# Backup Solution Testing on Cisco C-Series Server using CA ARCserve Backup

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# Backup Solution Testing

## Overview

This program Backup Testing (Backup to Disk/De-duplication Disk and Replicate to Tape) validates data backup from the Windows and Linux operating systems on the Cisco UCS environment. Backup data are stored in the Local HDD/De-duplication Disk and replicated to Quantum i80 External Tape Library . The objective of Backup Testing is to verify the Backup/Restore of Data files, entire disks of Windows 2012 R2, Linux SLES 11.3, RHEL 7.1, MS SQL, UCS Central and VM's by the backup software (CA ARCserve R17.0).

**Acronyms**

| Acronym | Description |
|---------|-------------|
| BDR | Baremetal Disaster Recovery |
| CNA | Converged Network Adapter |
| FI | Fabric Interconnect |
| FC | Fibre Channel |
| Gb | Gigabit Ethernet |
| GB/S | Gigabit per Second |
| HDD | Hard Disk Drive |
| JOS | Japanese Operating System |
| LUN | Logical Unit Number |
| MS | Microsoft |
| OS | Operating System |
| PCI | Peripheral Component Interface |
| PCIe | Peripheral Component Interface Express |

| Acronym | Description |
|---------|-------------|
| RAID | Redundant Array of Independent Disks |
| RDM | Raw Device Mapping |
| RHEL | RedHat Enterprise Linux |
| SLES | SUSE Linux Enterprise Server |
| SP | Service Pack |
| SQL | Structured Query Language |
| 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 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:

- JOS Windows Server 2012 R2(x64) 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. CA ARCserve R17.0 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 i80 External Tape Library using CA ARCserve R17.0 backup software

- 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 7 SP1, Windows Server 2012 R2, RHEL 7.0 and SLES 11.3 JOS are deployed as VMs.

- Data backup from the Windows Server 2012 R2, RHEL 7.0 and SLES 11.3 JOS are deployed in baremetal servers

- Full VM Backup of Windows 2012 R2 (x64), RHEL 7.0 and SLES 11.3 in ESXi 6.0 are deployed in UCS B Series servers (B200 M4, B460 M4, B260 M4) for Backup and Recovery to Same/Different host

- Cisco UCS Central VM is also deployed in UCS B Series servers (B200 M4, B460 M4, B260 M4) for Backup and Recovery to Same/Different host

- MS SQL Server 2014 Sp1 is installed in windows 2012 R2 (x64) VM for Database Backup. 15GB RDM is mapped to this VM for the database creation
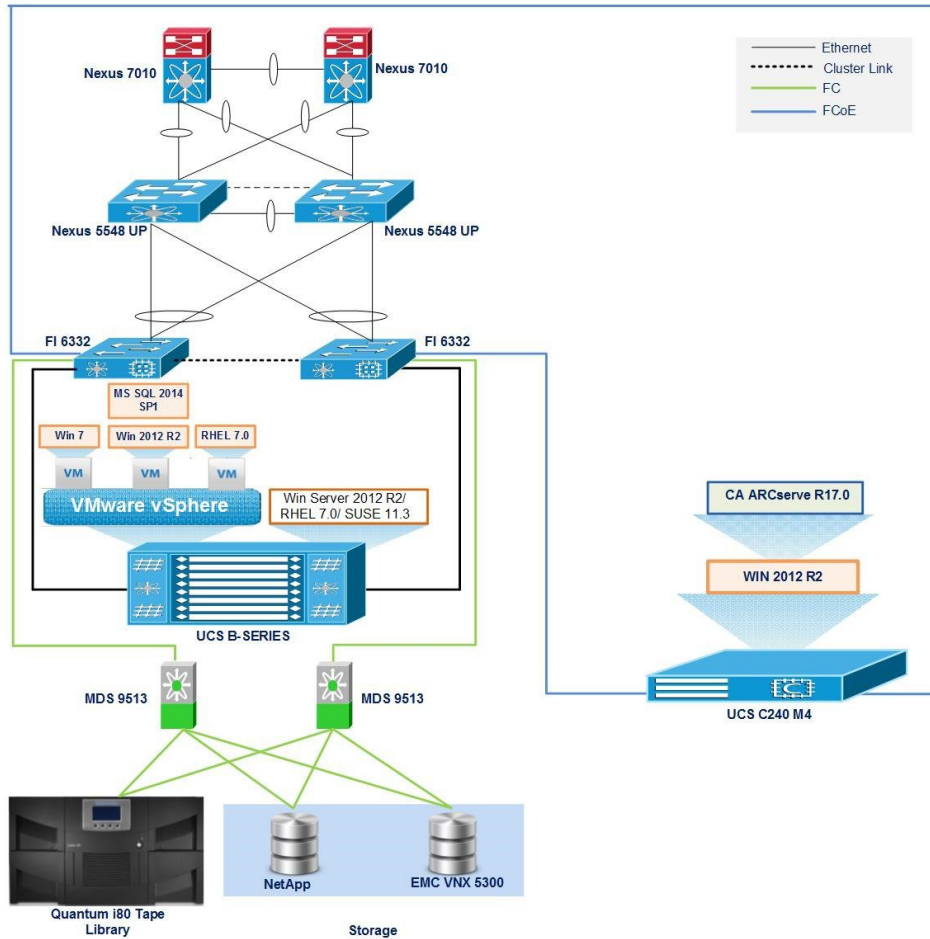
# Test Topology and Environment Matrix

## Test Topology

*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(2b) |
| CIMC | 2.0(13e) |
| **Adapters** | |
| Cisco UCS VIC 1380 | 4.1(2d) |
| **Infra** | |
| Nexus 7010 | 7.2(1)D1(1) |

| Component | Version |
|---|---|
| Nexus 5548 UP | 7.2(1)N1(1) |
| MDS 9513 | 6.2(13b) |
| **Backup Software** | |
| CA ARCserve Backup | R17.0 |
| **Operating Systems** | |
| Windows OS | Windows 7 Enterprise SP1 x64 (Japanese) |
| Windows Server OS | Windows Server 2012 R2 x64 (Japanese) |
| RHEL | Redhat Enterprise Linux 7.0 x64 (Japanese) |
| SLES | SUSE Linux Enterprise Server 11.3 (Japanese) |
| **Data Base** | |
| MS SQL server | Microsoft SQL Server 2014 SP1(Japanese) |
| **Hypervisor** | |
| ESXi | VMware ESXi 6.0 |
| **UCS Central** | |
| UCS Central | 1.5(1a) |
| **Tape Library** | |
| Quantum i80 | NA |
| **PCI Adapter** | |
| Cisco UCS VIC 1227 | 4.1(2d) |

