Data Center Transformation

Bob Stemmerik – Senior IT Manager

Network & Data Centre Services

Agenda

Cisco Facts & Figures

Cisco Data Centre Roadmap

Global Data Centre Program (multi-year plan)

Drivers For Change

Green – High Level

Early Adopters Program – Cisco showcase

Cisco Facts

- 300 locations in 90 countries
- 400 buildings
- **52 data centers and server rooms**
- 1500+ labs world wide (500+ in San Jose)
- 66,000+ Employees

   20,000 Channel Partners
- 110+ Application Service Providers
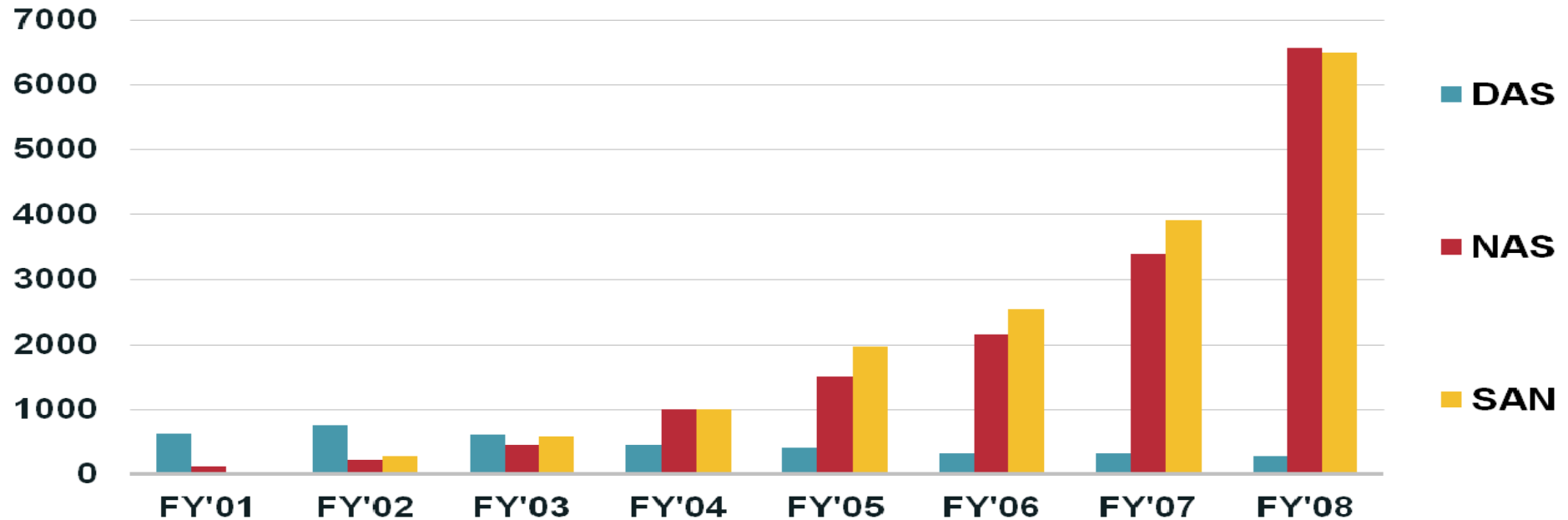- 210+ Business and Support Development Partners

