



Backup Solution Testing (Disk to Tape) on Cisco UCS C240 M4 server using Quantum Artico – Symantec NetBackup 8.0

First Published: 2017-04-28

Last Modified: 2017-04-28

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Backup Solution Testing

- [Overview, page 1](#)
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Overview

This program Backup Testing - Backup to Disk/De-duplication Disk and Replicate to Quantum Artico intelligent Storage Appliance .validates data backup from the Windowsand Linux operating systems on the Cisco UCS environment. Backup data stored in the Quantum Artico Storage Appliance will replicate the backup data to attached Quantum i80 tape Library using defined Storage policy. The objective of Backup Testing is to verify the Backup and Restore of Data files, entire disks of Windows 10, Windows server 2012 R2, Linux RHEL 7.2, SLES 12 and 12.2, Full VMs, MS SQL, P2V by the backup software (Symantec NetBackup 8.0) with the data repository models, which are covered in the features tested section.

Acronyms

Acronyms	Description
10GbE	10 Gigabit Ethernet
BDR	Baremetal Disaster Recovery
CAN	Converged Network Adapter
FI	Fabric interconnect
FC	Fabric Channel
HBA	Host Bus Adapter
HDD	Hard Disk Drive
JOS	Japanese Operating System
LVM	Logical Volume Manager
MS	Microsoft
OS	Operating System

Acronyms	Description
PCI	Peripheral Component Interface
PCIe	Peripheral Component Interface Express
RAID	Redundant Array of Independent Disks
RHEL	RedHat Enterprise Linux
SAS	Serial Attached Storage
SLES	SUSE Linux Enterprise Server
SQL	Structured Query Language
SAN	Storage Area Network
UCS	Unified Computing System
UCSM	Unified Computing System Manager
VIC	Virtual Interface Card
VM	Virtual Machine

Backup Testing Strategy

The requirements gathered for Backup Testing (Backup to Disk/De-duplication Disk and Replicate to Quantum Artico Storage Appliance) 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:

- JOS Windows Server 2012 R2(x64), SLES 12, RHEL 7.2 are installed on the Cisco UCS B Series Server (B460M4, B200M4, B260 M4) for Similar/ Dissimilar Hardware Disaster Recovery
- Windows Server 2012 R2 JOS is installed on the local HDD of C240 M4 Server. NetBackup 8.0 is installed on top of it and acts as Backup, Media Server.
- Backup data is stored in C240 M4 Server Local HDD/De-duplication disk and then replicate to Quantum Artico Storage Appliance using NetBackup 8.0 backup software.
- Backup data stored in the Quantum Artico Storage Appliance will replicate the backup data to attached Quantum i80 tape Library using defined Storage policy.
- Data files of size 500MB includes Microsoft Excel, Microsoft Word and PDF for full backup and additional 100MB files used for incremental/differential backup
- Data backup from the Windows 10, Windows Server 2012 R2, RHEL 7.2 and SLES 12 JOS are deployed as VMs.
- Data backup from the Windows Server 2012 R2, RHEL 7.2 and SLES 12.2 JOS are deployed in baremetal servers

- Full VM Backup of Windows 2012 R2 (x64), RHEL 7.2 and SLES 12 and 12.2 in ESXi 6.5 are deployed in UCS B Series servers (B200 M4, B460 M4, B260 M4) for Backup and Recovery to Same/Different host
- MS SQL Server 2014 Sp2 is installed in windows 2012 R2 (x64) VM for Database Backup. 15GB RDM is mapped to this VM for the database creation



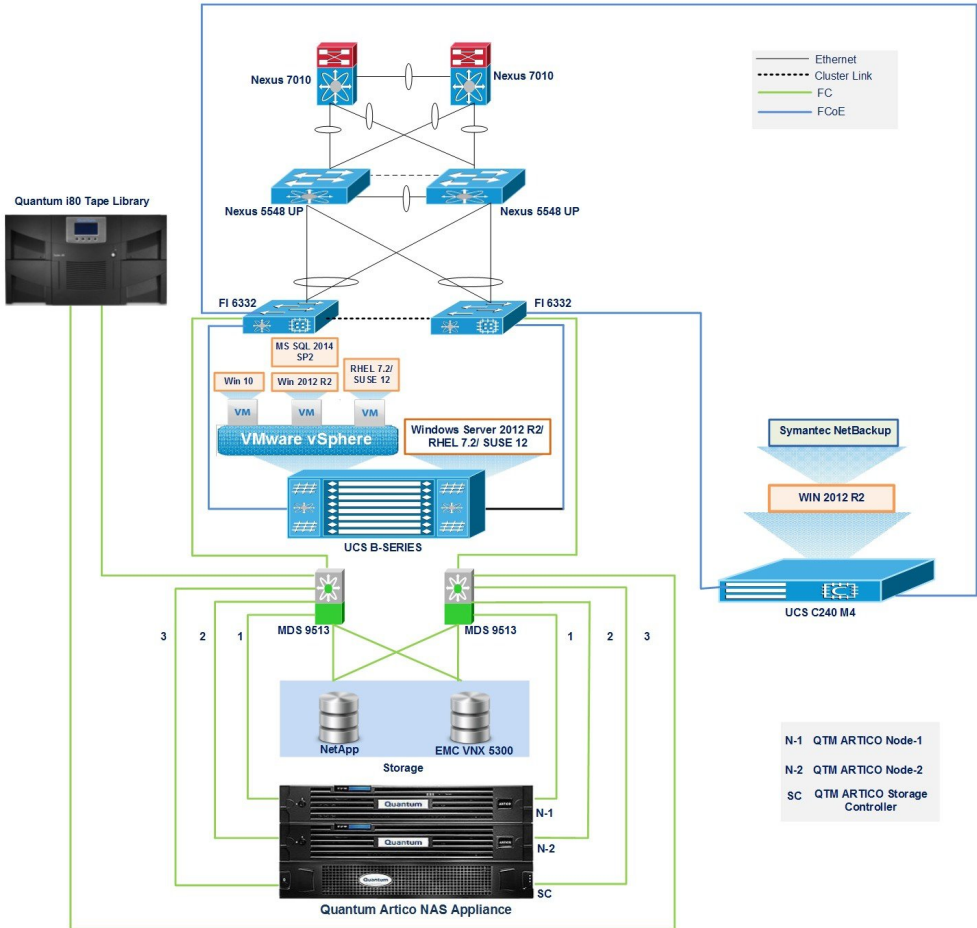
CHAPTER 2

Test Topology and Environment Matrix

- [Test Topology, page 6](#)
- [Environment Matrix, page 6](#)

Test Topology

Figure 1: Fig 1: Topology in use



Environment Matrix

Component	Version
UCS	
Blade servers	Cisco UCS B200 M4,B260 M4, B460 M4
Rack Server	Cisco UCS C240 M4
UCSM	3.1(2c)
Adapters	

