



Snapshots and Clones with SQL Server

Implementation Guide

Overview of the steps and considerations for creating and deploying snapshots and clones with SQL Server.



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1. Introduction

Snapshots and clones can have many uses ranging from performance scaling to workload isolation to deployment simplicity to data security. This makes snapshots and clones one of the most powerful tools on modern enterprise storage platforms. The following is a guide that walks the reader through snapshot and clone creation and deployment as well as covers some of the common considerations used for decision making. The guide should be an overview of the steps, in order, that should be taken. This guide does not replace the best practices guide or the array's user guides which should be used as companion documents.

1.1. Terminology

Before we get into the steps, let's clarify terminology.

- **Snapshots.** Point in time markers saved on the storage array. These markers allow an administrator to revert a LUN, or group of LUNs, back to the state of the data at the time of the marker.
- **Clone.** A new LUN, or set of LUNs, created to contain data with a state as of a point in time (a snapshot).
- **Thin clones** are merely pointers to the existing LUN or LUNs whereby changes to the data are held in the newly created clone LUNs but all of the original, non-changed, data is still stored in the source LUN.
- **Thick clones** are fully hydrated LUN or LUNs whereby the array will make an exact copy of the LUN into new LUNs and these new LUNs will act independently. Once a thick clone is created it cannot be remapped to another snapshot (point-in-time marker).
- **Remap.** The ability to change the source point-in-time marker (snapshot) for a thin clone.
- **Rollback.** Ability to revert the state of the LUN or LUNs back to a previous point-in-time (snapshot).

1.2. FSP: Flash Storage Platform

Violin Memory's Flash Storage Platform (FSP) is the combination of custom-for-flash hardware and custom-for-flash software delivering both cost effective and performance based storage solutions. Concerto OS7 is the software layer of the FSP that delivers a full suite of data services including protection, efficiency, continuity, migration and scaling. These features can also be combined for increased value and security. For example, an application consistent snapshot can reside on mirrored LUNs or the source LUNs can also be replicated to remote sites, etc.

Also included in the FSP are host based agents and tools which allow for advanced application consistent snapshots as well as other features. For the Microsoft Windows operating system, these tools and agents include:

- **SDM.** The SAN Disk Manager (SDM) is the foundation configuration tool which allows an administrator to connect the host to the FSP, configure Fibre channel or iSCSI connectivity, review snapshots, manage the other host agents and much more. This tool also acts as the primary on-host coordinating agent for application consistent snapshots. The snapshot process is initiated and owned by the FSP. This agent receives communication from the FSP during a snapshot and coordinates with the SQL Server agent to deliver application consistent snapshots. This agent also coordinates with the VSS agent to ensure proper flushing of all writes before the snapshot.
- **Snapshot Agent for Microsoft SQL Server.** This agent receives coordination from the SDM and then coordinates with the SQL Server to pause and release IOs during the snapshot process. This agent also allows for configuration of any scripts that may need to be ran before and/or after the actual snapshot.



- Snapshot Agent for FileSystems. This agent is the VSS hardware provider that coordinates with other agents to ensure that all writes have been flushed at the NTFS volume level before a snapshot is taken. This agent is a coordination agent and requires no additional configuration. This agent is required for application consistent snapshots of SQL Server databases.

2. Preparing the Source

The snapshot and clone process journey starts with the source host. In this section we will review the considerations and pre-snapshot steps that should be taken before creating and scheduling snapshots.

2.1. Considerations

Snapshots can be used for many purposes so considerations can cover a large amount of ground. The following are a few things to keep in mind when designing the architecture of the primary host.

2.1.1. Volume mapping

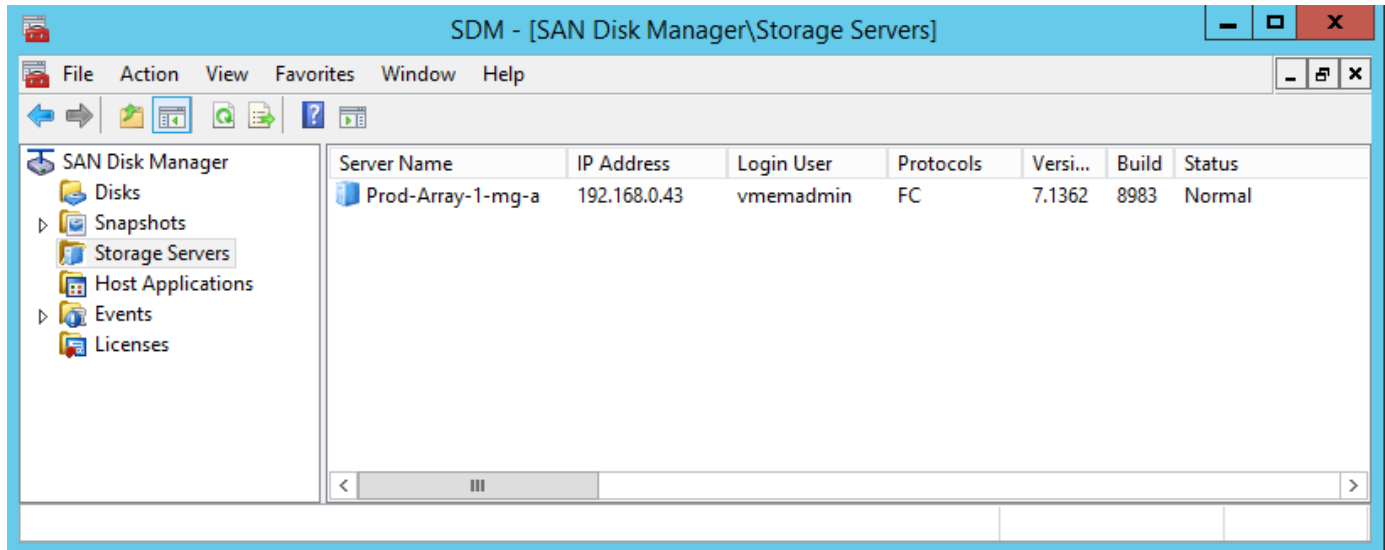
If the intent of the snapshot and cloning process is to mount a clone on a separate host then it simplifies the process if the appropriate volume drive letters and mount points are available on destination host. This allows Windows to mount the new LUNs without volume label conflict requiring administrators to execute scripts and add complexity to the process.

2.1.2. LUN based snapshots

Concerto OS7 is a LUN based snapshot technology. This means that while the array can, for application consistent snapshots, coordinate with the SQL Server to pause IO during the brief snapshot creation process, it will take a snapshot of the entire LUN. Clones will therefore be of the entire LUN, not specific volumes or files upon the LUN. So, if the intent of the architecture is to have the ability to only clone (or restore) one database, then multiple databases should not be resident on the same LUN as the cloned LUN will contain all volumes and files (databases).

