

# Using Microsoft<sup>®</sup> SQL Server<sup>™</sup> Snapshot Replication With ArcSDE<sup>®</sup> Data

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# Using Microsoft SQL Server Snapshot Replication With ArcSDE Data

## **An ESRI Technical Paper**

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# **Using Microsoft SQL Server Snapshot Replication With ArcSDE Data**

Replication is used to create multiple copies of the same data that can be distributed to other databases throughout an organization. Businesses typically use replication when they have a need to separate their transactional and reporting databases, or they want to minimize business interruption caused by server failure. This paper takes you through the steps required to set up and implement snapshot replication with ArcSDE<sup>®</sup> and Microsoft<sup>®</sup> SQL Server<sup>™</sup>.

### **Implementing Snapshot Replication** Snapshot **Replication** Snapshot **Replication** Snapshot **Replication** Snapshot **Replication** Snapshot **Replication** Snapshot replication is used to distribute an entire copy of the chosen information from the distributing database to the subscribing database. In SQL Server, it is the easiest type of replication to set up and maintain. It is most appropriate for read-only data, and there is a high degree of latency in this process. Any changes that are made to the data at the subscriber will be overwritten once the next snapshot image is downloaded from the distributor. Management of the distribution of the snapshot can be performed from the distribution server (a push subscription) or from the subscription server (a pull subscription). The use of a push or pull subscription is dependent on the particular circumstances of each organization. A push subscription can be centrally managed but will require a greater storage premium on the distribution server.

Implementation of snapshot replication, in this example, will be between two instances of SQL Server 2000. The procedure is similar for other versions of SQL Server as well. Although the creation of users within the database will not be covered, there will need to be an sde user preexisting in the database. Ensure the user has the appropriate privileges. If you need assistance with this part of the configuration, refer to the Configuration and Tuning guide for Microsoft SQL Server found on the installation media.

As ArcSDE data is being transferred to another database, care should be exercised to ensure compliance with your ESRI<sup>®</sup> software license agreement. Contact your sales representative or local distributor if you have any questions.

### **Configure Replication** From Enterprise Manager on the SQL Server you wish to replicate from, choose Tools; Replication; and Configure Publishing, Subscribers, and Distribution. This will begin the process of configuring the distribution server.



The Welcome to the Configure Publishing and Distribution Wizard appears.

Click Next.

nfigure Publishing and Distribution Wizard for 'PIOPIO\SD	E90' 🗙
Select Distributor Use this server as its own Distributor or select another server a	s the Distributor.
The Distributor is the server usually responsible for synchronizing da Subscribers.	ta between Publishers and
Make 'PIOPIO\SDE90' its own Distributor; SQL Server will creat and log	te a distribution database
C Use the following server (the selected server must already be co	onfigured as a Distributor):
HANDSOFF HKGIS HKGISVN/VGAS MAPDATA RICKOVER	Add <u>S</u> erver
< <u>B</u> ack <u>N</u> ext >	Cancel <u>H</u> elp

Choose the server to act as the distributor, then click Next.

Configure Publishing and Distribution Wizard for 'PIOPIO\SDE90'	×
Specify Snapshot Folder Specify the root location where snapshots from Publishers that use this Distributor will be stored.	
To allow Distribution and Merge Agents that run at Subscribers to access the snaps of their publications, you must refer to the snapshot folder using a network path.	hots
Snapshot folder: Npiopio\repl\	
< Back Next > Cancel	<u>H</u> elp

Specify the path to the replication snapshot folder. Ensure the location is accessible to all the subscribers, then click Next.

Configure Publishing and Distribution Wizard for 'PIOPIO\SDE90'	×
Customize the Configuration You can configure your server for replication with default settings, or you can customize the settings.	
Do you want to customize the publishing and distribution settings?	
Yes, let me set the distribution database properties, enable Publishers, or set the publishing settings.	
C No, use the following default settings:	
Configure 'PIOPIO\SDE90' as a Publisher. Use 'PIOPIO\SDE90' as the Distributor.	
Use '\\piopio\repl\' as the root snapshot folder for Publishers using this Distributor.	
Store the distribution database 'distribution' in 'C:\Program Files\Microsoft SQL Server\MSSQL\$SDE90\Data'.	
Store the distribution database log file in 'C:\Program Files\Microsoft SQL Server\MSSQL\$SDE90\Data'.	
< <u>B</u> ack Next > Cancel ∐elp	

You may accept the default configuration from SQL Server, but for this example, choose to customize the publishing and distribution settings. Click Next.

