



# Technology Solutions 2008

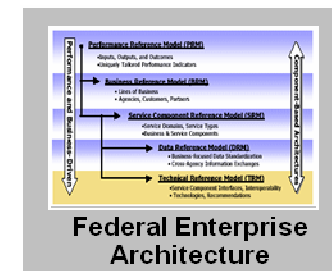
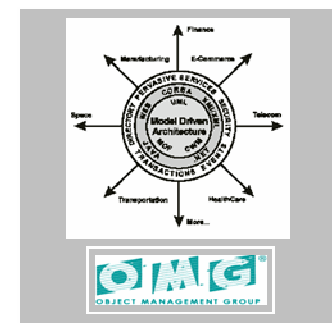
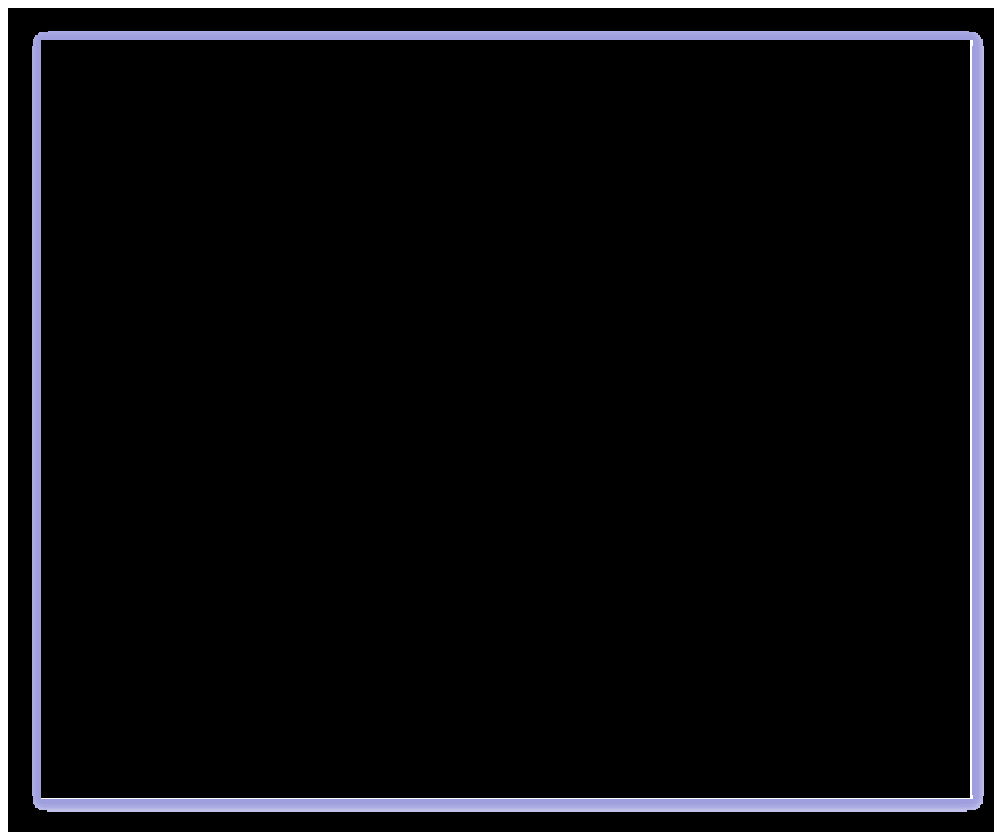
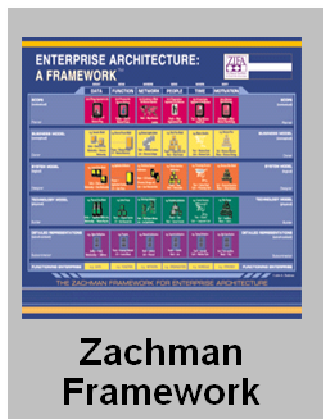
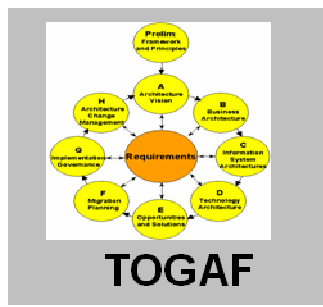


## **An Architectural Approach to the Data Centre**

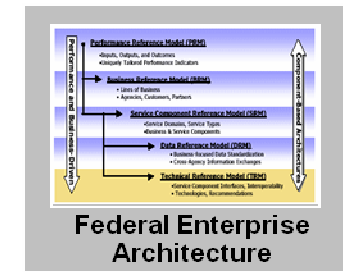
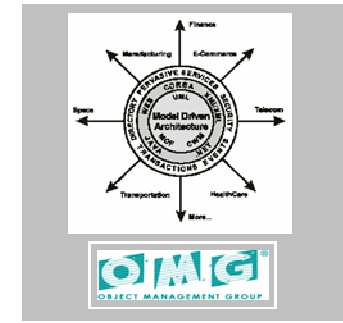
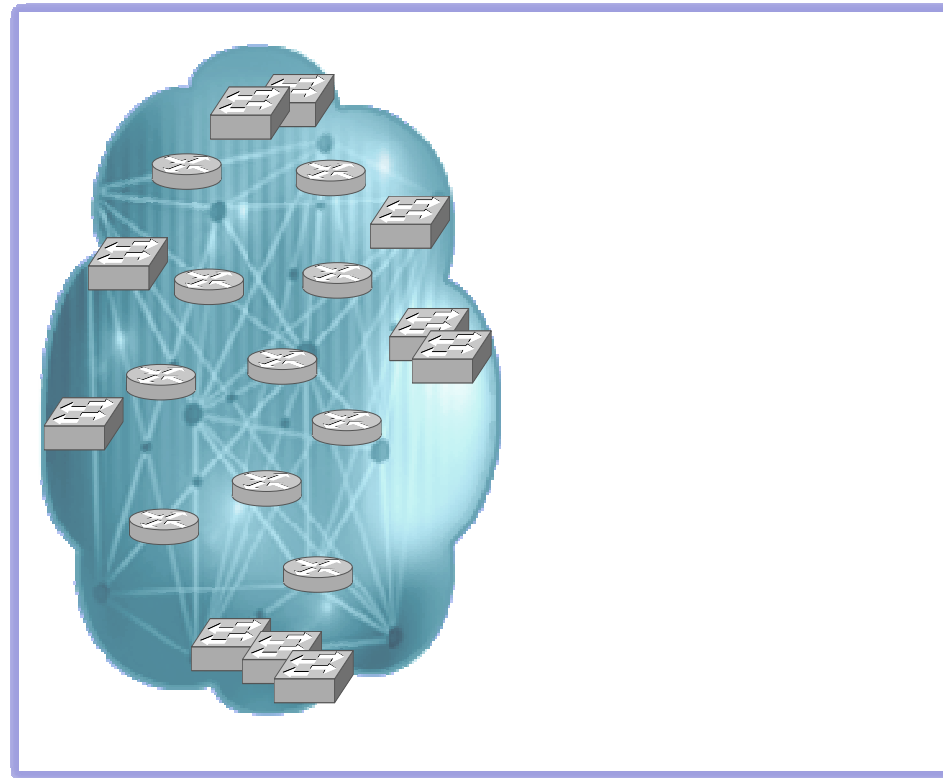
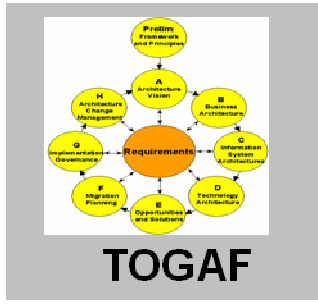
# Agenda

- **Industry Trends**
- **Data Centre Transformation**
  - **Consolidation**
  - **Virtualisation**
  - **Automation**
- **Data Center Assurance / Cisco Validated Designs**

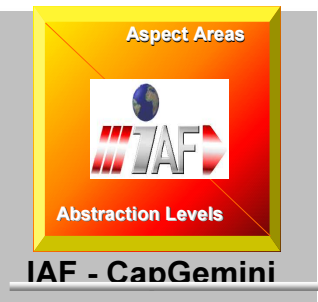
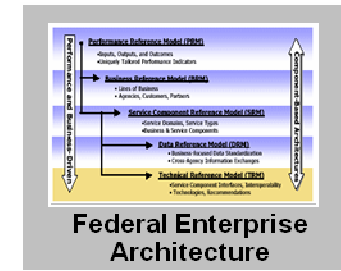
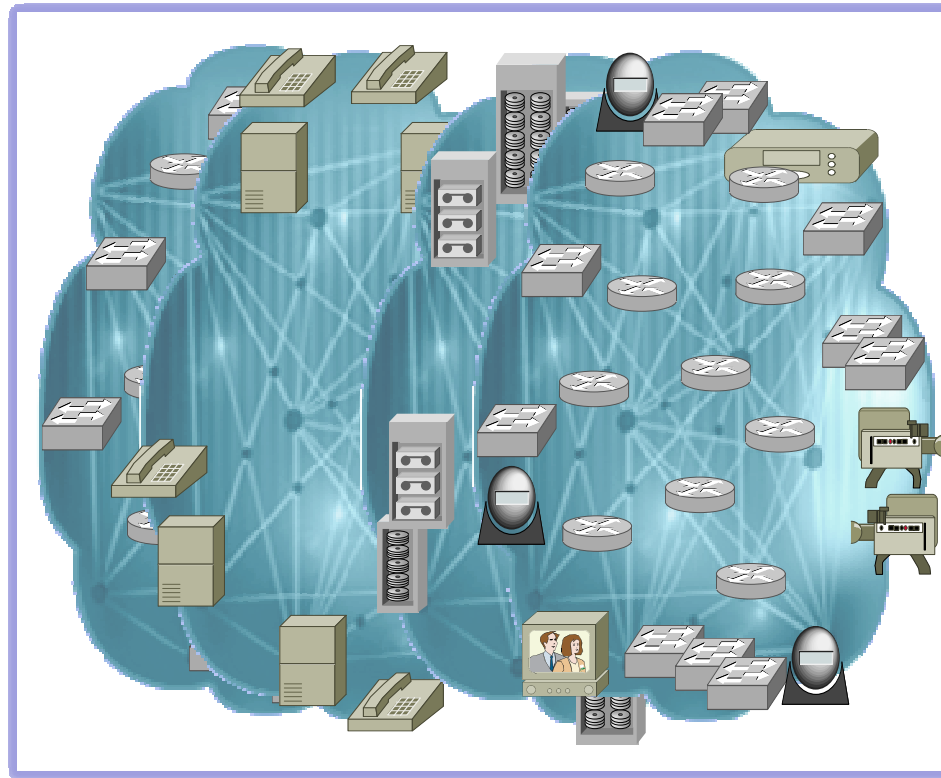
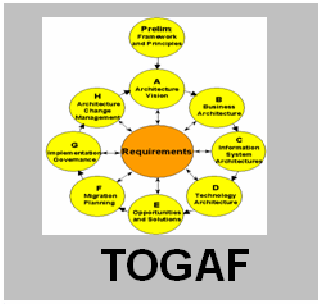
# Enterprise Architectures And The Network



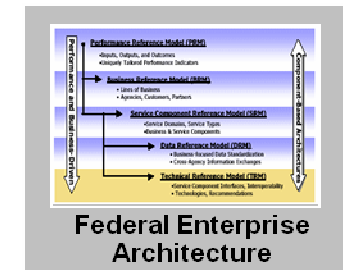
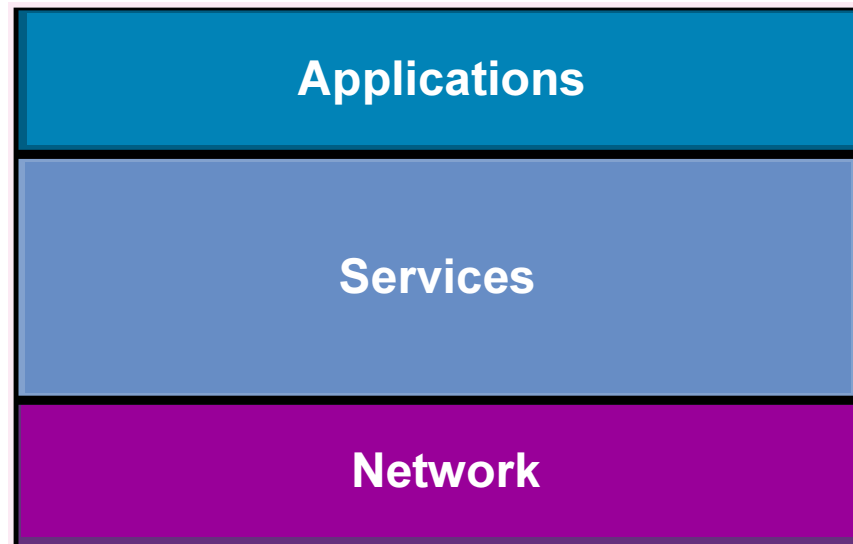
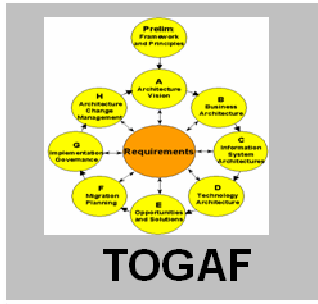
# More than Just Connectivity