2.2. Install SDM and Configure Storage Connectivity

The SAN Disk Manager (SDM) is the management tool that allows for a wide variety of tasks to be accomplished on the host server. With it an administrator can create LUNs, set up connections to storage, review agent events, review existing snapshots and much more. This is a required piece of software to be installed on any host that will be the source of snapshots as this tool configures the connection to the FSP, configures the Fibre Channel or iSCSI connectivity settings and manages the host agents after install.



2.2.1. Install the SDM

There are no options here beyond the directory for the binaries so click Next through to the end.

Windows Explorer view of the install executable for the SDM tool required for snapshots:

SDM-Windows-2.51-735-violin-x64

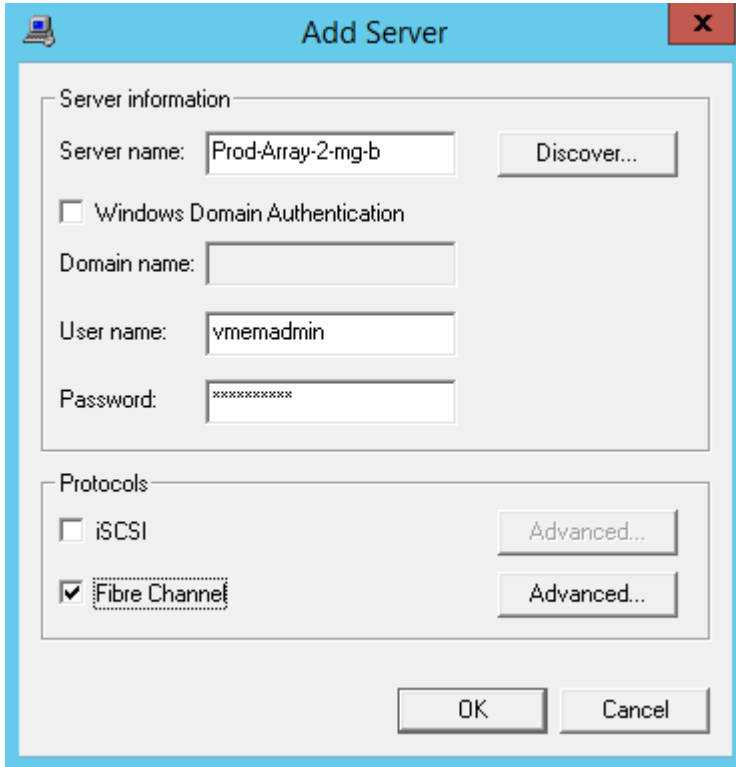
1/24/2015 8:58 AM

Application

2.2.2. Connect the SDM to the storage tier

Be sure to highlight the "Storage Server" node in the navigation pane on the left. Then, click Action|Add Server from the drop down menu.

In the Add Server wizard, enter the IP address or DNS name of the FSP along with the credentials established for managing the FSP itself. More specifically, for the FSP, enter the primary gateway controlling the database's LUNs. For snapshot groups, all LUNs must be managed by the same gateway and only one gateway can be active, per LUN, at a time. So, choose the active gateway managing the LUNs for the database. Most often this will be MG-A. Next, select iSCSI or Fibre Channel and click on the corresponding Advanced button to add the initiator configurations.



2.3. Install Agents

There are three agents that need to be installed on the host system. Each has a role and function spanning the operating system to the SQL Server. Install the agents in the order of the following sections. Ensure that you have the correct version of each agent.

Windows Explorer view of the install executables for the three agents available for snapshots:

Snapshot_Agent_FileSystem_Windows-5.00-735	1/24/2015 8:57 AM	Application
Snapshot_Agent_MSSQL_Windows-5.20-736-generic	1/24/2015 8:57 AM	Application
SnapshotAgent-VSS-Windows-5.10-735-generic	1/24/2015 8:56 AM	Application

2.3.1. Install and Configure the SQL Agent

The SQL agent is the process that coordinates with the SQL Server to pause IO during a snapshot. An administrator can review the logs of the SQL Server and see each database going into and out of a paused state. Install this agent first. It will be the executable with “MSSQL” in the name from the above picture list. Launch this executable and follow the installation steps.

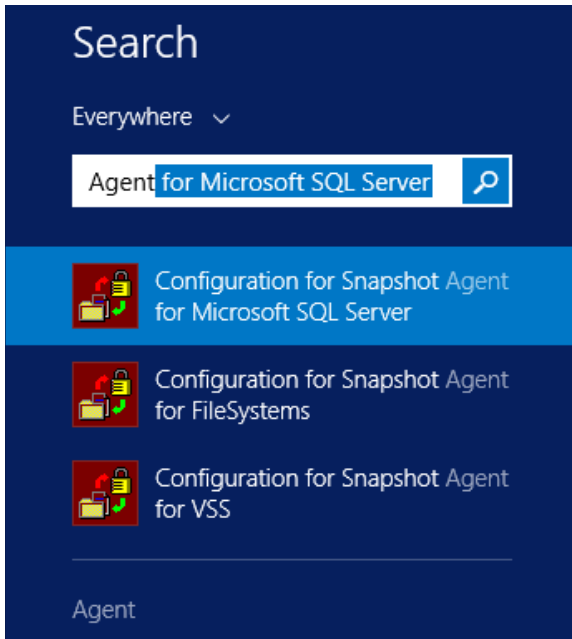
Later, after database snapshots have been running, you will be able to see the IO pausing effects of the SQL Agent as shown below in a sample of a SQL Server log entry.

SQL Server log entries showing IO pausing for application consistent snapshots:

12/1/2015 6:59:21 PM	spid52	I/O was resumed on database SnapThick. No user action is required.
12/1/2015 6:59:21 PM	spid52	I/O is frozen on database SnapThick. No user action is required. However, if I/O is not resumed promptly, you could cancel the backup.

