Cisco Expo 2010

Cloud Computing
Cisco Virtual Data Center

Maciej Bocian

mbocian@cisco.com

Architecture Sales Manager

Data Center and Virtualization, Central Europe

CCIE#7785

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Cloud Computing

IT resources and services that are abstracted from the underlying infrastructure and provided “on-demand” and “at scale” in a multi-tenant environment.

To some, clouds are associated with an off premise, hosted model…

© 2009 Cisco Systems, Inc. All rights reserved.

A Working Definition of Cloud Computing

- Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Cloud Computing – Service Categories

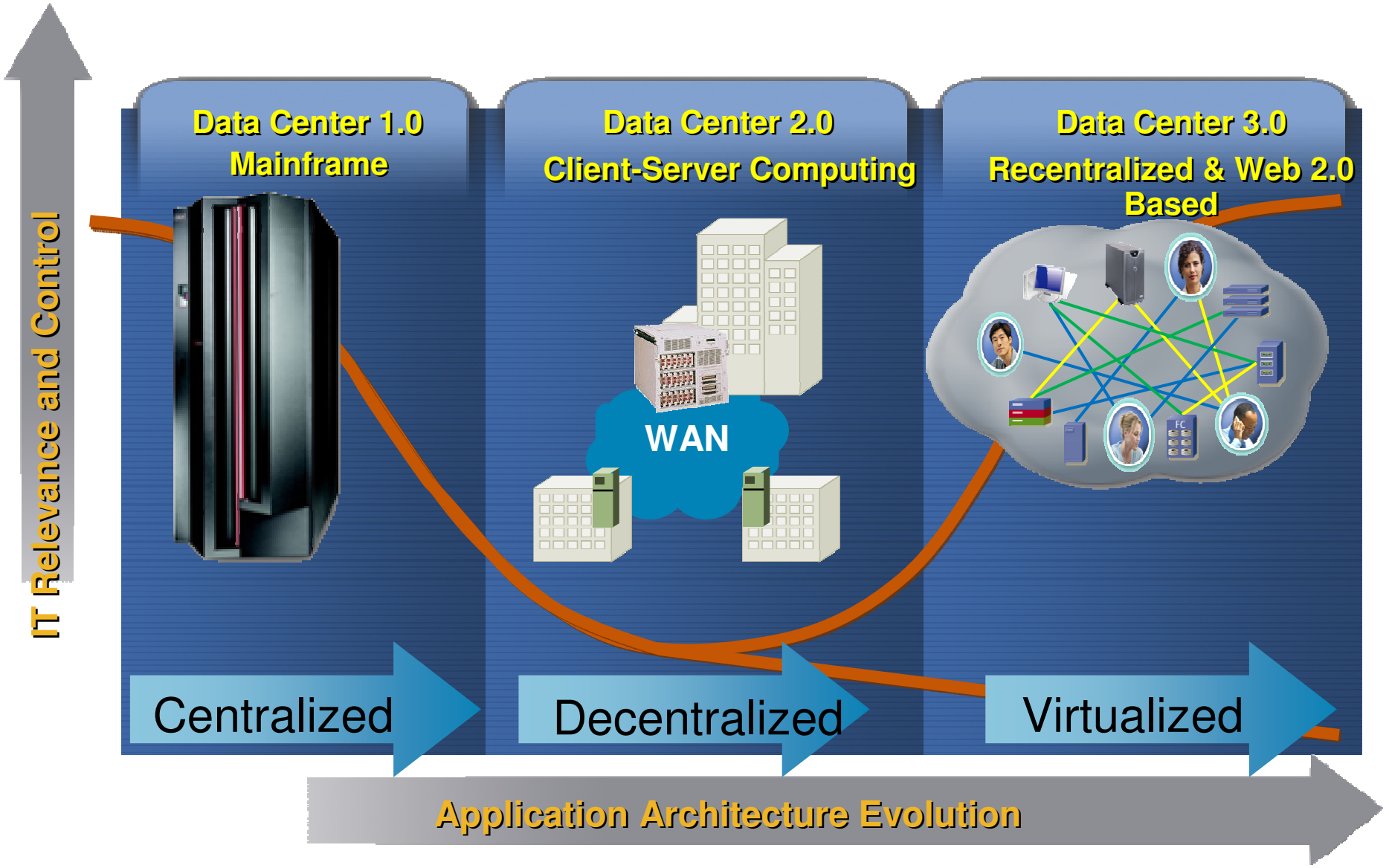
Software as a Service:
Applications services delivered over the network on a subscription basis

Platform as a Service:
Software development frameworks and components delivered over the network on a pay-as-you-go basis

Infrastructure as a Service:
Compute, network and storage delivered over the network on a pay-as-you-go basis

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

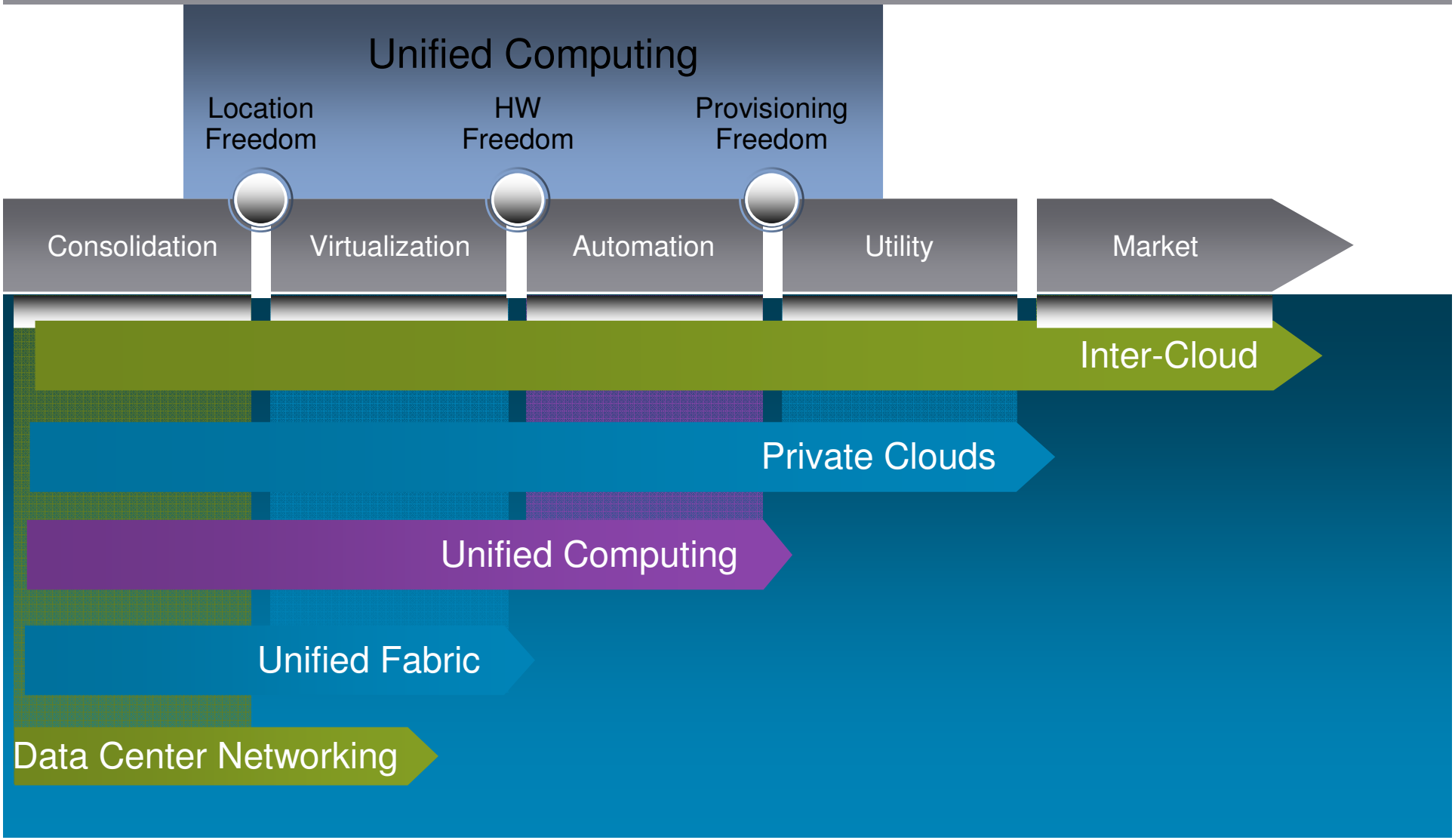
Data Center Transformation



© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Data Center 3.0 Evolution Path

Virtualization has created a market transition. “Servers” are becoming fluid objects in the network. The data center must evolve to continue to scale. Cisco is offering a fresh alternative toe traditional ad-hoc add-on approaches for virtualized data centers.

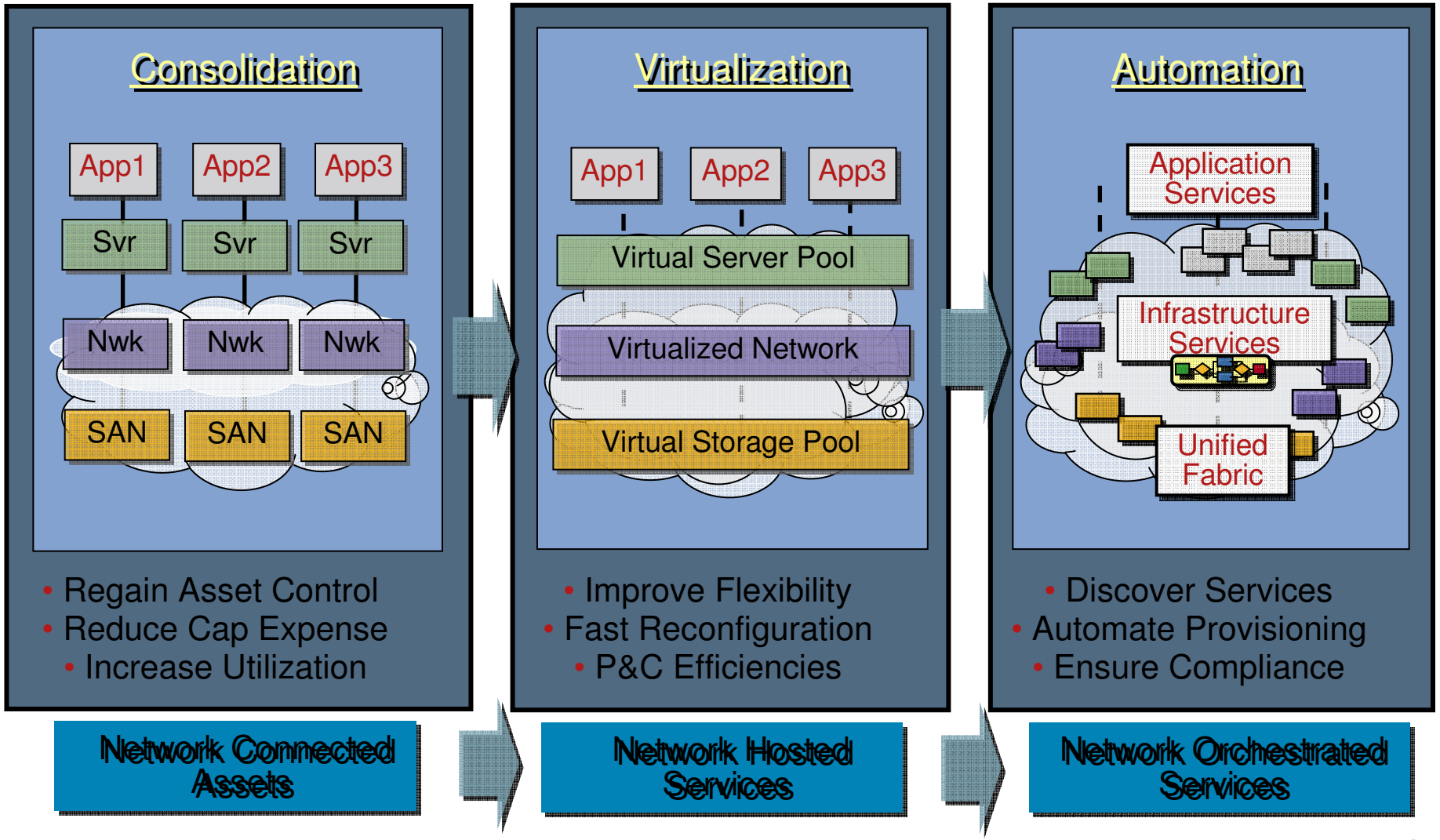


Common Industry Themes

Consolidation	Virtualization	Efficiency	Business Continuance
▪ Reduce OPEX & defer incremental CAPEX ▪ LAN/SAN Infrastructure ▪ Facilities/Premises ▪ Operations	▪ Network ▪ Server ▪ Storage	▪ Reduce Costs ▪ Scalability ▪ Energy ▪ Facilities ▪ Operations	▪ Maximum uptime ▪ Availability Reliability ▪ Disaster recovery

"Silos to Services"

The Path to Data Center 3.0 via the Network



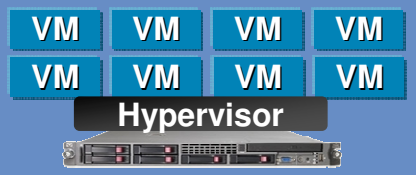
© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Server Virtualization - Key DC Trend

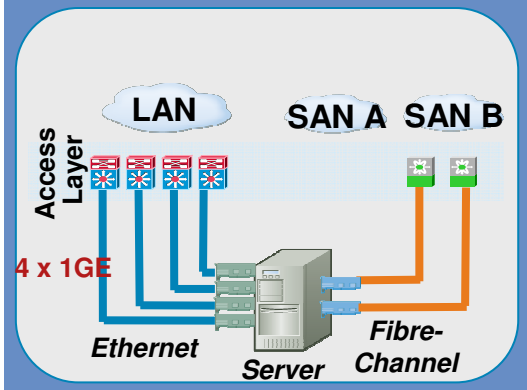
Today

- Many under utilized servers
- Cable sprawl
- High power, cooling costs
- High CAPEX
- For every $1 spent on server capex ~$5 spent on opex

Virtualization Step1



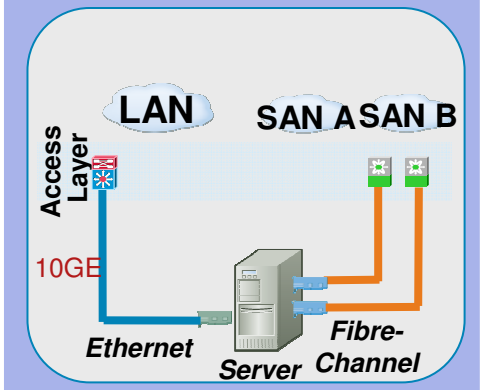
GE



- Cable sprawl
- power, cooling costs
- Less number of access layer Ethernet ports

Virtualization Step2

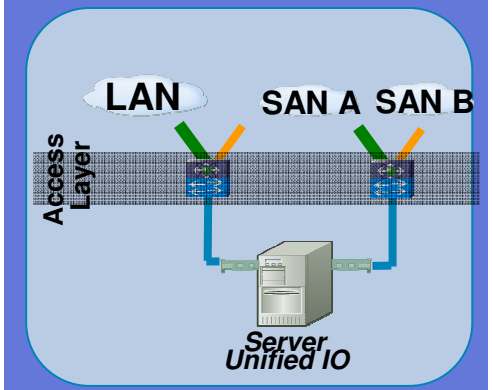
10 GE



- GE to 10GE in access layer
- Less interfaces – reduced Cable sprawl
- Savings from power and cooling

Virtualization Step3

10 GE/FCOE



- Unified I/O - LAN & SAN consolidation
- Reduce NICs, HBAs,
- Reduce cabling
- More Savings from power and cooling
- Lower capex

