



HP Insight Dynamics - VSE

Defining Storage for Logical Servers

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Introduction

HP Insight Dynamics — VSE allows you to create *logical servers*, which are a new class of abstracted servers that allow administrators to manage physical and virtual machines using the same management construct. A logical server definition is easily created and flexibly moved across physical and virtual machines. A logical server describes the system resources needed for a given operating system, application, and workload to operate (for example, configuration requirements such as processors and memory, and unique identifiers such as MAC addresses and World Wide Names (WWNs)). The logical server can be applied to the creation of a virtual machine using hypervisor-based software or to a bare-metal server blade using HP Virtual Connect technology. Logical servers can be defined using a software wizard, or created through the import of an existing server blade or virtual machine.

Defining the required storage resources for a logical server in a Virtual Connect environment requires some extra thought and planning. This document presents underlying concepts to provide a better understanding of how a given storage definition maps into the physical Virtual Connect environment, and explains how to define storage resources for a Virtual Connect blade logical server.

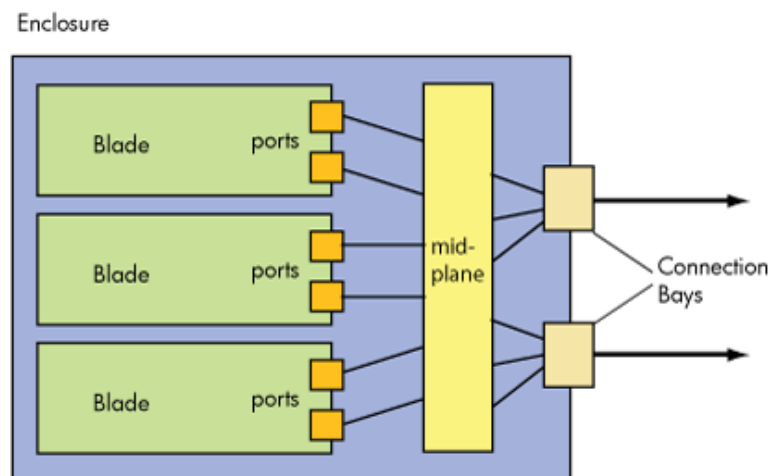
Concepts

See [Terms and Definitions](#) for definitions of the concepts described in this section.

The Virtual Connect environment

One of the many benefits of a Virtual Connect (VC) environment is that it allows many server blades to share a small set of connections for network and fibre channel (FC) communication. Blades plug into slots within a housing called an enclosure. The enclosure then handles all communication on behalf of the blades plugged into it. Using the blade's associated Virtual Connect profile, the enclosure takes on the persona of a blade while communicating for that blade. The VC profile includes all network MAC addresses and FC port world wide names (WWNs) associated with that blade.

Figure 1: Server blades in a BladeSystem c-Class enclosure

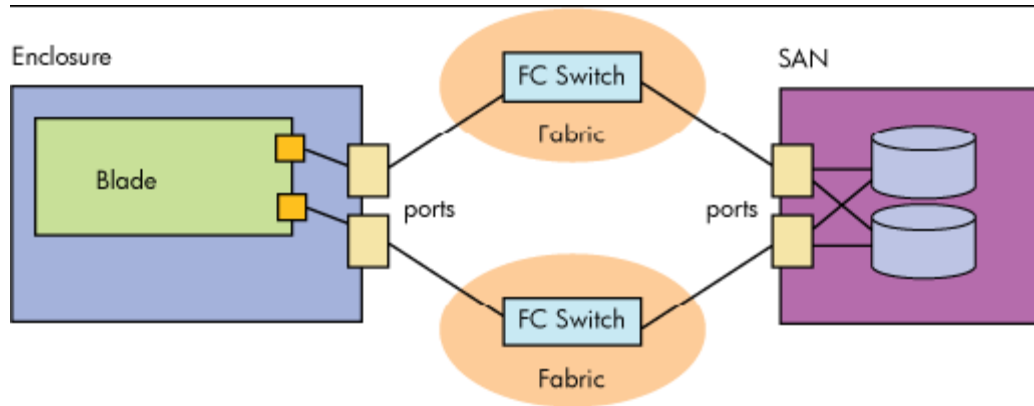


The FC and network connections within an enclosure are hardwired through a midplane which physically maps the blade's FC and network ports to the enclosure's connection bays on its backplane. (For detailed information on this mapping, see the [HP BladeSystem c-Class Enclosures](#) documentation.)

