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IBM BladeCenter Foundation for Cloud: Integration Guide

Solution overview

IBM® BladeCenter® Foundation for Cloud delivers an ideal platform to expedite virtualized computing through a pre-integrated, pre-tested system that helps you to deploy new workloads quickly.

BladeCenter Foundation for Cloud offers the following benefits:

- ▶ Reduced complexity and accelerated implementation of your virtualized data center, using pre-integrated and pre-tested systems with management software, servers, and converged networking.
- ▶ Preinstalled VMware ESXi.
- ▶ Easy connection to external storage, such as IP-based Small Computer System Interface (iSCSI), network-attached storage (NAS), Fibre Channel (FC), or Fibre Channel over Ethernet (FCoE). Choose from IBM System Storage® DS3500 or IBM Storwize® V7000 offerings.
- ▶ Reduced infrastructure administration cost with single point of management for virtual and physical resources.
- ▶ Extendable to a cloud environment without rip-and-replace.

IBM BladeCenter Foundation for Cloud is an optimized, integrated system consisting of servers, converged networking, storage, and software that can enable IBM Business Partners to quickly deploy a sophisticated IT solution that is ready for virtualization. This configuration requires obtaining a VMware vSphere license (Enterprise 4.1 at a minimum).

This IBM Redpaper™ document was developed to help IBM Business Partners deploy BladeCenter Foundation for Cloud using the solution elements described in this paper. The solution is available fully integrated from IBM; this document will help you customize the solution for your clients.

In this paper, we present sample BladeCenter Foundation for Cloud configurations in small, medium, and large sizes. For each of these configurations, we show you what to order and how to integrate, based on IBM-tested solutions. We provide additional resources you can contact and easy information for ordering all of the parts required for each configuration.

This paper contains the following sections:

- ▶ “Overview of small, medium, and large configurations” on page 2
- ▶ “Installing hardware components” on page 7
- ▶ “Populating the rack enclosures” on page 14
- ▶ “Cabling the BladeCenter Foundation for Cloud” on page 18
- ▶ “Updating the hardware and firmware drivers” on page 19
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- ▶ “Appendix B. Medium configuration parts catalog” on page 23
- ▶ “Appendix C. Large configuration parts catalog” on page 25

Overview of small, medium, and large configurations

There are three tested reference configurations for the IBM BladeCenter Foundation for Cloud:

- ▶ Small: Designed for departmental, pilot, and budget-conscious data centers
- ▶ Medium: Intended for most data centers looking for rapid migration and scale-up of resources
- ▶ Large: Designed to provide scale to new or existing virtualized data centers

Each configuration represents a number of workloads (including virtual machines) that can be supported and can be expanded to meet specific customer requirements. These configurations are shown in the following sections.

Small configuration

Figure 1 shows the BladeCenter Foundation for Cloud small configuration.

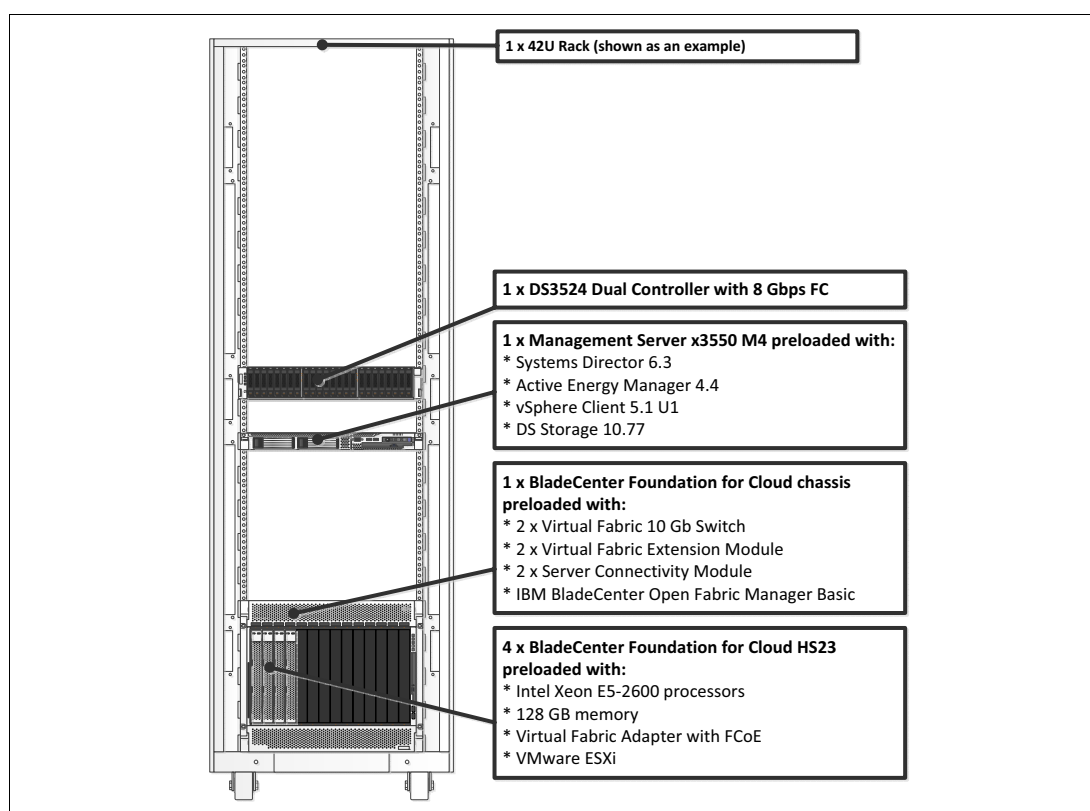


Figure 1 Small BladeCenter Foundation for Cloud configuration

Table 1 shows the part ordering information for the main components of a small configuration. Note that storage is optional depending on the requirements of the solution. “Appendix A. Small configuration parts catalog” on page 22 provides a complete list of parts for a small configuration.

Table 1 Small configuration parts list

Components	MTM	Quantity	Description
Management Server IBM System x3650 M4	7914-DDx	1	<ul style="list-style-type: none"> ▶ Microsoft Windows 2008 R2 Standard Edition x64 ▶ IBM Systems Director 6.3 with Active Energy Manager ▶ VMware vSphere Client 5.1 U1 ▶ IBM DS Storage Manager 10.77
Foundation for Cloud HS23	7875-91x	4	<ul style="list-style-type: none"> ▶ 2x Xeon E5-2620 6C 2.0GHz 15MB 1333MHz 95W ▶ 128 GB memory, composed of 16x 8-GB DIMMs ▶ Onboard 10Gb Ethernet with Emulex BE3 controller ▶ IBM Virtual Fabric Advanced Software Upgrade (LOM) providing support for FCoE ▶ IBM USB Memory Key for VMWare ESXi 5.0
Foundation for Cloud Chassis	8852-93x	1	<ul style="list-style-type: none"> ▶ Converged Network Switching ▶ BladeCenter Open Fabric Manager (BOFM) Basic
IBM System Storage DS3524	1746-A4D	1	<ul style="list-style-type: none"> ▶ 8 Gb Fibre Channel Interface ▶ Dual redundant controllers ▶ 12x 600-GB SAS drives

Medium configuration

There are two medium configurations for BladeCenter Foundation for Cloud, one with the IBM System Storage DS3524 storage server, and one with the IBM Storwize V7000 storage server.

Table 2 shows the part ordering information for the main components of a medium configuration with Storwize V7000 storage. Note that storage is optional, depending on the requirements of the solution. “Appendix B. Medium configuration parts catalog” on page 23 provides a complete list of parts for a medium configuration.

Table 2 Medium configuration with Storwize V7000 storage - Parts list

Components	MTM	Quantity	Description
Management Server IBM System x3650 M4	7914-DDx	1	<ul style="list-style-type: none">▶ Microsoft Windows 2008 R2 Standard Edition x64▶ IBM Systems Director 6.3 with Active Energy Manager▶ VMware vSphere Client 5.1 U1▶ IBM DS Storage Manager 10.77
Foundation for Cloud HS23	7875-91x	14	<ul style="list-style-type: none">▶ 2x Xeon E5-2620 6C 2.0GHz 15MB 1333MHz 95W▶ 128 GB memory, composed of 16x 8-GB DIMMs▶ Onboard 10Gb Ethernet with Emulex BladeEngine 3 (BE3) controller▶ IBM Virtual Fabric Advanced Software Upgrade (LOM) providing support for FCoE▶ IBM USB Memory Key for VMWare ESXi 5.0
Foundation for Cloud Chassis	8852-93x	1	<ul style="list-style-type: none">▶ Converged Network Switching▶ BladeCenter Open Fabric Manager (BOFM) Basic
Storwize V7000 Controller (24x 2.5-inch drive bays)	2076-124	1	<ul style="list-style-type: none">▶ Dual RAID controllers▶ IBM Storwize V7000 Software version 6.1 or later▶ 16x 600-GB SAS HDDs, 8x 200-GB SSDs
Storwize V7000 Expansion Enclosure (12 x 3.5-inch drive bays)	2076-212	1	<ul style="list-style-type: none">▶ Dual switched 6-Gbps ESMS, dual power supplies▶ 6x 3-TB NL SAS HDDs

Table 3 shows the part ordering information for the main components of a medium configuration with DS3524 storage. Note that storage is optional, depending on the requirements of the solution. “Appendix B. Medium configuration parts catalog” on page 23 provides a complete list of parts for a medium configuration.