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

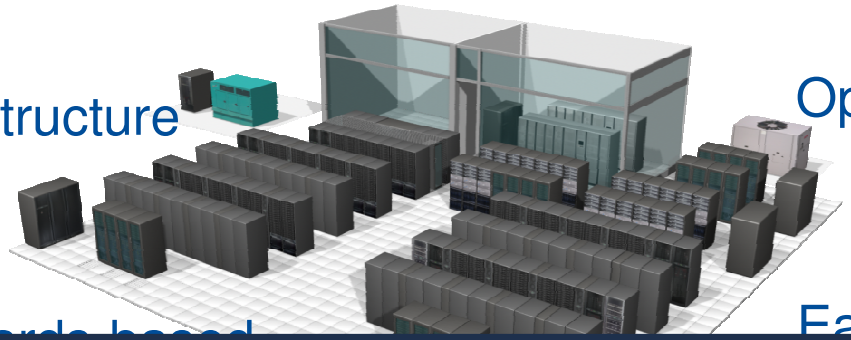
Cisco confidential and proprietary

Key Customer Requirements for Server Infrastructure

Scalable Infrastructure

Energy Efficient

Consolidated Infrastructure



Optimized for Virtualization

Open / Standards-based

Easy to Manage

Cisco Solution

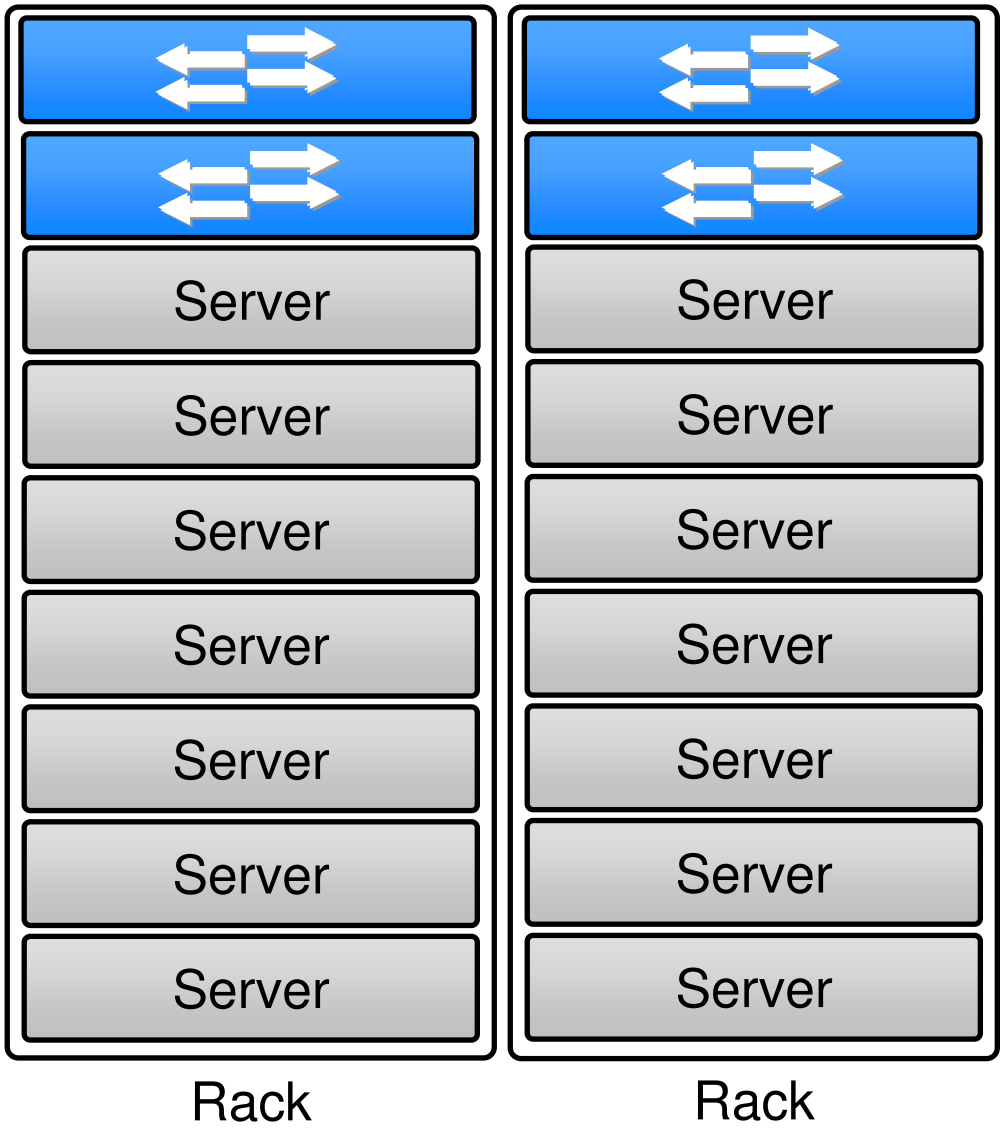
Cisco Unified Computing System

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Server evolution

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

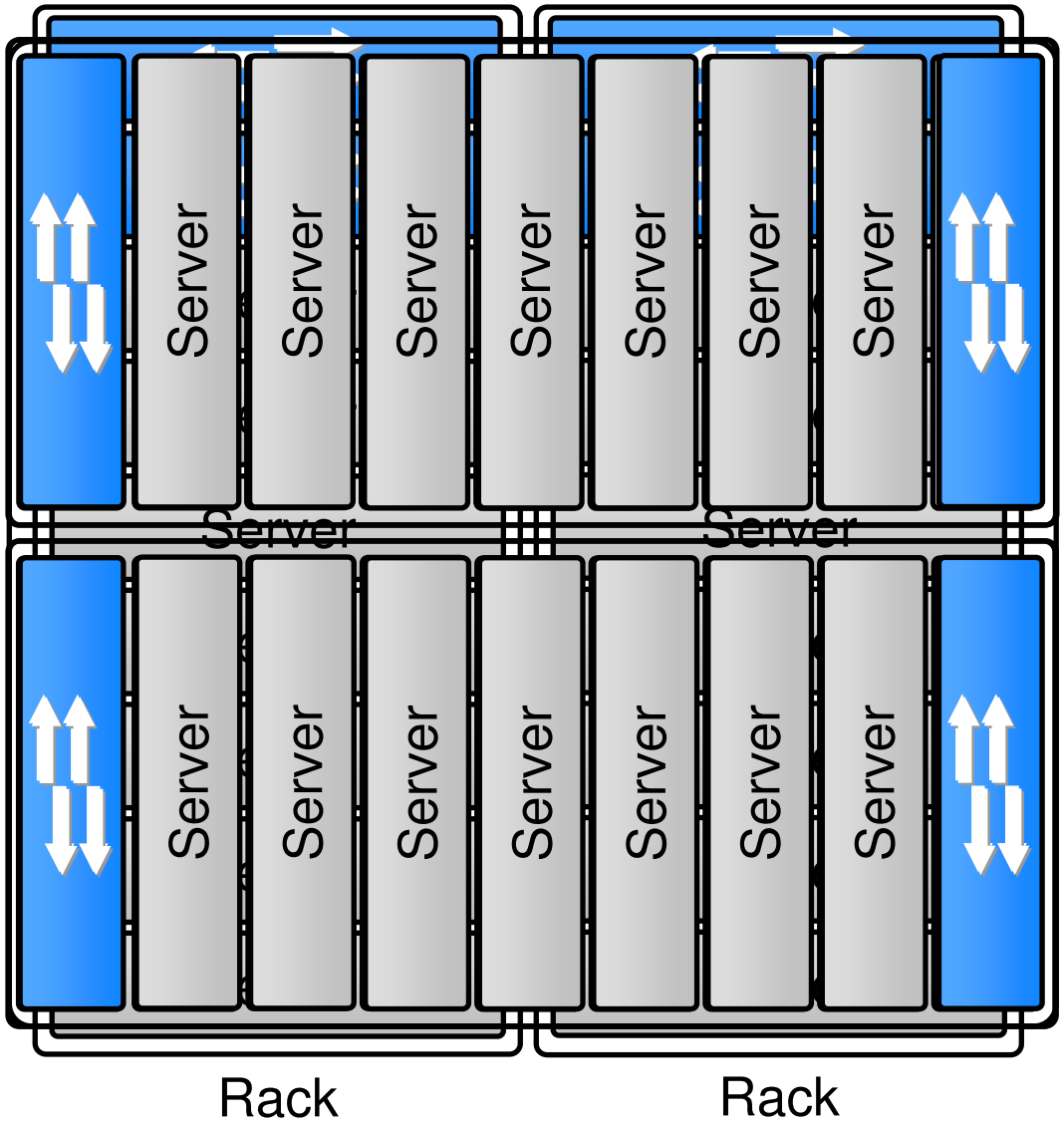
Server Deployment: Rackmounts



- First generation
  - Rack-optimized
  - Top of Rack or End of Row switches
  - Cables
- Benefits
  - Space utilization
  - Highly flexible
- Weakness
  - Cabling
  - Serviceability
  - Power efficiency

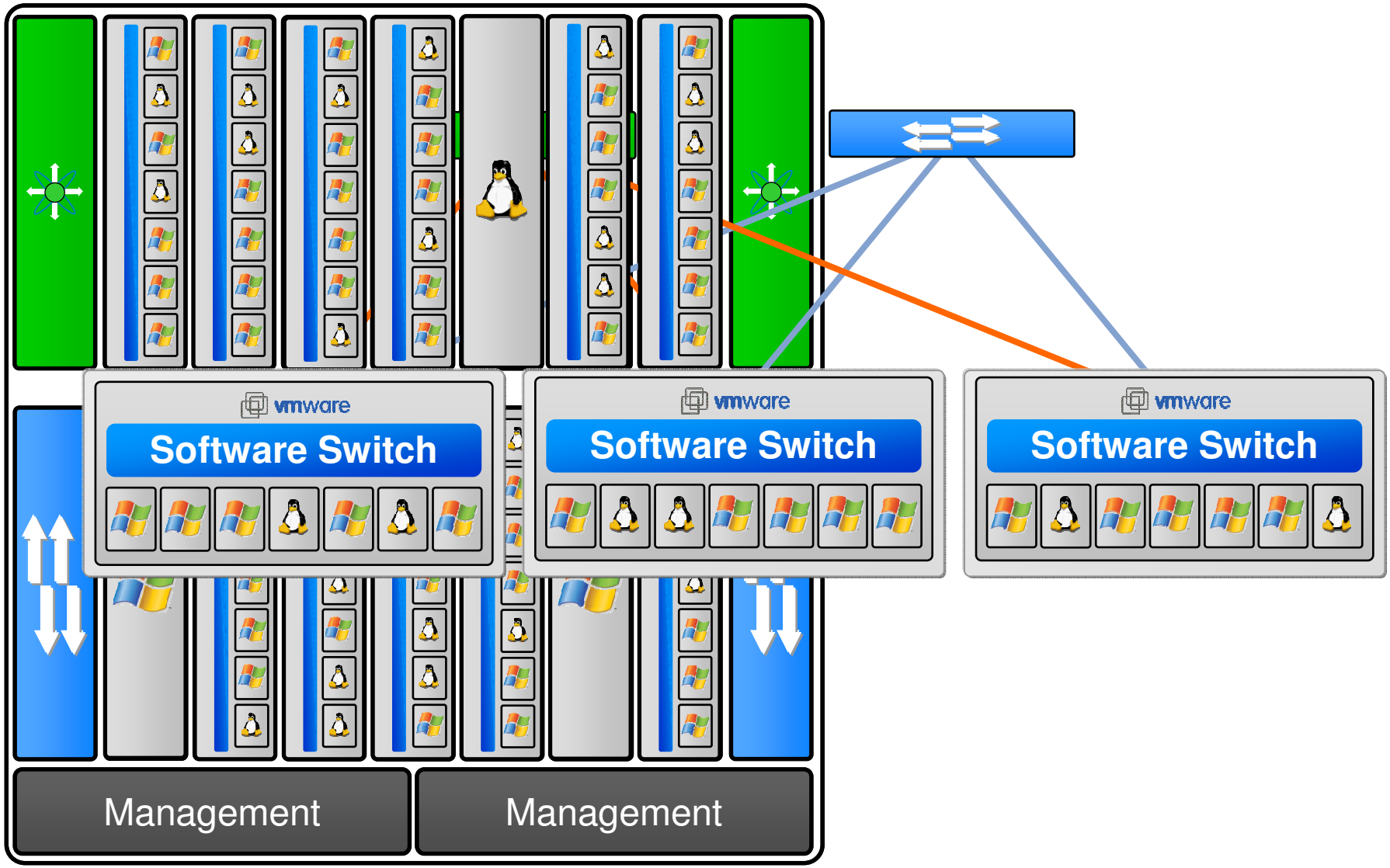
© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Server Deployment: Blades



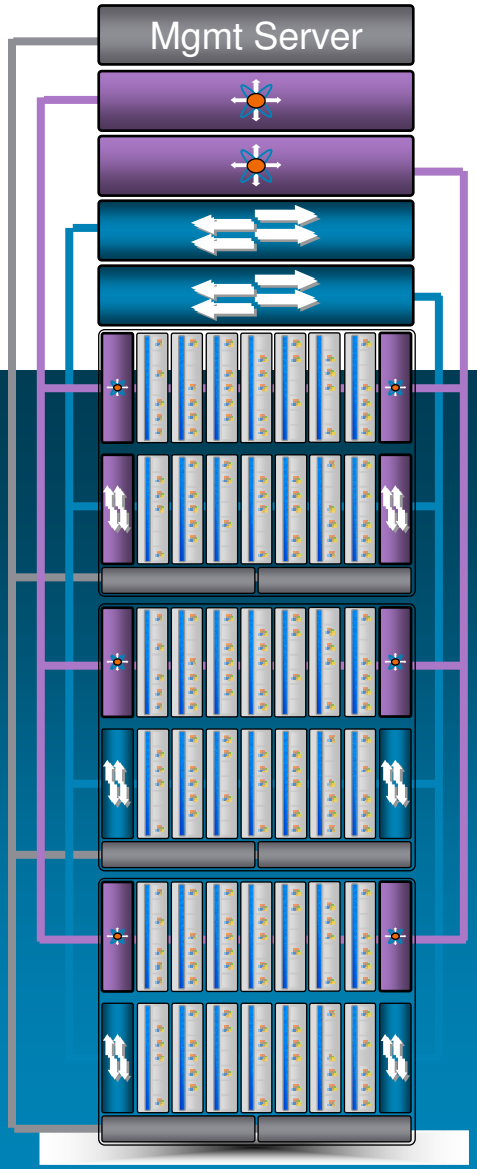
© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Server Deployment Scale