Storage in a Virtual Connect environment

Storage in a VC environment is often housed within storage area networks (SANs), which are accessed through FC connections. Using SAN storage has many advantages, including allowing a system to seamlessly failover from one blade to another in the case of a failure.

Figure 2: SAN storage



The endpoints in a FC connection are called physical ports. Ports are uniquely identified using assigned WWNs. This is similar to the way that MAC addresses uniquely identify Network Interface Controllers (NICs). Server blades and SANs have ports in which they communicate with the outside world. The general management of FC communication is handled through a FC switch within the context of a fabric.

Administrator roles in a Virtual Connect environment

The VC storage environment illustrated in Figure 2 often requires at least two administrator roles:

- The server administrator (or system administrator) manages the enclosure and all blades within it.
- The storage administrator manages the SAN and all defined storage volumes within the SAN.

When requested by a server administrator, a storage administrator carves out volumes of a specified size and type and provides access to these volumes. It is common to provide volume access only to specific server side WWNs (FC ports), tightly controlling who can access the volume within a highly shared environment. This process is called pre-presenting logical unit numbers (LUNs). (Note that the LUN is specified during presentation, not the LUN UUID.)

Extending the administrator roles discussed above, responsibilities for managing logical servers in ID-VSE are divided between the server administrator and the storage administrator.

- The server administrator is responsible for creating and managing logical servers, because they represent VC blades.
- The storage administrator is responsible for creating and managing the storage used by these logical servers.

Defining Logical Server Storage

ID-VSE allows you to logically represent your Virtual Connect storage environment in a logical server storage configuration. A logical server completely defines your storage, including all FC ports, fabrics, server WWNs, storage WWNs, volumes, and LUNs.

You can define your storage configuration in two ways.

- By creating a storage entry when you create a Virtual Connect blade logical server.
- By creating a storage pool entry before you create a Virtual Connect blade logical server.

Defining storage during Logical Server creation

Creating a logical server includes specifying the logical server identity, compute resources, storage, and network configuration. You can define the storage entry when the Virtual Connect logical server is created or modified. Defining storage during logical server creation is usually the responsibility of the server administrator.

To create a new storage entry during logical server creation, use the **Create->Logical Server...** menu selection. Complete the required information on the **Identity** and **Compute Resources** screens. On the third Create Logical Server screen, **Specify Storage**, click the **Create Storage Entry** button to display the **Storage Entry** screen.

Figure 3: Create logical server: specify storage screen



Follow the steps described in “[Steps in defining storage.](#)” After you save the storage entry on the **Storage Entry** screen, it is displayed in the **Storage Assignments** table shown in Figure 3 on the Create logical Server **Specify Storage** screen. You can save a partially completed storage entry and modify it later by clicking the **Modify** button for that entry. (Optionally, you can save the storage entry details into a storage pool entry that can be shared by other logical servers by checking the **Insert Storage Entry into Pool** checkbox.)

Note: Creating a new storage entry requires communication with the storage administrator to complete the prepresenting of LUNs. Depending on the speed of communication and the procedures in your workplace, it may take some time before the logical server and storage definition can be completed.

Defining storage within a storage pool

ID-VSE also provides a way for the storage administrator to predefine storage in anticipation of its need. These storage definitions are predefined in the context of a storage pool.

To create a storage pool entry before you create a logical server, use the **Modify->Logical Server Storage Pools...** menu selection. On the **Manage Storage Pools** screen, click the **Add Entry** button to display the **Storage Pool Entry** screen.

