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Hitachi Dynamic Replicator - Scout
Protecting Microsoft SQL Server

Hitachi Data Systems

MK-98DF8223-00

Table of Contents

Conventions

Keywords, command buttons and other such fields are enclosed in " " while being bold (for example, to denote 

"**Next**" is used)

Inputs for commands and Variables are shown in *Italics*
File names and paths are shown in **bold**
Commands are shown in **`Courier new font`**
Optional keywords and arguments are enclosed within [ ].

 **Notes:**

Contains suggestions or tips.

 **Caution:**

Contains critical information

How this Document is Designed

This document is divided into eight parts,

Part 1: Explains protecting and recovering standalone SQL servers. The part also includes usage of CLI wherever possible.

Part 2: This part describes protecting a Clustered SQL server to a standalone SQL server. Both failover and failback are explained in this part.

Part 3: This part explains protecting and recovering a clustered SQL server to another clustered SQL server.

Part 4: This part explains protecting and recovering selective SQL virtual servers. Failover, failback are explained

Part 5: This part of the document describes steps involved in protecting and recovering SQL server when MS providers are missing. This occurs while using third party hardware platforms

Part 6: This part explains protecting SQL servers with two active node clusters.

Part 7: This section of the document contains troubleshooting information.

This document explains the solution for SQL2005, however, the same solution holds good for SQL 2000 and SQL 2008.

Please note that Hitachi Dynamic Replicator - Scout does not currently support fabric-based solutions.

1 Before you begin

- Ensure that FX agent on all hosts is up and running with domain user privileges. This domain user should also be a member of local administrators
- Ensure SQL services (For Example: MSSQLServer, SQL Server Agent, SQL Browser, SQL VSS Writer) are up and running
- Ensure that a domain user is created with required privileges
- Ensure that firewall is not blocking any of the Scout components
- Ensure VX agents are installed on both the source and target hosts
- Install CX server within the same LAN as of the production server
- Point all VX, FX agents to the same CX server, and assign appropriate licenses
- Ensure that the Db and log files are present under a same location on both source and target hosts. Ensure that this is not on the system volume
- Same version of SQL server should be installed on both the source and target hosts
- Ensure enough free space on the retention volume and do not use this volume for any other purpose
- SQL 2005 server, SQL Server 2005 Express, Named Pipes and TCP/IP need to be added to the Enabled Protocols. By default, these are disabled. They must be enabled to accept remote connections
- Ensure that you have installed SQL Distributed Management Objects (SQL DMO) on both the production and DR servers
- The FX templates and process involved in protecting is same for SQL express 2005 and SQL 2005
- When the source machine is restarted after a failover, it registers with the DNS server again. To avoid this either uncheck "**Register this connection's addresses in DNS**" check box for all NICS OR add the "**DisableDynamicUpdate**" of type DWORD to the Registry key "**HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\ Tcpip\Parameters**" with value set to 1. This key disables DNS update registration for all adaptors on that computer
- On Windows 2008 platforms ensure that the SQL VSS service is up and running with domain administrator privileges
- Ensure that the SQL browser and SQL VSS writer services are up and running at all times.
- While protecting SQL 2000, ensure that you install the latest “hot fix” from Microsoft website (http://support.microsoft.com/kb/904418). This hot fix upgrades the VSS component on which the vacp.exe is dependant for issuing consistency tags.

Part 1: Non Clustered environment

This part covers protecting and recovering SQL server on a non clustered environment where Production Server and DR Server both are standalone machines. The recovery section is further branched into planned failover, unplanned failover and failback. Each of them can be performed through CX UI and CLI.

2 Introduction to the Solution

This solution is divided into three steps, Protecting SQL server, SQL failover and SQL failback. Each of them is achieved through a set of steps.

Protecting SQL server: SQL server is protected in three steps, SQL discovery, Replicating discovered volumes and issuing consistency tags on production SQL volumes.

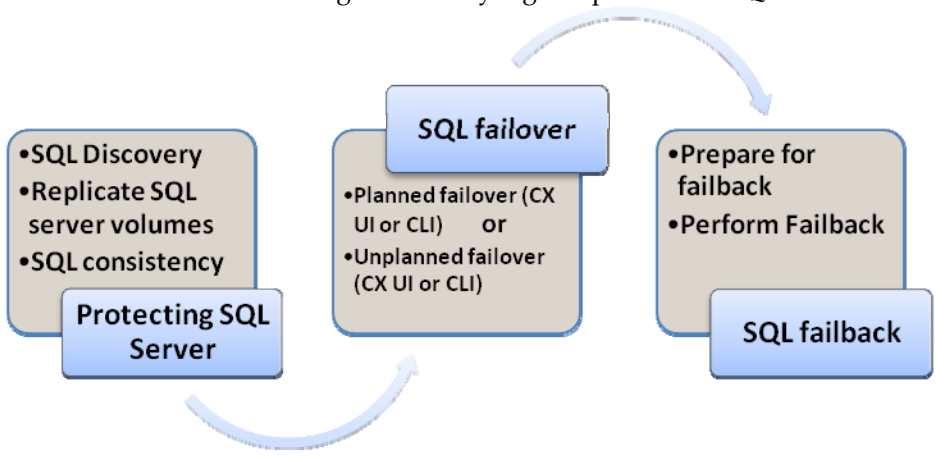


Figure 1:

SQL failover: There are two types of failovers, planned and unplanned failover. Each of them can be achieved either through the CX UI or the console.

SQL Failback: Failback is similar to a planned failover, however in a failback scenario the production server will act as the target and the DR server will act as the source. This is because a reverse replication will be set to update the production server with all the data changes during its outage. Replication is set through the CX UI and the actual failback can be achieved either through the CX UI or CLI.

Differences between planned and unplanned failover

Table 1: Differences between unplanned failover and planned failover

	Unplanned failover	Planned failover
When to use	Real-time or unexpected outages	Mock drills, To test the setup. Any expected outages
Recovered to	To latest consistent tag common for all SQL replication pairs	Issues a consistency tag on the SQL volumes. Target is recovered to the same consistent tag.
Performed through CX UI	Yes, unless the CX is down.	Yes
Performed through CLI	Yes	Yes

2.1 Privileges for SQL Failover and Failback

2.1.1 Introduction

The FX agent plays a critical role while performing a failover or a failback. It is important that the FX agent on both production and DR servers have appropriate privileges. It is always recommended that you create a special user with appropriate privileges and start the FX agent with that user's privileges.

This part describes the process to create a user with appropriate privileges require for the FX agent to start. It also describes the granular permissions required to allow the InMage service to successfully perform a SQL failover and failback. To set privileges you need to create domain user first then full control over the DNS for each source and target. The process involved is:

- Create a Domain User
- Add this domain user to the Production Server and DR Server record in DNS Server management console to give local administrator privileges.
- Add this user to Production Server and DR Server in Active Directory using ADSI Edit and give full permissions.

 **Notes:**

You will need domain administrator privileges for following the steps given below.

Detailed procedure to set privileges is as follows.

2.1.2 Create a Domain User

Step 1. Log on to the domain controller as an administrator where Production Server and DR Server are part of the domain.

Step 2. Click on **"Start->Programs->Administrative Tools ->Active Directory Users and Computers".**

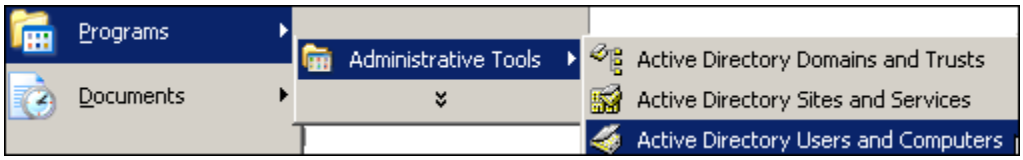


Figure 2:

Step 3. You should see the "**Active Directory Users and Computers"** screen. Under "**Active Directory Users and Computers".** Select **"Domain Users",** a list of users appears on the right hand side, right click and select **"New->User"**.

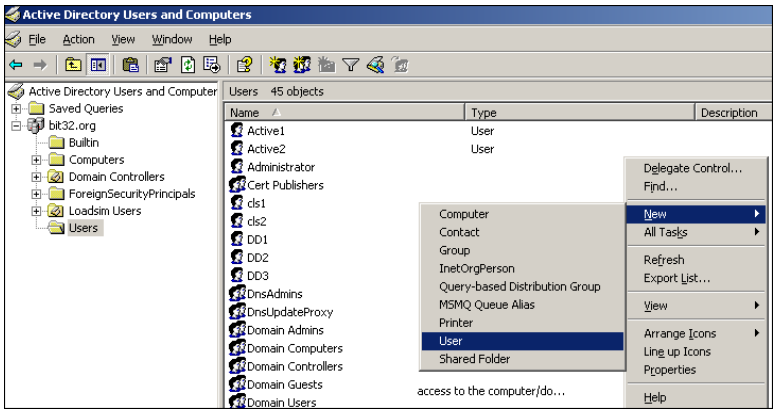


Figure 3:

Step 4. You should be able to see **"New Object-User"** screen. Enter the **"Name"** and **"User Logon Name**" and click on **"Next"**. In this example, first name and user logon name as "**InMageUser**" is used.

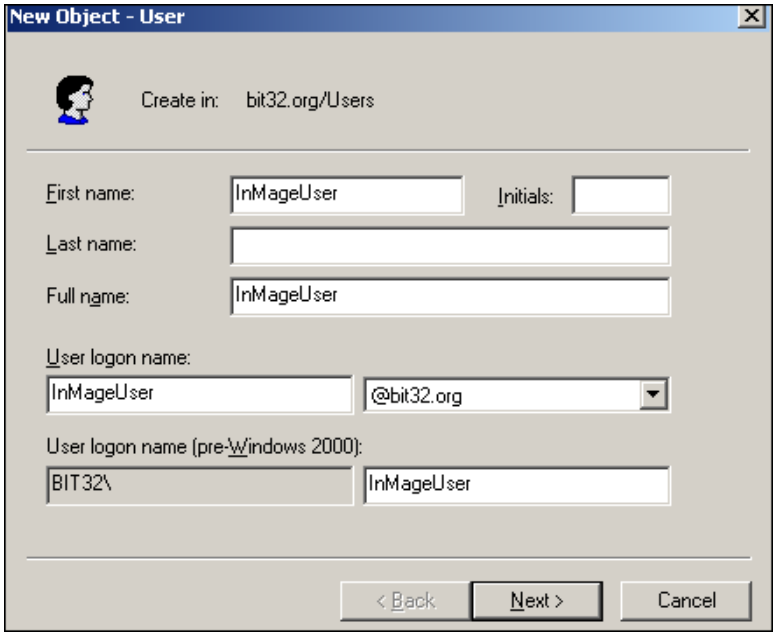


Figure 4:

Step 5. Enter the **"Password"** and select the "**Password Never Expires"** option. A message box appears prompting that you will not be required to change the password at next logon, click on **"OK"** then click on **"Next"**.

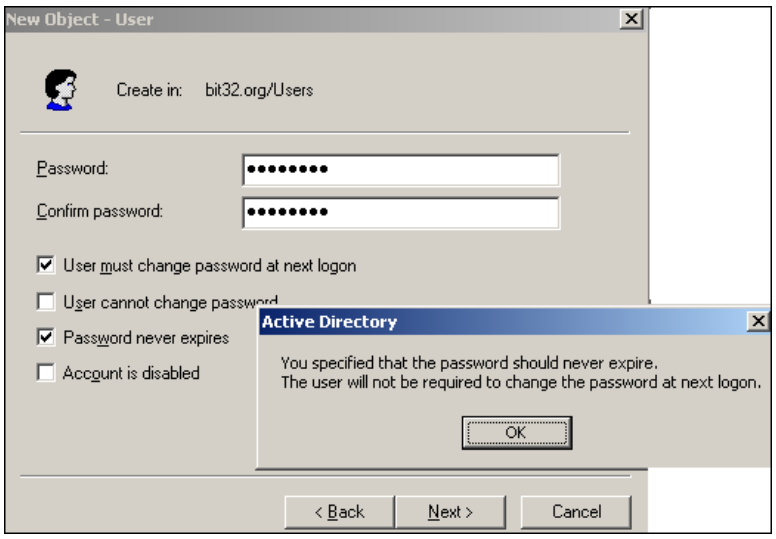


Figure 5:

Step 6. The next screen appears, click on "**Finish"** to continue.

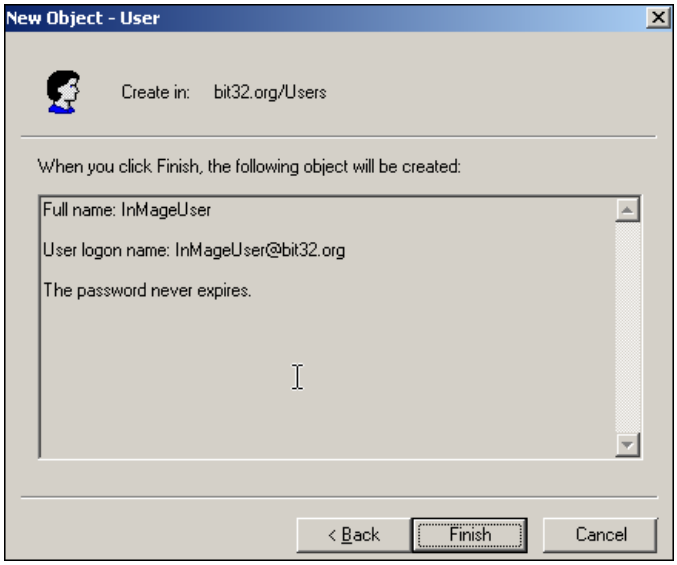


Figure 6:

Notes:

On Cluster environment, you will need to grant full privileges of DNS for the exchange virtual servers by repeating steps 1 to 4

2.1.3 Permission for DNS Record Change

Step 1. Click on "**Start->Programs->Administrative Tools->DNS**" or Run **"dnsmngmt.msc"** from command line. You should see the DNS management screen. Expand the **"Domain",** select the source host name on the right side, right click, and click on the **"Properties"**.

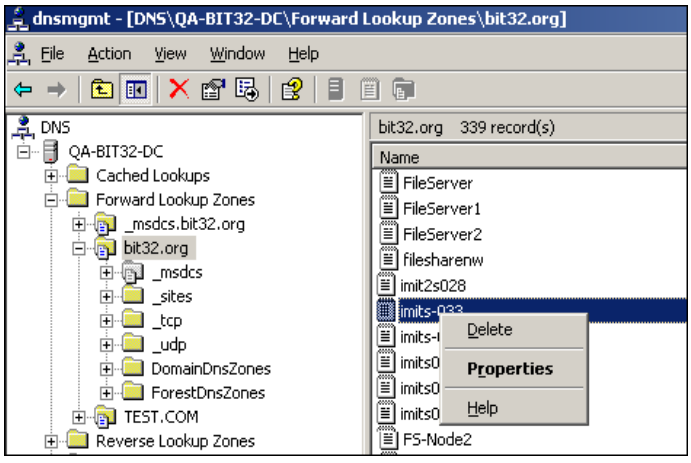


Figure 7:

Step 2. You should be able to see a source host properties screen. Click on the **"Security"** tab. Click on **"Add"**.

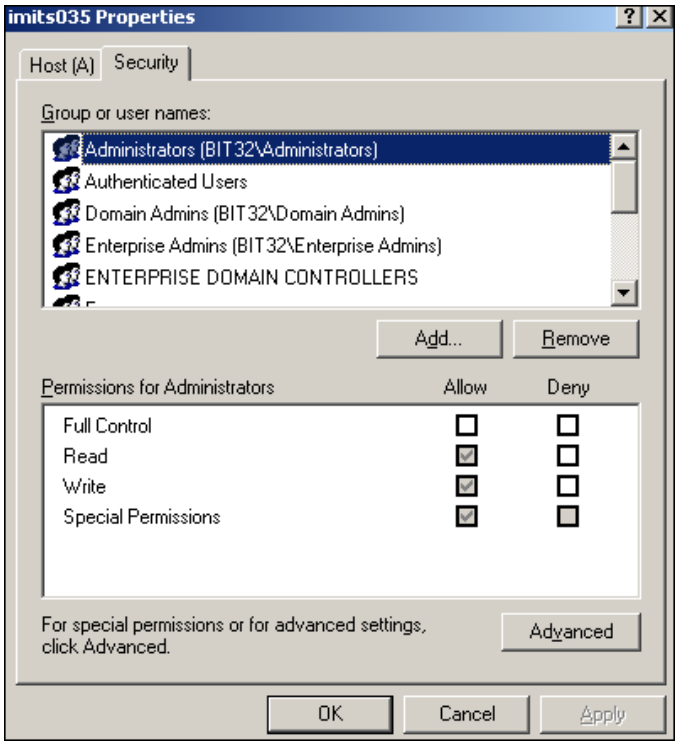


Figure 8:

Step 3. Select the domain user name (InMageUser) created in the previous steps and check if this username is available by clicking on the **"Check Names"**. Click on "**OK**".

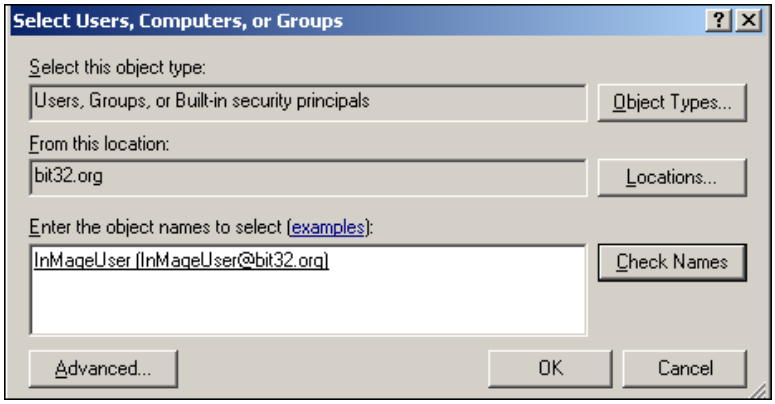


Figure 9:

Step 4. You will be taken back to the previous screen. Click on **"Full Control"** check box to grant all the privileges. Click on **"OK".**

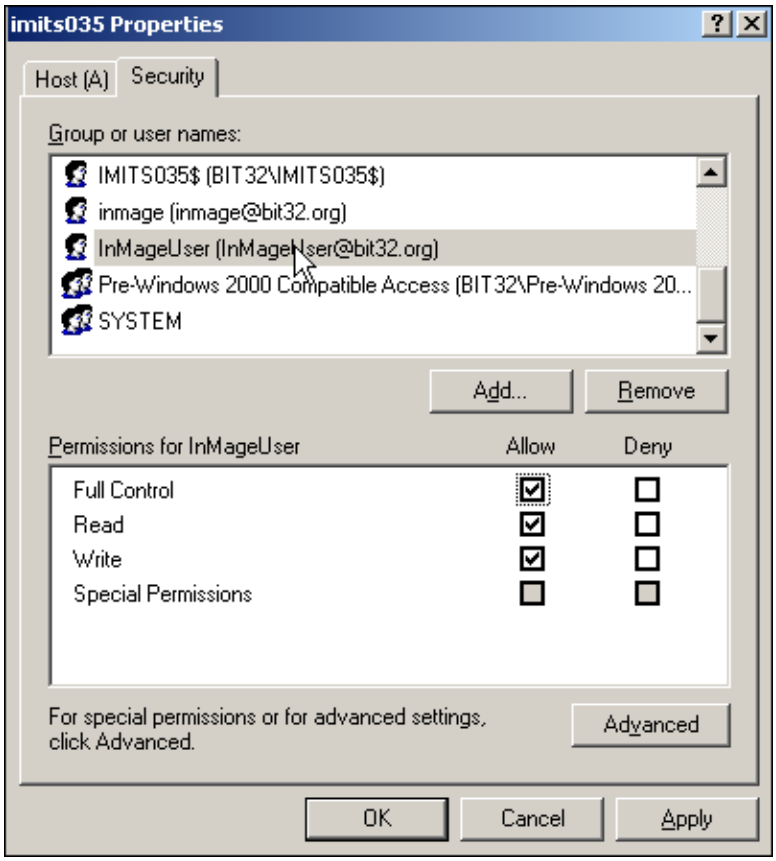


Figure 10:

Step 5. Repeat steps 1 to 4 for the **"DR-Server".**

Notes:

On Cluster environment, you will need to select the network name (SQL Virtual Server Name) and grant DNS privileges by repeating steps 1 to 4.

2.1.4 Permission for AD changes

Step 6. Click **"Start->Run->MMC"**, select **"Add/Remove Snap"**-from File Menu, and Click on **"Add"**.

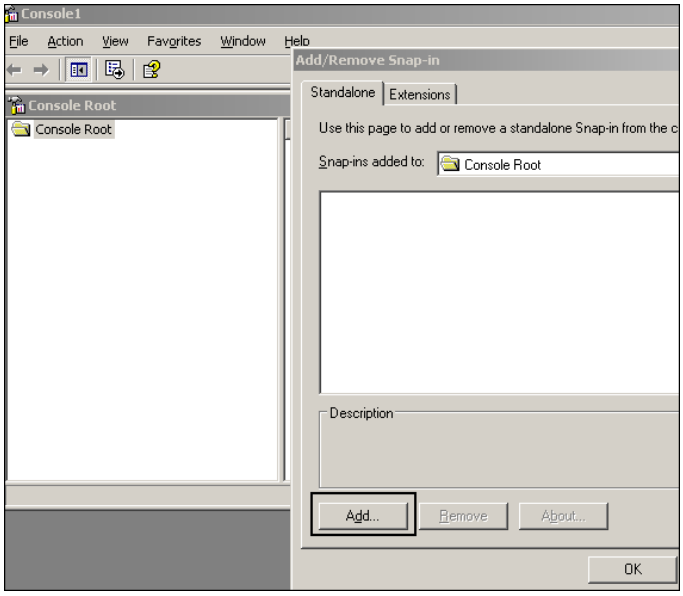


Figure 11:

Step 7. The **"Add Standalone Snap-in"** screen appears. Select **"ADSI Edit"**, and click on **"Add"**.

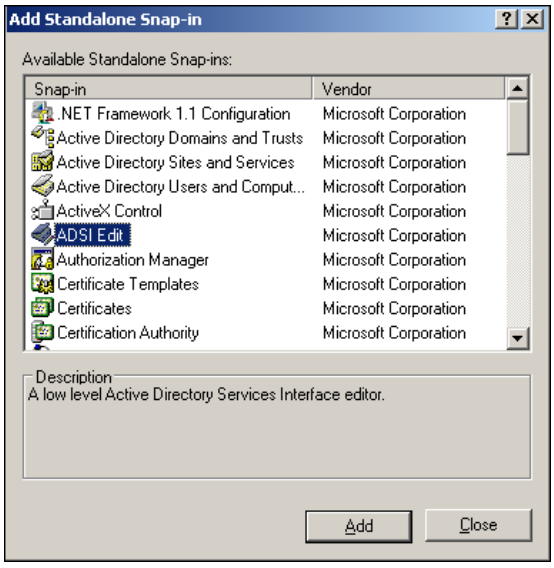


Figure 12:

Notes:

You need to install "ADSI Edit" before you add it in "Add Standalone Snap-in" (This is available in Windows Support Tools)

Step 8. You should be able to see **"Add/Remove Snap-in"** screen and click on **"OK"**.

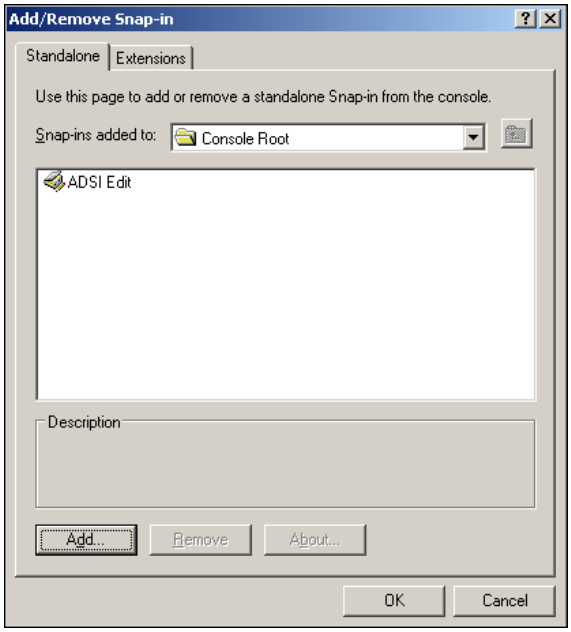


Figure 13:

Step 9. The **"console"** screen opens. Right click on **"ADSI Edit"**, and click on "**Connect To**".

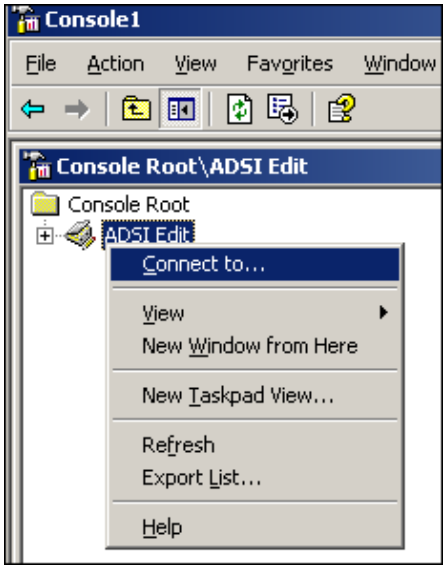


Figure 14:

Step 10. The **"Connection Settings"** screen opens up. Select the domain from **"Select a well known Naming Context"** or **"Domain"** and click on **"OK"**.

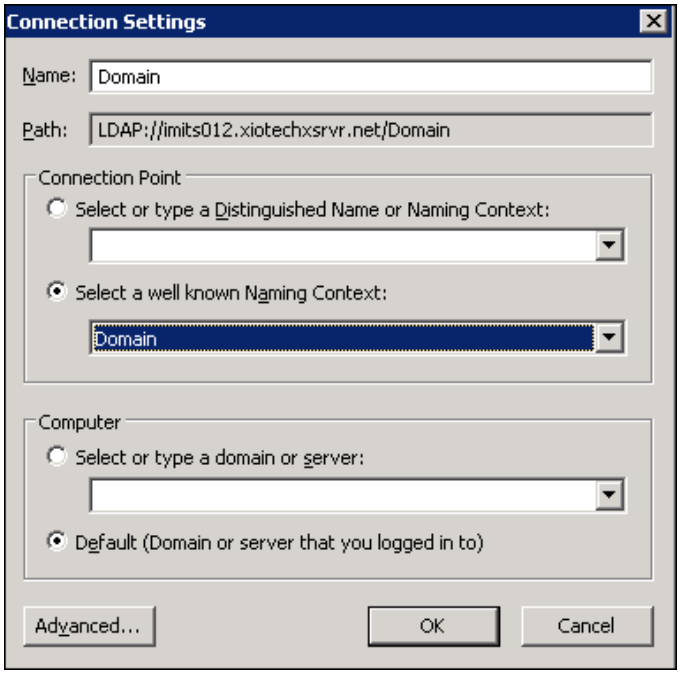


Figure 15:

Step 11. Expand the domain and select the domain user name (InMageUser) under **"Domain"** in the console root screen.

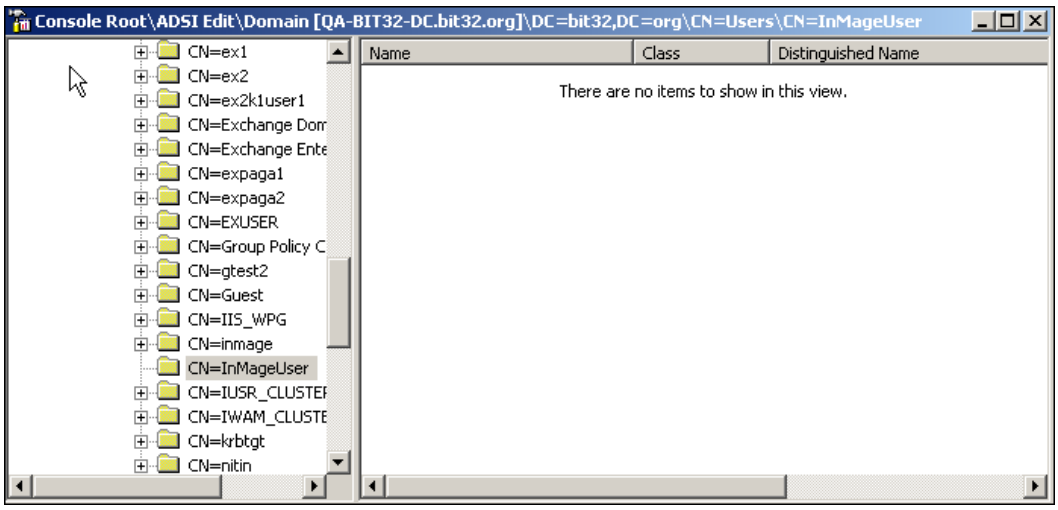


Figure 16:

Step 12. Right click and click on the **"Properties"**. You should be able to see the **"Properties"** screen and click on **"Security Tab"**.

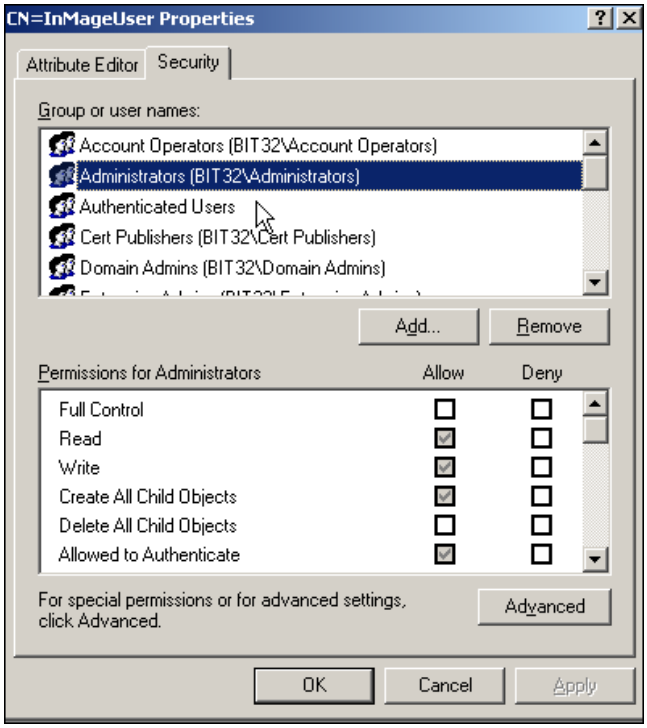


Figure 17:

Step 13. You should now see the **"Select Users, Computers, or Groups"** screen. Select the domain user (InMageUser) created in the previous steps and check if this username is available by clicking on the **"Check Names"**. Click on "**OK**".

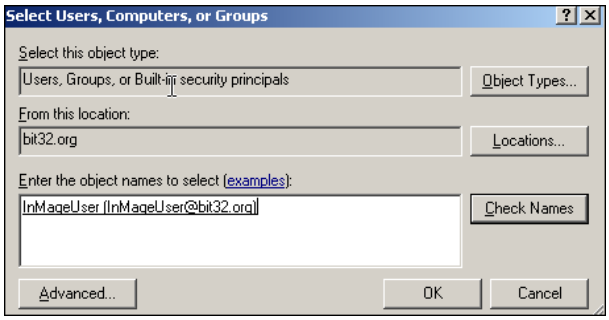


Figure 18:

Step 14. Click on **"Full Control"** check box and click on **"OK"**.

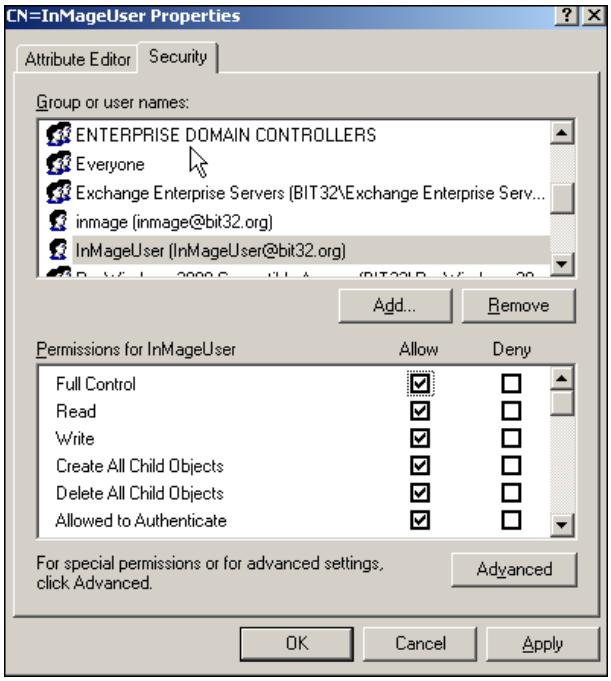


Figure 19:

2.1.5 Adding user to Host Machines

Step 15. Logon to **"Production Server"** with the domain administrator. Open Computer management console, click on "**Groups**" under **"Local Users and Groups"**, and click on "**Administrators**".

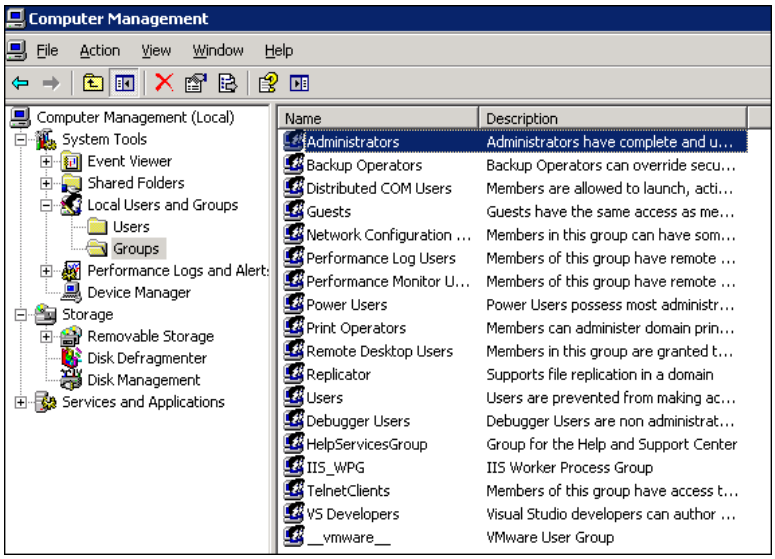


Figure 20:

Step 16. You should be able to see administrator's properties screen. Click on **"Add"**.

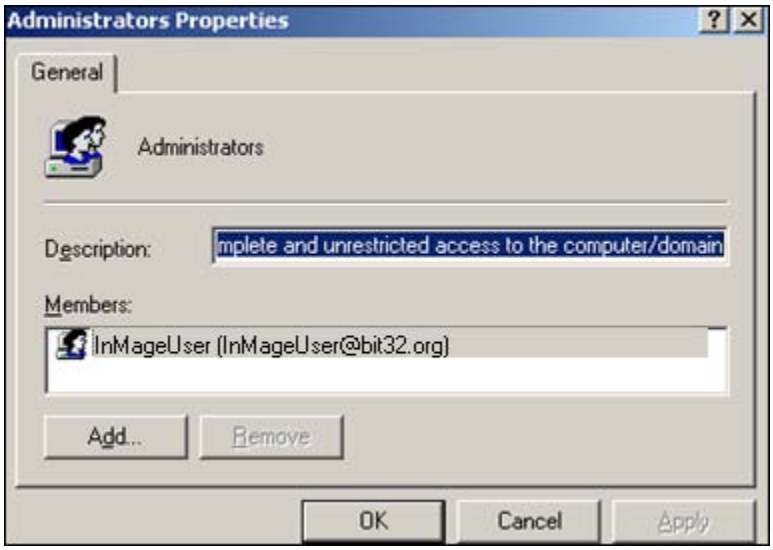


Figure 21:

Step 17. You see the **"Select Users, Computers, or Groups"** screen, Select the domain user name (InMageUser) created in the previous steps and check if this username is available by clicking on the **"Check Names"**. Click on "**OK**".

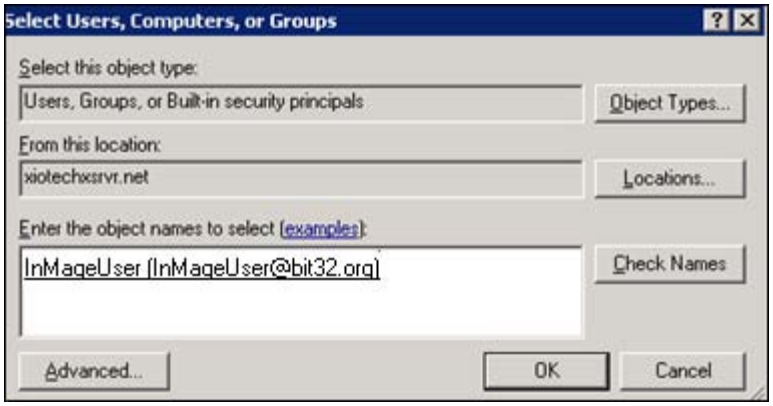


Figure 22:

Step 18. Click "**Start->Control Settings->Administrative Tools**". You should be able to see **"Administrator's Properties"** screen with the new domain user (InMageUser). Click on **"Apply"** and then on **"OK"**.

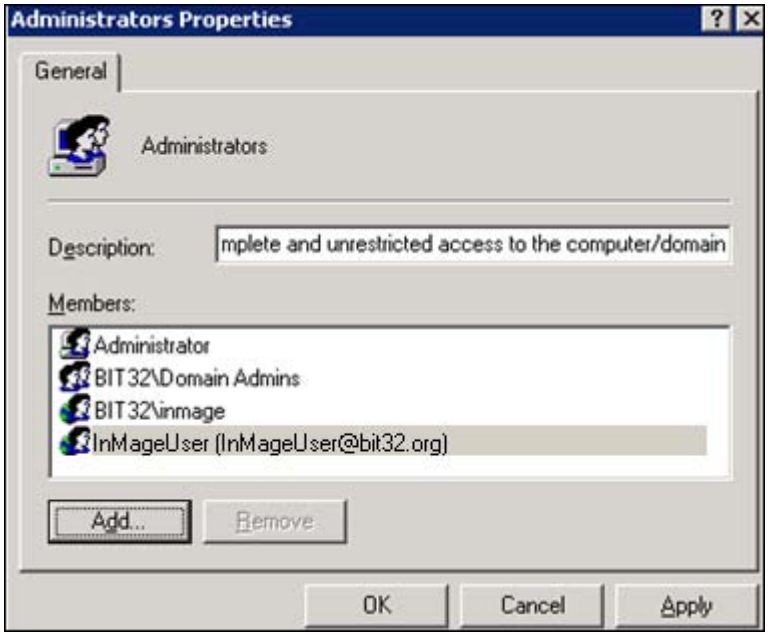


Figure 23:

Notes:

On Cluster environment you will need to add domain user to each node. Repeat the steps from 1 to 4.

2.1.6 Adding user to Logon Services

Step 19. Click "**Start->Program Files->Administrative Tools->Local Security Policy**".

Figure 24:

Step 20. You should see the **"Local Security Settings"** screen. Select **"User Rights Assignment"**, and select **"Log on as a Service"**.

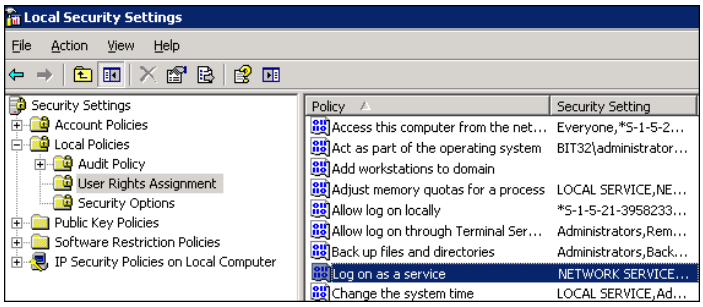


Figure 25:

Step 21. You should see the **"Log on as a Service Properties"** screen. Click on **"Add User or Group"**, and click on **"OK"**.

