Cisco UCS Architecture Comparison

Cisco Systems

Data Center and Virtualization
Unified Computing System

February 2014

Thomas Cloyd

Cisco UCS
The Cisco Unified Computing System Difference

Cisco UCS Architecture Comparison

Content

- Data Center Economics
- Blade Architecture and Scaling
- I/O and Virtualization
- Blade Management
- Total Cost of Ownership
- Blade Server Marketplace

Data Center Economics

Management is the Key Server TCO driver

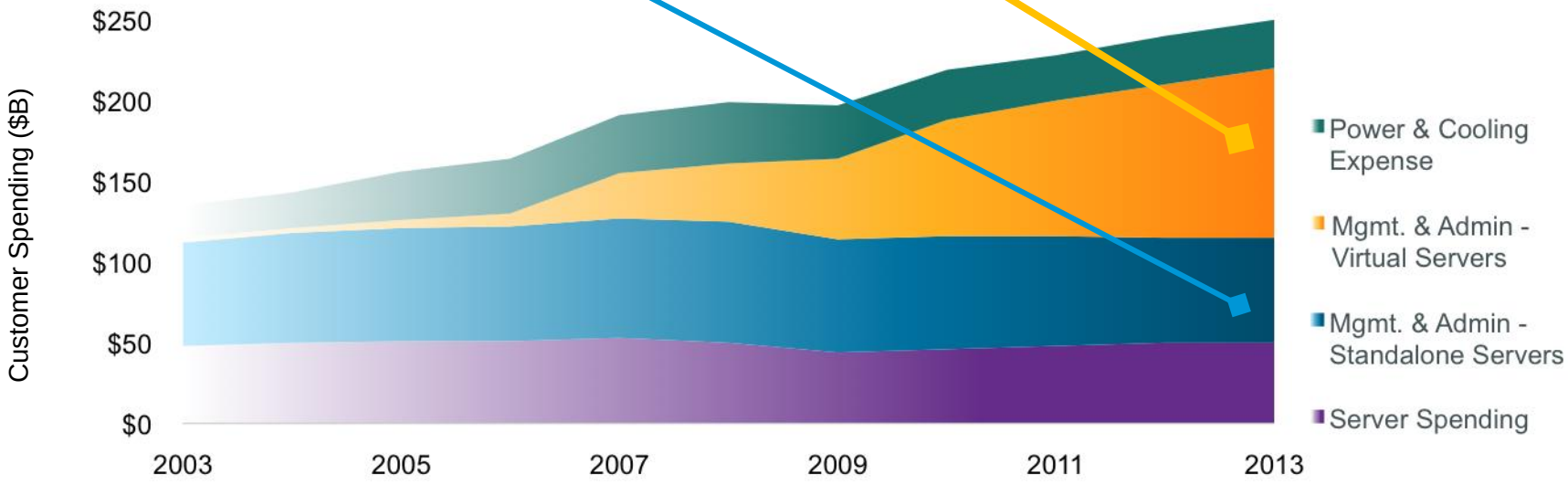
Data Center Spending

- Server purchase spending is flat
- Physical server management is down
- Virtual server management costs are way up

Billions of Dollars – WW **Server Management Spend**

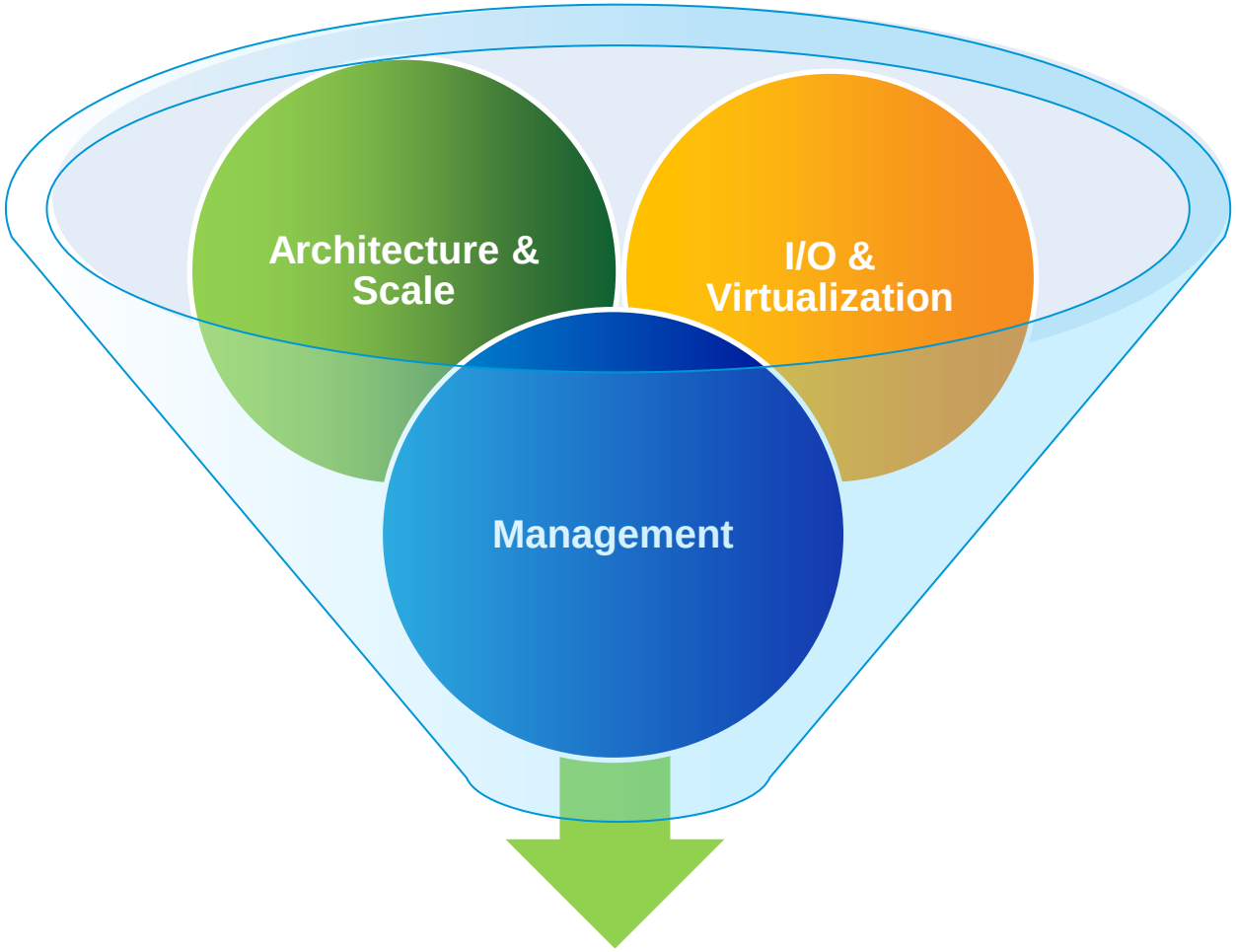
Year	Physical Servers	Virtual Servers	Total Server Related Spend
2003	$ 64	$ 3	$ 135
2007	$74	$ 28	$ 191
2013	**$50**	**$105**	**$250**
	- $24	**+ $ 77**	**+ $ 58**
	- 32%	**275%**	**31%**

WW Server Related Spend (CapEx + OpEx) - Servers, Power & Cooling, and Mgmt./Administration



Source: IDC, "New Economic Model for the Datacenter"

Controlling Data Center Cost



Unified Computing System

Cisco UCS Vs. “New” Legacy

Architecture and Scale

Cisco UCS Architecture	Legacy Designs
Unified Compute	**Scattered, De-centralized Compute**
• Stateless Computing, abstracted identity	• No truly functional identity abstraction
• Portable Identities - form factor agnostic, blade to rack server identity transfer	• Blade and rack servers segregated, no identity portability between form factors
• Physical & virtual functionally combined	• Physical & virtual identities independent

Cisco UCS Vs. “New” Legacy

I/O and Virtualization

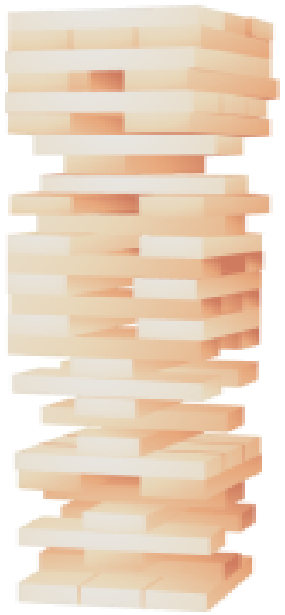
Cisco UCS Architecture	Legacy Designs
Unified Fabric	**Siloed and Complex**
• Single port - LAN, SAN, Mgmt path	• Multiple I/O protocols & stranded capacity
• Reduced complexity	• High port consumption, no design leverage
• Physical & virtual port end to end visibility and control with a single tool	• Limited & separate physical & virtual port visibility, minimal control, multiple tools.

Cisco UCS Vs. “New” Legacy

Management

Cisco UCS Architecture	Legacy Designs
Unified Management	**Complex Mgmt Structure**
• Single mgmt tool, single interface	• Multiple mgmt tools, multiple interfaces
• Highly collaborative roles based control	• Every Administrator has multiple tools
• Mgmt interface leveraged across multiple servers and domains	• Duplicative mgmt points and access, complicated and inefficient with no scale

Legacy Infrastructure and Management



Legacy Infrastructure Designs

- Infrastructures designed separately – not as a unified system
- Marketed as “converged”, but really management layers on top of multiple infrastructure silos
- Sprawling patchwork of tools, agents and management points

Complexity Drives Up Management Costs

- Rigid models to upgrade and maintain system-level designs
- Multiple tools means multiple points of configuration
- Brittle design with complex inter-dependencies

Eliminating Silos – Fabric Centric Architecture – Single Point of Mgmt.

CISCO UCS

UNIFIED by DESIGN

The Cisco UCS Difference

Cisco's Unified Data Center

Unifies physical and virtual infrastructures across data centers.

Delivered more economically

No compromise on

- Functionality,
- Performance,
- Scalability,
- Operational efficiency, or
- Security

Stateless Computing

- Identity = Server Settings and Policies, 127+ Parameters & Policies
- Abstracted Identity = Model-based, GUI Driven Service Profiles Portability
- Portability Between Blade AND Rack Servers

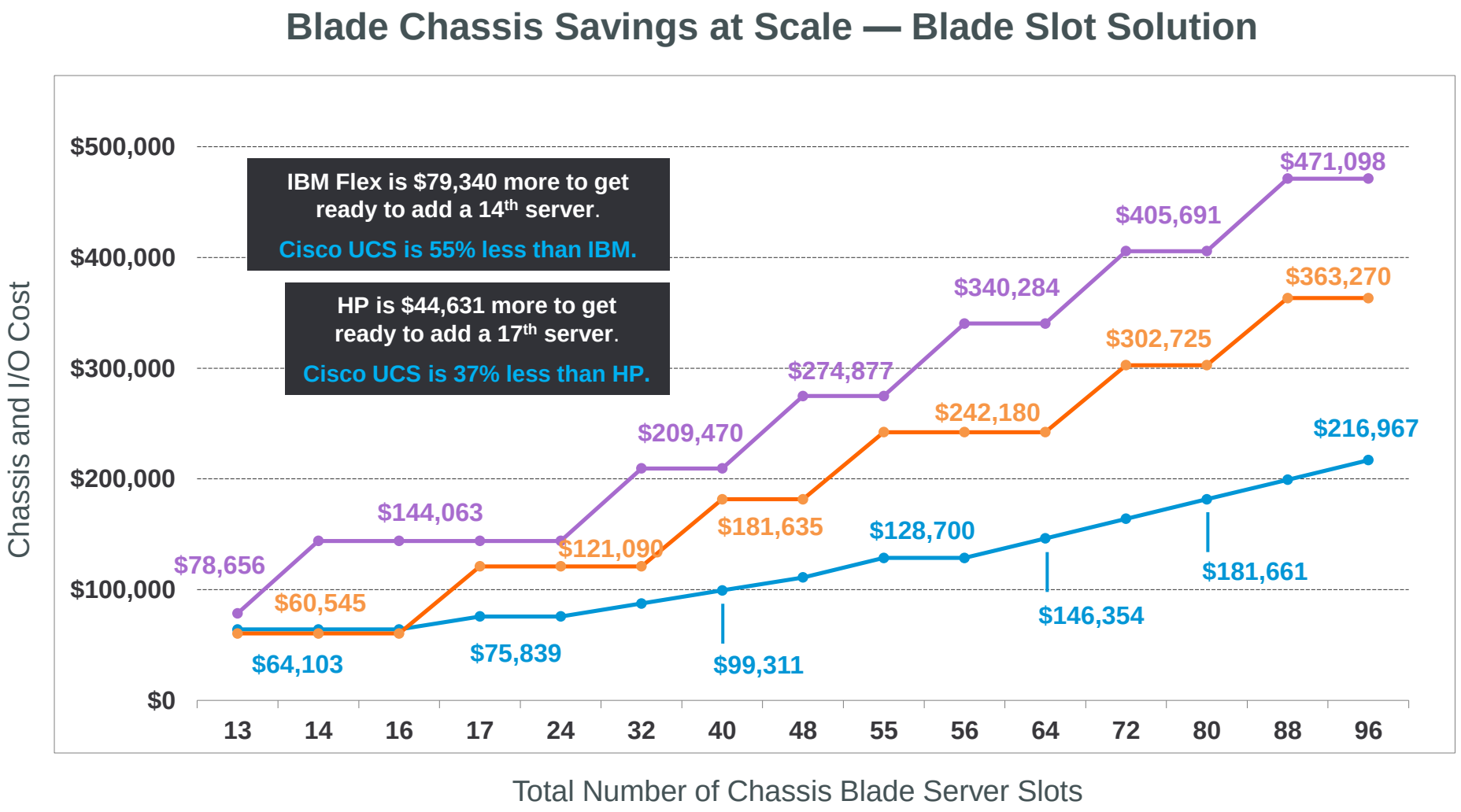
Unified Management – Architecture is Key

- Centralized Architecture, not De-centralized Legacy Design
- **Easy Scaling**
  Self Aware, Self Integrating, Automated
- **Form Factor Agnostic**
  Rack and Blade Together
- Reduced Complexity and Roles Based Access

  Servers, LAN, SAN, Management – One Tool, One Interface

UCS = Better, Easier, Simpler Architecture

No Infrastructure Penalty to Scale



UCS: UCS 5108 chassis with UCS 6248 FI (two uplinks per FEX)

HP: HP c7000 Plat chassis w/ 2x VC Flex Fabric and 16x HP IC. Price includes HP VCEM each chassis