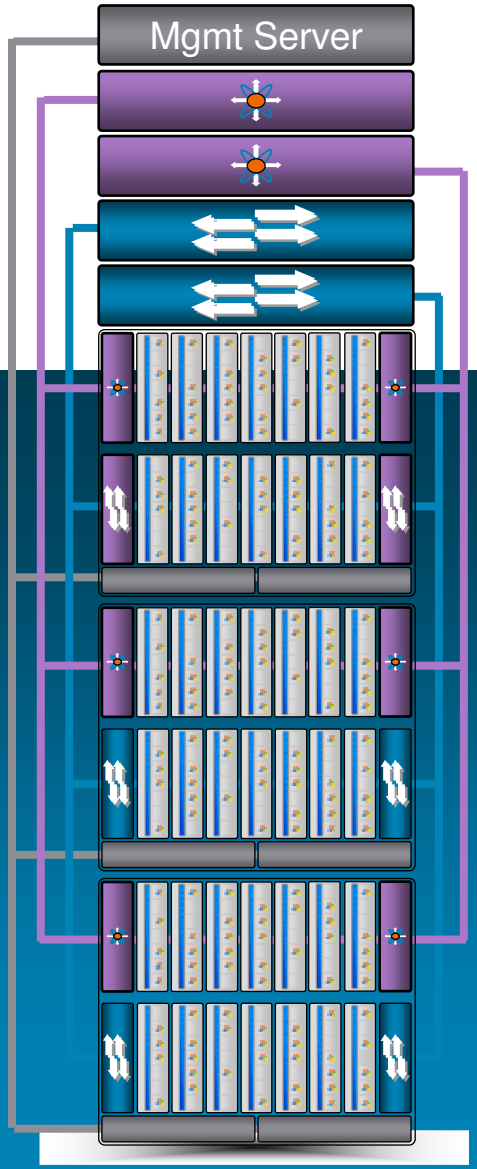


© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

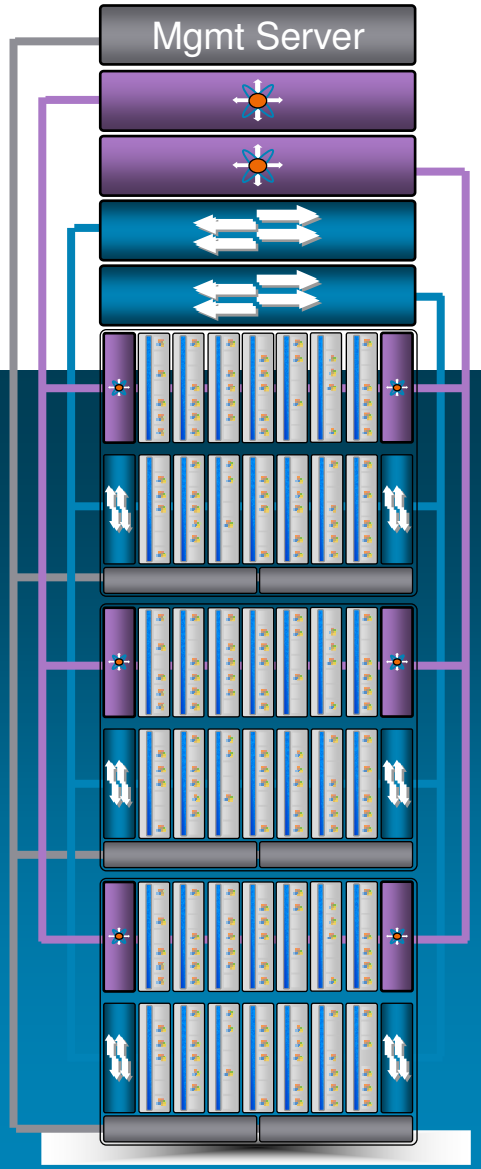
Simplifying the Data Center



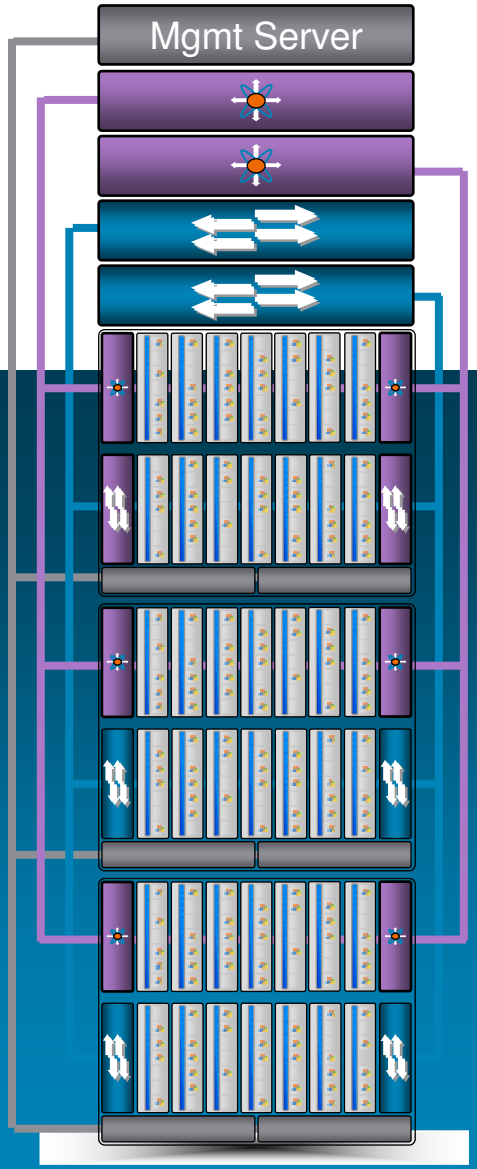
Simplifying the Data Center



A cohesive solution

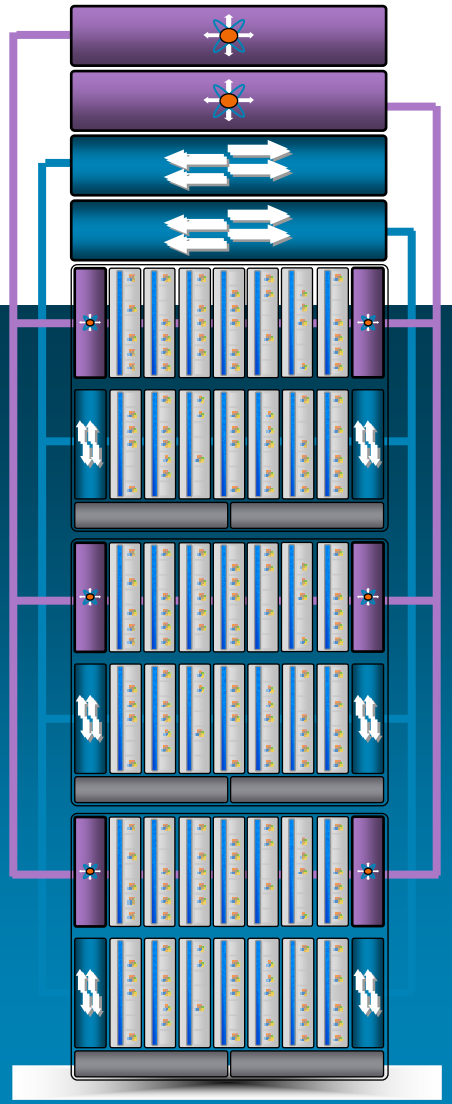


Simplifying the Data Center

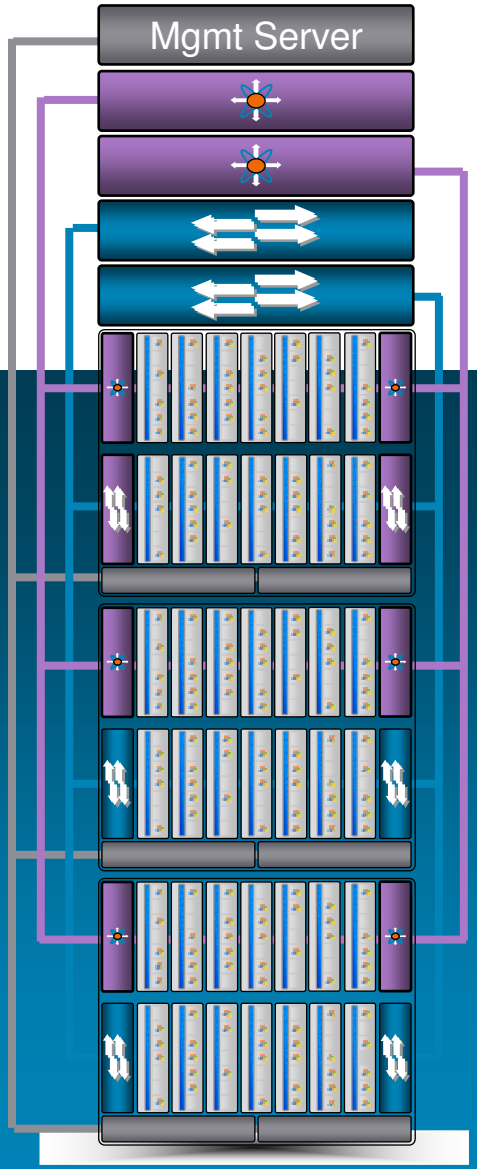


A cohesive solution

- Embed management

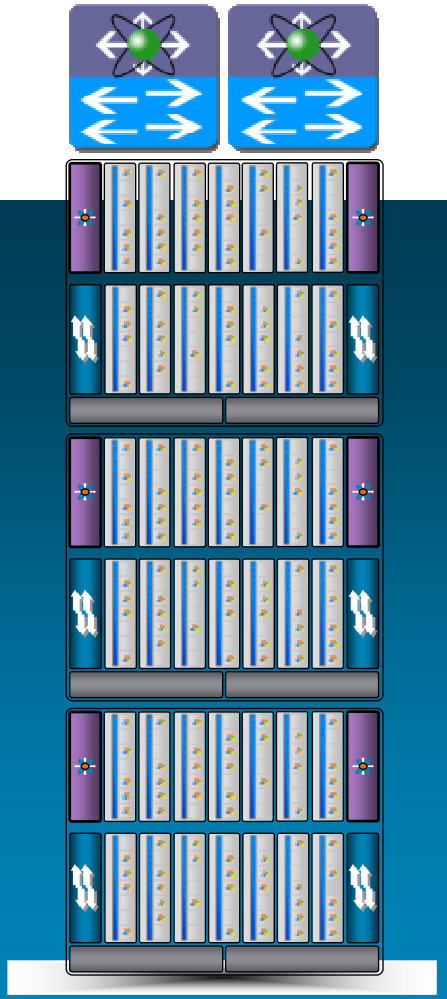


Simplifying the Data Center

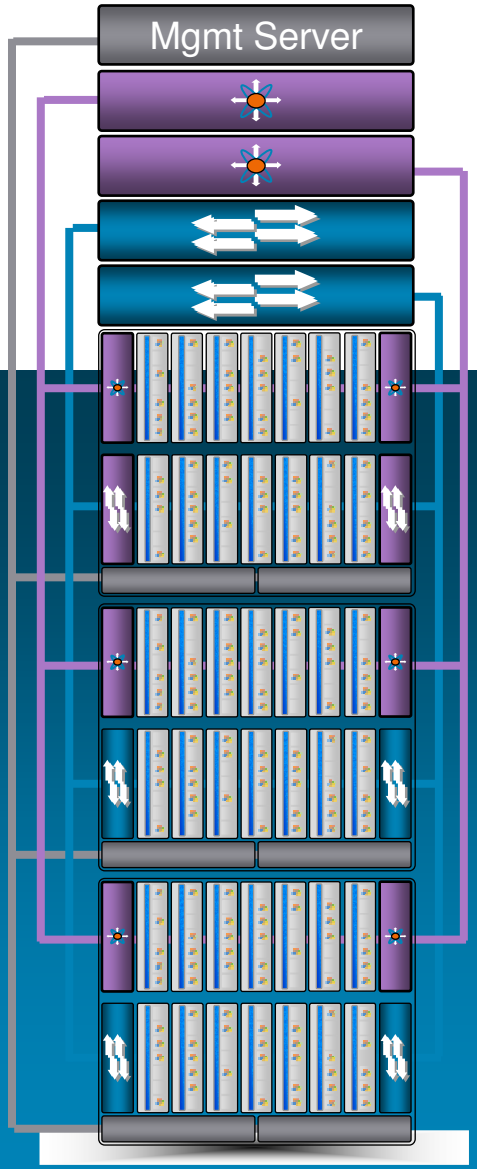


A cohesive solution

- Embed management
- Unify fabrics

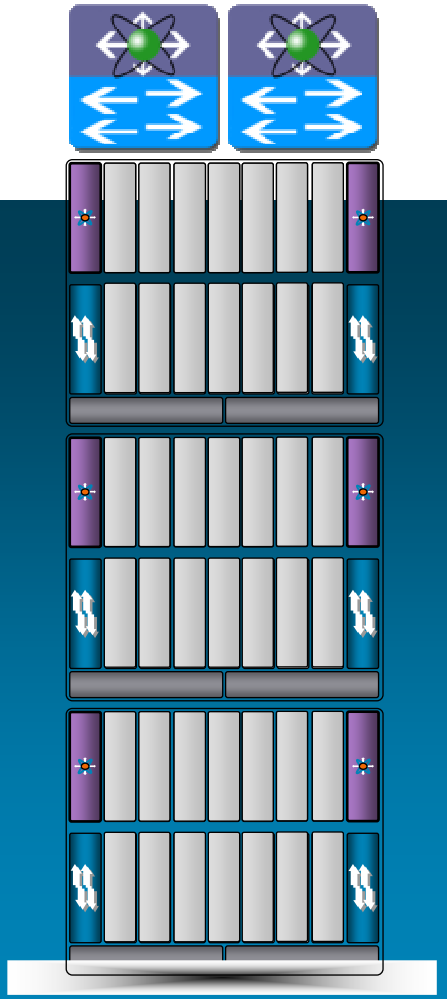


Simplifying the Data Center

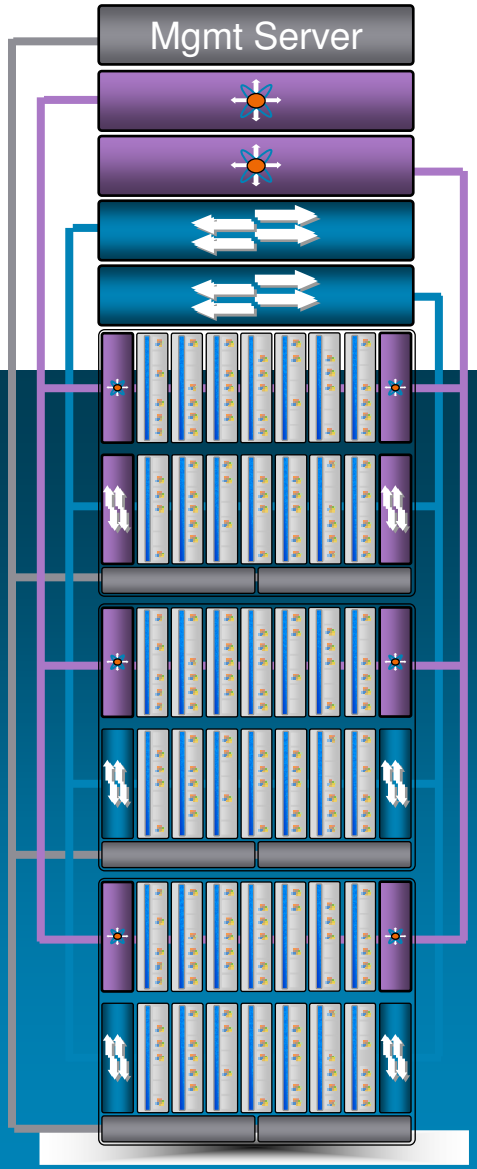


A cohesive solution

- Embed management
- Unify fabrics
- Optimize virtualization

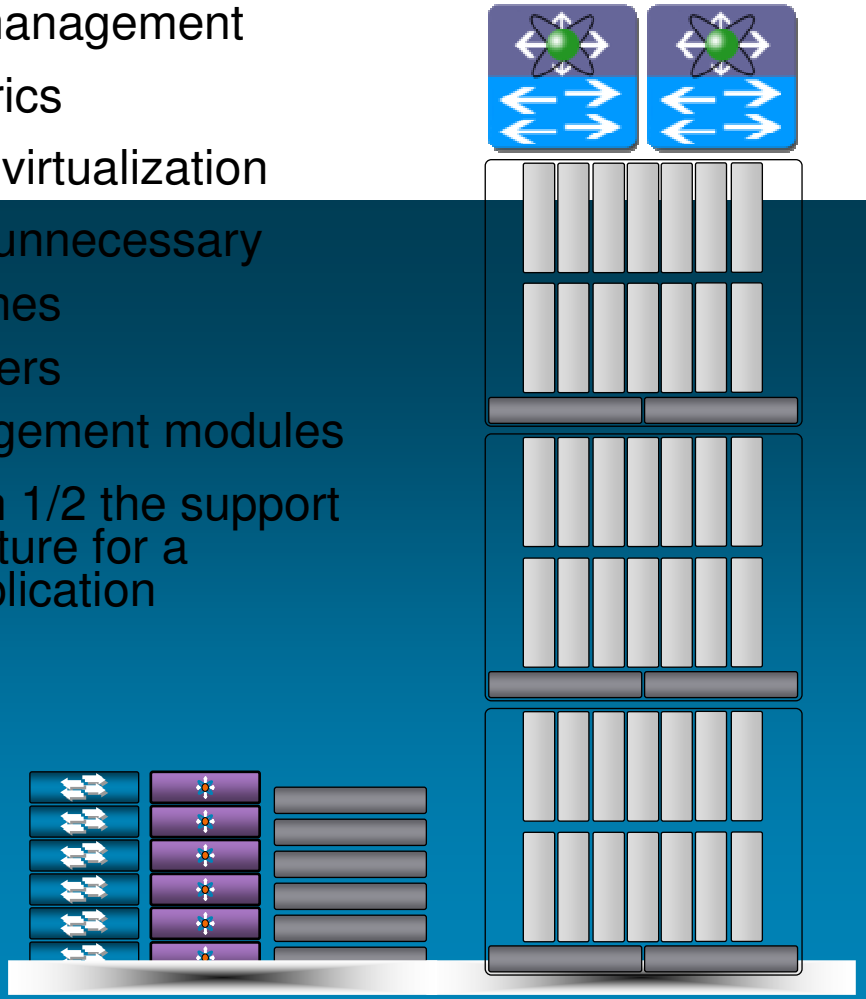


Simplifying the Data Center



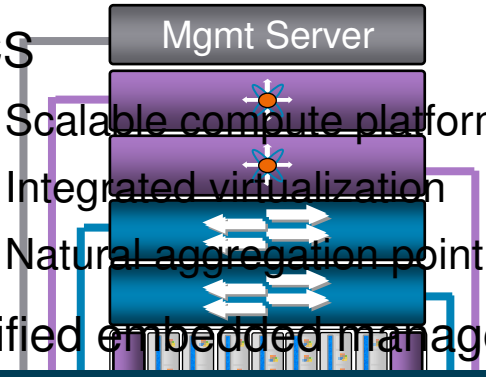
A cohesive solution

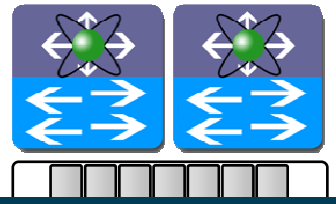
- Embed management
- Unify fabrics
- Optimize virtualization
- Remove unnecessary
  - Switches
  - Adapters
  - Management modules
- Less than 1/2 the support infrastructure for a given application



Cisco Unified Computing System

- UCS
  - Scalable compute platform
  - Integrated virtualization
  - Natural aggregation point: Network
- Unified embedded management





UCS Components

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Cisco Unified Computing System

The Cisco Unified Computing System is designed to dramatically reduce datacenter total cost of ownership while simultaneously increasing IT agility and responsiveness.

Process Automation (ITIL)

Business Service Management

Operations and Support

Automated Provisioning

- Embedded single point of management and provisioning
- Visibility and control across technology silos
- Ongoing management and compliance

Virtualized Services

- Fine-grained control, portability, and visibility of network, compute, and storage attributes
- Increased Processor Efficiency with Hypervisor Bypass

Industry Standard Servers

- Intel Xeon Processor 5500 series.
- More than double the memory capacity of competing systems
- Blade Form Factor

Unified Fabric

- Wire once, low latency FC and Ethernet
- Virtualization aware
- Dramatic reduction in adapters, switches, pass thru modules

Up to 90% greater administrator efficiency, with faster changes and fewer incidents

performance via Cisco Hypervisor Bypass Technology

purchase, manage, power, and cool

Up to 30% lower memory and SW licensing costs via Cisco Extended Memory Technology

Scalable Unified Fabric that delivers up to 320 server nodes in a single system

UCS Building Blocks

UCS Manager
Embedded– manages entire system

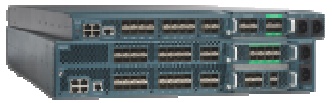
UCS Fabric Interconnect
20 Port 10Gb FCoE
40 Port 10Gb FCoE

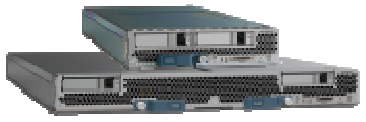
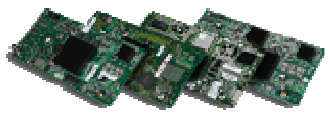
UCS Fabric Extender
Remote line card

UCS Blade Server Chassis
Flexible bay configurations

UCS Blade Server
Industry-standard architecture

UCS Virtual Adapters
Choice of multiple adapters



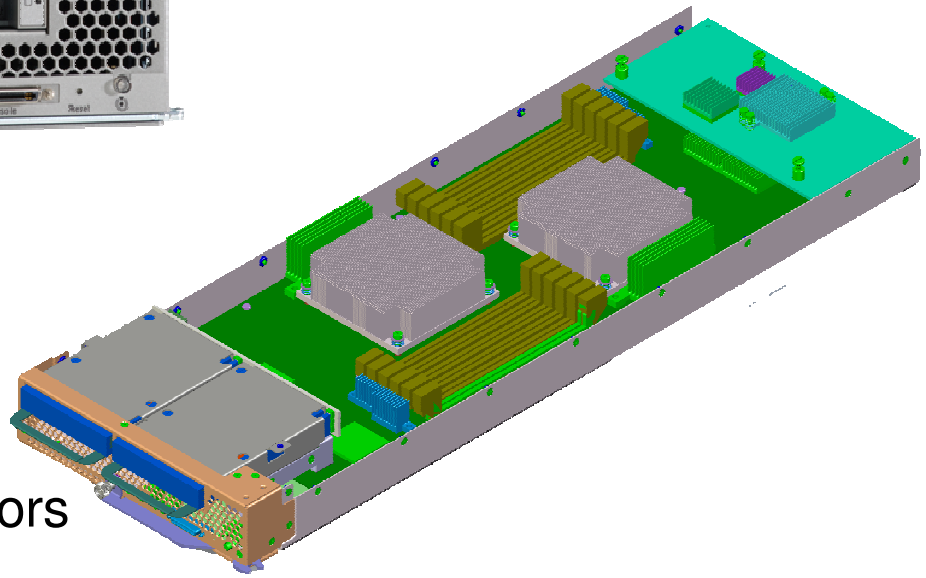
Blade Chassis

- 6RU Chassis
  - Blades and Power supplies plug-in from front
- Blades
  - Power & cooling budget allows leading edge processor performance and memory capacity
  - Combinations of half slot and full slot blades
    - Up to 8 Half slot blades
    - Up to 4 Full slot blades

- Power Supplies
  - 4x 2,500W hot-plug Power Supplies
  - 90% efficient
  - N+N redundancy (grid redundant)
  - No zoning
  - 4 single phase 220V, IEC320-C19

© 2009 Cisco Systems, Inc. All rights reserved.

