COMPLEXITY AND COST COMPARISON: CISCO UCS VS. IBM FLEX SYSTEM (REVISED)

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**

☑ **Highly available and scalable management interface**

in our research compared to the IBM® Flex System™

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 IBM Flex System both offer tools to streamline deployment and management of your IT infrastructure, but which does more to help you save in deployment, management, and hardware costs? We evaluated the technical features that the Cisco UCS and IBM Flex System 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. Additionally, the advantages of the Cisco UCS Unified Fabric are not limited to the chassis but extend to rack servers and even virtual machines. We also compared the costs of purchasing these solutions in different sized deployments, and found that the Cisco UCS solution could potentially reduce your capital expenditure by as much as 22.1 percent.

SIMPLIFIED ARCHITECTURE

The Cisco UCS solution provides all management and configuration services at the centrally located Fabric Interconnects, so you can manage large-scale deployments from a single location. This method lets you consolidate hardware and streamline management. The IBM Flex System solution uses a distributed management model with chassis-level control. This method adds complexity to the hardware configuration, which can increase management needs.

As Figures 1 and 2 show, the converged network with Cisco UCS architecture is considerably less complex than the distributed network with the IBM Flex System.

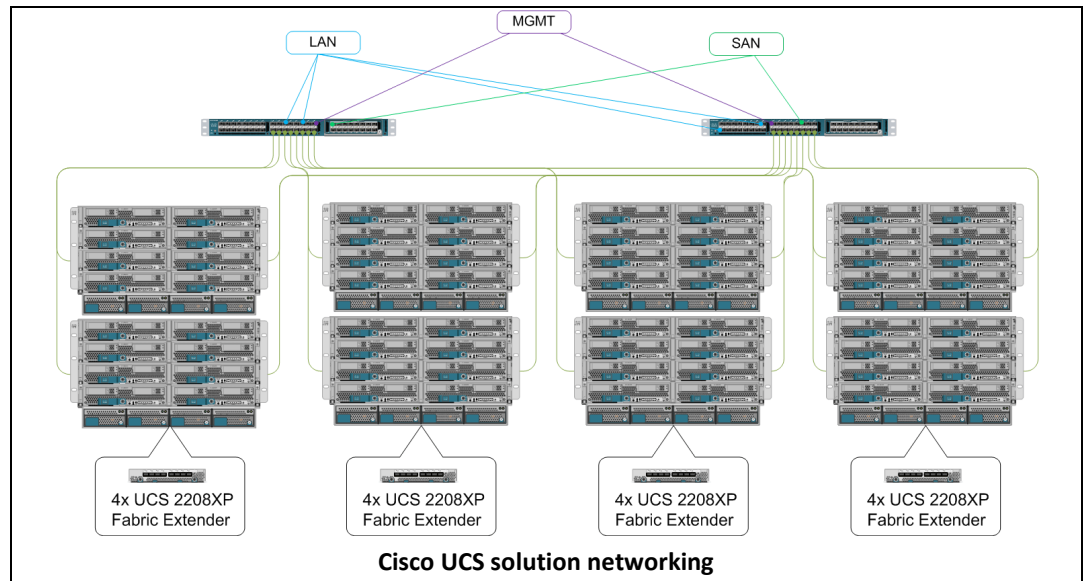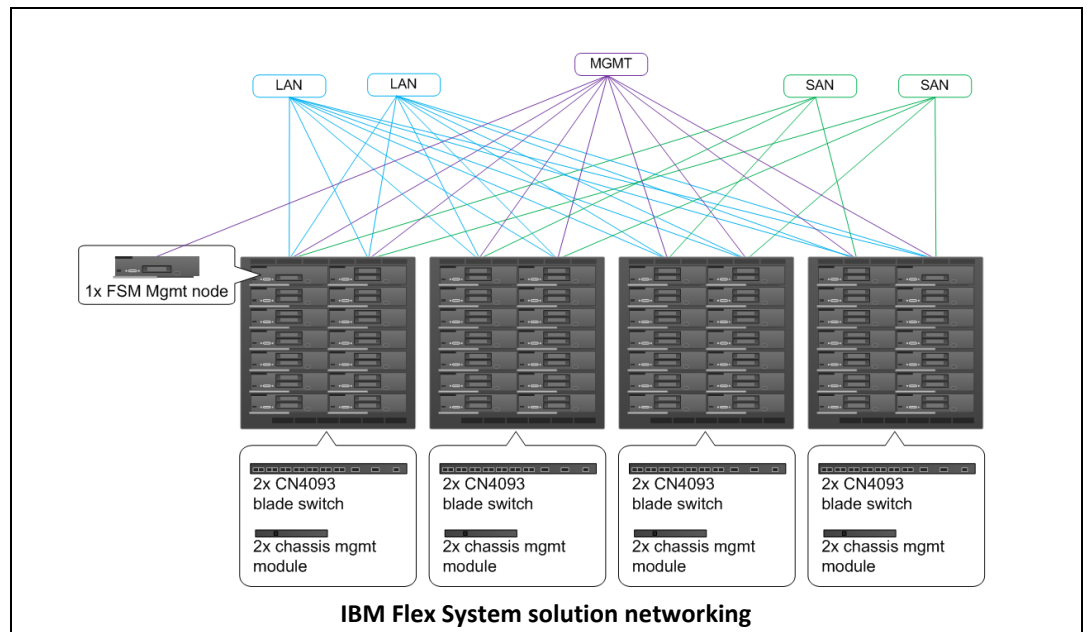**Figure 1: Enterprise view of the Cisco UCS management solution.**

Cisco UCS solution networking

Figure 2: Enterprise view of the IBM Flex System management solution.