Configure Publishing and Distribution Wizard for 'PIOPIO\SDE90' x Provide Distribution Database Information 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\MSSQL\$SDE90\Data Folder for the distribution database log file: C:\Program Files\Microsoft SQL Server\MSSQL\$SDE90\Data The paths must refer to disks that are local to 'PIOPIO\SDE90' and begin with a local drive letter and colon (for example, C:). Mapped drive letters and network paths are invalid. < <u>B</u>ack <u>N</u>ext> Cancel <u>H</u>elp

Select the name and location of the distribution database and log files. Click Next.

Configu	onfigure Publishing and Distribution Wizard for 'PIOPIO\SDE90'					
Ena	Enable Publishers Enable servers to use this Distributor after they are configured as Publishers.					
To : () <u>R</u> eg	set the login information and w button. jistered servers:	vorking folder for a serve	er, select	it, and then click the properties		
	Publishers	Distribution DB		Enable All		
	HKGIS	distribution				
	MAPDATA	distribution		Enable N <u>o</u> ne		
	PIOPIO\SDE90	distribution				
	RICKOVER	distribution		Ne <u>w</u>		
Clic	k New to register a new serve	r and enable it as a Pub	▶ blisher.			
		< <u>B</u> ack <u>N</u> ext :		Cancel <u>H</u> elp		

Enable the servers that will be allowed to use this distributor after they are configured as Publishers. Click Next.

Uatabase:	Merce	Database Name		Transactional
		sde bob		
		sde_cool		<u>E</u> nable All
		sac_opi		Enable None
				Merge
				Enable <u>A</u> ll
•			F	Enable None

Enable the databases that are to be used for replication. Choose the Transactional check box that includes snapshot. Click Next.

Configure Publishing and Distr	ibution Wizard	for 'PIOPIC	)\SDI	E90' 🗙
Enable Subscribers Enable servers to subscrib	e to publications	from this Publi	isher.	<b>Q</b>
To set the login information and then click the properties () bu Registered servers:	l default synchror Iton.	ization sched	lule fo	r a Subscriber, select it, and
Subscribers			<b></b>	Enable All
✓ HKGIS				
MAPDATA				Enable N <u>o</u> ne
PIOPIO\SDE90				
RICKOVER			$\overline{\mathbf{x}}$	Ne <u>w</u>
•		► I		
Click New to register a new ser heterogeneous Subscribers aft	ver and enable it er you complete ti	as a Subscrib nis wizard.	er. Yo	ou can enable
	< <u>B</u> ack	<u>N</u> ext >		Cancel <u>H</u> elp

Enable the subscribing server to receive publications from the distributor. Click Next.



Click Finish to complete the configuration of the distribution server.

5QL Ser	ver Enterprise Manager	×
-1/-	Because 'PIOPIO\SDE90' is now a Distributor, SQL Server Enterprise Manag has added Replication Monitor to the console tree.	ler
	Replication Monitor allows you to view the status of replication agents and troubleshoot problems at the Distributor.	
	You can use Replication Monitor to:	
	<ul> <li>View a list of Publishers, publications, and subscriptions that are supported by the Distributor</li> </ul>	
	• View schedules, current status, and history for each replication agent	
	Set up and monitor alerts related to replication events	
	You can monitor multiple Distributors easily with the Replication Monitor Group To get started, click Replication on the Tools menu, and then click Show Replication Monitor Group.	).
	Close	(

Click Close to complete the distribution configuration process.

**Creating a** Once replication is configured, it is time to create and manage a publication in Enterprise Manager. From the Tools menu, navigate to Replication, then choose Create and Manage Publications on PIOPIO\SDE90.



Highlight the intended source of the publication and click Create Publication.



The Welcome to the Create Publication Wizard will appear. This example will be run with the Show advanced options in this wizard configured. Click Next to continue.

Create Publication Wizard	×
Choose Publication Database Choose the database that contains the data or objects you want to publish.	<b>(</b>
Databases: isde_bob	
sde_repl	
< Back Next > Cancel	<u>H</u> elp

Highlight the database that contains the objects to be published, then click Next.



