

## The Cisco® Unified Computing System™



### A simplified, scalable datacenter solution:



Simplified architecture



Streamlined deployment



Cost savings that scale



Fabric extendible to rack servers and virtual machines

in our research compared to the HP Virtual Connect

Not all IT architectures are created equal. Whether you are updating your existing infrastructure or building from the ground up, choosing a solution that eases deployment and streamlines management while keeping costs down is a wise choice.

Cisco Unified Computing System (UCS®) and HP Virtual Connect both offer tools to streamline deployment and management of your IT infrastructure, but which does more to help you save in deployment and management? We researched the technical features that the Cisco UCS and HP Virtual Connect architectures offer, and found that the Cisco UCS Unified Fabric architecture and the Cisco UCS Manager help alleviate deployment and management burdens with less hardware and without additional software licensing compared to the HP solution. Additionally, the advantages of the Cisco UCS Unified Fabric are not limited to the blade chassis but also extend to rack servers.

These advantages, along with the fact that the Cisco solution supports all current and legacy UCS servers, not just current-generation servers, make Cisco Unified Computing System a complete datacenter solution that can meet a wide variety of infrastructure needs.

# SIMPLIFIED ARCHITECTURE

The Cisco UCS solution offers a simplified management framework by placing all management and configuration services at a pair of centrally located control points called Fabric Interconnects (FI). This method allows you to consolidate hardware and manage large-scale deployments from a single location. In contrast, the HP Virtual Connect solution uses a distributed management model with chassis-level control. The chassis-level method the HP system uses adds complexity to the configuration, which can increase management needs.

Figures 1 and 2 show the differences in complexity of the two approaches.

Figure 1: Enterprise view of the Cisco UCS management solution.

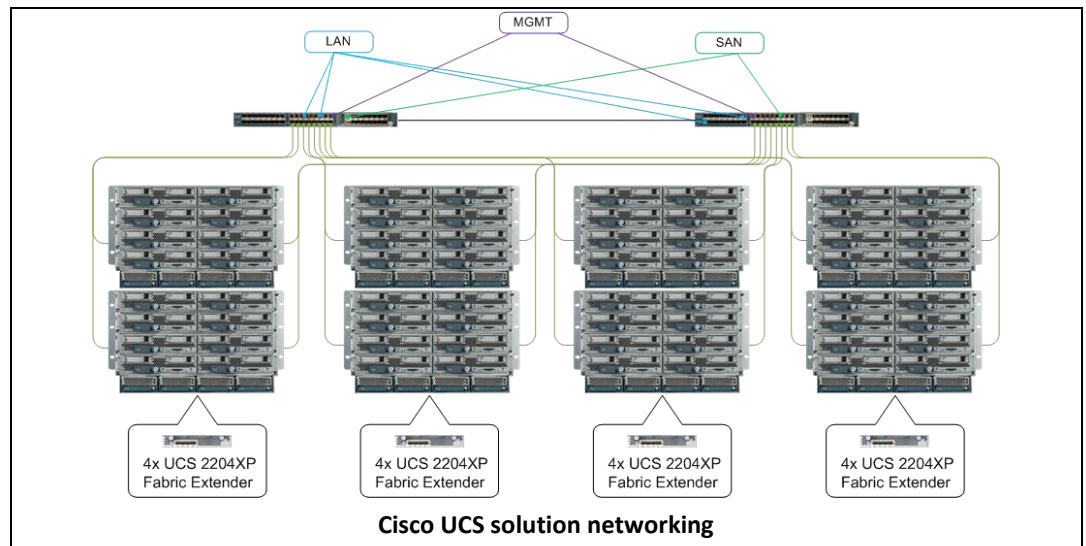
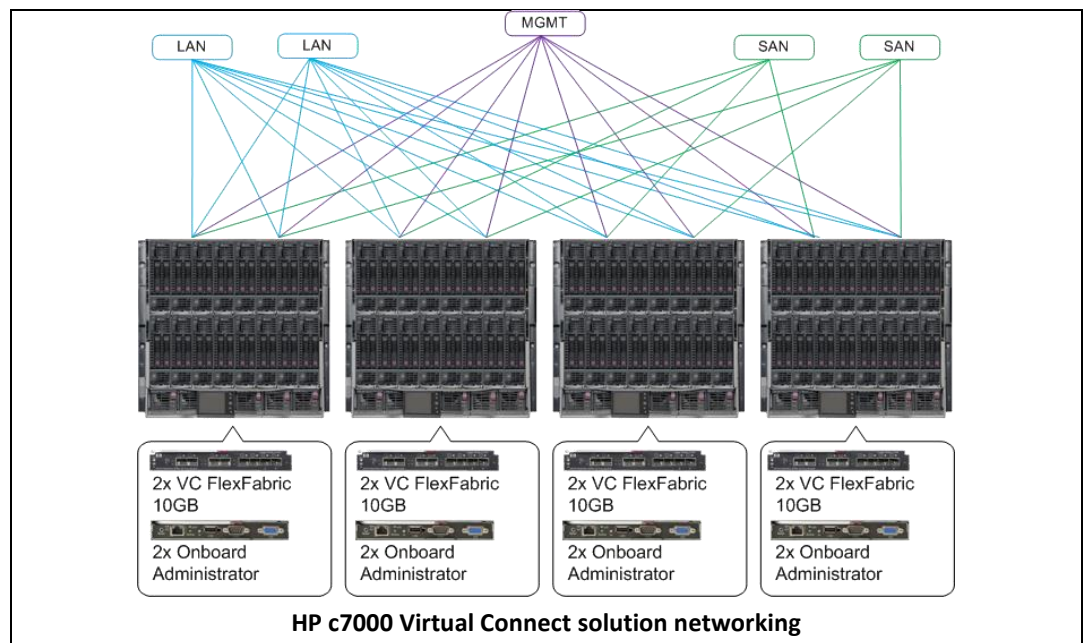