Table 3 Medium configuration with DS3524 storage - Parts list

Components	MTM	Quantity	Description
Management Server IBM System x3650 M4	7914-DDx	1	<ul style="list-style-type: none">▶ Microsoft Windows 2008 R2 Standard Edition x64▶ IBM Systems Director 6.3 with Active Energy Manager▶ VMware vSphere Client 5.1 U1▶ IBM DS Storage Manager 10.77
Foundation for Cloud HS23	7875-91x	4	<ul style="list-style-type: none">▶ 2x Xeon E5-2620 6C 2.0GHz 15MB 1333MHz 95W▶ 128 GB memory, composed of 16x 8-GB DIMMs operating at 1600 MHz▶ Onboard 10Gb Ethernet with Emulex BE3 controller▶ IBM Virtual Fabric Advanced Software Upgrade (LOM) providing support for FCoE▶ IBM USB Memory Key for VMWare ESXi 5.0

Components	MTM	Quantity	Description
Foundation for Cloud Chassis	8852-93x	1	<ul style="list-style-type: none"> ▶ Converged Network Switching ▶ BladeCenter Open Fabric Manager (BOFM) Basic
System Storage DS3524 (24x 2.5-inch drive bays)	1746A4D	1	<ul style="list-style-type: none"> ▶ 8 Gb Fibre Channel Interface ▶ Dual redundant controllers ▶ 24x 600-GB SAS drives
System Storage EXP3524 (24x 2.5-inch drive bays)	1746A4E	3	<ul style="list-style-type: none"> ▶ 6 Gb SAS disk enclosure ▶ 24x 600-GB SAS drives

Figure 2 shows an example of the medium configuration.

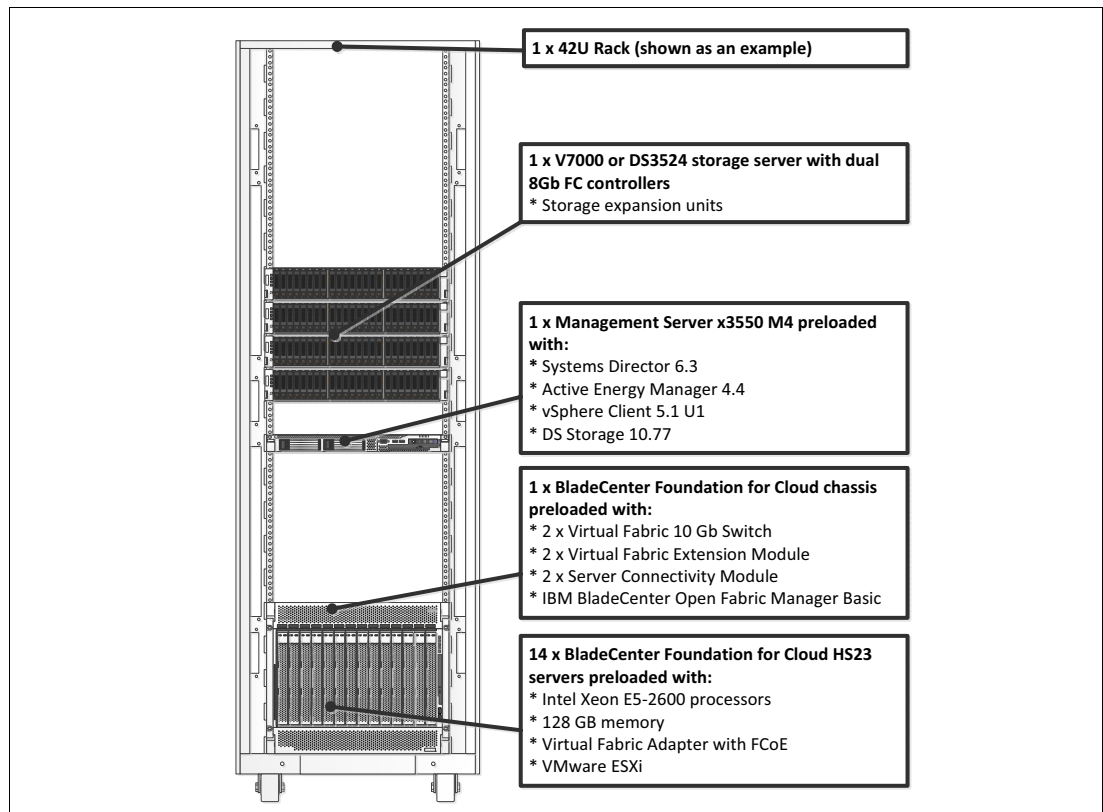


Figure 2 Medium BladeCenter Foundation for Cloud configuration - DS3524 storage

Large configuration

There are two large configurations for BladeCenter Foundation for Cloud, one with the IBM System Storage DS3524 storage server, and one with the IBM Storwize V7000 storage server.

Table 4 shows the part ordering information for the main components of a large configuration with Storwize V7000 storage. Note that storage is optional, depending on the requirements of the solution. "Appendix C. Large configuration parts catalog" on page 25 provides a complete list of parts for a large configuration.

Table 4 Large configuration with Storwize V7000 storage - Parts list

Components	MTM	Quantity	Description
Management Server IBM System x3650 M4	7914-DDx	1	<ul style="list-style-type: none"> ▶ Microsoft Windows 2008 R2 Standard Edition x64 ▶ IBM Systems Director 6.3 with Active Energy Manager ▶ VMware vSphere Client 5.1 U1 ▶ IBM DS Storage Manager 10.77
Foundation for Cloud HS23	7875-92x	28 (14 per chassis)	<ul style="list-style-type: none"> ▶ 2x Xeon E5-2650 8C 2.0GHz 20MB 1600MHz 95W ▶ 128 GB memory, composed of 16x 8-GB DIMMs ▶ Onboard 10Gb Ethernet with Emulex BE3 controller ▶ IBM Virtual Fabric Advanced Software Upgrade (LOM) providing support for FCoE ▶ IBM USB Memory Key for VMWare ESXi 5.0
Foundation for Cloud Chassis	8852-93x	2	<ul style="list-style-type: none"> ▶ Converged Network Switching ▶ BladeCenter Open Fabric Manager (BOFM) Basic
Storwize V7000 Controller (24x 2.5" drive bays)	2076-124	2	<ul style="list-style-type: none"> ▶ Dual RAID controllers ▶ IBM Storwize V7000 Software version 6.1 or later ▶ 8x 600-GB SAS HDDs ▶ 16x 200-GB SSDs
Storwize V7000 Expansion Enclosure (12 x 3.5-inch drive bays)	2076-212	2	<ul style="list-style-type: none"> ▶ Dual switched 6-Gbps ESMs, dual power supplies ▶ 12x 3-TB NL SAS HDDs
Storwize V7000 Expansion Enclosure (24 x 2.5-inch drive bays)	2076-224	2	<ul style="list-style-type: none"> ▶ Dual switched 6-Gbps ESMs, dual power supplies ▶ 24x 600-GB SAS HDDs

Table 5 shows the part ordering information for the main components of a large configuration with DS3524 storage. Note that storage is optional, depending on the requirements of the solution. "Appendix C. Large configuration parts catalog" on page 25 provides a complete list of parts for a large configuration.

Table 5 Large configuration with DS3524 storage - Parts list

Components	MTM	Quantity	Description
Management Server IBM System x3650 M4	7914-DDx	1	<ul style="list-style-type: none"> ▶ Microsoft Windows 2008 R2 Standard Edition x64 ▶ IBM Systems Director 6.3 with Active Energy Manager ▶ VMware vSphere Client 5.1 U1 ▶ IBM DS Storage Manager 10.77
Foundation for Cloud HS23	7875-92x	28 (14 per chassis)	<ul style="list-style-type: none"> ▶ 2x Xeon E5-2650 8C 2.0GHz 20MB 1600MHz 95W ▶ 128 GB memory, composed of 16x 8-GB DIMMs ▶ Onboard 10Gb Ethernet with Emulex BladeEngine 3 (BE3) controller ▶ IBM Virtual Fabric Advanced Software Upgrade (LOM) ▶ IBM USB Memory Key for VMWare ESXi 5.0
Foundation for Cloud Chassis	8852-93x	2	<ul style="list-style-type: none"> ▶ Converged Network Switching ▶ BladeCenter Open Fabric Manager (BOFM) Basic

Components	MTM	Quantity	Description
System Storage DS3524 (24x 2.5-inch drive bays)	1746-A4D	2	<ul style="list-style-type: none"> ▶ 8 Gb Fibre Channel Interface ▶ Dual redundant controllers ▶ 24x 600-GB SAS drives
System Storage EXP3524 (24x 2.5-inch drive bays)	1746A4E	6	<ul style="list-style-type: none"> ▶ 6 Gb SAS disk enclosure ▶ 24x 600-GB SAS drives

Figure 3 shows the large configuration.