Select Snapshot publication, then click Next.



Updatable Subscriptions are not supported with ArcSDE. Click Next.

Create Publication Wizard	×
Transform Published Data You can choose whether data is transformed before it is distributed to a Subscriber.	
Transforming data using Data Transformation Services (DTS) allows you to convert data values or types; change text case; and merge, break up, or calculate new data values.	
Do you want to transform the data before it is distributed to Subscribers?	
○ Yes, transform the data	
No. Subscribers receive data directly	
< <u>B</u> ack <u>N</u> ext > Cancel I	<u>H</u> elp

The data between publisher and subscriber will not be modified in this example. Click Next.

Create Publication Wizard
Specify Subscriber Types What types of Subscribers will subscribe to this publication?
Select all of the types of Subscribers that you expect to subscribe to this publication.
Servers running SQL Server 2000
Servers running SQL Server version 7.0
Heterogeneous data sources, such as Oracle or Microsoft Access; or servers running earlier versions of SQL Server
Subscribers that are servers running SQL Server version 7.0 cannot use properties that are new in SQL Server 2000. If you select this Subscriber type, the new properties will not be available in this wizard.
<u> &lt; B</u> ack <u>N</u> ext > Cancel <u>H</u> elp

For this example, SQL Server 2000 was run. ArcSDE currently supports SQL Server 2000 and SQL Server 7. Click Next.

Specify Articles Publish tables and other database objects as articles. You can filter the published data later in the wizard						e	
Choose the databa	ase object	s to publish	as ar	ticles			
Object Type	Show	Publish /			Owner	Object	4
Tables	•			==	sde	CITYLIMITS	
Stored Proced	•				sde	f4	
Views				==	sde	f5	
User Defined				===	sde	f6	
				==	sde	f7	
4				==	sde	GCDRULES	
					sde	GDB_ANNOSYMBOLS	
Show unpublis	hed objec	:ts		==	sde	GDB_ATTRRULES	
					sde	GDB_CODEDDOMAINS	
Article [	)efaults		1	[mm.]	•		Ŀ
			( <u>B</u> ac	:k	Ne	ext > Cancel	<u>H</u> elp

Choose the data to transfer; here all tables in sde will be replicated. All the Spatial Database Engine<sup>TM</sup> (SDE<sup>®</sup>) stored procedures, views, and user-defined functions will also be replicated. It is necessary here to ensure that the tables are also replicated with the correct properties on the subscribing database. A way to ensure that multiple tables have the same owner is to click the Article Defaults button to set the owner of the tables that you are about to publish.

Default Table Article P	roperties 🔀
General Snapshot	
<u>N</u> ame:	< Default is based on table name >
Description:	× v
Table information	
<u>S</u> ource table owner:	< Source table owner >
Source <u>t</u> able name:	< Source table name >
Destination table <u>o</u> wner:	sde
D <u>e</u> stination table name:	< Default is based on table name >
	OK Cancel Help

Confirm that the source table owner and the destination table owner are correct. We also need to ensure that the extended properties associated with the articles are replicated. Therefore, click the Snapshot tab on the Default Table Article Properties page to check the appropriate boxes.

Default T	able Article Properties		
General	Snapshot		
Name	conflicts		
lfa Sub	table with the same name as the destination table exists at the scriber:		
0	Keep the existing table unchanged		
۲	DROP the existing table and re-create it		
0	Delete data in the existing table that matches the row filter statement		
0	Delete all data in the existing table		
Сору с	bjects to destination		
Inde	exes for primary keys are always copied.		
	✓ Include declared referential integrity		
	Clustered indexes		
☑	✓ Nonclustered indexes		
	User triggers		
	Extended properties		
	C <u>o</u> llation		
V	Convert <u>u</u> ser-defined to base data types		
	OK Cancel Help		



IDENTITY is a unique identifier that is added to the XML tables used in ArcSDE. Click Next.

ate Publication Wizard	×
Select Publication Name and Description Select a name and description for this publication.	<b>(</b>
Publication name:	
sde_replication	
Publication description:	
Snapshot publication of sde_bob database from Publisher PI0PI0\SDE90.	4
List this publication in the Active Directory	
The publication name can contain any character except " $[] \setminus  / <>$ : " ? or %	
< <u>B</u> ack <u>N</u> ext> Lancel	Help

Enter a Publication name and Publication description, then click Next.



