

REPLICATION

Replication is the process of distribute data from one server to another server or even within the same server. We can also make available one set of data from one location to another for reporting purpose using replication.

Brief working of Replication:

At first data and object is synchronized between publisher and subscribers. The snapshot is created on the publisher and transmitted to subscribers. All the subsequent changes on the publisher are stored in distribution database. Subscriber receives the data either using push or pull mechanism as configured from distribution database.

The important components involved in replication are listed below.

- **Publisher: The Publisher** is the Source Database instance that publishes the data changes that can be distributed to another database. Data from a Single Publisher can be sent to a Single Subscriber or multiple Subscribers.
- **Articles:** Articles are the actual database objects included in replication like tables, views, indexes, Stored Procedure, or the User Defined Function. An article that will be replicated from Publisher to Subscriber.
- **Publication:** A Publication is a logical collection of articles from a database.
- **Distributor:** is a Database that stores change logs captured from Publisher databases. When a Server is enabled as a Distributor, it will create a system Database named the **distribution database**.
 - **Local Distributor** – Publisher & distributor on same machine.
 - **Remote Distributor** – Publisher & Distributor on different Machines
- **Subscriber:** A database instance that consumes SQL Server replication data from a publication is called a Subscriber. The subscriber can receive data from one or more publishers and publications.
- **Subscription:** A subscription is a request for a copy of a publication to be delivered to a Subscriber. The subscription defines what publication data will be received.
 - There are two types of subscriptions: **push subscriptions and pull subscriptions**
- ❖ **Push subscription:** Distributor directly updates the data in the **Subscriber database**.
- ❖ **Pull subscription:** The Subscriber database instance takes responsibility to pull the available data from the Distribution database and apply it to the **Subscriber database**.

Replication Agents

Snapshot Agent

- ❖ It prepares the Schema and initial data of all Articles included in a Publication on a Publisher.
- ❖ It stores the files in the snapshot folder, and records synchronization jobs in the distribution database.

Distribution Agent

- ❖ It applies the initial Snapshot files and incremental or available pending transactions from the Distribution database to the Subscriber database.
- ❖ The Distribution Agent runs from the Distributor Server for Push Subscriptions and the Subscriber Server for Pull Subscriptions.

Log Reader Agent

- ❖ It is used with transactional replication
- ❖ It moves replication transactions from the online transaction log of the publication database to the distribution database.
- ❖ The Log Reader Agent runs from the Distributor Server.

Queue Reader Agent

- ❖ It is used with transactional replication with the queued updating option.
- ❖ It runs at the Distributor and moves changes made at the Subscriber back to the Publisher.

Prerequisites configuring SQL Server Transactional Replication

- Make sure your servers that will act as a Publisher, Distributor or Subscriber can communicate with each other.
- Make sure all tables that need to be replicated have a primary key.
- Verify you have enough space in the log file and the drive where the database log file is stored.
- Network bandwidth is a crucial point you should keep in mind while planning replication otherwise your replication will face latency issues.

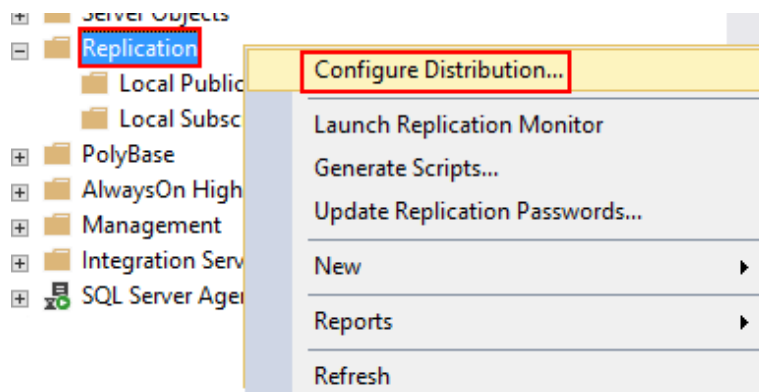
Let us now begin with the Configuring of the Transactional Replication.

There are 3 steps involved for Configuring the Transactional Replication:

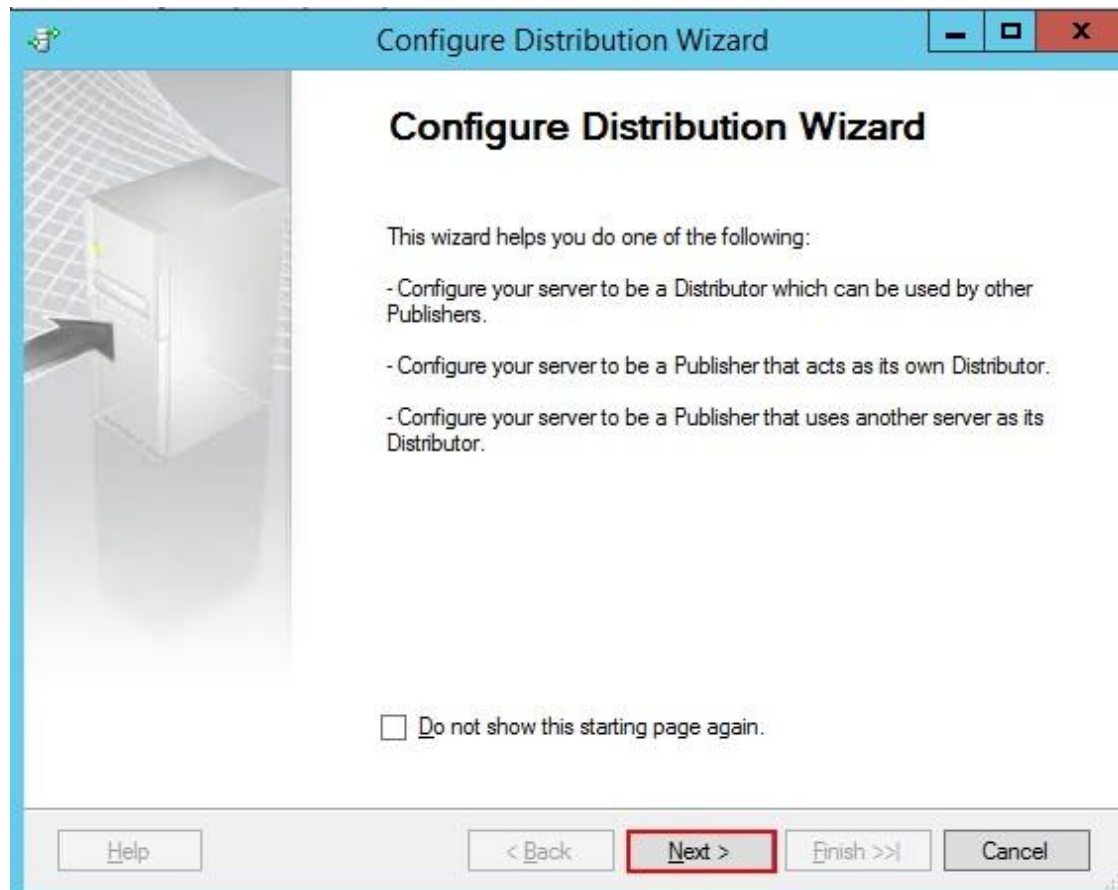
1. Configuring the Distribution Database.
2. Creating the publisher.
3. Creating the subscriber.

Configure Distributor

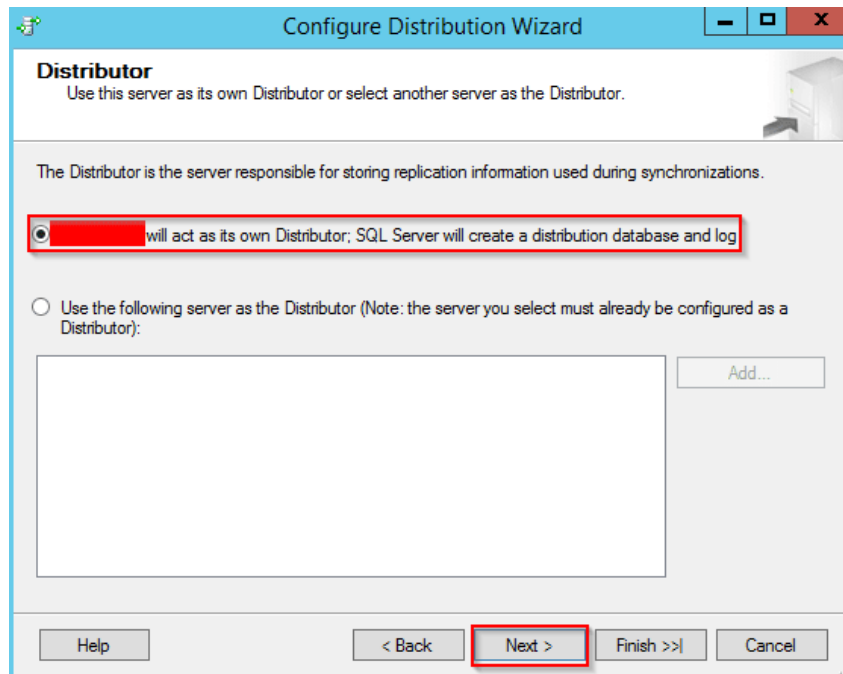
Step 1: Right click on Replication -> Configure Distributor -> Next



