What is a Data Center (DC)?

Rooms or Facilities that Contain Critical Computing Resources:
- In a Controlled Environment
- Under Centralized Management
- Supporting Business Needs 24 x 7 x 365

Computing Resources:
- Storage Subsystems, Network Infrastructure (IP & SAN).
Typical Data Center Topology

The Next Generation Enterprise

CEO Priorities
- Top line, bottom line growth, innovative thinking
- Globalization...markets, talent
- New business models...vertical to horizontal
- Process change...transactions to interactions
- Partnerships...revenue growth, competitiveness
- IT as a strategic enabler

CIO Priorities
- IT as a strategic business enabler
- Global scalability
- Escalating user expectations
- IT service quality, availability, green
- Compliance and security
- Strategic vendor partnerships

- Grassroots innovation
- Personalization
- Consumer participation
- Global talent

COLLABORATION, WEB 2.0, PRODUCTIVITY

NETWORK AS THE PLATFORM
The Data Center is Evolving
Server Centric to Service Centric

Complexity & Cost of your IT Infrastructure

- Customers are not able to provide increasingly more complex services in their own Data Center
- Financial and human resources
- New technology and application trends
Evolving Architectures
Productive, collaborative... complex

- **Client-Server/Silo-ed (Web 1.0)**
  - Limited inter-application traffic & data sharing
  - Relatively simple environment
  - Limited scaling, security, management & control

- **Collaborative (Web 2.0 and SOA)**
  - Extensive inter-application traffic & data sharing
  - Graphically Rich, Interactive environment
  - Significant scalability, security,

Networked → Connected → Collaborative

Tackling Business Challenges
Where to Invest?
70% of the IT Budget for *Maintenance*
30% Available for *Assets and Innovation* *

*Source: Gartner - IT Infrastructure, And The Shift To “Real-Time” Feb, 2005*
Let’s pause for a Moment

Remember When…..

Printers were attached to servers in the DC?

Where are we heading?

Do you have a home network?

The Network Consolidation Effect

Server Architecture  Peripheral  Network  Networked Resource
Looking Ahead: A New Family of Data Center-Class Platforms

<table>
<thead>
<tr>
<th>2000’s</th>
<th>2003</th>
<th>2006</th>
<th>2008-2010</th>
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</thead>
<tbody>
<tr>
<td>Classical Ethernet</td>
<td>Storage</td>
<td>Infiniband</td>
<td>Unified Fabric</td>
</tr>
<tr>
<td>Front-End</td>
<td>Fabric-A</td>
<td>Resilient</td>
<td>Real Time Scalable</td>
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<td>Back-End</td>
<td>Fabric-B</td>
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<tr>
<td>Mgmt</td>
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Scale of Current Problems Demands a New Approach

**Infrastructure Scalability**
- By 2009, 50% of large businesses will spend more on power and cooling than on new servers (Gartner, 2006)
- Quad-cores and octal-cores will drive significantly more traffic
- Storage is expected to continue to grow at a 40-70% CAGR (Gartner, 2006)

**Transport Flexibility**
- Continued deconstruction of the server increases demands on the network
- Market transitions between transport technologies and application architectures

**Operational Continuity**
- Expectation of 24x7 application availability
- 54% of network downtime is caused by human error (Uptime Institute, 2007)
The Network is the Platform for the New Data Center

Applications

Accelerated Delivery
Service Virtualization

Application
Optimization, Security

Servers

Virtual Machines
I/O Virtualization

Unified Fabrics
Server Fabric Switching, VFrame

Storage

Virtual SANs
Storage Virtualization

FibreChannel
Switches and Services

Network

Infrastructure Services
Dynamic Service Provisioning

Core Switching, Routing

Facilities

Active-Active Online
Transparent Backup

Optical High
Speed links

A Comprehensive Portfolio for Data Center 3.0

Unified Fabric Networking

Nexus 5000 and
7000 Modular
Switching System
(Unified Fabric ready)

Ethernet Networking

Nexus 7000
Nexus 5000
Catalyst® 6500 Series
Catalyst 4900M
Top-of-Rack
Catalyst Blade Server Switches

Storage Networking

MDS 9500
Storage Directors
MDS Fabric Switches
Blade Switches
(Unified Fabric ready)

Application Network Services

ACE Application Delivery –
Module and Appliance
Wide-Area Application Services
ACE XML Gateway

High Performance Computing

Nexus 5000 7000
Modular Switching System
SFS 7000
Infiniband Switch
SFS 3000
Infiniband GTWY