Over 180,000 people around the world in the extended Cisco family

Cisco Data Centers

Iron Port

SJ

WebEx

Linksys

Richardson

RQS

Amsterdam

RTP

Scientific
Atlanta

Total of 19.200 m2 of raised Data Center space at Cisco

Data Centers   ● Business Data Center   ◯ Engineering R&D Data Center

Data Center Server Landscape

- **14,400 virtual/physical servers**

- **3,775 Applications**

- **280 Production Databases**

Pie chart:
- **Solaris 20.5% 2,900**
- **HPUX 1.5% 217**
- **Windows 28% 4,200**
- **Linux 50% 7,300**
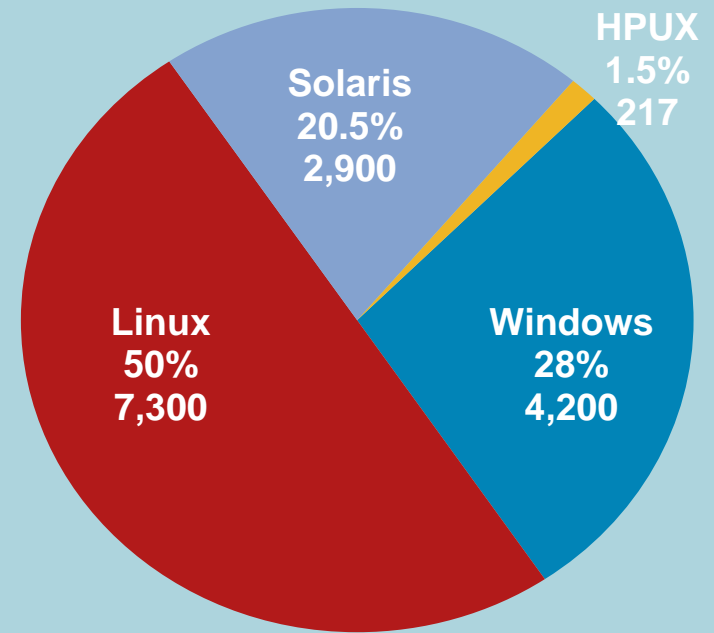
Cisco Data Center Storage Landscape

- **Over 12 PB of "raw" storage**
- **Overall Growth Rate: FY'02=69%, FY'03=32%, FY'04=50%, FY'05=58%, FY'06=29%, FY'07=52%, FY'08=48%**

State of play!

The Challenge

" 50% of Enterprise Class data centers will be technologically obsolete within 24 months"

Gartner

The Opportunity

"In a down turned market, companies must invest in Data Centers to sustain continuity and longer term growth"

Me

The CIO Challenge and Data Centres

1 How can I do more with less? How can I *simplify* my architecture to lower cost? How can I use virtualisation to increase my *asset utilisation* and decrease my *energy costs*?

2 How can I make our applications and *data* 7x24x365 *available* in a *secure* manner? *Globally*…? Anywhere, anytime on any device?
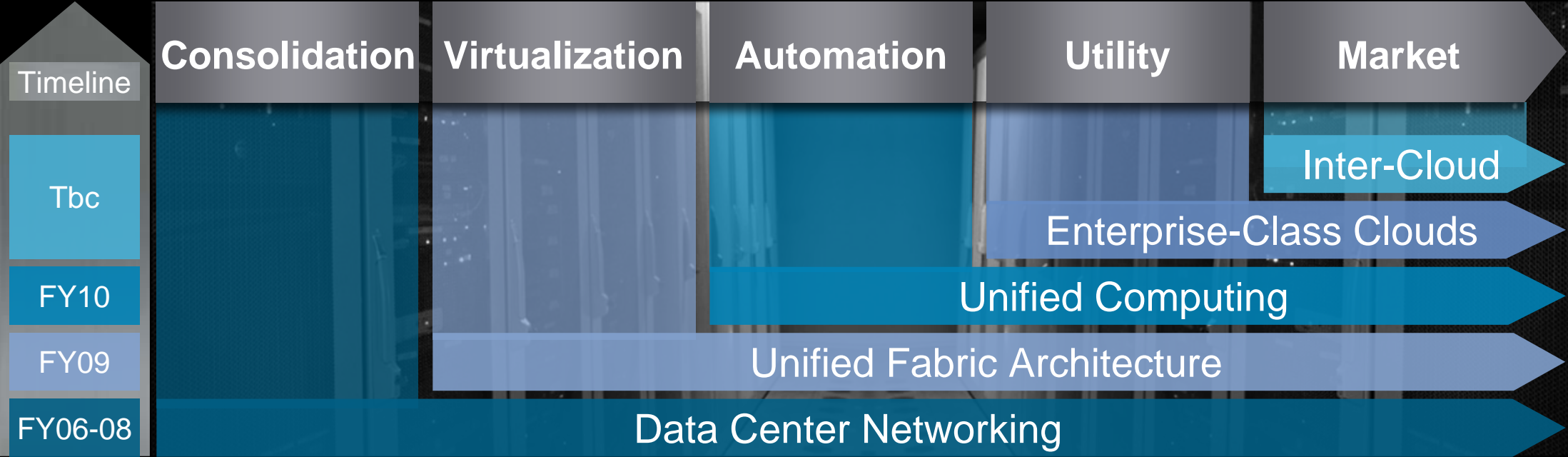
3 How can I use '*Cloud Computing*'? What should I run in my own data centres and what in out-tasked or outsourced data centres?