Figure 2: Enterprise view of the HP Virtual Connect management solution.



## Cisco UCS architecture

The Cisco UCS Fabric Interconnects are a pair of redundant network switches that act as a convergence and distribution point that combines traffic from SAN, management, and data networks into a single converged network fabric that connects directly to the managed compute nodes.

You can control your entire Cisco UCS infrastructure from anywhere with the Cisco UCS Manager, which is a highly available, single location for systems management. As your network scales out and you require multiple Fabric Interconnects, Cisco UCS Central consolidates all management systems together into a single dashboard by providing global policies and templates and enterprise role-based access control. With UCS Manager, you can apply all firmware versions and updates to existing servers, new nodes, and other hardware from a single location. A pair of Fabric Extenders (FEX) connects each Cisco blade chassis to the Fabric Interconnects. The FEX is not a switch; it is an aggregator that allows Fiber Channel over Ethernet (FCoE) connectivity without requiring any user configuration or additional connections. The concept of a Unified Fabric providing a highly available data plane and redundant embedded management is unique to Cisco systems.

## HP Virtual Connect architecture

In contrast, HP Virtual Connect architecture performs datacenter networking and management at the blade chassis level. This requires separate connections for LAN, SAN, and management networks to each blade chassis. Each HP c7000 blade chassis can contain up to eight Virtual Connect switch modules and two Onboard Administrator modules that you must configure and update as well. Two Virtual Connect modules must be installed in the c7000 chassis for minimum redundancy and connect to the blade via the onboard network controller. This results in one switch module and one management module for every eight blades. If greater network resources are needed, you must add additional Virtual Connect modules. In addition, each server would require an additional mezzanine card to be installed into all blades in the chassis to take advantage of the additional network resources. In the example of a six Virtual Connect module configuration, two mezzanine cards must be installed in each blade. Each HP c7000 chassis Virtual Connect module must have dedicated ports cabled and configured to utilize upstream switches for both Ethernet and Fibre Channel access. The increased number of cables, ports, IP addresses, and appliances to manage can add a significant amount of administration time for your IT staff. These interdependencies also increase risk of error when you make changes to your infrastructure.

## COST ADVANTAGES OF CISCO UCS ARCHITECTURE

When considering the deployment of your IT solution, it is important to consider the cost advantages, bandwidth, and management of the entire network. Our cost research shows that the Cisco UCS solution provides 20 Gb to the blade for a lower price than the HP Virtual Connect solution. The Cisco UCS flexible architecture also gives you the ability to scale bandwidth up to 40 Gb to the blade without scaling the price, and extends management outside the blade chassis to rack servers.

### Scale up without added management costs

Cisco UCS facilitates large-scale deployment and management with no additional hardware or software requirements. The Cisco UCS Manager and UCS Central software packages are included at no additional cost with the purchase of a pair of Cisco Fabric Interconnects. The advanced management features of UCS Manager are embedded in the Fabric Interconnects and do not require any additional software installation when compared to traditional blade deployments. In addition, UCS Manager manages up to 20 chassis, and UCS Central extends that capability to 100 chassis and 800 servers at no additional cost, scaling up to 10,000 servers with nominal licensing fees.