(Note: IBM does not provide a redundancy option for the FSM management module.)

IBM Flex System solution networking

Cisco UCS architecture

The Cisco UCS model features a converged fabric where all systems management and configuration originates from a pair of redundant layer 2 network switches called Fabric Interconnects (FI). The Fabric Interconnect is a convergence and distribution point that combines traffic from SAN, management, and data networks into a single converged network that connects directly to the managed compute nodes.

You can manage 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 layer 2 Fabric Interconnects, Cisco UCS Central consolidates all management systems together into one dashboard. A pair of Fabric Extenders (FEX) connects each Cisco blade chassis to the Fabric Interconnects. The FEX is not a switch; it simply aggregates Fiber Channel over Ethernet (FCoE) connectivity without requiring any user configuration. With UCS Manager, you can apply all firmware versions and updates to existing servers, new nodes, and other hardware with the click of a mouse.

IBM Flex System architecture

In contrast, IBM Flex System 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. With IBM Flex System, there is no central management location for updating and configuring the compute nodes in your datacenter. This means that every set of four blade chassis requires a separate Flex System Manager™ (FSM) appliance that you must log directly into to perform system updates.[1] IBM currently provides no high availability (HA) capabilities for the FSM.

Each IBM blade chassis also has its own set of up to four layer 2 switches and two Chassis Management Modules (CMMs) that you must configure and update as well. Due to the IBM solution's lacking a true system-wide converged network infrastructure, each IBM Flex System chassis 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.[2] These interdependencies also increase risk of error when you make changes to your infrastructure. In our IBM Flex System configuration, we chose two base CN4093 switches with the Switch Upgrade 2 license package to match the eight converged Ethernet and Fibre Channel connections on the Cisco UCS blade chassis.

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[1] www.redbooks.ibm.com/redbooks/pdfs/sg247984.pdf
[2] publib.boulder.ibm.com/infocenter/flexsys/information/index.jsp?topic=%2Fcom.ibm.acc.8731.doc%2Fwhats_new_120.html

Managing your entire infrastructure with one solution

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 both 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 one unified interface. This lets you optimize your infrastructure to match your workloads without sacrificing the management capabilities of UCS Manager or adding additional management products. This can make your infrastructure easier to manage and can reduce licensing costs.

The current release of IBM Flex System Manager, version 1.2, supports only the current generation of Flex System blade servers.[3] It does not support any of the Blade Center series or rack-based servers. This lack of support can create additional overhead and the need for additional IT staff time when deploying and maintain the IBM Flex System solution.

STREAMLINED DEPLOYMENT

As Figure 3 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	Deploying the IBM Flex System
1. Connect the power and network cables to the blade chassis. 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. 3. Apply the FEX module firmware update through UCS Manager.	1. Connect the power and network cables to the blade chassis. 2. Connect to the CMM Web interface to create user accounts and configure IP addresses for CMMs. 3. Power on the Flex System Manager node and connect to the Web interface.

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[3] www.redbooks.ibm.com/abstracts/tips0863.html

Deploying the Cisco UCS	Deploying the IBM Flex System

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.	4. Follow the FSM initial setup wizard and update management software and firmware. This could take up to two hours.[4]
	
	5. If there are more than four blade chassis being deployed, you need to repeat steps 2 through 4 for each set of four chassis.
	
	6. Using the FSM Web interface, you must "discover" and then "inventory" every compute node in your deployment environment before applying updates.
	
	7. Use FSM Configuration Patterns to configure the compute nodes from the Flex System Manager interface. Configuration Patterns can also set up blade network switches if additional IBM Fabric Manager software is purchased.
	
	8. Deploy the OS to compute nodes through the following methods:
	    a. ESXi, KVM, and RHEL install via FSM image deploy
	    b. Windows Server by PXE Microsoft Deployment services

Figure 3: Deployment process comparison for the two solutions.

The additional hardware of an IBM Flex System 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.

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 IBM solution requires that three separate managed networks connect to each blade chassis (see Figure 4). The IBM management network alone requires two extra cables and IP addresses in every chassis for the CMM modules (still required even with the FSM), along with cabling and IP for the FSM modules required for multi-chassis control. 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.

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[4] publib.boulder.ibm.com/infocenter/flexsys/information/index.jsp?topic=%2Fcom.ibm.acc.8731.doc%2Fgetting_started.html

Figure 4: Rear view of the Cisco UCS and IBM Flex System blade chassis showing the required network connections.

