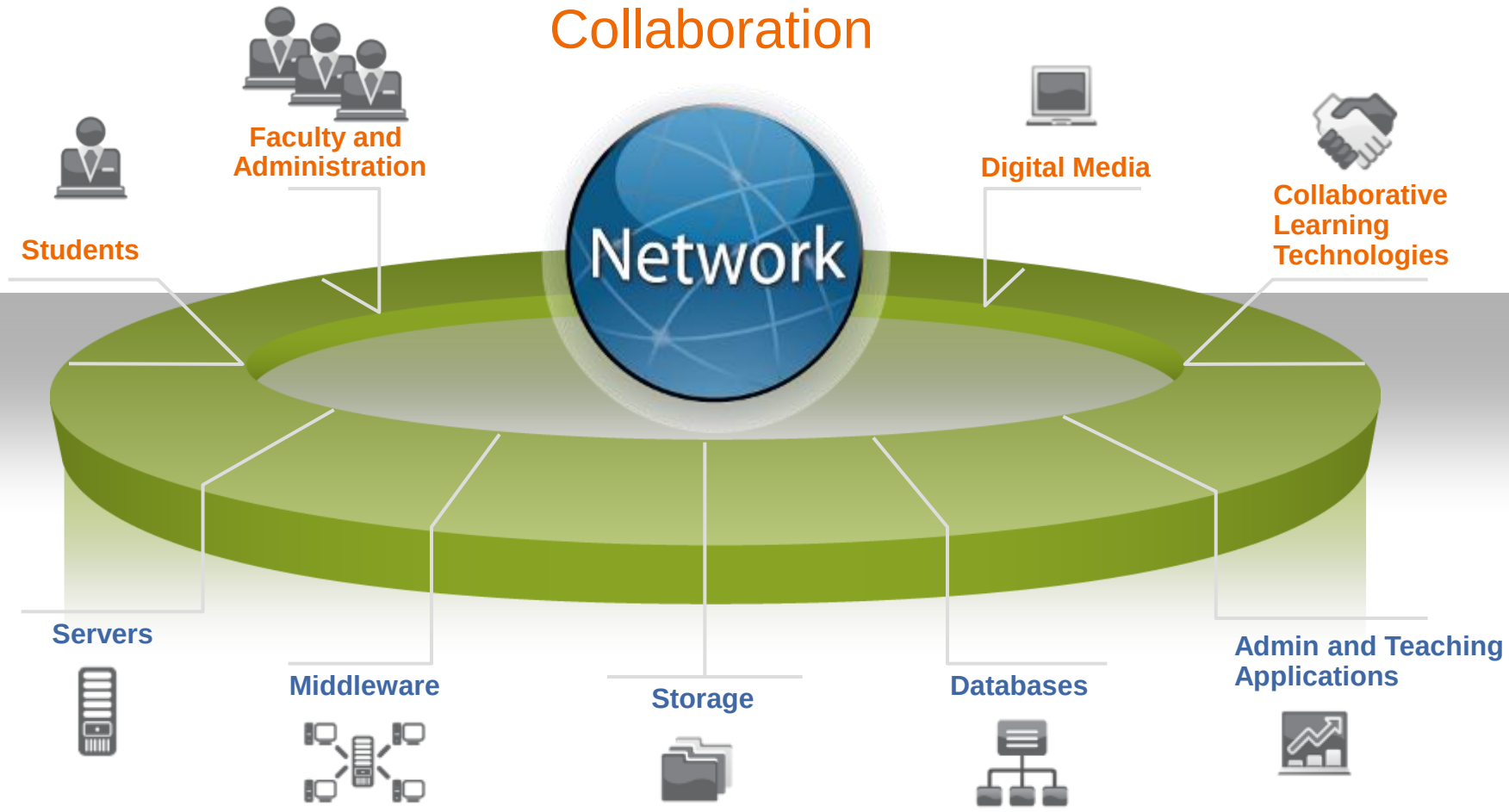
Cisco Open Cloud Architecture

How Consolidation and Virtualization Enable Connected Learning while Saving Time and Money

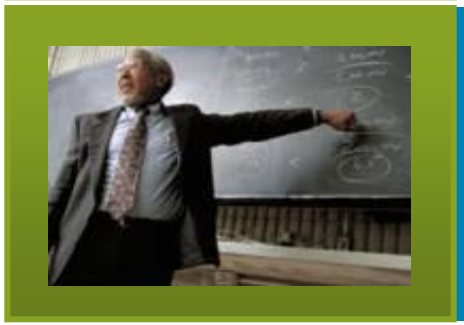
The Connected Learning Environment

Uses the Network as a Platform



The data center is the heart of the system for consolidation, virtualization, managing, sharing and securing resources and information

Data Center Challenges for Higher Education



- Accommodate more data center users, applications, and data—and escalating user expectations
- Simplify management and reduce TCO--computing, energy, and maintenance costs
- Maintain the university's reputation for leading-edge computing to attract students, faculty, and research.
- Seamlessly integrate applications, network, and computing to ensure the highest availability and ease of use.
- IT has been the foundation of university operations—IT is increasingly critical to connected learning, safety and security, and energy management.

Data Centers for Higher Education:
Maximize IT Resources and Improve Processes

Converge

- Converge multiple, disparate voice, video, and data systems onto one unified, robust IP network
- Increase performance, scalability, and manageability by centrally managing all applications and devices

Consolidate

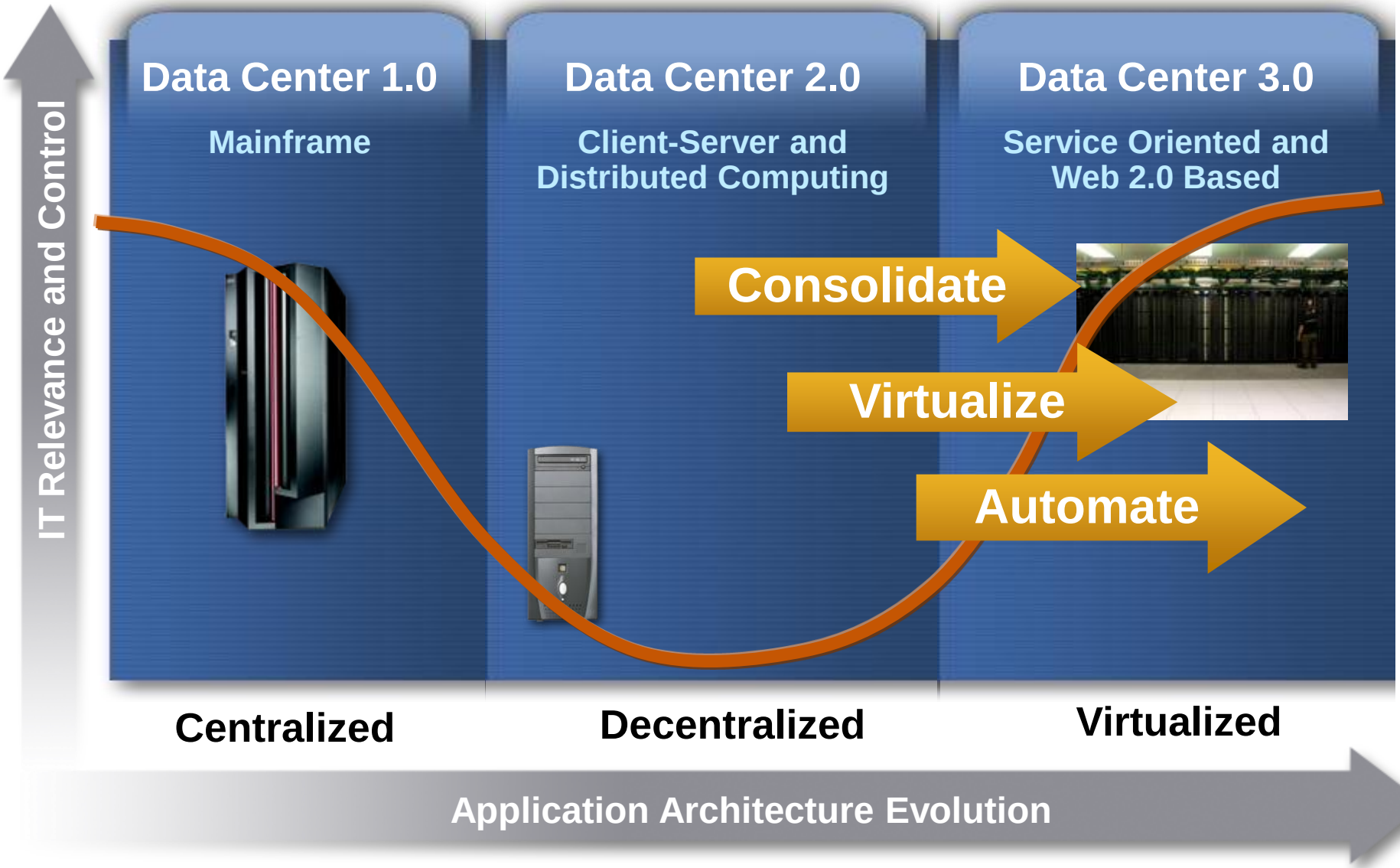
- Consolidate and embed services and applications into the network
- Consolidate servers, applications, and data centers to free up valuable IT resources and save money.

Virtualize

- Virtualize servers, applications, and desktops across the IP network
- Automatically update and standardize operating systems and applications.
- Reduce management and maintenance costs.
- Increase ability to scale and respond to growth needs.
- Extend life of existing equipment

Overview of Data Center Solutions

Data Center and Network Evolution



Data Center Benefits for the Higher Education

Consolidation

- Reduce the number of devices to decrease cost, environmental impact and improve management
- The foundation to improve services, agility, scalability, and productivity
- Open, secure and resilient
- Enable shared services

Virtualization

- Merge multiple applications to increase server virtualization
- Decreasing the number of equipment and appliances
- Decrease the cost of maintaining old equipment and reduce management

Unified Fabric/ Automation

- The solutions to improve service velocity, productivity, and communications
- Automate routine tasks
- Streamline management and operations

Unified Computing

- A common infrastructure for sharing new and innovative services
- Allows migration of existing applications to the shared infrastructure

Cloud Computing

- IT resources and services provided on-demand, at scale in a multi-tenant environment
- Allows for software as a service, platform as a service, infrastructure as a service

Security

The Network is the Platform

Data Center and Network Evolution in Education

Consolidation and Virtualization: Server

Reducing and optimizing servers will decrease costs of management, power, cooling, and physical challenges while enabling the sharing of servers and applications across different user groups.

Consolidation

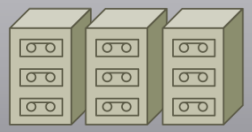
Data Center

vmware

Cisco partners with VMware for end-to-end data center virtualization.

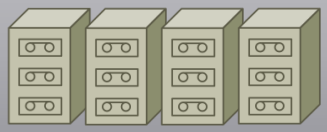
Virtualization

Main Campus



Satellite Campuses

Remote Learners and Faculty



Data Center and Network Evolution in Education

Consolidation and Virtualization: Storage

Merging separate storage environments will decrease many costs while allowing the sharing of equipment and information

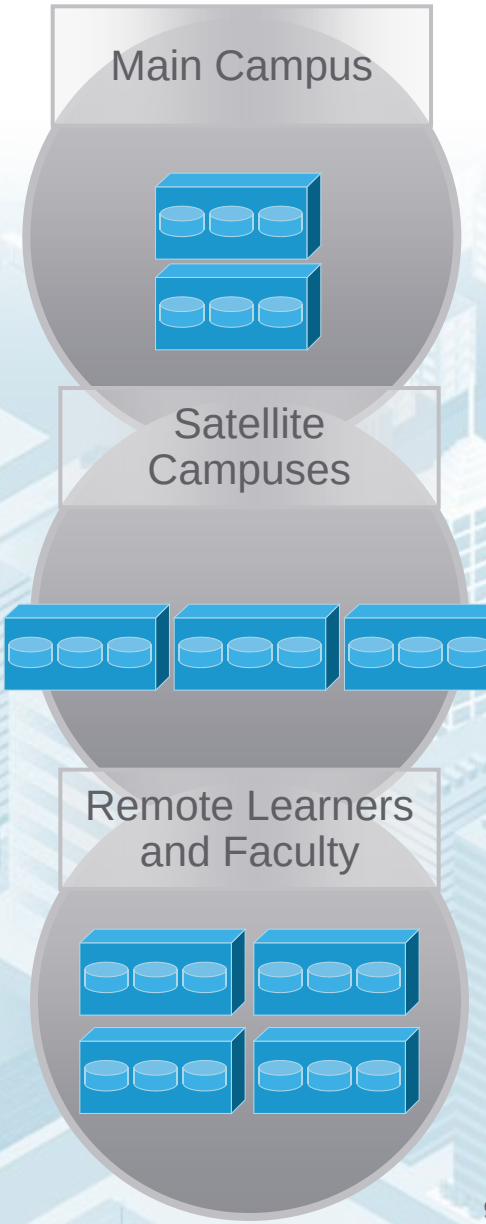
In addition to VMware and EMC, Cisco also works with NetApp, Microsoft, and other partners.

Consolidation

Data Center

Cisco and EMC deliver next generation SAN technology.

Virtualization

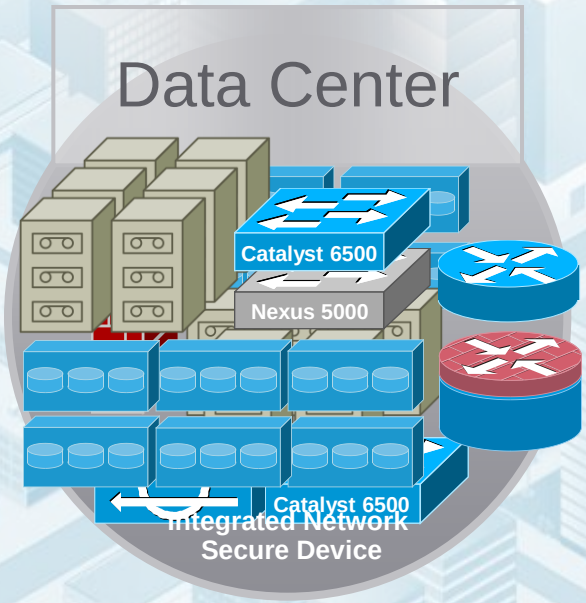


Data Center and Network Evolution in Education

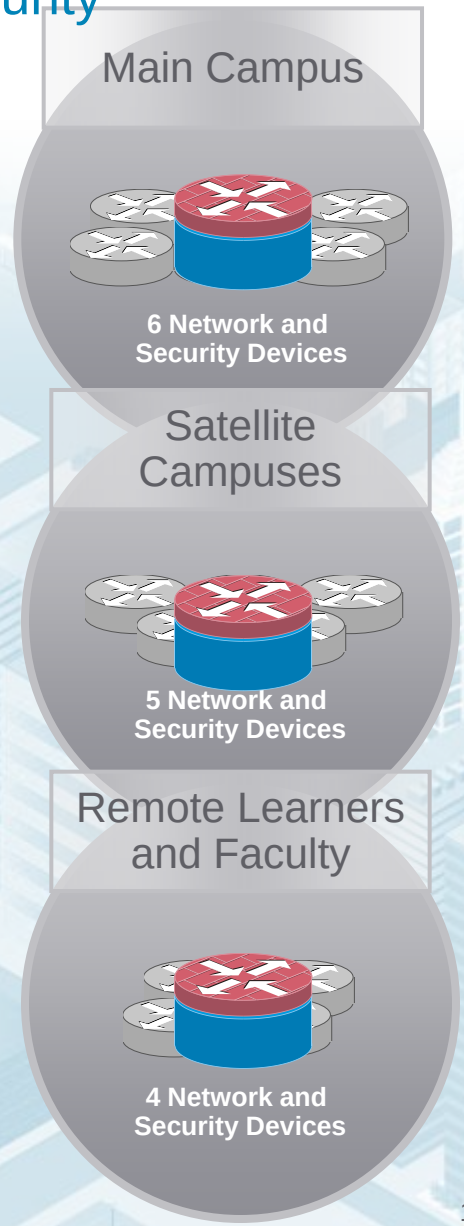
Consolidation and Virtualization: Network and Security

Integrating disparate network and security devices will improve overall efficiencies, reduce duplicate costs and optimize investment

Consolidation



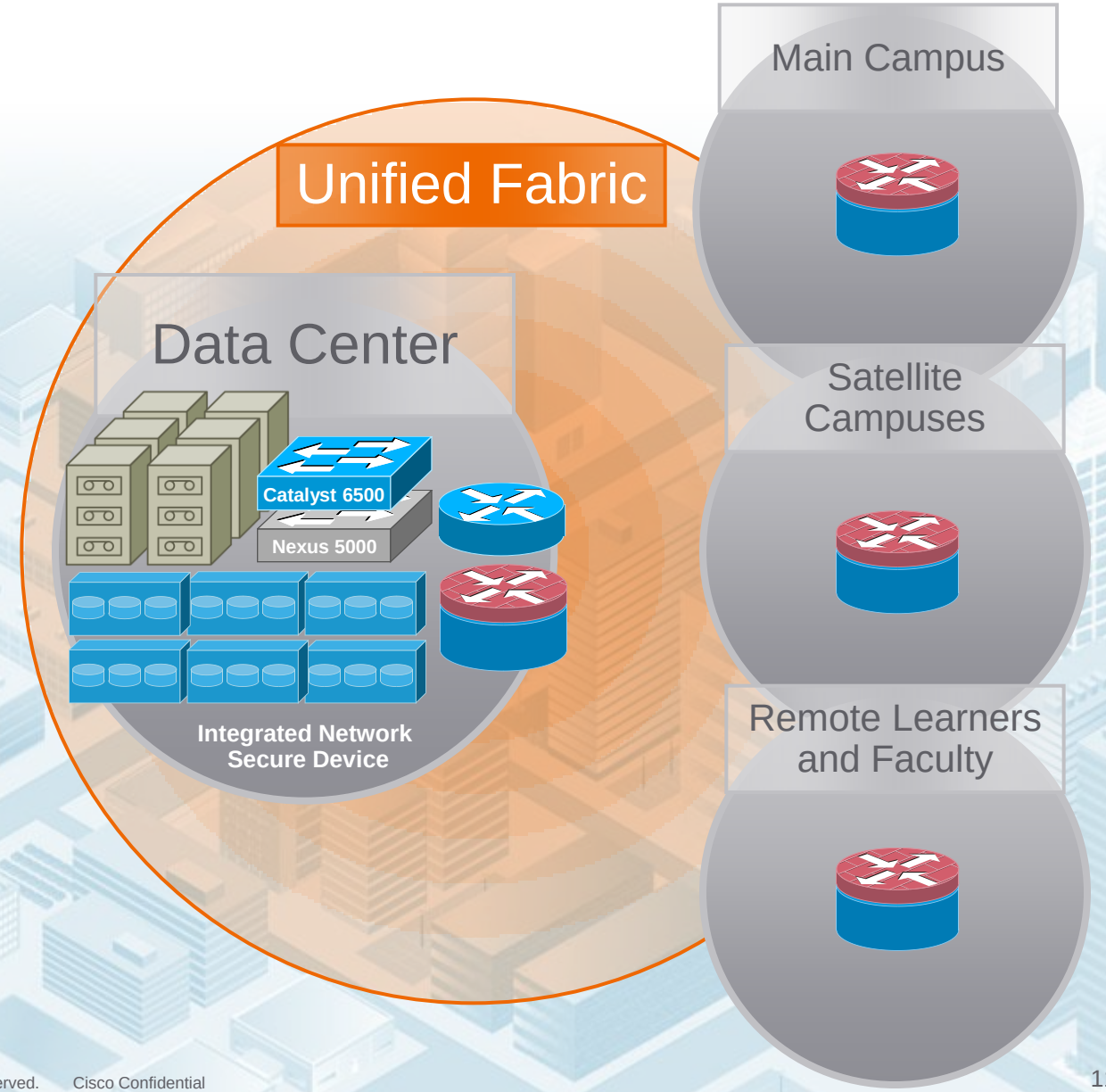
Virtualization



Data Center and Network Evolution in Education

Unified Fabric

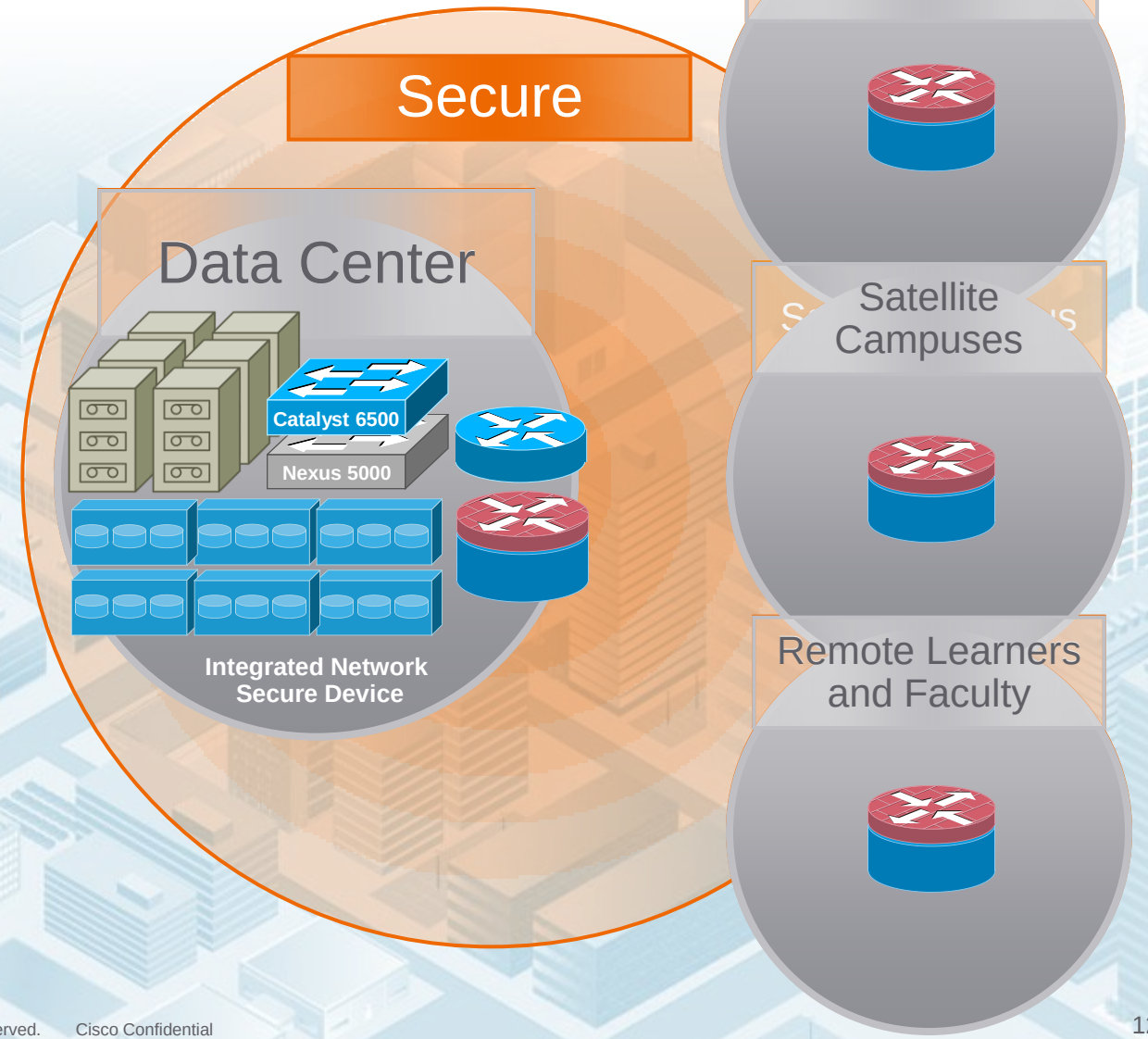
Server, storage, and network operations unified on a single, Unified Fabric enables an efficient, secure and versatile communications platform which does more, saves money and is prepared for the future



Data Center and Network Evolution in Education

Secure Data Center

Cisco Security is integrated in the data center and the entire network.