UCS B200 M1 Blade

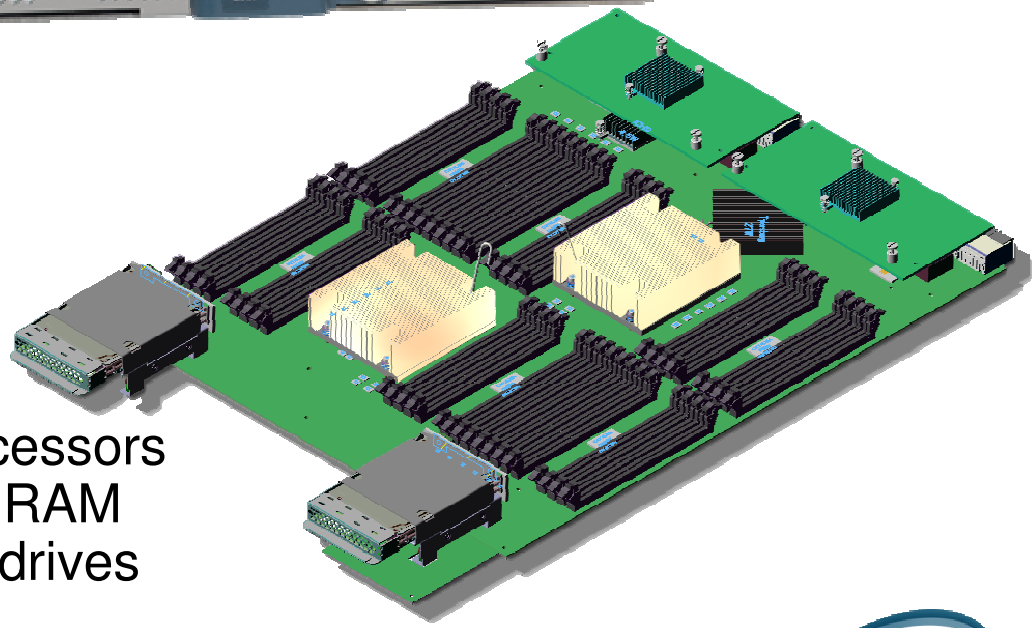


Blade Attributes:

–2 x Intel Xeon 5500 Series Processors
–12 x DIMM slots - up to 96GB RAM
–2 x optional SAS hot-plug hard drives
–RAID 0, 1
–1 x 10Gb dual port mezzanine adapter
–Remote and local access to keyboard, video, mouse, serial
–Integrated with UCS Manager

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

UCS B250 M1 Blade



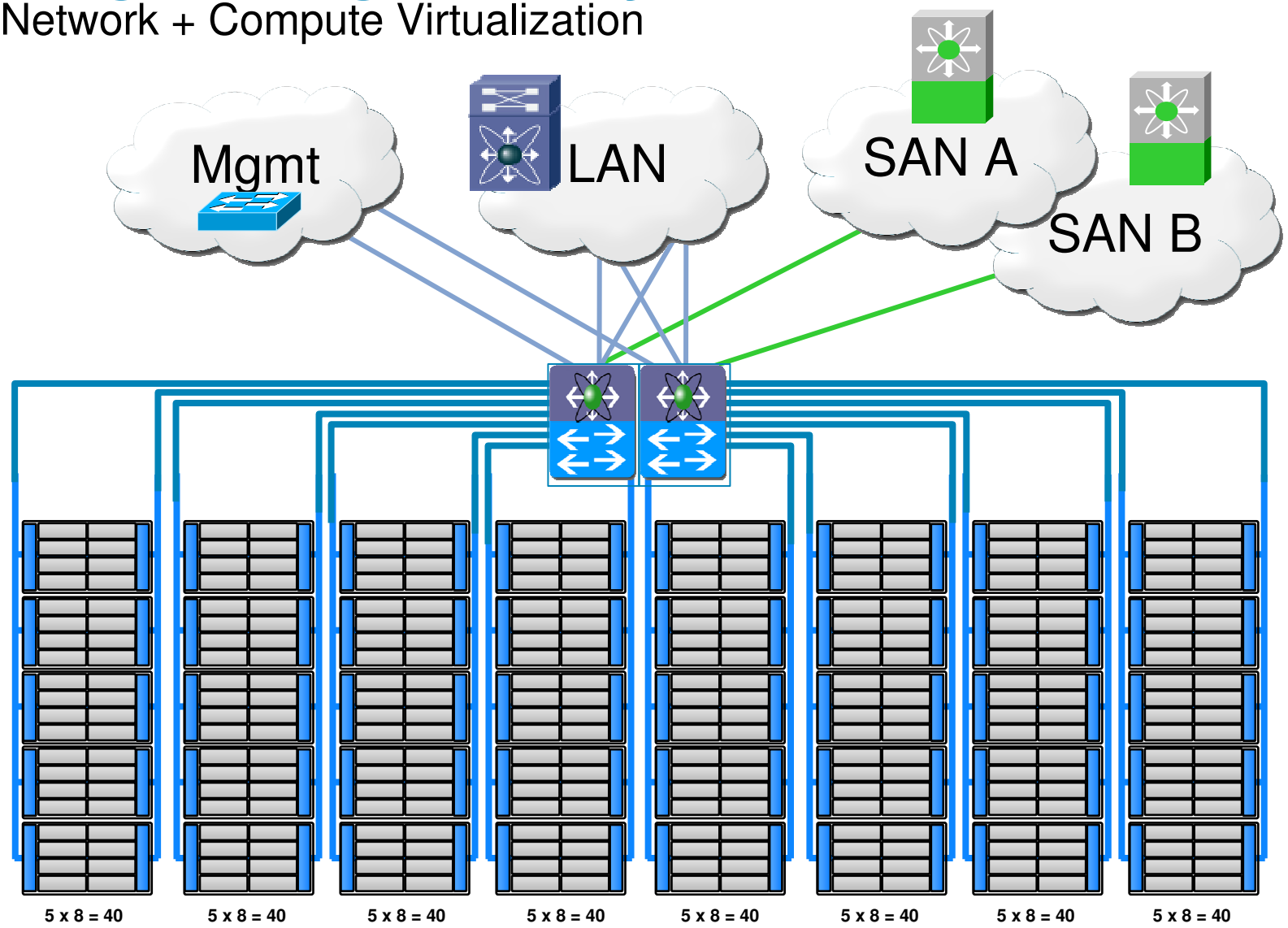
Blade Attributes:

–2 x Intel Xeon 5500 Series Processors
–48 x DIMM slots - up to 384GB RAM
–2 x optional SAS hot-plug hard drives
–RAID 0, 1
–2 x 10Gb dual port mezzanine adapter
–Remote and local access to keyboard, video, mouse, serial
–Integrated with UCS Manager

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

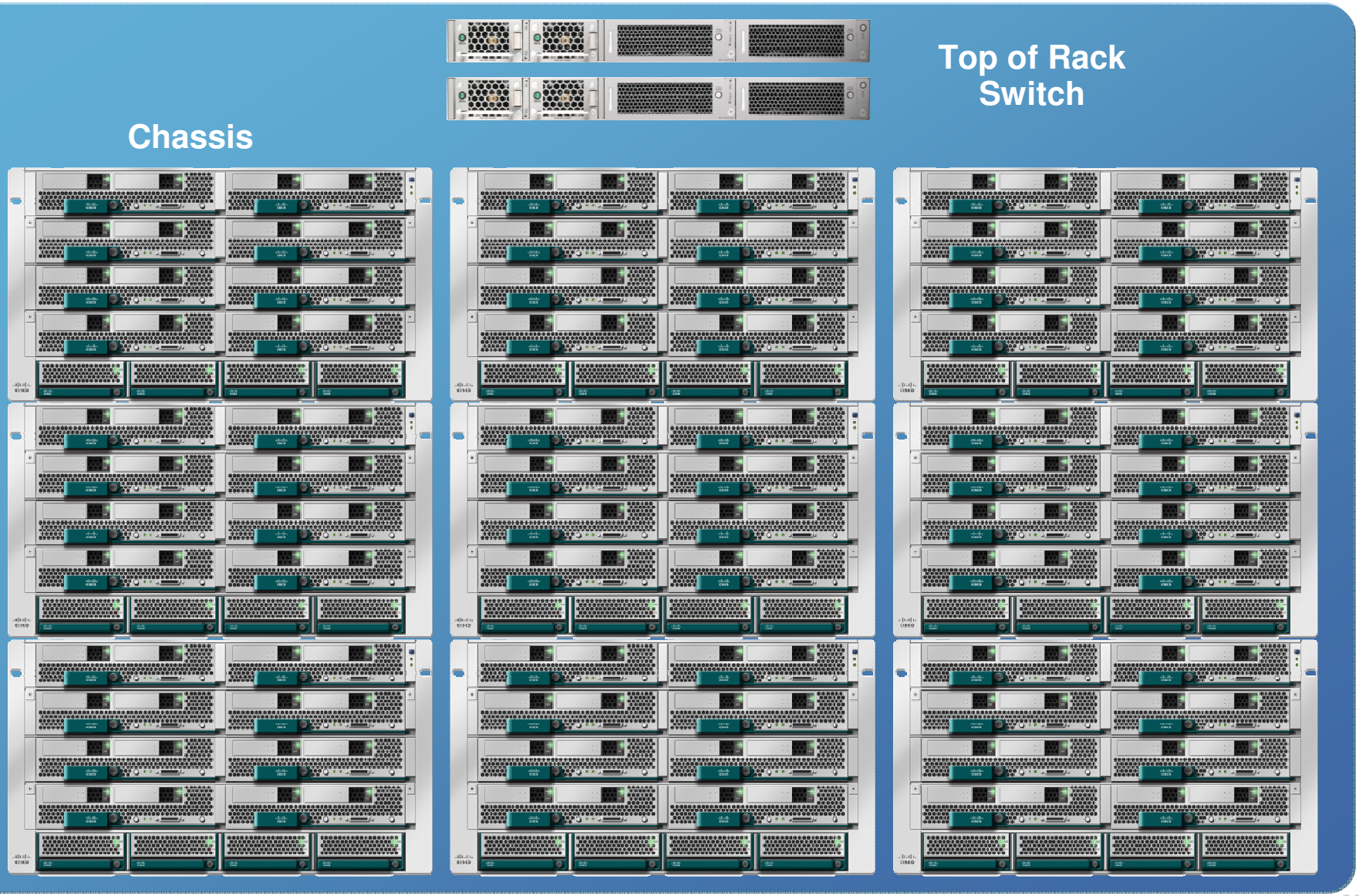
Single Integrated System

- Network + Compute Virtualization



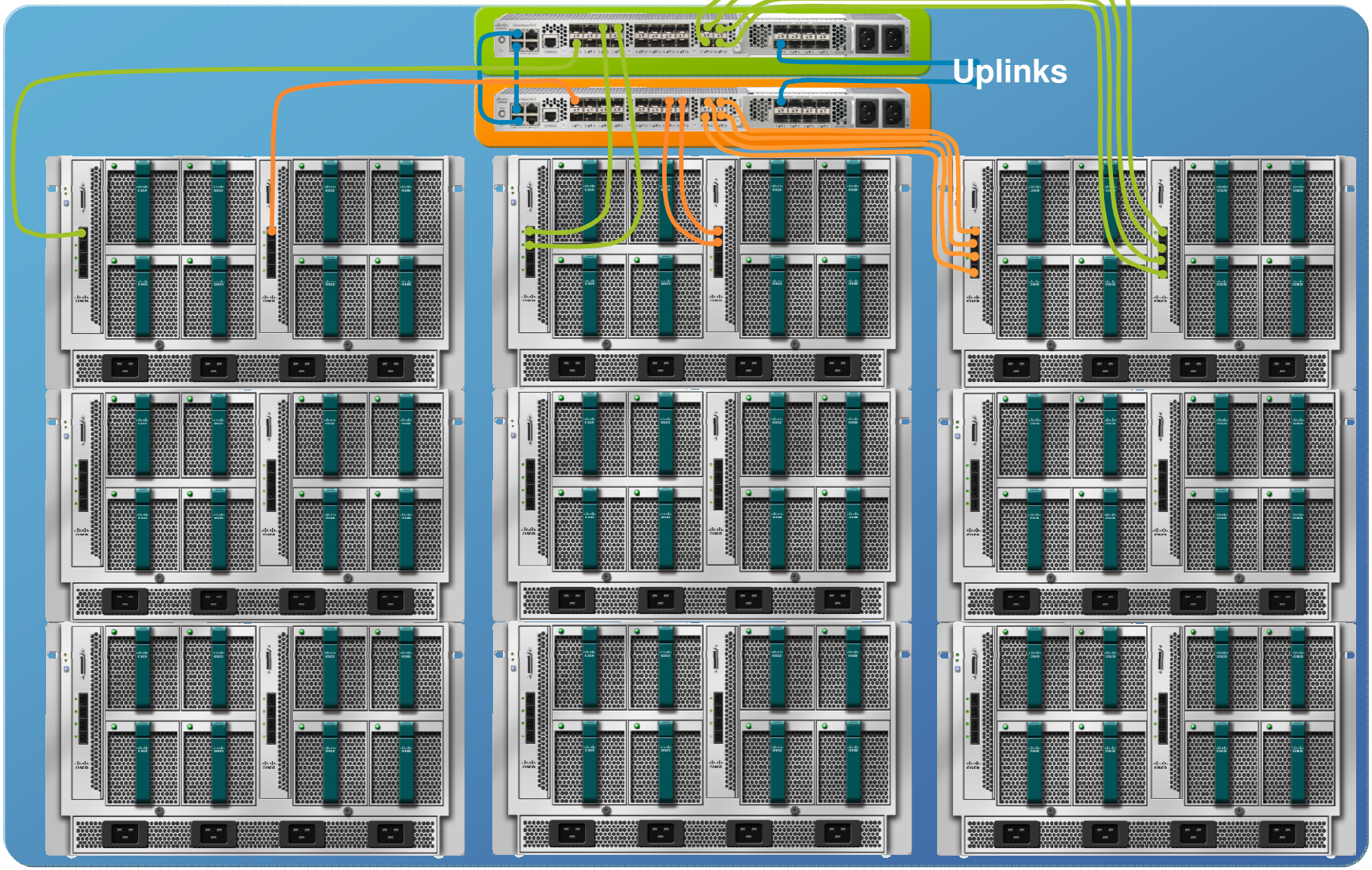
© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Overall System (Front)



© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Overall System (Rear)



© 2009 Cisco Systems, Inc. All rights reserved.

Memory Expansion

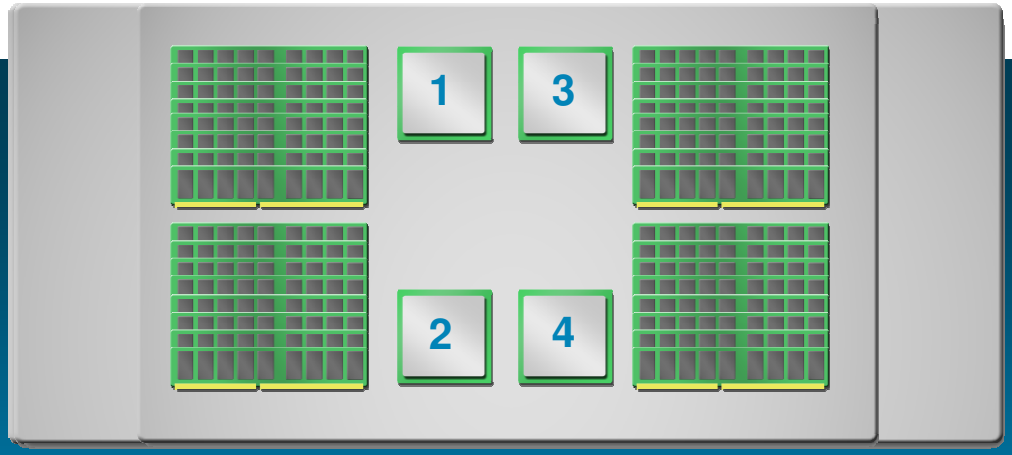
© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

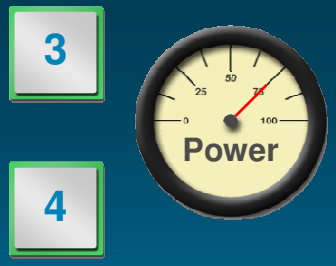
Memory Expansion

Higher server consolidation & larger VM density

Reduces CPU, power/cooling, and SW licensing costs

Competition - max 18 & high density with proprietary tech



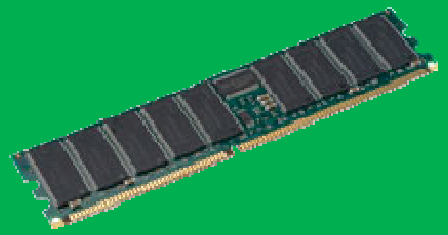


Savings

Cisco Extended Memory solution

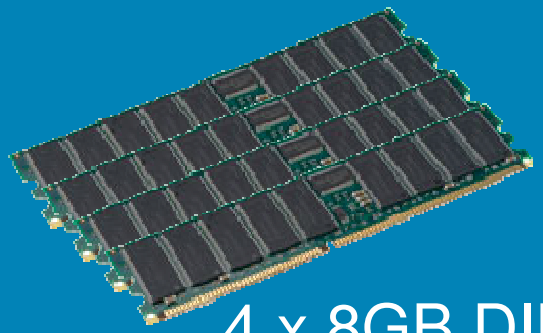
Intel's Nehalem memory controller is designed for future DIMM technology

32GB DIMM



Does not exist

32GB DIMM

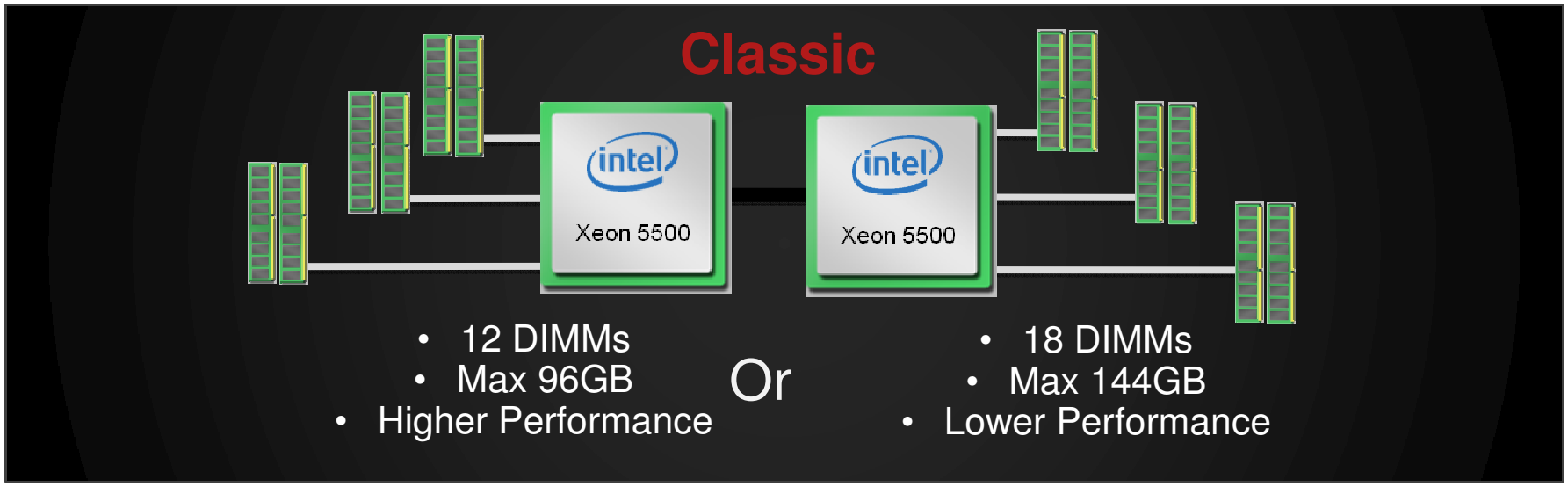


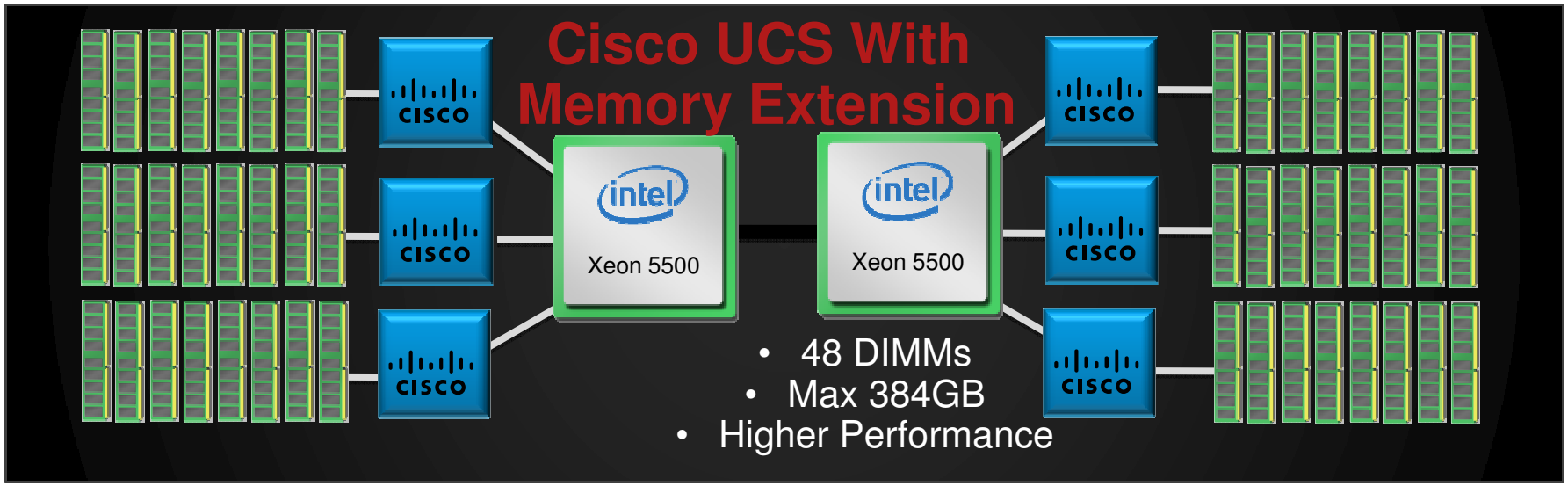
4 x 8GB DIMM

Cisco Extended Memory technology makes four DIMMs look like one!