(Note: IBM does not provide a redundancy option for the FSM management module.)
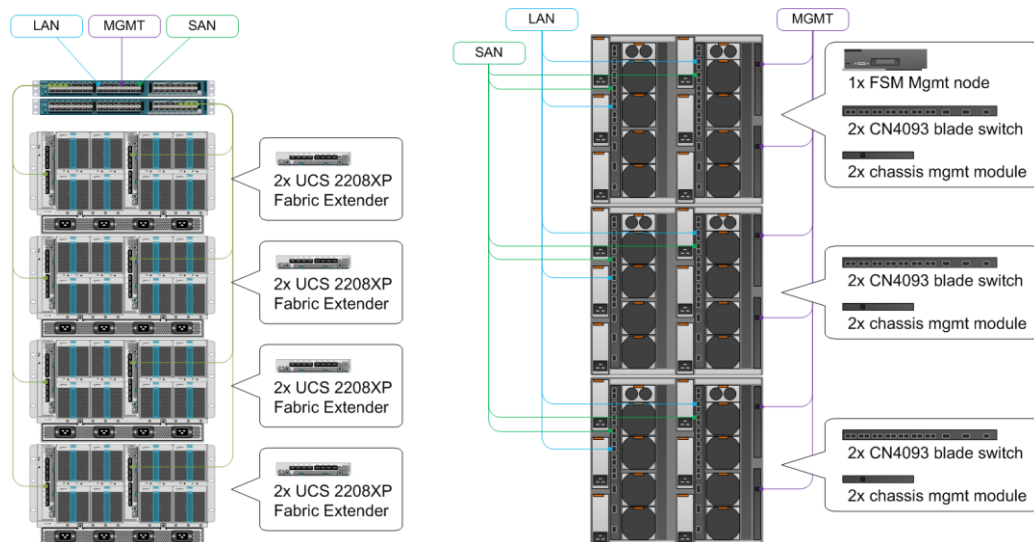
HIGHLY AVAILABLE AND SCALABLE MANAGEMENT

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 UCS Manager provides a redundant solution out of the box. One pair of Cisco Fabric Interconnects automatically provides a fault tolerant management interface for up to 160 servers, while similar hardware with IBM Flex System can manage 55 servers and does not provide any fault tolerance options at this time. Cisco UCS Central software also provides centralized management at no charge for up to five domains and up to 800 servers, which can help administrators get workloads moved and running should a failure occur. Figure 5 compares how the two solutions deliver high availability.

Cisco UCS Manager	IBM Flex System Manager
UCS Manager is a centralized and model-based XML API that is both comprehensive and adaptive to changes in the environment	Flex System Manager is pre-packaged software running on a locked appliance blade pushing down scripted commands to HW
Redundant Fabric Interconnects provide management to 160 servers (blade or rack) per domain	Flex System Manager nodes can manage only four chassis or up to 55 blades, and there is currently no redundant FSM option available
Access from a single-cluster IP address; Out of the box fault tolerant with Active-Standby Unified Management and Active-Active Unified Fabric for data	Access each node by individual IP address; if a node requires maintenance it will be unavailable, and if it fails, you must replace and reconfigure it before restoring functionality

Cisco UCS Manager	IBM Flex System Manager
Manage multiple domains from a single interface with UCS Central software; UCS Dashboard is free open-source monitor of managers	There is no multi-FSM aggregation tool available from IBM. Each FSM acts as an isolated node, and each FSM maintains a separate software image to back up and archive

Figure 5: High availability comparison for the two solutions.

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. This functionality is a result of the foundational advantages of Cisco's unified fabric model.

The IBM Flex System lacks the architectural advantages of the Cisco UCS fabric and requires extra setup and configuration to achieve equivalent failover functionality. IBM Flex System requires you set up and maintain traditional network switches for each chassis. For every new chassis, you are required to configure things such as load balancing, link aggregation, and VLANs, and carefully ensure that changes to an environment do not cause unintended consequences such as spanning tree loops and misconfigured ports. This adds another layer of management complexity and introduces risk, making management and change control more difficult.

> **Due to its unified fabric model, Cisco UCS is the only solution that delivers automatic network failover right out of the box.**

Centralized redundant management interface for large enterprises

While the Cisco UCS solution provides redundant system-wide, management embedded in the fabric, IBM Flex System does not offer any HA or redundancy options for FSM nodes. In the event of failure, administrators must manually replace and reconfigure an entirely new FSM node to restore functionality. Each target system has an OS agent that remains registered to the original FSM node and does not recognize the new FSM. Admins must manually unregister each of these agents from the failed node and then register them to the new FSM node. If you do not follow this procedure, you may get Request Access failures when you attempt to manage these resources.[5] Similar to initial setup, each compute node needs to go through the discovery and inventory process again before the new FSM can manage them. Reconfiguring is an unnecessary hassle, and it can be time consuming when compared to the Cisco UCS fault-tolerant cluster, which does this automatically in a matter of seconds.

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[5] publib.boulder.ibm.com/infocenter/flexsys/information/index.jsp?topic=%2Fcom.ibm.acc.8731.doc%2Ftroubleshooting_the_software.html

EXTENDS MANAGEMENT AND FABRIC TO RACK SERVERS AND VMS

Consider the features available to you when you receive your hardware and what features cost extra. Hidden license fees and other support costs can reduce your overall return on investment and increase the time it takes to realize actual gains from your purchase. There are many advanced features available at no additional cost with the Cisco UCS solution that are not available or require additional licensing with IBM Flex System.

Scale up without added management costs

Cisco UCS facilitates large-scale deployment and management with no additional hardware or software requirements. Cisco UCS Manager and UCS Central are included at no additional cost with the purchase of a pair of Cisco Fabric Interconnects. Because Cisco Fabric Interconnects can replace top-of-rack (TOR) switches, the advanced management features of UCS Manager are essentially free when compared to a traditional blade deployment. In addition, UCS Manager manages up to 20 chassis, scales up to 100 chassis and 800 servers with UCS Central at no additional cost, and scales up to 10,000+ with nominal licensing.

Cisco UCS Central can exist on a virtual machine (VM) in a highly available cluster to provide maximum uptime and resiliency of its network IP address.

