROUP [Distributor_AG] JOIN
GO

ALTER AVAILABILITY GROUP [Distributor_AG] GRANT CREATE ANY DATABASE
Go

exec sp_adddistributiondb @database = 'DBRS_distribution', @security_mode = 1
```

7. Run the script below to add WS19-ALWON-SQL1 and WS19-ALWON-SQL2 as publisher on WS19-ALWON-MAC1 and WS19-ALWON-MAC2

```
--Run below script on WS19-ALWON-MAC1 and WS19-ALWON-MAC2
USE master
Go
EXEC sp_addDistPublisher @publisher = 'WS19-ALWON-SQL1', @distribution_db =
'DBRS_distribution',
@working_directory =
'\\hitsnap03\Public\SHARED\DistributionDB_WorkingFolder\'
Go
EXEC sp_addDistPublisher @publisher = 'WS19-ALWON-SQL2', @distribution_db
= 'DBRS_distribution',
@working_directory =
'\\hitsnap03\Public\SHARED\DistributionDB_WorkingFolder\'
```

The value of @working_directory should be a network path independent of WS19-ALWON-MAC1 and WS19-ALWON-MAC2.

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8. All the nodes in the distribution database AG need to use the same domain account to run SQL Server Agent, and this domain account needs to have the same privilege on each node.

Additional Workflow

After AGs for Distributor and Publisher are configured properly, follow the steps below.

1. To add the distribution database AG listener as the Distributor, on Publisher DB replicas, run:

```
--Run below script on WS19-ALWON-SQL1 and WS19-ALWON-SQL2

USE master
Go
EXEC sp_adddistributor @distributor = 'DistAGListener', @password =
'Password'
```

The value of @password should be the one that was specified when Distributors were configured.

2. After adding the Distributor on the Publisher, enable replication for the publisher database **syni**.

```
-- run only on server instance used as primary replica (WS19-ALWON-SQL1)
Use master
Go
EXEC sys.sp_replicationdboption
@dbname = 'syni',
@optname = 'publish',
@value = 'true';
```

3. Follow steps in [Configuration of Replication in SDR](#) to create a replication.
4. After the publication has been created on the Publisher database, run the stored procedure `sp_redirect_publisher` to associate the original Publisher and the published DB with the AG listener name. Run the script below on the primary replica of Distribution DB.

```
-- Run on Primary replica (WS19-ALWON-MAC1), add Publisher's listener
USE DBRS_distribution
GO

EXEC sys.sp_redirect_publisher
@original_publisher = 'WS19-ALWON-SQL1',
@publisher_db = 'syni',
@redirected_publisher = 'SyniAGListener'
GO
```

5. Run the stored procedure `sp_validate_replica_hosts_as_publishers` to verify that the replica host is now configured to serve as Publisher for the published database.

