Blade Servers & Virtualization
State of the Industry

Industry Address

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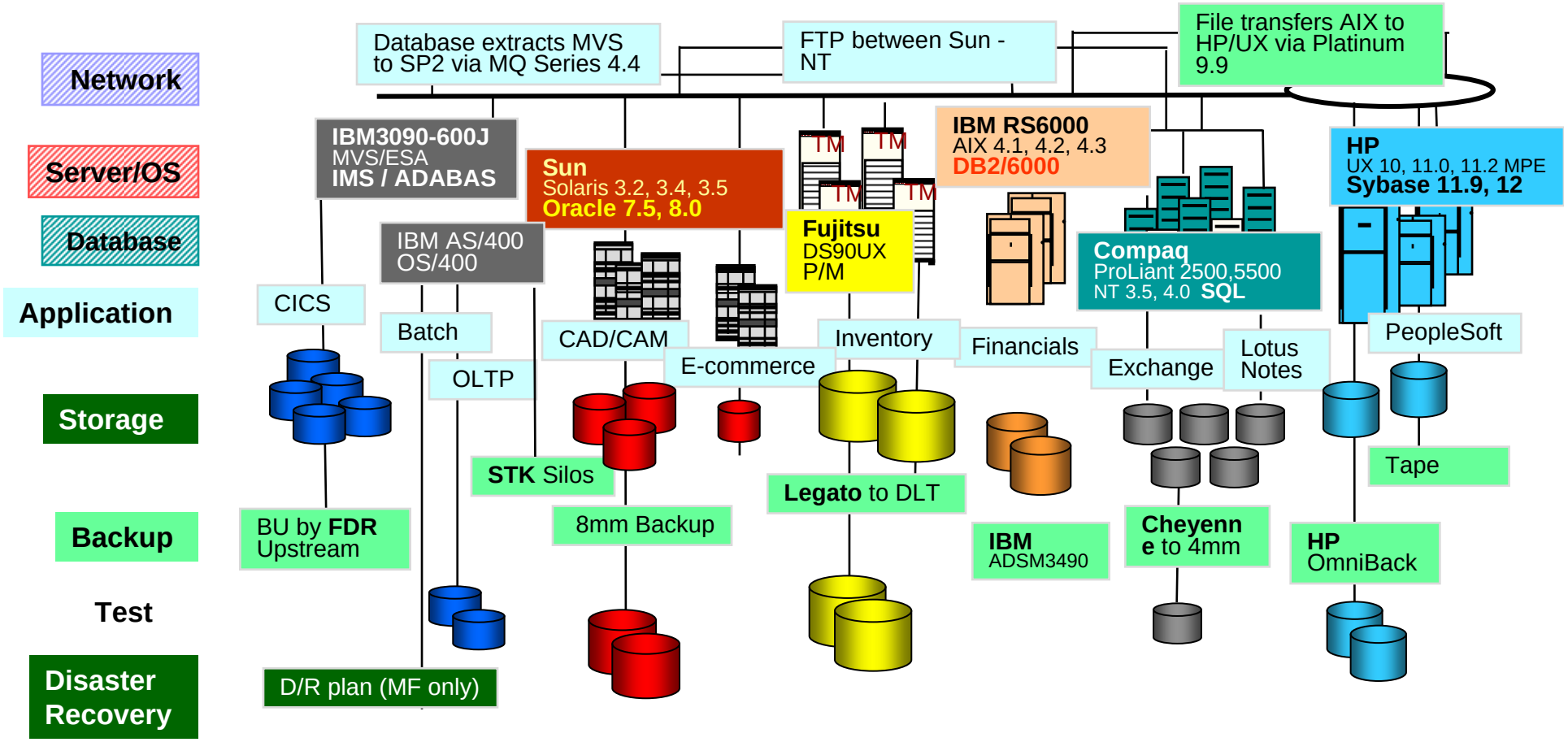
Chaos in the Enterprise . . .



(1) Scales poorly (2) Difficult to manage (3) Reliability is questionable (4) Management costs out of control

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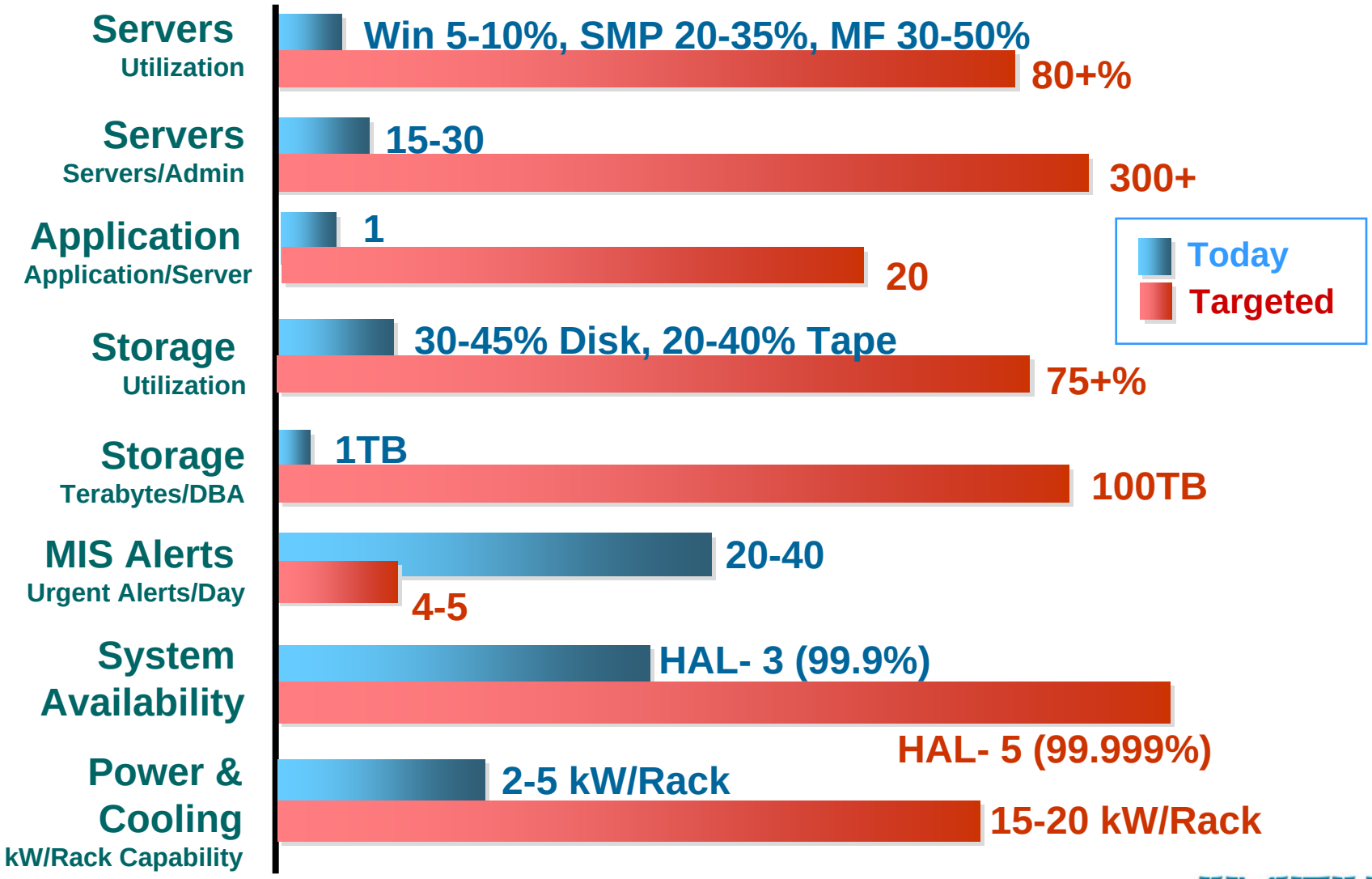
DC Infrastructure Nightmares Driving CIOs



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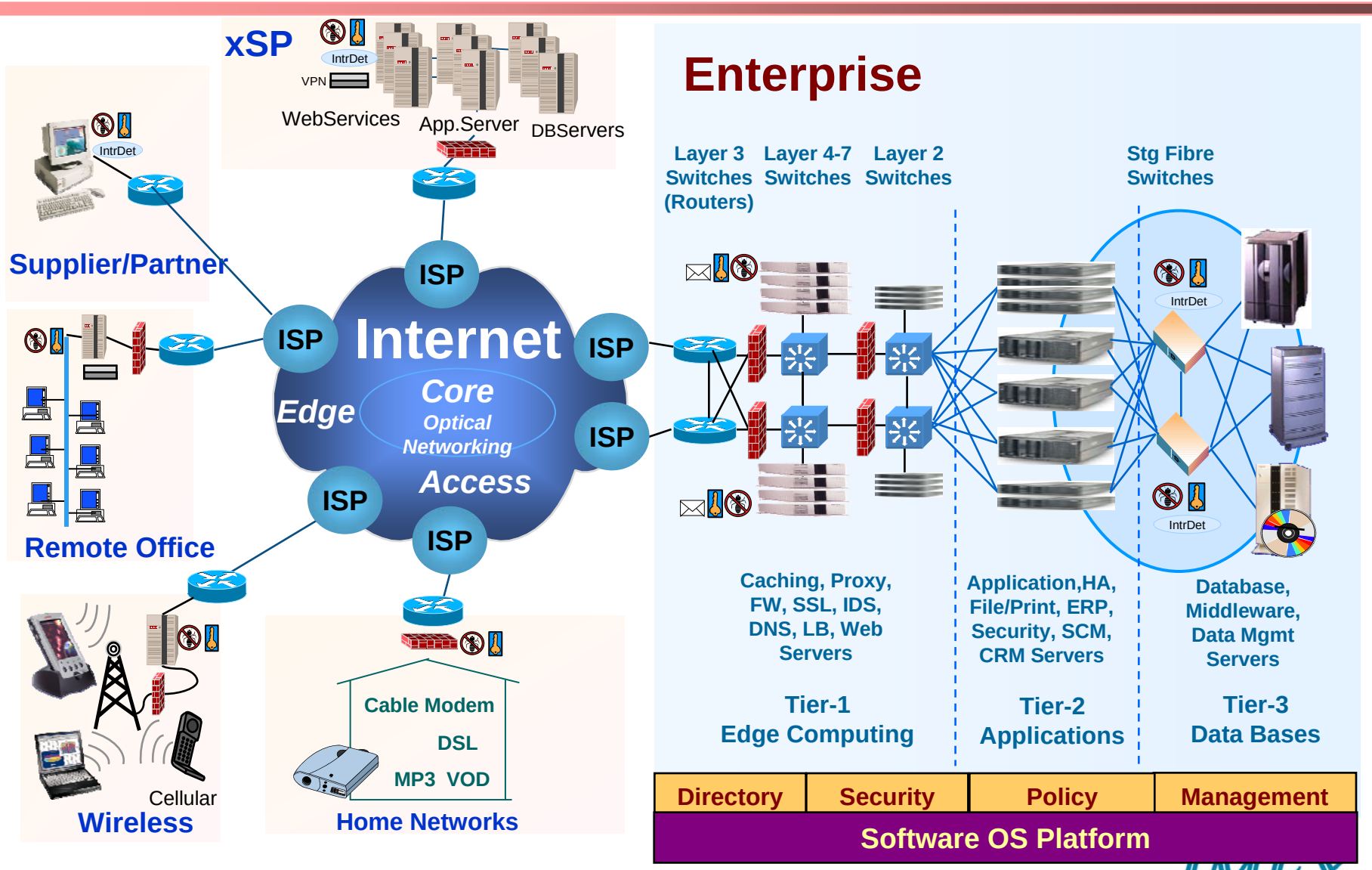
End to End IT Infrastructure *with HA & Security*