Data Center Security

Firewall
Services Module
Intrusion
Detection System Module
Web Application Firewall

Data Center Provisioning

VFrame Server/Service Provisioning System

Data Center Management

Data Center Network Manager – Topology Visualization and Provisioning

ANM – Advanced L4-7 Services Module Management
Critical Infrastructure for Data Center 3.0

Unified Fabric and I/O Interfaces
- Enables storage, Ethernet, IP, and HPC traffic to converge to a single network
- Lowers overall data center power draw

Cisco® Nexus Switching Platforms
- Multi-Terabit platform with ops-centric design
- Delivers unified fabric and I/O deployments
- Designed for the most stringent availability needs

NX-OS Operating System
- First multi-protocol DC-class operating system
- Virtualized control plane and scalable design sets new standard for usability

Data Center Network Manager Fabric Manager
- Builds on Cisco Fabric Manager to extend L2, L3, Fibre Channel, and unified fabric management
- Provides end-to-end systems visibility

Data Center Switching Platforms 2008/9

DCOS DC Switches

Catalyst 10GbE DC Switching

Fiber Channel

Compute Cluster

Nexus 7k 10-slot

Nexus 7k 5k

NEXUS 5k

10GbE Uplink

6500 VSS

4900M-10GE

IB Blade

SFS GW

MDS 8G FC

SFS-NG

IB

432-648P QDR

1HFY08

2HFY08

1HFY09
The Case for 10GbE to the Server

Multi-Core CPU architectures allowing bigger and multiple workloads on the same machine

Server virtualization driving the need for more I/O bandwidth per server

Growing need for network storage driving the demand for higher network bandwidth to the server

10GE LAN on server Motherboards (LoM) beginning mid-2008 (source: Broadcom)

The Case for Unified Fabric

Reduce overall Data Center power consumption by up to 8%. Extend the lifecycle of current data center.

Wire hosts once to connect to any network - SAN, LAN, HPC. Faster rollout of new apps and services.

Every host will be able to mount any storage target. Drive storage consolidation and improve utilization.

Rack, Row, and X-Data Center VM portability become possible.
“Silos to Services”: Network-Based DC Infrastructure Transformation

Consolidation
- Improved utilization, power efficiencies, lower costs

Virtualization
- Better utilization, flexibility, mobility of applications/data

Automation
- Policy-based adaptive service-oriented infrastructure

- Regain Asset Control
- Reduce Cap Expense
- Increase Utilization

- Improve Flexibility
- Fast Reconfiguration
- P&C Efficiencies

- Discover Services
- Automate Provisioning
- Ensure Compliance

Network Connected Assets
- Virtualized Storage Pool
- Virtualized Server Pool

Network Hosted Services
- Virtualized Network and Network Services
- Virtualized Storage Pool

Network Orchestrated Services
- Service Network 1
- Service Network 2
- Service Network 3

Data Center 3.0 Enablers & Attributes

- Service Virtualization
- Agile Application Delivery
- Adaptive Orchestration

DC 3.0 Fabric
Distributed Data Centers
Or Virtually Distributed Data Center

Data Center Services
Server Load Balancing and Health Monitoring, Caches, SSL Offload, Firewall, and Intrusion Detection

IP Network
FCIP Link
IP Storage Services Module for FCIP (GigE) in MDS9000 Switch

Production Data Center
Backup Data Center

Cisco Network Virtualization Today

V-Compute
Compute Resources

V-SAN Storage

Internet Services

V-LAN Networking

Storage Pool

Virtual Server
Virtual Disk
Virtual I/O

Management
The Data Center 3.0 Foundation

- Massive proliferation of server resources
- Orchestrate pools of compute, storage and I/O
- Based on application, process, or business objectives

Data Center Network Fabric
Resilient, Scalable, Real time

Resource Pool

Data Center 3.0: Service Virtualization

Secure Lan Switching
- SSL
- VPN
- FW
- IDS
- SLB

Intelligent Server Switching
- Blade Servers
- Web, E-mail Servers
- DB Servers

Intelligent San Switching
- Volume Mgmt.
- Backup Assist
- Replication
- NAS

Service "Backplane" Between All Resources
- Networking Pool
- Processor Pool
- Storage Pool

Virtualization
What is VFrame DC?

