Commvault Backup Solution Testing on Cisco UCS C-Series Server with IBM Tape Library

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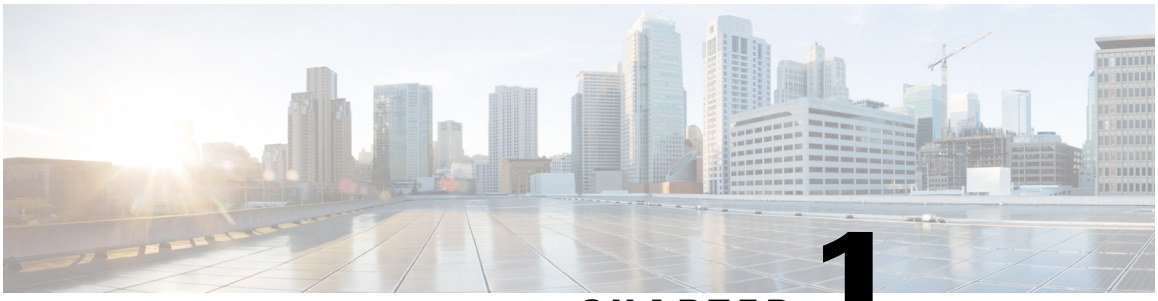


CHAPTER 1

Backup Solution Testing

- Overview, page 1
- Backup Test Strategy and Implementation, page 2

Overview

This program Backup Testing (Backup to Disk/De-duplication Disk/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/IBM System Storage 3573 L2U External Tape Library . The objective of Backup Testing is to verify the Backup/Restore of Data files, entire disks of Windows, RHEL and SUSE OS, MS SQL Data base and VMs by the backup software. (Commvault).

Acronyms

Acronym	Description
BDR	Baremetal Disaster Recovery
CNA	Converged Network Adapter
EOS	English Operating System
FI	Fabric Interconnect
Gb	Gigabit Ethernet
GB/S	Gigabit per Second
HBA	Host Bus Adapter
HDD	Hard Disk Drive
JOS	Japanese Operating System
LUN	Logical Unit Number
MS	Microsoft
OS	Operating System
P2V	Physical to Virtual

Acronym	Description
PCI	Peripheral Component Interface
PCIe	Peripheral Component Interface Express
RAID	Redundant Array of Independent Disks
RHEL	RedHat Enterprise Linux
SAS	Serial Attached SCSI
SCSI	Small Computer System Interface
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

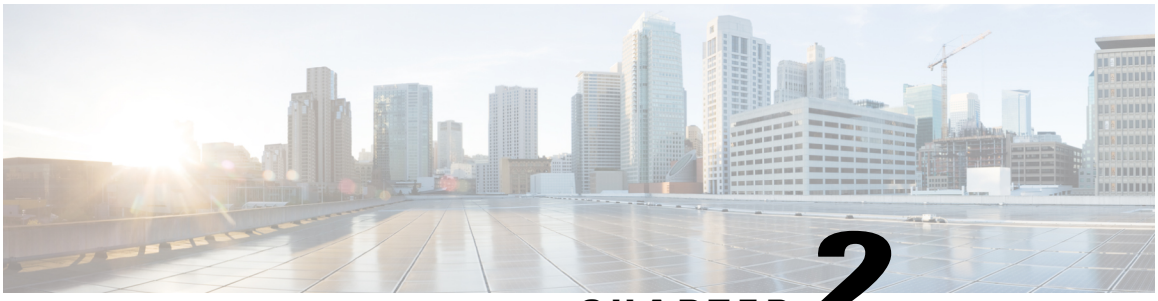
Backup Test Strategy and Implementation

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, RHEL 7.2 are installed on Local HDD/ LUN of the Cisco UCS B Series Baremetal Server (B460M4, B200M4, B260 M4) for Similar/ Dissimilar Hardware Disaster Recovery
- P2V Recovery of Windows and RHEL to VM is done using the Backup job of the BDR.
- Windows Server 2012 R2 JOS is installed on the local HDD of C240 M4 Server. Commvault 11.0 SP5 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 IBM System Storage 3573 L2U External SAS Tape Library using Backup software
- Cisco UCS 9300 -8E 12G SAS HBA adapter is used to connect the IBM External SAS Tape Library.
- VM's in client servers (UCS C240 M4) are deployed in the Local Datastore.
- 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 7.2 and SLES 12.2 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
- Windows Client Agent is installed on Windows Server 2012 R2, Windows 7 SP1 for Backup and Recovery.
- Linux Client agent isinstalled on RHEL 7.2, SLES 12.2 for Backup and Recovery.
- MS SQL Server 2014 Sp1 is installed in windows 2012 R2 VM for Database Backup.
- For Databse Backup, SQL Client Agent is installed by adding the required privilages.
- VMware vCenter 6.0 is integrated with Backup server for Agentless backup and recovery of VMs.
- Windows 7 SP1, RHEL 7.2, SUSE 12.2 are deployed as VMs in ESXi 6.0 Hypervisor for Full VM Backup and Recovery in UCS C240 M4 Client Server.
- Cisco UCS Central VM is also deployed in UCS C Series servers (UCS C240 M4) for Backup and Recovery.



CHAPTER 2

Test Topology and Environment Matrix

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Test Topology

Fig 1: Topology in use

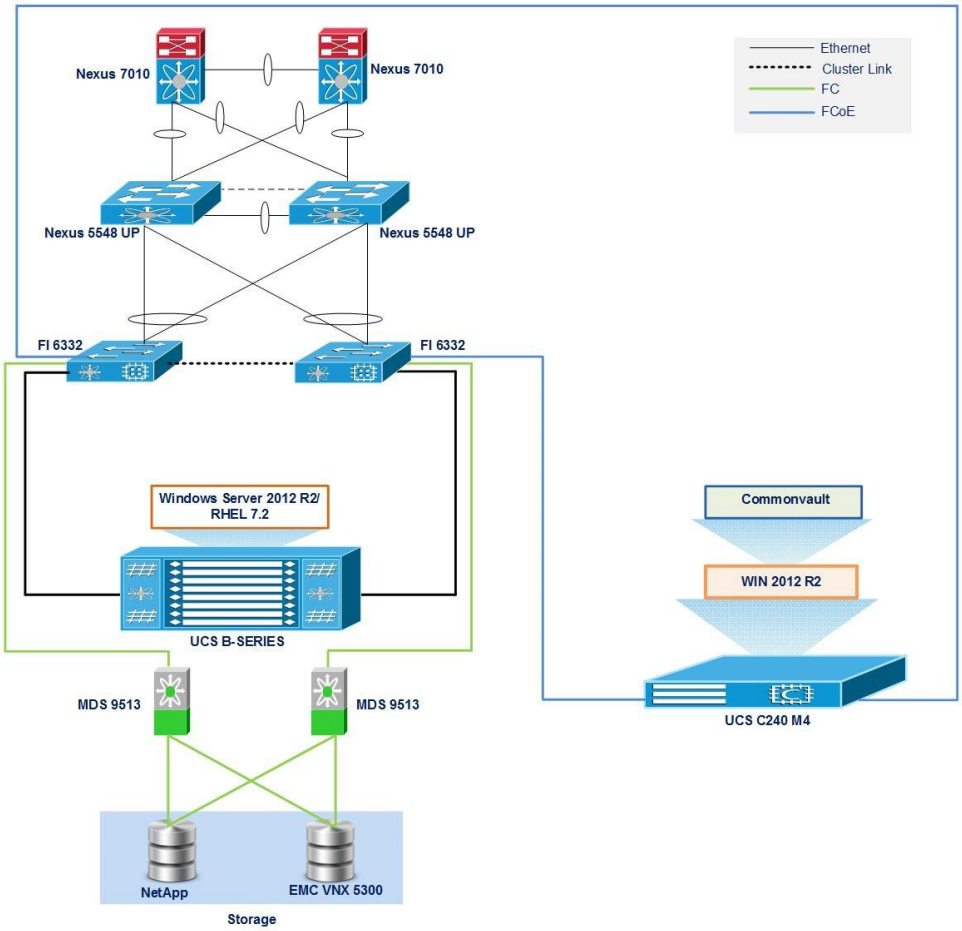
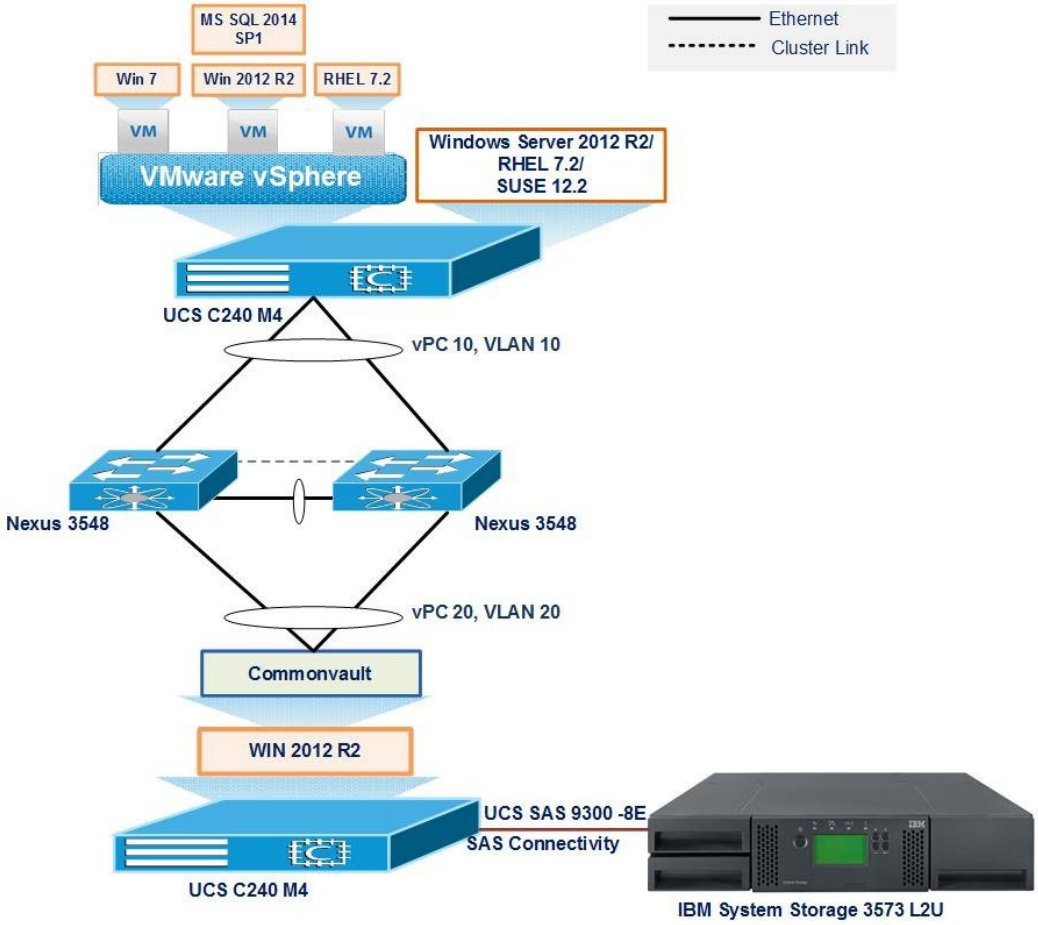