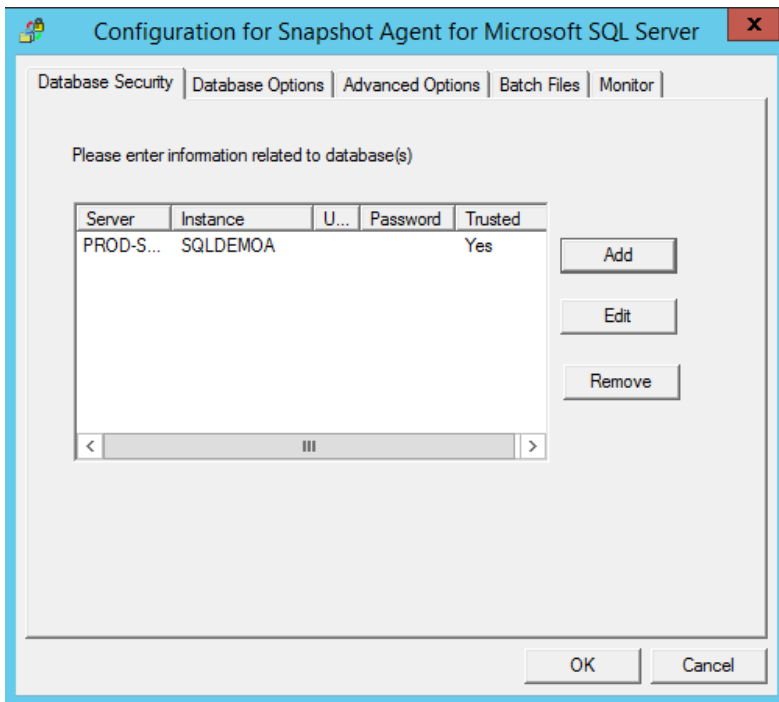
2.3.1.1. Open the SQL Agent

The SQL agent’s program name is “Configuration for Snapshot Agent for Microsoft SQL Server”. To Search for the program on the Windows desktop you can use “Agent” or “Snapshot” to bring up any of the agents.



2.3.1.2. Choose the appropriate SQL Server and credentials

On the Database Security tab, click the Add button to select the desired SQL Server and configure the appropriate credentials.



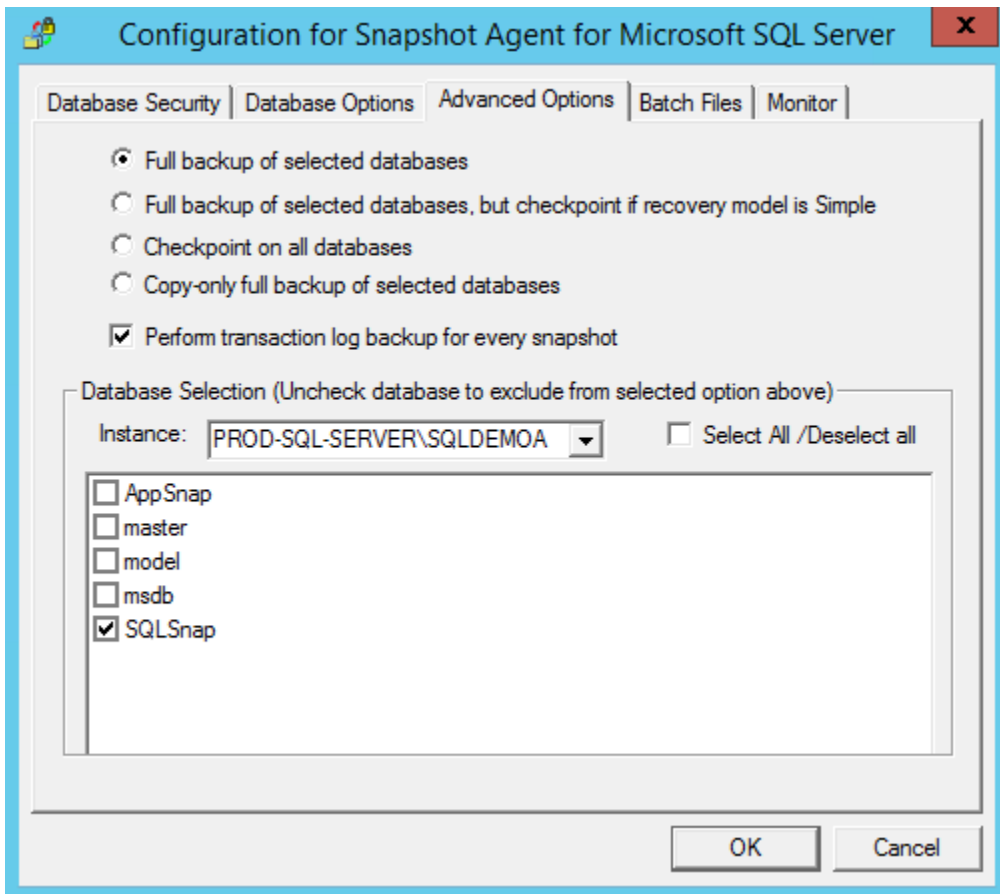
2.3.1.3. Select the desired databases and configuration options

On the Advanced Options tab, select the desired user databases. While it is common to have several user databases to snapshot it is also common to not include the system databases like master, model and msdb.

Choose “Full backup of selected databases” in order to direct the SQL agent to coordinate with the SQL Server to pause the IO during the actual snapshot execution. This is the option to select if true application consistent snapshots are desired.

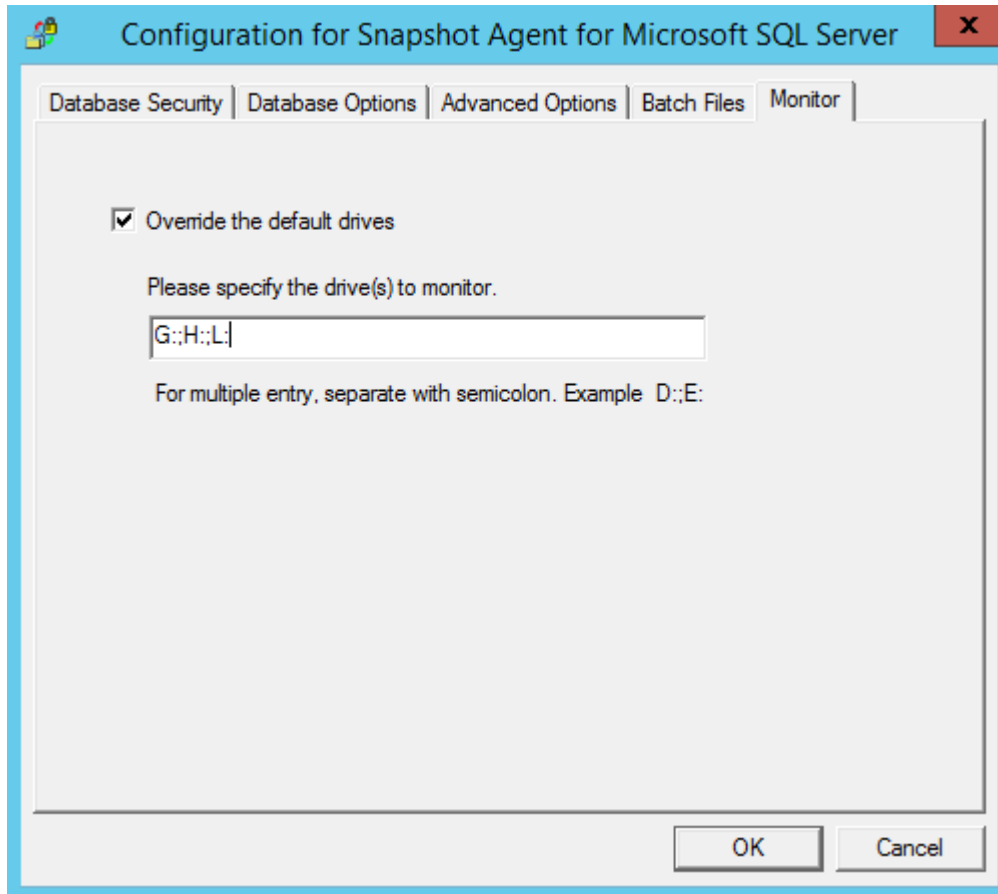
The “Checkpoint” option will cause a flush of dirty pages but will not pause IO during the snapshot execution. This would be considered a crash consistent type snapshot but after a buffer flush. The advantage here would be recovery time. With all of the dirty data pages flushed the recovery time for the database would be faster as it would not have to re-apply logged transactions to the data files.