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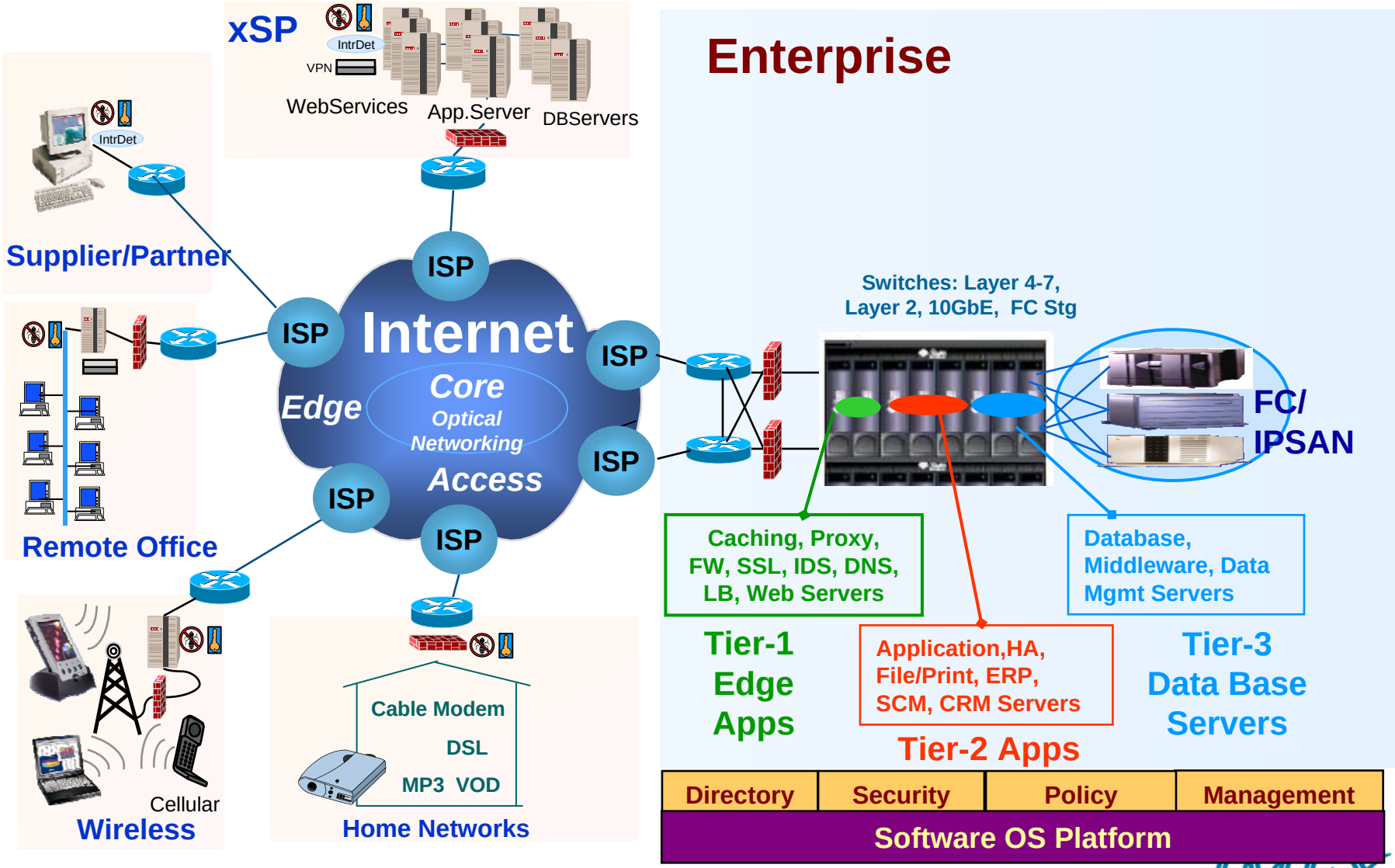
Consolidated Data Center



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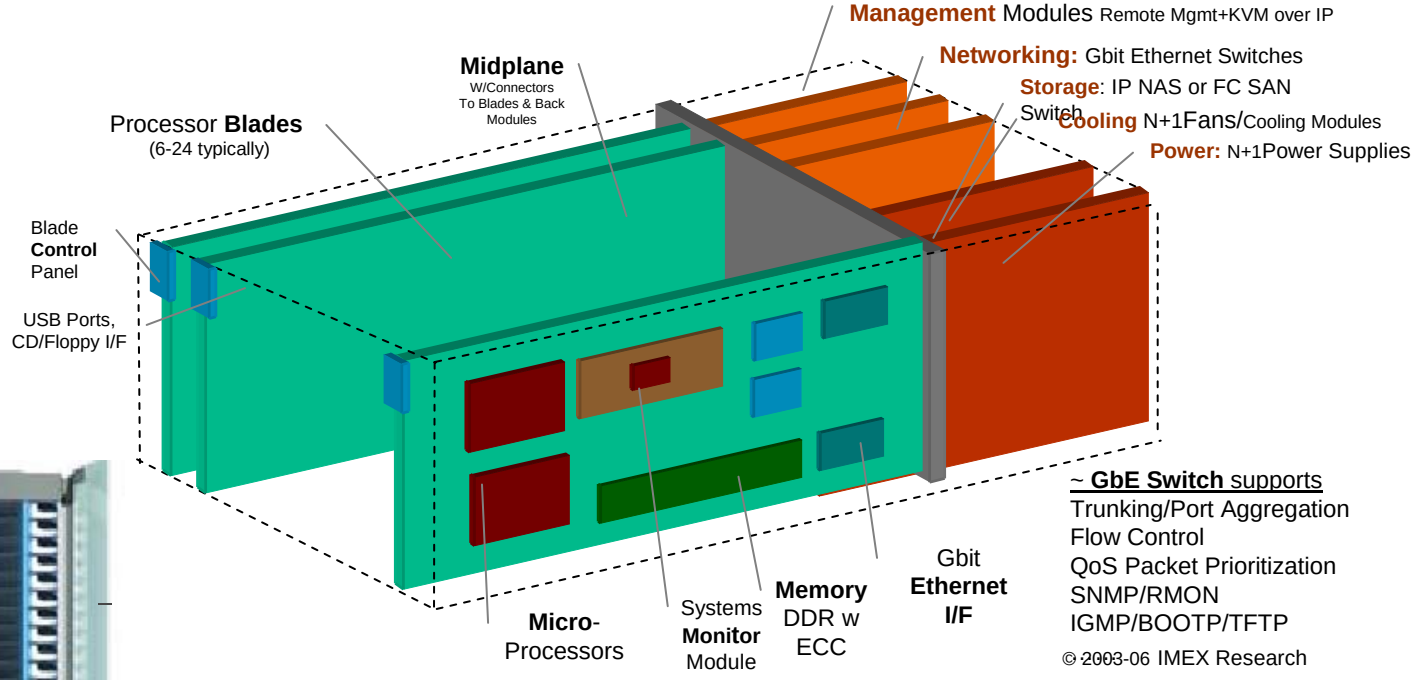
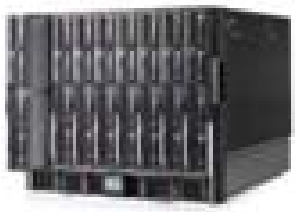
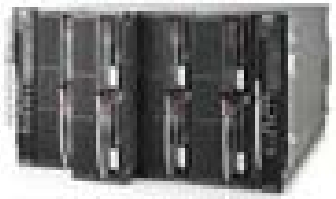
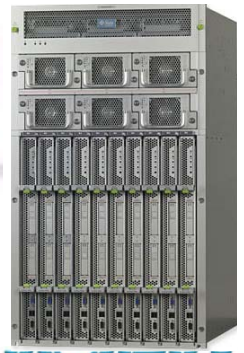
Blade Infrastructure:Local Area Grid (LAG©)



~ **GbE Switch** supports
Trunking/Port Aggregation
Flow Control
QoS Packet Prioritization
SNMP/RMON
IGMP/BOOTP/TFTP