Fig 2: Topology in use



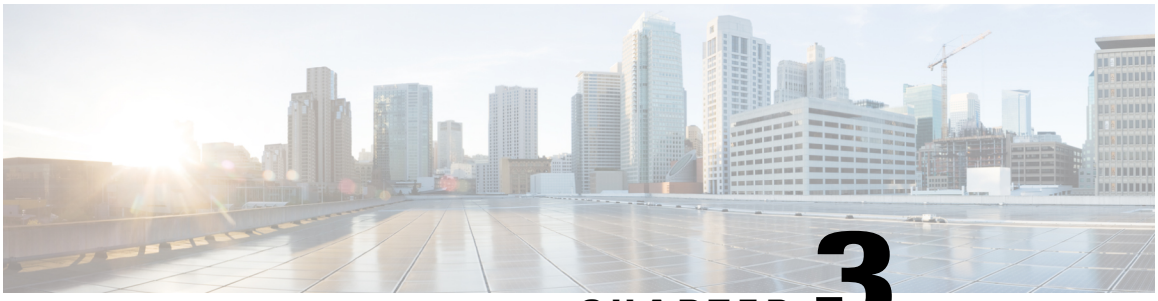
Environment Matrix

Component	Version
UCS	
Blade servers	Cisco UCS B200 M4, B260 M4, B460 M4
Rack Server	Cisco UCS C240 M4
UCSM	3.1(2c)
CIMC	3.0(1c)
Adapters	
Cisco UCS VIC 1380	4.1(2d)
Cisco UCS VIC 1340	4.1(2d)
Infra	

Component	Version
Nexus 7010	7.2(1)D1(1)
Nexus 5548 UP	7.2(1)N1(1)
Nexus 3548	6.0(2)A6(5a)
MDS 9513	6.2(13b)
Backup Software	
Commvault Backup	11.0 SP5
Operating Systems	
Windows OS	Windows 7 Enterprise SP1 x64 (Japanese)
Windows Server OS	Windows Server 2012 R2 x64 (Japanese)
RHEL	Redhat Enterprise Linux 7.2 x64 (Japanese)
SLES	SUSE Linux Enterprise Server 12.2 (Japanese)
Data Base	
MS SQL server	Microsoft SQL Server 2014 SP1(Japanese)
Hypervisor	
ESXi	VMware ESXi 6.0 (2494585)
UCS Central	
UCS Central	1.5(1b)
Tape Library	
IBM System Storage 3573 L2U	TS3100(E.20) with LTO5(G9N0)
PCI Adapter	
Cisco UCS VIC 1227	4.1(2d)
Cisco UCS 9300 -8E 12G SAS HBA	11.65.01.00-IT

Storage Array

Storage	Firmware
NetApp 2554	8.3.2 CMode
EMC VNX	05.32.000.5.218



CHAPTER 3

Features Tested

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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.

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.

Encryption

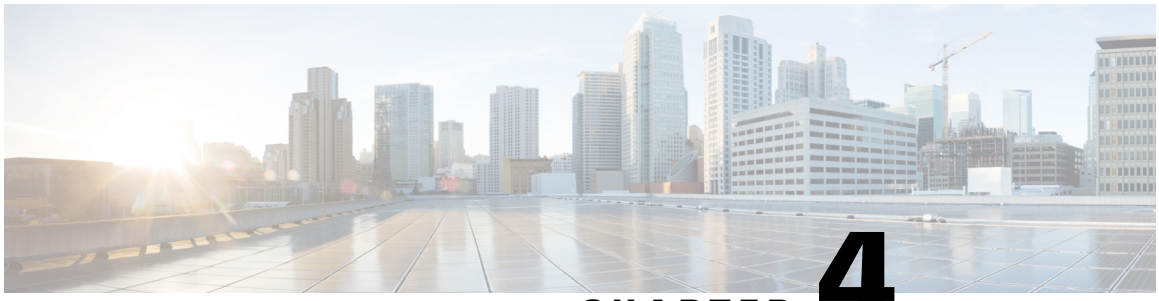
The Encryption attribute determines whether the backup should be encrypted. When the server initiates the backup, it passes on the Encryption policy attribute to the client in the backup request. The client compares the Encryption policy attribute to the Encryption host properties for the client. If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

AES 128: a data/file encryption technique that uses a 128-bit key to encrypt and decrypt data or files.

AES 256: a data/file encryption technique that uses a 256-bit key to encrypt and decrypt data or files.

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 7.6.1.



CHAPTER 4

Test Scenarios for UCS with Commvault Backup 11.0

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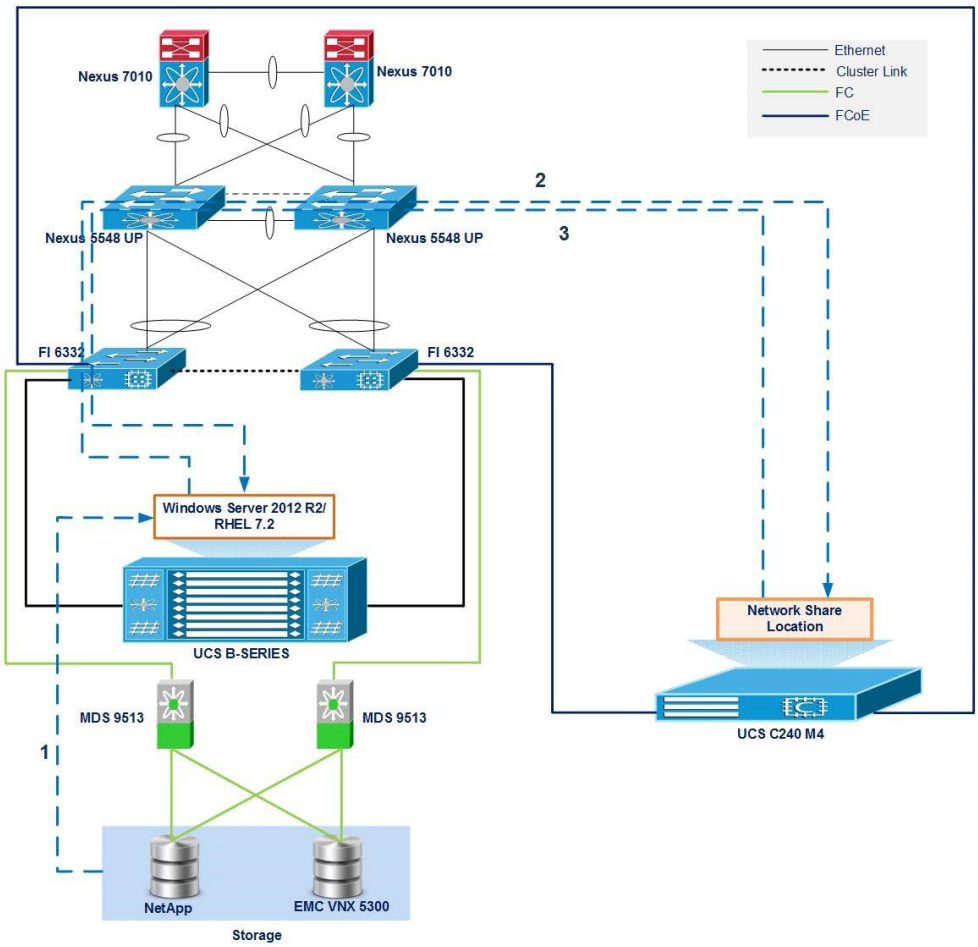
Disaster Recovery for Similar Hardware