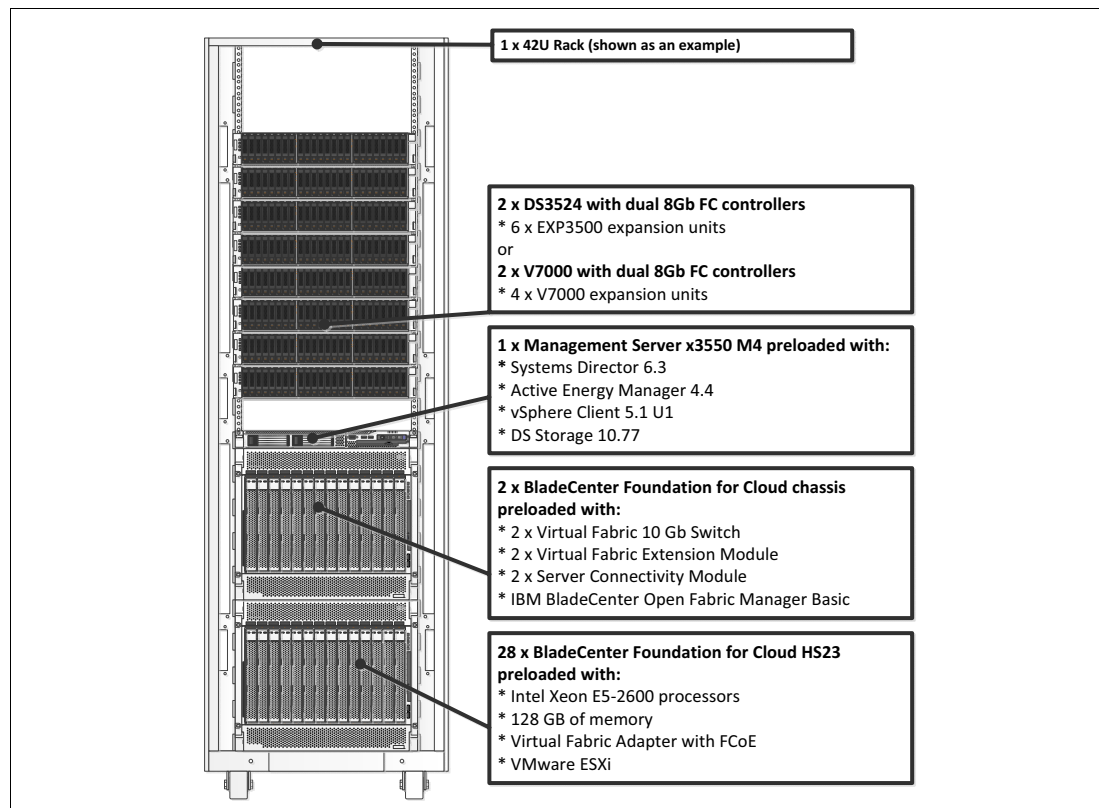


Figure 3 Large BladeCenter Foundation for Cloud configuration

Installing hardware components

Each BladeCenter Foundation for Cloud configuration has these common hardware elements:

- ▶ Management server
- ▶ Host servers with converged networking
- ▶ Chassis with converged networking
- ▶ Storage components

This section discusses these elements in detail.

System x3550 M4 management server

The specially configured management server is an IBM System x3550 M4, preloaded with the customizable systems management tools you need to manage the critical hardware components of IBM BladeCenter Foundations for Cloud. This management server can also easily scale to manage other components in your data center.

The IBM System x3550 M4 is shown in Figure 4.

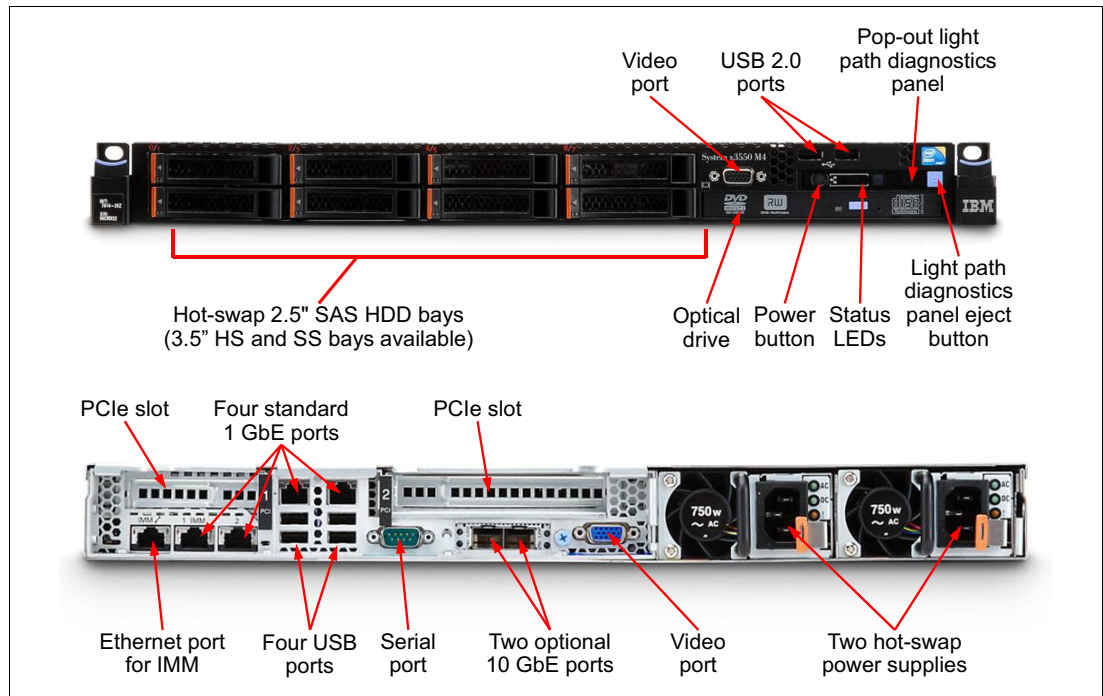


Figure 4 The IBM System x3550 M4

The management server comes with the following components preinstalled:

- ▶ Windows Server 2008 R2 Standard x64
- ▶ VMware vCenter Client 5.0 Update 1
- ▶ Systems management software:
 - IBM Systems Director 6.3
 - IBM Systems Director Active Energy Manager 4.4
 - IBM Systems Director Storage Manager 6.3
 - IBM Systems Director Update Manager 6.3
 - IBM Systems Director Service and Support Management 6.3
 - IBM DS Storage Manager 10.77.x5.28
 - IBM ToolsCenter, which is comprised of:
 - Dynamic System Analysis (DSA) 9.0 (12A)
 - Advanced Settings Utility (ASU) 9.0 (12A)
 - Update Express (UXSPI) 9.0 (12A)
 - Bootable Media Creator (BoMC) 9.0 (12A)
 - IBM FastSetup 1.1
 - IBM FastSetup System Templates 1.1

- ▶ Additional device drivers
 - RAID M5110 device driver 5.2.112
 - QLogic 8GB dual-port Fibre Channel device driver 9.1.9.25

The management server is an IBM System x3550 M4 model 7914-DDx, which has the following specifications:

- ▶ Two eight-core Intel Xeon™ E5-2600 series processors (E5-2620 6C 2.0GHz 15MB 1333MHz 95W)
- ▶ 32 GB of DDR3 ECC memory (eight 4 GB DIMMs), with capacity for up to Up to 768 GB with 24x 32 GB LRDIMMs and two processors.
- ▶ Integrated slotless 6 Gbps hardware RAID-1
- ▶ Support for up to eight hot-swap 2.5-inch SAS/SATA HDDs or SSD or up to three hot-swap SAS/SATA 3.5-inch HDDs
- ▶ Two 600 GB 10K 6Gbps SAS standard disk drives
- ▶ Highly functional chipset optimized for better application computing for general business workloads
- ▶ One PCIe 3.0 x16 slot plus one PCIe x8/x16 or optional PCIX slot that help provide flexibility, greater performance with long-term investment protection
- ▶ Intel Ethernet Dual Port Server Adapter I340-T2 (49Y4230) installed in one slot
- ▶ Total of six Gigabit Ethernet ports (four integrated, two using the Intel adapter) for high I/O capacity
- ▶ New energy-efficient design with two 550-watt ac power supplies, up to twelve cooling fans (six banks of counter-rotating dual fans) and energy-efficient planar components to help lower operational costs
- ▶ IBM Integrated Management Module Advanced Upgrade (90Y3901) for remote control and remote media support
- ▶ IBM UltraSlim Enhanced Serial Advanced Technology Attachment (SATA) multi-burner optical drive
- ▶ Rack slide kit and cable management arm

Details about this model can be found in the announcement letter:

<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&htmlfid=897/ENUS112-143>

We suggest that clients load and run their virtualization management software (for example, VMware vCenter) from the same server for optimal utilization of resources.