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Optimizing Memory with the Xeon 5500





© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Virtualized Adapter

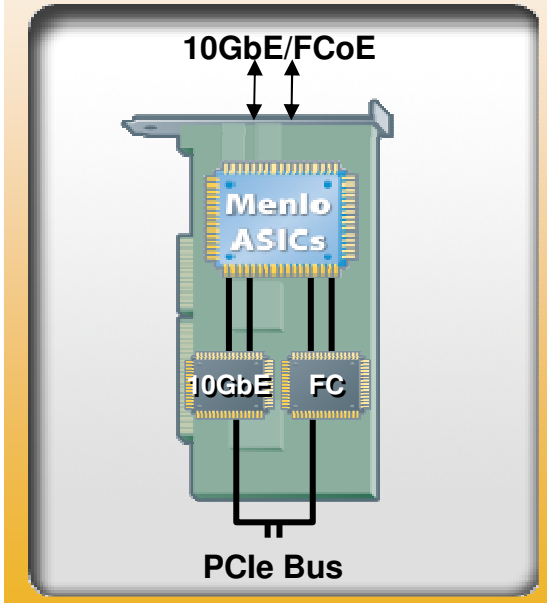
© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Adapter Offerings

Compatibility

Existing Driver Stacks

EMULEX QLOGIC



Cost

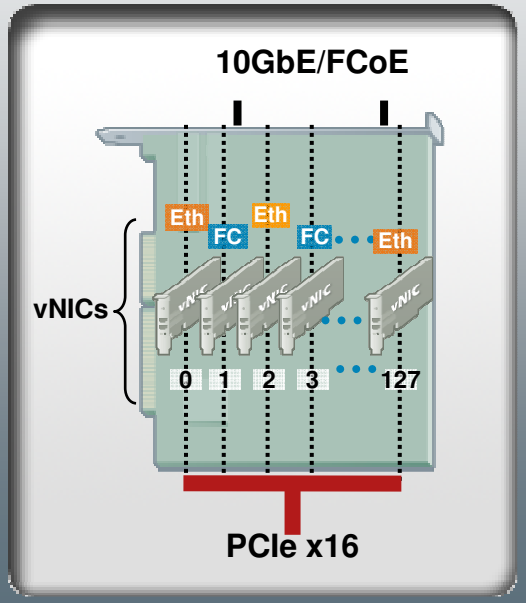
"Free" SAN Access for any Ethernet equipped host

Software FCoE

Virtualization

VM I/O Virtualization and Consolidation

CISCO



© 2009 Cisco Systems, Inc. All rights reserved.
Cisco Confidential

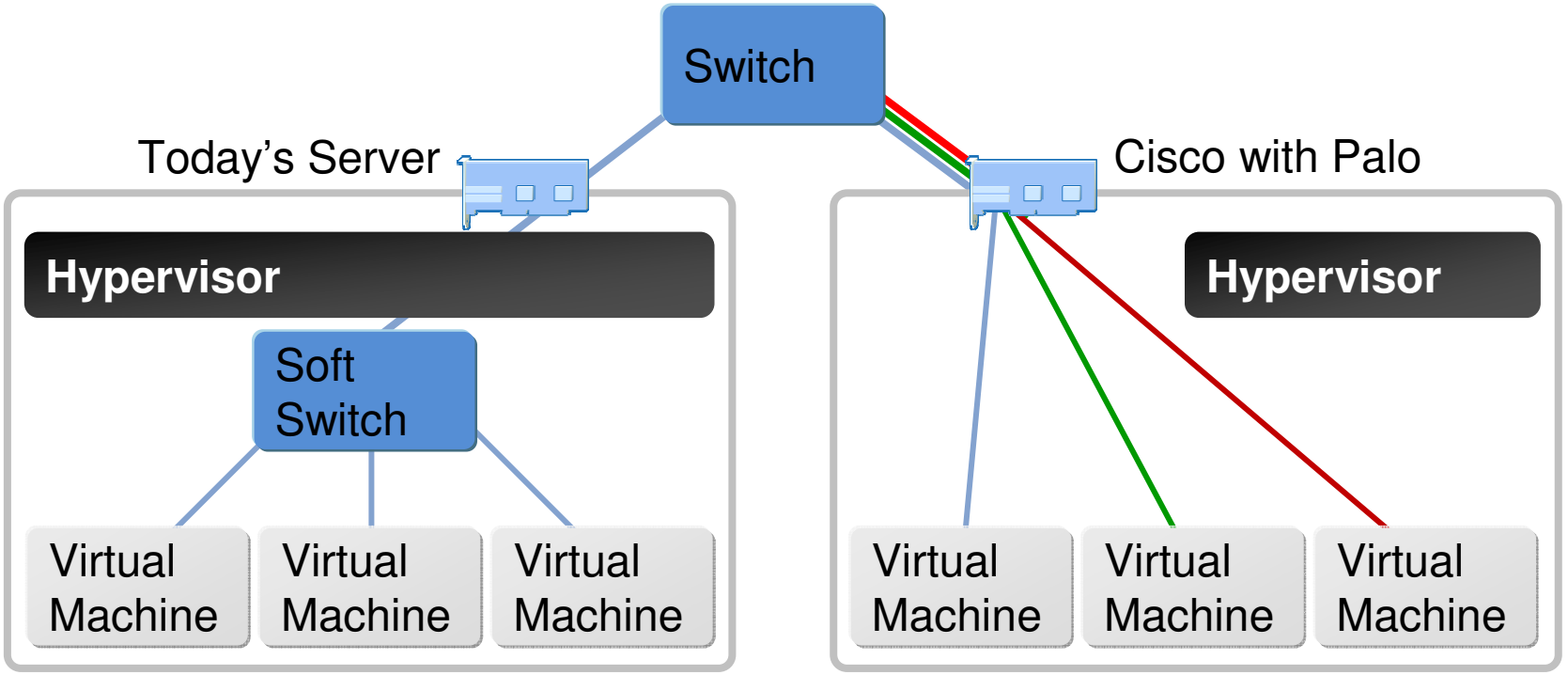
Virtualization Adapter

True wire once architecture – highly dynamic

Network policy and visibility brought to VMs

Hypervisor bypass support – increases performance

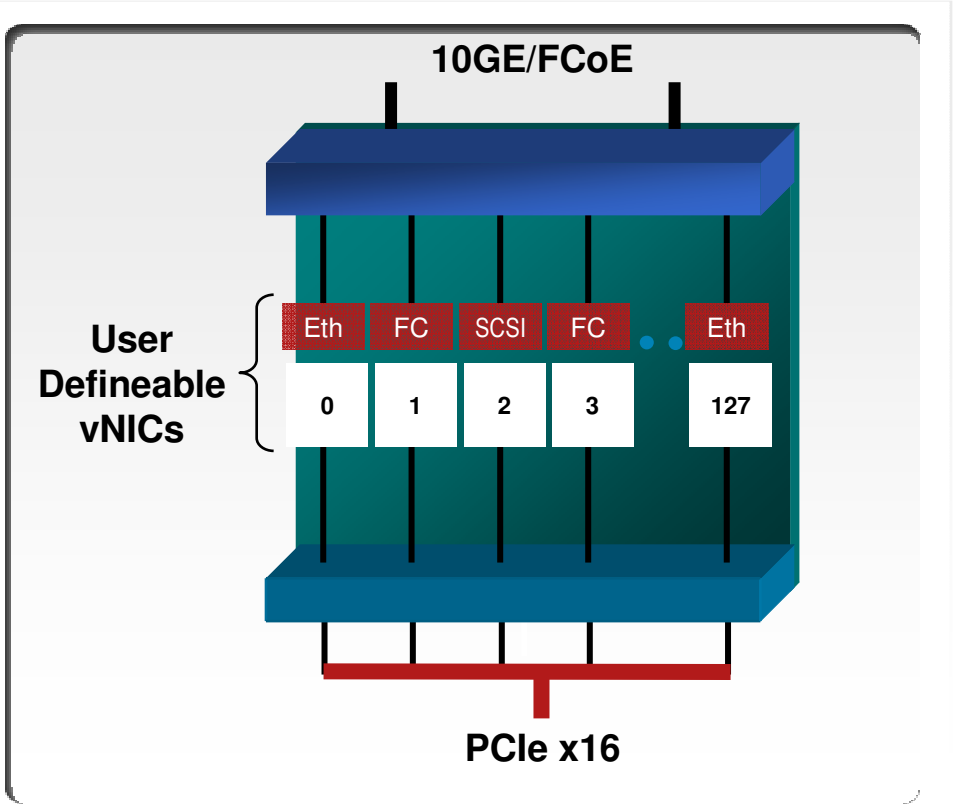
Reduce NIC and mezz card infrastucture



© 2009 Cisco Systems, Inc. All rights reserved.
Cisco Inc., Company Confidential - NDA Required

California Palo Adapter

- Virtualized adapter designed for both single-OS and VM-based deployments
- Provides mobility, isolation, and management from the network
  - Secure
  - Transparent to hosts
- Cut-through architecture
- High Performance
  - 2x 10Gb
  - Low latency
  - High BW IPC support
- 128 vNICs
  - Ethernet, FC or SCSI
  - 500K IOPS
  - Initiator and Target mode

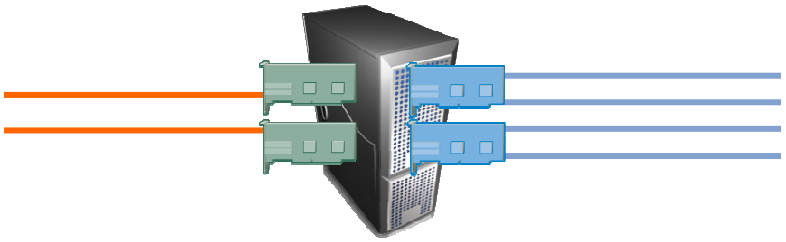


© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Management and service profiles

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Configuration Points



- Server

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Service Profiles

Blade identities can be duplicated, automatically moved and deployed, and failed-over to another blade

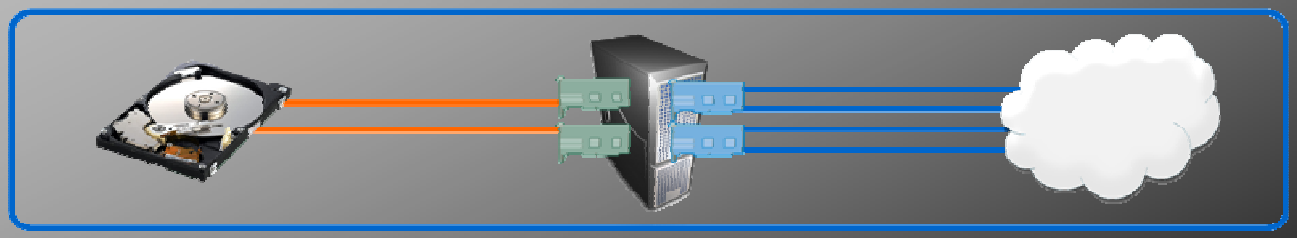
Firmware and bios included – competition does not do

“Stateless” environment

Significant process/labor savings

Service Profile

• Encapsulation of HW state – MAC, WWN, Firmware, BIOS



© 2009 Cisco Systems, Inc. All rights reserved.
Cisco Inc., Company Confidential - NDA Required

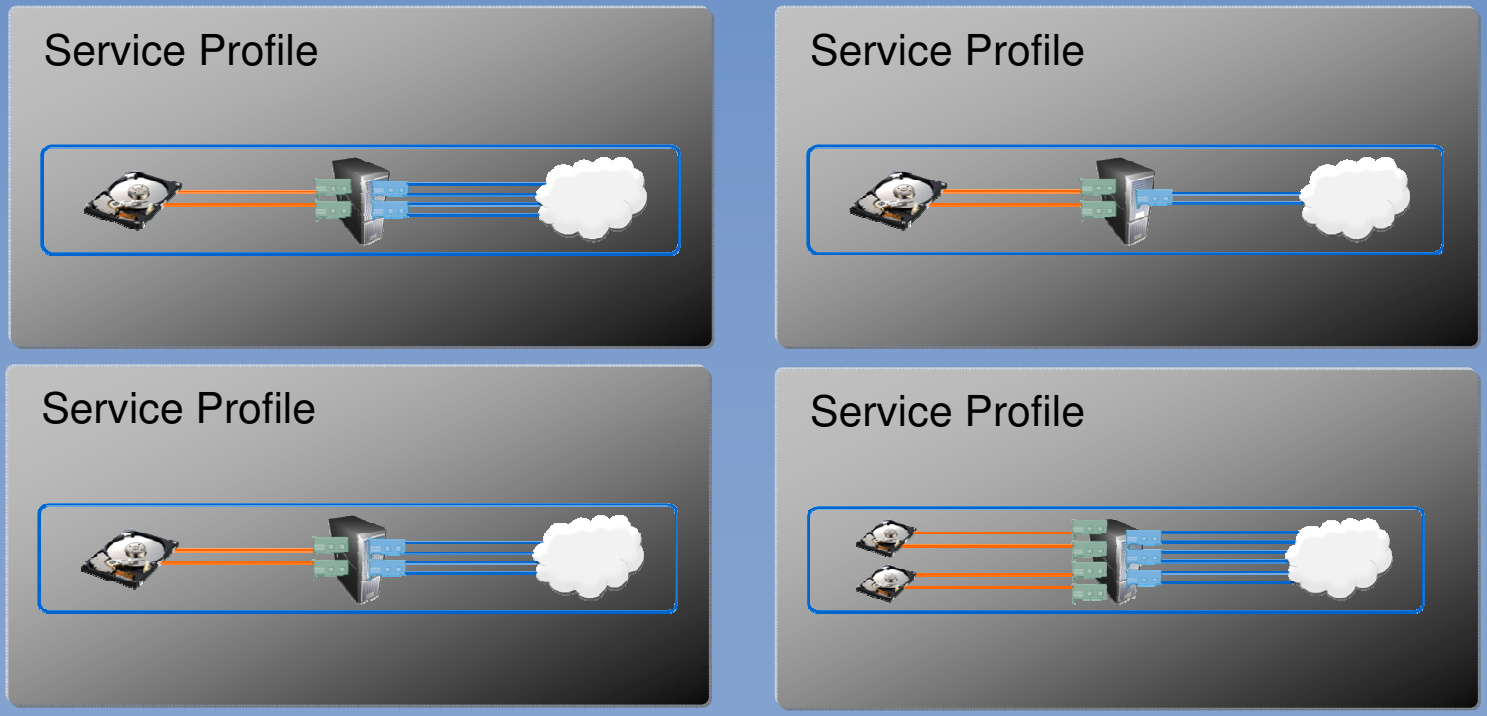
Service Profiles

Blade identities can be duplicated, automatically moved and deployed, and failed-over to another blade

Firmware and bios included – competition does not do

“Stateless” environment

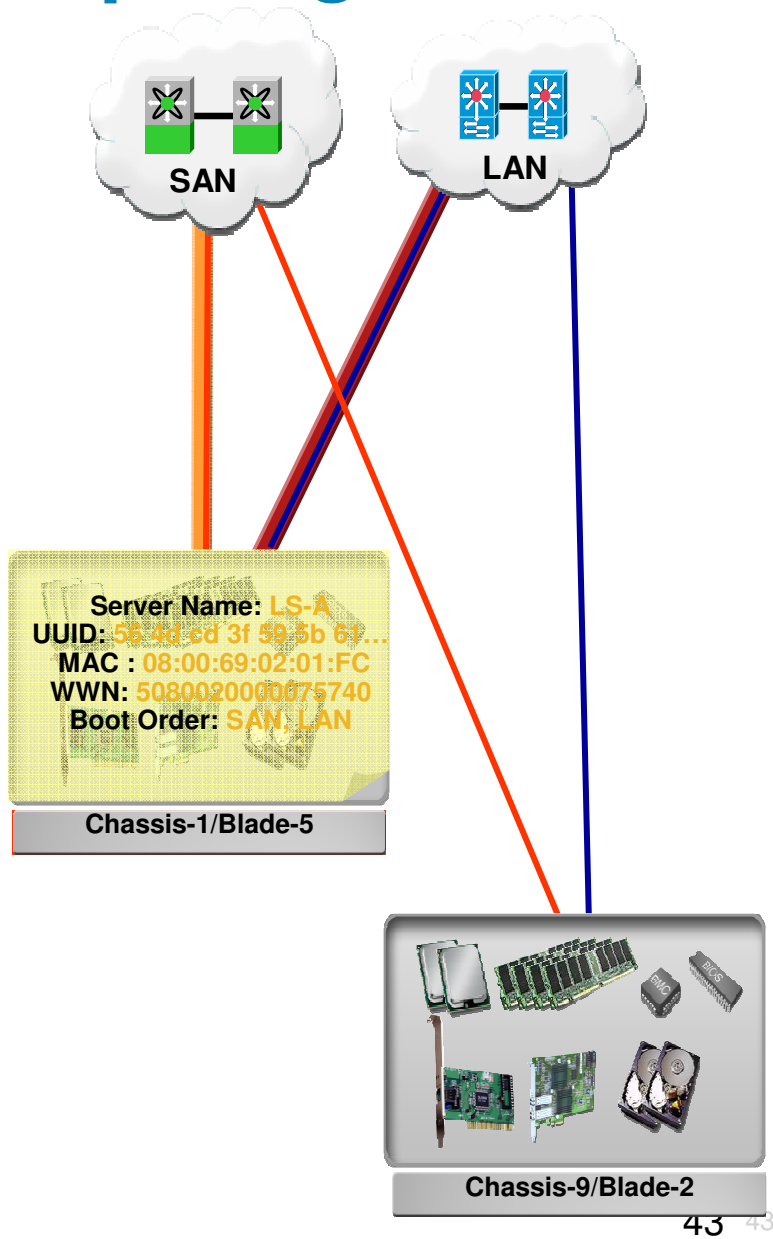
Significant process/labor savings



© 2009 Cisco Systems, Inc. All rights reserved.
Cisco Inc., Company Confidential - NDA Required