4 Should I rewrite all our mission critical applications as *SaaS* and *Web 2.0 compatible*? Is that "*SOA*" actually possible?

Cisco Data Centre Architecture Roadmap

Timeline	Consolidation	Virtualization	Automation	Utility	Market
Tbc					Inter-Cloud
				Enterprise-Class Clouds	
FY10			Unified Computing		
FY09		Unified Fabric Architecture			
FY06-08	Data Center Networking				

Cisco Data Centre Architecture Roadmap
The Cisco on Cisco story

FY10 Global DC Programme

Timeline	Consolidation	Virtualization	Automation	Utility	Market

Inter-Cloud

Enterprise-Class Clouds

Unified Computing

Unified Fabric Architecture

Data Center Networking

| tbc |
| FY10 |
| FY09 |
| FY06-08 |

We are here…

Legacy Data Centers

Cisco on Cisco
My IT challenges are the same as yours

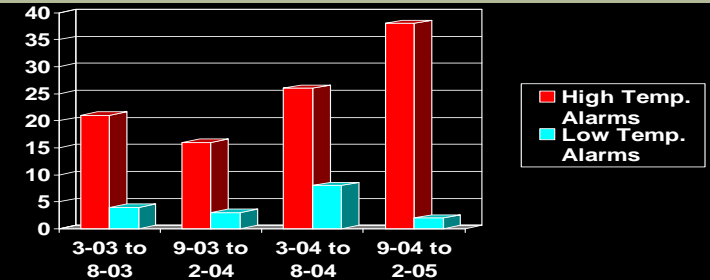| Floor space, power, cooling, legacy | Redundancy/ resilience (the Active-Active DC) | Data Centre upgrades/ maintenance | Aging Data Centre facilities | Legacy Applications |

Legacy PDC environment are at the max limit of power, cooling and weight-bearing capabilities

The current data center environments are nearing the thresholds of power, cooling, and load-bearing capabilities

Existing data centers are inadequate to meet the growing demand for IT services

INFRASTRUCTURE SYSTEM	REQUIRED 10 YEAR CAPACITY	SJC12 Existing Capacity	SJCK Existing Capacity	RTP Existing Capacity	CAPACITY GAP
CENTRAL COOLING SYSTEM	8500 kW @ N+1	1710 kW	630 kW	1650 kW	- 4510 kW
CRITICAL UPS POWER SYSTEMS	11000 kW System + System	1800 kW @ N+1	720 kW @ N+1	2400 kW @ N+1	- 6080 kW
EMERGENCY BACK-UP POWER SYSTEMS	16000 kW	3200 kW @ N+1	1200 kW @ N	3500 kW @ N+1	- 8100 kW
RAISED FLOOR AREA	10000m2	1350 m2	670 m2	1630 m2	- 6350 m2
FLOOR LOADING CAPACITY	750 kg/m2	390 kg/m2	490 kg/m2	490 kg/m2	- 260-360 kg/m2

Data Center cooling capacity is at the breaking point

Legend: High Temp. Alarms, Low Temp. Alarms

X-axis: 3-03 to 8-03, 9-03 to 2-04, 3-04 to 8-04, 9-04 to 2-05

Power, load-bearing, and cooling constraints are limiting the ability to utilize existing data center space

42U (Size) 42 | Weight 39.5 | Power 11.9 | Cooling 2.9
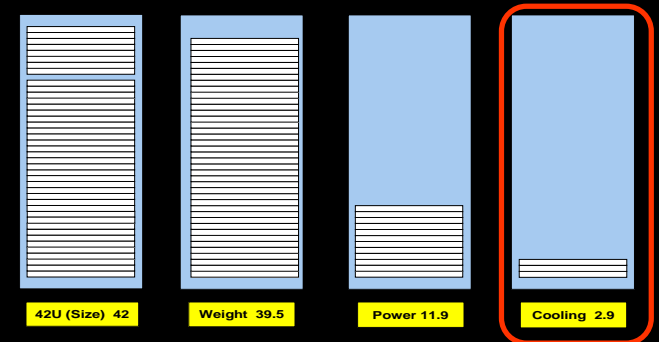
1. Based on our legacy Production DC's prior to provisioning new DC's in Richardson and Mountain View