Service Orchestration or Provisioning

- Hardware appliance
- Java Web Start GUI
- Web Services API
- Server Host Agent
- Extensibility macros

- Rules based infra provisioning
- Design once, deploy many
- Dynamic policy based change
- End to end orchestration
- Enhanced troubleshooting

VFrame - Enabling Virtual Services

Traditional Virtualization
Creating a virtual element

Domain Virtualization to Virtual Services with VFrame

VFrame Enabled Service Orchestration
Creating an End-to-End Virtual Service
Data Center Virtualization VMware and Cisco

Network Virtualization
- Segmentation and security
- Higher resource flexibility
- Improved capacity utilization

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

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

Cisco-VMware Joint Initiatives
ROBO/VDI/DR: Cisco WAAS and ISR Routers
Service Virtualization Infrastructure

Solved with Server Virtualization

- Low Server and Storage Utilization
- Power/Cooling Inefficiency
- Proliferation of Disparate Platforms

Solved with Infrastructure Orchestration

- Tightening Security Requirements
- Inefficient Use of Available Resources
- Poor Agility in Adding New Services

Transformation, Consolidation and Virtualization Through Data Center Intelligence

Cisco And Cirba
Managing the Virtualized Environment

Data Center Intelligence

Transformational Analytics
Rapidly analyzes and visually maps the safest path to an optimally transformed data center

Operational Analytics
Continually audits the environment to maintain the optimal state despite constantly changing constraints and configurations
Transformational Analytics

- P2P, P2V, V2V Mappings
- Granular Remediation Plans
- Virtual Cluster Design

Business Constraint Analysis
- Workload Constraint Analysis
- Configuration Data
- Business Attributes
- Existing Data Center

- CPU Usage
- Memory Usage
- Disk I/O Rates
- Network I/O
- VM Overhead
- iSCSI Models

Multi-Dimensional Analysis "Cube"

Operational Analytics

- Proactive Placement
- VM Rebalancing
- TCO Optimization
- Chargeback
- DRS Anti-Affinity Rules
- Risk & Outlier Analysis

- Runtime governance based on anticipated daily utilization
- Optimizing VMs onto existing hosts using proper constraint models
- Aggregated utilization tracking by department or logical group
- Runtime governance through automated DRS rule generation
- Advanced analysis of config outliers and unusual workloads

Optimized Data Center
How to Read CiRBA Analysis Maps

Benefits of the Cisco & CiRBA Approach

• Cross-platform coverage & enterprise scalability
• Rule-driven multi-strategy approach
• Considers business, process and technical constraints
• Flexible What-If? analysis allows exploration of options
• Unbiased results based on up to date information
• One solution for transformation and ongoing

BEST of Vmworld 2007 Capacity Planning and Server Consolidation Software

#1 on Top 10 List of Virtualization Management vendors to watch in 08

Ten Management Vendors to Watch in 08
Cisco Data Center Services Vision

Evolving Business Model for Services

- Customer Demand
- Cisco Solution

Business Consultancy
- Validated Architectures for Business Applications
- Broad services footprint
- Project Management

Network Optimization Services
- Services Globalization
- End-to-end accountability
- Customization

Data Center Services

Lifecyle Services Approach

Gathering Business Requirements
- Business Case Development
- Recommend Services
- Translate Services to Solutions
- Offer Technology Options
- Solution Deployment

Targeting Optimization of Business Applications!
Data Center Consolidation—Approach

- Prepare a High-Level Feasibility Report
  - Establish Target KPIs to Achieve
  - Understand TCO Metrics (Cost Structure)
  - Readiness to Adopt Shared Services
  - Current asset Utilization
- Application Profiling
- Operations Maturity
- Organization and Governance
- Understand Customer’s Goals and Scope

1. **Prepare**
   - Consolidation Strategy
   - Facilities Design to Accommodate new Infrastructure

2. **Plan**
   - Consolidation Plan
   - Detailed Business case justification + Risk mitigation plan
   - IT Service Mgmt Changes
   - Pre-Consolidation Changes
   - Consolidation Architecture
   - Governance and Organization
   - Virtualization Opportunities
   - Standardization
   - Platform Consolidation
   - Target DC Selection

3. **Design**
   - Consolidation Architecture
   - Security Design
   - Network Design (L2/L3, Load Balancing, etc.)
   - Storage/Network Design
   - Application Infrastructure Design
   - Facilities Design to Accommodation and Infrastructure

4. **Implement**
   - Detailed Business case justification + Risk mitigation plan
   - IT Service Mgmt Changes
   - Pre-Consolidation Changes
   - Consolidation Architecture
   - Governance and Organization
   - Virtualization Opportunities
   - Standardization
   - Platform Consolidation
   - Target DC Selection

5. **Operate**
   - Detailed Migration Plan
   - Develop Test and Validation Plan
   - Instrumentation and Tools as Support
   - OS and Application Provisioning Tools and Processes