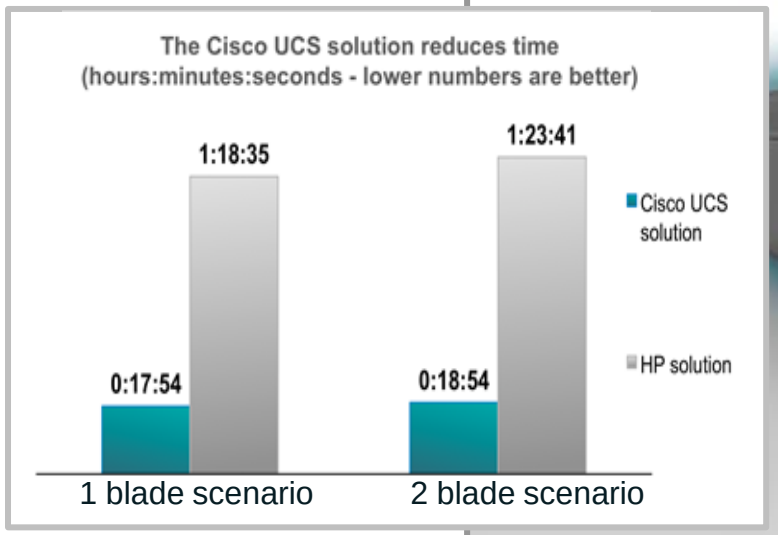
IBM: IBM Flex Chassis with 2x CN4093 switches, one Mgmt Node every 4 chassis, FSM license each chassis

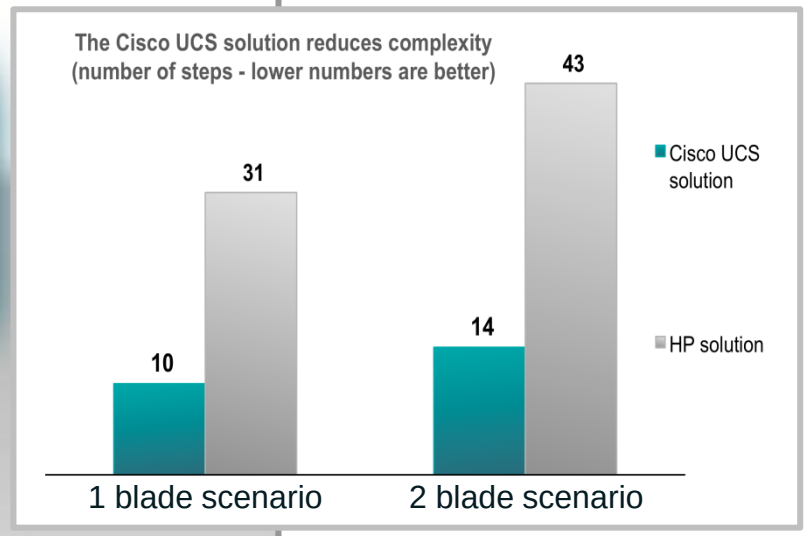
Cisco UCS B200 M3 MSRP pricing available on the "Build to Order" tab at http://buildprice.cisco.com/catalog/ucs/models/B200M3

Cisco pricing MSRP on 02/12/2014.
HP pricing publically available on 02/12/2014.
IBM pricing publically available 02/12/2014.

All pricing is for blade chassis and networking only. Servers are not included.

Faster, More Flexible - UCS Fast Automated Deployment





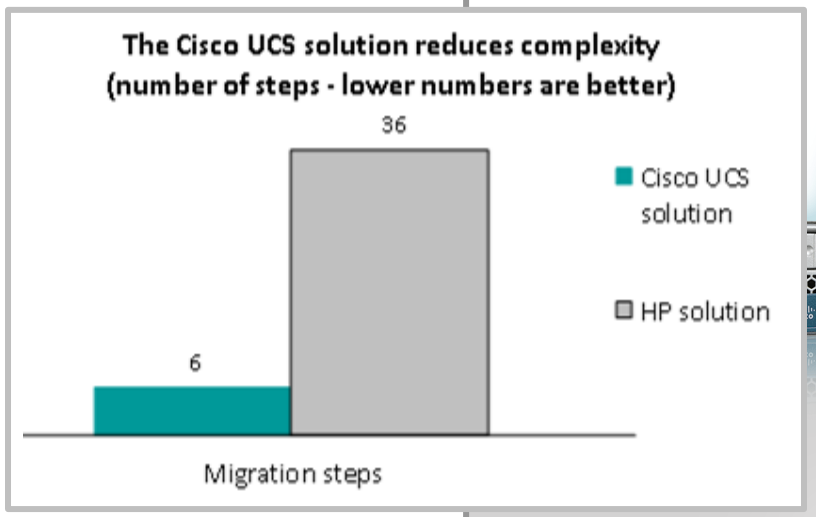
Read the White Paper
http://www.cisco.com/en/US/solutions/collateral/ns340/ns517/ns224/ns944/ucs77_faster_v_hp_for_blade_deployment.pdf

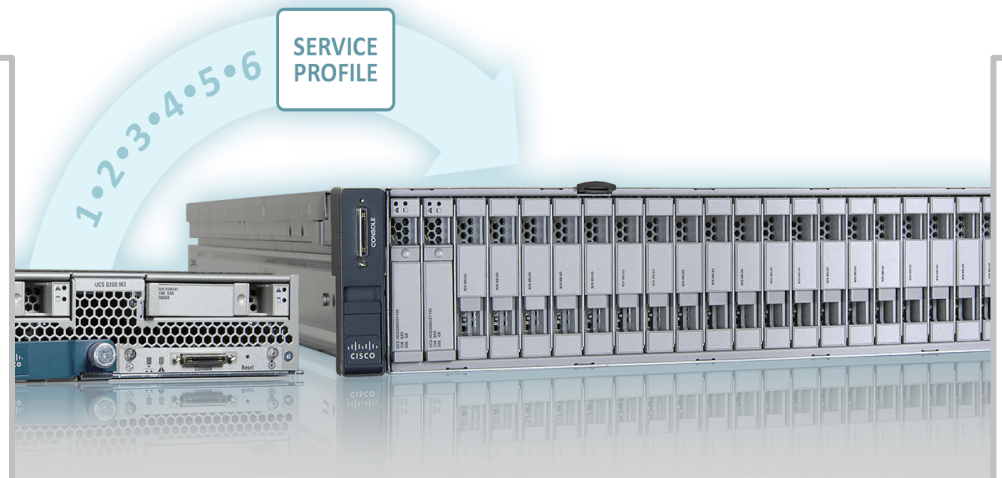
Watch the Video
http://www.youtube.com/watch?v=bSSQfNt7SFk

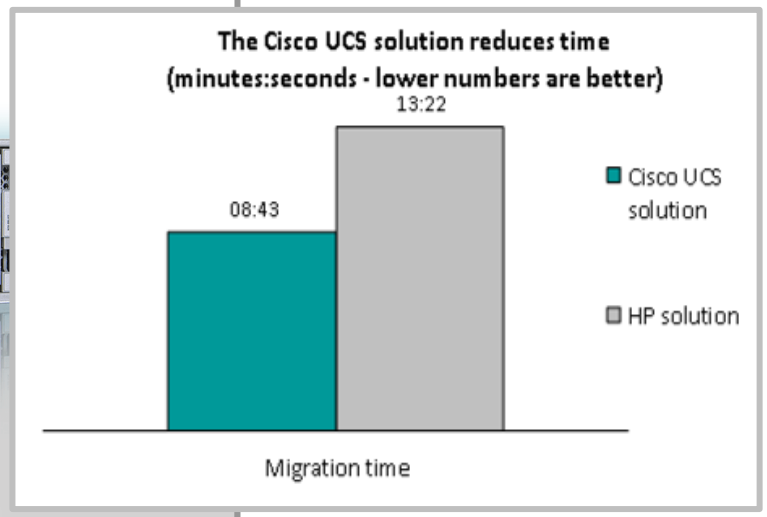
Cisco UCS - Model-based Management with Faster Deployment
More Automation - Fewer Touches Reduces Errors

Faster, More Flexible - UCS Blade to Rack Migration Automation

Migrate servers in 83.3% fewer steps







and 34.8% faster

Cisco® UCS™ B200 M3 Blade Server to a C240 M3 Rack Server

vs. HP ProLiant BL460c Gen8 server blade to a DL380p Gen8 rack server

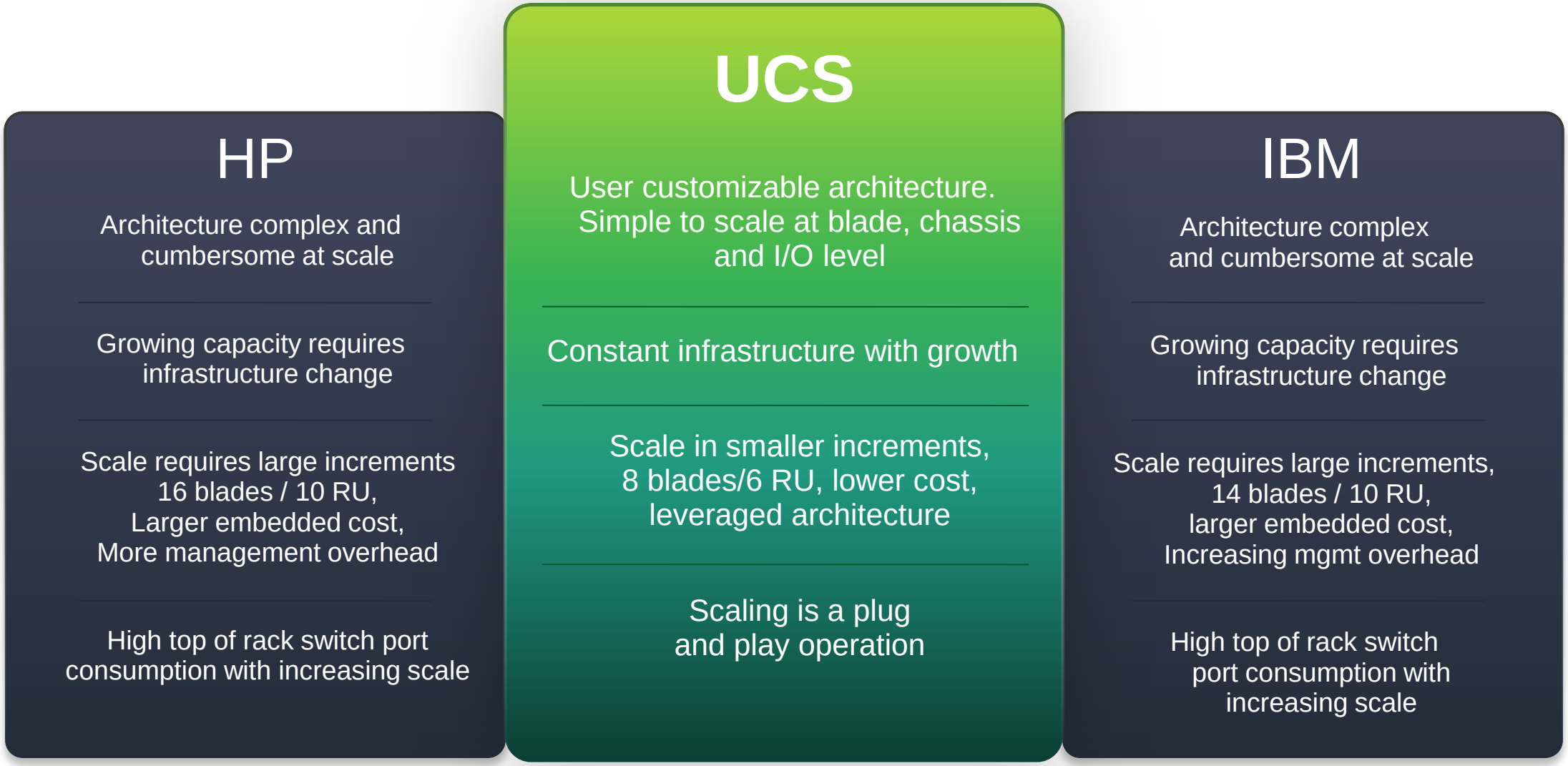
Read the White Paper
http://www.cisco.com/en/US/solutions/collateral/ns340/ns517/ns224/ns944/cisco_ucs_migrates.pdf

Watch the Video
http://www.youtube.com/watch?v=mN-aLzGCpEI

Cisco UCS - Model-based management is Form Factor Agnostic
Complete Migrate Server Identities from Blade to Rack

Blade Architecture and Scaling

Blade Architecture and Scaling UCS: Simpler Design, Scale Without Complexity

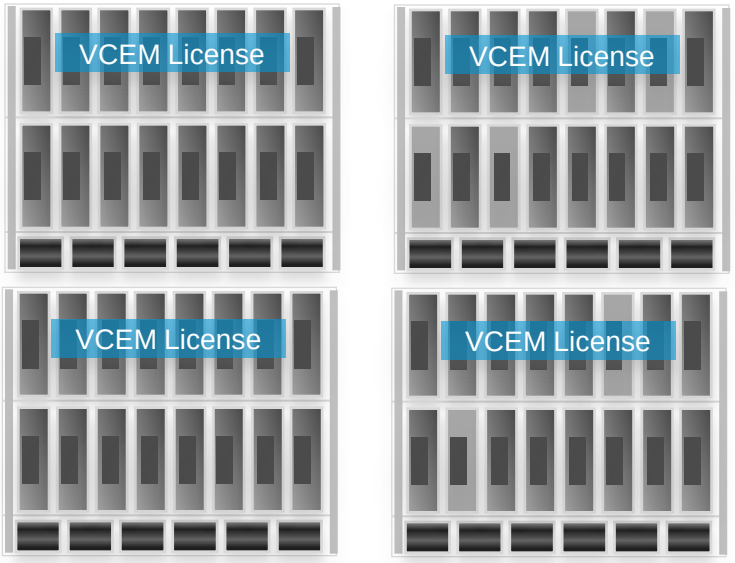


HP c7000 Platinum Blade Chassis

For UCS Manager parity, you need HP Virtual Connect (VC) Enterprise Manager (VCEM) + HP Insight Control, at the minimum.