2. Capacity is based un US Production DC's and does *not* include Engineering

3. Floor weight bearing limitations are based on <u>building subfloor</u> and not the raised floor capacity

Global DC Program

Richardson Data Center

Purpose: Meet Cisco current and future plans within scope of GDCS for Production Data Centers.

Power and space: Cisco's largest Production data center; ~2.700 m2 raised floor area ; power capacity of dual redundant 10 MW utility feeds.
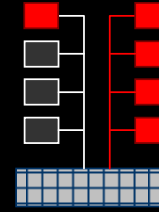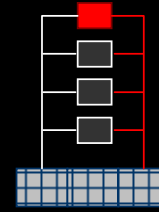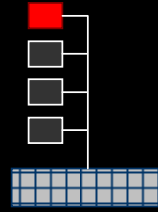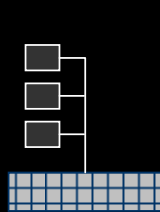
Devices: Space for ~1133 server racks;

Use: Hosting Cisco's primary production applications in a Tier III / IV data center.

Current state: Production Ready, service migration in process with first client operational August 2008.

Data Center Tier

RCDN9
All systems can be maintained without service interruption

SJC-K, SJC12, RTP5
Development/CDO DCs

Tier	I	II	III	IV
Components	Need only (N)	N + 1	N + 1	2 (N + 1)
Delivery Paths	One only	One only	One active One passive	Two active
Single Points of Failure	Yes	Yes	Yes	No
Concurrently Maintainable	No	Components only	Yes	Yes
Site Availability/ Annual Downtime*	99.671% 28.8 hours	99.749% 22.0 hours	99.982% 1.6 hours	99.995% 0.4 hours

No additional components, if any system fails expect downtime

Subsystems can be serviced without disruption

Tiering systems courtesy of The Uptime Institute

Defaults to lowest tier %

Environmental Inclusions

1.0 General & Operations

1.1 Collection & storage recyclables
1.2 Consolidation of equipment
1.3 Construction waste re-cycling
1.4 Energy star appliances
1.5 Building commissioning
1.6 Indoor air quality

2.0 Site

2.1 Erosion control
2.2 Wildlife habitat
2.3 Relocation of trees
2.4 Reduction in automobile use

3.0 Building Shell

3.1 Fly ash
3.2 Glazed screening
3.3 Re-use of existing facility

4.0 Interior Construction

4.1 Recycled content finishes
4.2 Low VOC materials
4.3 Non-CFC fire extinguishers
4.4 No gas suppression system
4.5 Carbon monoxide monitoring
4.6 Lighting controls
4.7 Re-use of building systems
4.8 Salvage & stock materials

5.0 Electrical

5.1 Generator emission controls
5.2 Distributed battery pack
5.3 Lighting controls
5.4 Generator test under build load
5.5 Transformer efficiency
5.6 Electronic ballasts
5.7 T8 flourescent lamps