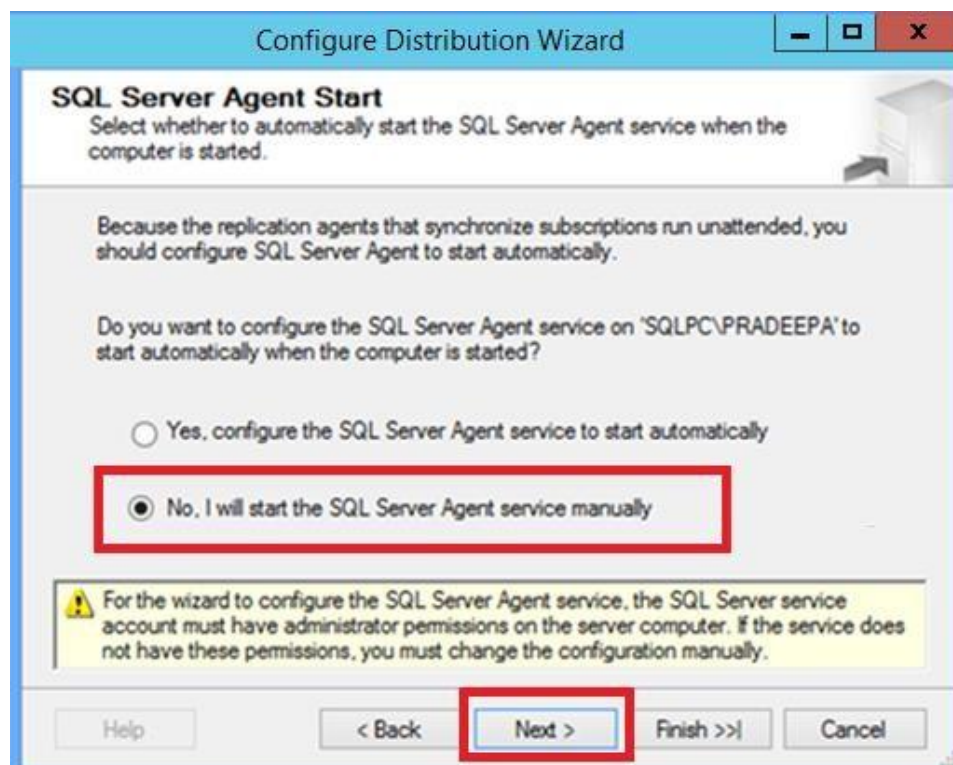
Step 2: The first page of the **Distribution Configuration Wizard** appears.



Step 3: To set up the current instance to be a Distributor or select another instance that's already been configured as a Distributor. In this case, the distributor is local so leave the default setting. *“Server Name’ will act as its own Distributor; SQL Server will create a distribution database and log”* and Click **Next**.



Step 4: Choose No; I will start SQL Server Agent service manually -> Next



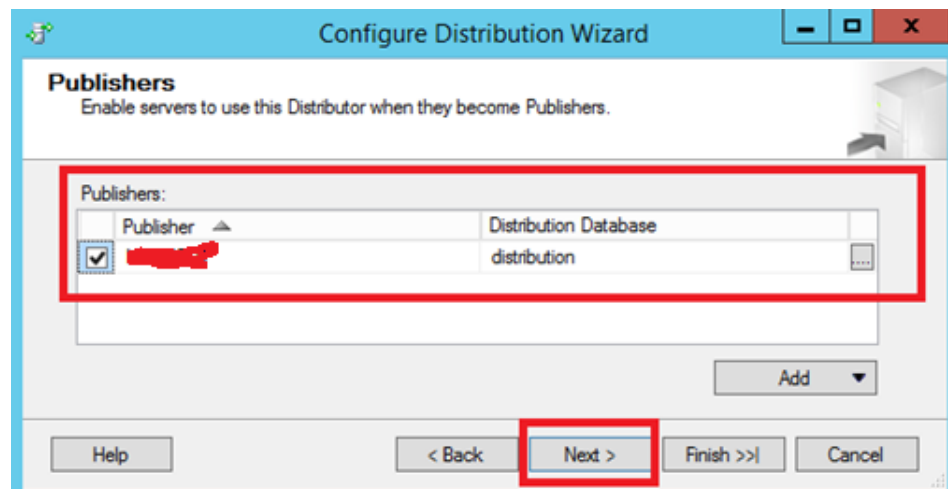
Step 5: Configure **Snapshot Folder**, type in the path of the SQL replication snapshot folder & **Next**

The screenshot shows the 'Configure Distribution Wizard' window, specifically the 'Snapshot Folder' step. The title bar reads 'Configure Distribution Wizard'. The main heading is 'Snapshot Folder' with the instruction 'Specify the root location where snapshots will be stored.' Below this, a note states: 'To allow Distribution and Merge Agents that run at Subscribers to access the snapshots of their publications, you must use a network path to refer to the snapshot folder.' A text box labeled 'Snapshot folder:' contains the path 'f:\Program Files\Microsoft SQL Server\MSSQL13.MSSQLSERVER\MSSQL\ReplData'. A yellow warning box below the text box says: 'This snapshot folder does not support pull subscriptions created at the Subscriber. It is not a network path or it is a drive letter mapped to a network path. To support both push and pull subscriptions, use a network path to refer to this folder.' At the bottom, there are buttons for 'Help', '< Back', 'Next >', 'Finish >>|', and 'Cancel'. The 'Next >' button is highlighted with a red rectangle.

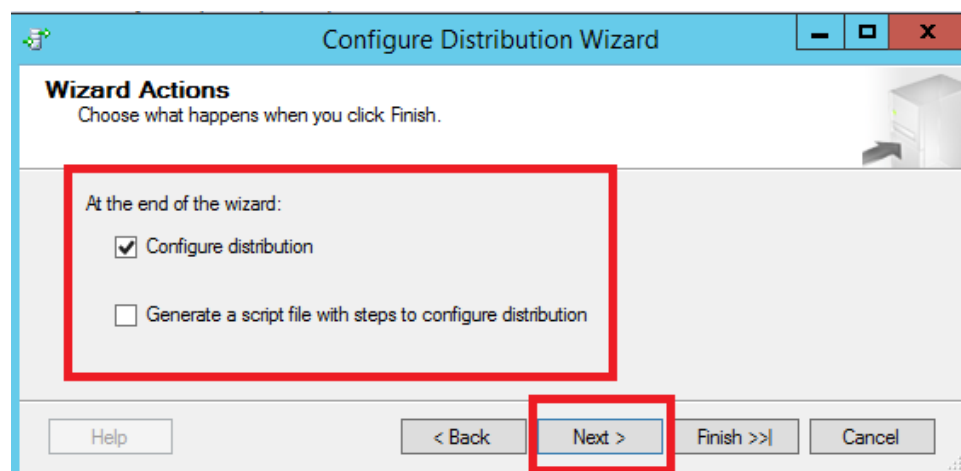
Step 6: Configure the SQL replication distribution database Specify the name of the Distributor Database, folder to store Distribution Database file and log file -> **Next**.

The screenshot shows the 'Configure Distribution Wizard' window, specifically the 'Distribution Database' step. The title bar reads 'Configure Distribution Wizard'. The main heading is 'Distribution Database' with the instruction 'Select the name and location of the distribution database and log files.' Below this, a note states: 'The distribution database stores changes to transactional publications until Subscribers can be updated. It also stores historical information for snapshot and merge publications.' Three text boxes are present: 'Distribution database name:' with the value 'distribution', 'Folder for the distribution database file:' with the path 'f:\Program Files\Microsoft SQL Server\MSSQL13.MSSQLSERVER\MSSQL\Data', and 'Folder for the distribution database log file:' with the path 'g:\Program Files\Microsoft SQL Server\MSSQL13.MSSQLSERVER\MSSQL\Data'. A note below the text boxes states: 'The paths must refer to disks that are local to the Distributor and begin with a local drive letter and colon (for example, C:). Mapped drive letters and network paths are invalid.' At the bottom, there are buttons for 'Help', '< Back', 'Next >', 'Finish >>|', and 'Cancel'. The 'Next >' button is highlighted with a red rectangle.