```
-- Run on Primary replica (WS19-ALWON-MAC1)
USE DBRS_distribution;
```

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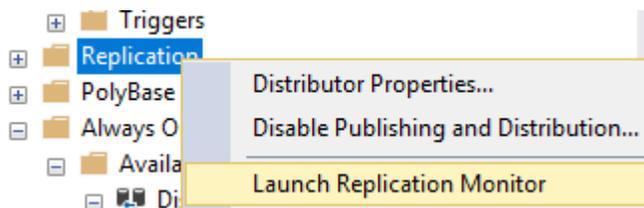
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```
GO

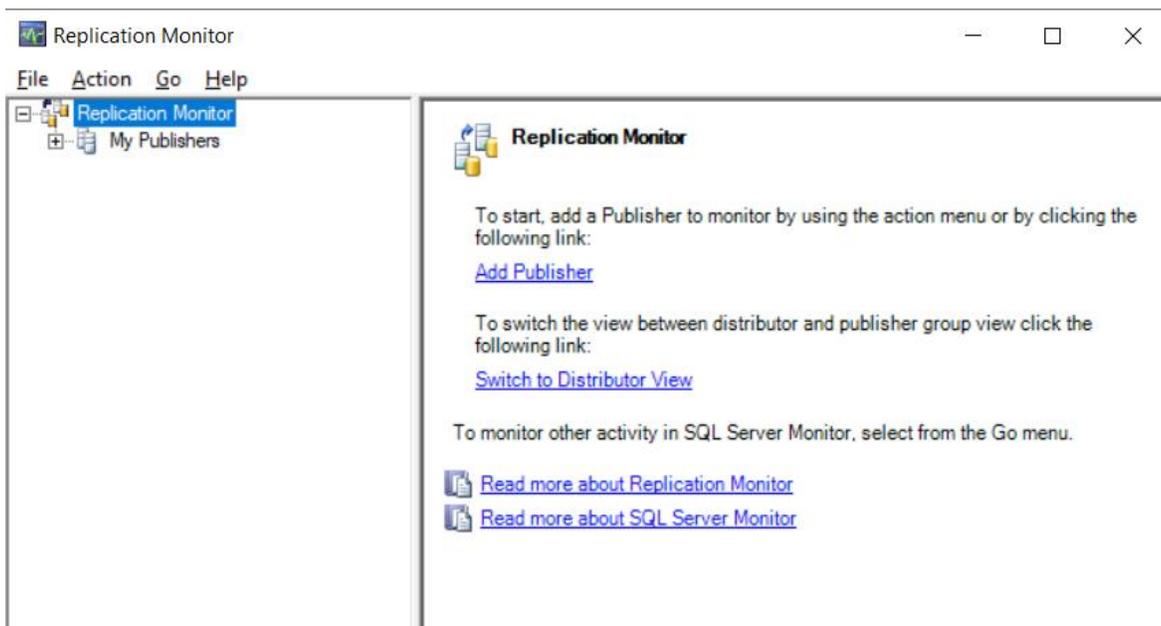
DECLARE @redirected_publisher sysname;
EXEC sys.sp_validate_replica_hosts_as_publishers
@original_publisher = 'WS19-ALWON-SQL1',
@publisher_db = 'syni',
@redirected_publisher = @redirected_publisher output;

PRINT @redirected_publisher --Output: SyniAGListener
```

- Using the Replication Monitor, register the Publisher's listener **syniAGListener** on the Distributor's Primary replica.