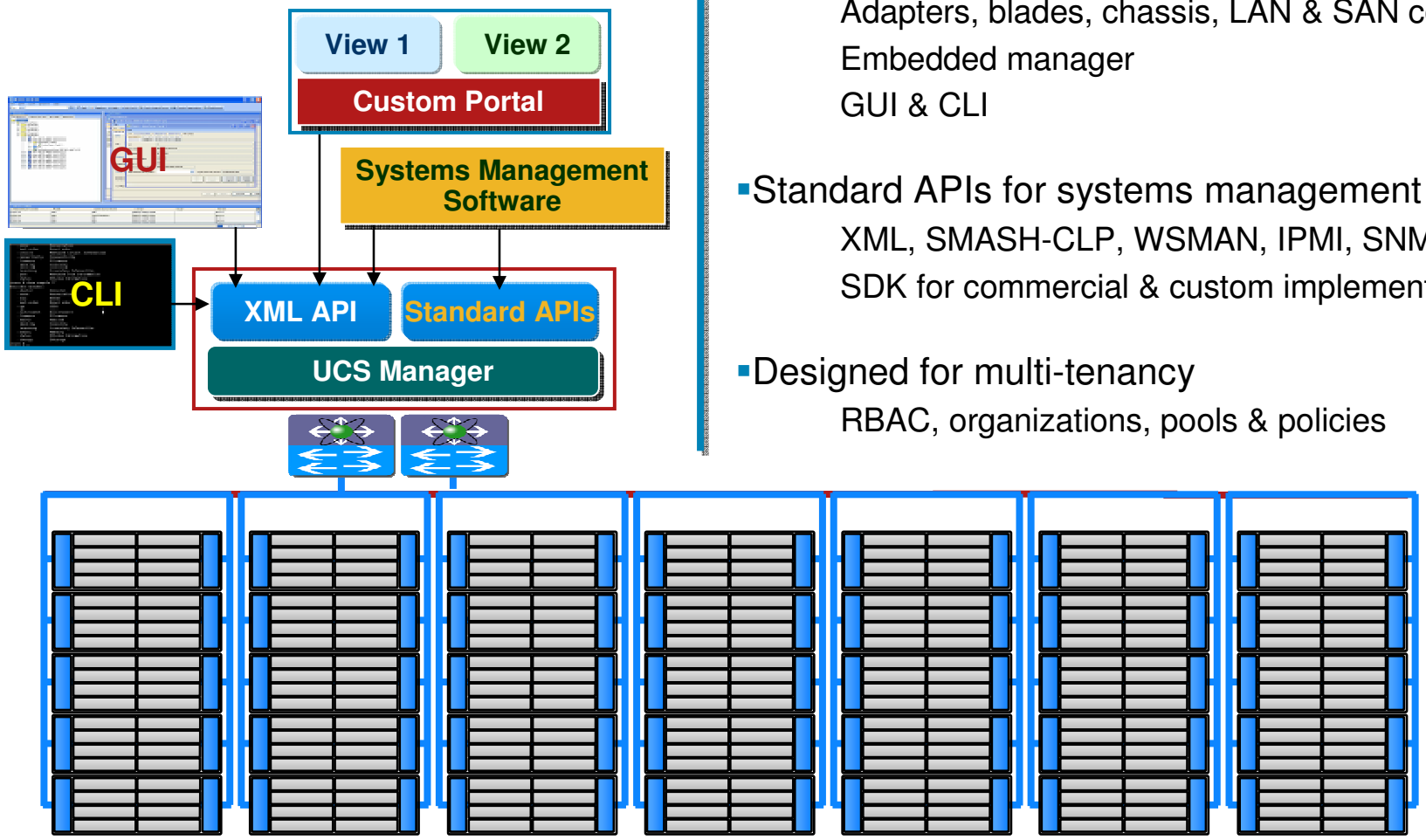
Integrated Stateless Computing

- Attributes no longer tied to physical hardware
  - Not just identity
  - Seamless server mobility
  - Within interconnect domain
- Dynamic Provisioning
  - Complete infrastructure repurposing
  - Integrated with 3rd part tools



© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Unified Management

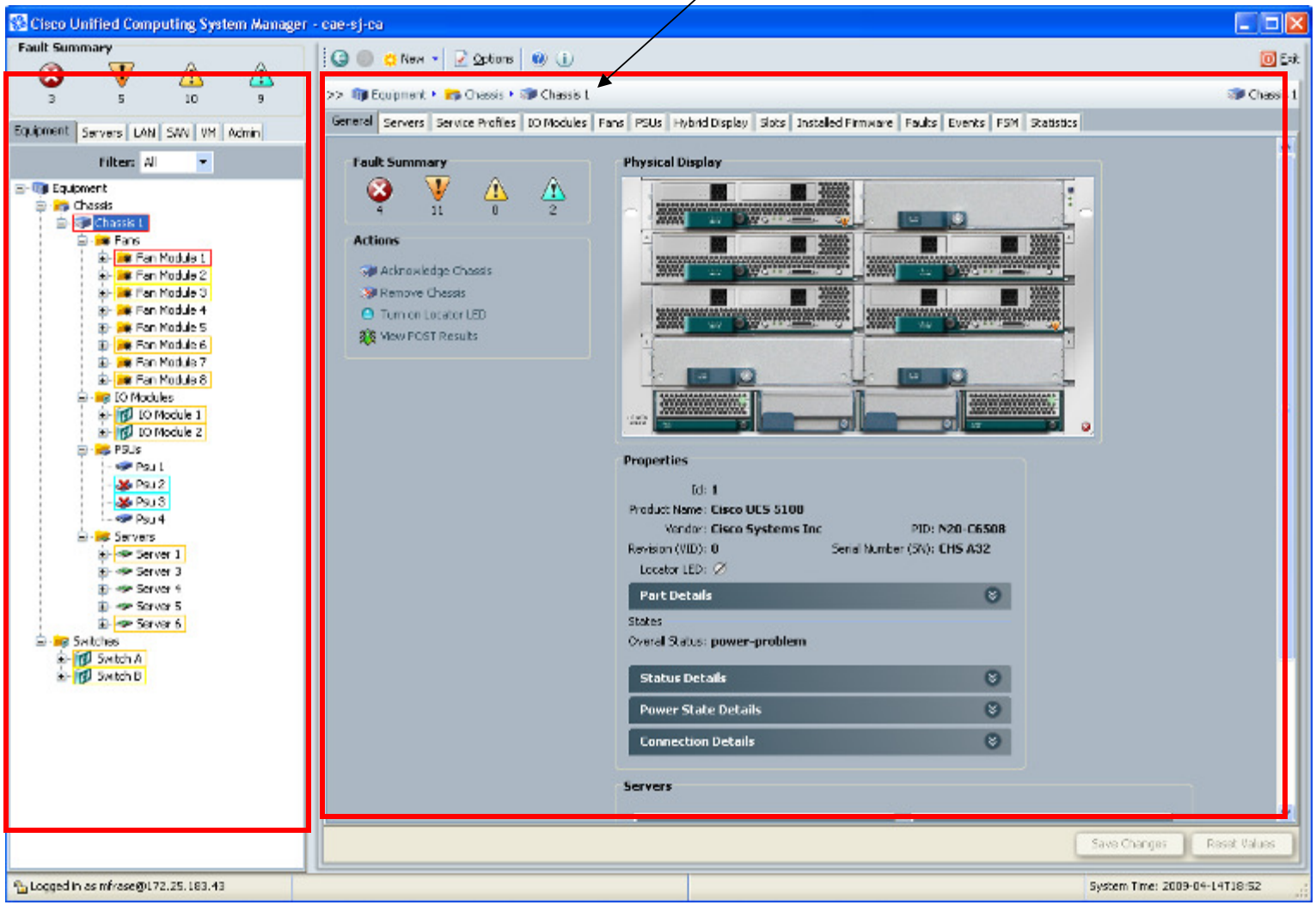


- Single point of device management
  - Adapters, blades, chassis, LAN & SAN connectivity
  - Embedded manager
  - GUI & CLI
- Standard APIs for systems management
  - XML, SMASH-CLP, WSMAN, IPMI, SNMP
  - SDK for commercial & custom implementations
- Designed for multi-tenancy
  - RBAC, organizations, pools & policies

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

UCS Graphical interface

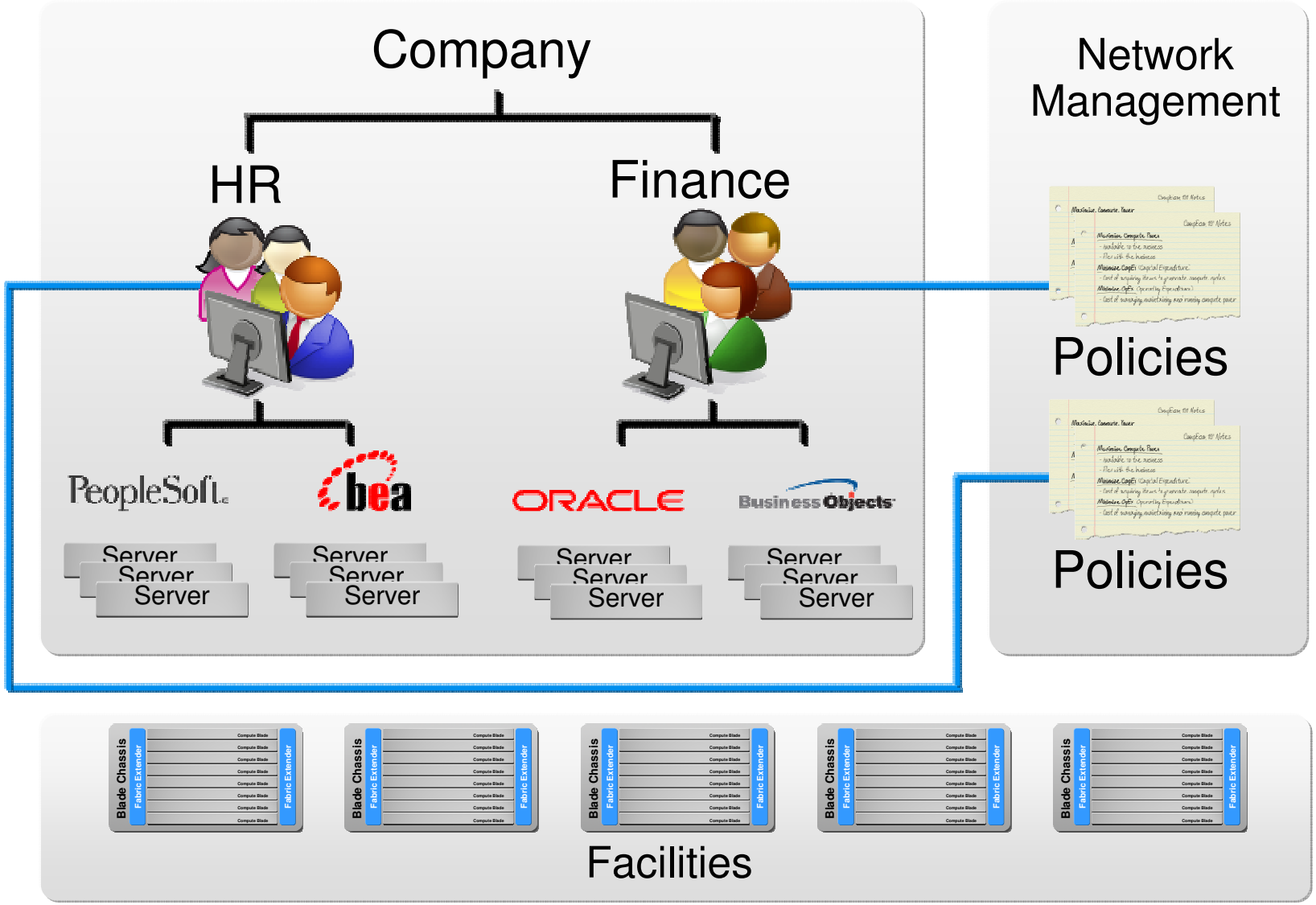
Top directory map tells you where you are in tree



NAVIGATION PANE **CONTENT PANE**

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Multi-Tenancy Model

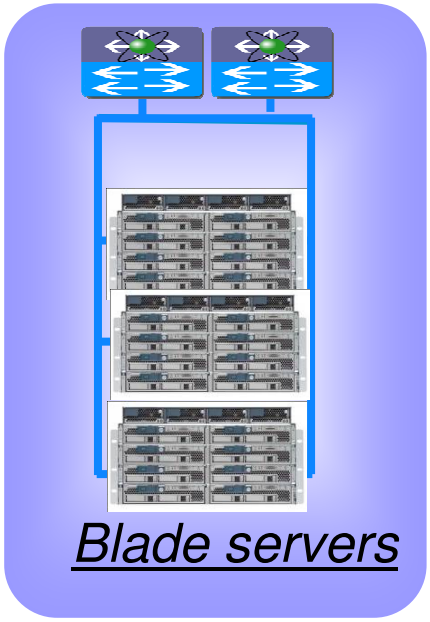


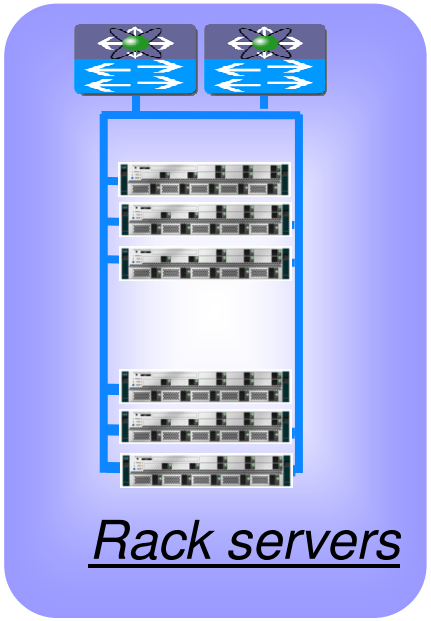
© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

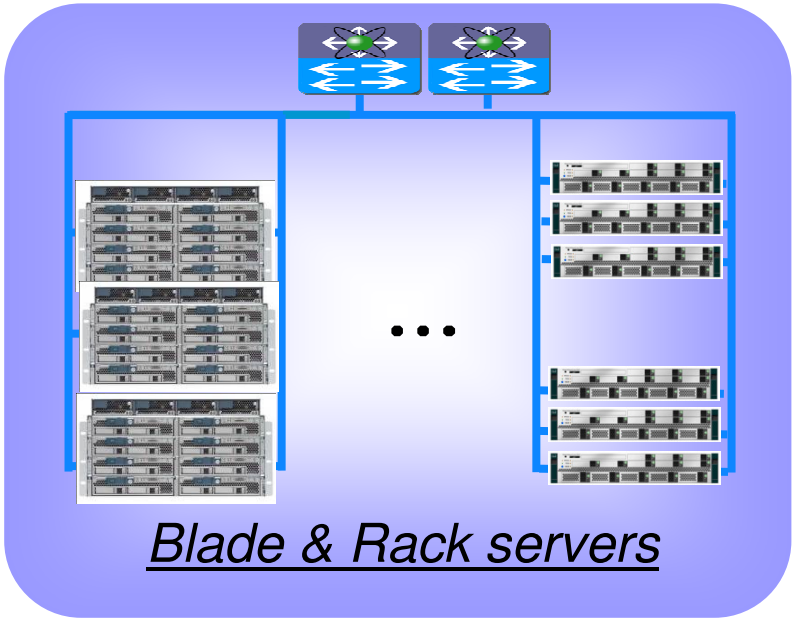
C-Series
Rack mounted servers

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Cisco UCS Architecture is Form-Factor Neutral
Customer Has Choice







Whether blade or rack form-factor, Cisco UCS customers benefit from

- Consolidated & Unified Infrastructure
- Unified Management & Dynamic Provisioning
- Virtualization Optimization
- Memory extension technology

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Cisco UCS C-Series Rack-Mount Servers

UCS C250 M1

UCS C210 M1

UCS C200 M1

Item	CPU	Size	Memory	Disks	Adaptor
UCS C250 M1 (memory intensive)	Intel Nehalem EP	2RU	48 DIMM 384 GB	8 SAS/SATA Drives	5 PCIe
UCS C210 M1	Intel Nehalem EP	2RU	12 DIMM 96 GB	16 SAS/SATA Drives	5 PCIe
UCS C200 M1	Intel Nehalem EP	1RU	12 DIMM 96GB	4 SAS/SATA Drives	2 PCIe

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Cisco UCS Rackserver Features & Benefits

UCS offers Significant Value

Features	Benefits
▪ Intel Nehalem EP Processors	▪ Performance
▪ RAID, Redundant power & fan	▪ Availability
▪ Front accessible HDDs & fans	▪ Serviceability
▪ Memory Extension Technology	▪ Scalability
▪ Unified Mgmt	▪ Manageability
▪ VN-LINK Technology	▪ Virtualization Ready

