Backup Solution Testing on UCS for Small-Medium Range Customers (Disk to Tape Library)

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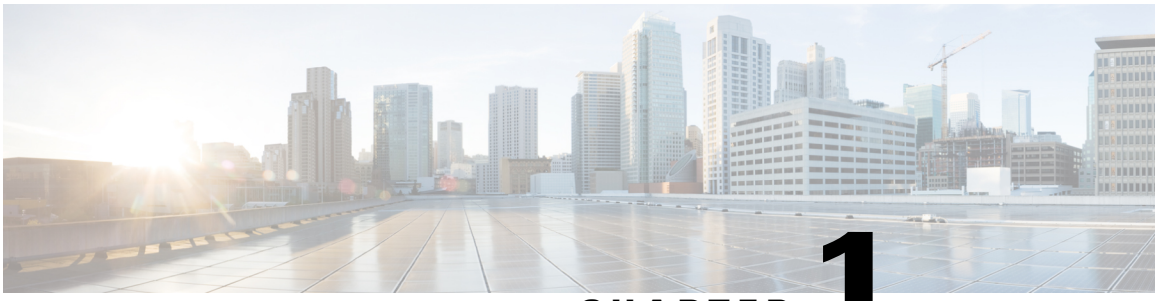


CHAPTER 1

Backup Solution Testing

Overview

This program (Backup Testing-Disk-to-Tape) validates data backup from the Windows and Linux operating systems on the Cisco UCS environment and the backup data stored in the Tape Library (Quantum i500/i40 Tape Library)

The objective of Backup Testing is to verify the Backup and Restore of Data/Database and Full Virtual machines by the backup software (Symantec Backup Exec 2012) with the data repository models, which are covered in the Feature Tested section.

Acronyms

Acronym	Description
10GbE	10 Gigabit Ethernet
CIMC	Cisco Integrated Management Controller
CNA	Converged Network Adapter
DB	Database
HDD	Hard Disk Drive
JOS	Japanese Operating System
MDS	Multilayer Director Switch
MS	Microsoft
OS	Operating System
RAID	Redundant Array of Independent Disks
RDM	Raw Device Mapping

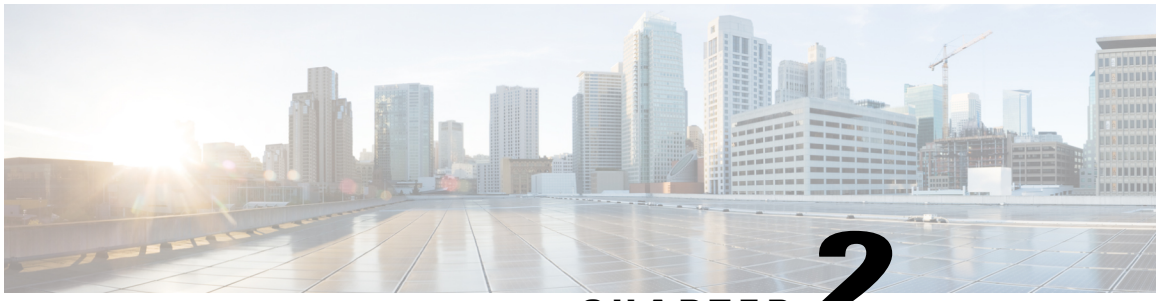
Acronym	Description
RHEL	Red Hat Enterprise Linux
SAN	Storage Area Network
SP	Service Pack
SQL	Structured Query Language
UCS	Unified Computing System
UCSM	Unified Computing System Manager
VM	Virtual Machine
VNIC	Virtual Network Interface Card
VSS	Volume Shadow Copy Service

Backup Testing Strategy

The requirements gathered for Backup Testing (Disk-to-Tape) are specific to the Japanese usage and market.