6. **Optimize**
   - Detailed Migration Plan
   - Develop Test and Validation Plan
   - Instrumentation and Tools as Support
   - OS and Application Provisioning Tools and Processes

**Cisco Partnerships for Data Center Services**

- Systems Integration
- Application Providers
- Specialized Partners
- Channel Partners
- OSM/Vendors
- Facilities
Cisco Saudi Arabia Data Center Team

Sales Support in Saudi Arabia (Excludes MEast)

Irfaan Harris
Data Center BDM
Wald Issa
Consulting Systems Engineer

Hama Ali
Muntasir Asad
Maqsood Siddiqui
Ahmad Ghannoum
Systems Engineers
Sales

Ayman Akdar
Abdulla Ahmed
Nidal Abu Sadeh
Eyad Mohammad
Systems Engineers
Channel

Q and A

Irfaan.harris@cisco.com
Cisco HPC & Top Tier Server Vendors

- Cisco has built relationships with server vendors to deliver integrated HPC and cluster solutions, jointly testing for solution delivery
Cisco Data Center Storage Partners

<table>
<thead>
<tr>
<th>Storage Manufacturers and Integrators</th>
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<tbody>
<tr>
<td>IBM</td>
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<tr>
<td>hp</td>
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<tr>
<td>EMC²</td>
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<tr>
<td>Sun</td>
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<td>HITACHI</td>
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<tr>
<td>Fujitsu &amp; Siemens</td>
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<tr>
<td>Dell</td>
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<tr>
<td>NetApp</td>
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Cisco Networking Business Relationships

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<tr>
<th>Internet Communications Software</th>
<th>Technology Developer Partners</th>
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<tbody>
<tr>
<td>ORACLE</td>
<td>at&amp;t, PacBell</td>
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<tr>
<td>OPENWAVE</td>
<td>vonage</td>
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<td>Sun</td>
<td>vialink</td>
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<td>TIBCO</td>
<td>CEQ</td>
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<td>BP GROUP</td>
<td>accord</td>
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<td>eQuant</td>
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<td>TIBCO</td>
<td>Sprint</td>
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<tr>
<th>Internet Business Solutions</th>
<th>Strategic Alliances</th>
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<tr>
<td>TIBCO</td>
<td>AT&amp;T, Nortel</td>
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<tr>
<td>Oracle</td>
<td>Ericsson</td>
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<td>Sun</td>
<td>Nortel</td>
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<tr>
<td>IBM</td>
<td>Lucent</td>
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<td>TIBCO</td>
<td>Cablevision</td>
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<td>SAP</td>
<td>MCI</td>
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<tr>
<td>IBM</td>
<td>SBC</td>
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<tr>
<td>TIBCO</td>
<td>BabyBell</td>
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<tr>
<th>Learning Partners</th>
<th>Network Security</th>
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<tbody>
<tr>
<td>TIBCO</td>
<td>IBM, Siemens, Alcatel, Nortel</td>
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<td>Microsoft</td>
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<td>Sun</td>
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<td>IBM</td>
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<td>TIBCO</td>
<td>IBM, RSA</td>
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<tr>
<td>TIBCO</td>
<td>EDS</td>
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<tr>
<td>Oracle</td>
<td>NCR</td>
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<tr>
<td>Sun</td>
<td>Compaq</td>
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CISCO
CSI 1  I think equant has changed names--is it Orange Business Services now?
Data Center 3.0 Infrastructure Portfolio

A Comprehensive Portfolio for Data Center 3.0 Revisted

Unified Fabric Networking
- Nexus 5000 and 7000 Modular Switching System (Unified Fabric ready)
- Ethernet Networking
- Nexus 7000, Nexus 5000, Catalyst 6500 Series, Catalyst 4900M Top-of-Rack Catalyst Blade Server Switches
- Storage Networking
- MDS 9500 Storage Directors, MDS Fabric Switches, Blade Switches (Unified Fabric ready)
- Application Network Services
- ACE Application Delivery – Module and Appliance, Wide-Area Application Services, ACE XML Gateway
- High Performance Computing
- Nexus 5000 7000 Modular Switching System, SFS 7000 Infiniband Switch, SFS 3000 Infiniband Gateway
- Data Center Security
- Firewall Services Module, Intrusion Detection System Module, Web Application Firewall

Data Center Provisioning
- VFrame Server/Service Provisioning System

Data Center Management
- Data Center Network Manager– Topology Visualization and Provisioning
- ANM– Advanced L4-7 Services Module Management