Management of HP Virtual Connect-enabled c7000 blade chassis is limited to four blade enclosures without the purchase of additional licenses. A Virtual Connect Enterprise Manager license allows support for 1,000 enclosures and 16,000 blade servers across 250 Virtual Connect domains. HP is replacing Virtual Connect Enterprise Manager, as well as Insight Control and Systems Insight Manager, with HP OneView, their latest infrastructure management application. HP OneView offers centralized management for up to 640 servers for updating and configuring the compute nodes in your datacenter, but at a starting list price of \$799 for an upgrade license per server.

### Provide 20 Gb to the blade for lower cost

Cisco UCS shares all available bandwidth with every chassis connected to the Unified Fabric. This allows an application to have the bandwidth it needs when it needs it, without requiring the customer to overprovision dedicated bandwidth to each chassis. We compared the actual cost of hardware and software for the Cisco and HP solutions with 20 Gb of available bandwidth to the blades. We configured the blade servers with Intel® Xeon® E5-2600 v2 processors and 128 GB of memory. We selected this configuration because both Cisco and HP offered it as a standard configuration bundle. We did increase the memory amount on the HP BL460c Gen8 from the standard 64 GB to 128 GB so it would match the Cisco configuration. For the comparison, we

looked at four deployment sizes that a business might choose: 20 blades, 40 blades, 60 blades, and 80 blades.

We found that the Cisco UCS solution was less expensive than the HP Virtual Connect with HP OneView solution at all four of the deployment sizes we analyzed, up to a 14.3 percent advantage. Figure 3 shows the comparison for the different blade configurations. ([Appendix A](#) shows a price breakdown for each configuration.)

	Blade configuration price			
	20	40	60	80
Cisco UCS solution (20 Gb)	\$280,822	\$512,729	\$756,431	\$994,256
HP Virtual Connect solution (20 Gb)	\$317,251	\$586,217	\$855,183	\$1,126,048

**Figure 3: Pricing for the two blade configurations (rounded to the nearest dollar). The Cisco UCS solution offers up to 14.3 percent savings over the HP Virtual Connect solution.**

For this comparison, we configured the HP c7000 blade chassis with two Virtual Connect modules, each with one 10Gb connection, allowing a total of 20 Gb of bandwidth per blade. We configured the Cisco UCS solution with two UCS 2204XP fabric extenders, each with one 10Gb connection, for a total of 20 Gb of bandwidth available to the blades.

### Scale bandwidth higher without scaling price

One advantage of the Cisco UCS solution is that you can double the amount of bandwidth available to the blade (to 40 Gb) for a small increase in price and the cost is still less than the HP Virtual Connect solution with 20 Gb available. The Cisco UCS chassis is configured with redundant UCS 2204XP fabric extenders. Each fabric extender provides four 10Gb connections to the Fabric Interconnect. This allows 80 Gb of bandwidth to the Fabric Interconnects and 40 Gb available to any blade in the chassis. To obtain this increased bandwidth, you simply purchase additional port licenses for the Fabric Interconnects and install the VIC 1240 port expander.

In contrast, the two Virtual Connect modules inside the HP c7000 blade chassis provide a maximum of 10 Gb of bandwidth per blade, or a total of 20 Gb per blade in a two-Virtual Connect configuration. In order to obtain additional bandwidth with the HP c7000 solution, you must purchase additional Virtual Connect modules and required mezzanine cards for each blade, increasing the cost and complexity of the solution.

When we look at the same four deployment sizes as in the previous comparison, we find that the 40Gb Cisco UCS solution is comparable in list price to the 20Gb HP Virtual Connect with HP OneView solution. Figure 4 shows the comparison for the different blade configurations. ([Appendix B](#) shows a price breakdown for each configuration.)



	Blade configuration price			
	20	40	60	80
Cisco UCS solution (40 Gb)	\$299,058	\$561,036	\$840,041	\$1,102,019
HP Virtual Connect solution (20 Gb)	\$317,251	\$586,217	\$855,183	\$1,126,048

Figure 4: Pricing for the two blade configurations (rounded to the nearest dollar). The Cisco UCS solution offers twice the redundant bandwidth available to the blade as compared to the HP Virtual Connect solution at up to 6.1 percent savings.

### Cisco Unified Fabric and UCS Manager, extended beyond the blade chassis

Server workloads can vary based on their requirements. For example, some are compute-intensive while others require large storage capacity and I/O. Because of these differences, most server deployments contain a mix of blade and rack mount servers. Ideally, the management solution you choose lets you support and manage both types of hardware from a single interface. Solutions without this support can create extra work for IT staff, who must perform every maintenance task—from firmware updates to server status monitoring—twice, using two separate tools and interfaces. Maintaining two separate management software products also increases licensing costs.