Component	Version
Cisco UCS MLOM 1227	4.1(2d)
Cisco UCS VIC 1340	4.1(2d)
Cisco UCS VIC 1380	4.1(2d)
Infra	
Nexus 7010	7.2(1)D1(1)
Nexus 5548 UP	7.2(1)N1(1)
MDS 9513	6.2(13b)
Backup Software	
Symantec NetBackup	8.0 (0165)
Operating Systems	
Windows OS	Windows 10 Enterprise x64 (Japanese)
Windows server OS	Windows Server 2012 R2 x64 (Japanese)
RHEL	Redhat Enterprise Linux 7.2 x64 (Japanese)
SLES	SUSE Linux Enterprise Server 12/12.2 (Japanese)
Database	
MS SQL server	Microsoft SQL Server 2014 SP2(Japanese)
Hypervisor	
ESXi	VMware ESXi 6.5
Tape Library	
Quantum Artico STORAGE Appliance	5.3.1
Quantum i80 Tape Library	180G.GS009
Storage	
EMC VNX 5300	05.32.000.5.218
NetApp FAS 2554	8.3.2 CMode



Implementation and Features Tested

- [Design and Implementation, page 9](#)
- [Features Tested, page 10](#)

Design and Implementation

- Backup Server UCS C240 M4 is deployed in UCSM integrated mode connected to FI using VIC 1227.
- The internal RAID controller used on Cisco UCS C240 M4 Server is Cisco 12G SAS Modular RAID Controller card.
- Backup server is connected to Quantum Artico Storage Appliance using Cisco MDS SAN switch.
- Quantum i80 tape library is connected with Quantum Artico Storage Appliance using Cisco MDS SAN switch
- Selectively allowing access to data between server, Quantum Artico Storage Appliance, quantum i80 tape library is done using zoning in SAN switch
- SAN block volume of required size is provisioned and attached to backup server for storing the replicated backup data in Quantum Artico Storage Appliance
- Esxi 6.5 is installed in the local HDD/SAN of the Client servers (UCS B200 M4, B460 M4, B260 M4).
- VM's in client servers (UCS B200 M4, B460 M4, B260 M4) are deployed in the LUN of EMC VNX and NetApp Storages.
- VMware Vcenter 6.5 is deployed to manage the ESXi host.
- Symantec NetBackup 8.0 backup client agent for Windows is installed on the Windows Server 2012 R2 x64 and Windows 7 SP1 x64.
- Symantec NetBackup 8.0 client agent for SQL is installed on top of Windows Server 2012 R2 by adding required privileges.
- Symantec NetBackup 8.0 client agent for Linux is also installed on SLES 12 and 12.2 and RHEL 7.2.
- VMware vCenter 6.5 is integrated with Symantec NetBackup 8.0 Backup server for Agentless backup and recovery of VMs.

Features Tested

Data Backup was tested with the following backup methods:

Full Backup

Full backup is the startingpoint for all other types of backup and containsall the data in the folders and files that are selected to be backed up. Because full backup storesall files and folders, frequentfull 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.

Synthetic backup

Synthetic backup is an accurate representation of the client's file system at the time of the most recent full backup.

De-Duplication

De-Duplication is the process of minimizing Storage space taken by the data by detecting data repetition and storing the identical data only once.

De-Duplication may also reduce network load: if, during a backup,a data is found to be a duplicate of an already stored one, its content is not transferred over the network.

Compression

Compression reduces the size of a backup by reducing the size of files in the backup. In turn, the smaller backup size decreases the number of media that is requiredfor Storage. Compression also decreases the amount of data that travels over the network as well as the network load.

Encryption

The Encryption attribute determines whether the backup should be encrypted. When the server initiates the backup, it passes on the Encryption policy attribute to the client in the backup request. The client compares the Encryption policy attribute to the Encryption host properties for the client. If the encryption permissions for the client are set to REQUIRED or ALLOWED, the policy can encrypt the backups for that client.

Volume Shadow Copy Service

These options are effective only for Windows operating systems.

The option defines whether a Volume Shadow Copy Service (VSS) provider has to notify VSS-aware applications that the backup is about to start. This ensures the consistent state of all data used by the applications; in particular, completion of all database transactions at the moment of taking the data snapshot by Symantec NetBackup 8.0.

LVM

This option is effective only for Linux operating systems when you back up volumes managed by Linux Logical Volume Manager (LVM). Such volumes are also called logical volumes. Symantec NetBackup 8.0 will use Linux Logical Volume Manager to take the snapshot and to work with it during backup.

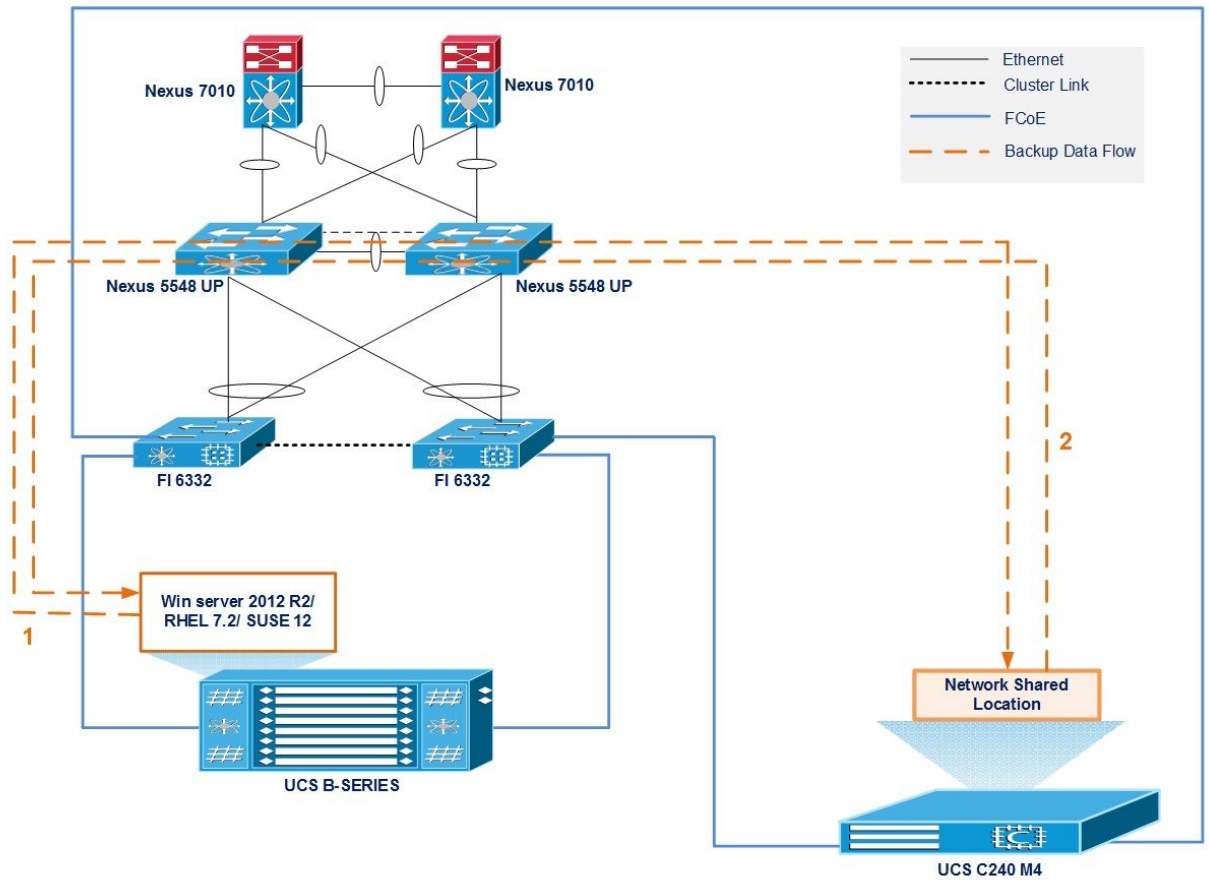


Test Scenarios for UCS with Symantec NetBackup 8

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Disaster Recovery for Similar Hardware (Local Boot)