IBM Flex System Manager requires individual software licenses and support contracts for each Flex System Manager node, as well as additional license fees for each blade chassis that the FSM nodes manage. Because one FSM node manages only four chassis (55 servers), these costs can quickly add up. For example, 10 IBM Flex System blade chassis would require customers to purchase three FSM appliances and would require 10 Flex System Manager software licenses, just to manage the hardware with a non-redundant management solution. Cisco UCS Manager provides this functionality with true high availability at no charge. In addition, because the Cisco UCS solution scales up much more easily than the IBM Flex System, you are not required to overprovision by purchasing as much hardware up front. You can instead add compute nodes and networking as you need them.

Advanced network policies and adapter settings

Cisco provides QoS at no charge as part of its network offering. IBM requires you purchase an FSM Service Fabric Provisioning upgrade to unlock QoS features from its switches.

Tighter integration of physical networks into the virtual world and features such as Quality of Service (QoS) provide real value to datacenters. QoS lets network administrators guarantee a certain level of network bandwidth to VMs and physical machines. Some events, such as failovers, can use all of the available bandwidth in a chassis. With QoS, administrators set a desired minimum bandwidth and the system automatically limits the other links to maintain server performance. Cisco provides QoS at no charge as part of its network offering. IBM requires purchase of Flex System

Manager Service Fabric Provisioning software and support upgrade to unlock QoS features from its switches.

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

In addition to the chassis, UCS offers the benefits of the unified fabric to rack servers as well. Cisco offers a complete line of Intel processor-based servers designed to meet a variety of business needs. All Cisco UCS C-series servers integrate directly into the Cisco Unified Computing Fabric. You can manage rack-mounted servers within the same UCS Manager as your blade servers.

Cisco UCS offers the VM-FEX feature to provide additional performance and security to virtual environments. Similar to the Fabric Extenders (FEX), the VM-FEX feature extends the management capabilities of the Fabric Interconnect switches into the vSwitch and vNIC connections inside VMware® vSphere®.[6] The same advanced security and performance features Fabric Interconnects provide, such as QoS and EtherChannel redundancy, and VMware Direct Path I/O are also available inside the hypervisor to provide VMs a direct link to the Fabric Interconnect. Cisco offers this feature at no charge with its UCS products; the IBM Flex System solution offers no similar feature.

Cisco Service Profiles and IBM Configuration Patterns

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

The global Server Profile approach of Cisco UCS Manager applies firmware updates at once, to all systems; the IBM Flex System solution requires individual updates.

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 archive a backup firmware version for each device to roll back to in case of error, with the click of a button. When Cisco UCS Manager automatically discovers a new chassis, you can immediately run 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.

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[6] www.youtube.com/watch?v=8uCU9ghxJKg

When you connect a new blade chassis with IBM Flex System Configuration Patterns, you must first log into the CMM and configure it, and then log into the FSM and configure that as well before working with the blades. Flex System Manager must discover and inventory each blade individually, which can be a time consuming process, before applying Configuration Patterns.

Once an IBM server registers inside Flex System Manager, the Configuration Patterns apply to the compute nodes. The BIOS and device configuration settings apply to compute nodes within the control of the FSM, which is limited to four blade chassis or 55 servers. To apply Configuration Patterns to additional servers, you must start over by creating entirely new Configuration Patterns that are deployed from a separate FSM domain entirely. This process is repeated as you deploy each rack as a stand-alone domain.

Unlike UCS, Flex System Manager updates firmware from a separate area, not from Configuration Patterns for your blades. With IBM Flex System, you must apply firmware updates to the target systems using separate tools, four chassis at a time, which can take considerable staff time. The global Service Profile approach of Cisco UCS Manager applies these updates at once, to all systems.

Support for multiple server models in one profile

The Cisco UCS solution can combine different server models and configurations into one global Service Profile to apply to an entire infrastructure in one update.

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 IBM Flex System Manager is top-down software and does not support multiple models per Configuration Pattern. This requires that you create and run a separate Configuration Pattern for each server model you deploy (i.e., an x240 Configuration Pattern can only apply to the x240). Archiving, managing, and individually running different Configuration Patterns with the IBM Flex System 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.

COST SAVINGS THAT SCALE

We found that the Cisco UCS solution required less capital expenditure than the IBM Flex System solution in every deployment size we analyzed. Savings from management and deployment efficiencies would increase this advantage.

In this section, we compare the actual cost of hardware, software, and warranties for the Cisco and IBM solutions. We picked configurations that provide maximum bandwidth, comparable burst capability, and the high availability features we discussed in this paper. We compared the cost of three typical deployment sizes that a business might choose: 12 blades, 40 blades, and 80 blades. We found that the Cisco UCS solution required less capital expenditure than the IBM Flex System solution in every deployment size we analyzed. Savings from management and deployment efficiencies increase this advantage as the solution scales. For detailed costs, see Appendix A.

Twelve-blade deployment (small size)

First, we compare a small deployment of 12 blades and the required hardware for a fully functional solution. The Cisco UCS solution uses two blade chassis to equal the same number of blades in one IBM chassis. (The second blade chassis is not fully populated, but we chose a blade number that would give the IBM solution the best possible pricing.) Each UCS blade chassis has two Fabric Extender modules that connect to a pair of Fabric Interconnect switches.