Customize the Properties of the Publication Define data filters or customize the remaining properties; otherwise, create the publication as specified.	-
Do you want to define data filters or customize the remaining properties of this publicati	ion?
<ul> <li>Yes, I will define data filters, enable anonymous subscriptions, or customize other properties</li> </ul>	
No, create the publication as specified:	
Create a snapshot publication from database 'sde_bob'. Do not allow updatable subscriptions. Do not allow subscriptions to transform the published data using DTS. The following types of Subscribers may subscribe to this publication: Servers running SQL Server 2000	1
< <u>B</u> ack <u>N</u> ext > Cancel	<u>H</u> elp

For this example, choose to customize the publication properties. Click Next.

Create Publication Wizard	×
Filter Data Filter the data to be included in this publication.	
How do you want to filter this publication?	
< <u>B</u> ack <u>N</u> ext > Cancel	Help

No filtering of this publication will be chosen. Click Next.



Only named subscriptions (servers) will be allowed in this example. Click Next.

Create Publication Wizard	X
Set Snapshot Agent Schedule Set the starting schedule for the Snapshot Agent.	
The Snapshot Agent creates files containing the publication schema a are used to initialize new subscriptions to this publication.	and data. These files
Snapshot Agent schedule:	
Occurs every 1 day(s), at 10:45:00 PM., ending 9/15/2003	Change
< <u>B</u> ack	Cancel <u>Help</u>

The snapshot agent schedule can be changed to run at appropriate times. Click Change.

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Edit Recurring Job Schedule - PIOPIO\SDE90	x	
Job name: (Initial Synchronization Schedule) Cocurs Daily		
⊡		
⊂ <u>W</u> eekly		
C Monthly		
Daily frequency		
Occurs once at: 1:45:00 AM +		
O Occurs every: 1 📑 Hour(s) 🗹 Starting at: 10:45:00 PM 🚔		
E <u>n</u> ding at: 11:59:59 PM		
Duration		
Start date: 9/15/2003 💌 O End date: 9/15/2003 💌		
No end date		
OK Cancel Help		

Set the parameters to make the snapshot. Click OK. You will return to the previous screen.

Create Publication Wizard
Set Snapshot Agent Schedule Set the starting schedule for the Snapshot Agent.
The Snapshot Agent creates files containing the publication schema and data. These files are used to initialize new subscriptions to this publication.
Snapshot Agent schedule:
Occurs every 1 day(s), at 1:45:00 AM.
<u> ≺ B</u> ack <u>N</u> ext > Cancel <u>H</u> elp

Click Next.

Freate Publication Wizard × Completing the Create Publication Wizard Click Finish to create a publication with the following options: Create a snapshot publication from database 'sde\_bob'. \* Do not allow updatable subscriptions. Do not allow subscriptions to transform the published data using DTS. The following types of Subscribers may subscribe to this ublication: Servers running SQL Server 2000 To monitor replication activity for this Publisher, expand Replication Monitor at the Distributor. <u>F</u>inish Cancel < <u>B</u>ack

Click Finish to complete the creation of the publication.

### **Creating a New Subscription** Subscription Subscription

Create and Manage Publications on PIOPIO\SDE90	X
Databases and publications:	
PIOPIO\SDE90	Create Publication
sde_bob	Push New <u>S</u> ubscription
🕀 🔰 sde_repl	
	Properties and Subscriptions
	Script Publication
	Delete Publication
	Close
'sde_replication' description: Snapshot publication of sde_bob database from Publish	ner PIOPIO\SDE90.

Highlight the publication, and click Push New Subscription.



The Welcome to the Push Subscription Wizard will appear. This example will select advanced options. Click Next.

Push Subscription Wizard	×
Choose Subscribers Choose one or more Subscribers or groups of Subscribers.	6
Select one or more Subscribers in the following list. Select a group name to select all Subscribers in that group.	
Subscribers:	
Enabled Subscribers	
(Back Next) Cancel H	leln Í
	p

 Push Subscription Wizard

 Choose Destination Database

 Specify the subscription database at the SQL Server Subscriber(s).

 Subscription database name:

 sde\_bob
 Browse or Create...