Cisco UCS Manager offers support for all current and previous generation UCS hardware models, including both blade and rack servers. Regardless of the hardware in your UCS deployment, you can manage it the same way from a single unified interface. This lets you optimize your infrastructure to match your workloads without sacrificing the management capabilities of UCS Manager or adding management products, which can make your infrastructure easier to manage and reduce licensing costs.

The current release of HP Virtual Connect Manager and HP OneView does not support server profiles outside the blade chassis. With HP OneView and Virtual Connect, you can create server profiles that have configuration information for the blade servers including BIOS configuration and Virtual Connect LAN and SAN configuration. With HP OneView 1.0, you cannot transfer this information to rack-mounted servers, so you must configure those servers individually. This lack of support can create additional overhead and the need for additional IT staff time when deploying and maintaining a complete HP solution.

## STREAMLINED DEPLOYMENT

As Figure 5 shows, updating and configuring a new, fully populated blade chassis in the datacenter is less complex using Cisco UCS architecture. This includes every step from plugging in the chassis to when the servers are ready to begin productive work.

Deploying the Cisco UCS solution	Deploying the HP Virtual Connect solution
<ol style="list-style-type: none"> <li>1. Connect the power and network cables to the blade chassis.</li> <li>2. The hardware is auto-discovered by UCS Manager. Using one global Service Profile you can apply all firmware updates and configure server BIOS and network settings.</li> <li>3. Apply the FEX module firmware update through UCS Manager.</li> <li>4. Deploy the OS to compute nodes using PXE boot and either vSphere Auto Deploy or Orchestrator, Microsoft Deployment services, or Red Hat Satellite services.</li> </ol>	<ol style="list-style-type: none"> <li>1. Import HP OneView OVF into VMware ESXi server for management hosting.</li> <li>2. Configure HP OneView for the environment with IP address and management account.</li> <li>3. Download latest HP Service Pack for ProLiant and add to HP OneView.</li> <li>4. Connect the power and network cables to the blade chassis.</li> <li>5. Select Enclosure → Add Enclosure from the HP OneView menu and add chassis IP address and login credentials. (Note: Select firmware baseline to automatically upgrade firmware.)</li> <li>6. Select Interconnects from HP OneView menu, and configure Virtual Connect modules.</li> <li>7. Select Server Hardware from menu and make sure the blades are listed. If not, select Add server hardware, and set up blade from iLO IP address or host name.</li> <li>8. Select Server Profiles → Create profile, and create server profiles for blades.</li> <li>9. Select Server Hardware, and assign server profile to blades.</li> <li>10. Deploy the OS to compute nodes through the following methods:               <ol style="list-style-type: none"> <li>a. ESXi, KVM, and RHEL install via OneView console or Onboard Administrator KVM.</li> <li>b. Windows Server by PXE Microsoft Deployment services.</li> </ol> </li> </ol>

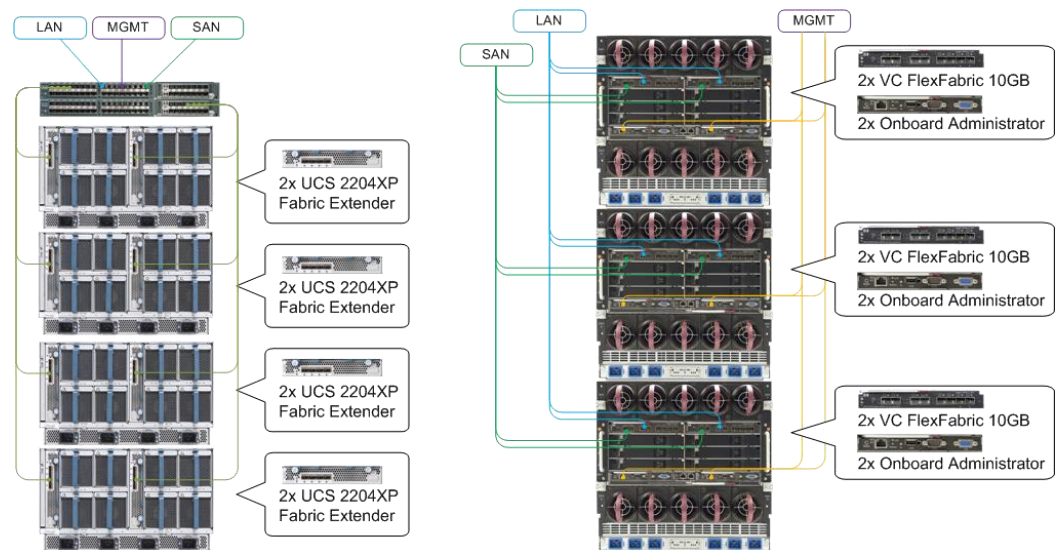
Figure 5: Deployment process comparison for the two solutions.