Figure 4: Manage storage pools screen

Virtual Connect Domain: MRO_VIRGO_BLADES_VCDG				
Storage Pool Entries				
Name	Description	Operating System	Available	Actions
MRO_VIRGO_BLADES_VCDG Pool_PoolEntry_220		Microsoft Windows	0	View Modify

Note: The Available column shows the number of unused Server WWNs within each port that have been confirmed and checked Ready on the Add or Modify Storage Pool Entry screens.

[Add Entry](#) [Done](#)

Follow the steps described in [“Steps in defining storage.”](#) After you save the entry on the **Storage Pool Entry** screen, it is displayed in the **Storage Pool Entries** table shown in Figure 4 on the **Manage Storage Pools** screen. You can save a partially completed storage pool entry and modify it later by clicking the **Modify** button for that entry.

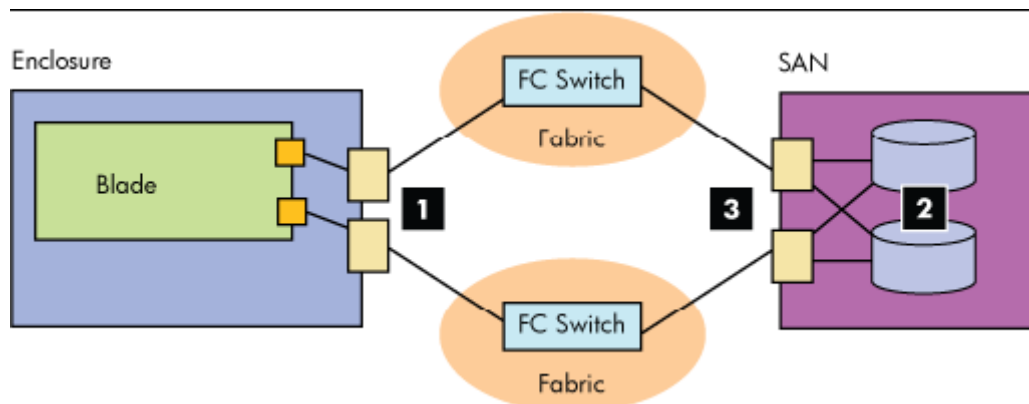
The storage pool entry is now available to the server administrator during logical server creation. This allows the server administrator to define the logical server without communicating with or waiting for the storage administrator to complete the presenting of LUNs.

See [“Using storage pools and shared storage”](#) for more information about using storage pools.

Steps in defining storage

Whether you are defining a storage entry during logical server creation or a within the context of a storage pool, the process of defining and creating storage is essentially the same.

Figure 5: Define and create storage steps



Note: On the **Storage Entry** and **Storage Pool Entry** screens, the **Volume Definition** table appears before the **Port Definition** table. However, HP recommends that you define your Virtual Connect storage by entering information in the following order:

1. Define logical ports to represent the FC ports on the server (blade).
2. Define and then create the needed volumes.
3. Define the path(s) used to communicate with the new volume(s).

To define Virtual Connect logical server storage during logical server creation or within a storage pool:

- Navigate to the **Storage Entry** screen by clicking the **Create Storage Entry** button on the Create Logical Server **Specify Storage** screen, or
- Navigate to the **Storage Pool Entry** screen by clicking the **Add Entry** button on the **Manage Storage Pools** screen.

Step 1: Define logical ports

Any communication with SAN storage within a VC environment starts with the server's FC ports. The storage (SAN) administrator provides access to these ports when representing LUNs.

Define one logical port for each server port (physical HBA port) by clicking **Add Port** on the **Port Selection** table.

Figure 6: Create storage entry screen: port definition

Boot Volume Port Definition

Port Selection			
Logical Port	Fabric	Speed	Server WWN
1	MRO_MSA_SAN3	Auto	50:06:0B:00:00:C2:62:1C

Note: Ports marked with an (*) are in the VC Profile and can not be deleted or modified.

Add Port Remove Last Port

Ports are added in sequential order. For each port, you must select the fabric from a drop-down menu with which the port will communicate. Each port is created with an automatically generated server WWN assigned to it. This WWN, like a MAC address for NICs, is used to uniquely identify this FC port to the SAN. The storage administrator provides access to these ports when representing LUNs.