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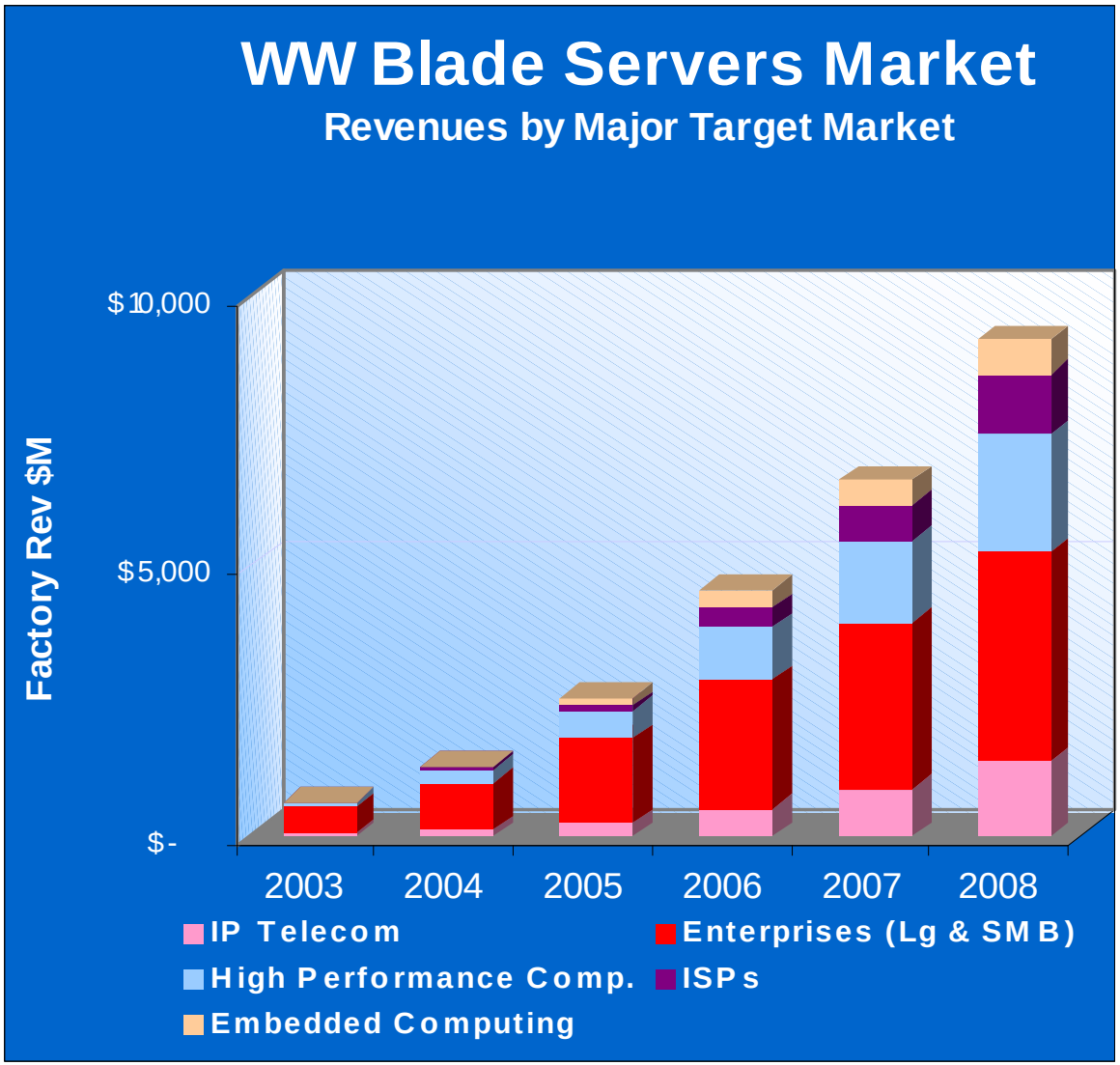
Blade Servers by Market Segments



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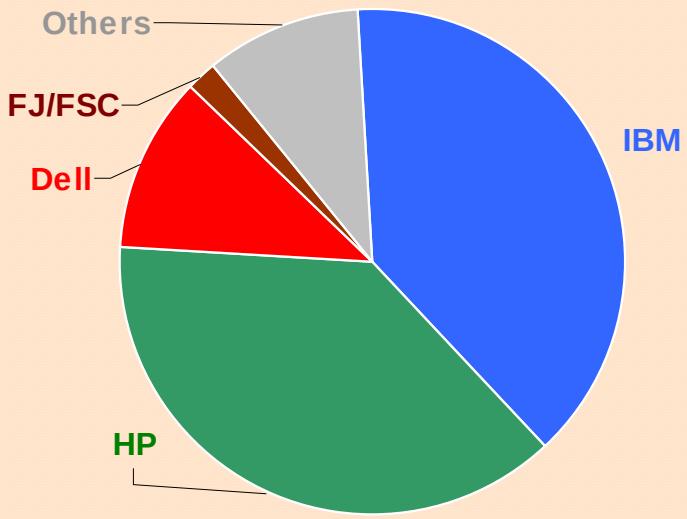
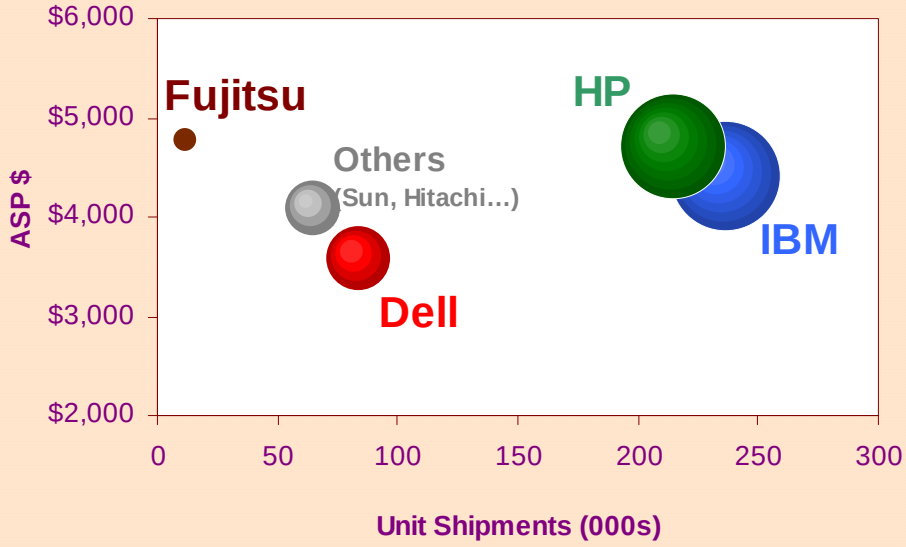
State-of-the-BladeSystems Vendors 2006

Blade Servers Market Shares By Revenues 2006



Blade Servers 2006

ASP vs. Shipments



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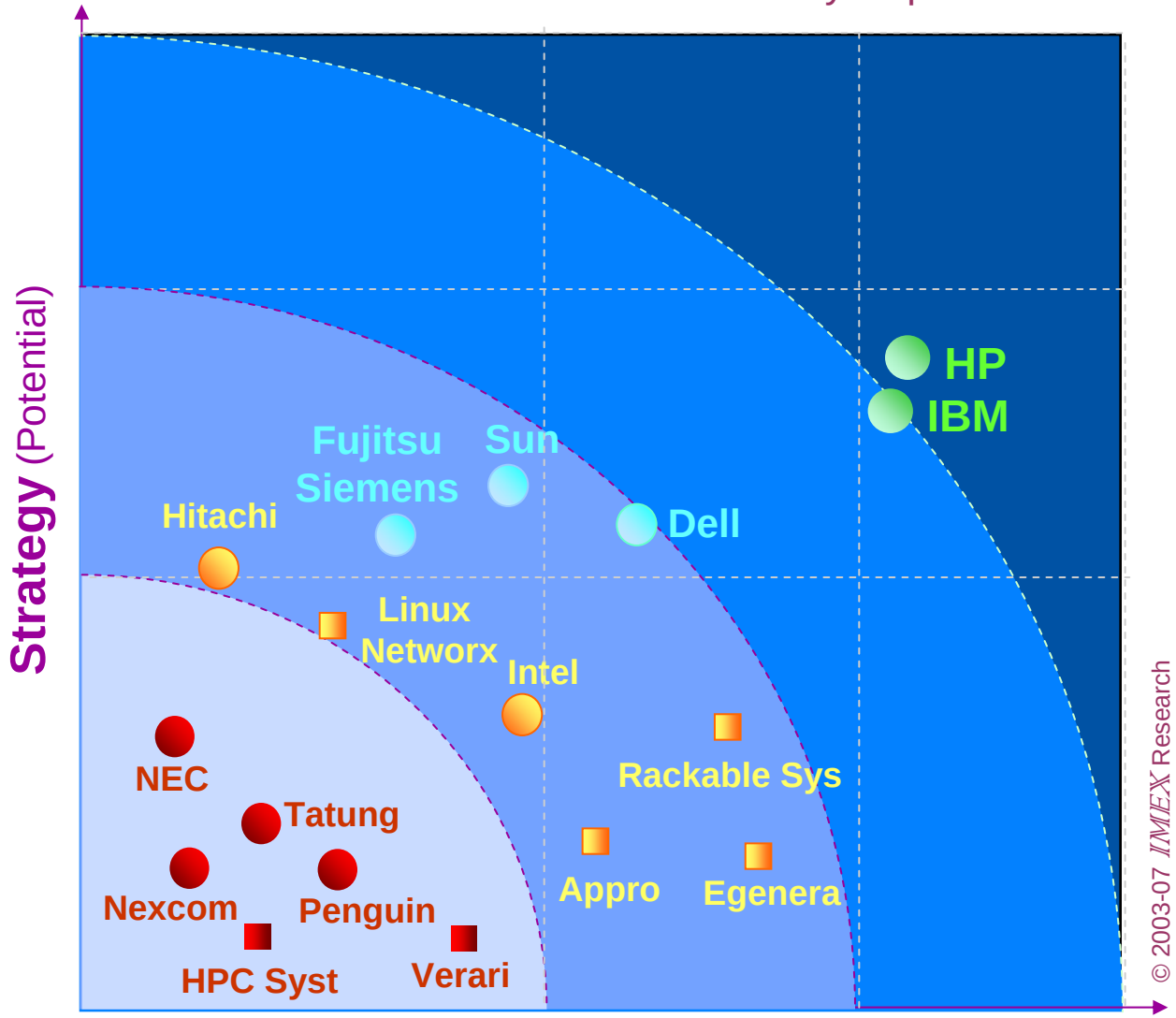
Blade Servers: Vendor Positioning Index

(**As of Oct 2006** - See IMEX Blade Servers Industry Report 2007 for latest data)