The IBM solution uses one fully populated blade chassis with 12 blade servers, one Flex System Manager node, and two CMMs. Because the IBM blade chassis contains two layer 2 switches, we do not include a top-of-rack switch for any of our deployment comparisons. Figure 6 depicts 12-blade configurations for both solutions.
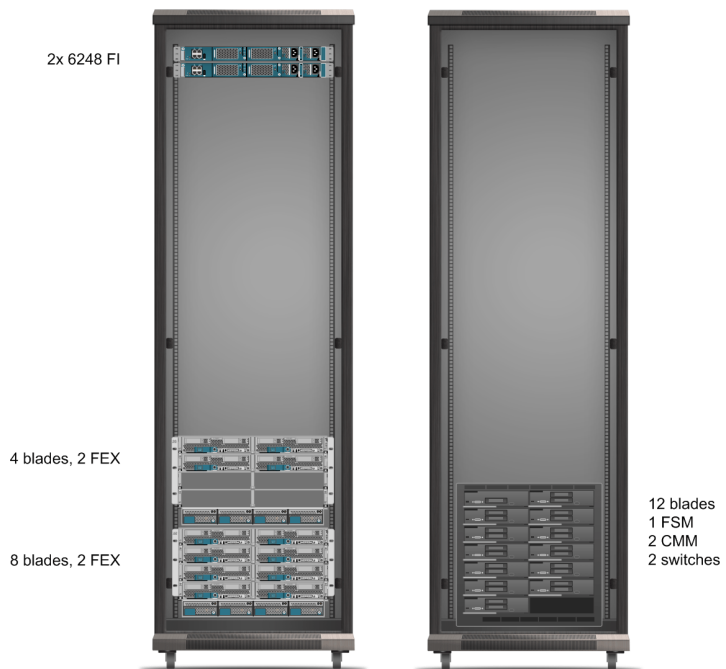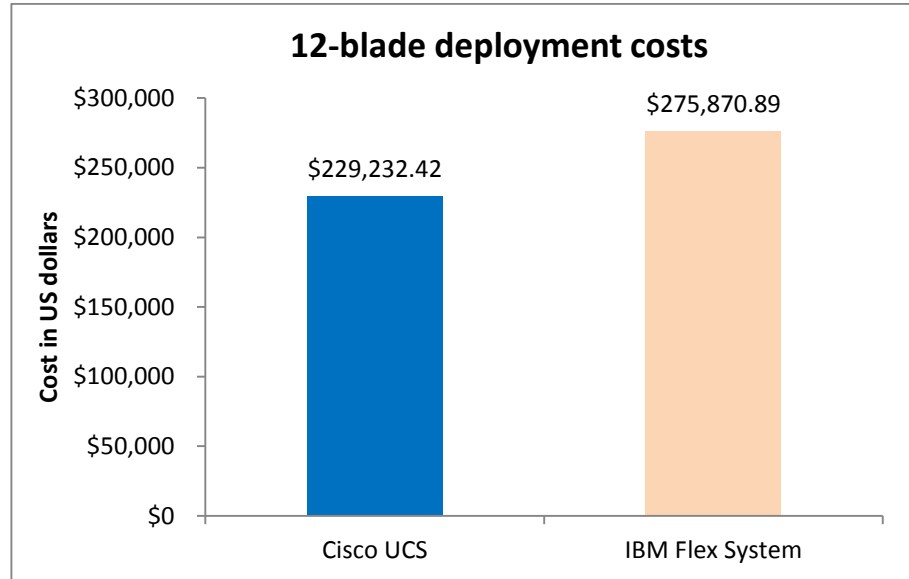

Figure 6: Side-by-side comparison of a typical small-sized deployment (12 blades).

2x 6248 FI

4 blades, 2 FEX

8 blades, 2 FEX

12 blades
1 FSM
2 CMM
2 switches

As Figure 7 shows, we found that the Cisco UCS solution can cost up to 16.9 percent less than the IBM Flex System solution for the 12-blade deployment we analyzed.[7] This is all while delivering added functionality to ease deployment and infrastructure management.

Figure 7: A 12-blade deployment using the Cisco UCS solution can cost up to 16.9 percent less than using IBM Flex System.

12-blade deployment costs

Cisco UCS: $229,232.42
IBM Flex System: $275,870.89
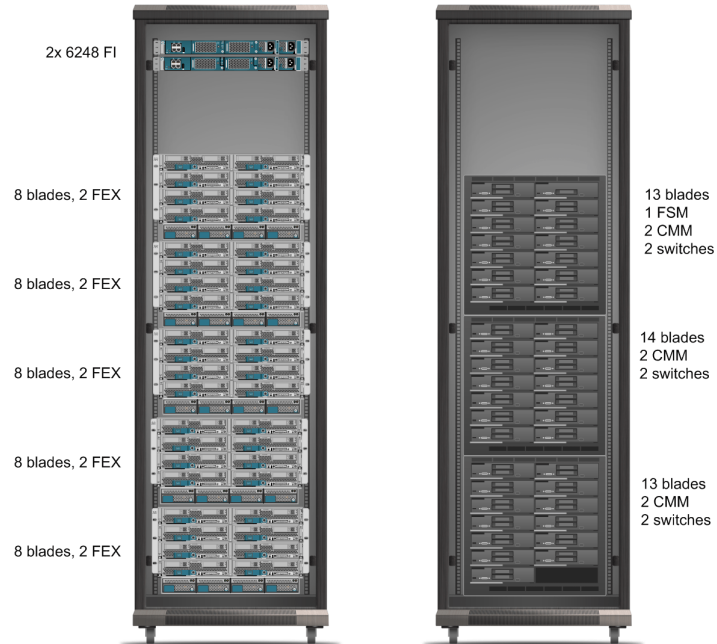
(Cost in US dollars; axis from $0 to $300,000)

Forty-blade deployment (medium size)

In the 40-blade deployment, each solution can provide a set of fully populated blade chassis. The Cisco UCS solution retains the pair of Fabric Interconnects and uses five blade chassis with two Fabric Extenders in each.