For more information about the IBM x3550 M4 server, see:

- ▶ IBM Redbooks Product Guide, *IBM System x3550 M4*:
<http://www.redbooks.ibm.com/abstracts/tips0851.html?Open>
- ▶ *IBM Installation and User's Guide for the x3550 M4*:
<http://ibm.com/support/entry/portal/docdisplay?ln docid=MIGR-5089486>

BladeCenter Foundation for Cloud chassis with converged networking

The small, medium, and large offerings include one or two configured IBM BladeCenter H chassis at the core. Figure 5 shows a view of the front and rear of a BladeCenter H, which is composed of the following components:

- ▶ Between four and 28x HS23 blades, depending on the configuration selected (small, medium, or large)
- ▶ Two IBM BNT® Virtual Fabric 10 Gb Switch Modules per chassis, in Bays 7 and 9
- ▶ Two QLogic Virtual Fabric Extension Modules per chassis, in Bays 3 and 5
- ▶ Two Server Connectivity Modules per chassis, in bays 1 and 2
- ▶ Four 2980 W high efficiency power supplies
- ▶ Two Advanced Management Modules



Figure 5 BladeCenter H front and rear views

IBM BNT Virtual Fabric 10 Gb Switch Modules and QLogic Virtual Fabric Extension Modules enable converged networking that can easily connect to the client's current LAN and SAN environment, without the need for additional top-of-rack hardware. Simply connect LAN infrastructure to the 10 Gb BNT Virtual Fabric Switch Module's Ethernet ports and SAN infrastructure to the Fibre Channel ports of the Virtual Fabric Extension Module for an optimized solution without rip-and-replace.

The Server Connectivity Module has been included in the configuration to provide additional 1 Gb ports.

BladeCenter Foundation for Cloud HS23 host servers

The IBM BladeCenter HS23 is a next-generation, two-socket blade server running the Intel Xeon processor E5-2600 product family. With its industry-leading energy efficiency, outstanding performance, flexible and scalable I/O, and complete systems management capability, HS23 offers a robust platform optimized for your mission-critical applications. The server ships with IBM Virtual Fabric 10Gb Ethernet integrated on the system planar, enabling up to eight virtual NICs.

The BladeCenter Foundation for Cloud HS23 includes an embedded hypervisor USB key with VMware ESXi 5.0 preinstalled. This enables easy deployment of the vSphere Hypervisor

virtualization solution. The server also includes IBM Virtual Fabric Advanced Software Upgrade, which enables FCoE on the integrated 10Gb Ethernet.

All of the management VMs and all of and compute VMs will be hosted on either the Storwize V7000 or DS3524 storage subsystems, or on external SAN-attached storage if BladeCenter Foundation for Cloud is being deployed with an existing SAN.

Figure 6 on page 11 shows the location of key components in the BladeCenter Foundation for Cloud HS23 server. More details can be found at the following address:

<http://ibm.com/systems/bladecenter/hardware/servers/hs23/>

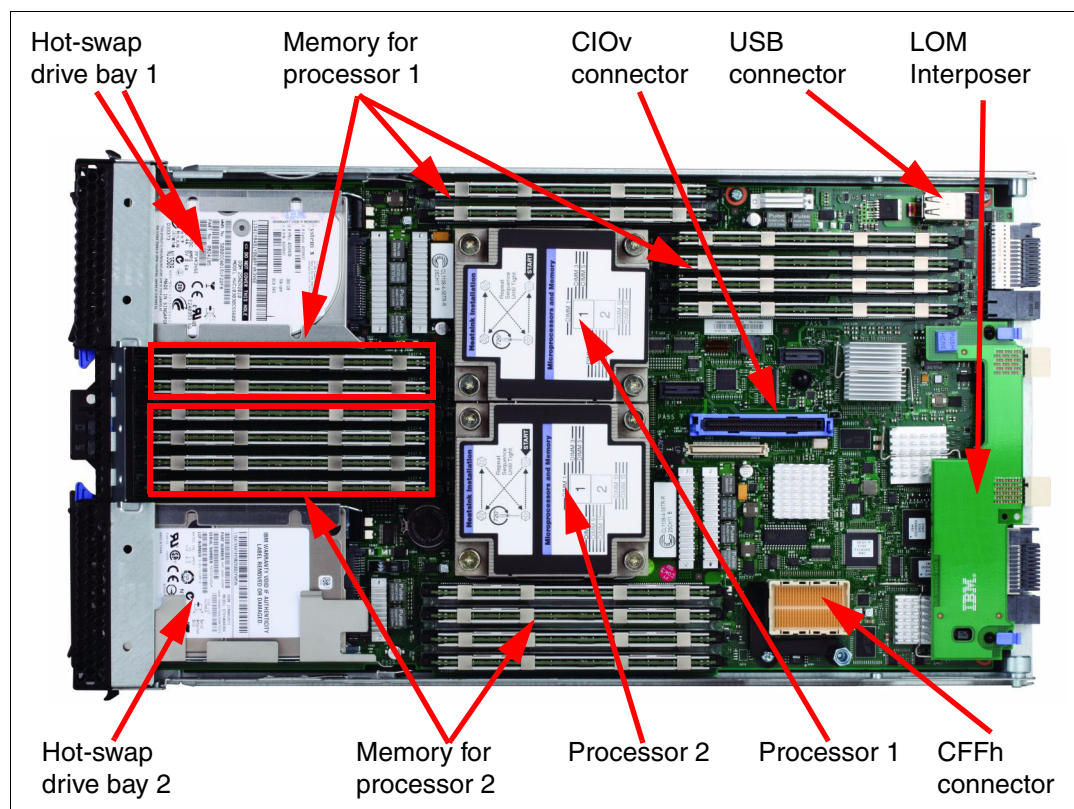


Figure 6 Internals of the HS23 blade server

Each of the HS23 servers ships in its own packaging and comes with preinstalled processor, memory, and other components. This process is the same for each of the BladeCenter Foundation for Cloud HS23 servers in the small, medium, or large IBM BladeCenter configurations.

The BladeCenter Foundation for Cloud HS23 server comes with the following preinstalled components:

Model 7875-91x:

- ▶ 2x Xeon E5-2620 6C 2.0 GHz, 15 MB, 1333 MHz, 95 W
- ▶ 128 GB memory, composed of 16x 8-GB DIMMs
- ▶ Onboard 10Gb Ethernet with Emulex BladeEngine 3 (BE3) controller
- ▶ IBM Virtual Fabric Advanced Software Upgrade (LOM), 90Y9310
- ▶ IBM USB Memory Key for VMware ESXi 5.0, 41Y8300

Model 7875-92x:

- ▶ 2x Xeon E5-2650 8C 2.0 GHz, 20 MB, 1600 MHz, 95 W

- ▶ 128 GB memory, composed of 16x 8-GB DIMMs
- ▶ Onboard 10Gb Ethernet with Emulex BladeEngine 3 (BE3) controller
- ▶ IBM Virtual Fabric Advanced Software Upgrade (LOM), 90Y9310
- ▶ IBM USB Memory Key for VMware ESXi 5.0, 41Y8300

For more information about the HS23, see the IBM Redbooks® Product Guide on the HS23:

<http://www.redbooks.ibm.com/abstracts/tips0843.html?Open>

IBM Storwize V7000

The IBM Storwize V7000 is a powerful storage system that combines hardware and software components to provide a single point of control to help support improved storage efficiency. By enabling virtualization, consolidation, and tiering in your organization, it helps to improve application availability and resource utilization. The Storwize V7000 offers easy-to-use, efficient, and cost-effective management capabilities for both new and existing storage resources in your IT infrastructure.

Figure 8 shows the front view of the Storwize V7000 unit.