Fig 3: Topology in use



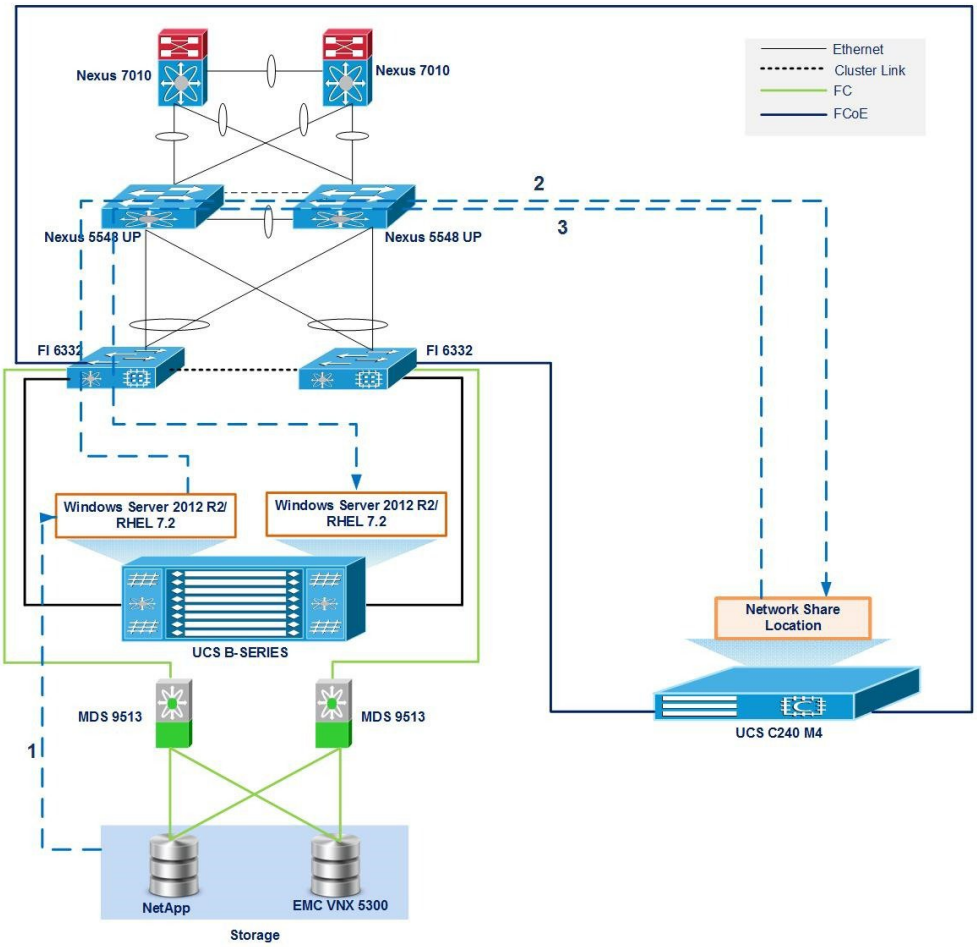
Backup Data flows		
Step	**From**	**To**
1	Disk Array (NetApp & EMC VNX)	B Series Baremetal Server
2	Backup of B Series Server(Entire Disk)	Network share/ Local HDD of Backup Server
3	Network share/ Local HDD of Backup Server	B Series Server

Description

- Backup of Entire Disks from Japanese RHEL 7.2 and Windows server 2012 R2 Operating System to Network share/ Local HDD of Backup Server.
- Restore the Entire Disks from Network share/ Local HDD of Backup Server to the Similar hardware using Backup Software.

Disaster Recovery for Dis-Similar Hardware

Fig 4: Topology in use



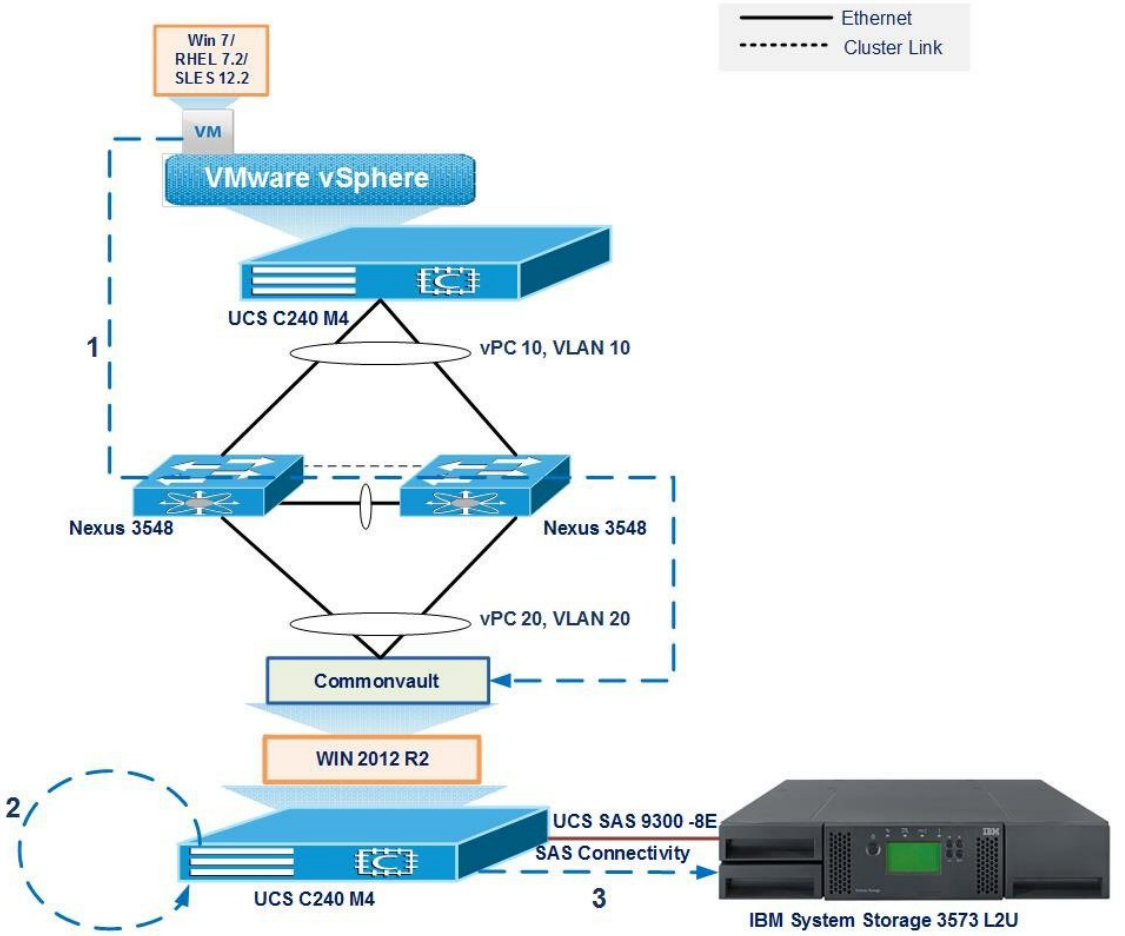
Backup Data flows		
Step	**From**	**To**
1	Disk Array (NetApp & EMC VNX)	B Series Baremetal Server
2	Backup of B Series Server(Entire Disk)	Network share/ Local HDD of Backup Server
3	Network share/ Local HDD of Backup Server	B Series Server (Different Server)

Description

- Backup of Entire Disks from Japanese RHEL 7.2 and Windows server 2012 R2 Operating System to Network share/ Local HDD of Backup Server.
- Restore the Entire Disks from Network share/ Local HDD of Backup Server to the Dis-Similar hardware using Backup Software.

Full VM

Fig 5: Topology in use



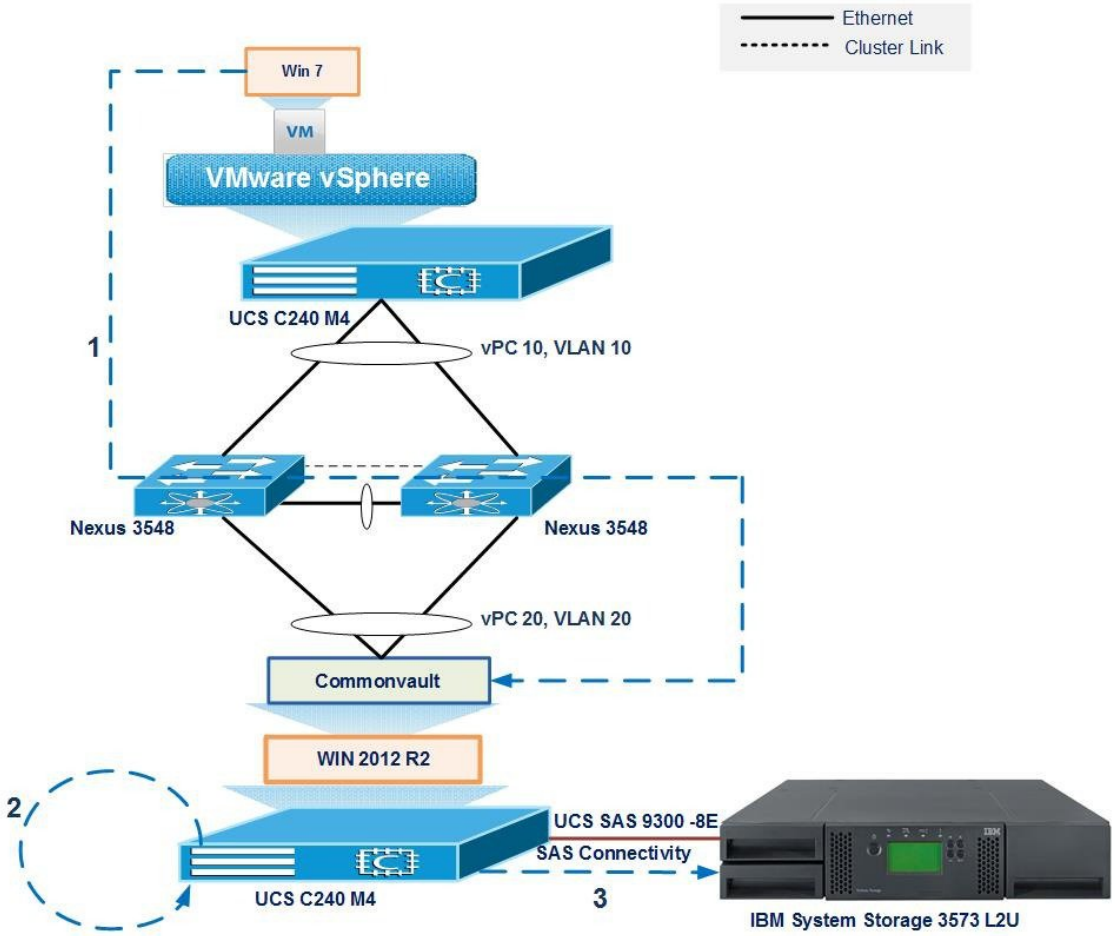
Backup Data flows		
Step	**From**	**To**
1	VM in C series Server(Backup Client)	Backup Server
2	Backup Server	Backup Server Disk
3	Backup Server Disk	IBM System Storage 3573 L2U

Description:

- Select the VM to backup in the Backup software.
- Run the backup job for the successful VM Backup.
- 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 6: Topology in use