The following requirements are derived based on the inputs and prioritization given by Cisco Japan Solution Engineers:

- Virtual Machines are available on ESXi 5.1, which is installed in the Cisco UCS B Series Servers (B22 M3, B200 M3, B200 M2, B230 M2, and B250 M2).
- Symantec Backup Exec 2012 is used as Backup software.
- Backup data is stored in Quantum i500/i40 Tape library.
- Backup the Full Virtual Machines from the ESXi 5.1 Server which is installed on UCS B Series server (B22 M3 ,B 200 M3, B200 M2, B230 M2 and B250 M2).Virtual Machines are installed with Windows Client/server or Linux Operating System.
- Fail over of the Backup Exec 2012 Server which is installed on Cisco UCS C240 M3 is achieved by enabling cluster between the Backup Exec servers.
- Data backup from the Windows 7 and RHEL 6.1 Japanese Operating Systems that are installed as Virtual machines. Data files include Microsoft Excel, Microsoft Word and PDF.
- Database backup from MS SQL Server 2008 R2 on the Windows Server 2008 R2 SP1 Japanese Operating System that is installed as a Virtual Machine.

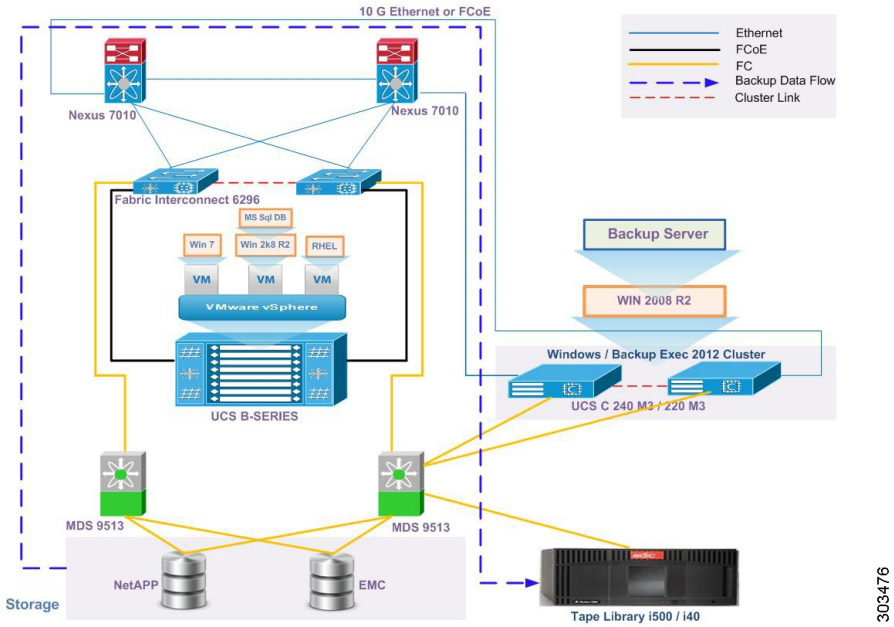


CHAPTER 2

Test Topology and Environment Matrix

Test Topology

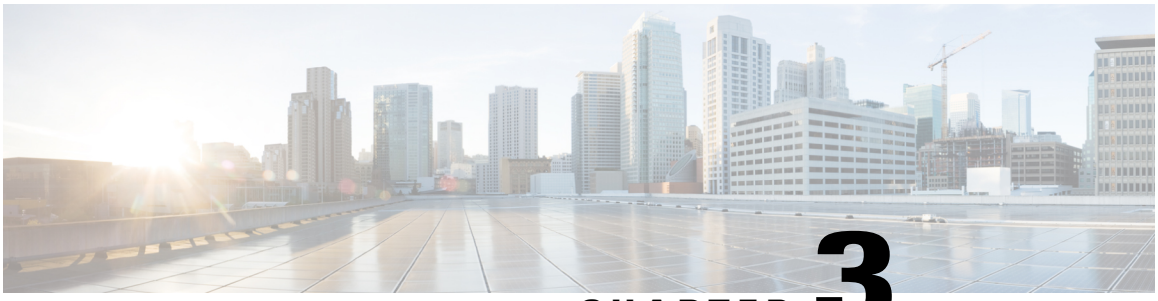
Figure 1: Topology In Use



Note The above Topology has been tested using Quantum i500 and Quantum i40 Tape Library