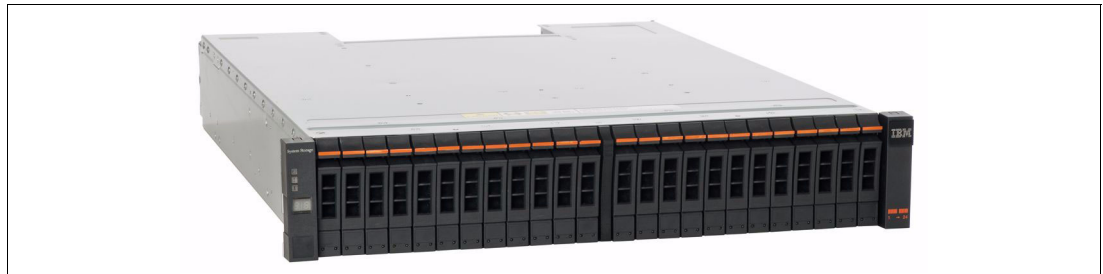


Figure 7 IBM Storwize V7000 storage subsystem

Physical characteristics of the Storwize V7000 include:

- ▶ 2U rack-mountable control enclosure
- ▶ Support for 24x 2.5-inch drive bays (model x24) or 12x 3.5-inch drive bays (model x12)
- ▶ Up to 36 TB of physical storage per enclosure using 3 TB near-line SAS disk drive modules, or up to 21.6 TB physical storage per enclosure using 900-GB SAS disk drive modules
- ▶ SAS disk drives, near-line SAS disk drives and SSDs
- ▶ Redundant dual-active intelligent RAID controllers
- ▶ 16 GB cache memory per control enclosure (8 GB per internal RAID controller) as a base feature
- ▶ For each control enclosure: Eight 8 Gbps Fibre Channel host ports (four 8-Gbps FC ports per RAID controller), four 1-Gbps and, optionally, four 10-Gbps iSCSI host ports (two 1-Gbps and, optionally, two 10-Gbps iSCSI host ports per RAID controller)
- ▶ RAID controller supports attachment of up to nine storage expansion units with configurations up to 360 TB physical storage capacities (720 TB in clustered systems)

Specifications are listed in Table 6.

Table 6 Storwize V7000 specifications

Specifications	Descriptions
Host interface	SAN-attached 8-Gbps Fibre Channel (FC) host connectivity, 1-Gbps iSCSI and optional 10-Gbps iSCSI
User interface	Graphical user interface (GUI)
Supported drives	3.5-inch disk drives: <ul style="list-style-type: none"> ▶ 2 TB, 3 TB 3.5-inch 7.2k Near-Line SAS disk 2.5-inch disk drives: <ul style="list-style-type: none"> ▶ 146 GB, 300 GB 2.5-inch 15k SAS disks ▶ 300 GB, 450 GB, 600 GB, 900 GB 2.5 -inch 10k SAS disks ▶ 200 GB, 300 GB, 400 GB 2.5-inch E-MLC solid-state drives ▶ 1 TB 2.5-inch 7.2k Near-Line SAS disk
RAID levels	RAID 0, 1, 5, 6, and 10
Maximum drives supported	240 per control enclosure; 480 per clustered system
Fans and power supplies	Fully redundant, hot swappable
Rack support	Standard 19 inch
Management software	Storwize V7000 and Storwize V7000 Unified software
Cache per controller/control enclosure/clustered system	8 GB/ 16 GB/ 32 GB
Advanced features included with each system	<ul style="list-style-type: none"> ▶ System Storage Easy Tier® ▶ FlashCopy® ▶ Thin provisioning
Additional available advanced features	<ul style="list-style-type: none"> ▶ Remote mirroring ▶ External virtualization ▶ IBM FlashCopy Manager ▶ IBM Tivoli® Storage Productivity Center for Disk Midrange Edition ▶ Tivoli Storage Manager ▶ IBM Tivoli Storage Manager FastBack® ▶ IBM Systems Director
Replication services	<ul style="list-style-type: none"> ▶ FlashCopy ▶ FlashCopy Manager ▶ Metro Mirror (Synchronous) ▶ Global Mirror (Asynchronous)

IBM System Storage DS3524

IBM has combined best-of-breed development with leading host interface and drive technology in the DS3524, providing a seamless path to consolidated and efficient storage while improving performance, flexibility, scalability, data security, and energy efficiency.

The DS3524 is a member of the DS3500 family of storage subsystems. See the DS3500 home page for more information about these products:

<http://ibm.com/systems/storage/disk/ds3500/>

Figure 8 on page 14 shows the front view of the DS3524 unit.



Figure 8 DS3524 storage subsystem

The DS3524 has two management Ethernet ports per controller. Use one Ethernet port for daily management of your DS3524 storage subsystem. Reserve the other port for use by service personnel or for subsystem monitoring hardware that might be available in the future.

IBM Power Distribution Units

Because the power supply varies from country to country (110 V versus 220 V, 50 Hz as opposed to 60 Hz, and so on), the IBM Power Distribution Unit must be selected appropriately to work in the country in which it is installed. We suggest that you use the IBM rack power configurator for each country where the unit is configured. We also suggest that you use IBM 7176 Ultra Density Enterprise Power Distribution Units for this solution. These units can be tightly integrated with IBM Systems Director Active Energy Manager™, a power management and monitoring component of the IBM Systems Director 6.2 platform.

Information about the rack power configurator can be found at the following address:

http://ibm.com/systems/xbc/cog/rackpwr/7176ultra_density_enterprise_pdu_us_ca.html

Power cables to connect to the PDU will vary depending on your geography or country-specific needs. Design your solution for redundancy with separate PDU and power sources for each redundant power supply on each particular device.

Populating the rack enclosures

This section describes the rack requirements for the small, medium, and large configurations and shows where to install each device in the cabinet. There are a number of locations common to all three solutions:

- ▶ The BladeCenter chassis are always mounted at or near the bottom of the cabinet for small and medium configurations and are stacked starting from the bottom of the rack for the large configuration.
- ▶ The Management server is always mounted in location U19.
- ▶ The first Storwize V7000 or DS3524 is always mounted in U23 and U24.

The suggested PDUs and necessary redundant power distribution are mounted elsewhere in the rack (not shown).

Racking the small configuration

The components required for a small configuration are the same as and limited to those listed in “Populating the rack enclosures” on page 14. Observe the following guidelines when installing these components for the small configuration:

- ▶ Mount the BladeCenter chassis at the bottom of the rack, locations U1 to U9.
- ▶ Mount the Management server in location U19.
- ▶ Mount the DS3524 in locations U23 to U24.

Install the suggested PDUs and necessary redundant power distribution units elsewhere in the rack (not shown). Figure 9 shows an example of a small configuration.

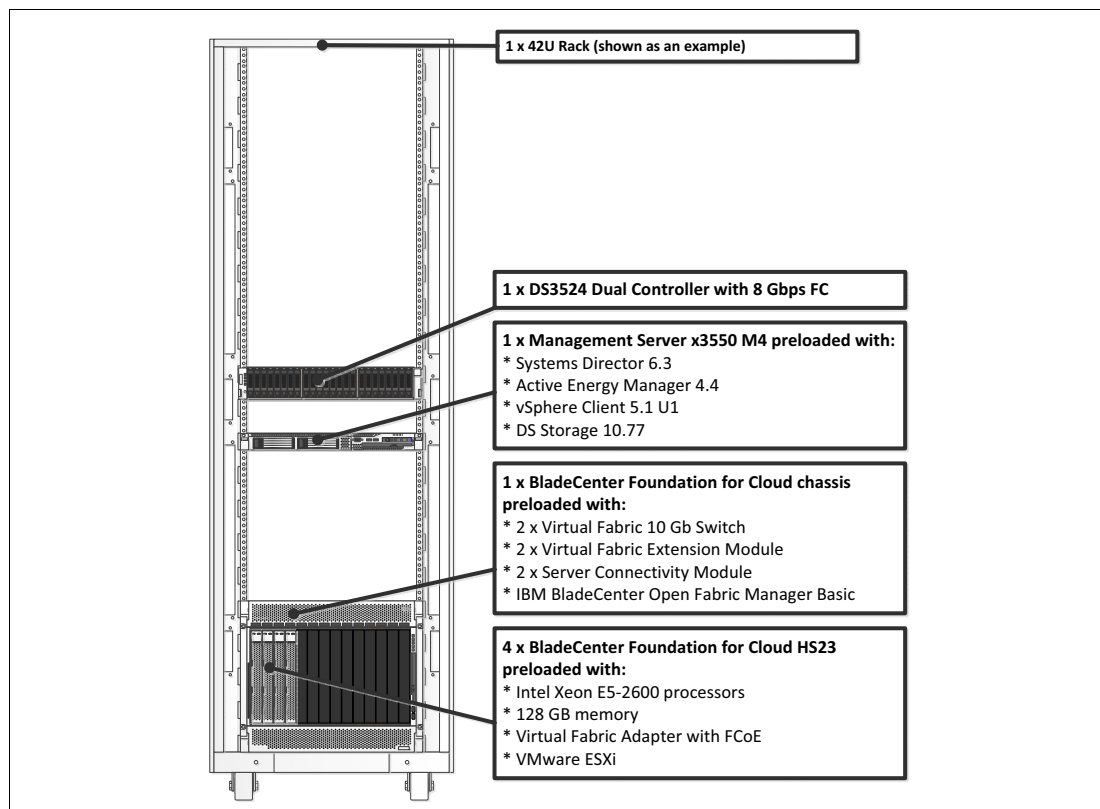


Figure 9 Small configuration racking

Racking the medium configuration

Observe the following guidelines when installing these components for the medium configuration:

- ▶ Mount the BladeCenter chassis at the bottom of the rack, locations U1 to U9.
- ▶ Mount the Management server in location U19.
- ▶ Mount the Storwize V7000 or DS3524 in locations U23 to U24.
- ▶ Mount the Storwize V7000 expansion units or EXP3524 units directly above the DS3524, in U25 to U30.