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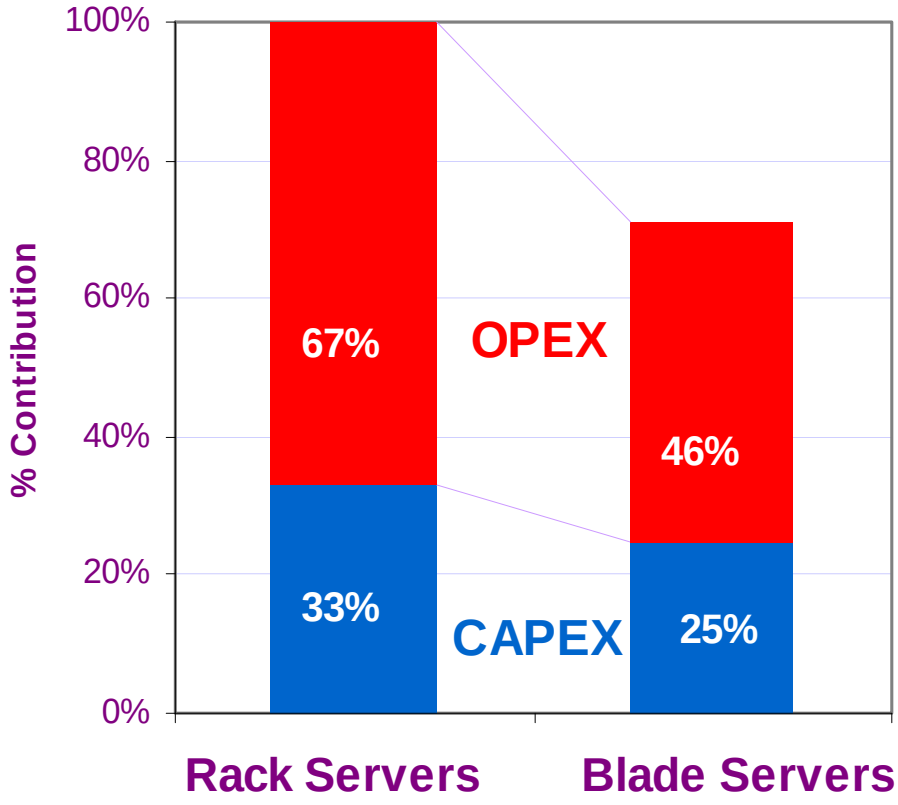
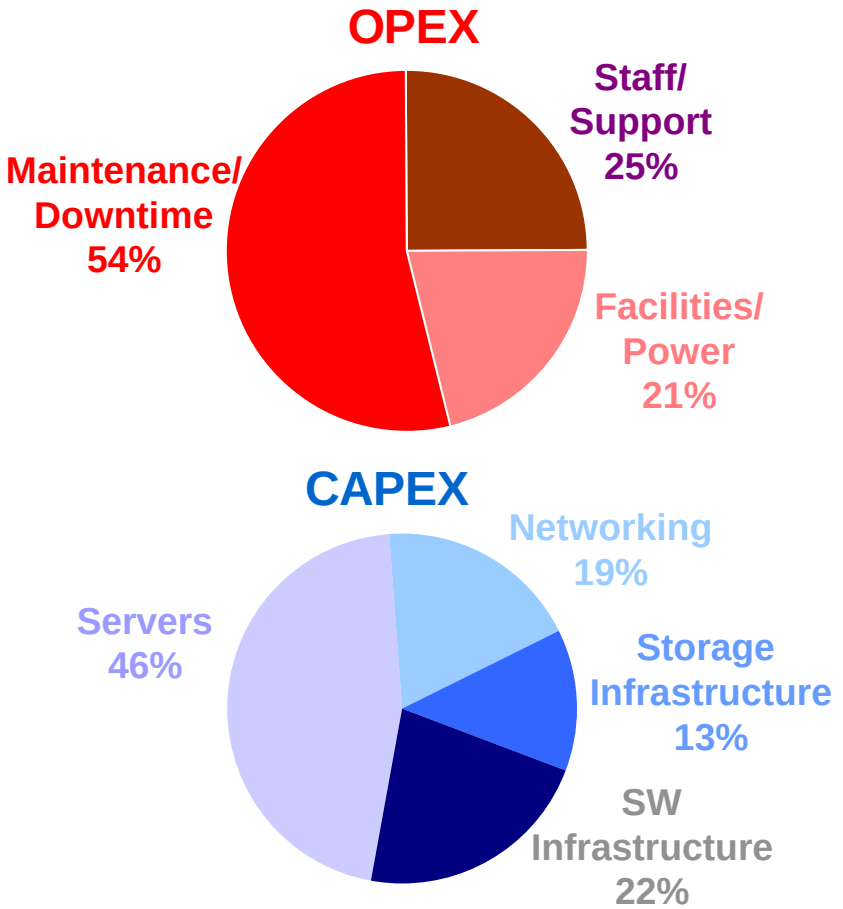
Blades - TCO Savings & ROI

3 Year TCO Savings
Rack vs. Blade Servers



TCO Savings in..



Data: IMEX Research 2004

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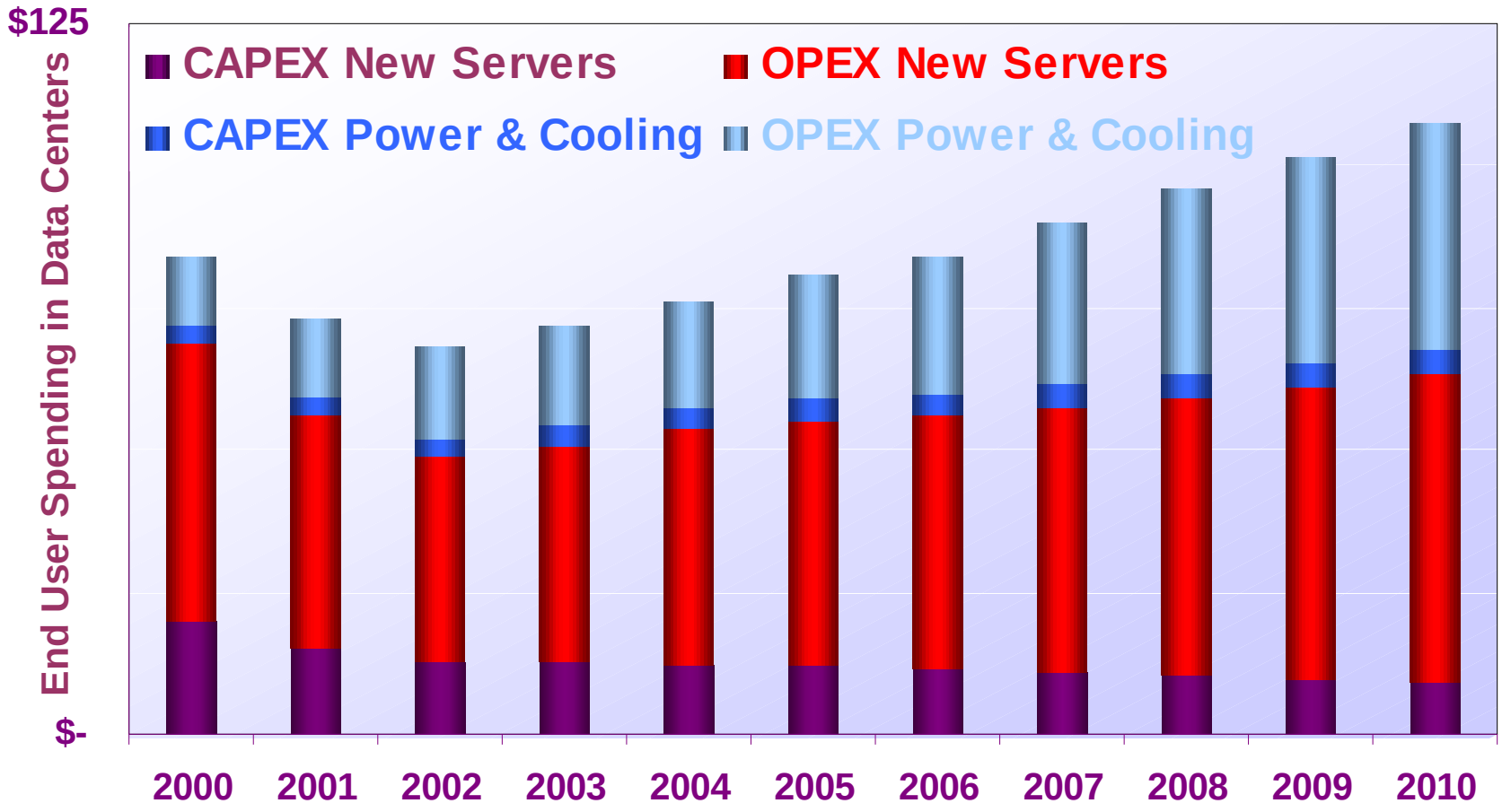
Power/Cooling Spending to rise dramatically to 40%

Power & Cooling Spending to rise to 40% of Total DC Spending by 2010



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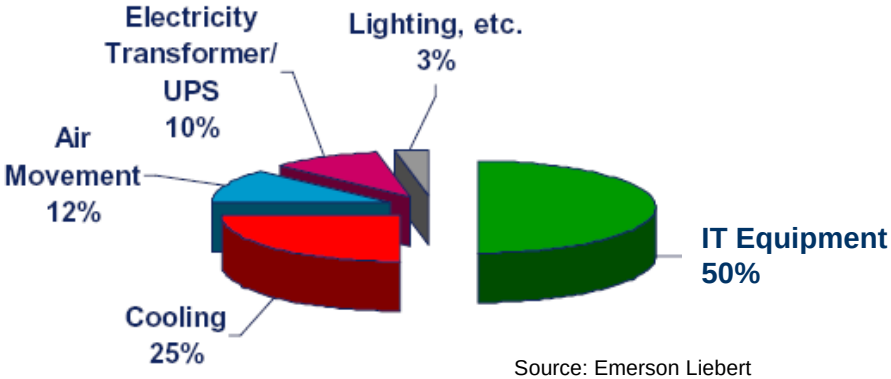
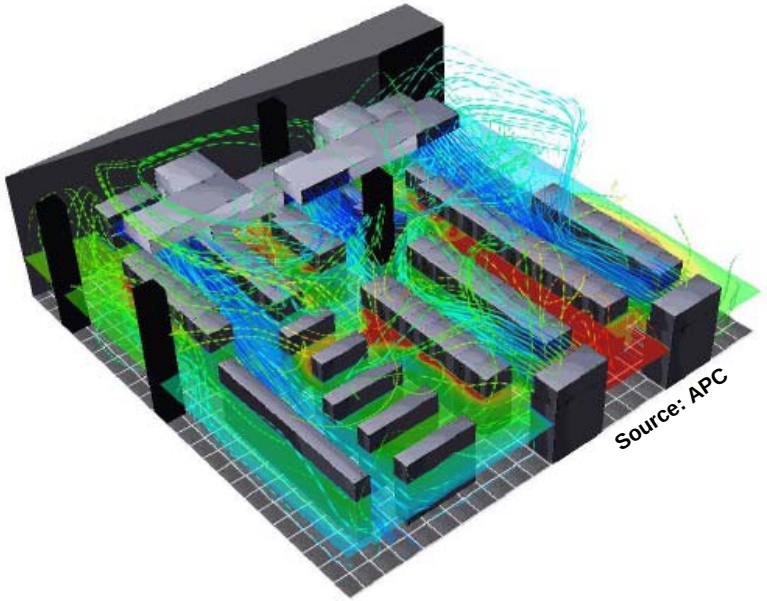
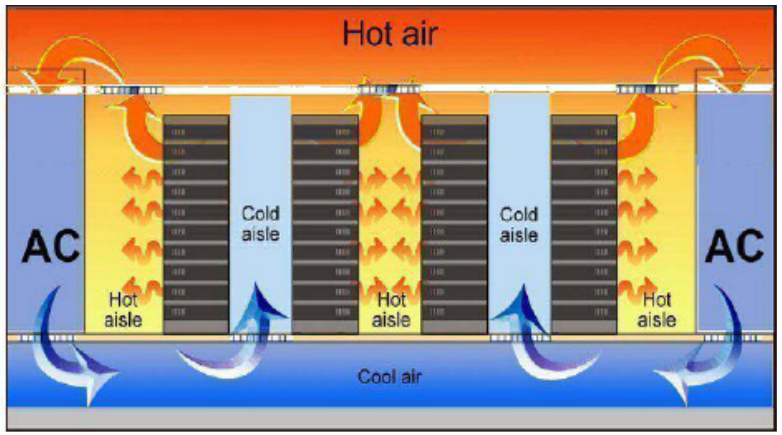
Data Center Cooling

