Implementing Veeam Backup and Replication 7.0 in VMware with Hitachi High Availability Manager

Implementation Guide

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Feedback

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# Table of Contents

**TESTED SOLUTION COMPONENTS** ................................................................. 2

- Hardware Components ............................................................................. 4
- Software Components ............................................................................. 5

**Solution Implementation** ........................................................................ 9

- Configure SAN .......................................................................................... 9
- Configure Storage ................................................................................... 10
- Deploy Hitachi High Availability Manager .............................................. 17
- Deploy VMware .......................................................................................... 31
- Deploy Veeam Backup and Replication Server 7.0 ..................................... 37
- Solution Specific Configuration ............................................................... 47
Implementing Veeam Backup and Replication 7.0 in VMware with Hitachi High Availability Manager

Implementation Guide

The purpose of this guide is to provide steps in deploying Veeam Backup and Replication 7.0 with an external/proxy backup server in a VMware environment with Hitachi High Availability Manager (HAM) running on Hitachi Virtual Storage Platform system. This paper describes the installation and configuration of Veeam Backup Server with a proxy server in VMware Cluster within metro distances on HAM. The metro storage cluster solution from Hitachi Data Systems consists of storage systems presenting replicated storage from different geographically distributed sites and enables high availability of services. A combination of Hitachi software and hardware provides key functions like storage failover, synchronous storage replication, and host multi-pathing to vSphere infrastructure.

This is written for IT professionals who are responsible for administering Veeam Backup Server, Storage Administrator/Implementors and those who need to understand VMware vSphere Infrastructure. It is expected that readers have basic knowledge of SAN, VMware vSphere, Hitachi Data Replication technologies, and working experience in managing Veeam Backup and Replication Software.
TESTED SOLUTION COMPONENTS

This guide demonstrates the installation and configuration of Veeam Backup and Replication Server 7.0 in the VMware environment using Virtual Storage Platform tested in Hitachi Data Systems lab.
Figure 1 describes the environment in the Hitachi Data Systems lab.
Hardware Components

The following sections describe the minimal system requirements to implement Veeam Backup Server and Replication and Hitachi High Availability Manager (HAM) in the VMware environment.

Table 1. Hardware Components

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Qty</th>
<th>Configuration</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitachi VSP (Primary)-S/N: 53103 (172.17.45.40)</td>
<td>1</td>
<td>16 Fibre Channel ports used 22 GB cache</td>
<td>Veeam Backup Server Storage (Primary Site)</td>
</tr>
<tr>
<td>Hitachi VSP(Secondary)-S/N: 65779 (172.17.45.41)</td>
<td>1</td>
<td>16 Fibre Channel ports used 204 GB cache</td>
<td>Veeam Backup Server Storage (Secondary Site)</td>
</tr>
<tr>
<td>Hitachi Compute Rack 220 Server (172.17.38.166)</td>
<td>1</td>
<td>2 × 4-Core Processor E5620 2.4 GHz 8 GB RAM</td>
<td>VMware ESX Server 5.0 (Primary)</td>
</tr>
<tr>
<td>Hitachi CR 220 Server (172.17.38.167)</td>
<td>1</td>
<td>2 × 4-Core Processor E5620 2.4 GHz 8 GB RAM</td>
<td>VMware ESX Server 5.0 (Secondary)</td>
</tr>
<tr>
<td>Hitachi CR 220 Server (172.17.38.178)</td>
<td>1</td>
<td>2 × 4-Core Processor E5620 2.4 GHz 8 GB RAM</td>
<td>CCI Server 1</td>
</tr>
<tr>
<td>Hitachi CR 220 Server (172.17.38.179)</td>
<td>1</td>
<td>2 × 4-Core Processor E5620 2.4 GHz 8 GB RAM</td>
<td>CCI Server 2</td>
</tr>
<tr>
<td>Hitachi CR 220 Server (172.17.38.180)</td>
<td>1</td>
<td>2 × 4-Core Processor E5620 2.4 GHz 8 GB RAM</td>
<td>Veeam Backup Server and Replication Server 7.0</td>
</tr>
<tr>
<td>Hitachi CR 220 Server (172.17.38.169)</td>
<td>1</td>
<td>Dual-Core Processor E5620 2.4 GHz 4 GB RAM</td>
<td>VMware vCenter Server and vSphere Client</td>
</tr>
<tr>
<td>Hitachi Unified Storage (HUS150)-S/N: 93040320 (172.17.38.86/87)</td>
<td>4</td>
<td>16 Fibre Channel Ports 32 GB cache</td>
<td>Quorum Disk</td>
</tr>
</tbody>
</table>

For recommended system requirements, at least two ESXi Servers should be configured as a cluster with HA and FT enabled per site. For Veeam Backup, configure at least two VMs per ESXi Server – one for Veeam Backup Server and one for Veeam Backup Proxy Server.
Software Components

Table 2. Software Components

<table>
<thead>
<tr>
<th>Software</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitachi Unified Storage Firmware (SN: 93040320)</td>
<td>0930/D-H-</td>
</tr>
<tr>
<td>Hitachi Virtual Storage Platform (S/N: 53103)</td>
<td>Main:70-06-01-00/00</td>
</tr>
<tr>
<td></td>
<td>SVP : 70-06-01/00</td>
</tr>
<tr>
<td>Hitachi Virtual Storage Platform (S/N: 65779)</td>
<td>Main : 70-06-01-00/00</td>
</tr>
<tr>
<td></td>
<td>SVP : 70-06-01/00</td>
</tr>
<tr>
<td>VMware ESX Server</td>
<td>5.0</td>
</tr>
<tr>
<td>VMware vCenter – vSphere Server and Client</td>
<td>5.0</td>
</tr>
<tr>
<td>Veeam Backup and Replication Server</td>
<td>7.0</td>
</tr>
<tr>
<td>RAID Manager - Command Control Interface (CCI) Server 1</td>
<td>12-10-16/10</td>
</tr>
<tr>
<td>RAID Manager - Command Control Interface (CCI) Server 2</td>
<td>12-10-16/10</td>
</tr>
<tr>
<td>Microsoft® Windows Server®</td>
<td>2008 R2 (64-Bit)</td>
</tr>
</tbody>
</table>

- **Hitachi Unified Storage**
  
  Hitachi Data Systems introduces a new family of unified storage for all data, to help businesses satisfy their growth requirements without compromise. Hitachi Unified Storage (HUS) systems are the only systems that can centrally consolidate file, block and object data (with Hitachi Content Platform) and storage from other vendors, to redefine unified storage.