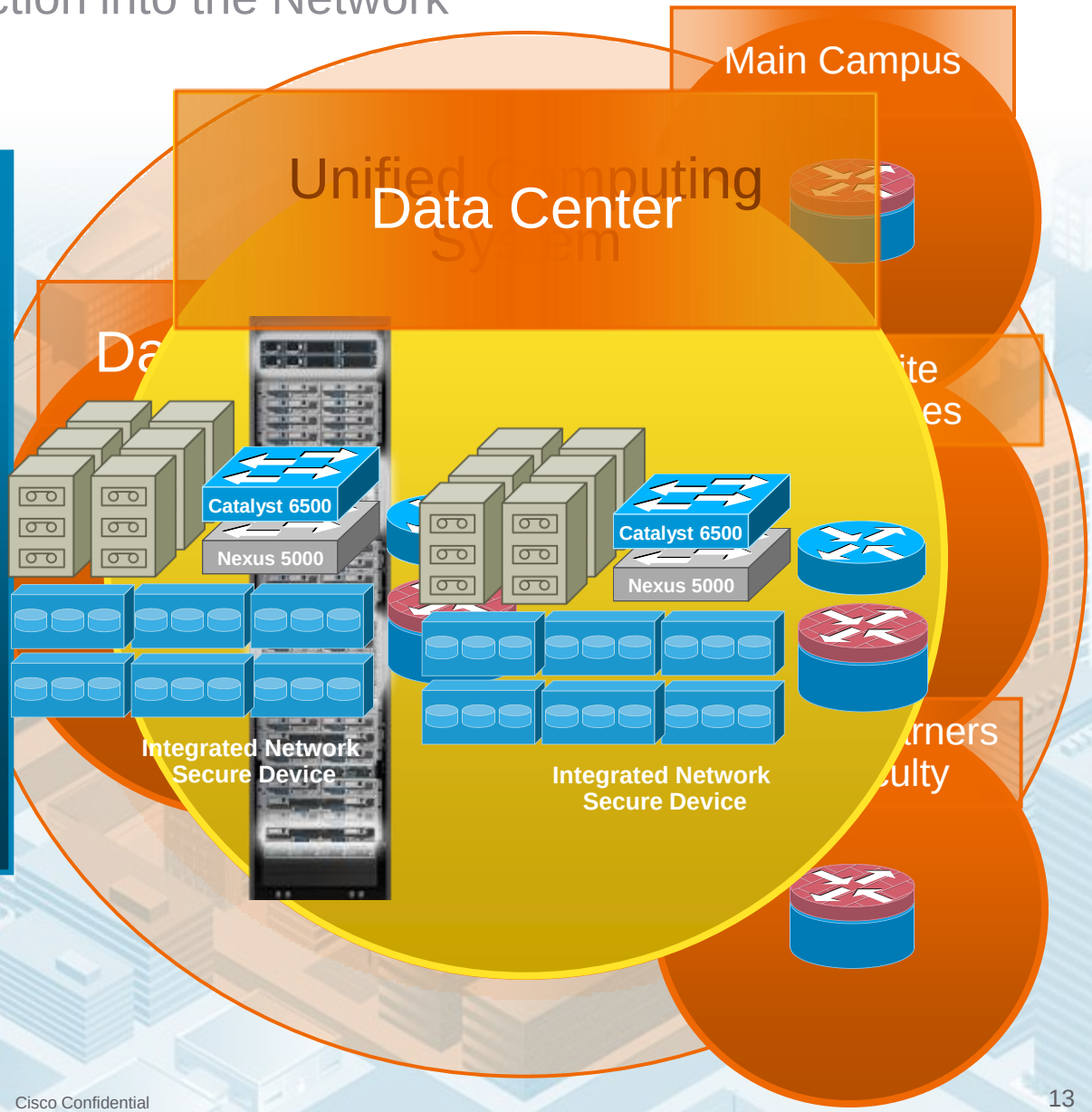
Data Center and Network Evolution in Education

Optimized for Interaction into the Network

Cisco Unified Computing System: Optimized for Interaction into the Network

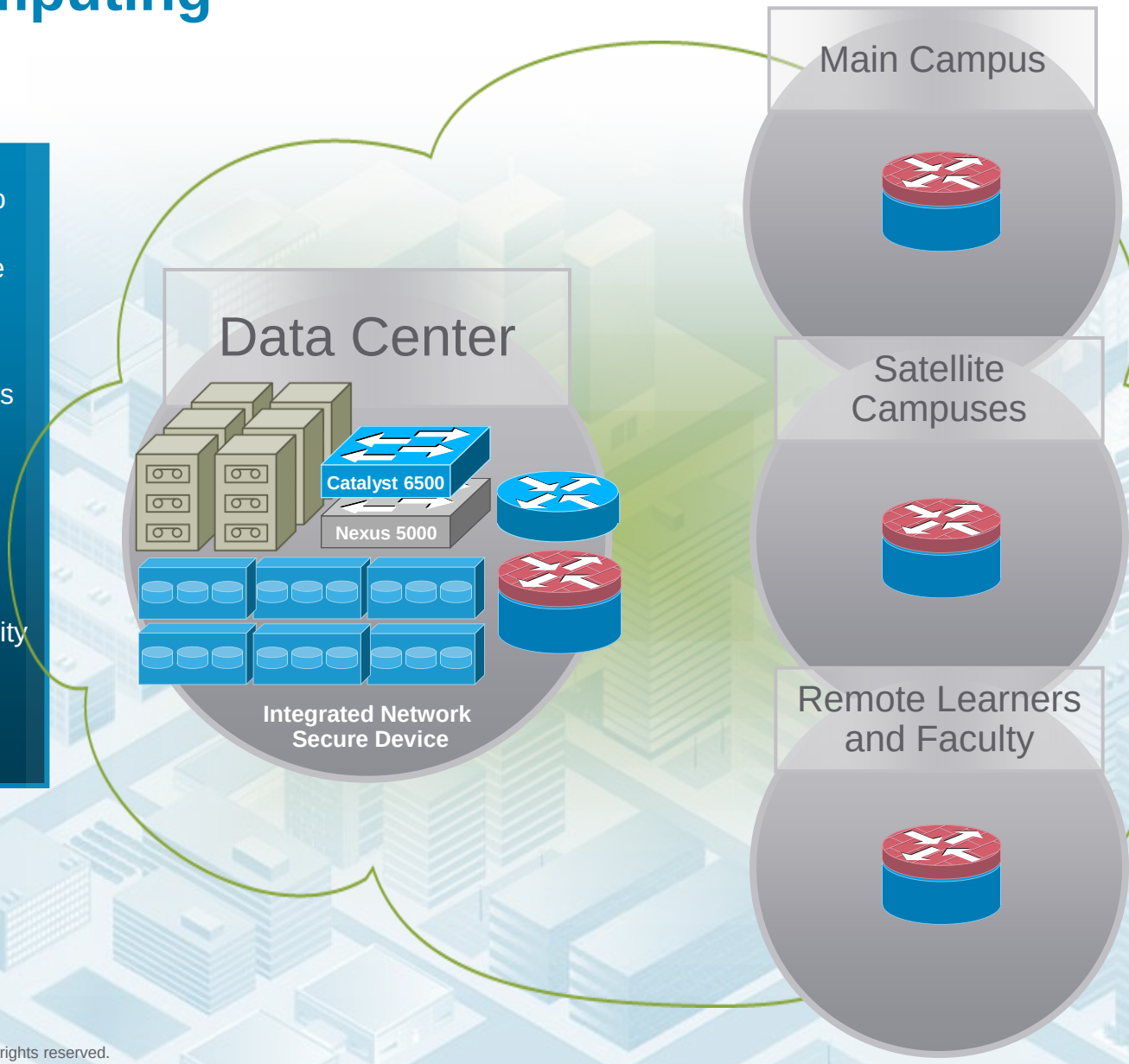
- Industry Standard Servers
- Unified Fabric
- Virtualization Optimization
- Automated Provisioning

Designed to dramatically reduce datacenter total cost of ownership while simultaneously increasing IT agility and responsiveness.



Cloud Computing

- Move from physical to virtual servers
- Unify and standardize architecture across campuses
- Maximize existing devices and resources
- Simplify DC, network, and application operations
- Meet increasing demands for access and availability
- Enable faster scalability
- Save on capital, maintenance, and energy costs



How Cisco has Helped in the Data Center

Hong Kong Institute of Education

Before

"Hong Kong Institute of Education strives to inculcate an appreciation and familiarity of multimedia technology in the area of education. We encourage the frequent constructive use of rich media and Web 2.0 applications in the context of education."

Victor Cheng – Director of Information Technology Services

After

"With this solution, Cisco has effectively brought our institute to the forefront of education in Hong Kong."

Victor Cheng – Director of Information Technology Services

University of Arizona

Converged data and storage networks save 50% of infrastructure costs

Challenge

Increase administrative efficiency

Reduce costs

Replace all enterprise applications and accelerate the adoption of virtualization

Support server virtualization and latency-sensitive applications

Solution

10 Gigabit Ethernet environment with a unified fabric for the LAN and SAN

Cisco Nexus 5010 Switches that support Fiber Channel over Ethernet

Cisco Nexus 7010 Switches to connect to the IP network and Cisco MDS 9509 Multilayer Director to connect to the SAN

Benefit

Capital cost savings and investment protection

Simplified cable management and more convenient maintenance

Reduced power consumption and cooling efficiency

Support for high-bandwidth and latency-sensitive applications

University of Arizona

“Our old data center fabric architecture was a shortcoming that we repeatedly had to design around. With users as tech-savvy as ours, the demands on our data center constantly grow and shift. The Cisco Nexus architecture is an enabler, empowering our department to focus on our primary mission, which is to provide the richest user experience possible.”

Derek Masseth, Senior Director for Infrastructure Services, University of Arizona

University of Salerno

Next-generation data center improves education services

Challenge

Meet the demand for more and better computer services and applications

Increase access to educational resources without increasing risk to system security

Solution

Cisco Data Center 3.0

Cisco routing and switching

Cisco Catalyst 6500 Series Firewall Services Module

Cisco MDS 9500 Series Multilayer Directors

Benefit

Increased education application performance by 30 percent

Improved access to educational resources without compromising security

Simplified and reduced the cost of data center operations

Reduced data center carbon footprint

University of Salerno

“Cisco’s data center vision and its networking technology are playing a critical role in enabling the University to deliver better, faster and more efficient services that further enhance education.”

Salvatore Ferrandino, IT Manager, University of Salerno

University of Naples

Bringing R&D to market faster with high-performance computing

Challenge

Maintain a reputation as a leading scientific research and development center

Increase the potential to attract new funding and investment in innovation

Use existing computing resources more effectively

Solution

Cisco SFS 7000 Series InfiniBand Server Switches

Cisco SFS 3012 Multifabric Server Switch

CiscoMDS 9500 Series Multilayer Directors

CiscoMDS 9100 Series Multilayer Fabric Switches

Benefit

Creates a world-class, high-performance computing environment for faster, more efficient research

Able to bring new research and development to market faster

Allows the university to take on more research and development projects

Helps attract more inward investment and increases new research funding

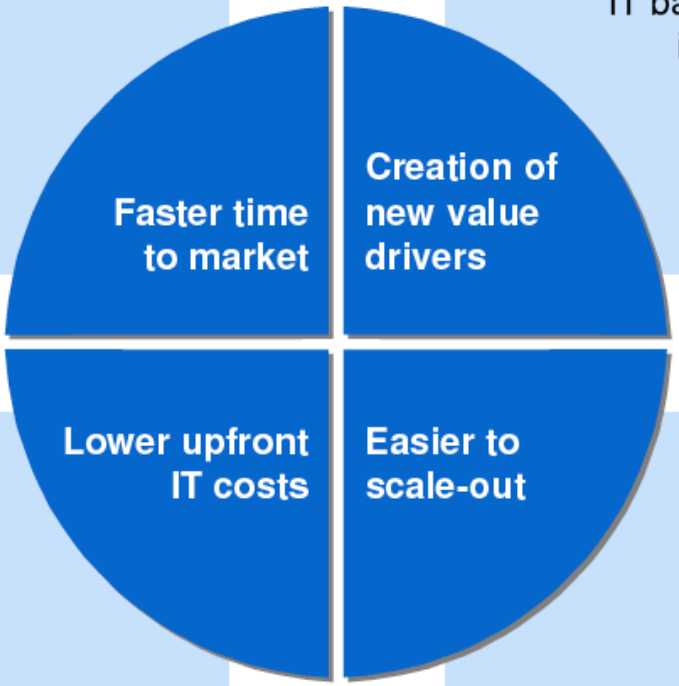
University of Naples

"We feel that Cisco's vision and attitude toward research is compelling and that the SCoPE networking solution will deliver real value to the University because it is enabling us to tackle business pressures—like securing funding and bringing research to market faster—by consolidating, virtualizing, and automating our computing resources to make them more efficient and cost effective."

Francesco Palmieri, Telecommunication Systems Director, Federico II University of Naples

Cloud computing has tremendous promise

- Clouds can provide an almost immediate access to hardware resources
- No upfront capital investments for users

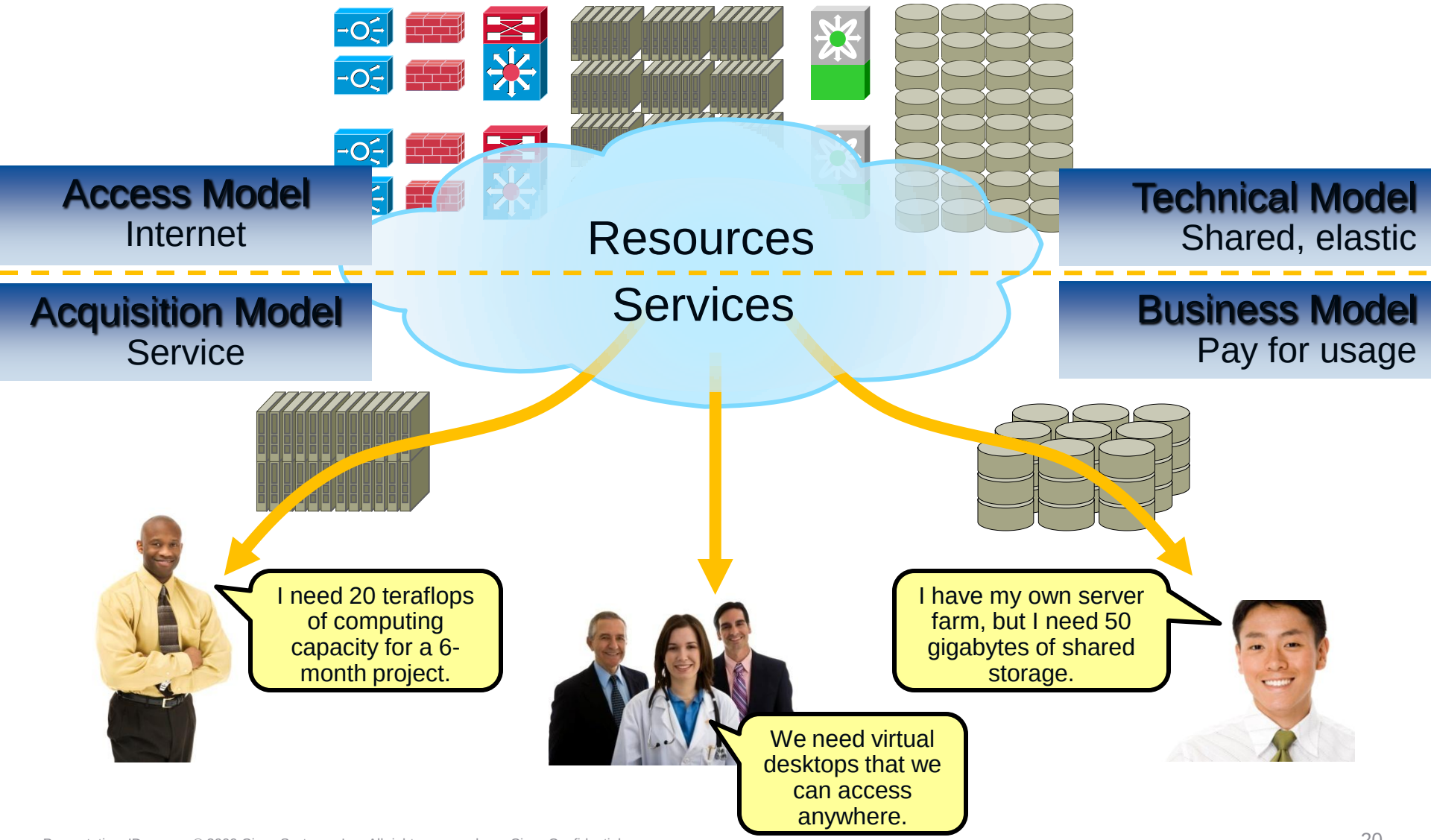


- Cloud computing can lower IT barriers to innovation and increase interoperability between disjoint technologies. HP's CloudPrint service is an example

- Pay-per-use billing dramatically reduces upfront costs

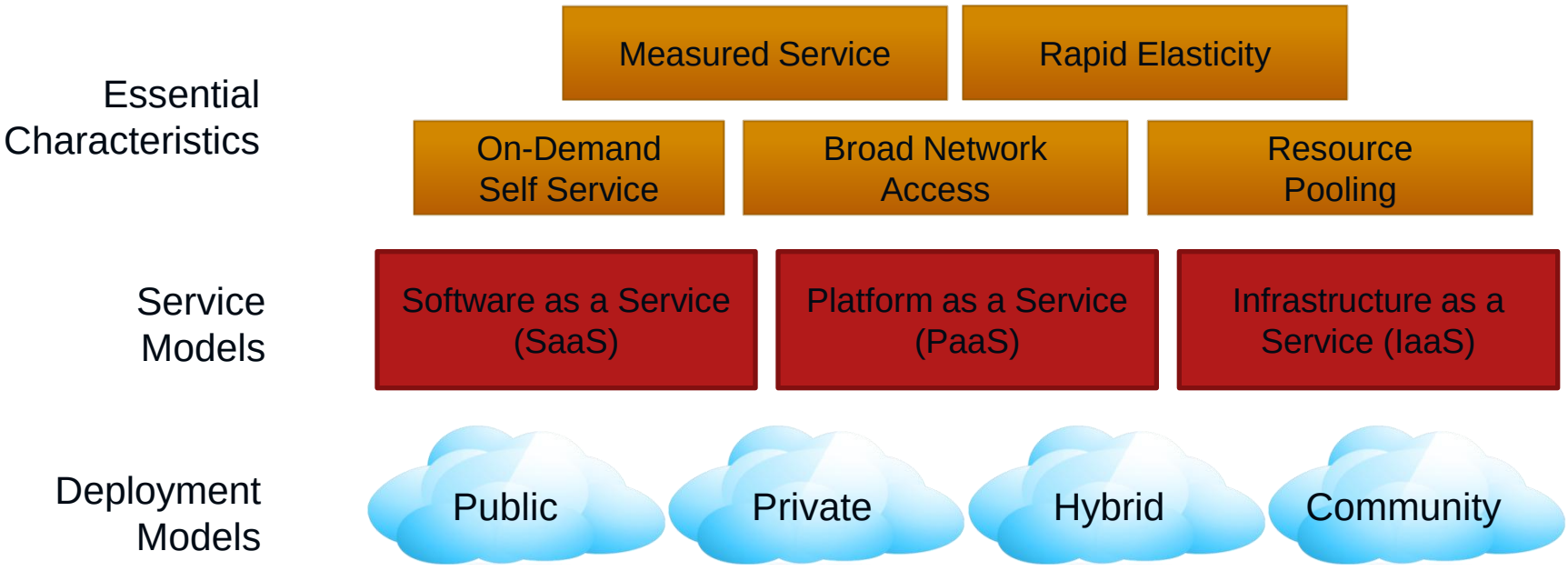
- Enterprises of all sizes can seamlessly scale their services in correlation with client demand

What does Cloud Computing mean for me?
Utility Computing or Subscription



What is Cloud Computing?