- **Mgmt SW host – Required for SIM & VCEM.**
- **VCEM required on each chassis to move blade identities (server profiles).**
- **10 RU chassis. 4 Chassis = 72 slots.**

Front view



ToR switches are needed to connect multiple chassis. Switches are redundant

FC Switch

10Gb Enet

1Gb Enet Mgmt

Mgmt SW host required

Each Chassis has:

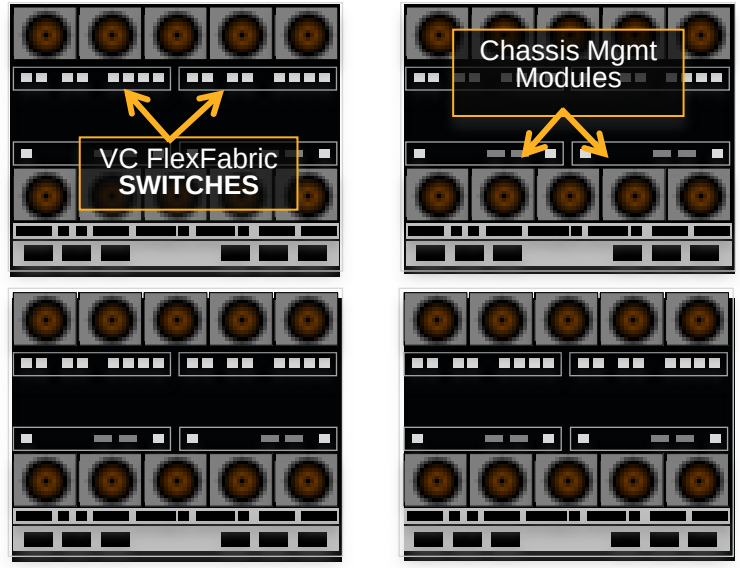
2 FlexFabric switches per chassis

2 x Mgmt Modules per chassis

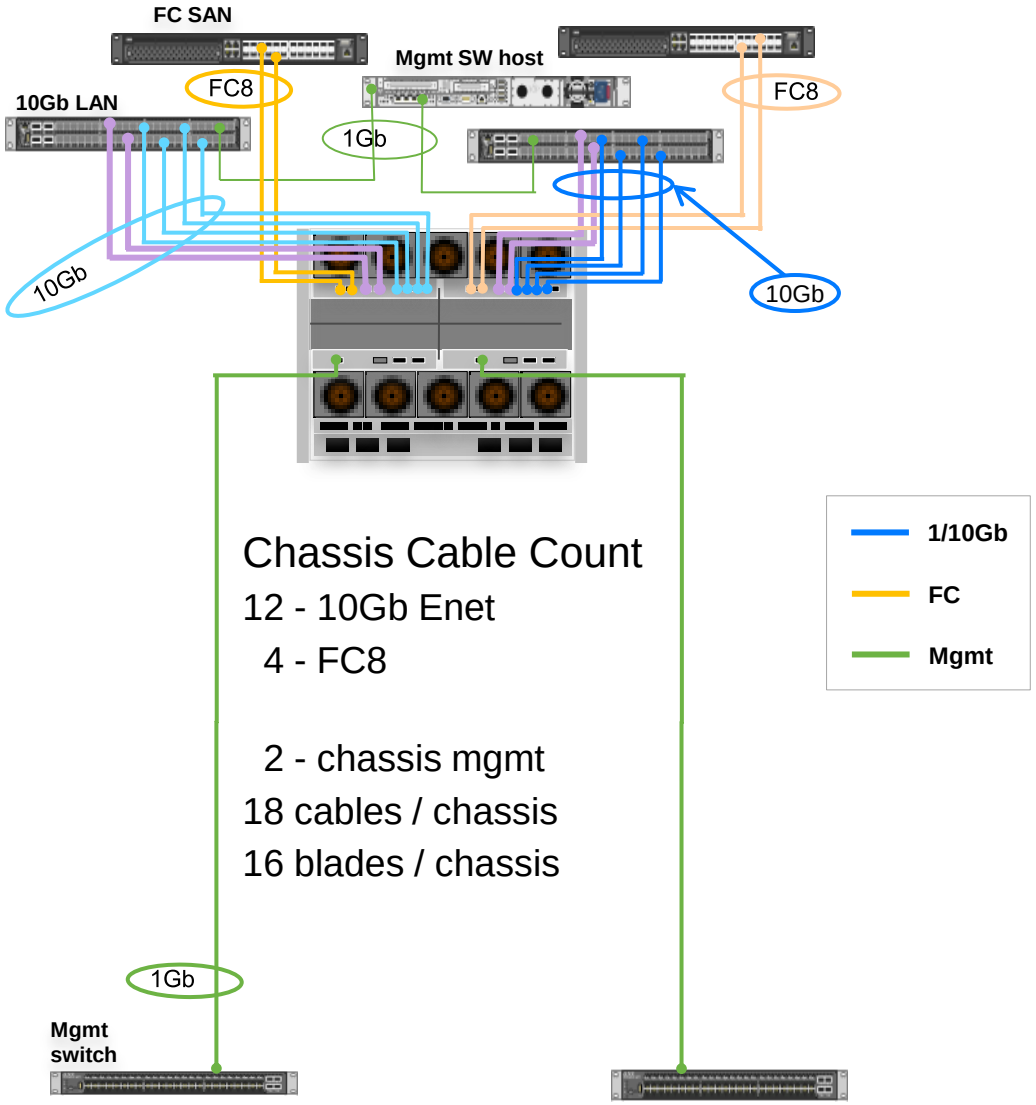
= 4 mgmt points.

4 Mgmt Points in EVERY chassis – minimum.

Back view



HP c7000 Platinum Chassis 7.5 Gbps Enet / blade (+ 2 Gbps FC / blade)



5 Gbps of Enet only / blade
2 Gbps FC only / blade
7 Gbps Total I/O per blade leaving chassis

You can add 2 more 10 Gb Enet connections per switch, 40 Gbps per chassis

80 (original Enet capacity)
+ 40 (new 2 x 10 Gb per switch **“ ——— ”)**
120 Gbps Enet leaving chassis
÷ 16 blades in each chassis
7.5 Gbps / blade

The single pair of FlexFabric switches are maxed out.

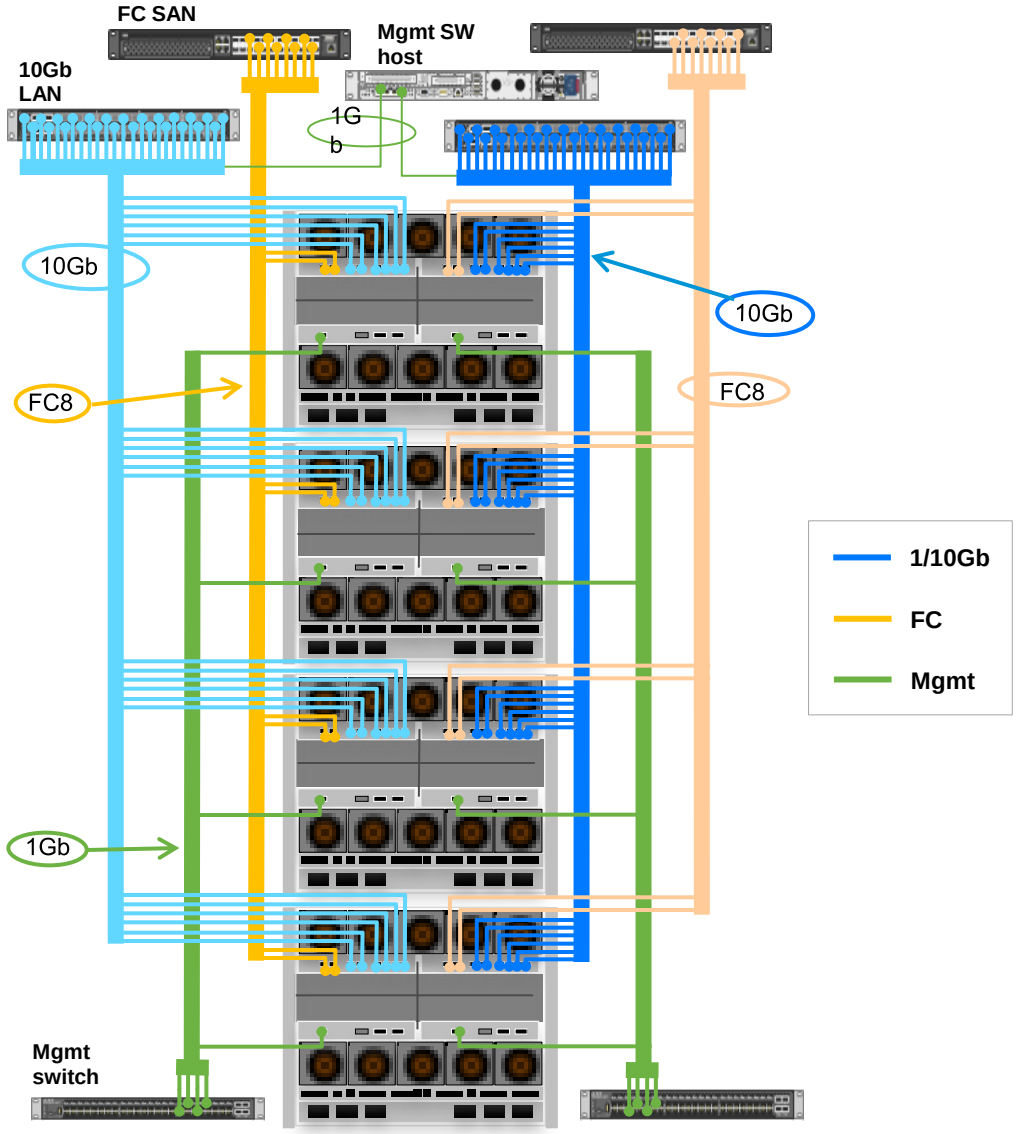
If you need I/O, more uplinks, there is only one option:

- **Buy another pair of switches – retail at $18,499 each = $36,998.**
- **This option requires more mezz cards as well: $849 x 16 blades = $13,584;**
- **$50,582 TOTAL to add more uplink I/O, per chassis.**

HP pricing publically available on 02/12/2014.

HP c7000 Platinum Chassis

7.5 Gbps Enet / blade (+ 2 Gbps FC / blade)



4 chassis – 64 blades

- **2 Gbps of FC / blade – dedicated, inflexible**
- **7.5 Gbps of Enet / blade– dedicated, inflexible**

Even more cables for each chassis:

2 x mgmt cables

4 x FC8 cables

12 x 10Gb Enet cables

18 Cables for each chassis : 16 blades

4 chassis
72 cables
72 ToR switch ports – 48 of them 10Gb ports
$ $ $ $ $

The HP Virtual Connect FlexFabric switches are maxed out.

4 chassis – 64 blades
16 management points – 4 per chassis.
We aren't managing the blades yet.

IBM Flex System Blade Chassis

- **For UCS Manager parity, you need IBM Flex System Manager (FSM) at the minimum.**
- **FSM Mgmt Node – Required for every 4 chassis.**
- **FSM Mgmt Node – NOT REDUNDANT.**
- **FSM license required for every chassis.**
- **10 RU chassis. 4 Chassis = 56 slots. Only 55 Compute**

ToR switches are needed to connect multiple chassis. Switches are redundant

FC Switch

10Gb Enet

1Gb Enet Mgmt

Each Chassis has:

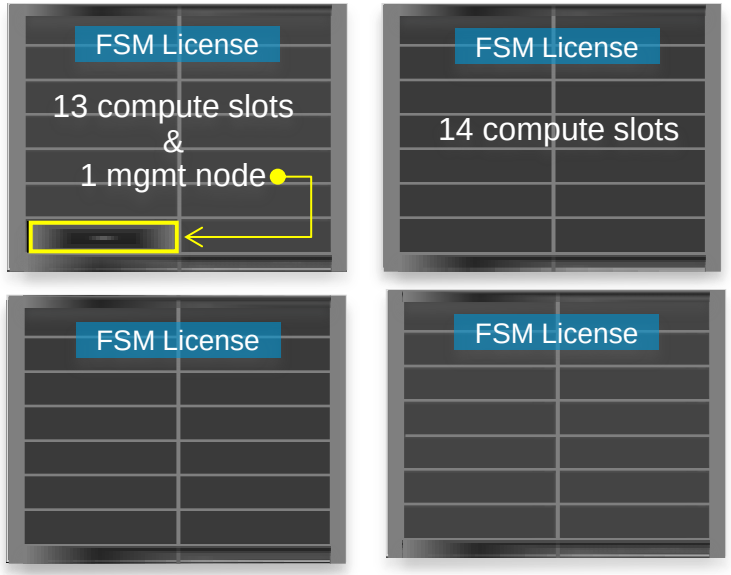
2 CN4093 switches per chassis

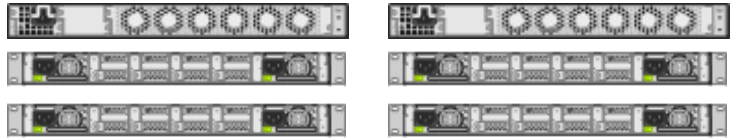
2 x Mgmt Modules per chassis.

= 4 mgmt points

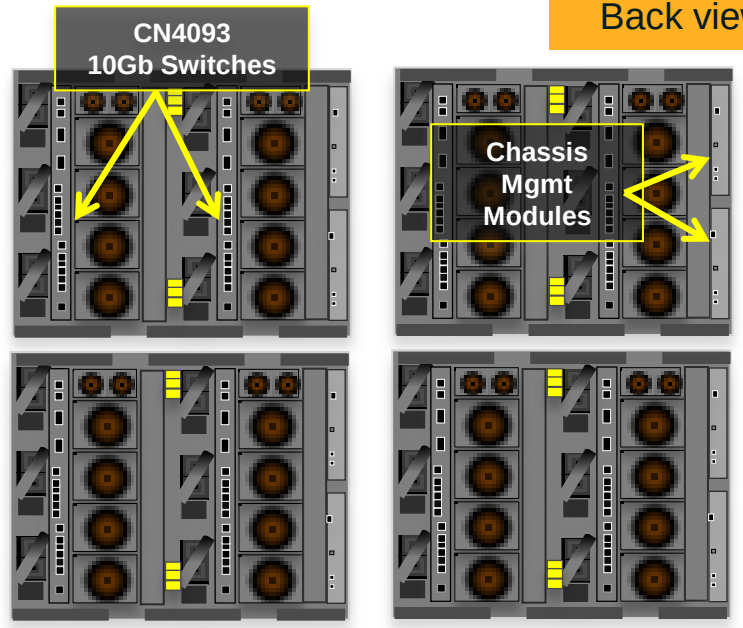
4 Mgmt Points in EVERY chassis – minimum