  A highly efficient unified architecture allows organizations to satisfy growth requirements and meet business goals while simplifying operations, reducing the total cost structure, and quickly adapting to changing storage environments. When combined with Hitachi Command Suite management software, HUS enables optimized and agile data infrastructure.

  - Scales system capacity to nearly 4PB without affecting performance
  - Meet performance requirements with lower investment in storage
  - Automatically correct performance issues and provision more quickly with dual dynamic virtual controllers
  
  Use Hitachi Dynamic Provisioning to pool and grow file and block storage for maximum flexibility without capacity limitations.

- **Hitachi Virtual Storage Platform**
  
  Hitachi Virtual Storage Platform is the first 3-D scaling storage platform designed for all data types. Its storage architecture flexibly adapts for performance, capacity, and multi-vendor storage. Combined with the unique Hitachi Command Suite management platform, it transforms the data center.
Scale up – Meet increasing demands by dynamically adding processors, connectivity and capacity in a single unit. Provide the highest performance for open and mainframe environments.

Scale Out – Meet multiple demands by dynamically combining multiple units into a single logical system with shared resources. Support increased demand in virtualized server environments. Ensure safe multi-tenancy and quality of service through partitioning of cache and ports.

Scale Deep – Extend storage value by virtualizing new and existing external storage systems dynamically. Extend the advanced functions of Hitachi Virtual Storage Platform to multivendor storage. Offload less demanding data to external tiers to save costs and to optimize the availability of tier one resources.

- **Hitachi Storage Navigator Software**

Hitachi Storage Navigator software is the integrated interface for the Virtual Storage Platform firmware and software features. Use it to take advantage of all of the Virtual Storage Platform’s features. Storage Navigator software provides a Web-accessible graphical management interface.

Storage Navigator software is used to map security levels for SAN ports and virtual ports and for inter-system path mapping. It is used for logical unit (LU) creation and expansion, and for online volume migrations. It also configures and manages Hitachi Replication products. It enables online microcode updates and other system maintenance functions and contains tools for SNMP integration with enterprise management systems.

- **Hitachi Dynamic Link Manager**

Hitachi Dynamic Link Manager (HDLM) is a host-based software solution that directly addresses the challenges associated with single point of failure (SPOF) while helping to reduce Total Cost of Ownership (TCO) and boost return on investment. HDLM features include the following:

- The ability to distribute loads across multiple paths also known as load-balancing
- The ability to continue running operations between host and storage
- The ability to bring a path that has recovered from an error back online also known as failback
- The ability to automatically check status of any given path at regular interval also known as path health checking
**Hitachi High Availability Manager**

Built on the ability of how Hitachi Virtual Storage Platform manages virtualized devices, the Hitachi High Availability Manager administers internal storage and externally attached heterogeneous storage with common and integrated management. Its use is in conjunction with storage system based replication technologies such as Hitachi Universal Replicator and Hitachi TrueCopy.

**Veeam Backup and Replication**

Veeam® Backup & Replication™ is a data protection and disaster recovery solution for virtual environments of any size and complexity. Veeam Backup & Replication provides fast, flexible, and reliable recovery of virtualized applications and data. It unifies backup and replication in a single solution, increases the value of backup and reinvents data protection for VMware vSphere and Microsoft Hyper-V virtual environments. Veeam Backup & Replication supports your entire virtual infrastructure with industry leading features such as instant file-level recovery and streamlined VM recovery, scalability, 2-in-1 backup & replication, built-in de-duplication, centralized management and more.

Veeam Backup has three core components namely:

Backup Server – the “brain” of the solution responsible for job management and scheduling, indexing tasks and general orchestration of the backup and replication environment.

Proxy Servers – the “muscle” for the solution. These servers read data from the VM snapshots, de-duplicate and compress that data, and send it on its way. In the case of Veeam replication, they also receive the replica data, and write it to the new replica acting as the data movers to transfer data from the source to target environment.

Repositories – these systems provide the “memory” storing backup images for future restores, and important metadata used during backup and replication. A repository may be a Windows or Linux Server or NAS device that supports CIFS access.

**VMware ESX Server**

VMware ESX servers provide the foundation for building a reliable and dynamic IT infrastructure. These market leading production-proven hypervisors abstract processor, memory, storage, and networking resources into multiple virtual machines that can each run an unmodified operating system and applications. VMware ESX servers are the most widely deployed hypervisors, delivering the highest levels of reliability and performance to companies of all sizes.
- **VMware vCenter Server/Client**

  VMware vCenter Server, formerly known as Virtual Center, is the centralized management tool for the vSphere suite. VMware vCenter Server allows for the management of multiple ESX servers and virtual machines (VMs) from different ESX servers through a single console application. All the well-known features of vSphere such as vMotion, Storage, vMotion, Distributed Resource Scheduler, High Availability, and Fault Tolerance require vCenter Server.

- **VMware High Availability**

  VMware High Availability (HA) provides easy-to-use, cost-effective high availability for applications running in virtual machines. In the event of a physical server failure, affected virtual machines are automatically restarted on other production servers with spare capacity. In the case of operating system failure, VMware HA restarts the affected virtual machine on the same physical server. The combination of VMware HA and the other availability features of the VMware vSphere platform provide organizations the ability to select and easily deliver the level of availability required for all of their important applications.

- **VMware Fault Tolerance**

  VMware Fault Tolerance (FT) is a leading-edge technology that allows virtual machines to continue running even when server failures occur. When VMware FT is enabled on a virtual machine (called the Primary VM), a copy of the Primary VM (called the Secondary VM) is automatically created on another host, chosen by VMware Distributed Resource Scheduler (DRS). If VMware DRS is not enabled, the target host is chosen from the list of available hosts. VMware FT then runs the Primary and Secondary VMs in lockstep with each other – essentially mirroring the execution state of the Primary VM to the Secondary VM. In the event that a hardware failure causes the Primary VM to fail, the Secondary VM immediately picks up where the Primary VM left off, and continues to run without any loss of network connections, transactions, or data.

- **VMware Distributed Resource Scheduler (DRS)**

  VMware Distributed Resource Scheduler (DRS) dynamically allocates and balances computing capacity across a collection of hardware resources aggregated into logical resource pools. VMware DRS continuously monitors utilization across resource pools and intelligently allocates available resources among the virtual machines based on pre-defined rules that reflect business needs and changing priorities. When a virtual machine experiences an increased load, VMware DRS automatically allocates additional resources by redistributing virtual machines among the physical servers in the resource pool.
Solution Implementation

Deploying this solution requires the following high-level steps:

1. Configure the SAN
2. Configure storage
3. Deploy Hitachi High Availability Manager (HAM)
4. Deploy VMware
   (a) Configure VMware HA and DRS
   (b) Configure VMware Fault Tolerance
5. Deploy Veeam Backup and Replication Server
6. Configure Veeam Backup and Replication Server
7. Configure solution specific best practices

Your checklist might vary based on your environment. More information about each of these steps is included in the following sections.