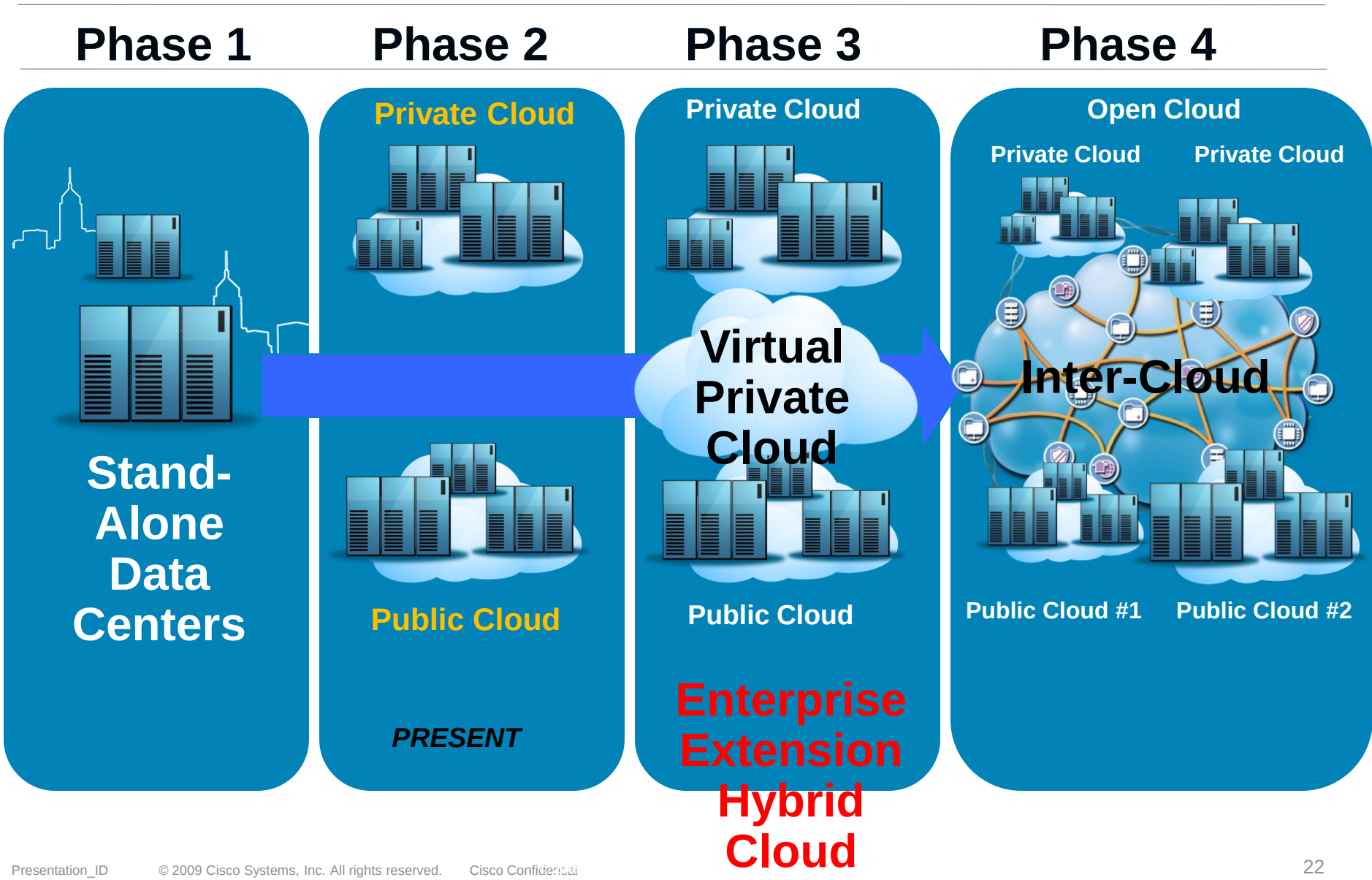
Visual Model of NIST's Working Definition of Cloud Computing



http://www.csrc.nist.gov/groups/SNS/cloud-computing/index.html

IT resources and services that are abstracted from the underlying infrastructure and are provided "On-Demand" and "At Scale"

Deployment Models – Private, Public, Hybrid



ECONOMICS OF CLOUD COMPUTING: PUBLIC VS PRIVATE

Simple Cost Calculation – Static Scenario

The Elastic Compute Unit (ECU) was introduced by Amazon EC2 as an abstraction of compute resources. Amazon's Definition of ECU notes "We use several benchmarks and tests to manage the consistency and predictability of the performance of an EC2 Compute Unit. One EC2 Compute Unit provides the equivalent CPU capacity of a 1.0-1.2 GHz 2007 Opteron or 2007 Xeon processor. This is also the equivalent to an early-2006 1.7 GHz Xeon processor referenced in our original documentation"

Amazon EC2		
Extra-large standard instance	1	
ECU / instance	8	
ECU	8	* http://aws.amazon.com/ec2/#instance
Price	0.8	$ / (extra-large standard instance * hour)
Additional services	0.2	* assumed to be additional 25% of the ECU price
Total costs	**0.125**	$ / (ECU * hour)

On-Premise		
Servers	1	Quad Core Intel Xeon 5405
ECUs / server	8	Quad Core Intel Xeon 5405
ECU	8	
Price / server	1700	Quad Core Intel Xeon 5405
Additional infrastructure	850	* assumption: 50% of server costs
CapEx	850	$ / year (straight line depreciation over 3 years, no discounting)
CapEx / hour	0.10	$ / hour
Power	213	* assumption: 25% of infrastructure costs / year
IT management	85	* assumption: 10% of infrastructure costs / year
Network fees	85	* assumption: 10% of infrastructure costs / year
OpEx	383	$ / year
OpEx / hour	0.04	$ / hour
Total costs	**0.0175**	$ / (ECU * hour)

Source: Forschungszentrum Informatik, Germany

Taking into Account Utilization

- EC2 costs 12.5c/(ECU hr)

  Assume 100% utilization

- On-Prem costs 1.75c/(ECU hr)

  Break-even at 14% utilization

- Like buying a car, it depends…

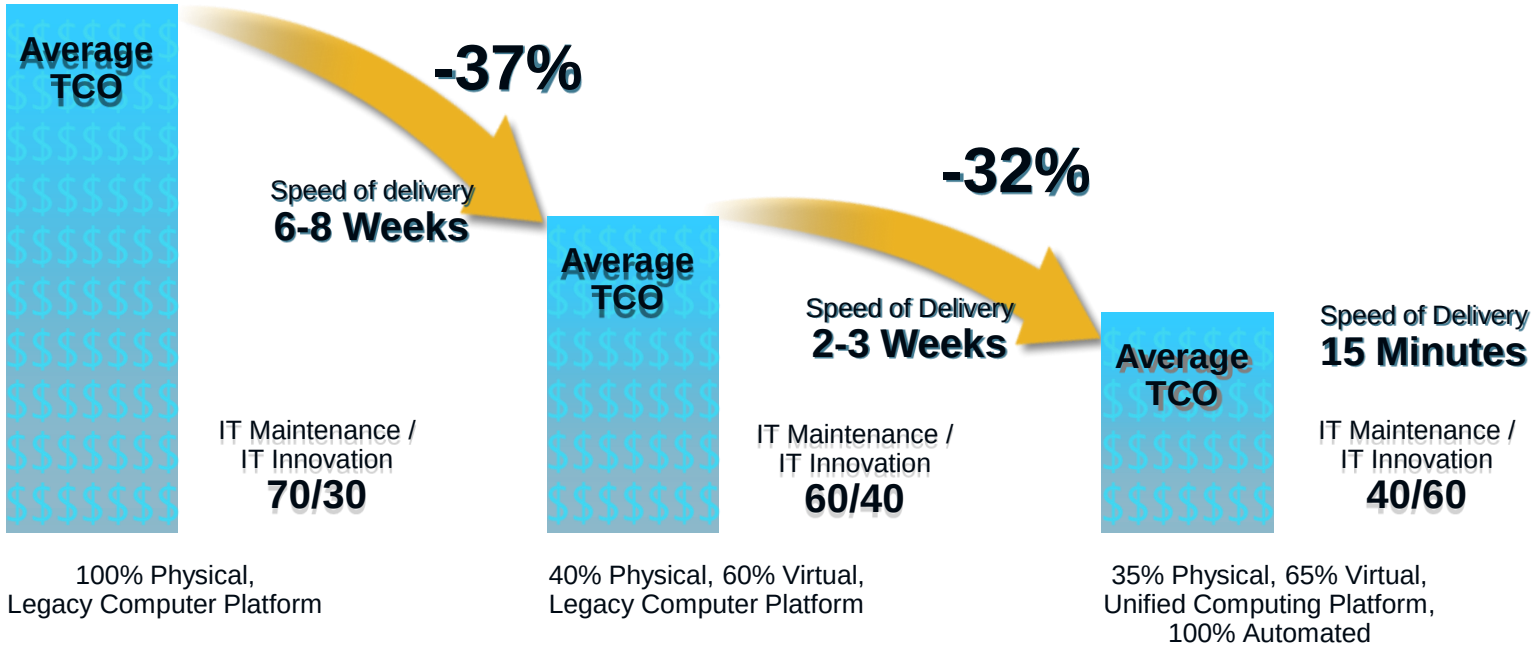
  “When making a 'lease or buy' decision you must look not only at financial comparisons but also at your own personal priorities — what's important to you.”

  - Leaseguide.com

BUILDING THE PRIVATE CLOUD/ PUBLIC CLOUD

Cisco IT Elastic Infrastructure Services (CITEIS): Journey to the Private Cloud

Cisco-on-Cisco Results: ROI Achieved by Cisco IT



Trusted Cloud: The Best Of Both Worlds

Trusted

Control

Reliable

Secure

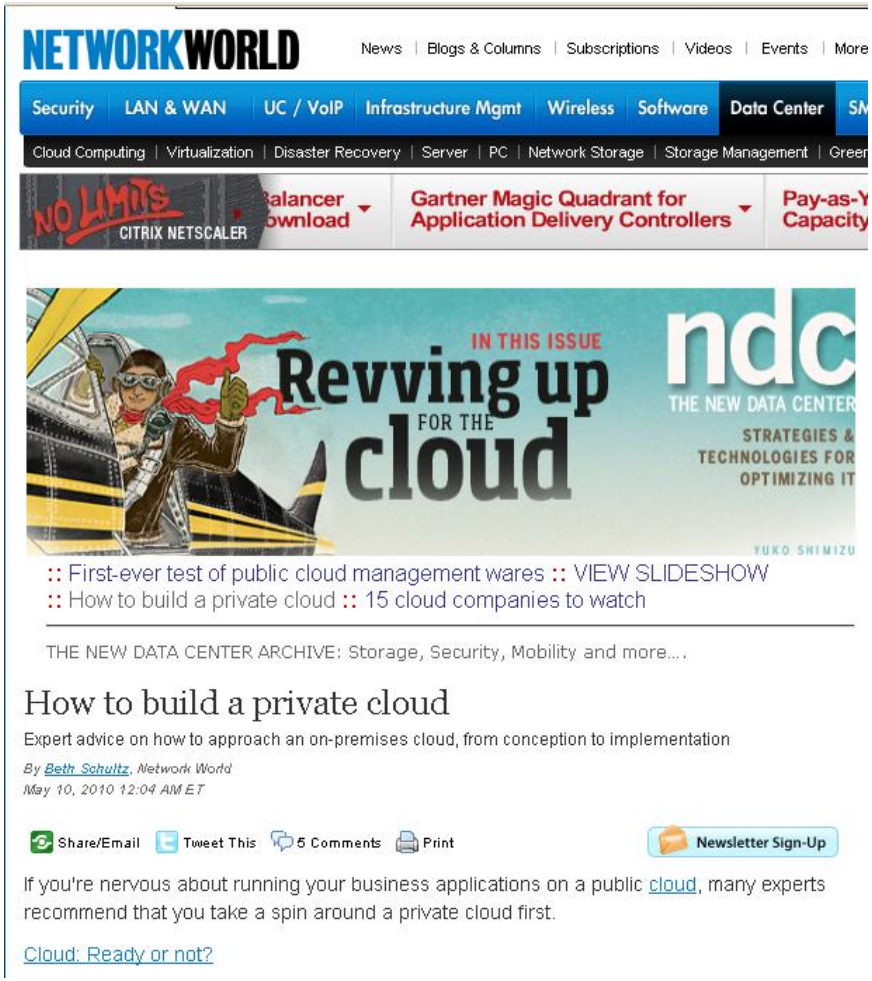
Flexible

Dynamic

On-demand

Efficient

Network World: How to Build a Private Cloud
May 10, 2010



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IN THIS ISSUE

Revving up FOR THE cloud

ndc THE NEW DATA CENTER

STRATEGIES & TECHNOLOGIES FOR OPTIMIZING IT

YUKO SHIMIZU

:: First-ever test of public cloud management wares :: VIEW SLIDESHOW
:: How to build a private cloud :: 15 cloud companies to watch

THE NEW DATA CENTER ARCHIVE: Storage, Security, Mobility and more....

How to build a private cloud

Expert advice on how to approach an on-premises cloud, from conception to implementation

By Beth Schultz, Network World
May 10, 2010 12:04 AM ET

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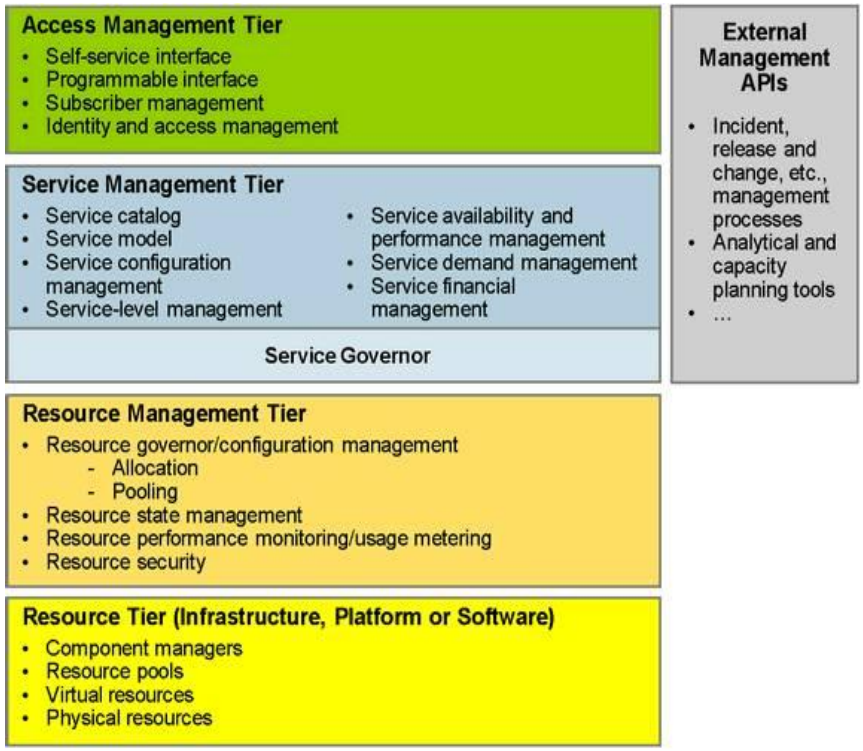
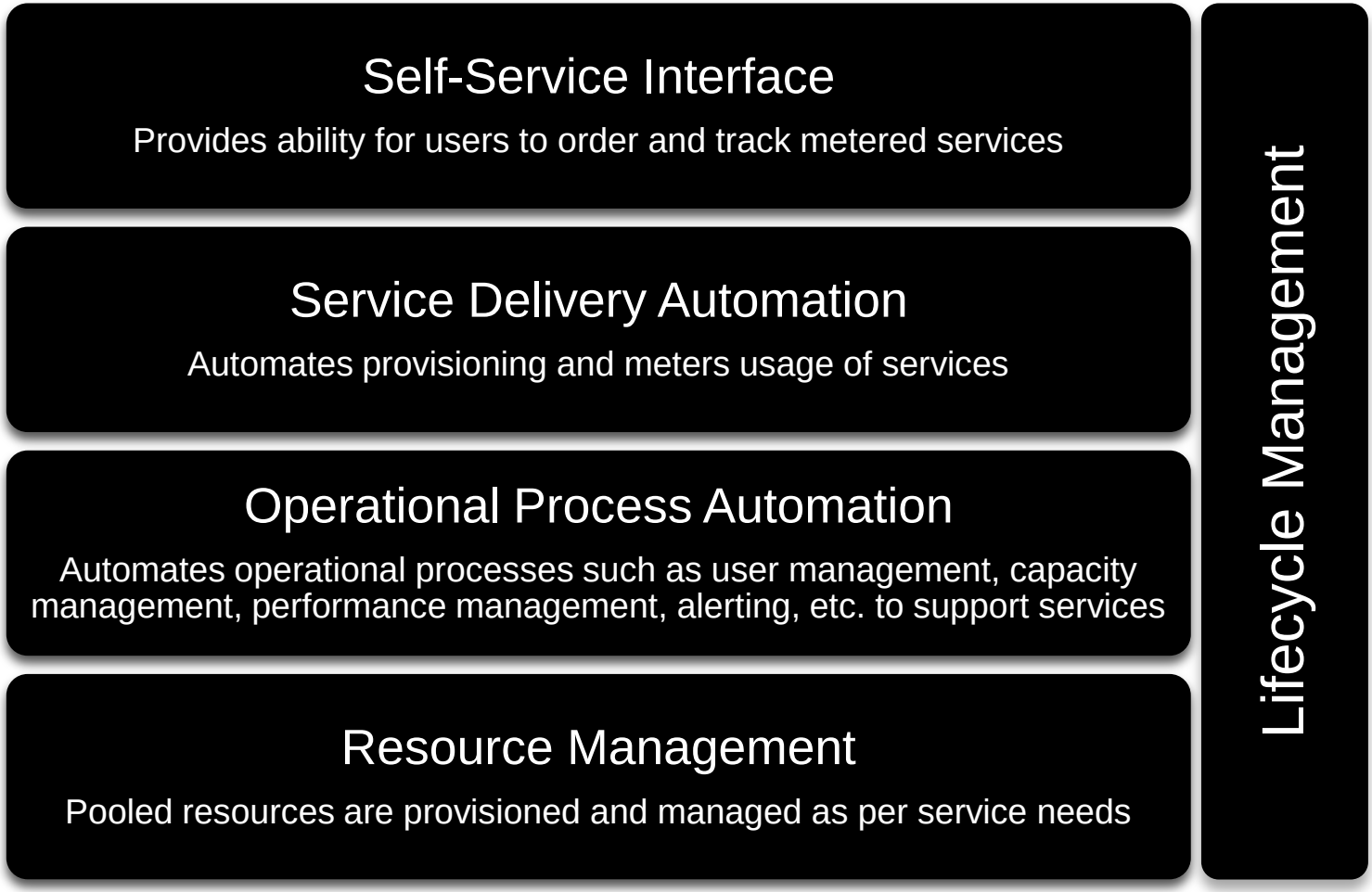
If you're nervous about running your business applications on a public cloud, many experts recommend that you take a spin around a private cloud first.

Cloud: Ready or not?