Environment Matrix

Components	Version
UCS	
1. Blade Servers	B22 M3 ,B200 M3, B200 M2 , B230 M2 and B250 M2
2. Rack servers	C240 M3, C 220 M3
3. UCSM	2.1(1a)
4. C Series Server CIMC	1.4.7b
Backup Software	
Symantec Backup Exec 2012	2012
Operating Systems	
1. Windows server	Windows Server 2008 R2 SP1 x64 (Japanese)
2. Windows OS	Windows 7 Enterprise SP1 x64 (Japanese)
3. RHEL	Redhat Enterprise Linux 6.1 x64 (Japanese)
Data Base	
MS SQL server	Microsoft SQL Server 2008 R2 Enterprise x64 (Japanese)
Hypervisor	
ESXi	VMware ESXi 5.1
Storage	
1. EMC CX4-120	04.30.000.5.525
2. NetApp 3240	8.0.2.
Tape Library	
Quantum i500/i40	621G.GS005 / 140G.GS005
FC Switch	
MDS	5.2(6b)
PCI Adapter	
Qlogic QLE2562	2.04



CHAPTER 3

Implementation and Features Tested

Design and Implementation

This program verifies and validates the functionality of Symantec Backup Exec 2012 features on Cisco UCS Servers for Japanese environment.

Backup Server components (Server and Client) are installed on JOS and schedule backup from B Series Server to the C Series Server.

Cluster between backup exec servers is formed, the tape libraries are shared and accessed by both the backup servers.

The following activities were involved in the Implementation phase:

- Installed VMware ESXi 5.1 on the B Series Servers (B22 M3, B200 M3, B200 M2, B230 M2, and B250 M2) that are configured to boot from SAN.
- Installed the Windows Server 2008 R2 Japanese operating system in the C Series Servers (C240 M3/ C220 M3) on a local hard disk that is configured with RAID 5 (single parity).
- In the B Series Servers installed with ESXi 5.1, three virtual machines were created and installed with the following Japanese Operating Systems respectively:
  - Windows 7 Enterprise SP1 x64
  - Windows Server 2008 R2 SP1 x64
  - Redhat Enterprise Linux 6.1 x64
- 10 GbE connectivity from the C Series CNA card (vNIC) was established to the B Series Blade Server for backup data Read/Write operations.
- Qlogic QLE2562 HBA card is used in C Series Server for Tape Library connectivity Via Cisco MDS 9513.
- C Series Servers were installed with the Windows Server 2008 R2 SP1 x64 Japanese Operating System.
- Symantec Backup Exec 2012 was installed on top of Japanese OS.

- Virtual machines installed with Symantec Backup Exec 2012 software Client Agents.
- In the C Series Servers installed with system Symantec Backup Exec 2012 software Server, the client Agents were added to the backup software.
- Virtual machines created on ESXi 5.1 Server which was installed on UCS B series Server. Add the ESXi Server to the backup exec Server. Backup the full Virtual machines that contains Windows and Linux Operating System then restore that Virtual machines on same or different ESXi host.
- Symantec Backup Exec 2012 uses a specific plugin for Microsoft SQL database backup. Installation of Microsoft SQL Server 2008 R2 and creation of databases was performed on RDM.
- Cisco UCS Central is deployed as the Virtual Machine on the VMware ESXi, where backup of UCS Central is performed from the Backup Exec 2012 and is able to restore the UCS Central at the active stage.

Features Tested

Data Backup was tested with the following backup methods.

Full Backup

Full backup is the starting point for all other types of backup and contains all the data in the folders and files that are selected to be backed up. Because full backup stores all files and folders, frequent full backups resulting faster and simpler restore operations.

Differential Backup

Differential backup contains all files that have changed since the last FULL backup. The advantage of a Differential backup is that it shortens restore time compared to a full backup or an incremental backup. However, if you perform the differential backup too many times, the size of the differential backup might grow to be larger than the baseline full backup.

Incremental Backup

Incremental backup stores all files that have changed since the last FULL, DIFFERENTIAL, or INCREMENTAL backup. The advantage of an incremental backup is that it takes the least time to complete. However, during a restore operation, each incremental backup must be processed, which could result in a lengthy restore job.

One-time Backup

A one-time backup is a job that only runs once without any recurring instances. We may want to create a one-time backup to create a baseline for a server before you upgrade it or install new software.

Compression

Copies the data to the media in its original form (uncompressed). Using some form of data compression can help expedite backups and preserve storage space. Hardware data compression should not be used in environments where storage devices that support hardware compression are used interchangeably with devices that do not have that functionality. In this situation, hardware compression is automatically disabled. You can manually turn on hardware compression on the drives that support it, but this results in media inconsistency. If the drive that supports hardware compression fails, the compressed media cannot be restored with the non-compression drive. Uses STAC software data compression, which compresses the data before it is sent to the storage device.