The “Full backup” based options do not actually create backups nor do they interfere with the backup chain. These options use the BACKUP function of the SQL Server to set the database into an IO pauses state so that the snaps can guarantee zero corruption during the snap.



2.3.1.4. Input the volumes to be snapshotted

In the Monitor tab, add the volumes that cover all of the database data and log files. This is a semicolon delimited list of drive letters including their colons.



2.3.2. Install the FileSystem Agent

The FileSystem agent is required for coordination with the file system during application consistent SQL Server snapshots and volume-only consistent snapshots. The database or volume configurations for database or file system snapshots, items such as scripts to run or database credentials, are configured in the SQL Server agent or FileSystem agent. This agent does not need additional configuration for a SQL Server application consistent snapshot as the NTFS volumes to coordinate with were previously configured on the Monitor tab of the SQL Server agent (above).

2.3.3. Skip the VSS Agent

The Snapshot Agent for VSS is not required.

3. Creating and Scheduling Snapshots

Moving from the database host to Symphony, now it is time to create the actual snapshot resources, policies and schedules. It is important to note that once initial configurations are set on the host, all management and monitoring will be done on the FSP via Symphony. Concerto OS7, the array software, is the overall owner of the snapshot execution and initiates coordination with the host agents. The array drives the process. Symphony is the management console tool that allows for configuration and monitoring of the Concerto OS7 software.



3.1. Snapshot Resource Area (SRA) Considerations

Snapshots track the application changes by saving both the new and old blocks. The older versions of the blocks are saved into a Snapshot Resource Area (SRA) that allows an administrator to allocate specific amounts of space for this function based upon their system’s requirements for data security and availability. The SRA can auto grow and shrink and can have many different retention policies.


If any or all of the LUNs in a snapshot group will have unique retention or sizing requirements then the SRA per LUN should be set up individually. This is done via the SNAPSHOT RESOURCES tab in Symphony. If, however, the LUNs can have the same sizing and retention policies then a batch process can be utilized for the SRA creation via the SNAPSHOT GROUP tab in Symphony. It is most common, and easier, to use the SNAPSHOT GROUPS tab’s wizard to create the SRA in a batch for all the LUNs at the same time. It is a best practice to utilize a few common policies over the snapshot use cases instead of unique policies for each.

3.2. Snapshot Group

With the wizard in the SNAPSHOT GROUPS tab, all of the snapshot resources, policies and scheduling can be created.

LUNs SAN CLIENTS SNAPSHOT RESOURCES SNAPSHOT POLICIES SNAPSHOTS REPLICATIONS SNAPSHOT GROUPS STORAGE POOLS									
+ ✎ 🗑️ 🔄 📄 📁 🔍 🔗 📄 📁 🔗									
Name	Type	Controller	Members	Clients	Snapshot Enabled	CDP Enabled	CDP Journal Storage Pool	Snapshot Notification Enabled	Search
SQL_DEMO_01	Snapshot	Prod-Array-1-mg-a	SQL_DATA_01 SQL_LOG_01 SQL_DATA_02		<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
SQL_Snap_Group	Snapshot	Prod-Array-1-mg-a	SQL_Snap_Data_1 SQL_Snap_Data_2 SQL_Snap_Log	PROD-SQL-SERVER[vmemadmin]	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input checked="" type="checkbox"/>	

3.2.1. Add Snapshot Group

The first step is to create a new Snapshot Group. In the SNAPSHOT GROUPS tab, click on the plus sign icon  and choose an appropriate name. This is also where you will choose all of the LUNs to include in the group and the controller to coordinate the snapshot process.



CREATE SNAPSHOT GROUP


Name:

Controller:

Member LUNs:

Show available LUNs

3.2.2. Create Snapshot Policy for the Snapshot Group

Next, start the wizard by clicking on the camera icon  and choosing Create Snapshot Policy. This wizard will take you through the steps required to set up the resource area (SRA), retention policy and scheduling. Click Start on the first page of the wizard to move to the next step.

CREATE SNAPSHOT POLICY

Snapshot Resource needs to be created before **Snapshot Policy** can be created.

LUN: SnapThickData-1, SnapThickLog, SnapThickData-2

Step 1: Add Snapshot Resource

Step 2: Add Snapshot Policy

Click the **Start** button to create **Snapshot Resource** followed by **Snapshot Policy**.

3.2.2.1. Create Snapshot Resource form

In this form you will configure several items. Fill out the Storage Policy, Resource Policy and Advanced tabs. Do not fill out the Reclamation Policy tab yet. Click Create when done with the first 3 tabs.

CREATE SNAPSHOT RESOURCE

Storage Policy | Resource Policy | Advanced | Reclamation Policy

LUN: SnapThickData-1, SnapThickLog, SnapThickData-2

Storage Pool:

Allocated Size: GiB *

Available Size: 32028 GiB (Storage Pool Size 40970 GiB)

Threshold: % *

Expand Automatically: ON

Increment Size: GiB *

Max Size: GiB

Values are examples only. Please refer to the user guide and best practice guide for further information on these settings.

On the Resource Policy tab (pictured below), leave the Enable Snapshot Notification option to ON. There is also three choices for snapshot retention titled Resource Policy:

- **Preserve All Snapshots:** Grow the SRA as needed and potentially stall writes to the LUN(s) if the SRA is full and cannot grow.
- **Preserve Recent Snapshots:** Selecting this will cause a new dialog to pop asking how many snapshots to preserve. These will be kept in rolling fashion, with SRA growing as needed to accommodate this number of snaps.
- **Always Maintain Write Operations:** Grow SRA as needed until it cannot grow anymore, then purge snapshots, starting with the oldest, to free space to keep from stalling incoming writes to LUN(s).