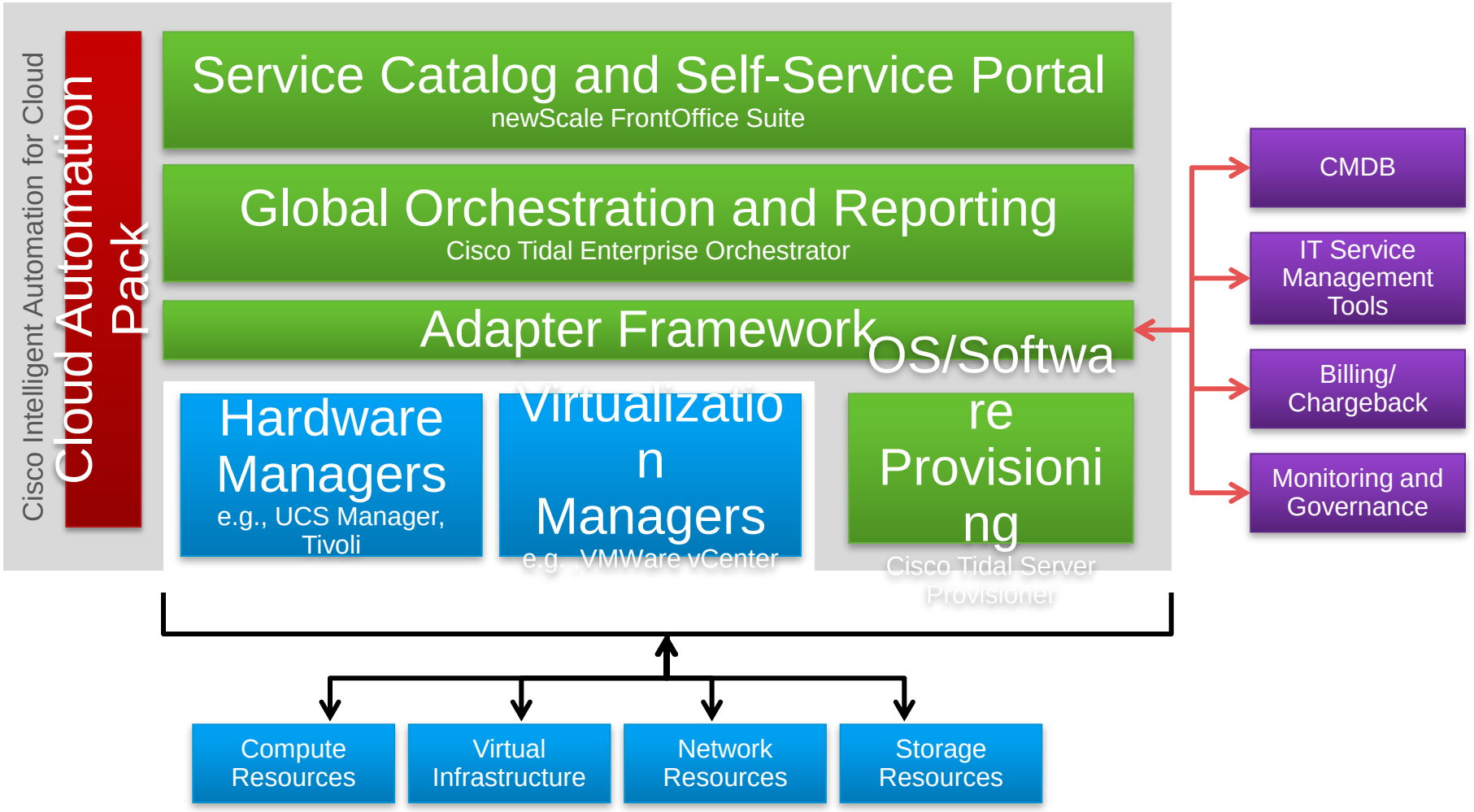


"It begins with data center consolidation, rationalization of OS, hardware and software platforms, and virtualization up and down the stack – servers, storage and network"
-Joe Tobolski, director of cloud computing at Accenture

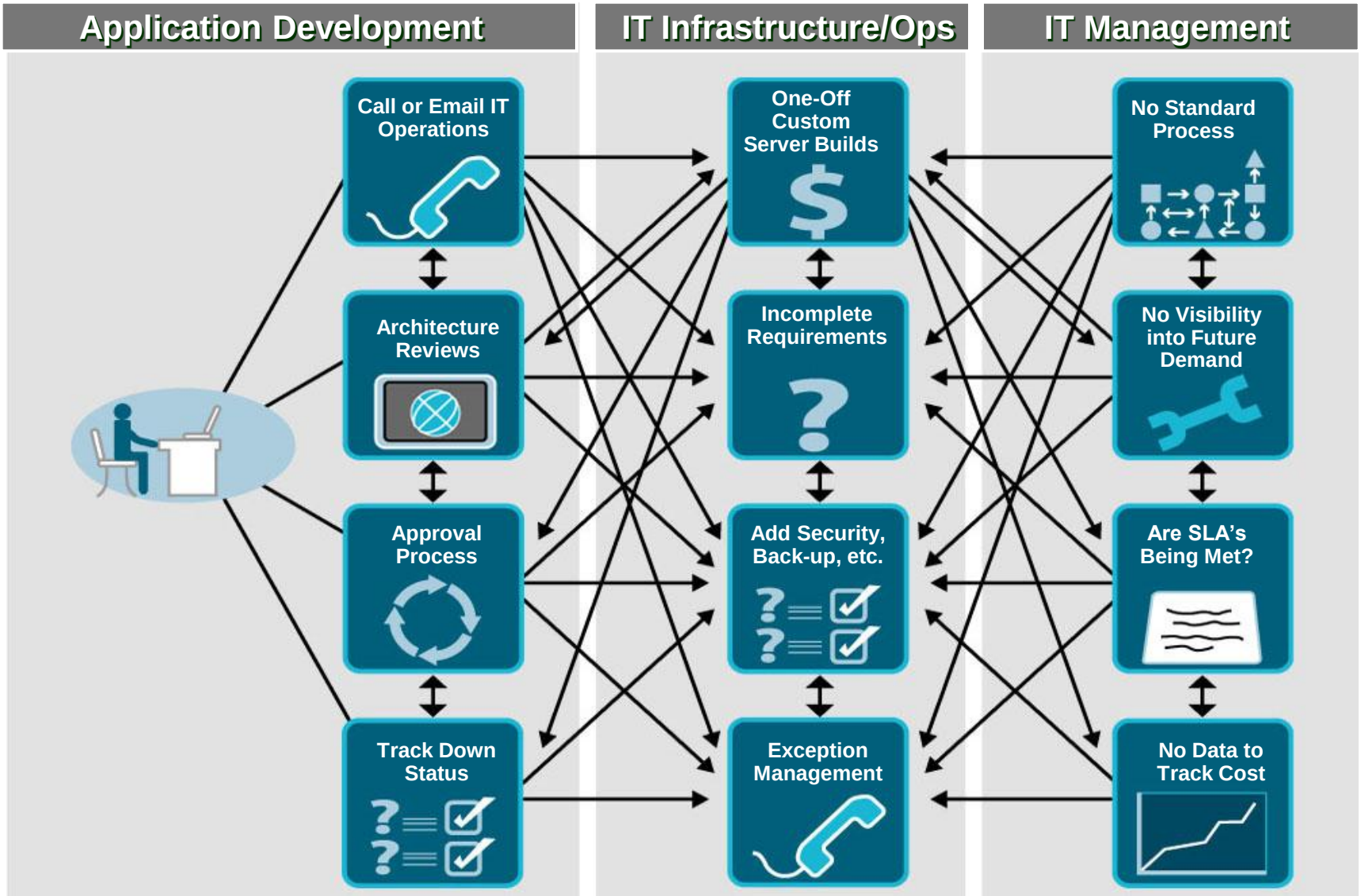
Elements of Private Cloud Computing



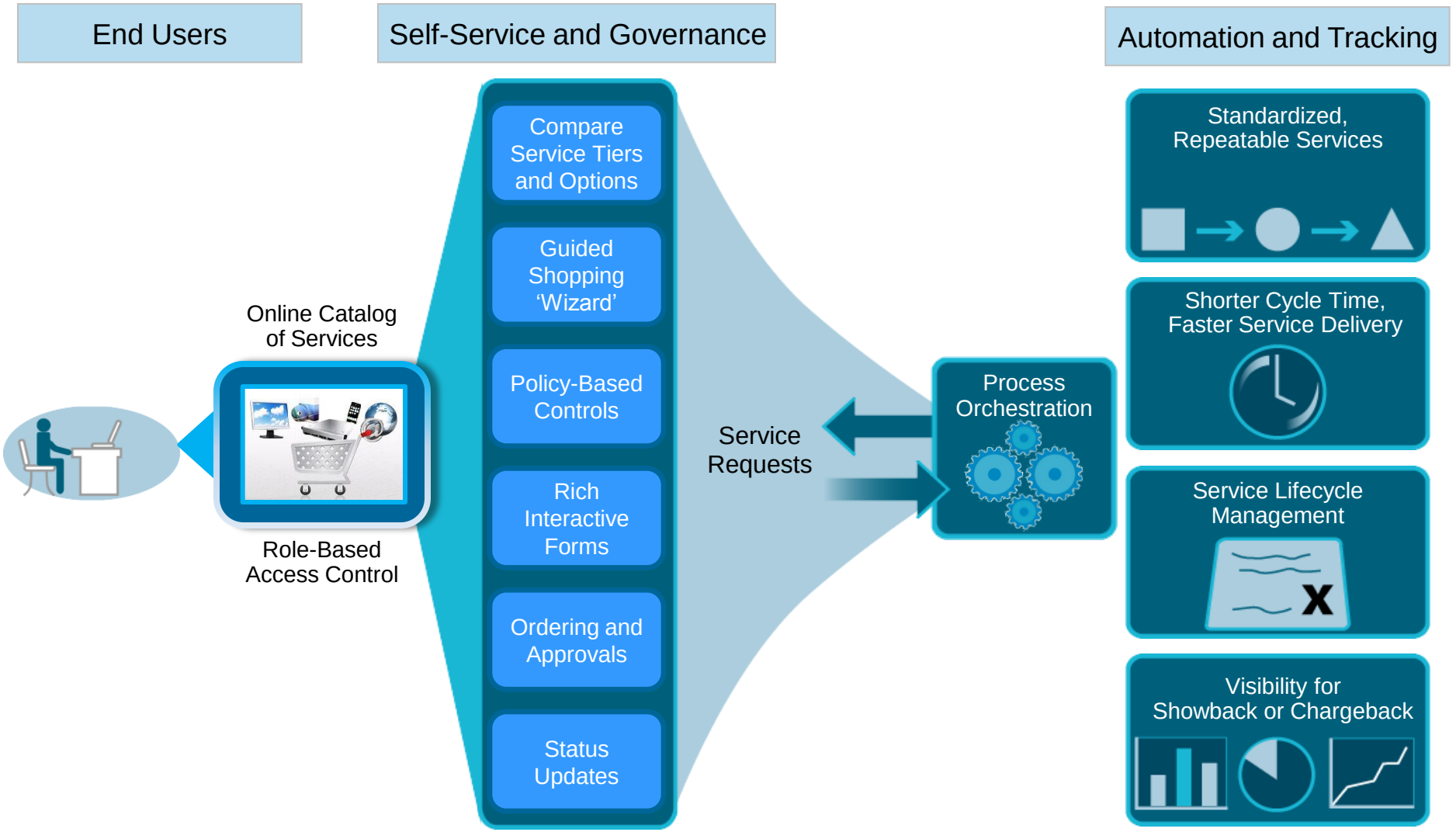
Cisco Intelligent Automation for Cloud



Existing Provisioning Process – Complex, Time-Consuming, Expensive

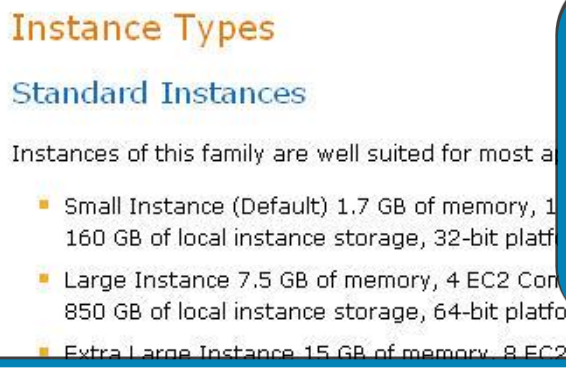


Potential Customer Future State

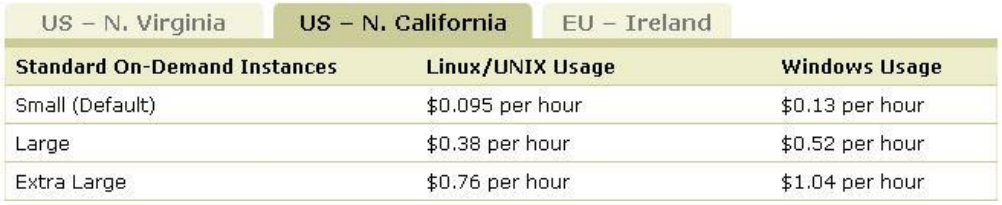


Amazon EC2 Sets the Bar for Enterprise IT

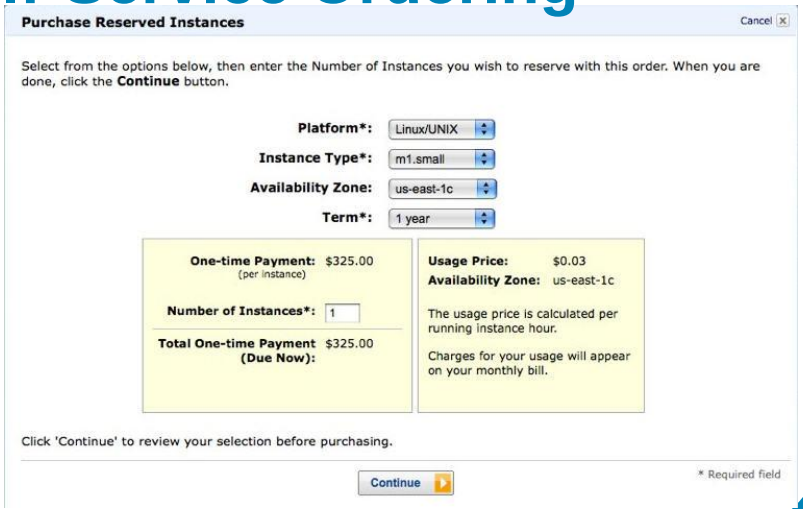
Standard Offerings



Pricing Options



Self-Service Ordering



Billing

Windows Application Hosting

Overview Compare

Tier 1- Gold

Physical
Secure, Reliable

Mission Critical

Tier 2- Silver

Virtual
Any Time Access

Business Relevant

Tier 3- Bronze

Internal Cloud
Ready, Safe, Fast

Development & Test

Server Size	Large	Medium	Small
Availability	99.99%	99.90%	98.00%
Hours of Unavability	.876	8.76	175.2
Time to Provision (days)	10	1	1
Level 1 Monitoring*	Included	Included	Included
Storage	SAN Array 1TB	NAS 1000 GB	NAS 500 GB

Comparative Pricing

Cisco's Cloud Strategy

Enterprise Network

- Cloud-Enabling Infrastructure
- Unified Computing
- Unified Fabric

Network Services

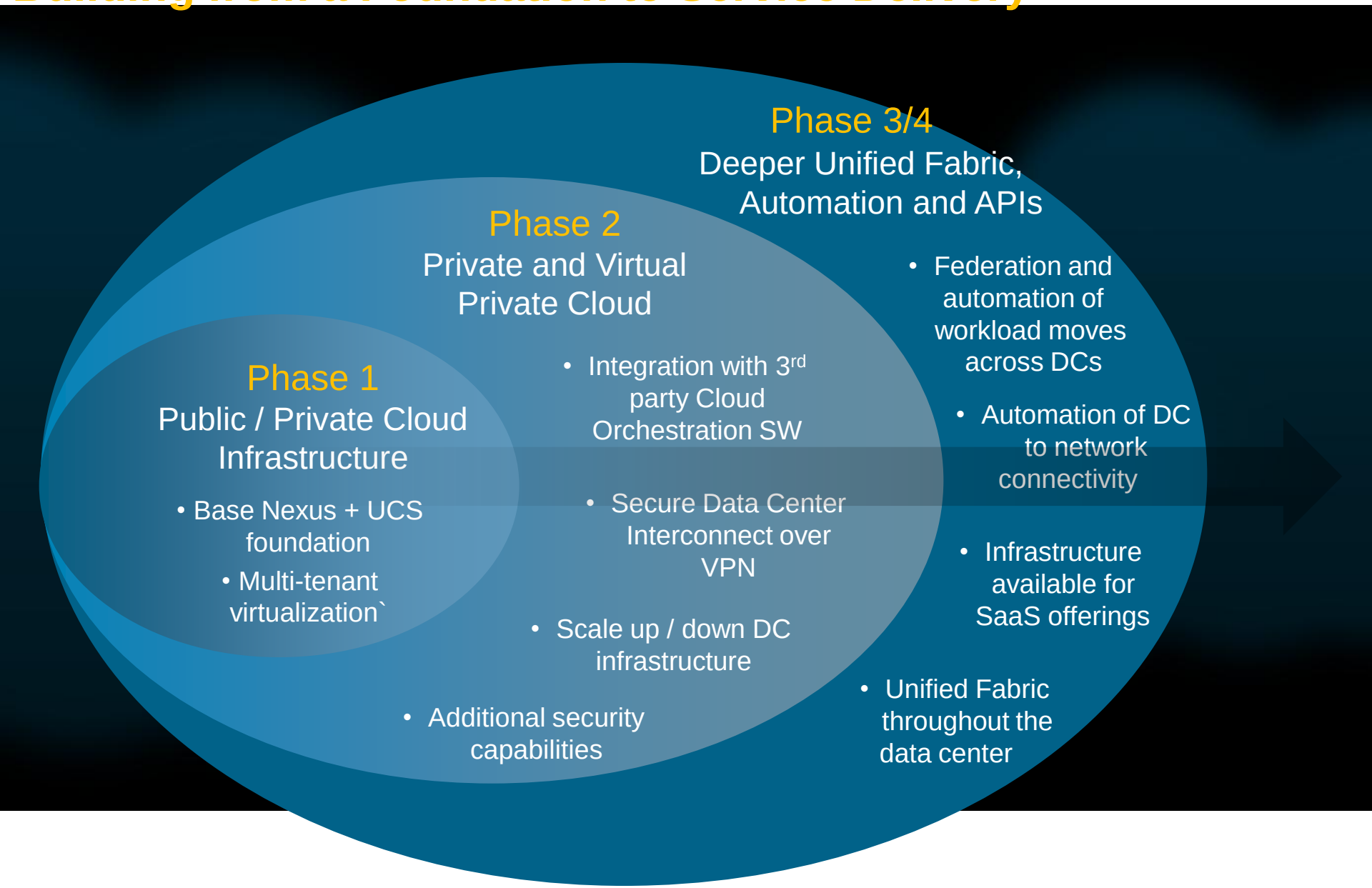
- IP-NGN
- CSR
- Security

Service Provider Cloud

- Unified Service Delivery
- IaaS/SaaS Solutions

Innovation ▪ Open Standards ▪ Ecosystem Development

Cloud Systems Plan
Building from a Foundation to Service Delivery



Key Trends Impacting the Data Center

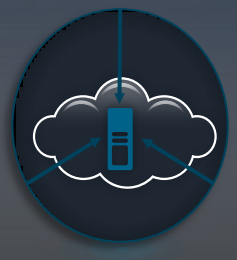
The need to reduce costs and/or maximize profits

IT as business enabler

Applications availability

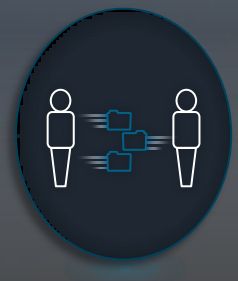
Drive for Green—power, cooling and space