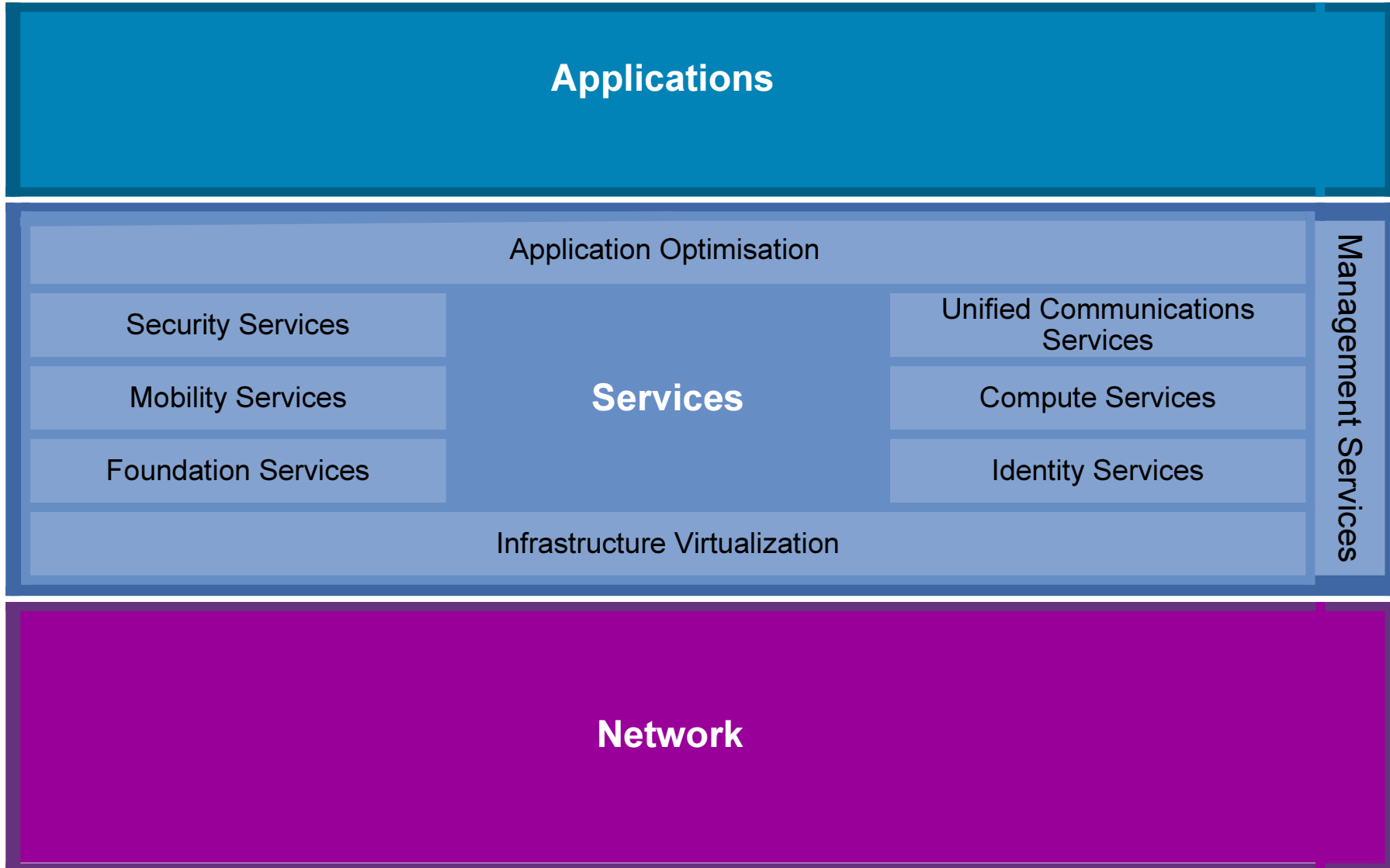
# More than Just Connectivity



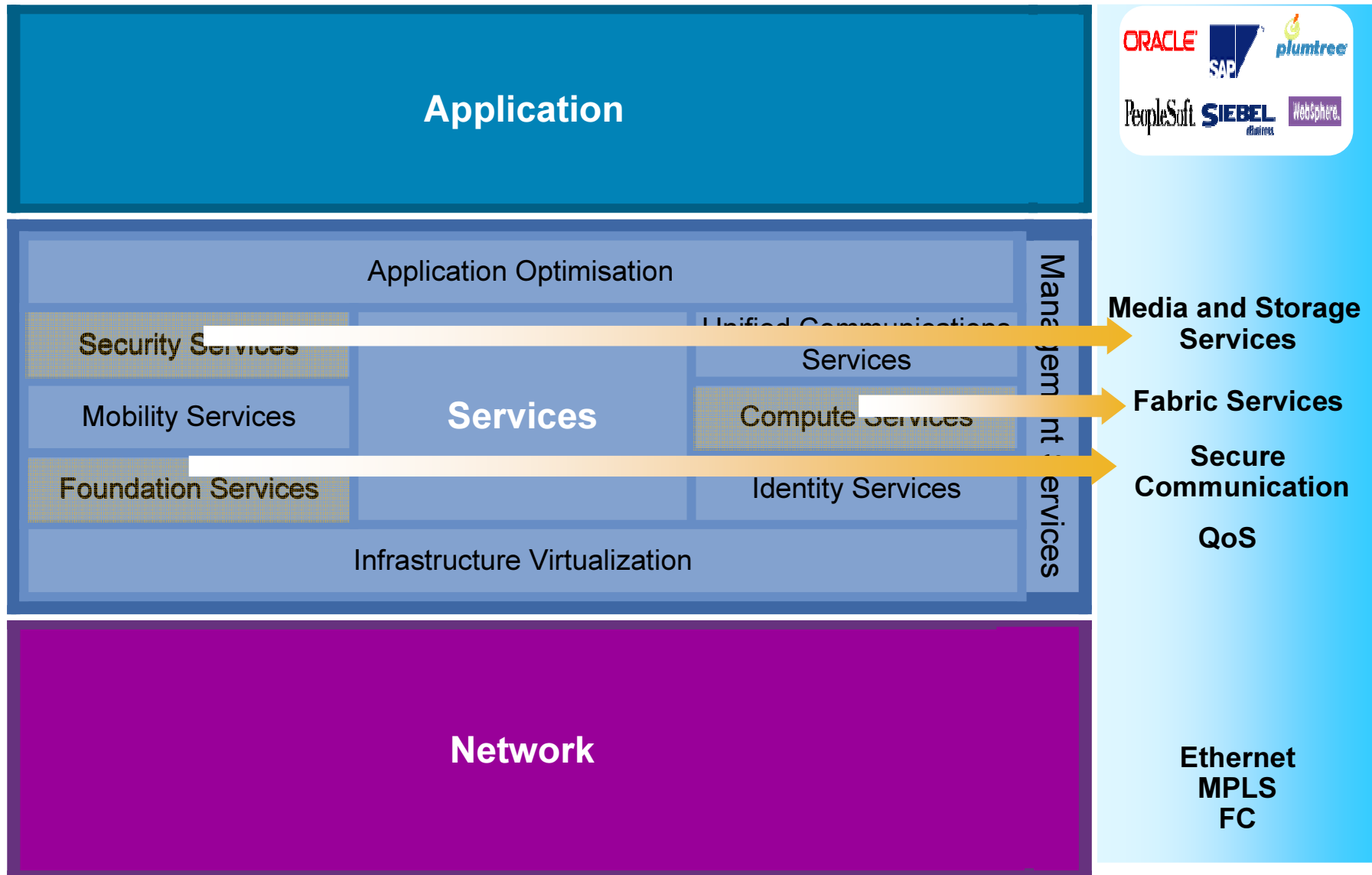
# More than Just Connectivity



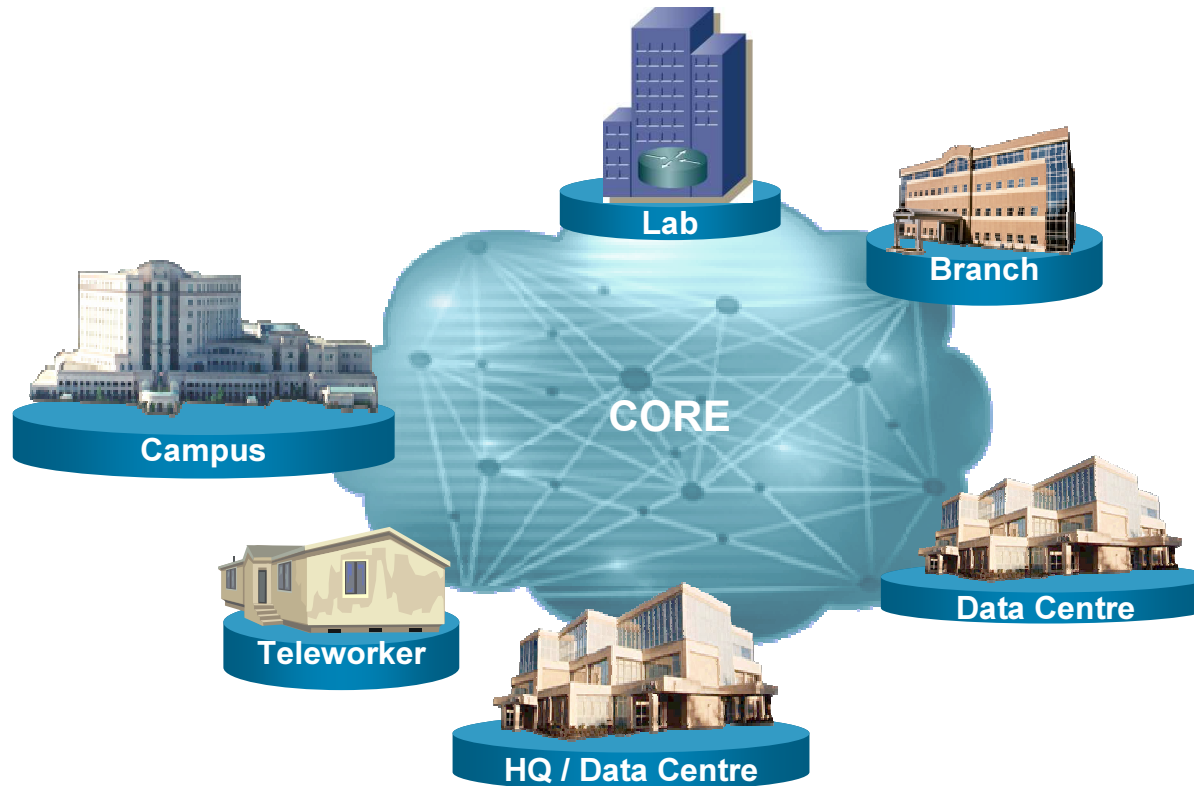
# An Architectural Framework



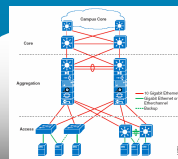
# The Network as The Platform for ...



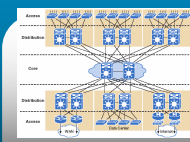
# Places In The Network



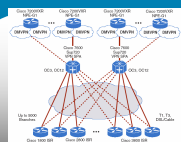
## Cisco Validated Designs (CVD)