6.0 Mechanical

6.1 Waterside economizer
6.2 Pump curves
6.3 Chiller efficiencies
6.4 Cooling tower water treatment
6.5 Non CFC refrigerant
6.6 VFD's
6.7 UPS heat tempering
6.8 Heat recovery for office space
6.9 Chilled water operating temps
6.10 Motion activated fixtures
6.11 Vapour barrier
6.12 N+2 chiller configuration
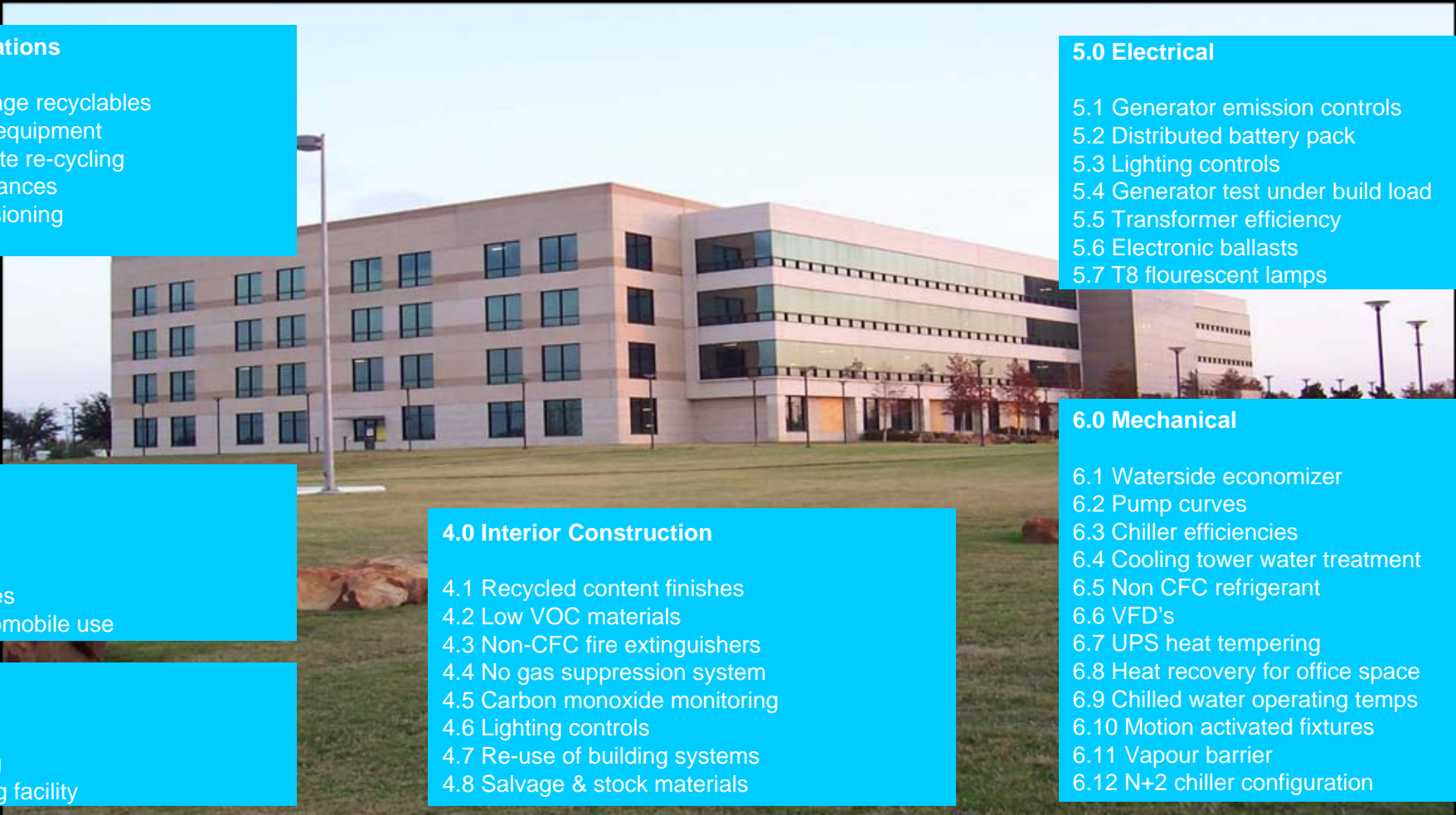
Cisco on Cisco Consolidation
Global Data Centre Presence - Target State
Shared Resilient Infrastructure Enables Diversified Business Growth
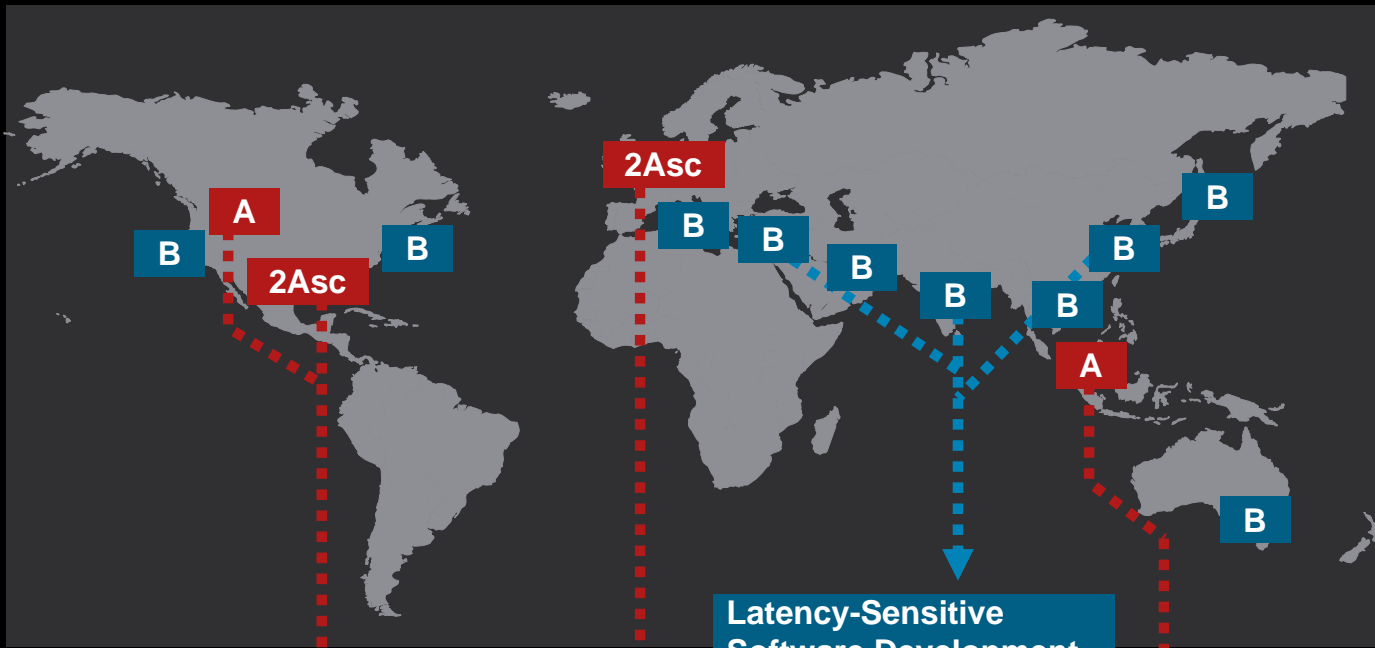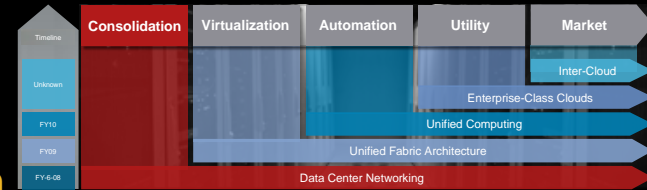
FY13