Server virtualization — higher performance



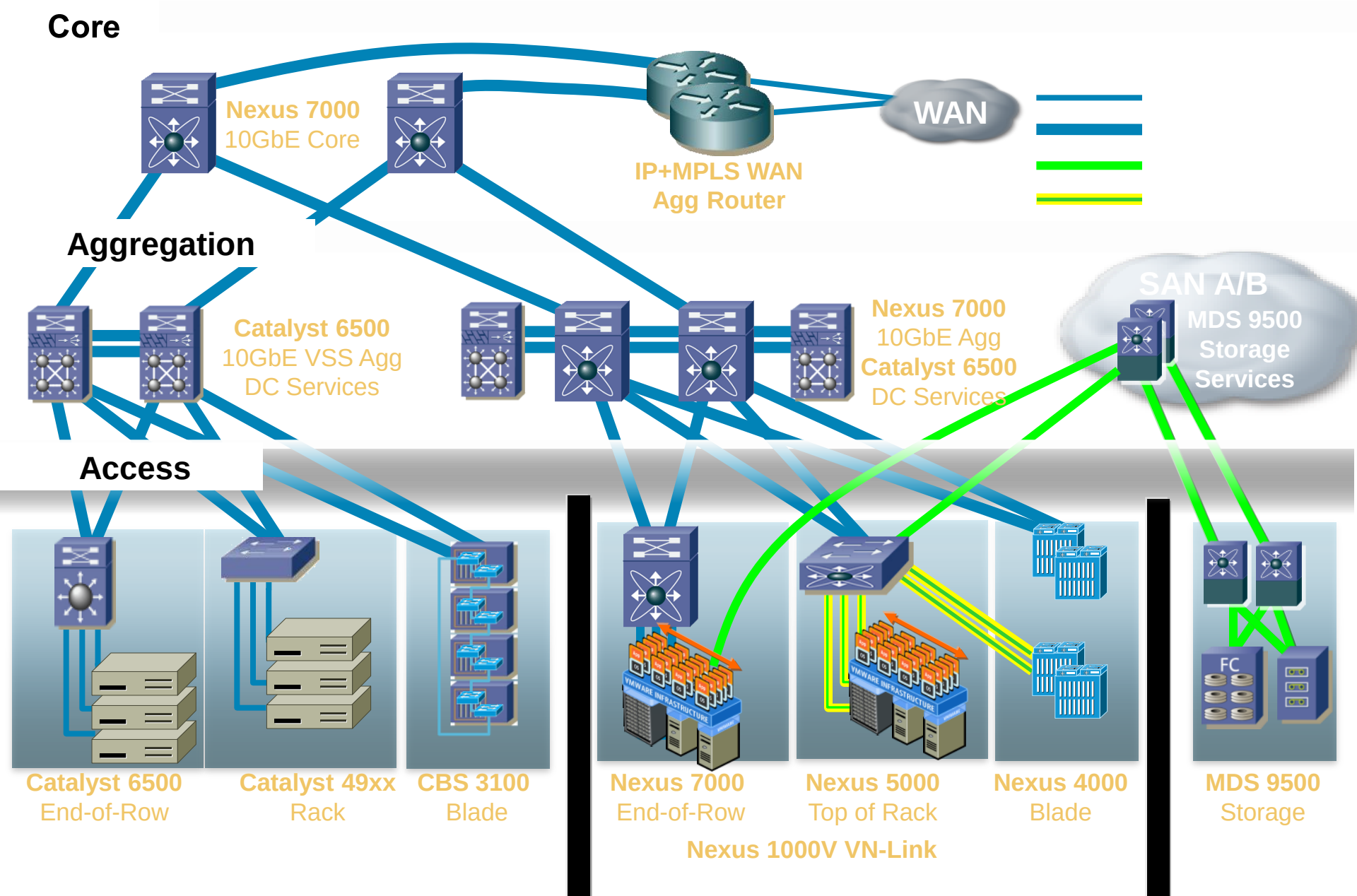
LAN and Storage convergence

VM-Level awareness

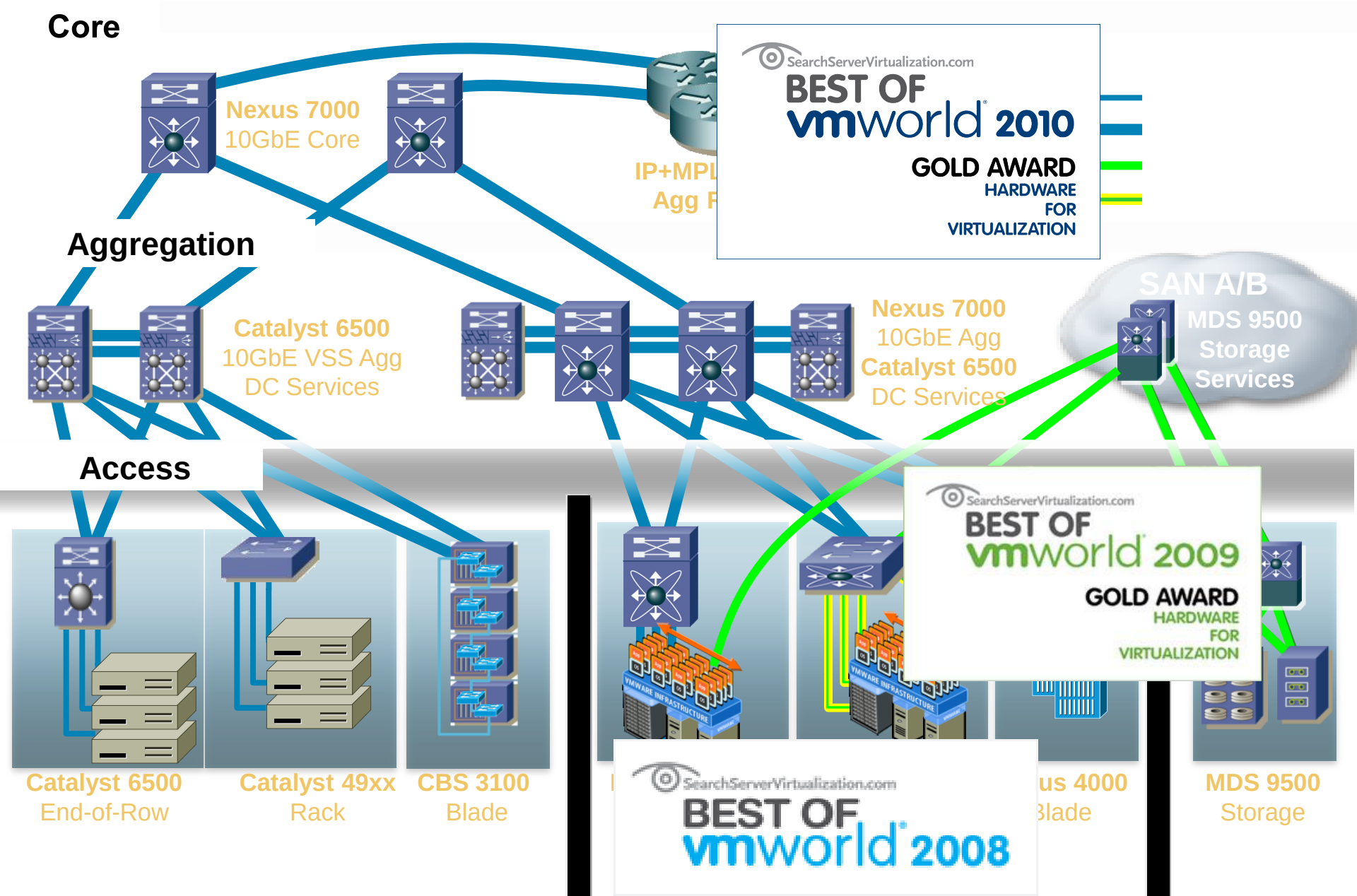


Workload provisioning

Cloud Network Architecture



Cloud Network Architecture

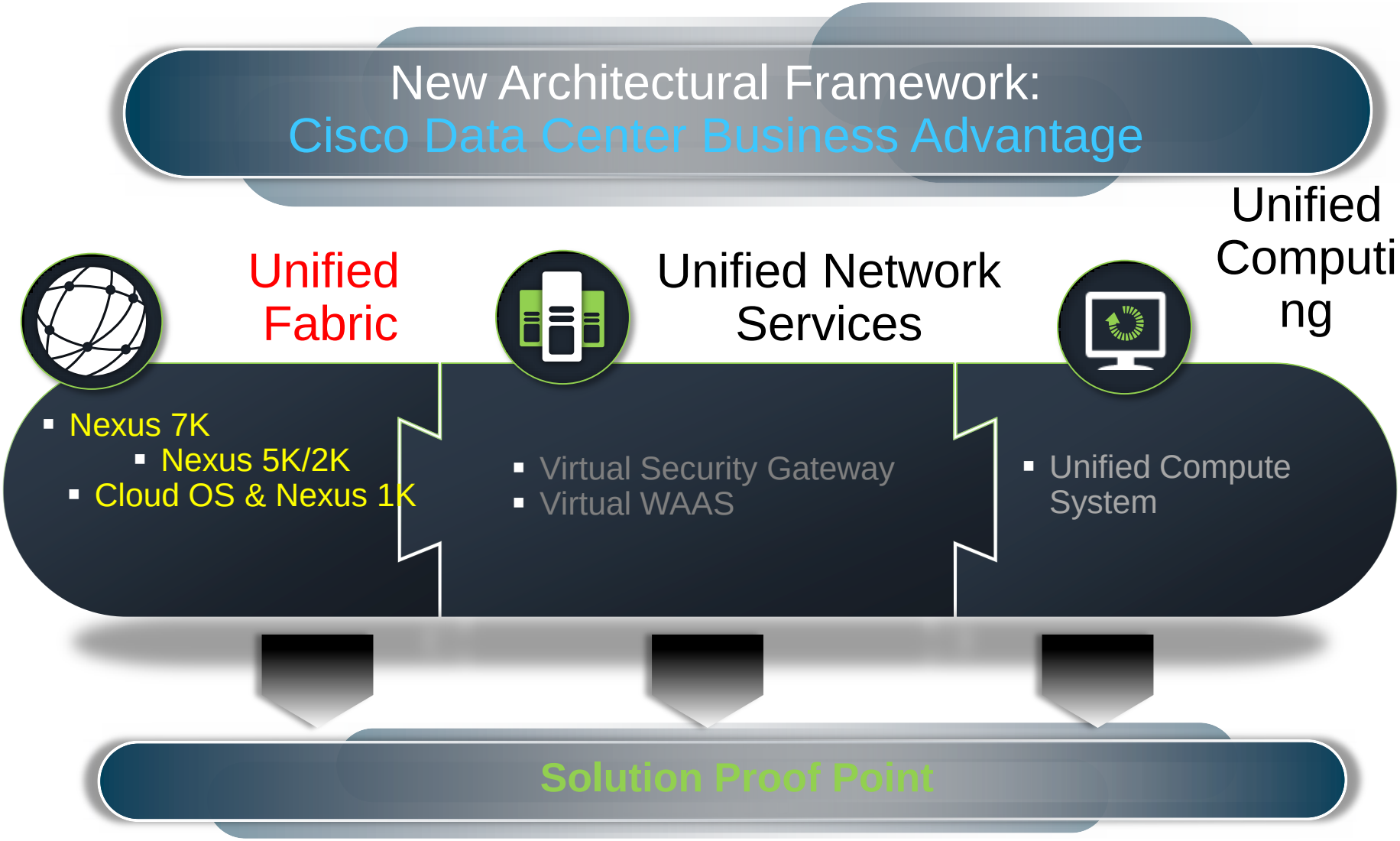


Category: New Technology
Winner: Cisco Systems Inc. for Cisco Nexus 1000V/Cisco VN-Link/NX-0S 4.1

Category: Hardware for Virtualization
Gold: Cisco Systems Inc., Unified Computing System

Category: Hardware for Virtualization
Gold: Cisco Systems Inc., OTV Nexus 7000

Data Center Business Advantage



Cisco Unified Fabric
Continued Architectural Innovation

CONVERGENCE

SCALE

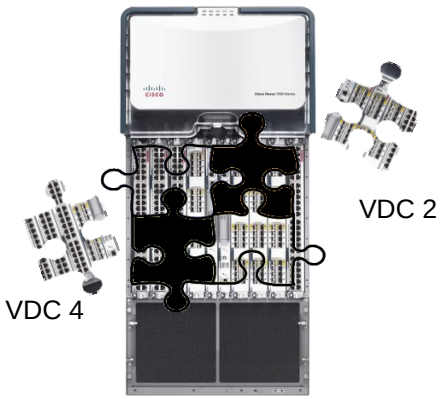
INTELLIGENCE

New!

Unified Ports	Dynamic Convergence Ports
DCB/FCoE	Consolidated I/O
FEX-link	Simplified Management
FabricPath	Flexibility and Scale
OTV	Workload Mobility
vPC	Active-Active Uplinks
VN-Link	VM-Aware Networking
VSG	Secure Virtual Network Services
VDC	Virtualizes the Switch

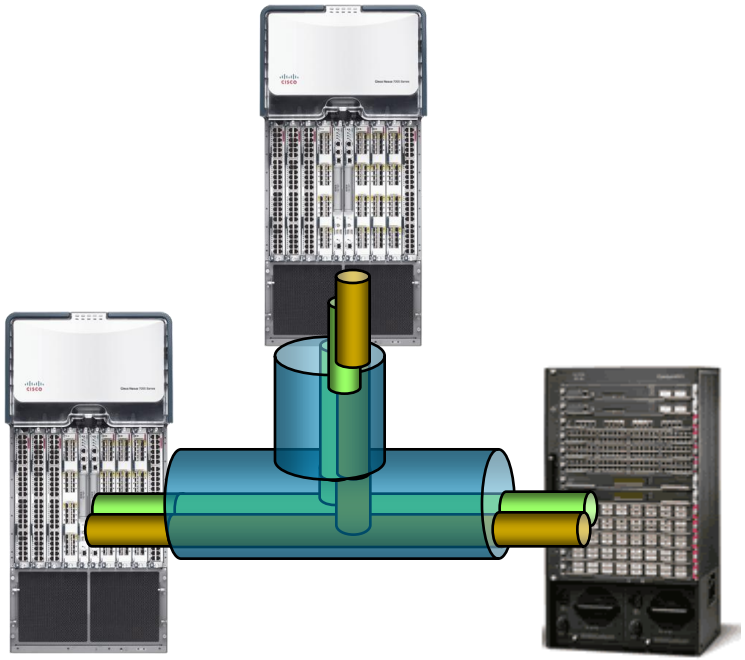
Network Virtualization Methods

Device Partitioning



- VDCs
- Reduced number of physical switch

Virtualized Interconnect



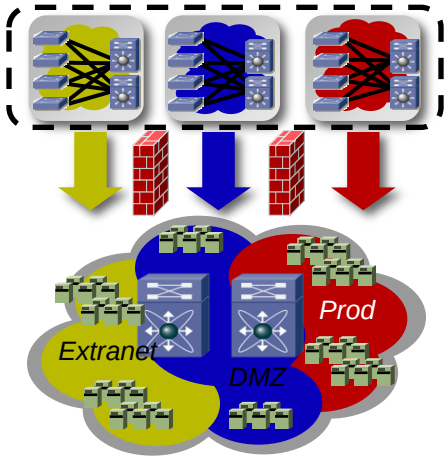
- OTV*
- Extend L2 across multiple site
- Easy deployment

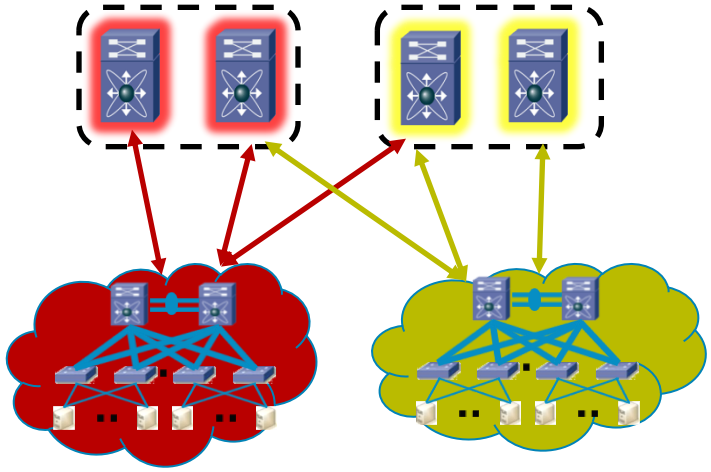
Device Pooling

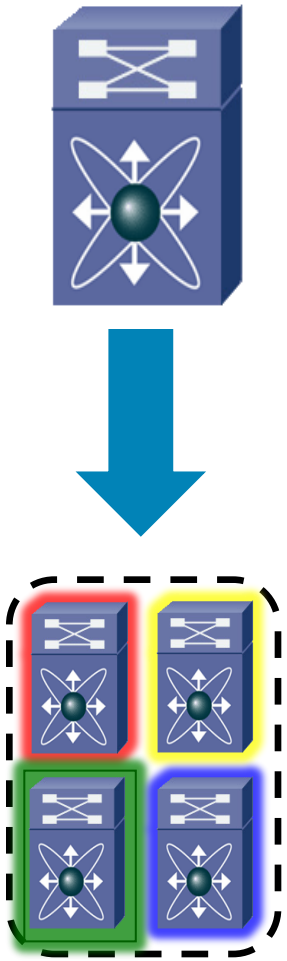
- Virtual Port Channel
- Fabric Path TRILL
- Build Mega site

Virtual Switches

- One physical switch can act as multiple virtual switches
  - Reduces the number of physical switches in the network, lowers capex and power
- Applications Include separating Networks, Isolating Security Domains using the same physical switch

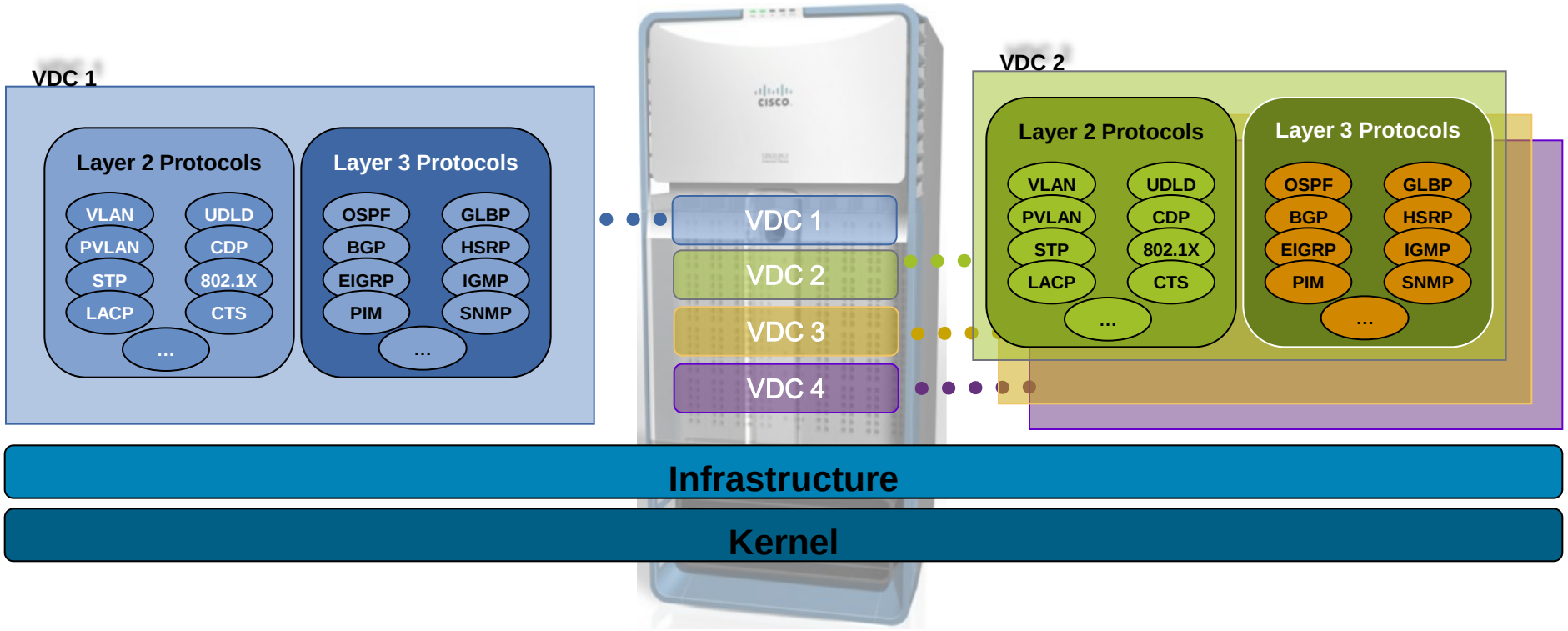






- Note: Should not be used for dual homing high availability. Physical redundancy is more robust