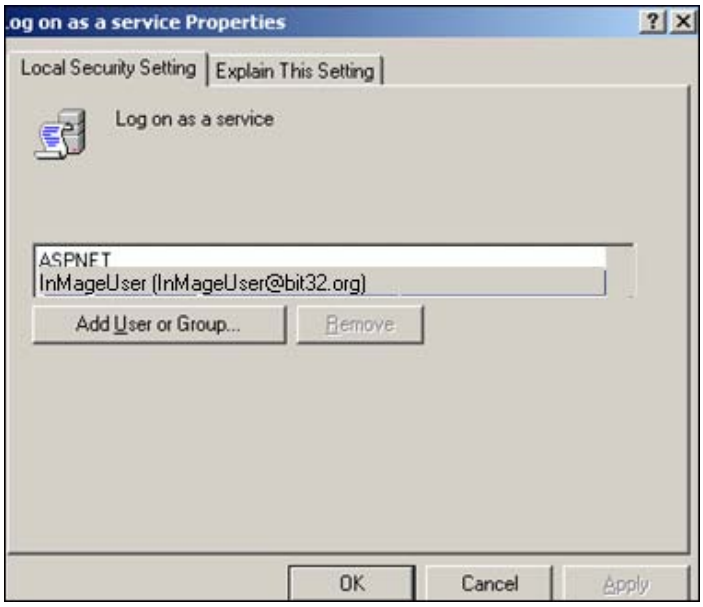


Figure 26:

Step 22. This should open **"Select Users, Computers, or Groups"** screen. Select the domain user name created in the previous steps and check if this username is available or not by clicking on the **"Check Names"**. Click on "**OK**".

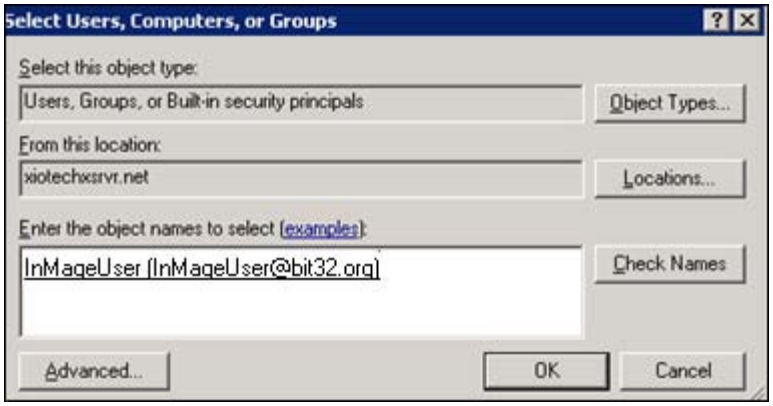


Figure 27:

Step 23. You should be able to see the previous screen. Now, click on **"Apply"**, and then on **"OK"**.

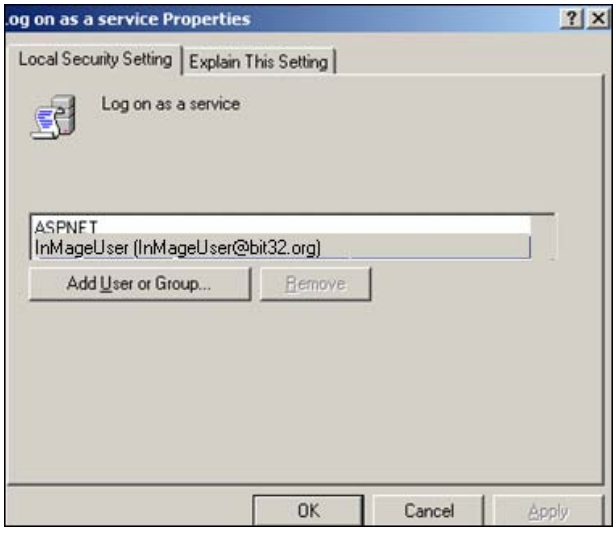


Figure 28:

Step 24. Log on to **"Production Server"** with the domain user created above. Click "**Start->Run->Services.msc"**, select the **"FX agent service"**, right click, and click on the **"Properties"**.

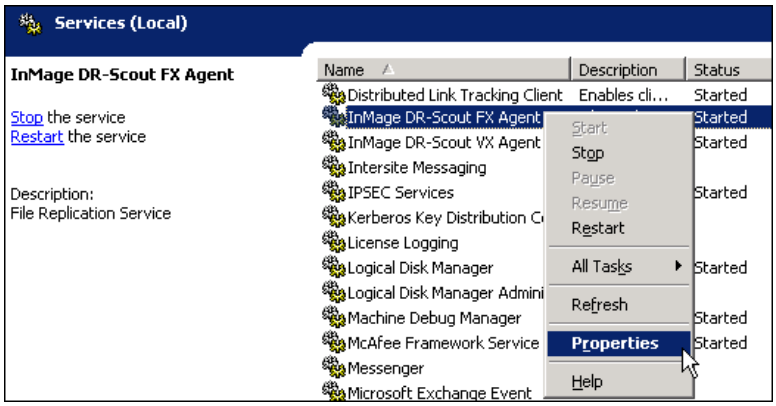


Figure 29:

Step 25. You should see the **"FX agent Properties"** screen. Enter the **"Domain Username"** and password details. Then, click on **"Apply"** and then **"OK".**

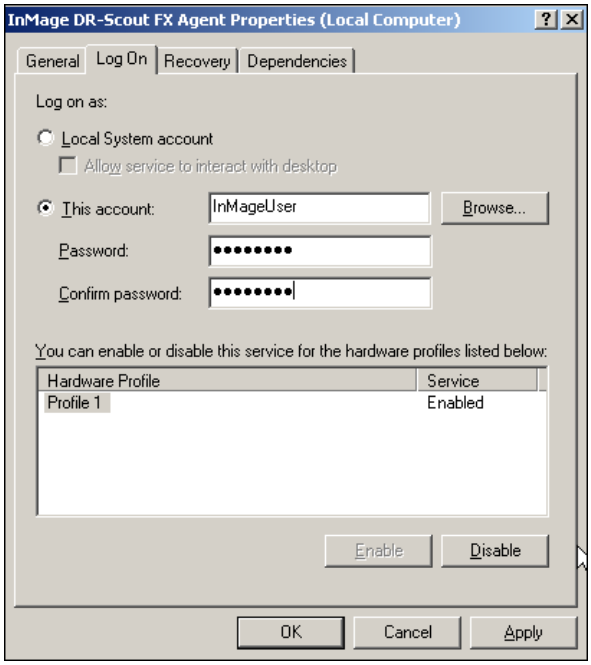


Figure 30:

Step 26. Restart the **"FX Agent Service"**. Repeat the step 1 to 7 for "**DR-Server"**

Notes:

On Cluster environment you will need to add domain user to each node. Repeat the steps from 1 to 8.

2.2 Verify privileges

It is recommended that you verify the privileges assigned in the previous step. This is verified through a single FX job. The result of the FX job will determine if the privileges are valid or not.

Step 27. Access the CX UI and click on "**File Protection",** you should now see the "**File Protection**" screen. Click on "**New Job Group Wizard"**

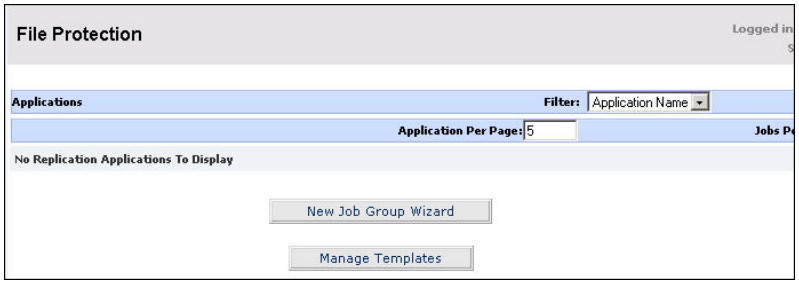


Figure 31

Step 28. The next screen opens up, click on "**Add Job"**

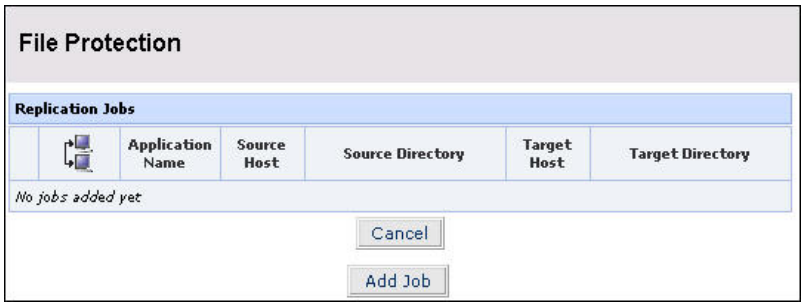


Figure 32

Step 29. Select the source as the production server and the Destination as the DR Server. Select the FX template as "**VerifySqlPermissions"**

Figure 33

Step 30. The job options screen opens up, scroll down to see that the source prescript and target prescript are filled up automatically. Click on "**Finish"** to continue

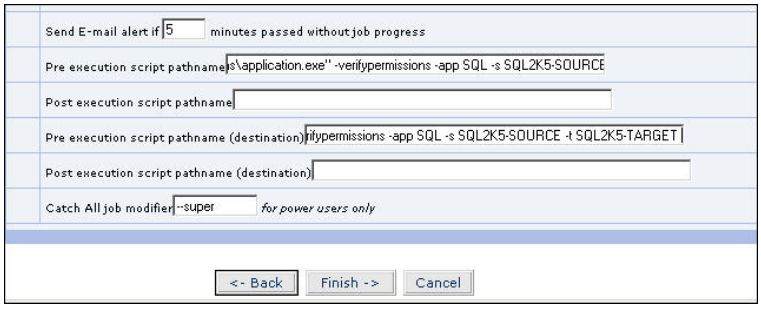


Figure 34

Step 31. The last screen appears, click on "**Finish"** to save the job

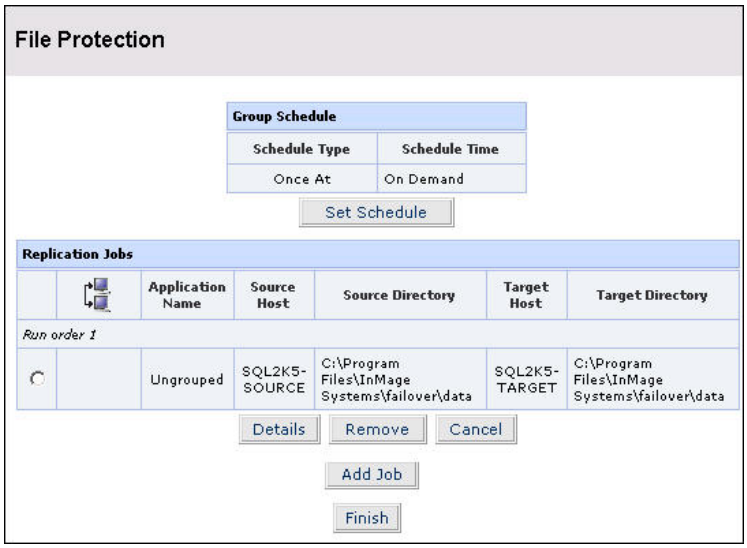


Figure 35

Step 32. Start the job and monitor the progress under the Protection Status screen

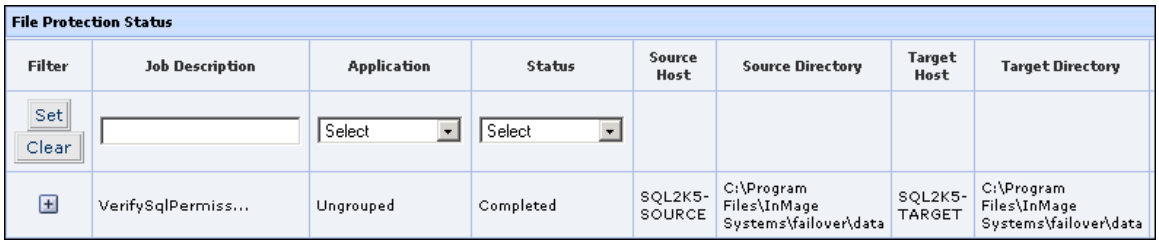


Figure 36

Step 33. Click on the "**+**" to expand the view and click on "**Log**" to see the result of the execution. This FX job will show **"[SUCCESS] The logon user has sufficient permissions to perform failover/failback of the Application**" when all the privileges are present or "**[ERROR] The service/logon account does NOT have sufficient privileges to update the DNS records of the above failed server"** when the privileges are not present.

2.3 Move SQL Databases from system drive.

This section describes steps involved in moving SQL System Database from boot or system volumes. This is performed in three simple steps as shown below.

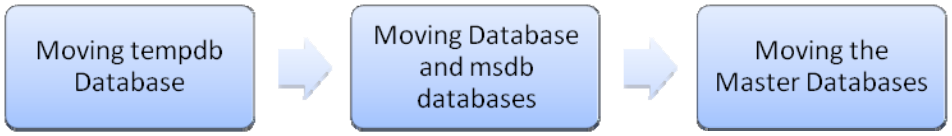


Figure 37:

2.3.1 Moving Tempdb Database

Step 34. Click on **"Start->Programs-> Microsoft SQL Server 2005->SQL Server Management Studio"** on the production server**.**

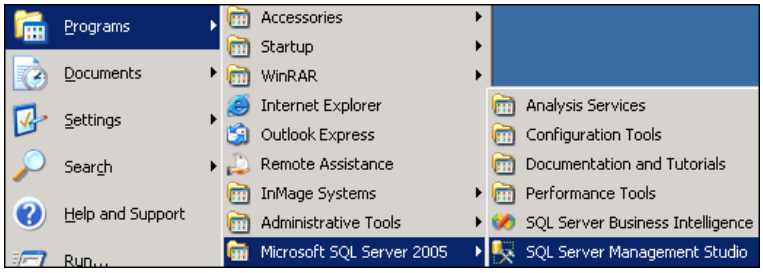


Figure 38:

Step 35. You should be able to see **"Microsoft SQL Server Management Studio"** screen. Click on **"New Query Manager"** under file menu to open the "**Query Manager"**.

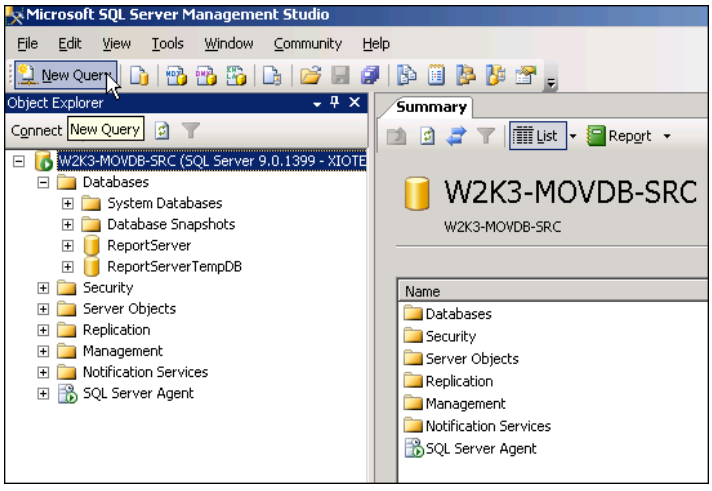


Figure 39:

Step 36. The **"Query Manager"** screen appears on the right side. Then, issue the following commands to view the physical location of the master database under the "**Results"** tab.

```
Use master
Go
sp_helpfile
go
```

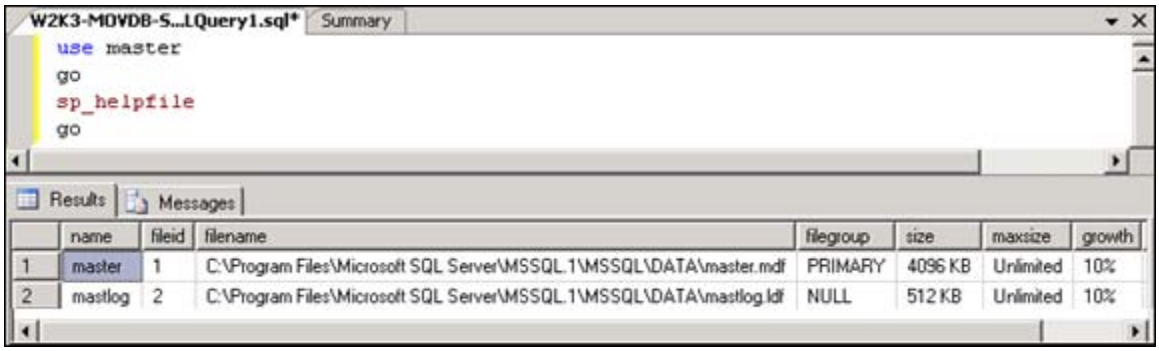


Figure 40:

Step 37. Proceed to move the tempDB by executing the following command:

```
USE master;
GO
alter database tempdb MODIFY FILE NAME = tempdev, FILENAME='NEW
PATH+FILENAME');
```

Step 38. .The above command shows the path where it has to be moved and this can be seen in the bottom pane.

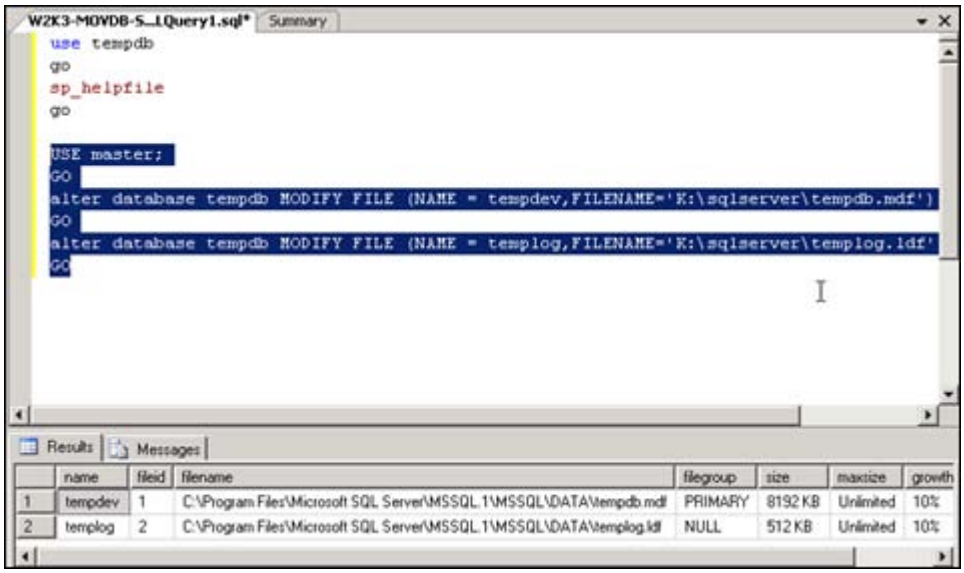


Figure 41:

Step 39. You should be able to see the "**Messages"** tab containing success message.

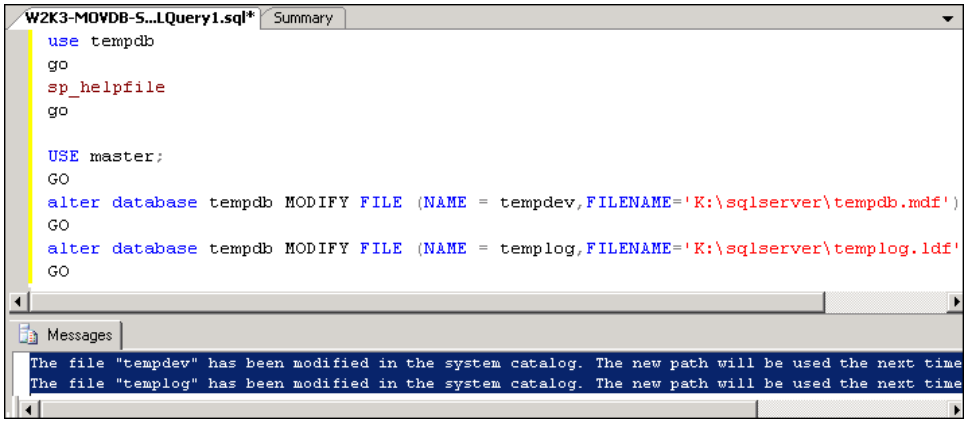


Figure 42:

Step 40. Now, that the Tempdb is moved, restart the **"SQL Server (MSSQLSERVER)"** service from the services interface as shown below.

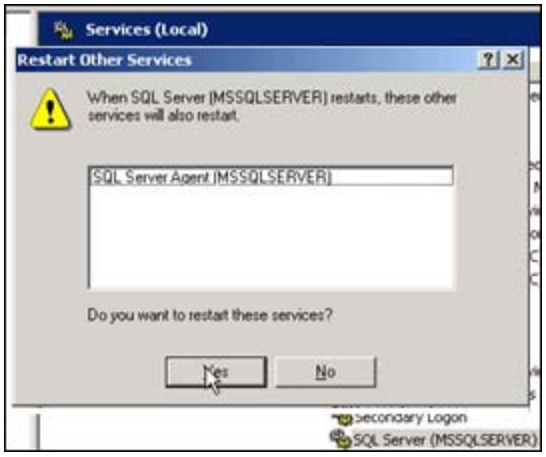


Figure 43:

Step 41. Now, switch back to the "**Query Manager",** and issue the following commands to confirm the new path.

```
use tempdb
go
sp_helpfile
go
```

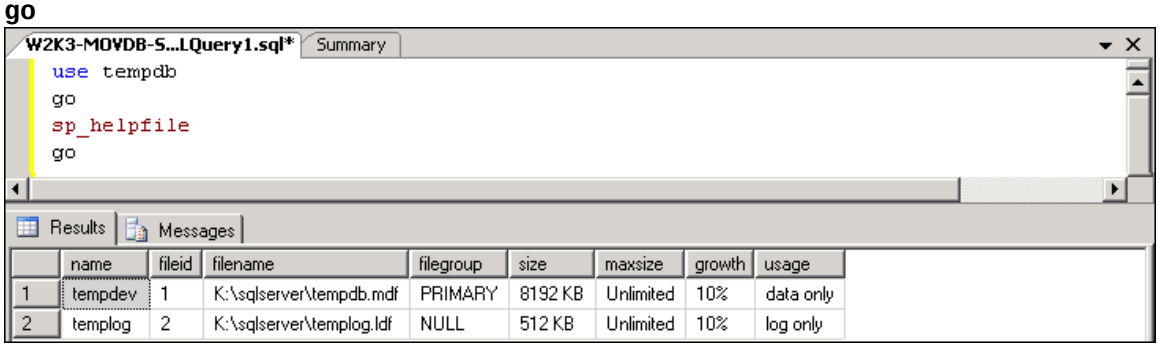


Figure 44:

2.3.2 Moving the Model and MSDB Database

Step 42. Choose a destination folder where you intend to move the Model and MSDB folder.

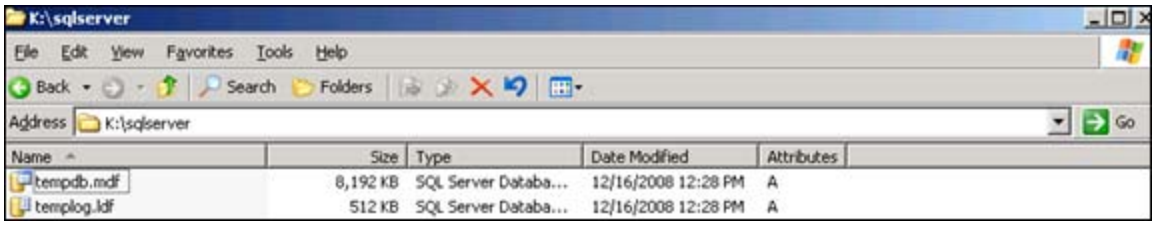


Figure 45:

Step 43. Stop the **"Services"**. You would be able to see "**Stop Other Services**" screen which asks whether you wish to stop the services, click "**Yes**" to stop the services.

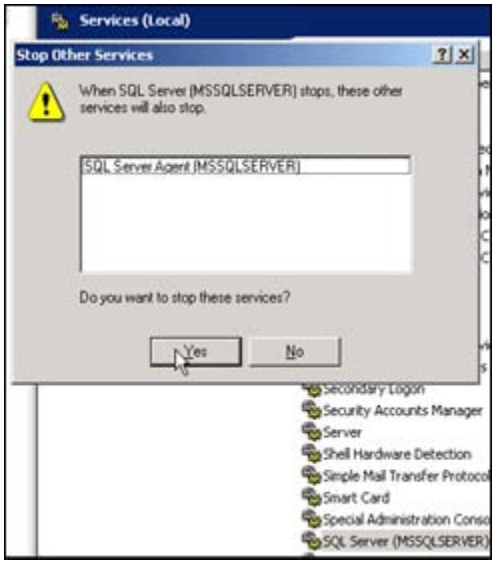


Figure 46:

Step 44. Go to **"Installation path\Microsoft SQL Server\MSSQL.1\MSSQL\Data",** select the four files as shown in the screen below, and copy them.

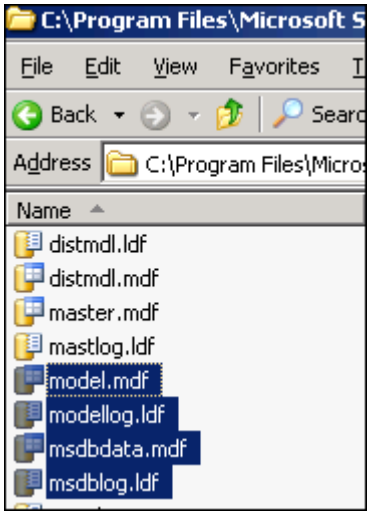


Figure 47:

Step 45. Choose the desired location and paste them.

Figure 48:

Step 46. Now, switch back to the "**Query Manager",** and issue the following commands to confirm the new path.

```
use tempdb
go
sp_helpfile
go
```

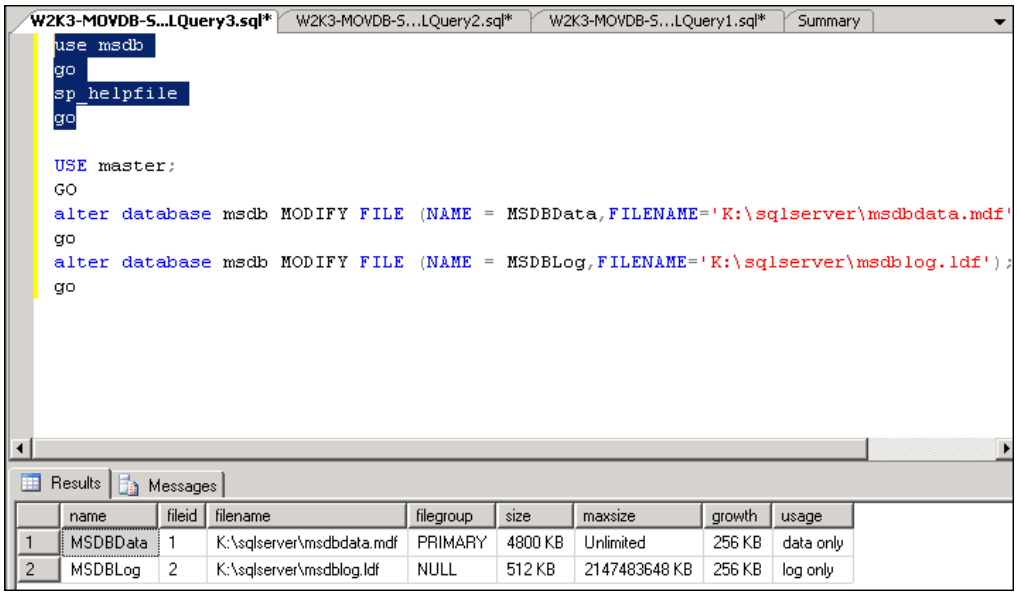


Figure 49:

Step 47. The command **"SP_HELPDB_MASTER"** reflects the new path. The new path appears in the bottom pane.

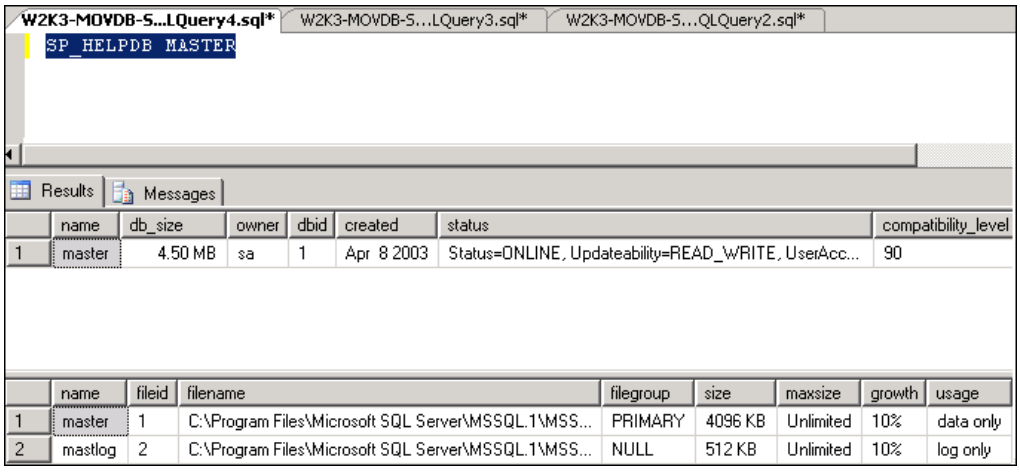


Figure 50:

2.3.3 Moving Master Database

Step 48. Go to **"Installation path\Microsoft SQL Server\MSSQL.1\MSSQL\Data"** and select the two files as shown in the screen below. .

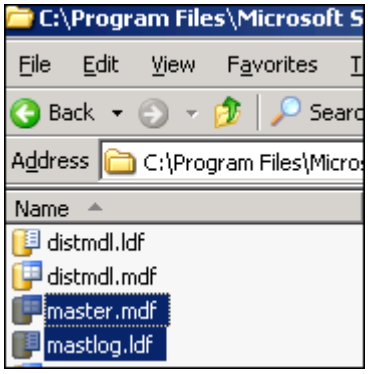


Figure 51:

Step 49. Click on **"Start->Programs-> Microsoft SQL Server 2005->Configuration Task->SQL Server Configuration Manager".**

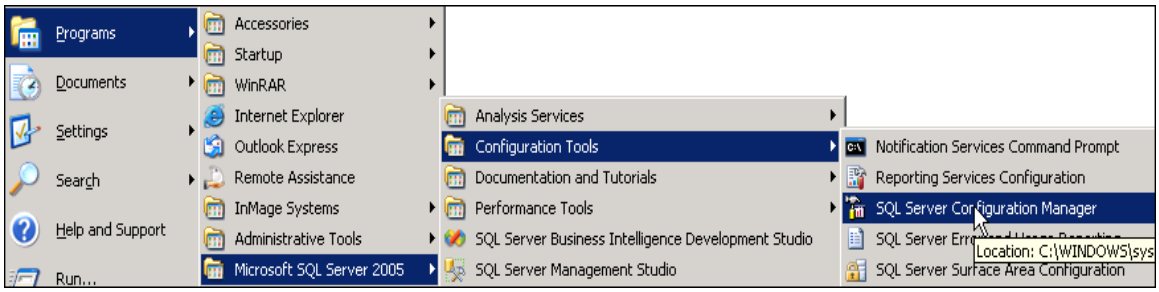


Figure 52:

Step 50. Select **"SQL Server (MSSQLSERVER)"** on the right pane.

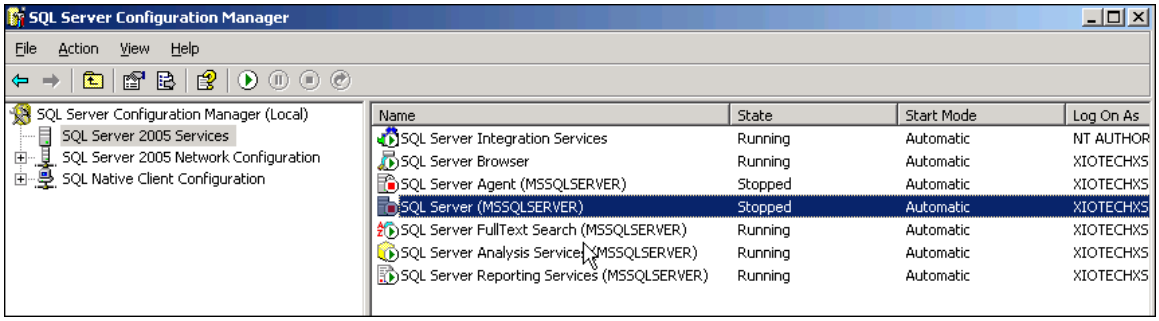


Figure 53:

Step 51. Right click and click on the **"properties"**.

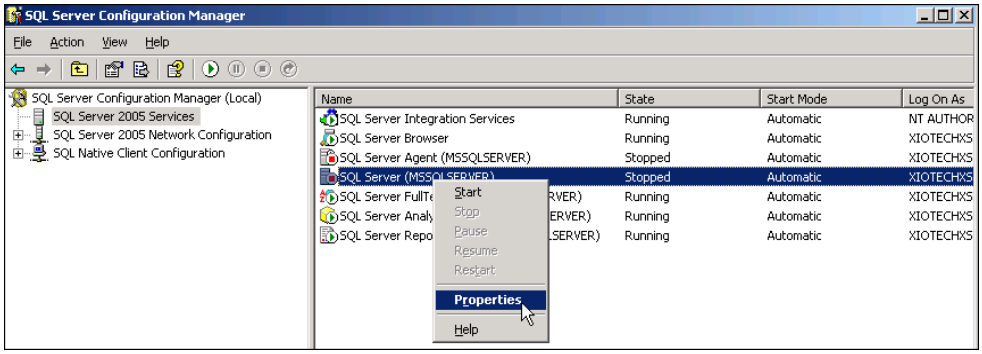


Figure 54:

Step 52. Click on **"Advanced Tab"**, scroll down, and select **"Startup Parameters"** list box. List of file path appear, delete them, and enter the new path where you want to move.

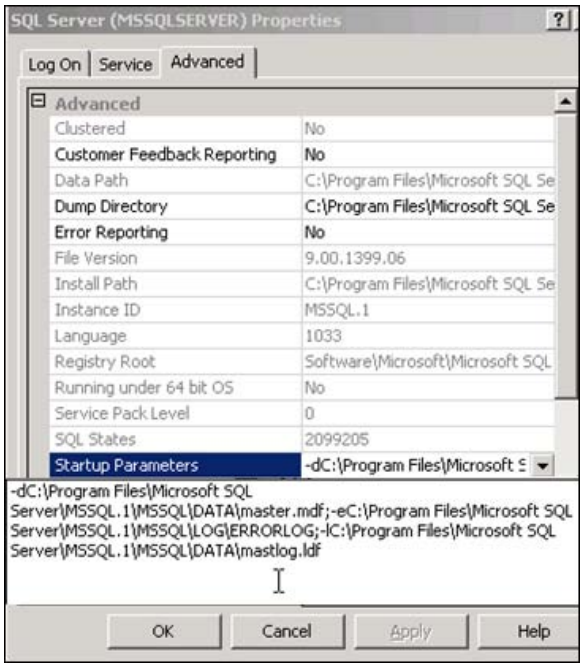


Figure 55:

Step 53. A message box appears indicating changes made would be saved and will not affect until the service is stopped or restarted. Click on **"OK"** and restart the **"SQL services"**.

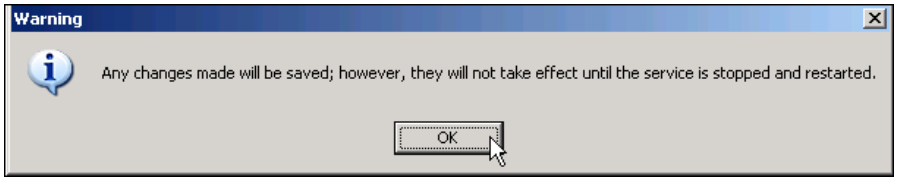


Figure 56:

Step 54. The command **"SP_HELPDB_MASTER"** marked with blue reflects the new path. The new path appears in the bottom pane.

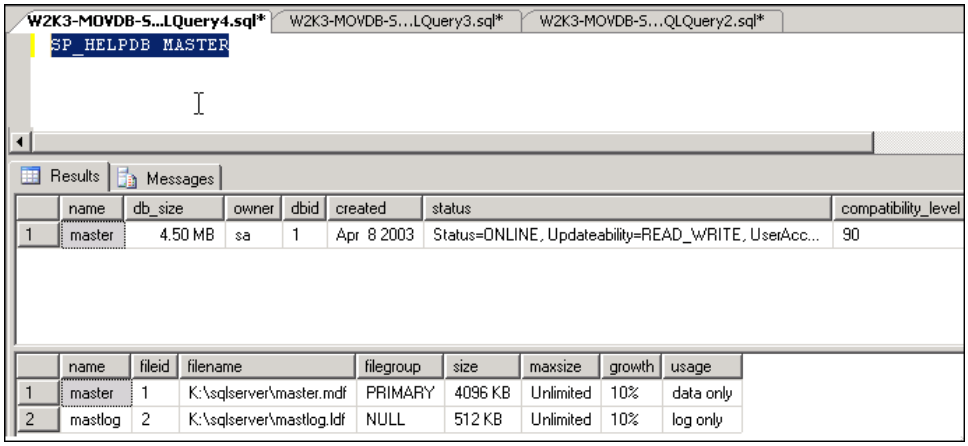


Figure 57:

Perform a SQL discovery as explained in SQL discovery section on page 45. You should not see any warning or error messages in the FX log this time.

2.4 Additional steps for NAT environment

- Install the CX server
- Install the VX and FX agents on the source followed by the target
- Enable NAT host name and NAT IP for VX and FX agents on source and target machines

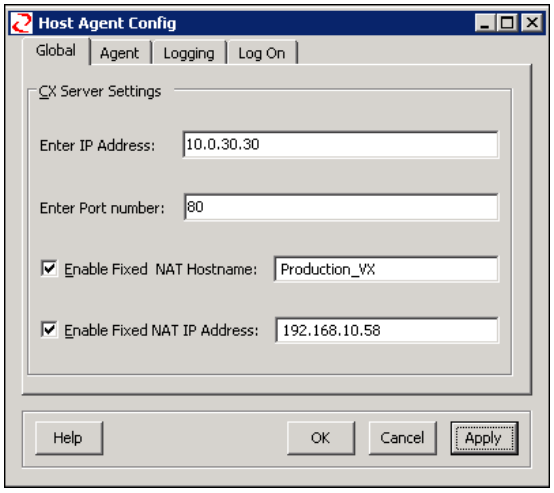


Figure 58

Access the CX UI and navigate to "**System->Agent settings"** and select the NAT agents and enter the "**CX NAT IP**" to enable the agents to communicate the CX server.

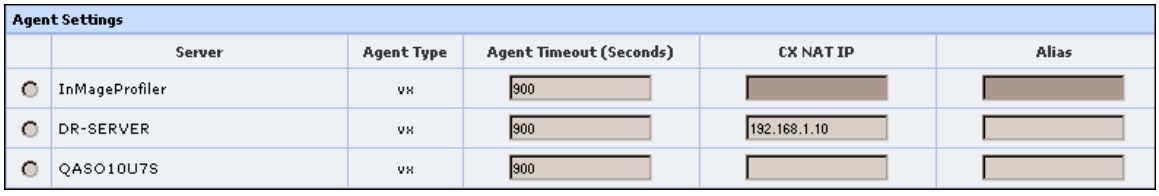


Figure 59: Example screen

2.5 Dependent services

For SQL Server, Scout does not start or stop all the dependent services automatically during failover or failback operation. By default, it starts and stops SQLServer and SQL Agent services. To start and stop other dependent services during failover and failback operation, use Failoverservices.conf file. The "**failoverservices.conf**" file is located under the "**consistency**" folder (under VX installation path).

