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AwashBank

Database Replication In SQL Server

By:
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Database Replication?

- **Database replication** is the frequent electronic copying data from a **database** in one computer to a **database** in another.
- And then synchronizing between databases to maintain consistency.
- The result is a distributed **database** in which users can access data relevant to their tasks without interfering with the work of others

Why Replication?

- Load Balancing
- Scalability
- Fault tolerance
- Reliability
- Fast response
- To allow sites work independently

Replication Scenarios

- Replication scenarios can be divided into two broad categories:
  - ✓ replicating data in a server to server environment(implemented using transactional replication, sometimes snapshot replication) and
  - ✓ Replicating data between server and clients(implemented using merge replication).

Methods of replication ?

- Microsoft SQL Server offers three types of replication

1. Snapshot replication
2. Transactional replication
3. Merge replication

1. Snapshot Replication?

- Snapshot replication is used when the following scenarios is true.
  - ✓ Data changes infrequently.
  - ✓ It is acceptable to have copies of data that are out of date with respect to the Publisher for a period of time
  - ✓ Replicating small volumes of data.
  - ✓ A large volume of changes occurs over a short period of time.

- Example: if a sales organization maintains a product price list and the prices are all updated at the same time once or twice each year, replicating the entire snapshot of data after it has changed is recommended.

2. Merge Replication?

- Merge replication is typically used in server-to-client environments.
- Merge replication is appropriate in any of the following situations:

  - ✓ A Multiple Subscribers might update the same data at various times and propagate those changes to the Publisher and to other Subscribers.
  - ✓ Subscribers need to receive data, make changes offline, and later synchronize changes with the Publisher and other Subscribers
  - ✓ Each Subscriber requires a different partition of data.

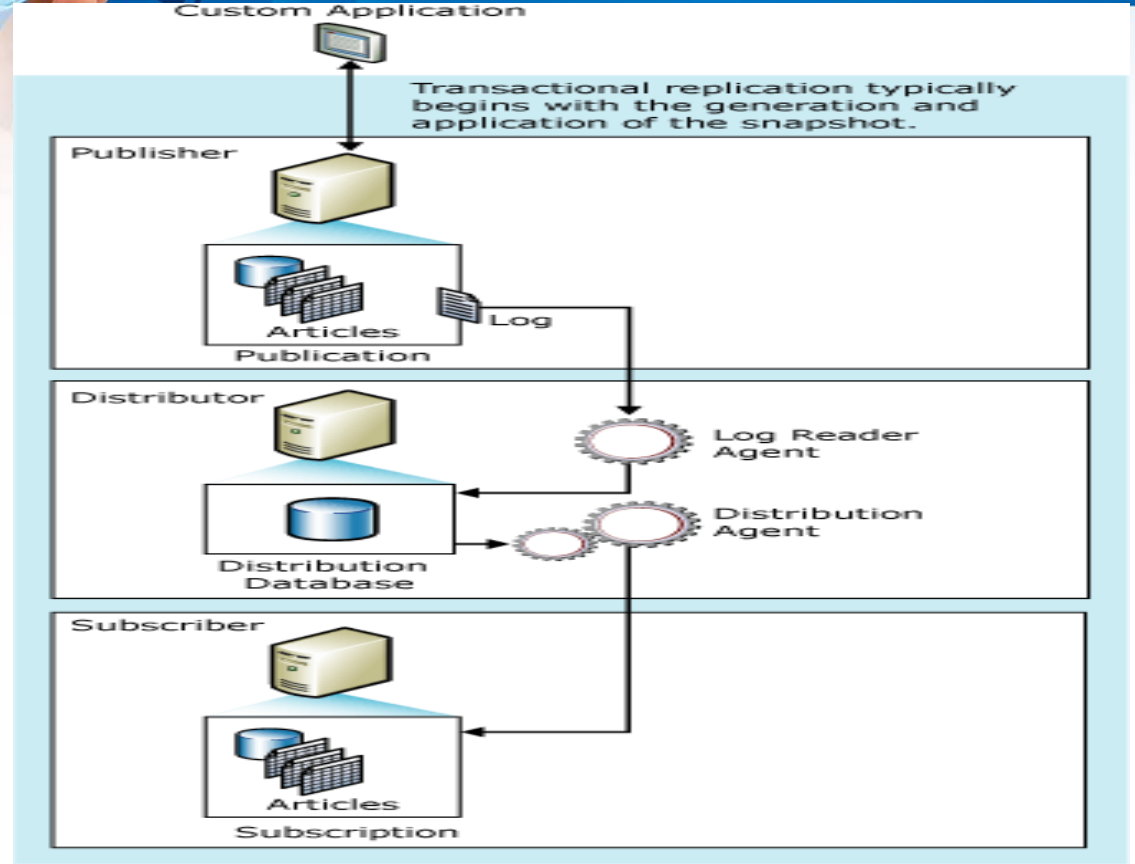
- **Example: Merge replication is commonly used by laptop and other mobile users who cannot be constantly connected to the publisher, but still need to carry around a copy of the database that they can make changes to.**

3. Transactional Replication?

- Transactional replication is typically used in server-to-server environments and is appropriate in each of the following cases.
  - ✓ You want incremental changes to be propagated to Subscribers as they occur.
  - ✓ The application requires access to intermediate data states
  - ✓ The Publisher has a very high volume of insert, update, and delete activity.
  - ✓ The Publisher or Subscriber is a non-SQL Server database, such as Oracle.

- Example: So to the best of our knowledge we have selected the transactional replication because incremental changes on the transaction must be propagated to the subscribers simultaneously in order keep consistency among bank data's.

How Transactional Replication Works in SQL Server ?



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1. Distributer The Distributor is a database instance that acts as a store for replication specific data associated with one or more Publishers.

2. Publisher: maintains the original copy of the data or where the replication originates.

3. Articles An **article** can be a **database** object, such as a table or a stored procedure, or a selection of table columns and rows

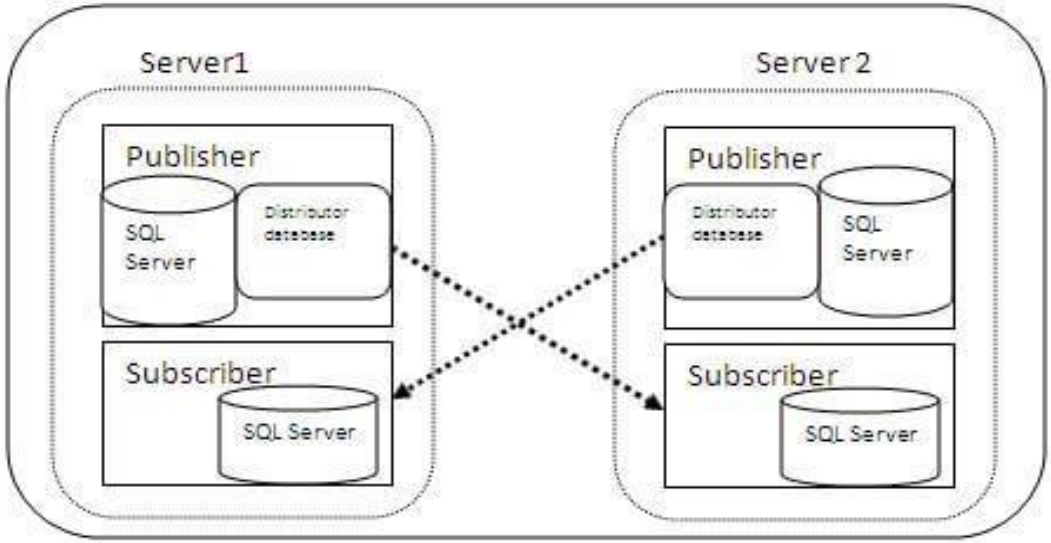
4. Subscriber receives the articles from a publisher. It can subscribe to one or more publication

Prerequisites for Transactional Replication

- **Primary Key:** This is a basic rule that every article should have a Primary Key to be a candidate table for Transactional Replication.
- **Securing Snapshot folder**
- **Network Bandwidth**
- **Enough disk space for database being published**

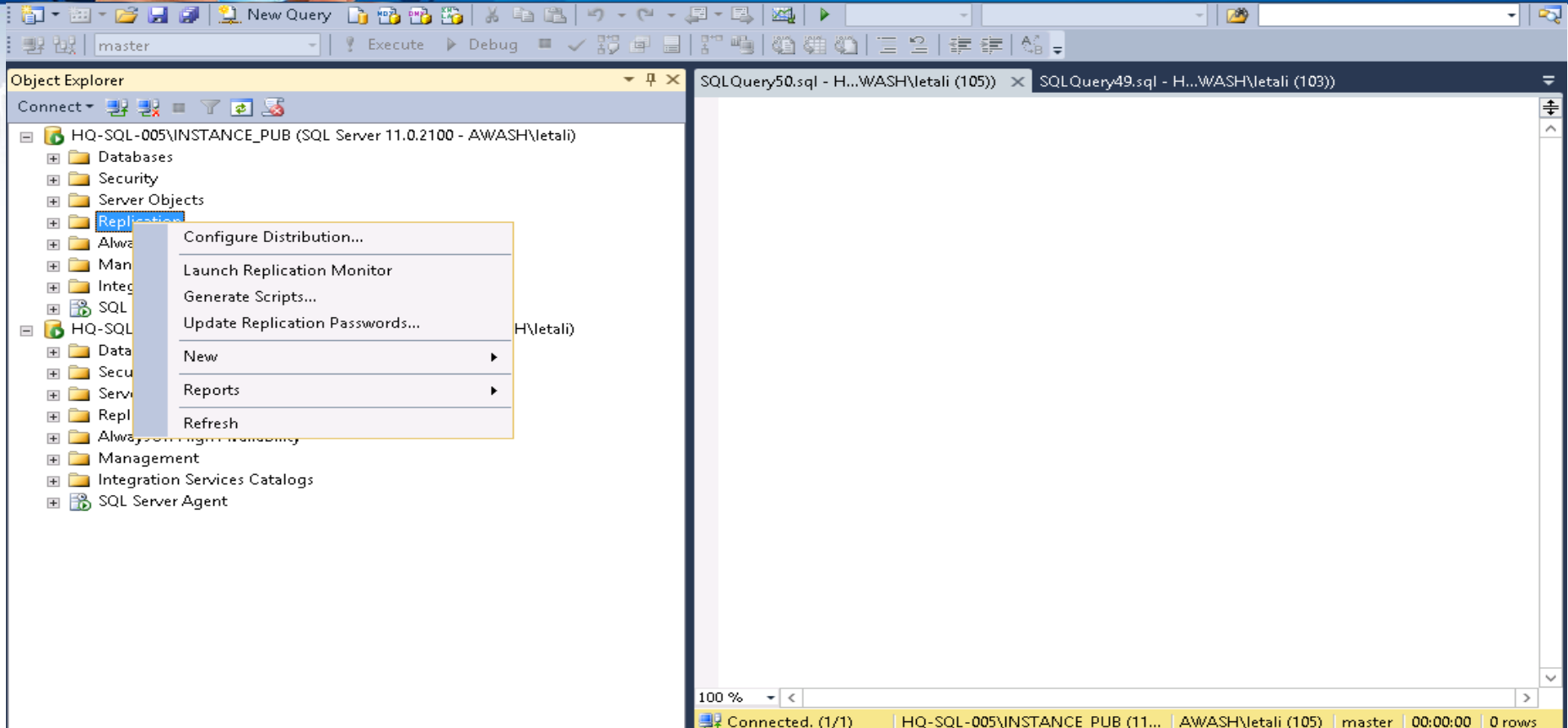
Peer-to-Peer Transactional Replication

- P2P replication is built on transactional replication.
- It maintains transactional replication between servers and allows publishers and subscribers to send data to each other



How to configure P2P transactional replication In SQL Management Studio 2012?