CREATE SNAPSHOT RESOURCE

Storage Policy

Resource Policy

Advanced

Reclamation Policy

Resource Policy: Preserve All Snapshots
 Preserve Recent Snapshots
 Always Maintain Write Operations

Enable Snapshot Notification: ON

Values are examples only. Please refer to the user guide and best practice guide for further information on these settings.

3.2.2.2. Create Snapshot Policy form

In this form, fill out the Schedule, Notification and Retention tabs. Skip the other two tabs.

When setting up the schedule, make sure to leave time before the first snapshot is taken to finish up any other configurations that may need to be done.

Note that the application consistent process requires pausing IO on each database which requires coordination by the SQL agent. If there is more than one database being snapshotted this could add to the length of time the whole snapshot process takes. Also, be aware that while the pause in IO only lasts a few seconds, the entire coordination process per database can take longer than that. Therefore it is recommended to make sure that ample time is left between snapshots. For implementations with many databases to be snapped in the same group, 30 minutes is a common minimum time between snapshots.



CREATE SNAPSHOT POLICY

Schedule Notification Replication Retention CDP

Group: SnapThickGroup

Schedule Snapshots: ON

Initial Snapshot On: *

Snapshot Frequency: *

Trigger Snapshot Notification: ON

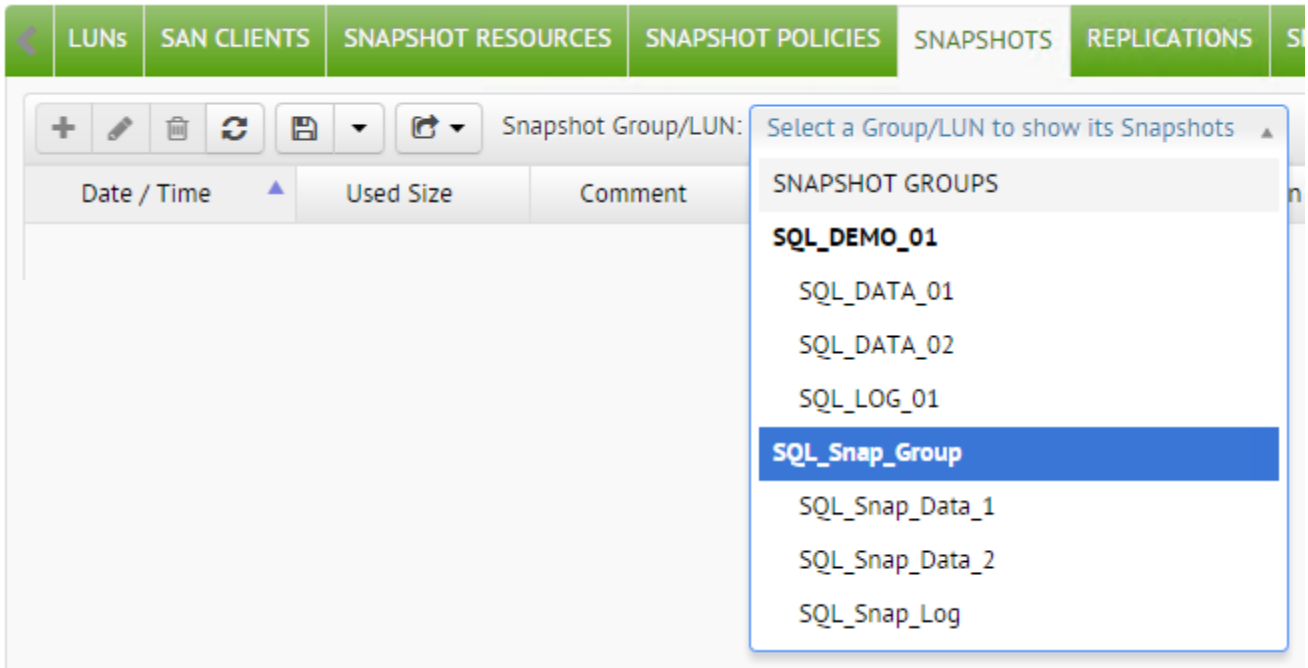
Snapshot Notification Every: scheduled snapshots *

Maximum Snapshots: *

Values are examples only. Please refer to the user guide and best practice guide for further information on these settings.

3.3. Done with Snapshots

The process of creating and scheduling snapshots is now done. You can review the snapshots as they are created by the system by going to the SNAPSHOTS tab in Symphony. Use the “Snapshot Group/LUN” drop down to review the existing snapshots for individual LUNs or snapshot groups.




In the resulting grid, the Quiescent column indicates which snapshots are application consistent (checked) or crash consistent (not checked).

Date / Time	Used Size	Comment	Priority	Quiescent	Thin Clone
12/2/15 7:30:00 PM		Scheduled_20151202193000	low	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12/2/15 7:45:00 PM		Scheduled_20151202194500	low	<input type="checkbox"/>	<input type="checkbox"/>
12/2/15 8:00:00 PM		Scheduled_20151202200000	low	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12/2/15 8:15:00 PM		Scheduled_20151202201500	low	<input type="checkbox"/>	<input type="checkbox"/>
12/2/15 8:30:00 PM		Scheduled_20151202203000	low	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12/2/15 8:45:00 PM		Scheduled_20151202204500	low	<input type="checkbox"/>	<input type="checkbox"/>
12/2/15 9:00:00 PM		Scheduled_20151202210000	low	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12/2/15 9:15:00 PM		Scheduled_20151202211500	low	<input type="checkbox"/>	<input type="checkbox"/>
12/2/15 9:30:00 PM		Scheduled_20151202213000	low	<input checked="" type="checkbox"/>	<input type="checkbox"/>

4. Create Clones

Now that snapshots are being taken, you can choose to turn one LUN or snapshot group into a thick or thin clone and mount it back to the same host or a different host.

4.1. Choose Snapshot Source

Choose one of the LUNs or snapshot groups in the “Snapshot Group/LUN” drop down. Choose a row item that matches your requirements. Then, click the “Thin Clone” button  from the task bar.