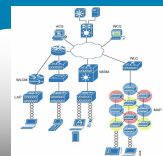
Data Centre Architecture



Campus Architecture



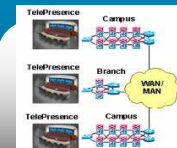
WAN/Branch Architecture



Secure Mobility Architecture



Unified Communications



Telepresence Architecture

# Data Centers are Under Increasing Pressure



Collaboration



Empowered User



SLA Metrics



Global Availability



Reg. Compliance

## New Business Pressures



## Operational Limitations

Power & Cooling



Asset Utilization



Provisioning



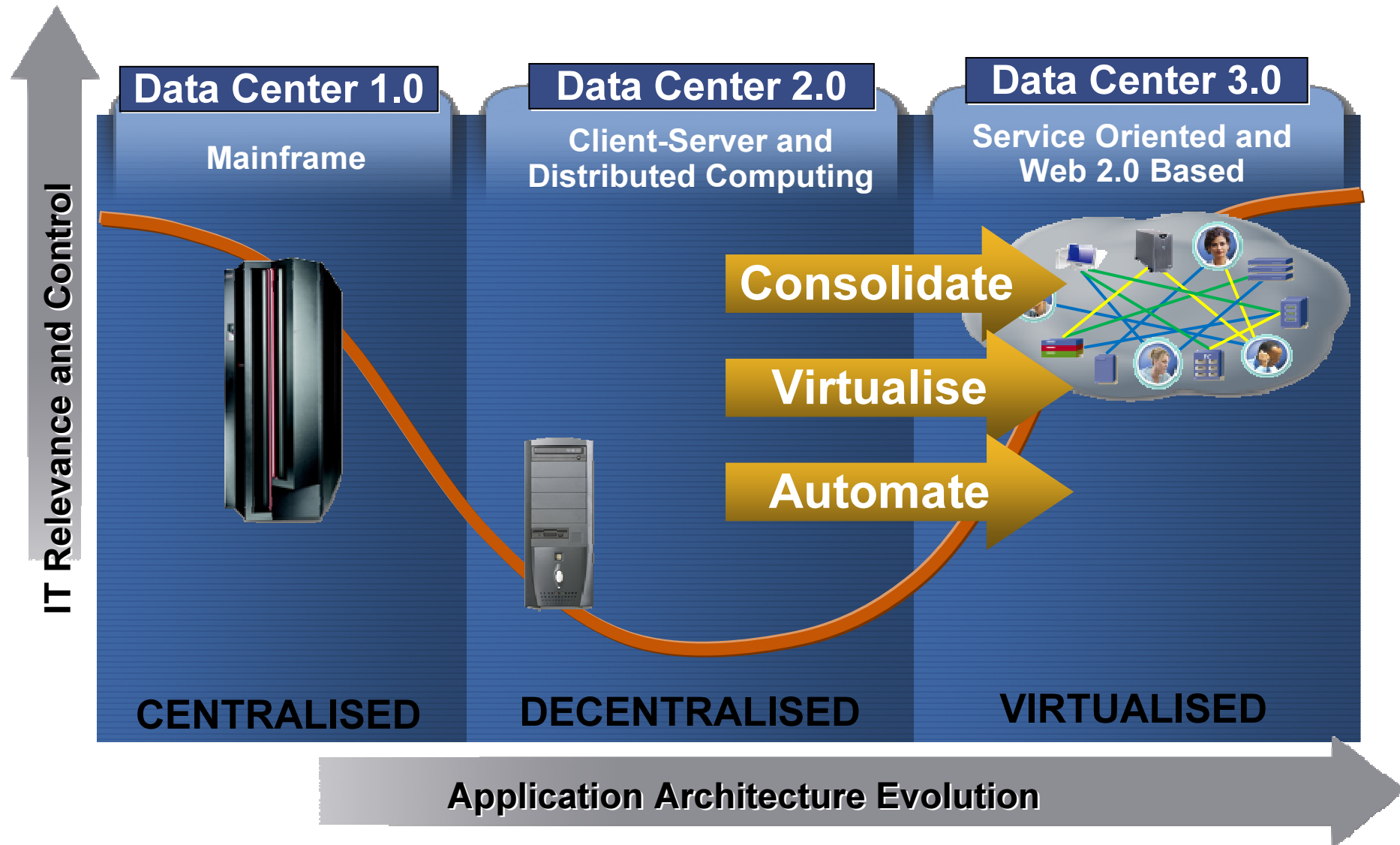
Security Threats



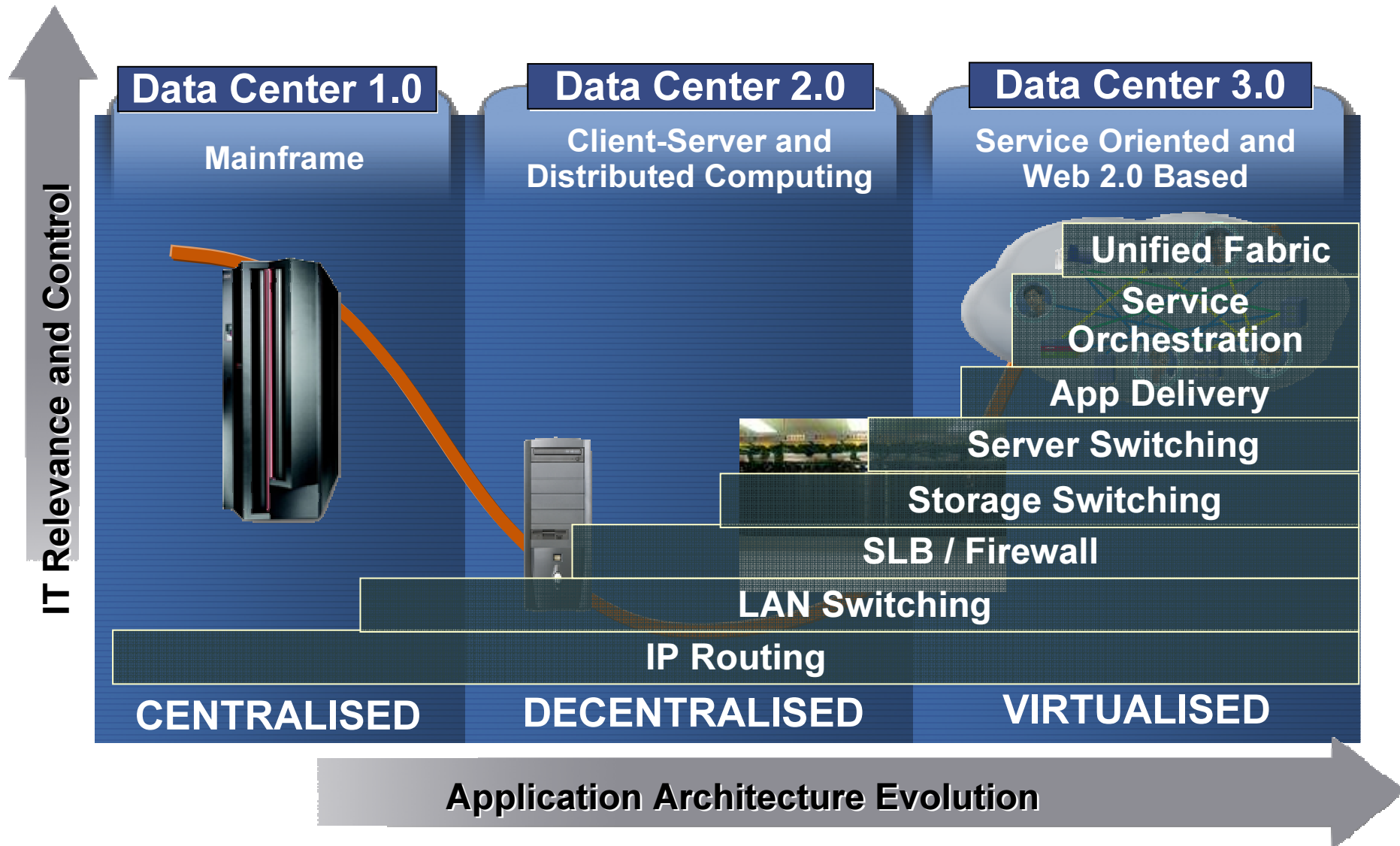
Bus. Continuance



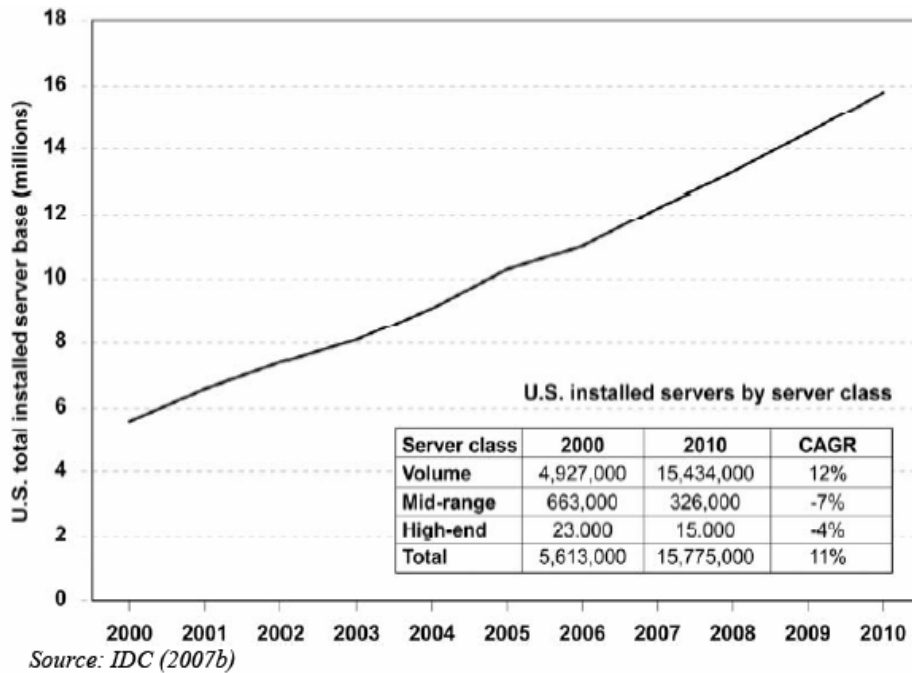
# Data Center and Network Evolution



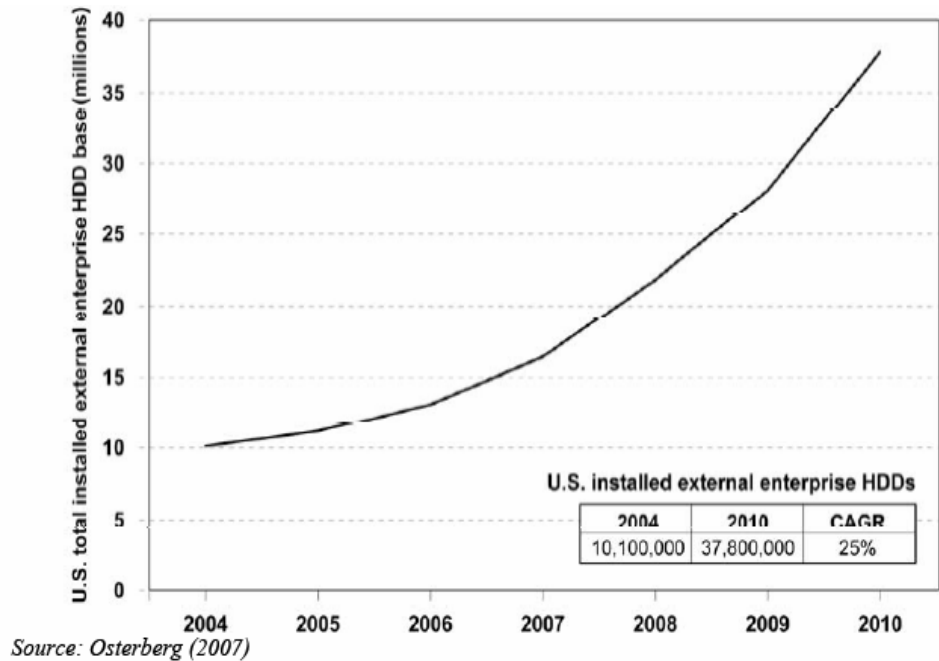
# Data Center and Network Evolution



# Server and Storage Growth



## Servers

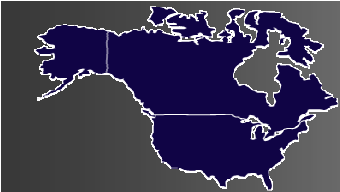
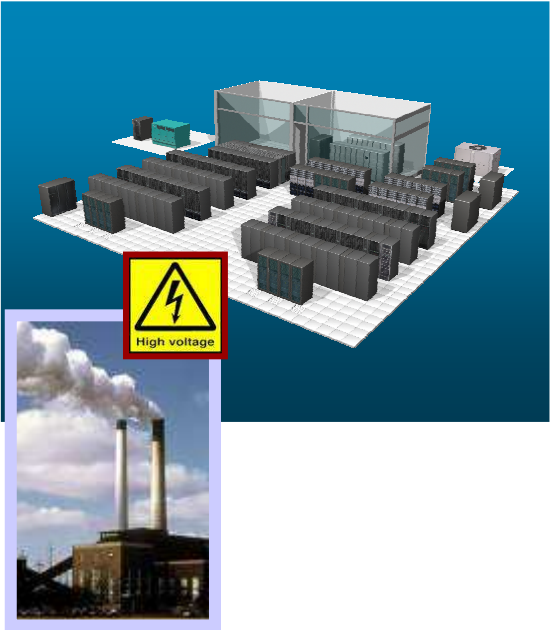


## Storage

Source: US EPA Report to Congress on Server and Data Center Energy Efficiency

# Generation and Consumption

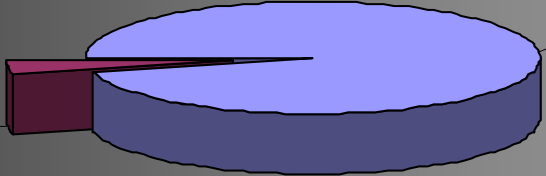
## “Coal Fired Packets”



USA Total Generated 2005:  
405.5B KWh

### U.S. Data Center Consumption Estimate 2004

U.S. DC  
Estimate\*  
4% and  
growing



Other  
96%

Source: EPRI/Ecos Consulting & EIA Commercial Electricity Consumption Data

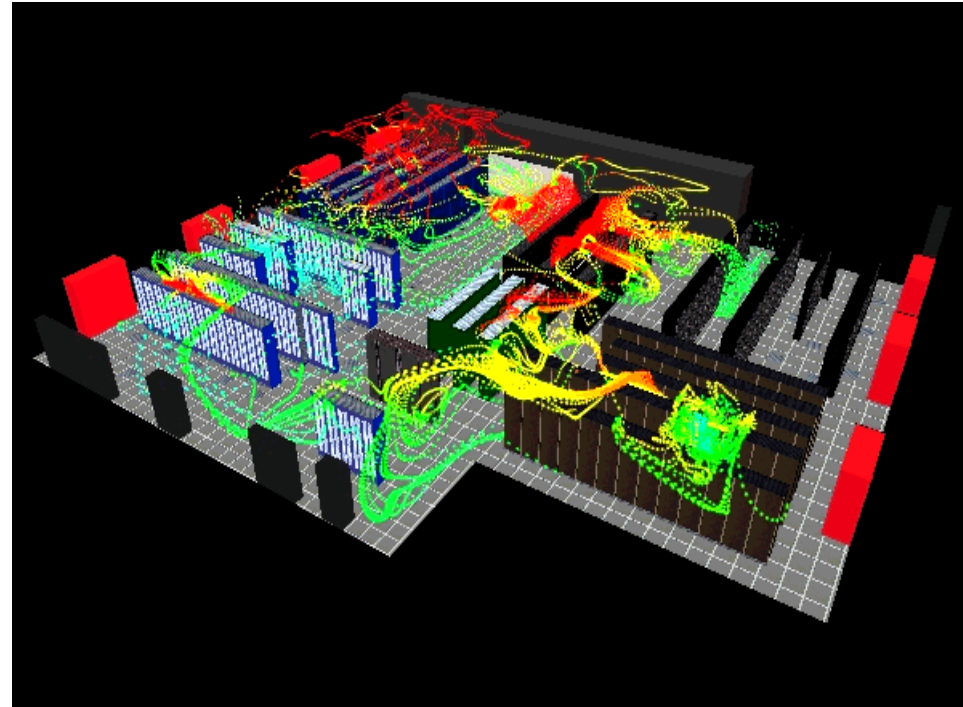
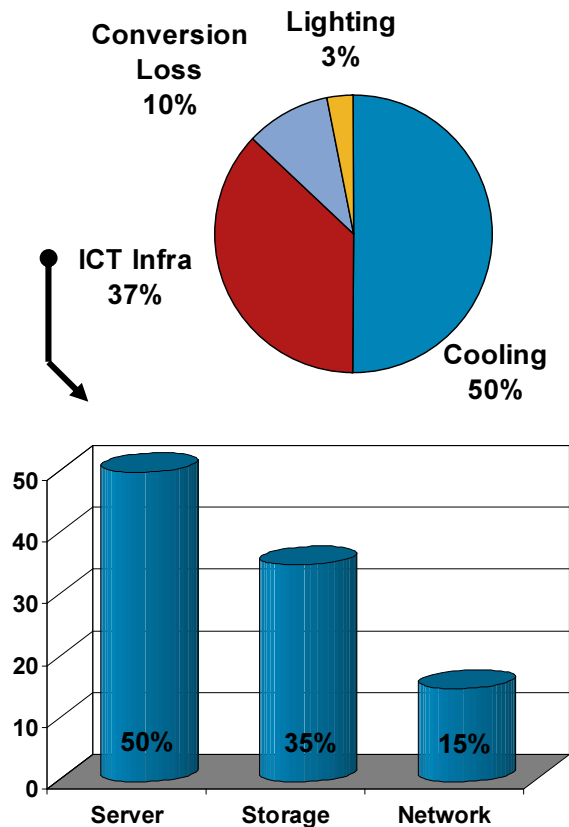
# Power and Cooling Projections

- 2008, 50% of today's data centers will have insufficient power and cooling capacity to meet the demands of high-density equipment
- Through 2009, energy costs will emerge as the second-highest operating cost (behind labor) in 70% of DC facilities WW
- 2011, power demand for high-density equipment will level off or decline
- 2011, in-rack and in-row cooling will be the predominant cooling strategy for high-density equipment
- 2011, in chassis cooling technologies will be adopted in 15% of the servers

Source: Gartner; Meeting the DC power and cooling challenge



# DC Power Consumption Breakdown

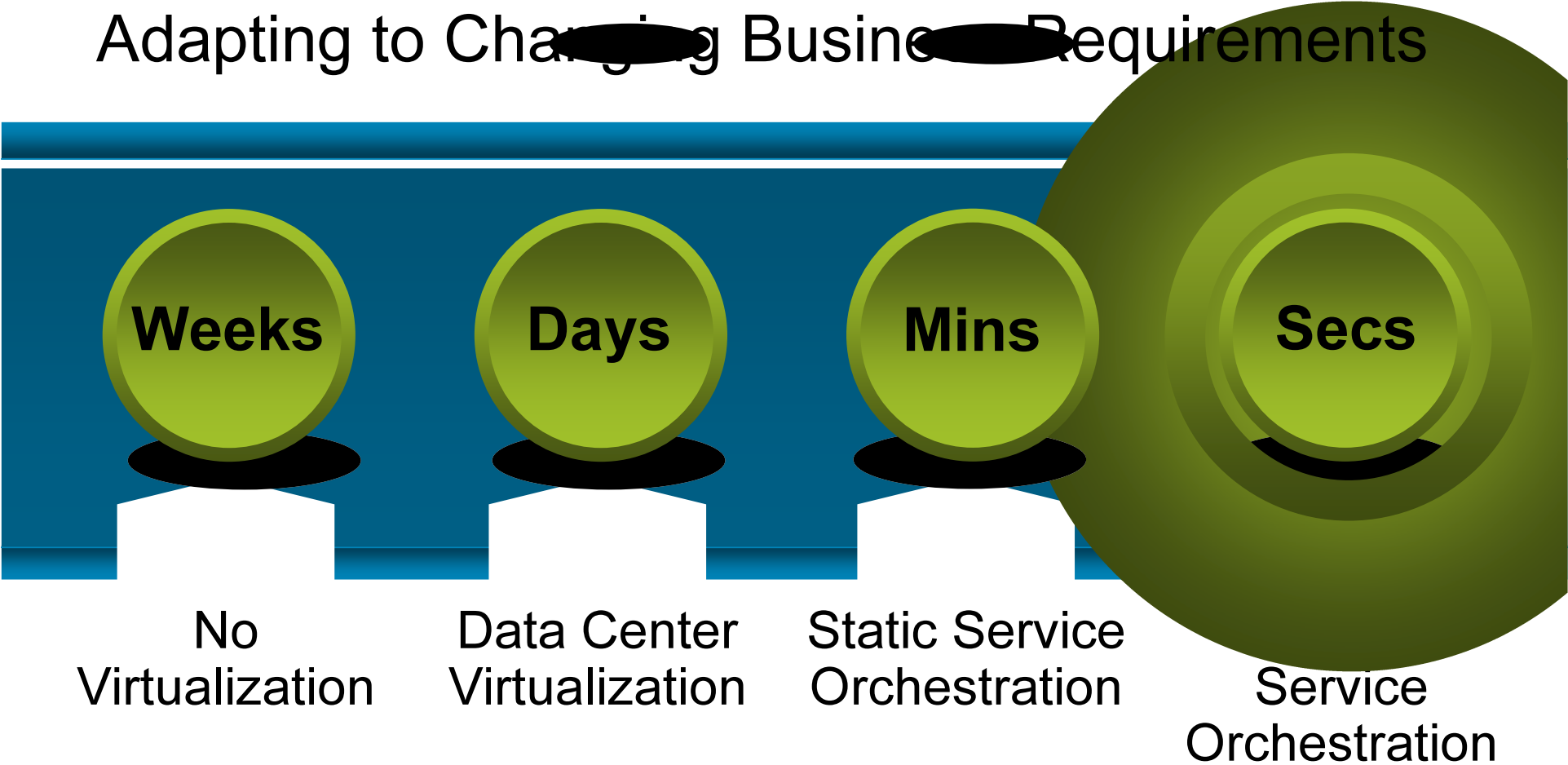


Each watt consumed by IT infrastructure carries a “burden factor” of 1.8 to 2.5 for power consumption associated with cooling, conversion/distribution and lighting

Sources: EYP Mission Critical Facilities, Cisco IT, Network World, Customer Interviews, APC

# DC - Improving IT Responsiveness

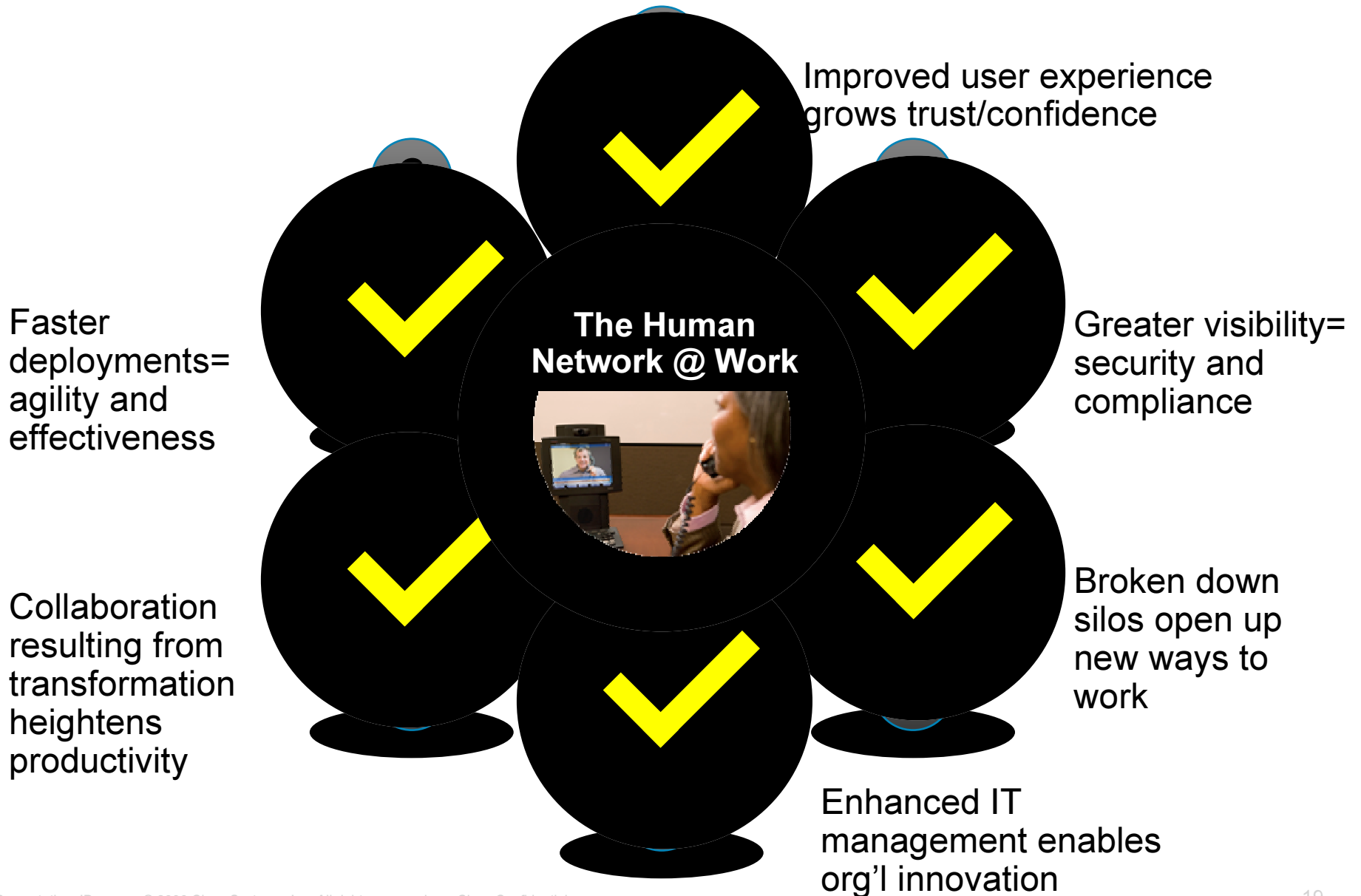
Adapting to Changing Business Requirements