**Storage Array**

| Storage | Firmware |
|---|---|
| NetApp 2554 | 8.3.2 CMode |
| EMC VNX | 05.32.000.5.218 |

# Implementation and Features Tested

## 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 i80 External Tape Library through the 8 GB/s FC uplink of the FI.
- Esxi 6.0 is installed in the local HDD of the Client servers (UCS B200 M4, B460 M4, B260 M4).
- VMs in client servers (UCS B200 M4, B460 M4, B260 M4) are deployed in the LUN of EMC VNX and Netapp storages.
- VMware vCenter 6.0 is deployed to Manage the ESXi host.
- CA ARCserve Backup R17.0 backup client agent for Windows is installed on the Windows Server 2012 R2 x64 and Windows 7 SP1 x64.
- CA ARCserve Backup R17.0 client agent for SQL is installed on top of Windows Server 2012 R2 by adding required privileges.
- CA ARCserve Backup R17.0 client agent for Linux is also installed on SLES 11.3 and RHEL 7.0.
- VMware Vcenter 6.0 is integrated with CA ARCserve 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 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.

### 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

Deduplication is the process of minimizing storage space taken by the data by detecting data repetition and storing the identical data only once. Deduplication 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.

### Disk Staging Backup

This is a process in which first data is copied on a Storage Unit then copied to another Storage unit. Images expire after copying data to secondary unit.

### 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 required for storage. Compression also decreases the amount of data that travels over the network as well as the network load.

The two different ways to compress data in a backup job are

- **At agen**t--Select this option to compress the backup data on the system where the agent is installed and running.

- **At backup server**--Select this option to compress the backup data at the ARCserve Backup server during the backup process. This option lets you compress files before backing them up using a software compression algorithm

### Encryption

ARCserve Backup provides the flexibility to use encryption to protect sensitive data during various stages of the backup process. Generally, during the backup process, the sooner the data encryption occurs, the more secure your information will be. However, speed, performance, and scheduling restrictions are also factors to consider when choosing the best approach to securing your data.

The three different ways to encrypt data in a backup job are:

- Encryption at the agent server (or source) prior to the backup process

- Encryption at the ARCserve Backup server during the backup process

• Encryption at the ARCserve Backup server during the migration process (for a staging job)

**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 CA ARCserve R17.0.
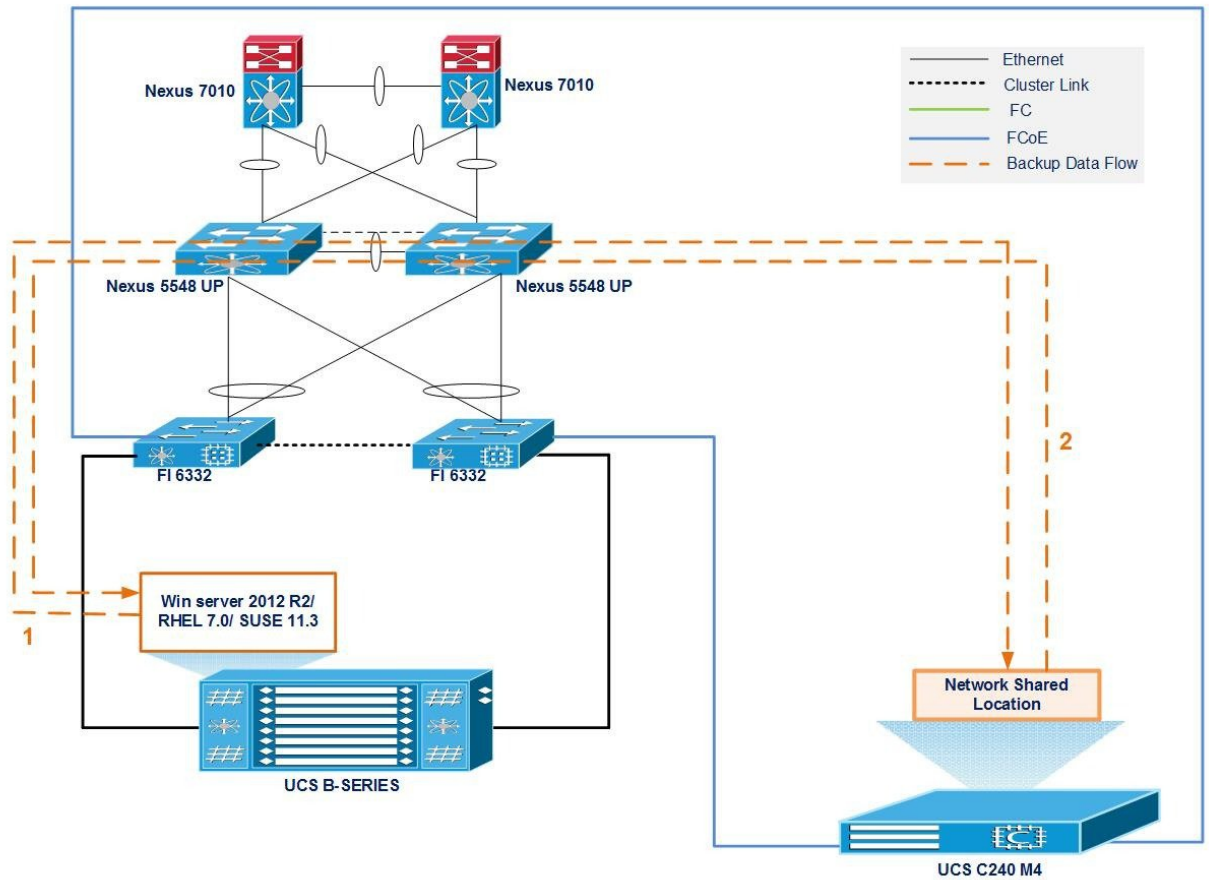
C H A P T E R **4**

# Test Scenarios for UCS with CA ARCserve Backup R17.0

# Disaster Recovery for Similar Hardware

*Fig 2: Topology in Use*

| Backup Data flows | | |
|---|---|---|
| **Step** | **From** | **To** |
| 1 | Backup of B Series Server(Entire Disk) | Network Share |
| 2 | Network Share | B Series Server |