Figure 2: Fig 2: Topology in use



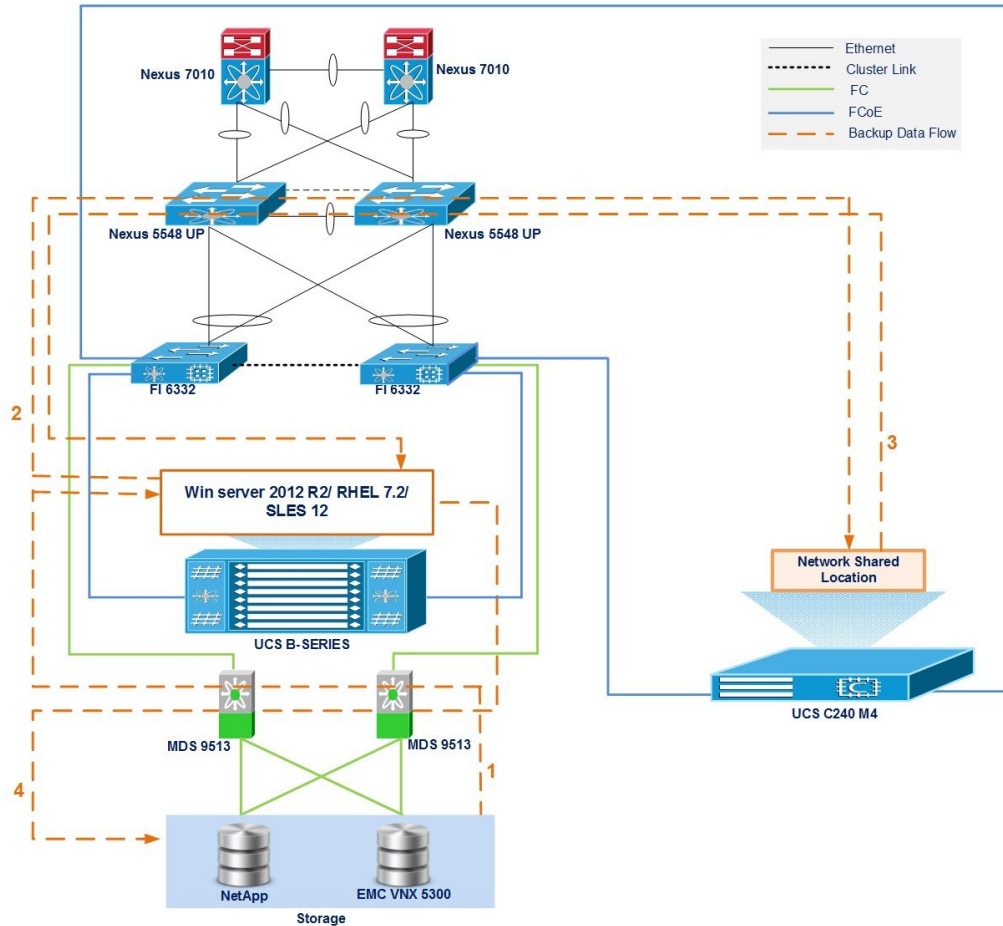
Backup Data flows		
Step	From	To
1	Backup of B Series Server(Entire Disks)	Network Share
2	Network Share	B Series Server(local HDD)

Description:

- Backup of Entire Disks from Japanese SLES 12,RHEL 7.2 and Windows server 2012 R2 Operating System to Network Share Location
- Restore the EntireDisks from NetworkShare location to the Similarhardware local HDD) fromSymantec NetBackup 8.0 Recover Option

Disaster Recovery for Similar Hardware (SAN boot)

Figure 3: Fig 3: Topology in use



Backup Data flows		
Step	From	To
1	Backup of B Series Server(Entire Disks)	Network Share
2	Network Share	B Series Server (SAN)

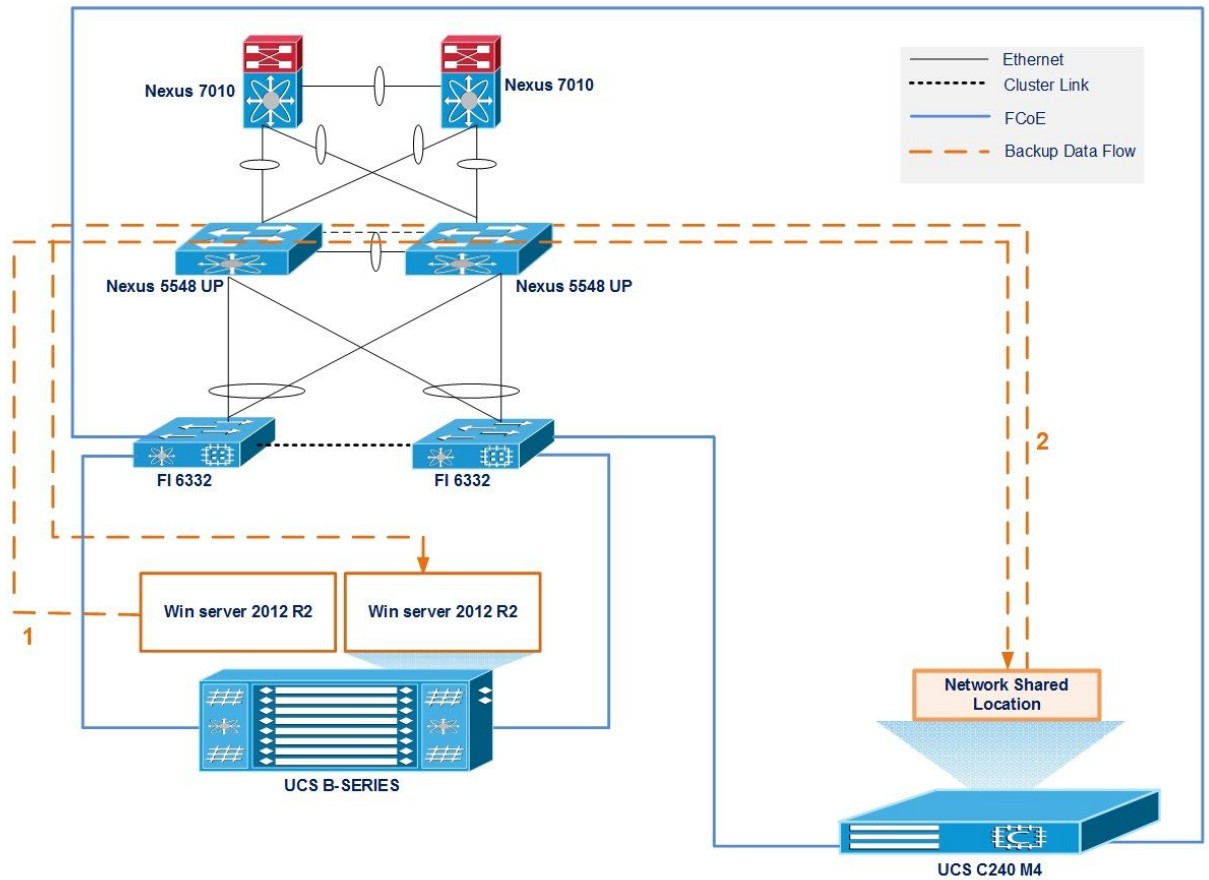
Description:

- Backup of Entire Disks from Japanese SLES 12, RHEL 7.2 and Windows server 2012 R2 Operating System to Network Share Location

- Restore the Entire Disks from Network Share location to the Similar hardware(SAN) from Symantec NetBackup 8.0 Recover Option

Disaster Recovery for Dissimilar Hardware (Local Boot)

Figure 4: Fig 4: Topology in use



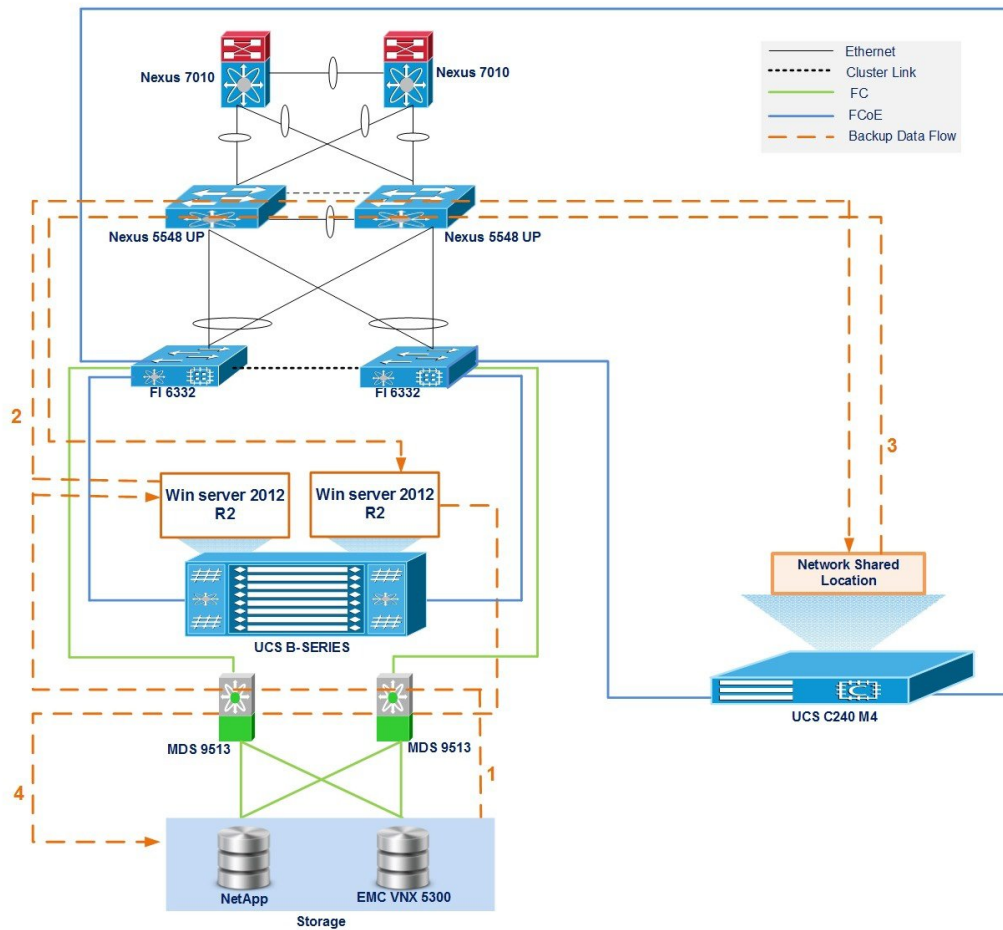
Backup Data flows		
Step	From	To
1	Backup of B Series Server(Entire Disks)	Network Share
2	Network Share	B Series Server (local HDD)

Description:

- Backup of Entire Disks from Japanese Windows server 2012 R2 Operating System to Network Share Location
- Restore the Entire Disks from Network Share location to the Dissimilar hardware (local HDD) from Symantec NetBackup 8.0 Recover Option

Disaster Recovery for Dissimilar Hardware (SAN boot)

Figure 5: Fig 5: Topology in use



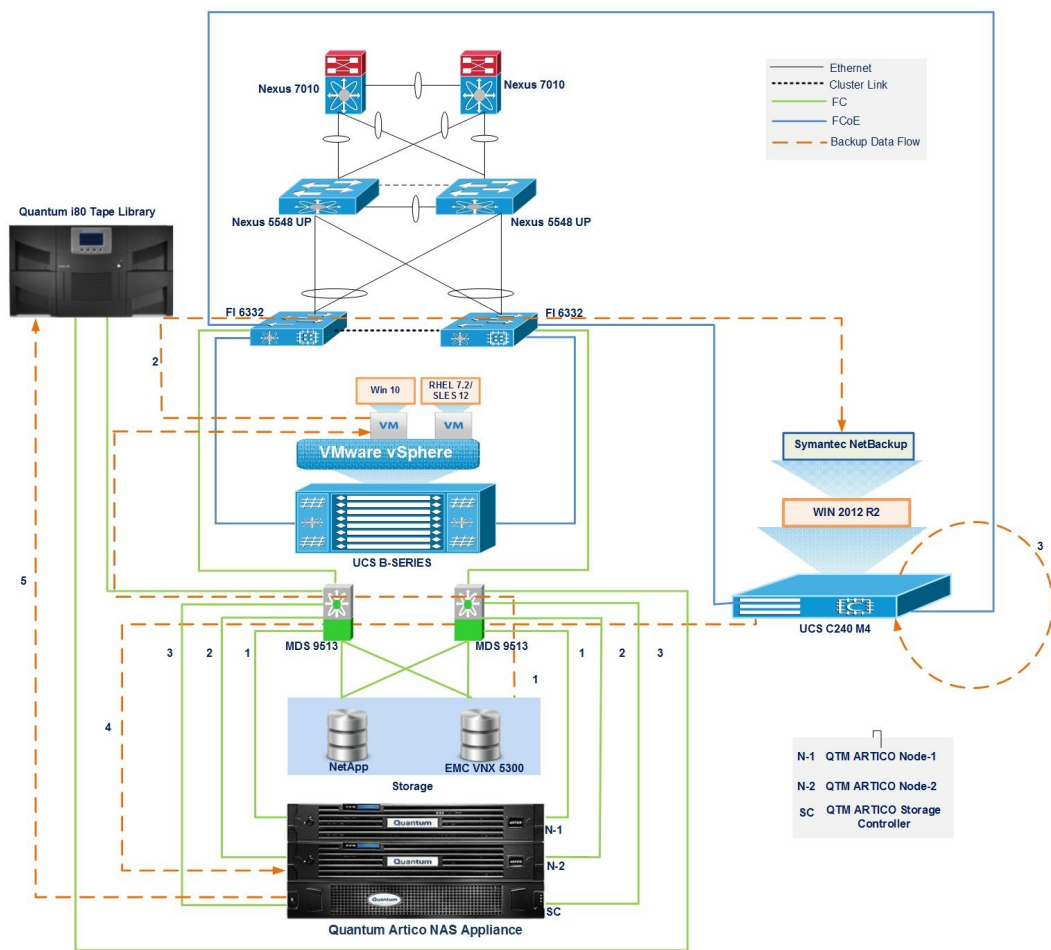
Backup Data flows		
Step	From	To
1	Backup of B Series Server(Entire Disks)	Network Share
2	Network Share	B Series Server (SAN)