Configure SAN

In the tested deployment, servers were connected to a single HBA with dual ports to a single Brocade 5000 Fibre Channel Switch. Specific fibre ports are assigned to all hosts in site 1 and another set of ports to all hosts in site 2. To reduce points of failure, it is recommended that each server have two HBAs with dual-port and two Fibre Channel switches. HBA1 port must be connected to Fibre Channel Switch 1 while HBA2 port must be connected to Fibre Channel Switch 2. Table 3 lists the path configuration used in this solution.

Table 3. Path Configuration

<table>
<thead>
<tr>
<th>Node Allocated</th>
<th>LUN</th>
<th>SIZE (GB)</th>
<th>RAID</th>
<th>PORT</th>
<th>HOST GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>172.17.38.166</td>
<td>0024</td>
<td>100.00</td>
<td>RAID5 (3D+1P)</td>
<td>5D (VSP1)</td>
<td>5D-HAMVTEAM-HG</td>
</tr>
<tr>
<td>172.17.38.166</td>
<td>0029</td>
<td>100.00</td>
<td>RAID5 (3D+1P)</td>
<td>5D (VSP1)</td>
<td>5D-HAMVTEAM-HG</td>
</tr>
<tr>
<td>172.17.38.166</td>
<td>002A</td>
<td>150.00</td>
<td>RAID5 (3D+1P)</td>
<td>5D (VSP1)</td>
<td>5D-HAMVTEAM-HG</td>
</tr>
<tr>
<td>172.17.38.178</td>
<td>0016</td>
<td>0.04</td>
<td>RAID5 (3D+1P)</td>
<td>6F (VSP1)</td>
<td>HAMVTEAM_38_178_CCI_P1_VSP1_5F</td>
</tr>
<tr>
<td>172.17.38.167</td>
<td>00E2</td>
<td>100.00</td>
<td>RAID5 (3D+1P)</td>
<td>7A (VSP2)</td>
<td>7A-HAMVTEAM-HG</td>
</tr>
</tbody>
</table>
Configure Storage

Hitachi Data Systems used a Hitachi Virtual Storage Platform (VSP) one each site (Primary and Secondary) for Hitachi High Availability Manager (HAM) setup and Hitachi Unified Storage 150 (HUS 150) for the HAM quorum disk. The World Wide Names (WWNs) of the HBAs residing on a physical server have been assigned to a host group and the associated LUNs assigned to each host group. Table 4 contains the port names used in this solution.

<table>
<thead>
<tr>
<th>Node Allocated</th>
<th>LUN</th>
<th>SIZE (GB)</th>
<th>RAID</th>
<th>PORT</th>
<th>HOST GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>172.17.38.167</td>
<td>00E3</td>
<td>100.00</td>
<td>RAID5</td>
<td>7A</td>
<td>7A-HAMVEEAM-HG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3D+1P)</td>
<td>(VSP2)</td>
<td></td>
</tr>
<tr>
<td>172.17.38.167</td>
<td>00E4</td>
<td>150.00</td>
<td>RAID5</td>
<td>7A</td>
<td>7A-HAMVEEAM-HG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3D+1P)</td>
<td>(VSP2)</td>
<td></td>
</tr>
</tbody>
</table>
| 172.17.38.179  | 0134| 0.04      | RAID5     | 7D          | HAMVEEAM_3 8_179_CCI_P2_
|                |     |           | (3D+1P)   | (VSP2)      | VSP2_7D                  |
| 172.17.38.179  | 00E1| 50.00     | RAID5     | 7D          | HAMVEEAM_3 8_179_CCI_P2_
|                |     |           | (3D+1P)   | (VSP2)      | VSP2_7D                  |
| 172.17.38.179  | 000E| 50.00     | RAID5     | 6F          | HAMVEEAM_3 8_178_CCI_P1_
|                |     |           | (3D+1P)   | (VSP1)      | VSP1_6F                  |

Table 3. Path Configuration (Continued)

Table 4. Port Names

<table>
<thead>
<tr>
<th>WWN - PORT NAME</th>
<th>TYPE</th>
<th>ROLE</th>
<th>HOST GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOST-166</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10000000C9AA872</td>
<td>HBA</td>
<td>ESX-1</td>
<td>5D-HAMVEEAM-HG</td>
</tr>
<tr>
<td>50060E8006CF6F43</td>
<td>VSP1</td>
<td>ESX-1</td>
<td>5D-HAMVEEAM-HG</td>
</tr>
<tr>
<td>10000000C9AAA873</td>
<td>HBA</td>
<td>ESX-1</td>
<td>7A-HAMVEEAM-HG</td>
</tr>
<tr>
<td>50060E801600F360</td>
<td>VSP2</td>
<td>ESX-1</td>
<td>7A-HAMVEEAM-HG</td>
</tr>
<tr>
<td>HOST-167</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10000000C9AA258</td>
<td>VSP2</td>
<td>ESX-2</td>
<td>5F-HAMVEEAM-HG</td>
</tr>
<tr>
<td>50060E8006CF6F45</td>
<td>VSP2</td>
<td>ESX-2</td>
<td>5F-HAMVEEAM-HG</td>
</tr>
<tr>
<td>10000000C9AAA259</td>
<td>HBA</td>
<td>ESX-2</td>
<td>7B-HAMVEEAM-HG</td>
</tr>
<tr>
<td>50060E801600EF361</td>
<td>VSP2</td>
<td>ESX-2</td>
<td>7B-HAMVEEAM-HG</td>
</tr>
<tr>
<td>HOST-178</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10000000C9AAA271</td>
<td>HBA</td>
<td>CCI-1</td>
<td>6F-HAMVEEAM-HG</td>
</tr>
<tr>
<td>50060E8006CF6F55</td>
<td>VSP1</td>
<td>CCI-1</td>
<td>6F-HAMVEEAM-HG</td>
</tr>
<tr>
<td>HOST-179</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10000000C9AAA59</td>
<td>HBA</td>
<td>CCI-2</td>
<td>7D-HAMVEEAM-HG</td>
</tr>
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Table 4. Port Names (Continued)