Encryption

Backup Exec supports two security levels of encryption: 128-bit Advanced Encryption Standard (AES) and 256-bit AES. The 256-bit AES encryption provides a stronger level of security because the key is longer for 256-bit AES than for 128-bit AES. However, 128-bit AES encryption enables backup jobs to process more quickly. Hardware encryption using the T10 standard requires 256-bit AES.

Software Encryption

While installing Backup Exec, the installation program installs encryption software on the Backup Exec server and on any remote computers that use a Backup Exec agent. Backup Exec can encrypt data at a computer that uses a Backup Exec agent, and then transfer the encrypted data to the Backup Exec server. Backup Exec then writes the encrypted data on a set-by-set basis to tape or to a backup-to-disk folder.

Backup Exec encrypts the following types of data:

- User data, such as files and Microsoft Exchange databases.
- Metadata, such as file names, attributes, and operating system information.
- On-tape catalog file and directory information.

Backup Exec does not encrypt Backup Exec metadata or on-disk catalog file and directory information.

Encrypted

Anyone can use the key to encrypt data during a backup job, but users other than the key owner must know the pass phrase. If a user other than the key owner tries to restore the encrypted data, Backup Exec prompts the user for the pass phrase. If you cannot supply the correct pass phrase for the key, you cannot restore the data.

Advanced Open File Options

Backup Exec can use snapshot technology to capture any files that are open when a backup runs. You can configure default options for open files, which your backup jobs inherit when you create them. Or you can override the default open file settings when you create backup jobs.

Snapshot Technology

Enables the use of snapshot technology for backup jobs.

Automatically Select Snapshot Technology

Enables Backup Exec to select the best snapshot method to use for the type of data that you back up.

Microsoft Volume Shadow Copy Server (Windows 2003 and later)

Enables third-party hardware and software vendors to create snapshot add-ins for use with Microsoft technology. Microsoft, as well as other third party software vendors, often provide the additional components that work with VSS. These components are called Writers. Writers flush application data or file data (if a file is open) that resides in the computer's memory. The data is flushed before the Microsoft Volume Shadow Copy Service makes a snapshot of the volume to be backed up.

Snapshot Provider

Lets us select one of the following snapshot providers for jobs:

- Automatic - Allow VSS to select the snapshot provider. Select this option to enable VSS to select the best provider for the selected volume. The order in which a snapshot provider is selected is hardware provider and then the system provider.
- System - Use Microsoft Software Shadow Copy Provider.
- Hardware - Use technology provided by hardware manufacture.

If you select Hardware as the snapshot provider, then the following information applies:

- If multiple volumes are selected, then the same type of provider must be able to snap all volumes.
- Hardware providers cannot both be used to snap different volumes in the same job. You must either create another job, or select the option "Process logical volumes for backup one at a time".

SQL Backup Options

Consistency check before backup .

Specifies one of the following consistency checks to run before a backup:

- None. This option does not run a consistency check before a backup. Symantec recommends that you always run a consistency check either before the backup.
- Full check, excluding indexes. This option excludes indexes from the consistency check. If indexes are not checked, the consistency check runs significantly faster but is not as thorough.
- Full check, including indexes. This option includes indexes in the consistency check. Any errors are logged.
- Physical check only. This option performs a low overhead check of the physical consistency of the database. This option only checks the integrity of the physical structure of the page. This option is selected by default.

Full VM Backup

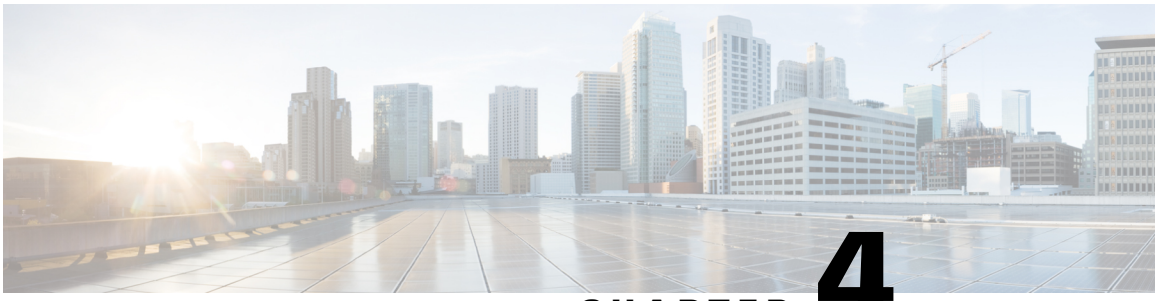
The Symantec Backup Exec Agent for VMware Virtual Infrastructure (Agent for VMware) backup and restore virtual machines **.** Backup Exec performs a single-pass backup to protect all Guest virtual machines and VSS-aware applications that are installed on the Guest virtual machines. Backup Exec's Granular Recovery Technology (GRT) is enabled by default for jobs. You can use a GRT-enabled backup to restore individual files and folders from a Windows Guest virtual machine without restoring the entire virtual machine.