← LUNs SAN CLIENTS SNAPSHOT RESOURCES SNAPSHOT POLICIES SNAPSHOTS REPLICATIONS SNAPSHOT GROUPS						
+ ✎ 🗑️ 📄 ↻ 🔄 📁 Snapshot Group/LUN: SQL_Snap_Group						
Date / Time	Used Size	Comment	Priority	Quiescent	Thin Clone	
12/2/15 7:30:00 PM		Scheduled_20151202193000	low	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
12/2/15 7:45:00 PM		Scheduled_20151202194500	low	<input type="checkbox"/>	<input type="checkbox"/>	
12/2/15 8:00:00 PM		Scheduled_20151202200000	low	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
12/2/15 8:15:00 PM		Scheduled_20151202201500	low	<input type="checkbox"/>	<input type="checkbox"/>	
12/2/15 8:30:00 PM		Scheduled_20151202203000	low	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
12/2/15 8:45:00 PM		Scheduled_20151202204500	low	<input type="checkbox"/>	<input type="checkbox"/>	
12/2/15 9:00:00 PM		Scheduled_20151202210000	low	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
12/2/15 9:15:00 PM		Scheduled_20151202211500	low	<input type="checkbox"/>	<input type="checkbox"/>	
12/2/15 9:30:00 PM		Scheduled_20151202213000	low	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

4.2. Choose Clone Type

The default is a thin clone, which does not require an additional space. To create a fully hydrated thick clone, use the Instant Copy button on the bottom of the Thin Clone Snapshot form. This will create a background process that will copy data into the destination LUNs resulting in a full separate copy of the source LUNs. Thick clones can be mounted instantly, before the data materialization into the new LUNs is complete, by turning on the Instant Copy option on the Snapshot tab.

THIN CLONE SNAPSHOT

Snapshot Storage Policy

Group: SnapThickGroup

Snapshot At: 11/30/15 12:00:00 PM - Scheduled_20151130120000 *

Storage Pool: A Thick *

Allocated Size: 5 GiB *

Thin Clone Name Format: {n}_{t} ? *

Thin Clone Names: SnapThickData-1_20151130120000 SnapThickLog_20151130120000
SnapThickData-2_20151130120000

Instant Copy: OFF


Cancel Clone

Values are examples only. Please refer to the user guide and best practice guide for further information on these settings.

4.3. Assign Clone to Host

Choose which host to assign the thin clone. This can be the same host as the source database or an entirely new host server.

Start by navigating to the LUN tab in Symphoni. Then highlight one of the new LUNs created by the thin clone process and click

the computer button  in the task bar. Then choose “Assign to SAN Client”

LUNs						
SAN CLIENTS						
SNAPSHOT RESOURCES						
SNAPSHOT POLICIES						
SNAPSHOTS						
REPLICATIONS						
SNAPS						
snapthick						
Assign to SAN Client						
Search Search Sear Search						
LUN	LUN Type	Controller	Storage Pool	Snapshot Group	Tags	Status
SnapThickData-1	Thick	Prod-Array-1-mg-a	Thick	SnapThickGroup		Online
SnapThickData-1_20151130120000	Thin Clone	Prod-Array-1-mg-a	Thick			
SnapThickData-2	Thick	Prod-Array-1-mg-a	Thick	SnapThickGroup		Online
SnapThickData-2_20151130120000	Thin Clone	Prod-Array-1-mg-a	Thick			
SnapThickLog	Thick	Prod-Array-1-mg-a	Thick	SnapThickGroup		Online
SnapThickLog_20151130120000	Thin Clone	Prod-Array-1-mg-a	Thick			

In the ASSIGN LUNS form, select all of the LUNs in the snapshot group on the left and the desired host on the right and click the Assign button at the bottom.

ASSIGN LUNS

Select LUNs to Assign

Select All Deselect All

20151130120000 Search Search

LUN	LUN #	Type	Group
<input checked="" type="checkbox"/> SnapThickData-1_20151130120000	auto	Thin Clone	
<input checked="" type="checkbox"/> SnapThickData-2_20151130120000	auto	Thin Clone	
<input checked="" type="checkbox"/> SnapThickLog_20151130120000	auto	Thin Clone	

Showing 1 to 3 of 3 entries (filtered from 22 total entries)

Assign to SAN Clients

Select All Deselect All

Search

Client	Allowed
<input type="checkbox"/> Prod-ESXi-4	Online
<input type="checkbox"/> Prod-ESXi-5	Online
<input checked="" type="checkbox"/> PROD-SQL-SERVER[vmemadmin]	Online
<input type="checkbox"/> SDVA-Client	Online

Showing 1 to 4 of 4 entries

Available LUN #: 13-255

Access: Read/Write (Shared)

All Targets: ON

Cancel **Assign**

5. Mounting Clones to a Windows Host

Moving back to the destination host for the clone, this section covers how to configure the newly assigned LUN or LUNs.

5.1. Prepare Volumes

If the new clone is being assigned to a new host for the first time then Windows will have no mapping of the LUN IDs to their drive letters. So, you must online the volumes and assign the drives letters desired. If the Windows instance has seen the LUNs before then it will already have a mapping. Depending on the Windows version it can also auto-assign the next available drive letters. Make sure that the drive letters end up mapped appropriately or a script is launched to handle the online and drive letter mapping.