To stop and start the dependent services, create a section [SQL2000] for SQL 2000, [SQL2005] for SQL2005 and [SQL2008] for SQL 2008 in failoverServices.conf file if not already present. In the section, add two keys START and STOP. Write dependent services name that should be started in START key separated by comma and write dependent services that should be stopped in STOP key. The service name should NOT be placed in double quotes even if there is any space in the service name. The services name must be listed in the proper order. Scout starts services from right to left and stops services from left to right. Scout stops all the listed dependent services before stopping default SQL services and will start all the listed dependent services after starting default SQL services. This ensures that these services are stopped and started while performing failover.

Format of the section appears as below.
[SQLXXX]
START=<ServiceName1>,<ServiceName2>,….
STOP=<ServiceName1>,<ServiceName2>,….

Example,
[SQL2005]
START=ReportServer$SQLINST1, MsDtsServer, SQLBrowser
STOP= ReportServer$SQLINST1, MsDtsServer, SQLBrowser

Notes:

If dependent services of the SQL Server are running and those are not listed in failoverservices.conf file, then SQL Server service cannot be stopped.

3 Concept of Failover and Failback

This document attempts to tackle SQL server outages by instantly replacing it with a backup SQL server of similar or greater hardware configuration. This process can be referred to as the failover. Failover can be performed under a variety of conditions such as logical corruption or a hardware error or any other situation where the production server is down. Failing over to the backup server is a transparent process to end users and minimizes server downtime. Given below is a picture of a failover process.

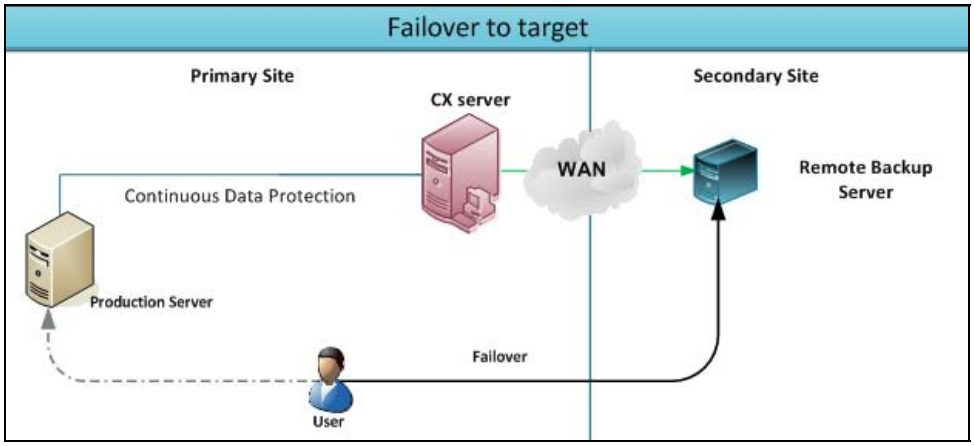


Figure 60

A failback is initiated when the production SQL server is back online and ready to resume its activities. Depending on the time of outage and data changes, administrators can choose to reverse replicate -- i.e., update the production server with all the data changes (occurred during its outage) from the backup server and then replace the backup server (acting in place of the production server) with the production server.

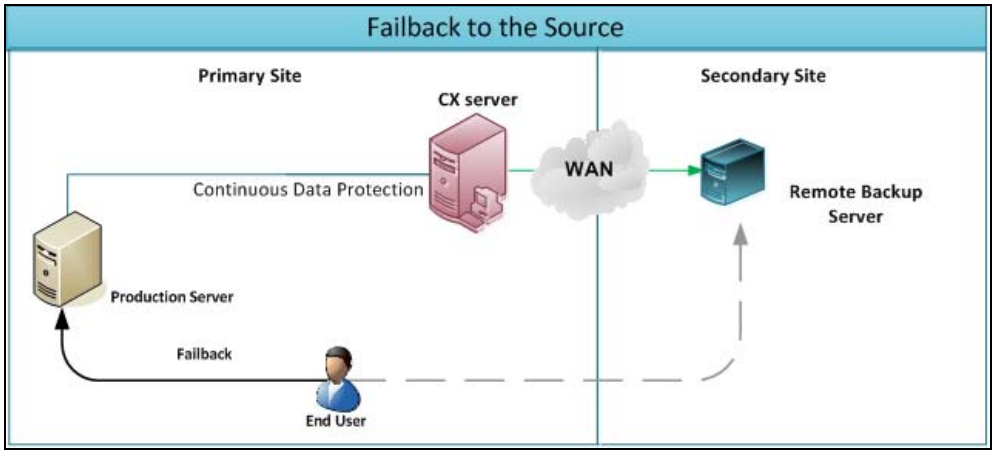


Figure 61

4 What this Solution can do for you

The Solution is capable of:

- Consolidating all backup operations
- Minimize Recovery time objective (time taken to recover from an outage)
- Continuously backup production server(s) thus reducing the RPO.
- Supporting multiple backup servers (both local and remote).
- Respond to an outage by failing over to a backup server.

Given below is a picture representing a single SQL server being backed up to two target SQL servers. These target hosts can be located either locally or a remote site or multiple remote sites.

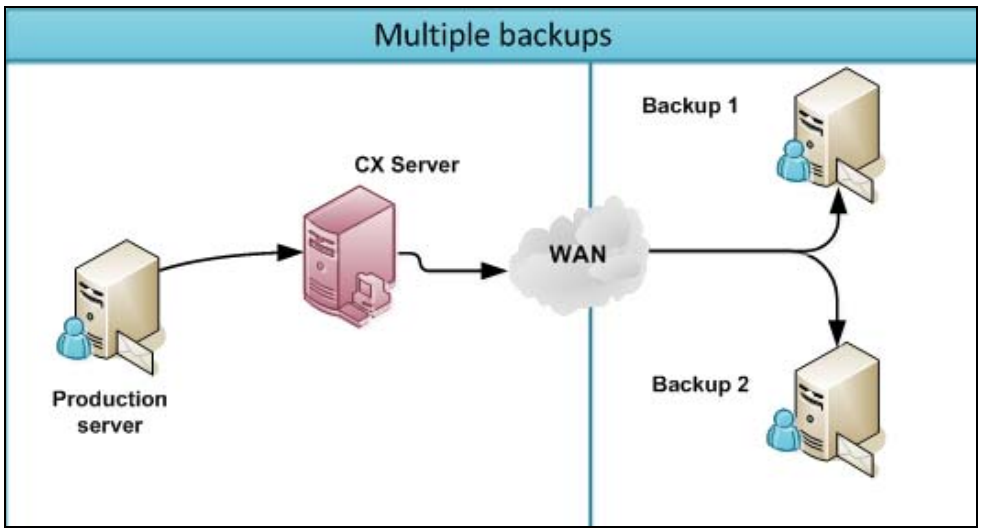


Figure 62

This document describes the process failover and failback SQL server in a simple one to one environment.

Notes:

Only one of the target hosts will be used for a failover.

5 How this solution works

5.1 Protecting SQL server

SQL server is protected by performing four steps as given in the picture below

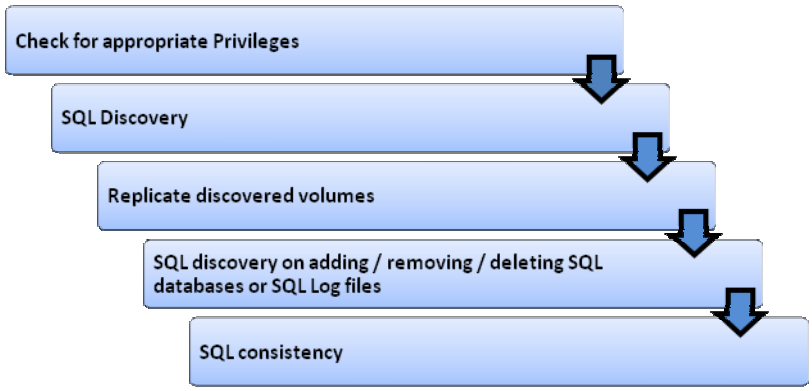


Figure 63:

As mentioned earlier, there are two types of failover the first is a planned failover which is used to test the backup setup or for mock drills. The second type of failover is an unplanned failover, which is used for recovering from a real time outage.

5.2 SQL failover

5.2.1 Workflow of Planned Failover

Planned failover involves issuing a consistency tag on the production server to ensure no data loss. Planned failover can be performed from both the CX UI and through the CLI

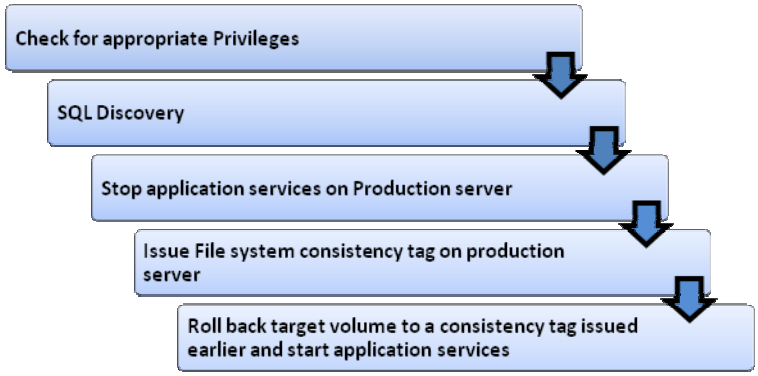


Figure 64:

5.2.2 Workflow of unplanned failover

Unplanned failover requires at least one consistent point generated on production SQL server while it is up and running. To minimize the data loss, it is recommended to schedule the SQL consistency job to execute at regular intervals, for example every 15 minutes. During unplanned failover, the target volume(s) is rolled back to the latest common consistent point across all SQL volumes.

Unplanned failover can be performed through the CX UI and the CLI.

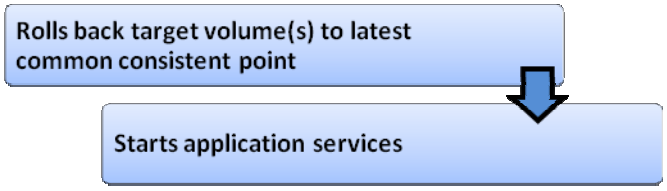


Figure 65

5.3 SQL failback

Once the production server is back online and ready, a failback is performed which is similar to a planned failback. We set a reverse replication (i.e., from DR server to production server). This is done to ensure that the production will be updated with all the data changes during its outage.

Failback can be performed either through CX UI or CLI.

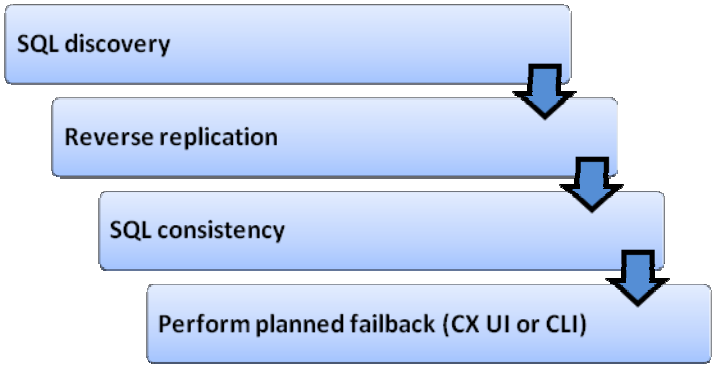


Figure 66:

Caution:

Ensure that FX agent service has domain administrator privileges else FX jobs will fail. Before starting Discovery ensure that SQL browser service is up and running and in SQL Server Network configuration, enable PIPE and TCP/IP protocols. This SQL Server Network configuration is available in SQL Server configuration manager.

6 Protect

6.1 SQL discovery

Discovery can be performed either through CX UI or through the CLI; both methods are explained in the following two sections.

SQL Discovery job discovers all SQL instances, corresponding databases and transaction logs and then reports it to the CX server. It also collects retention log path information corresponding to protected volumes and persists to a file. So it is essential to run the discovery job on adding/removing/moving databases/logs or change in replication pair configuration of database/log volumes.

6.1.1 Discovery through CX UI

Step 55. Open the CX user interface (CX UI). Then click on "**File Protection**". This opens up the file protection screen. Click on "**New Job Group Wizard"**

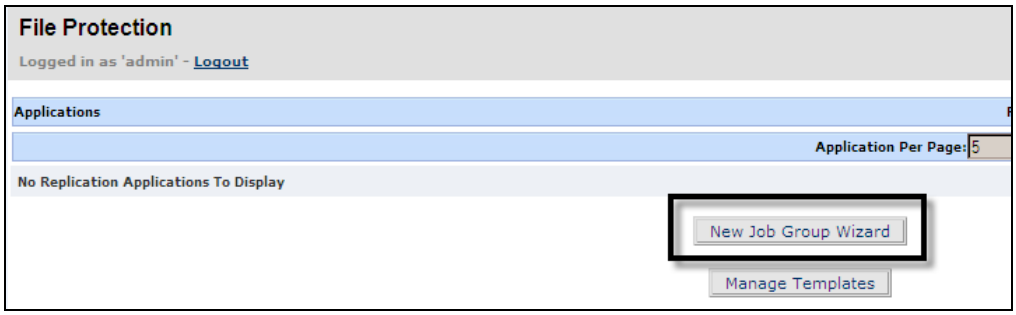


Figure 67:

Step 56. Then the next screen appears, observe that the screen is empty, click on "**Add Job"** to proceed

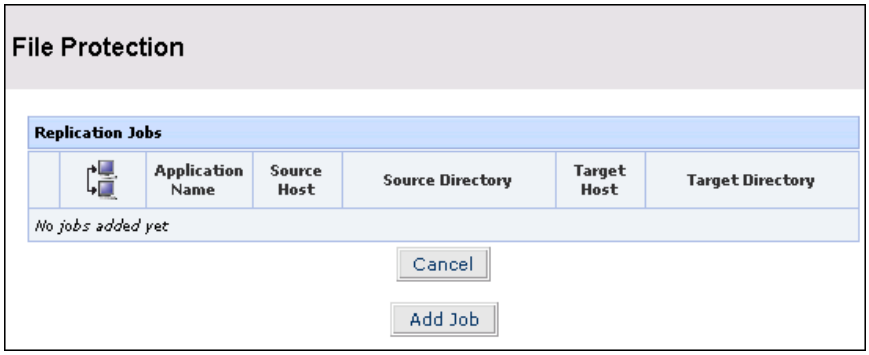


Figure 68:

Step 57. Enter the "**Application Name"** as SQL and the "**Job Description"** as "**Discovering SQL server"** since this is user defined, you may choose to enter any other label. Then, select the template as "**SQL 2005 Discovery"** and click on "**Next"**

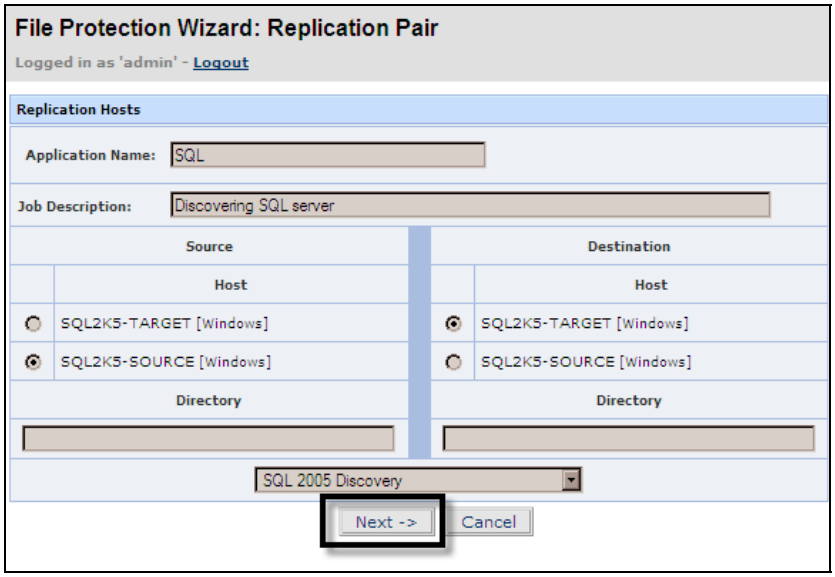


Figure 69:

Step 58. The FX job options page opens up. Observe that all the required fields are filled up automatically by the template. Scroll down and click on "**Finish"**.

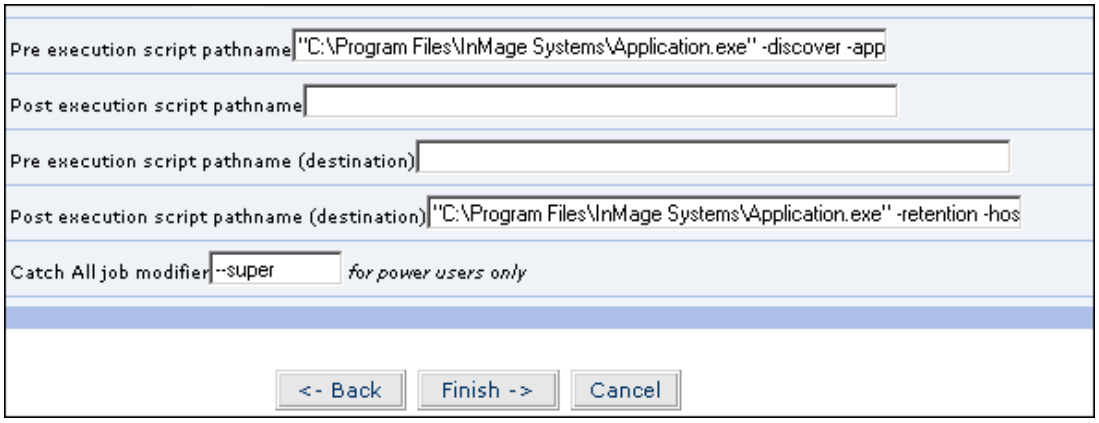


Figure 70:

Step 59. You will be returned to one of the previous screens (with the required fields filled up). Click on "**Finish"** to conclude configuring the SQL discovery job.

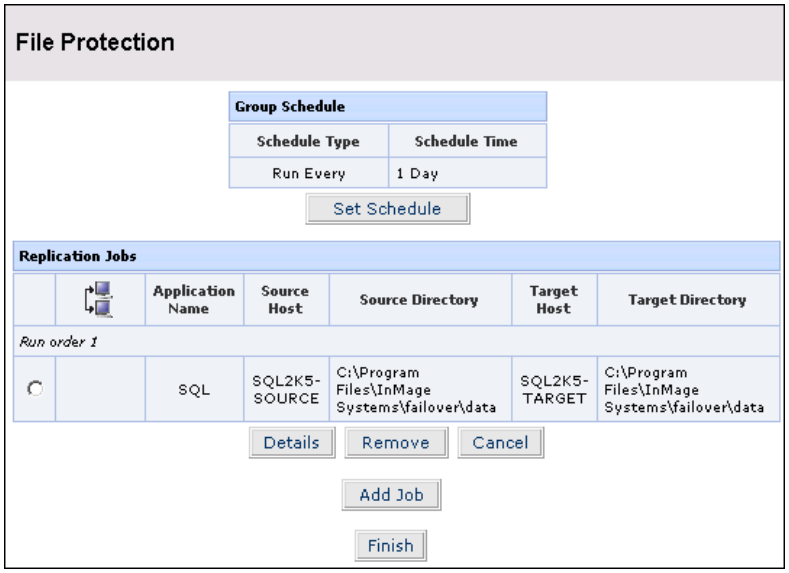


Figure 71:

Notes:

You may choose to click on "Set Schedule" to alter the job execution time.
While using SQL 2000 the FX template for discovery is "SQL Discovery", similarly for SQL 2008 the template is "SQL 2008 Discovery"

By default the job is scheduled to execute once a day**.** To start the job, click on "**File Protection"** then, expand SQL (if you have entered the "**Application name"** as SQL) then select the "**Discovering SQL server**" and click on "**Start".**

You may click on "**Protection Status**" to see the progress of the FX job. Once the job is complete successfully the Status will change to "**Completed**"

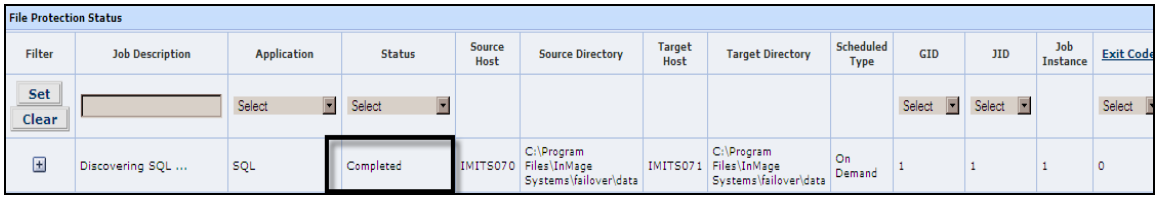


Figure 72:

6.1.2 Discovery through CLI

Access the source host's console and navigate to the InMage agent installation folder and then issue the following command

`Application.exe -discover -app sql2005 -host <source SQL server name>`

```
C:\Program Files\InMage Systems>Application -discover -app sql2005 -host sql2k5-
Source

Command Line: Application -discover -app sql2005 -host sql2k5-Source
Running under the user: XIOTECHXSRVR.NET\administrator
Local Machine Name is : Sql2K5-Source
Process ID: 3484

Attempting to determine SQL Virtual Server name for host : sql2k5-Source in case
 it's a clustered configuration
Checking NAT Configuration of Local Machine
NAT is disabled in this Local machine

Discovering Databases ...
```

Figure 73:

Copy the "<*installation folder*>**\Failover\data**" on the source host to the target host manually, then execute the SQL discovery command on the target host as shown below

`Application.exe -retention -host<source SQL server name>`

```
C:\Program Files\InMage Systems>application -retention -host SQL2K5-SOURCE

Command Line: application -retention -host SQL2K5-SOURCE
Running under the user: XIOTECHXSRVR.NET\administrator
Local Machine Name is : Sql2K5-Target
Process ID: 1900

Checking NAT is enabled or NOT
NAT is disabled in this Local machine

Discovering Databases ...
```

Notes:

When there are multiple SQL server instances, the list of volumes for each is displayed in the output.

Caution:

Before starting Discovery ensure that SQL browser service is up and running and in SQL.

6.2 Replicate discovered volume(s)

After the discovery is complete, you will have a list of volumes being used by SQL server within the SQL Discovery FX log file. In this example the list of volumes are K, M and N. The source host is **SQL2K5-SOURCE** and the target host is **SQL2K5-TARGET.** In this step we perform a VX replication for all the SQL server volumes on the source host.

Step 60. Open the CX UI, then click on "**Volume Protection"** and select the SQL server database volume (in this example we replicate the volume K first followed by M and N volumes) and click on "**Start Replication"**

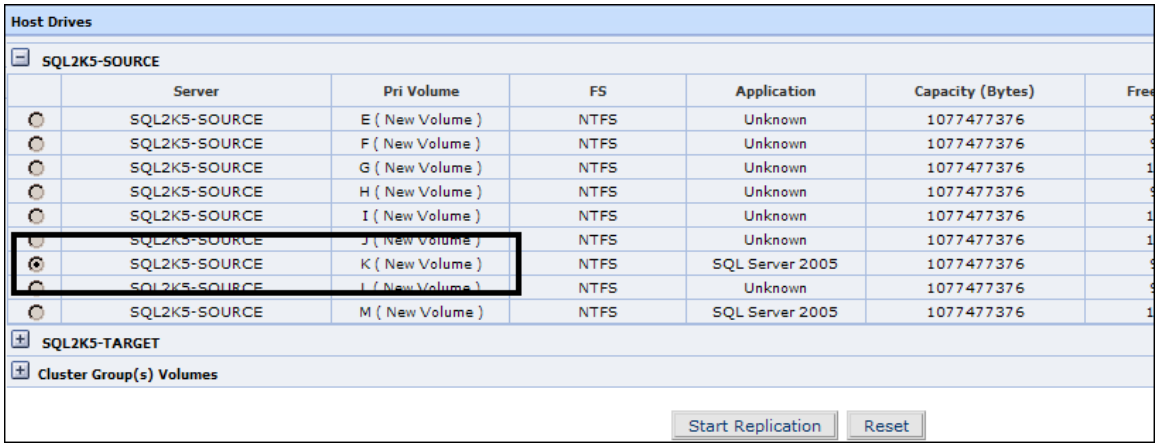


Figure 74:

Step 61. The next screen opens up for selecting the target volume, select the same drive letter as of the source volume and then scroll down to set the "**Replication Options"**

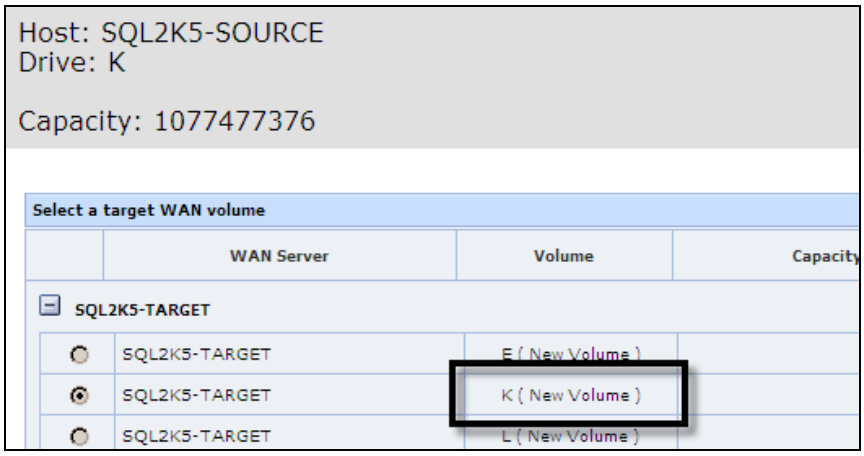


Figure 75:

Caution:

Ensure that you stop the SQL Express 2005 services on the DR SQL server before setting the replication pair.

Step 62. Under the replication options, Check "**Enable the CDP retention option**", while the rest are optional. Click on "**Submit"** to proceed to the next screen.

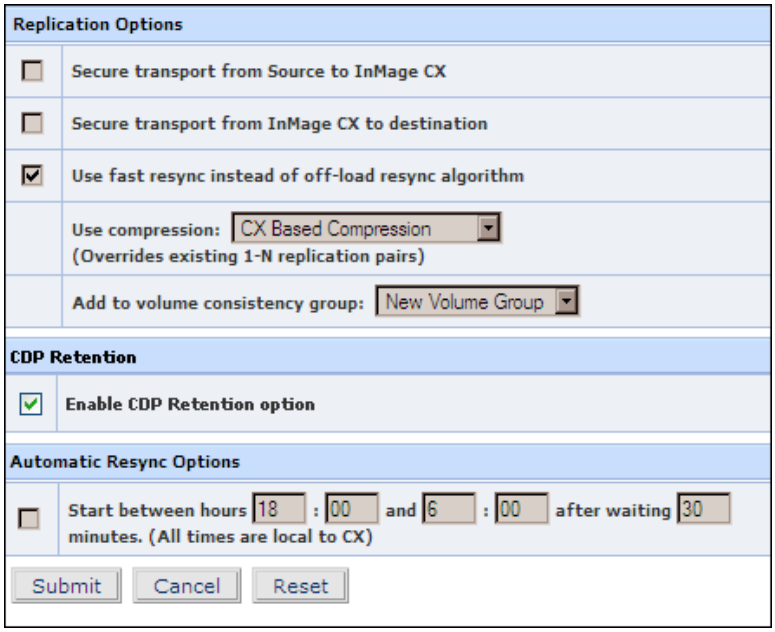


Figure 76:

Step 63. The final screen is where we define the type of retention policy for this replication pair, Enter the required values and click on "**Submit"** to start the replication pair.

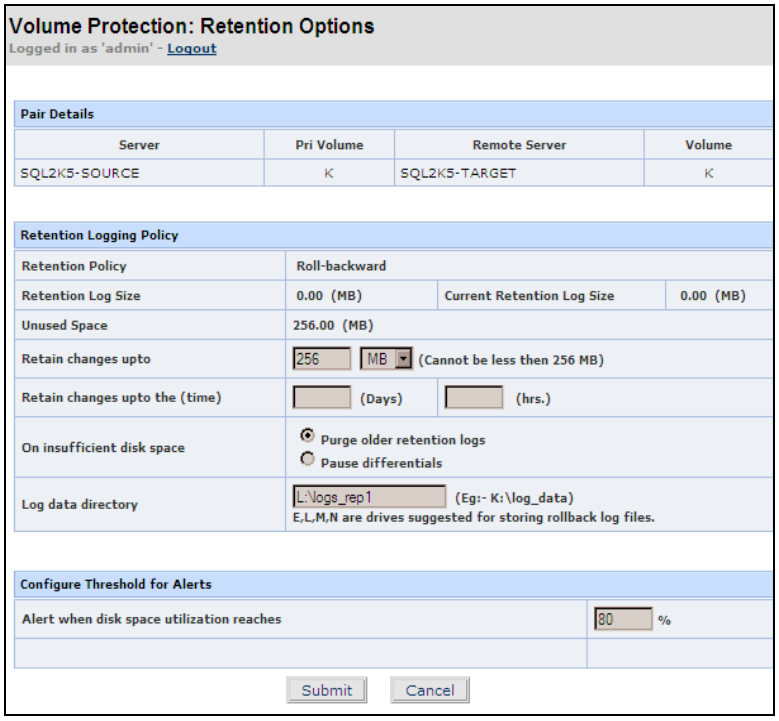
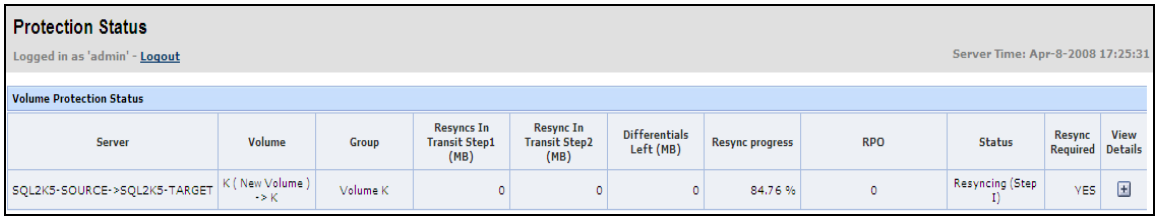


Figure 77:

Step 64. The replication pair starts from "**Resync step 1"** then moves to "**Resync step 2"** and then reaches Differential Sync.



Protection Status

Logged in as 'admin' - Logout

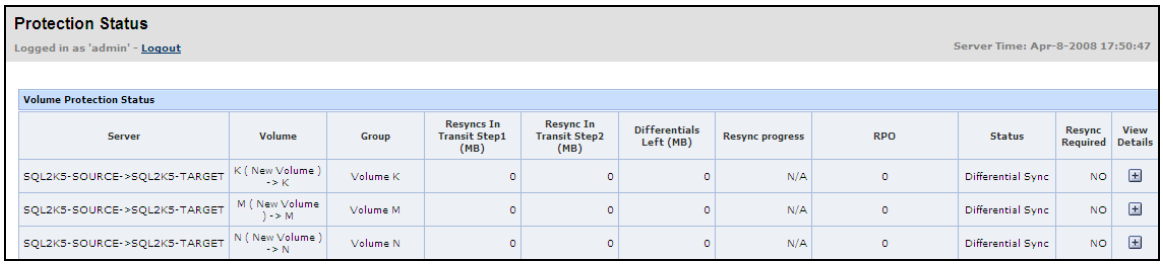
Server Time: Apr-8-2008 17:25:31

Volume Protection Status

Server	Volume	Group	Resyncs In Transit Step1 (MB)	Resync In Transit Step2 (MB)	Differentials Left (MB)	Resync progress	RPO	Status	Resync Required	View Details
SQL2K5-SOURCE->SQL2K5-TARGET	K (New Volume) -> K	Volume K	0	0	0	84.76 %	0	Resyncing (Step I)	YES	

Figure 78:

If there are multiple volumes, then follow the same process to replicate them as well. In this example we have three volumes and all of them are replicated to the target host to the same drive letter/mountpoint.



Protection Status

Logged in as 'admin' - Logout

Server Time: Apr-8-2008 17:50:47

Volume Protection Status

Server	Volume	Group	Resyncs In Transit Step1 (MB)	Resync In Transit Step2 (MB)	Differentials Left (MB)	Resync progress	RPO	Status	Resync Required	View Details
SQL2K5-SOURCE->SQL2K5-TARGET	K (New Volume) -> K	Volume K	0	0	0	N/A	0	Differential Sync	NO	
SQL2K5-SOURCE->SQL2K5-TARGET	M (New Volume) -> M	Volume M	0	0	0	N/A	0	Differential Sync	NO	
SQL2K5-SOURCE->SQL2K5-TARGET	N (New Volume) -> N	Volume N	0	0	0	N/A	0	Differential Sync	NO	

Figure 79:

Notes:

Ensure that the replication is set to the same drive letter or same mount point on the target

Caution:

Any changes such as adding, removing, moving databases/logs or their corresponding volumes will require a SQL discovery job to run again. And the newly created SQL volumes will have to be replicated to the target host as well. If the replication pair configuration is changed, SQL discovery job should be executed again.

Refrain from using disk management tools on the target volume(s).

6.3 SQL consistency

Consistency tags are issued on the production volumes. By doing this a recovery can be made to one of these tags.

6.3.1 Consistency through CX UI

Step 65. After setting the volume replication(s), click on "**File Protection**" and then on "**New Job Group**"

Figure 80:

Step 66. The next screen opens up, click on "**Add Job**"

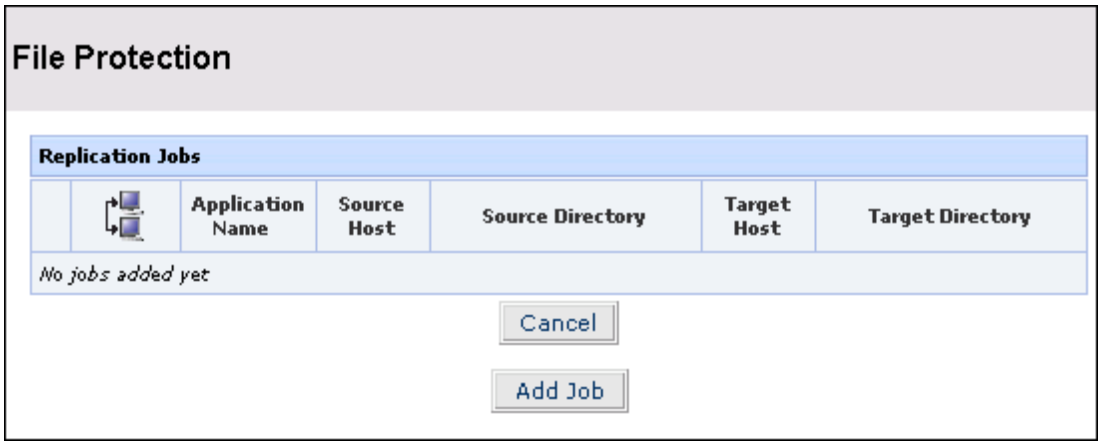


Figure 81:

Notes:

While working on SQL 2000 the FX consistency template will be "SQL Consistency"
While working on SQL 2008 the FX consistency template will be "SQL 2008 Consistency"

Step 67. Enter the "**Application Name"**, "**Job Description"** and select the "**source"** and "**destination"** as the production SQL server. Then select the FX template as "**SQL 2005 Consistency"** and click on "**Next"**

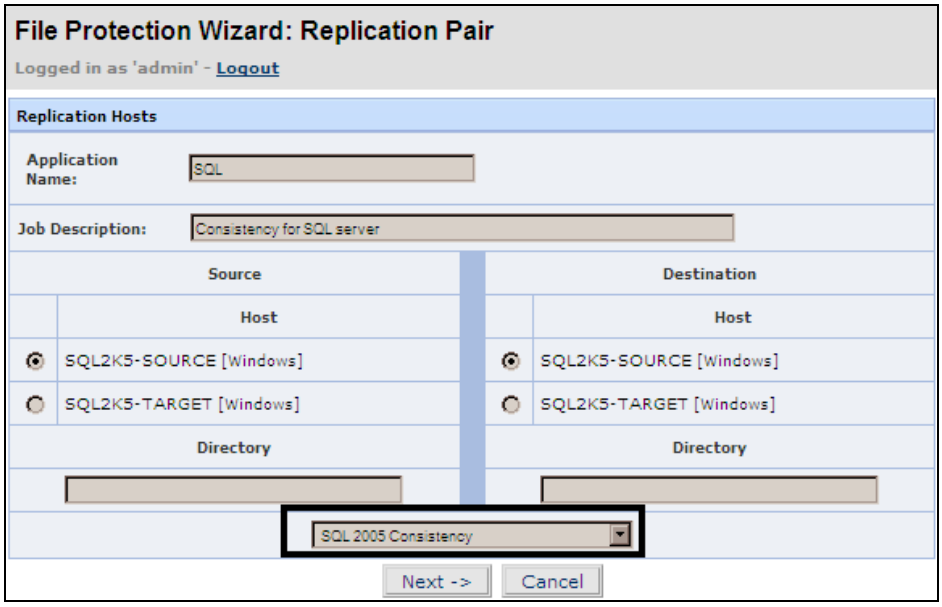


Figure 82:

Step 68. The next screen "**FX Job Options"** opens up with all the required fields filled up, observer that the prescript for source is already entered. Do not alter any settings, scroll down and click on "**Finish"**

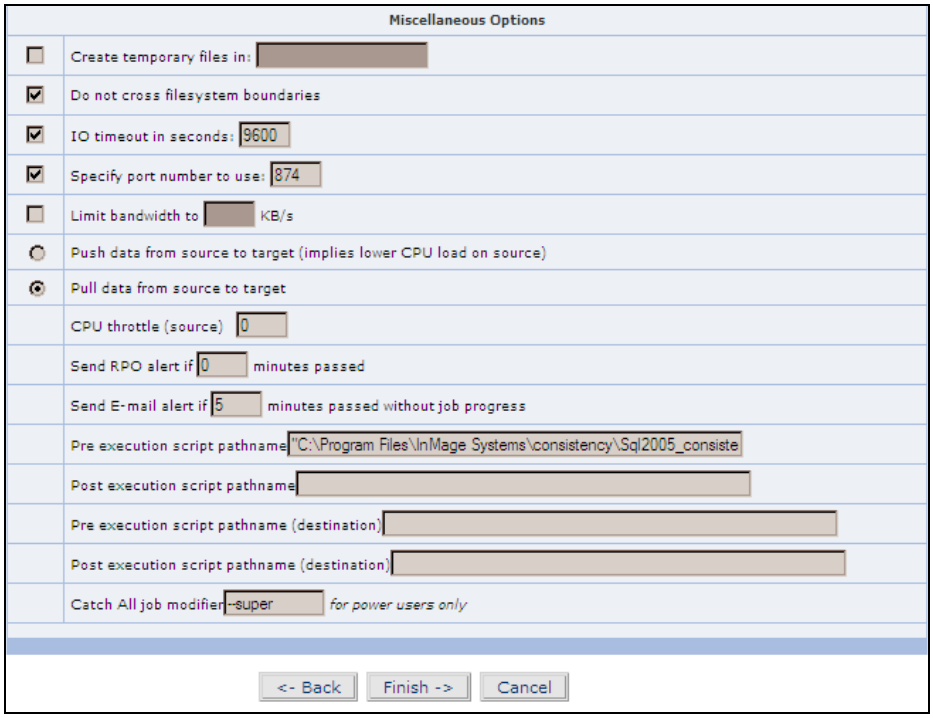


Figure 83:

Step 69. You will be returned to one of the previous screens, but this time with all the required fields filled up. Click on "**Finish**".