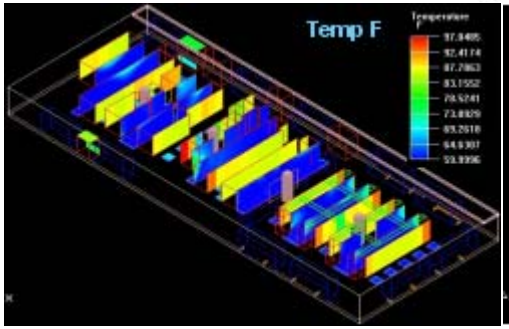
Where does the power go in Data Centers ?

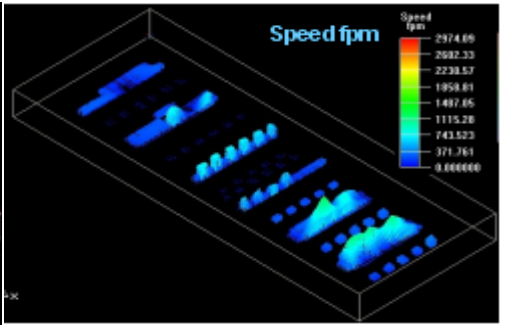


Source: Emerson Liebert









Many techniques, methodologies and equipments from air cooling to liquid assisted cooling available form a variety of vendors and Consultants ….
(Email imex@imexresearch.com for more info and Assessment of competitive vendor products, consultants l data center power & cooling integrators)

Source: IBM 2005

Computer Simulation using widely available software (e.g. Fluent Airpack Ansys CFD …) to verify Cooling Designed is the most cost effective before commiting to final implementation.

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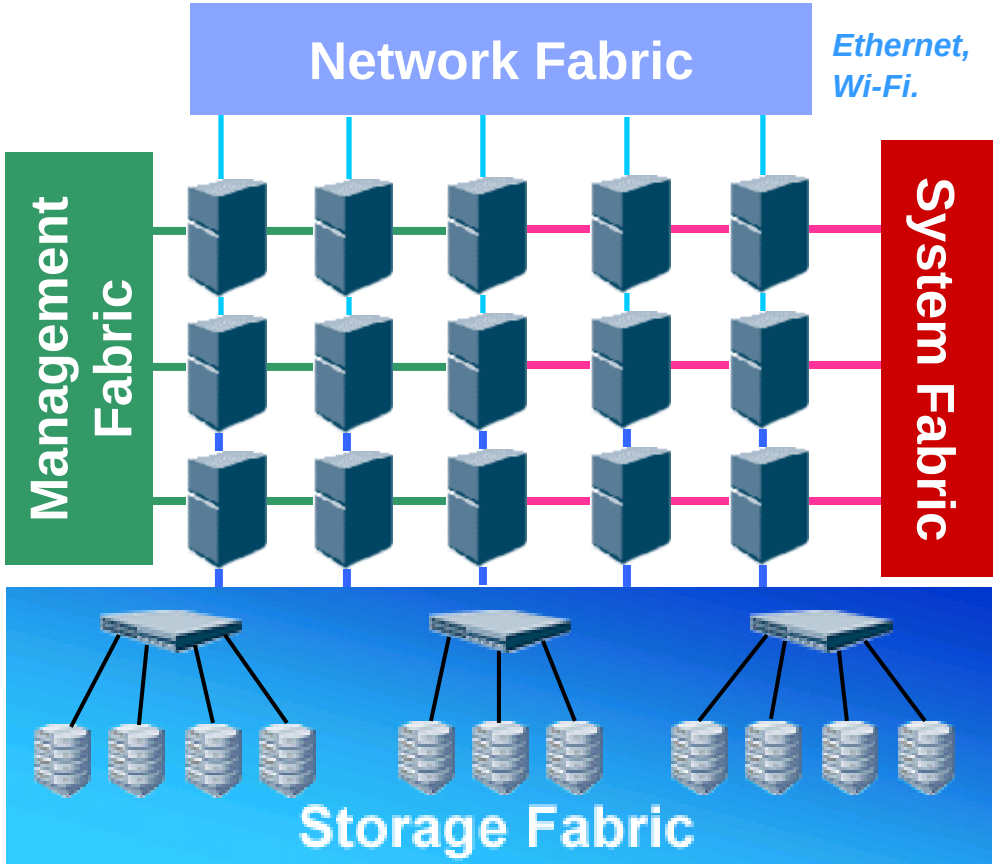
Key to Integration: Interconnect Fabrics



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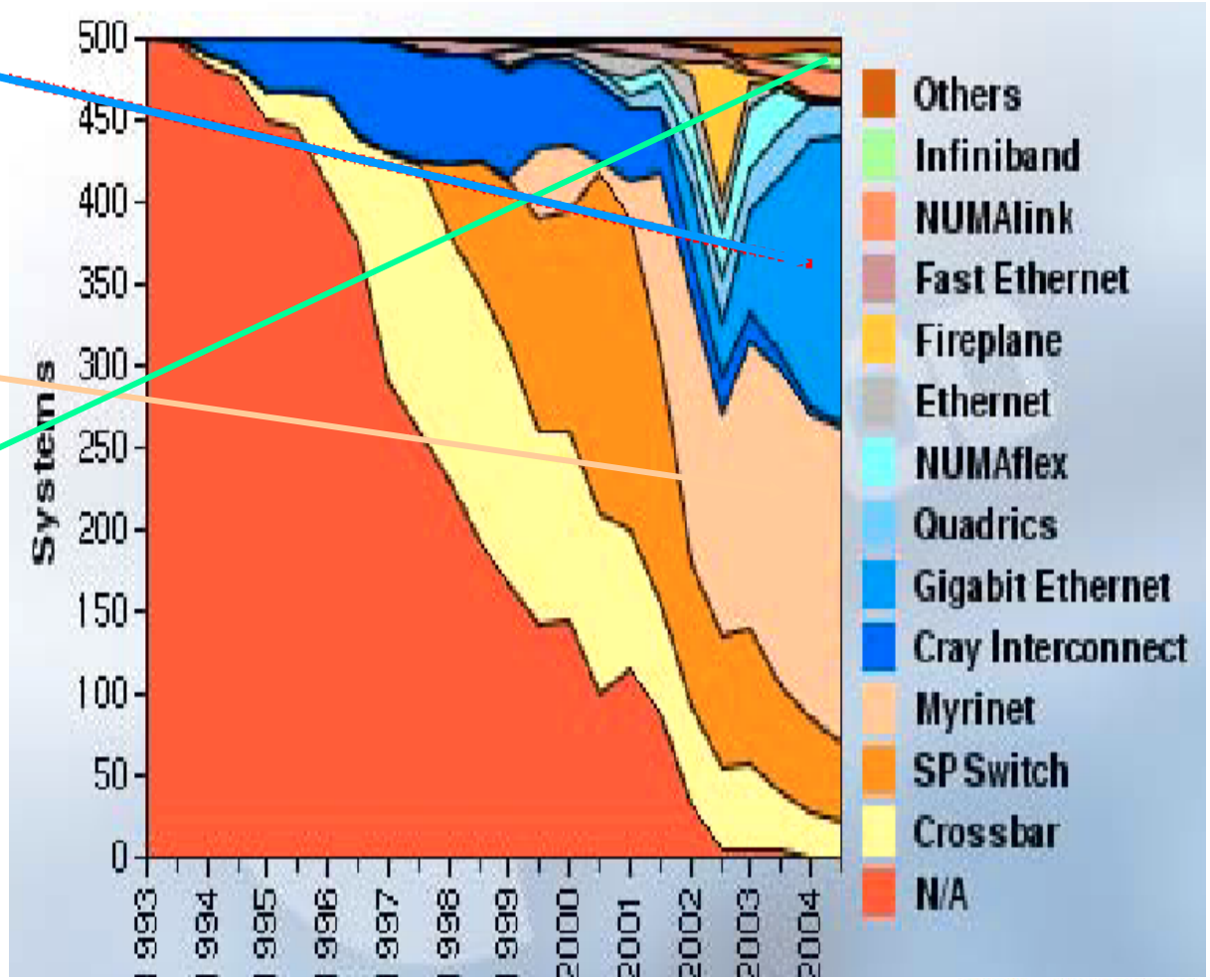
HPC Interconnect – Leaders

GbE for majority of applications dominate the Interconnect for HPC. **Myrinet** for the highly latency sensitive applications while **Infiniband** is rearing up at the Midrange latency applications