<table>
<thead>
<tr>
<th>WWN - PORT NAME</th>
<th>TYPE</th>
<th>ROLE</th>
<th>HOST GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>50060E801600F363</td>
<td>VSP2 (45.41)</td>
<td>CCI-2</td>
<td>7D-HAMVEEAM-HG</td>
</tr>
<tr>
<td>50060E8006CF6F63</td>
<td>VSP1 (45.40)</td>
<td>VSP1-MCU1</td>
<td>HAMVEEAM_VSP1_7D_VSP2_8A</td>
</tr>
<tr>
<td>50060E8006CF6F65</td>
<td>VSP1 (45.40)</td>
<td>VSP1-RCU-TGT1</td>
<td>HAMVEEAM_VSP1_7F_VSP2_8C</td>
</tr>
<tr>
<td>50060E8006CF6F73</td>
<td>VSP1 (45.40)</td>
<td>VSP1-MCU2</td>
<td>HAMVEEAM_VSP1_8D_VSP2_8B</td>
</tr>
<tr>
<td>50060E8006CF6F75</td>
<td>VSP1 (45.40)</td>
<td>VSP1-RCU-TGT2</td>
<td>HAMVEEAM_VSP1_8F_VSP2_8D</td>
</tr>
<tr>
<td>50060E801600F370</td>
<td>VSP2 (45.41)</td>
<td>VSP2-RCU-TGT1</td>
<td>HAMVEEAM_VSP1_7D_VSP2_8A</td>
</tr>
<tr>
<td>50060E801600F372</td>
<td>VSP2 (45.41)</td>
<td>VSP2-MCU1</td>
<td>HAMVEEAM_VSP1_7F_VSP2_8C</td>
</tr>
<tr>
<td>50060E801600F371</td>
<td>VSP2 (45.41)</td>
<td>VSP2-RCU-TGT2</td>
<td>HAMVEEAM_VSP1_8D_VSP2_8B</td>
</tr>
<tr>
<td>50060E801600F373</td>
<td>VSP2 (45.41)</td>
<td>VSP2-MCU2</td>
<td>HAMVEEAM_VSP1_8F_VSP2_8D</td>
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<tr>
<td>50060E801600F362</td>
<td>HUS (44.86)</td>
<td>HUS-EXT</td>
<td>HAMVEEAM_VSP1_6D_HUS150_0E</td>
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<tr>
<td>50060E8006CF6F53</td>
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<td>HUS-VSP1</td>
<td>HAMVEEAM_VSP1_6D_HUS150_0E</td>
</tr>
<tr>
<td>50060E80101AEF0C</td>
<td>HUS (44.86)</td>
<td>HUS-EXT</td>
<td>HAMVEEAM_VSP2_7C_HUS150_1E</td>
</tr>
<tr>
<td>50060E801600F362</td>
<td>VSP2 (45.41)</td>
<td>HUS-VSP2</td>
<td>HAMVEEAM_VSP2_7C_HUS150_1E</td>
</tr>
</tbody>
</table>
Configure Volumes/LDEVs in VSP

Use Hitachi Storage Navigator Software to create one or more LDEVs/volumes in a RAID Group on the Hitachi Virtual Storage (VSP):

1. Choose Actions -> Create LDEVs. The create LDEV windows displays.
2. From the Provisioning Type drop-down menu, select Basic.
3. From the Emulation Type drop-down menu, select OPEN-V.
4. Choose a menu item from the Drive Type/RPM drop-down menu and from the RAID Level drop-down menu. These options allow you to filter the available parity group volumes. Choose the Select Free Spaces (Optional).
5. Highlight the Parity Group in the Available Free Space window and choose OK.
6. Enter the capacity amount in the LDEV Capacity field and choose a unit of measure from the drop-down menu.
7. Enter the number of LDEVs of that size to be created in the Number of LDEVs field.
8. In the LDEV Name pane, assign a prefix in the Prefix field and assign an initial number in the Initial Number field.
9. Expand the Options pane.
10. Review the value in the LDKC field. Modify the LDKC value if the default of 00 is not appropriate. This is most often the case if the storage will be configured with more than one LDKC.
11. Choose a value from the CU drop-down menu.
12. Choose a value from the DEV drop-down menu.
13. Choose a value from Interval drop-down menu (Optional). Leave this value at the default of 0 for sequential numbering of LDEVs. If you want a different numbering sequence, choose a different value.
14. Review the default values in the Initial SSID field, the CLPR field, and the Processor Blade field. In most situations, use the default values. Change them only if your environment requires different values.
15. Click the Add button. Selected LDEVs pane is populated.
16. Click the Finish button. The confirmation window for creating LDEVs displays.
17. Click the Apply button.
**Configure Host Groups in VSP**
To create host groups using Hitachi Storage Navigator Software, follow these steps:

1. Choose Actions > Ports/Host Groups > Create Host Groups. The Create Host Groups window displays.
2. Assign a name in the Host Group Name field.
3. From the Host Mode drop-down menu, select the appropriate host mode value.
4. In the Available Hosts pane, highlight one or more hosts.
5. In the Available Ports pane, highlight one or more ports.
6. Click the Add button. The Selected Host Groups pane is populated.
7. Click the Finish button. The Create Host Groups window displays.
8. Click the Apply button.

**Map LDEVs**
To map LDEVs using Hitachi Storage Navigator software, follow these steps:

1. Choose Actions > Logical Device > Add LUN Paths. The Add LUN Paths window displays.
2. In the Available LDEVs pane, highlight one or more LDEVs.
3. Click the Add button. The Selected LDEVs pane is populated.
4. Click Next. The Add LUN Paths window displays.
5. In the Available Host Groups pane, highlight one or more host groups.
6. Click the Add button. The Selected Host Groups pane is populated.
7. Click Next. The Add LUN Paths window displays.
8. Click Finish. The Add LUN Paths window displays.
9. Click the Apply button.
Configure RAID Groups on the Hitachi Unified Storage 150 (HUS150)

Use Hitachi Storage Navigator Modular 2 software (HSNM2) to configure RAID groups on the Hitachi Unified Storage:

1. From the Arrays list in the Arrays dialog box, click the desired storage system name to display the information window for the specific storage system.

2. Confirm the storage system is in a ready state by checking the Status field.

3. From the left navigation pane, click Groups, then click Volumes to display the Volumes dialog box.

4. Click the RAID Groups tab to display the RAID Groups list as shown below. RAID groups and volumes defined for the storage system display.

5. Click the Create RG button. The Create RAID Group dialog box displays.

6. Select or enter values for the following fields, list boxes, or text boxes:

- RAID Group
- RAID Level
- Combination
- Number of Parity Groups
7. In the Drives region, select one of the following radio buttons:
   - Automatic Selection to direct the system to automatically select a drive. Select a drive type and a drive capacity in the two list boxes in this region.
   - Manual Selection to manually select a desired drive in the Assignable Drives list. Select an assignable drive in the list.