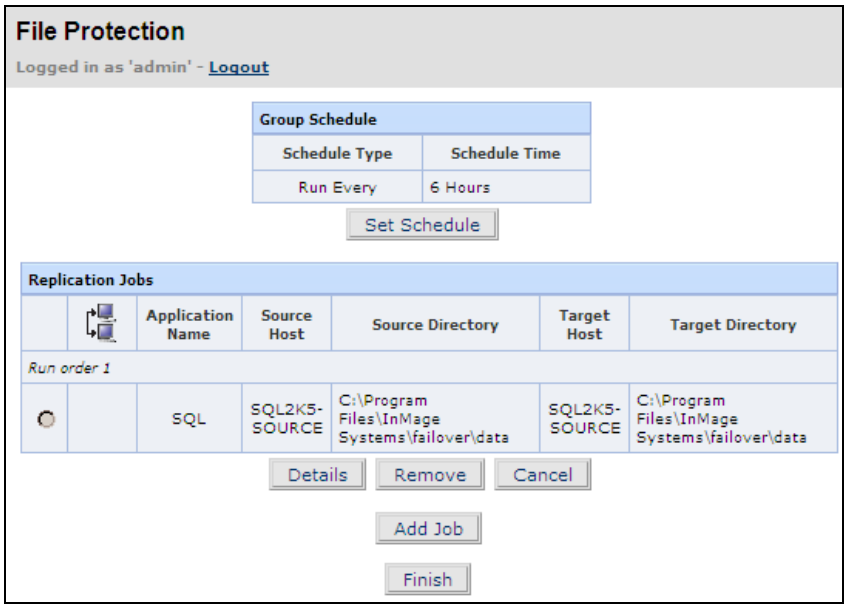


Figure 84:

Notes:

The fields "Application Name" and "Job description" are user defined. They enable you to group a set of jobs.
You may choose to click on "Set Schedule" to alter the execution time of the FX job

Now all the SQL server volumes are being replicated to the target host and SQL consistency job is issuing consistency tags at regular intervals. You may choose to monitor these operations through "**Protection Status"** on the CX UI

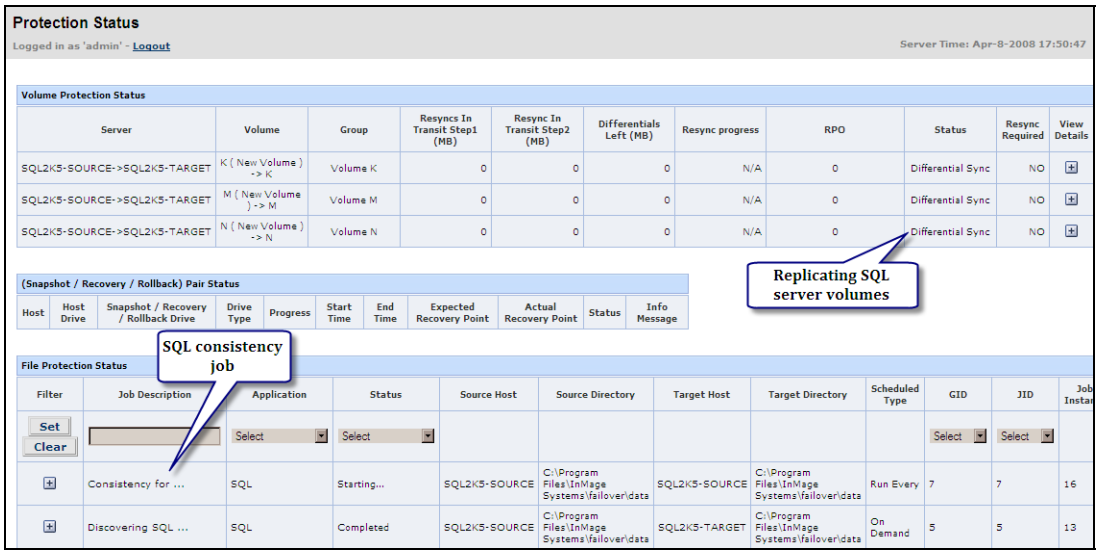


Figure 85:

6.3.2 Consistency through CLI

Consistency tags can also be issued through the CLI. Access the source SQL server's console and navigate to Hitachi Dynamic Replicator installation folder, then use the following command for Filesystem consistency.

vacp -v <SQL volume 1>;<SQL volume 2>;<SQL volume 3> -t "<name of the tag>

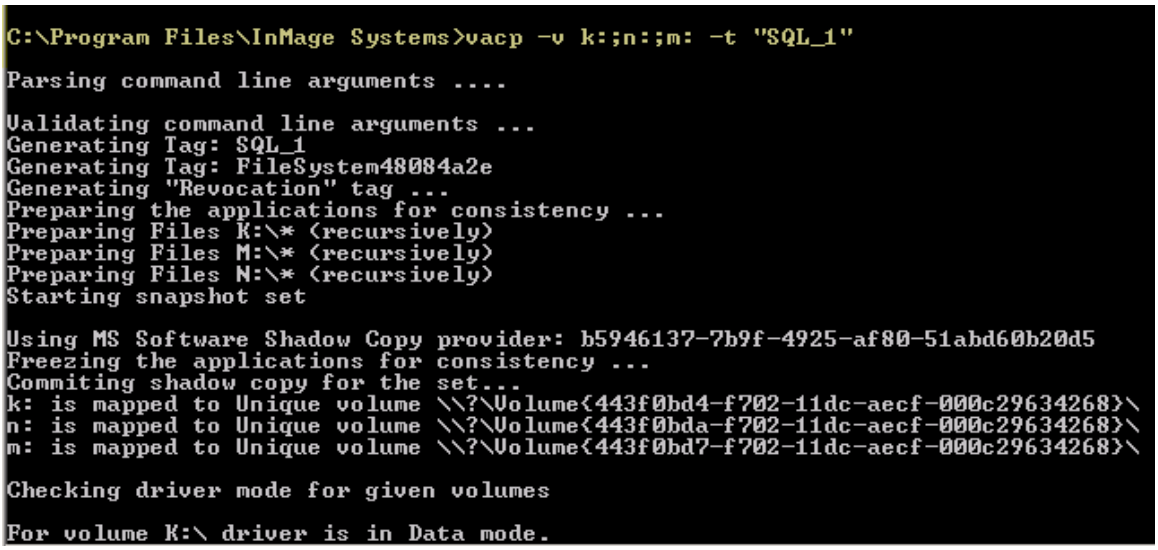


Figure 86:

For SQL 2005 application consistency use the command

vacp -a sql2005 -t <name of the tag>

Notes:

For SQL 2000 use the switch –a sql
For SQL 2008 use the switch –a sql2008

Caution:

Before starting SQL consistency ensure that SQL VSS service is up and running and in SQL Production Server.

7 Failover

7.1 Planned failover

7.1.1 Through CX UI

Step 70. Planned SQL server failover can be performed through FX job. Assuming that you are still on the CX UI, click on "**File Protection**" then on "**New Job group wizard**".

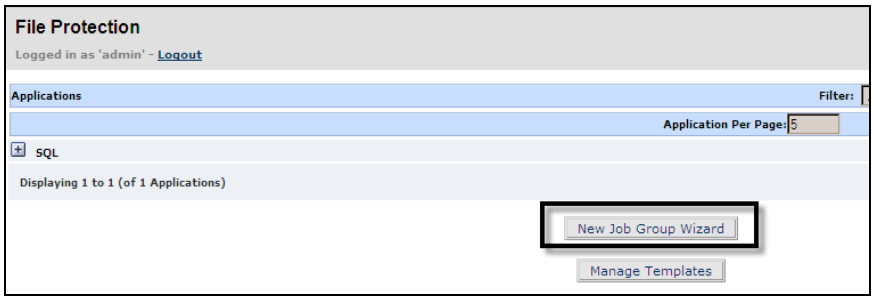


Figure 87:

Step 71. The next screen opens up. Click on "**Add Job**".

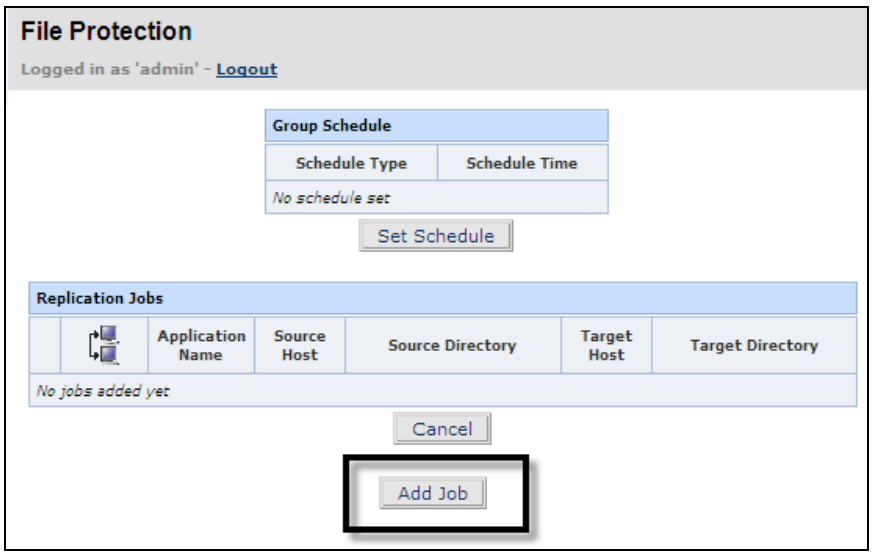


Figure 88:

Notes:

For SQL 2000 the FX script for planned failover will be "SQL Planned Failover"
For SQL 2008 the FX script for planned failover will be "SQL 2008 Planned Failover"

Step 72. Enter the "**Application Name"** as SQL and "**Job Description**" as SQL planned failover, then select the FX template as "**SQL 2005 Planned Failover"**, then click on "**Next".**

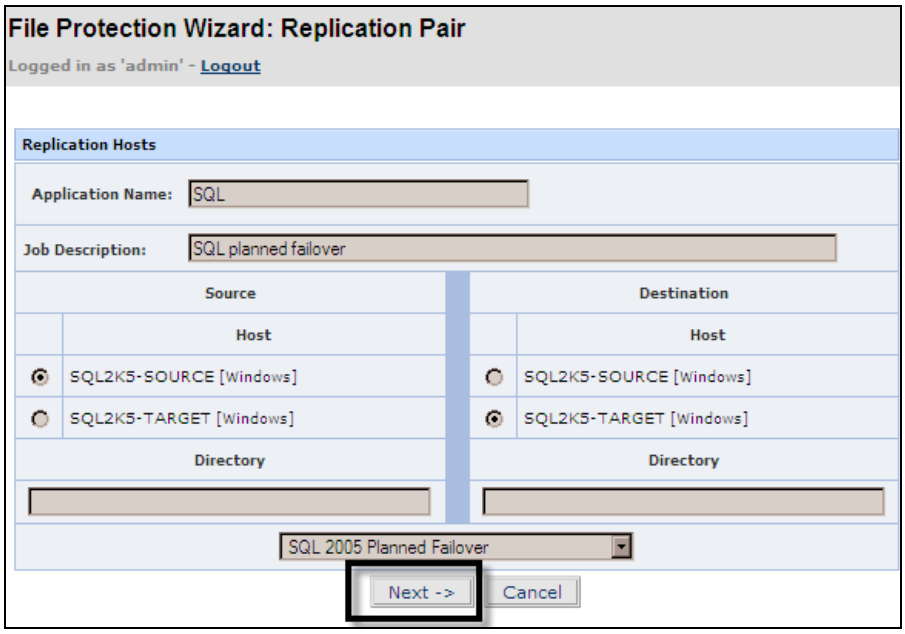


Figure 89:

Step 73. The **"Job Options"** screen opens up with all the required fields filled up including the prescript for the source and the post script for the target. Scroll down and click on "**Finish".**

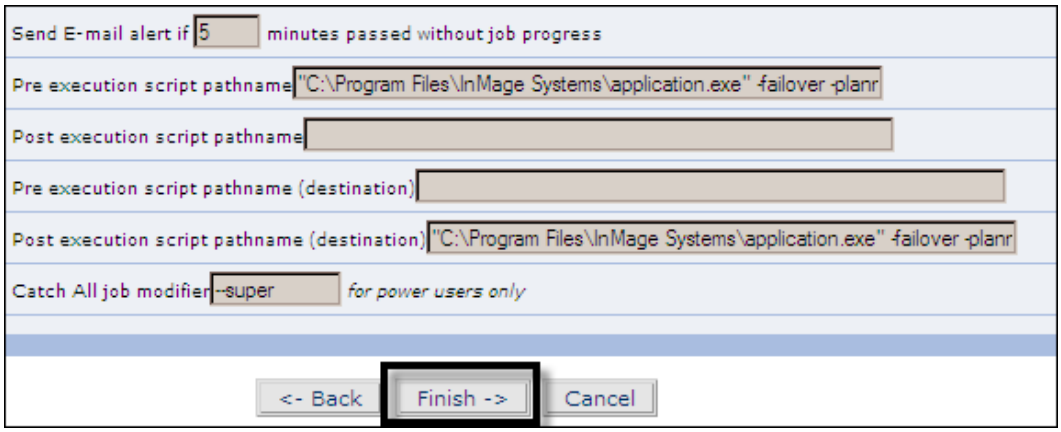


Figure 90:

Notes:

On a NAT environment, always append the –nodnsfailover switch on the target post script. This will skip all DNS related operations

Step 74. By default the job will be set to run "**On Demand".** Click on "**Finish".**

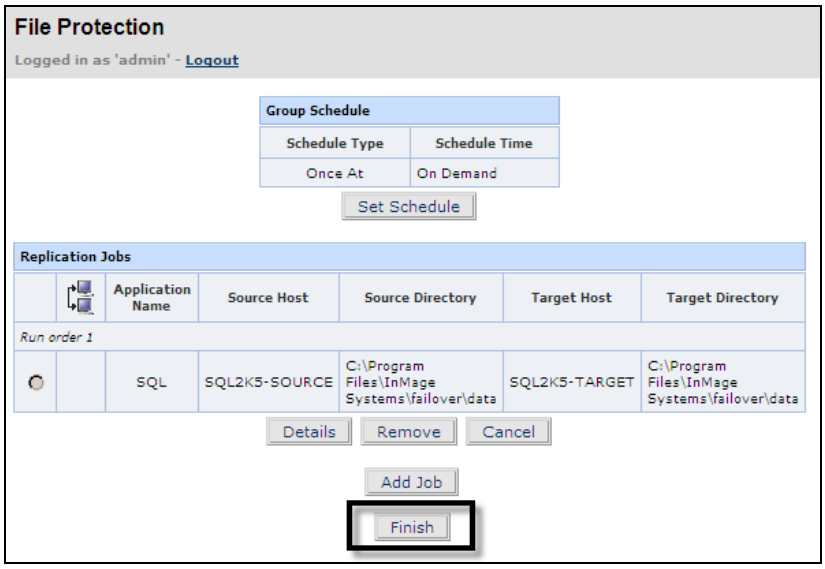


Figure 91:

Step 75. To execute the job, click on "**File Protection"** then select the SQL planned failover job and click "**Start".** Once the job completes execution, the SQL server replications will disappear from the CX UI. This is because the target volumes are rolled back to a consistent point. This concludes Planned SQL server failover through CX UI.

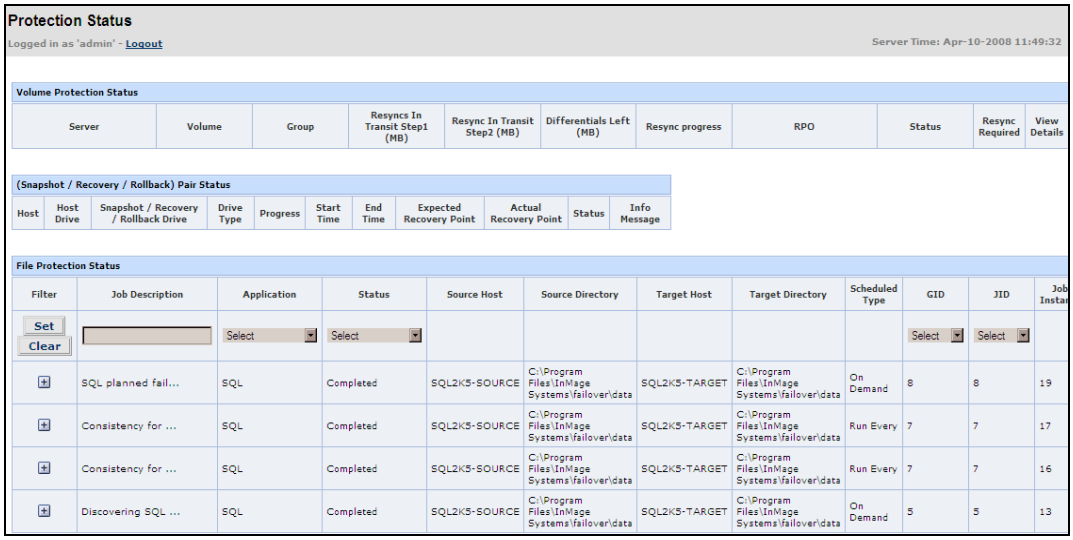


Figure 92:

Notes:

By default AD will not be replicated during MS SQL Server failover. However if you need AD replication as part of MSSQL Server failover edit the command line/pre and post script with the "–doadreplication" switch.
OR
You may run "WinOp.exe" from command line to perform AD replication and DNS Update

7.1.2 Through CLI

Step 76. Planned failover can be performed through CLI as well. Access the source SQL server's console and navigate to the Hitachi Dynamic Replicator installation folder to issue the following command

`Application –failover –planned –app sql2005 –s <source SQL server name> -t <target SQL server name> -builtin –tag NONE`

```
C:\Program Files\InMage Systems>application -failover -planned -app sql2005 -s S
QL2K5-SOURCE -t SQL2K5-TARGET -builtIn -tag NONE
SQL2K5-SOURCE IP address = 10.0.163.21
SQL2K5-TARGET IP address = 10.0.163.22
Attempting to determine Virtual Server Name for host : SQL2K5-SOURCE in case it'
s a clustered configuration
Discovering Databases ...
 Instance Name is :sql2k5-source
 Instance Name is :sql2k5-source\instance1

Connecting to server sql2k5-source

Connecting to server sql2k5-source\instance1

Discovering Volumes ...

Discovering sql2005 volumes for the host: sql2k5-source
```

Figure 93: Command on Source SQL server

Notes:

On a NAT environment, always append the –nodnsfailover switch on the source command. This will skip all DNS related operations

The command under the IMPORTANT INFORMATION will also show the same "-nodnsfailover" switch to the end

At the end of the output another command is displayed within the "**important information**" as shown in the figure below. This command has to be executed from the target SQL server console to complete SQL planned failover through CLI.

```
***** The actual tag to failover to is : FileSystem48084b50

********************IMPORTANT INFORMATION*********************************

Please run the following command on the Target Host to complete failover

Application.exe -failover -planned -app sql2005 -s sql2k5-source -t sql2k5-targe
t -builtIn -tag FileSystem48084b50

*******************************************************************************
*****Successfully finished failover at source*****
```

Figure 94:

Step 77. Now switch to the target console, navigate to Hitachi Dynamic Replicator installation folder and issue the above mentioned command. This concludes planned failover through CLI.

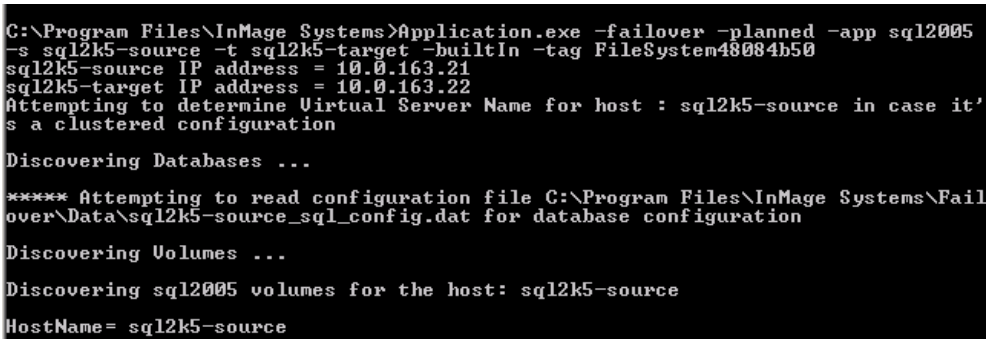


Figure 95: Command issued on target host to complete planned failover.

Notes:

For SQL 2000 the -app switch will be sql

For SQL 2005 the -app switch will be sql2005

For SQL 2008 the -app switch will be sql2008

To failover to an application tag or user defined consistency tag, append the command with -tag <name of the tag> -tagtype <type of the tag>.

The tagtype for SQL Server 2000 is "SQL", for SQL 2005 it is "SQL2005" and for SQL server 2008 it's "SQL2008".

The tag type for user defined tag is USERDEFINED.

The name of tag given should belong to the type of the tag specified.

If the tagtype is not mentioned, by default the FS tagtype is considered

7.2 Unplanned failover

7.2.1 Through CX UI

Unplanned failover through CX UI is performed when the production server is down but the CX server is up and running.

Step 78. Open the CX UI, click on "**File Protection**" then on **"New Job Group Wizard"**

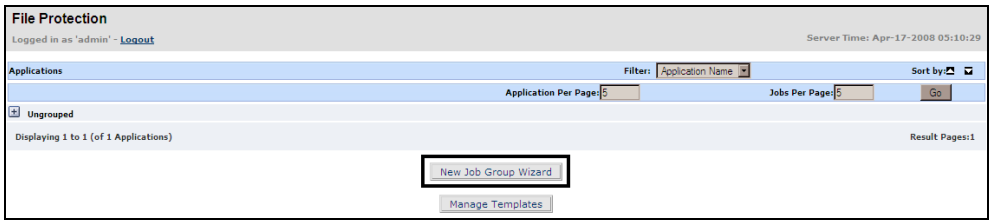


Figure 96:

Step 79. The next screen opens up, click on "**Add Job**" to proceed.

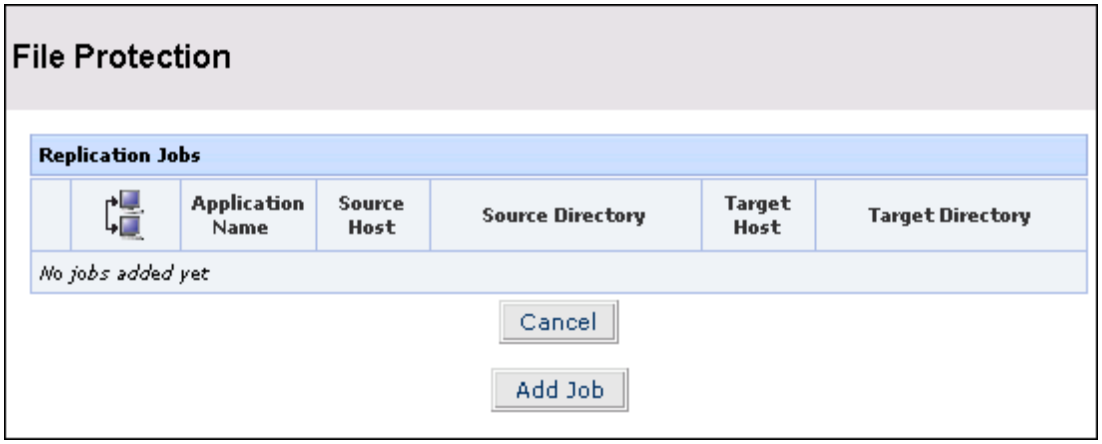


Figure 97:

Step 80. Enter the "**Application name"** and "**Job Description"** then select the "**source"** as the DR server (because the production server is down) and the "**destination"** as the DR server, Select the FX template as "**SQL 2005 Unplanned Failover**" and click on "**Next".**

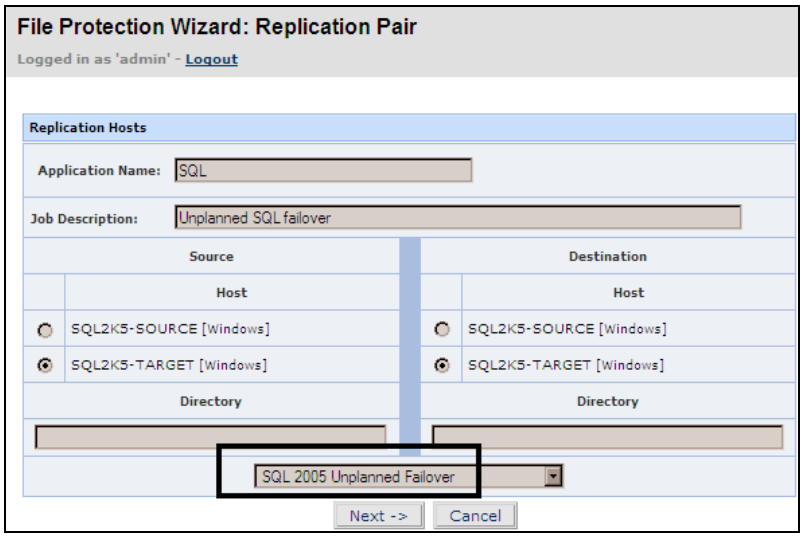


Figure 98:

Notes:

For SQL 2000 the FX template is "SQL Unplanned Failover"
For SQL 2008 the FX template is "SQL 2008 Unplanned Failover"

Step 81. The "**Job Options**" screen opens up with all the required fields filled up including the target post script. Edit the target post script at the –s switch to enter the production server name then click on "**Finish"**

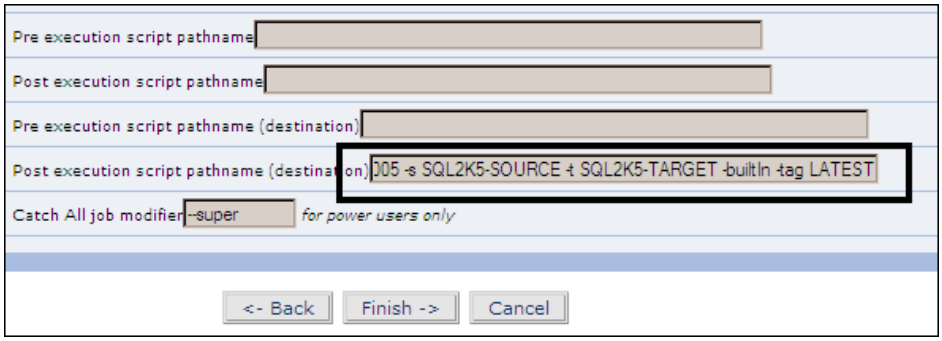


Figure 99:

Notes:

On a NAT environment, always append the –nodnsfailover switch for the target post script. This will skip all DNS related operations

Step 82. You will be returned to one of the previous screens, the job will be scheduled to run "**On Demand".** You may choose to change this by clicking on the "**Set Schedule".** Click on "**Finish"** to save the job

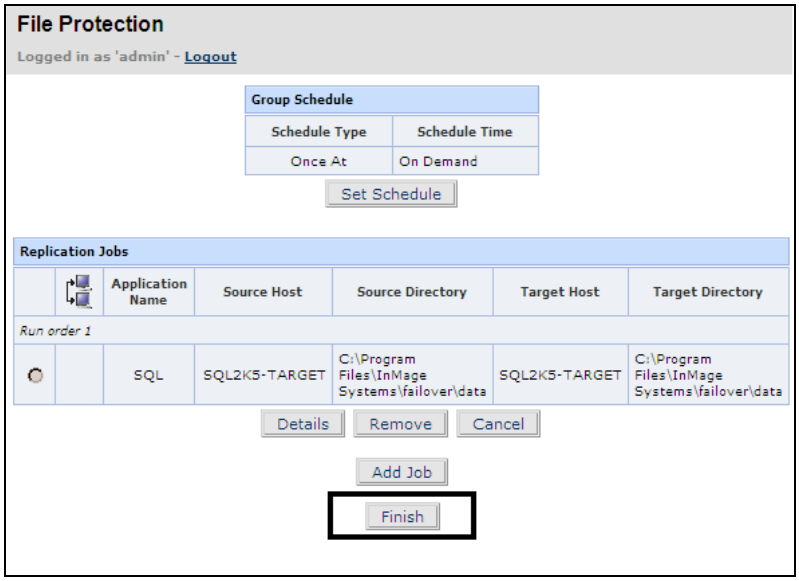


Figure 100:

Step 83. Start the job to perform SQL unplanned Failover.

7.2.2 Through CLI

If the CX and the production servers are both down, then to perform a unplanned failover, access the target host's console to issue the following command

`Application –failover –unplanned –app sql2005 –s <source SQL server name> -t <target SQL server name> -builtin –tag LATEST`

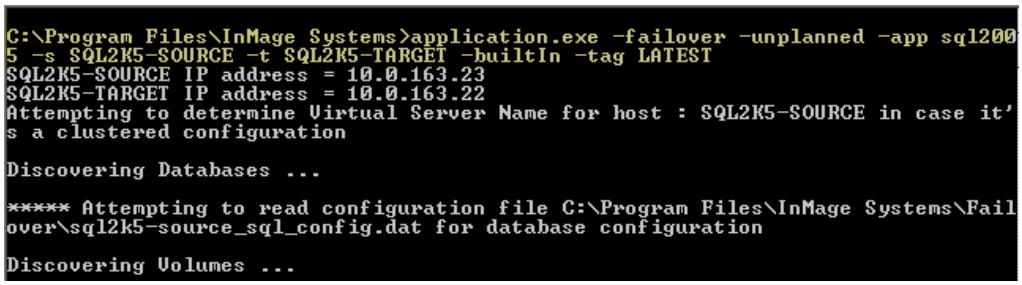


Figure 101:

Notes:

For SQL 2000 the –app switch will be sql
For SQL 2008 the –app switch will be sql2008
Append the –nodnsfailover while operating on a NAT environment

7.3 Failover without CDP Retention Option

7.3.1 Through CX UI

To perform a failover for replication pairs without CDP retention through CX UI, select the FX template as "**SQL 2005 Failover without Retention**".

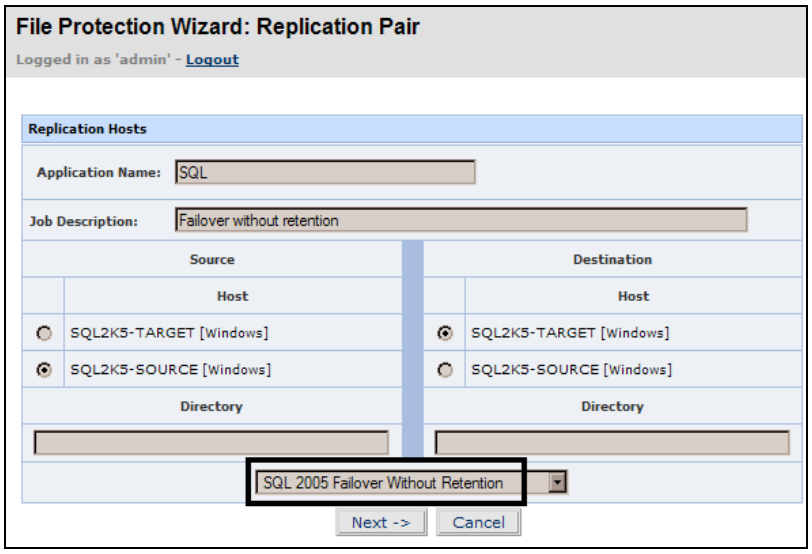


Figure 102:

Notes:

For SQL 2000 the FX template will be "SQL Failover Without Retention"

For SQL 2008 the –app switch will be "SQL2008 Failover Without Retention"

On a NAT environment, always append the –nodnsfailover switch for the target post script. This will skip all DNS related operations

7.3.2 Through CLI

The same can also be achieved through the CLI, access the target console and navigate to the agent installation folder to issue the following command

```
Application.exe –failover –unplanned –app sql2005 –s <source host name>
-t <target host name> -builtin –tag NONE
```

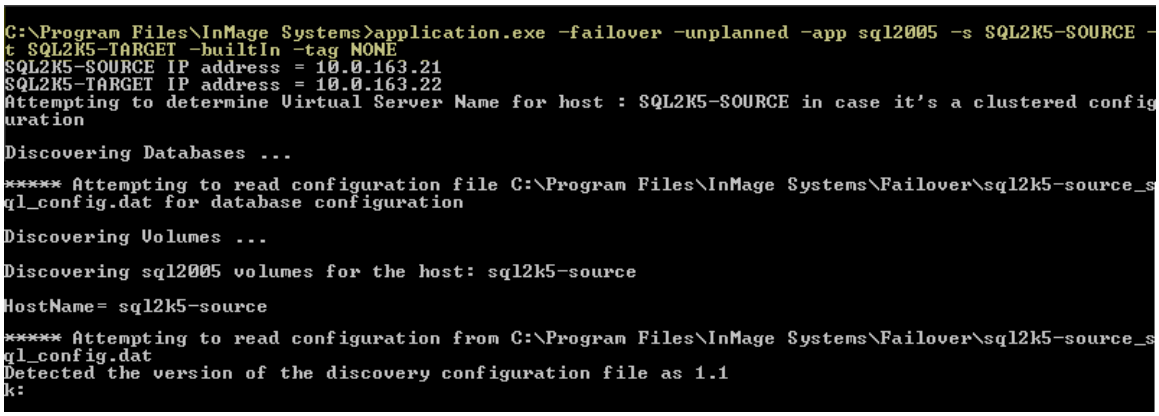


Figure 103:

Here the target volume(s) will be made visible and the replication will pause. For pairs with CDP retention options enabled the replication pairs will be stopped.

Notes:

For SQL 2000 the –app switch will be sql
For SQL 2008 the –app switch will be sql2008
Append the –nodnsfailover while operating on a NAT environment

8 Failback

8.1 Through CX UI

Failback is performed in five steps.

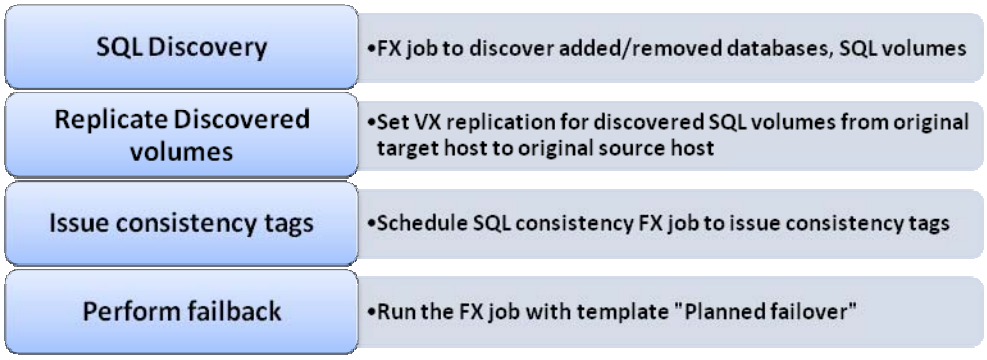


Figure 104:

8.1.1 SQL discovery

Step 84. SQL discovery is performed to discover newly added/deleted SQL databases and volumes. This process is the almost the same as mentioned in SQL discovery to list volumes on page 45 with one difference, since this is a reverse replication the source will be selected as the original target and the target will be selected as the original source.

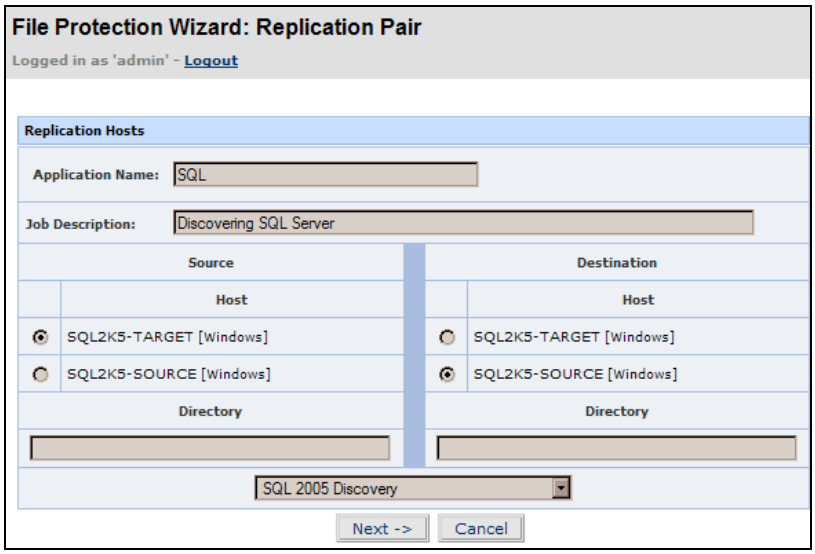


Figure 105:

Once the job is executed successfully, proceed to perform a VX replication.

8.1.2 Replicate discovered volumes

Step 85. Set a reverse replication from the DR server to the production server. Ensure that you set replication pair with the CDP retention option. The replication starts from Initial Sync step 1 then moves to initial Sync step 2 before reaching the Differential Sync state. You can monitor this through the "**protection status**"

Step 86. Repeat the same process for the rest of the SQL server volumes from DR server to the production server with CDP retention enabled.