1. Configuring Distributor



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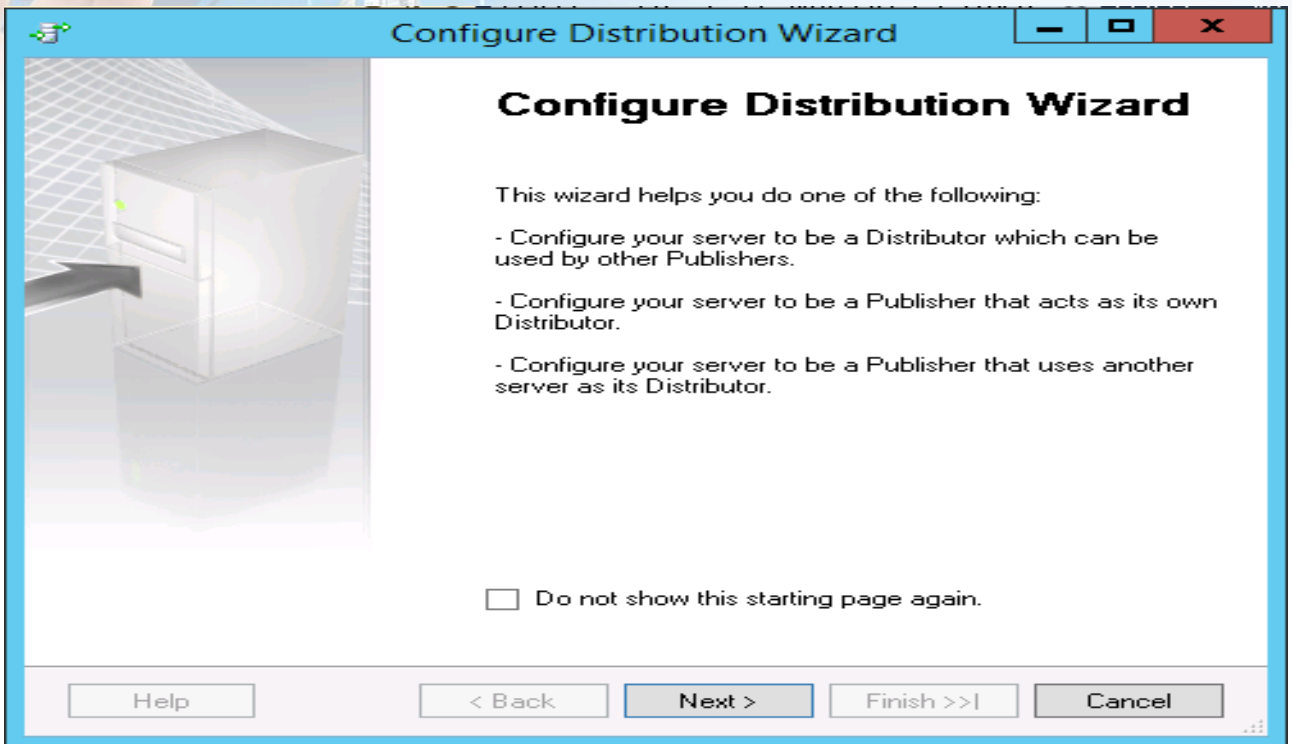
Configure Distribution Wizard
Configure Distribution Wizard
This wizard helps you do one of the following:
- Configure your server to be a Distributor which can be used by other Publishers.
- Configure your server to be a Publisher that acts as its own Distributor.
- Configure your server to be a Publisher that uses another server as its Distributor.
Do not show this starting page again.
Help
< Back
Next >
Finish >>|
Cancel

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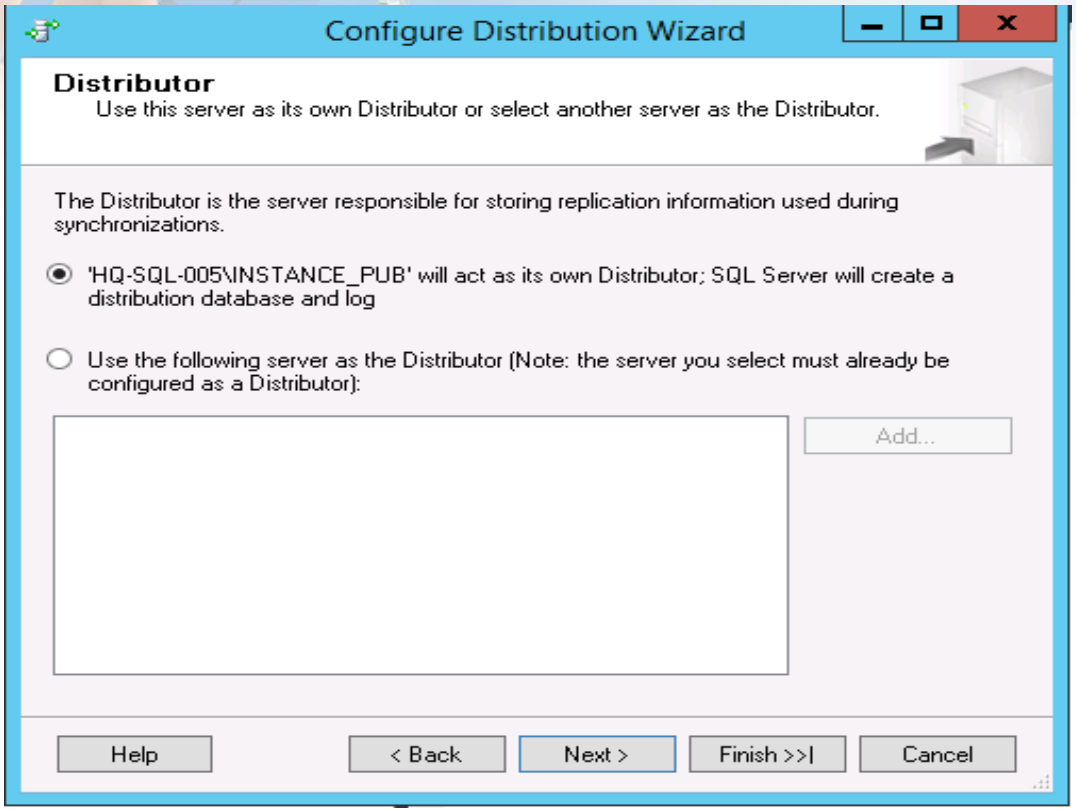
Configure Distribution Wizard
Distributor
Use this server as its own Distributor or select another server as the Distributor.
The Distributor is the server responsible for storing replication information used during synchronizations.
'HQ-SQL-005\INSTANCE_PUB' will act as its own Distributor; SQL Server will create a distribution database and log
Use the following server as the Distributor (Note: the server you select must already be configured as a Distributor):
Add...
Help
< Back
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Finish >>|
Cancel

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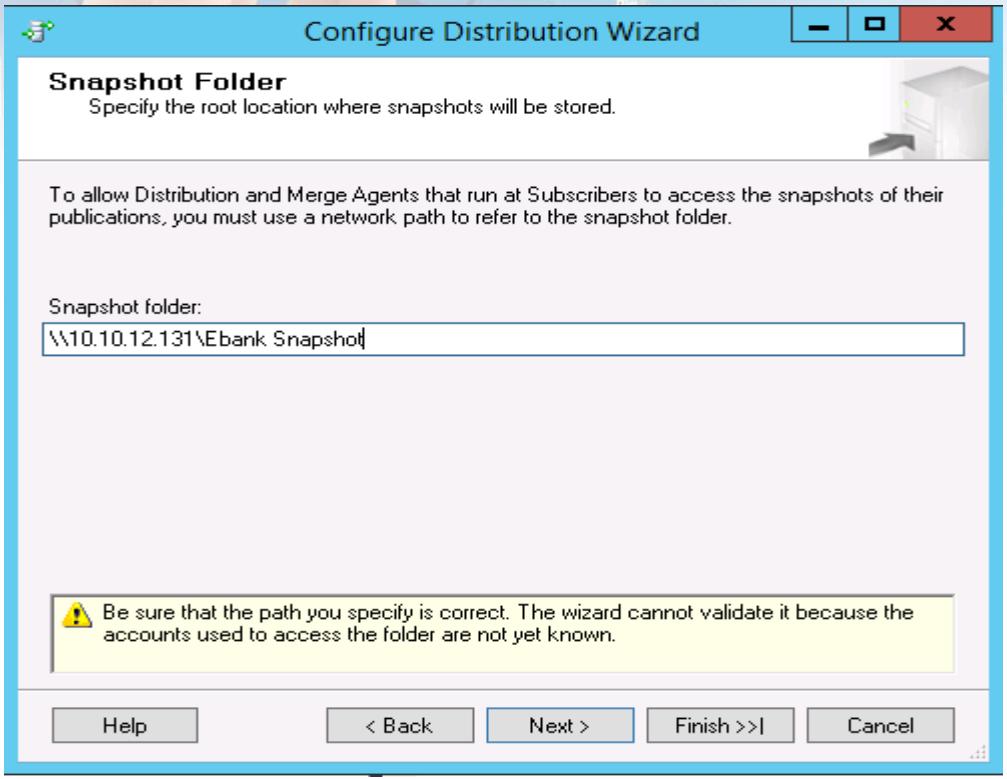
Configure Distribution Wizard
Snapshot Folder
Specify the root location where snapshots will be stored.
To allow Distribution and Merge Agents that run at Subscribers to access the snapshots of their publications, you must use a network path to refer to the snapshot folder.
Snapshot folder:
\\10.10.12.131\Ebank Snapshot
Be sure that the path you specify is correct. The wizard cannot validate it because the accounts used to access the folder are not yet known.
Help
< Back
Next >
Finish >>|
Cancel

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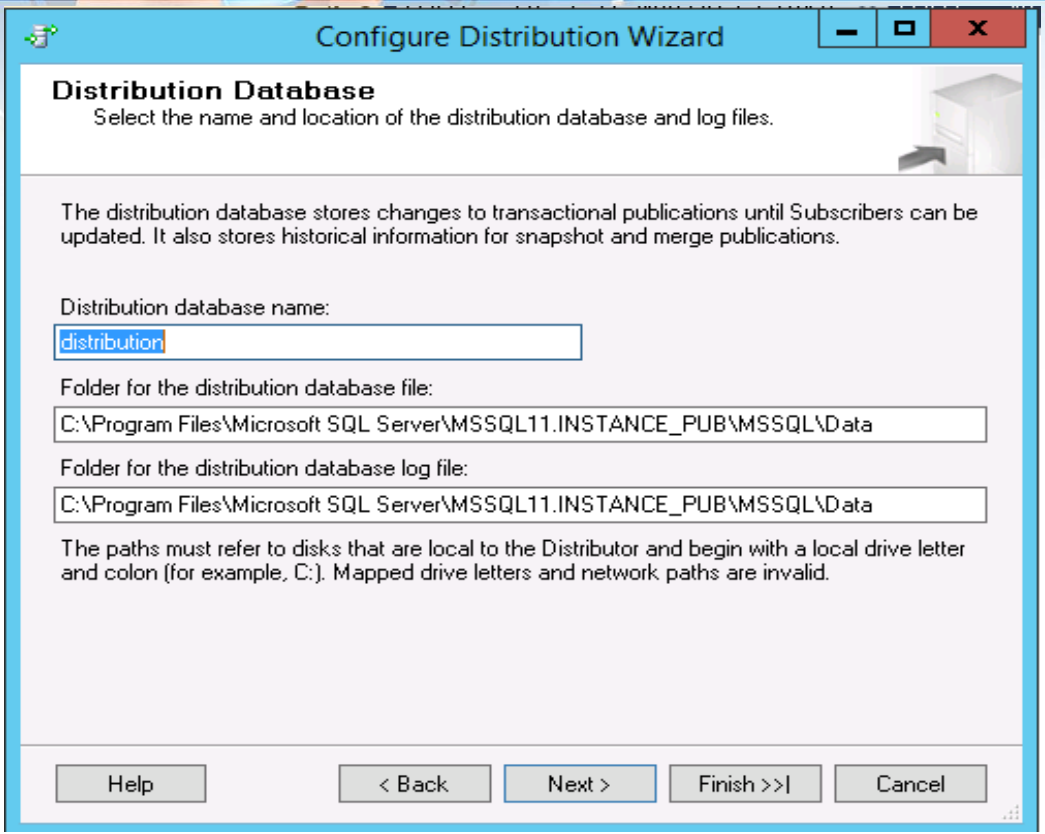
Configure Distribution Wizard
Distribution Database
Select the name and location of the distribution database and log files.
The distribution database stores changes to transactional publications until Subscribers can be updated. It also stores historical information for snapshot and merge publications.
Distribution database name:
distribution
Folder for the distribution database file:
C:\Program Files\Microsoft SQL Server\MSSQL11.INSTANCE_PUB\MSSQL\Data
Folder for the distribution database log file:
C:\Program Files\Microsoft SQL Server\MSSQL11.INSTANCE_PUB\MSSQL\Data
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.
Help
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Next >
Finish >>|
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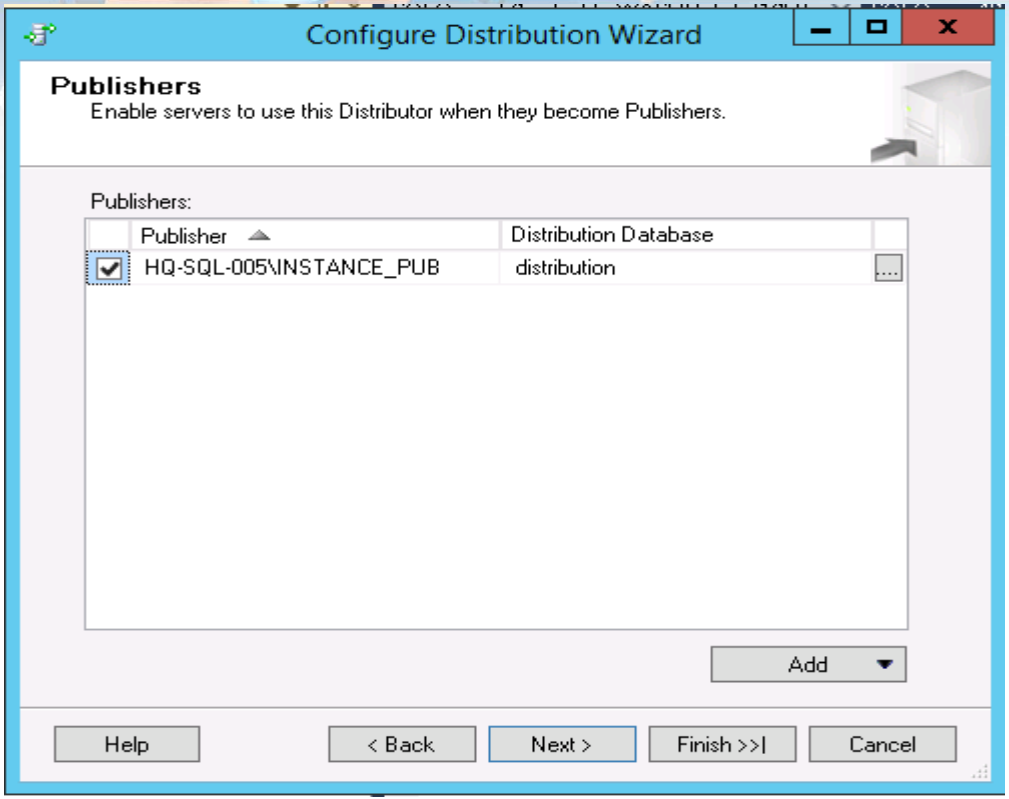
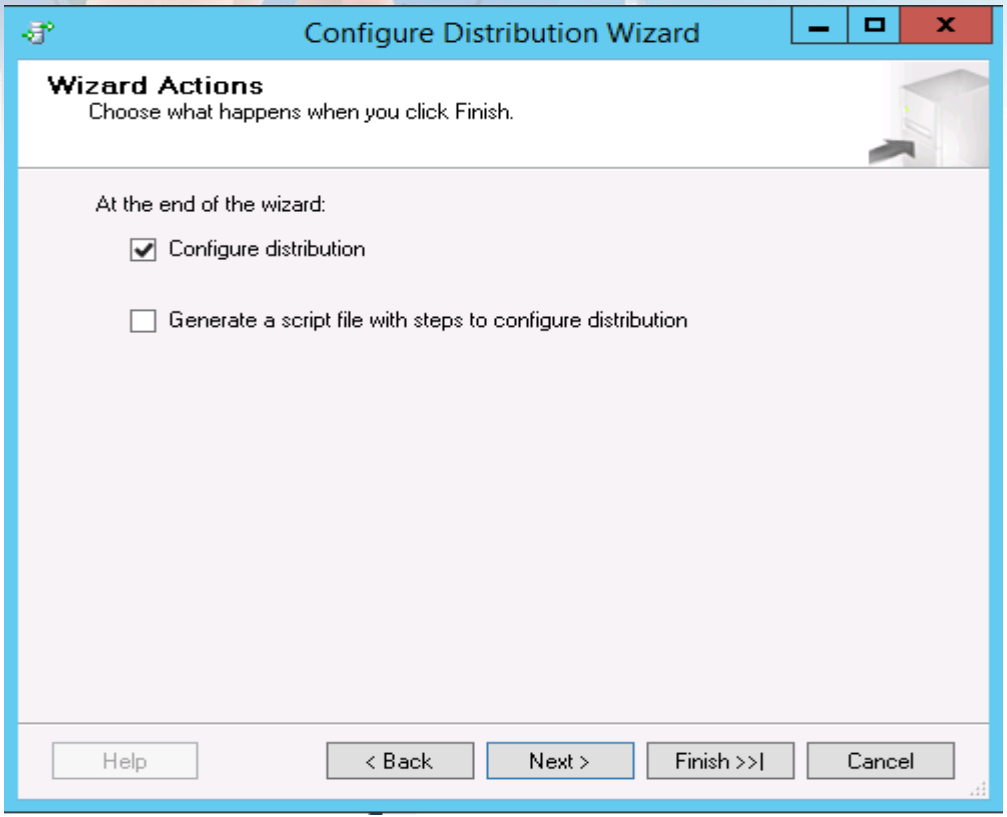
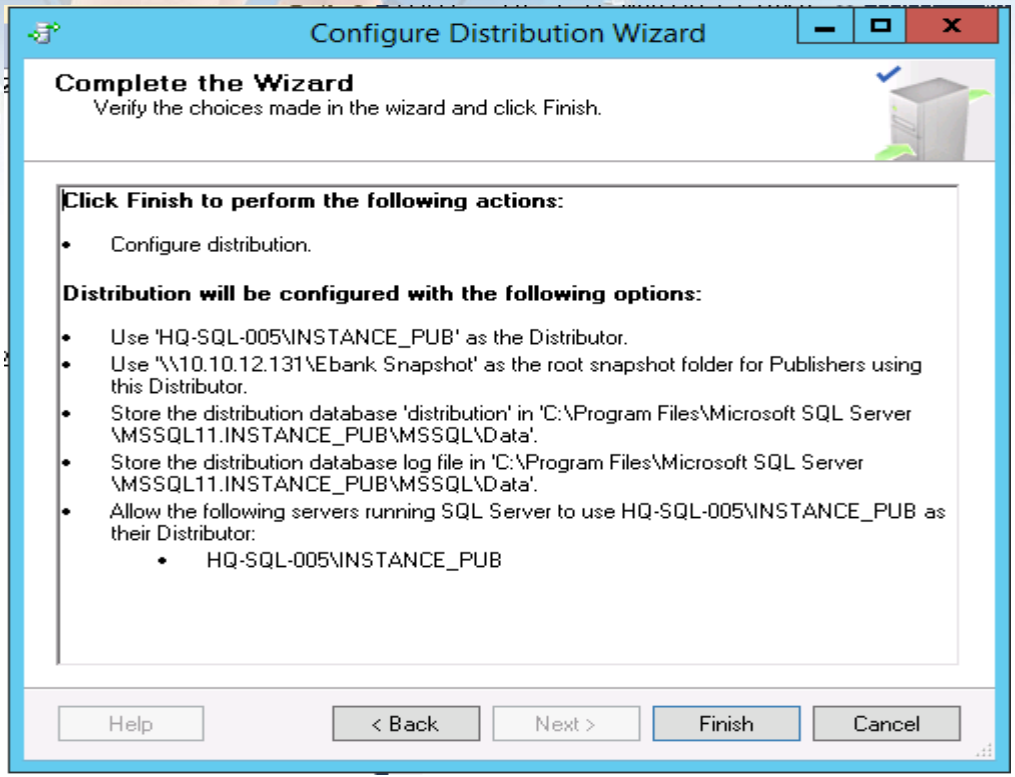