Note: ID-VSE uses the fabric specification to determine which logical ports represent (map to) which physical ports. In Figure 6, Logical Port 1 represents the physical port that is hardwired to the interconnect bay configured to communicate with the MRO_MSA_SAN3 fabric.

Step 2: Define and create volumes

Use the **Volume Selection** table to specify the details of your storage volumes.

Figure 7: Create storage entry screen: volume definition

Volume Definition

Use Redundancy for all Storage Volumes for this Logical Server

Volume Selection				
Volume	Redundancy	Size(GB)	Properties	Boot Volume
1	<input type="checkbox"/>	10.0	Raid 0	Yes

Add Volume Remove Volume

Click the **Add Volume** button to add a new volume definition. For each volume, specify the size in gigabytes and whether the volume is a boot volume or a data volume. (Each logical server can have

only one boot volume defined.) You can optionally specify additional volume properties, such as the RAID level to be used.

Important: After you have defined your storage volume(s), you must provide this information to the storage administrator. The storage administrator carves out the defined volumes and presents them to the specified server WWN(s). In the example in Figure 7, you would provide the storage administrator with the following information:

Volume 1: Size = 10.0GB, Raid 0, Boot Volume, Server WWN = 50:06:0B:00:00:C2:62:1C

Step 3: Define storage path

After creating and presenting the volumes (LUNs), the storage administrator provides the server administrator with the information required to complete the logical server storage definition. This information includes:

- Storage WWN, uniquely identifying the port used to communicate with the SAN.
- LUN, uniquely identifying the created volume within the SAN.

Using these two pieces of information, the path to the LUN is unique within the FC environment.

With this information in hand, you can define the storage path.

Figure 8: Create storage entry screen: volume definition

Volume Path Settings				
Volume	Logical Port	Path Priority	Storage WWN	LUN ID
1	1	Primary	50:06:0B:00:00:C2:62:2D	11

Note: Storage WWN and LUN ID values are optional but must be provided before the logical server can be activated.

Validate

ID-VSE automatically creates one row in the **Volume Path Settings** table for each volume. If you check the **Redundancy** checkbox, two rows per volume are created. (See "[Redundancy \(multi-pathing\)](#)" for more information.)

For each volume path, you must specify:

- the logical port,
- the path priority,
- the storage WWN returned by the storage administrator, and
- the LUN returned by the storage administrator.

In the example in Figure 8, ID-VSE has hardcoded the logical port to 1 because only one port is defined. If a second port was defined, the port numbers 1 and 2 would be included in a dropdown menu. Set the path priority to **Primary** unless you checked the **Redundancy** checkbox. (See "[Redundancy \(multi-pathing\)](#)" for more information.)

This completes the storage definition.

Validating storage definitions

You can optionally validate your Virtual Connect blade logical server storage configuration by performing on-demand checking of Enterprise Virtual Array (EVA) and Modular Smart Array (MSA) storage. Validation allows you to identify and correct errors by confirming the existence of each storage WWN and LUN ID pair. It also compares each storage volume attribute by displaying the user defined value with the actual value.

Verify that the storage definitions are correct and that the volumes have been correctly presented by clicking the **Validate** button. ID-VSE communicates with the underlying environment to verify that the defined paths and volumes are available. If the information is correct, two results tables are displayed that are similar to the following:

Figure 9: Storage validation

Validation Status				
WWN/LUN Validation				
Server WWN	↑	Storage WWN	LUN ID	Result
50:06:0B:00:05:02:00:39		50:00:1F:E1:50:03:50:6D	1	Found
50:06:0B:00:05:02:00:39		50:00:1F:E1:50:03:50:6D	2	Found
50:06:0B:00:05:02:00:3A		50:00:1F:E1:50:03:50:69	1	Found
50:06:0B:00:05:02:00:3A		50:00:1F:E1:50:03:50:69	2	Found

User Definitions/Actual Storage Validation				
Volume	↑	Name	Defined	Actual
1		Size	5	5
1		Raid	Exchange Boot	RAID5
1		HostMode	Microsoft Windows	Microsoft Windows
2		Size	20	20
2		Raid	Exchange Database	RAID5
2		HostMode	Microsoft Windows	Microsoft Windows

These tables show the validation results for a storage entry with two volumes defined and redundancy used for both volumes.