Front view

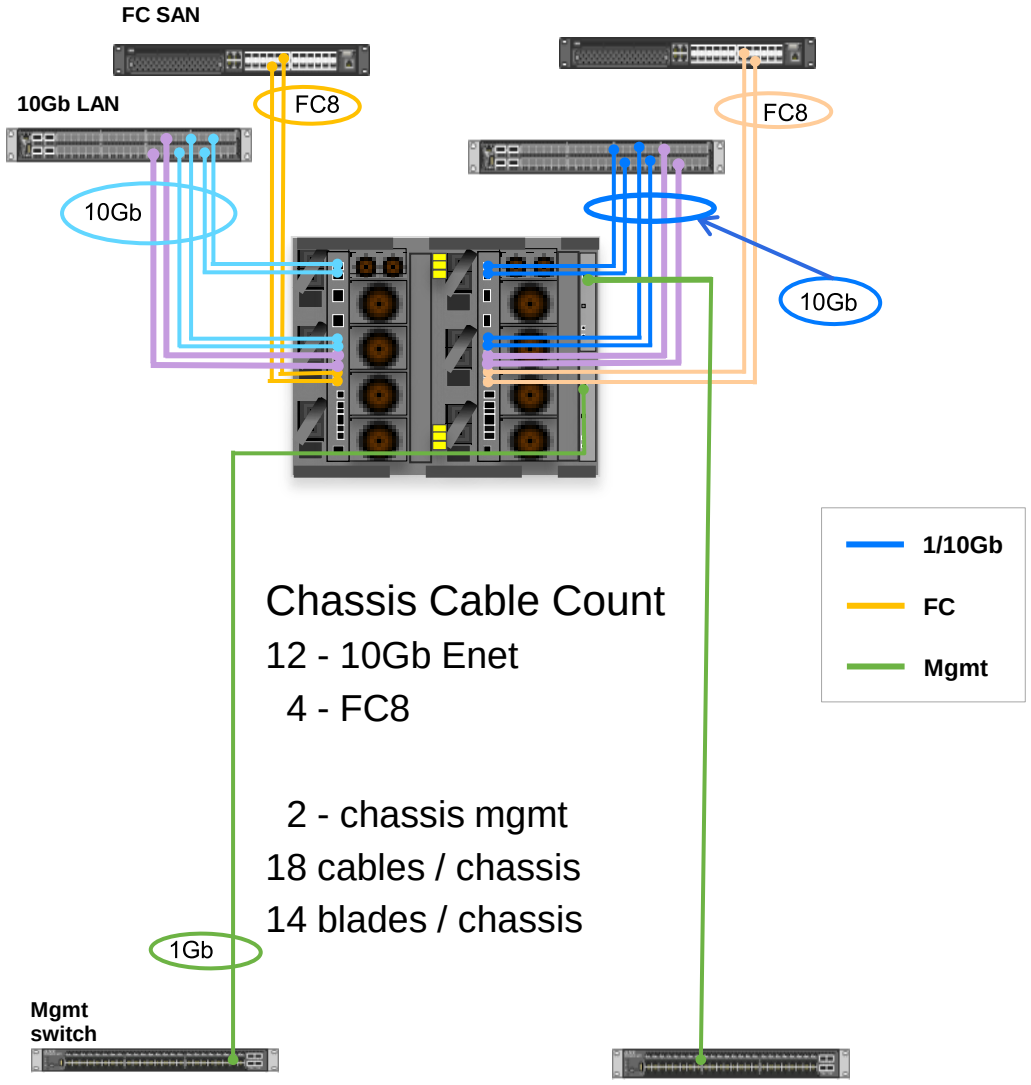




Back view



IBM Flex System Chassis 8.6 Gbps Enet / blade (+ 2.3 Gbps FC / blade)



Chassis Cable Count
12 - 10Gb Enet
4 - FC8

2 - chassis mgmt
18 cables / chassis
14 blades / chassis

5.7 Gbps of Enet only / blade
2.3 Gbps FC only / blade
8 Gbps Total I/O per blade leaving chassis

You can add 2 more 10 Gb Enet connections per switch, 40 Gbps per chassis

80 (original Enet capacity)
+ 40 (new 2 x 10 Gb per switch **“ ——— ”)**
120 Gbps Enet leaving chassis
÷ 14 blades in each chassis
8.6 Gbps / blade

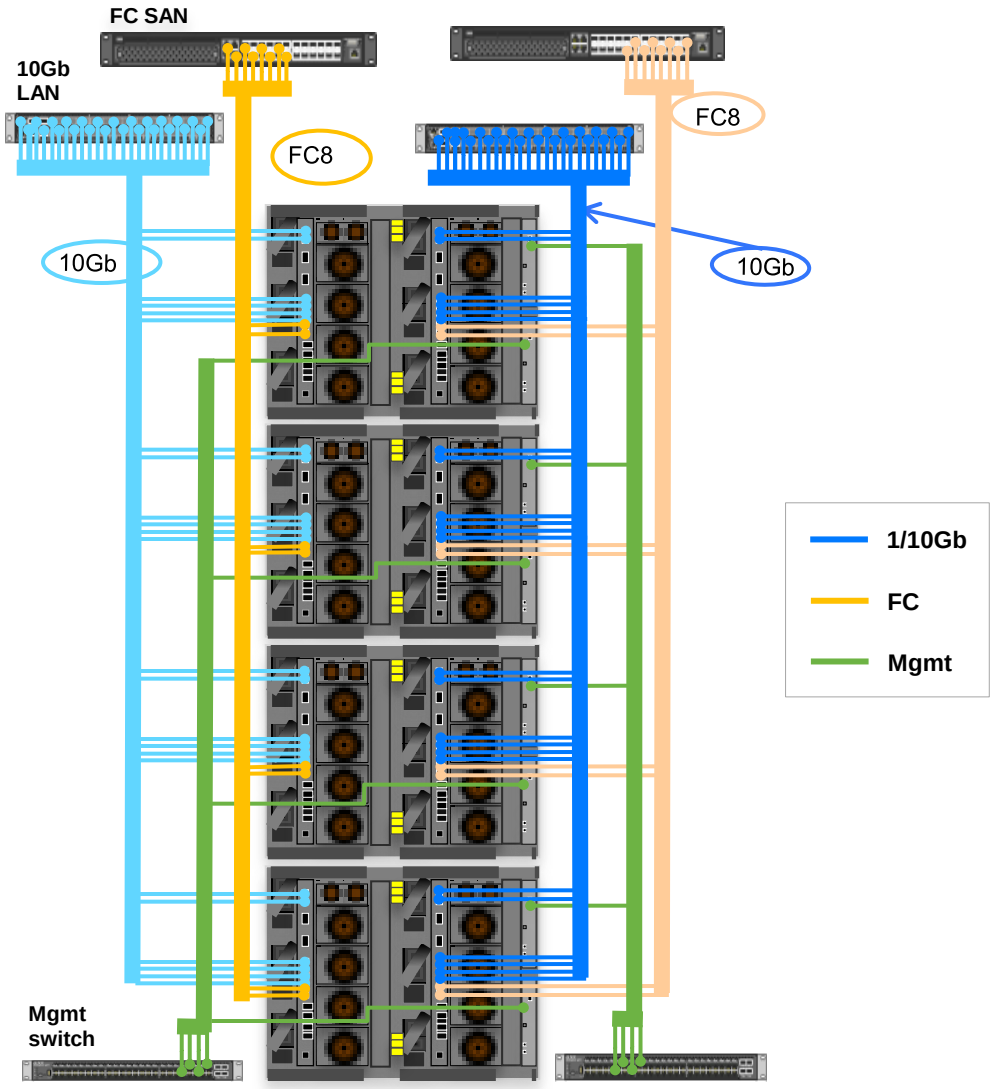
The native ports on the CN4093 switches are maxed out.

If you need I/O, more uplinks, there are two options:

1. **Buy upgrades for both switches – retail at $10,999 each = $21,998**
2. **Buy another pair of switches – retail at $20,899 each = $41,798. This option requires more mezz cards as well – $1,868 x 14 blades = $26,152 (card and SW upgrade); TOTAL to add switches is $67,950**

IBM pricing publically available on 02/12/2014.

IBM Flex System Chassis 8.5 Gbps Enet / blade (+ 2.3 Gbps FC / blade)



4 chassis / 55 blades ; 4 x 14 blades = 56 – 1 FSM node, (IBM Flex System Manager domain maximum 16 chassis. No redundant mgmt node capability exists at this time.)

- **2.3 Gbps of FC / blade**
- **7.5 Gbps of Enet / blade**

This is a lot of cables for 10.8 Gbps of I/O / blade

2 x mgmt cables

4 x FC8 cables

12 x 10Gb Enet cables

18 Cables for each chassis

1.28 cables per blade server

4 chassis

72 cables

72 ToR switch ports

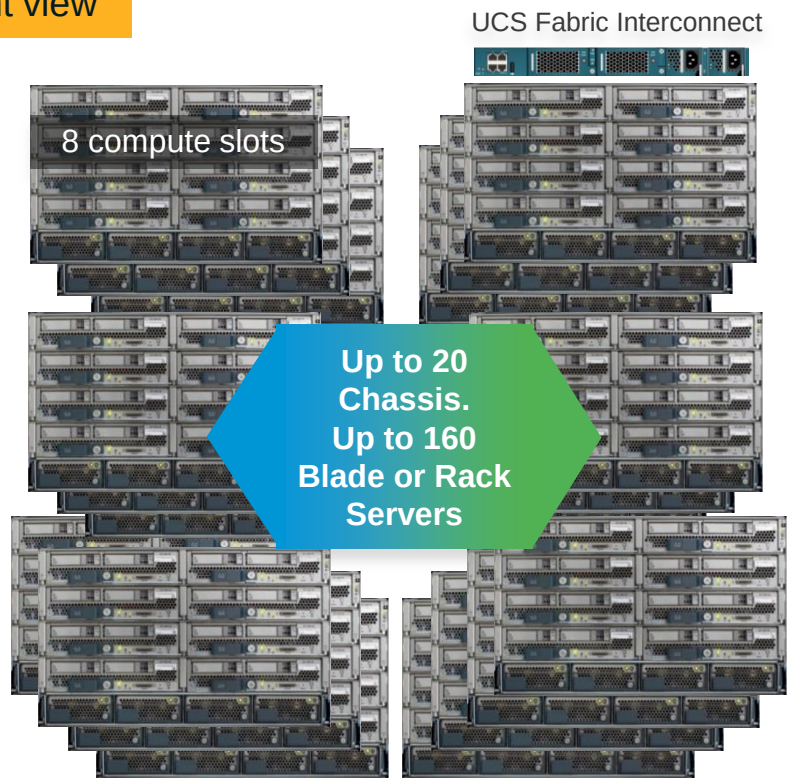
8 management switch ports

$ $ $ $ $

Cisco UCS Blade Chassis

- No Extra Mgmt SW / Hardware needed.
- No “per chassis” licensing needed or required.
- UCS Management is FULLY REDUNDANT.
- 1 to 20 chassis or 160 RACK or BLADE servers.
- 2 x UCS Fabric Interconnects (FI) required.
  48 or 96 port models – 10 Gbps FCoE.
- All Mgmt SW (UCS Manager) is included in FIs.

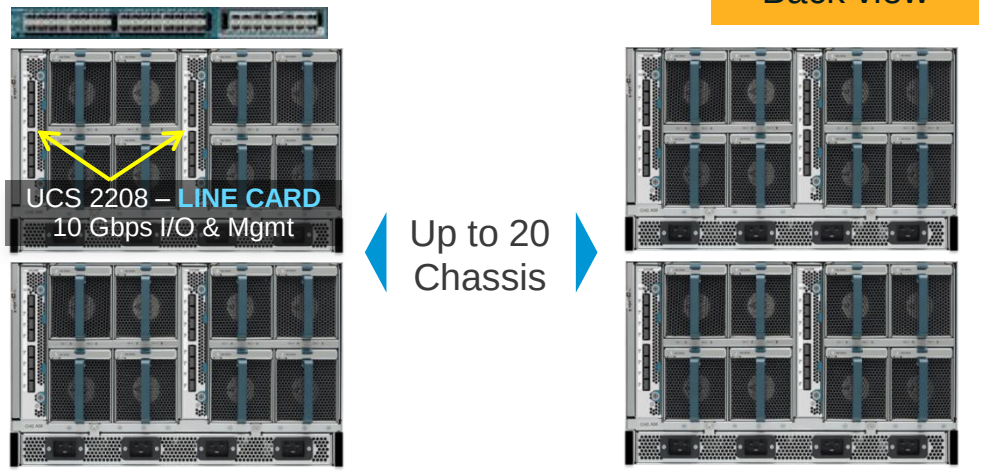
Front view



Fabric Interconnects Required

- UCS Fabric Interconnects are Active / Active Cluster
  = 1 mgmt point for ALL chassis & rack servers.
- Each UCS 2208 has 8 x 10Gbps FCoE ports
  (management path included).
- UCS 2204 version has 4 ports each.
- UCS 2208 / 2204 are **Line Cards NOT switches**.
  They are remote line cards for the Fabric Interconnects and are not a mgmt point.

Back view



Up to 20 blade chassis (160 blade servers) –

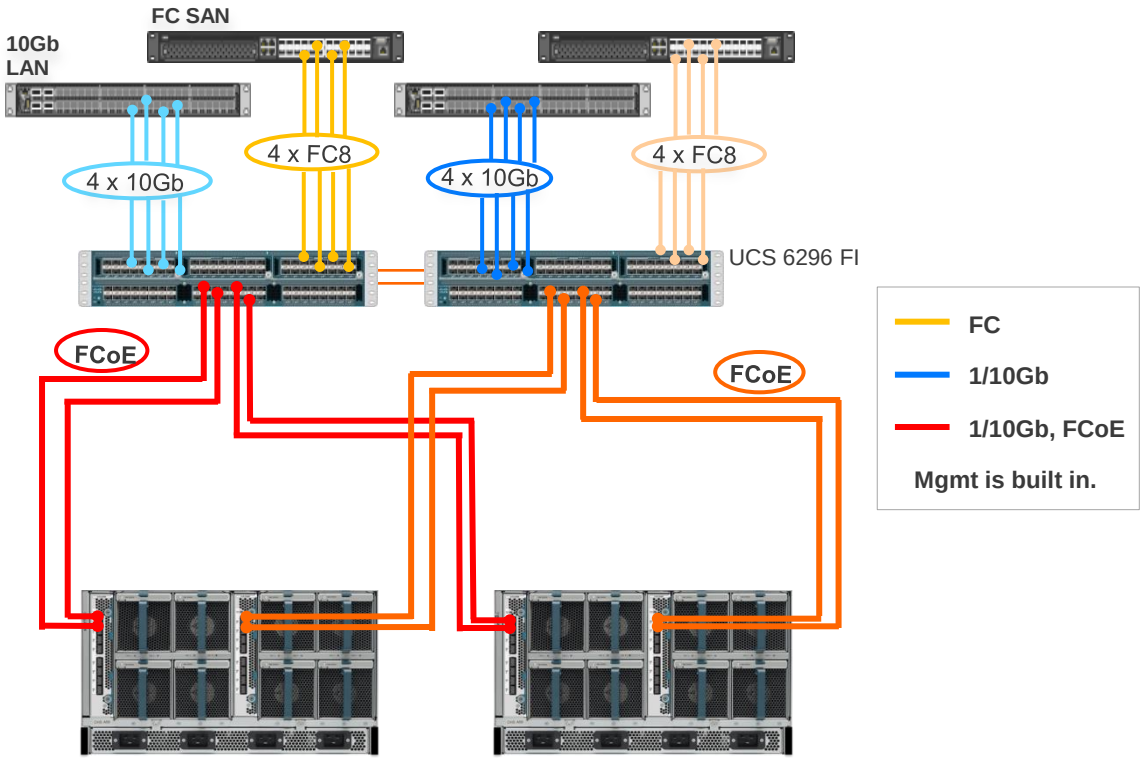
Mix Blade AND Rack Servers – up to 160 servers total.