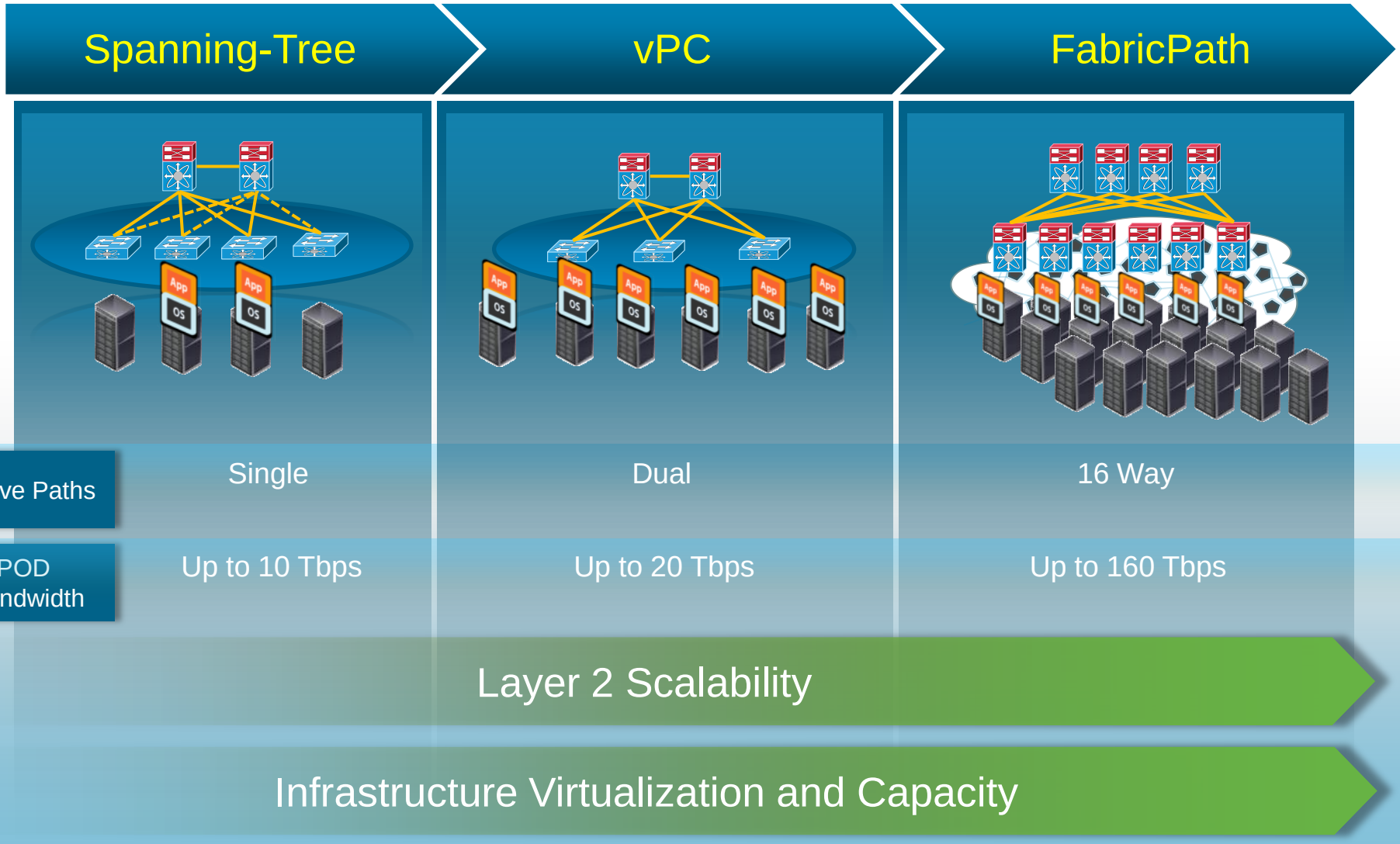
Nexus 7000 Virtualization with VDCs



VDC – Virtual Device Context

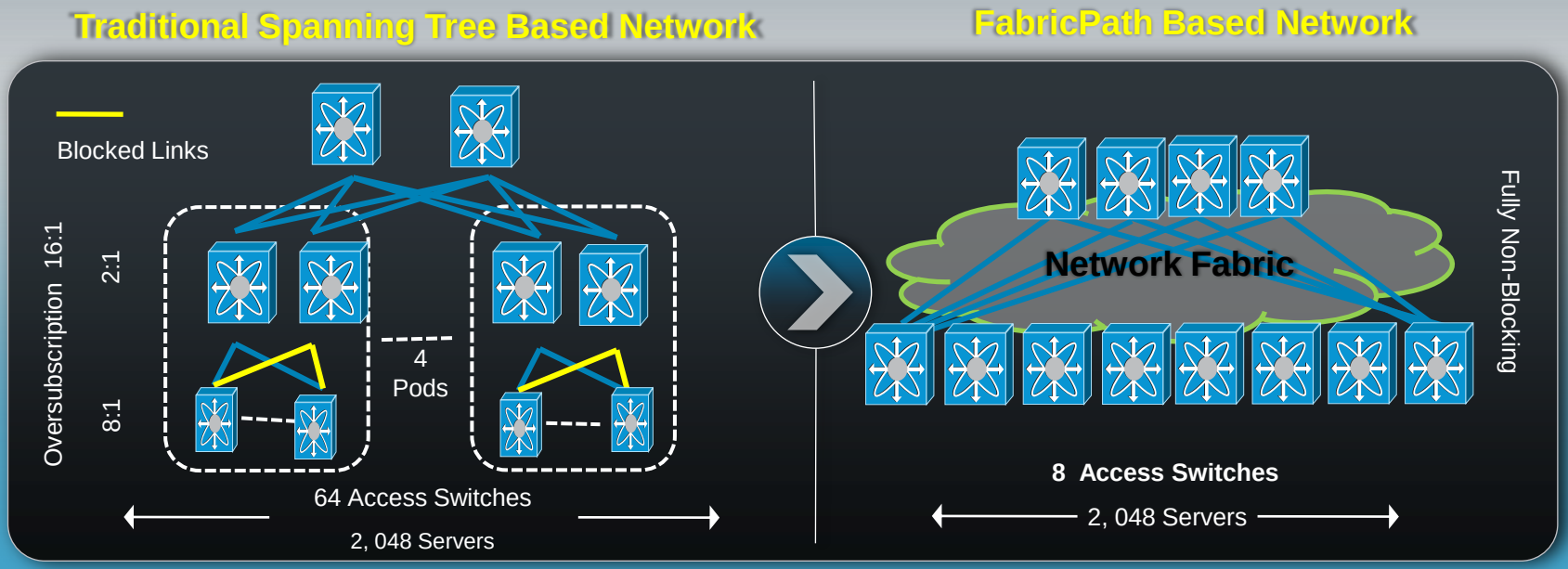
- Flexible separation/distribution of hardware resources and software components
- Complete data plane and control plane separation
- Complete software fault isolation
- Securely delineated administrative contexts
- Forwarding engine scalability with appropriate interface allocation

Architecture Flexibility Through NX-OS



Scaling Bandwidth with FabricPath
Example: 2,048 X 10GE Server

- 16X improvement in bandwidth performance
- From 74 managed devices to 12 devices
- 2X+ increase in network availability
- Simplified IT operations



SearchServerVirtualization.com
BEST OF vmworld 2010
GOLD AWARD
HARDWARE FOR VIRTUALIZATION

OTV wins Best of VMworld 2010 Gold Award

We are thrilled to announce that **Cisco Nexus 7000** won the prestigious Best OF VMworld 2010 award in the **Hardware for Virtualization** category for **Overlay Transport Protocol (OTV)**.

The panel of judges for the Best of VMworld 2010 awards was a mix of industry experts, IT consultants and TechTarget editors. 200 entrants were scored on innovation, the value provided by the product, performance, reliability and ease of use.

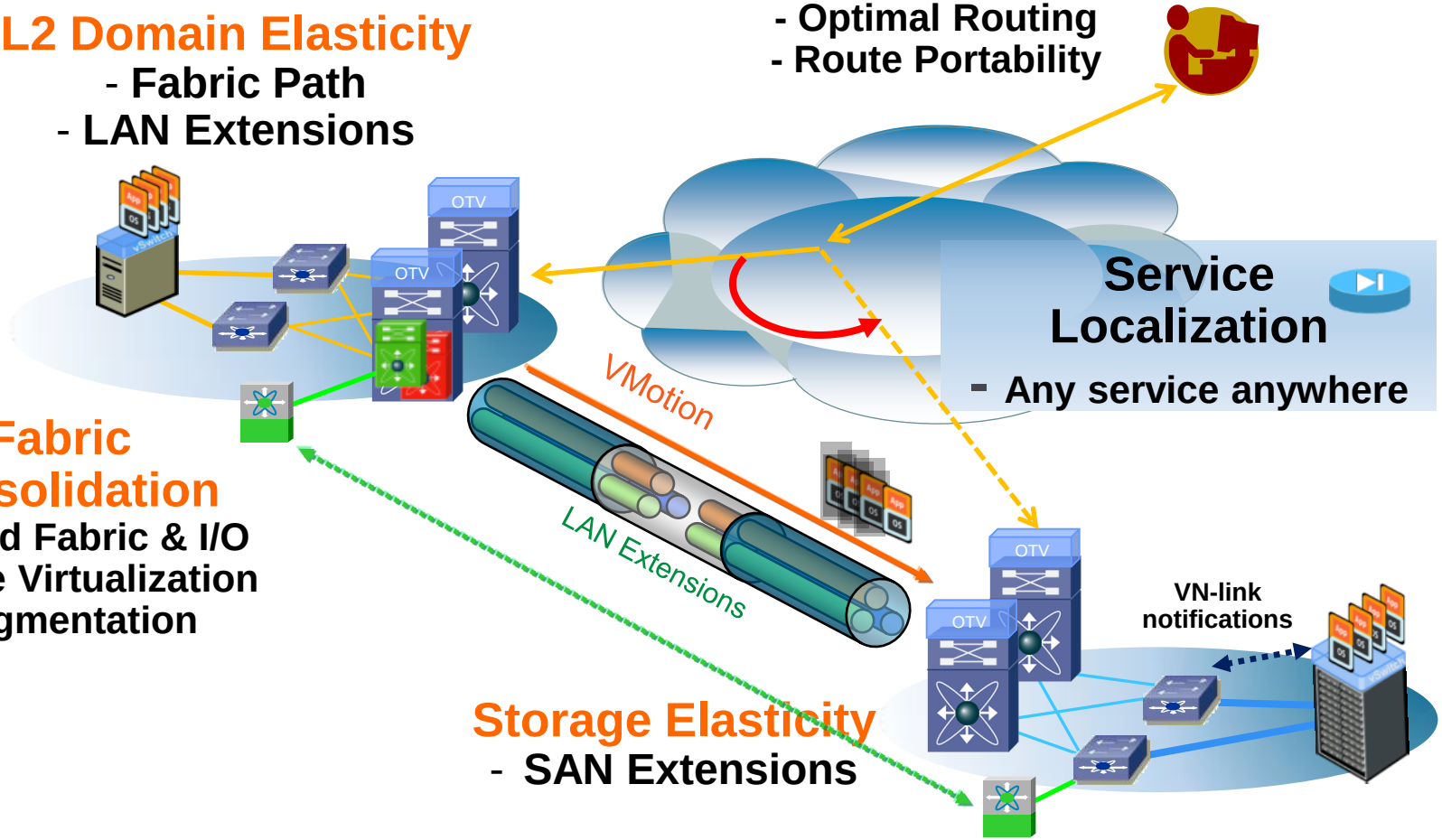
What the judges said: "*Cisco Nexus 7000 Overlay Transport Virtualization lets you extend data networks across data centers, which has tremendous benefits for multi-site disaster recovery.*"

Go here for more information about the award
Best of VMworld 2010 Awards

DCI Connectivity Requirements
Connecting Virtualized Data Centers

L2 Domain Elasticity
- Fabric Path
- LAN Extensions

IP localization
- Optimal Routing
- Route Portability



Service Localization
- Any service anywhere

Fabric Consolidation
- Unified Fabric & I/O
- Device Virtualization
- Segmentation

Storage Elasticity
- SAN Extensions

VM-awareness
- VN-link intelligence

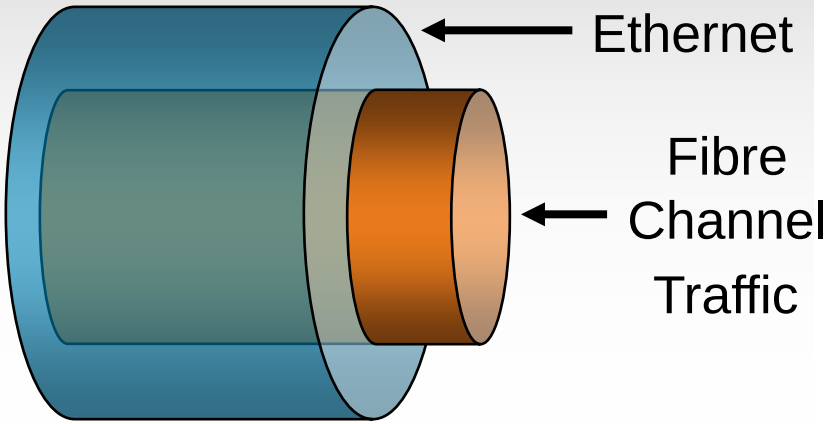
Unified Fabric over Ethernet
Technologies & Standards

IEEE DCB

- Priority Flow Control IEEE 802.1Qbb creates lossless Ethernet with classes of service
- Bandwidth Management IEEE 802.1Qaz allows flexible bandwidth sharing for LAN and SAN
- Data Center Bridging Exchange Protocol IEEE 802.1Qbb provides device-device communication on resources

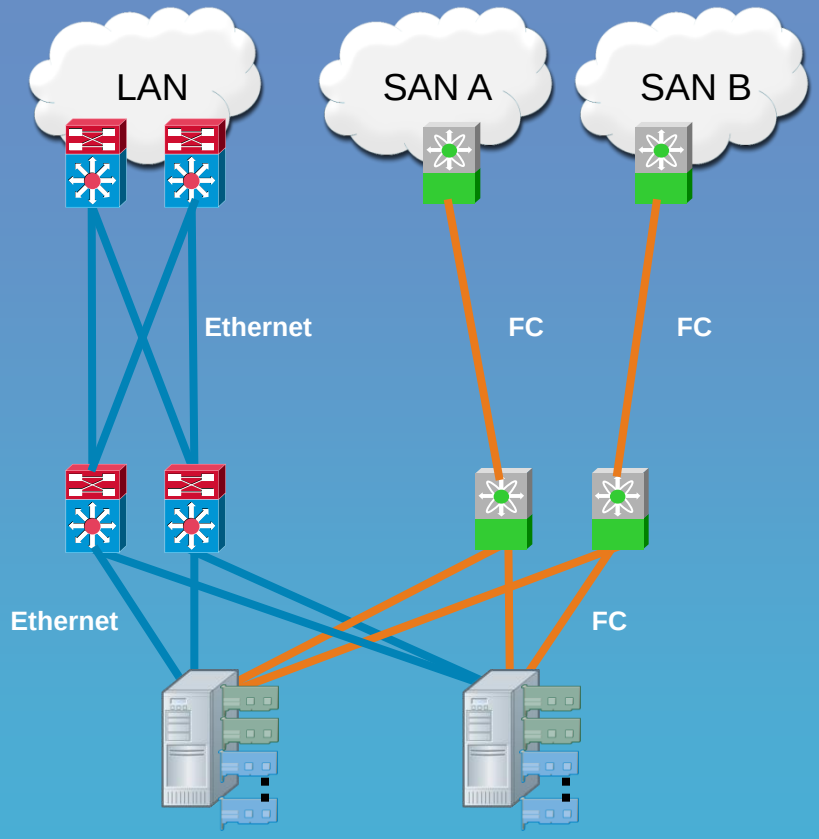
FCoE

- Mapping of FC Frames over Ethernet
- Enables FC to Run on a Lossless Ethernet

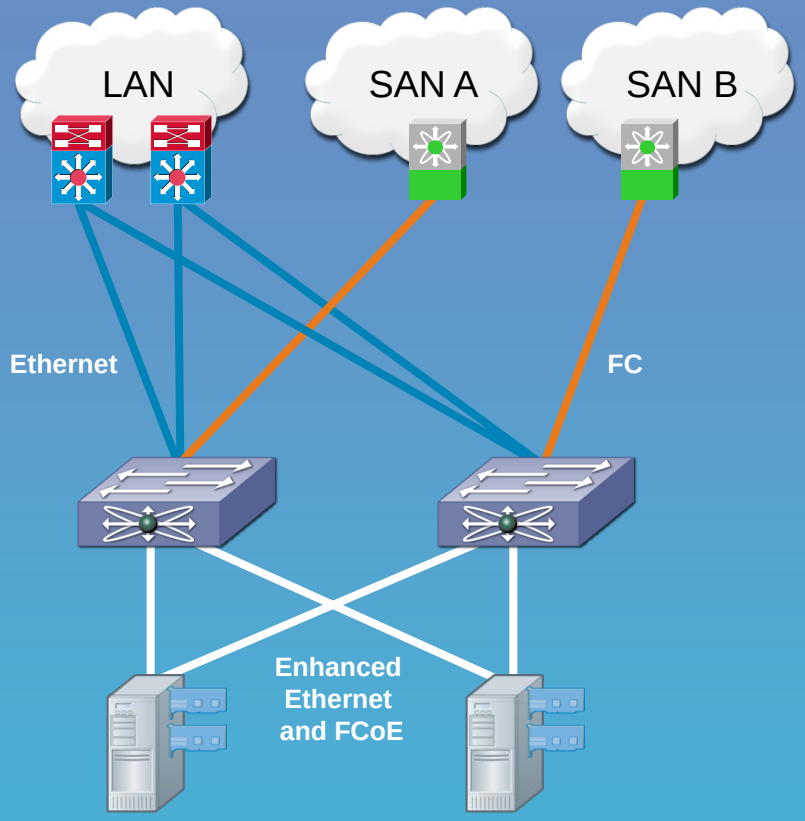


I/O Consolidation

Traditional



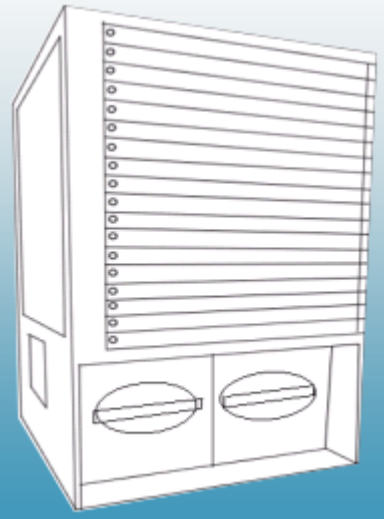
I/O Consolidation with FCoE



Nexus + FEX Single Access Layer

Nexus Parent Switch

Cisco Nexus® 2000 FEX

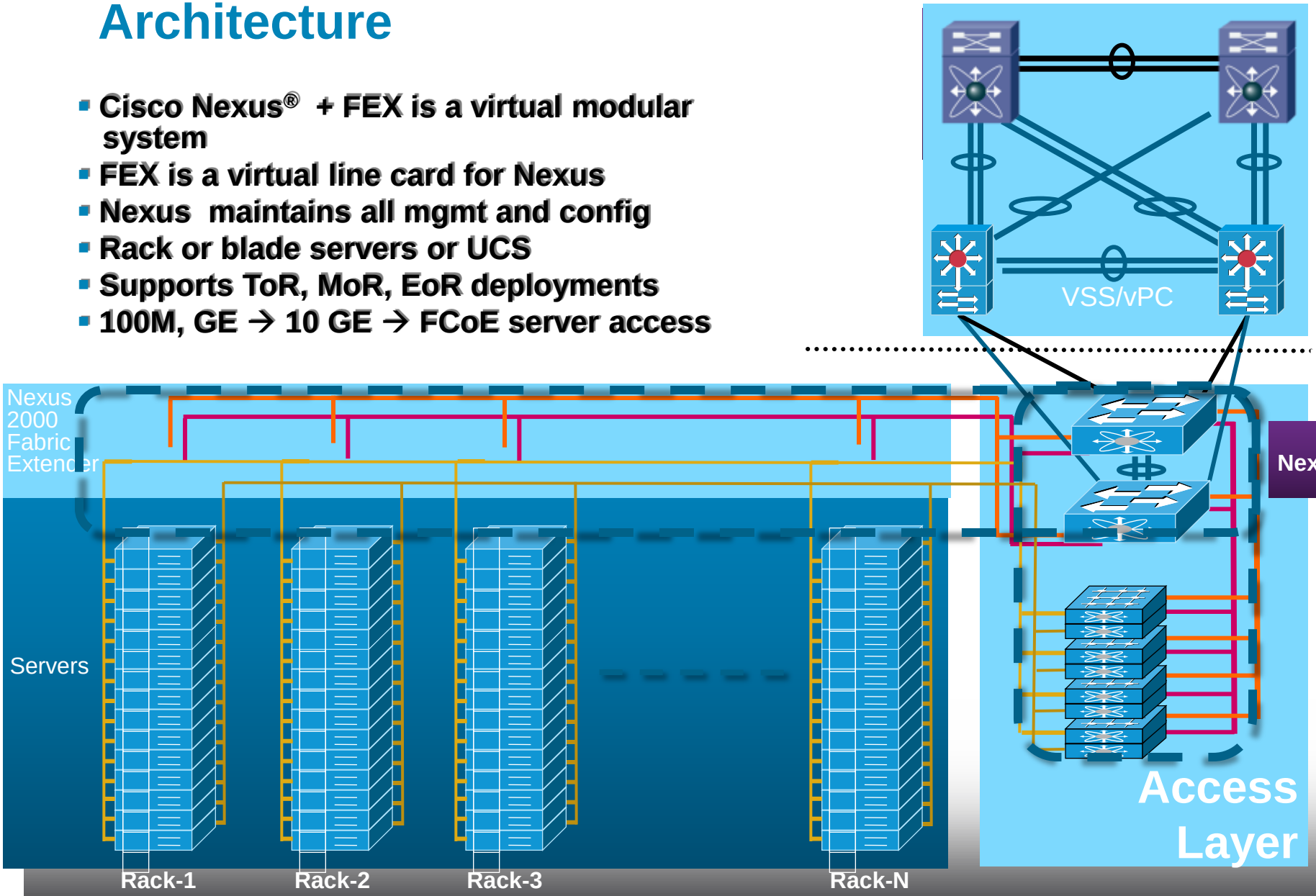


Virtual Modular System

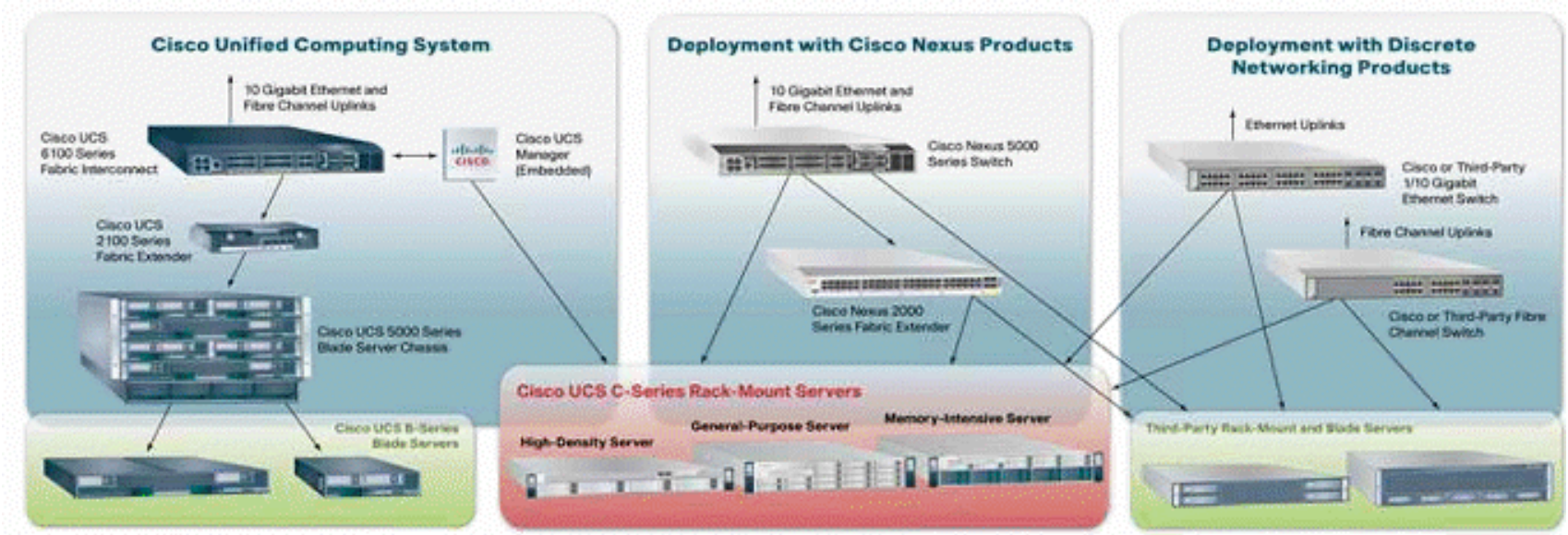
- Nexus + FEX combines logically as a Virtual Modular System
- Nexus 2000 FEX is a Virtual Line Card to the Nexus
- Nexus maintains all management & configuration
- No Spanning Tree between FEX & Nexus