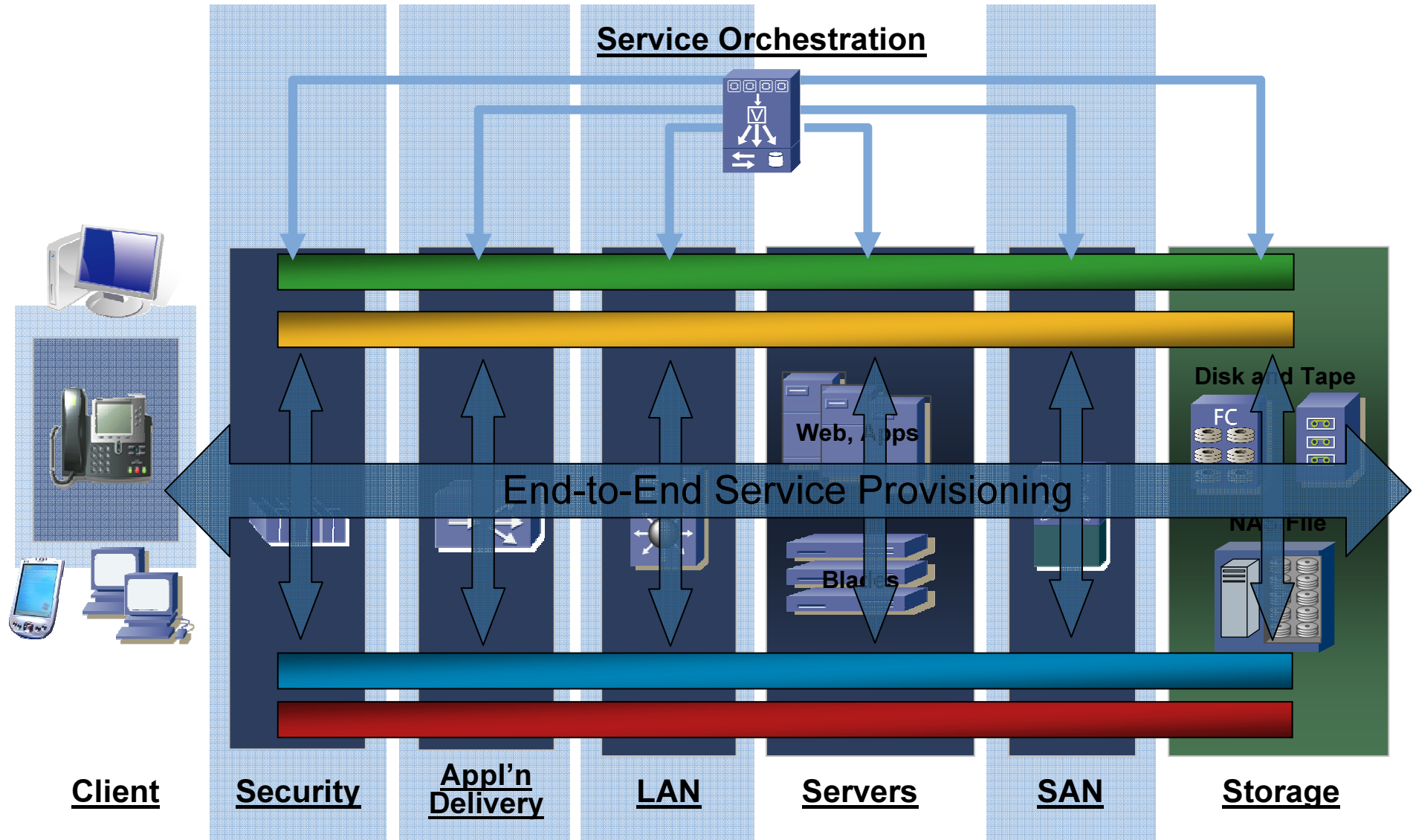


# Data Centre Transformation

# DC 3.0 and Business Imperatives



# Services Oriented Data Center



# Next Steps in Data Center Transformation

## Consolidate

### Teams, IT Assets, and Facilities

- Assign Data Center Architecture Leads
- Build Integrated Critical Teams
- Integrate Transport Operations
- Centralize Branch Servers

## Virtualize

- SLB and FW Network Services
- IT Assets – Servers, Storage, Networks, Services = Data Centers

## Automate

- Service Provisioning
- Deployments and Changes
- Sustainable Processes





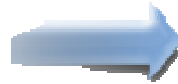
# Consolidation

# Data Center Consolidation

*Reducing operational costs & improving manageability*

## Reduce:

- Operational costs
- Number server farms
- App deployment time



## Network Implications:

- Higher Server Farm Density
- Higher Traffic Loads
- Network-based Services
- Larger & Flatter Networks
- At Least N+1 Redundancy

## Increase

- Uptime
- Flexibility
- Manageability

## Facilities Implications

- Higher Power & Cooling
- Increased Square Footage

## Standardize:

- Physical Requirements
- Operational best practices
- Server platform

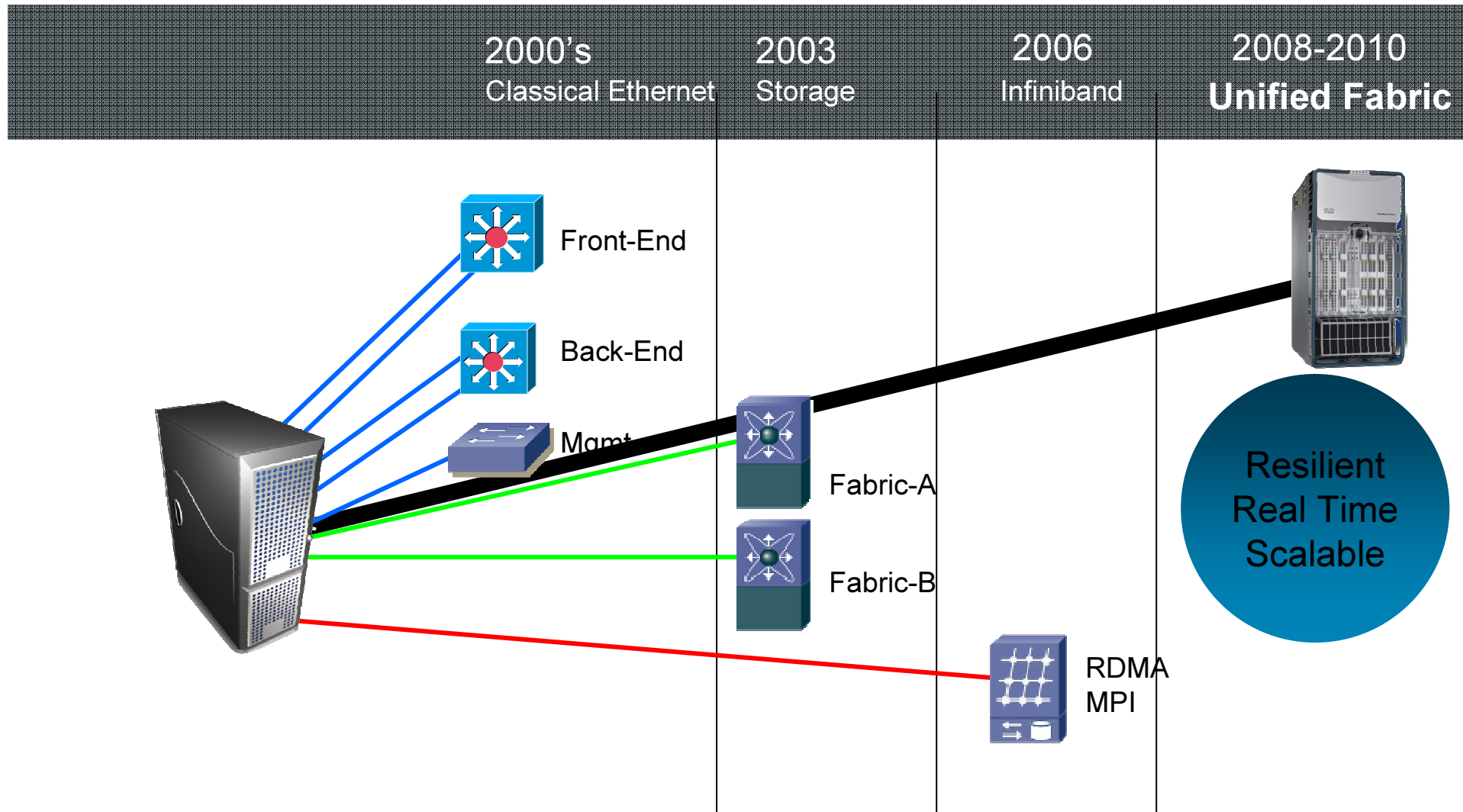
## Establish:

- Future DC Architecture
- Initial phase network design
- Technology Adoption Strategy
- Migration Strategy

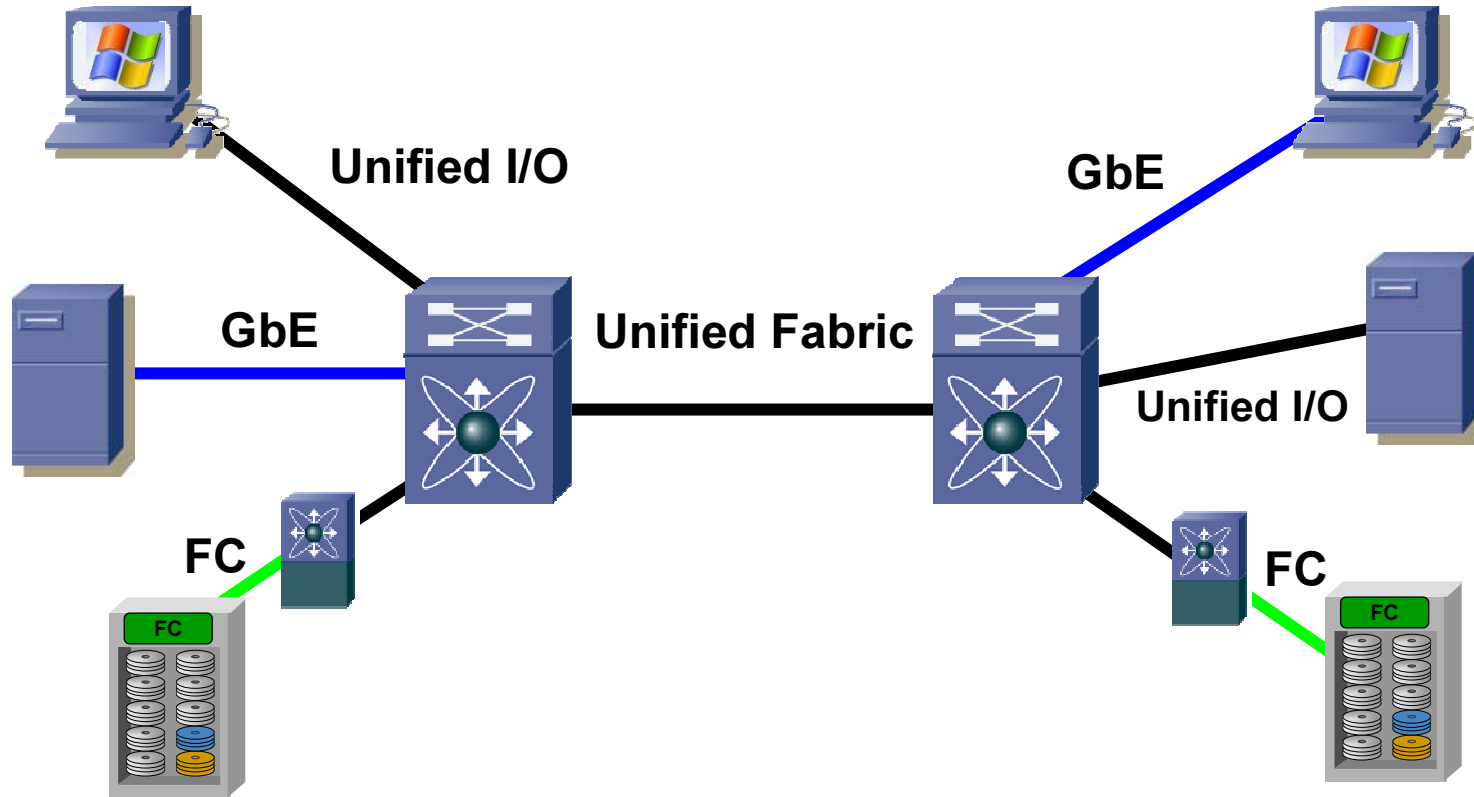
# Data Center 3.0 Consolidation Enablers and Attributes