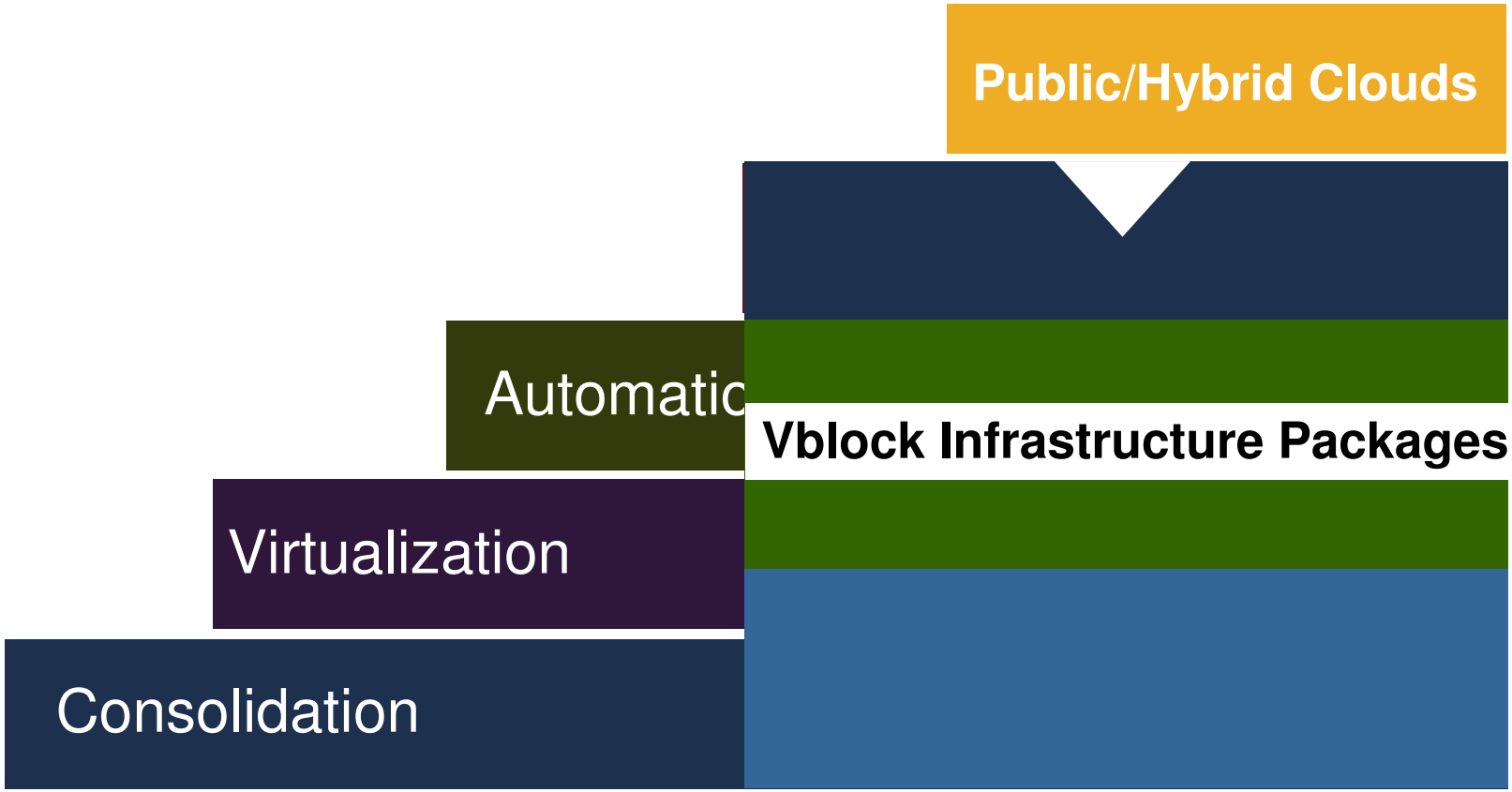
Key Cisco Differentiators

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

IaaS foundation: VBLOCK

© 2009 Cisco Systems, Inc. All rights reserved.

IT Transformation has begun….



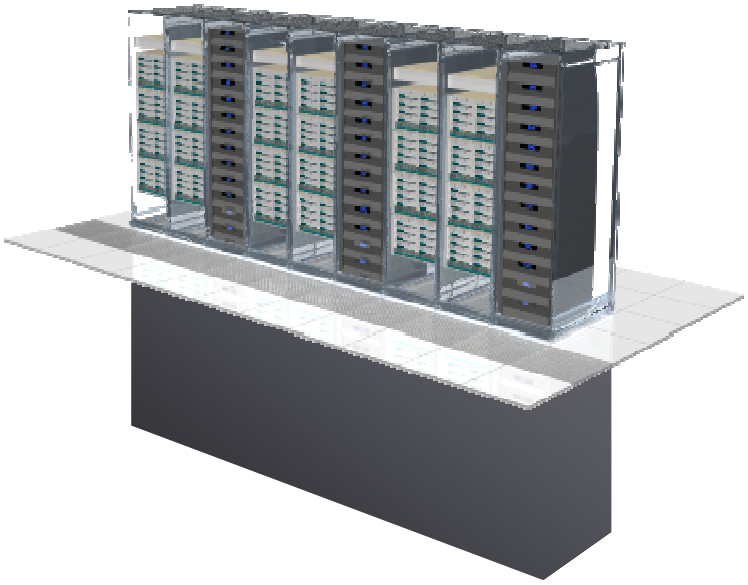
…. Vblock Infrastructure Packages accelerate infrastructure virtualization & private cloud adoption

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Vblock Infrastructure Packages

Scalable Platform for Building Solutions

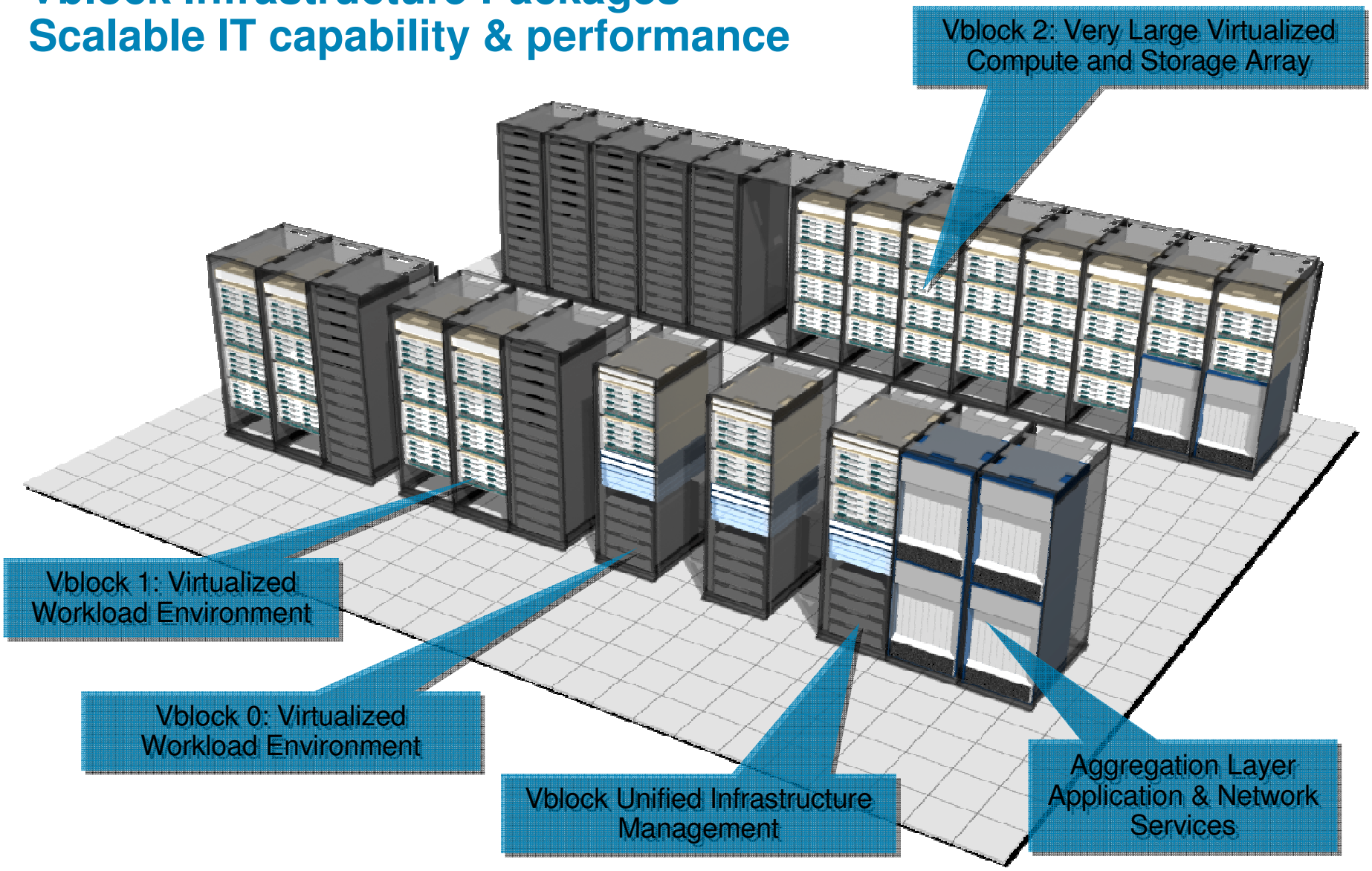
- Vblock 2
  - A high-end configuration - extensible to meet the most demanding IT needs
  - Typical Use case:
    Business critical ERP, CRM systems
- Vblock 1
  - A mid-sized configuration - broad range of IT capabilities for organizations of all sizes
  - Typical use case:
    Shared services – Email, File & Print, Virtual Desktops, etc
- Vblock 0 (1H 2010)
  - An entry-level configuration addresses small datacenters or organizations



Vblock Infrastructure Packages for development and production deployments

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

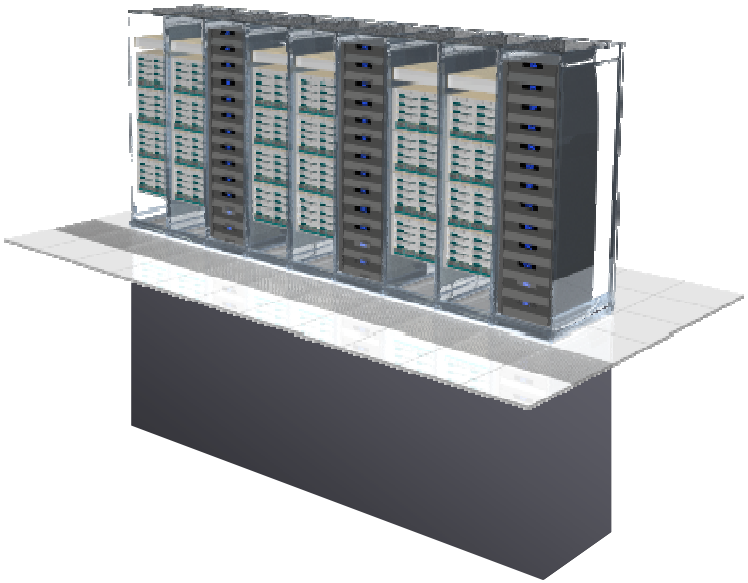
Vblock Infrastructure Packages
Scalable IT capability & performance



© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Vblock 1 Components

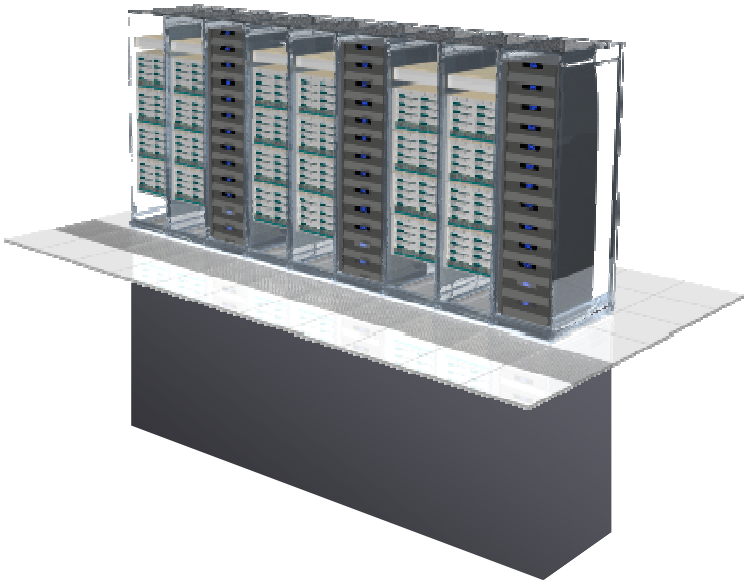
- Compute
  - Cisco UCS B-series
- Network
  - Cisco Nexus 1000V
  - Cisco MDS 9222i
- Storage
  - EMC CLARiiON CX4
- Hypervisor
  - VMware vSphere 4
- Management
  - EMC Ionix Unified Infrastructure Manager
  - VMware vCenter
  - EMC NaviSphere
  - EMC PowerPath
  - Cisco UCS Manager
  - Cisco Fabric Manager



© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

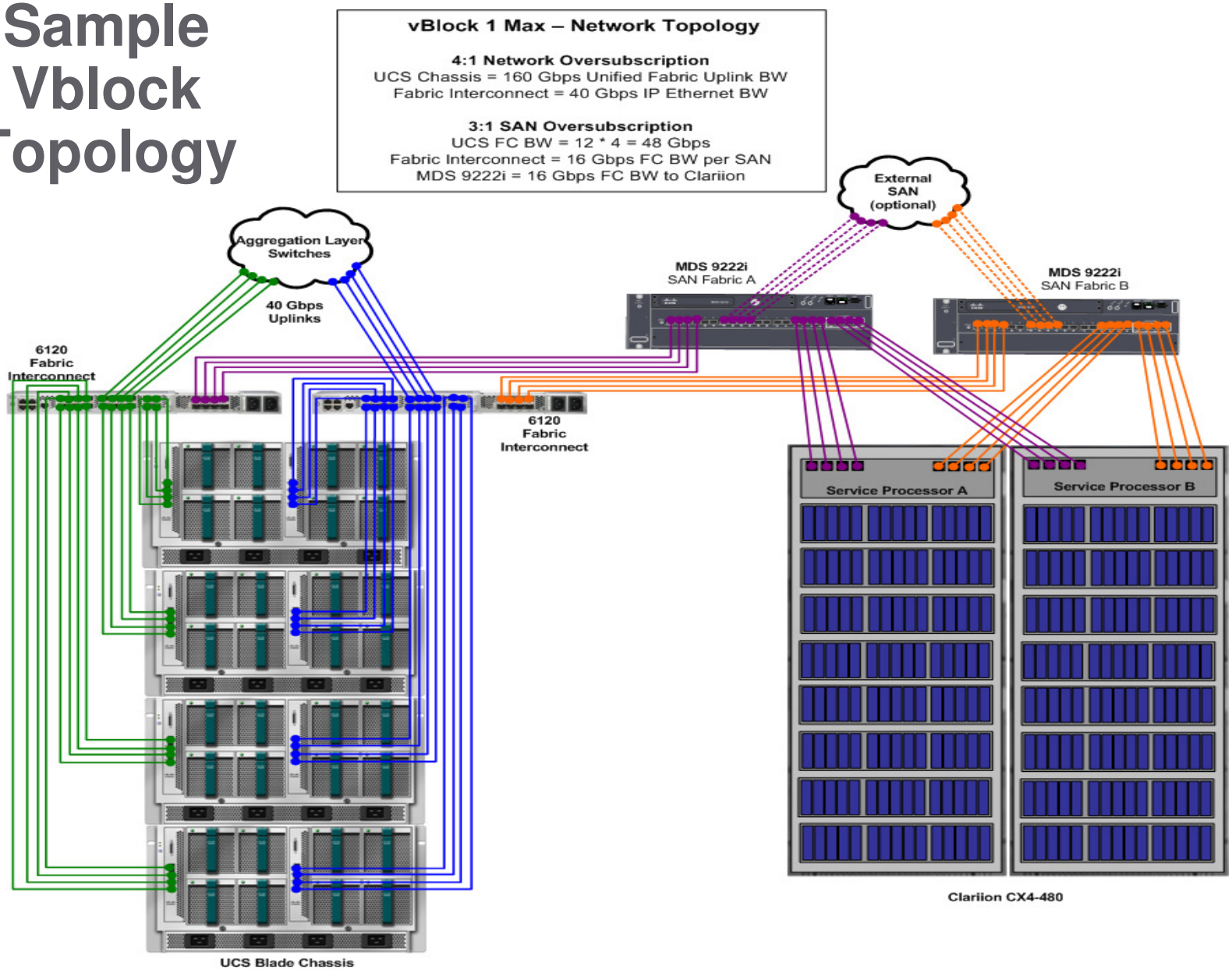
Vblock 2 Components

- Compute
  - Cisco UCS B-series
- Network
  - Cisco Nexus 1000V
  - Cisco MDS 9506
- Storage
  - EMC Symmetrix V-Max
- Hypervisor
  - VMware vSphere 4
- Management
  - EMC Ionix Unified Infrastructure Manager
  - VMware vCenter
  - EMC Symmetrix Management console
  - EMC PowerPath
  - Cisco UCS Manager
  - Cisco Fabric Manager



© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Sample Vblock Topology



© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

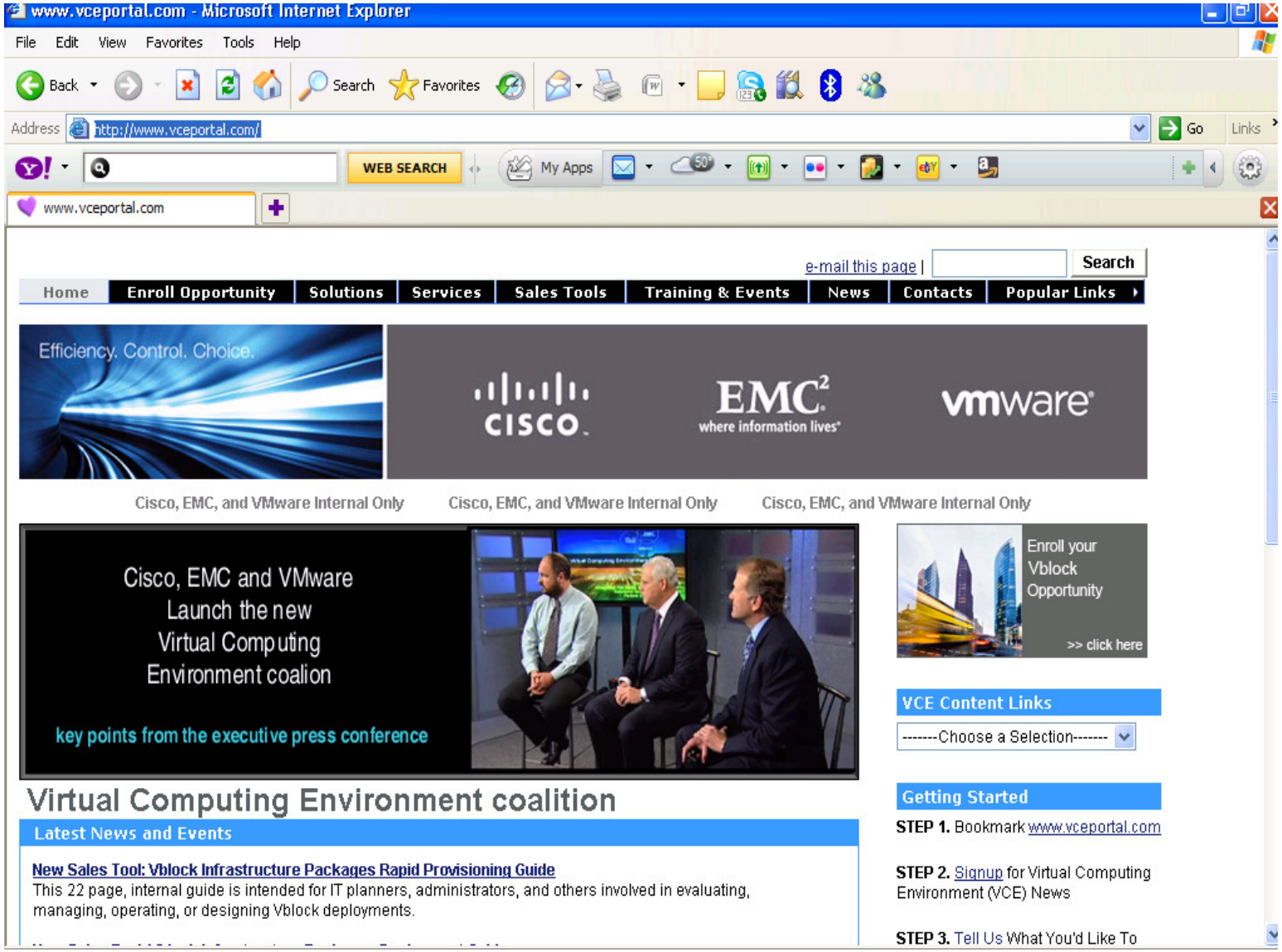
Vblock: O/S & Application support

- Vblock accelerates virtualization of applications by standardizing IT infrastructure & IT processes
- Broad range of O/S support
- Over 300 Enterprise Applications explicitly supported
- Vblock validated applications
  - SAP
  - VMware View 3.5
  - View 4 in-test
  - Oracle RAC
  - Exchange
  - Sharepoint