8. Click OK.

**Configure Volumes in Hitachi Unified Storage 150 (HUS150)**

Use Hitachi Storage Navigator Modular 2 software (SNM2) to create volumes on the Unified Storage 150:

1. Click the Create a new volumes check box.

2. Perform one of the following steps:
   - Enter the desired Volume Capacity and Number of Volumes. Each volume that will be created will be the same size that you specify in this field.
   - Click Create One Volume to assign one of the maximum free space in the selected RAID group to create a single logical unit consisting of the maximum available free space in the selected RAID group.

3. Click OK to complete.
Create Host Groups in HUS
Use Hitachi Storage Navigator Modular 2 software to create host groups following the steps below:

1. Choose Groups > Ports/Host Groups > Create Host Groups. The Create Host Groups window displays.
2. Assign a name in the Host Group Name field.
3. From the Host Mode drop down menu, choose [Standard].
4. In the Available Hosts pane, highlight one or more hosts.
5. In the Available Ports pane, highlight one or more ports.
6. Click the Add button. The Selected Host Groups pane is populated.
7. Click the OK button.
Deploy Hitachi High Availability Manager

Deploy the Hitachi High Availability Manager (HAM) with at least two Virtual Storage Platforms (VSP). One VSP on Primary Site and the second VSP on the Recovery Site (DR). For more information, see the Hitachi Virtual Storage Platform High Availability Manager User’s Guide.

Configure Hitachi High Availability Manager

1. Cabling and Zoning
2. Setup Hitachi Dynamic Link Manager
3. Configure HAM
4. Setup and Configure CCI

Configure Cabling and Zoning

All servers and storage systems should be cabled to the appropriate fabrics and the proper zones should have been created. For this environment, Table 5 lists the zoning configuration.

Table 5. Zoning Configuration

<table>
<thead>
<tr>
<th>SITE1</th>
<th>ZONED TO</th>
<th>SITE2</th>
<th>ZONED TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP-1</td>
<td>VSP-2 (Rep RCU 8A)</td>
<td>VSP-2</td>
<td>VSP-1 (Rep RCU 7F)</td>
</tr>
<tr>
<td>Rep MCU 7D</td>
<td>Rep MCU 8C</td>
<td>Rep MCU 8D</td>
<td>VSP-1 (Rep RCU 8F)</td>
</tr>
<tr>
<td>Rep MCU 8D</td>
<td>Rep RCU 8A</td>
<td>VSP-2 (Rep MCU 7C)</td>
<td>VSP-1 (Rep MCU 8D)</td>
</tr>
<tr>
<td>Rep RCU 7F</td>
<td>Rep RCU 8B</td>
<td>Rep RCU 8B</td>
<td>HUS150 1E</td>
</tr>
<tr>
<td>Rep RCU 8F</td>
<td>VSP-2 (Rep MCU 8D)</td>
<td>Target Port 7B</td>
<td>ESX Server–N2 Port P1</td>
</tr>
<tr>
<td>External Port 6D</td>
<td>HUS150 0E</td>
<td>Target Port 7A</td>
<td>ESX Server–N1 Port P1</td>
</tr>
<tr>
<td>Target Port 5D</td>
<td>ESX Server–N1 Port P0</td>
<td>Target Port 7A</td>
<td>ESX Server–N1 Port P1</td>
</tr>
<tr>
<td>Target Port 5F</td>
<td>ESX Server–N2 Port P0</td>
<td>Target Port 7A</td>
<td>ESX Server–N1 Port P1</td>
</tr>
<tr>
<td>Target Port 6F</td>
<td>CCI Server 1 P1</td>
<td>Target Port 7D</td>
<td>CCI Server 1 P1</td>
</tr>
</tbody>
</table>

1. For external ports, it is recommended to have at least dual ports allocated.
2. For target ports, it is recommended to have dual ports allocated.
**Provision Storage**

Allocate storage to VMware ESX Servers. The volumes can be traditional parity groups or dynamic provisioning. For this setup, the traditional parity group is used. Table 6 lists the volumes in our configuration. The VSP systems must be identical in configuration.

Table 6. Volume Details

<table>
<thead>
<tr>
<th>VOLUME ID</th>
<th>SIZE (GB)</th>
<th>SIZE (BLOCKS)</th>
<th>ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VSP-1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00:00:24</td>
<td>100.00</td>
<td>209715840</td>
<td>Veeam Backup Server</td>
</tr>
<tr>
<td>00:00:29</td>
<td>100.00</td>
<td>209715840</td>
<td>Veeam Backup Server</td>
</tr>
<tr>
<td>00:00:2A</td>
<td>150.00</td>
<td>314572800</td>
<td>Veeam Backup Server Repository</td>
</tr>
<tr>
<td><strong>VSP-2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00:00:E2</td>
<td>100.00</td>
<td>209715840</td>
<td>Veeam Backup Server</td>
</tr>
<tr>
<td>00:00:E3</td>
<td>100.00</td>
<td>209715840</td>
<td>Veeam Backup Server</td>
</tr>
<tr>
<td>00:00:E4</td>
<td>150.00</td>
<td>314572800</td>
<td>Veeam Backup Server Repository</td>
</tr>
</tbody>
</table>

**Configure Data Volumes**

In order for HAM to work, the volumes intended for use must meet the following requirements:

1. Must be formatted, i.e. not blocked.
2. Primary (P-VOLs) and secondary (S-VOLs) volumes must have identical block counts and capacity.
3. A primary volume (P-VOL) can be copied to only one S-VOL.
4. A secondary volume (S-VOL) can be the copy of only one P-VOL.
5. P-VOLs and S-VOLs must be mapped before creating HAM pairs.

To create volumes in VSP, please refer to the section Configure Volumes/LDEVs in VSP. These tasks must be performed on both VSPs. Repeat as necessary to create the appropriate number of volumes. Make sure to use the block size unit when setting the capacity on new volumes otherwise a potential mismatch on volumes between VSP-1 and VSP-2 may result in HAM pairs not being created.
Configure Command Devices
We need one Command Device (CMD) from each VSP for CCI. To configure a CMD, create a volume with smallest capacity possible (96,000 blocks) from either parity group or DP pool. For this setup, the parity group is used. Table 7 provides the details of the CMD for each VSP.