**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 Similar hardware from CA ARCserve Backup R17.0 Recover Option
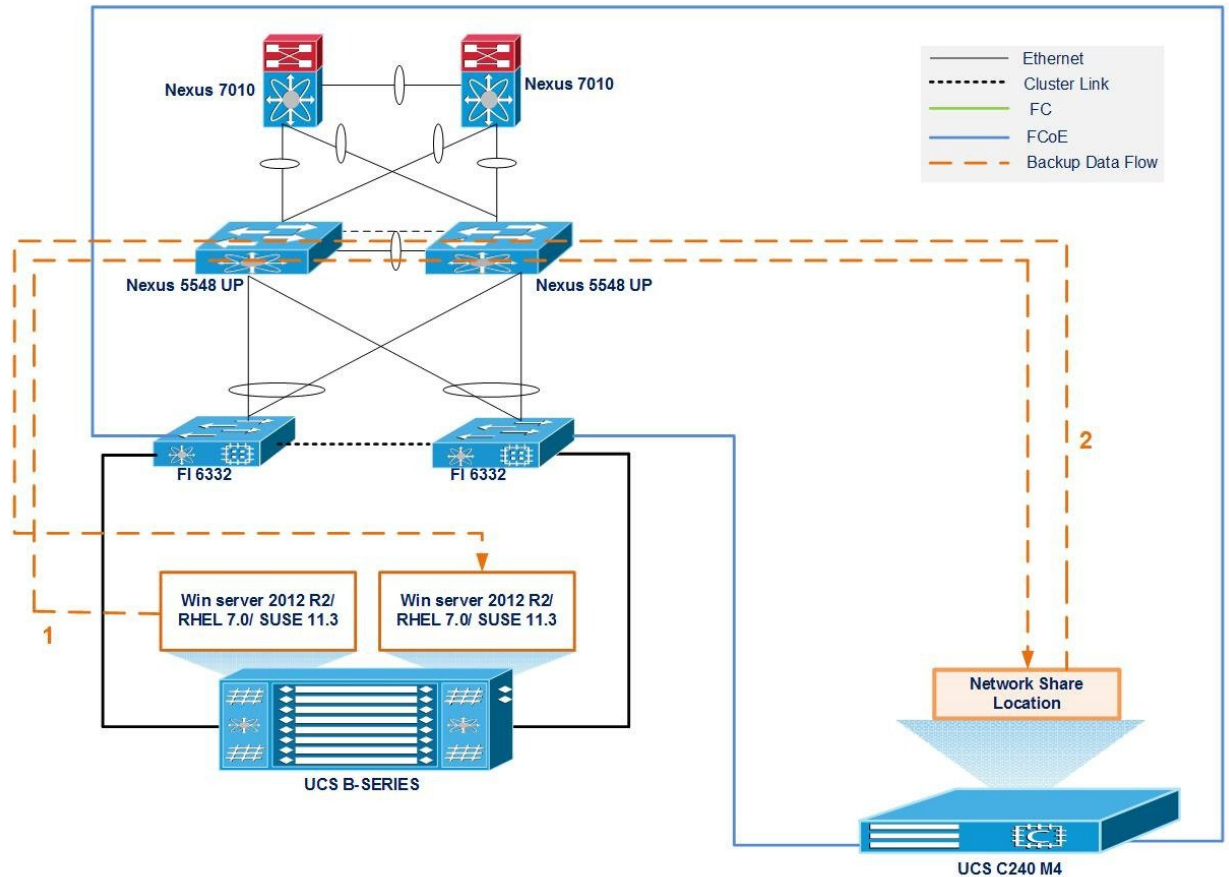
*Fig 3: Topology in Use*
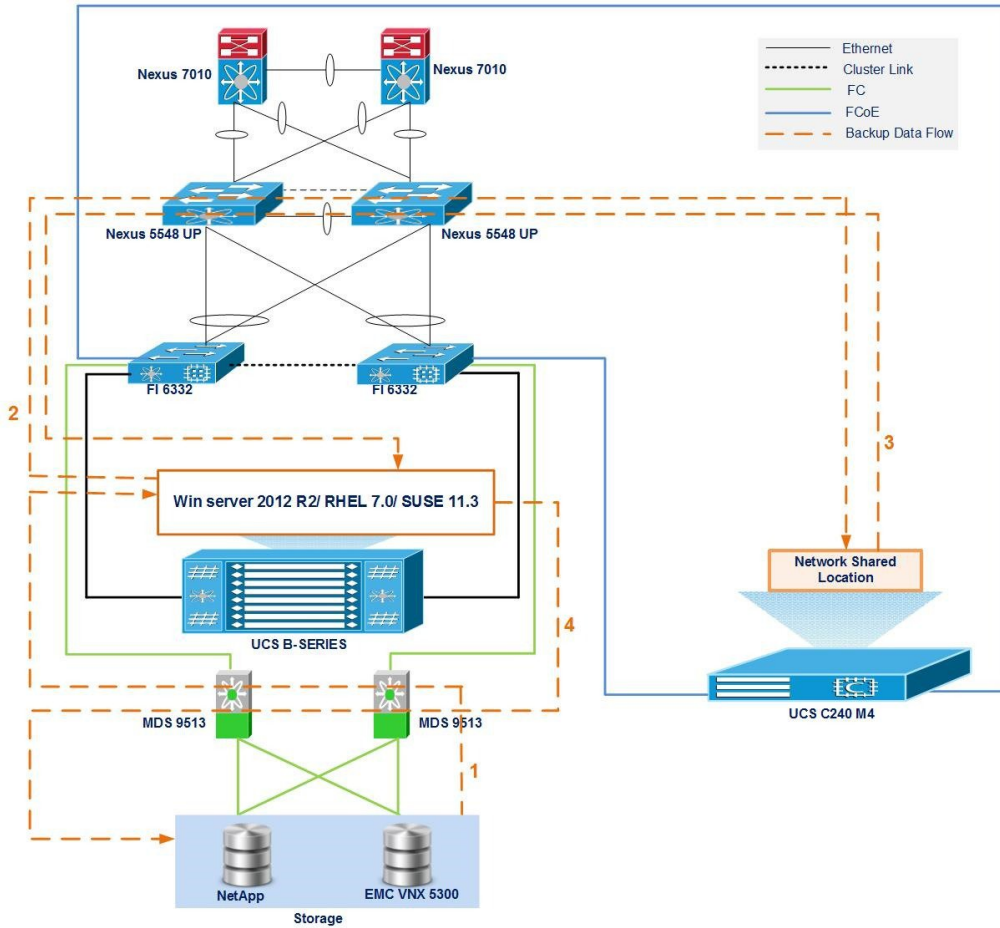
| Backup Data flows | | |
|---|---|---|
| **Step** | **From** | **To** |
| 1 | Disk array(NetApp, EMC VNX) | B Series Server |
| 2 | B Series Server(Entire Disks) | Network Share |
| 3 | Network Share | B Series Server |
| 4 | B Series Server | Disk array(NetApp, EMC VNX) |