Backup Data flows		
Step	**From**	**To**
1	VM in C series Server(Backup Client)	Backup Server

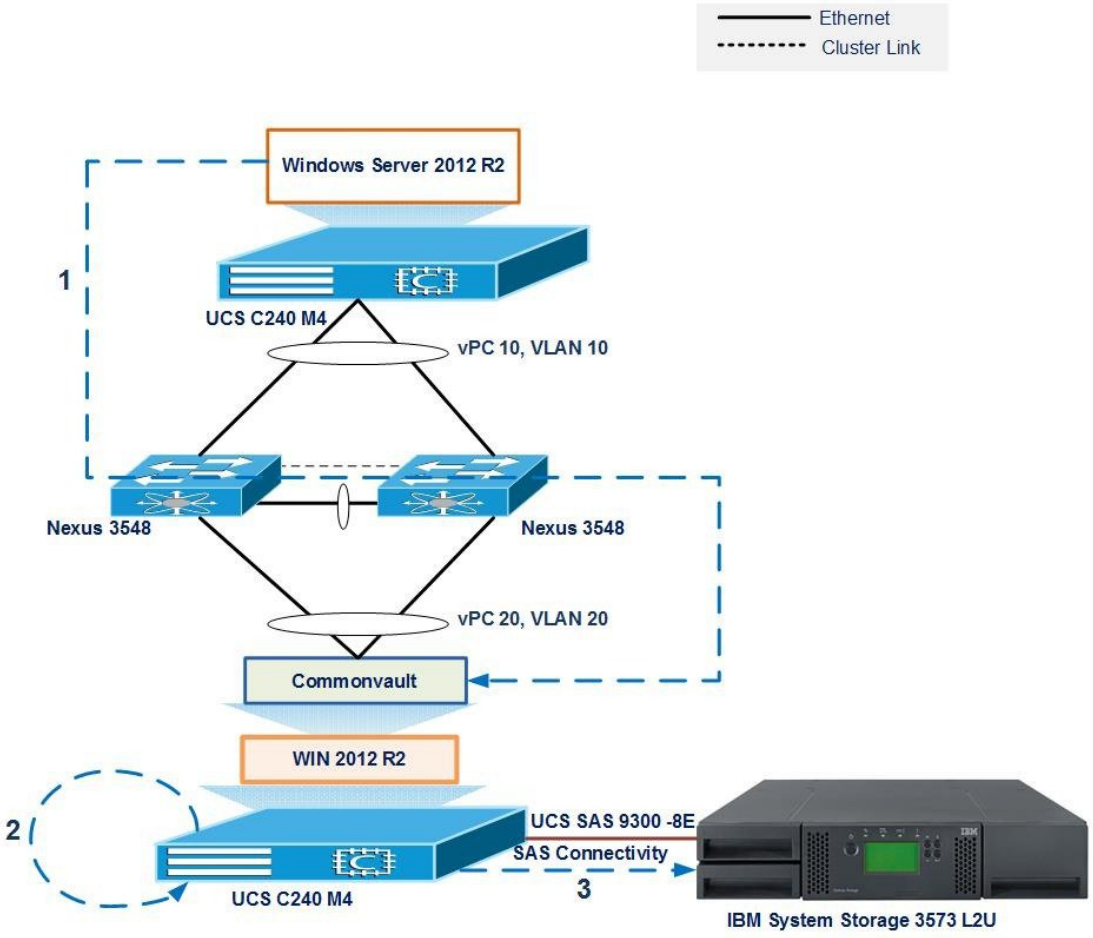
Backup Data flows		
2	Backup Server	Backup Server Disk
3	Backup Server Disk	IBM System Storage 3573 L2U

Description

- Backup of data files (Word, PDF, and Excel) from Windows 7 JOS to Backup Server Local HDD/De-duplication disk and then replicate the same to IBM System Storage 3753 L2U External Tape Library using the Backup software.
- Recover the Files either from Local HDD/De-duplication disk or IBM System Storage 3753 L2U External SAS Tape Library by using various Recovery Options available on the Backup Software.

Windows Files and Folders- Baremetal

Fig 7: Topology in use



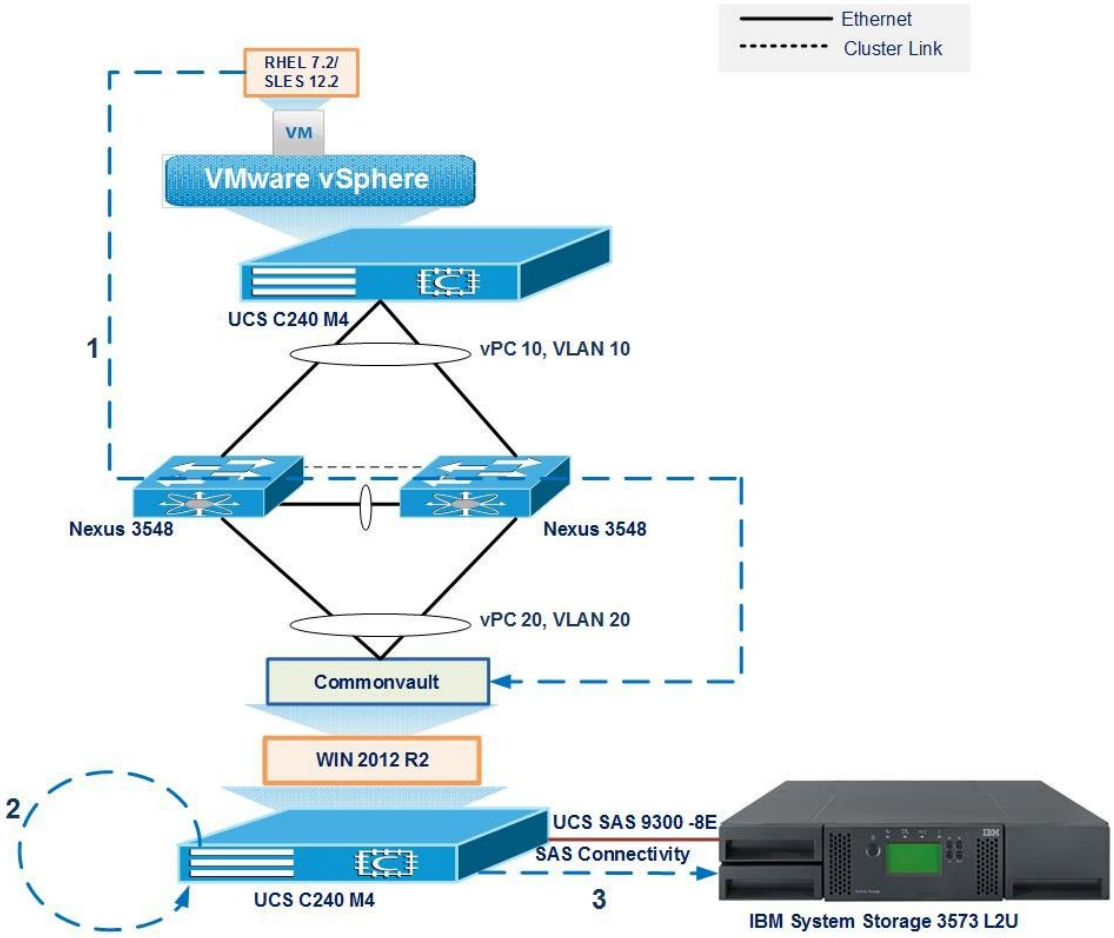
Backup Data flows		
Step	**From**	**To**
1	C series Baremetal Server(Backup Client)	Backup Server
2	Backup Server	Backup Server Disk
3	Backup Server Disk	IBM System Storage 3573 L2U

Description:

- Backup of data files (Word, PDF, and Excel) from Windows 2012 R2 JOS to Backup Server Local HDD/De-duplication disk and then replicate the same to IBM System Storage 3573 L2U External SAS Tape Library using the Backup software.
- Recover the Files either from Local HDD/De-duplication disk or IBM System Storage 3573 L2U External SAS Tape Library by using various Recovery Options available on the Backup Software.

Linux Files and Folders-VM

Fig 8: Topology in use



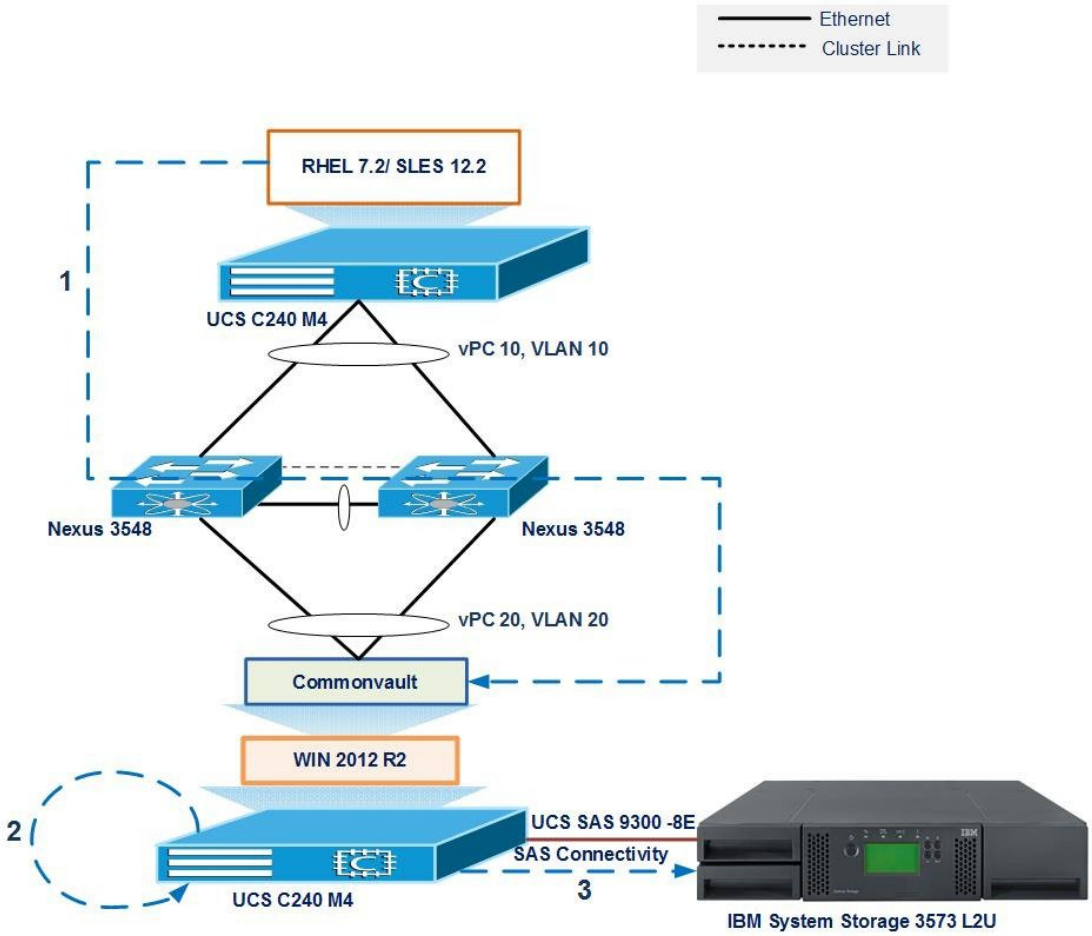
Backup Data flows		
Step	**From**	**To**
1	VM in C series Server(Backup Client)	Backup Server
2	Backup Server	Backup Server Disk
3	Backup Server Disk	IBM System Storage 3573 L2U