The additional hardware of an HP Virtual Connect distributed network management solution demands not only additional cost, but also extra time for setup and configuration of each module, which grows with deployment size. The steps to configure the c7000 blade chassis, blade servers, and Virtual Connect add to the deployment time.

## Reducing network complexity

IP addresses and switch ports increase administrator work and add extra cost in network cables and switches. The Cisco UCS solution reduces network complexity and cost by requiring only one converged network, while the HP Virtual Connect solution requires that two separate managed networks connect to each blade chassis (see Figure 6). The HP management network alone requires two extra cables per chassis for the Onboard Administrator modules, along with cabling for the Virtual Connect modules required for local area network (LAN) and storage area network (SAN). You then must repeat these steps for each blade chassis in your configuration.

**Figure 6: Rear view of the Cisco UCS and HP c7000 blade chassis showing the required network connections.**



In addition to using fewer network cables, the Cisco UCS solution uses fewer IP addresses than the HP Virtual Connect solution. Cisco UCS requires one address per Fabric Interconnect and one address for the cluster, for three total IP addresses. This means only three IP addresses are needed for as many blade chassis as the Fabric Interconnect can support. For example, four Cisco UCS chassis connected to a redundant Fabric Interconnect would require only three IP addresses.

In contrast, the HP Virtual Connect requires 16 IP addresses for every four blade chassis. Each individual c7000 blade chassis with redundant Onboard Administrator and two Virtual Connect modules would require four total IP addresses, one for each component. If additional Virtual Connect modules are installed, even more IP addresses per chassis may be required.

The Cisco UCS converged network makes it possible to send management traffic to the blades without burdening system administrators with any additional network management workload or cost overhead.



## HIGHLY AVAILABLE AND SCALABLE MANAGEMENT

Downtime due to hardware outage or failure can be costly, so it is important that management solutions provide redundancy and make it easy for administrators to transition workloads to keep business moving. Cisco's unified fabric design gives it significant out-of-box redundancy advantages compared to HP Virtual Connect.

### Automatic network failover

Careful planning and management are required to maintain a fully redundant network. Due to its unified fabric model, Cisco UCS is the only solution that delivers automatic network failover right out of the box—you do not need to configure any hardware or software or make any additional purchases. A Cisco UCS network adapter is connected to both fabrics (EtherChannel groups A and B), so even if one network path fails, the host continues without interruption. If an entire fabric fails, all network traffic routes to the second fabric automatically, without loss of connection.

The HP Virtual Connect lacks the out-of-the-box advantages of the Cisco UCS unified fabric and requires extra setup and configuration to achieve equivalent failover functionality.

## EXTENDS MANAGEMENT THROUGH PROFILES

Cisco UCS and HP Virtual Connect architectures both offer automation support to streamline many common server setup tasks and keep them running smoothly. Both solutions provide an automated method for applying settings to network-connected hardware and updating firmware: Cisco UCS uses Service Profiles, and HP OneView uses Server Profiles. While both solutions provide similar functionality, the methods to achieve them, the features they provide, and the associated costs are very different.

### Firmware updates and management for individual nodes

Cisco UCS Service Profiles provide a one-stop shop for all of your organization's hardware setup and maintenance needs. In one Service Profile, you can set all of the BIOS, device, and firmware configuration settings for a compute node as well as update the firmware version. Service Profiles let you easily archive a backup firmware version for each device to roll back to in case of error. When Cisco UCS Manager automatically discovers a new chassis, you can immediately apply the Service Profile to configure the server and update its firmware. This is the advantage of the UCS design as a model-based unified management engine.

HP OneView Server Profiles allow you to set the BIOS and firmware version as well, but limit you to one hardware type. In OneView, you define a hardware profile and assign a Server Profile for that hardware configuration. The advantage to this approach is that you know all blade servers with the same hardware profile are identical, so a

Server Profile can be transferred to any of these systems without configuration issues. However, with multiple blade configurations in a datacenter, it limits the ability to transfer profiles to any blade.