The 40-blade IBM solution contains three blade chassis, each with two CMMs and two blade switches. A single FSM node manages the three blade chassis. Figure 8 depicts 40-blade configurations for both solutions.
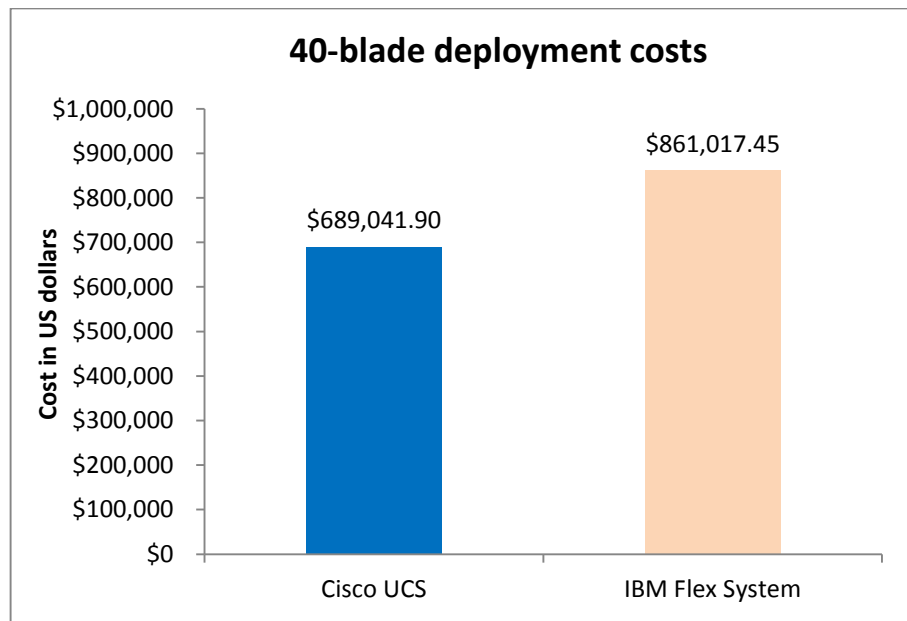
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[7] All costs in this study are actual purchase price from the Cost Central Web site on 06/27/2013. We do not include volume discounts, tax, or shipping.

Figure 8: Side-by-side comparison of a typical mid-sized deployment (40 blades).

2x 6248 FI

8 blades, 2 FEX

8 blades, 2 FEX

8 blades, 2 FEX

8 blades, 2 FEX

8 blades, 2 FEX

13 blades
1 FSM
2 CMM
2 switches

14 blades
2 CMM
2 switches

13 blades
2 CMM
2 switches

We found that a 40-blade deployment of Cisco UCS infrastructure can cost up to 20.0 percent less than a comparable IBM Flex System solution (see Figure 9).

Figure 9: A 40-blade deployment using the Cisco UCS solution can cost up to 20.0 percent less than using IBM Flex System.

40-blade deployment costs

Cost in US dollars

$1,000,000
$900,000
$800,000
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$0

Cisco UCS — $689,041.90
IBM Flex System — $861,017.45

## Eighty-blade deployment (large size)

The large deployment replaces Cisco 6248UP Fabric Interconnect switches with Cisco 6296UP Fabric Interconnect switches to support the additional connections that the Cisco blade chassis requires. The IBM Flex System solution requires one extra FSM node because it crosses the four-chassis threshold that one FSM can support. Figure 10 depicts 80-blade configurations for both solutions.

Figure 10: Side-by-side comparison of a typical large-sized deployment (80 blades).

2x 6296 FI

16 blades, 4 FEX

16 blades, 4 FEX

16 blades, 4 FEX

16 blades, 4 FEX

16 blades, 4 FEX

27 blades
1 FSM
4 CMM
4 switches

28 blades
4 CMM
4 switches

25 blades
1 FSM
4 CMM
4 switches

In a large deployment of 80 blade servers, the Cisco UCS solution can cost up to 22.1 percent less to implement than a comparable IBM Flex System configuration (see Figure 11).

Figure 11: An 80-blade deployment using the Cisco UCS solution can cost up to 22.1 percent less than using IBM Flex System.

80-blade deployment costs

Cisco UCS: $1,341,278.04
IBM Flex System: $1,722,034.90
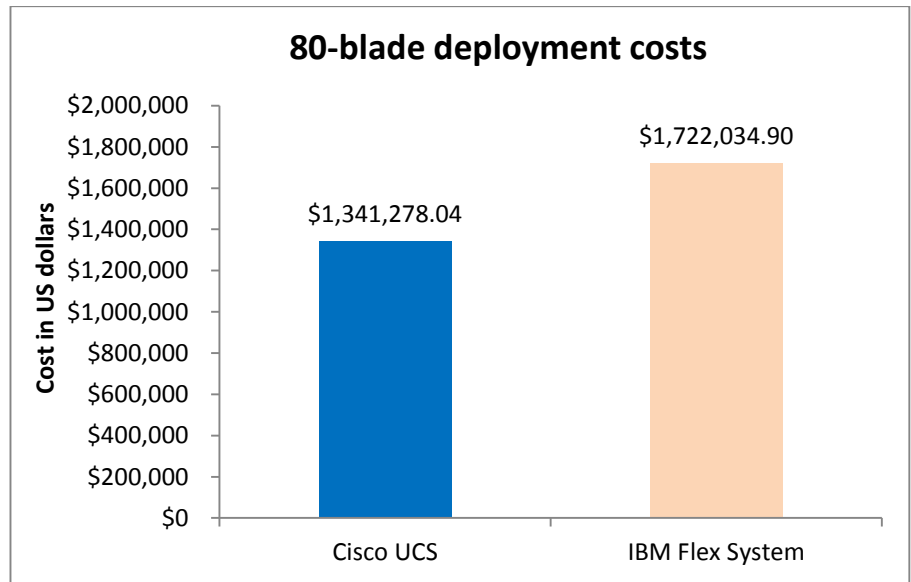
IN CONCLUSION