Description:

- Backup of data files (Word, PDF, and Excel) from Linux OS (RHEL 7.2/ SUSE 12.2) to Backup Server Local HDD/De-duplication disk and then replicate the same to IBM System Storage 3753 L2U External SAS Tape Library using the Backup software.
- Recover the Files either from Local HDD/De-duplication disk or IBM System Storage 3753 L2U External SAS Tape Library by using various Recovery Options available on the Backup Software.

Linux Files and Folders-Baremetal

Fig 9: Topology in use



Backup Data flows		
Step	**From**	**To**
1	C series Baremetal Server(Backup Client)	Backup Server
2	Backup Server	Backup Server Disk
3	Backup Server Disk	IBM System Storage 3573 L2U

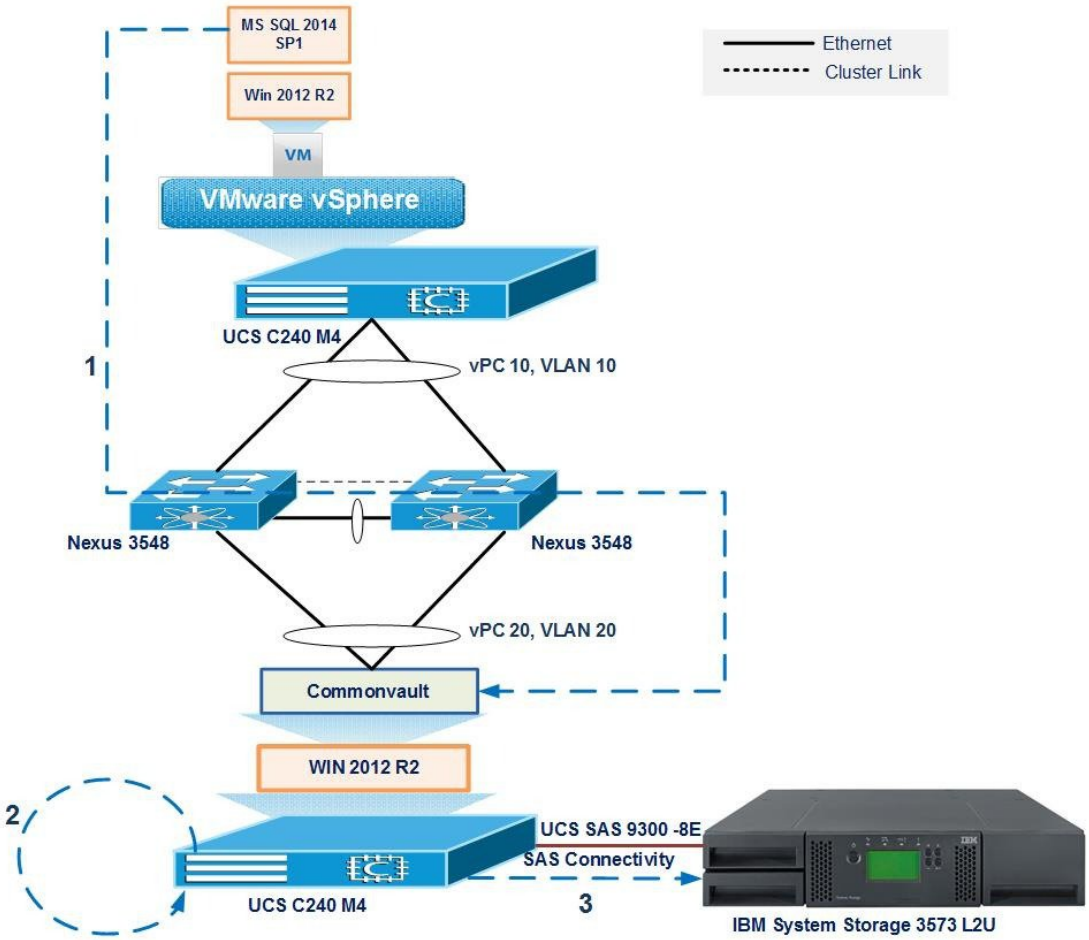
Description:

- Backup of data files (Word, PDF, and Excel) from Linux OS (RHEL 7.2/ SUSE 12.2) to Backup Server Local HDD/De-duplication disk and then replicate the same to IBM System Storage 3573 L2U External SAS Tape Library using the Backup software.

- Recover the Files either from Local HDD/De-duplication disk or IBM System Storage 3573 L2U External SAS Tape Library by using various Recovery Options available on the Backup Software.

SQL Backup

Fig 10: Topology in use



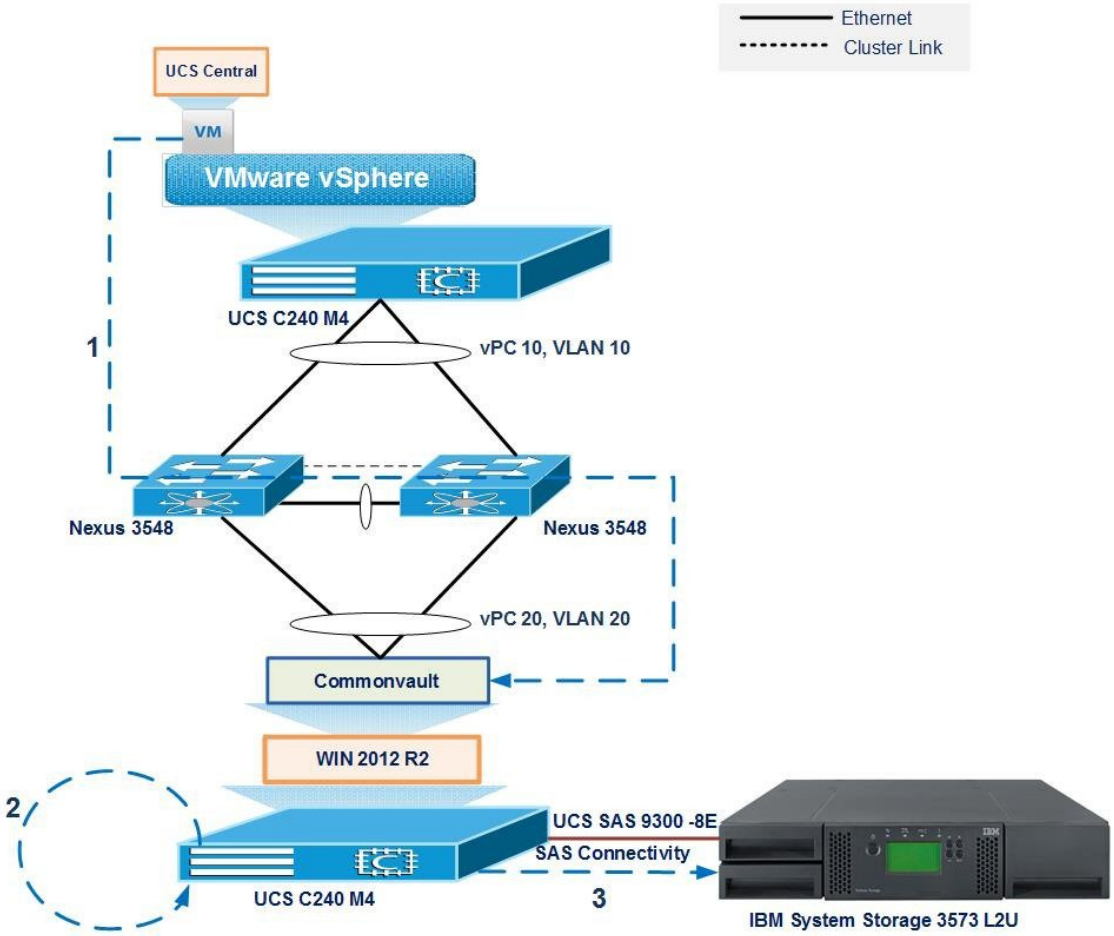
Backup Data flows		
Step	**From**	**To**
1	VM in B series Server(Backup Client)	Backup Server
2	Backup Server	Backup Server Disk
3	Backup Server Disk	IBM System Storage 3753 L2U

Description:

- Backup of database from MS SQL 2014 SP1 Server to Backup Server Local HDD/De-duplication disk and then replicate the same to IBM System Storage 3753 L2U External SAS Tape Library using the Backup software.
- Recover the Files either from Local HDD/De-duplication disk or IBM System Storage 3753 L2U External SAS Tape Library by using various Recovery Options available on the Backup Software.