### Support for multiple server models in one profile

Most infrastructures use multiple server models. The Cisco UCS solution can combine different server models (both blade and rack) and configurations into one global Service Profile to apply to an entire infrastructure in one update. This is a result of UCS Manager being adaptive and model-based. Alternatively, the HP Virtual Connect is top-down software and does not support multiple models per Server Profile. This requires that you create and run a separate Server Profile for the different server configurations you deploy. Archiving, managing, and individually running different Server Profiles with the HP OneView solution increases the time and effort for IT administrators to keep the network running. This leaves less time available for IT managers to oversee strategic projects that can provide additional value to your organization.

## IN CONCLUSION

Moving to a well-managed IT architecture streamlines server deployment and reduces maintenance time. Your infrastructure should be highly available, easy to use, scalable, and cost-effective to implement. Cisco UCS Manager provides a streamlined method for automating hardware setup and firmware updates in one highly available solution to keep management costs down. Due to its converged network model, Cisco UCS Manager provides all of this functionality in a cost-effective package with no hidden fees or additional licensing costs. In contrast, HP Virtual Connect with OneView provides fewer vital features out of the box, increases network and management complexity, requires additional hardware and licensing, and has lower available network bandwidth in a configuration comparable in price to the Cisco UCS solution. With more available network bandwidth to the blade for similar cost, less network complexity, streamlined deployment and management, and greater out-of-box functionality, Cisco UCS provides a flexible and cost-effective solution to meet your architectural needs.

## APPENDIX A – DETAILED COSTS WITH COMPARABLE AVAILABLE BANDWIDTH

Figure 7 details the equipment and costs we used in our analysis for the Cisco UCS solution. We used Cisco's build and price Web site ([buildprice.cisco.com/config/ucs/blade-server/N20-Z0001](http://buildprice.cisco.com/config/ucs/blade-server/N20-Z0001)) and used MSRP pricing. We used the UCS 6248UP with the 12 included licenses for the Fabric Interconnect. We added individual licenses to the price for the additional ports. Cisco does offer options to purchase the UCS 6248UP with all ports licensed, which can be more cost-effective and save money.

We configured the UCS 5108 blade chassis with redundant UCS 2204XP fabric extenders and assumed one port from each extender connected to the Fabric Interconnect. This means each UCS 5108 had two ports connected to the Fabric Interconnect, so each chassis required two UCS port licenses.

We assumed each Fabric Interconnect has four licenses used for uplinks to external switches. These four ports were for two Fibre connections and two network connections.

Cisco UCS solution	Part number	Individual price	Blade configuration price			
			20	40	60	80
<b>B200 M3 blade server (fully configured)</b>						
B200 M3 without CPU, memory, HDD, or LOM	UCSB-B200-M3	\$1,682.13				
Intel Xeon E5-2660 v2 (2.2 GHz) processors (2 x \$2,106.13 each)	UCS-CPU-E52660B	\$4,212.26				
128GB memory (8 x 16GB PC3-14900 Dual Rank Reg 1.5v \$388.80 each)	UCS-MR-1X162RZ-A	\$3,110.40				
146GB, 15k rpm, SAS hard drives (2 x \$369.07 each)	A03-D146GC2	\$738.14				
Cisco UCS VIC 1240	UCSB-MLOM-40G-01	\$799.47				
<b>Total B200 M3 blade server</b>		<b>\$10,542.40</b>	<b>\$210,848.00</b>	<b>\$421,696.00</b>	<b>\$632,544.00</b>	<b>\$843,392.00</b>
<b>UCS 5108 Blade Chassis (configured)</b>						
UCS 5108 chassis 0 PSU/8 fans/ 0 fabric extender	N20-C6508	\$3,199.47				
2500 watt power supply (4 x \$499.20 each)	UCSB-PSU-2500ACPL	\$1,996.80				
UCS 2204XP fabric extender module (2 x \$2,666.67 each)	UCS-IOM-2204XP	\$5,333.34				
UCS 5108 fan module (8 x \$0.00 each; included in base chassis)	N20-FAN5	included				
Accessory kit for UCS 5108 blade server chassis	N20-CAK	included				
<b>Total UCS 5108 Blade Chassis</b>		<b>\$10,529.61</b>	<b>\$31,588.83</b>	<b>\$52,648.05</b>	<b>\$84,236.88</b>	<b>\$105,296.10</b>