Install the suggested PDUs and necessary redundant power distribution units elsewhere in the rack (not shown). Figure 10 shows an example of the medium configuration.

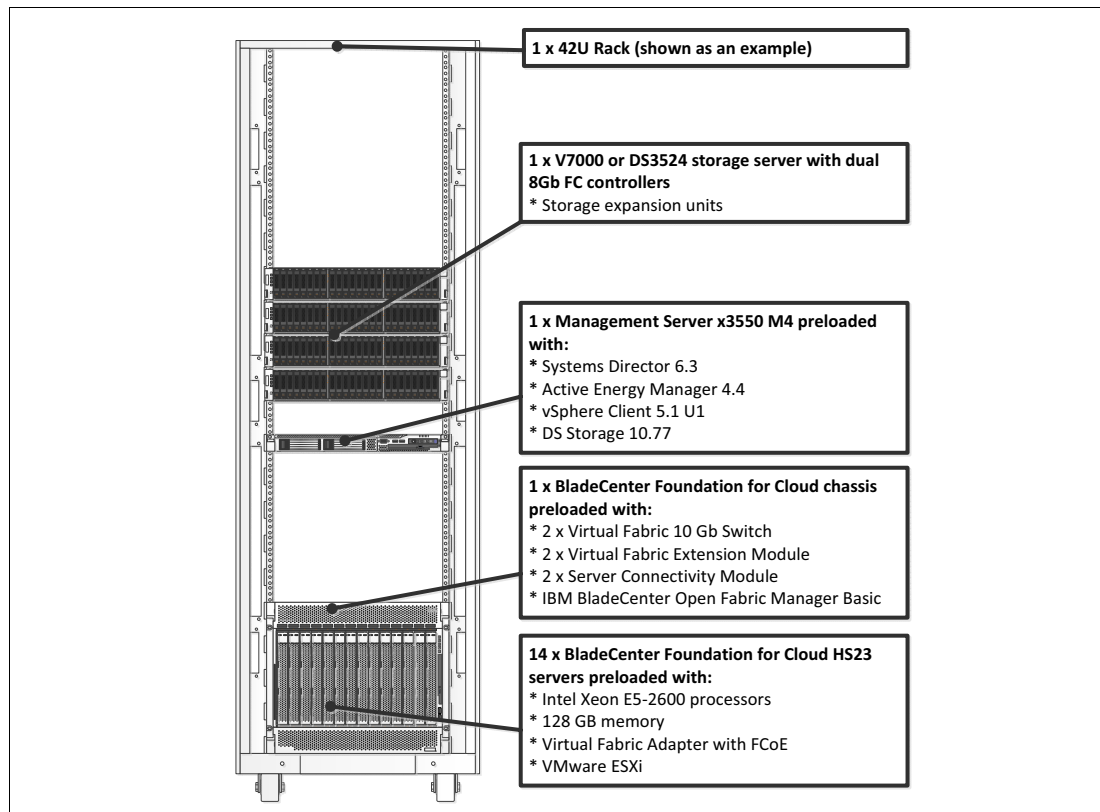


Figure 10 Medium configuration racking

Racking the large configuration

Observe the following guidelines when installing these components for the large configuration:

- ▶ Mount the first BladeCenter chassis in locations U1 to U9.
- ▶ Mount the second chassis in locations U10 to U18.
- ▶ Mount the Management server in U19.
- ▶ Mount the storage starting at location U23 and working upwards in the rack. Install the controllers first then the expansion units above the controllers.

Install the suggested PDUs and necessary redundant power distribution units elsewhere in the rack (not shown). Figure 11 shows an example of a large configuration.

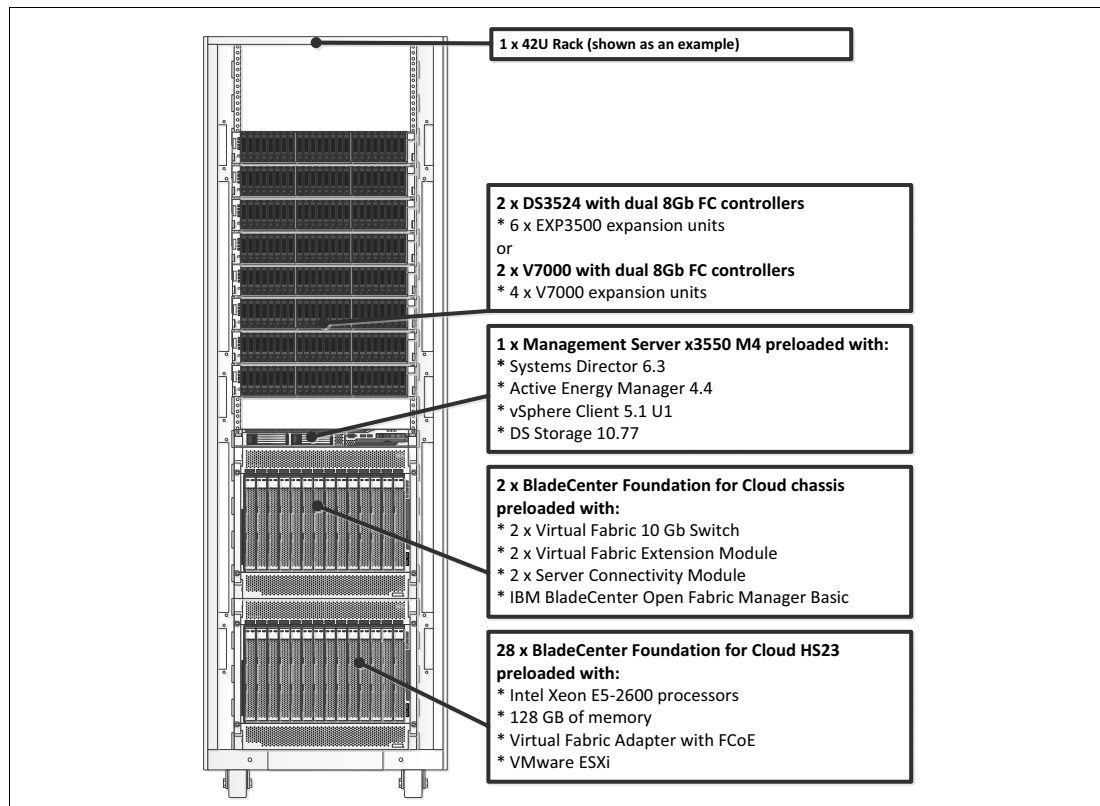


Figure 11 Large configuration racking

Cabling the BladeCenter Foundation for Cloud

This section shows how to cable the small, medium, and large BladeCenter Foundation for Cloud configurations.

Cabling the small and medium configurations

Because the number of servers is the only difference between the small and medium configurations, the cabling shown in Figure 12 applies to both.