UCS Central Backup

Fig 11: Topology in use



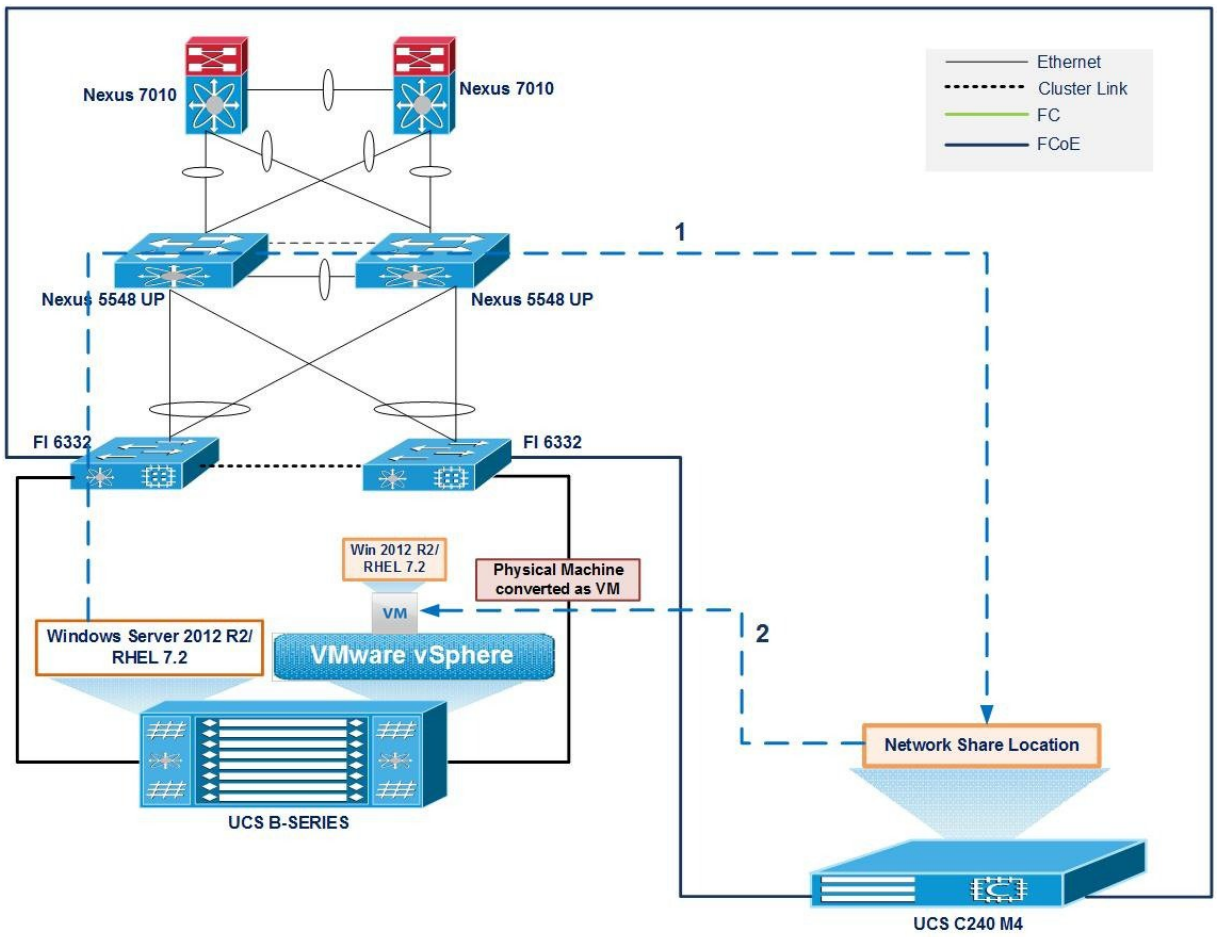
Backup Data flows		
Step	**From**	**To**
1	VM in B series Server(Backup Client)	Backup Server
2	Backup Server	Backup Server Disk
3	Backup Server Disk	IBM System Storage 3573 L2U

Description:

- Backup of UCS Central to Backup Server Local HDD/De-duplication disk and then replicate the same to IBM System Storage 3753 L2U External SAS Tape Library using the Backup software.
- Recover the UCS Central VM either from Local HDD/De-duplication disk or IBM System Storage 3753 L2U External SAS Tape Library by using various Recovery Options available on the Backup Software.

P2V

Fig 12: Topology in use



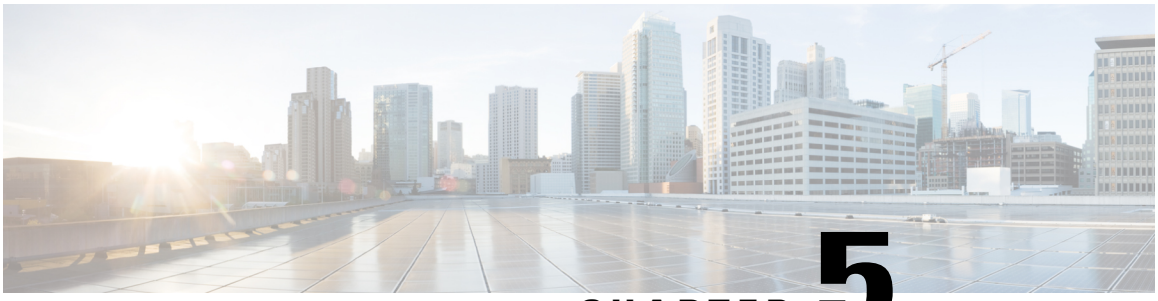
Backup Data flows		
Step	**From**	**To**
1	B series Baremetal Server(Backup Client)	Network share/ Local HDD of Backup Server

Backup Data flows		
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.

P2V



CHAPTER 5

Issues

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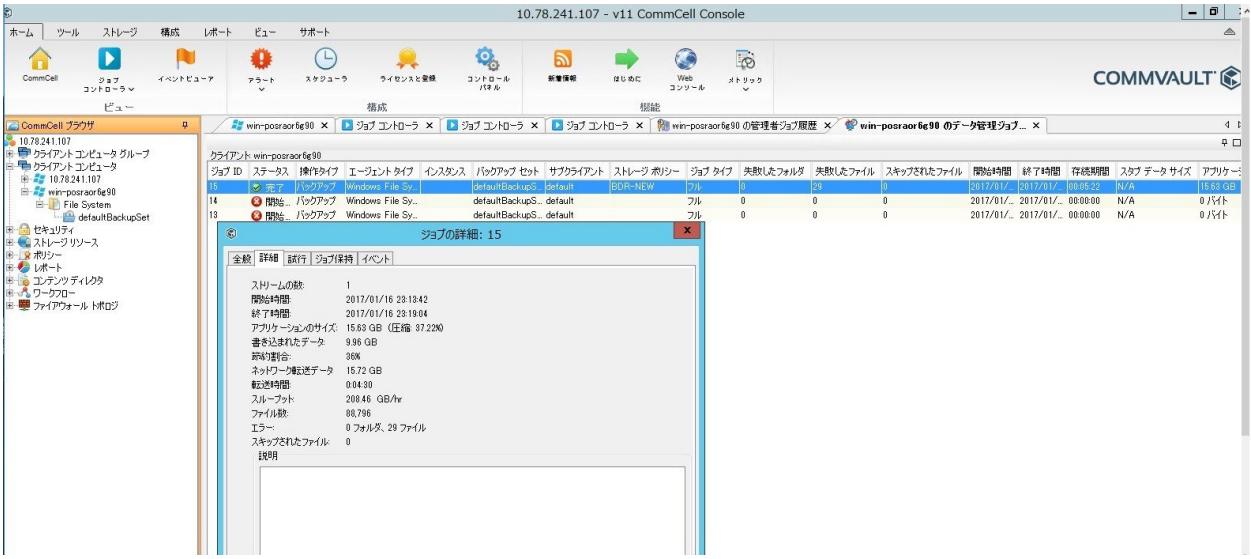
Issues

Windows Baremetal Disaster Recovery failed, on page 25

Backup client failed to install on RHEL 7.0/7.1/7.2 JOS, on page 27

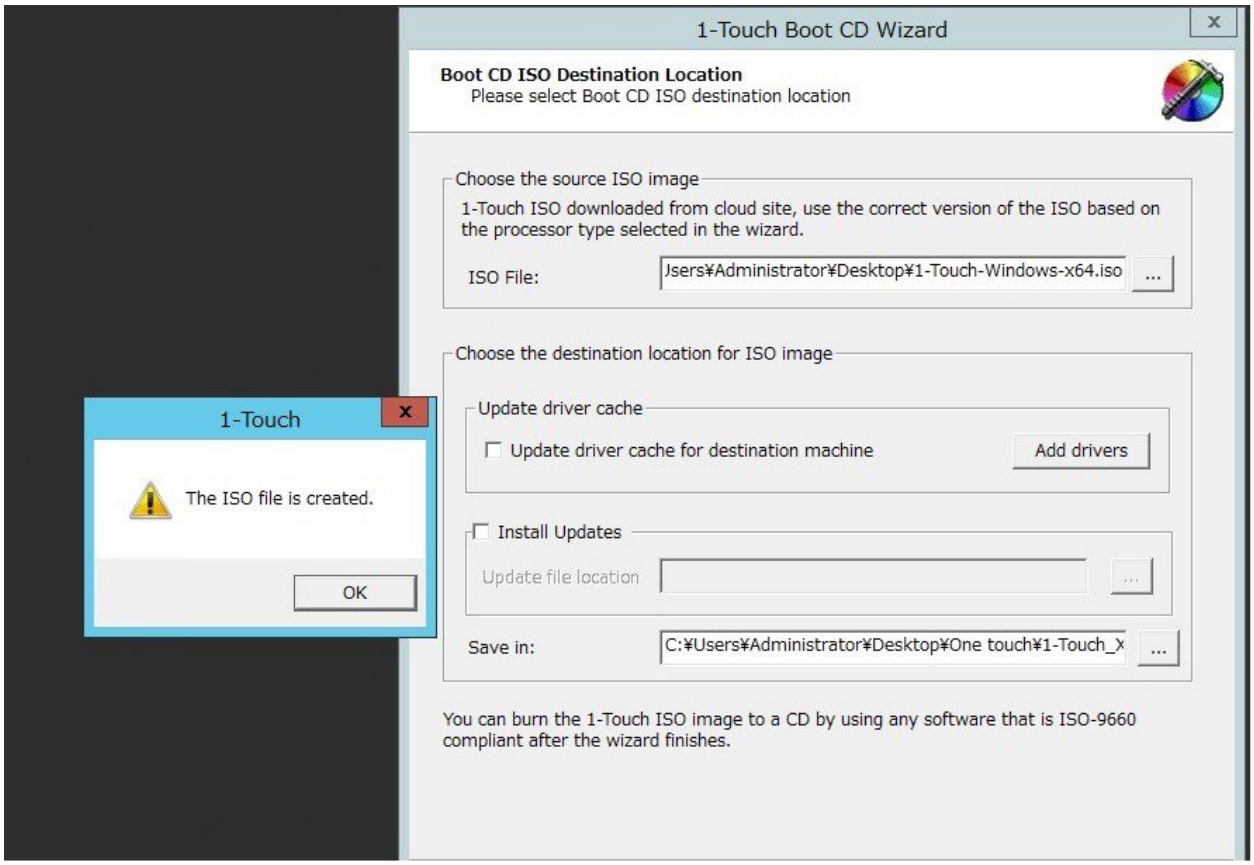
Windows Baremetal Disaster Recovery failed