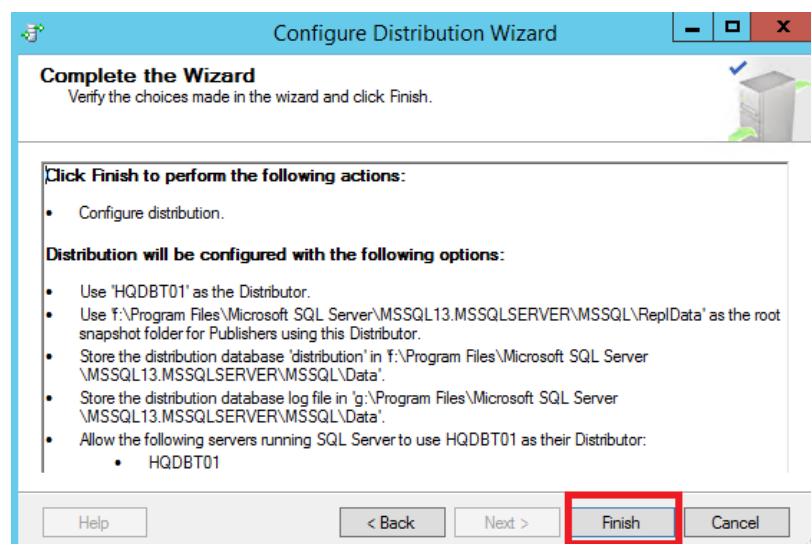
Step 7: In the **Publishers** page, specify the SQL replication Publishers that are going to access the Distributor and Click Next.



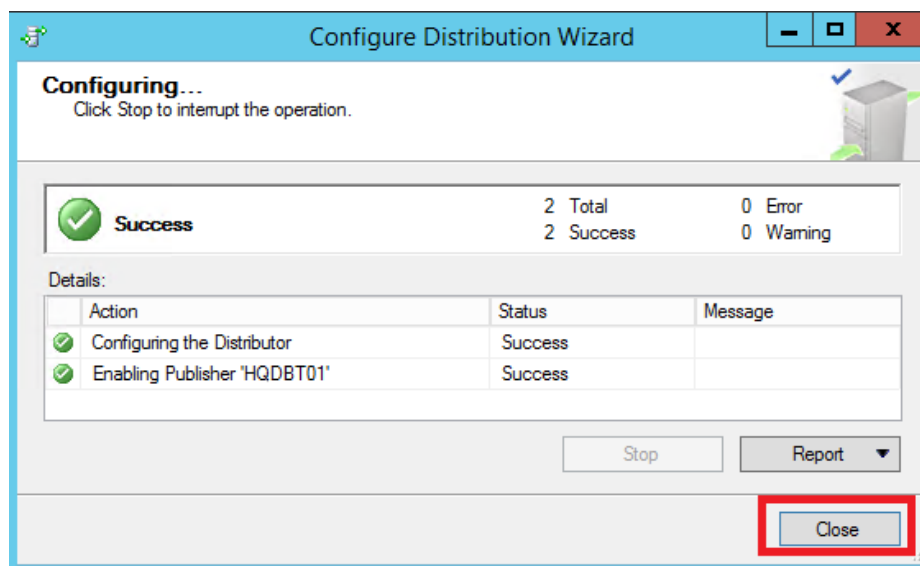
Step 8: In **Wizard Actions**, You've an option to run immediately or create a script that can be executed at a later time and Click **Next**.



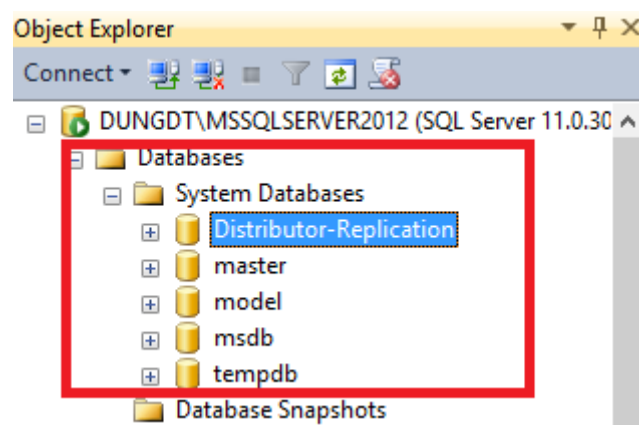
Step 9: Review the settings and configuration options, and then click **Finish** to enable the Distributor.



Step 10: Configuring... the following page appears and it shows the progress of the distributor setup.

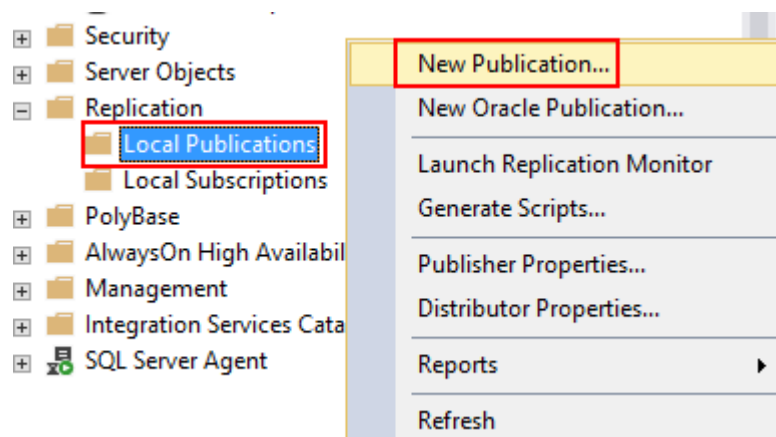


Now, you can see Distribution Database in the System Databases folder

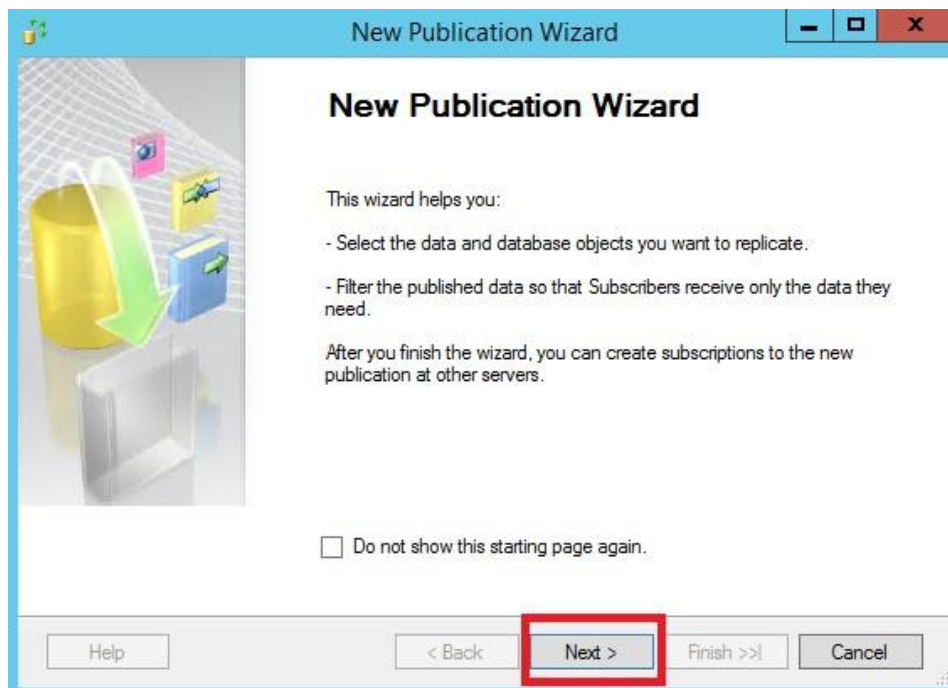


***** **Configure Publisher** *****

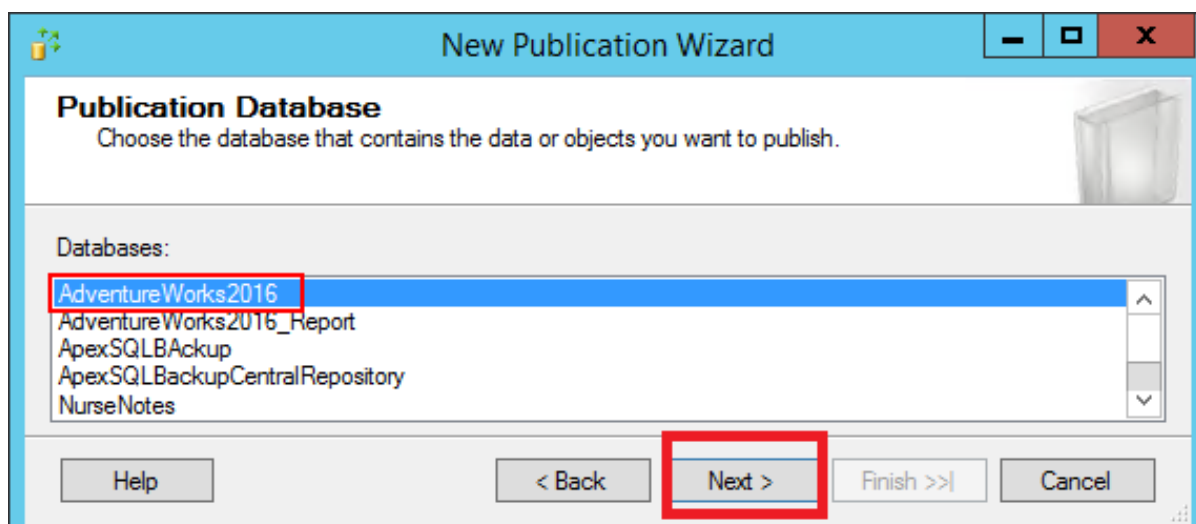
Step 11: Object Explorer, locate the **Replication** folder, right-click **Local Publication**, and then click **New Publication**.