FEX Provides Unified Server Access Architecture

- Cisco Nexus® + FEX is a virtual modular system
- FEX is a virtual line card for Nexus
- Nexus maintains all mgmt and config
- Rack or blade servers or UCS
- Supports ToR, MoR, EoR deployments
- 100M, GE → 10 GE → FCoE server access

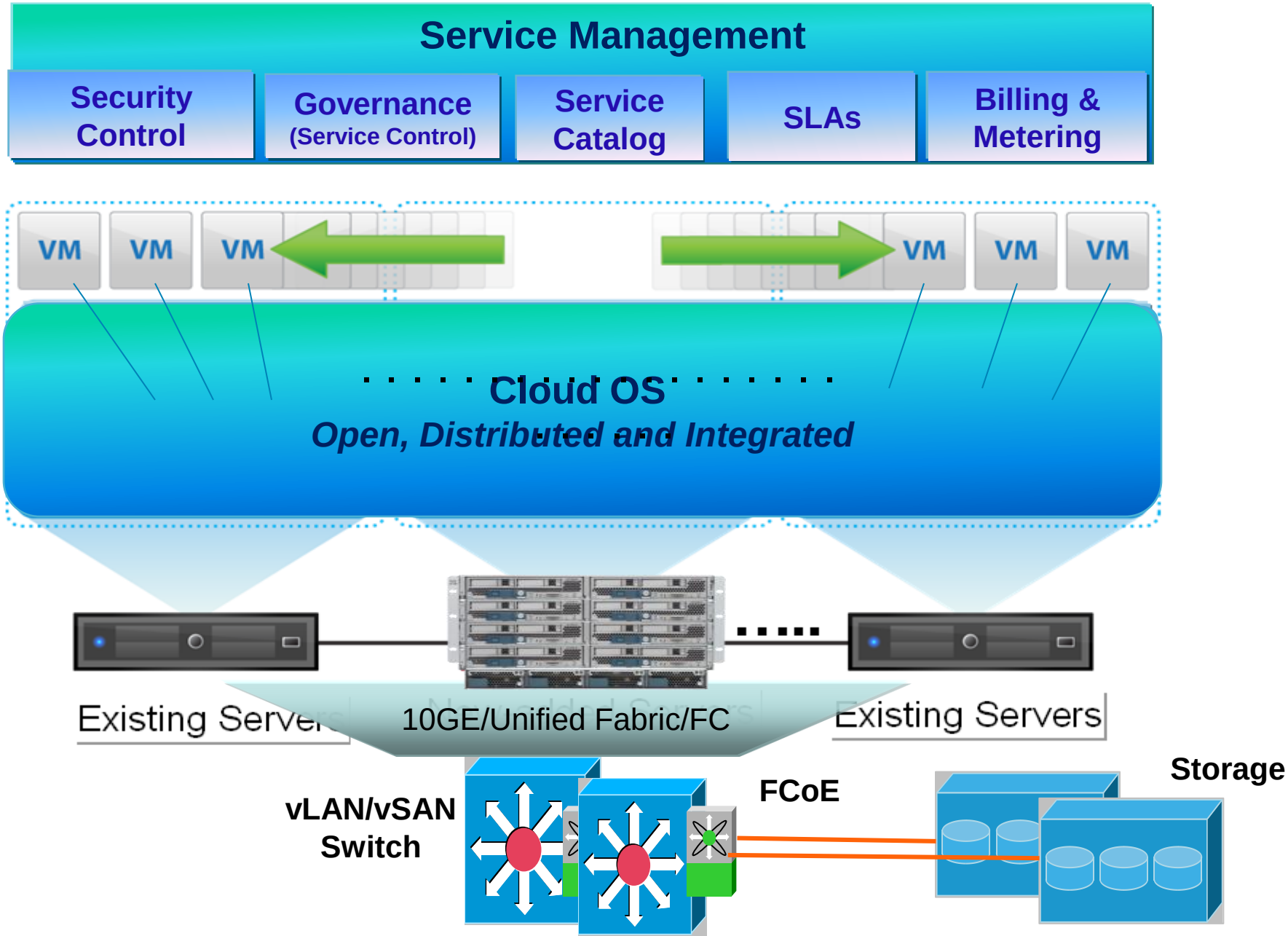


B-Series and C-Series Positioning



Cisco UCS B-Series Blade Servers	Cisco UCS C-Series Rack-Mount Servers
Data centers	Data centers, corporate, branch and remote offices
• Large deployments by central IT organizations in which integration with Cisco Unified Computing System and unified network fabric is desired • Environments with high-bandwidth unified and virtualized network fabric • Environments requiring higher density • Environments desiring infrastructure reduction through simplified cabling, fewer switches, reduced power consumption, and increased serviceability • Cloud computing environments	• Environments that need an incremental and flexible deployment model in which servers may be purchased by individual organizations • Environments that need more flexibility and incremental options for I/O • Environments that need greater internal disk capacity • Environments that need access to Cisco Unified Computing System innovations, standard form factor, and future migration path to Cisco Unified Computing System • Environments that need Gigabit Ethernet and migration path to 10 Gigabit Ethernet and unified fabric

Cisco Cloud OS and Open Cloud Architecture



Accelerate Evolution to Cloud

- **Security Control**
  - ***VM/Domain Access control***
  - ***Path Isolation***
- **Performance**
  - **Software v.s. Hardware**
  - **Eliminate *I/O Bottleneck***
  - **Eliminate *Memory Bottleneck***

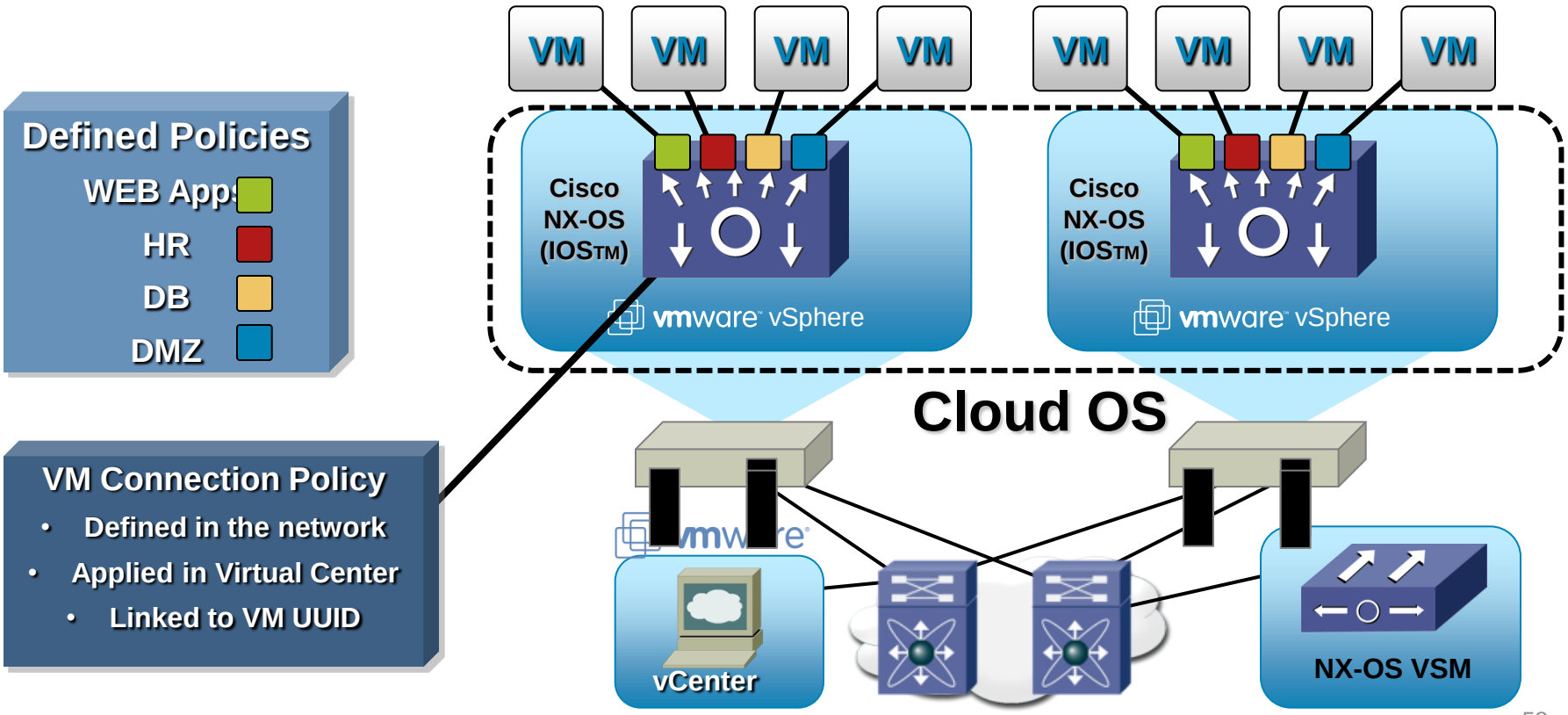
Cloud OS and VN-Link

VN-Link: Virtual Network Link

Policy-Based VM Connectivity

Mobility of Network & Security Properties

Non-Disruptive Operational Model



Cloud OS and VN-Link

VN-Link: Virtual Network Link

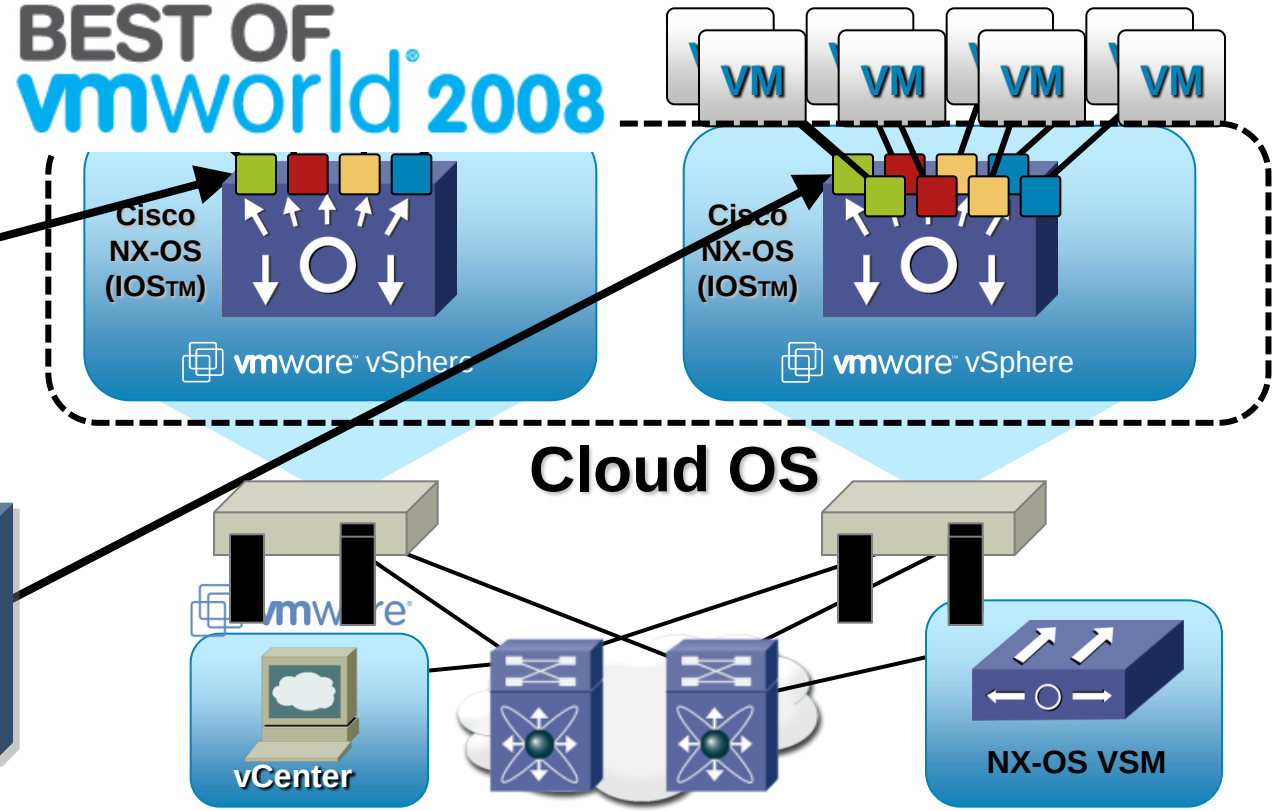
Policy-Based VM Connectivity

Mobility of Network & Security Properties

Non-Disruptive Operational Model

BEST OF vmworld 2008

VMs Need to Move
- VMotion
- DRS
- SW Upgrade/Patch
- Hardware Failure



VN-Link Property Mobility
- VMotion for the network
- Ensures VM security
- Maintains connection state

802.1Qbh: Bridged Port Extension

- **November 19, 2009**: IEEE votes unanimously to authorize a project to amend the Ethernet switch standard to include the capabilities provided by Cisco's VNTag technology.
- Official Scope of Project:

  Amendment specifies protocols, procedures, and managed objects to support Port Extension. A Port Extender attaches to a MAC port of an 802.1Q bridge and provides additional MAC ports that are logically ports of the 802.1Q bridge to which it is attached (i.e. the "Controlling Bridge"). The protocols, procedures, and managed objects specified in this amendment are expected to specify new behavior in bridges that support port extension as well as the behavior of Port Extenders themselves. In addition, the protocols, procedures, and managed objects specified in this amendment support the cascading of Port Extenders. To the extent technically reasonable, all frame filtering and relay functions remain in the Controlling Bridge.

  Use of a STag for Multichannel capability as being defined in Edge Virtual Bridging is envisaged to achieve this objective. A new on-the-wire indication (e.g. a new tag) is envisioned to support remote replication for purposes including frame flooding and group address support.

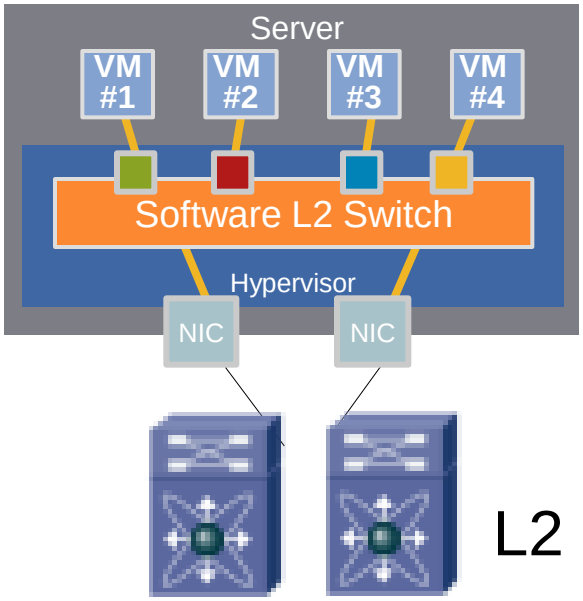
- This IEEE project approval is validation of Cisco's Fabric Extender and **VN-Link** strategies.
- Cisco is committed to supporting 802.1Qbh in our products as the project becomes a ratified standard.
- 802.1Qbh – Virtual Bridged LANs Amendment: Bridge Port Extension

  PAR http://www.ieee802.org/1/files/public/docs2009/new-qbh-draft-par-0909.pdf

  5C http://www.ieee802.org/1/files/public/docs2009/new-qbh-draft-5c-0909.pdf

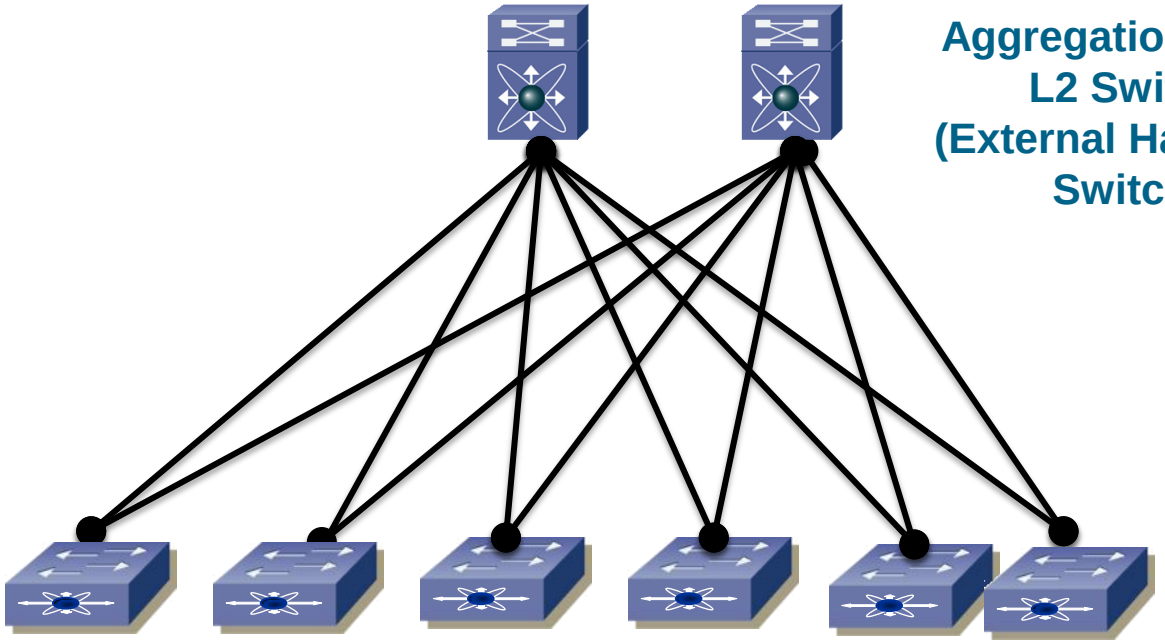
Issues : Software L2 switch running upon Hypervisor

vNIC running on software
vHBA running on software



L2 Switch

Loop Avoidance and Spanning Tree Protocol(STP)



Aggregation Layer
L2 Switch
(External Hardware
Switch)

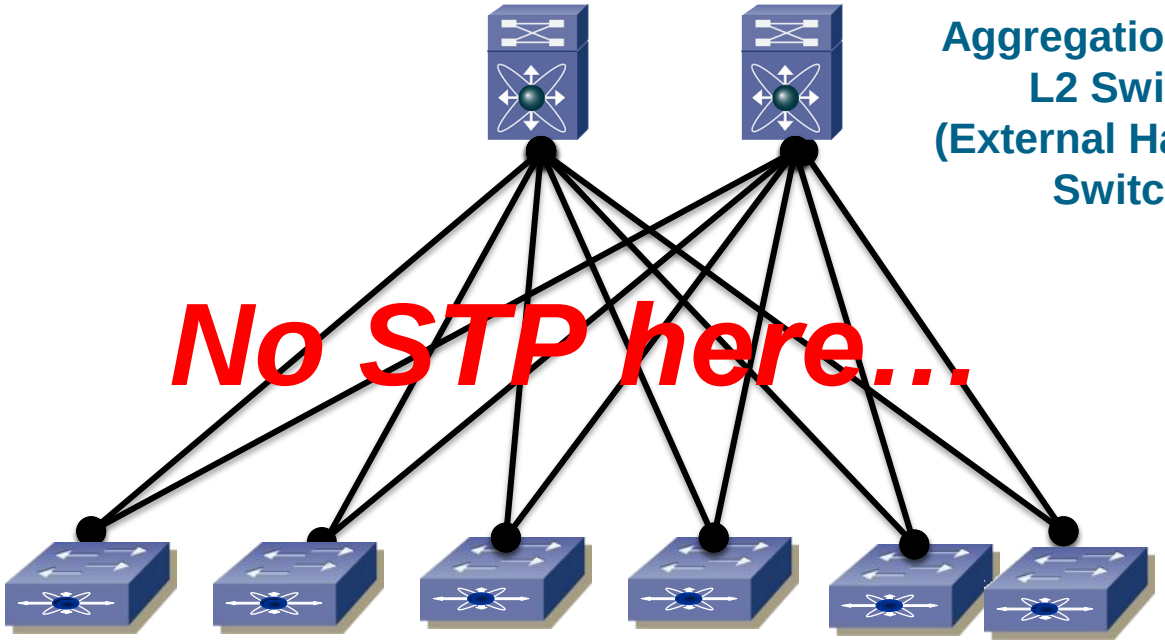
Software L2 Switch
(inside Server)

How many loops are there for each VLAN?...How many VLANs are there?