Backup job successfully completed with 1-Touch Windows image



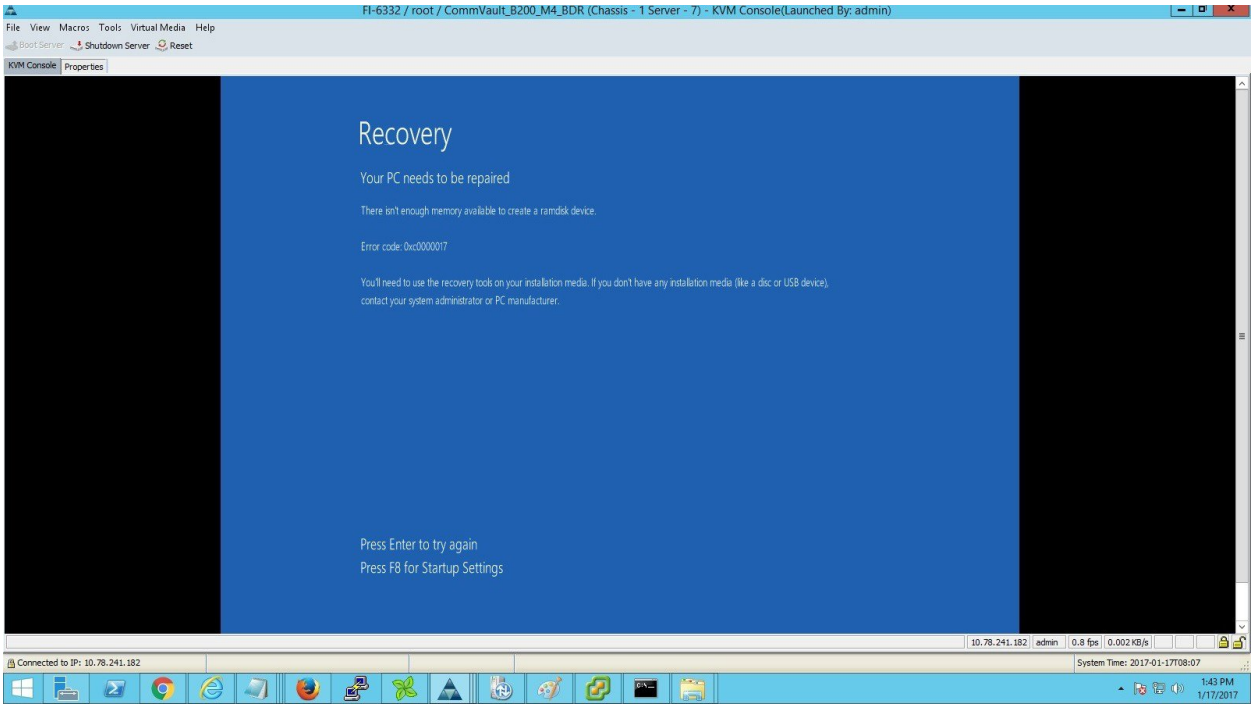
Successfully added Storage and NIC drivers to 1-Touch Windows ISO image

Issues

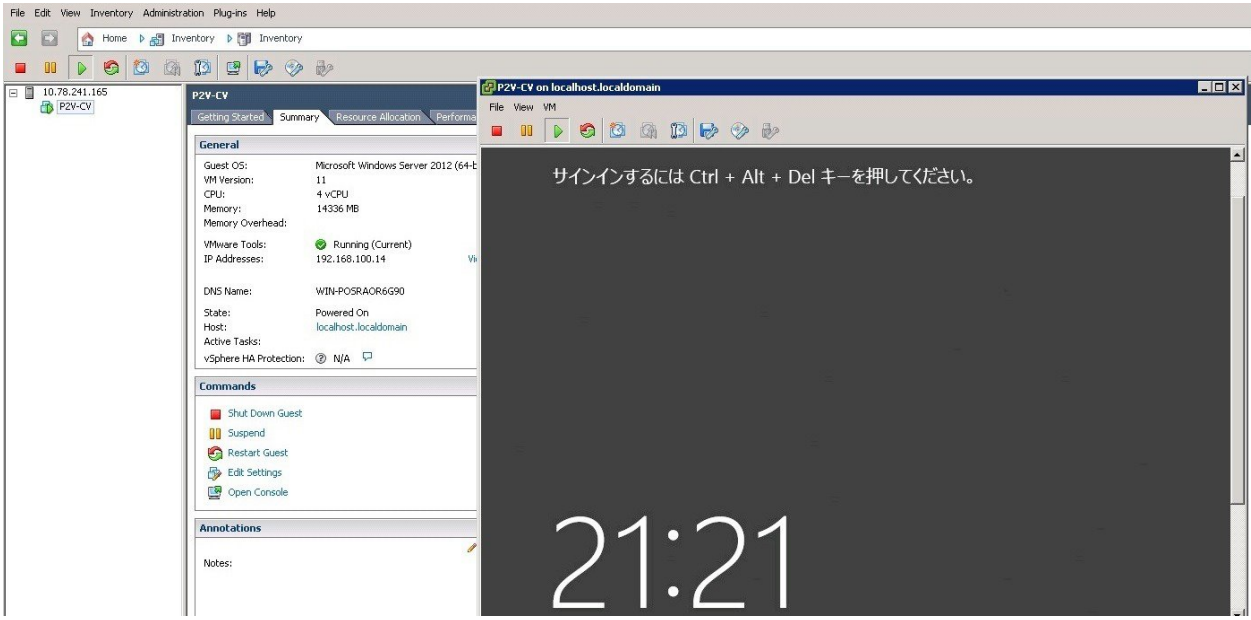


Booting the server with 1-Touch Windows ISO image failed to recover the BDR backup and getting the below screen

Issues



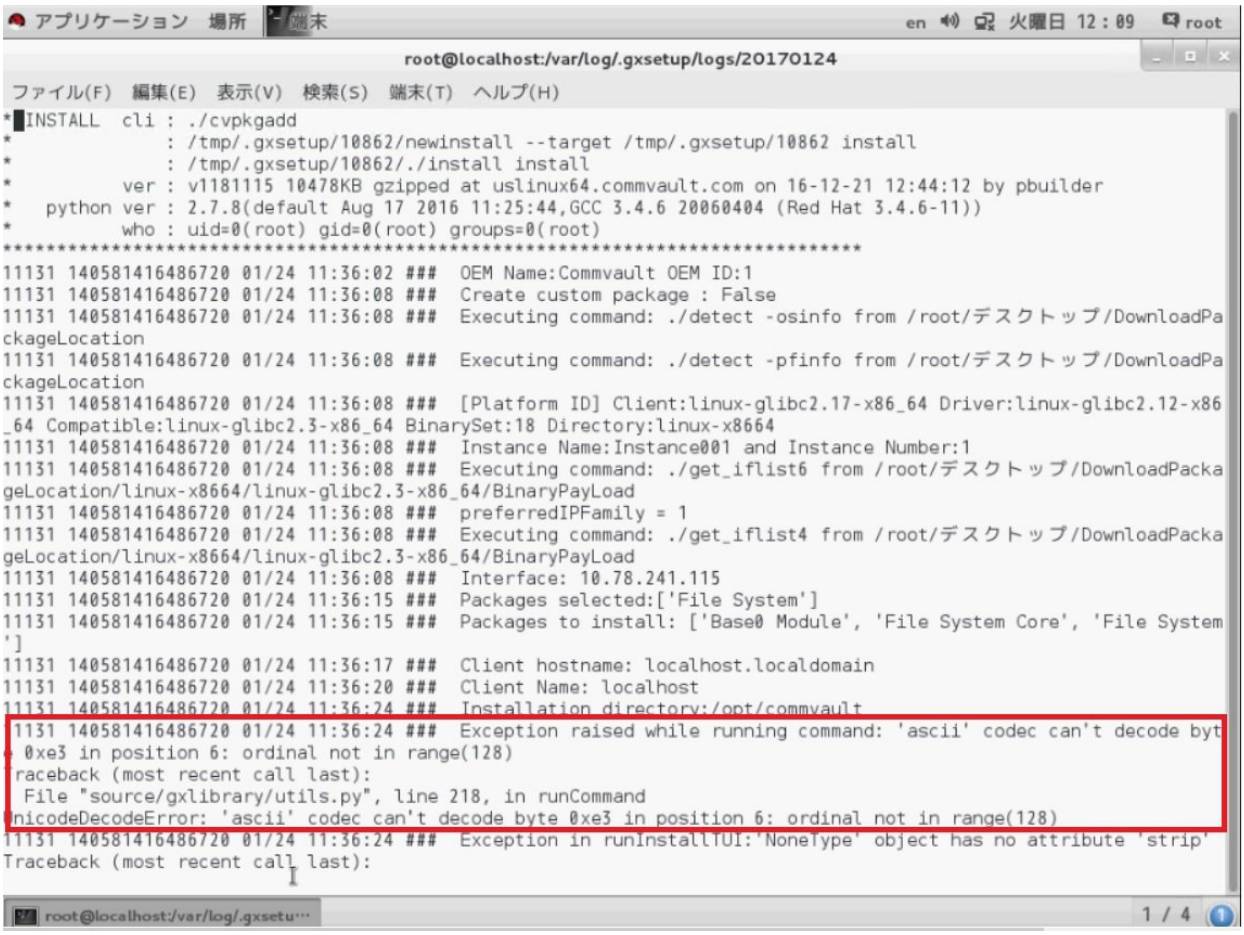
BDR Backup successfully restored as VM using 1-Touch windows ISO image