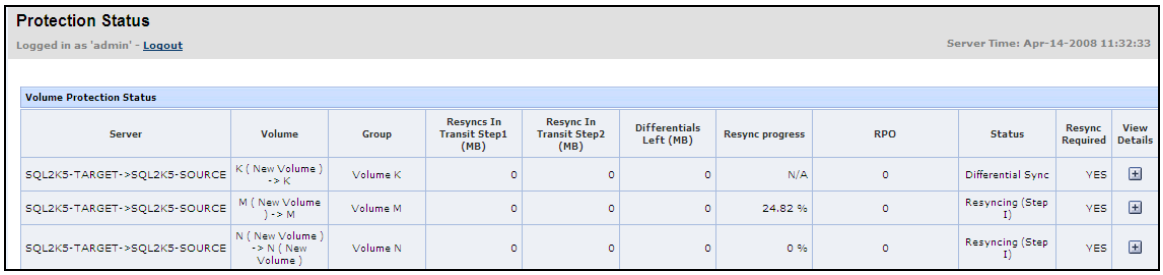


Figure 106:

8.1.3 Issue consistency tags

Step 87. Issuing SQL consistency tags can be performed through CLI or through CX UI. This is almost the same as mentioned in the section SQL consistency on page 52 with one change. Since this is a failback, we select the DR server as source and production server as target and click on "**Next"**

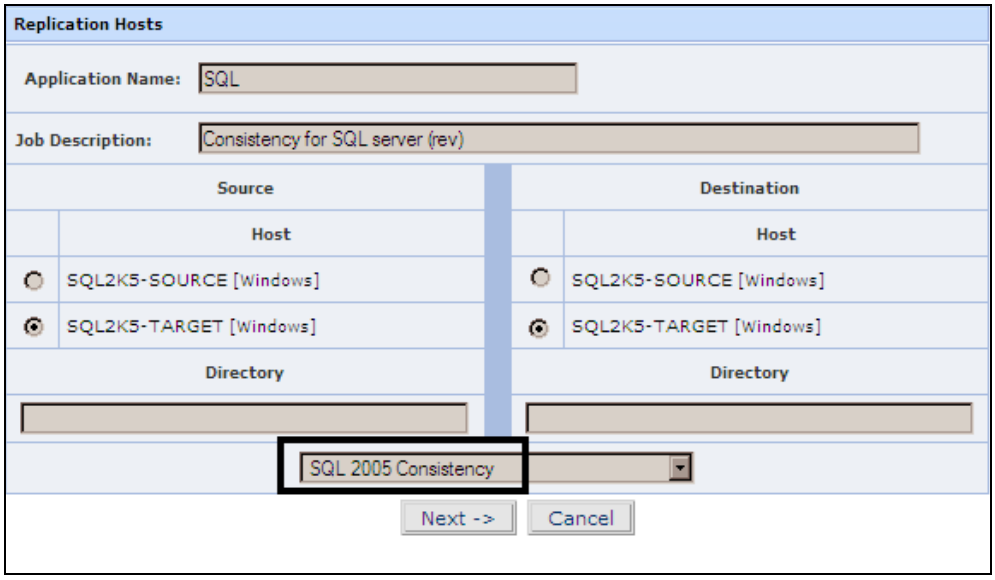


Figure 107:

Step 88. The next page FX "**Job Options",** all the required options are filled up automatically including the source pre script. Do not change any values here, scroll down and click on "**Finish".**

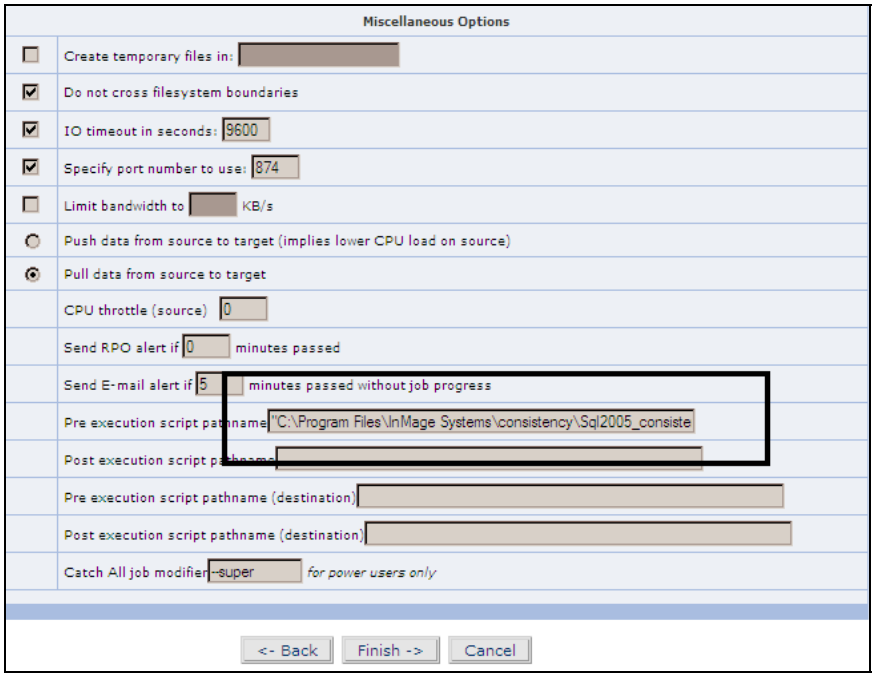


Figure 108:

Step 89. Schedule the job and then click on "**Finish".**

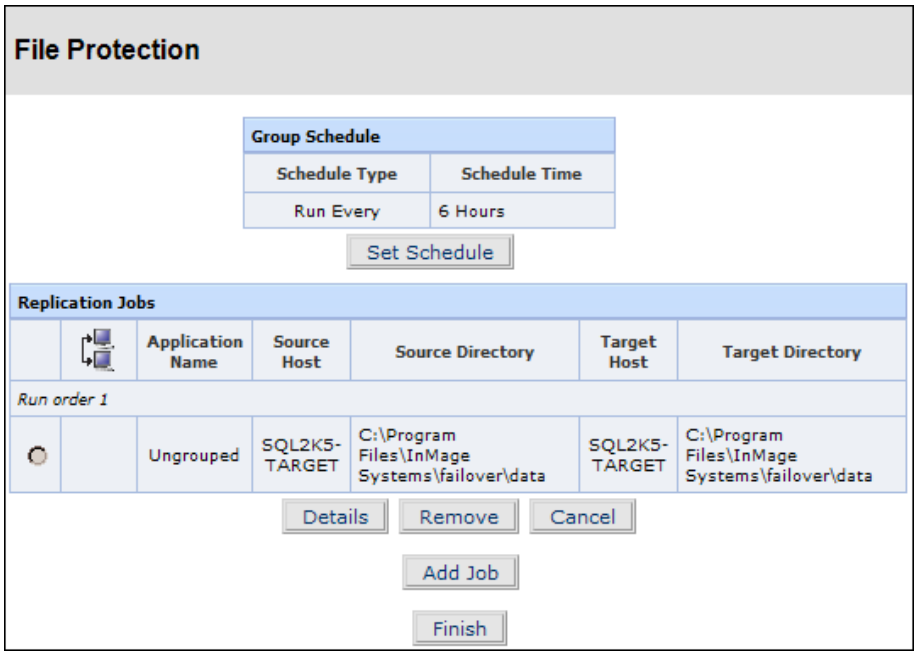


Figure 109:

8.1.4 SQL failback

Step 90. Once the consistency job is complete, perform a failback to the production server (source host). This is done by executing the "**SQL 2005 planned failover**" FX template.

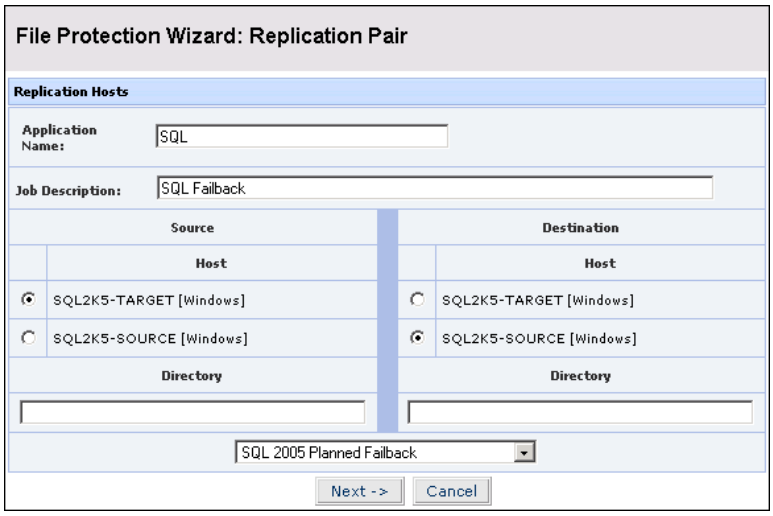


Figure 110:

Step 91. The next screen "**FX Job Options"** opens up with all the required fields filled up, Scroll down to "**Miscellaneous Options** "to see that the Pre script and post script are filled up automatically. Click on "**Finish".**

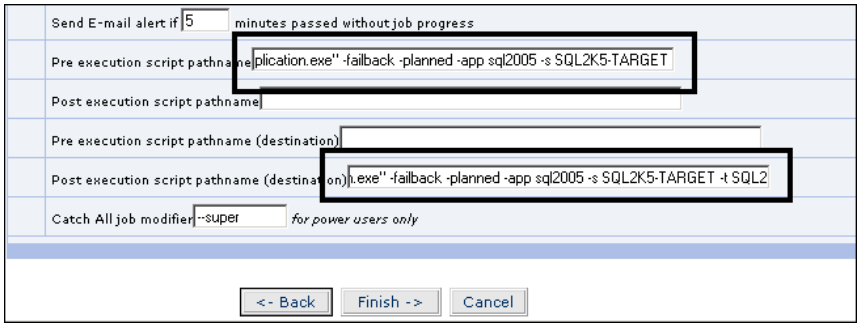


Figure 111:

Notes:

On a NAT environment, always append the –nodnsfailover switch on the target post script. This will skip all DNS related operations

Step 92. The job will be scheduled to run "**On Demand"**, click on "**Finish"** to save the job.

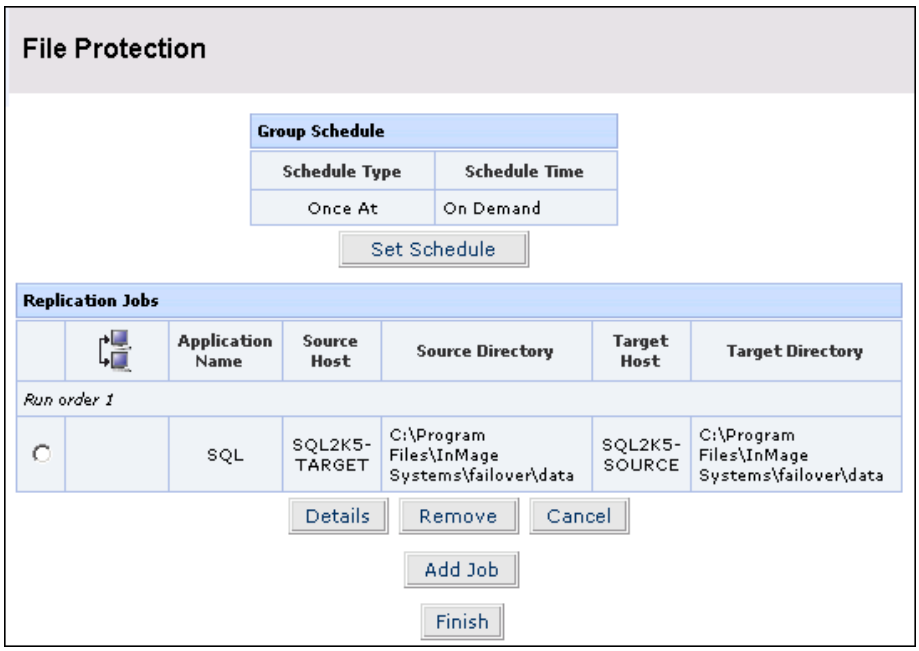


Figure 112:

Step 93. Start the job to failback to the original source host. All the SQL server replication pairs between the original target and original source stop.

8.2 Through CLI

The steps required to perform a failback through CLI are similar that of a failback through CX UI.

8.2.1 Discovery

Step 94. Access the DR server's console and navigate to Hitachi Dynamic Replicator installation folder then issue the following command

`Application –discover –app SQL2005 -host <DR Server>`

Figure 113:

Copy the "*<installation folder>***Failover\data**"* on the source host to the target host manually, then execute the SQL discovery command on the target host as shown below

`Application.exe –retention –host<source SQL server name>`

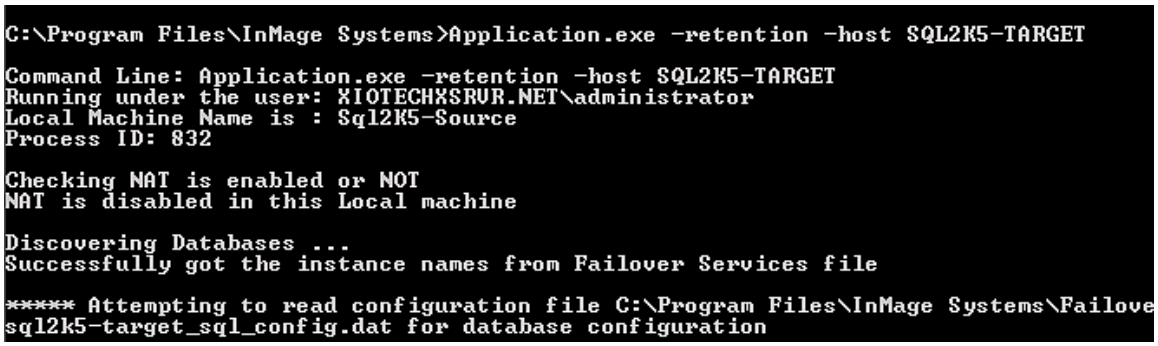


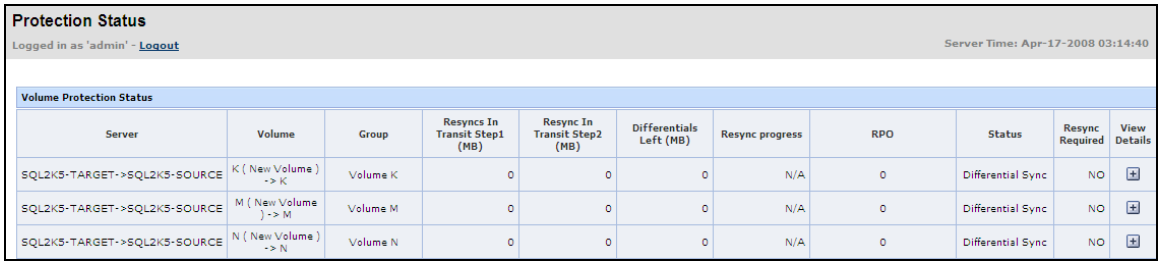
Figure 114

Notes:

When there are multiple SQL server instances, the list of volumes for each is displayed in the output.

8.2.2 Reverse Replication

Step 95. Then reverse replicate all the SQL volumes from the target SQL server to the source SQL server. Once the replication pair(s) reaches **"Differential Sync",** proceed to issue consistency tags.



Server	Volume	Group	Resyncs In Transit Step1 (MB)	Resync In Transit Step2 (MB)	Differentials Left (MB)	Resync progress	RPO	Status	Resync Required	View Details
SQL2K5-TARGET->SQL2K5-SOURCE	K (New Volume) -> K	Volume K	0	0	0	N/A	0	Differential Sync	NO	
SQL2K5-TARGET->SQL2K5-SOURCE	M (New Volume) -> M	Volume M	0	0	0	N/A	0	Differential Sync	NO	
SQL2K5-TARGET->SQL2K5-SOURCE	N (New Volume) -> N	Volume N	0	0	0	N/A	0	Differential Sync	NO	

Figure 115:

8.2.3 Consistency tags

Step 96. To issue consistency tags through CX UI, refer to the section Consistency through CX UI on page 52. Since this is a reverse replication ensure that you select the source as DR server and target as the production server. To issue the consistency tags through console, access the DR Server's (now source host) console and then navigate to the Hitachi Dynamic Replicator installation folder and use the following command

```
vacp -a SQL2005 -t<Tag Name>
```

8.2.4 Failback

Step 97. Switch to original target's console (now the source) and issue the following command

`Application-failback –planned –app sqL2005 –s <`*source server, in this case original target*`> -t <`*target server, in this case original source*`> -builtin –tag NONE`

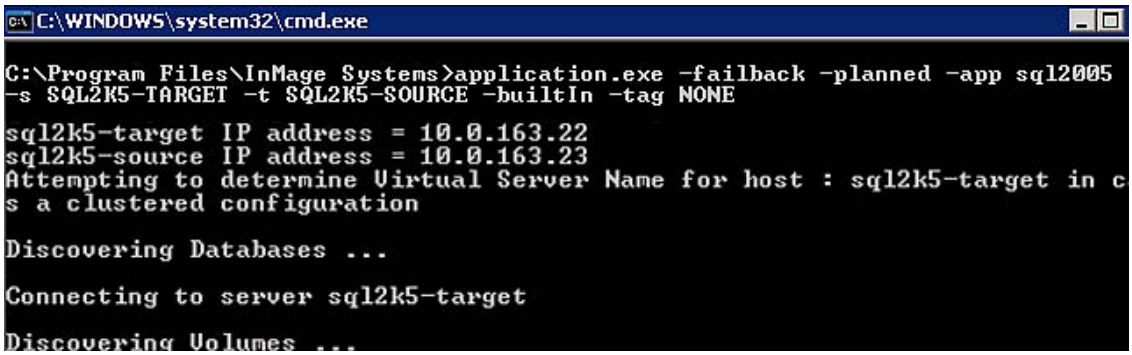


Figure 116:

Notes:

On a NAT environment, always append the –nodnsfailover switch on the source command. This will skip all DNS related operations

The command under the IMPORTANT INFORMATION will also show the same "-nodnsfailover" switch to the end

Step 98. The above command ends with a resultant command that is it to be executed on the target server, copy the command and access the target console

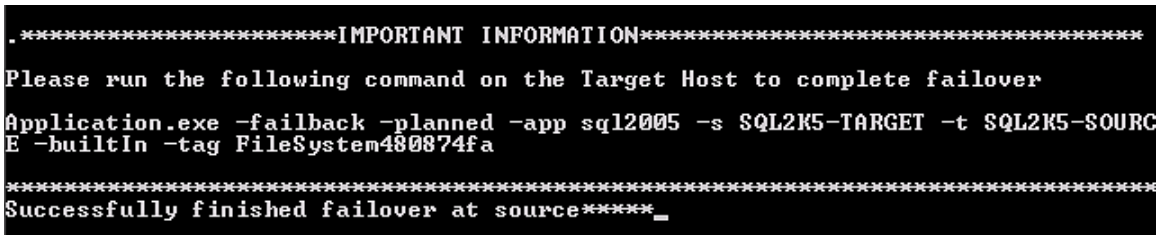


Figure 117:

Step 99. After accessing the target console, navigate to the Hitachi Dynamic Replicator installation folder then issue the command as given in the previous step's output.

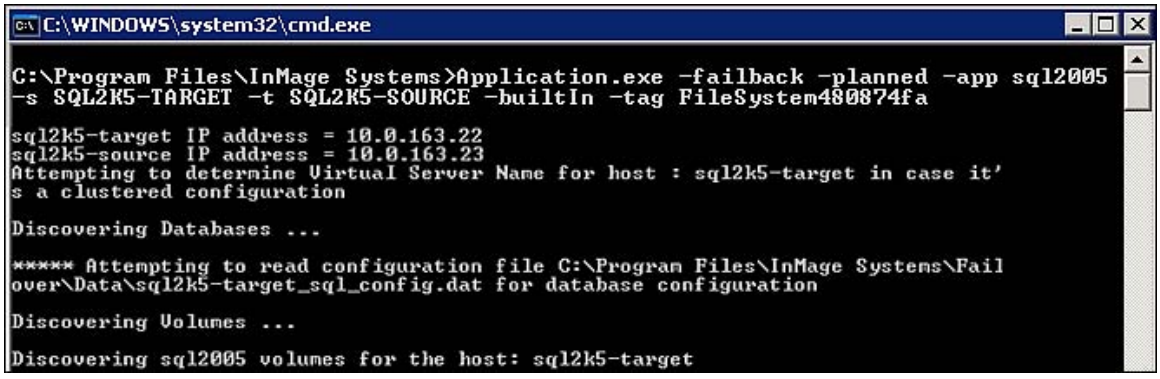


Figure 118:

9 Failover and failback using crash consistency tag

In normal setup, DR scout uses VSS snapshot to issue application or consistency tag but in a setup it is not possible to issue VSS consistency tag. In this case, crash consistency tag can be used and the same can be used for failover and failback. When crash consistency tag is used it always generates USERDEFINED tag. It will not generate any filesystem or application consistency tag.

9.1 Discovery

Use the application discovery template as used in planned failover. No changes are required.

9.2 Consistency

To set crash consistency FX job use the **SQLXXXX_consistency_fstag.bat** file and pass the required argument as given below.

Syntax:

```
SQL2005_consistency_fstag.bat "List of volumes separated by semicolon"
-CrashConsistency
```

For example, SQL 2005 has databases in G, H, K:\Mnt1, J:\Mnt2 volumes. Use the following command in prescript to set the crashconsistency job or run it through CLI.

```
"C:\Program Files (x86)\InMage
Systems\consistency\SQL2005_consistency_fstag.bat”
"G:;H:;K:\Mnt1;J:\Mnt2" –CrashConsistency
```

Notes:

List of volumes must be in double quotes else only first Drive or mount point is taken for issuing tag.
-Crashconsitency can be written with or without double quotes

9.3 Planned Failover

9.3.1 Planned failover through CX UI

When you set the planned failover job, in the planned failover template, add the prescript with "**–crashconsistency**" and postscript with-"**-tagtype USERDEFINED**"
For example,

Pre script: "C:\Program Files (x86)\InMage Systems\application.exe" -failover -planned -app sql2005 -s W2K3-SRC -t W2K3-TGT -builtIn -tag NONE **-CrashConsistency**

Post script: "C:\Program Files (x86)\InMage Systems\application.exe" -failover -planned -app sql2005 -s W2K3-SRC -t W2K3-TGT -builtIn -tag PLANNED **-tagtype USERDEFINED**

9.3.2 Planned Failover through CLI

When you run through CLI follow the same procedure as in section 8.2. The only change is add "**–crashconsistency**" switch to the source command and target command with "**-tagtype USERDEFINED**".

Source Command:
"C:\Program Files (x86)\InMage Systems\application.exe" -failover -planned -app sql2005 -s W2K3-SRC -t W2K3-TGT -builtIn -tag NONE **-CrashConsistency**

Target command:
"C:\Program Files (x86)\InMage Systems\application.exe" -failover -planned -app sql2005 -s W2K3-SRC -t W2K3-TGT -builtIn -tag <User Defined Tag> **-tagtype USERDEFINED**

9.4 Failback

9.4.1 Failback through CX

Use the same failback template as in section 8.2.4. The only change is add ”**–crashconsistency**” switch to the source command and target command with “**-tagtype USERDEFINED**”.

For example,
Pre script: "C:\Program Files (x86)\InMage Systems\application.exe" -failback -planned -app sql2005 -s W2K3-TGT t W2K3-SRC -builtIn -tag NONE **-CrashConsistency**

Post script: "C:\Program Files (x86)\InMage Systems\application.exe" - failback -planned -app sql2005 -s W2K3-TGT -t W2K3-SRC -builtIn -tag PLANNED **-tagtype USERDEFINED**

9.4.2 Failback through CLI

When you run through CLI follow the same procedure as in section 8.2.4. The only change is add ”**–crashconsistency**” switch to the source command and target command with “**-tagtype USERDEFINED**”.

Source command:
"C:\Program Files (x86)\InMage Systems\application.exe" - failback -planned -app sql2005 -s W2K3-TGT -t W2K3-SRC -builtIn -tag NONE **-CrashConsistency**

Target command:
"C:\Program Files (x86)\InMage Systems\application.exe" - failback -planned -app sql2005 -s W2K3-TGT -t W2K3-SRC -builtIn -tag <User Defined Tag> **-tagtype USERDEFINED**

9.5 Unplanned Failover

When you set the unplanned failover job, in the unplanned failover template, add the postscript with-“**-tagtype USERDEFINED**”. The same can be used for the CLI

For example,
“C:\Program Files (x86)\InMage Systems>application.exe -failover -unplanned -app sql2005 -s W2K3-SRC –t W2K3-TGT -builtIn -tag LATEST **-tagtype USERDEFINED”**

Part 2: Clustered Production Server and Standalone DR Server

Part 2 explains protecting and recovering SQL server on clustered to non-clustered environment where production SQl server is a clustered environment and DR server is standalone machine. The recovery section is branched into planned and unplanned failover. Each of them again is achieved through CX UI and CLI.

10 SQL Server on a Cluster environment

Similar to a non clustered environment, a discovery job is run to probe for SQL server volumes. However, before proceeding with the discovery job the VX and FX agents need to be assigned a Fixed NAT IP address (IP address of the respective hosts). Access the "**Host Agent Config"** window on the production server for the VX agent and "**Enable Fixed NAT IP Address option**" and enter its IP address and click on "**Apply**" and then on "**Ok".**

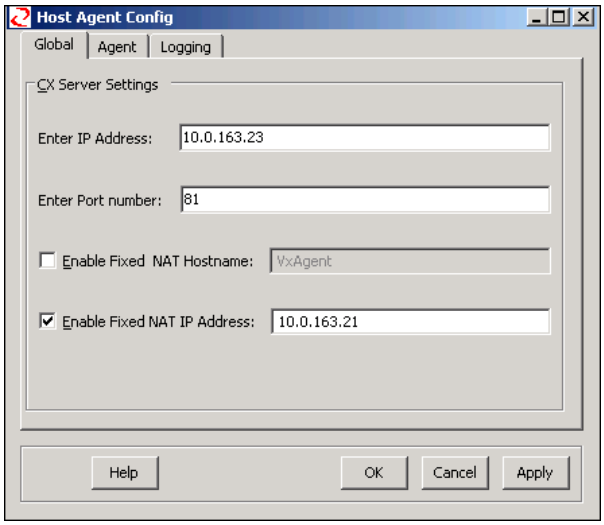


Figure 119

Repeat the same for the FX agent as well. Then repeat the process for all other nodes in the cluster

Figure 120:

When there are multiple instances refer to the section Protect on page 113.

Refer to the Verify privileges on page 28 for detailed steps.

11 Introduction

On a MS cluster environment, SQL server solution is solution is divided into two steps, Protecting SQL server and SQL failover .Each of them is again branched into a set of steps.

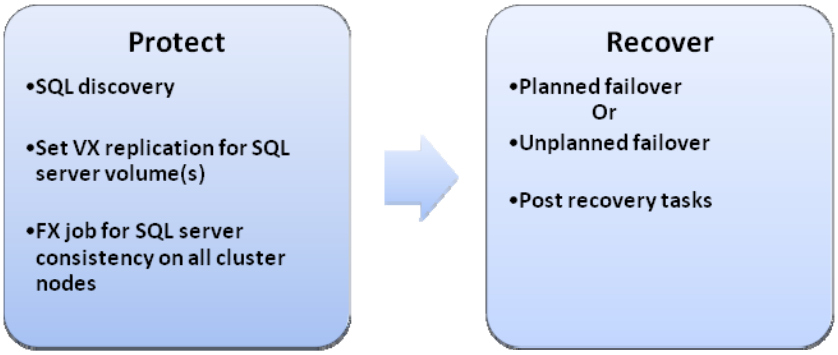


Figure 121:

Notes:

The target SQL server will be standalone (non clustered).

Protecting SQL server is achieved in three steps, SQL discovery, replicate discovered volumes, and SQL consistency on the source volume(s).

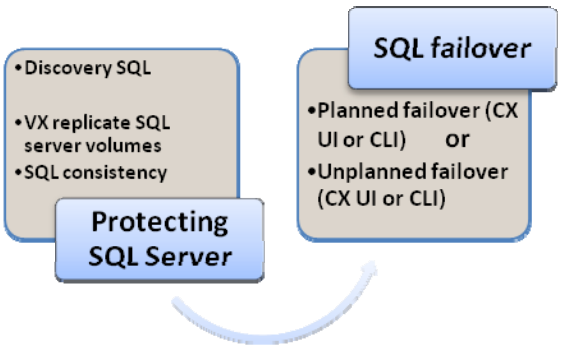


Figure 122:

SQL server failover on the other hand can be performed either through CLI or the CX UI for both planned and unplanned failover

12 Protect

12.1 SQL discovery

Step 100. On the CX UI, click on "**File Protection",** then on "**New Job Group Wizard**"

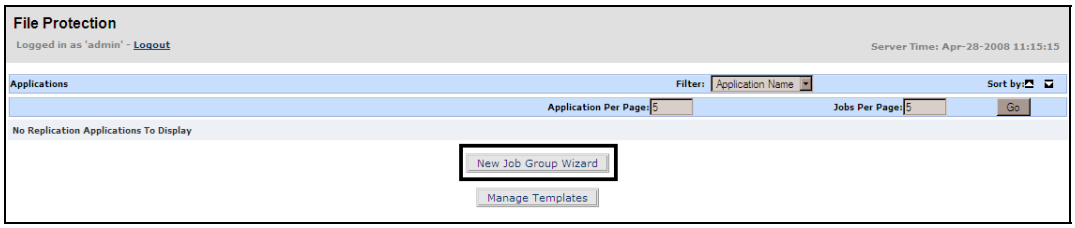


Figure 123:

Step 101. Click on "**Add Job**" as marked in the picture below

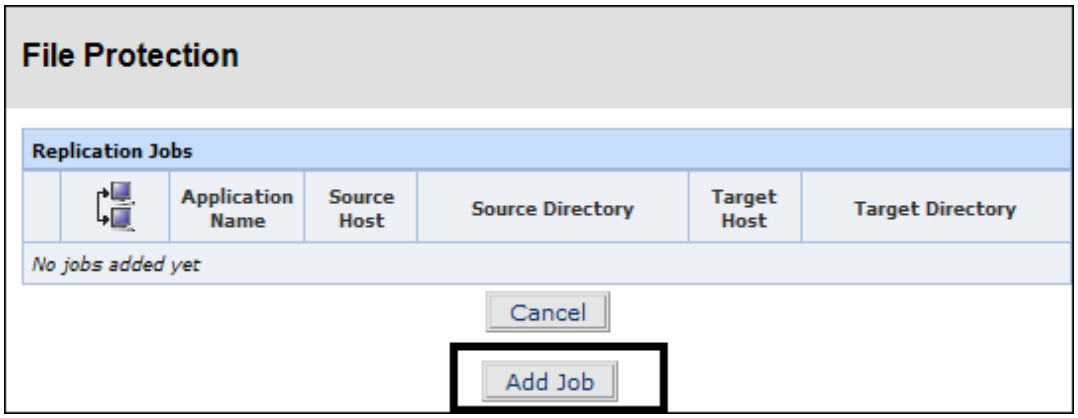


Figure 124:

Step 102. The next screen "**Replication Pair**" opens up, enter the "**Application Name"**, "**Job Description"** then select the active node for "**Source**" and select the target a non clustered SQL server. Scroll down and select the FX template as "**SQL 2005 Discovery"** and click on "**Next"**

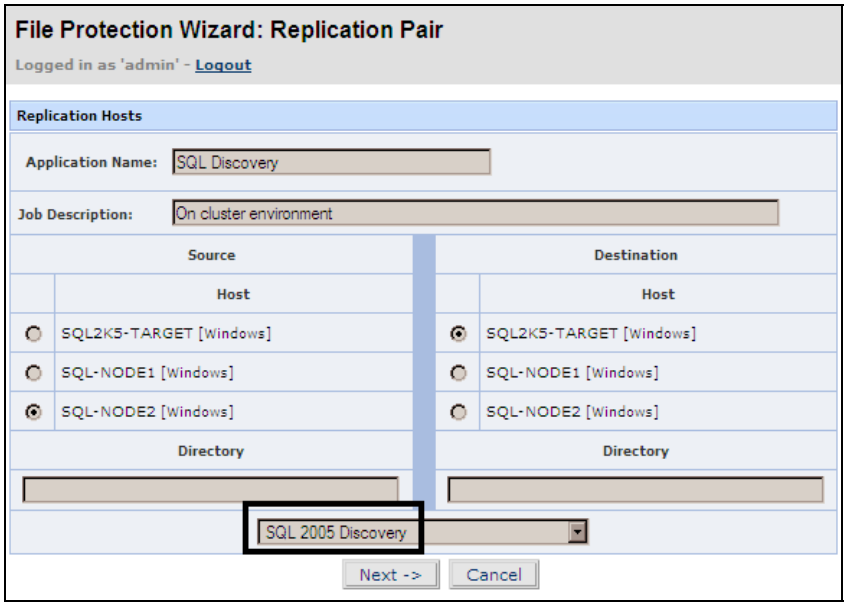


Figure 125:

Step 103. FX job Options screen opens up, scroll down to "**Miscellaneous Options"** to edit the pre script as

`Application.exe –discover –app sql2005 –virtualserver <`*`name of the corresponding virtual server`*`>`

`And the target post script as Application.exe -retention -host <`*`name of the corresponding virtual server`*`>`

Click on "**Finish"** to continue

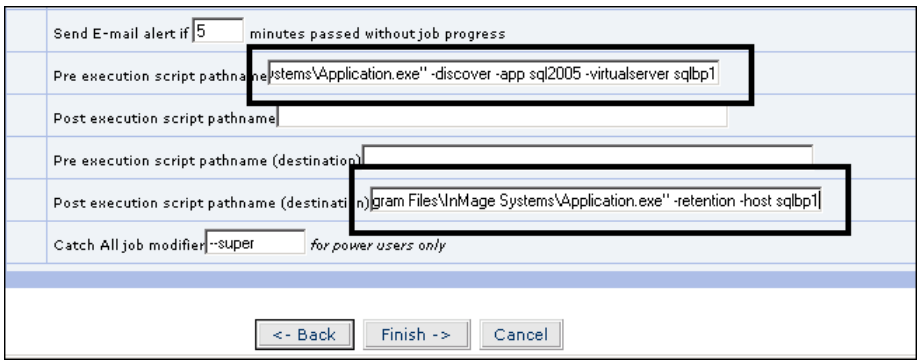


Figure 126

Step 104. You will be returned to the one of the previous screens with all the required fields filled up, By default the job will be set to run once every day.

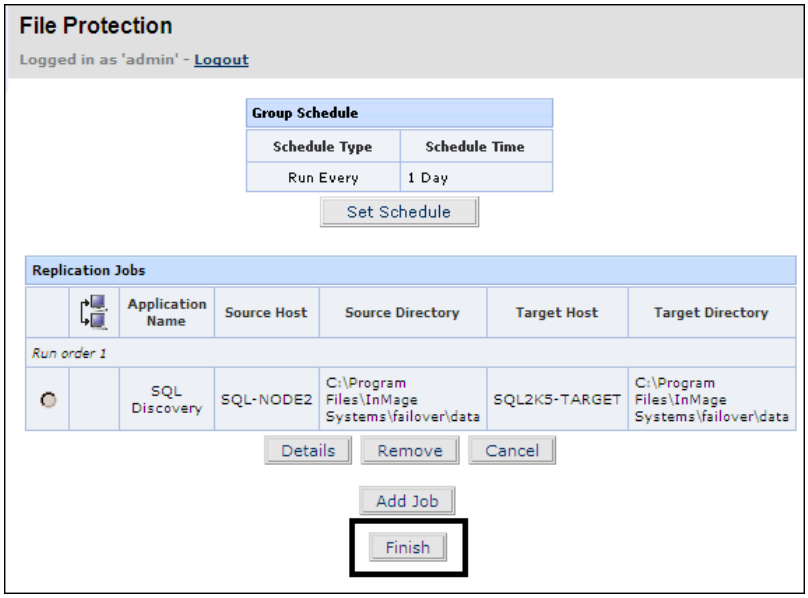


Figure 127:

Step 105. The FX job will start automatically.

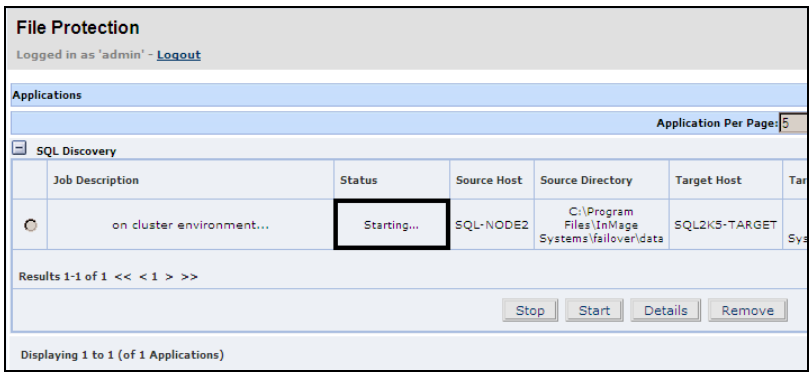


Figure 128:

Step 106. The progress of the job can be monitored by clicking on "**Protection Status**".

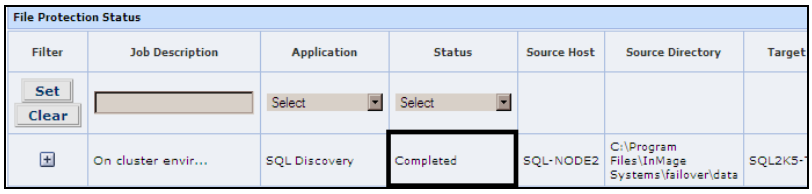


Figure 129:

12.2 Replicate Discovered Volume(s)

Step 107. After the Discovery job is completed, click on "**Volume Protection",** then expand "**Cluster Group(s) Volumes**" to select SQL server volume and click on "**Start Replication".**

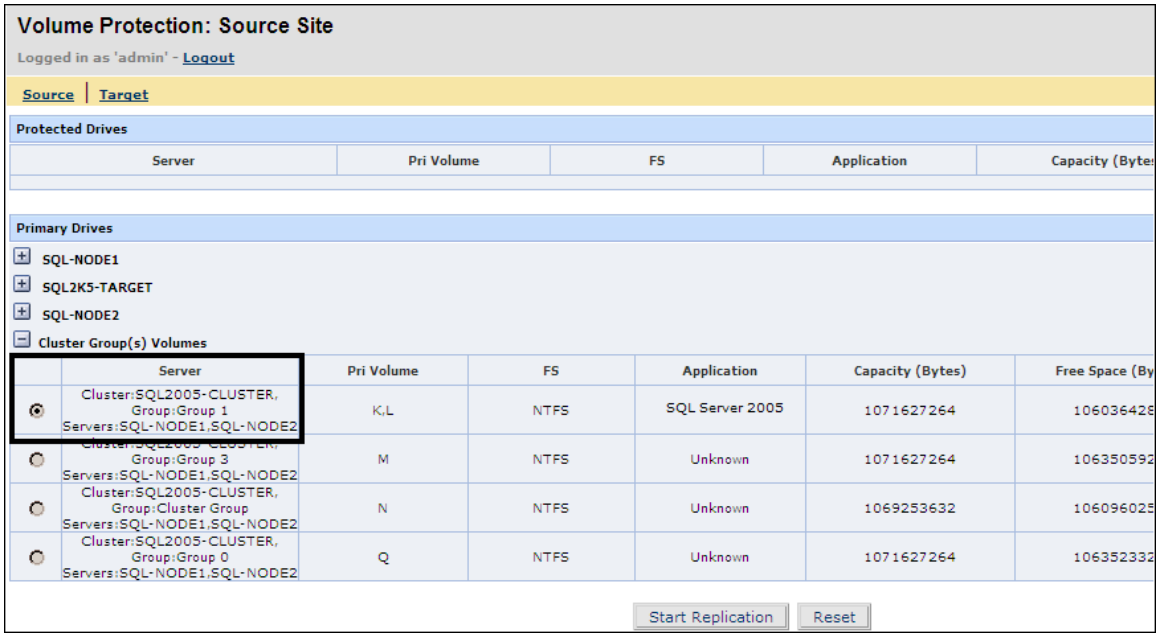


Figure 130:

Step 108. The next screen "**Cluster Setup**" opens up, select the SQL server volume, and click on "**Next".**

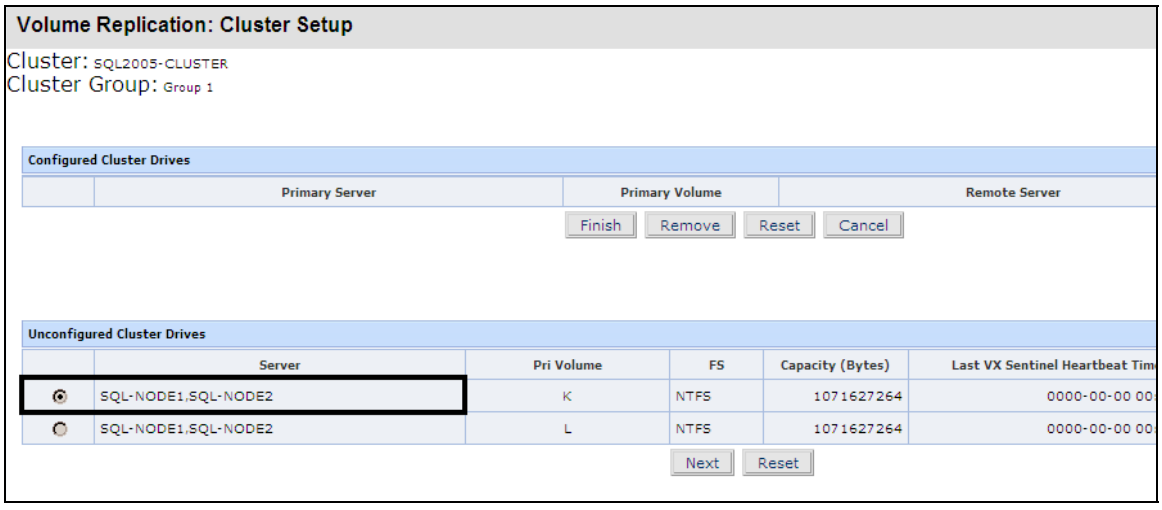


Figure 131:

Step 109. The next screen opens up, expand the target SQL server, and select the target volume (must be the same drive letter as the source volume).