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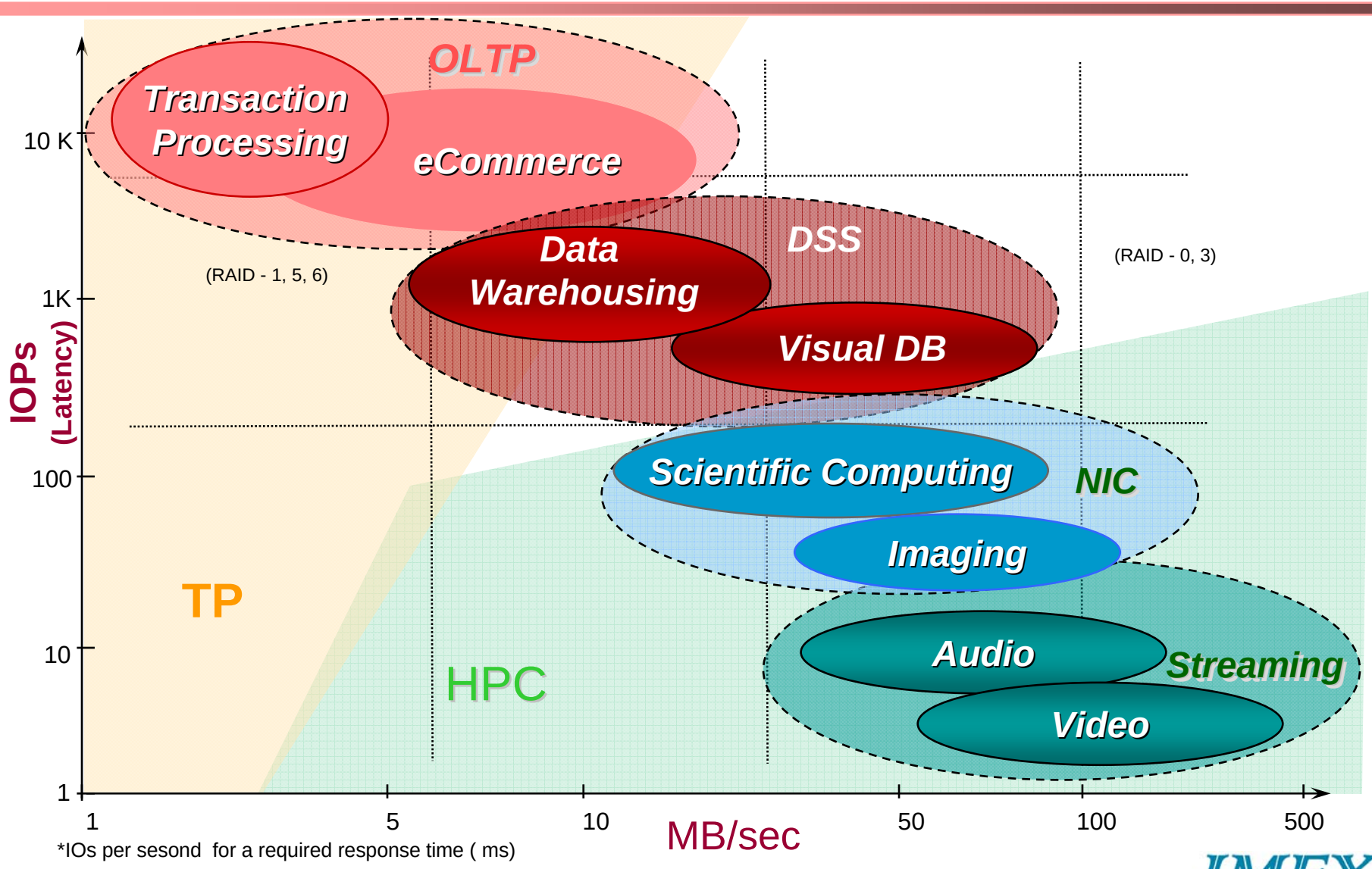
Market Segments by Applications



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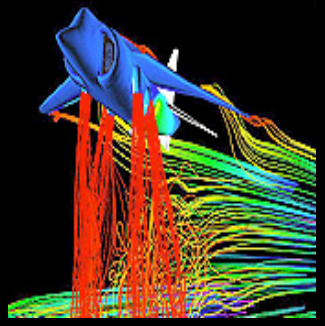
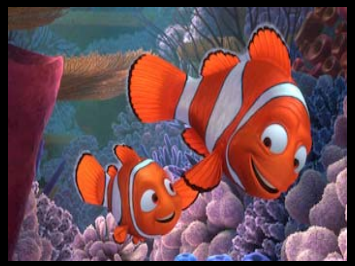
HPC – From Academia to Wall St to Hollywood

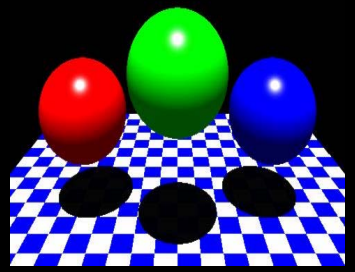
High Performance Computing



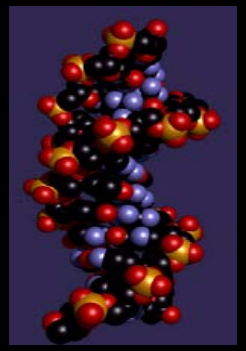
- 100+ Teraflops
- Throughput = 100 GB/s

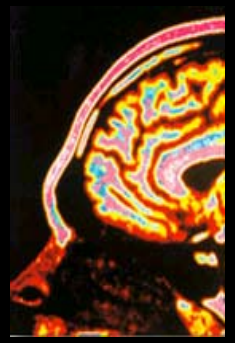
Commercial Visualization





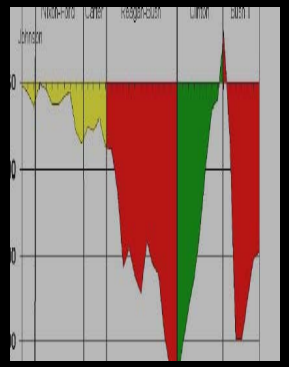
Bioinformatics





- Rendering (Texture & Polygons)
- Throughput = 1.2 GB/s

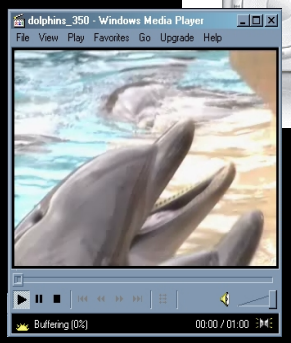
Decision-Support Systems



- Data rate & capacity
- Throughput : DSL/Cable

Entertainment

Audio/Video OnDemand

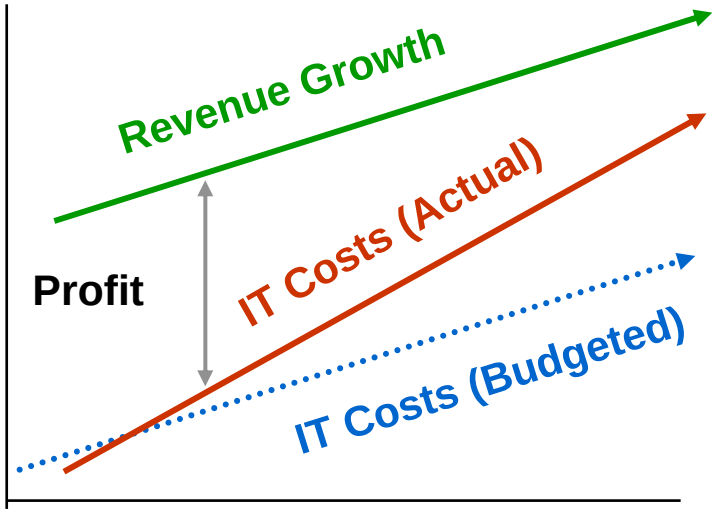


Data: IMEX Research & Panasas

Genesis of Virtualization & Grid Computing

CFO vs. CIO - Shocking Observations

- IT Infrastructure Investments yet to achieve TCO/ROI Financial Objectives
- Expected Boost in Corporate Productivity not Visible
- Post 2000 Dictum: Do More with Less



Reason – IT Spiral

- Web Growth > **New Apps Mushroom > Lo Cost Windows Servers Sprawl (Tier-1)**
- Business Growth **> More Computing Power > Applications/DB Servers Sprawl (Tier-2,3)**
- **More Servers > ↑ Storage >↑DC Facilities >↑ IT Support > ↑IT Staff**
- **More Low Cost Servers > 5% Utilization >Scale Out Infrastructure**
- **IT Costs ≠ Business Growth**

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Next-Gen Data Center - Observations

- **WW, there are 5.1 million data centers (you are not alone)**
- **Now costs $100-175M to build a large data center**
  - ~$1005/Sqft, $40,000/Rack, $2,500/Server, 2.5U
  - 82% of installed equipment (Srvr,Stg,Ntwk) has only10% utilizn.
  - For every $1 invested in new IT infrastructure, $7 spent to maintain
  - For every $1 in new Server spending, 50c spent on Power & Cooling /2006
  - Virtual Servers growth will outstrip growth of Physical servers by 50% with an associated rise in managing virtual servers
  - Blades increasing Power/Rack by 10x Need Power/Cooling, Weight, Solutions to pursue

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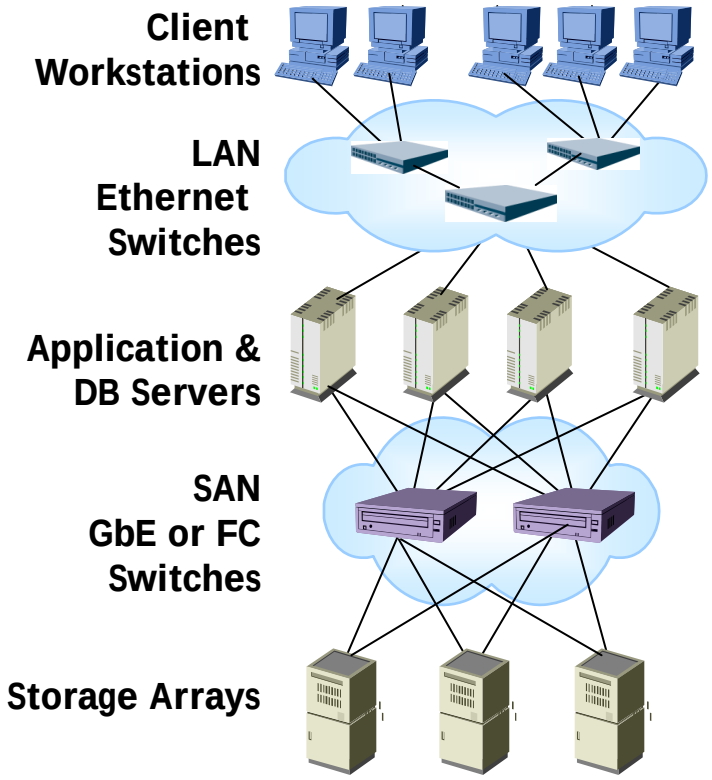
Implementing Virtualization