Additional features of the Agent for VMware do the following:

- Redirect the restore of data from a Guest virtual machine to an alternate folder, data store, host, or network.
- Back up to a disk device or to a tape device.
- Perform incremental and differential backup jobs.

Backup Exec server Fail over

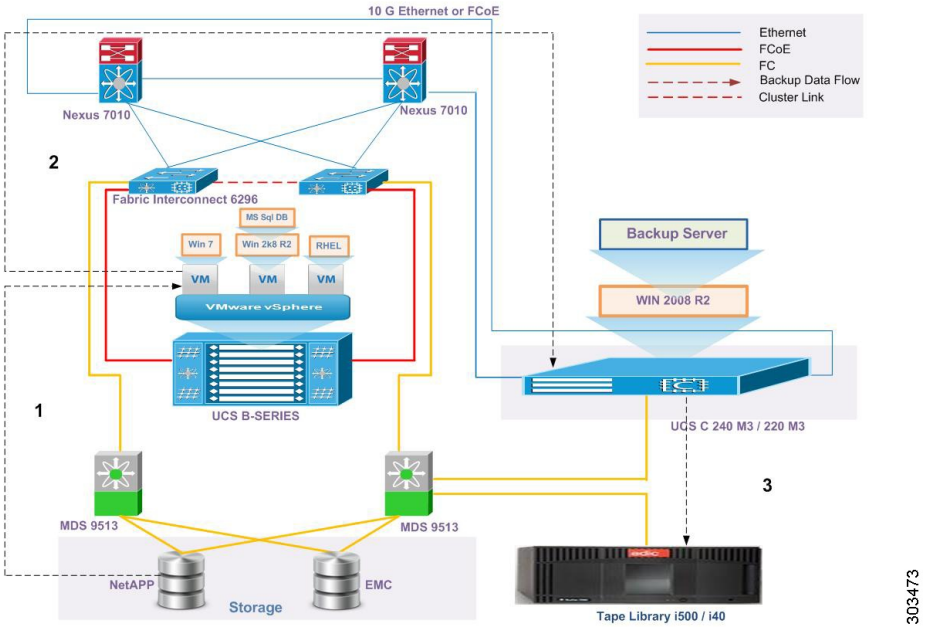
- Fail over of the active backup job is tested by simulating failover for the active backup server and the same job got re-scheduled and re-runs on the standby node becomes online.
- Backup job done by the active node is restored by the standby node .



CHAPTER 4

Test Scenarios for UCS with Symantec Backup Exec 2012

Backup to Tape



Backup data flows:		
Step	**From**	**To**
1	Disk Array (NetApp & EMC)	Each B series SAN based Server (Backup client)
2	Each SAN based Server (Backup client)	C series Server(Backup Server)
3	C series Server(Backup Server)	Quantum Tape Library