**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 Similar hardware from CA ARCserve Backup R17.0 Recover Option

# Disaster Recovery for Dis-Similar Hardware

*Fig 4: Topology in Use*



| Backup Data flows | | |
|---|---|---|
| Step | From | To |
| 1 | Backup of B Series Server(Entire Disk) | Network Share |
| 2 | Network Share | B Series Server |

**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 Dis-Similar hardware from CA ARCserve Backup R17.0 Recover Option
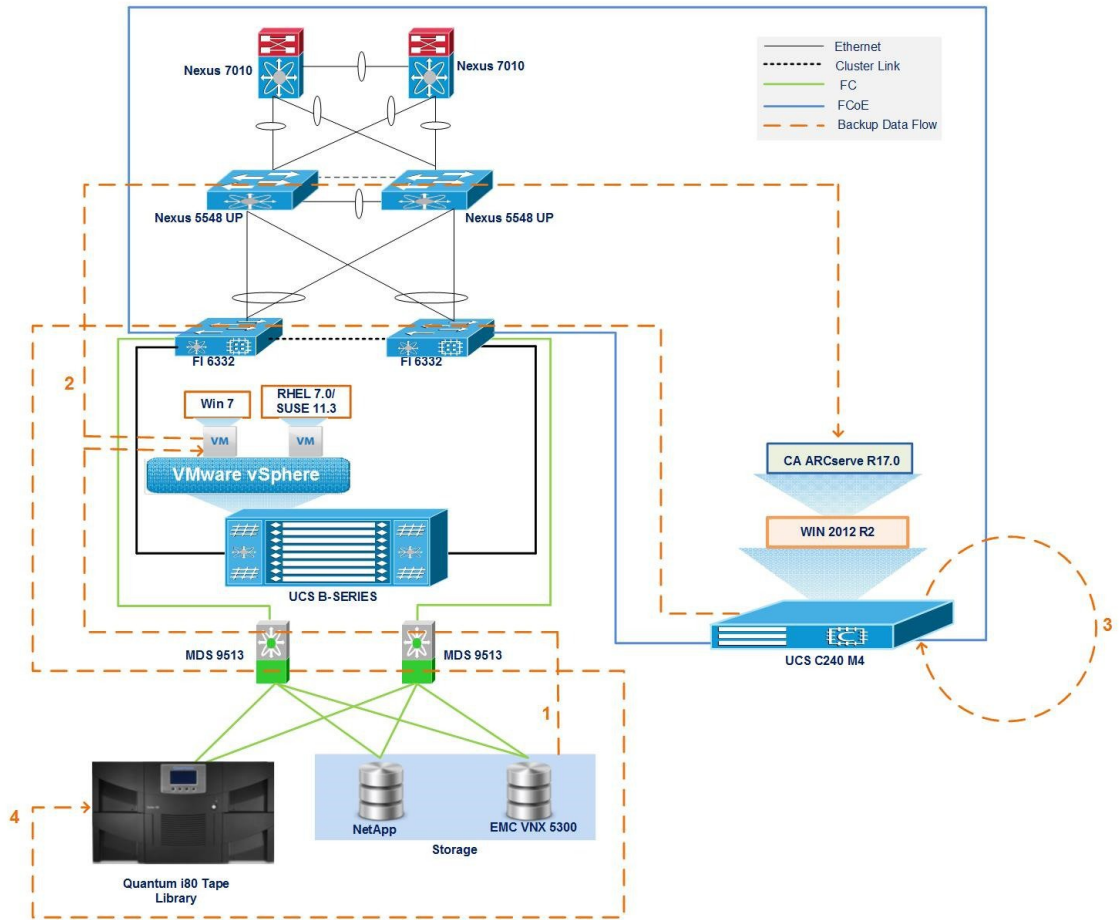
*Fig 5: Topology in Use*
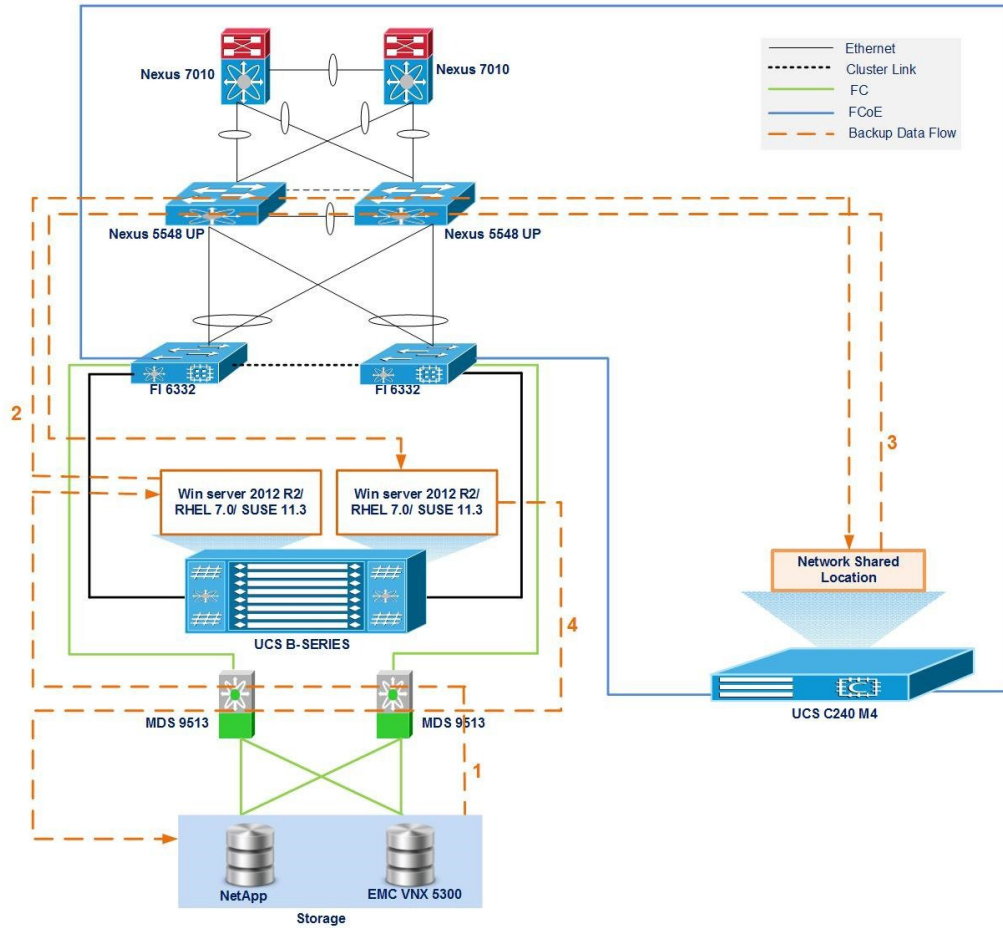
| Backup Data flows | | |
|---|---|---|
| **Step** | **From** | **To** |
| 1 | Disk array(NetApp, EMC VNX) | B Series Server |
| 2 | B Series Server(Entire Disks) | Network Share |
| 3 | Network Share | B Series Server (Different Server) |
| 4 | B Series Server (Different Server) | Disk array(NetApp, EMC VNX) |