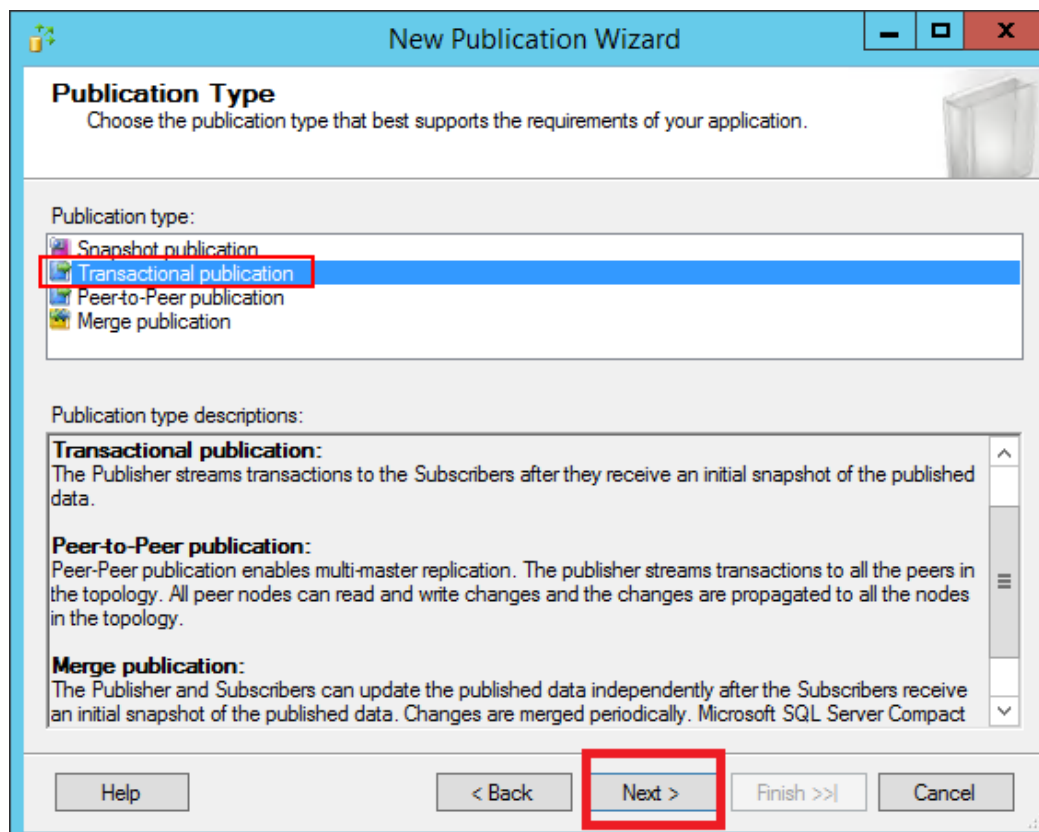
Step 12: The **New Publication Wizard** appears and outlines the general information about creating Publication and click **NEXT**.



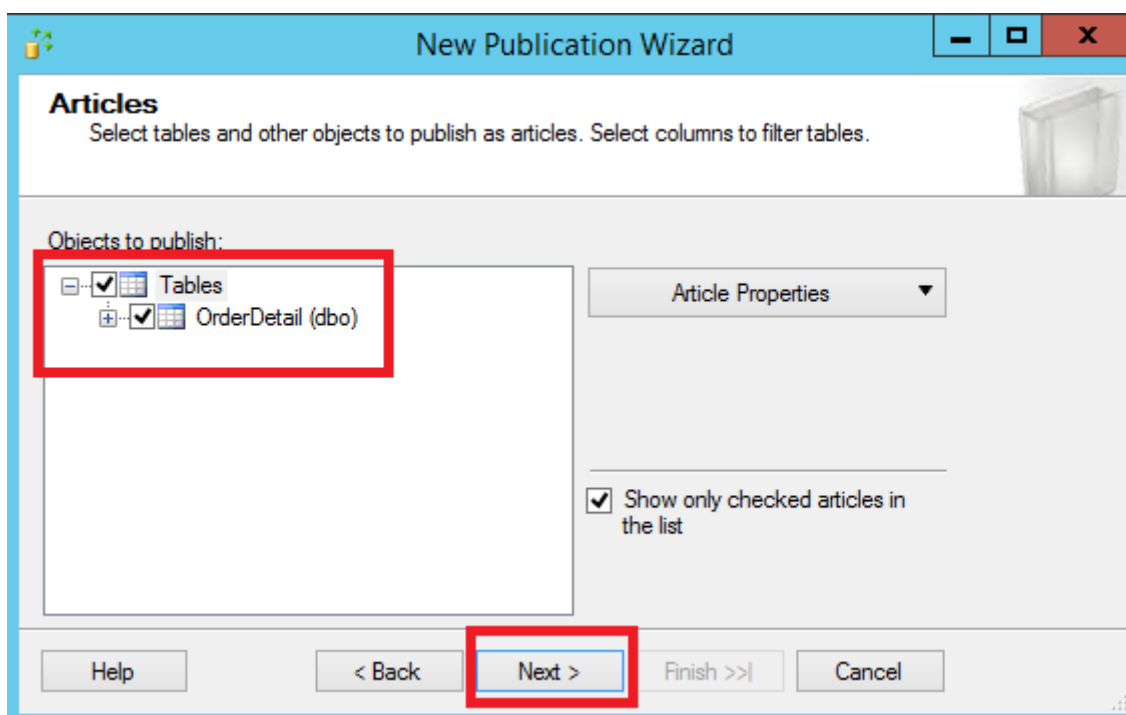
Step 13: In the **Publication Database** page, select the **database** you want to publish and click **Next**.



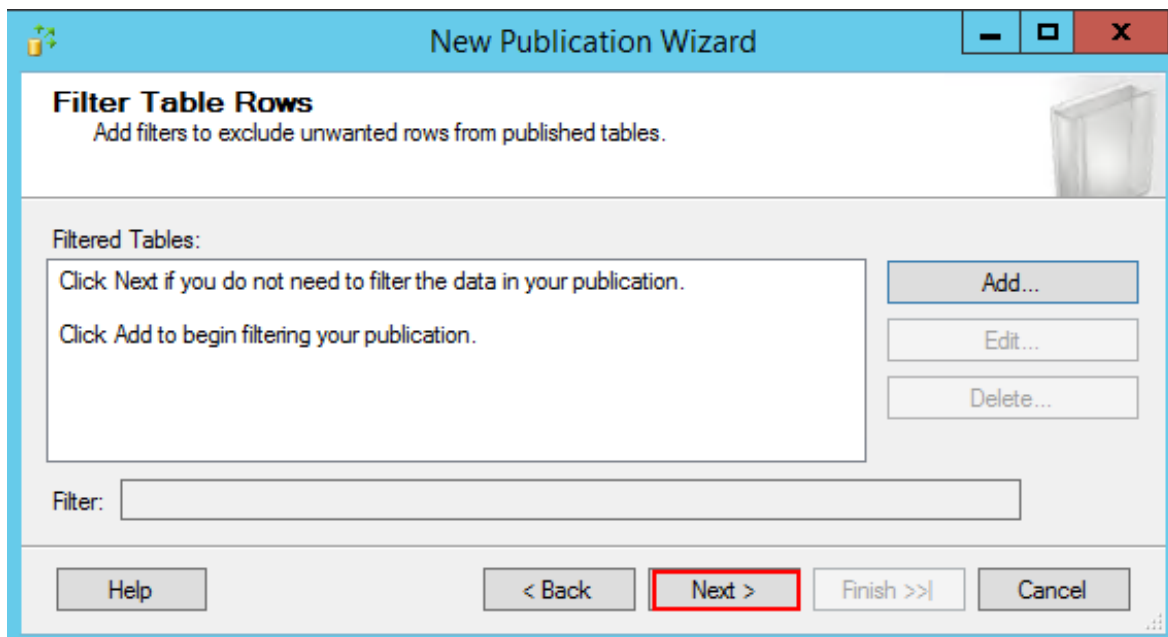
Step 14: On the **Publication Type** page, select **Transactional publication**, and click **Next**.