Cisco UCS solution	Part number	Individual price	Blade configuration price			
			20	40	60	80
<b>UCS 6248 Fabric Interconnect (configured with 12 licenses)</b>						
UCS 6248UP Fabric Interconnect/no PSU/32 UP/12p LIC	UCS-FI-6248UP	\$17,066.67				
UCS 6248UP power supply (2 x \$746.67 each)	UCS-PSU-6248UP-AC	\$1,493.34				
Total UCS 6248 Fabric Interconnect		\$18,560.01	\$37,120.02	\$37,120.02	\$37,120.02	\$37,120.02
<b>Additional items</b>						
UCS 6200 16-port Expansion module 16 UP/8p LIC	UCS-FI-E16UP	\$8,533.33	N/A	N/A	N/A	N/A
UCS 6200 series 1-port 1/10GE/FC-port license	UCS-LIC-10GE	\$1,479.47	N/A	N/A	N/A	\$5,917.88
Cisco R Series rack	R42610	\$1,265.07	\$1,265.07	\$1,265.07	\$2,530.14	\$2,530.14
<b>Grand total</b>			<b>\$280,821.92</b>	<b>\$512,729.14</b>	<b>\$756,431.04</b>	<b>\$994,256.14</b>

Figure 7: The equipment and costs we used in our analysis for the Cisco UCS solution with equal bandwidth to the HP solution.

Figure 8 details the equipment and costs we used in our analysis for the HP Virtual Connect solution. We used the HP Product Bulletin ([h18004.www1.hp.com/products/quickspecs/About\\_ProductBulletin.pdf](http://h18004.www1.hp.com/products/quickspecs/About_ProductBulletin.pdf)) for all MSRP pricing. We found the HP part number from the system specs for each item and then looked up the part number price in the HP Product Bulletin.

We configured the c7000 blade chassis with redundant Onboard Administrator modules and redundant Virtual Connect modules. We configured all blades with HP iLO Advanced licenses for full management functionality.

For the HP OneView licensing we used the upgrade option part number E5Y45AAE. According to the HP OneView technical specs this license upgrade can be used if an iLO Advanced license is in place. We found this was the lowest-cost option for our configuration. A HP OneView license is required for each managed HP server.

HP Virtual Connect solution	Part number	Individual price	Blade configuration price			
			20	40	60	80
<b>HP BL460c Gen8 blade server (fully configured)</b>						
HP BL460c Gen8 configurable blade	735151-B21	\$1,986.00				
Intel Xeon E5-2660 v2 (2.2 GHz) processors (2 x \$1,859.00 each)	718058-L21	\$3,718.00				
128GB memory (8 x 16GB PC3-14900 Dual Rank Reg 1.5v \$369.00 each)	708641-B21	\$2,952.00				
146GB, 15k rpm, SAS hard drives (2 x \$355.00 each)	652605-B21	\$710.00				
HP FlexFabric 10G 2-port 554FLB adapter	647586-B21	\$599.00				
Total HP BL460c Gen8 blade server		\$9,965.00	\$199,300.00	\$398,600.00	\$597,900.00	\$797,200.00
<b>HP c7000 blade chassis (configured)</b>						
HP c7000 blade chassis w/one OBA; 2 x PS; 4 x fans	681840-B21	\$5,999.00				
HP 2400 watt Platinum hot plug power supplies (4 x \$399 each)	588603-B21	\$1,596.00				

HP Virtual Connect solution	Part number	Individual price	Blade configuration price			
			20	40	60	80
HP BladeSystem c7000 fans (6 x \$149.00 each)	412140-B21	\$894.00				
HP Onboard Admin w/KVM (redundant)	456204-B21	\$899.00				
HP Virtual Connect FlexFabric 10Gb/24-port Module (2 x \$18,499.00 each)	571956-B21	\$36,998.00				
<b>Total HP c7000 blade chassis</b>		<b>\$46,386.00</b>	<b>\$92,772.00</b>	<b>\$139,158.00</b>	<b>\$185,544.00</b>	<b>\$231,930.00</b>
<b>Additional items</b>						
HP iLO Advanced Blade 1 server license 3yr 24x7	BD502A	\$365.00	\$7,300.00	\$14,600.00	\$21,900.00	\$29,200.00
HP OneView 3 year 24x7	E5Y45AAE	\$799.00	\$15,980.00	\$31,960.00	\$47,940.00	\$63,920.00
HP 642 series rack	BW904A	\$1,899.00	\$1,899.00	\$1,899.00	\$1,899.00	\$3,798.00
<b>Grand total</b>			<b>\$317,251.00</b>	<b>\$586,217.00</b>	<b>\$855,183.00</b>	<b>\$1,126,048.00</b>

Figure 8: The equipment and costs we used in our analysis for the HP Virtual Connect solution.