Configure Distribution Wizard
Publishers
Enable servers to use this Distributor when they become Publishers.
Publishers:
Publisher
Distribution Database
HQ-SQL-005\INSTANCE_PUB
distribution
Add
Help
< Back
Next >
Finish >>|
Cancel

Cont..d


Configure Distribution Wizard
Wizard Actions
Choose what happens when you click Finish.
At the end of the wizard:
Configure distribution
Generate a script file with steps to configure distribution
Help
< Back
Next >
Finish >>|
Cancel

Cont..d


Configure Distribution Wizard
Complete the Wizard
Verify the choices made in the wizard and click Finish.
Click Finish to perform the following actions:
Configure distribution.
Distribution will be configured with the following options:
Use 'HQ-SQL-005\INSTANCE_PUB' as the Distributor.
Use '\\10.10.12.131\Ebank Snapshot' as the root snapshot folder for Publishers using this Distributor.
Store the distribution database 'distribution' in 'C:\Program Files\Microsoft SQL Server \MSSQL11.INSTANCE_PUB\MSSQL\Data'.
Store the distribution database log file in 'C:\Program Files\Microsoft SQL Server \MSSQL11.INSTANCE_PUB\MSSQL\Data'.
Allow the following servers running SQL Server to use HQ-SQL-005\INSTANCE_PUB as their Distributor:
HQ-SQL-005\INSTANCE_PUB
Help
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Finish
Cancel

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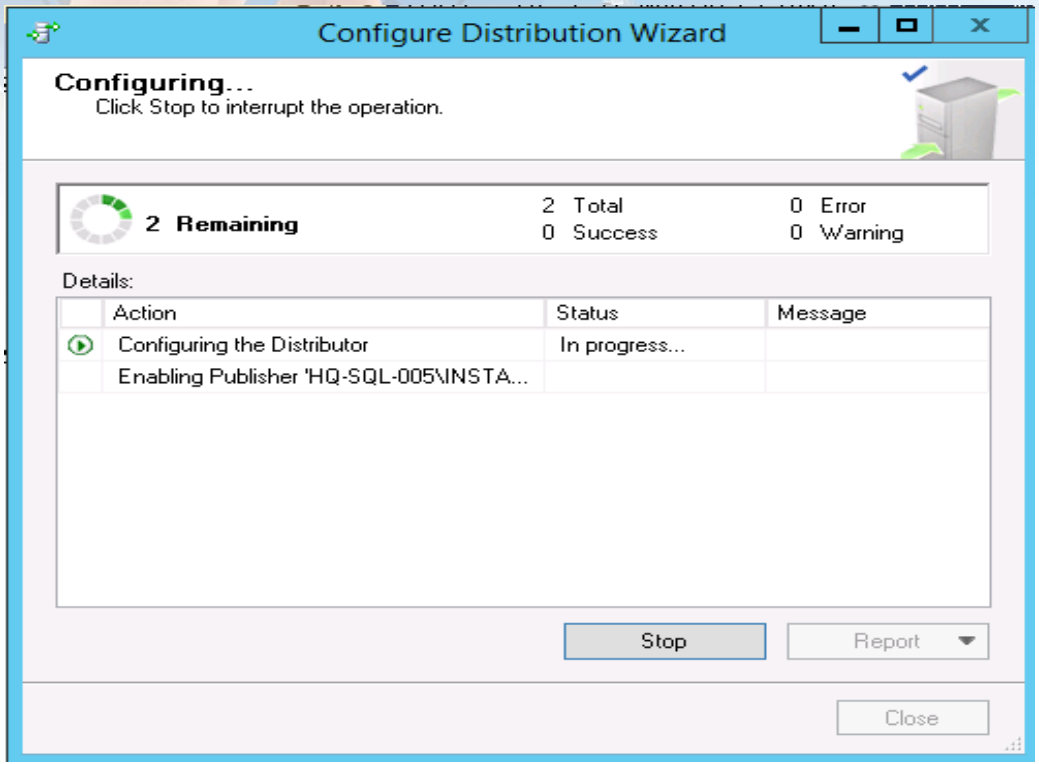
Configure Distribution Wizard
Configuring...
Click Stop to interrupt the operation.
2 Remaining
2 Total
0 Success
0 Error
0 Warning
Details:
Action
Status
Message
Configuring the Distributor
In progress...
Enabling Publisher 'HQ-SQL-005\INSTA...
Stop
Report
Close

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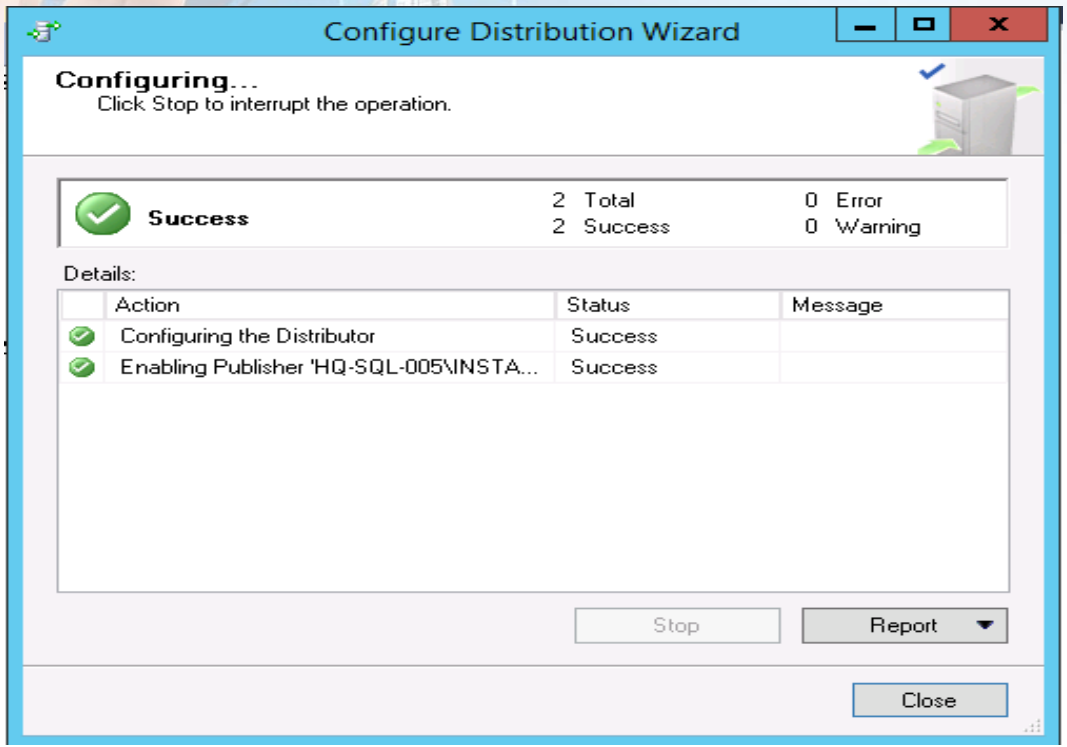
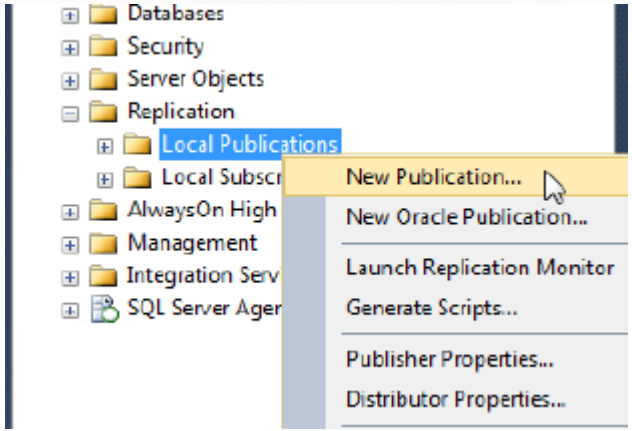

Configure Distribution Wizard
Configuring...
Click Stop to interrupt the operation.
Success
2 Total
2 Success
0 Error
0 Warning
Details:
Action
Status
Message
Configuring the Distributor
Success
Enabling Publisher 'HQ-SQL-005\INSTA...
Success
Stop
Report
Close