If the tables indicate that a volume is **Not Found**, verify the storage WWN and LUN information that you entered. If the information appears to be correct, you may need to work with the storage administrator to track down the problem.

Advanced Topics

The following sections describe the advanced storage features available in ID-VSE logical servers.

Redundancy (multi-pathing)

Redundancy, also called multi-pathing, is an environment in which a storage volume has two or more parallel paths to it. If one path fails, the other path can be used to access the volume.

To enable redundancy, perform the steps described in "[Steps in defining storage](#)" with the following modifications:

- Define, at a minimum, two ports (one primary and one secondary).
- Check the **Use Redundancy for all Storage Volumes for this Logical Server** checkbox if you want all volumes to implement redundancy, or
- Check the **Redundancy** checkbox next to a specific volume to implement redundancy for only that volume.

For example, if you check the **Use Redundancy for all Storage Volumes for this Logical Server** checkbox and define two storage volumes in the **Volume Selection** table, then four volume paths (two storage volumes times two ports) will be displayed in the **Volume Path Settings** table.

Note: Notify the storage administrator about which volumes need redundancy, and provide the server WWNs for both ports. Identify the server WWN that should be primary and the server WWN that should be secondary. The storage administrator will return two storage WWNs per LUN.

Using multiple storage definitions

In [“Steps in defining storage,”](#) the examples show how to set up a single storage entry with one port and one volume defined. However, ID-VSE provides flexibility in the way that storage can be defined. Logical server storage can be a composite of two or more storage entries. For example, after you have defined a complete storage entry with a single boot volume, you may want to define more than one data volume. There are two ways to accomplish this, as follows:

- Add a new data volume to the existing storage entry or pool entry.
- Create a second storage entry or pool entry specifically for the data volumes.

You can modify a Virtual Connect blade logical server storage entry to add a new LUN to the list of storage volumes. (Note that you cannot modify the size of, or “grow,” an existing LUN.) This feature is useful if applications running on the logical server require additional storage, or new applications are added to the logical server. In addition, many operating system deployment tools (such as RDP) require that only one path be visible when installing the operating system. This allows you to create the logical server with only the boot volume, then later modify the logical server to add a data volume.

If you create a second storage entry for data volumes, follow the basic steps outlined in [“Step 2: Define and create volumes,”](#) and define data volumes instead of the boot volume.

Using storage pools and shared storage

Logical servers and storage entries are created in the context of a Virtual Connect domain group. (See [Virtual Connect Enterprise Manager](#) documentation for more information about domain groups.) Storage entries are available only to logical servers that are created within the same VC domain group. ID-VSE creates one storage pool per VC domain group to house these storage entries.

Through storage pools, ID-VSE supports the sharing of storage definitions. When a storage entry is created within the context of a storage pool, you can specify that the storage entry is to be shared by modifying the Maximum Number of Sharers field to a value greater than one.

ID-VSE allocates enough server WWNs so that each logical server that shares a storage definition is assigned a unique server WWN. The number of allocated server WWNs is determined by the maximum number of sharers. This is useful in a cluster environment, in which each system within the cluster has access to the same storage volumes. Note that any system that shares storage should have a shared distributed lock management system in place to coordinate LUN access.

Figure 10: Add storage pool entry and Create storage entry screens: Maximum sharers

Maximum Number of Sharers: Update Maximum Sharers (Adjust number of Server WWNs assigned to each port.)

Each allocated server WWN that will be used for sharing storage must be individually presented the LUN. To help a storage administrator manage these lists of server WWNS, ID-VSE provides a **Manage Server WWNs** table on the **Storage Pool Entry** screen (accessible from the **Manage Storage Pools** screen).