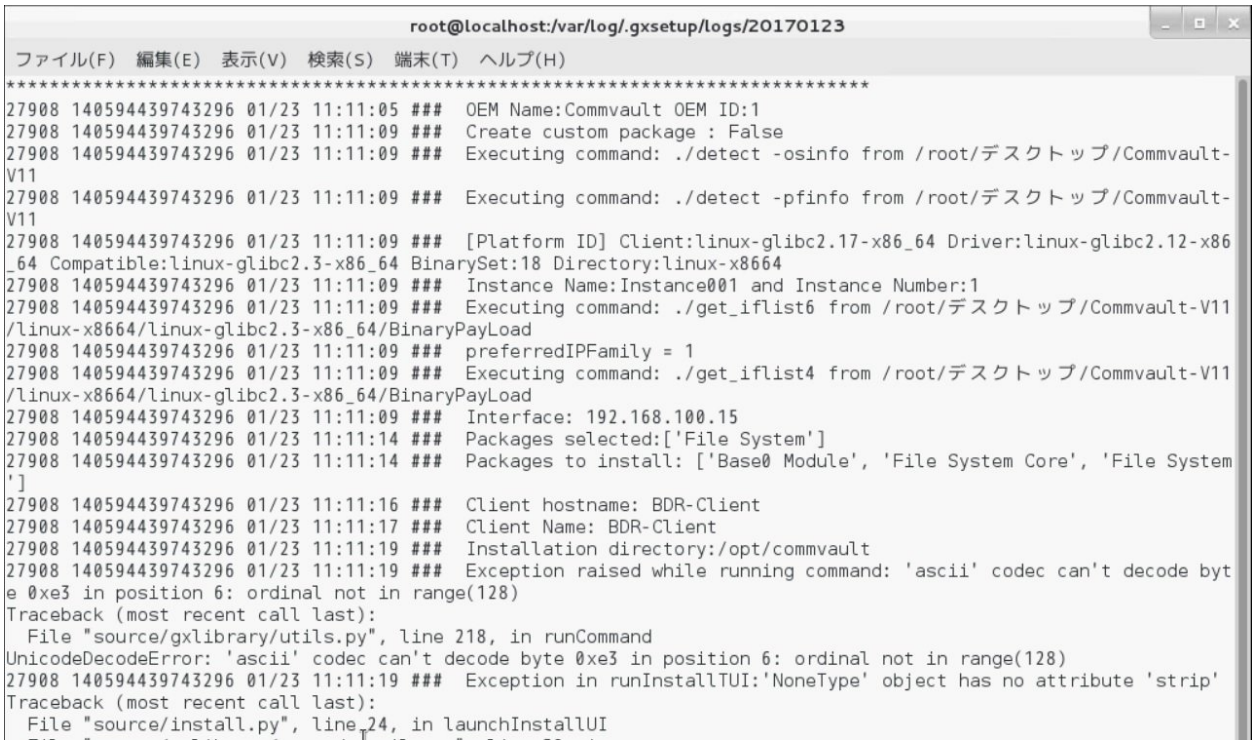
Backup client failed to install on RHEL 7.0/7.1/7.2 JOS

Backup client installation shows *UnicodeDecodeError* in RHEL 7.0 JOS

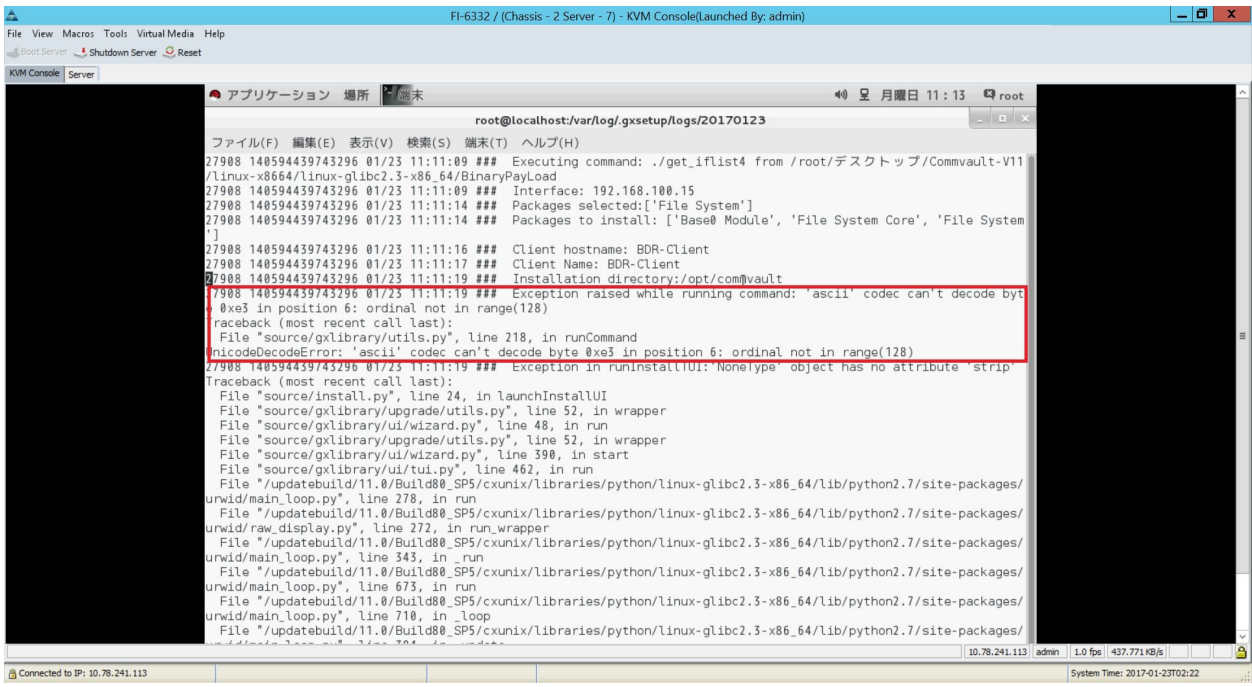
Issues



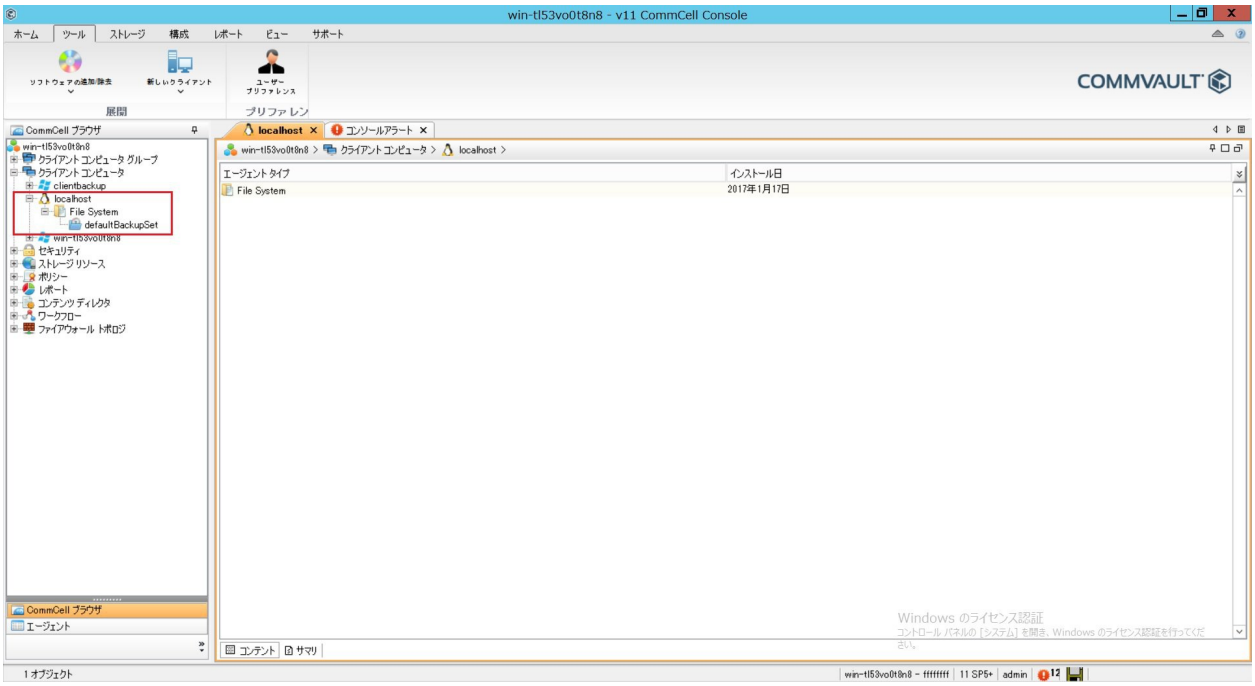
Backup Client installation shows *UnicodeDecodeError* in RHEL 7.1 JOS



Backup client installation shows *UnicodeDecodeError* in RHEL 7.2 JOS



Backup client installation successful on RHEL 7.2 EOS



Related Documentation

Cisco Servers- Unified Computing

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

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

Commvault Backup 11.0

http://documentation.commvault.com/commvault/v11/article