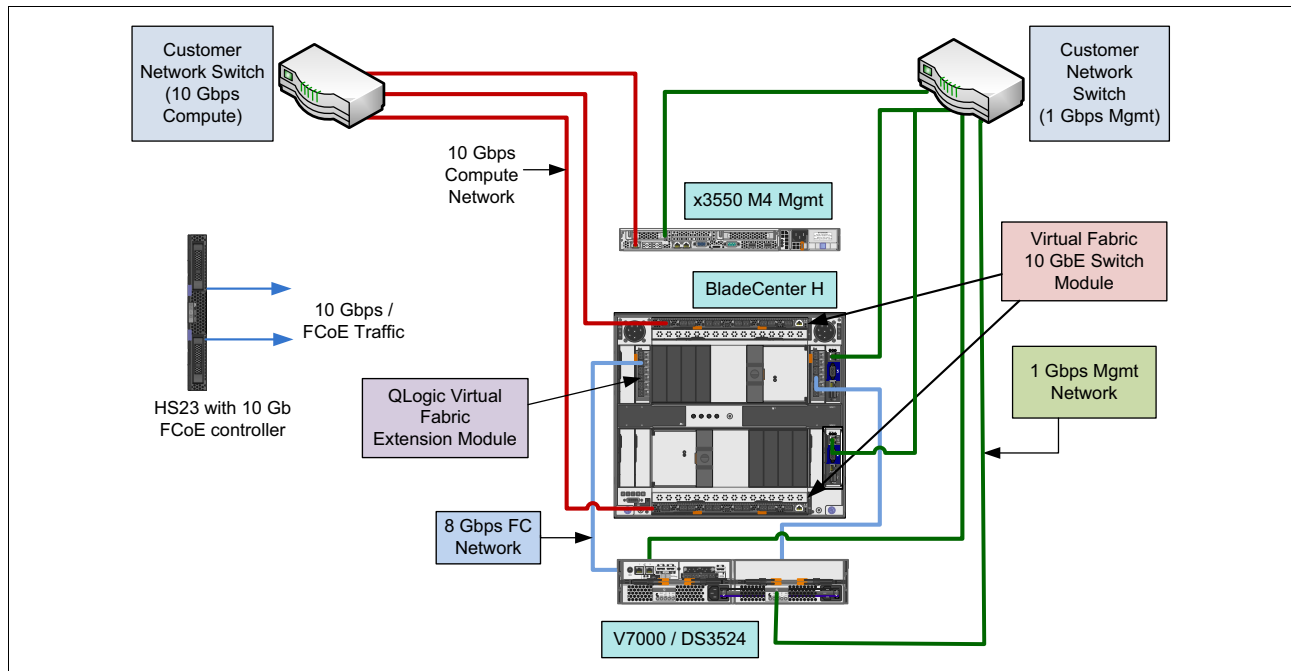


Figure 12 Small and medium configuration cabling

Cabling the large configuration

Figure 13 shows the cabling for a large configuration.

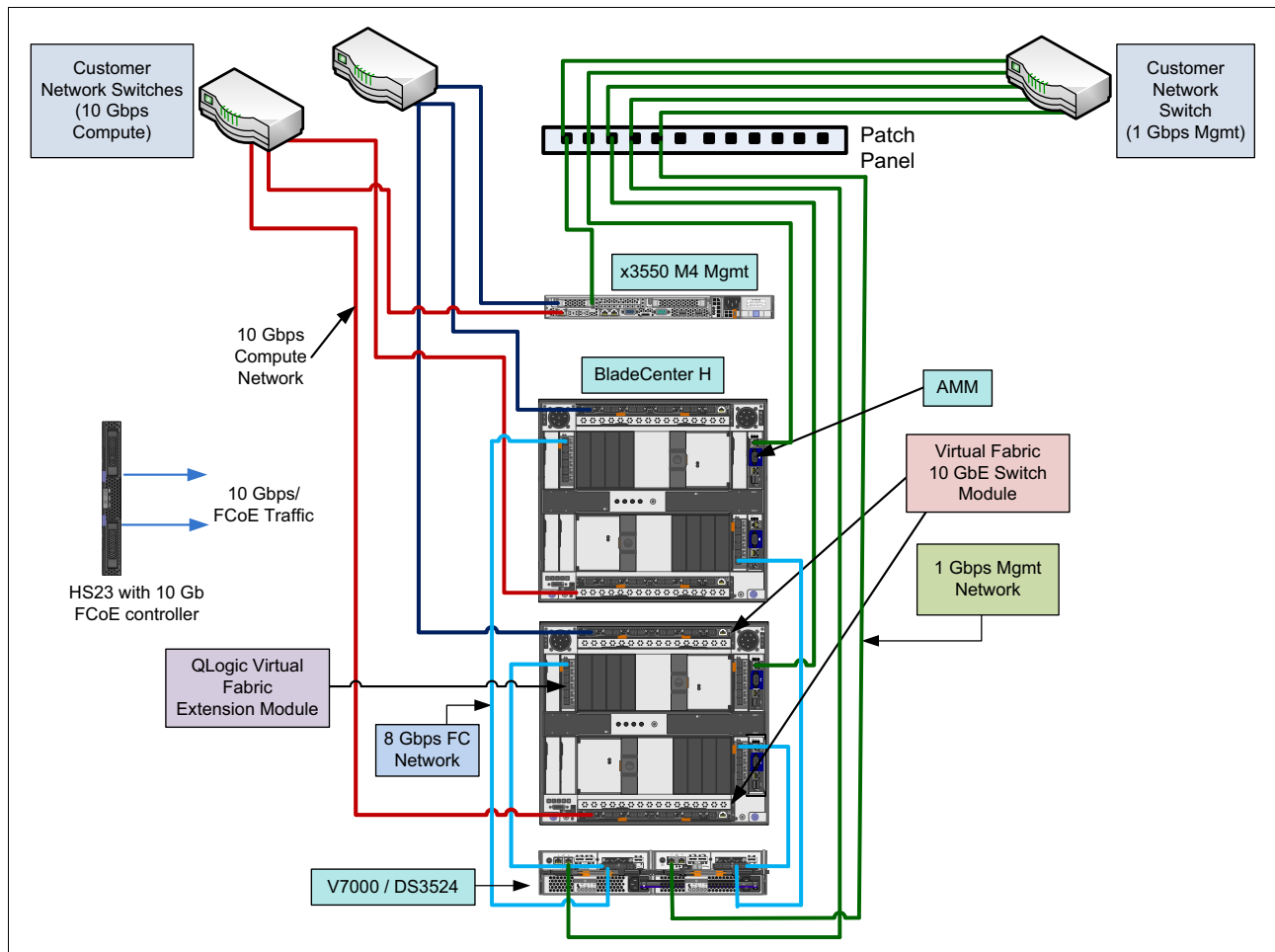


Figure 13 Large configuration cabling

Updating the hardware and firmware drivers

Hardware and firmware drivers for the BladeCenter Foundation for Cloud solution should be updated prior to taking any other action. An FTP or TFTP server is required, with network access to the Advanced Management Module (AMM) or the Management network on each device, to update the device drivers.

To update devices using the network, each device must have a valid IP address and be reachable from end to end by ping, HTTP, FTP, or TFTP, depending on the update method.

A unique IBM ToolsCenter bootable CD/DVD can be created to update the firmware for most of the components for System x® and BladeCenter servers. The ToolsCenter Creation tools can be found at the following address:

<http://ibm.com/support/entry/portal/docdisplay?ln docid=T00L-CENTER>

Table 7 shows the supported components of the BladeCenter Foundation for Cloud. If you deviate from the suggestions outlined in the table, you might have unexpected results. The firmware levels in Table 7 can be used for small, medium, and large BladeCenter Foundation for Cloud configurations.

Table 7 Firmware levels

	Product	Firmware	Version
Chassis / Networking switches	BladeCenter AMM Firmware		v3.62c
	IBM BladeCenter Virtual Fabric 10Gb Switch Module	BladeOS (TFTP server required)	v6.7.1.0 Detailed instructions can be found at: ftp://ftp.software.ibm.com/systems/support/system_x_pdf/46m1525.pdf and: http://www.bladenetwork.net/IBM-BladeCenter-support.html
	Server Connectivity Module		v1.1.3.0
	QLogic Virtual Fabric Extension Module		v9.0.3.02
Blade server	BladeCenter HS23	IMMv2 UEFI DSA Preboot Emulex Embedded VFA	1.22 1.02 4.03 GA level
	Virtual Fabric Advanced II adapter		Emulex Release 2.3 OCM 5.1.42-12

Additional references

- ▶ IBM BladeCenter Foundation for Cloud home page
<http://ibm.com/systems/bladecenter/solutions/infrastructure/virtualization/integratedcloudplatform/>
- ▶ BladeCenter H:
<http://ibm.com/support/fixcentral/systemx/selectFixes>
- ▶ BladeCenter HS23 firmware updates:
<http://ibm.com/support/fixcentral/systemx/selectFixes#Network>

Appendix A. Small configuration parts catalog

Table 8 contains the parts catalog for an IBM BladeCenter Foundation for Cloud small configuration.

Table 8 Small parts configuration catalog

Part #	Description	Quantity
Management server		
7914-DDx	IBM System x3550 M4 with IBM Systems Director 6.3, Active Energy Manager 4.4, vSphere Client 5.1 U1, DS Storage Manager 10.77	1
Chassis / Networking (one chassis)		
88524Tx	IBM BladeCenter H	1
68Y6601	IBM BladeCenter H 2980 W AC Power Modules w/Fan Pack	1
2019A1X	IBM BladeCenter Advanced Management Module	1
46M0902	IBM UltraSlim Enhanced SATA Multi-Burner	1
46C7191	BNT Virtual Fabric 10 Gb Switch Module for IBM BladeCenter	2
39Y9324	Server Connectivity Module for IBM BladeCenter	2
46M6172	QLogic Virtual Fabric Extension Module for IBM BladeCenter	2
44X1964	IBM 8 Gb SFP+ SW Optic Transceiver	4
44W4408	10 GbE 850 nm Fiber SFP+ Transceiver (SR) for IBM BladeCenter	8
2019B1X	IBM BladeCenter Open Fabric Manager	1
Blade Server (four servers)		
7875-91x	IBM BladeCenter HS23 <ul style="list-style-type: none"> ▶ 2x Xeon E5-2620 6C 2.0GHz 15MB 1333MHz 95W ▶ 128 GB memory, composed of 16x 8-GB DIMMs ▶ Onboard 10Gb Ethernet with Emulex BE3 controller ▶ IBM Virtual Fabric Advanced Software Upgrade providing FCoE support ▶ IBM USB Memory Key for VMWare ESXi 5.0 	4
DS3524 storage server		
1746A4D	DS3524 - Dual Controller Base Unit	1
49Y2048	600-GB, 10,000 rpm, 2.5-inch SAS drive	12
68Y8432	DS3500 Series - 8-Gb FC 4-port card	2

Appendix B. Medium configuration parts catalog

Table 9 contains the parts catalog for an IBM BladeCenter Foundation for Cloud medium configuration. Table 10 lists the parts for the DS3524 storage server configuration. Table 11 on page 24 lists the parts for the Storwize V7000 storage server configuration.