Table 7. CMD Details

<table>
<thead>
<tr>
<th>VOLUME ID</th>
<th>SIZE (GB)</th>
<th>SIZE (BLOCKS)</th>
<th>ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP-1</td>
<td>0.04</td>
<td>96000</td>
<td>Command Device for CCI1 Server</td>
</tr>
<tr>
<td>VSP-2</td>
<td>0.04</td>
<td>96000</td>
<td>Command Device for CCI2 Server</td>
</tr>
</tbody>
</table>

Once the volumes have been created, enable the Command Device feature on the volume.

2. Choose the Logical Device (LDEV) to be used as command device.
3. On bottom right section, click More Actions -> Edit Command Devices.

5. Set Command Device Attributes as follows:
   - Command Device Security: Disable
   - User Authentication: Disable
   - Device Group Definition: Disable
6. Click Finish and Apply to execute the task.
### Create Host Group and Host Mode Option

Host groups allow sharing a physical storage port with multiple servers. A host group is made up of three components: World Wide Names (WWNs), Volumes, and Host Mode Options. The server(s) with WWNs specified in a host group are allowed to see and use the volumes that are also identified in that host group. Host mode options are settings that manipulate the interaction between the server(s) and storage port. For the host groups in our environment, refer to Table 8:

### Table 8. Host Group Details

<table>
<thead>
<tr>
<th>SITE1</th>
<th>ZONED TO</th>
<th>SITE2</th>
<th>ZONED TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP-1</td>
<td></td>
<td>VSP-2</td>
<td></td>
</tr>
<tr>
<td>Target Port 5D</td>
<td>HAMVEEAM_38_166_P0_PATH1_VSP1_5D</td>
<td>Target Port 7A</td>
<td>HAMVEEAM_38_166_P1_PATH2_VSP2_7A</td>
</tr>
<tr>
<td>Target Port 5F</td>
<td>HAMVEEAM_38_167_P0_PATH1_VSP1_5F</td>
<td>Target Port 7B</td>
<td>HAMVEEAM_38_167_P0_PATH2_VSP2_7B</td>
</tr>
<tr>
<td>Target Port 6F</td>
<td>HAMVEEAM_38_178_P1_CCI_VSP1_6F</td>
<td>Target Port 7D</td>
<td>HAMVEEAM_38_179_P1_CCI_VSP2_7D</td>
</tr>
</tbody>
</table>

VSP-1 Host Group 1 will have the WWNs of Port 0 of Node 166 (ESXi Server 1) and will be created on storage port 5D. Host group 2 will have the WWNs of Port 0 of Node 167 (ESXi Server 2) and will be created on storage port 5F. These host groups should include the Veeam Backup Volumes. Moreover, Host Group 3 will have the WWNs of Port 1 of CCI Server 1 (178) and will be created on storage port 6F.

VSP-2 Host Group 1 will have the WWNs of Port 1 of Node 166 (ESXi Server 1) and will be created on storage port 7A. Host Group 2 will have the WWNs of Port 0 of Node 167 (ESXi Server 2) and will be created on storage port 7B. Host Group 3 will have the WWNs of Port 1 of CCI Server 2 (179) and will be created on storage port 7D.
To create host group in VSP, please refer to section “Configure Host Groups in VSP”. For this setup using the VMware platform with HAM, the recommended host mode setting is Host Mode 57 (HAM Response Change). Please refer to Figure 2:

Figure 2

- Setup Hitachi Dynamic Link Manager (HDLM)
- Install HDLM

Perform the installation process on the remote management client (vSphere Server) and the host (ESX Server). The installation procedure assumes that VMware vSphere has been installed on the host and the storage systems are connected in a multi-path configuration. To install HDLM7.4, perform the following steps:

1. Log on to Windows on the remote management client as a member of administrator group.
2. Extract the HDLM7.4 installer. Select HDLM_VMware folder.
3. Click “Setup.exe” to start the installation.
4. Supply the license key and follow the wizard to complete. The system will prompt to reboot for changes to take effect.
- **Install VMware vSphere CLI**

In order to execute HDLM command line commands, VMware vSphere Command Line Interface needs to be installed. To install, perform the following steps:

1. Click “Start.exe” to start the installation.
2. Follow the wizard to completion.

3. Run the command below to validate that HDLM is installed with the expected results.

   ```
   C:\Program Files(x86)\VMware\VMware vSphere CLI\bin>esxcli --server=scisv38-167 --username=root --password=password software vib list | findstr hdlm
   ```
To use HDLM, perform the following steps:

1. Launch the Administrator: Command Prompt window.
2. Execute the HDLM command's view operation to confirm that HDLM has been installed.

PROMPT> dlnkmgr -l view –sys

Configure High Availability Manager (HAM)

Setup Quorum Disk

HUS 150 is the storage for quorum disk for HAM. To configure quorum disk, perform the following steps:

1. Create a small volume in HUS 150. For this setup, we used 50 GB size and there is no specific requirement if you are using Parity Group or DP Pool.
   - Using SNMP2, go to Groups -> Volumes -> Create Volume
   - Supply values for the fields below:
     - Type: RAID Group
     - RAID Group Number
     - Capacity
     - Volume Number
   - Click OK

2. Create host groups for the VSP arrays based on zoning. For this setup, see Table 9:

Table 9. VSP Zoning

<table>
<thead>
<tr>
<th>SITE1</th>
<th>ZONED TO</th>
<th>SITE2</th>
<th>ZONED TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP-1</td>
<td></td>
<td>VSP-2</td>
<td></td>
</tr>
<tr>
<td>External Port 6D</td>
<td>HAMVEEAM_VSP1_6D_HUS150_0E</td>
<td>External Port 7C</td>
<td>HAMVEEAM_VSP2_7C_HUS150_1E</td>
</tr>
</tbody>
</table>
CONFIGURE VSP-1 AND VSP-2 STORAGE

With the HUS 150 volume presented to the VSP arrays, the specified volume will be discovered and virtualized. Follow these steps for VSP-1 and VSP-2:

1. Using Storage Navigator, login to VSP-1.

2. From the menu bar, click Actions -> External Storage -> Add External Volumes.

3. Click Create External Path Group.

4. Click Discover External Target Ports.

5. Select external ports 6D and click Add.

6. Click OK.

7. The HUS 150 ports should be listed under Available External Paths. Select paths -> click Add.

8. Click OK and Click Next.

9. The 50 GB volume should be listed under “Discovered External Volumes.” Choose it and enter a descriptive name for the volume. Set the CU to FD (use the higher control units for volumes that are not directly allocated to servers).