2. Configuring Publisher



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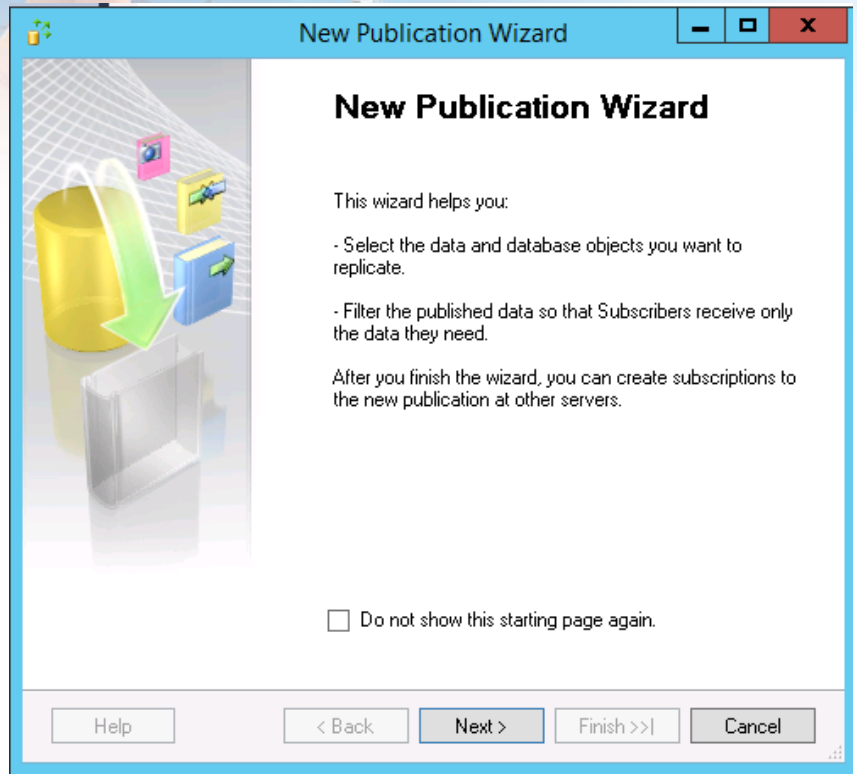
New Publication Wizard
New Publication Wizard
This wizard helps you:
- Select the data and database objects you want to replicate.
- Filter the published data so that Subscribers receive only the data they need.
After you finish the wizard, you can create subscriptions to the new publication at other servers.
Do not show this starting page again.
Help
< Back
Next >
Finish >>|
Cancel

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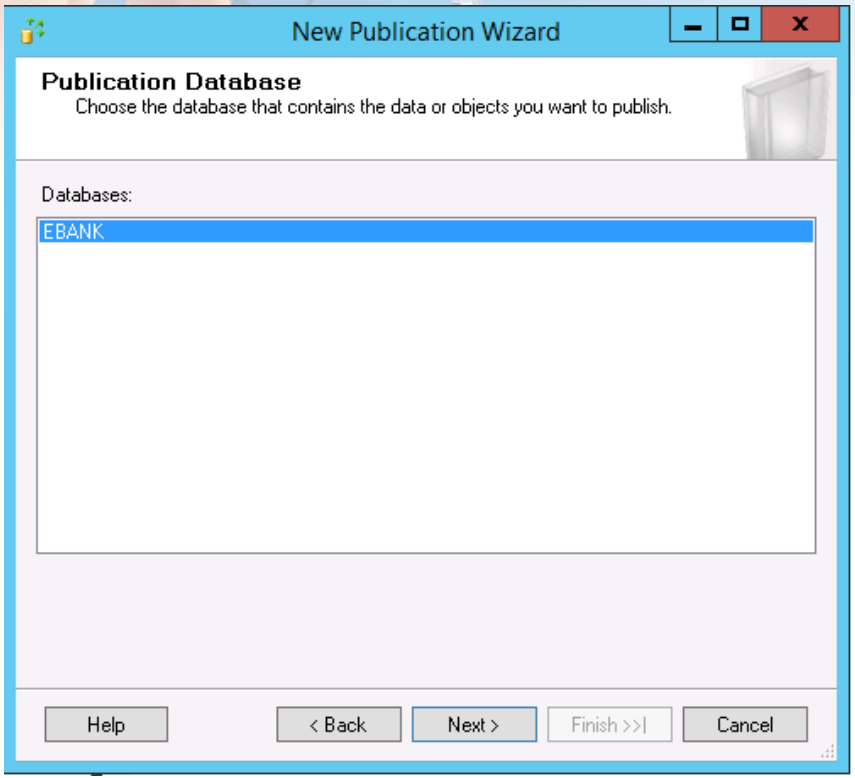
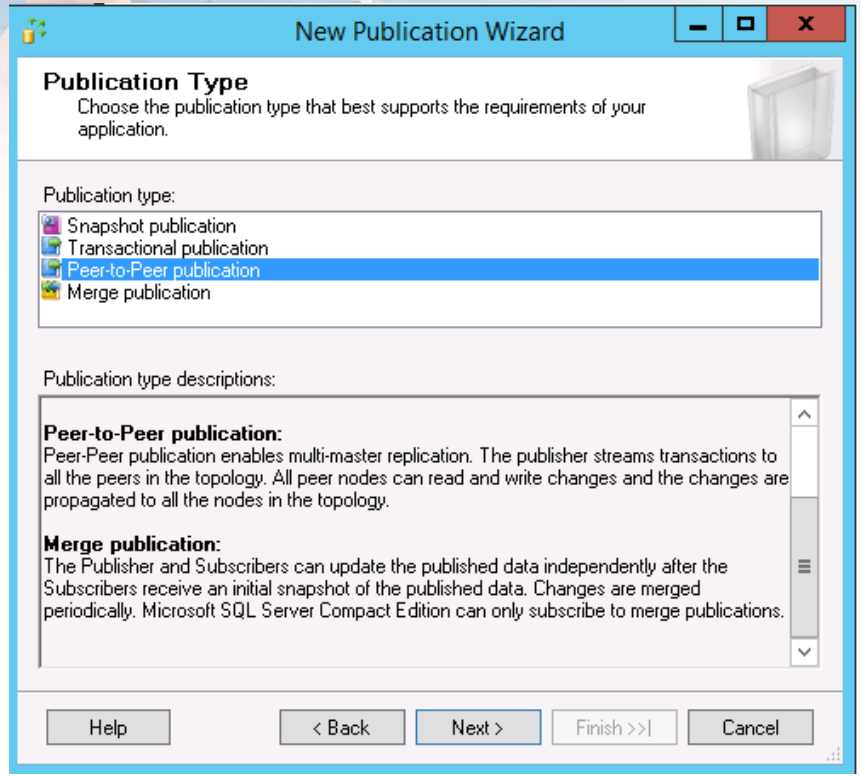
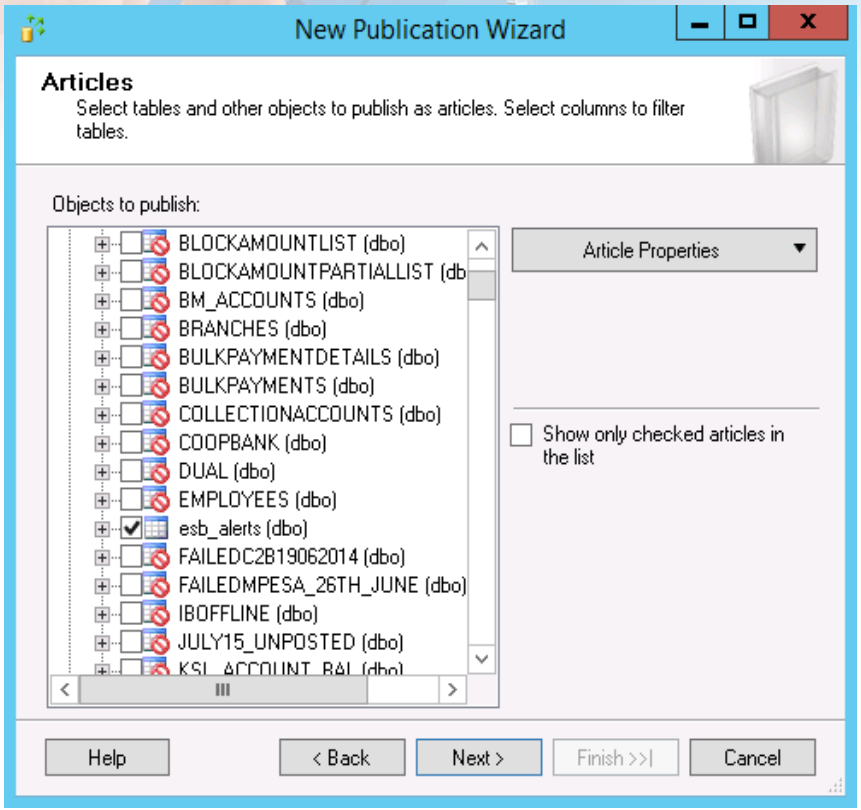

New Publication Wizard
Publication Database
Choose the database that contains the data or objects you want to publish.
Databases:
EBANK
Help
< Back
Next >
Finish >>|
Cancel

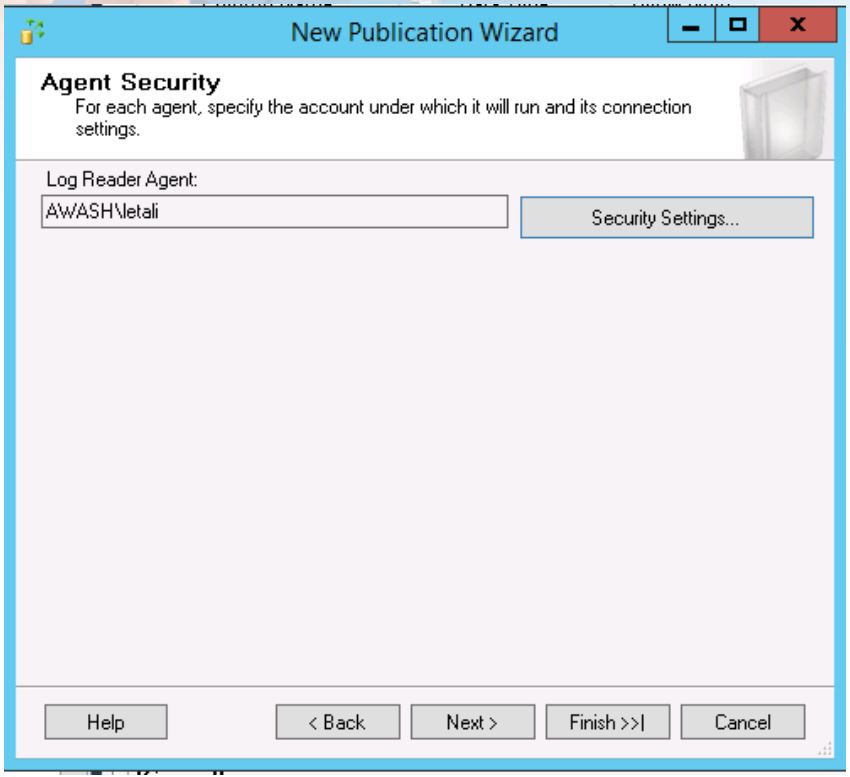
Cont…d


New Publication Wizard
Publication Type
Choose the publication type that best supports the requirements of your application.
Publication type:
Snapshot publication
Transactional publication
Peer-to-Peer publication
Merge publication
Publication type descriptions:
Peer-to-Peer publication:
Peer-Peer publication enables multi-master replication. The publisher streams transactions to all the peers in the topology. All peer nodes can read and write changes and the changes are propagated to all the nodes in the topology.
Merge publication:
The Publisher and Subscribers can update the published data independently after the Subscribers receive an initial snapshot of the published data. Changes are merged periodically. Microsoft SQL Server Compact Edition can only subscribe to merge publications.
Help
< Back
Next >
Finish >>|
Cancel