Moving to a managed solution 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—saving up to 22.1 percent—with no hidden fees or additional licensing costs. In contrast, IBM Flex System provides fewer vital features out-of-box, increases network and management complexity, requires additional hardware and licensing, and costs more over the life of the solution. With lower cost, less network complexity, streamlined deployment and management, and greater out-of-box functionality, Cisco UCS provides a comprehensive management solution to meet your business needs.

APPENDIX A – DETAILED COSTS

Figures 12 through 14 detail the equipment and costs we used in our analysis. We used configurations that provide the maximum bandwidth and high availability features discussed in this paper. All Cisco and IBM prices were current as of 06/27/2013 from the Cost Central Web site. The Cost Central website provides published purchase prices for all components in this study without having to contact a reseller. We obtained a reseller quote to validate these numbers and they are comparable for all unit prices. Standard warranty is included in the list price for both solutions and prices do not include volume discounts, taxes, or shipping. Please note that IBM currently does not offer any redundancy for the FSM node, if failover capability is offered in a future release the cost of redundant nodes will further increase the cost of each of the Flex system configurations in this Appendix.

Cisco product	Price	Qty	Total Cisco solution cost	Total IBM solution cost	Qty	Price	IBM product
UCS B200 M3 blade server	$1,405.10	12	**$16,861.20**	**$64,344.96**	12	$5,362.08	IBM x240 blade server, 1 Xeon processor E5-2690
Intel Xeon processors E5-2690	$2,718.89	24	**$65,253.36**	**$26,593.44**	12	$2,216.12	Intel Xeon processors E5-2690
16GB 1,600MHz DDR3 RAM	$278.43	192	**$53,458.56**	**$61,620.48**	192	$320.94	16GB 1,600MHz DDR3 RAM
146GB 6Gb SAS 15K RPM SFF HDD	$302.45	24	**$7,258.80**	**$7,682.16**	24	$320.09	146GB 6Gb SAS 15K RPM SFF HDD
VIC 1240 modular LOM	$654.90	12	**$7,858.80**	**$12,582.24**	12	$1,048.52	CN4054 10Gb Virtual Fabric Adapter
UCS 5108 Blade Chassis	$2,639.56	2	**$5,279.12**	**$8,804.88**	12	$733.74	CN4054 Virtual Fabric Adapter-SW Upgrade
2500W Platinum PSU for UCS 5108	$416.99	8	**$3,335.92**	**$5,332.50**	1	$5,332.50	Flex System Enterprise Blade Chassis
Fan module for UCS 5108 (included with chassis)	$0.00	8	**$0.00**	**$1,675.84**	4	$418.96	Blade Chassis 2500W Power Module
2208XP FEX fabric extender modules	$4,455.00	4	**$17,820.00**	**$837.92**	2	$418.96	Redundant 80mm Fan Module (2 pack)
Cisco R-series rack	$1,295.92	1	**$1,295.92**	**$891.69**	1	$891.69	Additional Chassis Mgt Module
UCS 6248UP Fabric Interconnect + 12pL	$14,169.60	2	**$28,339.20**	**$1,547.30**	1	$1,547.30	IBM Static Server rack
UCS 6200 Series 1PORT license	$1,235.81	16	**$19,772.96**	**$39,882.86**	2	$19,941.43	Flex System Fabric CN4093 10Gb Scalable Switch
UCS 6248UP Power Supply	$607.82	4	**$2,431.28**	**$20,989.94**	2	$10,494.97	Flex System Fabric CN4093 10Gb Switch Upgrade 2 license

Cisco product	Price	Qty	Total Cisco solution cost	Total IBM solution cost	Qty	Price	IBM product
UCS 6248UP Chassis Accessory Kit	$133.65	2	**$267.30**	**$1,669.71**	1	$1,669.71	FSM Service Fabric Provisioning w/3 Yr S&S (per chassis)
UCS 6248UP Fan Module (included)	$0.00	0	**$0.00**	**$12,021.67**	1	$12,021.67	FSM Node
				$9,393.30	1	$9,393.30	FSM Standard license per chassis
Total			**$ 229,232.42**	**$275,870.89**			**Total**
Cisco cost advantage			**16.9%**				

Figure 12: Cost comparison for a 12-blade deployment.