All in

One Mgmt Tool, One Mgmt Interface

One Mgmt Domain

Cisco UCS



2 chassis – 16 blades

16 B200 M3 blades, 8 per chassis.
- **mLOM UCS 1240 VIC – 4 x 10Gb FCoE ports**

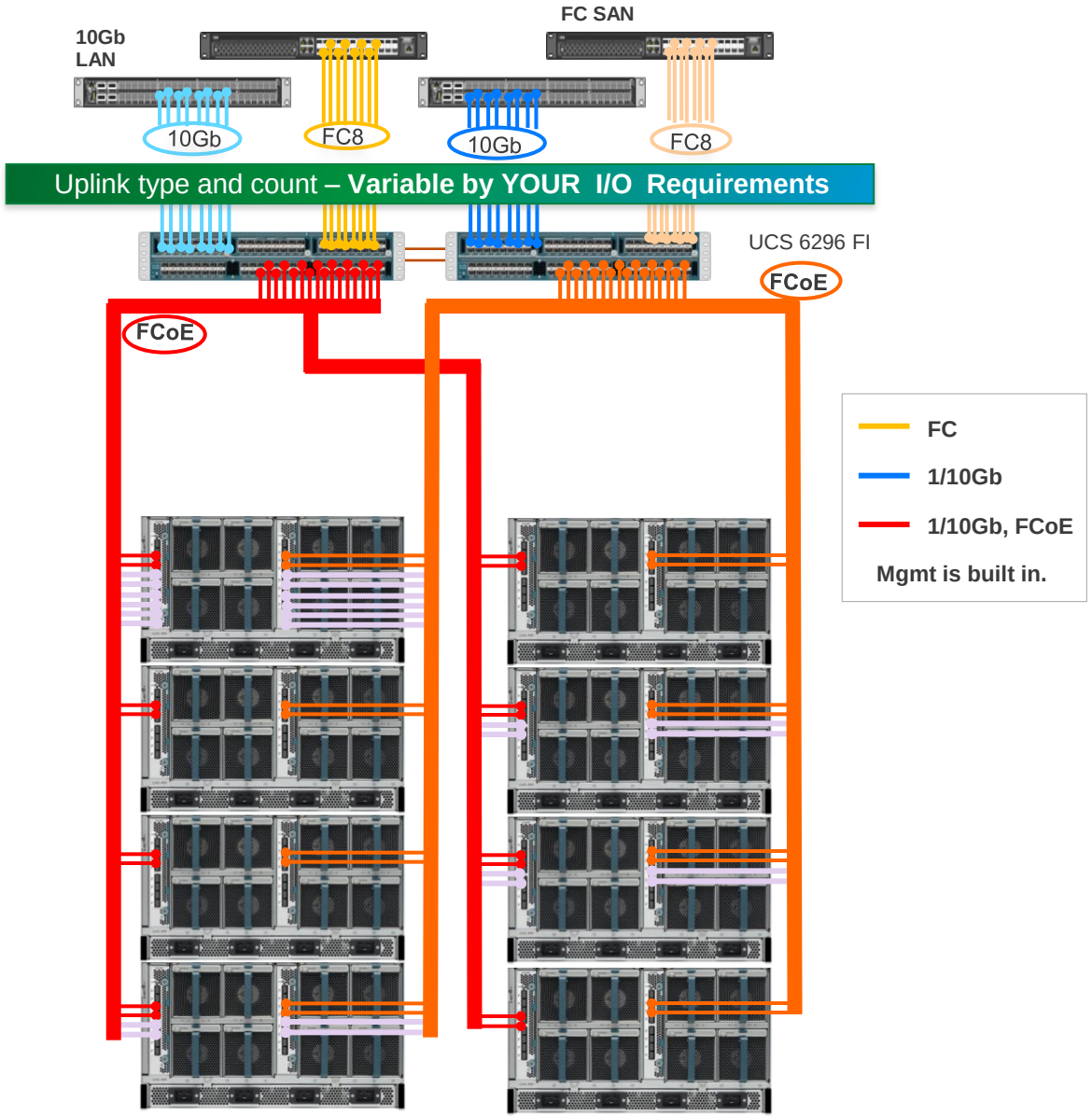
UCS 5108 chassis, each with 2 x 2208 I/O modules
Each 2208 has 8 x 10Gb FCoE ports = 80 Gb each

Illustrated here:
40 Gb (2 x 10 Gb ports per module)
÷ 8 blades
5 Gb / blade leaving chassis

2 x UCS 6296UP Fabric Interconnects (FI)
96 Universal Ports each for I/O
Universal ports for 10 Gb / FCoE / FC4/8
Use for Southbound (to chassis) or Northbound

Shown Here: 5 Gbps / blade, 8 blades per chassis
5 Gbps FCoE per blade leaving chassis
- **All I/O is available to all blades in the chassis**
- **20 Gb minimum available from each blade**
- **FC is prioritized**
- **QoS is set per blade by admins to meet needs**

Cisco UCS



8 chassis - 64 Blades
Less than ½ of the UCS Manager Domain limit:

Some chassis / some blades, may need more I/O than others.

Add I/O from the chassis to the FI
= Add cables “ ____ ”

Get up to 80Gbps per blade – Your choice

Add more Northbound I/O from the FI
= Set the port characteristics, add cables

Uplink type and count –
Variable by YOUR I/O Requirements

Cisco UCS has:

- **No requirement for blades to be identically configured.**
- **No need to add costly “intra-chassis” switches just to have or add more I/O on a few blades.**
- **No requirement for chassis to be identically configured.**

I/O and Virtualization

I/O and Virtualization UCS - Unification Reduces Complexity

HP

Growing capacity increases complexity

Limited visibility of virtual server I/O. Added software required.

Scale requires large hardware increments including high ToR switch port consumption.

Only partial I/O identity with deployment. Deploying servers very manual and time consuming.

UCS

Unification yields constant, leveraged infrastructure.

Full Port to Port visibility for both physical and virtual servers. No added cost.

Scale in smaller increments, leveraging existing infrastructure. Plug and Play to increase chassis and blade I/O.

UCS Automated Deployment / Provisioning includes I/O mapping, policies and security.

IBM

Growing capacity increases complexity

Limited visibility of virtual server I/O. Added software required with additional cost.

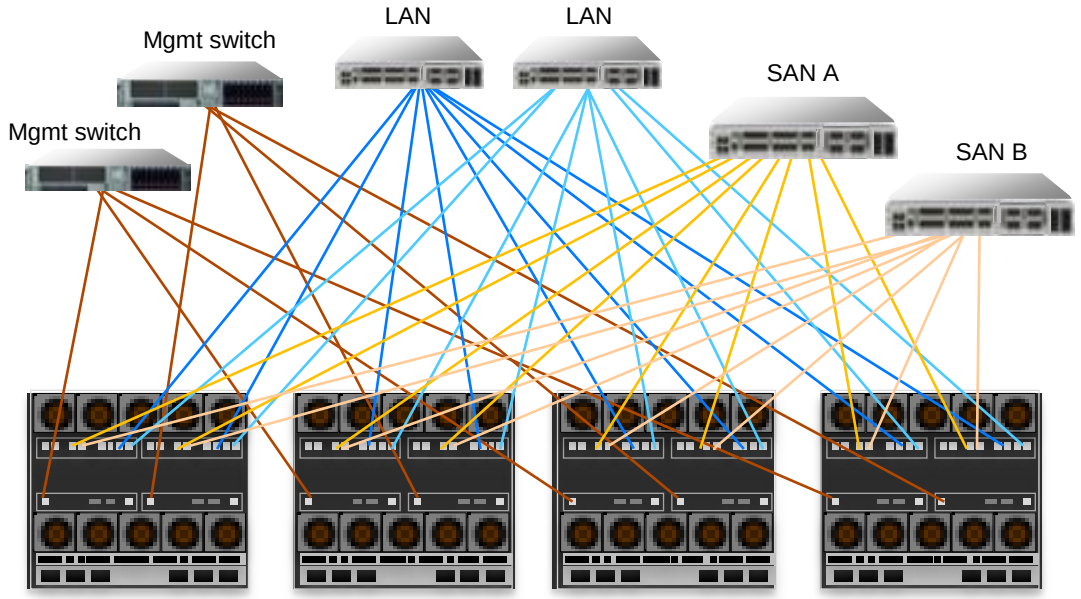
Scale requires large hardware increments including high ToR switch port consumption.

Only partial I/O identity with deployment. Deploying servers very manual and time consuming.

Simpler Architecture HP doubling servers = doubling touches; UCS = 1 touch point

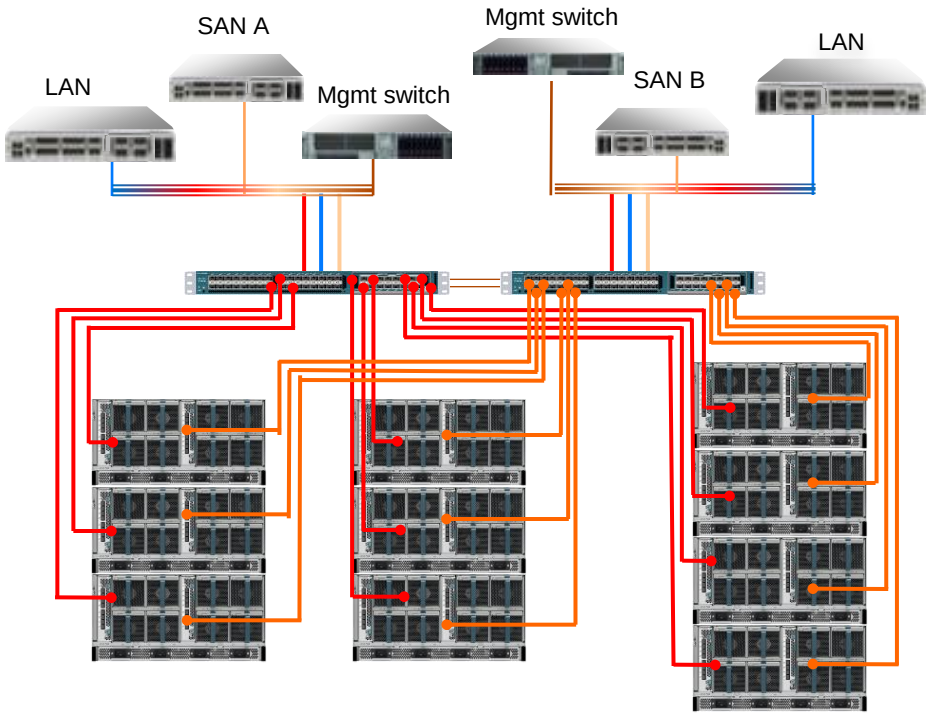
64 Blades – 4 x HP c7000

Fabric Interconnects	0
Intra Chassis Switches	8
Chassis Mgmt Module	8
Total Mgmt Points	**16**



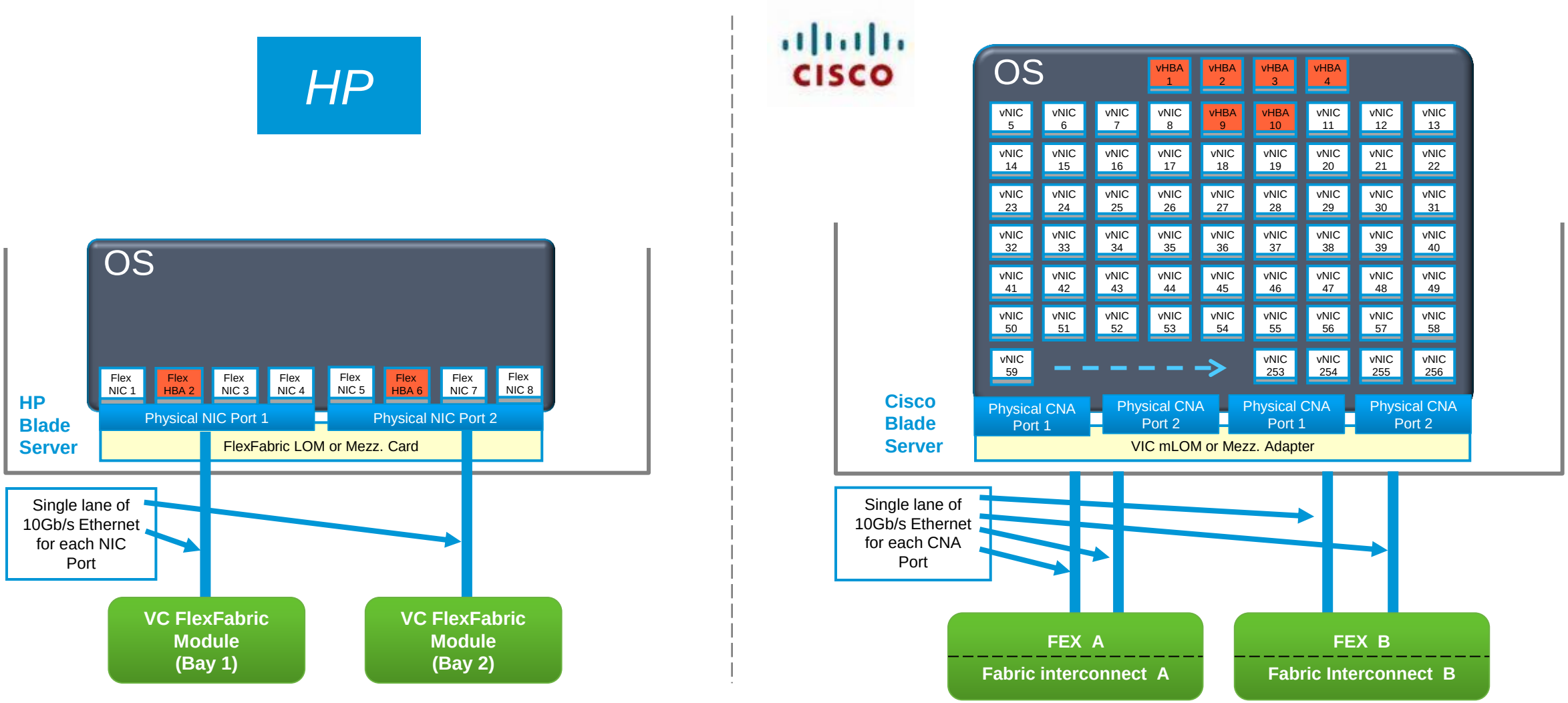
80 Blades – 10 x Cisco UCS 5108

Fabric Interconnects	2
Intra Chassis Switches	0
Chassis Mgmt Module	0
Total Mgmt Points	**1**



Cisco VIC vs. HP FlexFabric Adapter

Cisco VIC is really like a “Flex-256” adapter that includes multiple vHBA support point