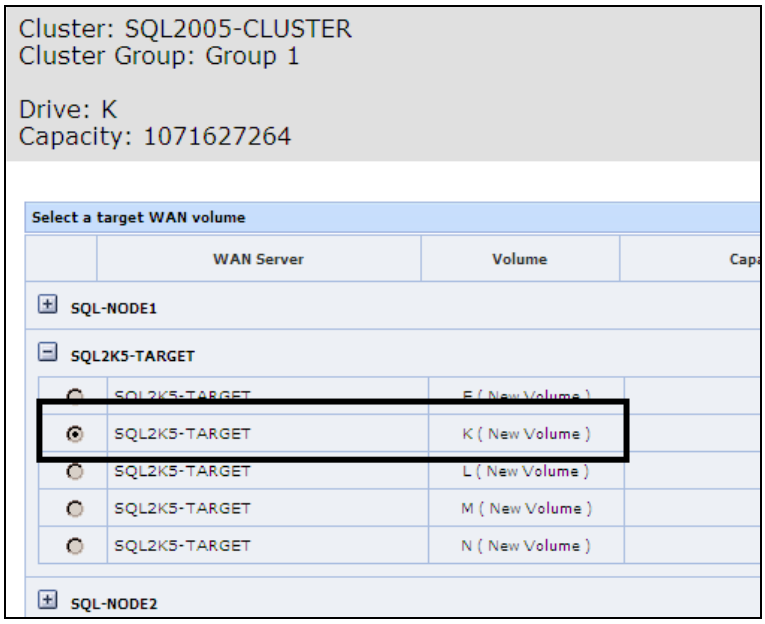


Figure 132:

Step 110. Scroll down to set the "**Replication Options",** Check the option "**Enable CDP Retention option"** and click on "**Submit".**

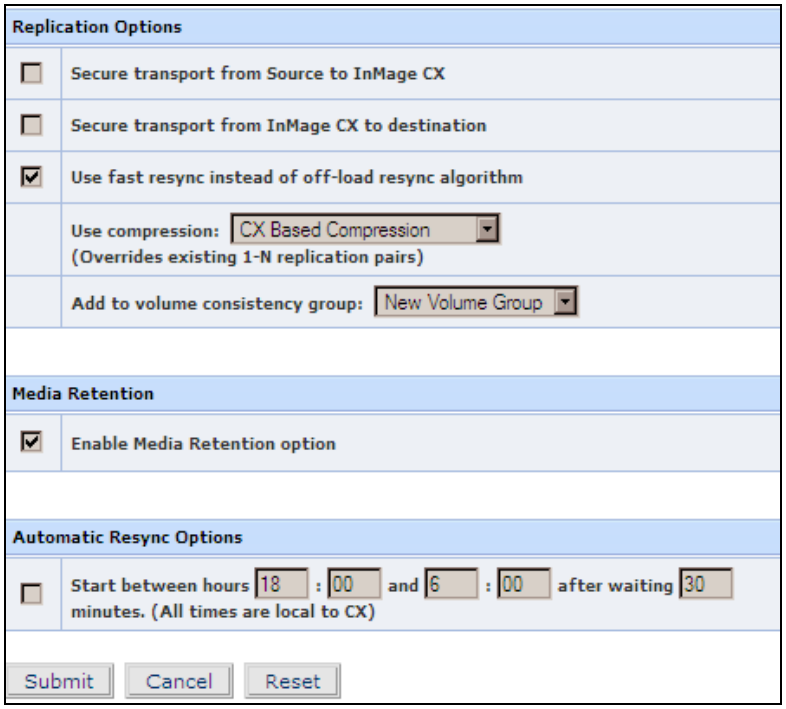


Figure 133:

Step 111. The "**Retention Options"** page opens up, choose the type of retention policy, and click on "**Submit".**

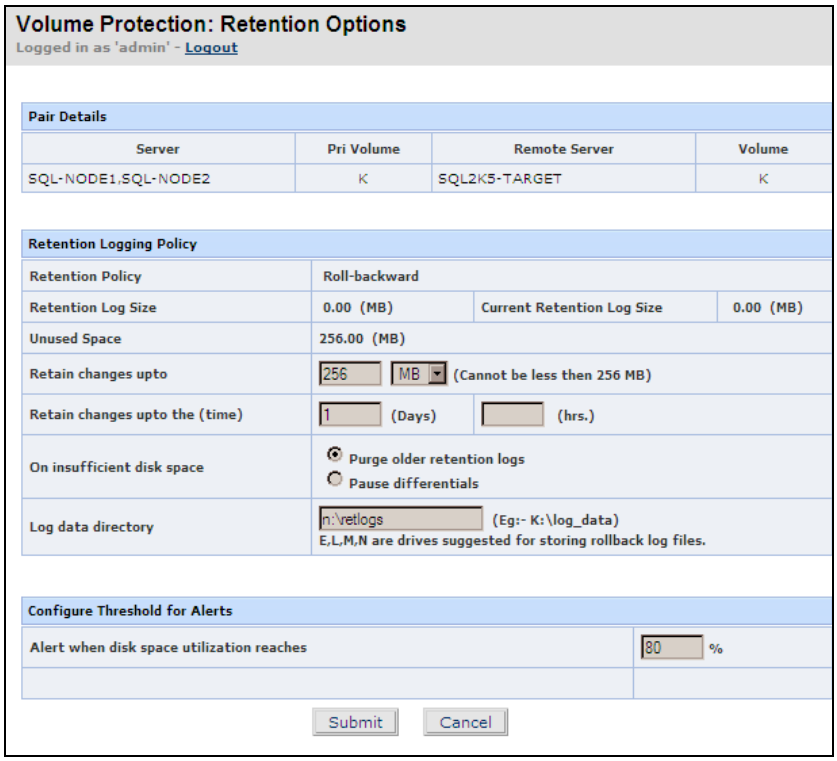


Figure 134:

Step 112. This will open up Cluster Setup screen, under the Configured Cluster Drives, select the entry representing the current source volume and click on "**Finish"**

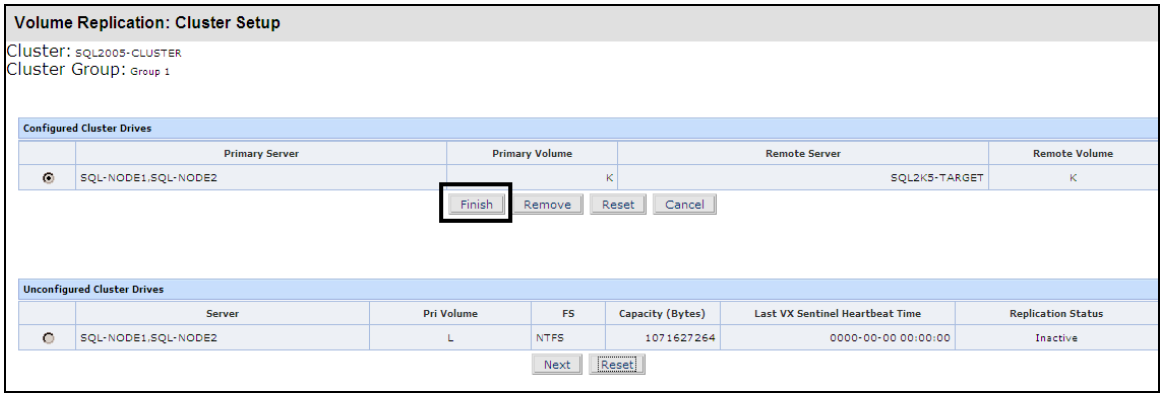


Figure 135:

Step 113. This will start the replication pair, the progress can be monitored under "**Protection Status"**

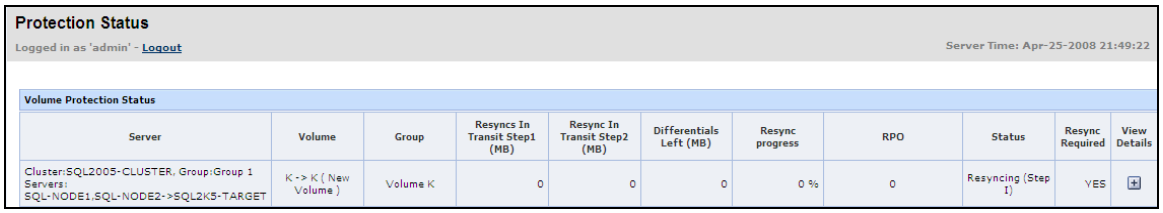


Figure 136:

Step 114. Now repeat the same process for other SQL server volumes. In this example we have two SQL server volumes the first volume is already being replicated.

Step 115. Click on "**Protection Status"** to monitor the replication pairs

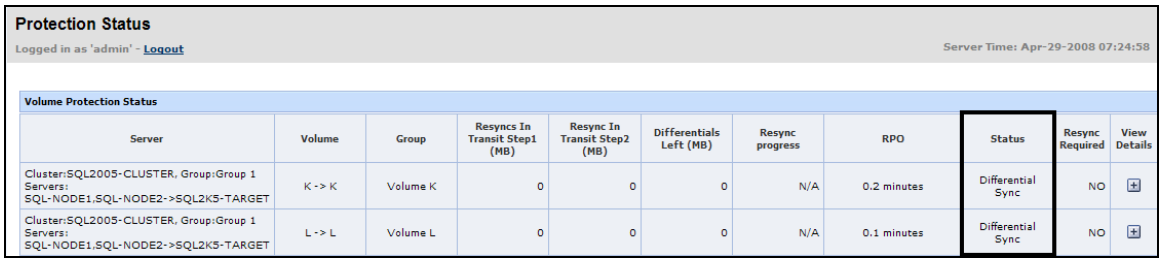


Figure 137:

12.3 SQL Consistency

After the VX replication pair(s) reach "**Differential Sync**", proceed to setup SQL consistency through FX job on each of the cluster nodes.

Step 116. Click on "**File Protection",** then on **"New Job Group Wizard"**

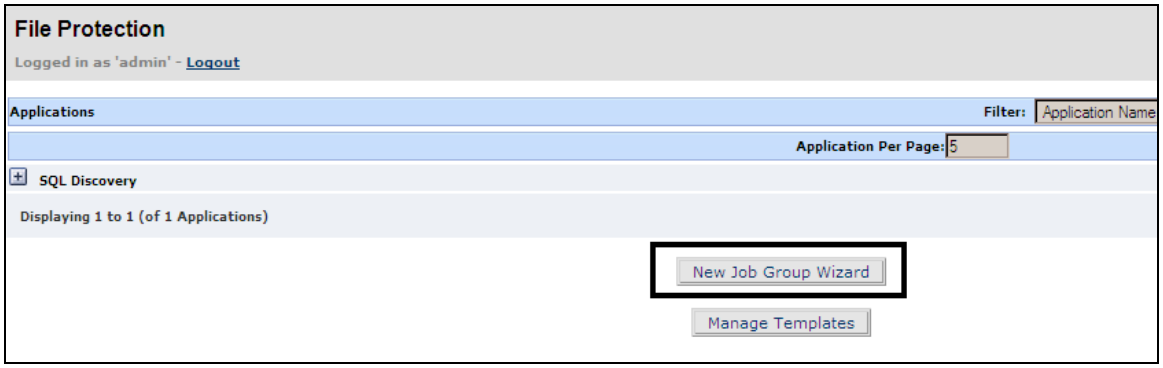


Figure 138:

Step 117. The next screen opens up, click on "**Add Job** "

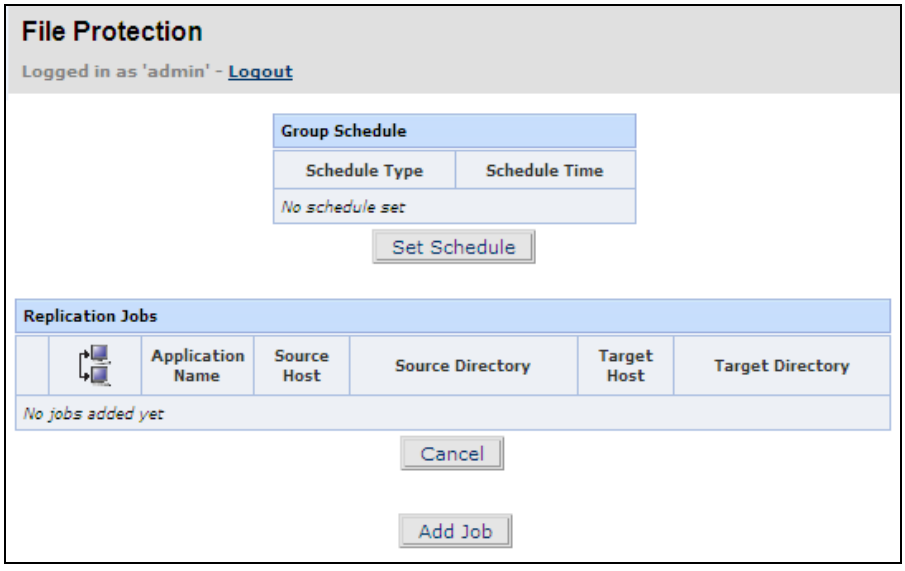


Figure 139:

Step 118. The "**Replication Pair"** screen opens up, enter the "**Application Name"**, "**Job Description"** then select the active node for "**Source**" and the target host for "**Destination".** Then select the FX template as "**SQL 2005 Consistency"** and click on **"Next"**

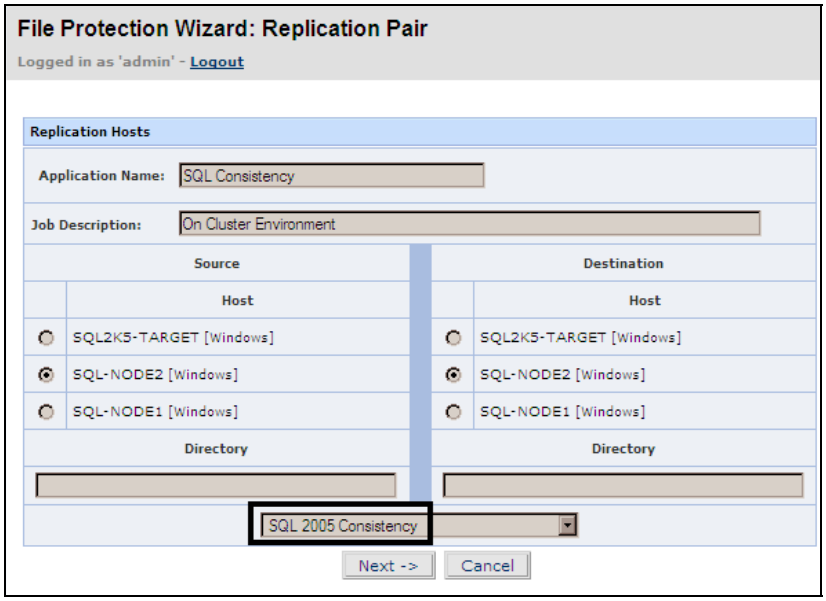


Figure 140:

Step 119. By selecting the SQL 2005 Consistency as the template, all the required fields including the source pre script will be filled up automatically, scroll down and click on "**Finish"**

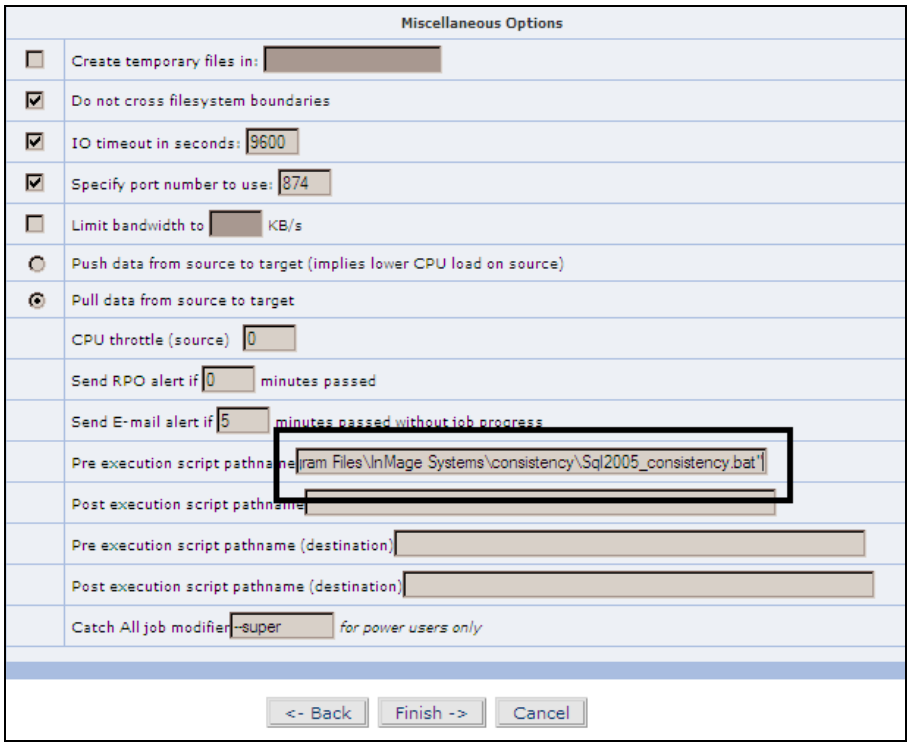


Figure 141:

Step 120. The next screen opens up, by default the job will be set to execute every six hours, you may change this by clicking on the "**Set Schedule".** Then click on "**Finish"** to save the job.

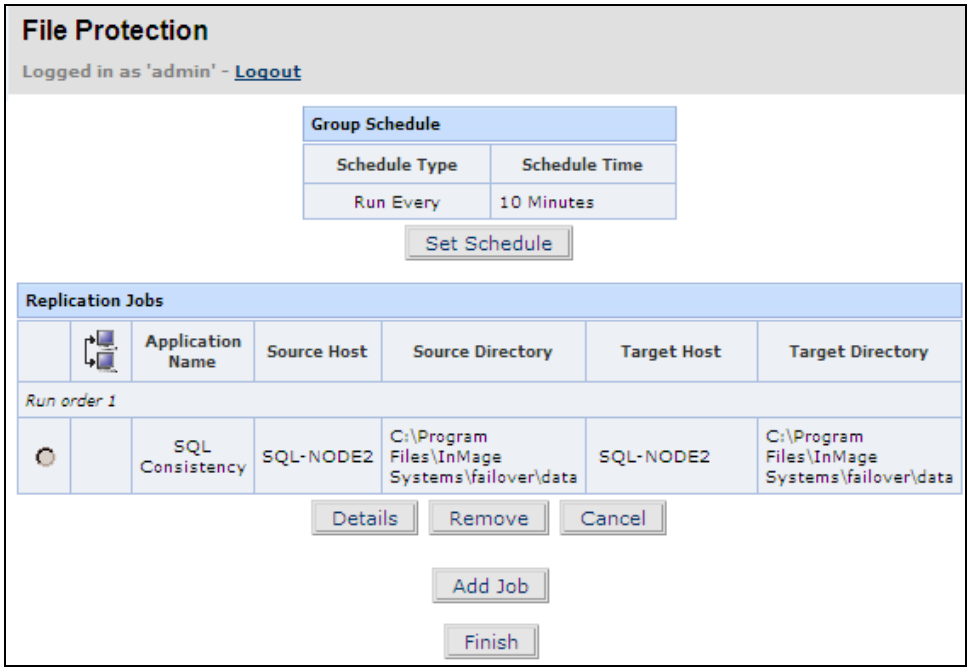


Figure 142:

SQL consistency job now executes at regular intervals issuing vacp tags on the source volume(s). This progress can be monitored by clicking on the "**Protection Status**"

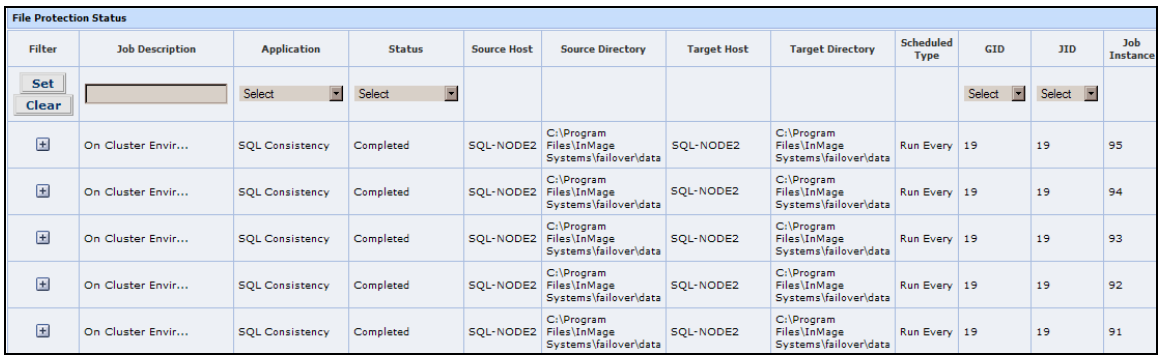


Figure 143:

Notes:

Ensure that you set the consistency jobs for each of the cluster node.

13 Failover

13.1 Planned failover

13.1.1 Through CX UI

Step 121. To perform a planned failover through the CX UI setup a FX job. Click on "**File Protection**" then on "**New Job Group Wizard**"

Figure 144:

Step 122. The next screen opens up, click on "**Add Job**"

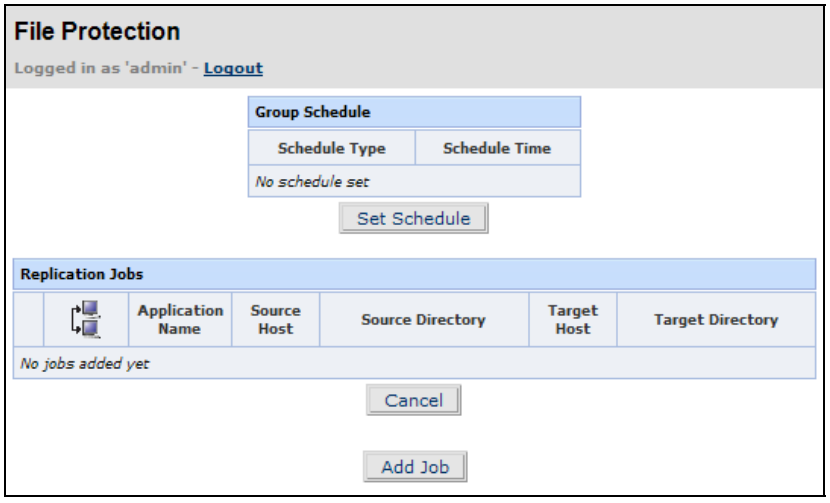


Figure 145:

Step 123. The "**Replication Pair"** screen opens up, enter the "**Application Name"**, "**Job Description"** then select the "**Source"** as active node and the "**Destination"** as the target SQL server. Then select the FX template as "**SQL 2005 Planned Failover"** and click on "**Next"**

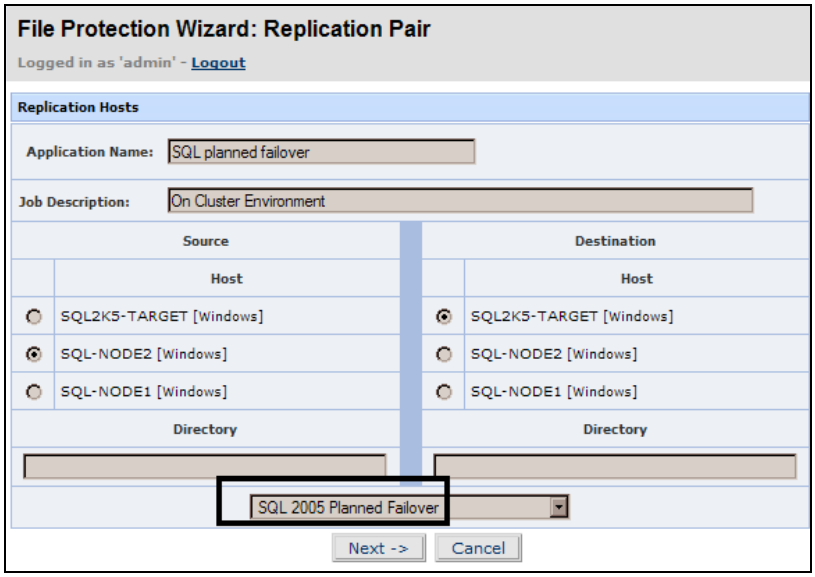


Figure 146:

Step 124. The Job Options screen opens up, scroll down to "**Miscellaneous Options**" to append the switch **`-virtualserver`** **<***name of the corresponding virtual server name***>** to both source pre script and target post script

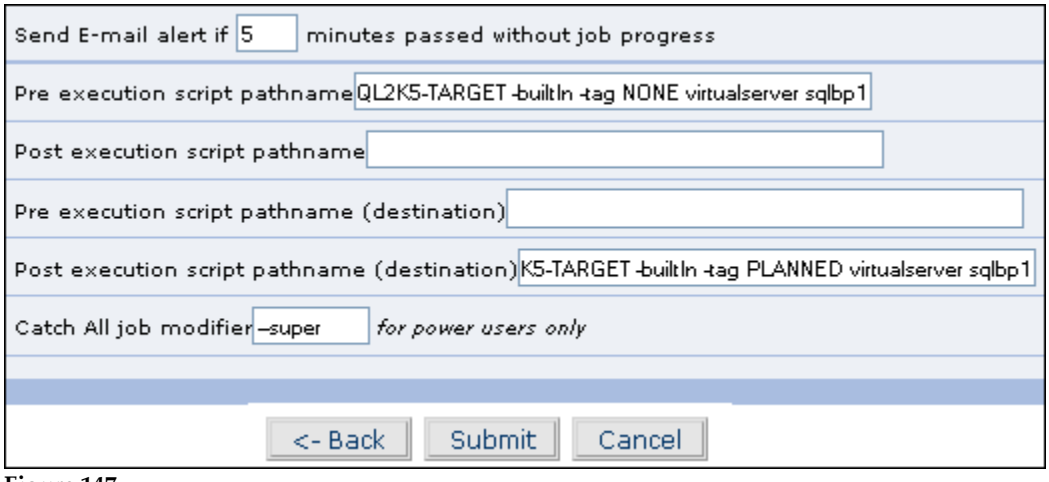


Figure 147

Step 125. The next screen opens up, click on "**Finish**" to continue

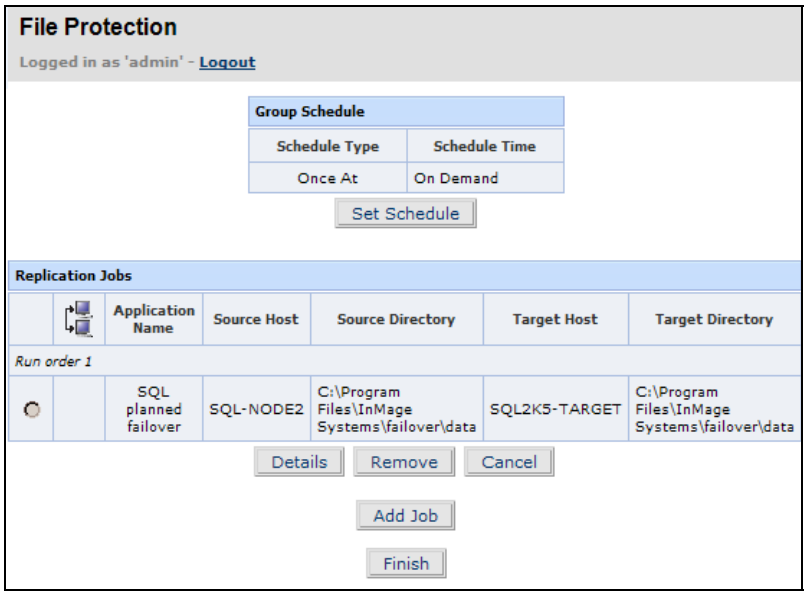


Figure 148:

Step 126. Start the job to perform SQL Planned failover through CX UI.

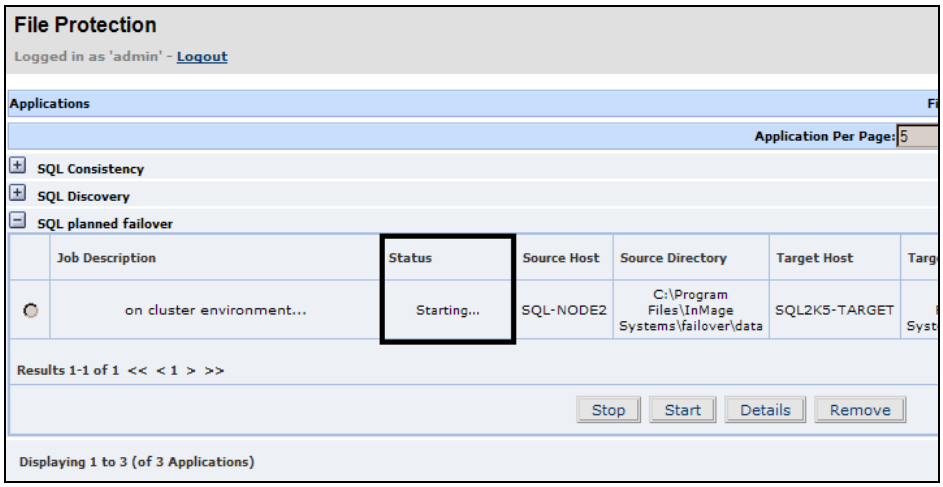


Figure 149:

Notes:

After failover SQL consistency job will be set to run "On Demand". However this requires the CX server to be online else the jobs will fail.

By default AD will not be replicated during MSSQL Server failover. However if you need AD replication as part of MSSQL Server failover edit the command line/pre and post script with the "–doadreplication" switch.
OR
You may run "WinOp.exe" from command line to perform AD replication and DNS Update

13.1.2 Through CLI

On active node (source)

Step 127. Planned failover can also be performed through console. Access the active node's console then navigate to the agent installation path to issue the following command

`Application.exe –failover –planned –app sql2005 –s <`*`active node host name`*`> -t <`*`target host name`*`> -builtin –tag NONE`

```
C:\Program Files\InMage Systems>application.exe -failover -planned -app sql2005
-s SQL-NODE2 -t SQL2K5-TARGET  -builtIn -tag NONE
SQL-NODE2 IP address = 192.168.133.191
SQL2K5-TARGET IP address = 10.0.163.22
Attempting to determine Virtual Server Name for host : SQL-NODE2 in case it's a
clustered configuration
ACE_Semaphore::ACE_Semaphore: Input/output error
The Source SQL server is part of a Clustered Configuration. The virtual Server N
ame for Host : SQL-NODE2 is : HERCULES
ACE_Semaphore::ACE_Semaphore: Input/output error

Discovering Databases ...

Connecting to server hercules

Discovering Volumes ...

Discovering sql volumes for the host: hercules
```

Figure 150:

The command ends with the output as shown in the picture below. The resultant command enclosed within "**IMPORTANT INFORMATION**" should be executed on the target host to complete SQL server planned failover.

```
**********IMPORTANT INFORMATION**********

Please run the following command on the Target Host to complete failover

Application.exe -failover -planned -app SQL2005 -s sql-node2 -t sql2k5-target -buil
tIn -tag FileSystem48183e91

********************************************************************************
*****Successfully finished failover at source*****
```

Figure 151:

Step 128. Switch to the target host then navigate to the agent installation path and issue the above command

```
C:\Program Files\InMage Systems>application.exe -failover -planned -app sql2005  -s S
QL-NODE2 -t SQL2K5-TARGET  -builtIn -tag FileSystem48183e91
sql-node2 IP address = 10.0.133.191
sql2k5-target IP address = 10.0.163.22
Attempting to determine Virtual Server Name for host : sql-node2 in case it's a
clustered configuration
ACE_Semaphore::ACE_Semaphore: Input/output error
The Source SQL server is part of a Clustered Configuration. The virtual Server N
ame for Host : sql-node2 is : HERCULES
ACE_Semaphore::ACE_Semaphore: Input/output error

Discovering Databases ...
ACE_Semaphore::ACE_Semaphore: Input/output error

***** Attempting to read configuration file C:\Program Files\InMage Systems\Fail
over\Data\hercules_sql_config.dat for database configuration

Discovering Volumes ...

Discovering sql volumes for the host: hercules
```

Figure 152:

13.2 Unplanned failover

13.2.1 Through CX UI

This is similar to performing an unplanned failover through CX UI on non clustered environment. Select the DR server as both source and destination, then select the FX template as "**SQL 2005 Unplanned Failover**". Refer to the section Unplanned failover through CX UI on page 61 and edit post script to add –virtualserver <SQL Virtual Server Name>. For example

```
Application –failover –planned –app sql2005 –s SQL-NODE2 -t
SQL2K5- TARGET -builtin –tag LATEST –virtualserver SQLDB1
```

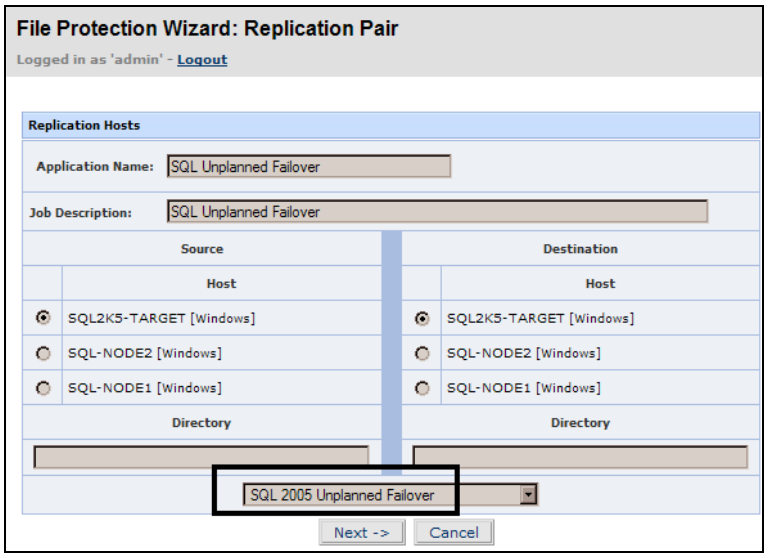


Figure 153:

Caution:

Ensure that you edit the target post script at the –s switch to enter the production server name and add –virtualserver name.

13.2.2 Through CLI

To perform Unplanned SQL server failover, switch to the target host's console then navigate to the agent installation path and issue the following command:

```
Application.exe –failover –unplanned –app sql2005 –s <Production server> -t
<DR Server> -builtin –tag LATEST –virtualserver <SQL Virtual Server Name>
```

13.3 Failover without CDP Retention Option

13.3.1 Through CX UI

For replication pairs set without the CDP retention option, select the "**SQL 2005 Failover without Retention"** as the FX template for performing a failover.

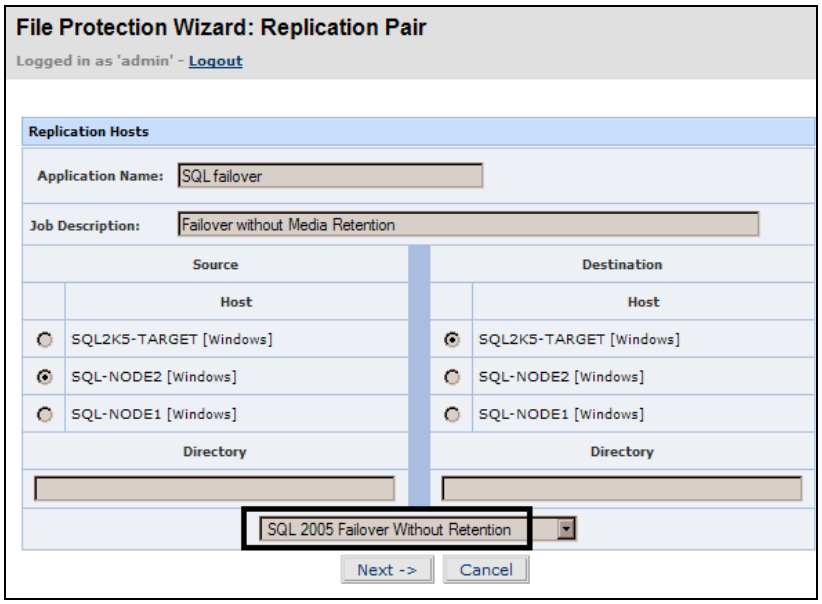


Figure 154:

13.3.2 Through CLI

The same can also be achieved through CLI. Access the target console and navigate to the agent installation path to issue the following command

`Application.exe –failover –unplanned –app sql2005 –s <`*`Production server`*`> –t <`*`target host`*`> -builtin –tag NONE`

Notes:

Failover without CDP retention option is un-planned failover.

```
C:\Program Files\InMage Systems>application.exe -failover -unplanned -app sql2005 -s SQL-NODE2 -t SQ
L2K5-TARGET -builtIn -tag NONE
SQL-NODE2 IP address = 10.0.133.191
SQL2K5-TARGET IP address = 10.0.163.22
Attempting to determine Virtual Server Name for host : SQL-NODE2 in case it's a clustered configurat
ion
The Source SQL server is part of a Clustered Configuration. The virtual Server Name for Host : SQL-N
ODE2 is : HERCULES

Discovering Databases ...

***** Attempting to read configuration file C:\Program Files\InMage Systems\Failover\hercules_sql_co
nfig.dat for database configuration

Discovering Volumes ...

Discovering sql volumes for the host: hercules

HostName= hercules

***** Attempting to read configuration from C:\Program Files\InMage Systems\Failover\hercules_sql_co
nfig.dat
Detected the version of the discovery configuration file as 1.1
k:
l:
```

Figure 155:

Here the target volume(s) will be made visible and the replication will pause. For pairs with CDP retention options enabled the replication pairs will be stopped.

14 Failback from Standalone to Clustered SQL server

A failback is the reverse of a failover. Failover can only be performed to a standalone server. However, to perform a failback to a clustered server, it will be turned into a standalone server during the failback process. Once the failback is complete it will be turned back into a clustered server.

Figure 156:

14.1 Convert cluster to standalone

Step 1. Access the active node's command prompt, and then navigate to the VX agent installation path to issue the following command

`Clusutil –prepare clustertostandalone: <`*`name of the active node`*`> -shutdown <`*`name of the passive node`*`>`

```
C:\Program Files\InMage Systems>ClusUtil.exe -prepare ClusterToStandalone:1st -shutdown 2nd
Connected to [2nd] SCM
Waiting for the service [svagents] to stop
```

Figure 157:

After the command is execute the active node will turn into a standalone server while the rest of the nodes are shutdown.

Notes:

For Windows Server 2008 cluster, you will need to perform onlinedisk operation after the node restarted as the result of the above step.

In Windows Server 2008 cluster, after server restarts, cluster disk will be offline and cannot be used until it becomes online. You may use the "ClusUtil.exe –prepare onlinedisk" command to bring all the disks online.

When you need only selected clustered disks online, you may access the cluster management interface and take the other disks offline

14.2 Protect

14.2.1 SQL Discovery

Step 129. Open the CX UI then click on "**File Protection -> New Job Group Wizard"**

Step 130. You will now need to setup a discover job between the DR SQL server and the production SQl server that is converted to standalone in the previous step. Ensure that you select the "**SQL 2005 Discovery**" template

Step 131. Click on "**File Protection"** to find the new job, select the job and click on "**Start"** to run the job. You can check the progress by clicking on the "**Protection Status**"

14.2.2 Reverse VX Replication

Step 132. After SQL discovery is completed, proceed to replicate the discovered SQL server volume(s) with the "**CDP retention**" option. Set reverse replication from the DR-SQL server to the production SQL server.

Step 133. Start the discovery job again to fetch the latest retention information.

14.2.3 SQL Consistency job

Step 134. Then set up a FX job for SQL consistency. Select the source as the DR server and the target as the production server. Select the FX template as "**SQL 2005 Consistency"**

Step 135. By selecting the "**SQL 2005 Consistency"** all the required entries are filled up in the next screen (**job options**). Follow the wizard to save the job.

14.3 Failback

14.3.1 Step 1: Rollback target volume(s)

Step 136. Now proceed to roll back the target volume to the consistency tag issued in the previous step. A roll back can be performed either through console or through the CX UI. In this example we perform a rollback through the CX UI.

On the CX UI, click on "**Recovery",** then select the replication pair and click on "**Rollback".** A confirmation dialogue appears, click on "**Ok**" to proceed.

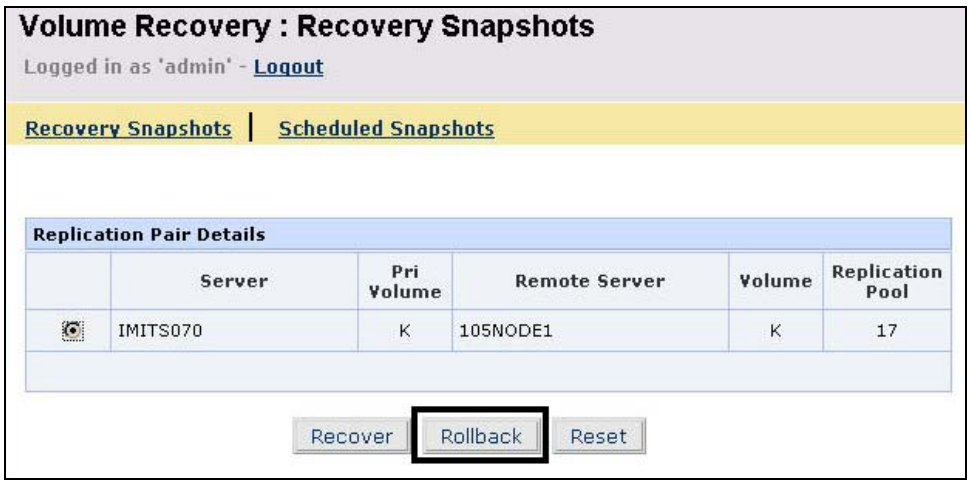


Figure 158:

Step 137. The next screen appears, Select the option "**Using Application consistency & Event based"**

Figure 159:

Step 138. This will change the interface below and the list of consistency tags appear under the "**Search Result**". Select the consistency tag issued in the previous step and then click on "**Save".** This will start the target volume rollback.