10. Click Add.

11. Click Finish to review the settings.

12. Click Apply to execute

Repeat these steps for VSP-2.
- **Setup Replication Paths**

Prepare the replication paths between two VSP arrays. On VSP-1, the MCU ports are linked to the RCU ports of VSP-2. On VSP-2, the MCU ports are linked to the RCU ports of VSP-1. To configure replication paths, perform the following steps:

1. For VSP-1, select four VSP-1 ports to be assigned and setup as follows:
   - MCU1 Initiator Port
   - RCU1 Target Port
   - MCU2 Initiator Port
   - RCU2 Target Port

2. Using Storage Navigator Java Console, switch to the RCU operations tab.

3. In the left panel, select CU free.

4. Right click on the main window on the right -> RCU Operation -> Add RCU (Fibre)

5. For RCU S/N, the serial number of VSP-2 Controller ID should be “6 (VSP)”.

6. Enter the MCU ports for VSP-1 and RCU ports for VSP-2. Click Options.
7. Accept the default options. Click Set.

8. Click Apply.

9. Once the task has completed, the replication paths should show up as normal.

10. Repeat the steps above on VSP-2 but must switch the roles around so that VSP-2 MCU ports are connected to VSP-1’s RCU ports.

**Setup HAM Pairs**

After configuring replication paths, we are ready to create the HAM pairs. The process will start replicating data from the P-VOLs to the S-VOLs. Once replication has started, the S-VOL becomes locked and the hosts can no longer read or write to the volume. This guarantees that the data cannot be corrupted by hosts, and the data content is consistent with the P-VOLs. To setup HAM pairs, perform the following steps in VSP-1 only:

1. Using Storage Navigator Java Console, go to Actions -> Remote Copy -> TrueCopy -> Pair Copy Operations.

2. Switch to Pair Operation Tab, Select the appropriate VSP-1 port.

3. Select all volumes. Right click -> Paircreate -> HAM.

4. Click OK.
Setup and Configure CCI

- **Install CCI and Setup Command Devices**

A command device is a dedicated logical volume on the storage system that functions as the interface to the storage system from the host. It accepts commands that are executed on the storage system. To install Hitachi Command Control Interface software, follow these steps:

1. Insert the installation media. Navigate to the root directory.

2. Copy all files from the installation to the target host.

3. For Windows platforms, the correct installer is located in the WIN_NT folder.

4. Click on setup.exe to start the HORCM installation and follow the wizard to complete.
Create Definition Files and Start CCI

- **Create Definition Files**

In order to get CCI running, definition files must be created (text format). CCI definitions in Figure 3 and Figure 4 are used. Update the content accordingly to match your environment.

- HORCM_MON – replaces the IP address with the local CCI server
- HORCM_CMD – identifies the CMS. Replace the serial number to match your system
- HORCM_LDEV – describes the HAM pairs. Replace the serial number and LDEV IDs
- HORCM_INST – replaces the IP address with remote CCI server

CCI Server 1 – horcm0.conf

![horcm0.conf screenshot](image)

**Figure 3**
### CCI Server 2 – horcm1.conf

#### HORCM_CONF

<table>
<thead>
<tr>
<th>service</th>
<th>poll(10ms)</th>
<th>timeout(10ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10001</td>
<td>12000</td>
<td>3000</td>
</tr>
</tbody>
</table>

#### HORCM_CMD

```bash
#dev_name dev_name
```

#### HORCM_LDEV

<table>
<thead>
<tr>
<th>dev_group</th>
<th>dev_name</th>
<th>Serial#</th>
<th>CU:LDEV(LDEV#)</th>
</tr>
</thead>
<tbody>
<tr>
<td>hamveeam</td>
<td>0000_00E1</td>
<td>65779</td>
<td>00:02</td>
</tr>
<tr>
<td>hamveeam</td>
<td>0001_00E2</td>
<td>65779</td>
<td>00:03</td>
</tr>
<tr>
<td>hamveeam</td>
<td>0002_00E3</td>
<td>65779</td>
<td>00:04</td>
</tr>
</tbody>
</table>

#### HORCM_INST

```bash
#dev_group ip_address service
```

---

**Figure 4**

---
Start CCI

When CCI instances are started, CCI parses the content of the definition files and loads it in memory. Then we can issue replication commands, e.g. pairresync, against the volumes as described in the definition files.

1. On CCI Server 1, open a command prompt.
2. Navigate to C:\HORCM\etc.
3. Start instance 0: horcmstart 0.
4. Repeat the same steps on CCI Server 2, but start instance 1 instead: horcmstart 1.
5. On CCI Server 1, display the status of the HAM P-VOLs:
   pairdisplay.exe –IH0 –g hameeam –fcx 1;
6. On CCI Server 2, display the status of the HAM S-VOLs:
   pairdisplay.exe –IH0 –g –fcx –l
7. Both P-VOLs and S-VOLs should be in PAIR status.
Deploy VMware

The VMware component is one of the key pieces that have addressed the downtime of Veeam Backup Server when failover occurs at the application level, potentially including the HAM level. For this scenario, we have utilized VMware High Availability features such as High Availability, Dynamic Resource Scheduler, and Fault Tolerance to reduce unplanned downtime and provide rapid recovery from outages. Below are the high-level steps to deploy the VMware component:

1. Configure VMware High Availability (HA).
3. Configure VMware Fault Tolerance (FT).
Configure VMware vSphere High Availability (HA)

VMware vSphere High Availability (HA) reduces unplanned downtime by leveraging multiple VMware vSphere ESX hosts configured as a cluster and provides rapid recovery from outages and cost-effective high-availability for applications running in virtual machines. To setup HA, perform the following steps:

1. Select the Hosts and Cluster View.
2. Right-click the Datacenter in the inventory tree and click New Cluster.
3. Complete the New Cluster wizard. Do not enable HA at this time.
4. Click Finish and create the cluster.
5. Right-Click the cluster and add the host by completing the following:
   - IP Address
   - Username and password

6. Right-Click the cluster and click Edit Settings. Configure the vSphere HA settings as appropriate:
   - Host Monitoring Status
   - Admission Control
   - Virtual Machine Options
   - VM Monitoring
   - Datastore Heartbeating

7. Click OK to complete HA configuration.
Configure VMware Dynamic Resource Scheduler (DRS)

DRS is an automated vMotion; when DRS recognizes an imbalance in the resources used on one ESX server in a cluster, it rebalances the VMs among those servers. To setup a fully automated DRS cluster perform the following steps:

1. Choose level of automation as appropriate – Manual, Partially Automated, or Fully Automated.
2. Configure vSphere DRS settings appropriate for your cluster:
   - DRS Group Manager
- Rules

- Virtual Machines Options
- Power Management
- **Configure VMware Fault Tolerance**

Fault tolerance provides full uptime during the course of a physical host failure due to power outage, system panic, or similar reasons. To configure fault tolerance, perform the steps below:

1. Connect vSphere client to vCenter Server using an account with cluster administrator permission.
2. Select Host and Cluster View.
3. Right-click a single virtual machine and select fault tolerance.