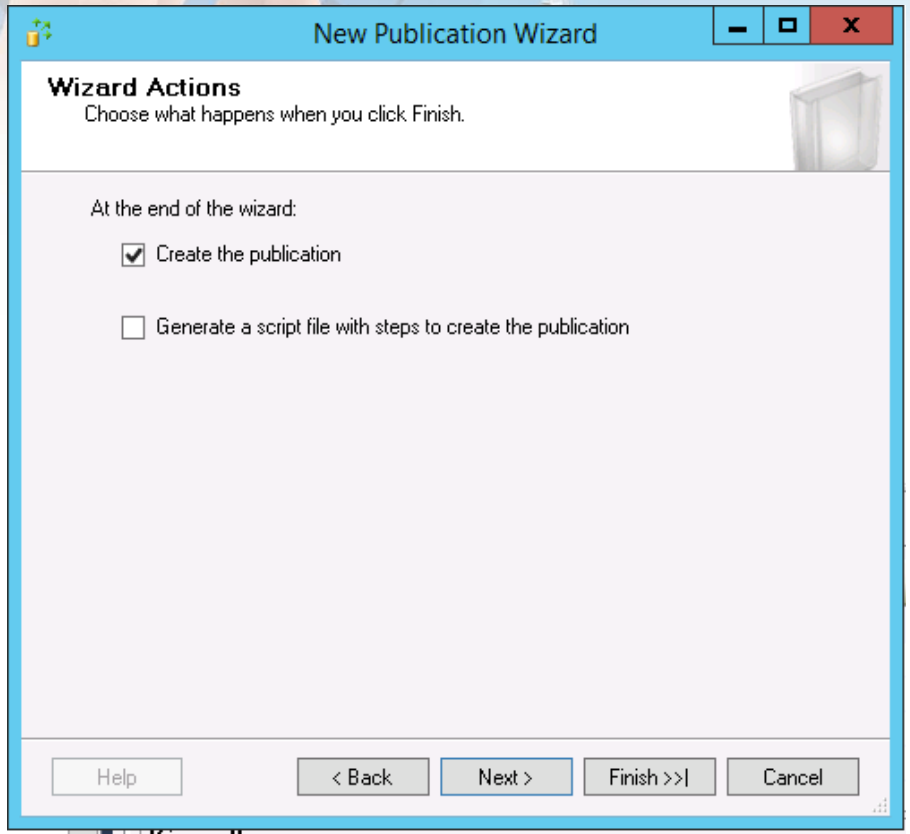
Cont...d


New Publication Wizard
Articles
Select tables and other objects to publish as articles. Select columns to filter tables.
Objects to publish:
BLOCKAMOUNTLIST (dbo)
BLOCKAMOUNTPARTIALLIST (db
BM_ACCOUNTS (dbo)
BRANCHES (dbo)
BULKPAYMENTDETAILS (dbo)
BULKPAYMENTS (dbo)
COLLECTIONACCOUNTS (dbo)
COOPBANK (dbo)
DUAL (dbo)
EMPLOYEES (dbo)
esb_alerts (dbo)
FAILEDC2B19062014 (dbo)
FAILEDMPESA_26TH_JUNE (dbo)
IBOFFLINE (dbo)
JULY15_UNPOSTED (dbo)
Article Properties
Show only checked articles in the list
Help
< Back
Next >
Finish >>|
Cancel

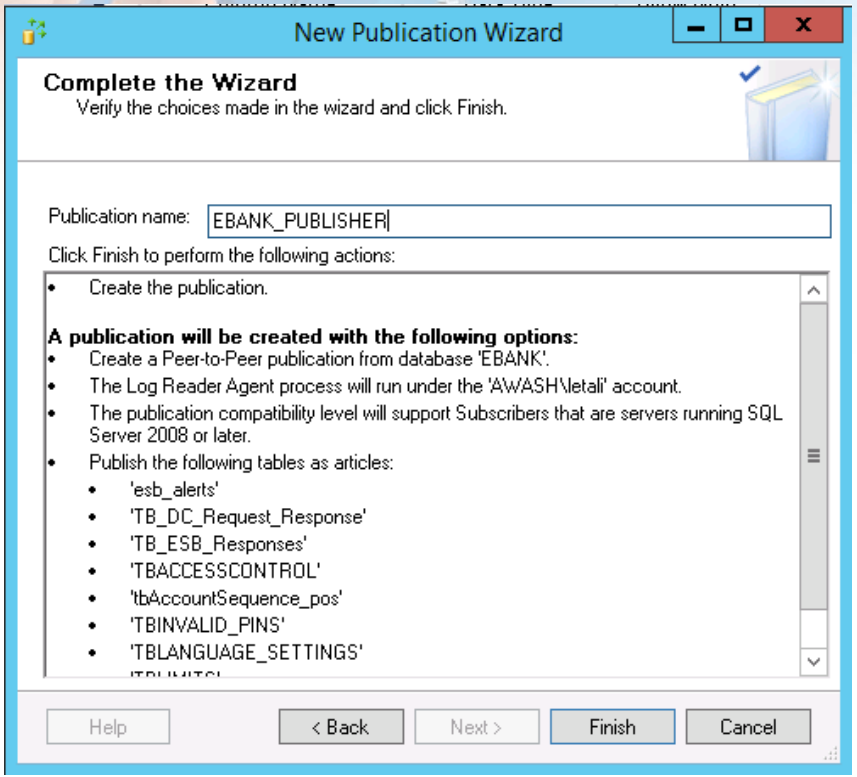
Cont…d


New Publication Wizard
Agent Security
For each agent, specify the account under which it will run and its connection settings.
Log Reader Agent:
AWASH\letali
Security Settings...
Help
< Back
Next >
Finish >>|
Cancel

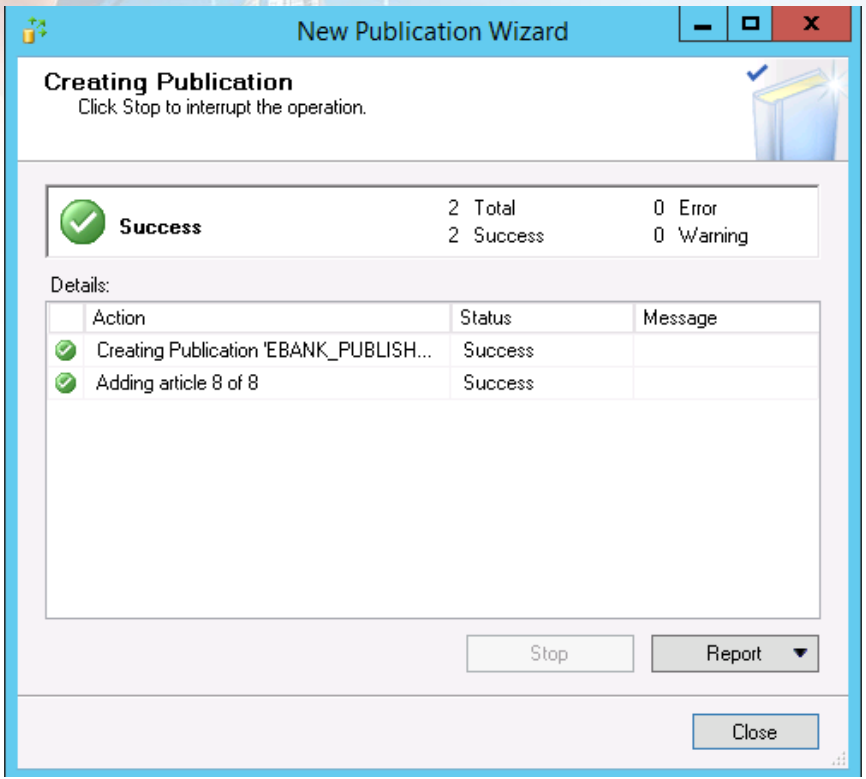
Cont…d


New Publication Wizard
Wizard Actions
Choose what happens when you click Finish.
At the end of the wizard:
Create the publication
Generate a script file with steps to create the publication
Help
< Back
Next >
Finish >>|
Cancel

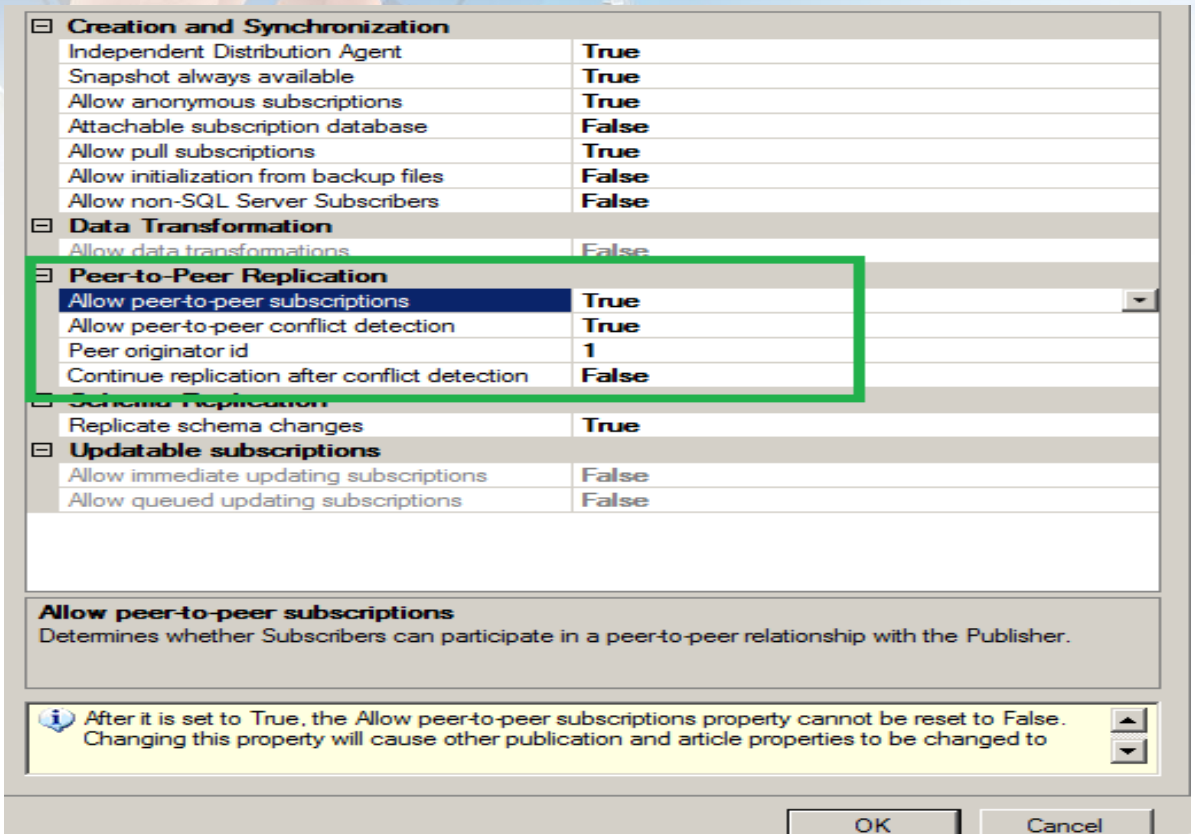
Cont…d


New Publication Wizard
Complete the Wizard
Verify the choices made in the wizard and click Finish.
Publication name:
EBANK_PUBLISHER
Click Finish to perform the following actions:
Create the publication.
A publication will be created with the following options:
Create a Peer-to-Peer publication from database 'EBANK'.
The Log Reader Agent process will run under the 'AWASH\letali' account.
The publication compatibility level will support Subscribers that are servers running SQL Server 2008 or later.
Publish the following tables as articles:
'esb_alerts'
'TB_DC_Request_Response'
'TB_ESB_Responses'
'TBACCESSCONTROL'
'tbAccountSequence_pos'
'TBINVALID_PINS'
'TBLANGUAGE_SETTINGS'
Help
< Back
Next >
Finish
Cancel

Cont...d


New Publication Wizard
Creating Publication
Click Stop to interrupt the operation.
Success
2 Total
2 Success
0 Error
0 Warning
Details:
Action
Status
Message
Creating Publication 'EBANK_PUBLISH...
Success
Adding article 8 of 8
Success
Stop
Report
Close

Configuring P2P Topology



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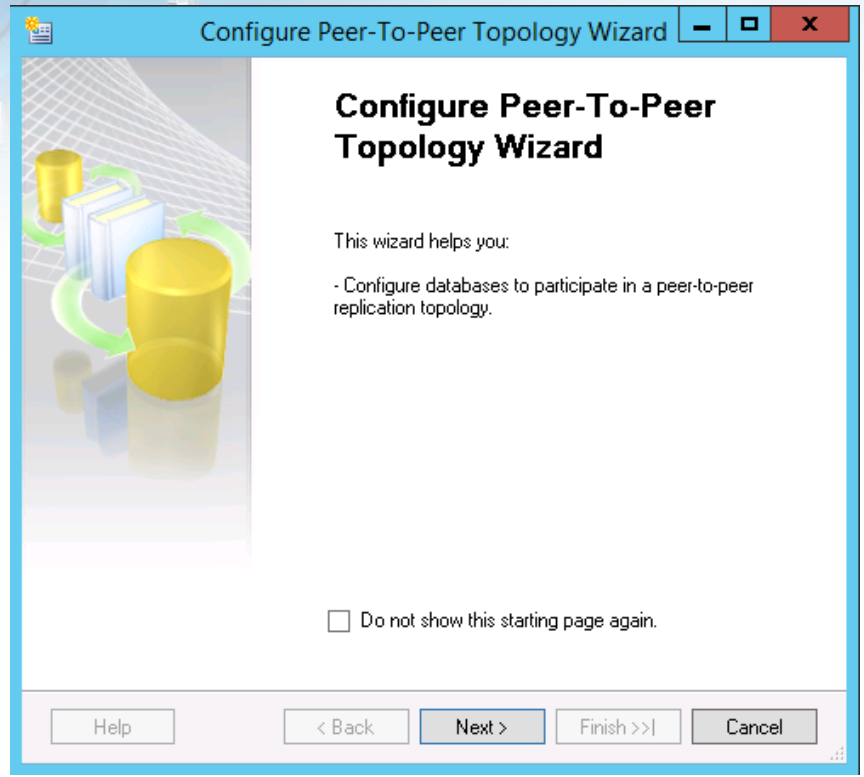
Configure Peer-To-Peer Topology Wizard
Configure Peer-To-Peer Topology Wizard
This wizard helps you:
- Configure databases to participate in a peer-to-peer replication topology.
Do not show this starting page again.
Help
< Back
Next >
Finish >>|
Cancel