Step 15: Now, on the Articles page, choose the articles should be part of this publication. Sometimes, there is an error message if your tables do not have PRIMARY KEY.

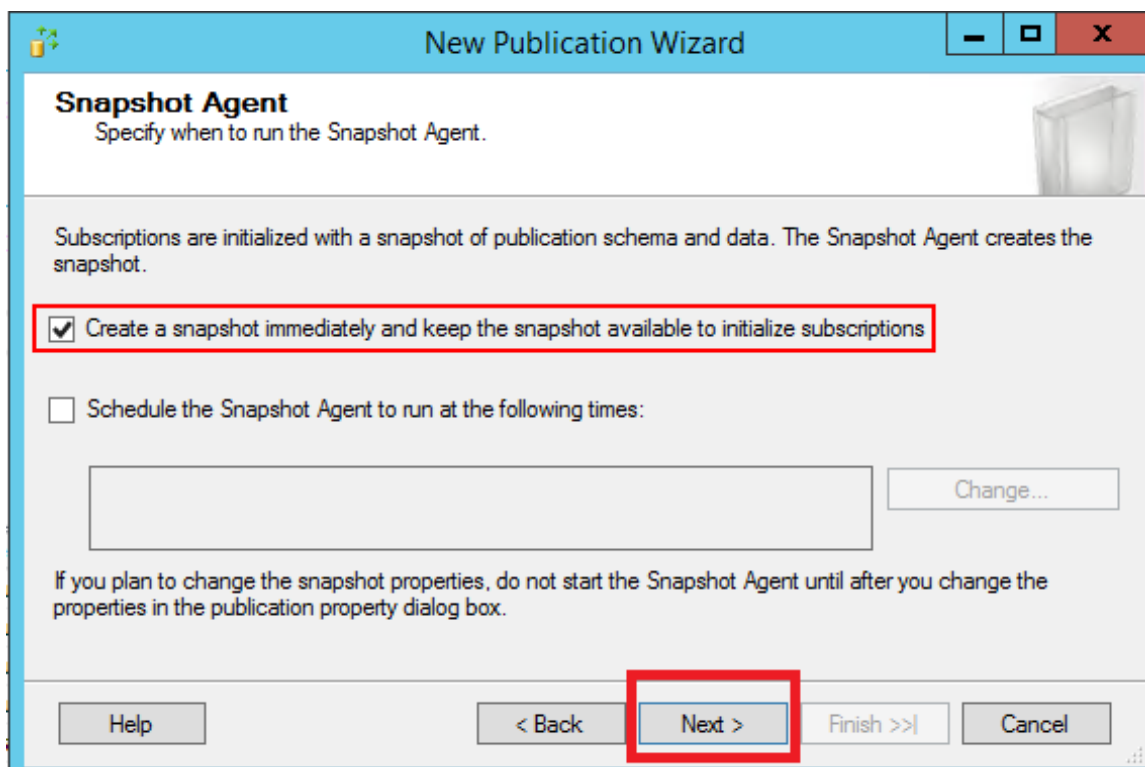


Step 16: In the **Filter Table Rows** page, define filters that should be applied to your articles. Let us go with the default values.



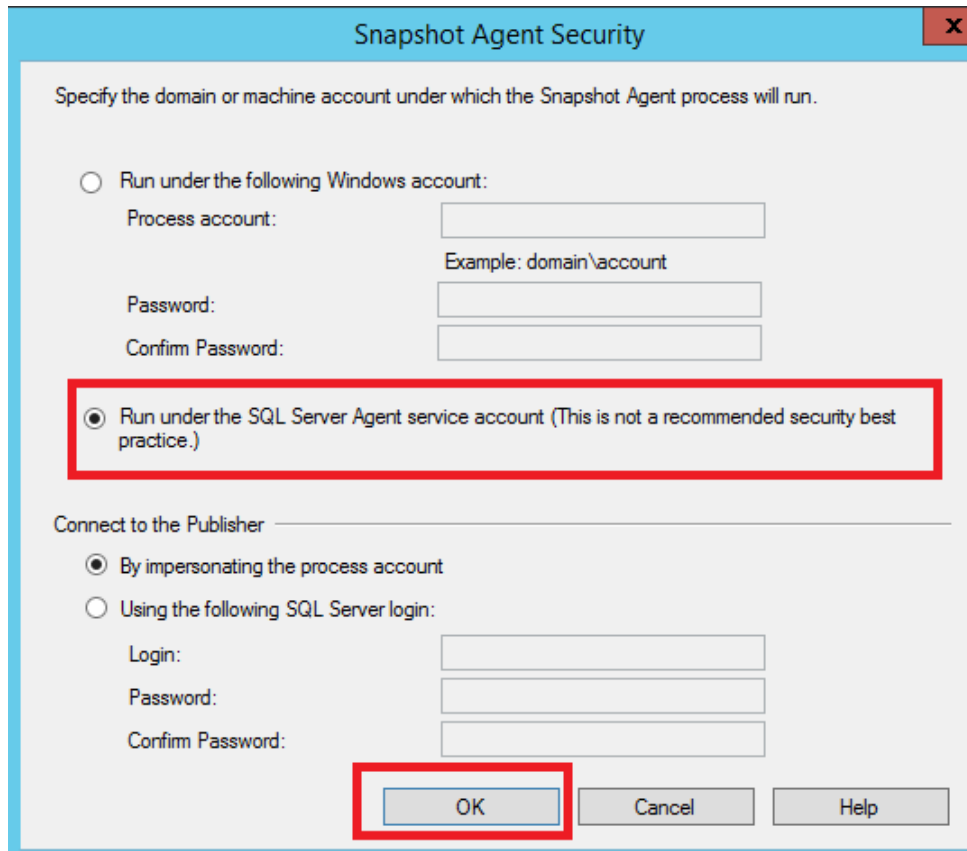
The screenshot shows the 'Filter Table Rows' page of the 'New Publication Wizard'. The title bar is blue with the text 'New Publication Wizard' and standard window controls. The page header is 'Filter Table Rows' with a subtitle 'Add filters to exclude unwanted rows from published tables.' Below this, there is a section 'Filtered Tables:' with a text box containing instructions: 'Click Next if you do not need to filter the data in your publication.' and 'Click Add to begin filtering your publication.' To the right of this text box are three buttons: 'Add...', 'Edit...', and 'Delete...'. Below the text box is a 'Filter:' label followed by an empty text input field. At the bottom of the window are five buttons: 'Help', '< Back', 'Next >' (highlighted with a red rectangle), 'Finish >>|', and 'Cancel'.

Step 17: In the **Snapshot Agent** page specify when to run the Snapshot Agent. It can be run immediately or it can schedule to run at a later time. In this case, **Create a snapshot** immediately is used.

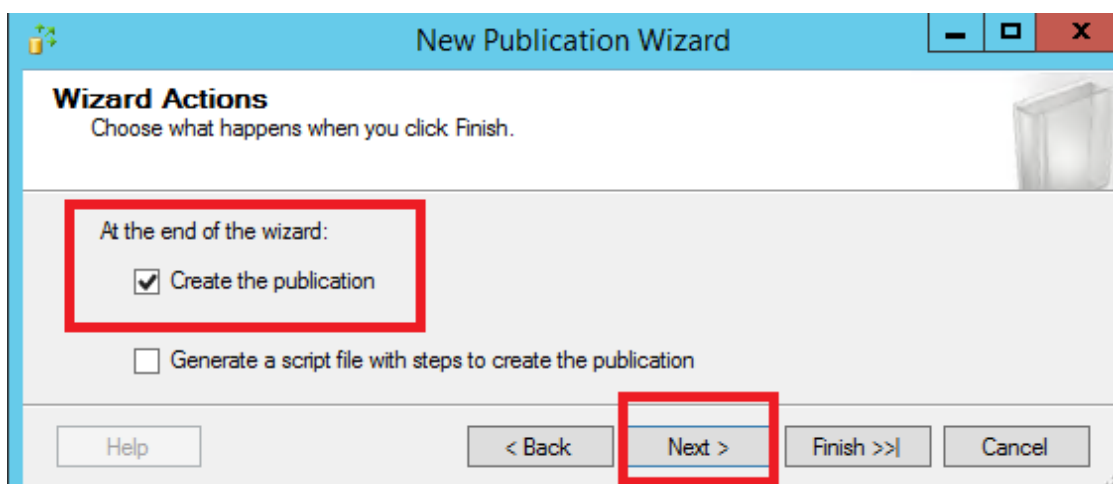


The screenshot shows the 'Snapshot Agent' page of the 'New Publication Wizard'. The title bar is blue with the text 'New Publication Wizard' and standard window controls. The page header is 'Snapshot Agent' with a subtitle 'Specify when to run the Snapshot Agent.' Below this, there is a text box containing information: 'Subscriptions are initialized with a snapshot of publication schema and data. The Snapshot Agent creates the snapshot.' Below the text box are two options: a checked checkbox labeled 'Create a snapshot immediately and keep the snapshot available to initialize subscriptions' (highlighted with a red rectangle) and an unchecked checkbox labeled 'Schedule the Snapshot Agent to run at the following times:'. Below the second checkbox is a text input field and a 'Change...' button. At the bottom of the window are five buttons: 'Help', '< Back', 'Next >' (highlighted with a red rectangle), 'Finish >>|', and 'Cancel'. A note at the bottom states: 'If you plan to change the snapshot properties, do not start the Snapshot Agent until after you change the properties in the publication property dialog box.'