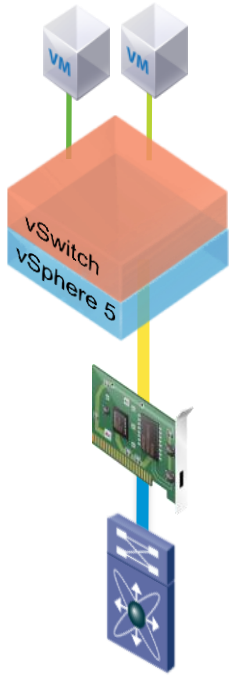


VM-FEX Highest Performing Virtual Networking

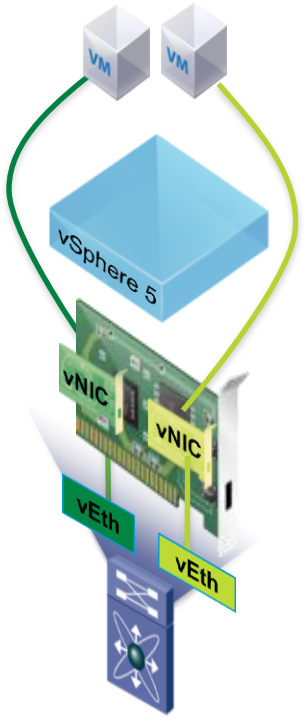
Cisco UCS Delivers Enhanced Performance

Others

Software Switch



VM-FEX
(Hypervisor Bypass)



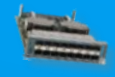
Latency	↓	Up to **40% lower** end-to-end latency
Throughput	↑	Up to **10% more** At 30% lower CPU utilization
Application Performance	↑	Up to **15% more** (Database workload)

Blade Chassis Fabric Comparisons

Product Features and Specs – qty. per switch	Cisco UCS 6248UP	Cisco UCS 6296UP	HP Virtual Connect FlexFabric	IBM Flex System Fabric CN4093
Switch Management	**Built-in; Full Featured**	**Built-in; Full Featured**	**VC Mgr – Limited; VC EM - $$**	**Yes**
Switch Fabric Throughput	**960 Gbps**	**1.92 Tbps**	**240 Gbps**	1.28 Tbps
Maximum Chassis Attached	**20**	**20**	**1**	**1**
Maximum Server Population	**160 blade or rack**	**160 blade or rack**	**16 blade only**	**14 blade only**
Switch Footprint	**1RU**	**2RU**	**Intra-chassis**	**Intra-chassis**
Maximum Available Ports	**48**	**96**	**8**	**16**
1 Gb Ethernet Port Density – max	**48**	**96**	**4**	**14**
10 Gb Ethernet Port Density – max	**48**	**96**	**8**	**8 w/ base; 6 more $$**
8 Gb FC Port Density – maximum	**48**	**96**	**4**	**6 w/ base; 6 more $$**
Chassis: 40 Gigabit Ethernet Ready Chassis	✔	✔	Recent launch, no retrofit available at this time.	Recent launch in completely new chassis.
MANAGEMENT – Chassis and blades	✔ **Built-in Fully integrated**	✔ **Built-in Fully integrated**	**No, additional hardware and connections required**	**No, additional hardware and connections required**

Cisco UCS Fabric Infrastructure Portfolio

Cisco UCS™ 6200 and 2200 with Unified Ports

	Typical Deployments	High End Deployments
UCS Fabric Interconnects	**48 Port Fabric Interconnect**  UCS-FI-6248UP  • Performance for typical deployments • 1TB throughput • 48 ports in 1RU • Infrastructure agility with Unified Ports	**96 Port Fabric Interconnect**  UCS-FI-6296UP  • High Application performance • 2TB through put • High workload density 96 ports in 2RU • Infrastructure agility with Unified Ports
UCS FEX I/O Modules	**16 Port I/O Module**  UCS-FI-2204XP • 80G/ chassis • 20Gb to the Blade each, 40Gb total per blade Improved Utilization with Port Channels	**32 Port I/O Module**  UCS-IOM-2208XP • 160G/ chassis • 40Gb to the Blade each, 80Gb total per blade, for burst traffic • Improved Resiliency • Improved Utilization with Port Channels.

Blade Management

Blade Management with UCS Less Complexity, More Flexibility, Easy Scale

HP

Back of each blade chassis has a "rack's worth of infrastructure"

Blade and Rack servers require separate management

Back of each chassis is a hardware profit center

Adding chassis adds a "rack's worth of infrastructure" burden

UCS

One infrastructure for multiple blade chassis and racks

One Management interface for multiple blade chassis AND rack servers

Low cost FEX integrates Management and I/O (Enet, FC and Mgmt)

127+ Server ID Settings — completely automated including firmware and I/O devices

IBM

Back of each blade chassis has a "rack's worth of infrastructure"

Blade and Rack servers require separate management

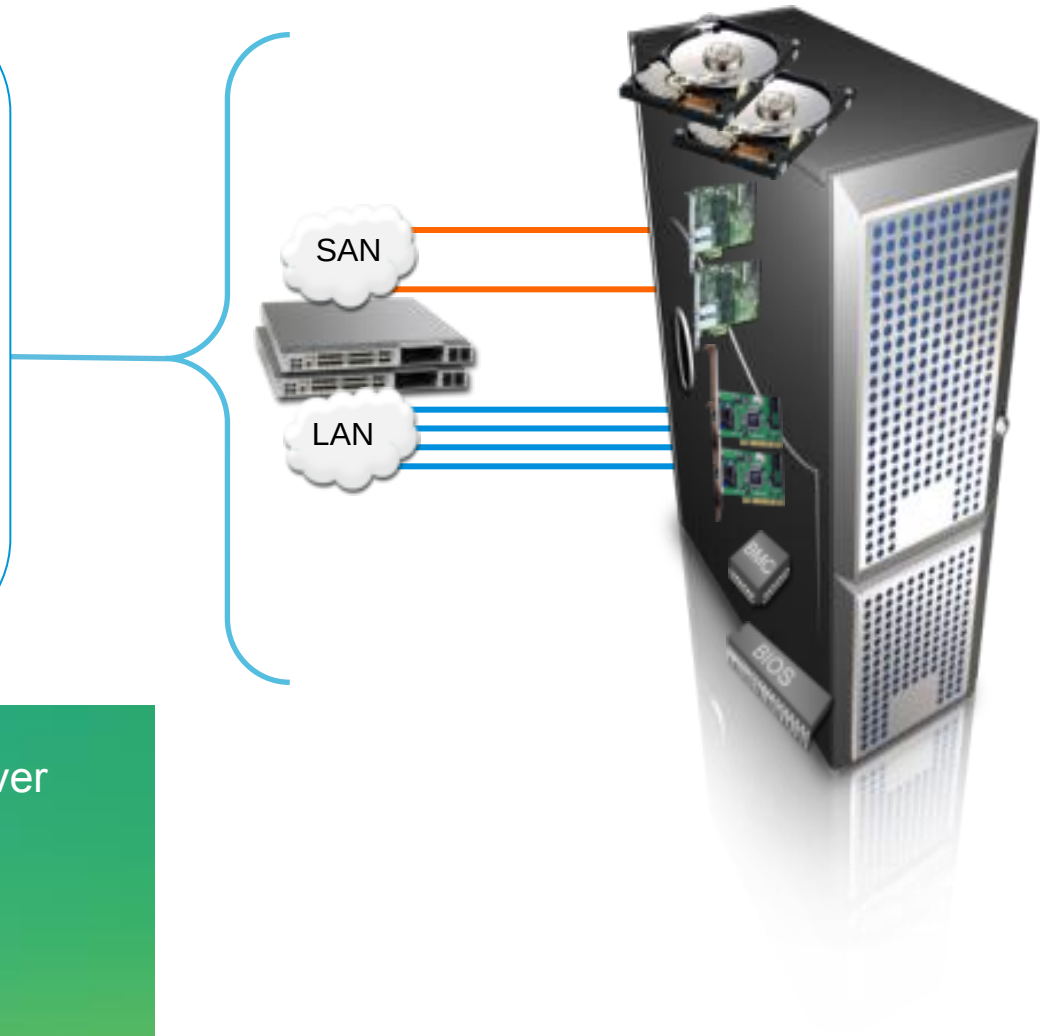
Architecture is a Software Profit Center. Back of each chassis is a hardware profit center.

Adding chassis adds management software burden and a "rack's worth of infrastructure" burden

Cisco Service Profiles Heart of Unified Model-Based Management

CISCO UCS SERVICE PROFILES

NIC MACs	IPMI Settings	BIOS firmware
HBA WWNs	Number of vHBAs	Adapter firmware
Server UUID	QoS	BMC firmware
VLAN Assignments	Call Home	RAID settings
VLAN Tagging	Template Association	Advanced NIC settings
FC Fabrics Assignments	Org & Sub Org Assoc.	Serial over LAN settings
FC Boot Parameters	Server Pool Association	BIOS Settings
Number of vNICs	Statistic Thresholds	More….
Boot order	BIOS scrub actions	
PXE settings	Disk scrub actions	



- Allows YOU to define the “to-be” server, NOT settle for the “as is” server
- Created through Cisco UCS Manager
- Configure once then reuse
- Templates as Best practices
- Blade and Rack Servers – Service Profiles are Form Factor Agnostic

BIOS Server Setting Capabilities

This table details the BIOS settings that can be managed by UCS Manager, HP VC and IBM FSM. All BIOS settings for Cisco UCS servers may be defined and set within the Service Profile.

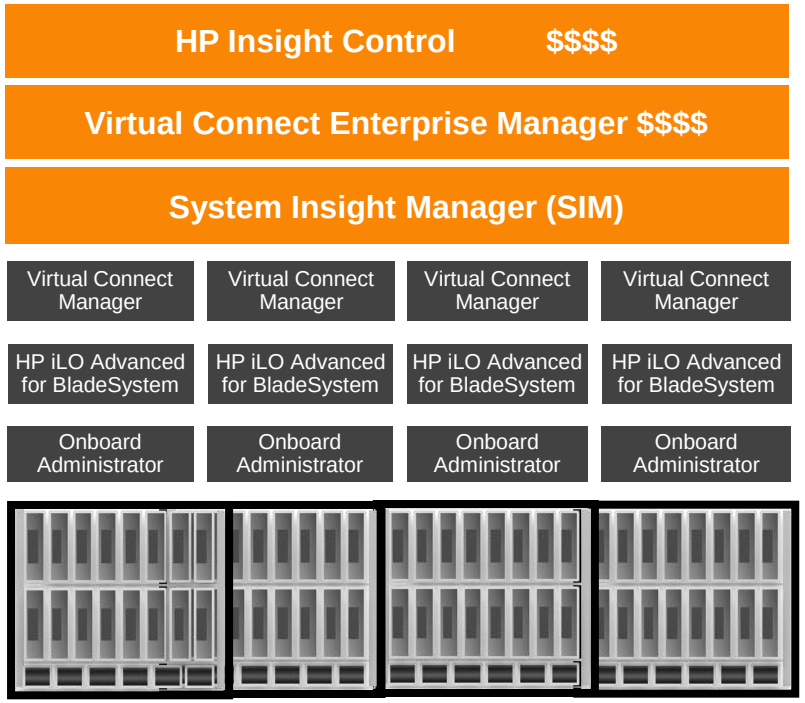
IBM has limited BIOS configuration support and each solution is only applicable to their newest generation of blade servers. Cisco Service Profiles may be applied to any generation and any server platform: **Rack or Blade**.

HP Virtual Connect Server Profile Added Cost - $	IBM Flex System Manager Added Cost - $	Cisco UCS Service Profiles NO ADDED COST
0 Settings	12 Settings	48 Settings
	BIOS – Processor Hyper Threading	BIOS All BIOS Settings Blade and Rack server
	BIOS – Processor OPI Link Frequency Plan	
	BIOS – Memory Speed Plan	
	BIOS – Memory Channel Mode	
	BIOS – Memory Socket interleave	
	BIOS – Patrol Scrub	
	BIOS – POST watchdog timer	
	BIOS – OS watchdog timer	
	BIOS – LAN over USB	
	BIOS – Reboot system on NMI	
	BIOS – Power off delay	
	BIOS – Halt on server error	

UCS—More Flexible, Less Complexity

HP c7000

HP Server Hardware Management
Multiple Layers of Software Required



64 blade servers
0 rack servers

Separate Management - Every Chassis, All Software
Separate Enet & Fibre Channel I/O leaving the chassis