4. Turn-on fault tolerance.
Deploy Veeam Backup and Replication Server 7.0

- **Installation of Veeam Backup and Replication Server 7.0**

  This section describes the steps to install Veeam Backup and Replication Server 7.0. The pre-requirements should be in place before installing.

  1. To install Veeam Backup 7.0, double click the Setup icon to launch the installation wizard.
2. Select Install Veeam Backup and Replication.

3. Click Next.
4. Choose the radio button to accept the terms for License Agreement. Click Next to move to the next step.

5. Provide Veeam Backup and Replication License Key.

![Veeam Backup & Replication Setup](image)

7. Specify Veeam Backup and Replication Service Account.

![Service Account Credentials](image)
8. Select New Instance of SQL Server and click Next.

9. Specify port configuration that Veeam Backup and Replication will use.
10. Specify directory configuration for guest file system catalog and vPower NFS.

11. Click Install to begin Veeam Backup and Replication installation.
12. Click Finish to complete installation.

13. Once the wizard completes, launch Veeam Backup and Replication Console.
Configure Veeam Backup and Replication Server 7.0

To configure Veeam Backup and Replication Server 7.0, perform the following steps:

1. Add VMware Server Select Backup Infrastructure → Add Server -> Select VMware vSphere.

2. Configure the VMware Server wizard as appropriate:
   - DNS Server or IP address
   - Username & password
   - VMware Web Services Port

3. Click OK.
- **Add Veeam Backup Repository**

To add a Veeam Backup Repository, perform the following steps:

1. Select Backup Infrastructure → Choose Backup Repositories → Click Add Repository.

2. Configure the Backup Repository wizard as appropriate:
   - Repository Name
   - Type Backup Repository
   - Select Specific Server
   - Specify location – path to folder
   - Load Control

3. Click OK.
- **Add Veeam Proxy Server (as Guest VM)**

To add a Veeam proxy server, perform the following steps:

1. Select Backup Infrastructure → Choose Proxy Server → Click Add Proxy → VMware.

2. Configure the Proxy Server wizard as appropriate:
   - Select Server
   - Transport Mode
   - Connected DataStore

3. Click OK.

For more details on how to setup Veeam Backup, Recovery, and Replication Jobs, refer to the VMware Veeam User Guide.
Solution Specific Configuration

For this setup, we have one scenario that has been identified to deploy this configuration namely:

**Scenario 1: Veeam Backup Server in VMware VM with HAM**

For this setup, Veeam Backup Server is running as a VM in Node-1 of a VMware Two-Node Cluster. Node-1 is considered the primary site, while Node-2 is the secondary site. In the backend, Node-1 storage is on VSP-1 while Node-2 storage is on VSP-2. Both VSP-1 and VSP-2 were configured with remote replication using HAM while HUS 150 was used as quorum array for HAM. The following configurations are recommended:

1. When setting up VMware Cluster with High Availability (HA) feature enabled in a HAM environment, All LUs assigned (e.g. OS, Veeam Application, or Veeam Repository) must reside on the SAN otherwise VMs on a cluster node will fail when failover occurs.

2. When possible, put all Veeam components (Veeam Backup Server, Veeam Proxy Server, and Veeam Repository) in a single LU.

3. When setting up Fault Tolerance (FT), a virtual machine and its secondary copy are not allowed to run on the same host. Fault Tolerance uses anti-affinity rules that ensure that the two instances of the fault tolerant virtual machine are never on the same host. This ensures that a host failure cannot result in the loss of both virtual machines.

4. VMware Fault Tolerance functions best with compatible nodes. When setting up the cluster, hosts should have the following:
   - Processors from the same compatible processor group
   - Common access to datastores used by the virtual machines
   - The same virtual machine network configuration
   - The same ESX/ESXi version
   - The same BIOS settings for all hosts

5. When setting up VMware Fault Tolerant virtual machines, a minimum of two is needed but there should be no more than four virtual machines on any single host. This is dependent on the sizes and workloads of the ESX/ESXi hosts and may vary.

6. To ensure redundancy and maximum Fault Tolerance protection, VMware recommends a minimum of three hosts in the cluster. For this setup, we have started with two only.
7. When VMware Fault Tolerant VMs are configured containing backup applications like Veeam Backup, the following has been observed and may vary depending on your environment.

- Veeam active sessions are not terminated/do not timeout
- Veeam active sessions have slight delayed response between 2-5 sec
- Veeam active backup jobs are completed

8. For Veeam virtual proxies, use HotAdd mode which requires that a proxy server be located on a VM in the same cluster/hosts as the VM being backed up. When using network mode, Veeam Backup attempts to locate a proxy that is on the same subnet as the ESXi management interface to improve performance.

9. When a Veeam Server’s connection to the host, vCenter, or repository is lost during a Veeam Backup operation, make sure the following job settings are configured as appropriate:

- Automatic Retry – Retry failed VMs processing = 3 times (default)
- Automatic Retry – Wait before each retry attempt for = 10 Mins (default)
10. For this setup, we have configured Veeam Backup and Replication in the following deployment:

- **Simple** - install one instance of Veeam Backup & Replication on a physical or virtual Windows-based machine as shown in Figure 5. All Veeam components such as Backup Server, Backup Proxy, and Backup Repository are included using SAN shared storage. Please note that HAM replication is used instead of Veeam replication.

![Figure 5](image)
- Distributed - deployed in the production site to be responsible for backup jobs and/or local replication, and another Veeam Backup server installed at the DR site for the remote replication job as shown in Figure 6. Typically, it is recommended to deploy one proxy for backup & restore, and another for replication and failover. Please note that HAM replication is used instead of Veeam Replication.

**Figure 6**

11. When setting up the Veeam Proxy server, this system should be as close to the source storage as possible and generally consider the following resources. This may vary depending on your environment.

   - For Veeam virtual proxy, it would be best to allocate at least 4 vCPUs to leave resources available.
   - For Veeam physical servers, it would be best to allocate 2 cores for every job, while for virtual servers allocate 2 vCPUs for every active job.

12. Follow general recommended practice by running the VMware vCenter server at a third site. An site-wide failure does not affect the management of the virtual environment. For VCenter Server management redundancy, consider running it as a virtual machine with the VMware high availability feature enabled.
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