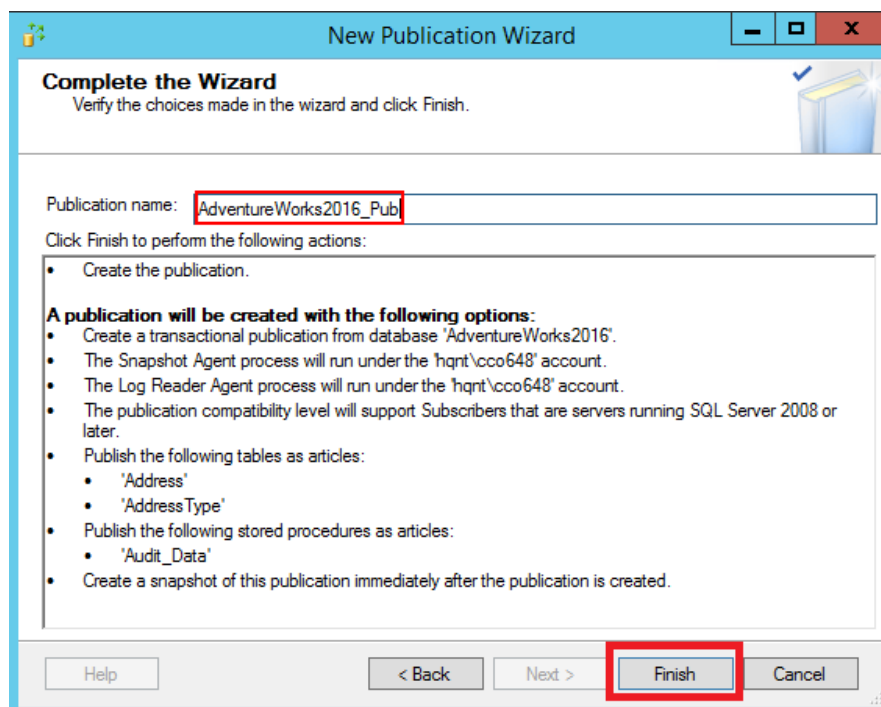
Step 18: In the **Agent Security** page, specify the account to use to run the Snapshot Agent using **Security settings...** and click **OK**.



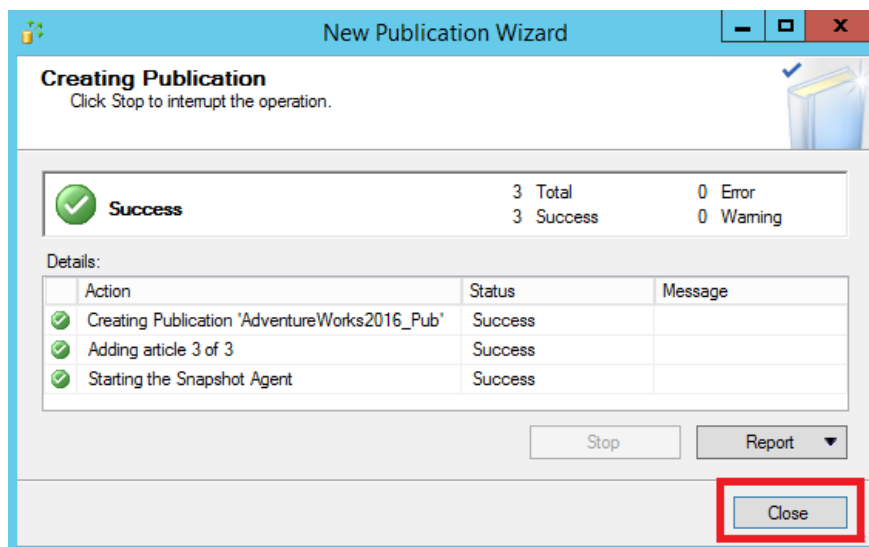
Step 19: In the complete **Wizard Actions** page, you've two options. You can create the Publication immediately or save the configuration in the script file to run at a later time.



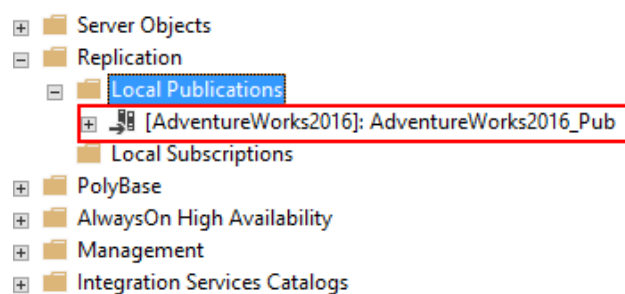
Step 20: Type in the publication name and Click **Finish**.



Step 21: In the **Creating Publication** page, you'll find information about the wizard's progress as it works through each step of the process.

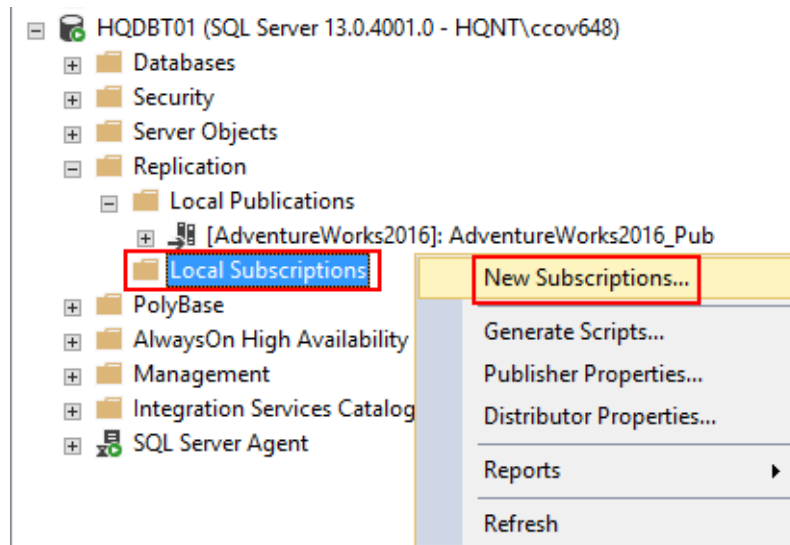


Now, you can see that Publication is created under the local publication folder



***** **Configure Subscriber** *****

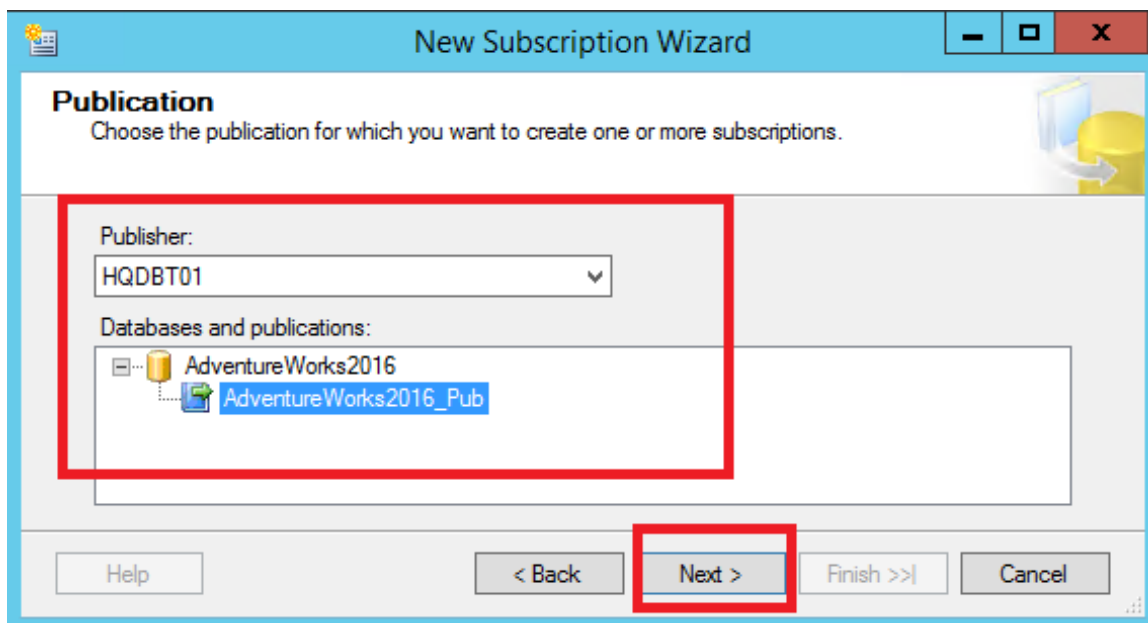
Step 21: Expand the Replication folder, right-click Local Subscriptions, and then click New Subscriptions.