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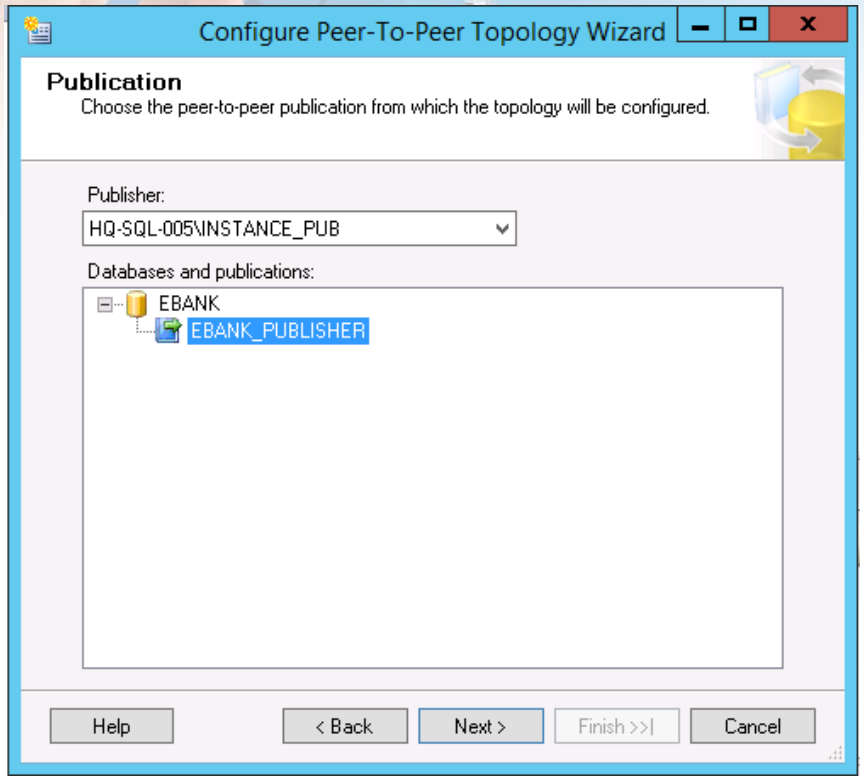
Configure Peer-To-Peer Topology Wizard
Publication
Choose the peer-to-peer publication from which the topology will be configured.
Publisher:
HQ-SQL-005\INSTANCE_PUB
Databases and publications:
EBANK
EBANK_PUBLISHER
Help
< Back
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Finish >>|
Cancel

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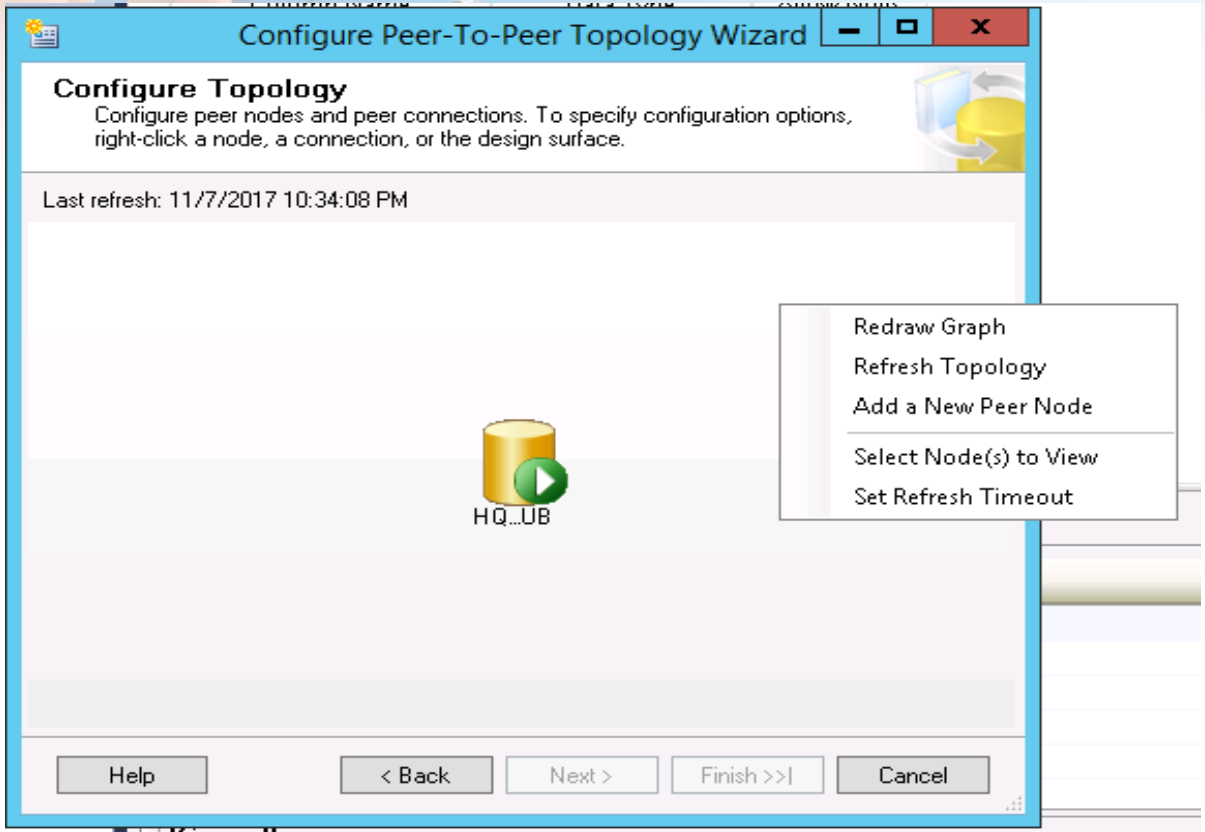
Configure Peer-To-Peer Topology Wizard
Configure Topology
Configure peer nodes and peer connections. To specify configuration options, right-click a node, a connection, or the design surface.
Last refresh: 11/7/2017 10:34:08 PM
HQ...UB
Redraw Graph
Refresh Topology
Add a New Peer Node
Select Node(s) to View
Set Refresh Timeout
Help
< Back
Next >
Finish >>|
Cancel

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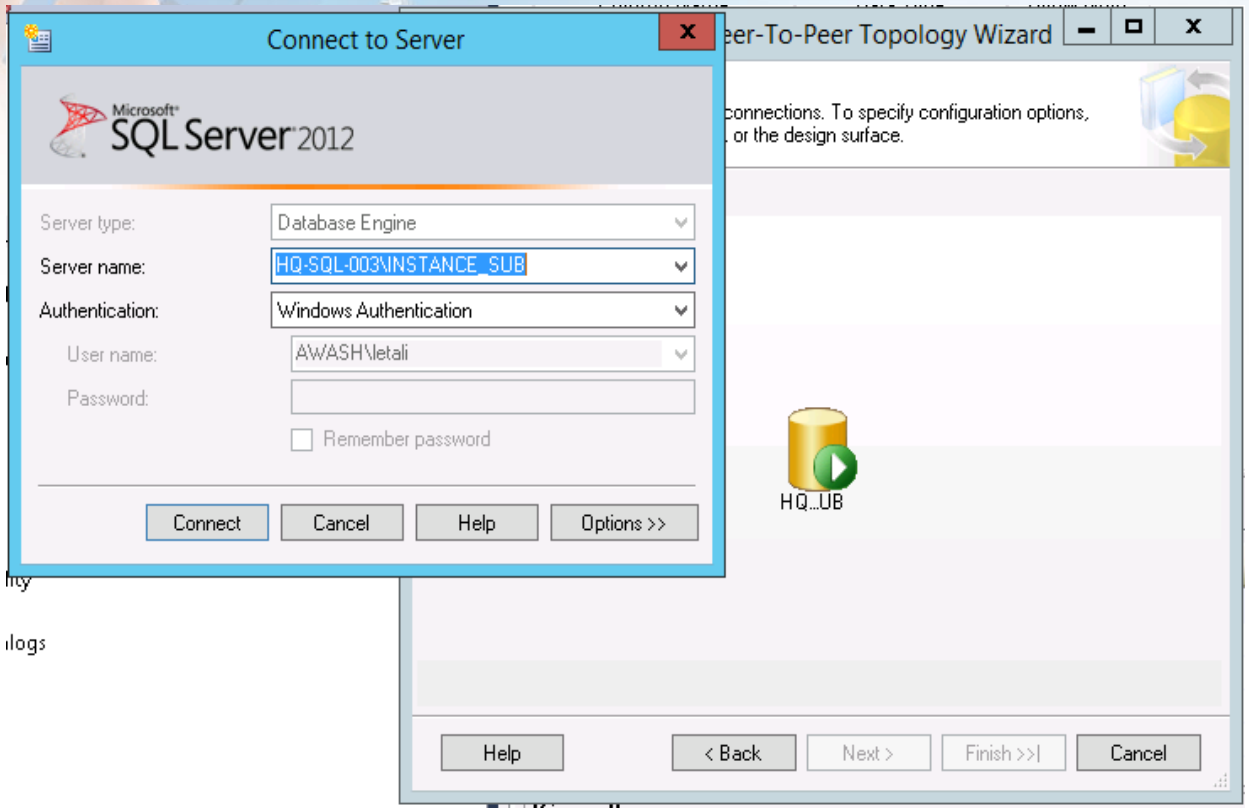
Connect to Server
Microsoft SQL Server 2012
Server type:
Database Engine
Server name:
HQ-SQL-003\INSTANCE_SUB
Authentication:
Windows Authentication
User name:
AWASH\letali
Password:
Remember password
Connect
Cancel
Help
Options >>
er-To-Peer Topology Wizard
connections. To specify configuration options,
or the design surface.
HQ...UB
Help
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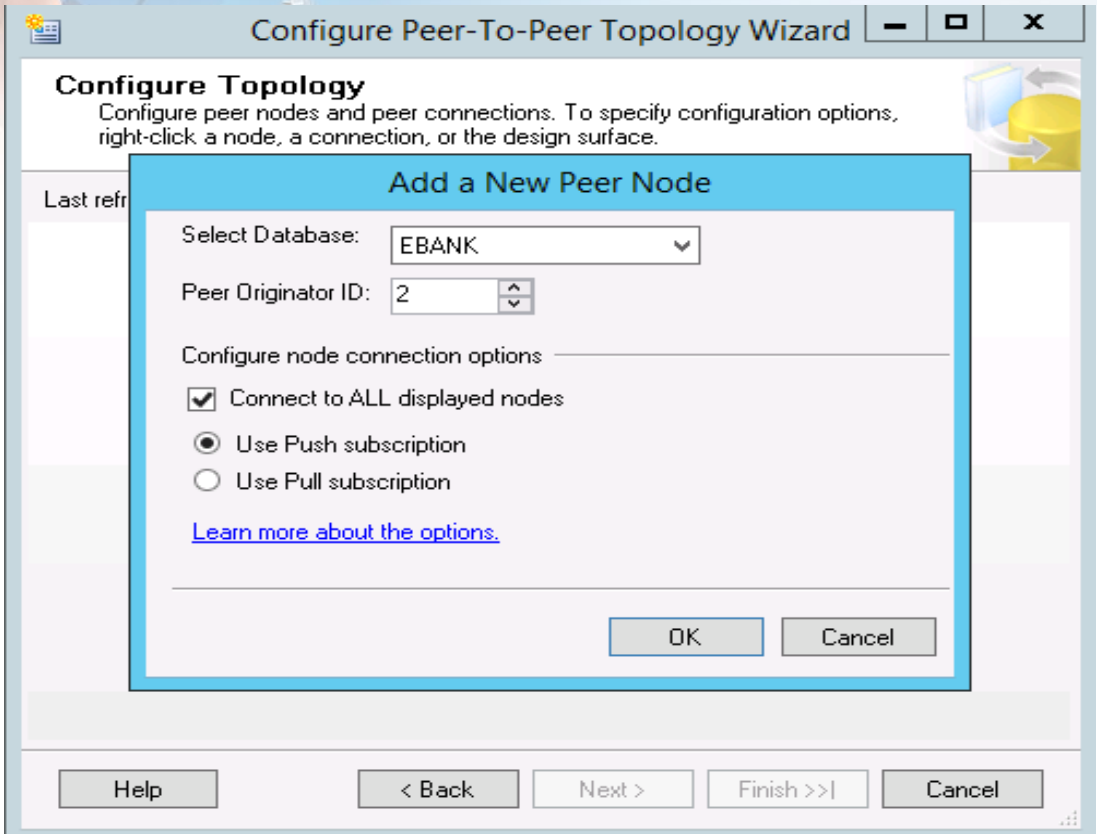
Next >
Finish >>|
Cancel

Cont..d


Configure Peer-To-Peer Topology Wizard
Configure Topology
Configure peer nodes and peer connections. To specify configuration options, right-click a node, a connection, or the design surface.
Last refr
Add a New Peer Node
Select Database:
EBANK
Peer Originator ID:
2
Configure node connection options
Connect to ALL displayed nodes
Use Push subscription
Use Pull subscription
Learn more about the options.
OK
Cancel
Help
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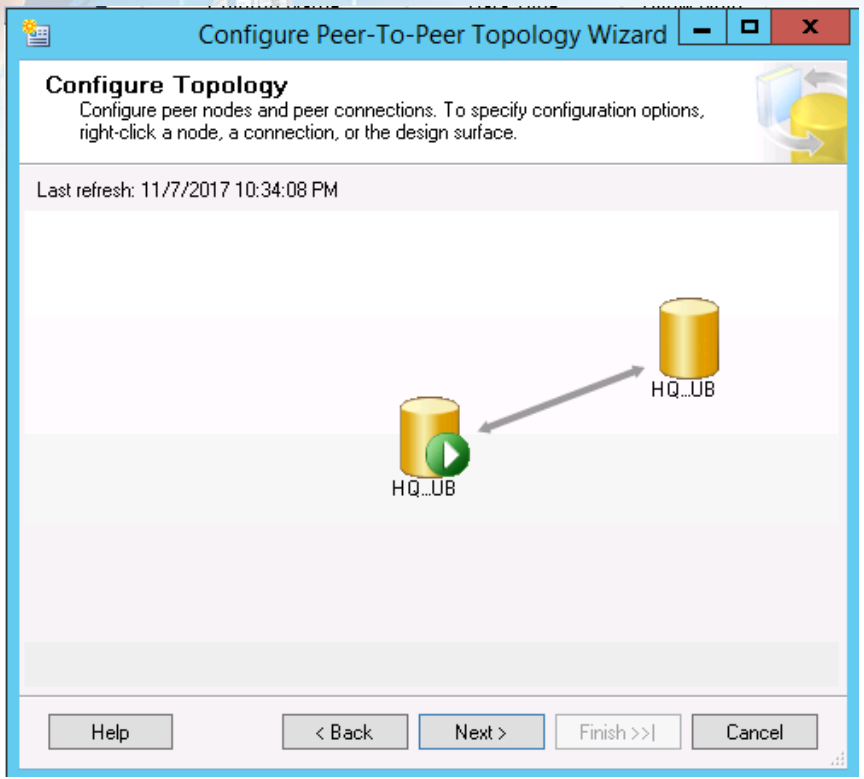
Next >
Finish >>|
Cancel