What actions will STP take for server up/down or add/delete?

How is the cloud system architecture which is receiving hundreds/thousands of STP syslog alerts everyday?

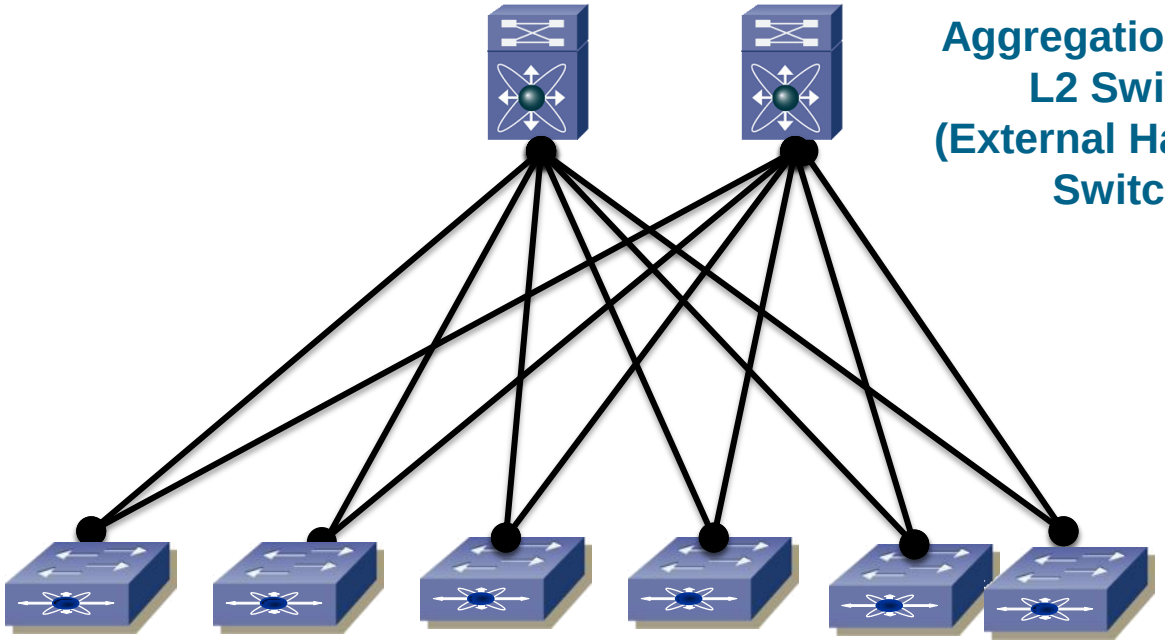
Disable Spanning Tree Protocol(STP)



“It is actually possible, with some effort, to introduce a loop with virtual switches. To do so, you may run Layer 2 bridging software in a guest with two virtual Ethernet adapters connected to the same subnet…. .Or…”.

Bridging loops issues may cause serious impact to the entire network. It is also very difficult to troubleshoot to find out the root cause, if there is no STP running on the bridging network.

Layer2 Ethernet Frame Forwarding - Software switch in server



Each frame forwarding will be done after MAC-addr searching/mapping.

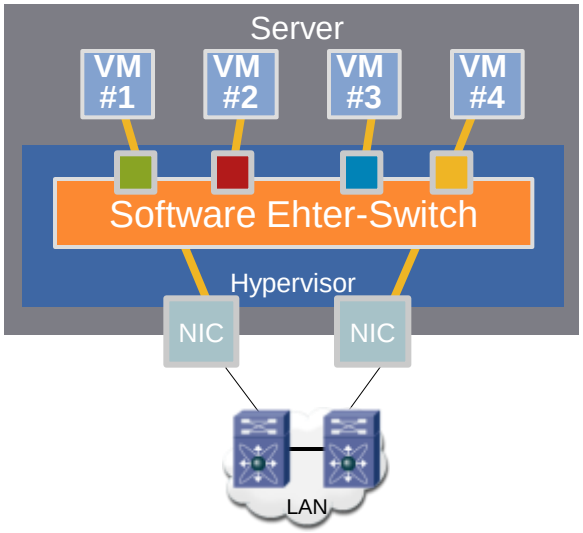
The software switch is powered by server CPU..

How many percent of CPU computing power will be used by the software switch?

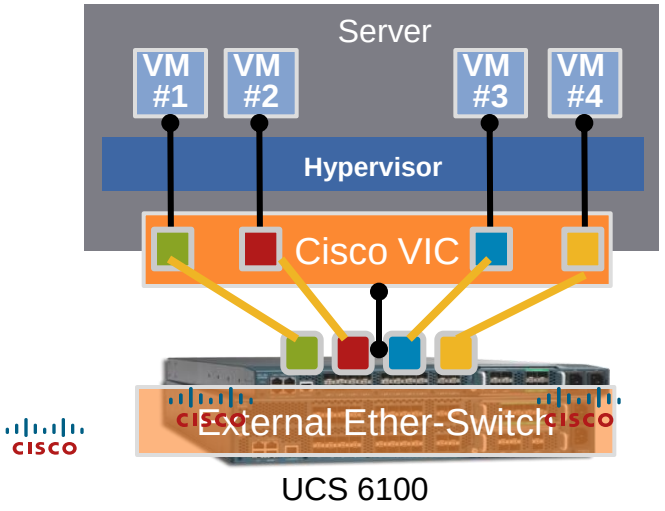
Software L2 switch running on Hypervisor

No Software Switch running on Hypervisor

vNIC running on software
vHBA running on software



vNIC running on ASIC
vHBA running on ASIC



Policy-Based VM Connectivity

Mobility of Network & Security Properties

Non-Disruptive Operational Model

Hypervisor Passthrough

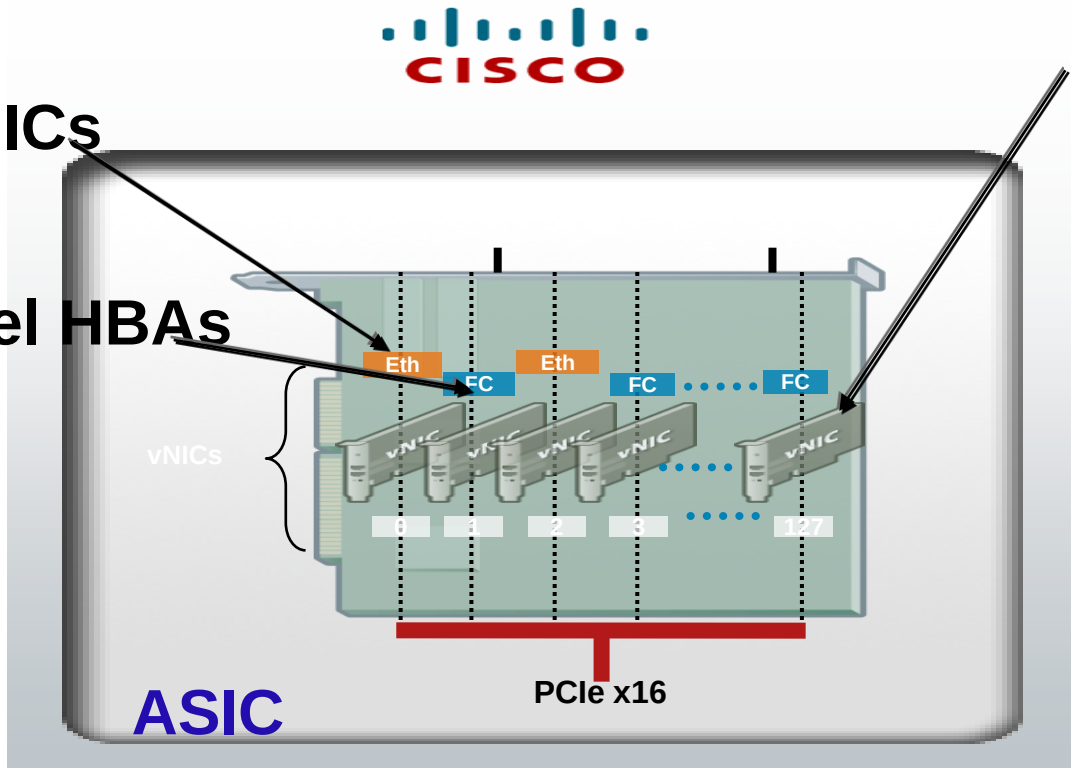
VM I/O Virtualization and Consolidation

Virtualization

58 Programmable Virtual Interfaces

Ethernet NICs

ber Channel HBAs

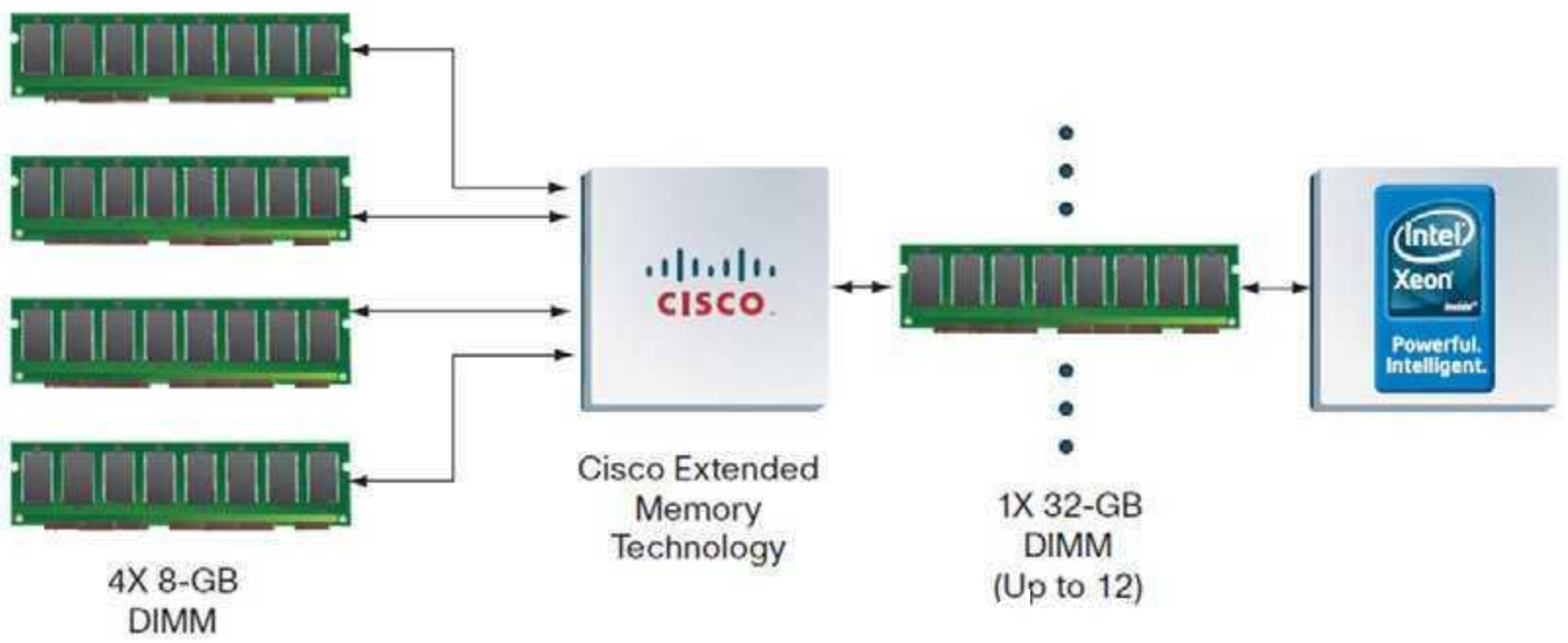


Allows virtual adapters to be defined as FC or Ethernet:

-Highly flexible I/O environment

>500,000 I/O operations per second (IOPS), with latency<9.4 microseconds

Cisco Extended Memory Technology

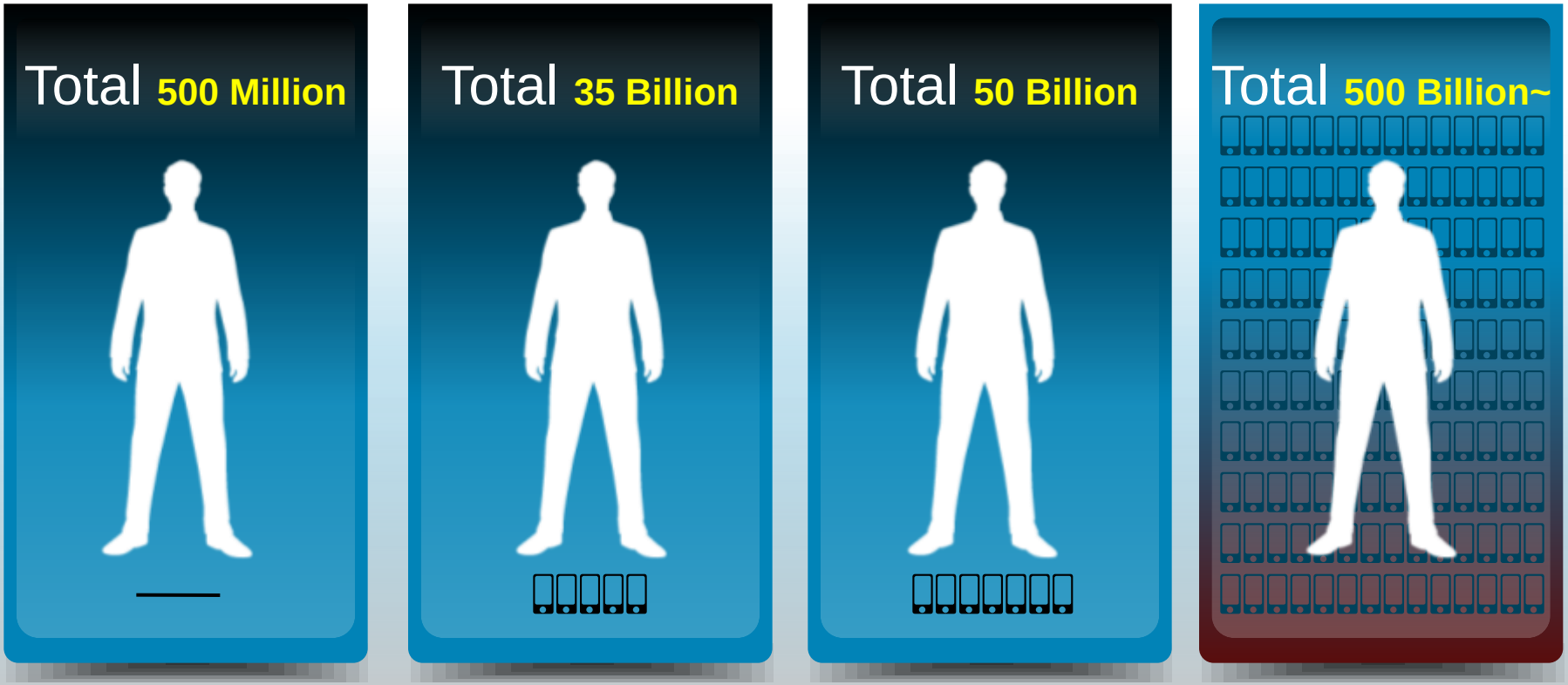


- ✓ Intel Nehalem processor
  - 4x the memory: up to 384GB
- ✓ 100% standard
  - DIMMs, CPUs
  - OS, Apps

- ✓ Reduce infrastructure
  - Less power & cooling
- ✓ Increase performance
  for memory bound applications

Cloud covers a lot of territory

Growth of Connected Devices



1/10th of a Device per Person on Earth	5 Devices per Person on Earth	7 Devices per Person on Earth	70~ Devices per Person on Earth
2007	**2010**	**2013**	**2020**

Source: Forrester Research, Cisco IBSG

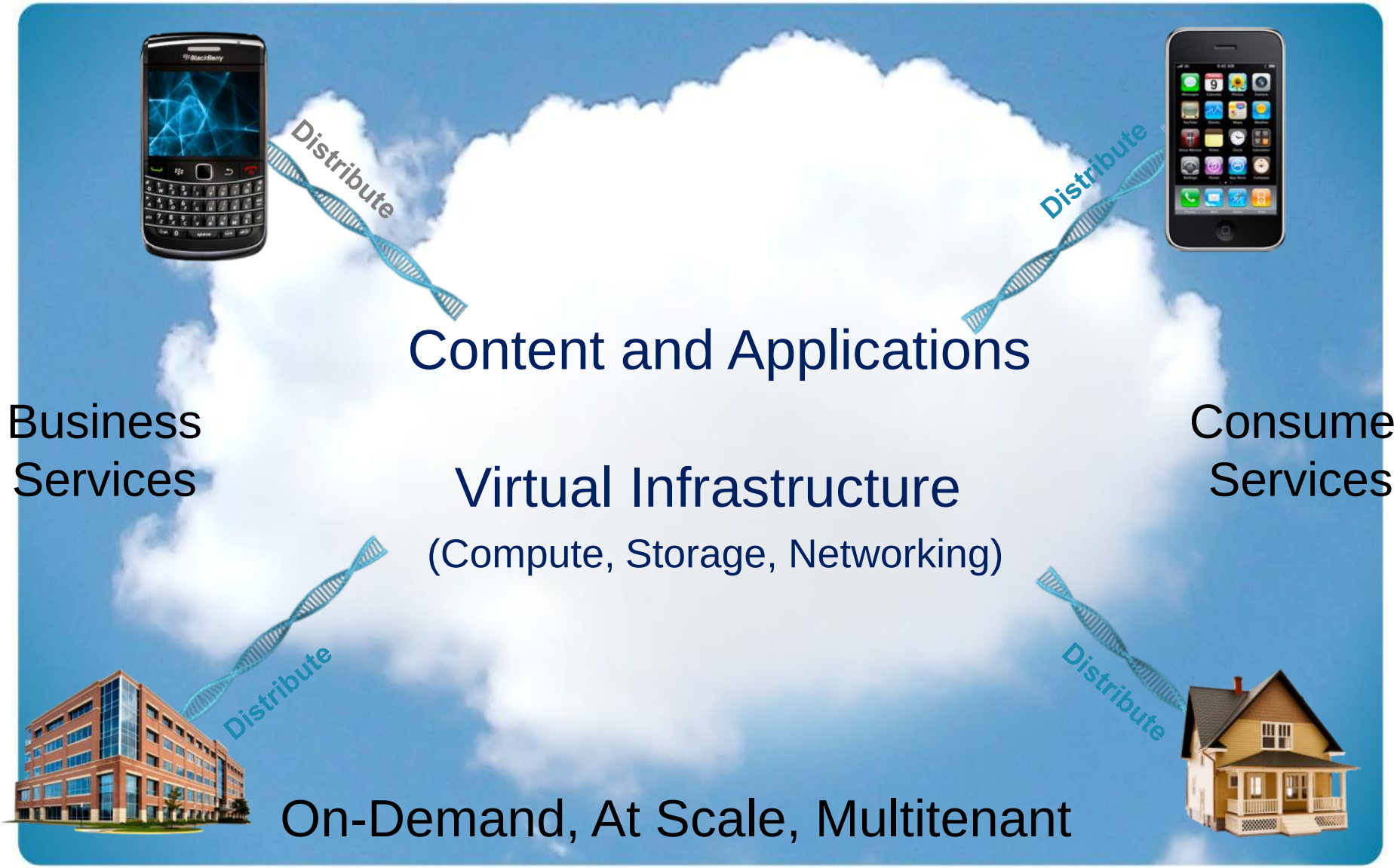
We Are Rapidly Approaching…

1 Trillion
Connected Devices

1 Million
Applications

1 Zettabyte
1B Terabytes of Content

Everything as a service in the cloud



60%

IT decision makers who saw public cloud as an enabler, versus 40% who viewed it as “immature”.
– Yankee Group, August 2010

IT decision makers using or planning to use enterprise-class cloud technology within two years.
– Savvis, July 2010

70%

100%

Expected growth of server hardware market between 2010 and 2014 due solely to public and private cloud computing.
– IDC, August 2010

IT is adopting cloud NOW!


CISCO