At Various Levels

Microprocessor

– Intel VT, AMD-Pacifica

OS

- zOS, pOS, UNIX, Windows, Linux

- IBM, HP, Sun, VMWare, Xen, SWSoft

File System

- DFS

Networking

- Multiport

Storage

- Host, SAN, Controller

- In-Band, Out-of-Band Management

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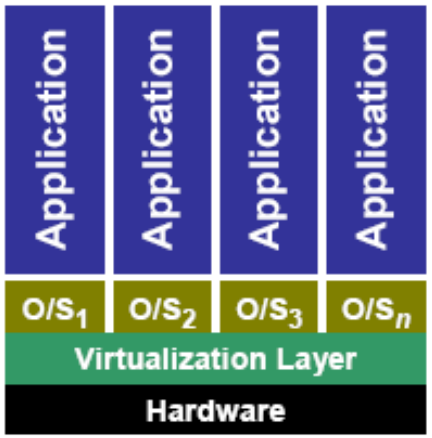
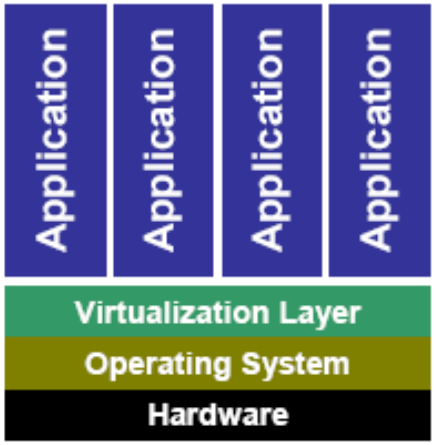
Virtualization Models

Hypervisor model



- Each application is contained by its own Operating System instance
- The Virtualization layer is tasked with spoofing each OS into believing its is the only OS on the system
- Users can mix and match guest OS's with various versions of Windows or Linux.
- Major Players: VMWare, Microsoft, Xen

O/S Virtualization



- A single OS hosts multiple applications.
- The Virtualization layer handles resource allocation between applications
- The VZ layer also provides protection to the host OS so that a misbehaving application does not cause problems for the system as a whole
- Major Players: SWSoft, Sun/Containers

Data: Dan Olds,Gabriel Consulting

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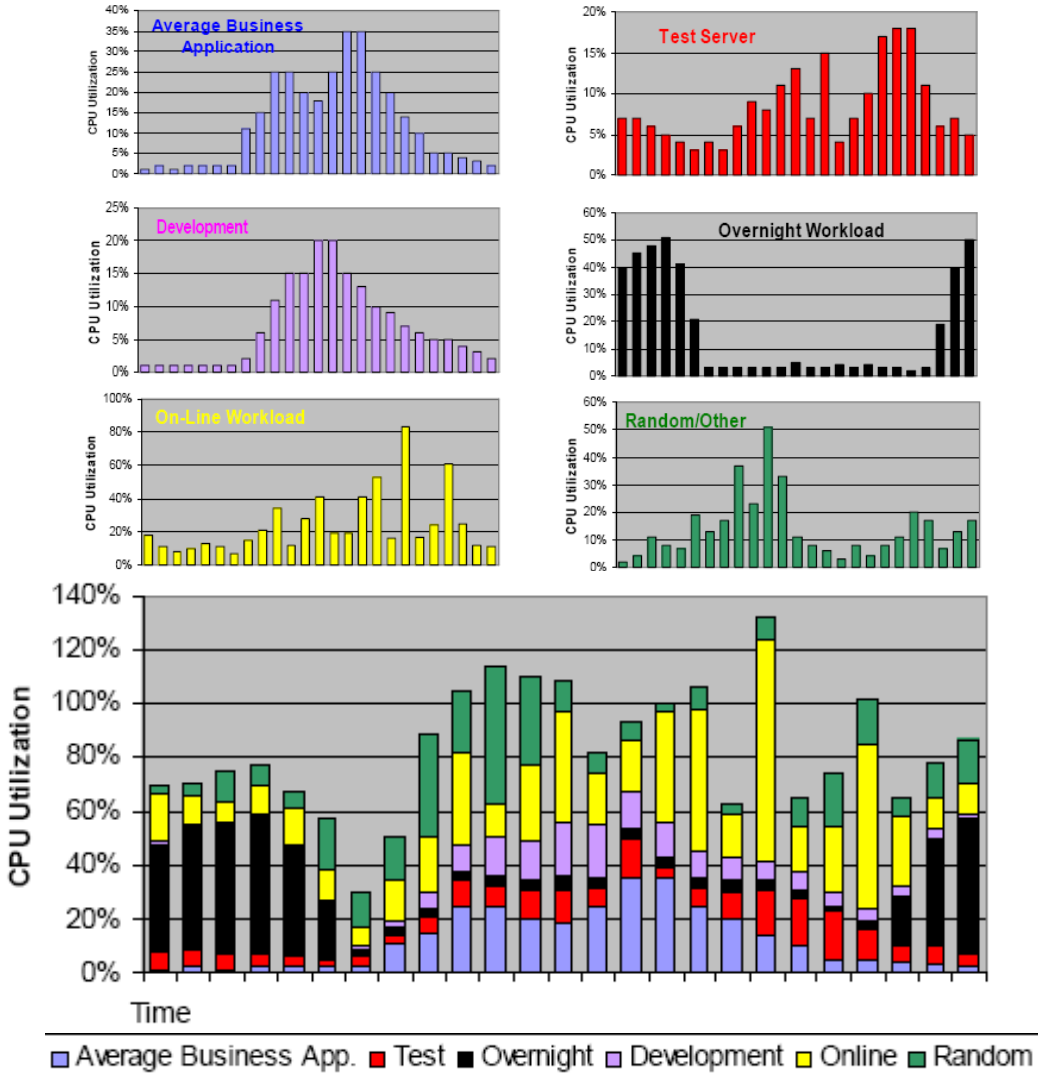
Workloads Consolidation using VZ



Data: Dan Olds,Gabriel Consulting

- A single server 1.5x larger than standard 2-way server will handle consolidated load of 6 servers.
- VZ manages the workloads + important apps get the compute resources they need automatically w/o operator intervention.
- Physical consolidation of 15-20:1 is easily possible
- Reasonable goal for VZ x86 servers – 40-50% utilization on large systems (>4way), rising as dual/quad core processors becomes available
- Savings result in Real Estate, Power & Cooling, High Availability, Hardware, Management

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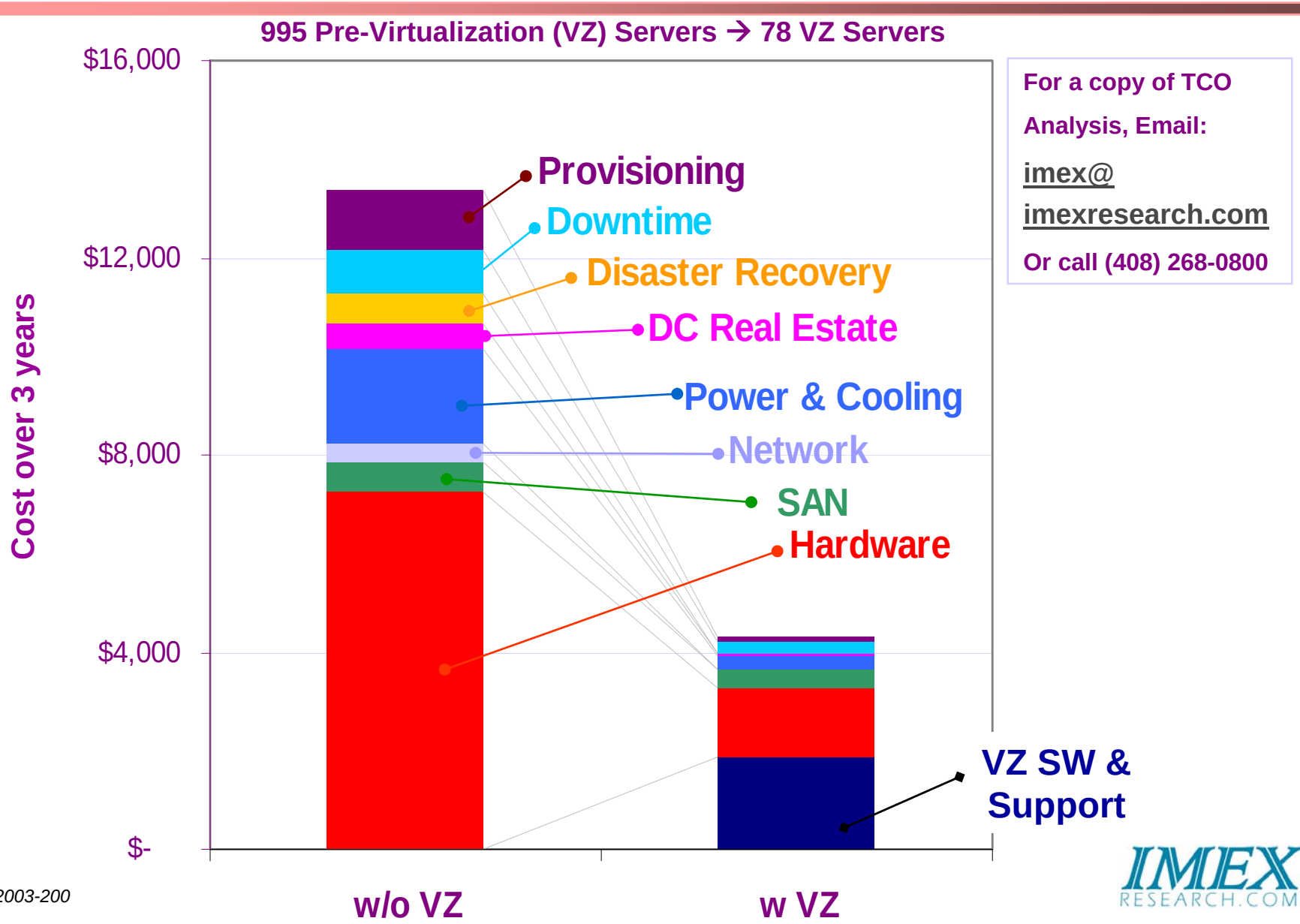
TCO Savings with Virtualization



For a copy of TCO Analysis, Email:

imex@imexresearch.com

Or call (408) 268-0800

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Virtualization Players by Category