Key:

A	Type-A: Tier-III (Redundant) Facility in Low-Risk Area
2Asc	Type-2Asc: 2x Tier-A at Synchronous-Capable Distance
B	Type-B: Tier-II (Less Redundant) (Directional—Not Actual)

Latency-Sensitive Software Development

Traditional Business Applications (Centralized)

Single-Trading Company Order Management

Continental Hub Communications

Traditional Business Model

Software-as-a-Service (SaaS): Resilient, Scalable, Cost-effective Presence in Each Continent

New Business Models

Timeline | Consolidation | Virtualization | Automation | Utility | Market
Unknown
FY10
FY09
FY-6-08

Inter-Cloud
Enterprise-Class Clouds
Unified Computing
Unified Fabric Architecture
Data Center Networking

GDCP Key Points

Global Data Centre Program (GDCP)

1) IT's Long Term DC Strategy (10 year plan)

2) Greenfield provides opportunity to innovate

3) Quantum Leap on "Green Data Centre" design

4) Long Term Scalability & Growth

Drivers For Change

Cisco New Business Model DC Impact
Software as a Service Consumes Much More Power Per Revenue $

Power (MegaWatts)

30.00

New business model

Traditional business model

Power Demand
per US $1 M Revenue

New business model demand

Traditional Cisco Business Model

0.00

FY08 FY09 FY10 FY11 FY12 FY13 FY14 FY15
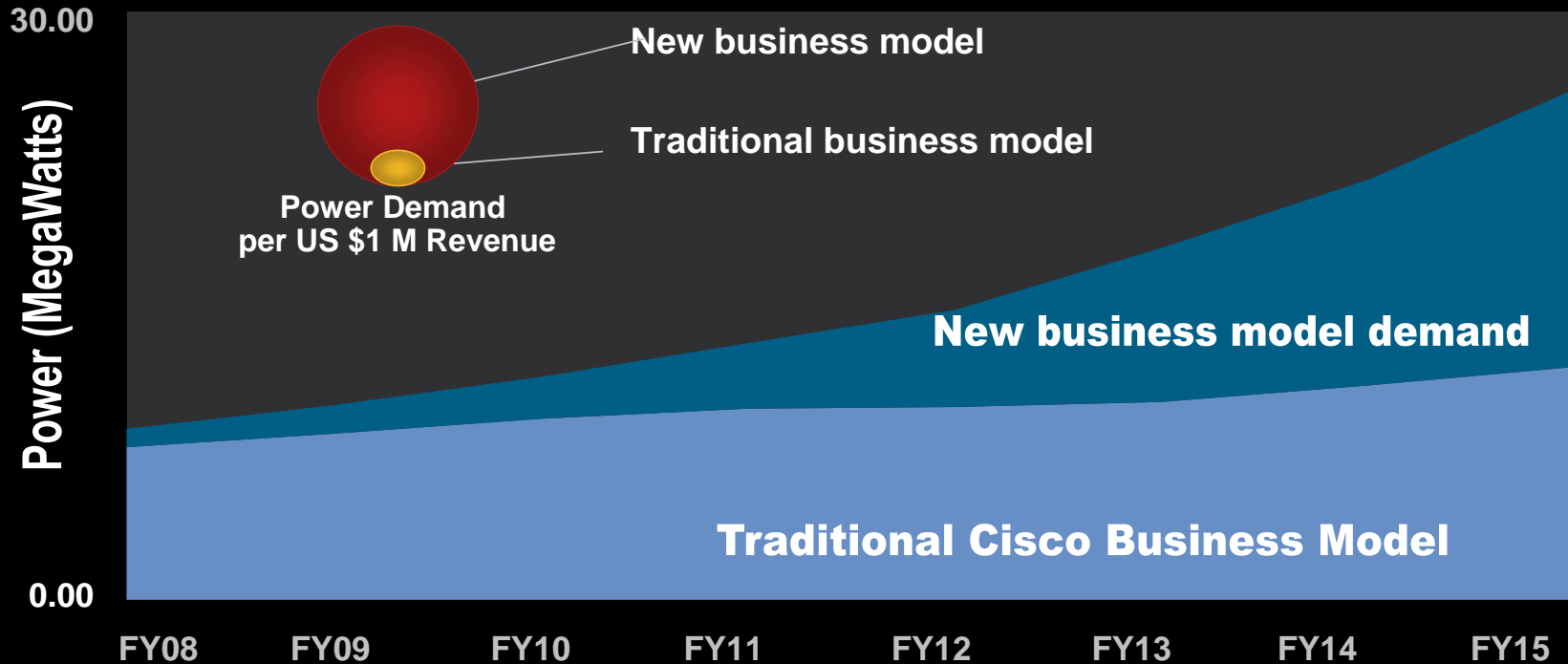
Additional Considerations

- Highly **resilient** service delivery needed for **both** traditional and new business model success
- Data center **proximity** drives performance, experience, and revenue

Cisco on Cisco Virtualization
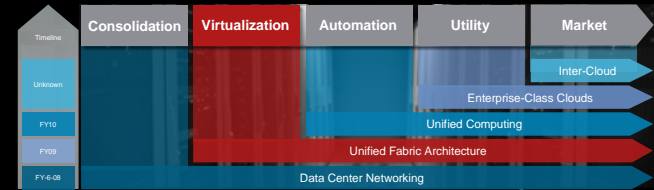
Phase 1:
Server Networking

Phase 2:
Storage Networking

Phase 3:
Unified Fabric via the Nexus platform

Phase 4:
Virtual Machine Optimized

Phase 5:
Transparent Virtualization

We are here

By implementing virtualization, Cisco can achieve:
- Increased resource utilization
- Decreased power and cooling consumption
- Faster provisioning
- Higher availability
- Business continuity

Broaden and deepen virtualization:
1. Span multiple DCs
2. All resources
3. Multi-tenancy
4. Internal and external clouds

Demands and constraints continue to grow

1) Blades reduce space but increase heat output.