## APPENDIX B – DETAILED COSTS OF INCREASED UCS BANDWIDTH

Figure 9 details the equipment and costs we used in our analysis for the Cisco UCS solution with increased network bandwidth. As with the prices in Appendix A, we used the Cisco Build & Price Web site ([buildprice.cisco.com/config/ucs/blade-server/N20-Z0001](http://buildprice.cisco.com/config/ucs/blade-server/N20-Z0001)) and used MSRP pricing. We used the UCS 6248UP with the 12 included licenses for the Fabric Interconnect. We added individual licenses to the price for the additional ports. Cisco does offer options to purchase the UCS 6248UP with all ports licensed, which can be more cost-effective and save money.

We configured the UCS 5108 blade chassis with redundant UCS 2204XP fabric extenders and assumed all four ports connected to the Fabric Interconnect. This means each UCS 5108 had eight ports connected to the Fabric Interconnect, so each chassis required eight UCS port licenses. We added the Cisco UCS Port Expander Card for VIC 1240 to each blade price so they have 40 Gb of available bandwidth.

We assumed each Fabric Interconnect has four licenses used for uplinks to external switches. These four ports were for two Fibre connections and two network connections.

Cisco UCS solution	Part number	Individual price	Blade configuration price			
			20	40	60	80
<b>B200 M3 blade server (fully configured)</b>						
B200 M3 without CPU, memory, HDD, or LOM	UCSB-B200-M3	\$1,682.13				
Intel Xeon E5-2660 v2 (2.2 GHz) processors (2 x \$2,106.13 each)	UCS-CPU-E52660B	\$4,212.26				
128GB memory (8 x 16GB PC3-14900 Dual Rank Reg 1.5v \$388.80 each)	UCS-MR-1X162RZ-A	\$3,110.40				
146GB, 15k rpm, SAS hard drives (2 x \$369.07 each)	A03-D146GC2	\$738.14				
Cisco UCS VIC 1240	UCSB-MLOM-40G-01	\$799.47				
Cisco UCS Port Expander Card (mezz) for VIC 1240	UCSB-MLOM-PT-01	\$320.00				
<b>Total B200 M3 blade server</b>		<b>\$10,862.40</b>	<b>\$217,248.00</b>	<b>\$434,496.00</b>	<b>\$651,744.00</b>	<b>\$868,992.00</b>
<b>UCS 5108 Blade Chassis (configured)</b>						
UCS 5108 chassis 0 PSU/8 fans/ 0 fabric extender	N20-C6508	\$3,199.47				
2500 watt power supply (4 x \$499.20 each)	UCSB-PSU-2500ACPL	\$1,996.80				
UCS 2204XP fabric extender module (2 x \$2,666.67 each)	UCS-IOM-2204XP	\$5,333.34				
UCS 5108 fan module (8 x \$0.00 each; included in base chassis)	N20-FAN5	included				

Cisco UCS solution	Part number	Individual price	Blade configuration price			
			20	40	60	80
Accessory kit for UCS 5108 blade server chassis	N20-CAK	included				
Total UCS 5108 Blade Chassis		\$10,529.61	\$31,588.83	\$52,648.05	\$84,236.88	\$105,296.10
<b>UCS 6248 Fabric Interconnect (configured with 12 licenses)</b>						
UCS 6248UP Fabric Interconnect/no PSU/32 UP/12p LIC	UCS-FI-6248UP	\$17,066.67				
UCS 6248UP power supply (2 x \$746.67 each)	UCS-PSU-6248UP-AC	\$1,493.34				
Total UCS 6248 Fabric Interconnect		\$18,560.01	\$37,120.02	\$37,120.02	\$37,120.02	\$37,120.02
<b>Additional items</b>						
UCS 6200 16-port Expansion module 16 UP/8p LIC	UCS-FI-E16UP	\$8,533.33	N/A	N/A	\$17,066.66	\$17,066.66
UCS 6200 series 1-port 1/10GE/FC-port license	UCS-LIC-10GE	\$1,479.47	\$11,835.76	\$35,507.28	\$47,343.04	\$71,014.56
Cisco R Series rack	R42610	\$1,265.07	\$1,265.07	\$1,265.07	\$2,530.14	\$2,530.14
<b>Grand total</b>			<b>\$299,057.68</b>	<b>\$561,036.42</b>	<b>\$840,040.74</b>	<b>\$1,102,019.48</b>

Figure 9: The equipment and costs we used in our analysis for the Cisco UCS solution with increased bandwidth.

## ABOUT PRINCIPLED TECHNOLOGIES



Principled Technologies, Inc.  
1007 Slater Road, Suite 300  
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We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help our clients assess how it will fare against its competition, its performance, its market readiness, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.

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