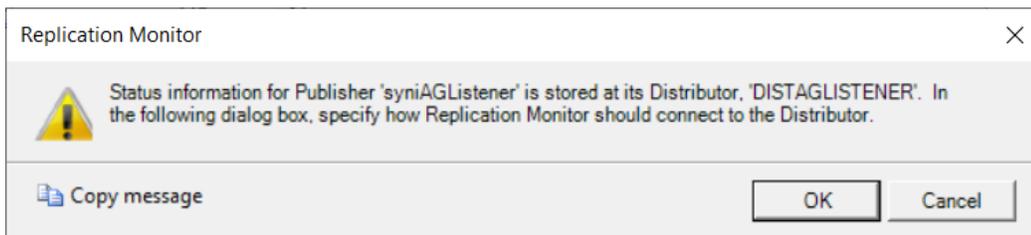
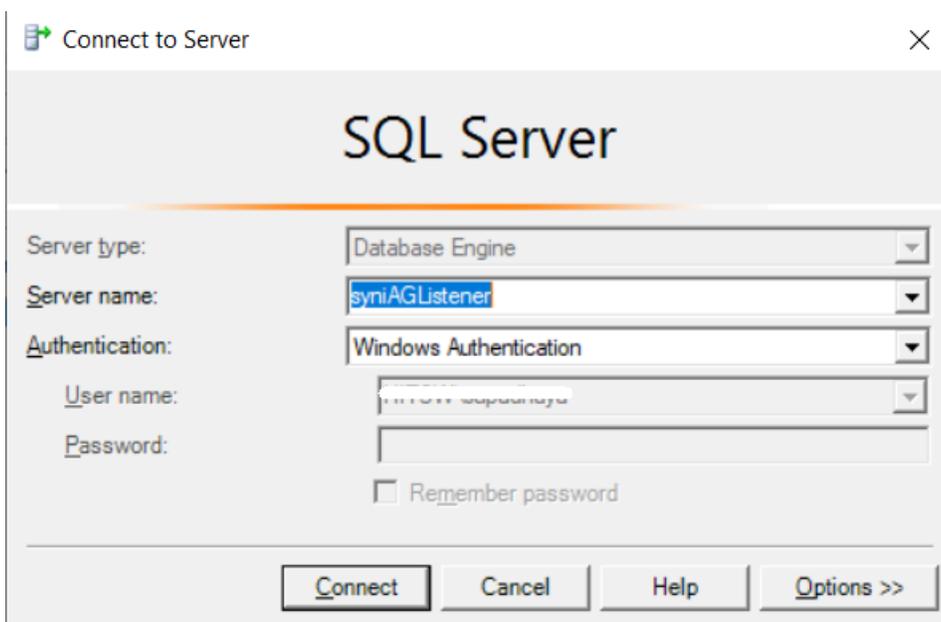
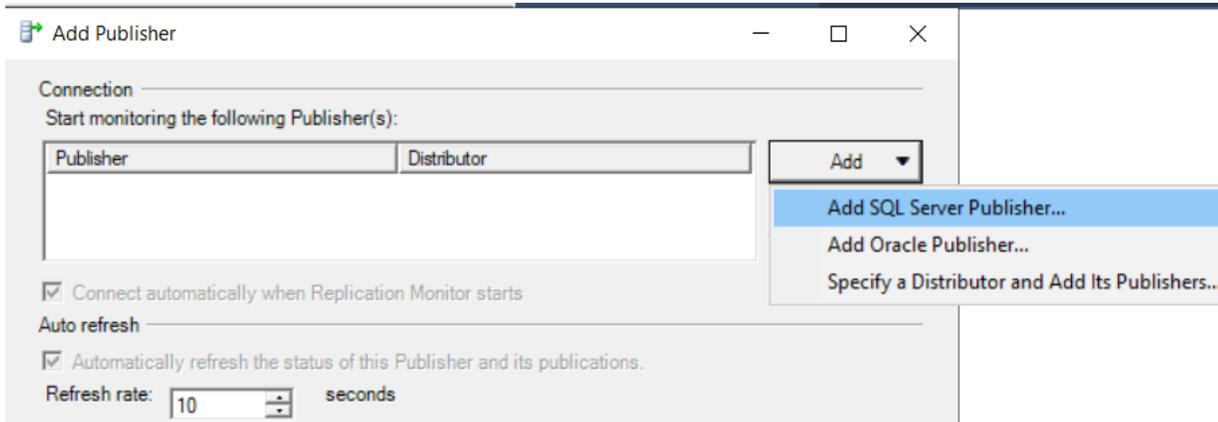


- Click on the **Add Publisher** link.

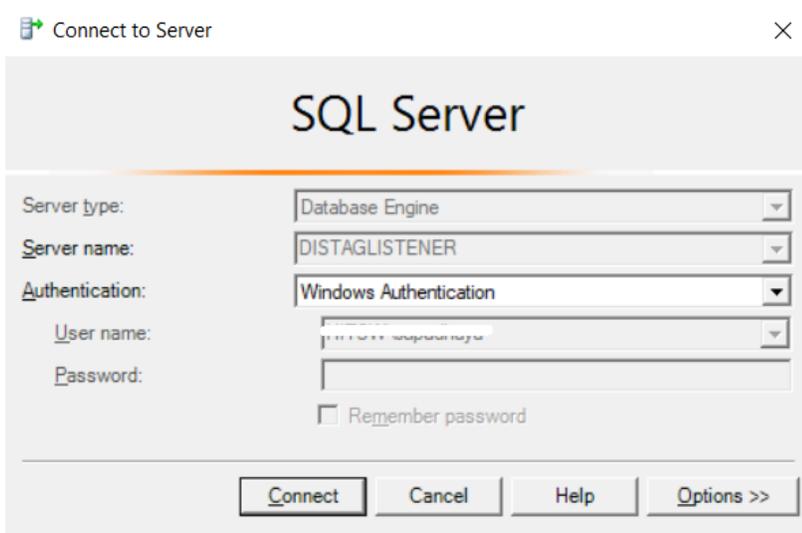


- Click on **Add SQL Server Publisher** as shown.