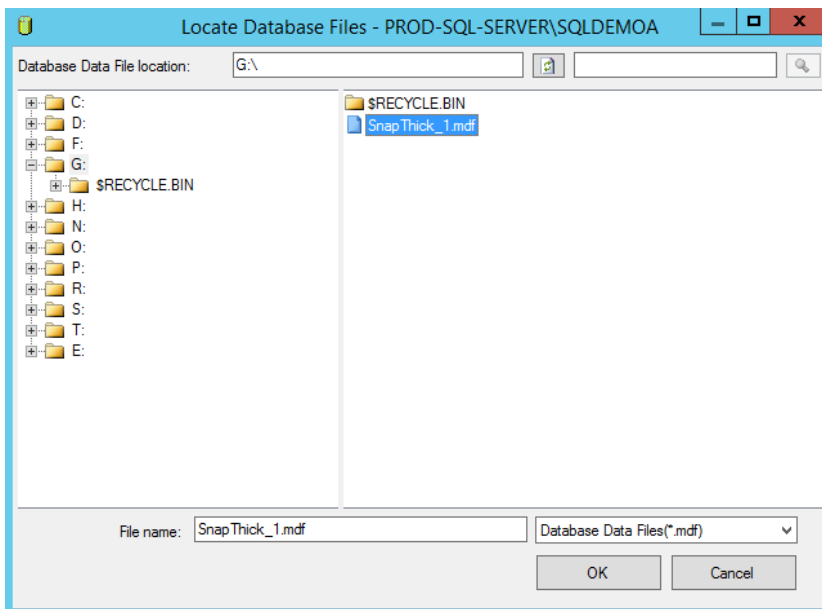
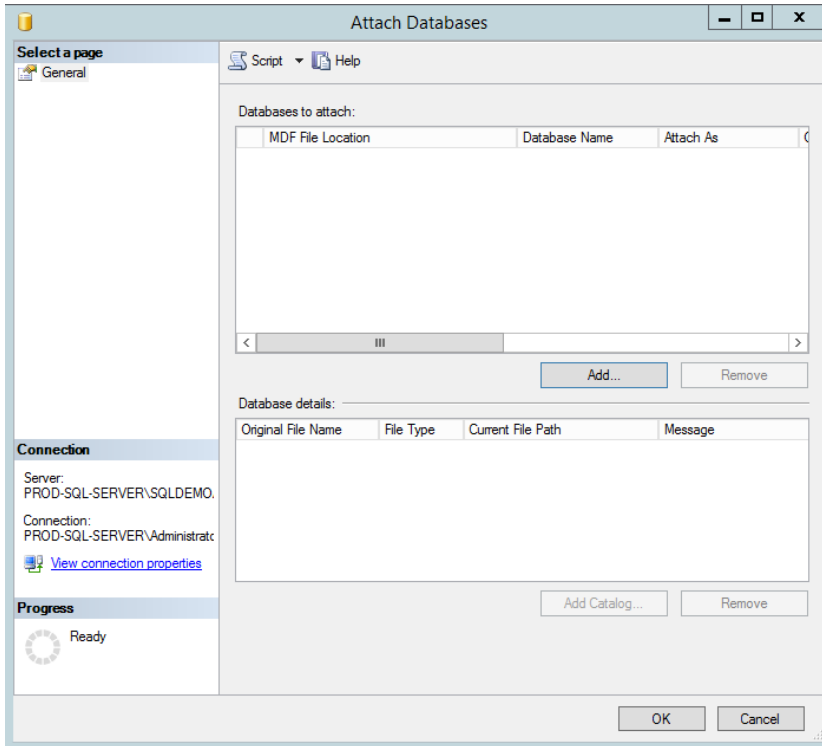


6. Attaching Cloned Databases to SQL Server

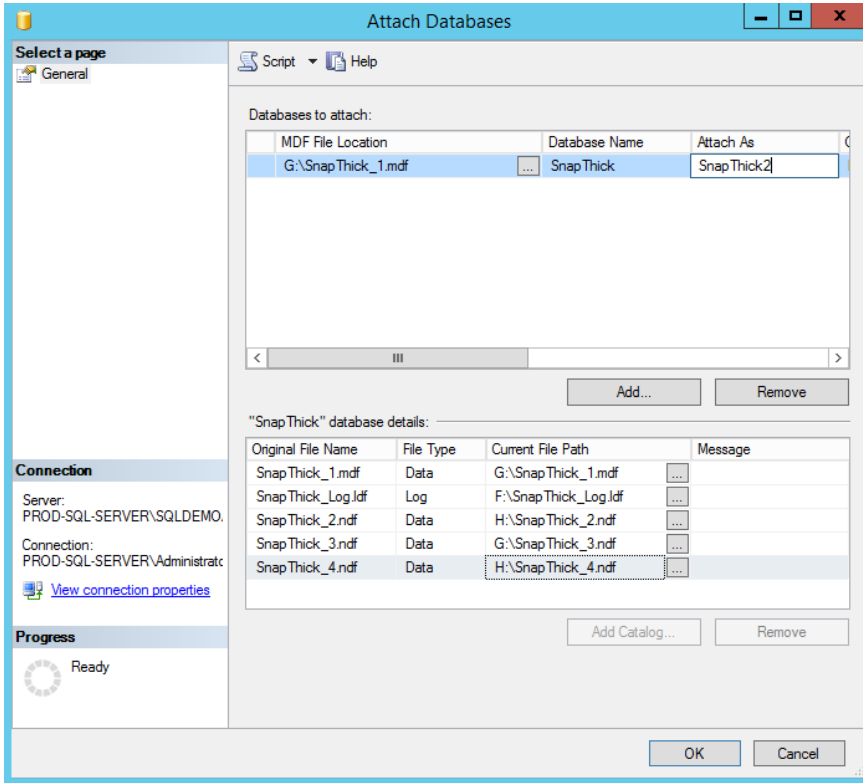
Now that the drive letters have been assigned, you are ready to attach the database to SQL Server. In SQL Server Management Studio, connect to the SQL Server, navigate to the Databases node, right click on the Databases node and choose the Attach option. This will open a form that allows navigation to the mdf file. The mdf file for each SQL database contains all the necessary information to start the process.

6.1. Attaching a Cloned Database to a SQL Server for the First Time

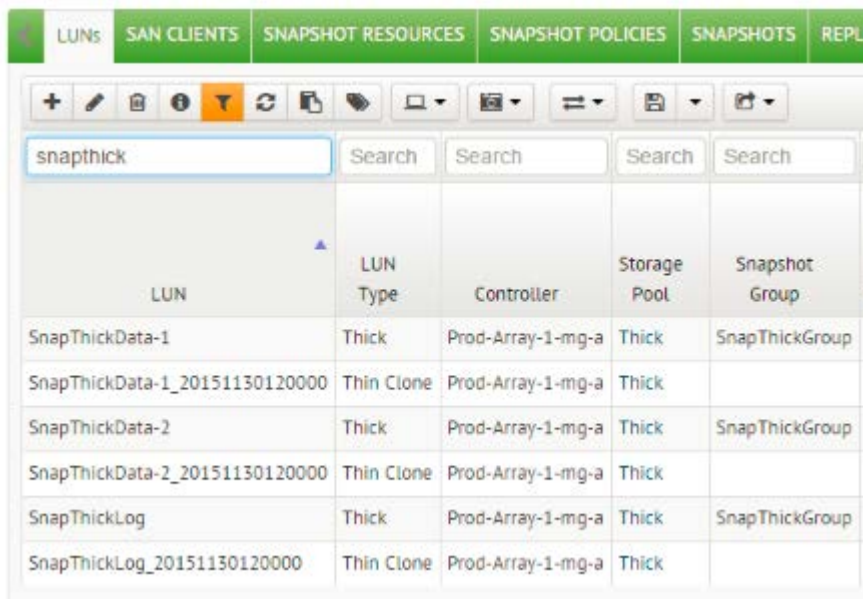
In the Attach Database form, click the Add button in the middle right and navigate to the mdf file on the newly assigned volumes.



Be sure to change the database name (Attach As) in the upper right and to change the Current File Path in the bottom grid to correspond to the new drive letters where these files can be found.



A new database will be added to the SQL Server that can be queried and written to like any normal database. Any new changes will be kept in a thin clone based LUNs shown on the LUNS tab in Symphony with a LUN Type of Thin Clone.