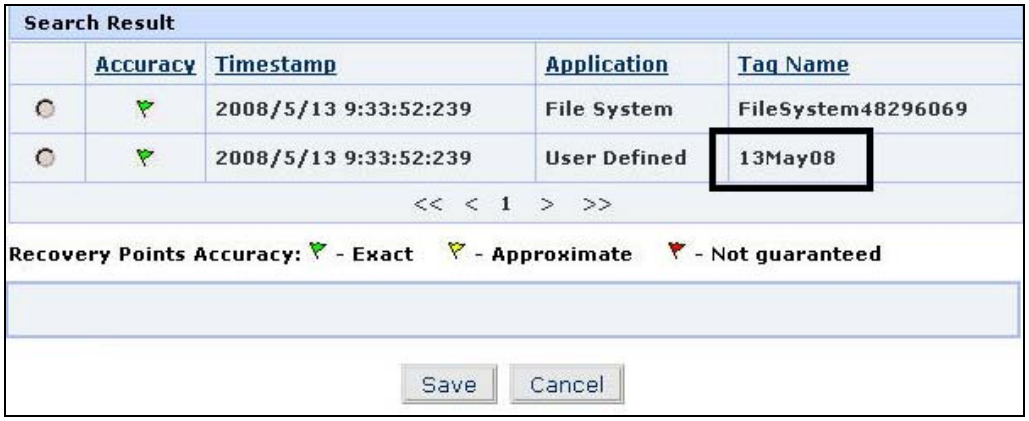


Figure 160:

Step 139. The progress can be monitored by clicking on "**Recovery"**

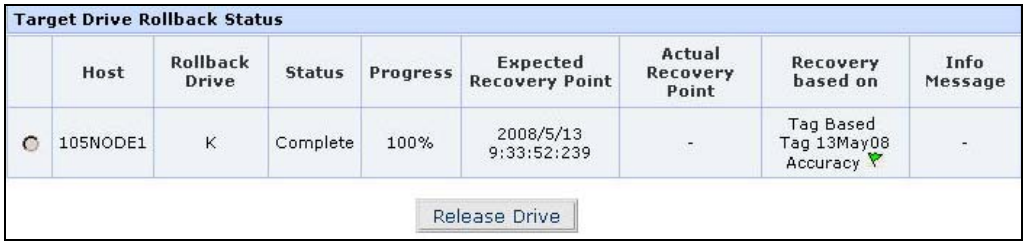


Figure 161:

Now that the target volume is rolled back, proceed to add the volume back to clustering

14.3.2 Step 2: DNS failback

Step 140. Then switch to the active node's console to perform a DNS failback command.

`dns -failback -host <`*`Virtual server name`*`> -ip <`*`Virtual server IP`*`>`

14.3.3 Standalone to cluster

Step 2. After failback, access the standalone production server to convert it back to a clustered server. Access the command prompt, and then navigate to the VX agent installation path to issue the following command

```
ClusUtil.exe -prepare StandalonetoCluster <standalone name>
```

This will restart the machine and restore it to its former clustered state. Then start all passive nodes that were shutdown earlier. Access the cluster administrator interface to bring the SQL server group online. Verify that all the cluster resources are coming online and client can access the cluster.

Part 3: Clustered Production Server and Clustered DR Server

This part lists out the steps involved in protecting and recovering SQL server on a clustered environment where both production server and DR server are clustered.

15 Introduction to the solution

This solution involves cluster SQL servers on both the source and target side. Since a clustered volume cannot be locked, the target clustered SQL server will be converted into a Standalone SQL server through a utility named “clusutil.exe” found under the VX installation folder.

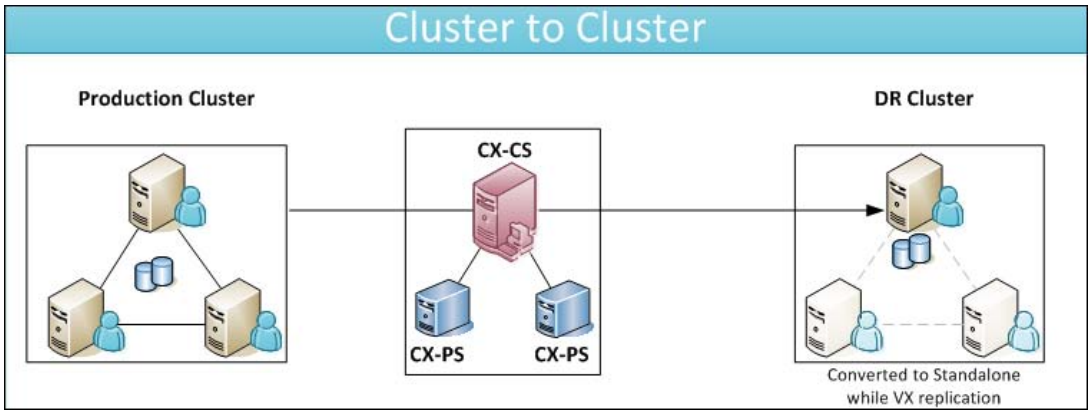


Figure 162

Protecting SQL server

Clustered SQL server is protected to another clustered SQL server in two stages prepare and protect. The prepare section describes about steps to be taken before deploying the solution. The Protect section describes the steps involved in backing up the source clustered server.
The recovery section explains about planned and unplanned failovers, Post recovery section describes converting the standalone SQL server back into a clustered SQL server.

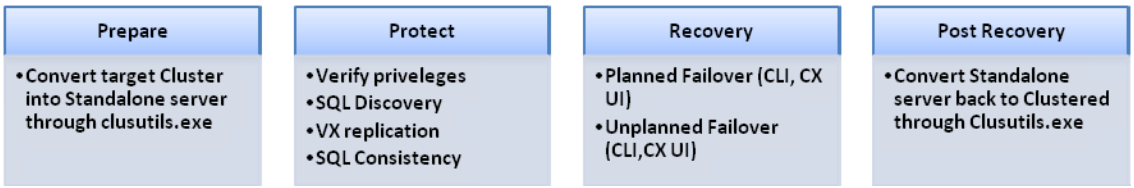


Figure 163

16 Prepare

Caution:

Ensure that the CX server is up and running before running the **clusutil** command.
Clusutil.exe is to be executed on the node which is supposed to be turned into a standalone server.
Ensure that you have administrator privileges to run the clusutil.exe command

Step 141. The source and target SQL servers are both clustered. Access the target SQL server's command prompt and navigate to VX agent installation path to issue the following command

Clusutil –prepare clustertostandalone: <*active node*> -shutdown <*passive node*> -force

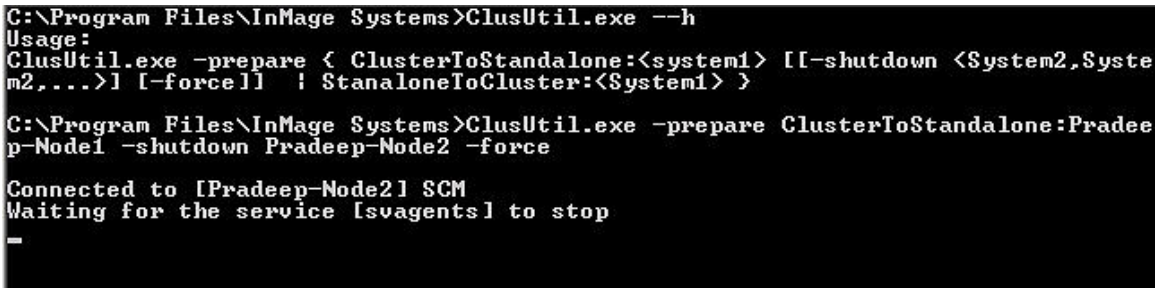


Figure 164

Doing this will convert the target cluster machine into a standalone server and shuts down the passive nodes.

Notes:

For Windows 2008 cluster and above versions, once the active node restarts, the volumes would go offline. To bring the volumes online use the following command

Clusutil –prepare onlinedisk

17 Protect

Refer to the Verify privileges on page 28 for detailed steps.

17.1 SQL Discovery

Step 142. SQL discovery

Access the CX UI and set the SQL discovery job between the production cluster and standalone DR server. To learn more about setting up a discovery job for SQL server refer to the section SQL discovery on page 45. You will need to modify the source prescript and the target post script to accommodate the name of the virtual server. An example is given below

Pre script:

```
"C:\Program Files\InMage Systems\Application.exe" -discover -app
sql2005 -virtualserver  <virtual server name>
```

Post Script:

```
"C:\Program Files\InMage Systems\Application.exe" –retention -host
<virtual server name>
```

Notes:

The application.exe file is found under the VX agent installation directory. The VX agent is installed under the "C:\Program Files\InMage Systems" by default

17.2 Replication

Step 143. The standalone server's volumes are now listed as normal volumes on the CX UI. Set VX replication pairs form the production cluster to the standalone server on the DR site. Ensure that you maintain drive mapping while selecting appropriate target volumes.

Step 144. The replication pairs should progress from "**Initial Sync step 1"** and finally reach "**Differential Sync**". You will now need to configure SQL consistency job for issuing vacp consistency tags through a single FX job. To learn more, refer to the SQL consistency on page 52. Similarly set consistency jobs from all nodes of the source cluster to the standalone target server.

17.3 Consistency tags

Step 145. Once the replication pair reaches "**Differential Sync",** proceed to issue consistency tags on the source volume (source volume for this replication pair).

Step 146. Access the CX UI and create a single FX job with source as the active node and destination as the DR server. Ensure that you select the "**SQL 2005 consistency"** FX template

You can also issue this consistency tag through the command prompt. Access the command prompt of the active node and navigate to the VX agent installation folder to issue the following command

`Vacp –a SQL2005 -t <"`*`name of the tag`*`">`

Notes:

You can also set FX jobs to automate the consistency operation. While issuing consistency tags form the CX UI, ensure that you set the consistency jobs for each of the cluster node.

18 Recover

You may perform planned or unplanned failover either from CX UI or through CLI. For this example an unplanned failover through CLI is performed.

18.1 Failover

18.1.1 Planned failover

Step 147. Offline the SQL services on the production server

Step 148. Issue a consistency tag on the production server (active node) by using the following command

```
vacp -v <SQL server volumes>  -t <name of the tag>
```

Step 149. Rollback target volumes

Access the standalone DR server's command prompt to rollback all target volumes to the consistency tag issued in the previous step. Switch to the CX UI and rollback the target volumes. When the CX server is down or unreachable you may also use the cdpcli.exe command found under the VX agent install directory.

```
cdpcli --rollback --dest=<target volume>  --db= <retention log path> --event=
--app=sql2005 --force=yes
```

Step 150. Access the DR server's (once clustered and now standalone server) command prompt to convert it back to its clustered state. Navigate to VX agent installation folder to issue the following command

```
Clusutil –prepare clustertostandalone: <name of the original source>
```

This restores the DR SQL server back to its clustered state and concludes failover

19 Failback

A failback is the reverse of a failover. This is performed in four stages. The prepare section here explains steps to convert the original source SQL server from clustered to standalone SQL server, doing this will enable you to use it as a target host.

Before performing the actual failback, the original source SQL server will have to be updated with all the changes occurred during its outage. A reverse replication is performed to accomplish this data update.

Figure 165

Once all the data is updated to the production SQL server, a planned failover is performed then the source SQL cluster is converted back to its former cluster state.

19.1 Prepare

Step 151. You will first need to convert the clustered production server to a standalone server. Access the active node of the clustered production server and navigate to the VX agent installation path to issue the clusutil.exe command. The machine will go down for a reboot.

Step 152. The machine should be back online as a standalone server.

19.2 Protect

Step 153. SQL Discovery:

Access the CX UI and set the discovery job from the DR cluster to the standalone production server. You will need to modify the source prescript and the target post script to accommodate the virtual server name. An example is given below

Pre script: **"C:\Program Files\InMage Systems\Application.exe" -discover -app sql2005 -virtualserver <***virtual server name***>**
Post Script: **"C:\Program Files\InMage Systems\Application.exe" -retention -host <***virtual server name***>**

Step 154. Set VX replication from the DR SQL server to the production SQL server.

Step 155. Set the FX job for SQL consistency. Select the source and destination as the DR SQLserver and the production SQL server respectively. Ensure that you select the "**SQL 2005 consistency**" template. You may also issue consistency tags through the DR server's command prompt using the vacp.exe utility found under the VX installation folder

`Vacp.exe -a sql2005 -t <`*`name of the tag`*`>`

19.3 Recover

Step 156. Offline the SQL service on the DR server

Step 157. Issue the issue a consistency tag on the DR server (active node) by using the following command

`vacp -v <`*`SQL server volumes`*`>  -t <`*`name of the tag`*`>`

Step 158. Access the CX UI and rollback the target volumes to the above consistency tag.

19.4 Post failback

Step 159. Access the production server and use the clusutil.exe to convert the standalone production server back to a clustered server.

Step 160. Perform a DNS failback as shown in the command below.

`dns.exe -failback -host <`*`active node's name`*`> -IP <`*`Original IP address of the active node`*`>`

Part 4: Selective SQL Virtual server failover

Part 4 explains protecting and recovering SQL virtual servers. Planned and unplanned failover are explained in detail for both CX UI and CLI.

20 Introduction to the solution

There can be more than one SQL virtual server on clustered SQL machine. You may choose to protect or recover desired virtual servers. The basic steps to protect /recover remain the same as previously described.

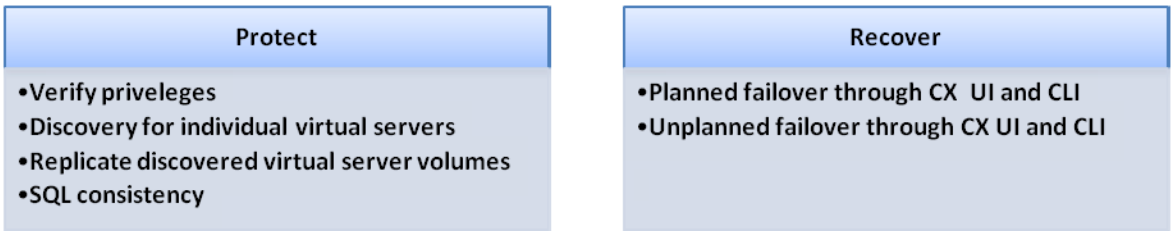


Figure 166:

Refer to the Verify privileges on page 28 for detailed steps.

21 Protect

21.1 SQL Discovery

21.1.1 Discovering Default instance for the first virtual server

Step 161. SQL Discovery can be performed through a single FX job. Click on "**File Protection"** then on **"New Job Group**". This opens the "**Replication Pair**" as shown below. Select the source host as the active node (clustered source), destination host as standalone SQL server and FX template as "**SQL 2005 Discovery**" then click on "**Next"**

Figure 167

Step 162. FX job Options screen opens up, scroll down to "**Miscellaneous Options"** to edit the pre script as

`Application.exe –discover –app sql2005 –virtualserver <`*`name of the corresponding virtual server`*`>`

`And the target post script as Application.exe -retention -host <`*`name of the corresponding virtual server`*`>`

Click on "**Finish"** to continue

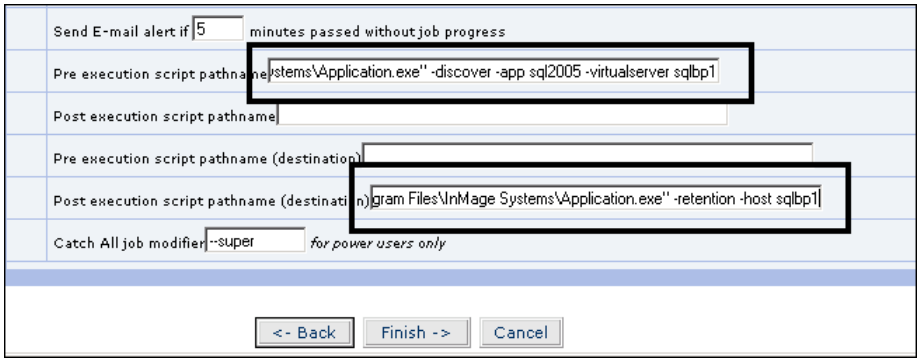


Figure 168

Step 163. The job is scheduled to run once a day, click on "**Finish"** to save the job. You may start the job through "**File Protection**" screen.

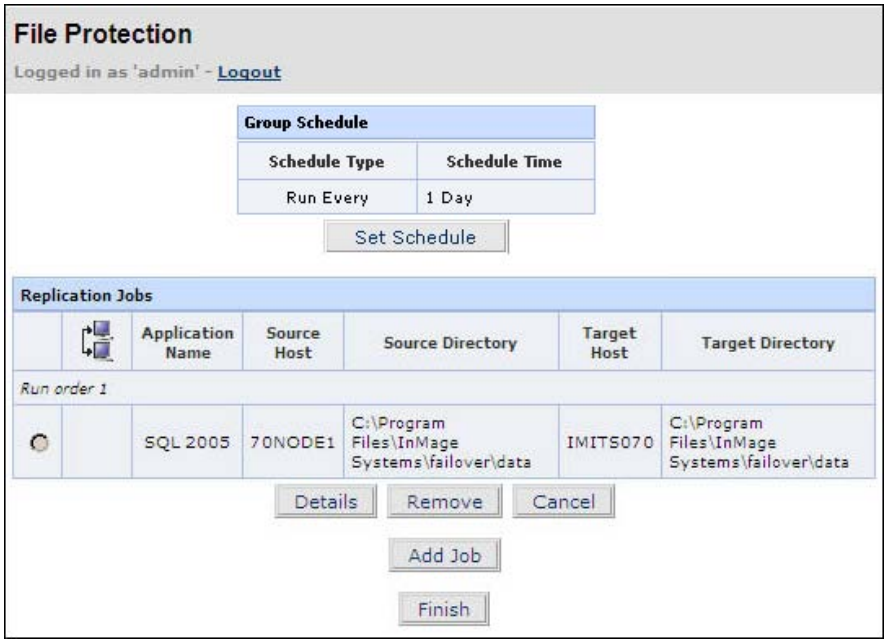


Figure 169

21.1.2 Discovering named instance for the second virtual server

Step 164. Discovering a named instance is similar to that of a default instance. Setup the FX job with "**Source"** as the active node, "**Destination"** as standalone SQL server and FX template as SQL "**2005 Discovery**". Click on "**Next"** to continue

Figure 170

Step 165. FX job Options screen opens up, scroll down to "**Miscellaneous Options"** to edit the pre script as

`Application.exe –discover –app sql2005 –virtualserver <`*`name of the corresponding virtual server`*`>`

And the target post script as

`Application.exe -retention -host <`*`name of the corresponding virtual server`*`>`

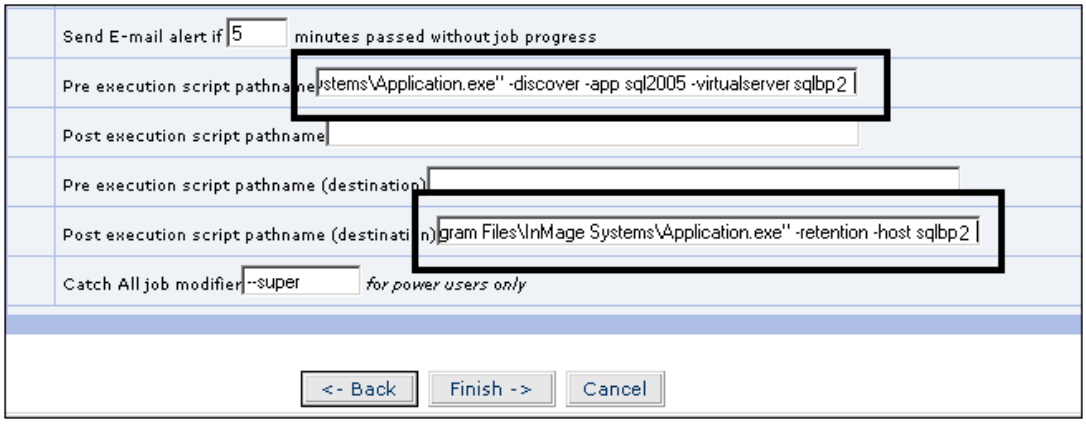


Figure 171

Step 166. The job is set to execute "**On Demand",** click on "**Finish"** to save the job. You may start this job through the "**File Protection"** screen

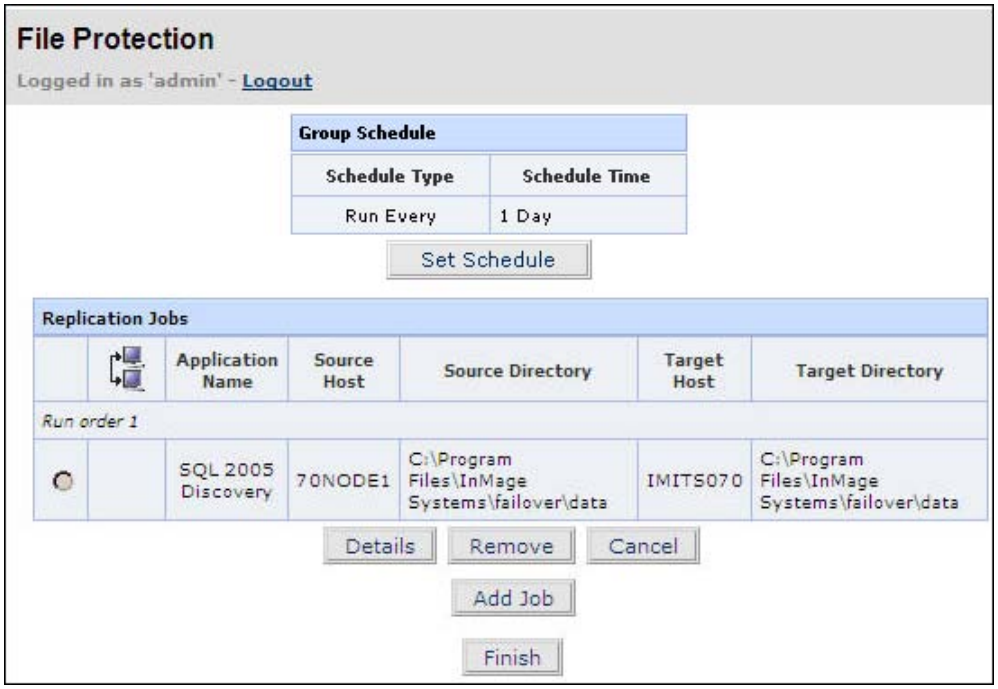


Figure 172

21.2 Protect default instance for the first virtual server

Step 167. Open the CX UI, expand the "**Cluster Group(s) Volumes**" to select the SQL volume and click on "**Start Replication"**.

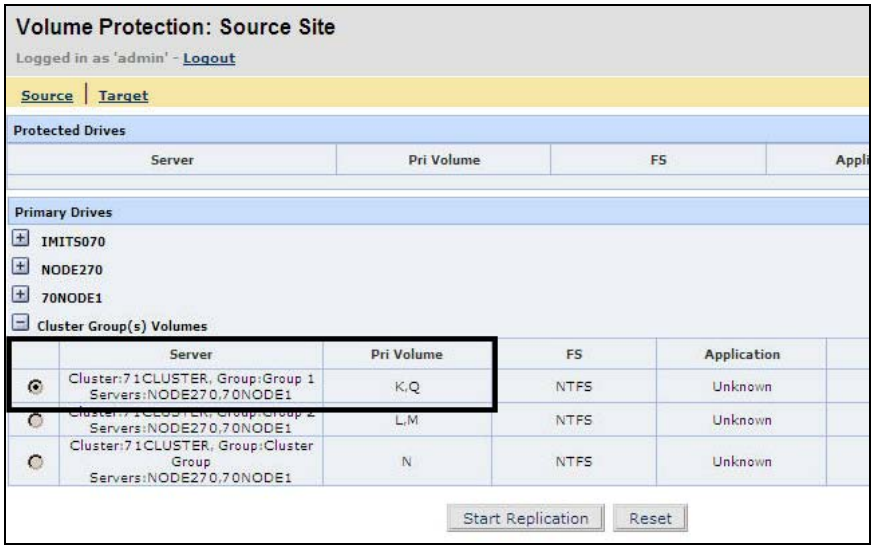


Figure 173

Step 168. The next screen opens up, select the SQL server volume and click on "**Next"**

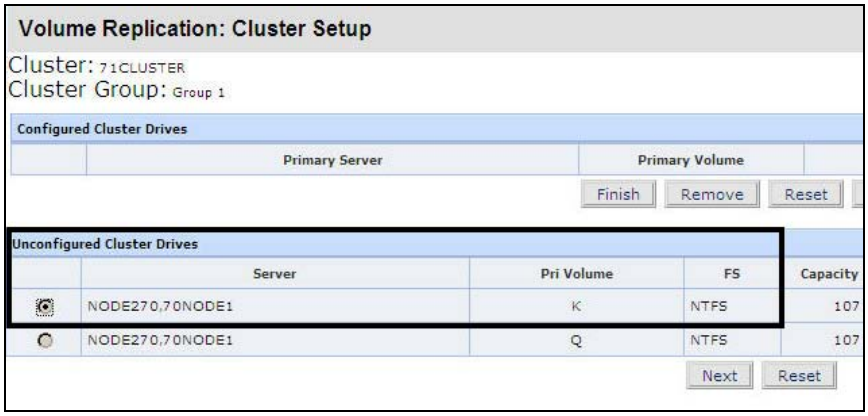


Figure 174

Step 169. Expand the target host to select the target volume (with the same drive letter) and scroll down to set "replication options"

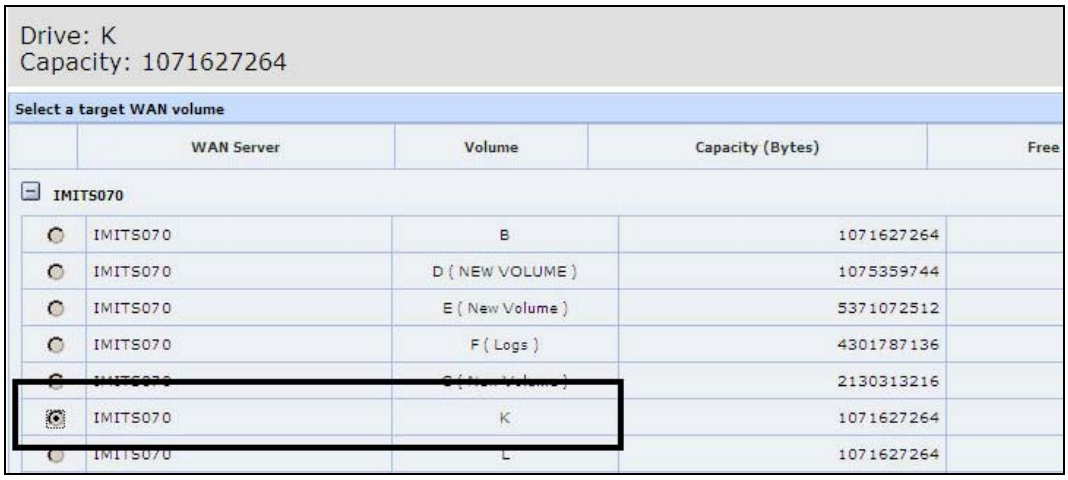


Figure 175

Step 170. Enable the "**CDP Retention"** option and click on "**Submit**"

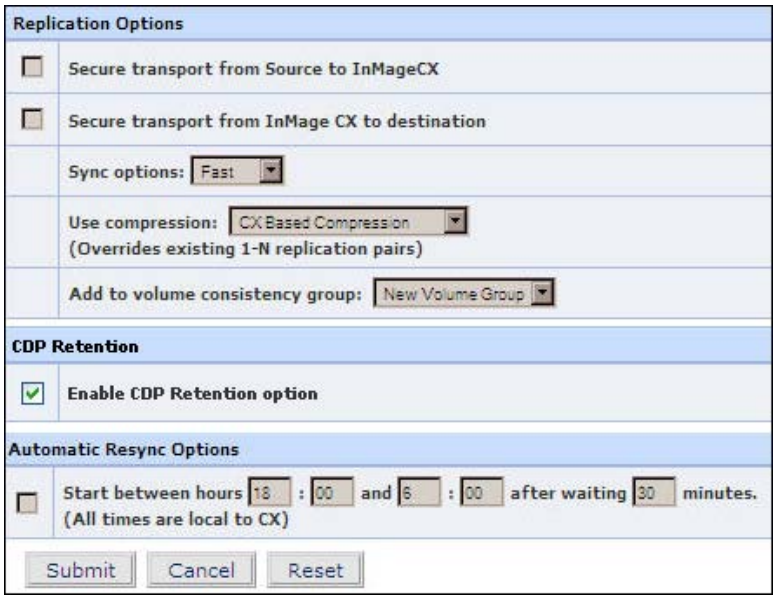


Figure 176

Step 171. In the following screen, define the type of retention policy specific for this replication pair. You may choose time based, space based or a combination of both. Then click on "**Submit**"

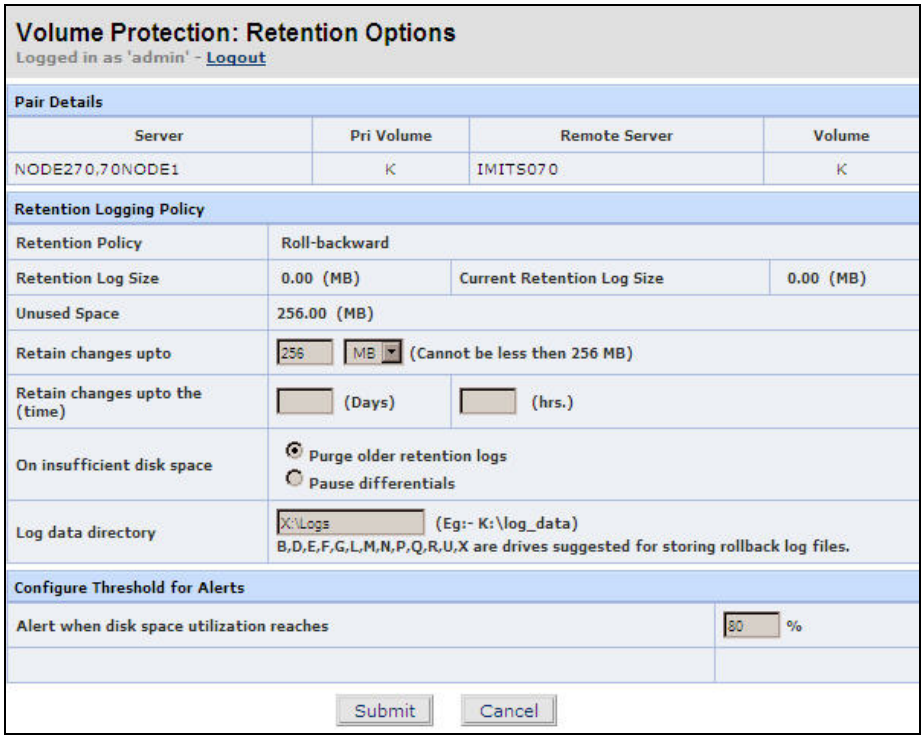


Figure 177

Step 172. The final screen for setting up a replication pair opens up, select the cluster drive from the "**configured cluster drives**" and click on "**Finish"** to start the replication pair.

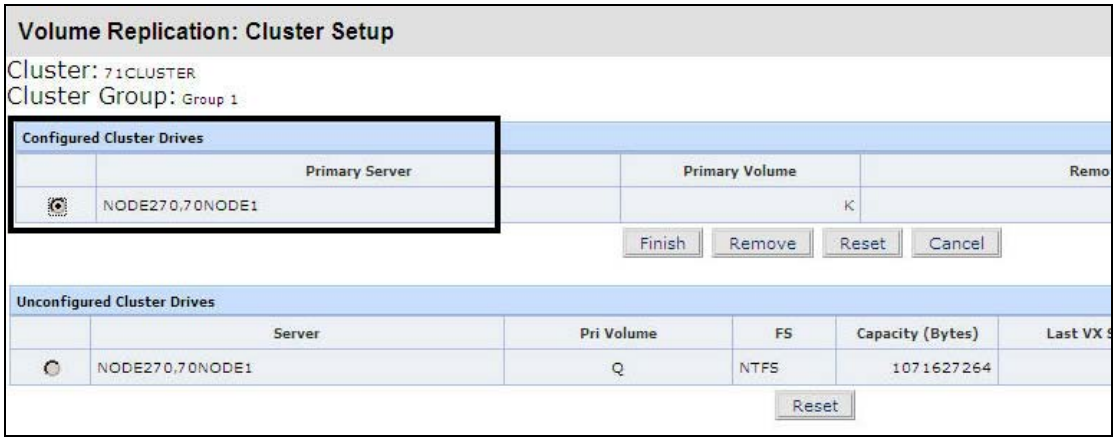


Figure 178

Step 173. The replication pair starts from "**Resync Step 1**, **Resync Step 2**" and finally reaches "**Differential Sync"**

Figure 179

21.3 Protect named instance for the second virtual server

Step 174. Once the default instance is being replicated, proceed to replicate the named instance. Click on "**Volume Protection"** and expand the cluster volumes to select the entry representing SQL named instance then click on "**Start Replication"**

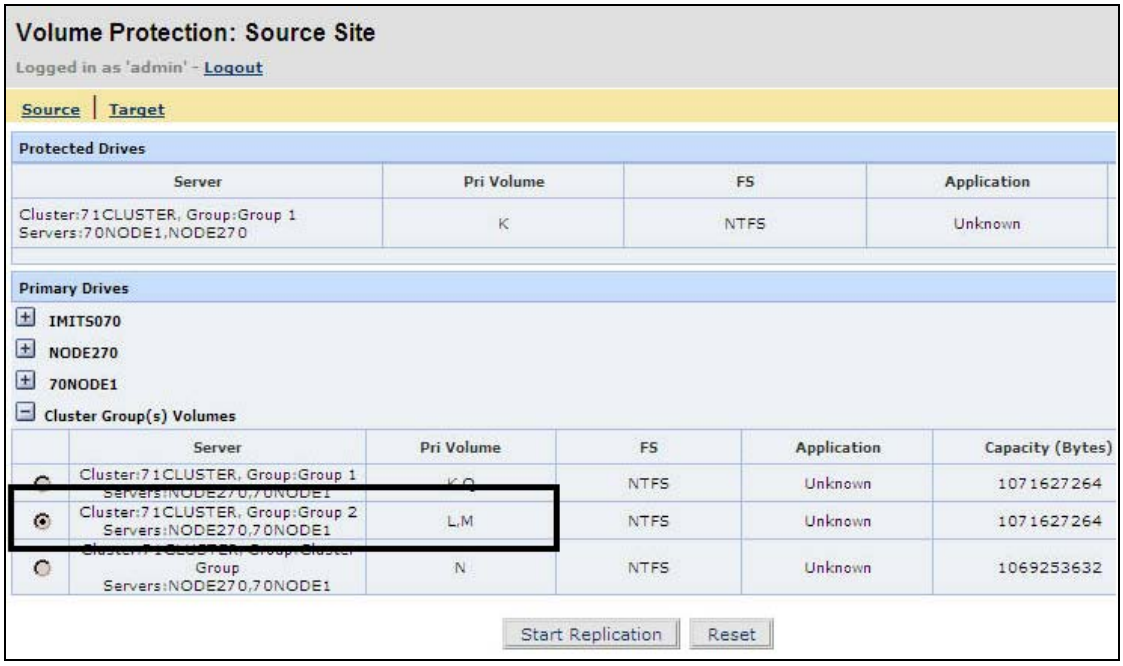


Figure 180

Step 175. Select the cluster volume in the next screen and click on "**Next"**

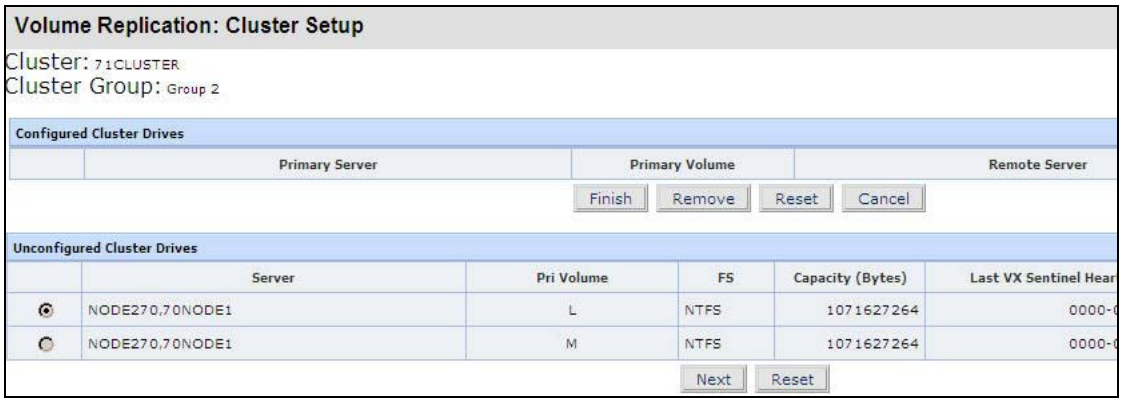


Figure 181

Step 176. The target screen opens up, expand the target host to select the target volume. Scroll down and enable the "**CDP Retention**" and click on "**Submit**"

Figure 182

Then define the retention policy and click on "**Submit"**. Click on "**Finish"** in the following screen to start the replication pair. The replication pair starts and reaches "**Differential Sync**".

You will need to perform SQL discovery as described in the SQL Discovery section on page 113. Since the jobs are already configured, start the FX jobs to complete the discovery.