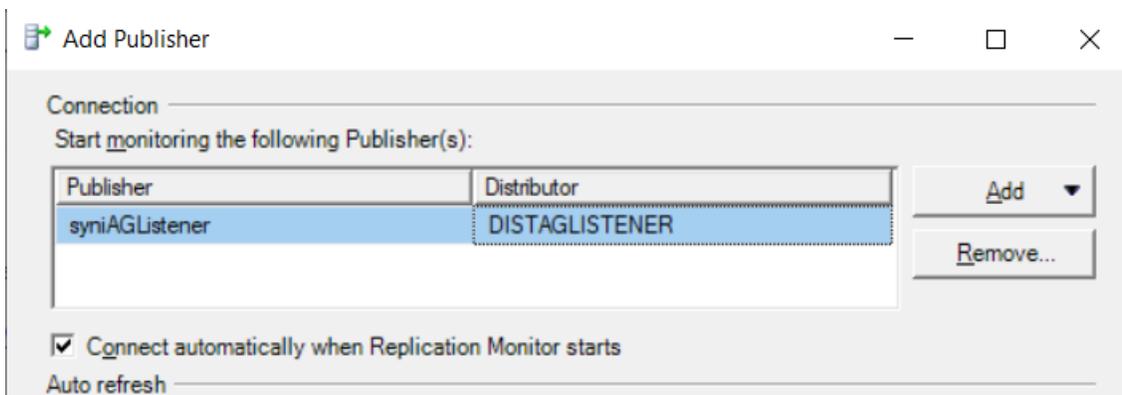
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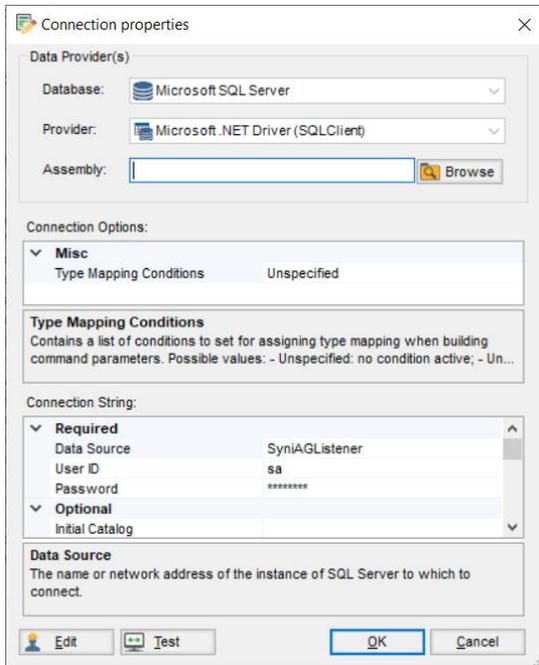
9. Connect to the Distributor's listener to retrieve publisher settings.



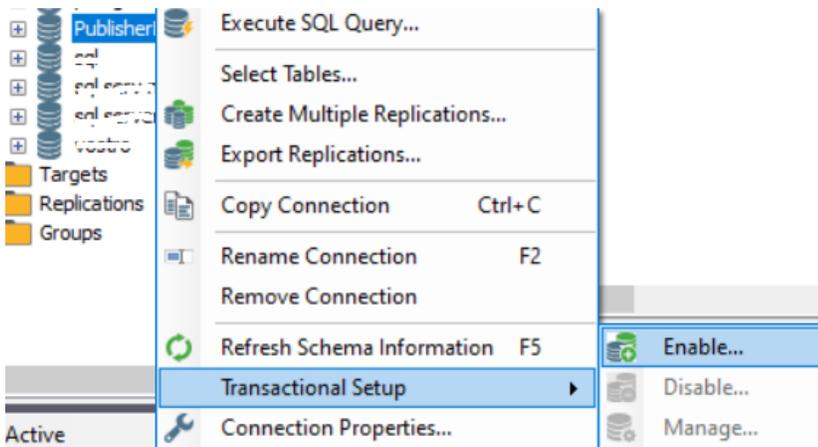
Configuration of Replication in SDR

1. Create a source connection to the Publisher DB from SDR. The Publisher's AG Listener name should be used as **Data Source** in the connection string (as shown in the screenshot), instead of one of the node's instance names.