**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 Dis-Similar hardware from CA ARCserve Backup R17.0 Recover Option
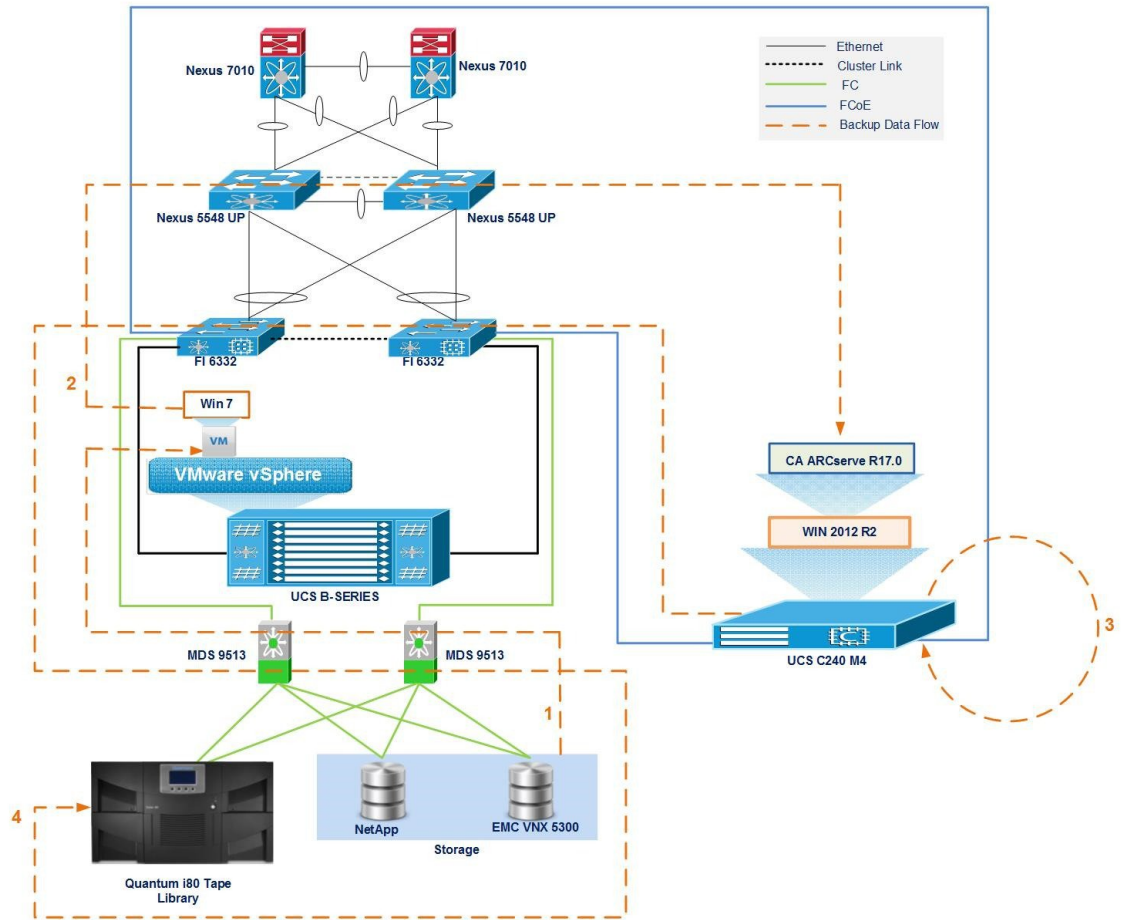
# Full VM

*Fig 6: Topology in use*



| Backup Data flows | | |
|---|---|---|
| **Step** | **From** | **To** |
| 1 | Disk Array (NetApp, 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 | Quantum i80 Tape Library |

• Select the VM to be backed up using CA ARCserve Backup R17.0

• 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 and Folders-VM
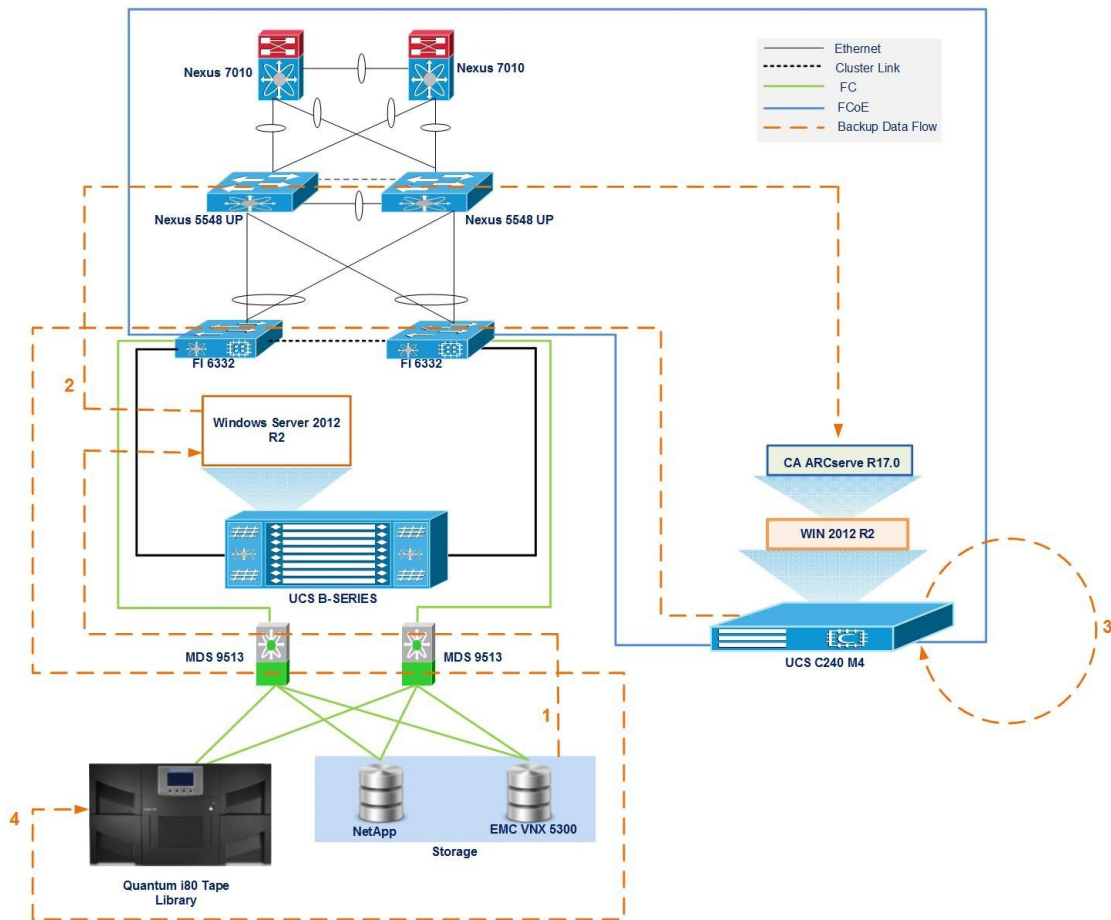
*Fig 7: Topology in Use*