# Data Centre Network Evolution

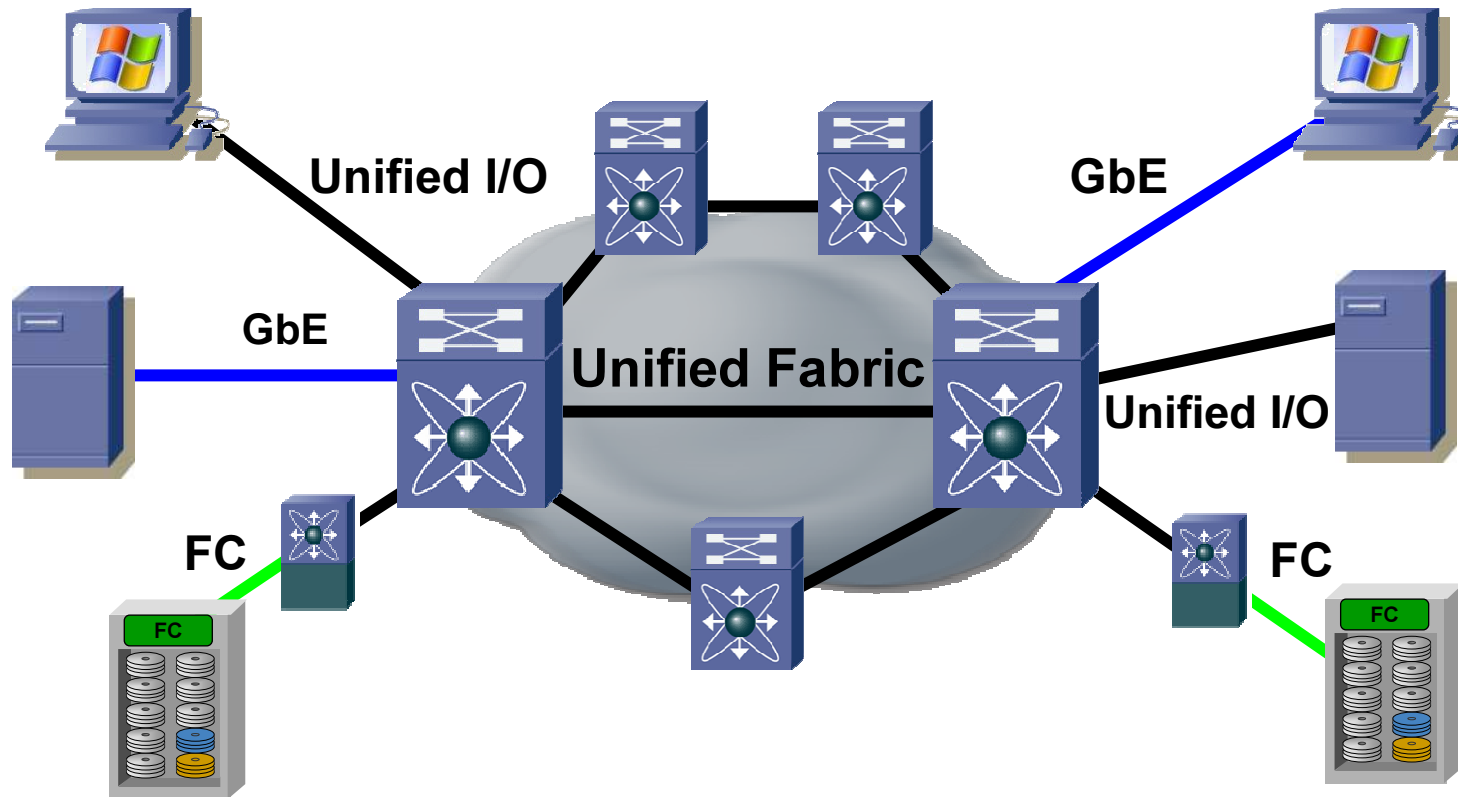


# Cisco Data Center Unified Fabric



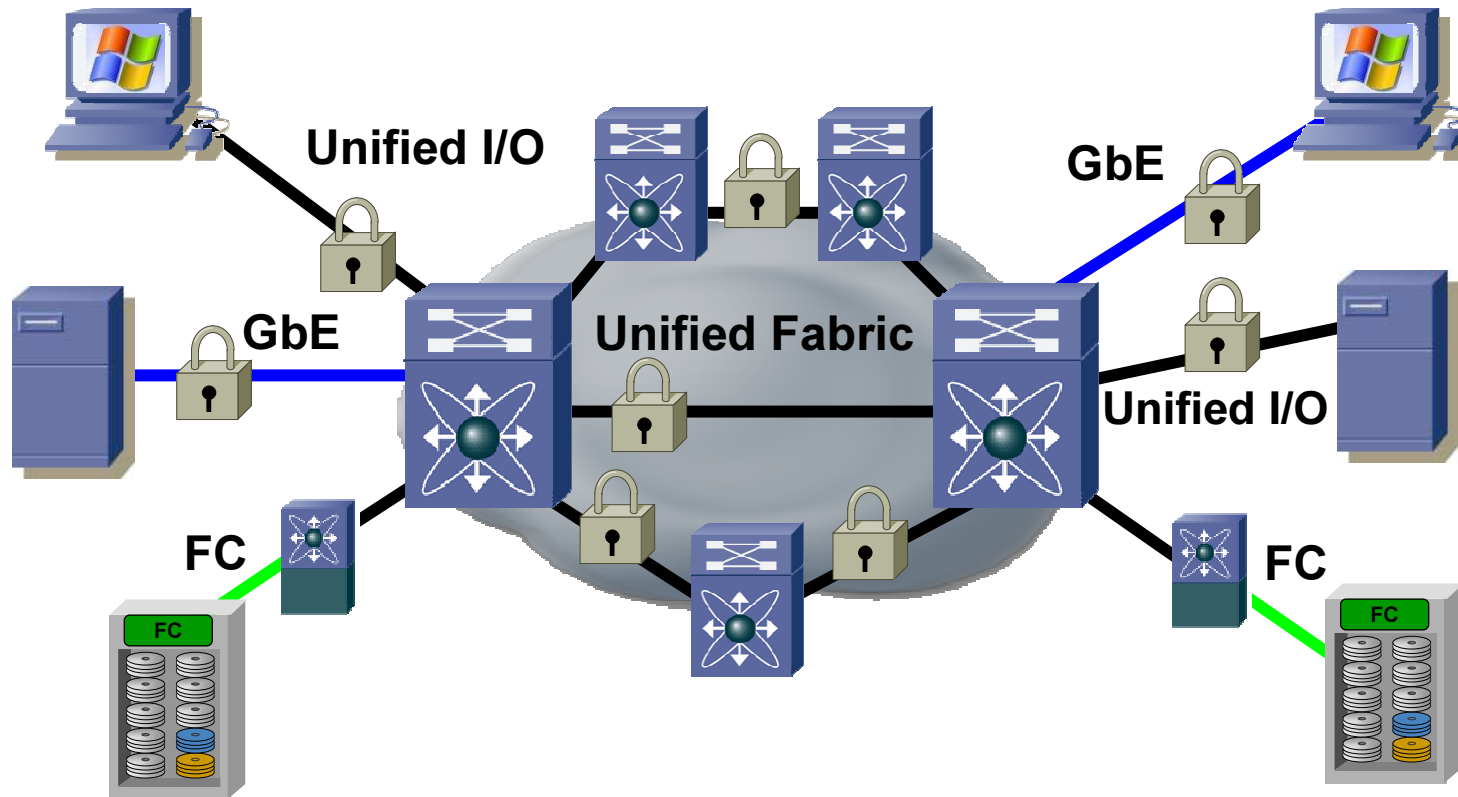
**Seamless service interworking over a common unified fabric**

# Cisco Data Center Unified Fabric



...while simplifying topologies, improving performance, and eliminating spanning-tree...

# Cisco Data Center Unified Fabric



...and encrypting every packet on the wire with TrustSec roles-based security...

# Server Consolidation

*Reducing capital costs & improving application availability*

## Reduce:

- Number of OSs
- Server Idle time
- Costs per RU



## Network Implications:

- Higher uplink capacity
- Increase throughput per server
- Larger & Flatter Networks
- At Least N+1 Redundancy
- Availability beyond a single DC

## Increase

- Application Performance
- Application Uptime
- Server Density
- I/O, MEM, CPU capacity per RU

## Facilities Implications

- Higher Power & Cooling
- Increased Square Footage
- Closer integration with DC Arch

## Standardize:

- SW architecture
- NG HW platforms (bound to tiers)
- I/O (capacity, cabling)

## Requirements:

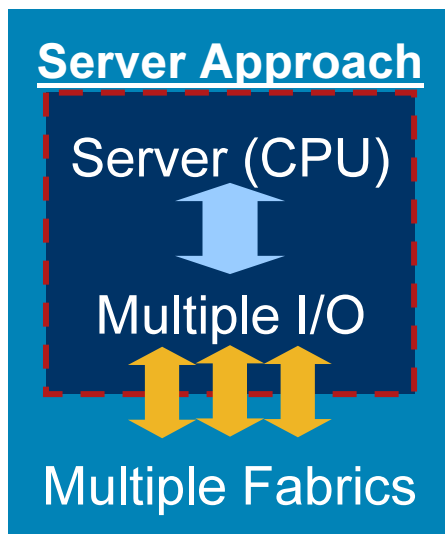
- Scalability of DC architecture
- Initial phase network design
- Technology Adoption Strategy
- Migration Strategy

## Establish:

- Server architecture direction
- Facilities support strategy

# Vision: I/O Consolidation in the Data Centre

**I/O Consolidation simplifies platform architectures and reduces overall platform costs**

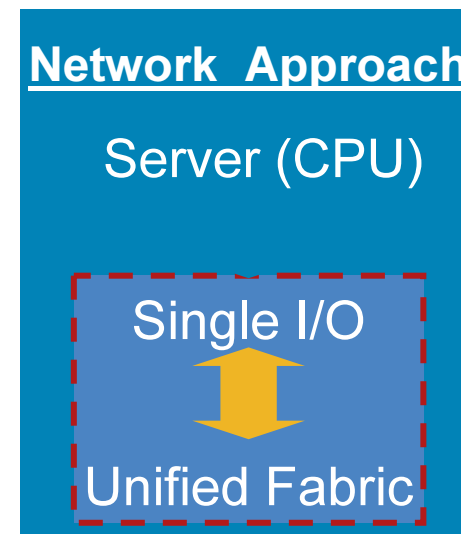


Today, three network interface cards:

Ethernet for Data

Fibre Channel (FC) for Storage

IB / Myrinet / Ethernet for Cluster



Tomorrow, with Ethernet:

A single network interface card carrying all three kinds of traffic

[http://www.ieee802.org/3/ar/public/0503/wadekar\\_1\\_0503.pdf](http://www.ieee802.org/3/ar/public/0503/wadekar_1_0503.pdf) - Manoj Wadekar (Intel)

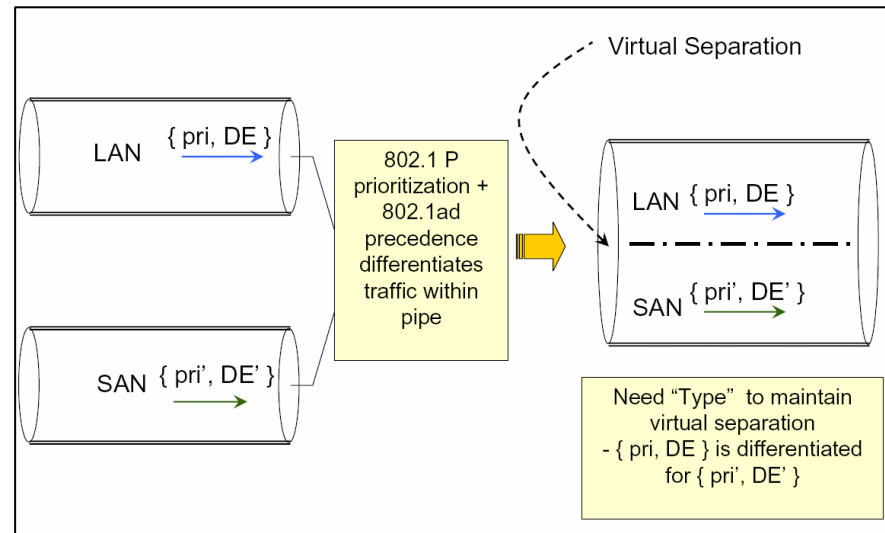
# 802.1Qau - Virtually Partitioned Traffic

- What is it –

Basic building block for I/O consolidation is virtual lane or virtual link (VL)

Enhanced user priority

Reuses the same 3 bits, user priority, from 802.1q tag



- Enhancements are –

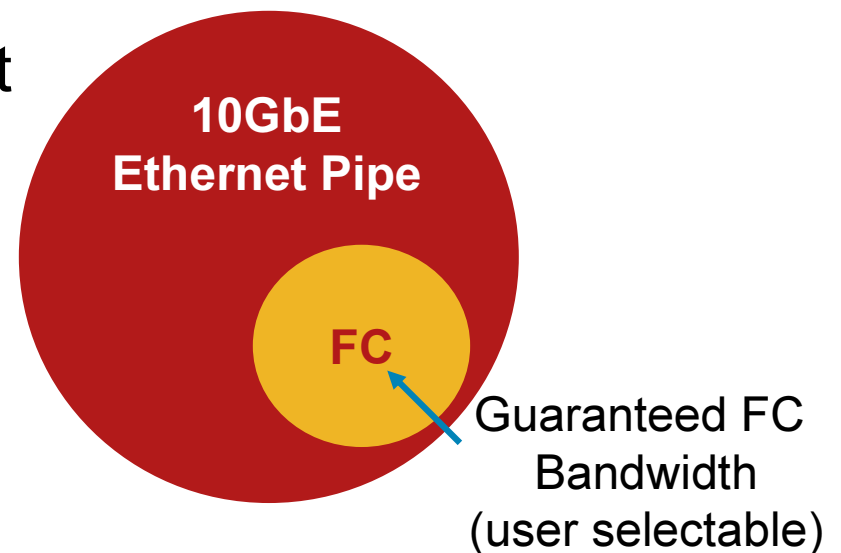
Additional QoS parameter per VL, **drop characteristic** – normal drop **OR** no drop in the presence of congestion

New scheduling mechanism to support traffic isolation and scheduling of the three different classes on the same link

- “Priority Group” maintains relative priority among various flows within a traffic type, rate controller per virtual link

# What is FCoE?

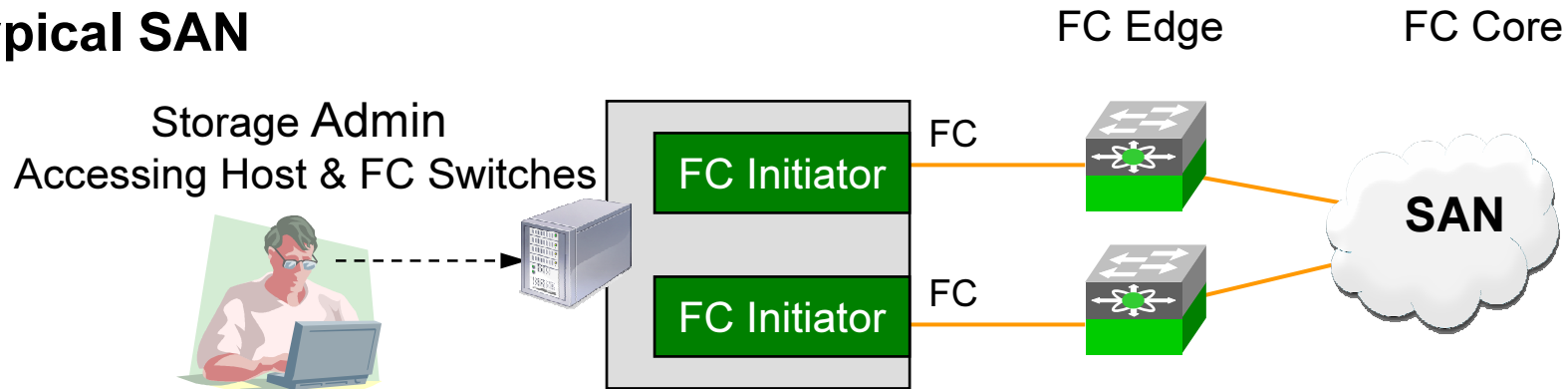
- An Ethernet transport for Fibre Channel
  - Ethernet with Pause provides a service comparable to Fibre Channel with credits
- FCoE appears as Fibre Channel to user
  - Same operational model
- Standards activity development



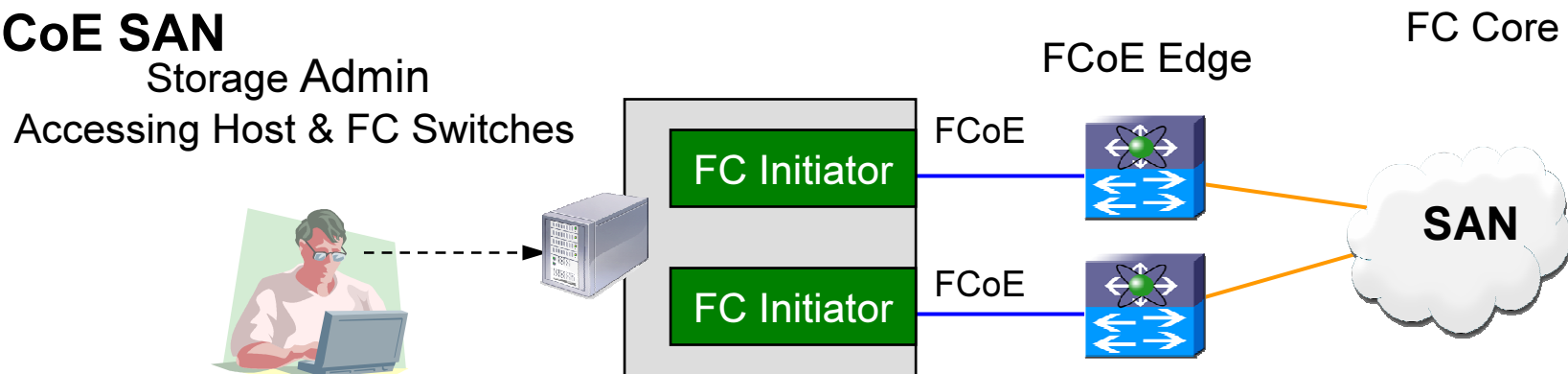
[www.t11.org](http://www.t11.org) - FCoE Specification in INCITS T11.3, FC-BB-5

# FCoE I/O Consolidation Benefit: Management Consistency

## Typical SAN



## FCoE SAN



Storage Administrator view is no different with FCoE at the Edge  
(FCoE HBA's display FC initiators)