Cont..d


Configure Peer-To-Peer Topology Wizard
Configure Topology
Configure peer nodes and peer connections. To specify configuration options, right-click a node, a connection, or the design surface.
Last refresh: 11/7/2017 10:34:08 PM
HQ...UB
HQ...UB
Help
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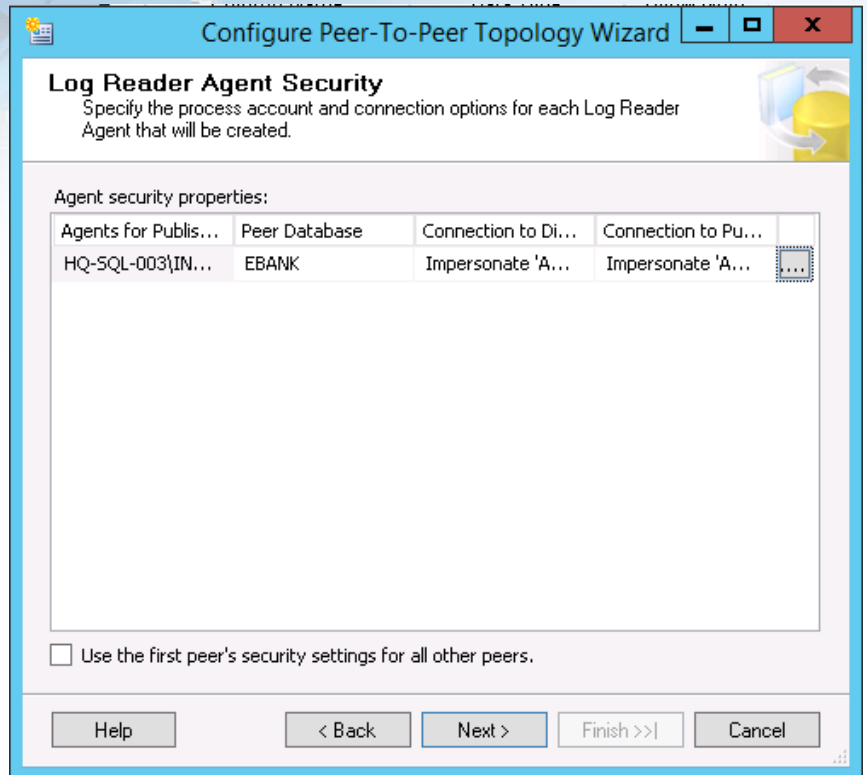
Finish >>|
Cancel

Cont..d


Configure Peer-To-Peer Topology Wizard
Log Reader Agent Security
Specify the process account and connection options for each Log Reader Agent that will be created.
Agent security properties:
Agents for Publis...
Peer Database
Connection to Di...
Connection to Pu...
HQ-SQL-003\IN...
EBANK
Impersonate 'A...
Impersonate 'A...
...
Use the first peer's security settings for all other peers.
Help
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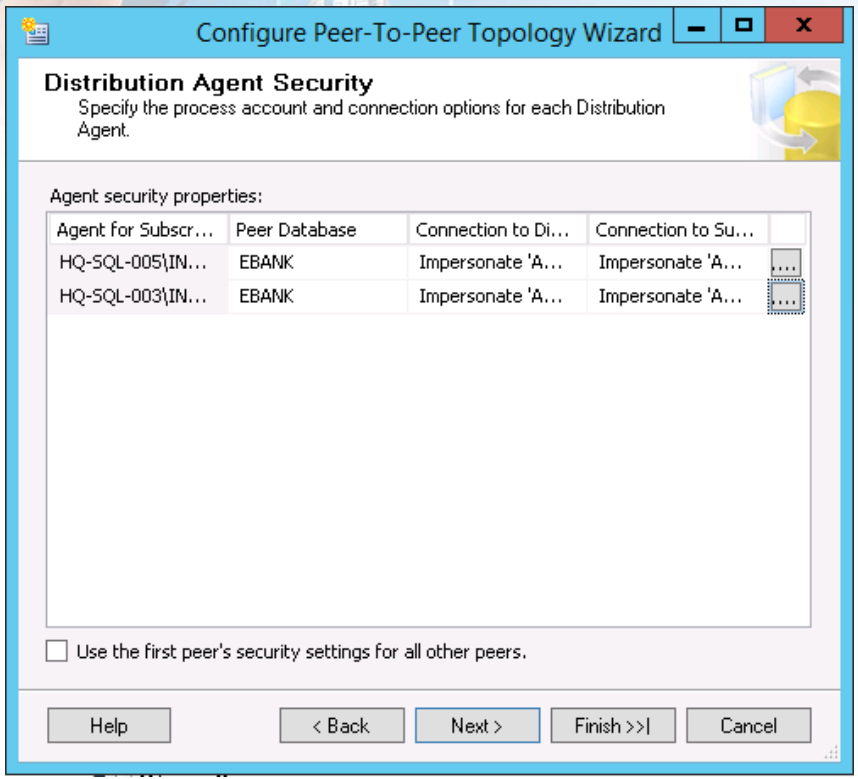
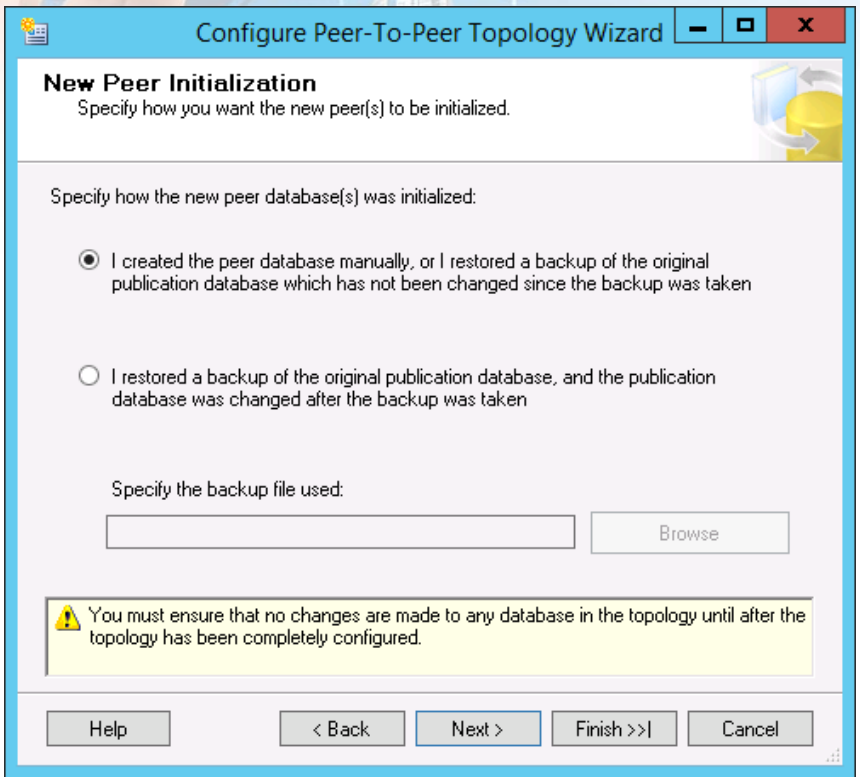
Finish >>|
Cancel

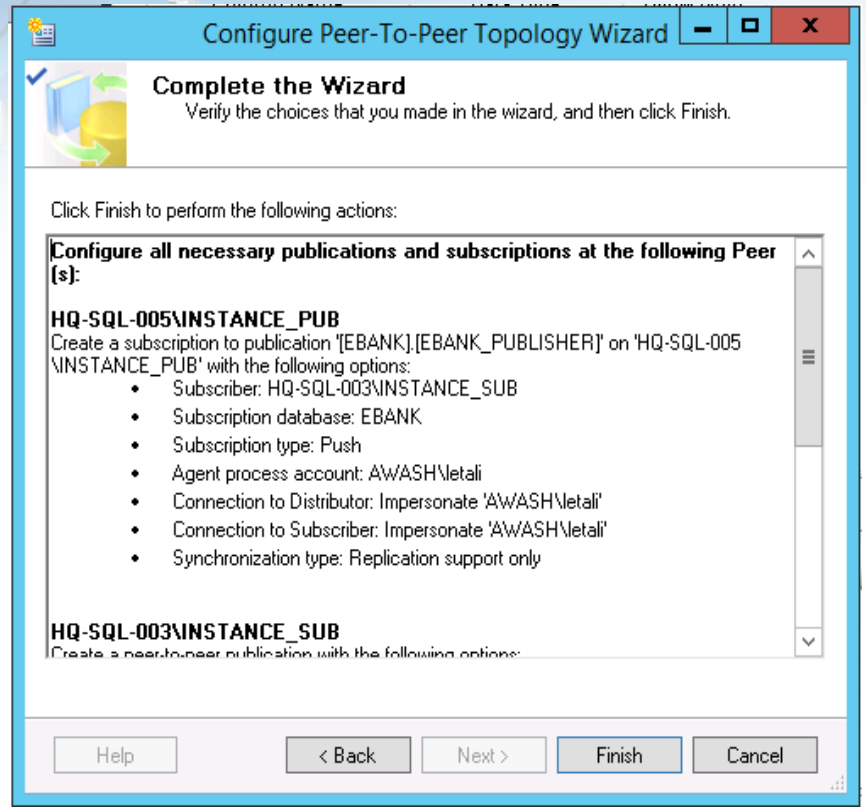
Cont..d


Configure Peer-To-Peer Topology Wizard
Distribution Agent Security
Specify the process account and connection options for each Distribution Agent.
Agent security properties:
Agent for Subscr...
Peer Database
Connection to Di...
Connection to Su...
HQ-SQL-005\IN...
EBANK
Impersonate 'A...
Impersonate 'A...
HQ-SQL-003\IN...
EBANK
Impersonate 'A...
Impersonate 'A...
Use the first peer's security settings for all other peers.
Help
< Back
Next >
Finish >>|
Cancel

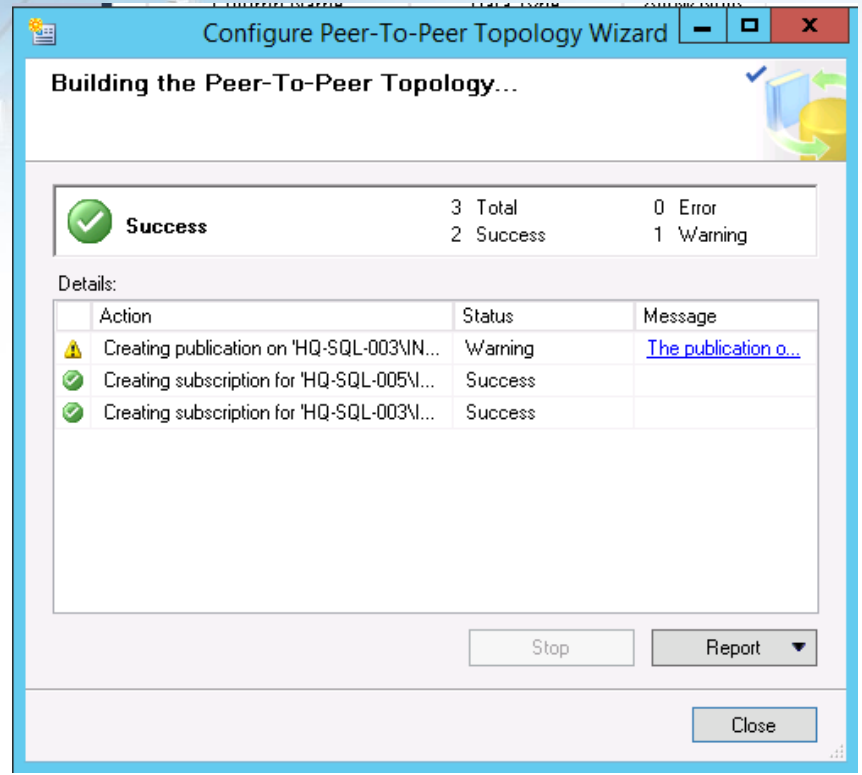
Cont..d


Configure Peer-To-Peer Topology Wizard
New Peer Initialization
Specify how you want the new peer(s) to be initialized.
Specify how the new peer database(s) was initialized:
I created the peer database manually, or I restored a backup of the original publication database which has not been changed since the backup was taken
I restored a backup of the original publication database, and the publication database was changed after the backup was taken
Specify the backup file used:
Browse
You must ensure that no changes are made to any database in the topology until after the topology has been completely configured.
Help
< Back
Next >
Finish >>|
Cancel