Cisco product	Price	Qty	Total Cisco solution cost	Total IBM solution cost	Qty	Price	IBM product
UCS B200 M3 blade server	$1,405.10	40	**$56,204.00**	**$214,483.20**	40	$5,362.08	IBM x240 blade server, 1 Xeon processor E5-2690
Intel Xeon processors E5-2690	$2,718.89	80	**$217,511.20**	**$88,644.80**	40	$2,216.12	Intel Xeon processors E5-2690
16GB 1,600MHz DDR3 RAM	$278.43	640	**$178,195.20**	**$205,401.60**	640	$320.94	16GB 1,600MHz DDR3 RAM
146GB 6Gb SAS 15K RPM SFF HDD	$302.45	80	**$24,196.00**	**$25,607.20**	80	$320.09	146GB 6Gb SAS 15K RPM SFF HDD
VIC 1240 modular LOM	$654.90	40	**$26,196.00**	**$41,940.80**	40	$1,048.52	CN4054 10Gb Virtual Fabric Adapter
UCS 5108 Blade Chassis	$2,639.56	5	**$13,197.80**	**$29,349.60**	40	$733.74	CN4054 Virtual Fabric Adapter-SW Upgrade
2500W Platinum PSU for UCS 5108	$416.99	20	**$8,339.80**	**$15,997.50**	3	$5,332.50	Flex System Enterprise Blade Chassis
2208XP FEX fabric extender modules	$4,455.00	10	**$44,550.00**	**$5,027.52**	12	$418.96	Blade Chassis 2500W Power Module
Cisco R-series rack	$1,295.92	1	**$1,295.92**	**$2,513.76**	6	$418.96	Redundant 80mm Fan Module (2 pack)
UCS 6248UP Fabric Interconnect + 12 pL	$14,169.60	2	**$28,339.20**	**$2,675.07**	3	$891.69	Additional Chassis Mgt Module
UCS 6200 Series 1PORT license	$1,235.81	60	**$74,148.60**	**$1,574.30**	1	$1,547.30	IBM Static Server rack
UCS 6248UP 16-port expander + 8pL	$7,084.80	2	**$14,169.60**	**$119,648.58**	6	$19,941.43	Flex System Fabric CN4093 10Gb Scalable Switch
UCS 6248UP Power Supply	$607.82	4	**$2,431.28**	**$62,969.82**	6	$10,494.97	Flex System Fabric CN4093 10Gb Switch Upgrade 2 license
UCS 6248UP Chassis Accessory Kit	$133.65	2	**$267.30**	**$5,009.13**	3	$1,669.71	FSM Service Fabric Provisioning w/3 Yr S&S (per chassis)
UCS 6248UP Fan Module included	$0.00	0	**$0.00**	**$12,021.67**	1	$12,021.67	FSM Node
				$28,179.90	3	$9,393.30	FSM Standard license per chassis
Total			**$689,041.90**	**$861,017.45**			**Total**
Cisco cost advantage			**20.0%**				

Figure 13: Cost comparison for a 40-blade deployment.

Cisco product	Price	Qty	Total Cisco solution cost	Total IBM solution cost	Qty	Price	IBM product
UCS B200 M3 blade server	$1,405.10	80	**$112,408.00**	**$428,966.40**	80	$5,362.08	IBM x240 blade server, 1 Xeon processor E5-2690
Intel Xeon processors E5-2690	$2,718.89	160	**$435,022.40**	**$177,289.60**	80	$2,216.12	Intel Xeon processors E5-2690
16GB 1,600MHz DDR3 RAM	$278.43	1280	**$356,390.40**	**$410,803.20**	1,280	$320.94	16GB 1,600MHz DDR3 RAM
146GB 6Gb SAS 15K RPM SFF HDD	$302.45	160	**$48,392.00**	**$51,214.40**	160	$320.09	146GB 6Gb SAS 15K RPM SFF HDD
VIC 1240 modular LOM	$654.90	80	**$52,392.00**	**$83,881.60**	80	$1,048.52	CN4054 10Gb Virtual Fabric Adapter
UCS 5108 Blade Chassis	$2,639.56	10	**$26,395.60**	**$58,699.20**	80	$733.74	CN4054 Virtual Fabric Adapter-SW Upgrade
2500W Platinum PSU for UCS 5108	$416.99	40	**$16,679.60**	**$31,995.00**	6	$5,332.50	Flex System Enterprise Blade Chassis
2208XP FEX fabric extender modules	$4,455.00	20	**$89,100.00**	**$10,055.04**	24	$418.96	Blade Chassis 2500W Power Module
Cisco R-series rack	$1,295.92	2	**$2,591.84**	**$5,027.52**	12	$418.96	Redundant 80mm Fan Module (2 pack)
UCS 6296UP Fabric Interconnect + 18 pL	$22,718.60	2	**$45,437.20**	**$5,350.14**	6	$891.69	Additional Chassis Mgt Module
UCS 6200 Series 1PORT license	$1,235.81	92	**$113,694.52**	**$3,094.60**	2	$1,547.30	IBM Static Server rack
UCS 6296UP 16-port expander + 8pL	$7,084.80	6	**$42,508.80**	**$239,297.16**	12	$19,941.43	Flex System Fabric CN4093 10Gb Scalable Switch
UCS 6296UP Power Supply (included)	$0.00	0	**$0.00**	**$125,939.64**	12	$10,494.97	Flex System Fabric CN4093 10Gb Switch Upgrade 2 license
UCS 6296UP Chassis Accessory Kit	$132.84	2	**$265.68**	**$10,018.26**	6	$1,669.71	FSM Service Fabric Provisioning w/3 Yr S&S (per chassis)
UCS 6296UP Fan Module (included)	$0.00	0	**$0.00**	**$24,043.34**	2	$12,021.67	FSM Node
				$56,359.80	6	$9,393.30	FSM Standard license per chassis
Total			**$1,341,278.04**	**$1,722,034.90**			**Total**
Cisco cost advantage			**22.1%**				

Figure 14: Cost comparison for an 80-blade deployment.

ABOUT PRINCIPLED TECHNOLOGIES

Principled Technologies®

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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.