| Backup Data flows | | |
|---|---|---|
| **Step** | **From** | **To** |
| 1 | Disk Array (NetApp, 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 | Quantum i80 Tape Library |

**Description:**

- Backup of data files (Word, PDF, and Excel) from Windows 7 JOS to Backup Server LocalHDD/De-duplication disk and then replicate the same to Quantum i80 Tape Library using CA ARCserve Backup R17.0 software.

- Recover the Files either from Local HDD/De-duplication disk or Quantum i80 Tape Library by using various Recovery Options available on CA ARCserve Backup R17.0 Software.

# Windows Files and Folders-Baremetal

*Fig 8: Topology in Use*



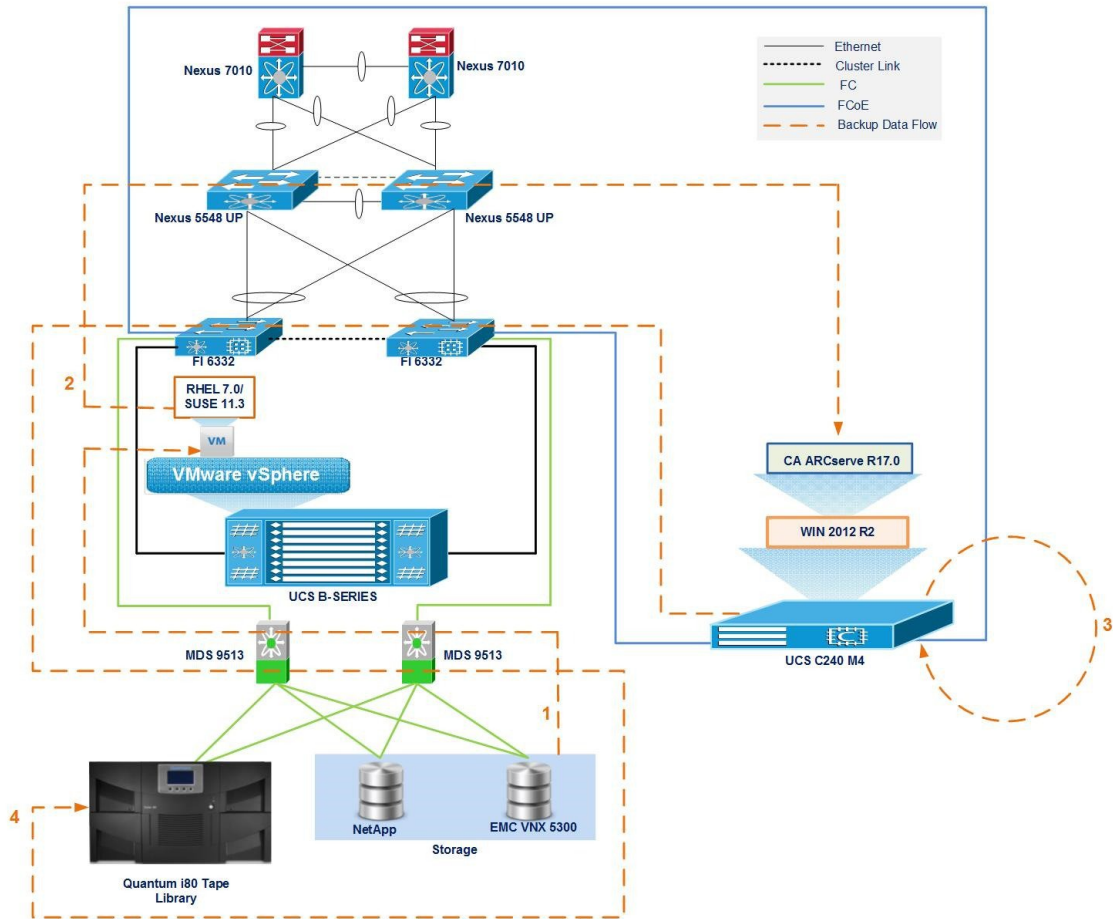| Backup Data flows | | |
| --- | --- | --- |
| **Step** | **From** | **To** |
| 1 | Disk Array (NetApp, EMC VNX) | B series SAN based Baremetal Server |

| Backup Data flows | | |
|---|---|---|
| 2 | B series SAN based Baremetal Server (Backup Client) | Backup Server |
| 3 | Backup Server | Backup Server Disk |
| 4 | Backup Server | Quantum i80 Tape Library |

**Description:**

- Backup of data files (Word, PDF, and Excel) from Windows 7 JOS to Backup Server LocalHDD/De-duplication disk and then replicate the same to Quantum i80 Tape Library using CA ARCserve Backup R17.0 software.

- Recover the Files either from Local HDD/De-duplication disk or Quantum i80 Tape Library by using various Recovery Options available on CA ARCserve Backup R17.0 Software.