Description:

- Backup of Entire Disks from Japanese Windows server 2012 R2 Operating System to Network Share Location
- Restore the Entire Disks from Network Share location to the Dissimilar hardware (SAN) from Symantec NetBackup 8.0 Recover Option

Full VM

Figure 6: Fig 6: Topology in use



Backup Data flows		
Step	From	To
1	Disk Array (NetApp FAS & EMC VNX)	VM in B series SAN based server

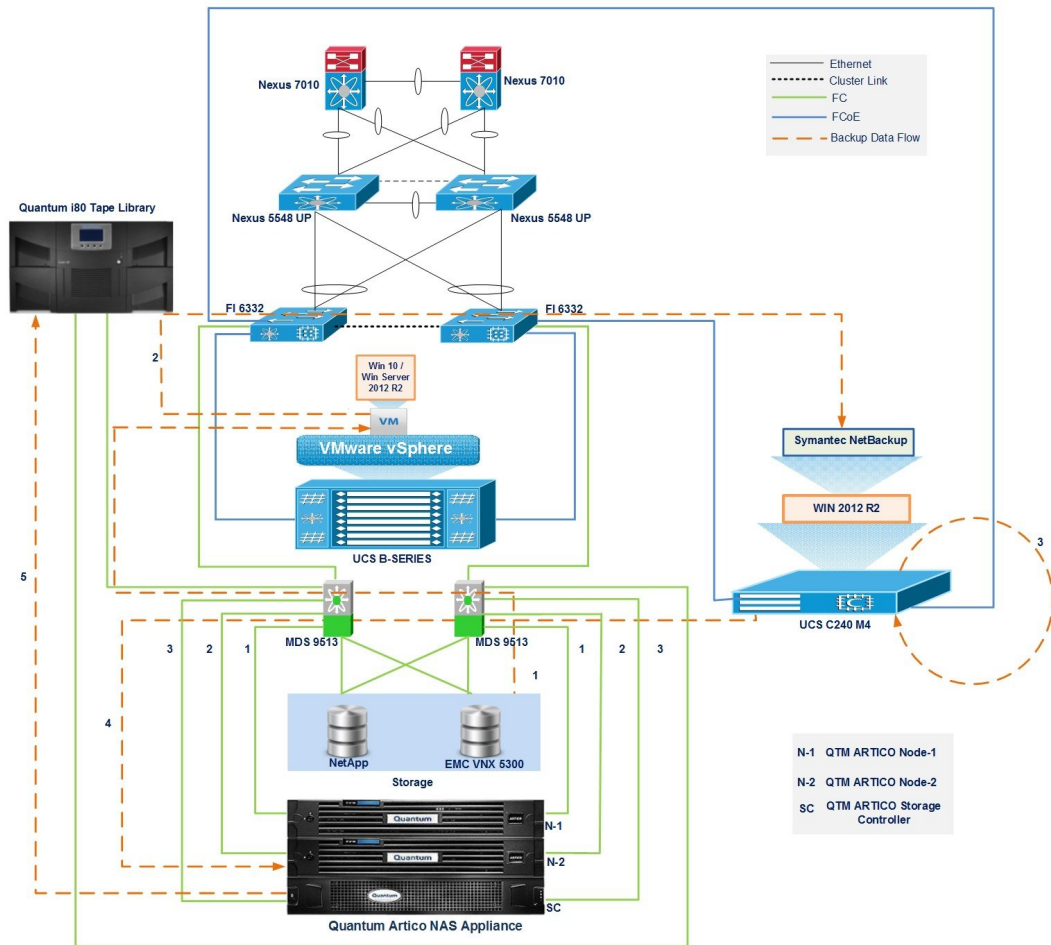
Backup Data flows		
2	VM in B series SAN based server(Backup client)	Backup Server
3	Backup Server	Backup Server Disk
4	Backup Server Disk	Quantum Artico Storage Appliance
5	Quantum Artico Storage Appliance	Quantum i80 Tape Library

Description:

- Select the VM to be backed up using Symantec NetBackup 8.0.
- Run the Backup Job and Backup of VM is Successful.
- Select the Archive and create Recovery Plan.
- Specify where to recover as "New Virtual Machine" in Recovery Plan.
- Run the Recovery Job and the Restore of VM is successful.