21.4 Consistency

Step 177. Unlike discovery which needs separate FX jobs for default and named instances, the consistency job remains the same for all SQL virtual servers on the source host. Set the FX job with "**source"** and "**destination"** as the active node and FX template and "**SQL 2005 Consistency".** Click on "**Next"** to continue

Figure 183

Step 178. The Job Options screen opens up, scroll down and click on "**Finish"**

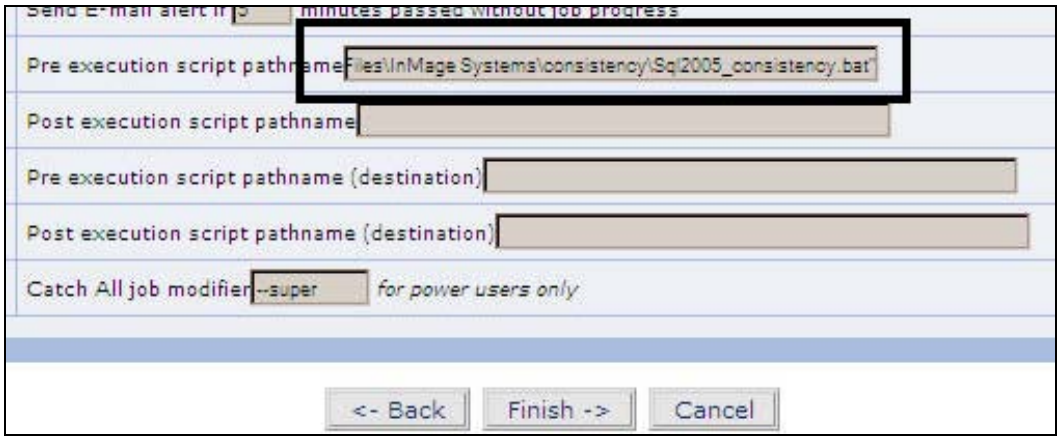


Figure 184

Step 179. The job is set to execute every six hours, you may choose to change this by clicking on the "**Set Schedule**". Click on "**Finish"** to save the job

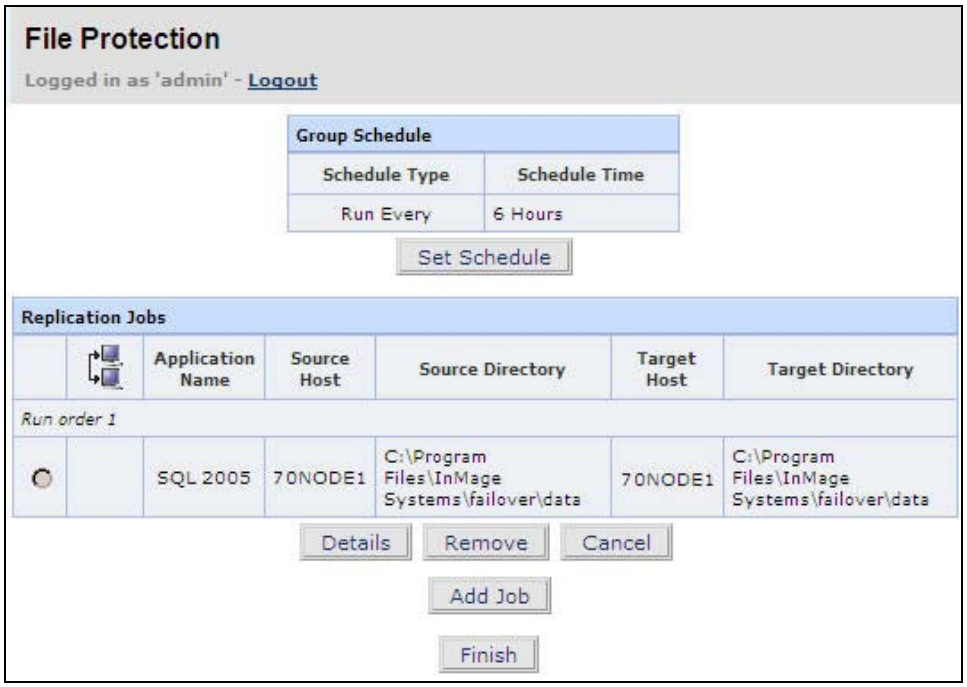


Figure 185

22 Failover

22.1 Planned failover through CX UI

22.1.1 Default instance of the first virtual server

Step 180. Set the FX job with "**source"** as the active node, "**destination"** as the standalone SQL server and FX template as "**SQL 2005 Planned Failover".** Click on "**Next"** to continue

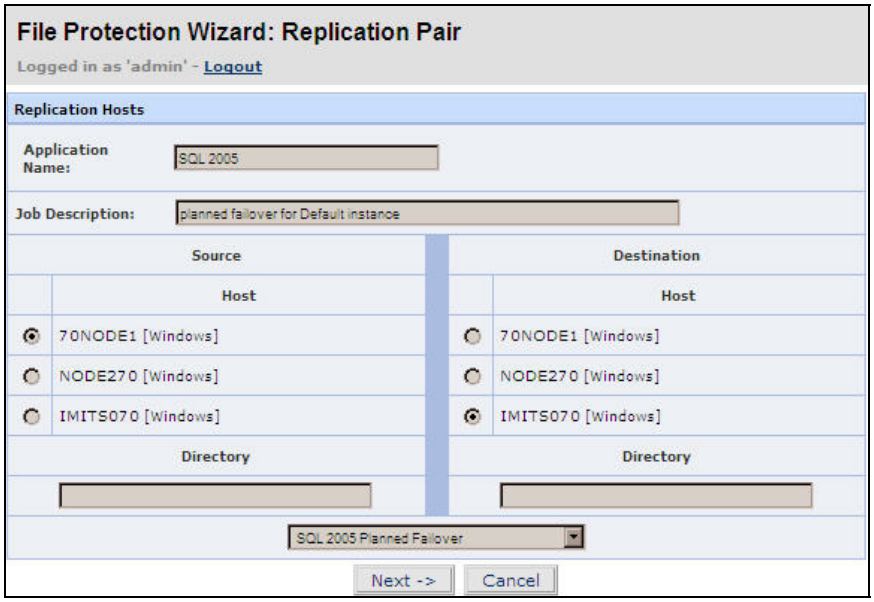


Figure 186

Step 181. The Job Options screen opens up, scroll down to "**Miscellaneous Options**" to append the switch **`-virtualserver`** **<***name of the corresponding virtual server name***>** to both source pre script and target post script

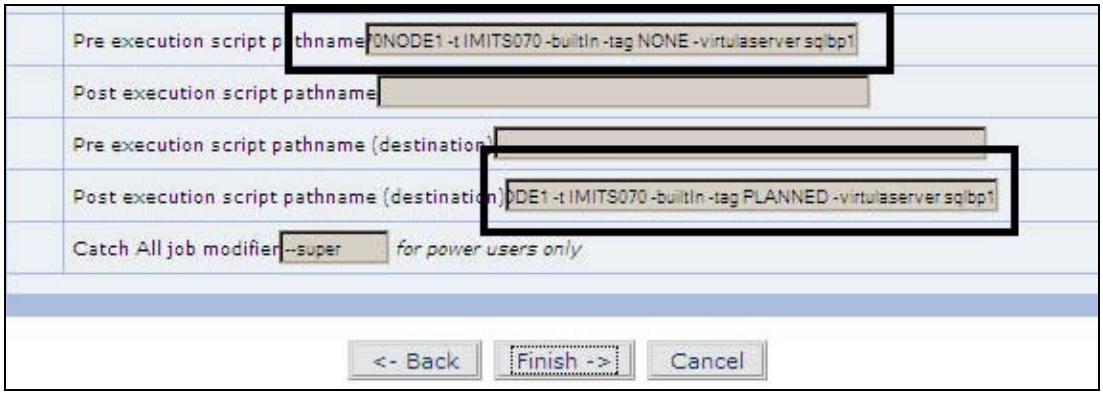


Figure 187

Step 182. The FX job is set to execute "**On Demand".** Click on "**Finish"** to save the job

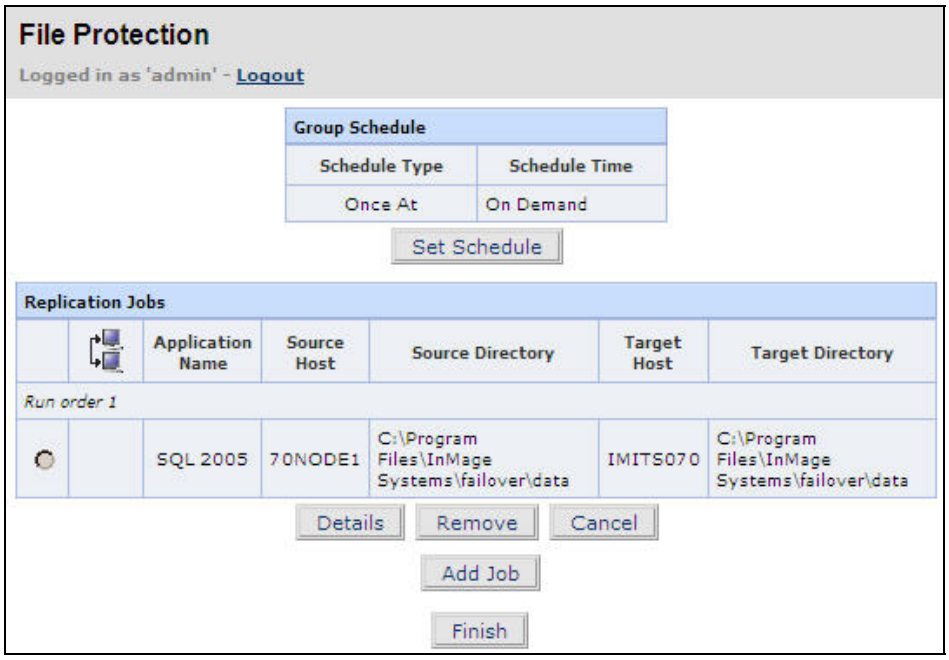


Figure 188

Step 183. You may start the job through "**File Protection**" to perform a planned failover for default instance.

22.1.2 Named instance for the second virtual server

Planned failover is similar to that of a default instance, the only difference is to add the **`–virtualserver`** ***<name of the corresponding virtual server>*** switch to the source pre script and target post script

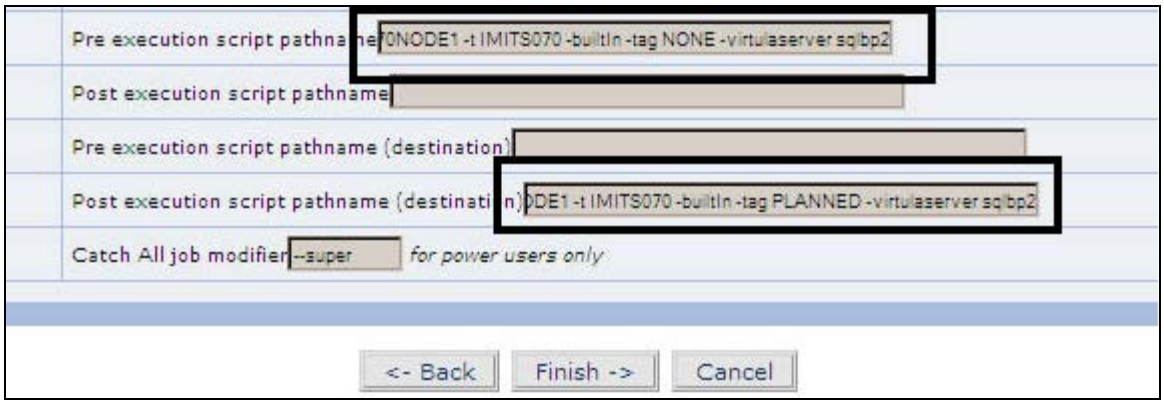


Figure 189

Notes:

By default AD will not be replicated during MSSQL server failover. However if you need AD replication as part of MSSQL Server failover edit the command line/pre and post script with the "–doadreplication" switch.
OR
You may run "WinOp.exe" from command line to perform AD replication and DNS Update

22.2 Planned failover through CLI

22.2.1 Default instance of the first virtual server

Step 184. To perform a default instance planned failover, access the active node's command prompt to issue the following command under the VX agent installation path

`Application.exe –failover –planned –app sql2005 –s <`*`name of the active node`*`> -t <`*`name of the target host`*` > -tag none –virtualserver <`*`name of the corresponding virtual server`*`>`

```
C:\Program Files\InMage Systems>Application.exe -failover -planned -app sql2005 -s 70NODE1 -t IMITS0
70 -builtin -tag NONE -virtualserver sqlbp1
Virtual Server Name for Host : 70NODE1 is : sqlbp1
sqlbp1 IP address = 10.0.71.210
IMITS070 IP address = 10.0.1.70

Command Line: Application.exe -failover -planned -app sql2005 -s 70NODE1 -t IMITS070 -builtin -tag N
ONE -virtualserver sqlbp1
Running under the user: XIOTECHXSRVR.NET\administrator
Process ID: 324


Discovering Databases ...
 Instance Name is :SQLBP1
 Instance Name is :SQLBP2\SQLSERVER1

Connecting to server SQLBP1
```

Figure 190

Step 185. The command ends with an output enclosed within "**IMPORTANT INFORMATION".** This command is to be executed on the target host to complete a failover.

```
***** The actual tag to failover to is : FileSystem487c812d

**********IMPORTANT INFORMATION**********

Please run the following command on the Target Host to complete failover

Application.exe -failover -planned -app sql2005 -s 70node1 -t imits070 -builtIn -tag FileSystem487c8
12d -virtualserver sqlbp1

********************************************************************************
*****Successfully finished failover at source*****
```

Figure 191

Step 186. Execute the above command (enclosed within important information) on the target command prompt. (you should execute this command under the VX agent installation folder). This execution completes failover.

```
C:\Program Files\InMage Systems>Application.exe -failover -planned -app sql2005 -s 70node1 -t imits0
70 -builtIn -tag FileSystem487c812d -virtualserver sqlbp1
Virtual Server Name for Host : 70node1 is : sqlbp1
sqlbp1 IP address = 10.0.71.210
imits070 IP address = 10.0.1.70

Command Line: Application.exe -failover -planned -app sql2005 -s 70node1 -t imits070 -builtIn -tag F
ileSystem487c812d -virtualserver sqlbp1
Running under the user: XIOTECHXSRVR.NET\administrator
Process ID: 5792


Discovering Databases ...
successfully got the instance names from failover services file

***** Attempting to read configuration file C:\Program Files\InMage Systems\Failover\Data\sqlbp1_sql
```

Figure 192

22.2.2 Named instance of the second virtual server

Step 187. To failover a named instance from command prompt, access the active node's command prompt and navigate to the VX agent installation folder to issue the following command

`Application.exe –failover –planned –app sql2005 –s <`*`name of the active node`*`> -t <`*`name of the target host`*`> -builtin –tag none –virtualserver <`*`name of the corresponding virtual server`*`>`

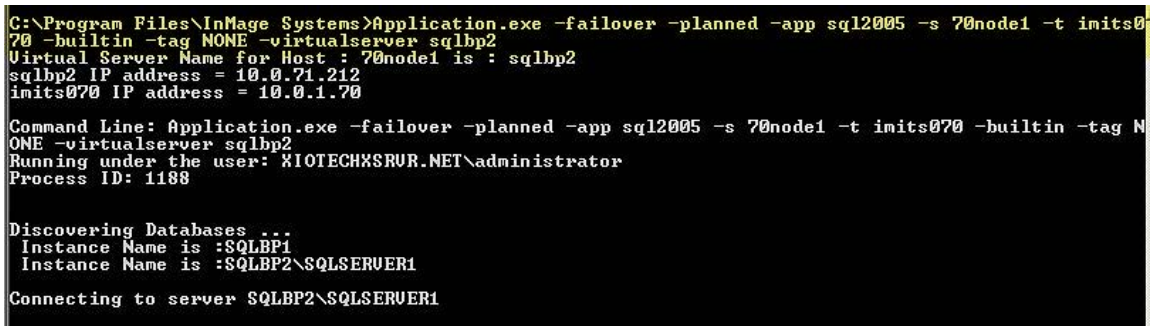


Figure 193

Step 188. The command ends with an output enclosed within "IMPORTANT INFORMATION"

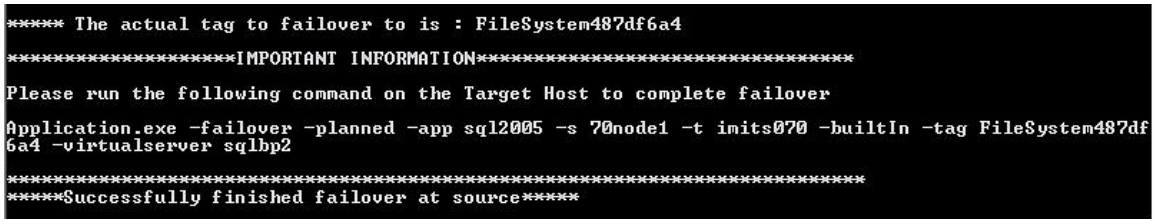


Figure 194

Step 189. Access the target command prompt and navigate to the VX agent installation path then execute the above command at the target prompt to complete named instance planned failover.

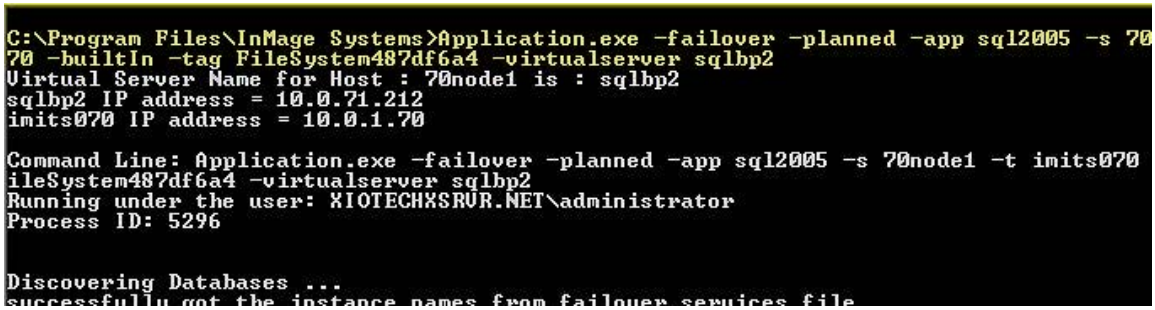


Figure 195

22.3 Unplanned failover through CX UI

22.3.1 Default instance of the first virtual server

Step 190. Set the FX job with source and destination as the target host then select FX template a "**SQL 2005 Unplanned Failover"**, click on "**Next"** to continue

Figure 196

Step 191. The FX job Options screen opens up, scroll down to miscellaneous options to change the –s switch to **`-s <`***name of the active node***`>`** and append the **`-virtualserver <`*** name of the corresponding virtual server***`>`**
to the target post script. Click on "**Finish"** to continue

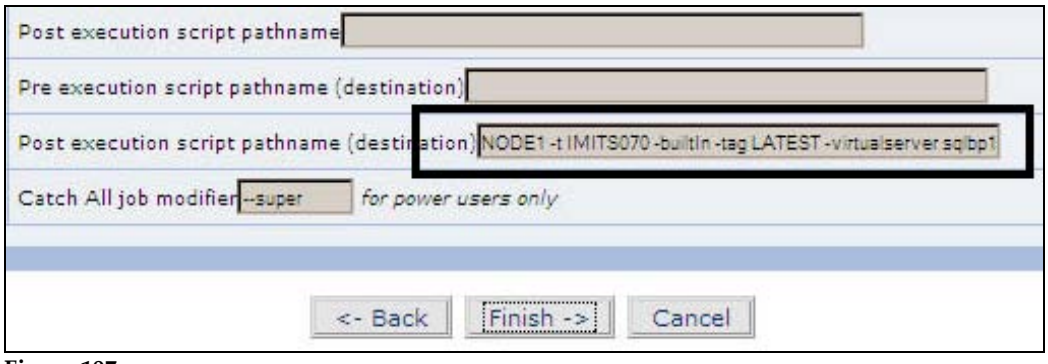


Figure 197

Step 192. The job is set to execute "**On Demand**", Click on Finish to save the job and start the job through File Protection to perform

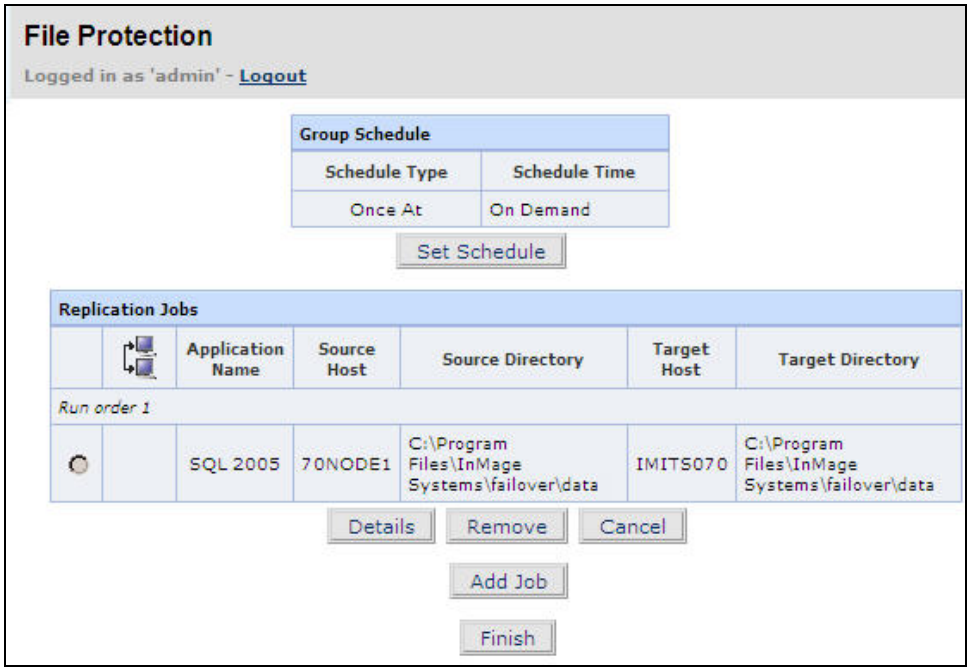


Figure 198

22.3.2 Named instance of the second virtual server

Step 193. An unplanned failover is similar for both default and named instances, the only difference is with the target post script found under the miscellaneous options. Append the **`-virtualserver <`*name of the corresponding virtual server*`>`**

Click on "**Finish"** to continue

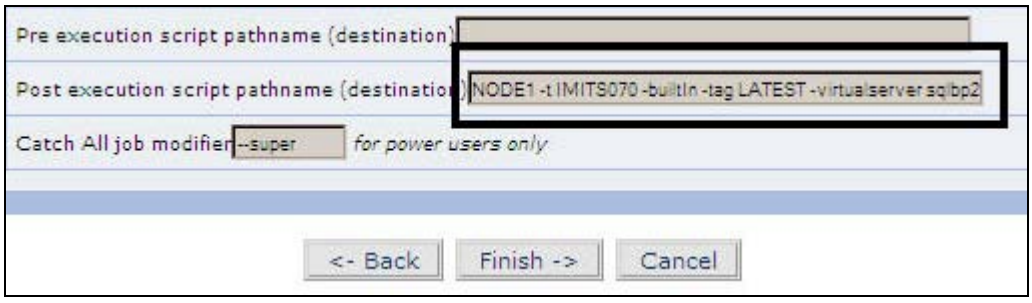


Figure 199

22.4 Unplanned failover through CLI

22.4.1 Default instance of the first virtual server

Step 194. Unplanned failover can also be performed through the CLI. Access the target host's command prompt, then navigate to the VX agent installation path to issue the following command

`Application.exe –failover –unplanned –app sql2005 –s <`*`name of the active node`*`> -t <`*`name of the target host`*`> -builtin –tag <`*`name of the tag`*`> –virtualserver <`*`name of the corresponding virtual server`*`>`

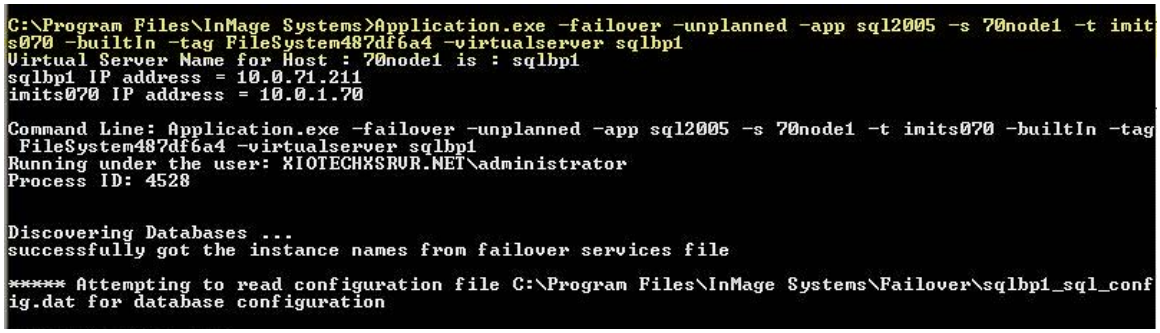


Figure 200

22.4.2 Named instance of the second virtual server

Step 195. For named instance unplanned failover, the command syntax is similar as above.

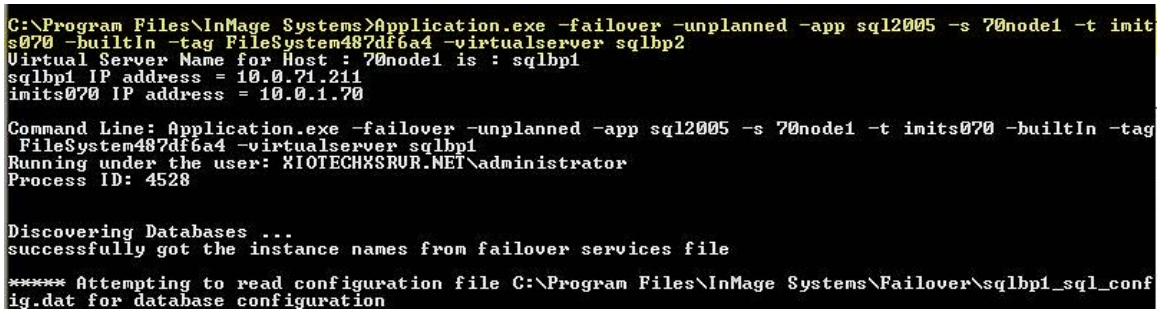


Figure 201

Part 5: SQL server audit

This part of the document describes steps involved in performing an unplanned failover without stopping the VX replication pairs

23 Introduction

A failover always stops the VX replication pairs, by using the "**-audit**" switch while performing the unplanned failover, you may retain the replication pairs even after a failover. The replication pairs however will be paused and will not continue until you hide the target volumes and perform a resync. This is especially useful when there are many volumes to be replicated.

The following table shows the advantages and disadvantages which will guide you in deciding to use this feature

Table 2

	-audit switch	Without the -audit switch (normal failover)
VX replication pairs	VX replication pairs are intact from the CX UI. VX replication pairs are paused while the target volumes are unhidden.	VX replication pairs are stopped and you will need to set them manually.
Retention logs	Old retention logs are invalid	Older retention logs are invalid
Data changes	Data changes on the DR SQL server will be lost	A reverse replication ensures that no data is lost while failback
Type of failover	Only unplanned failover	Both planned and unplanned failover are supported

24 Protect

SQL server is protected in three steps, Discovery, VX replication and Consistency. Refer the section Protect section on page 45 for detail steps.

25 Recover

Ensure that the CX server is online while using the "**-audit**" switch.

25.1 Unplanned Failover

You may either perform this unplanned failover through the CX UI by using a single FX job or through the DR SQL server's command prompt. For this example we show this through the CX UI.

Step 196. Set the FX job with the source as the production SQL server and the Destination as the DR SQL server. Select the FX template as "**SQL 2008 Unplanned Failover**" (for SQL 2008). Click on "**Next"** to continue

Figure 202

Step 197. Scroll down to the "**Miscellaneous Options"** and append the **"-audit"** switch to the target post script. Click on "**Submit"** to continue.

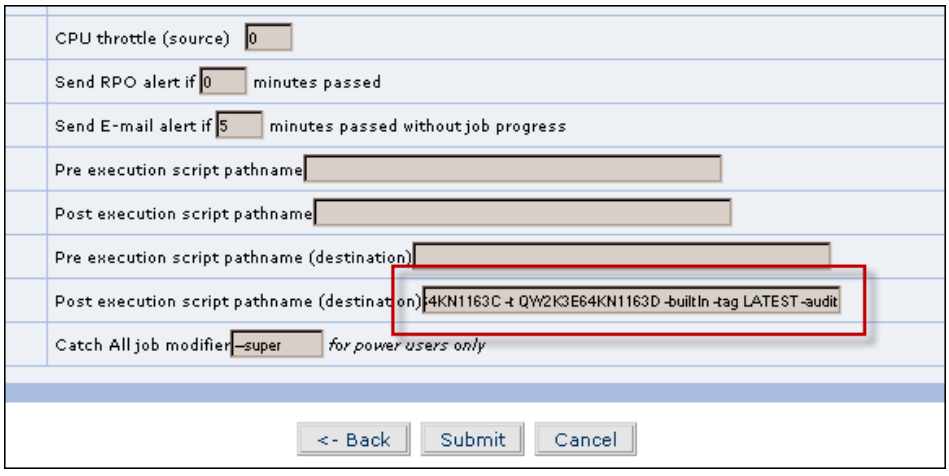


Figure 203

Step 198. The FX job will be set to execute "**On Demand**". Click on "**Submit"** to save the job.

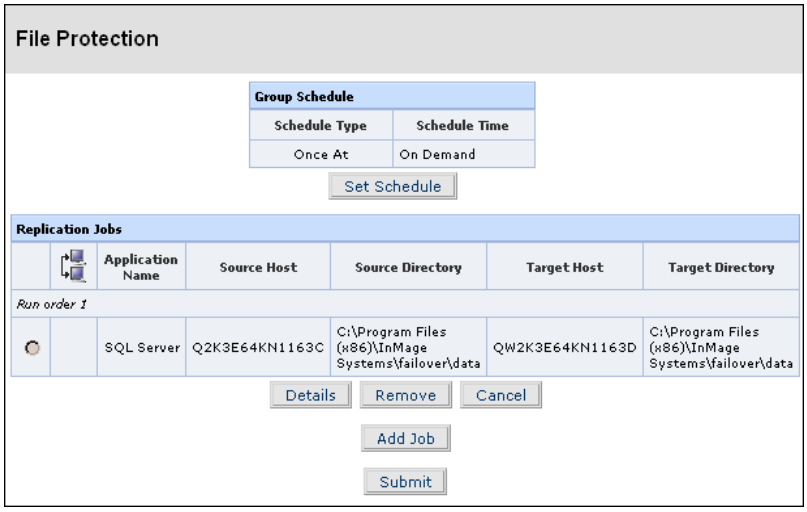


Figure 204

Step 199. The FX job starts once it is saved and performs an unplanned failover. However the replication pairs are not broken and can be seen on the CX UI with the resync set to "Yes". You may go on and use the target volumes which are rolled back.

25.2 Failback (resume replication)

Step 200. To resume replication access the command prompt of the DR SQL server and navigate to the VX agent installation path to issue the following command

`Application.exe -hidevolume -app <sql 2008 or sql 2005 or sql 2000> -s <production SQL server> -t <DR SQL server>`

```
C:\Program Files (x86)\InMage Systems>Application.exe -hidevolume -app sql2008 -s Q2K3E64KN1163C -t
QW2K3E64KN1163D

Command Line: Application.exe -hidevolume -app sql2008 -s Q2K3E64KN1163C -t QW2K3E64KN1163D
Running under the user: QA-DOMAIN.NET\Administrator
Local Machine Name is : qw2k3e64kn1163D
Process ID: 2968

Attempting to determine SQL Virtual Server name for host : Q2K3E64KN1163C in case it's a clustered c
onfiguration
Successfully got the Volumes names from Audit file

Executing cdpcli command :
cdpcli --hide K:

 \\.\K: is a symbolic link to K:
```

Figure 205

Step 201. You will need to perform a resync through the CX UI to start the replication pair

Part 6: SQL Single Instance Failover among Multiple Instances for standalone server

26 Introduction to the solution

SQL Server instances can be recovered using Hitachi Dynamic Replicator - Scout, through following steps.

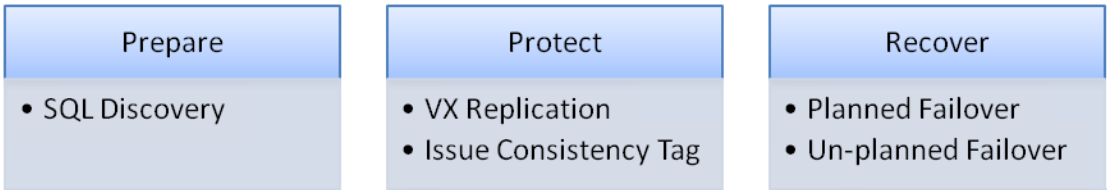


Figure 206

26.1 Prepare

26.1.1 SQL Discovery

Follow the following steps to discover through CX UI.

Step 202. Navigate to **"File Protection"** and click **"New Job Wizard".**

Step 203. Click **"Add Job"** to create a new FX job.

Step 204. Enter the "**Application Name"** and "**Job Description".** Select the source volume and destination volume. Then, select the template as **"SQL 2005 Discovery"** and click on "**Next"**

Step 205. Configure the required **"FX Job Options"** and click "**Submit"**.

Step 206. Schedule the above FX job as required. Select the required job from **"Replication Jobs"** list and click **"Submit".**

Step 207. Start the above scheduled FX job through **"File Protection"**. Select the above job and click the **"Start"** button.

Step 208. You can check the progress of the FX job through "**Protection Status**". Once the job is complete successfully the Status will change to "**Completed**"

26.2 Protect

26.2.1 Replicate discovered volumes

Set a replication pair form SQL Production Server to DR Server with same drive letters. To do so follow the following steps:

Step 209. To start replication pair, navigate to **"Volume Protection→Host Drives".** Choose the volume where SQl exists. Click **"Start Replication"** button to choose DR volume.

Step 210. Select the DR volume from the **"Select a Target Volume"** UI. The default options should remain as it is. Enable **"CDP Retention"** option. Click "Submit" button. The "Retention Options" UI appears after clicking on submit button.

Step 211. Choose the retention log options and click **"Submit"** button.

Step 212. Check the status of this replication pair, through **"Protection Status".** The replication pair should come to **"Differential Sync"** mode.

26.2.2 Setup consistency job

To issue consistency tag for single SQL instance which needs to be protected, move to production server console and navigate to Consistency folder of Hitachi Dynamic Replicator Installation path and access SQLxxxxx_consistency.bat file and edit the vacp command.

For example: Move to C:\Program Files\InMage Systems\consistency on production SQL server and access Sql2005_consistency.bat. Add **"–s"** option in vacp command.

```
GENERATE_TAGS

 %VACP_CMD% -s -a %APPLICATION_NAME% -t %APPLICATION_BOOKMARK_MSG%  >
consistency_tag.txt
 IF %errorlevel% EQU 0 GOTO SUCCESS_EXIT
  type consistency_tag.txt
  ECHO "Exiting abnormally......."
 exit 1
```

Move to CX UI and follow the below mention steps:

Step 213. Navigate to **"File Protection→New Job Group Wizard"**, to set a FX job.

Step 214. Click "**Add Job".**

Step 215. Provide **"Application Name"** and **"Job Description"**. Choose Production Server volume and DR Server volume. Provide the source and target directory for installation path for "Failover\Data". Choose **"SQL 2005 Consistency"** template from the drop down menu. Click **"Next".**

Step 216. Choose the required **"FX job options"**. Click **"Submit"** button.

Step 217. Schedule the above FX Job through **"Scheduling"** UI.

Step 218. Select the FX job and click **"Submit"** button.

Step 219. Start the above scheduled FX job through **"File Protection"**. Select the above job and click the **"Start"** button.

Step 220. You can check the status of the above job through **"Protection Status"**. The FX job status should show **"Completed"**.

26.3 Recover

MSSQL Server can be recovered by performing Planner Failover, Un-Planned Failover.

26.3.1 Planned Failover

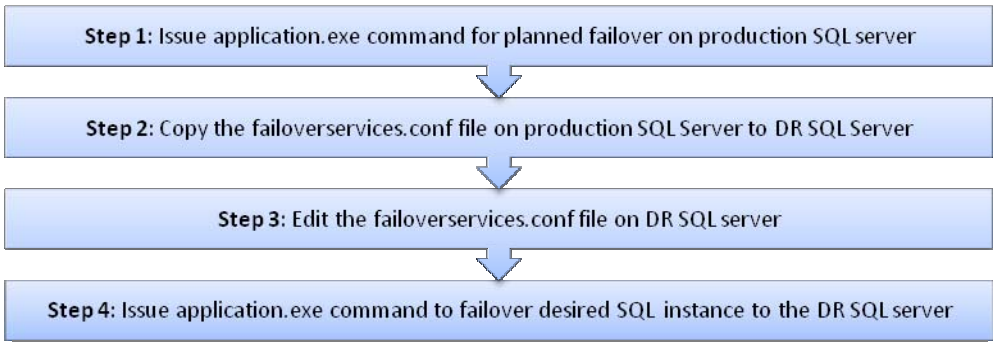


Figure 207

Step 221. Navigate to production SQL server console and execute the following command:

```
application.exe -failover -planned -app sql2008 -s <Production Server
Name> -t <DR Server Name>
```

Example:

```
application.exe -failover -planned -app sql2008 -s QW2K8E-NODE1 -t
CLUS2K8-64-TRG
```

Step 222. Copy the file "failoverservices.conf" present in Hitachi Dynamic Replicator installation path (i.e., InMage Systems\Failover\Dataon production SQL Server to DR SQL Server with same directory structure).

Step 223. Edit the file "failoverservices.conf" on DR SQL Server (i.e., remove other instances information; keep only instance information that needs planned failover). Save the file to DR Server.

Step 224. Issue the following command to failover desired SQL instance to the DR SQl Server.

```
application.exe" -failover -planned -app sql2008 -s <Production Server
Name> -t <DR Server Name>
```

Example:

```
application.exe" -failover -planned -app sql2008 -s QW2K8E-NODE1 -t
CLUS2K8-64-TRG -builtIn -tag PLANNED
```

26.3.2 Un-Planned Failover

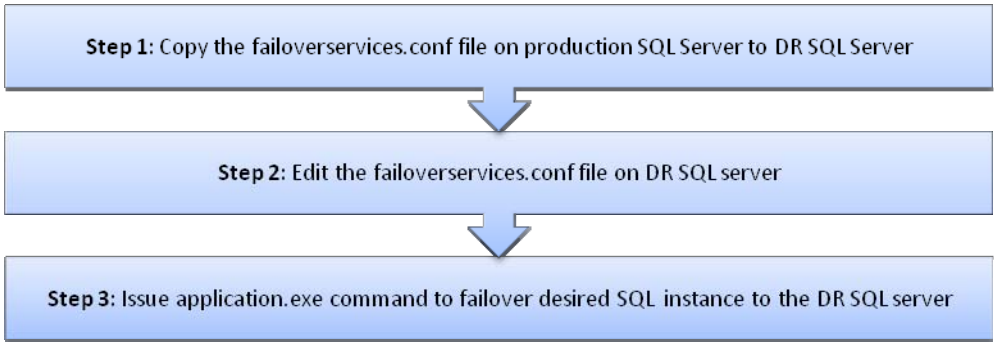


Figure 208

Step 225. Copy the file "failoverservices.conf" present in Hitachi Dynamic Replicator installation path (i.e., InMage Systems\Failover\Data on production SQL Server to DR SQL Server with same directory structure.)

Step 226. Edit the file "failoverservices.conf" on DR SQL Server (i.e., remove other instances information; keep only instance information that needs planned failover). Save the file to DR Server.

Step 227. Issue the following command to failover desired SQL instance to the DR SQl Server.

```
application.exe" -failover –Unplanned -app sql2008 -s <Production
Server Name> -t <DR Server Name>
```

Example:

```
application.exe" -failover -Unplanned -app sql2008 -s QW2K8E-NODE1 -t
CLUS2K8-64-TRG -builtIn -tag PLANNED
```

Part 7: Troubleshooting

27 Troubleshooting

27.1 Error Code 10

Error: FX job fails with Error 10

Condition: This occurs on cluster environment. The FX agent cannot choose between local IP address and cluster IP address

Workaround: Change the following registry values in [**HKEY_LOCAL_MACHINE\SOFTWARE\SV Systems\FileReplicationAgent**] key
The registry value "**UseConfiguredIP**" should be set to decimal 3255.
Another registry value "**ConfiguredIP**" should be set to the public IP address, since the private IP address will be internally used for clustering.

27.2 Error code -255

Error: FX job fails with error -255

Condition: FX agent not up with domain administrator privileges

Workaround: As mentioned earlier, FX agent service should start with domain administrator privileges. Open the "**Host FX Config**" and click on "**Log On"** tab and enter the full user name and the corresponding password and click on "**Ok**". Alternatively you may choose to do the same by opening "**services.msc**". Then double click on InMage FX agent service and click on "**Logon**". Enter the domain user login credentials for FX agent and then restart the service.

27.3 Unknown error "-XXX". (SQLEditors)

Error: An error message appears on the target server while accessing the database tables through the SQL server management studio.

Condition: This is caused due to authentication issues. Either the DNS server may be down/ unreachable or you do not have the required privileges to access the database tables

Workaround:
This issue occurs when you are trying to log into SQL server as a domain user on the target when the network interface is down. Even though passwords are cached locally, SQL query operations on a DB table have to validate permissions by contacting the AD. Ensure that the AD is reachable and you have required privileges.

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