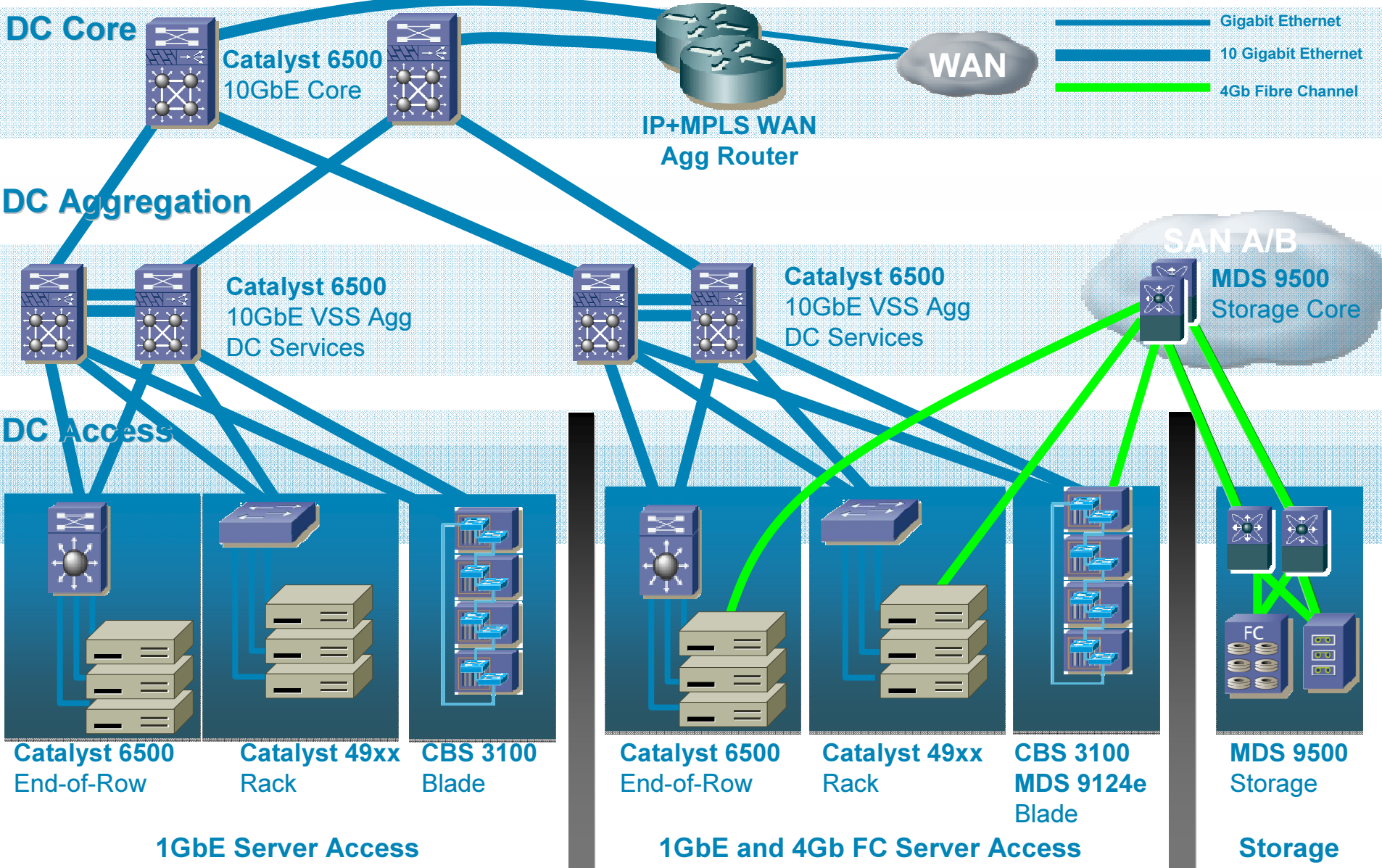
# Fibre Channel over Ethernet (FCoE)

	Fibre Channel	Ethernet	FCoE
No Drop/Lossless Transport	X		X
Bandwidth Control	X		X
Storage Management	X		X
10Gb Performance		X	X
Interoperability		X	X
Economics of Solution		X	X
Adapter Multipathing		X	X

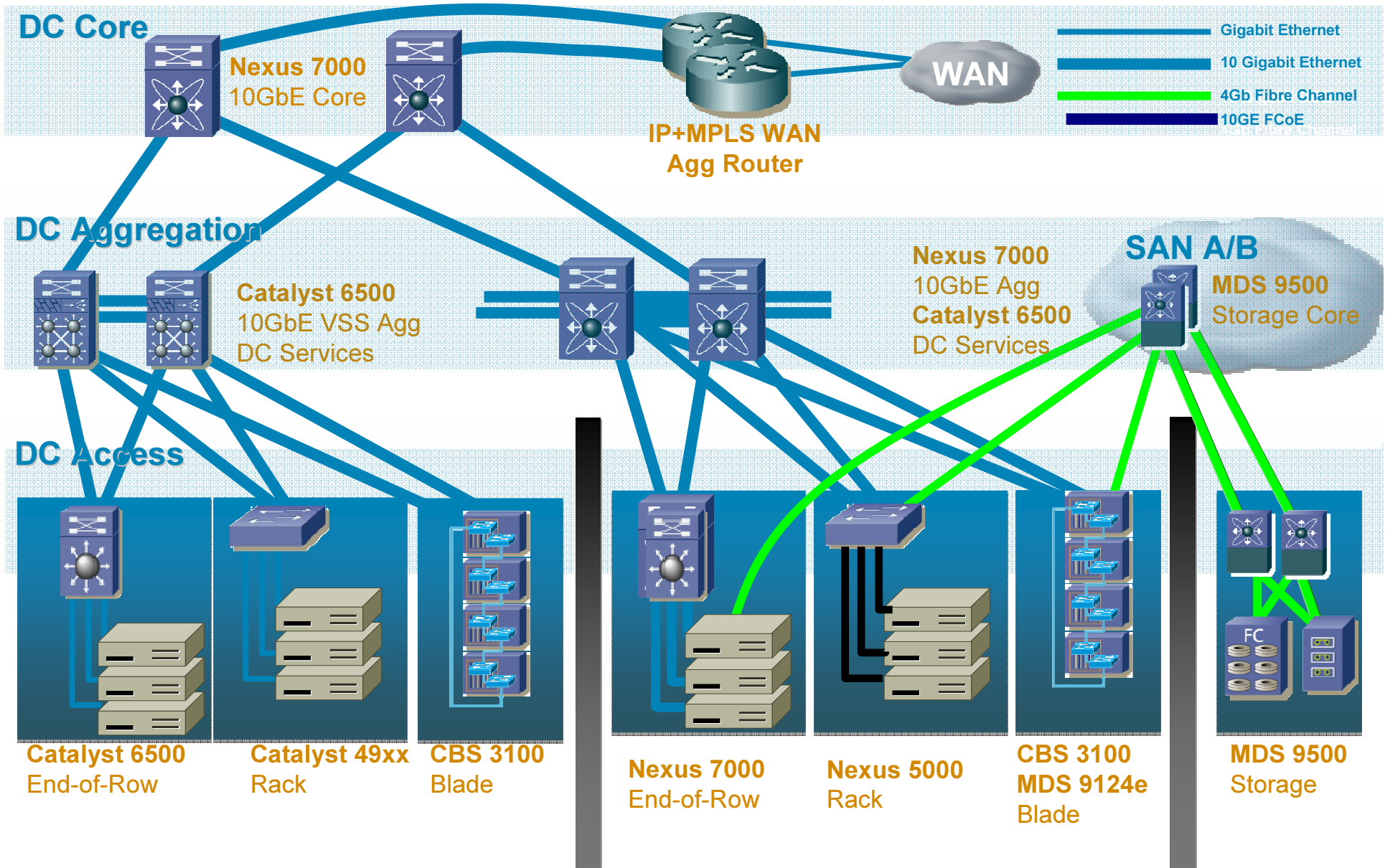
# 10GE (802.3an) - Media Technologies

Technology	Cable	Distance	Power (each side)	Transceiver Latency (link)
SFP+ CU Copper	26-28G Twin ax	10m	0W normalized	~0.25µs
SFP+ USR ultra short reach	MM OM2 MM OM3	10m 100m	1W	~0.1µs
SFP+ SR short reach	MM 62.5mm MM 50mm	82m 300m	1W	~0.1µs
SFP+ LRM long reach mm	MM 62.5mm	220m	1W	~0.1µs
10GBASE-T	Cat6 Cat6a/7 Cat6a/7	55m 100m 30m	~8W ~8W ~4W	2.5µs 2.5µs 1.5µs

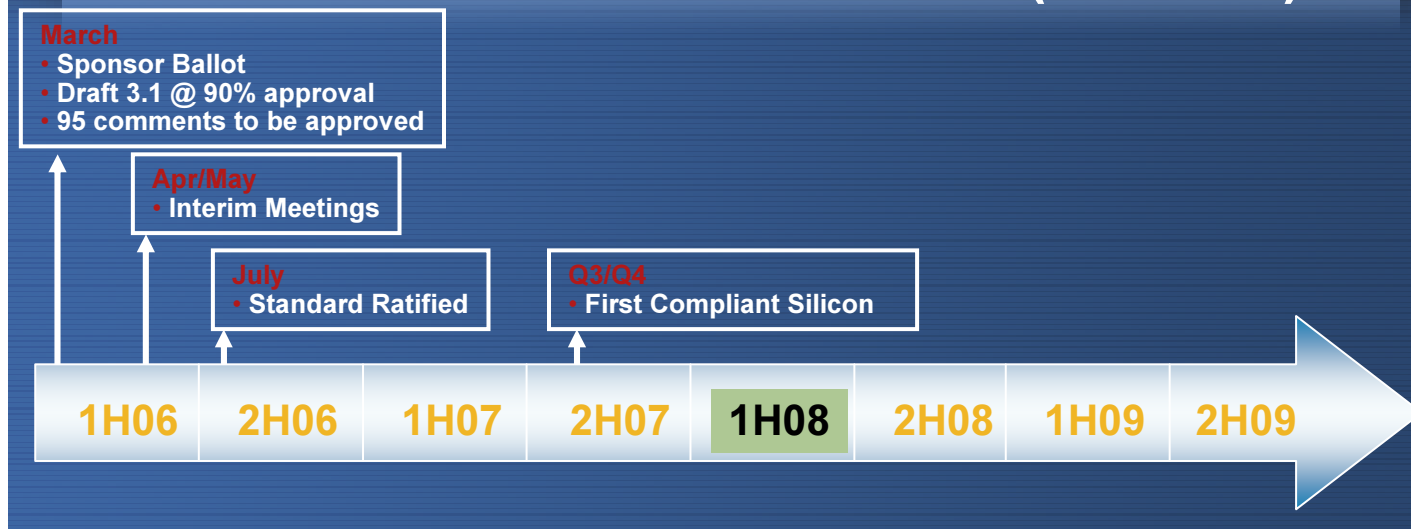
# Unified Fabric Evolution – DC Today



# Unified Fabric Evolution – First Step ?



## 10GBaseT Standard Status (802.3an)



- 10 Gigabit **Server Connections** will be primarily driven by IP/Ethernet and Storage Consolidation
- 10Gb **TODAY** over a Copper Cable has some challenges –
  - Latency** – Could be as high as 2.5usec per PHY
  - Cable Plant** – Requires Cat6A Cabling Specifications
  - Distance** – 100m (standard) or 30m with lower power spec (non-standard)
  - Power** – 10-12w initial per PHY, dropping to 5-8w over a 12-18m period
  - Timing** – End of 2007 is optimistic for 1<sup>st</sup> generation products
- **10Gb / Fiber with XFP and future SFP+ Optics will approach today's GbE/SFP Prices**



# Virtualisation

# Virtualisation in the Data Center

**Servers:** the capability of decoupling CPU, Mem and I/O functions from physical devices that provide them to increase their effective utilization, to enhance the flexibility in how they are utilized and to allow the dynamic management of logical instances

**Storage:** the capability of abstracting the physical location of data storage by presenting logical storage to the user for thus achieving location independence

**Network-based Services:** the capability of manipulating service instances independent from the service device thus providing flexibility in their usage

**Network Infrastructure:** the capability of partitioning groups of networked resources providing logical isolation and common policy

## Common Benefits

- Increase resource usability – Lower CAPEX
- Loosely couple re-usable functions - Flexibility
- Dynamic allocation of virtual instances - Automation
- Centralized policy Management – Lower TCO
- Distributed Capabilities – Broad use of functions

# Data Center End-to-End Virtualization

## Network Virtualization

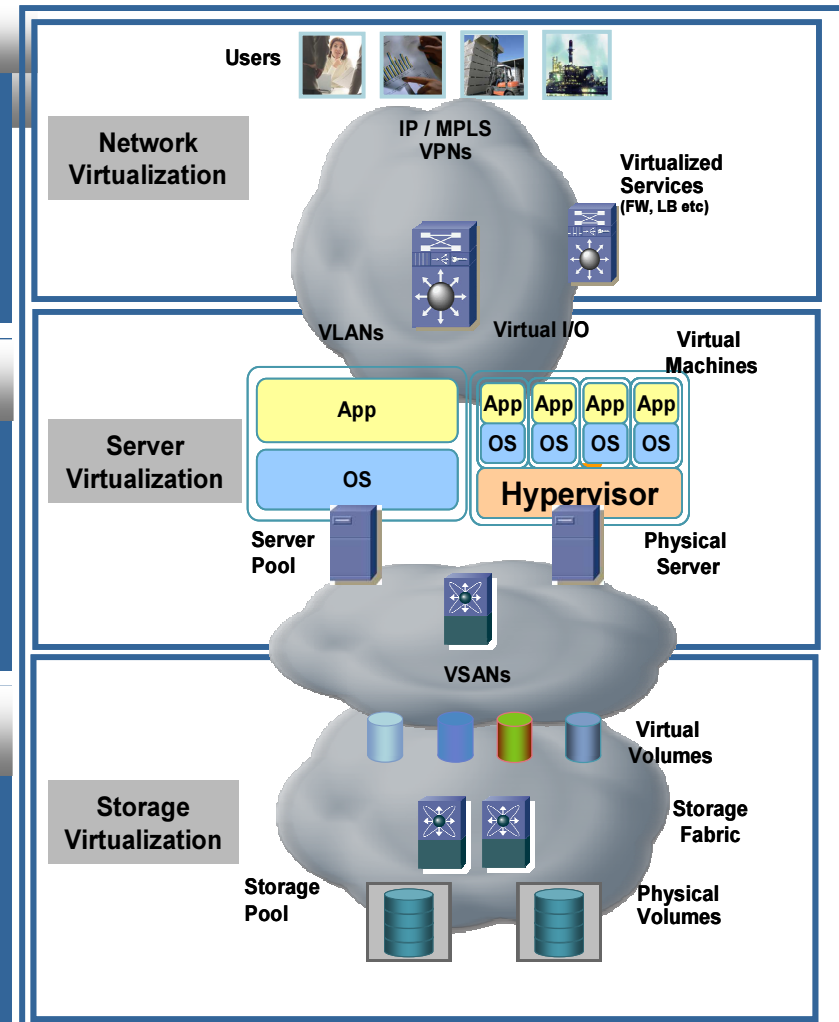
- Segmentation and security
- Higher resource flexibility
- Improved capacity utilisation

## Server Virtualisation

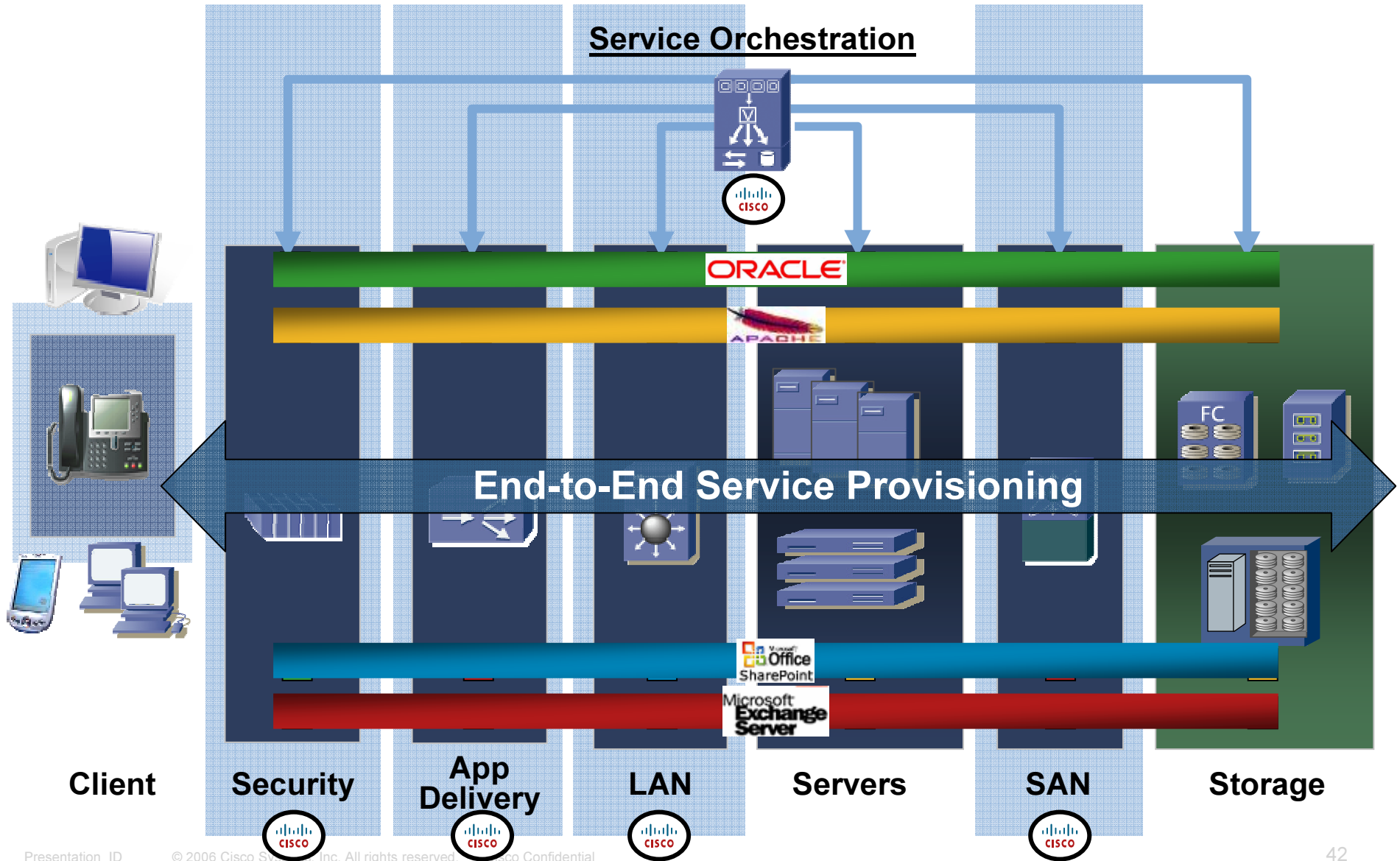
- Consolidation of physical servers
- Virtual Machine mobility
- Rapid application deployment with VMs