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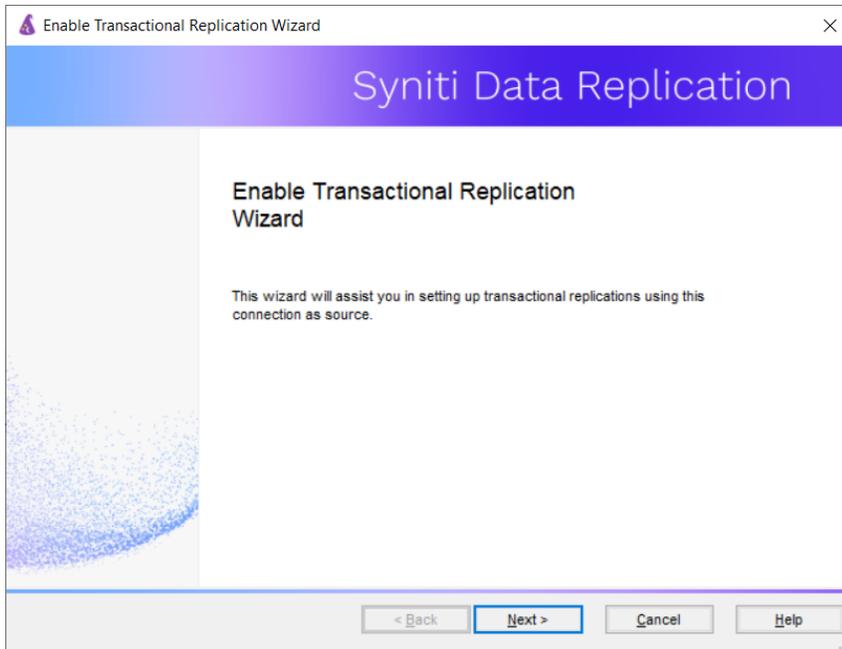