Table 9 Medium parts configuration catalog

Part #	Description	Quantity
Management Server		
7914-DDx	IBM System x3550 M4 with IBM Systems Director 6.3, Active Energy Manager 4.4, vSphere Client 5.1 U1, DS Storage Manager 10.77	1
Chassis / Networking (one chassis)		
88524Tx	IBM BladeCenter H	1
68Y6601	IBM BladeCenter H 2980 W AC Power Modules w/Fan Pack	1
2019A1X	IBM BladeCenter Advanced Management Module	1
46M0902	IBM UltraSlim Enhanced SATA Multi-Burner	1
46C7191	BNT Virtual Fabric 10 Gb Switch Module for IBM BladeCenter	2
39Y9324	Server Connectivity Module for IBM BladeCenter	2
46M6172	QLogic Virtual Fabric Extension Module for IBM BladeCenter	2
44X1964	IBM 8 Gb SFP+ SW Optic Transceiver	4
44W4408	10 GbE 850 nm Fiber SFP+ Transceiver (SR) for IBM BladeCenter	8
2019B1X	IBM BladeCenter Open Fabric Manager	1
Blade Server (14 servers)		
7875-91x	IBM BladeCenter HS23 <ul style="list-style-type: none"> ▶ 2x Xeon E5-2620 6C 2.0GHz 15MB 1333MHz 95W ▶ 128 GB memory, composed of 16x 8 GB DIMMs ▶ Onboard 10Gb Ethernet with Emulex BE3 controller ▶ IBM Virtual Fabric Advanced Software Upgrade providing FCoE support ▶ IBM USB Memory Key for VMWare ESXi 5.0 	14

Table 10 Medium configuration - DS3524 storage server

Part	Description	Quantity
1746A4D	DS3500 - Dual Controller Base Unit (DS3524)	1
1746A4E	EXP3500 - Expansion Unit for DS3500. 2U, 24x 2.5-inch drive bays (EXP3524)	1
49Y2048	600GB 10,000 rpm 2.5-inch SAS drive	48
68Y8432	DS3500 Series - 8 Gb FC 4 Port Card	2
69Y0245	DS3500 Series - Environmental Services Module (ESM)	1

Table 11 Medium configuration - Storwize V7000 storage server

Model	Description	Quantity
2076-124	Storwize V7000 Controller - includes 24x SFF drive bays, dual RAID controllers, dual power supplies, redundant cooling, rack mounting rails, IBM Storwize V7000 Software version 6.1 or later preinstalled	1
2076-212	Storwize V7000 Expansion Enclosure - includes 12x LFF drive bays, dual switched 6 Gbps ESMS, dual power supplies with cooling components	1
2076-3206	Storwize V7000 - 600 GB SAS SFF (2.5-inch) 10,000 rpm drive (installed in either 24-bay controller or 24-bay expansion)	16
2076-3512	Storwize V7000 - 200-GB SSD E-MLC (enterprise-multi level cell) SFF (2.5-inch) drive (installed in either 24-bay controller or 24-bay expansion)	8
2076-3303	Storwize V7000 - 3 TB SAS LFF (3.5-inch) 7,200 rpm drive (installed in either 12-bay controller or 12-bay expansion)	6
2076-6008	Storwize V7000 - 8 GB Cache, each enclosure contains two sets of 8 GB cache. (Two required, no charge)	2
2076-5401	Storwize V7000 - 1 m, 6 Gbps external mini SAS cable (Two required to attach each Expansion Enclosure)	2
2076-9801	Storwize V7000 Controller - AC Power Supply. (Two required, no charge)	4
2076-0010	Storwize V7000 - Preload IBM Storwize Software, must be included with each IBM V7000 enclosure ordered (no charge)	1
5639-VM1-0001	Storwize V7000 Base Software V6 - per storage device, includes one year SW maintenance	2

Appendix C. Large configuration parts catalog

Table 12 contains the parts catalog for an IBM BladeCenter Foundation for Cloud large configuration. Table 13 lists the parts for the DS3524 storage server configuration. Table 14 on page 26 lists the parts for the Storwize V7000 storage server configuration.

Table 12 Large parts configuration catalog

Part #	Description	Quantity
Management Server		
7914-DDx	IBM System x3550 M4 with IBM Systems Director 6.3, Active Energy Manager 4.4, vSphere Client 5.1 U1, DS Storage Manager 10.77	1
Chassis / Networking (two chassis)		
88524Tx	IBM BladeCenter H	2
68Y6601	IBM BladeCenter H 2980 W AC Power Modules w/Fan Pack	2
2019A1X	IBM BladeCenter Advanced Management Module	2
46M0902	IBM UltraSlim Enhanced SATA Multi-Burner	2
46C7191	BNT Virtual Fabric 10 Gb Switch Module for IBM BladeCenter	4
39Y9324	Server Connectivity Module for IBM BladeCenter	4
46M6172	QLogic Virtual Fabric Extension Module for IBM BladeCenter	4
44X1964	IBM 8 Gb SFP+ SW Optic Transceiver	8
44W4408	10 GbE 850 nm Fiber SFP+ Transceiver (SR) for IBM BladeCenter	16
2019B1X	IBM BladeCenter Open Fabric Manager	2
Blade Server (28 servers)		
7875-92x	IBM BladeCenter HS23 <ul style="list-style-type: none"> ▶ 2x Xeon E5-2650 8C 2.0GHz 20MB 1600MHz 95W ▶ 128 GB memory, composed of 16x 8-GB DIMMs ▶ Onboard 10Gb Ethernet with Emulex BE3 controller ▶ IBM Virtual Fabric Advanced Software Upgrade (LOM) providing support for FCoE ▶ IBM USB Memory Key for VMWare ESXi 5.0 	28

Table 13 Large configuration - DS3524 storage server

Model	Description	Quantity
1746A4D	DS3500 - Dual Controller Base Unit (DS3524)	1
1746A4E	EXP3500 - Expansion Unit for DS3500. 2U, 24 x 2.5-inch drive bays (EXP3524)	3
49Y2048	600 GB 10,000 rpm 2.5-inch SAS drive	96
68Y8432	DS3500 Series - 8 Gb FC 4 Port Card	2
69Y0245	DS3500 Series - Environmental Services Module (ESM)	3

Table 14 Large configuration - Storwize V7000 storage server

Model	Description	Quantity
2076-124	Storwize V7000 Controller - includes 24x SFF drive bays, dual RAID controllers, dual power supplies, redundant cooling, rack mounting rails, IBM Storwize V7000 Software version 6.1 or later preinstalled	1
2076-212	Storwize V7000 Expansion Enclosure - includes 12x LFF drive bays, dual switched 6Gbps ESMs, dual power supplies with cooling components	1
2076-224	Storwize V7000 Expansion Enclosure - includes 24x SFF drive bays, dual switched 6 Gbps ESMs, dual power supplies with cooling components	1
2076-3206	Storwize V7000 - 600 GB SAS SFF (2.5-inch) 10,000 rpm drive (installed in either 24-bay controller or 24-bay expansion)	32
2076-3512	Storwize V7000 - 200 GB SSD E-MLC (enterprise-multi level cell) SFF (2.5-inch) drive (installed in either 24-bay controller or 24-bay expansion)	16
2076-3303	Storwize V7000 - 3 TB SAS LFF (3.5-inch) 7,200 rpm drive (installed in either 12-bay controller or 12-bay expansion)	12
2076-6008	Storwize V7000 - 8 GB Cache, each enclosure contains two sets of 8 GB cache. (Two required, no charge)	2
2076-5401	Storwize V7000 - 1m, 6 Gbps external mini SAS cable (Two required to attach each Expansion Enclosure)	2
2076-9801	Storwize V7000 Controller - AC Power Supply. (Two required, no charge)	6
2076-0010	Storwize V7000 - Preload IBM Storwize Software, must be included with each IBM Storwize V7000 enclosure ordered (no charge)	2
5639-VM1-0001	Storwize V7000 Base Software V6 - per storage device, includes one year SW maintenance	3

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