Cisco UCS

UCS Manager
1 Console
No Added Cost
Rack and Blade Together

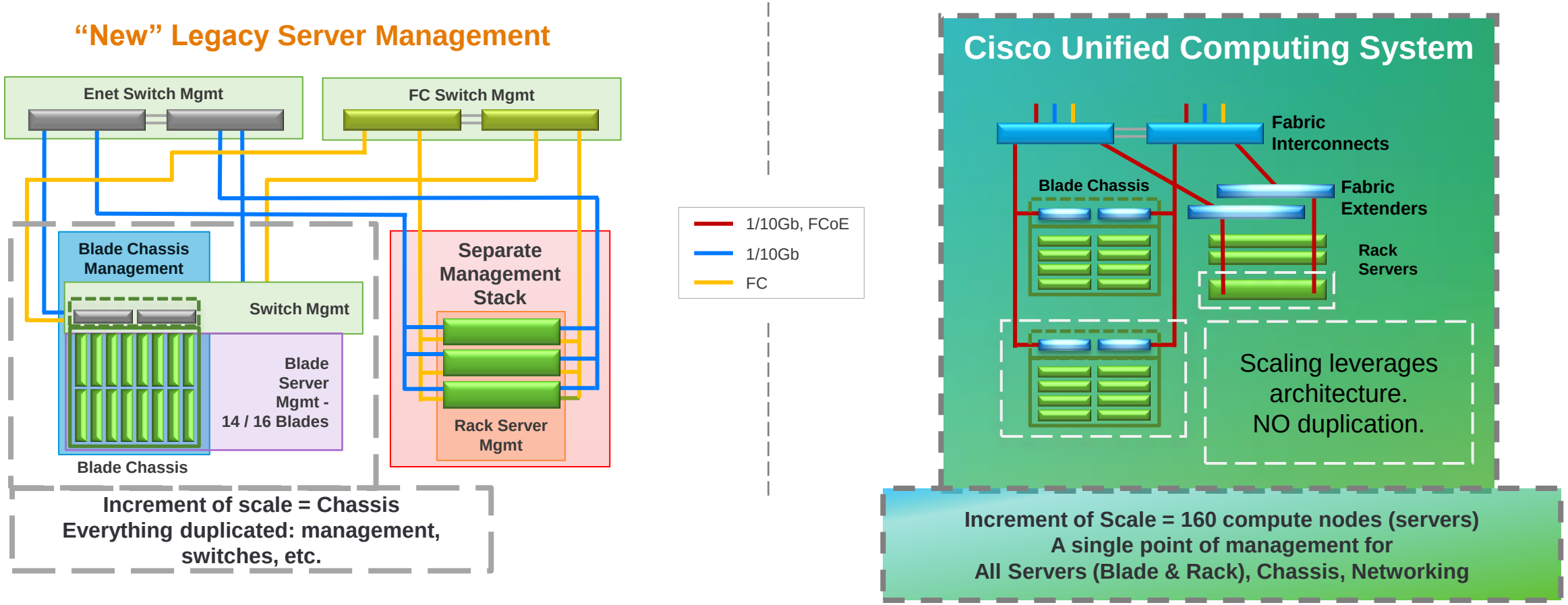
Up to 160 servers
Blade or Rack mount

Unified Compute, Unified Management,
Unified Fabric

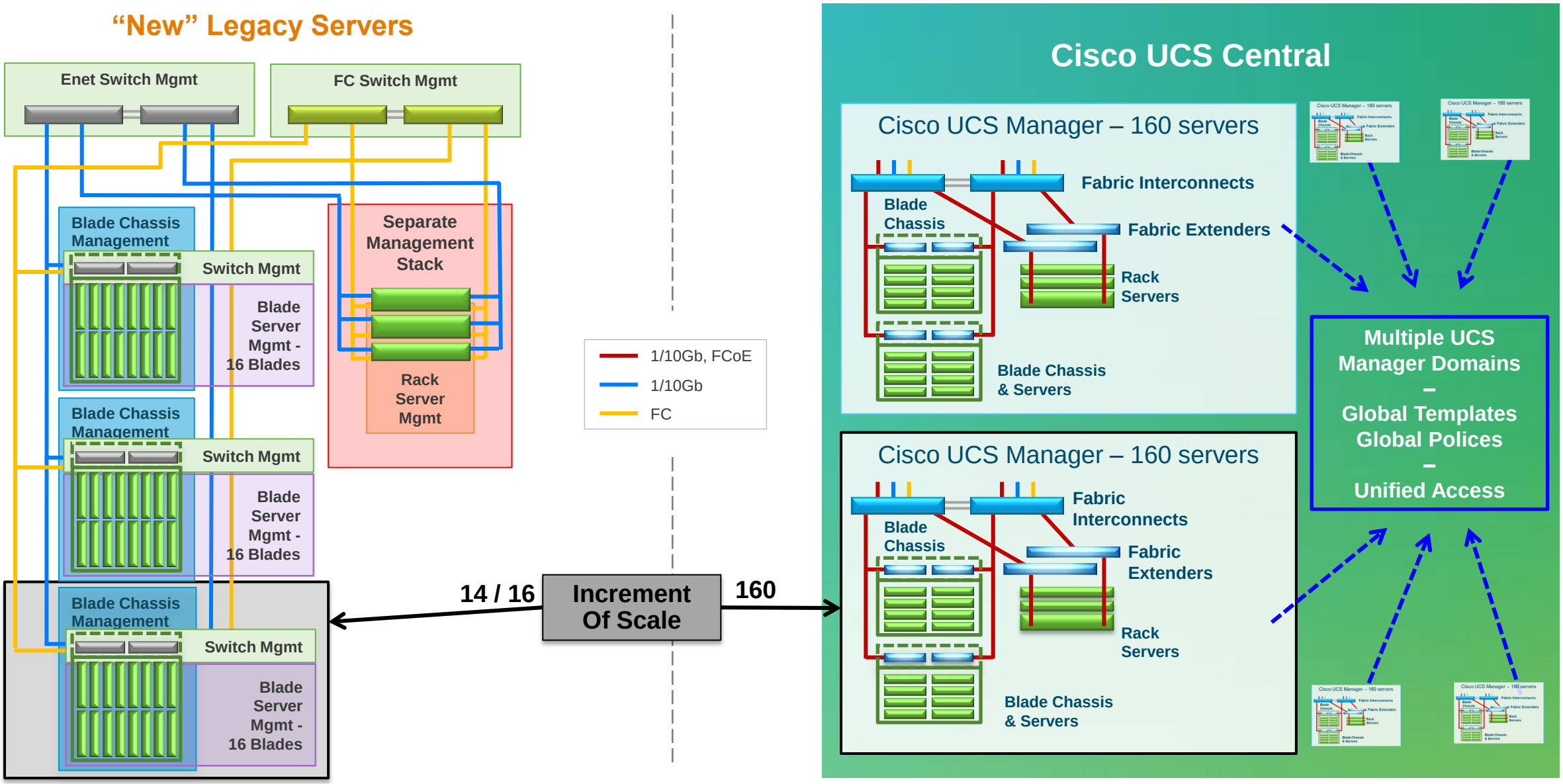
The Cisco UCS Management Difference

Cisco UCS provides a Single Management Tool & Interface (UCS Manager)

- Unified Compute – Abstracted Server Identities to Service Profiles 127+ identity settings
- Form Factor agnostic – blade or rack – with portability back and forth
- Unified Fabric – Server, LAN, SAN and Management into one interface
- Unified Management – unified across a distributed environment

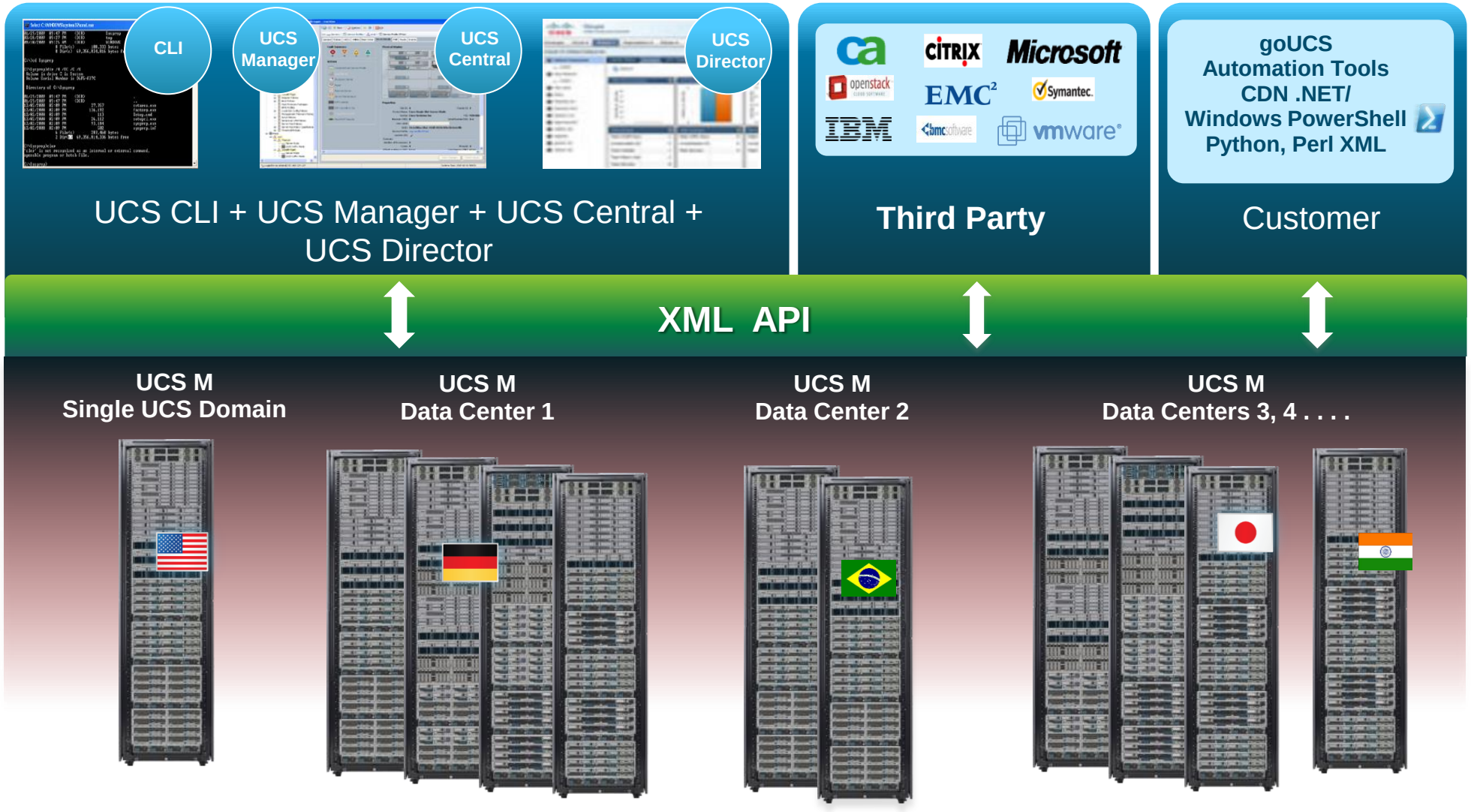


Increasing Scale **UCS has 160 server increments**, not 16 blades (only blades)



UCS Is Redefining Server Management

10,000 UCS SERVERS — Monitor and Manage Seamlessly



- Blade and Rack Servers in the same domain – Form Factor Agnostic
- Standards-based XML API presents bidirectional single interface to entire solution
- UCS offers the customers the broadest choice of Cisco or 3rd party management tools

Total Cost of Ownership

Total Cost of Ownership (TCO) UCS–Effective, Efficient and Easy

HP

Costly to add more chassis and I/O

HP “accidental mini-rack” chassis design has high cost burden to scale

Through-put trade off for features

HP just announced a new chassis with no upgrade for older chassis.

UCS

Efficient and Effective, low cost I/O additions

UCS delivers lower TCO by design with easy, lower cost scaling

No sacrifice of function for features

UCS chassis has the future built in today

IBM

Costly to add more chassis and I/O

IBM Flex System is more of the same with high cost burden to scale

Lots of cost adders for limited additional functionality.

New IBM Flex System chassis is a software selling mechanism.

UCS & HP Infrastructure Scaling Cost

Cisco UCS
28% less than HP

32 Servers
28% Less
$33,515 Less

HP c7000 Platinum chassis, each with:
- **10 fans, 6 power supplies & cords**
- **16 Insight Control Licenses**
- **2 Enclosure Management Modules**
- **2 Flex Fabric switches**
- **HP VC Enterprise Manager**

UCS 6248UP Fabric Interconnects, each with:
- **All fans, power supplies & cords, and access kits**

Cisco UCS chassis, each with:
- **8 fans, 4 power supplies & cords**
- **2 – UCS 2208 I/O modules per chassis**
- **4 – 10Gb SFP+ cables**

HP: $ 3,784 / server

HP No benefit from scale

- Doubling capacity.
- Doubles Incremental Cost.
- No leverage.
- Flat infrastructure cost / server
- $3,784 / server

UCS: $ 2,737 / server

UCS True benefit of scale

- Doubling capacity
- Much Lower Incremental Cost
- Lower infrastructure cost / server
- From $4006 to $2260 / server

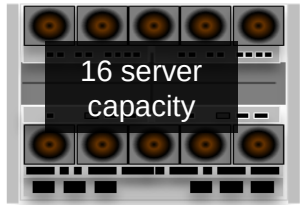
$60,545
HP c7000 chassis

$121,090

32

$ 87,575

$23,472
2 x UCS 5108 chassis



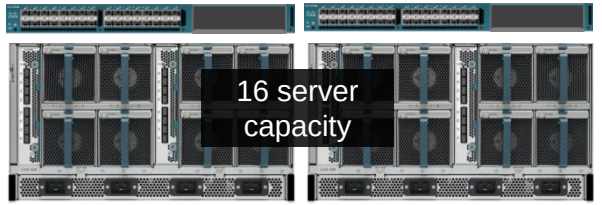
$60,545
HP c7000 chassis

$ 60,545

16

$ 64,103

$64,103
2 x UCS 6248UP FI
2 x UCS 5108 chassis



All pricing is online / retail and publically available on 02/12/2014.

UCS & HP Infrastructure Scaling Cost

HP: $ 3,784 / server

Flat per server cost for all capacities.

16 servers @ $3,784 / server

64 servers @ $3,784

No benefit of scale

Cisco UCS

40% less than HP

64 Servers

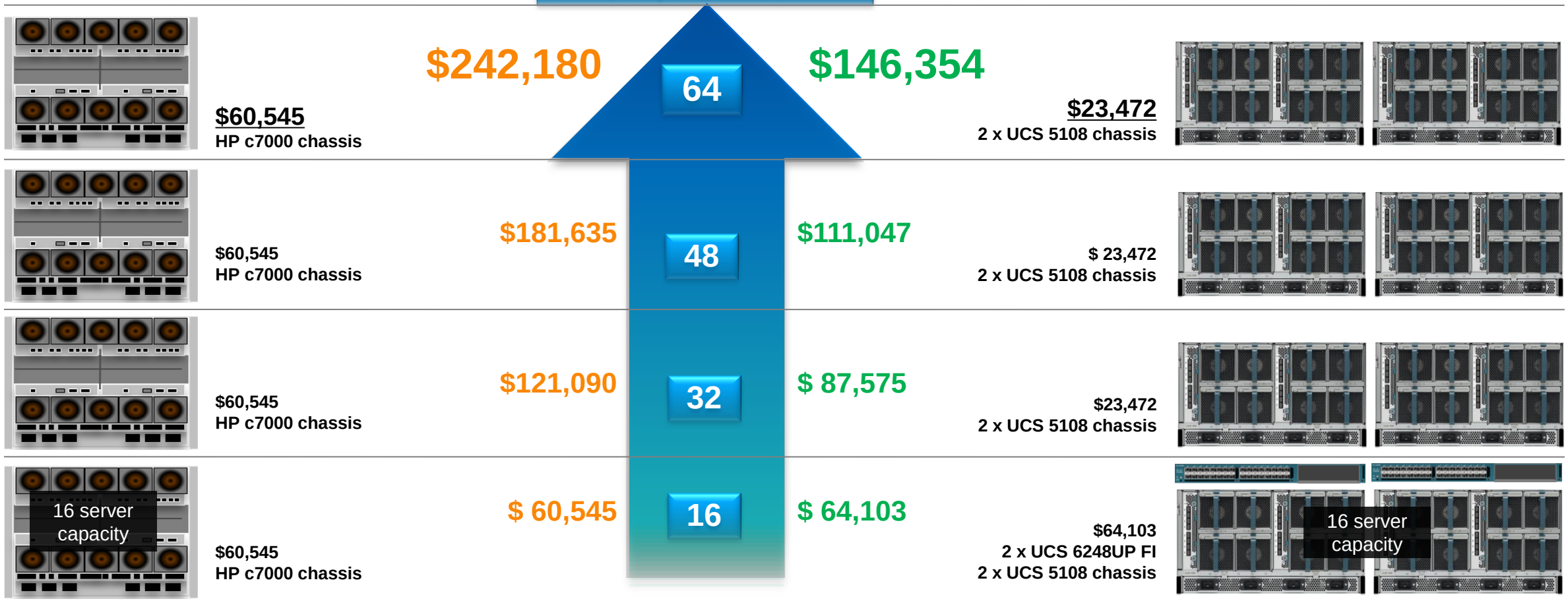
40% Less,
$95,826 Less

UCS: $ 2,287 / server

Adding capacity leverages UCS architecture

32 servers @ $2,737 / server

64 servers @ $2,287 / server



All pricing is online / retail and publically available on 02/12/2014.