# Linux Files and Folders-VM
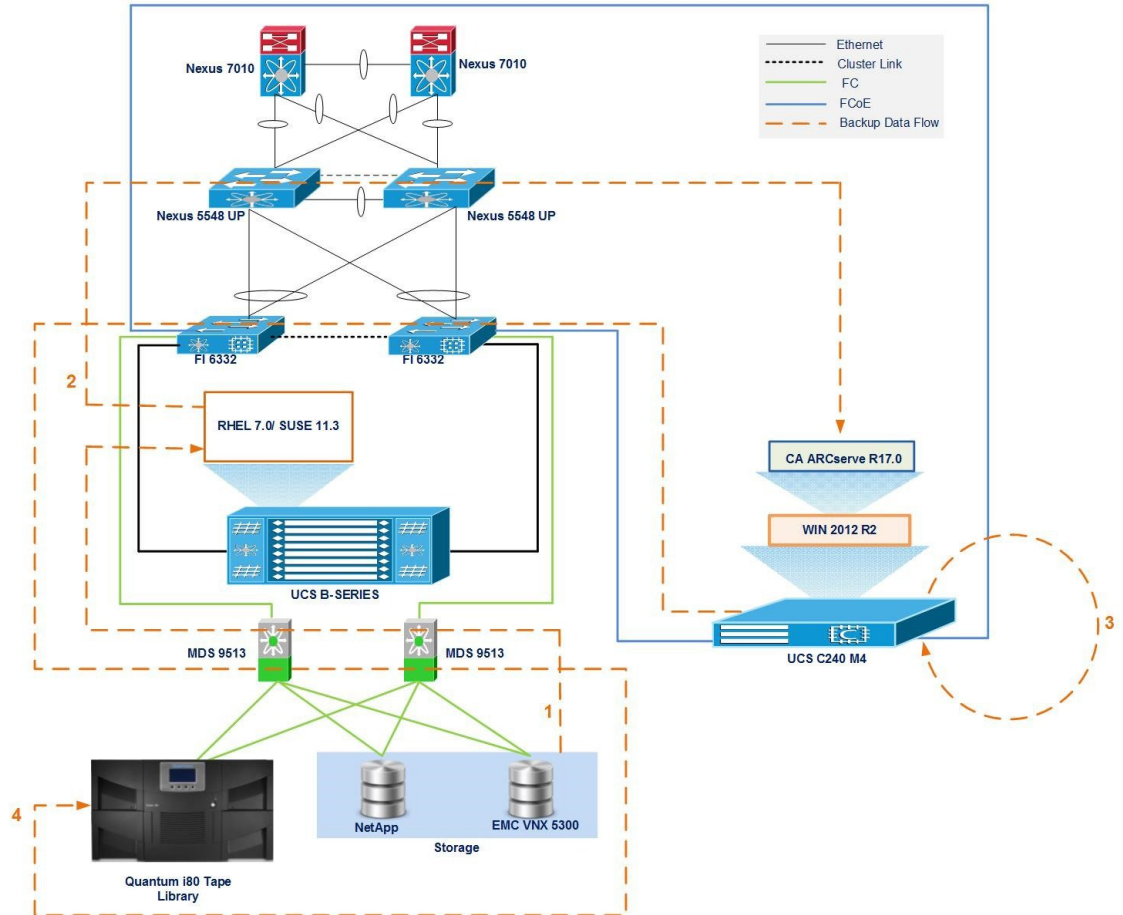
*Fig 9: Topology in use*

| Backup Data flows | | |
|---|---|---|
| **Step** | **From** | **To** |
| 1 | Disk Array (NetApp, 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 | Quantum i80 Tape Library |

- Backup of data files (Word, PDF, and Excel) from Linux OS (RHEL 7.0/SUSE 11.3)to Backup Server LocalHDD/De-duplication disk and then replicate the same to Quantum i80 Tape Library using CA ARCserve Backup R17.0 software.

- Recover the Files either from Local HDD/De-duplication disk or Quantum i80 Tape Library by using various Recovery Options available on CA ARCserve Backup R17.0 Software.

# Linux Files and Folders-Baremetal

*Fig 10: Topology in use*



**Backup Data flows**

| Step | From | To |
|------|------|-----|
| 1 | Disk Array (NetApp, 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 | Quantum i80 Tape Library |

**Description:**

- Backup of data files (Word, PDF, and Excel) from Linux OS (RHEL 7.0/SUSE 11.3) to Backup Server LocalHDD/De-duplication disk and then replicate the same to Quantum i80 Tape Library using CA ARCserve Backup R17.0 software.

- Recover the Files either from Local HDD/De-duplication disk or Quantum i80 Tape Library by using various Recovery Options available on CA ARCserve Backup R17.0 Software.