 Note: The specified database must exist at each Subscriber when the subscription is initialized.

Browse to or create the database on the subscribing database that will receive the publication. The subscribing database must be named identically to the publishing database. Click Next.

Push Subs	scription Wizard	×
<b>Set D</b> i Ya Su	istribution Agent Location u can choose whether the Distribution Agent runs at the Distributor or at the ubscriber.	63
Where	do you want the synchronization agent to run?	
•	Run the agent at the <u>Distributor</u> Run the agent at the <u>S</u> ubscriber (supported only for Windows 2000 and Window Subscribers)	IS NT
	Network computer name of Subscriber:	-
	After the subscription is created, you can use the subscription properties dialo box to verify that the agent can run at the Subscriber.	g
	< <u>B</u> ack <u>N</u> ext > Cancel	<u>H</u> elp

For this example, the agent will be run at the Distributor. Click Next.



This example will change the Distribution Agent schedule rather than run continuously. Click Change.

Edit Recurring Job Schedule - PIOPIO\SDE90	×I	
Job name: (Default Distribution Agent Schedule) Cocurs		
C Weekly		
○ <u>M</u> onthly		
Daily frequency		
Occurs once at: 12:00:00 AM ÷		
C Occurs every: 1 🚍 Hour(s) ▼ Starting at: 12:00:00 AM 🐳		
Ending at: 11:59:00 PM		
Duration		
<u>Start date:</u> 9/15/2003 ▼ C End date: 9/15/2003 ▼		
No end date		
OK Cancel Help		

Select the parameters to run the Distribution Agent schedule. Click OK.

Push Subscription Wizard	×
Initialize Subscription Specify whether the subscription(s) needs to be initialized, and if so, when to start the initialization process.	
Does Microsoft SQL Server need to initialize the publication schema and data at the Subsc when the subscription is created?	riber
Yes, initialize the schema and data	
If yes, the Snapshot Agent must first create a snapshot of the publication schema and data. You must then start the Distribution Agent manually when the snapshot is available.	
<ul> <li>Ng, the publication already has the schema and data</li> </ul>	
<u> &lt; B</u> ack <u>N</u> ext > Cancel <u>H</u> e	ip

For this example, choose Yes, initialize the schema and data. Check Start the Snapshot Agent to begin the initialization process immediately. Click Next.

Push Subscript	tion Wizard	×
<b>Start Requ</b> See the be starte	ired Services status of the services required for this subscrip ed after the subscription(s) is created.	tion(s) and select those to
This sub servers.	scription(s) requires the following services to be	running on the indicated
	Service (on Server)	Status
☑ 💦	SQLServerAgent (on PIOPIO\SDE90)	Running
A service subscrip started n	e whose check box is selected will be started a tion(s) is created. A service whose check box i nanually for your subscription to work.	■ utomatically after the s not selected will have to be
	< Back Next >	Cancel   <u>H</u> elp

Click Next to start the required services.

Push Subscription Wizard		×
	Completing the Push Subscription Wizard	
	Click Finish to subscribe with the following options:	
	Publisher 'PIOPIO\SDE30'. Create a subscription at the following Subscriber(s): HKGIS	
	Create each subscription in a database named 'sde_bob'. Run the agent(s) that synchronizes the subscription(s) at	
	To monitor activity for this subscription(s), use Replication Monitor at the Distributor.	
	< <u>B</u> ack <u>[Einish</u> ] Cancel <u>H</u> elp	

Click Finish to complete the replication procedure.

# Completing the Replication Setup Once the snapshot has been successfully completed, you may need to manually start the agent to push it to the subscriber for the first time. Thereafter, it will occur on schedule. The subscription will then be ready for ArcSDE to be started or installed. Once you have successfully completed a subscriber update, continue to look at ArcSDE on the subscriber machine. Configuring ArcSDE If ArcSDE is not already installed on the subscriber machine, install it now. When you get to the postinstallation part of the setup, skip the repository setup. All that you need to do is create and start the ArcSDE service. If all the SDE tables, stored procedures, views, and functions were successfully created, then the service should start without hesitation.

**Conclusion** Snapshot replication can be used with ArcSDE for creating read-only spatial databases. Setup is via the SQL Server tools provided for creating snapshot replication. No special configuration of ArcSDE is required.



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