## Storage Virtualisation

- Segmentation and security
- Improved data mgmt. & compliance
- Non-disruptive provisioning & migration

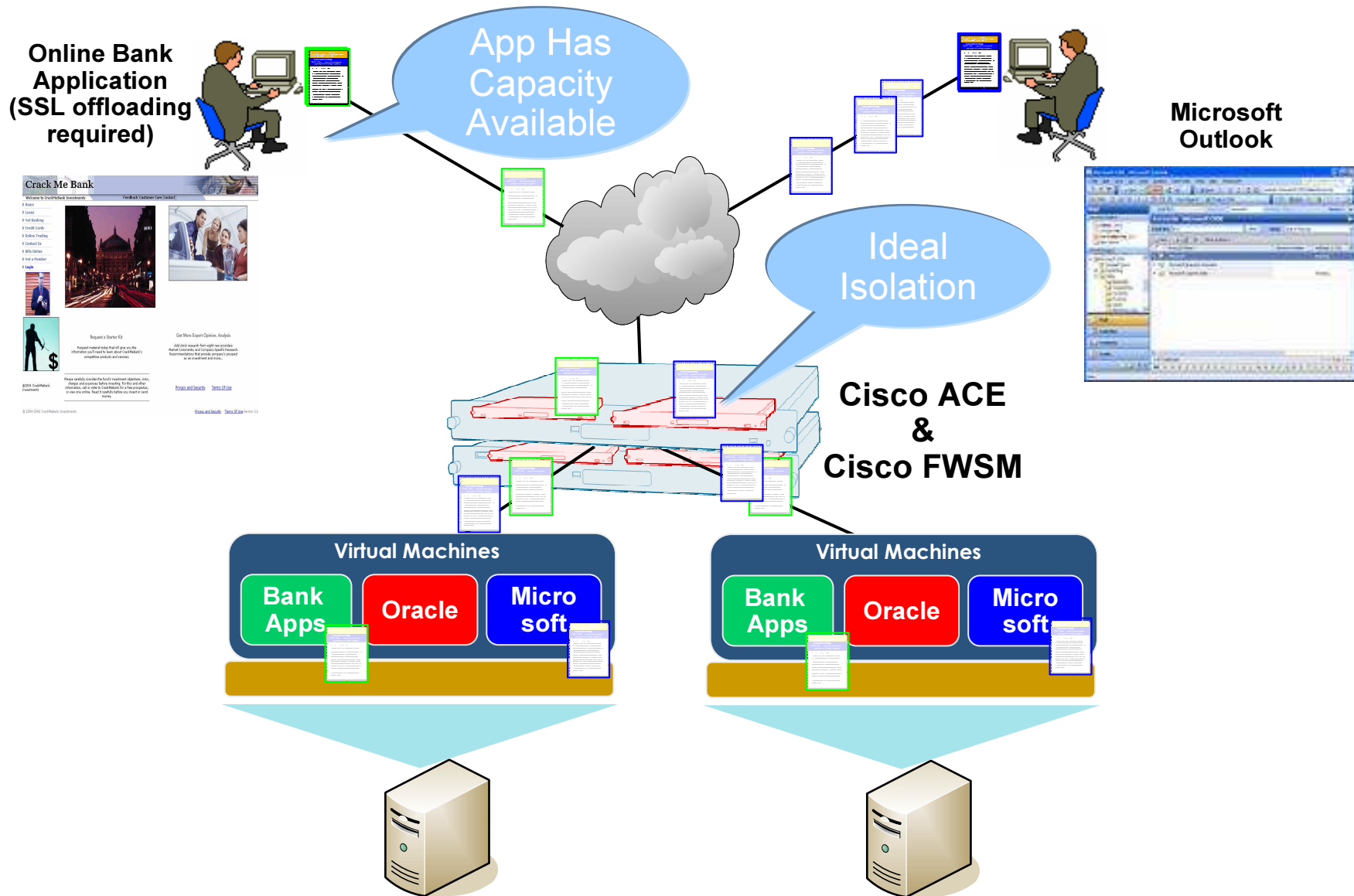


# Data Center Virtualization Via the Network



# Virtualized Secure Application Switching

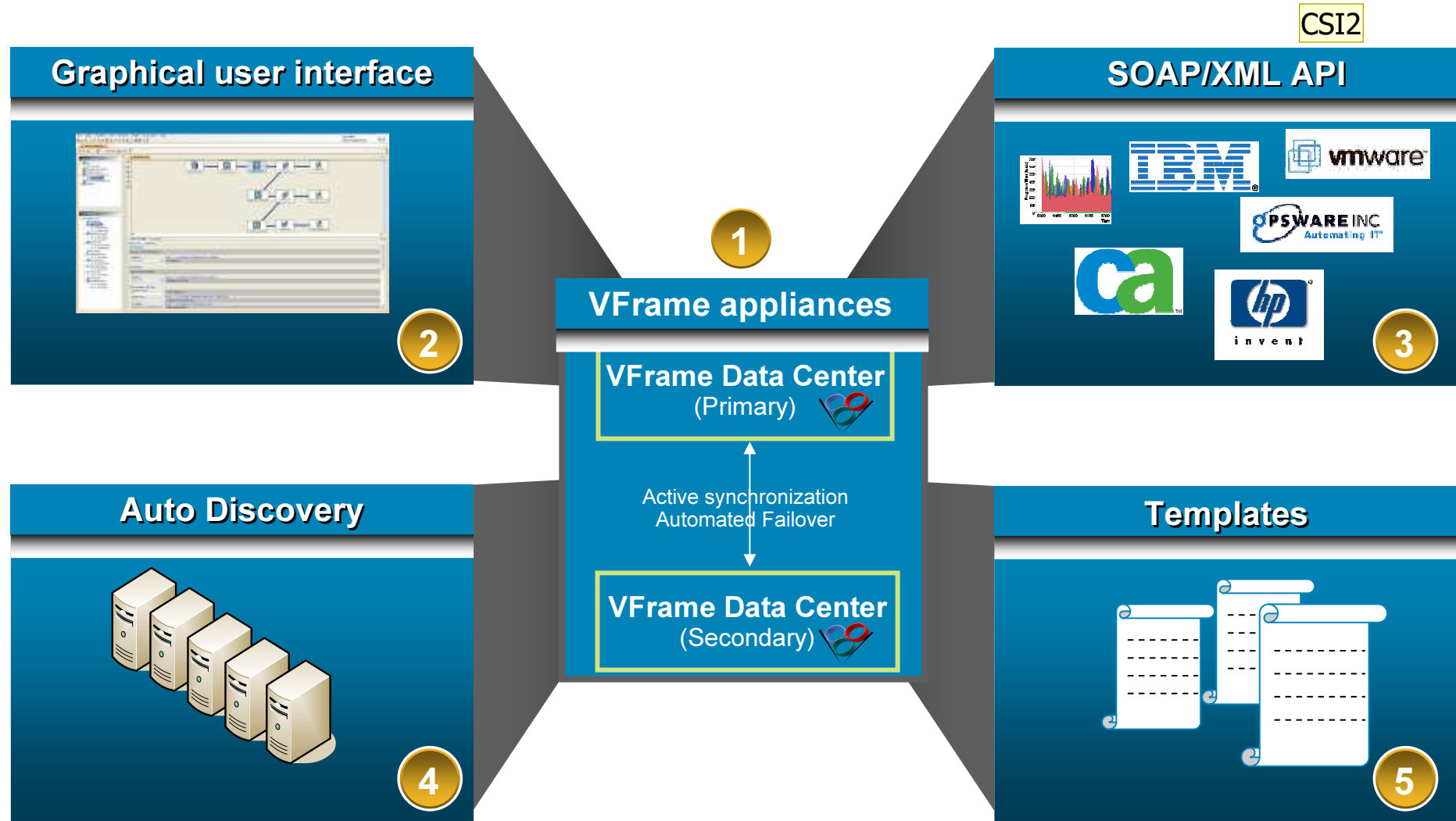
## Cisco ACE and FWSM virtualized





# Automation

# DC Orchestration



**Slide 45**

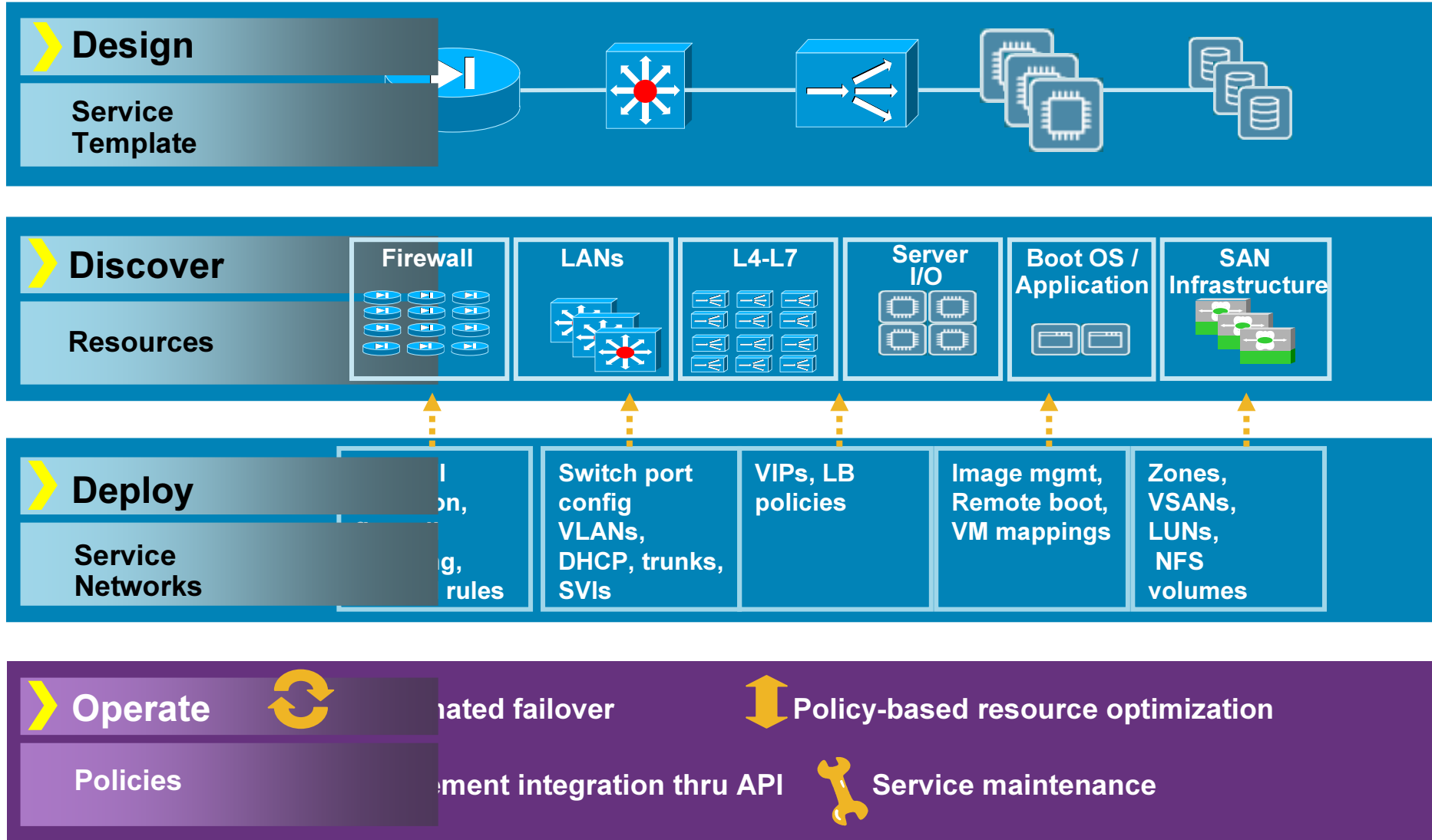
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**CSI2**

Geta Carlson 7/6/2007  
Define SOAP in the script.  
Cisco Systems, Inc., 2007-07-08

# Design to Operate Workflow for SODC

Logical, Structured for Ease of Use

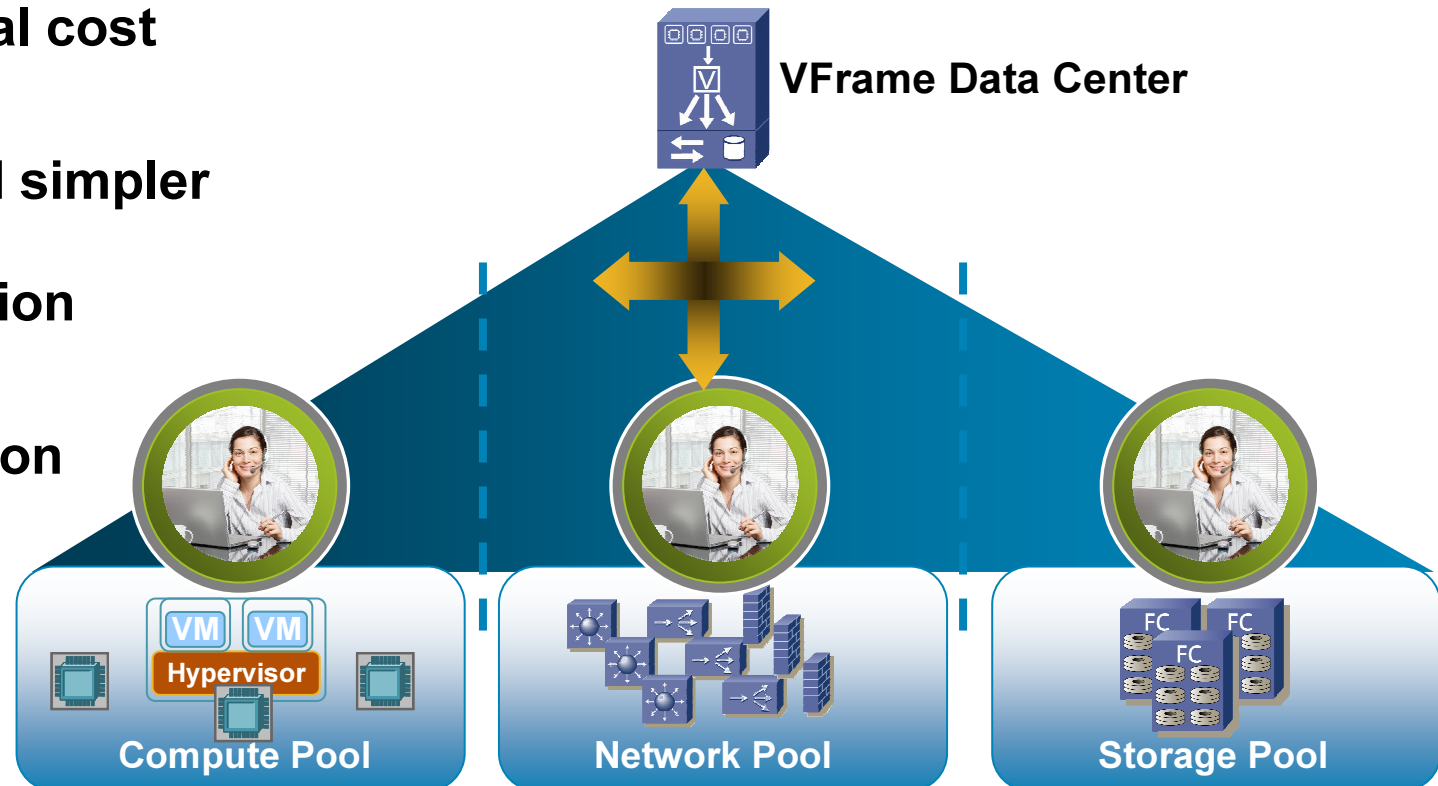


# Cisco VFrame Data Center:

## Network-Driven Service Orchestration

Coordinated provisioning and reuse of physical and virtualized compute, storage, and network resources