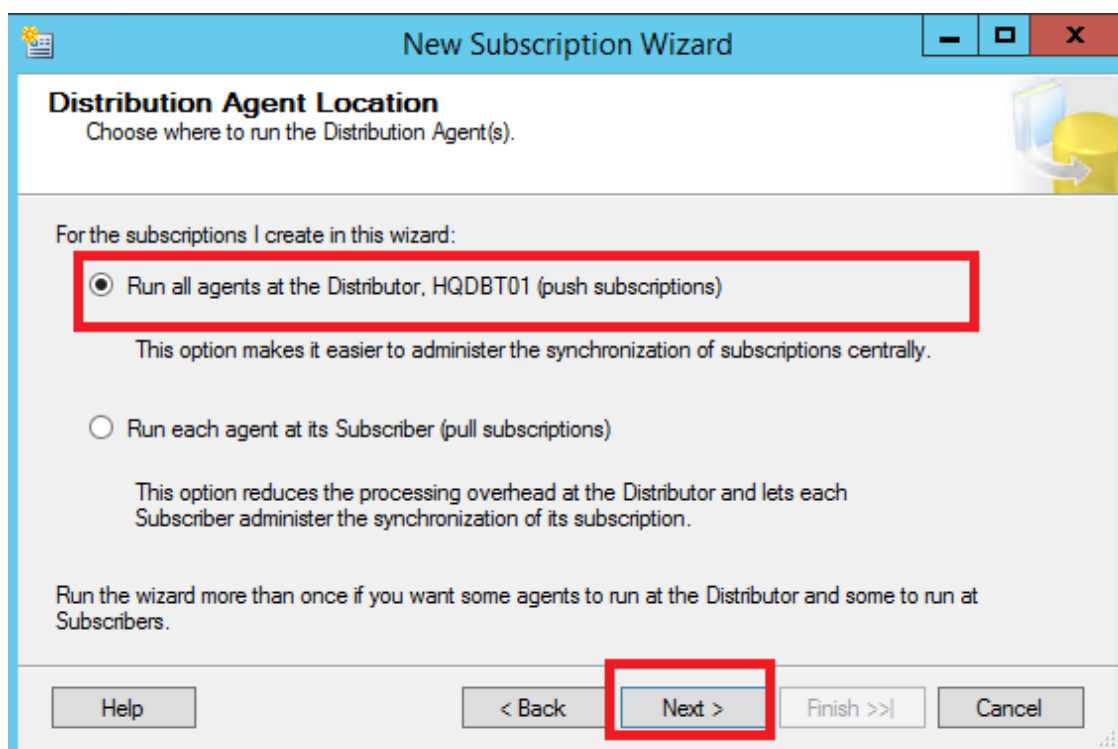
Step 22: The New Subscription Wizard appears outlines the general information about the wizard.



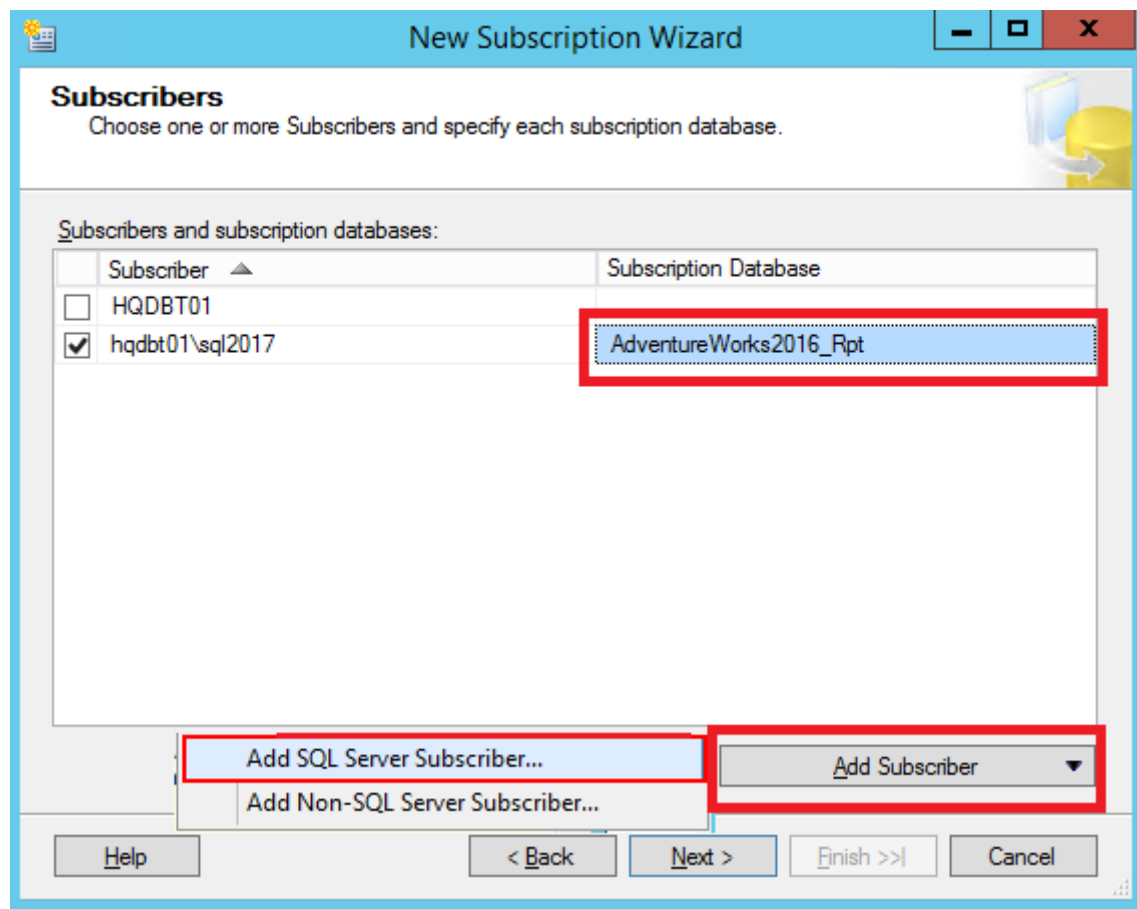
Step 23: On the **Publication** page, select Publication and then click **Next**.



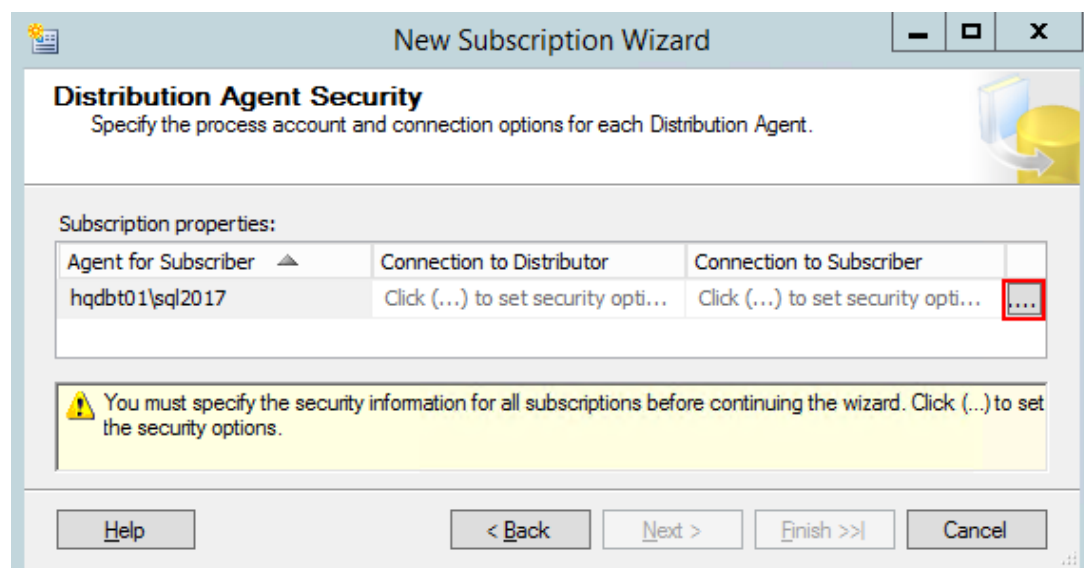
Step 24: On the Distribution Agent location page, select “Run all agents at the Distributor” and Click **Next**.