Figure 11: Add storage pool entry screen: Manage server WWNs

Manage Server WWNs			
Port	Ready	WWN	Owner
1	<input type="checkbox"/>	(3 WWNs)	
	<input type="checkbox"/>	50:06:0B:00:00:C2:62:44	
	<input type="checkbox"/>	50:06:0B:00:00:C2:62:43	
	<input type="checkbox"/>	50:06:0B:00:00:C2:62:42	

Note: After the Server WWNs are configured, check the Ready checkboxes in the table above to make the Server WWNs available for logical servers to use.

After the storage administrator completes the presentation of a LUN to a specific server WWN, he or she can mark that WWN as **Ready** by checking the checkbox. Only server WWNs that are marked as **Ready** can be assigned to logical servers.

Note: The number of storage entries that appear as **Available** in the **Storage Pool Entries** table on the **Manage Storage Pools** screen is determined by the number of server WWNs marked as **Ready** minus the number of logical servers that are already sharing the storage entry:

$$\text{Available} = \text{Ready} - \text{Sharers}$$

If two or more ports are specified, the port with the lower number of server WWNS marked as **Ready** is used to determine the number of available storage entries.

Summary

ID-VSE provides an easy, yet powerful, way to define Virtual Connect storage. By following the steps outlined in this white paper, while keeping the underlining concepts in mind, defining storage is a simple and straightforward process. As discussed in the Advanced Topics section, ID-VSE has additional capabilities that will help you not only define storage, but do it in a way that is appropriate to the procedures used in your workplace.

Terms and Definitions

Boot volume The disk volume containing the operating system. If you only one storage volume is defined, it must be a boot volume. If more than one storage volume is defined, only one can be a boot volume.

Enclosure A physical container for a set of server blades consisting of a backplane and hardware for cabling and thermal issues. It also hosts the CPU or server power supplies.

Fabric Hardware that connects servers to storage devices in a storage area network.

Fibre channel A technology for transmitting data between computer devices, used especially for connecting servers to shared and clustered storage devices and for interconnecting storage controllers and drives.

Logical port An ID-VSE representation of a port that can represent a physical port or a virtual port.

Logical servers Configuration information that you create, activate, and move across physical and virtual machines. A logical server contains the logical server definition and description, including the server compute resources (for example, number of processors and amount of memory), and the server connections to storage and networks.

Logical unit number (LUN) A virtual partition, or volumes, of a RAID (redundant array of independent disks) set. When a storage volume is mapped to a controller port, it becomes addressable in the SAN as a LUN. The LUN is specified during presentation.

Media access control (MAC) address Address assigned to your hardware that uniquely identifies its place on the network.

Physical port A host bus adapter (HBA) port on a blade's Fibre Channel mezzanine card. Each physical port can have one or more logical ports.

Path priority The primary or secondary path to a LUN, if multiple paths are defined.

Redundancy An environment in which a storage volume has two or more parallel paths to it. If one path fails, the other path can be used to access the volume.

Sharers Maximum number of logical servers that are allowed to share a storage entry or storage pool entry.

Storage area network (SAN) A high-speed network that interconnects different kinds of data storage devices with associated data servers on behalf of a larger network of users.

Server world wide name (WWN) Hexadecimal number automatically generated by ID-VSE for each port in a storage entry or storage pool entry.

Storage entry An entry in the Virtual Connect storage configuration, and includes the volume definition, boot volume port definition, and volume path definition.

Storage pool A collection of storage pool entries accessible to logical servers. Each Virtual Connect domain group contains one storage pool.

Storage pool entry An entry in the storage pool that includes the volume definition, boot volume port definition, and volume path definition. Each storage pool entry can be associated with more than one logical server, and each logical server can have multiple storage pool entries.

Storage volume A fixed disk drive on a disk array in a storage area network (SAN) that is not necessarily mapped to a controller port.

Storage world wide name (WWN) WWN for the array controller port or target WWN. This is a hexadecimal number that the storage administrator provides for each server WWN. The storage WWN must be entered before the logical server can be activated.

Virtual Connect domain Includes a single HP c-Class BladeSystem enclosure.

Virtual Connect domain group A logical collection of domains with the same network and storage configuration.

Virtual Connect profile A logical grouping of attributes related to server connectivity that can be assigned to a server blade. A server profile can be assigned to any server blade within the VC domain.