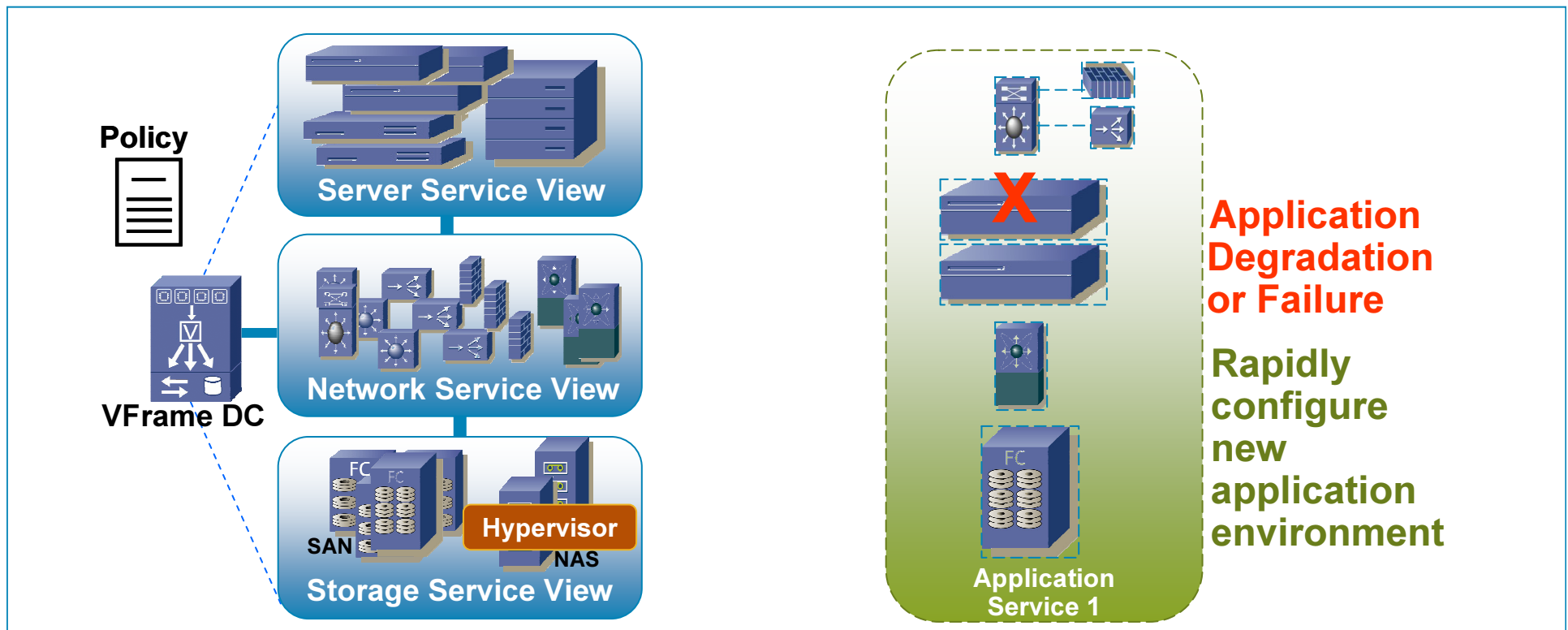
- **Operational cost savings**
- **Faster and simpler service orchestration**
- **Robust virtualization scale-out**



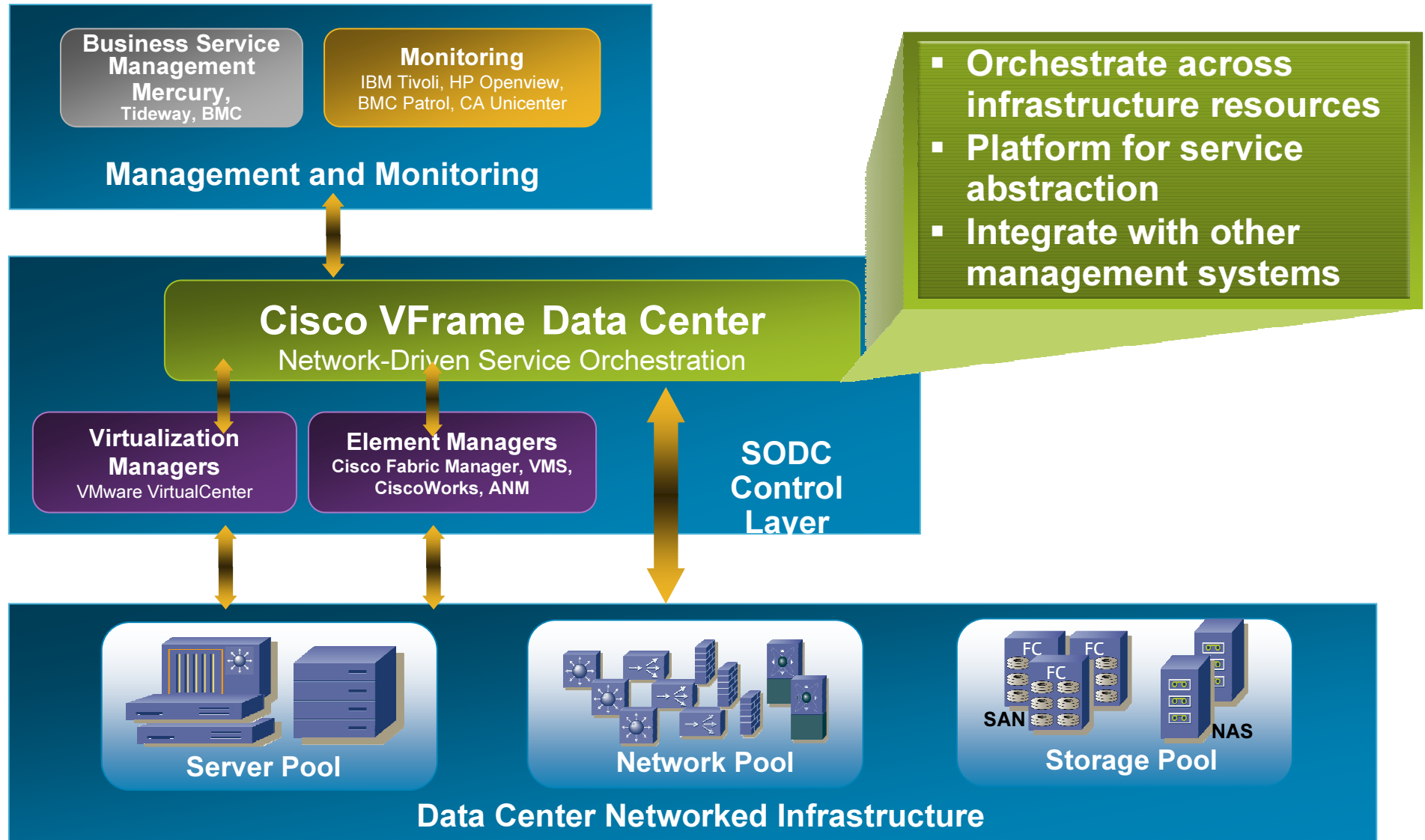
# Adopting VFrame DC Today

## Addressing Today's Challenges while Building SODC Foundation

1. Categorize physical resources into service views
2. Ensure design consistency with standardized infrastructure templates
3. Automate physical provisioning for server virtualization environments
4. Reduce break-fix server support costs with rapid recovery from shared pool
5. Recover failed service with rapid local disaster recovery
6. Provide policy-based dynamic capacity on-demand for applications



# Cisco VFrame Data Center Helps Build the Foundation of a Service-Oriented Data Centre (SODC)





# Data Centre Assurance Program (DCAP)

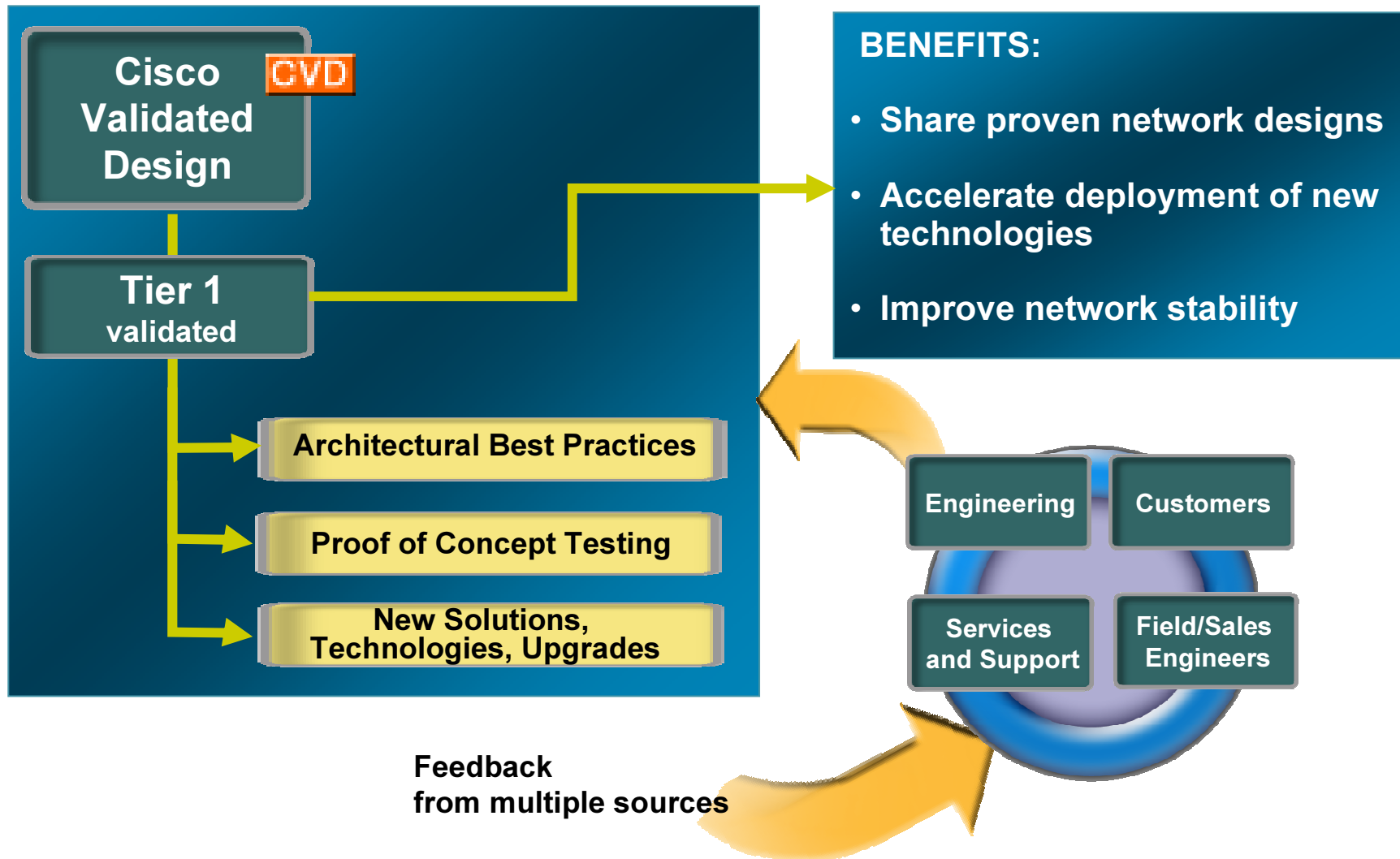
# DCAP – What is it?

- DCAP is a CVD Tier II testing initiative
- Safe Harbor Solution Testing focused on assuring the interoperability, functionality and stability of Data Center products
- Uses the Safe Harbor testing methodology
- Extends the hardening process of Safe Harbor to the Data Center
- Based on ESE designs (enhanced with customer feedback)
- Safe Harbor or vendor Certified code is used when applicable
- Field involvement includes multiple financial customers to ensure relevancy, consistency and stability in their environments

[http://www.cisco.com/en/US/solutions/ns340/ns414/ns742/ns741/networking\\_solutions\\_products\\_genericcontent0900aec80601e22.html#datacenter](http://www.cisco.com/en/US/solutions/ns340/ns414/ns742/ns741/networking_solutions_products_genericcontent0900aec80601e22.html#datacenter)

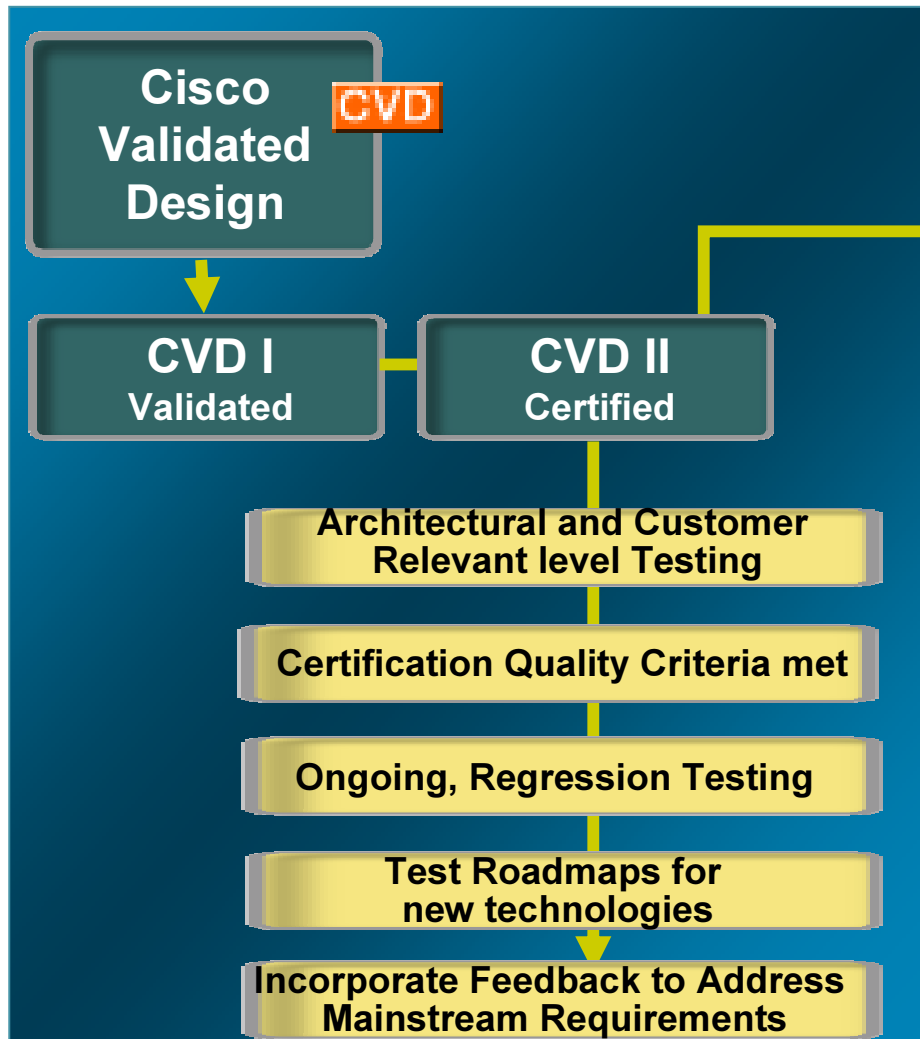
# Cisco Validated Design Program

## CVD I - Validated Designs



# Cisco Validated Design Program

## CVD II - Certified Designs



### Certified Design BENEFITS:

- Includes the Benefits of CVD Tier 1 – Validated Designs
- Moves design out of early adopter realm into mainstream deployment
- Provides higher degree of confidence in the system design integrity
- Ongoing testing of new software images as related to certified designs
- Provides a robust basis for customer and CA Service customized designs
- Provides customers with detailed test documentation

# Data Center Assurance

Cisco Validated Designs : Design Best Practices for the Data Center

Home

HOME  
Version 20.3

Overview Reference Designs : CVD-I Data Center Assurance Program : CVD-II

## Welcome to the Cisco Data Center Networking best practices interactive tool.

This tool is provided to help users gain access to the design and test information in an intuitive, interactive way. To find the network design guidance you need for a specific data center project, go to the CVD-I tab and navigate the topology. To access the test descriptions, results and device configurations of the latest fully tested data center network architecture go to the CVD-II tab. Navigate the topology to find the tests and configurations associated with any specific solution or device. We hope you find this tool helpful for locating the information you need to complete a successful data center network deployment.

### Overview

Cisco Data Center Networking design best practices, based on extensive research, testing and customer engagements are provided to help accelerate and lower the cost of designing and deploying Cisco data center networking technologies.

[Learn More](#)

### Reference Designs

For customers at the planning and design stages of a data center project, Cisco reference designs describe the considerations associated with designing and deploying specific solutions and offer system level guidance, based on testing, and customer engagements.

[Learn More](#)

### Data Center Assurance Program

For customers at the design and implementation stages of a data center networking project the data center assurance program provides validated configurations, test results and software versions that can be used as a baseline.

[Learn More](#)

[www.cisco.com/go/dcap](http://www.cisco.com/go/dcap)



# Summary

## Summary

- Cisco Validated Designs to assist with DC Architecture and Design needs and help reduce deployment costs
- IT Services will continue to centralise into the Data Centre
- Along with Business pressures, will force a transformation of the Data Centre
- The Network is the Platform for Transforming Data Center
- LAS VEGAS – (In a town where gambling is the primary industry), Booth “agreed that it's not a good idea to bet against Ethernet. “

[www.cisco.com/go/datacenter](http://www.cisco.com/go/datacenter)