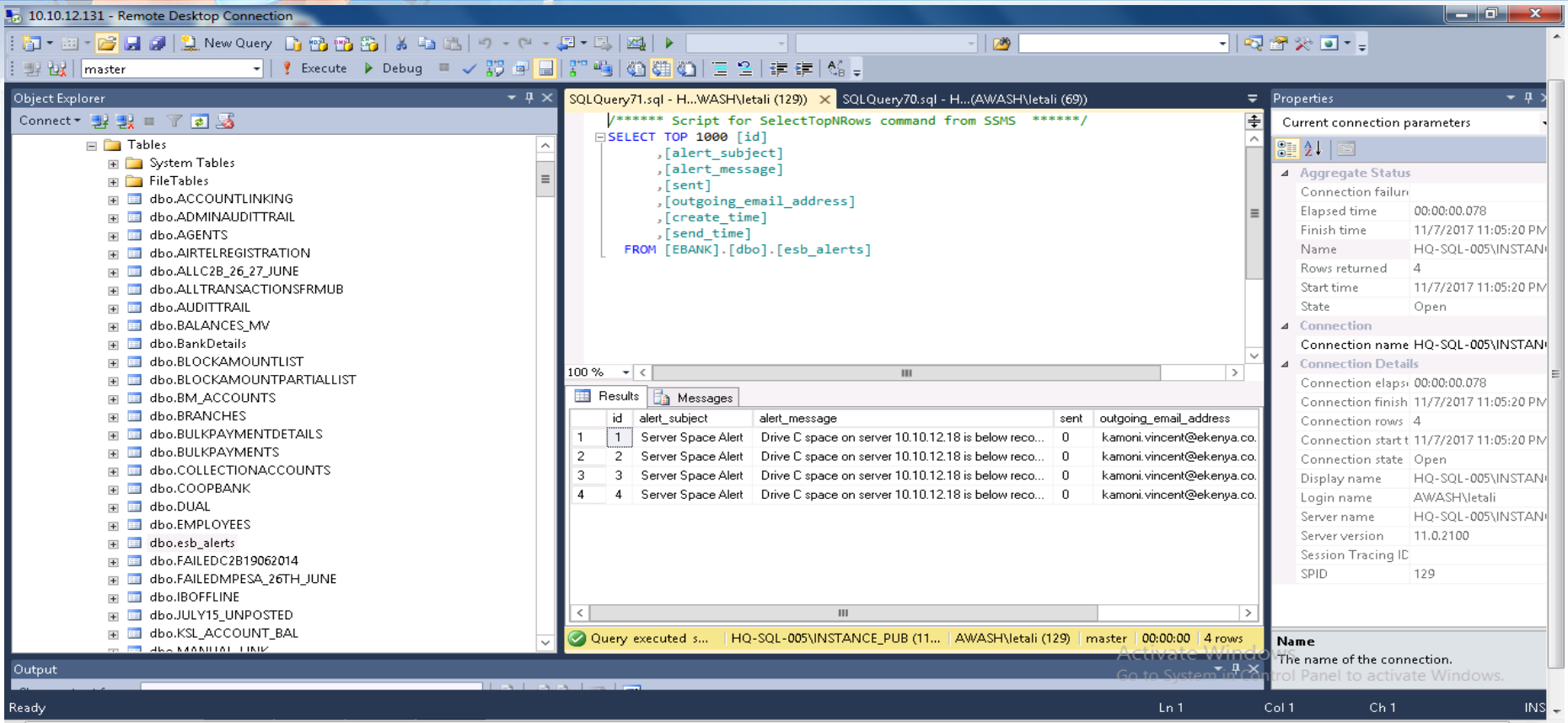
Cont..d


Configure Peer-To-Peer Topology Wizard
Complete the Wizard
Verify the choices that you made in the wizard, and then click Finish.
Click Finish to perform the following actions:
Configure all necessary publications and subscriptions at the following Peer (s):
HQ-SQL-005\INSTANCE_PUB
Create a subscription to publication '[EBANK].[EBANK_PUBLISHER]' on 'HQ-SQL-005 \INSTANCE_PUB' with the following options:
Subscriber: HQ-SQL-003\INSTANCE_SUB
Subscription database: EBANK
Subscription type: Push
Agent process account: AWASH\letali
Connection to Distributor: Impersonate 'AWASH\letali'
Connection to Subscriber: Impersonate 'AWASH\letali'
Synchronization type: Replication support only
HQ-SQL-003\INSTANCE_SUB
Help
< Back
Next >
Finish
Cancel

Cont..d


Configure Peer-To-Peer Topology Wizard
Building the Peer-To-Peer Topology...
Success
3 Total
2 Success
0 Error
1 Warning
Details:
Action
Status
Message
Creating publication on 'HQ-SQL-003\IN...
Warning
The publication o...
Creating subscription for 'HQ-SQL-005\I...
Success
Creating subscription for 'HQ-SQL-003\I...
Success
Stop
Report
Close

Checking up the replication through Queries



Cont....d

100 %

Results | Messages

	id	alert_subject	alert_message	sent	outgoing_email_address	create_time	send_t
1	1	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.ke	NULL	NULL
2	2	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.ke	NULL	NULL
3	3	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.ke	NULL	NULL
4	4	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.ke	NULL	NULL

10.10.12.124 - Remote Desktop Connection

Object Explorer

Connect

- Tables
  - System Tables
  - FileTables
  - dbo.ACCOUNTLINKING
  - dbo.ADMINAUDITTRAIL
  - dbo.AGENTS
  - dbo.AIRTELREGISTRATION
  - dbo.ALLC2B_26_27_JUNE
  - dbo.ALLTRANSACTIONSFRMUB
  - dbo.AUDITTRAIL
  - dbo.BALANCES_MV
  - dbo.BankDetails
  - dbo.BLOCKAMOUNTLIST
  - dbo.BLOCKAMOUNTPARTIALLIST
  - dbo.BM_ACCOUNTS
  - dbo.BRANCHES
  - dbo.BULKPAYMENTDETAILS
  - dbo.BULKPAYMENTS
  - dbo.COLLECTIONACCOUNTS
  - dbo.COOPBANK
  - dbo.DUAL
  - dbo.EMPLOYEES
  - dbo.esb_alerts
  - dbo.FAILEDC2B19062014

SQLQuery5.sql - H...AWASH\mersit (70)) | SQLQuery4.sql - H...AWASH\mersit (61))

```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP 1000 [id]
      ,[alert_subject]
      ,[alert_message]
      ,[sent]
      ,[outgoing_email_address]
      ,[create_time]
      ,[send_time]
  FROM [EBANK].[dbo].[esb_alerts]
```

100 %

Results | Messages

	id	alert_subject	alert_message	sent	outgoing_email_address	create_time	send_t
1	1	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.ke	NULL	NULL
2	2	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.ke	NULL	NULL
3	3	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.ke	NULL	NULL
4	4	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.ke	NULL	NULL

Properties

Current connection parameters

- Aggregate Status
  - Connection failu
  - Elapsed time 00:00:00.015
  - Finish time 11/7/2017 11:25:22 PM
  - Name HQ-SQL-003\INSTAN
  - Rows returned 4
  - Start time 11/7/2017 11:25:22 PM
  - State Open
- Connection
  - Connection name HQ-SQL-003\INSTAN
- Connection Details
  - Connection elaps 00:00:00.015
  - Connection finish 11/7/2017 11:25:22 PM
  - Connection rows 4
  - Connection start t 11/7/2017 11:25:22 PM
  - Connection state Open
  - Display name HQ-SQL-003\INSTAN
  - Login name AWASH\mersit
  - Server name HQ-SQL-003\INSTAN
  - Server version 11.0.2100
  - Session Tracing ID

Cont….d

```
USE [EBANK]
GO

INSERT INTO [dbo].[esb_alerts]
           ([alert_subject]
           ,[alert_message]
           ,[sent]
           ,[outgoing_email_address]
           ,[create_time]
           ,[send_time])
     VALUES
           ('SERVER SPACE','Drive D: space on server 10.10.10.13 is below recomm
GO
```

100 %

Messages

```
(1 row(s) affected)
```

Cont....d

```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP 1000 [id]
      ,[alert_subject]
      ,[alert_message]
      ,[sent]
      ,[outgoing_email_address]
      ,[create_time]
      ,[send_time]
  FROM [EBANK].[dbo].[esb_alerts]
```

100 %

Results | Messages

	id	alert_subject	alert_message	sent	outgoing_email_address
1	1	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.
2	2	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.
3	3	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.
4	4	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@ekenya.co.
5	6	SERVER SPACE	Drive D: space on server 10.10.10.13 is below rec...	0	kamoni.vincent@ekenya.co.

Cont….d

```
USE [EBANK]
GO

UPDATE [dbo].[esb_alerts]
   SET [alert_subject] = 'SERVER SPACE ALERT'

      ,[sent] ='1'

 WHERE id=1
GO
```

100 %

Messages

```
(1 row(s) affected)
```

Cont....d

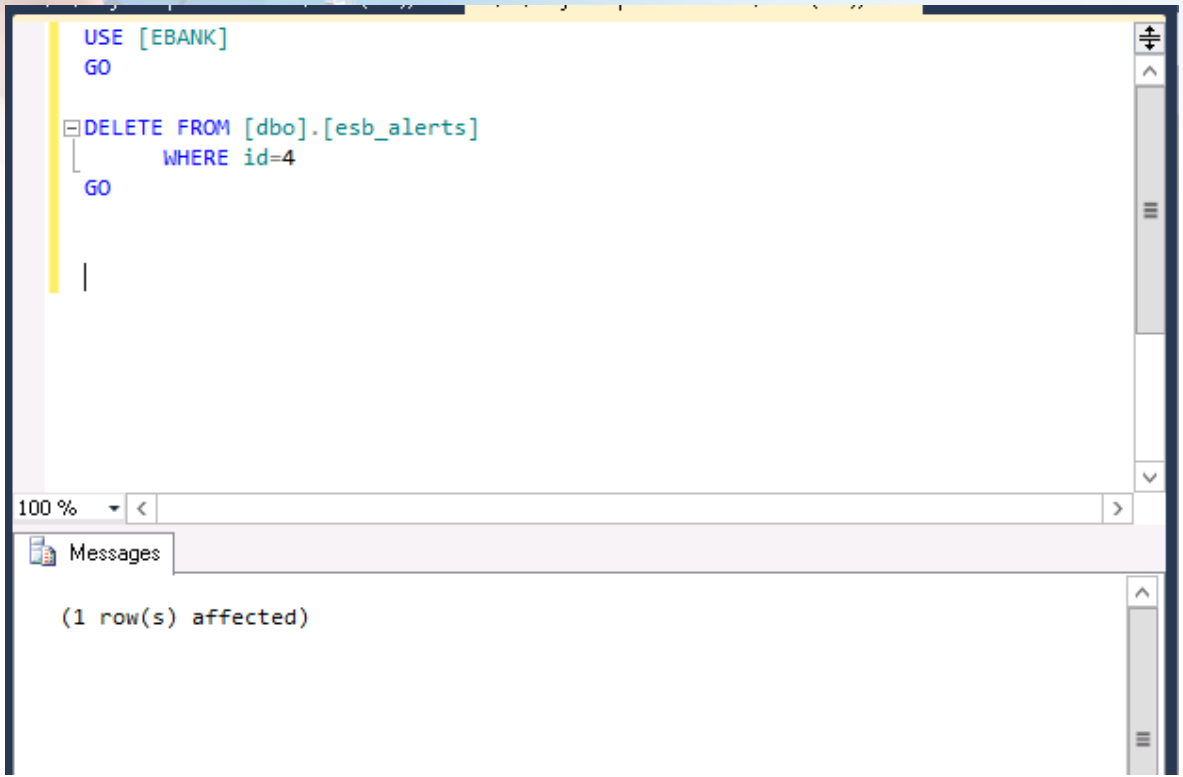
```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP 1000 [id]
      ,[alert_subject]
      ,[alert_message]
      ,[sent]
      ,[outgoing_email_address]
      ,[create_time]
      ,[send_time]
  FROM [EBANK].[dbo].[esb_alerts]
```

100 %

Results | Messages

	id	alert_subject	alert_message	sent	outgoing_email_addres
1	1	SERVER SPACE ALERT	Drive C space on server 10.10.12.18 is below reco...	1	kamoni.vincent@eker
2	2	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@eker
3	3	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@eker
4	4	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@eker
5	6	SERVER SPACE	Drive D: space on server 10.10.10.13 is below rec...	0	kamoni.vincent@eker

Cont….d


USE [EBANK]
GO
DELETE FROM [dbo].[esb_alerts]
WHERE id=4
GO
100 %
Messages
(1 row(s) affected)

Cont....d

```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP 1000 [id]
      ,[alert_subject]
      ,[alert_message]
      ,[sent]
      ,[outgoing_email_address]
      ,[create_time]
      ,[send_time]
  FROM [EBANK].[dbo].[esb_alerts]
```

100 %

Results | Messages

	id	alert_subject	alert_message	sent	outgoing_email_addres
1	1	SERVER SPACE ALERT	Drive C space on server 10.10.12.18 is below reco...	1	kamoni.vincent@eker
2	2	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@eker
3	3	Server Space Alert	Drive C space on server 10.10.12.18 is below reco...	0	kamoni.vincent@eker
4	6	SERVER SPACE	Drive D: space on server 10.10.10.13 is below rec...	0	kamoni.vincent@eker

THANK YOU!