Windows Files/Folders- VM

Figure 7: Fig 7: Topology in use



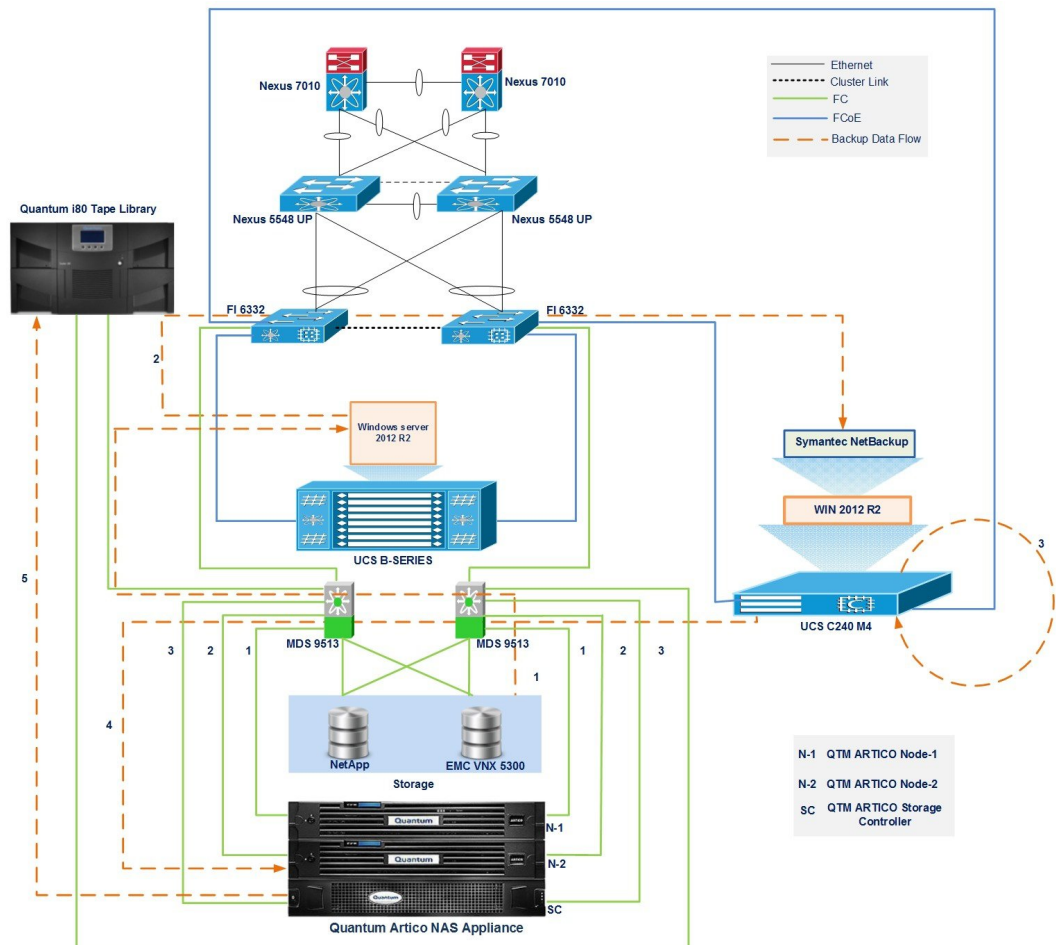
Backup Data flows		
Step	From	To
1	Disk Array (NetApp FAS & EMC VNX)	VM in B series SAN based server
2	VM in B series SAN based server(Backup Client)	Backup Server
3	Backup Server	Backup Server Disk
4	Backup Server Disk	Quantum Artico Storage Appliance
5	Quantum Artico Storage Appliance	Quantum i80 Tape Library

Description:

- Backup of data files (Word,PDF, and Excel) from Windows 10, windows 2012 R2 JOS to Backup Server Local HDD/De-duplication disk/De-duplication disk and then replicate the same to Quantum Artico Storage Appliance will replicate the backup data to attached Quantum i80 tape Library using defined Storage policy.
- Using Symantec NetBackup 8.0 software.
- Quantum Artico Storage Appliance will recover the Files from Quantum i80 tape library by using various Recovery Options available on Symantec NetBackup 8.0 Software.

Windows Files/Folders- Baremetal

Figure 8: Fig 8: Topology in use



Backup Data flows		
Step	From	To

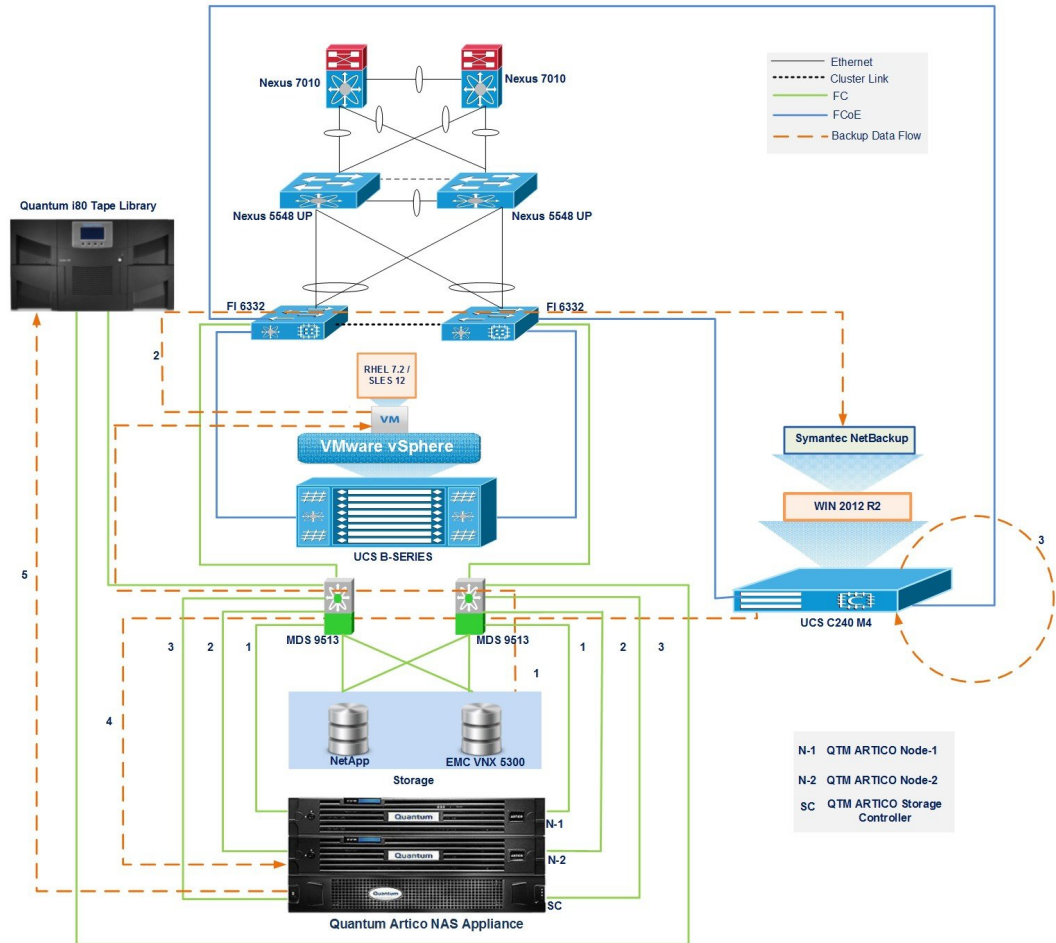
Backup Data flows		
1	Disk Array (NetApp FAS & EMC VNX)	B series SAN based baremetal server
2	B series SAN based baremetal server(Backup Client)	Backup Server
3	Backup Server	Backup Server Disk
4	Backup Server Disk	Quantum Artico Storage Appliance
5	Quantum Artico Storage Appliance	Quantum i80 Tape Library

Description:

- Backup of data files (Word,PDF, and Excel) from Windows Server 2012 R2 to Backup Server Local HDD/De-duplication disk and then replicate the same to Artico Storage Appliance will replicate the backup data to attached Quantum i80 tape Library using defined Storage policy.
- Using Symantec NetBackup 8.0 Software.
- Artico Storage Appliance will Recover the Files from Quantum i80 tape library by using various Recovery Options available on Symantec NetBackup 8.0 Software.