App VZ	OS	Processor	PC	Servers	Storage	Tools	
Appistry	Fedora	AMD	Altiris	Akimbi Syste	Cloverleaf	Acronis	Sun
Data Synapse	Novell	Intel	AppStream	AppStream	Compellent*	Altiris	Surgient
	OpenVZ		Ardence	Ardence	Datacore	BladeLogic	VizionCore
	Red Hat		Checkpoint	Egenera	EMC*	BMC SW	VMware
	Sun		Citrix	HP	FalconStor	CA	vThere
			Fujitsu	IBM	Fujitsu*	Cassatt	
			Fujitsu-Sieme	Microsoft	HDS*	Cirba	
			Hitachi	Parallels	HP*	Dunes	
			HP	Sun	IBM Tivoli	Ecora	
			IBM	SWsoft	IBM*	IBM	
			LeoStream	Virtual Iron	NetApp*	Microsoft	
			NEC	VMware	Netreon	Opsware	
			Parallels	Xen	SANRAD	Parallels	
			Platform		StorageAge	PHD	
			Microsoft		Sun/STK*	PlateSpin	
			Sun		Symantec	Platform	
			Wyse		Vicom	Scalent	

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Summary - Virtualization

- **Server Virtualization (VZ) now a mainstream technology**
- **VZ is turning Data Center strategies & core infrastructure upside down**
- **DC Professionals very happy with its future use**
- **VZ means "Doing More for Less" (finally making CFOs get off your back)**
- **Issues to be Resolved**
  - VMs exploding – Managing them a nightmare: needs more tools
  - Database Performance (one reason HP bought Polyserve)
- **Follow SIVA© in executing your DC strategy**
  - **Standardize** (Windows/Linux, GbE, IP Storage/iSCSI,SATA..)
  - **Integrate** (Blades, Management Tools..)
  - **Virtualize** (Infrastructure-uP,Servers, Storage, Networks,Clients w P2V tools)
  - **Automate** (Provide important Apps required resources automatically w/o intervention to ↓OPEX costs)
- **Create VZ Justification: TCO Reduction of 60-70% over 3 years, ROI >58%**
- **Follow VZ in 3 phases**
  - ❶ Consolidation & Resource Sharing ❷ HA/BC/DR, WkLd Balancing ❸ Automation
  - Consolidate through VZ and Workload Management,
  - Reduce # systems Footprints & OS instances (↓OS Lic Costs, ↓ Mgmt Admin Costs)
  - Create Workload Mgmt based on Business Policies (Mission Critical, & DB Wklds)

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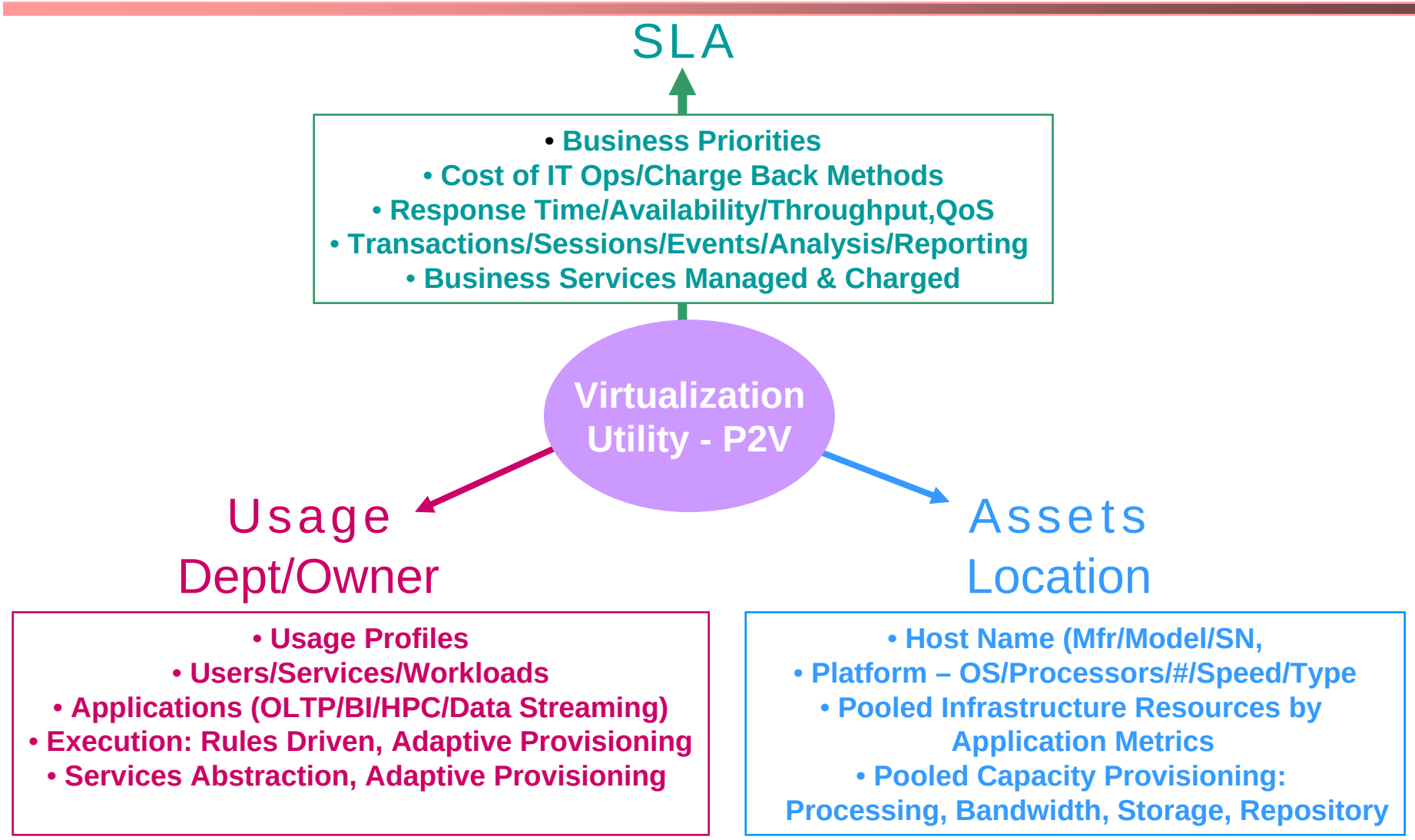
Virtualizing your IT Infrastructure

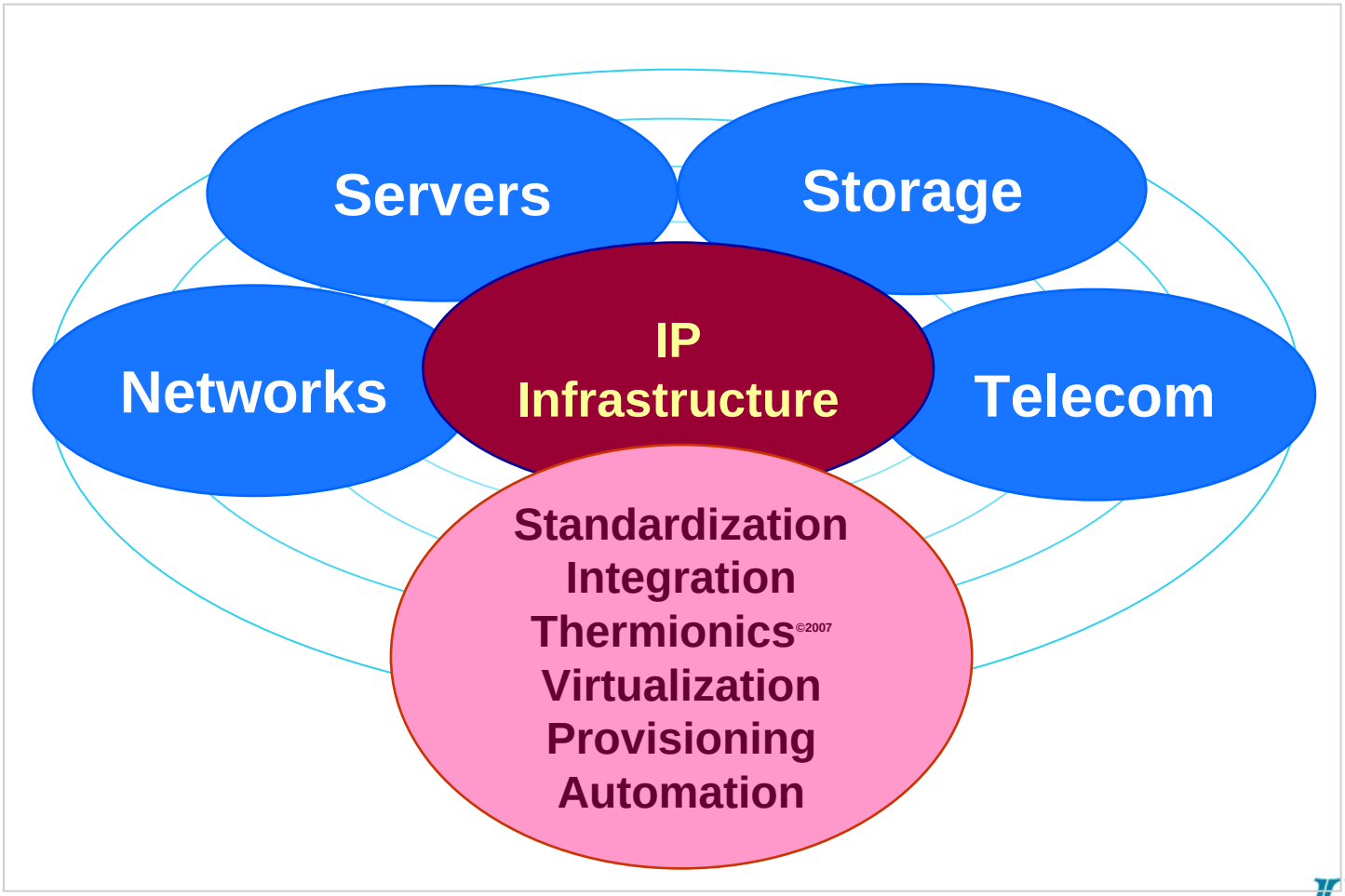


IMEX

For copy of case study on how a major financial institution implemented virtualization email imex@imexresearch.com

Future: IP Everywhere Based Infrastructure

Follow SIVA©2007– Standardization, Integration, Virtualization & Autonomics
In your Next Generation Data Center



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