2) Redundancy requirements become baseline business needs.

3) Run Data Centres warmer (ASHRAE Addendum Aug 2008)

4) Major upfront investment to gain longer term savings & benefits. CFO's want to _cut_ IT spend.

5) The EU Code of Conduct for Energy Efficient Data Centres?

Business Challenges

- **Transformation is disruptive and _not entirely_ without risk!**

- **Green technologies around Data Centre physical design are costly.**

- **Major upfront investment to gain longer term savings & benefits.**

- **The old car analogy… keep fixing or walk away?**

Green considerations

Green – high level

Green is not just the physical data centres!!

- Green is about a total view of IT Assets, Applications, Services & the physical Data Center(s)

- A Data Centre by nature is _not_ green!

- Power consumption will continue to rise as business grows

- The key is to be as CO2 neutral, as possible.

- A paradigm shift from distributed to more centralised incl the PC itself (Network aware apps & Saas).

Challenges with attempting Green

Power & Heat load trending up

- **2000 - Servers consumed 1.5kW per rack**

- **2005 - Servers consumed 4.5kW per rack**

- **Today – Servers consume 14.7kW per rack**

Note: Based on 42U rack with and ~350W max per server

Tier III & IV Data Centres

- **Add more redundant Data Centre resilience (UPS, Gensets, Cooling)**

- **Negatively affects your PUE**

Early Adopters Program

New Production DC Testbed

MTV5 and DRT

An Opportunity for IT to be "Cisco's First and Best Customer" on new leading edge technologies

Early Adopters Program

- Vision - Roadmap
  - Six tracks
  - Key transformation areas
- Enablers
  - Nexus product deployments
  - Virtualisation and Storage evolution
  - Early Adopter Pod (EAP)
  - Case study – comparison on Nexus and Cat6 designs

DC Evolution – plan on a page

| Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |

	CY08	CY09	CY10	CY11
Ethernet	**Phase I**: Scale Aggregation and Access Scale **HA** (STP Stability)	**Phase II**: Reliability **Scale**: Aggregation, Access and Compute Farms **HA** (Less Reliance on STP)	**Phase III**: Transformation **HA**: No STP **Scale**: Multi-site DC	
IO		IO Consolidation (In Rack) Scalability	Fabric consolidation	United Fabric SAN: FCoE on Arrays
Server		Alternate Server Vendor Authorization management	Unix Virtualization / Multi-Site Clustering	
Virtualization	Server virtualization Orchestration	Client virtualization Data Virtualization	Site virtualization DC Virtualization	
Service Layer Application Capabilities		Service Virtualization Service Optimization	Data Compression Transport optimization	Active/Active
Facilities		New DC Designs Server POD, Cabling Layout Cooling, Electrical Systems, CRs	Bay Area Texas 2	Texas 3

New Product Portfolio for Data Center 3.0

Unified Fabric Networking

NEW

Nexus 7000 Modular Switching System

Nexus Rack Switch
(future)

Nexus Blade Switch
(future)

Ethernet Networking

NEW

Catalyst® 6500 Series

Catalyst 4900M Top-of-Rack

Cataly... Server Swi...

Storage Networking

MDS 9500 Storage Directors

SSM

MDS Fabric Switches

Blade Switches

Application Network Services

ACE Application Delivery – Module and Appliance

Wide-Area Application Services

ACE XML Gateway

NEW

InfinibandClustering

SFS 7000 Infiniband Switch

SFS 3000 Infiniband Gateway

Data Center Security

Firewall Services Module

Data Center Provisioning

VFrame Server/Service Provisioning System

Data Center Management

Data Center Network Manager– Topology Visualisation and... ANM– Advanced L4-7 Services Module ...nagement Provisioning

NEW

Q & A