2. Enable a transactional replication using the Enable Transactional Replication Setup wizard in SDR.

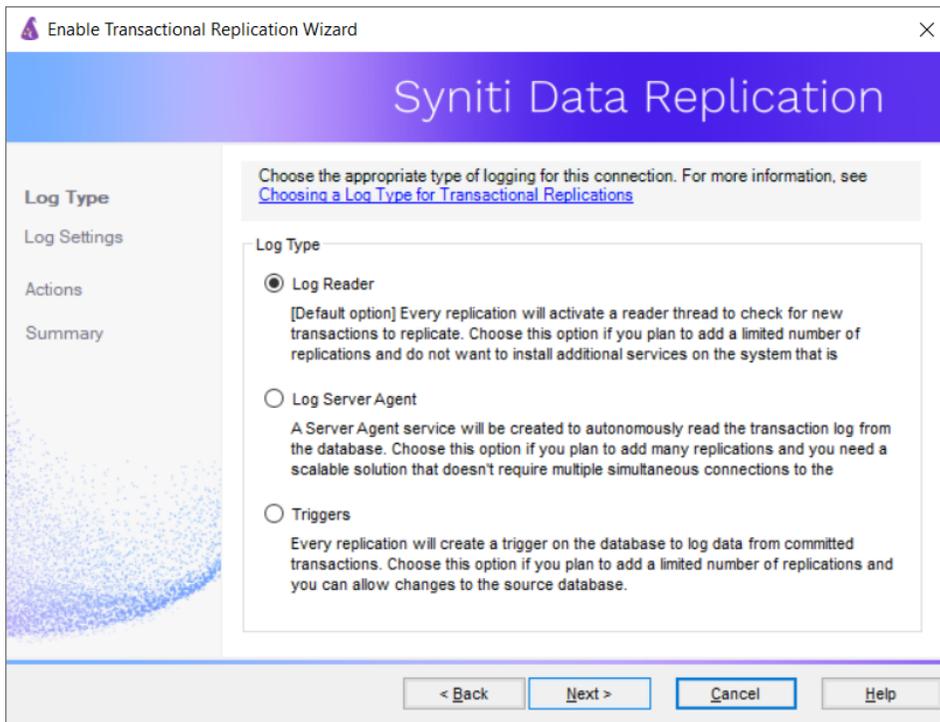


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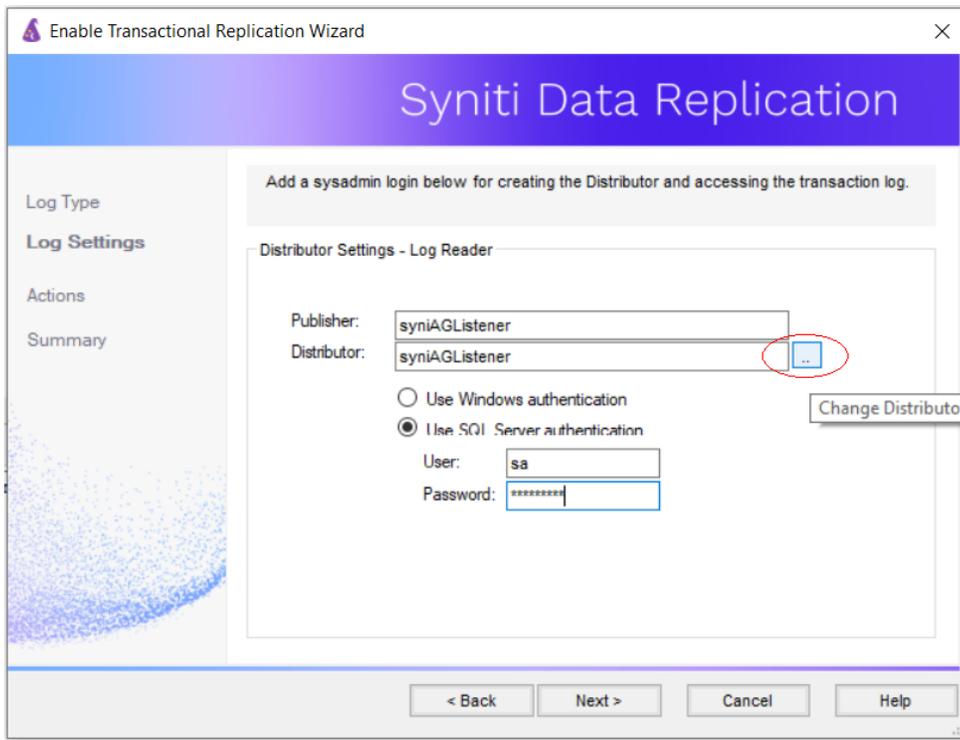
3. Choose **Log Reader** as the Log Type.



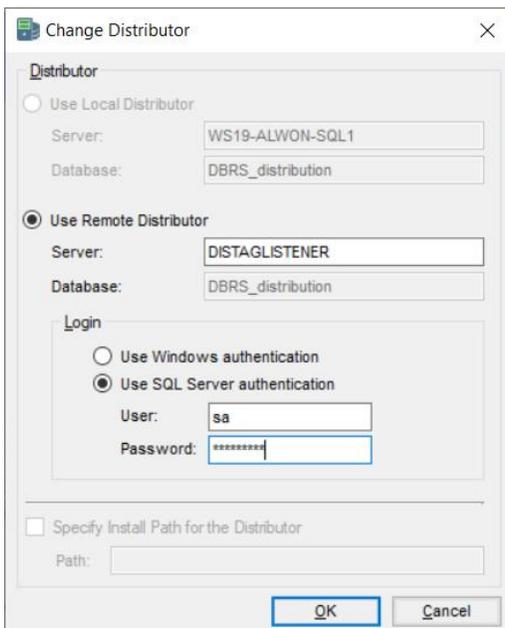
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4. Provide system admin credentials and click on the highlighted button to make sure the remote distributor is selected.



5. Provide login credentials for the remote distributor and click **OK**.



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6. Add a target connection and create replications in the usual way. This will create publications on the Publisher DB.