Step 25: On the **Subscribers** page, select **Add Subscriber**, and then select Add SQL Server Subscriber from the drop-down. This step opens the Connect to Server dialog box. Enter the subscriber instance name and then select Connect.



Step 26: On the **Distribution Agent Security** page, select the ellipsis (...) button. Type in the process account details and Click Ok.



Specify the domain or machines account under which the distribution agent process will run and click ok. Distribution Agent Security -> Choose to use SQL Server Agent service account

Distribution Agent Security

Specify the domain or machine account under which the Distribution Agent process will run when synchronizing this subscription.

☐ Run under the following Windows account:
 Process account:
 Example: domain\account
 Password:
 Confirm Password:

☒ Run under the SQL Server Agent service account. (This is not a recommended security best practice.)

Connect to the Distributor
☒ By impersonating the process account
☐ Using a SQL Server login
 The connection to the server on which the agent runs must impersonate the process account. The process account must be a member of the Publication Access List.

Connect to the Subscriber
☒ By impersonating the process account
☐ Using the following SQL Server login:
 Login:
 Password:
 Confirm password:
 The login used to connect to the Subscriber must be a database owner of the subscription database.

OK Cancel Help

Step 27: Synchronization Schedule. You can schedule to synchronize data using

- Run continuously: run synchronization immediately
- Run on demand only: only run if required
- Define a specific schedule: Schedule the agent and click next

New Subscription Wizard

Synchronization Schedule
Specify the synchronization schedule for each agent.

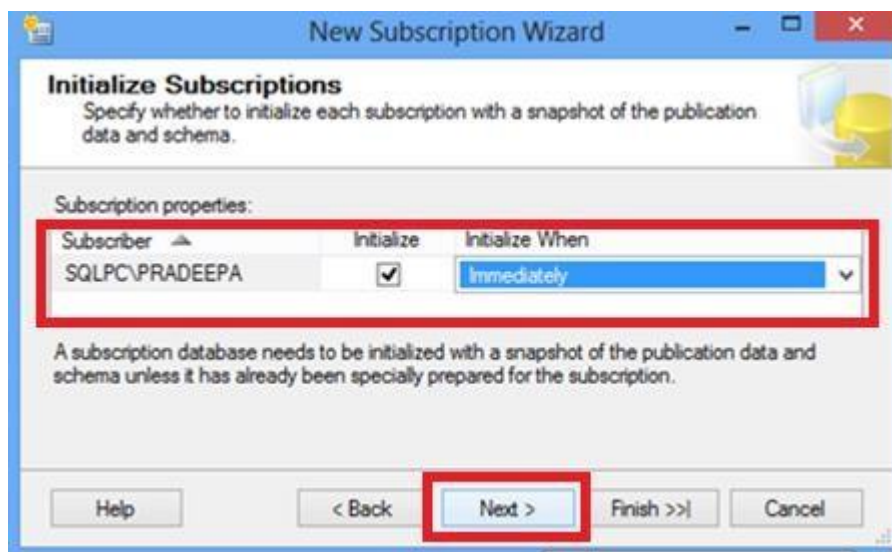
Subscribers and subscription databases:

Subscriber	Agent Location	Agent Schedule
DUNGD\SERVER2008R2	Distributor	Run continuously

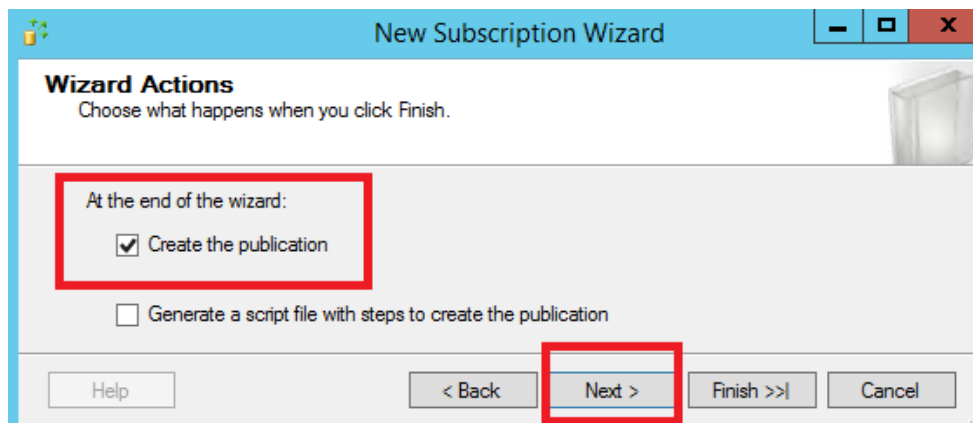
Add Subscriber

Help < Back **Next >** Finish >> Cancel

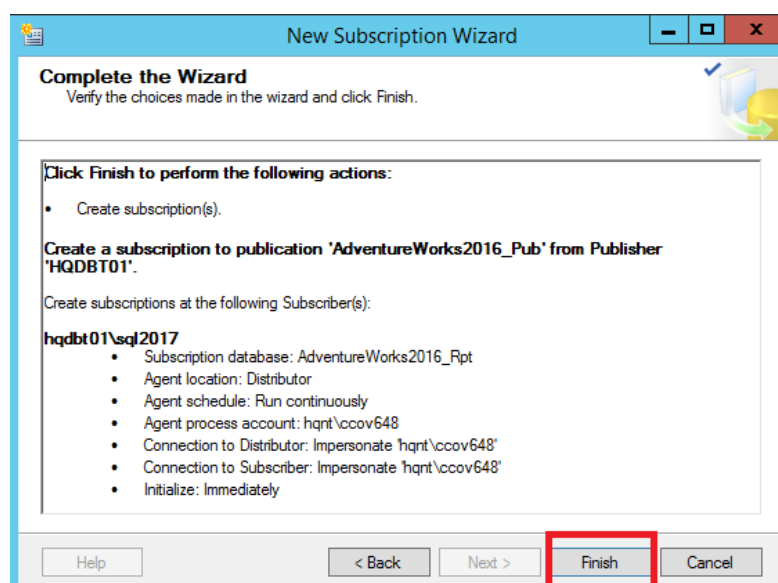
Step 28: Initialize the subscription as immediately and click next



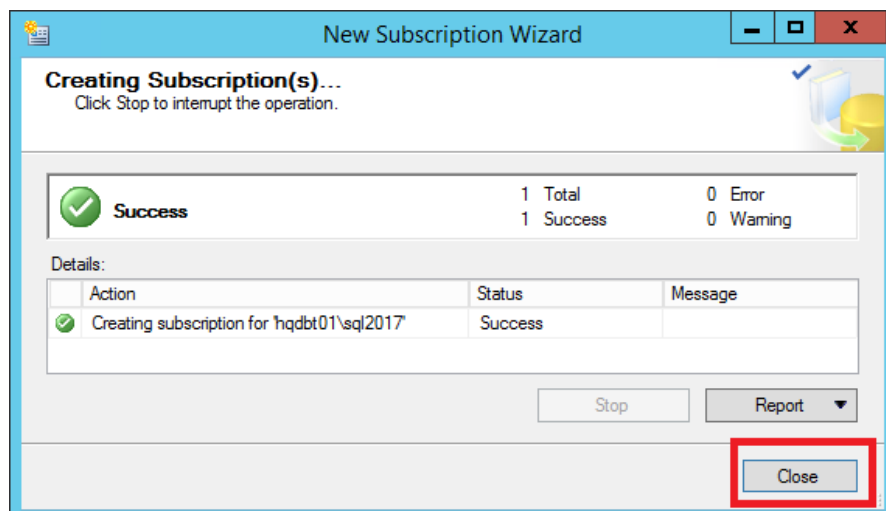
Step 29: Checks create the subscription and click next



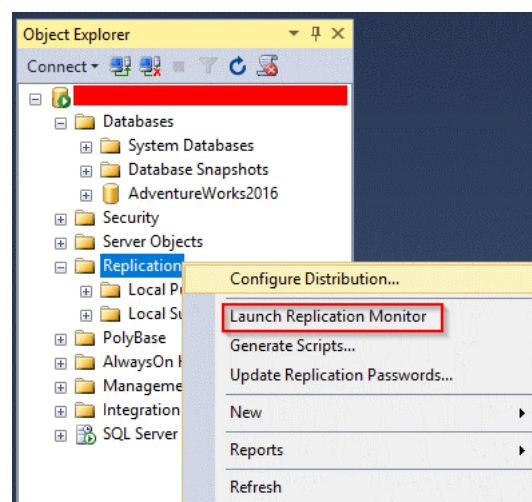
Step 30: On the complete the wizard page, you can see the detailed summary of the newly created subscription. Click **Finish**.



Step 31: In the Creating Subscription page should show that the process has been successful or not.



Step 32: Connect to the publisher in SQL Server Management Studio. In the Object explorer, right-click the Replication folder, and then select Launch Replication Monitor to verify the status of the newly created transactional replication setup.



Replication Monitor