- Windows NT 4.0
- Windows 2000
- Windows Server 2003
- Windows Server 2008
- Windows Vista
- Windows XP
- RHEL5
- RHEL4
- RHEL3
- RHEL2.1
- SLES10
- SLES9
- SLES8
- Ubuntu 7.04
- Solaris 10 for x86
- NetWare 6.5
- NetWare 6.0
- NetWare 6.1
- Debian
- CentOS
- FreeBSD
- Asianux
- SCO OpenServer
- SCO Unixware
- …

Accelerate virtualization, standardize IT infrastructure

http://www.vceportal.com/



© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

Business Benefits

Unified Computing System

Reduces total cost of ownership

- CAPEX: Up to 20% reduction on average
- OPEX: Up to 30% reduction on average
- Cooling and power efficient

Increases business agility

- Provision applications in minutes instead of days
- Automation reduces service outages
- Just-in-time resource provisioning

Investment protection

- Industry standards-based
- Co-exist with existing data center infrastructure
- Leverage existing management applications via API

Summary

© 2009 Cisco Systems, Inc. All rights reserved.

SP IaaS Cloud Characteristics

Business Drivers

- Pay by Consumption – pay by CPU hour, GB stored, and Gbps transferred
- Short-term Contracts – allow customers to come and go freely
- Reduce CAPEX, OPEX
- Competitive Differentiation via Service Tiers
- Reduce Time to Service Delivery
- Solution Selling

Design Implications

- Abstracted Infrastructure – standardized and abstracted allowing workload movement
- Fully Virtualized – offering a mix of virtual and physical servers
- Dynamic Infrastructure – ability to add, change, delete servers automatically
- Application & OS Independent – run any app or OS so long as it doesn't need direct hardware access
- Differentiated Services

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

IaaS Cloud Services
Solution Architecture Components

Design Objectives

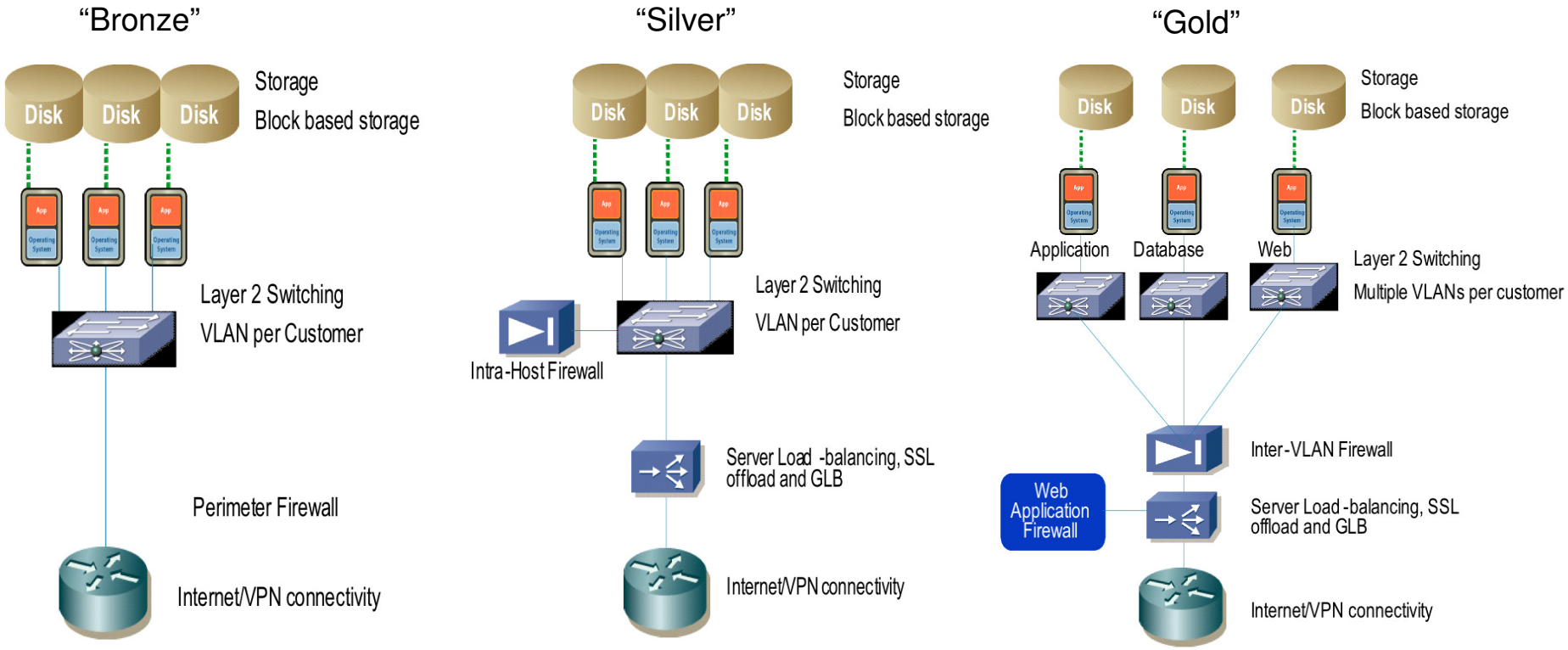
- Scalability (10GE L2/L3 DC platforms)
- Distributed Computing/Network-based Storage
- Server, Storage and Switching Virtualization
- Backup/resiliency and Business Continuity/Optimization Services
- Agility (Virtual Data Center Provisioning and Resource reallocation)

Technologies

- Nexus 7k, 5k, Multichassis C6500 with VSS1440, SUP 720
- SAN (MDS9k), FCOE Unified Fabric
- VMWare ESX Virtual Machines; Nexus 1k Virtual switch; Nexus 7k Virtual Device Contexts
- Data Center Interconnect via L2VPN (EoMPLS PW, VPLS); ACE redirection and load balancing; Global Site Selection; FWSM, WAAS
- VMWare's Vmotion & DRS; Nexus 1k virtual switch; UCS Mgr + Service Profiles

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

IaaS Service = Compute + Storage + Network



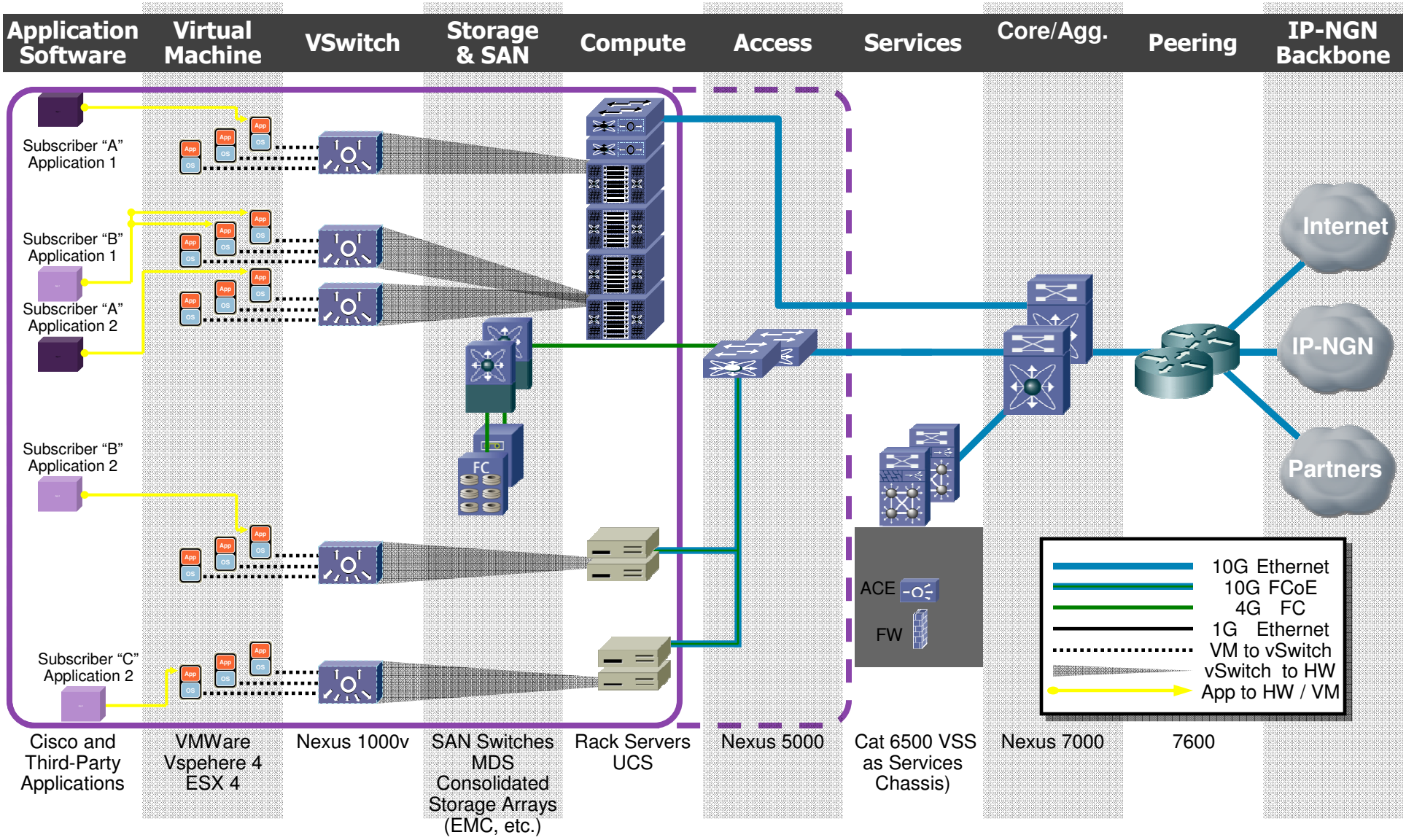
Bronze	CPU	RAM	SAN
Web1	.5	4	500G
DB1	.5	8	500G
App1	.5	16	500G

Silver	CPU	RAM	SAN
Web2	1	4	Nx500G
DB2	1	8	Nx500G
App2	1	16	Nx500G

Gold	CPU	RAM	SAN
Web3	2	4	Nx500G
DB3	2	8	Nx500G
App3	2	16	Nx500G

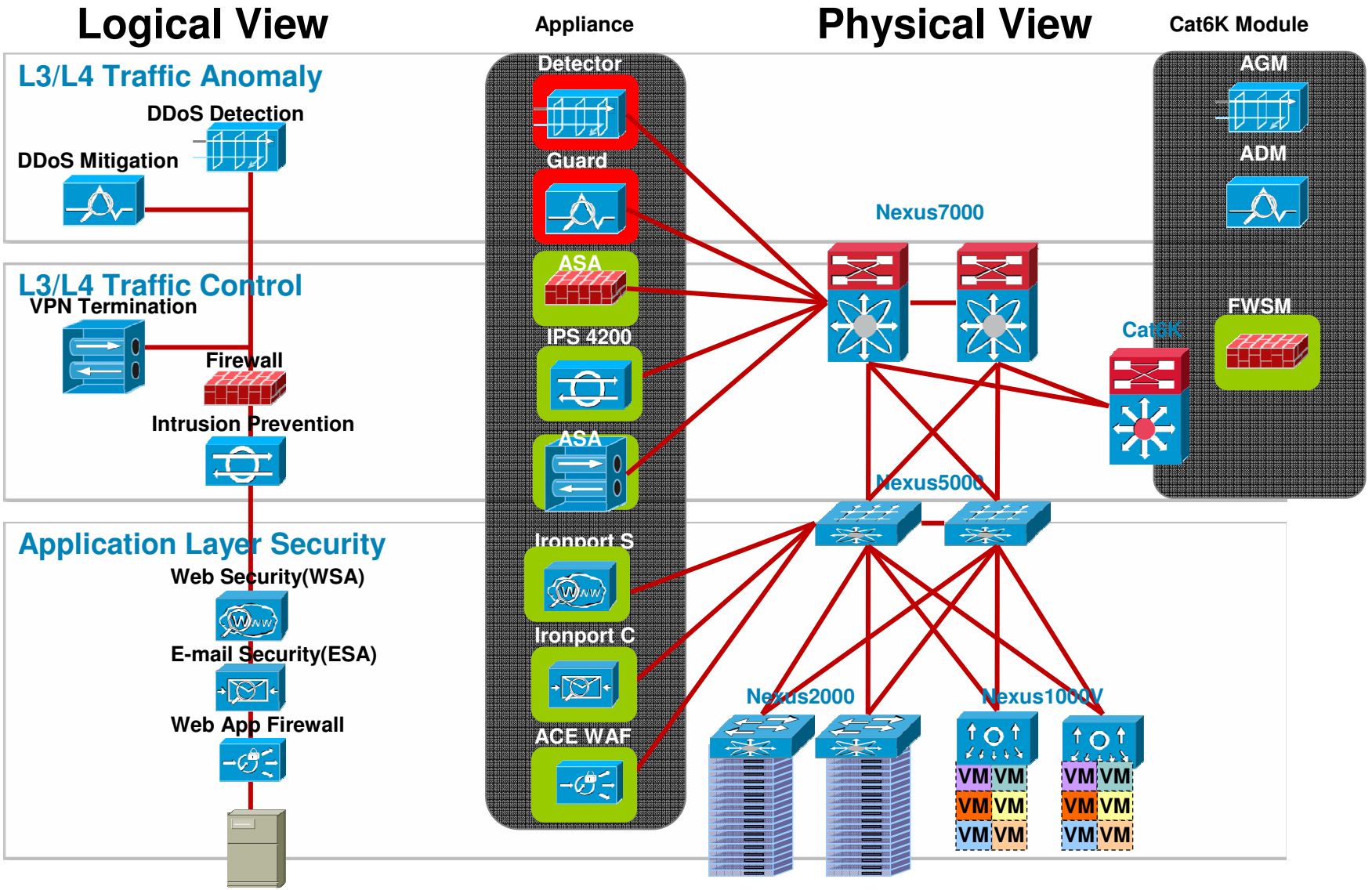
© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

IaaS Cloud Services
Solution Architecture



© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

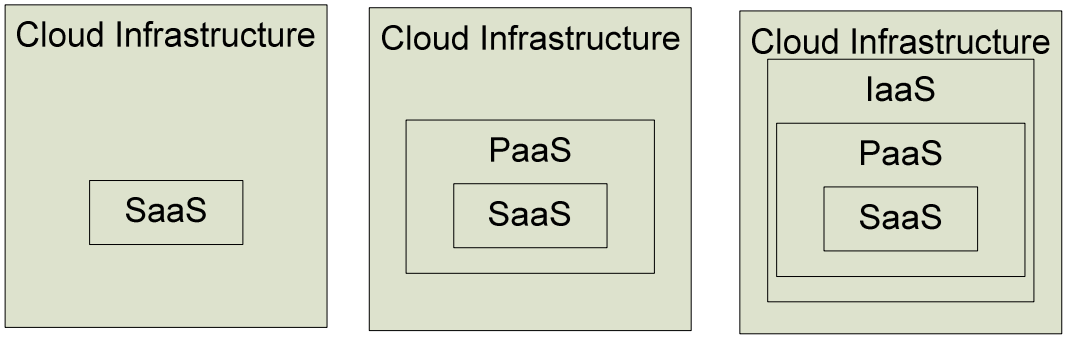
IaaS DC Security
Service Model



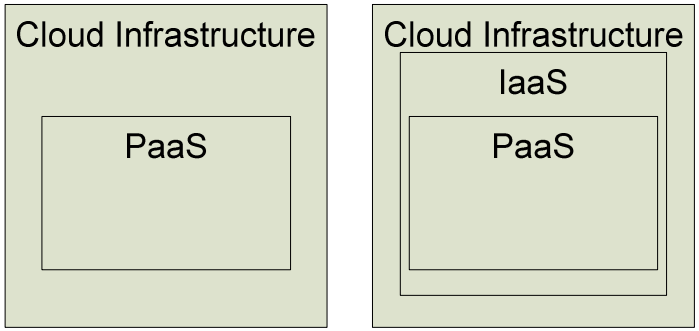
ESA = Email Security Appliance = C-series: anti-spam, ESA acts like an MTA
WSA = Web Security Appliance = S-series: malware protection of web traffic, WSA acts like an outbound HTTP(S) proxy

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

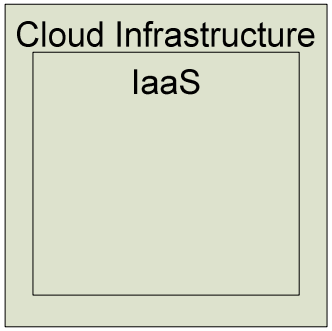
Service Model Architectures



Software as a Service (SaaS) Architectures



Platform as a Service (PaaS) Architectures



Infrastructure as a Service (IaaS) Architectures

© 2009 Cisco Systems, Inc. All rights reserved. Cisco Confidential

© 2009 Cisco Systems, Inc. All rights reserved.