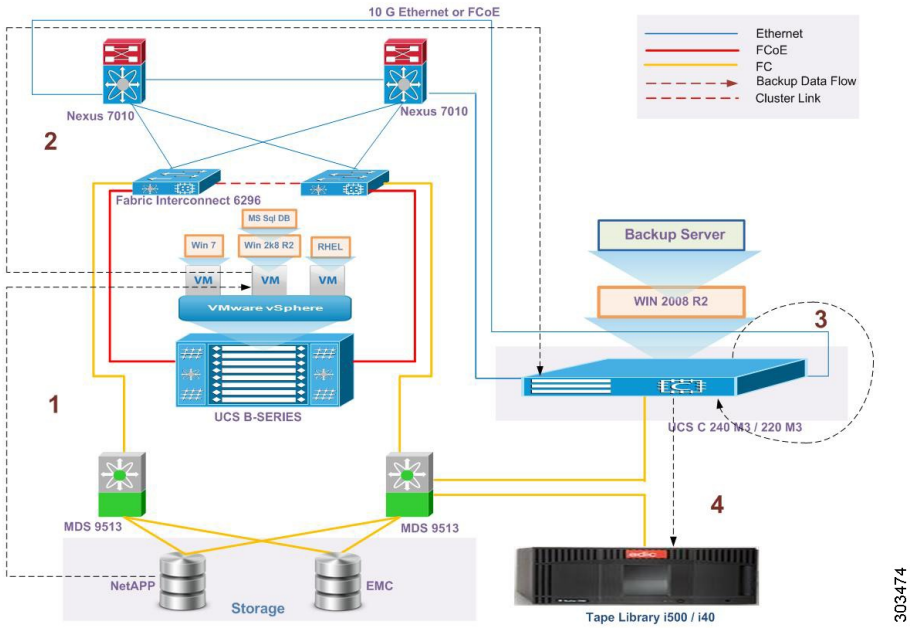
Description

- Backup of data files (Word, PDF, and Excel) from Windows 7 and RHEL 6.1 Japanese Operating System using Backup Exec 2012 Backup software.
- Backup of MS SQL database from Windows 2008 R2 Operating System using Backup Exec 2012 Backup software.
- Backup a full VM from ESXi 5.1 host and restore the same using Backup Exec 2012 software.

Tested Combinations

Storage Used for Backup Client	UCS used for Backup client	UCS used for Backup Server	Storage Used for Backup Server
NetApp FAS 3240 / EMC CLARiiON	B22 M3, B200 M3, B200 M2, B230 M2 and B250 M2.	C240 M3 / C220 M3	Quantum i500/i40 Tape Library

Backup to Disk and duplicate to Tape



Backup Data Flows:		
Step	**From**	**To**
1	Disk Array (NetApp & EMC)	Each B series SAN based Server (Backup client)
2	Each SAN based Server (Backup client)	C Series Server(Backup Server)
3	C Series Server(Backup Server)	Local HDD of C Series Server (Backup Server)
4	Local HDD of C Series Server (Backup Server)	Quantum Tape Library

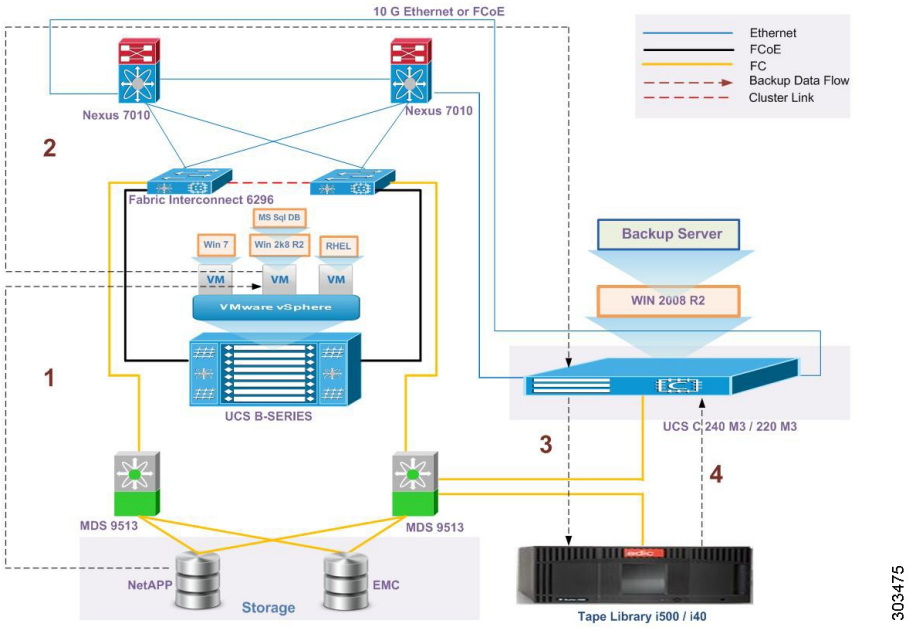
Description

- Backup of data files (Word, PDF, and Excel) from Windows 7 and RHEL 6.1 Japanese Operating System to C Series Server Local HDD and then Duplicate the same to Quantum i500/i40 Tape Library using Backup Exec 2012 Backup software.
- Backup of MS SQL database from Windows 2008 R2 Japanese Operating System to C Series Server Local HDD and then Duplicate the same to Quantum i500/i40 Tape Library using Backup Exec 2012 Backup software.
- Backup a full VM from ESXi 5.1 host to C Series Server Local HDD, Then Duplicate the same to Quantum i500/i40 Tape Library and restore the same using Backup Exec 2012 software.