# SQL Backup

*Fig 11: Topology in use*
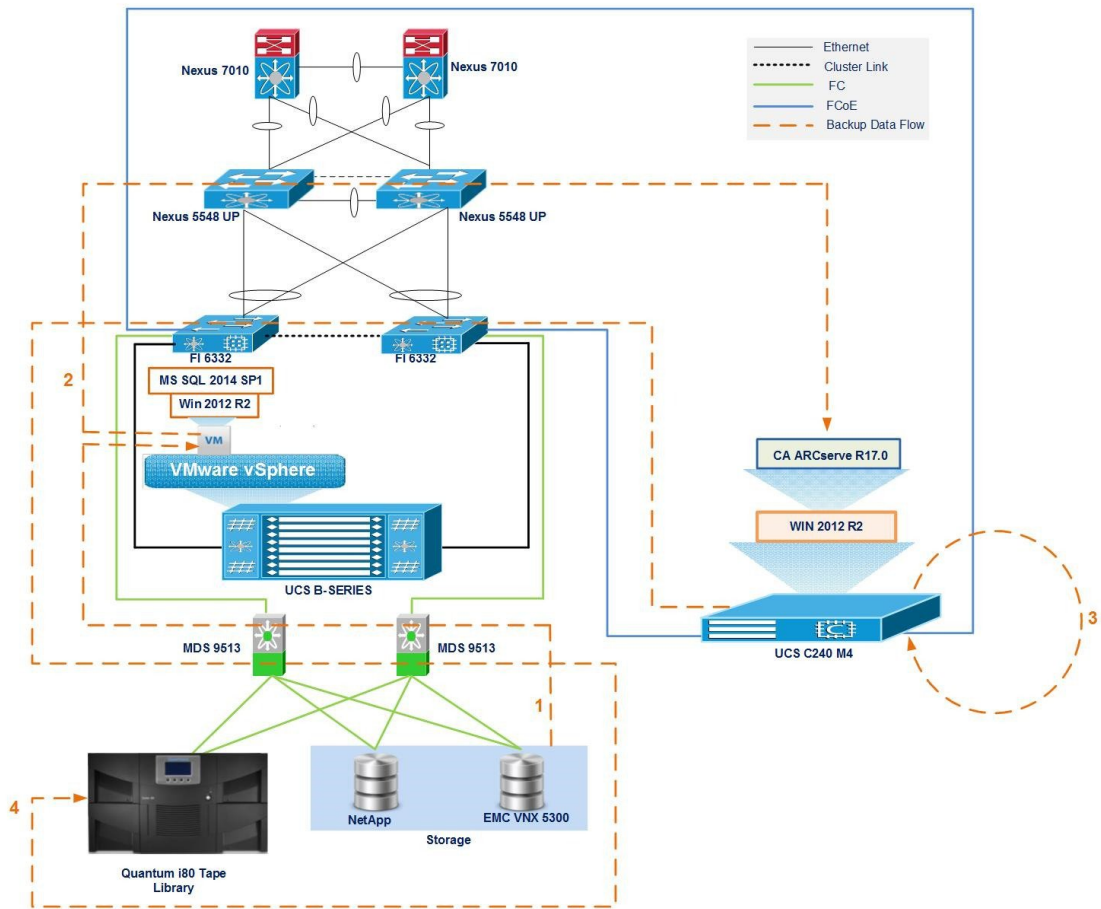


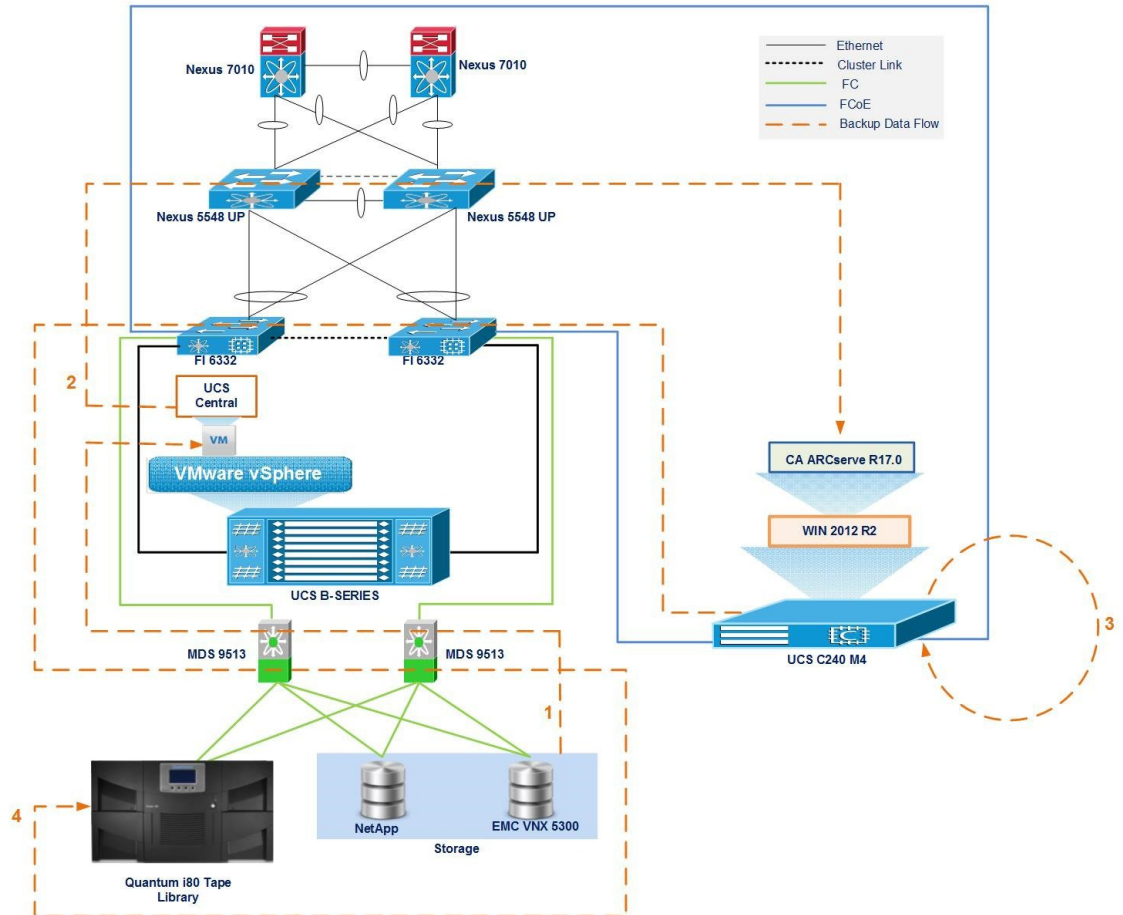| Backup Data flow | | |
|---|---|---|
| **Step** | **From** | **To** |
| 1 | Disk Array (NetApp, EMC VNX) | VM in B series SAN based Server |
| 2 | VM in B series SAN based Server(Backup Client) | Backup Server |
| 3 | Backup Server | Backup Server Disk |

| Backup Data flow | | |
|---|---|---|
| 4 | Backup Server | Quantum i80 Tape Library |

**Description:**

- Backup of database from MS SQL 2014 SP1 Server to Backup Server Local HDD/De-duplication disk and then replicate the same to Quantum i80 Tape Library using CA ARCserve Backup R17.0 software.

- Recover the Files either from Local HDD/De-duplication disk or Quantum i80 Tape Library by using various Recovery Options available on CA ARCserve Backup R17.0 Software.

# UCS Central Backup

*Fig 12: Topology in use*



| Backup Data flows | | |
|---|---|---|
| **Step** | **From** | **To** |

| Backup Data flows | | |
|---|---|---|
| 1 | Disk Array (NetApp, 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 | Quantum i80 Tape Library |

**Description:**

- Backup of UCS Central to Backup Server LocalHDD/De-duplication disk and then replicate the same to Quantum i80 Tape Library using CA ARCserve Backup R17.0 software.

- Recover the Files either from Local HDD/De-duplication disk or Quantum i80 Tape Library by using various Recovery Options available on CA ARCserve Backup R17.0 Software.

# Related Documentation

**Cisco Servers- Unified Computing**

http://www.cisco.com/en/US/docs/unified_computing/ucs/overview/guide/UCS_roadmap.html

**Software Download**

https://software.cisco.com/download/navigator.html

**CA ARCserve Backup**

https://arcserve.zendesk.com/hc/en-us/categories/200181035-Arcserve-Backup

**Quantum i80 Tape Library**

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