UCS & IBM: Infrastructure Scaling Cost

IBM Flex System chassis, each with:
- All fans, power supplies & cords
- 2 – chassis management modules
- 2 – CN4093 10Gb switches
- 1 – Flex System Manager license
- 1 – IBM FSM Mgmt Node – chassis 1 only

Cisco UCS
39% less than IBM

27	UCS	32

More server capacity
$56,000 less

UCS 6248UP Fabric Interconnects, each with:
- All fans, power supplies & cords, and access kits

Cisco UCS chassis, each with:
- 8 fans, 4 power supplies & cords
- 2 – UCS 2208 I/O modules per chassis
- 4 – 10Gb SFP+ cables

IBM: $ 5,336 / server

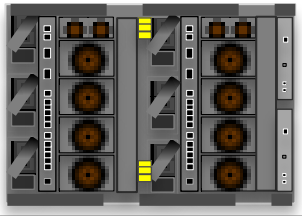
IBM No Real Benefit from Scale

- Doubling capacity.
- Adds Incremental Cost.
- No real leverage.
- Large infrastructure cost / server
- From $6,050 to $5,336 / server

UCS: $ 2,737 / server

UCS True benefit of scale

- Doubling capacity
- Much Lower Incremental Cost
- Lower infrastructure cost / server
- From $4006 to $2260 / server



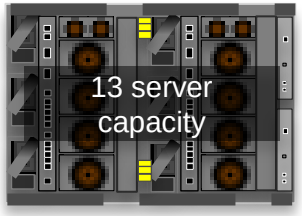
$65,407
IBM Flex System chassis
14 Compute slots

$144,063

27 | 32

$87,575

$23,472
2 x UCS 5108 chassis



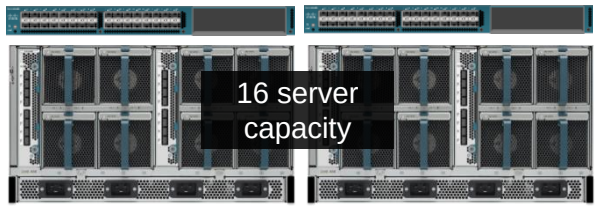
$78,656
IBM Flex System chassis
13 servers (14 – 1 FSM node)
All other chassis = 14 slots

$78,656

13 | 16

$64,103

$64,103
2 x UCS 6248UP FI
2 x UCS 5108 chassis



All pricing is online / retail and publically available on 02/12/2014.

UCS & IBM: Infrastructure Scaling Cost

IBM: $ 4,998 / server

No Real Benefit of Scale

13 servers @ $6,050 / server

27 servers @ $5,336

55 servers @ $4,998 / server

Cisco UCS

47% less than IBM

55 | UCS | 64

9 more servers

$128,000 less

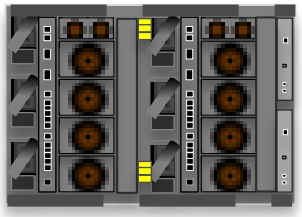
UCS: $ 2,287 / server

Adding capacity leverages UCS architecture

16 servers @ $4,045 / server

32 servers @ $2,756 / server

64 servers @ $2,296 / server



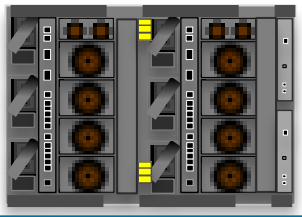
$65,407
IBM Flex System chassis
14 compute slots

$274,877

$146,354

55 | 64

$23,472
2 x UCS 5108 chassis



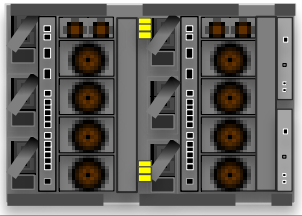
$65,407
IBM Flex System chassis
14 compute slots

$209,470

$ 111,047

41 | 48

$ 23,472
2 x UCS 5108 chassis



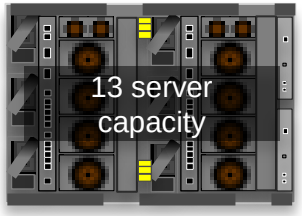
$65,407
IBM Flex System chassis
14 Compute slots

$144,063

$87,575

27 | 32

$23,472
2 x UCS 5108 chassis



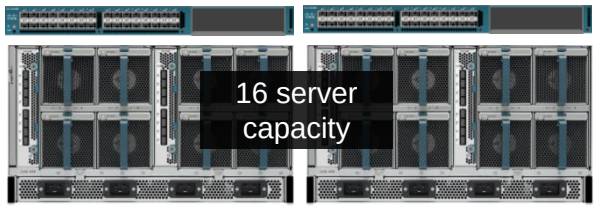
$78,656

$64,103

13 | 16

$78,656
IBM Flex System chassis
13 servers (14 – 1 FSM node)
All other chassis = 14 slots

$64,103
2 x UCS 6248UP FI
2 x UCS 5108 chassis

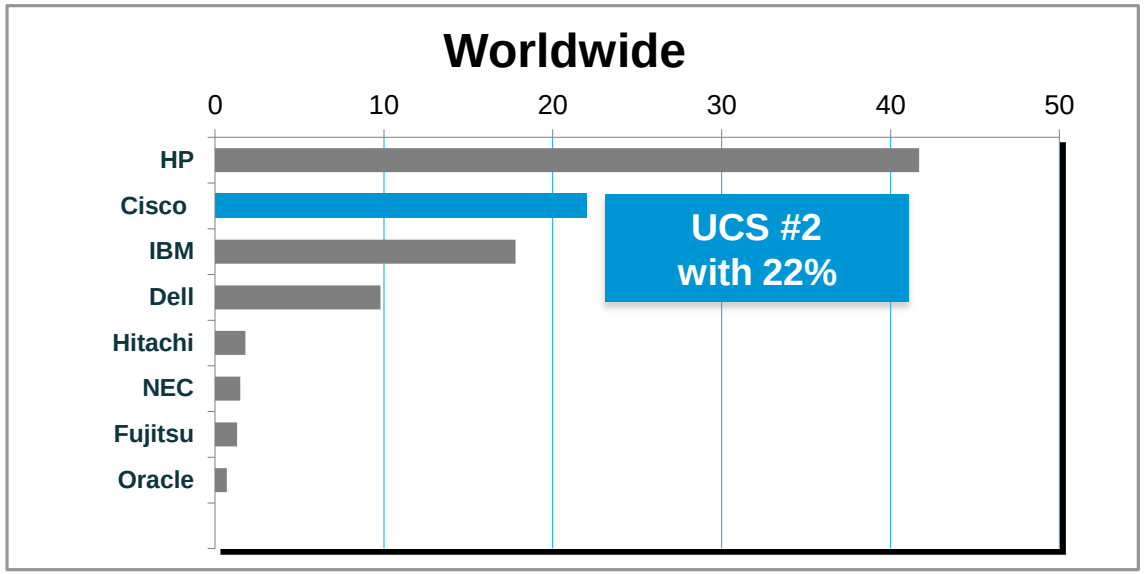


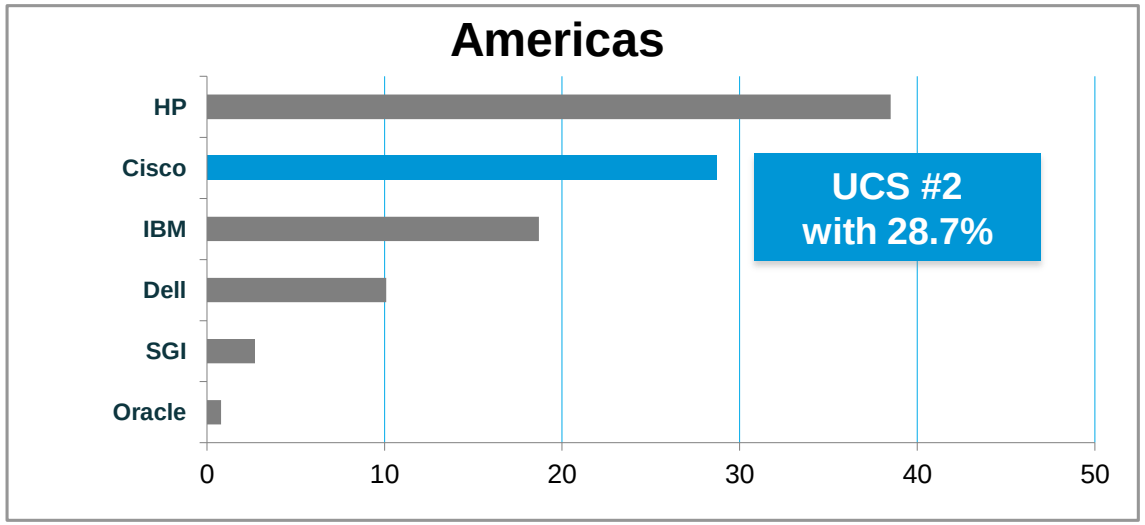
All pricing is online / retail and publically available on 02/12/2014.

Blade Server Marketplace

Customers Have Spoken

X86 Server Blade Market Share, Q3CY13[1]





- UCS momentum is fueled by game-changing innovation; Cisco is quickly passing established players
- Q3CY13 – UCS x86 Blade Server revenue WW grew 46% Y/Y, and USA grew 55%[1]

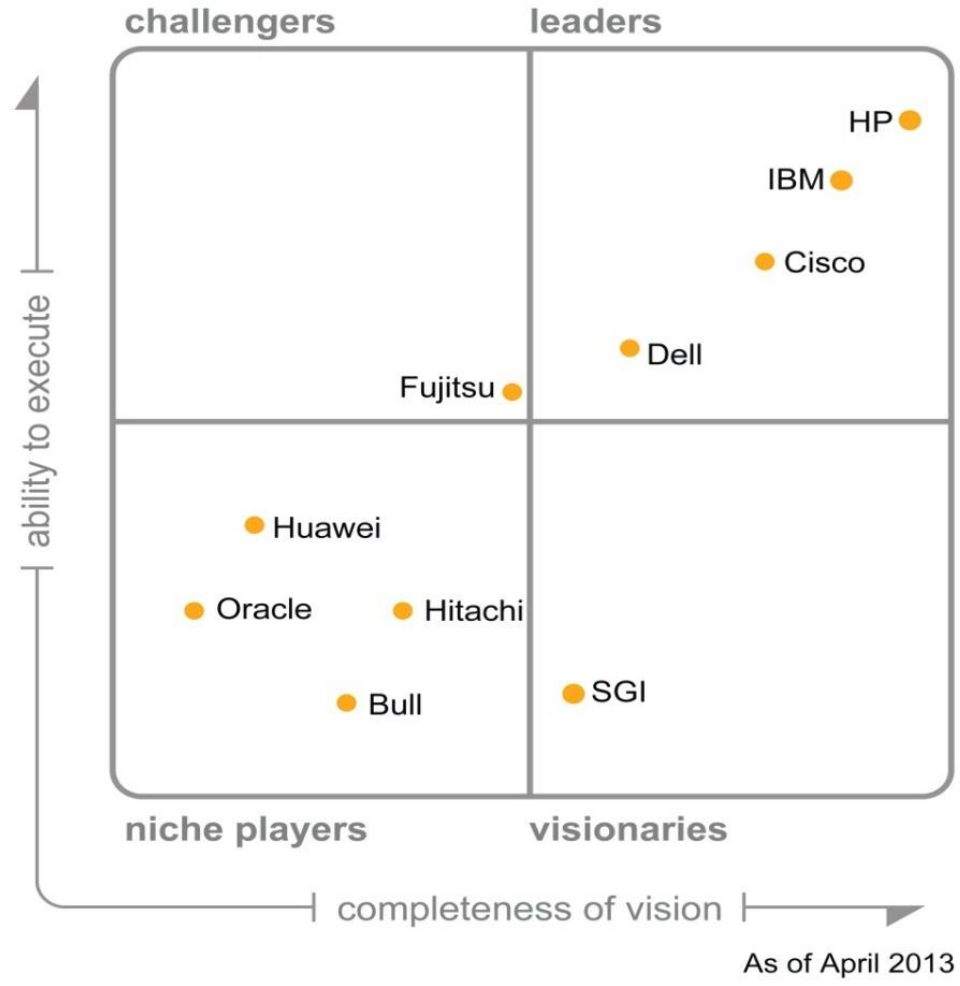
UCS #2 in Only Four Years

- Maintained #2 in Americas (28.7%), #2 in N. America (29.9%, and #2 in the US (30.4%)[1]
- Maintained to #2 worldwide in x86 Blades with 22%[1]

[1] Source: IDC Worldwide Quarterly Server Tracker, Q3 2013, December 2013, Revenue Share

Cisco is a Leader in the 2013 Gartner Magic Quadrant for Blade Servers

Figure 1. Magic Quadrant for Blade Servers



Source: Gartner (April 2013)

Read the Full Report here:

Gartner 2013 Magic Quadrant for Blade Servers

By Andrew Butler and George J. Weiss, G00250031, April 29, 2013, © 2013 Gartner Inc

This graphic was published by Gartner, Inc. as part of a larger research document and should be evaluated in the context of the entire document. The Gartner document is available upon request from Gartner 2013 Magic Quadrant for Blade Servers

Gartner does not endorse any vendor, product or service depicted in its research publications, and does not advise technology users to select only those vendors with the highest ratings. Gartner research publications consist of the opinions of Gartner's research organization and should not be construed as statements of fact. Gartner disclaims all warranties, expressed or implied, with respect to this research, including any warranties of merchantability or fitness for a particular purpose.

Market Share Changes – Q3'11 to Q3'13
Customers are Voting for UCS

X86 Blade Market Share Numbers
WW and US Q3 2011 to Q3 2013 Share Changes

Worldwide	Market Share of WW x86 Blade Total Factory Revenue	Market Share of WW x86 Blade Total Units
	Revenue Share Change	Unit Share Change
Cisco	**+ 10.1%**	**+ 7.2%**
Dell	+ 1.7%	+ 3.0%
HP	**- 7.1%**	**- 4.4%**
IBM	**- 1.0%**	**- 3.5%**
All Others	**- 3.7%**	**- 2.3%**

USA	Market Share of USA x86 Blade Total Factory Revenue	Market Share of USA x86 Blade Total Units
	Revenue Share Change	Unit Share Change
Cisco	**+ 10.9%**	**+ 8.1%**
Dell	+ 2.7%	+ 5.1%
HP	**- 13.1%**	**- 9.4%**
IBM	**- 1.8%**	**- 2.5%**
All Others	+ 1.3%	**- 1.2%**

Source: IDC Worldwide Quarterly Server Tracker, Q3 2013, December 2013

Thank you.