Tested Combinations

Storage Used for Backup Client	UCS used for Backup client	UCS used for Backup Server	Storage Used for Backup Server
NetApp FAS 3240 / EMC CLARiiON	B22 M3, B200 M3, B200 M2, B230 M2 and B250 M2.	C240 M3 / C220 M3	Local HDD of C240 M3/ Quantum i500/i40 Tape Library

Backup to Tape and duplicate to Disk



Backup Data Flows:		
Step	**From**	**To**
1	Disk Array (NetApp & EMC)	Each B series SAN based Server (Backup client)
2	Each SAN based Server (Backup client)	C Series Server(Backup Server)
3	C Series Server(Backup Server)	Quantum Tape Library
4	Quantum Tape Library	Local HDD of C Series Server (Backup Server)

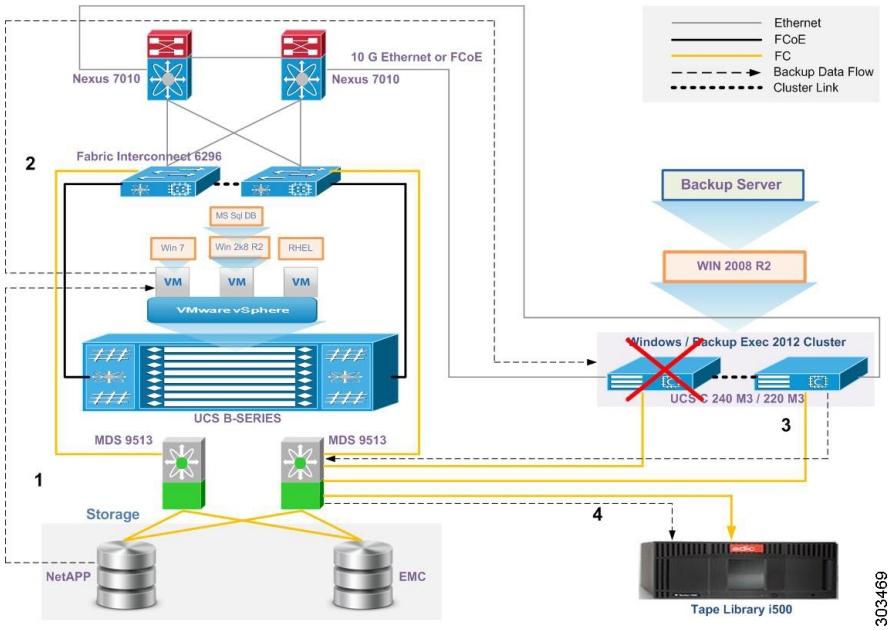
Description

- Backup of data files (Word, PDF, and Excel) from Windows 7 and RHEL 6.1 Japanese Operating System to Quantum i500/i40 Tape Library and then Duplicate the same to C Series Server Local HDD using Backup Exec 2012 Backup software.
- Backup of MS SQL database from Windows 2008 R2 Japanese Operating System to Quantum i500/i40 Tape Library and then Duplicate the same to C Series Server Local HDD using Backup Exec 2012 Backup software.
- Backup a full VM from ESXi 5.1 host to Quantum i500/i40 Tape Library, then Duplicate the same to C Series Server Local HDD and restore the same using Backup Exec 2012 software.