Linux Files/Folders- VM

Figure 9: Fig 9: Topology in use



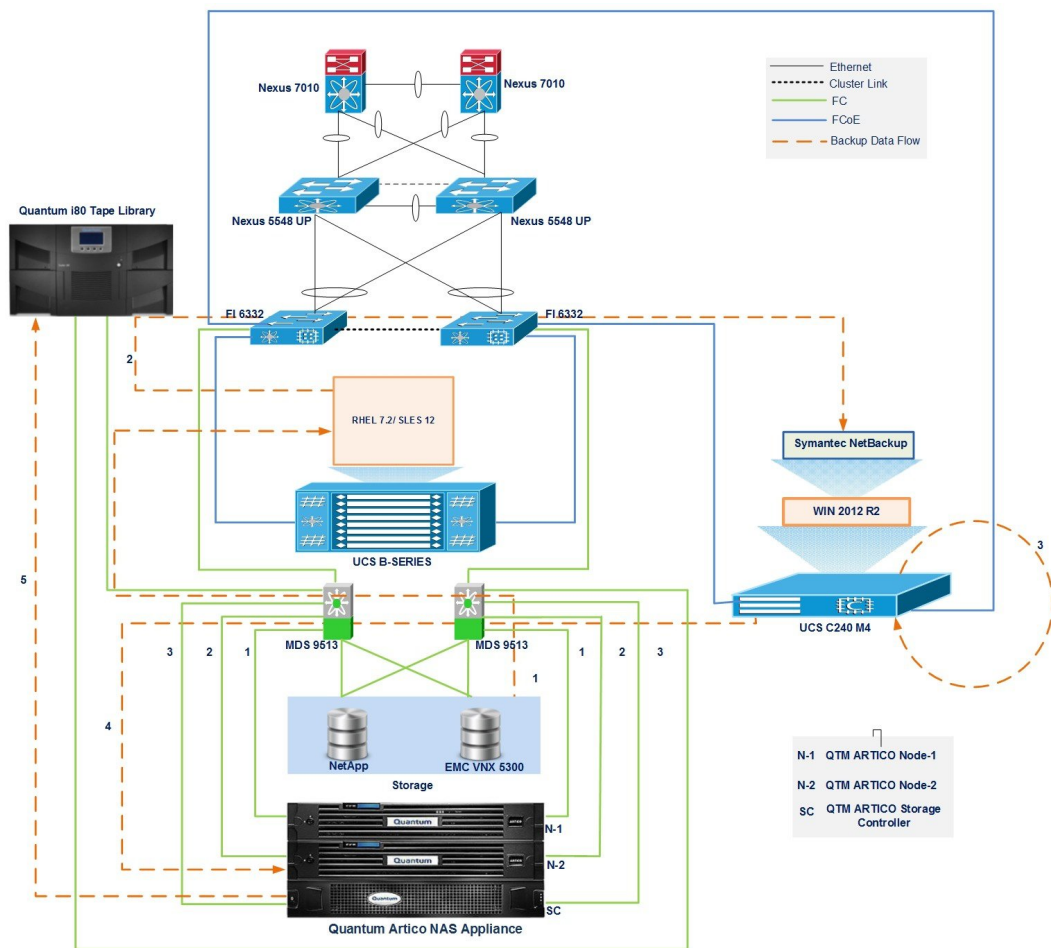
Backup Data flows		
Step	From	To
1	Disk Array (NetApp FAS & EMC VNX)	VM in B series SAN based server
2	VM in B series SAN based server(Backup Client)	Backup Server
3	Backup Server	Backup Server Disk
4	Backup Server Disk	Quantum Artico Storage Appliance
5	Quantum Artico Storage Appliance	Quantum i80 Tape Library

Description:

- Backup of data files (Word,PDF, and Excel) from SLES 12/RHEL 7.2 to Backup Server Local HDD/De-Duplication disk and then Replicate the same to Artico Storage Appliance will replicate the backup data to attached Quantum i80 tape Library using defined Storage policy.
- Artico Storage Appliance will Recover the Files from Quantum i80 tape library by using various Recovery Options available on Symantec NetBackup 8.0 Software.

Linux Files/Folders- Baremetal

Figure 10: Fig 10: Topology in use



Backup Data flows		
Step	From	To
1	Disk Array (NetApp FAS & EMC VNX)	B series SAN based baremetal server

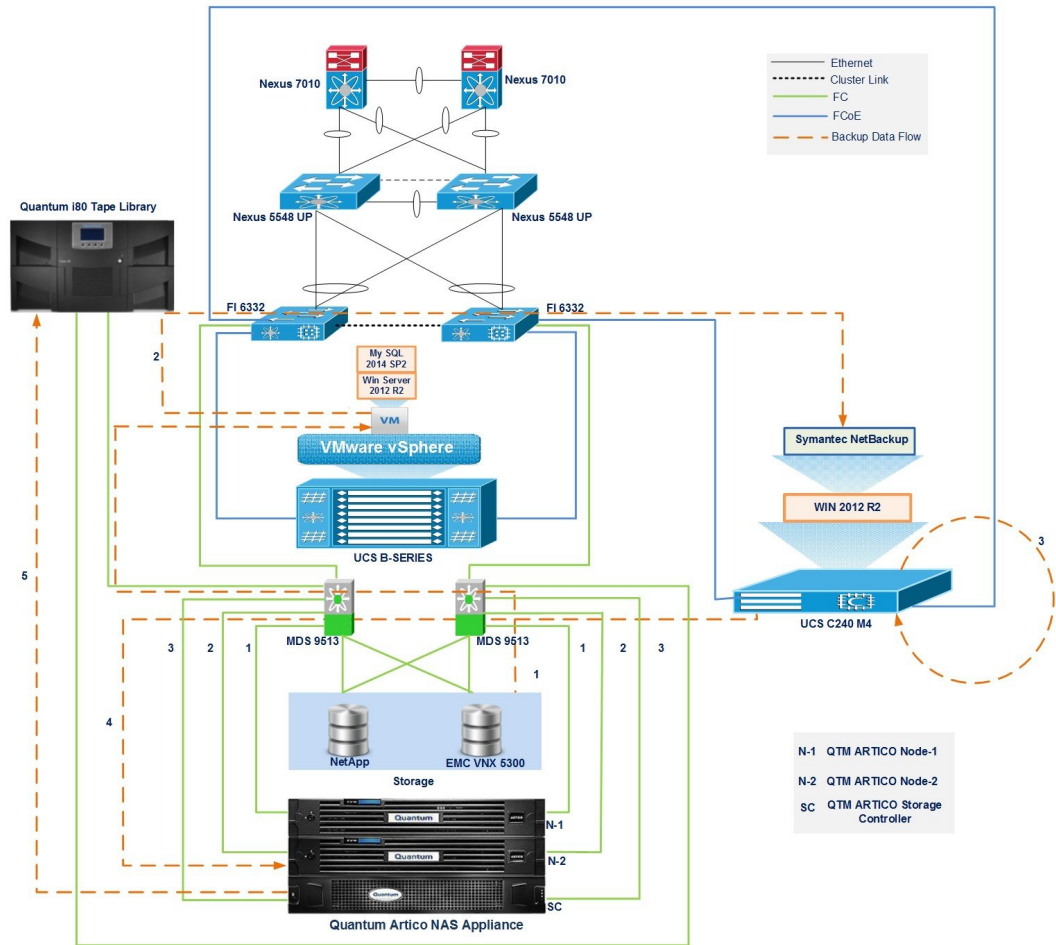
Backup Data flows		
2	B series SAN based baremetal server(Backup Client)	Backup Server

Description:

- Backup of data files (Word,PDF, and Excel) from RHEL 7.2/ SLES 12.2 to Backup Server Local HDD/De-duplication disk and then Replicate the same to Artico Storage Appliance will replicate the backup data to attached Quantum i80 tape Library using defined Storage policy.
- Quantum Artico Storage Appliance will recover files from Quantum i80 tape library by using various Recovery Options available on Symantec NetBackup 8.0 Software.