For more information

HP Insight Dynamics – VSE

Information on HP Insight Dynamics – VSE is available at <http://www.hp.com/go/insightdynamics>

HP Insight Control Environment and BladeSystem

Information on HP Insight Control Environment is available at <http://www.hp.com/go/ice>

Information on HP BladeSystem is available at <http://www.hp.com/go/blades>

Information on server blade firmware and software as well as the most recent versions is available at <http://www.hp.com/go/bladesystemupdates>

HP Rapid Deployment Pack

Information on the HP Rapid Deployment Pack is available at <http://www.hp.com/go/rdp>

The User's Guide is available at

<http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c01154890/c01154890.pdf>

A knowledge base article on *How to Perform a Boot From SAN Installation* is available at

http://h18013.www1.hp.com/products/servers/management/rdp/knowledgebase/00000127.htm?jumpid=reg_R1002_USEN

HP Systems Insight Manager (HP SIM)

Information on HP SIM is available online at <http://www.hp.com/go/hpsim>

Quickspecs (including supported Central Management Server configurations) are located at <http://h18013.www1.hp.com/products/servers/management/hpsim/quickspecs.html>

Information regarding the CMS requirements of various management tools is available at <http://h18013.www1.hp.com/products/servers/management/hpsim/plugin-apps.html>

Information regarding HP SIM training is available at

<http://h18013.www1.hp.com/products/servers/management/hpsim/training.html>

HP Virtual Connect

Information regarding HP Virtual Connect is available at <http://www.hp.com/go/vc> (c-Class infrastructure components such as switches, mezzanine cards, and Virtual Connect).

HP Virtual Connect Primer, <http://h71028.www7.hp.com/ERC/downloads/4AA0-5821ENW.pdf>

HP Virtual Connect for BladeSystem c-Class User Guide,

<http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00865618/c00865618.pdf>

A whitepaper on Virtual Connect and VMware Infrastructure 3 (including the new server deployment usage scenario) is available at <http://h71028.www7.hp.com/ERC/downloads/4AA1-1145ENW.pdf>

Information regarding VCEM is available at <http://www.hp.com/go/vcem>

The VCEM User Guide is available at

<http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c01273046/c01273046.pdf>

Storage Management

General information regarding boot from SAN is online at

http://h18004.www1.hp.com/storage/networking/bootsan.html?jumpid=reg_R1002_USEN

Information regarding Storage Essentials is available at <http://www.hp.com/go/storageessentials>

The User Guide for StorageWorks Command View EVA is available at
<http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c01081029/c01081029.pdf>

Information regarding the MSA2000fc array is available online at
<http://www.hp.com/go/msa2000> and the reference guide is available online at
<http://bizsupport1.austin.hp.com/bc/docs/support/SupportManual/c01565941/c01565941.pdf>

The Reference Guide for the Array Configuration Utility is available at
<http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c01081029/c01081029.pdf>

HP Virtual Connect technology with Oracle 10g grid (includes Boot from SAN)
<http://h71019.www7.hp.com/ActiveAnswers/downloads/4AA1-0394ENW.pdf>

HP StorageWorks Booting Windows Server 2003 and Windows Serverx64 Edition Systems from a Storage Area Network Application Notes
<http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00099862/c00099862.pdf>

Booting HP ProLiant Servers from a Storage Area Network HOWTO, 2nd edition
http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00580093/c00580093.pdf?jumpid=reg_R1002_USEN

Boot from SAN in Windows Server 2003 and Windows 2000 Server (published by Microsoft Corporation, December 2003) <http://download.microsoft.com/download/f/9/7/f9775acc-baa6-45cc-9dec-b82983705620/Boot%20from%20SAN%20in%20Windows.doc>

Configuring the HP StorageWorks Modular Smart Array 1000 and 1500 for external boot with HP ProLiant Blade Servers
<http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c00859301/c00859301.pdf>

The HP StorageWorks 1000/1500 Modular Smart Array Command Line Interface user guide is available online at
<http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c01183955/c01183955.pdf>



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