Tested Combinations

Storage Used for Backup Client	UCS used for Backup client	UCS used for Backup Server	Storage Used for Backup Server
NetApp FAS 3240 / EMC CLARiiON	B22 M3, B200 M3, B200 M2, B230 M2 and B250 M2.	C240 M3 / C220 M3	Local HDD of C240 M3/ Quantum i500/i40 Tape Library

Backup Server failover



Backup Data Flows:		
Step	**From**	**To**
1	Disk Array (NetApp & EMC)	Each B series SAN based Server (Backup client)
2	Each SAN based Server (Backup client)	C series Server A(Active Node Backup Server)
3	C series Server B(Backup Server)	Quantum Tape Library

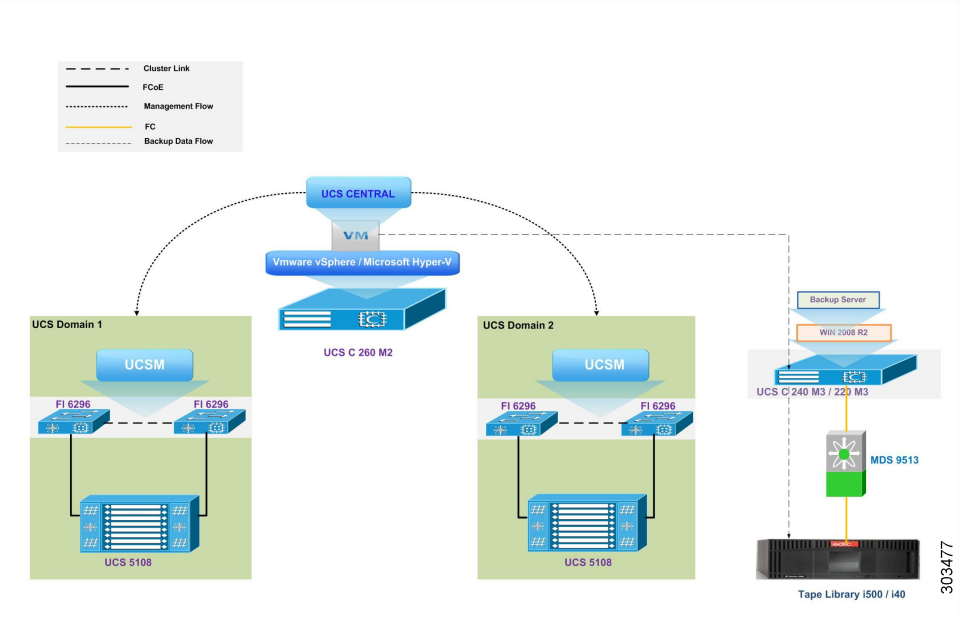
Description

- Windows and Backup Server Clustering is enabled .
- Backup of data files (Word, PDF, and Excel) from Windows 7 and RHEL 6.1 Japanese Operating System using Backup Exec 2012 Backup software is scheduled. When a Failover occurs ,active backup job is re-scheduled and executed by the standby node and the same can be restored .

Tested Combinations

Storage Used for Backup Client	UCS used for Backup client	UCS used for Backup Server	Storage Used for Backup Server
NetApp FAS 3240 / EMC CLARiiON	B22 M3, B200 M3, B200 M2, B230 M2 and B250 M2.	C240 M3 / C220 M3	Local HDD of C240 M3/ Quantum i500/i40 Tape Library

UCS Central Backup



Backup Data Flows:		
Step	**From**	**To**
1	UCS Central(VM)	C Series Server(Backup Server)
2	C Series Server(Backup Server)	Quantum Tape Library

Description

- Backup the VM from ESXi 5.1 host running with UCS central application and restore it using Backup Exec 2012 software.

Tested Combinations

Storage Used for Backup Client	UCS used for Backup client	UCS used for Backup Server	Storage Used for Backup Server
NetApp FAS 3240 / EMC CLARiiON	B22 M3,B200 M3, B200 M2, B230 M2 and B250 M2.	C240 M3 / C220 M3	Quantum i500/i40 Tape Library

Related Documentation

Symantec Backup Exec

http://www.symantec.com/backup-exec

Symantec Backup Exec 2012 Administrator's Guide

http://www.symantec.com/business/support/index?page=content&id=doc5211

Backup Exec 2012 Software Compatibility List

http://www.symantec.com/business/support/index?page=content&id=TECH175581&key=15047&basecat=COMPATIBILITY_LIST&actp=LIST

Quantum Tape Library

http://www.quantum.com/Products/TapeLibraries/Scalari500/Index.aspx

http://www.quantum.com/Products/TapeLibraries/Scalari40i80/Index.aspx