MS SQL

Figure 11: Fig 11: Topology in use



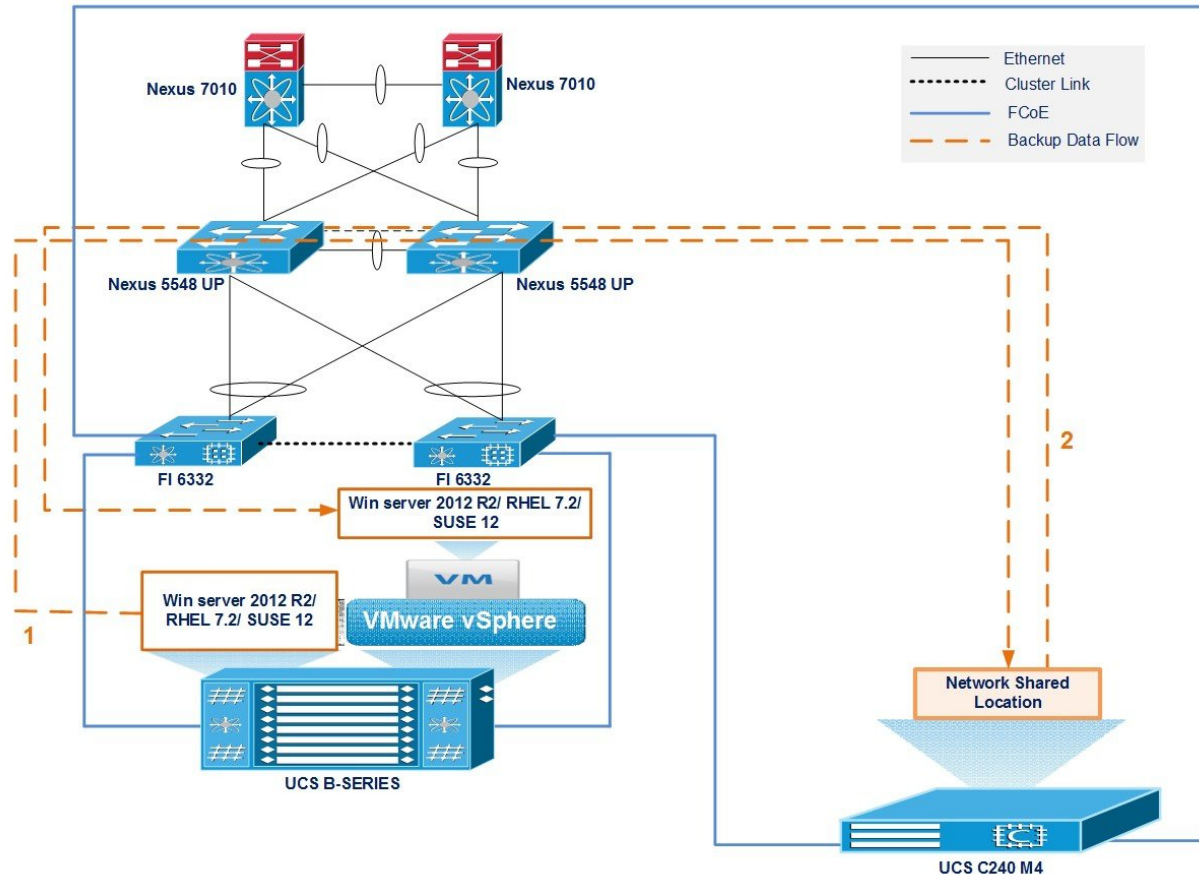
Backup Data flows		
Step	From	To
1	Disk Array (NetApp FAS & EMC VNX)	VM in B series SAN based server
2	VM in B series SAN based server(Backup Client)	Backup Server
3	Backup Server	Backup Server Disk
4	Backup Server Disk	Quantum Artico Storage Appliance
5	Quantum Artico Storage Appliance	Quantum i80 Tape Library

Description:

- Backup of Data base from MS SQL 2014 SP2 Server to Backup Server Local HDD and then Replicate the same to Artico Storage Appliance will replicate the backup data to attached Quantum i80 tape Library using defined Storage policy.
- Quantum Artico Storage Appliance will recover Files from Quantum i80 tape library by using various Recovery Options available on Symantec NetBackup 8.0 Software.

P2V (LOCAL boot)

Figure 12: Fig 12: Topology in use



Backup Data flows		
Step	From	To
1	B series Baremetal Server(Backup Client)	Network share/ Local HDD of Backup Server
2	Network share/ Local HDD of Backup Server	VM on ESXi on other B Series Server

Description:

- Backup of Baremetal Server to Network share/ Local HDD of Backup Server using the Backup software.
- Recover the machine from Network share/ Local HDD of Backup Server as a VM on ESXi installed on other B Series Server by using various Recovery Options available on the Backup Software.



Issues

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Issues

Quantum Artico Storage Appliance NAS solution failed to work with Cisco Nexus Switches

- Quantum Artico Storage Appliance supports Intel 850nm LASER PROD class 1 21CFR1040.10
- Cisco Nexus Switch supports Cisco SFP 10G LR class 1 10-2457-01
- Cross interoperability of SFPs is not working in Quantum Artico Storage Appliance and Nexus Switches.
- Quantum Artico Storage Appliance throws SFP+ validation error with Cisco SFP 10G LR class 1 10-2457-01

Related Documentation

Cisco Servers -Unified Computing

<http://www.cisco.com/c/en/us/products/servers-unified-computing/index.html>

Cisco 9300 -8e SAS HBA Adaptor

<http://www.avagotech.com/products/server-storage/host-bus-adapters/sas-9300-8e>

Symantec NetBackup 8.0

https://www.veritas.com/support/en_US/article.000116412

https://www.veritas.com/support/en_US/article.000115725

https://www.veritas.com/support/en_US/article.000116389

Quantum Artico Storage Appliance

<http://www.quantum.com/products/archive-storage/artico-nas/index.aspx>

<https://www.google.co.in/>

<http://www.cisco.com/c/en/us/products/servers-unified-computing/index.html>