7. Remap a Cloned Database

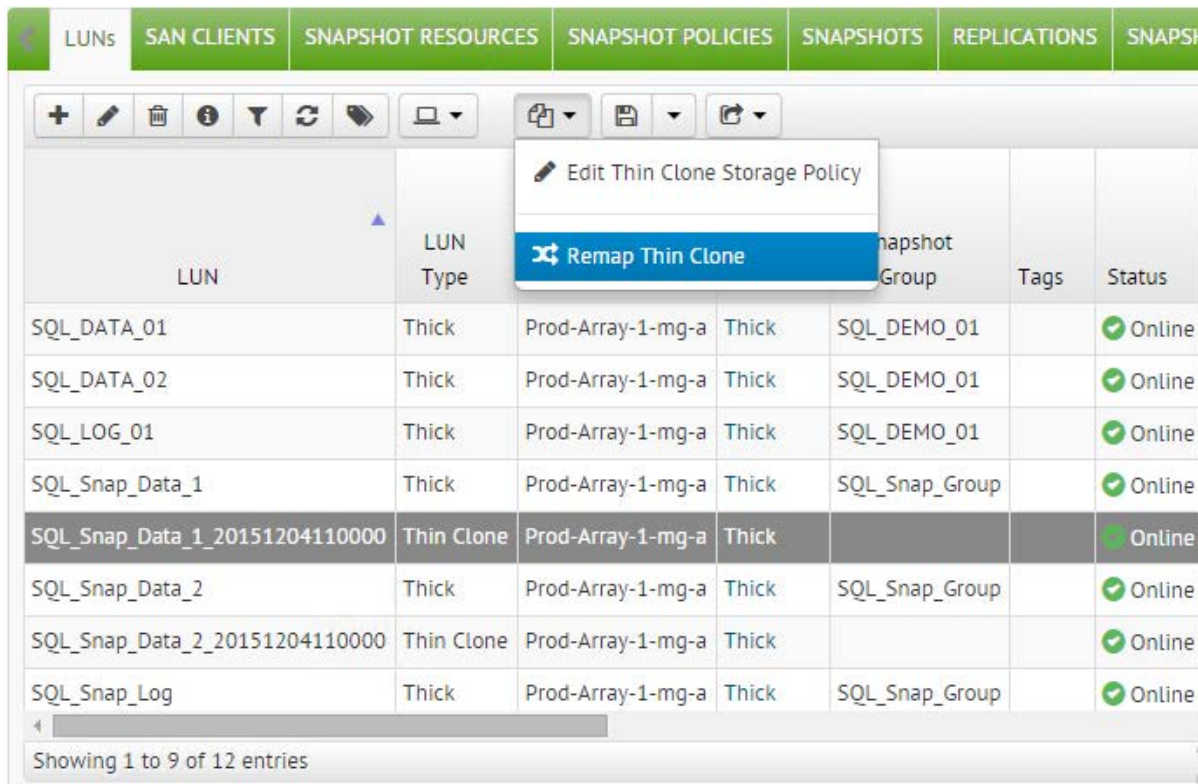
It is possible to change the state of the data inside of a thin clone to another point-in-time (snapshot). This is called remapping. The most common uses for this would be to either revert a change that was made (remap to a former snapshot) or to advance the thin clone to a more recent data set (remap to a newer snapshot).

7.1. Prepare the Database and Volumes

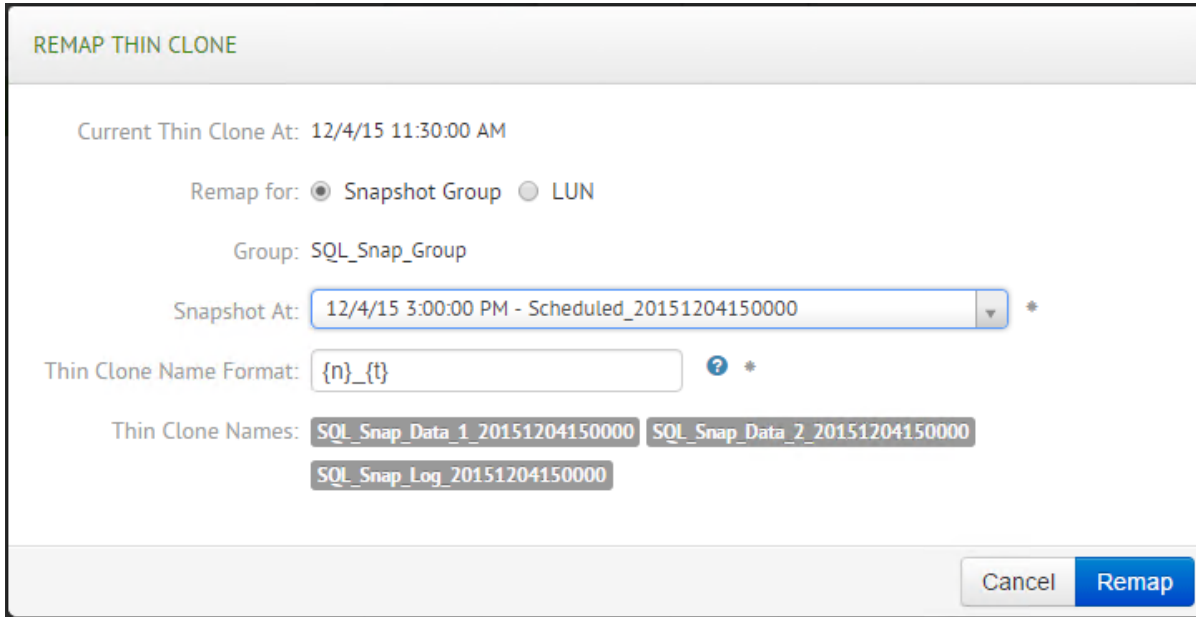
Similar to application consistent snapshots versus crash consistent snapshots, in order to ensure that there is no data corruption when making changes at the LUN or snapshot level, it is a best practice to offline the database and the volumes on the host. This makes sure that nothing is in flight or in memory when the change is made.

7.2. Remap the Clone

In Symphony, on the LUNs tab, select one of the LUNs associated with the snapshot group. This will change the tool bar and introduce the clone button . Click on it and select the “Remap Thin Clone” option.



Choose the desired new snapshot in the “Snapshot At:” drop down then click on Remap at the bottom.



7.3. Online the Volumes and Database

Now that the source LUNs have been remapped to a new point-in-time (snapshot) you can now online the volumes with Disk Manager and then online the database in SQL Server Management Studio.

Note: Sometimes Windows will mark the modified LUNs as read-only. If this happens, use the diskpart utility to clear the readonly parameter of the volumes.

