Next-Gen Data Center

Improving TCO & ROI in Data Centers thru Virtualization and Blade Servers

Anil Vasudeva
Chief Analyst & President
vasudeva@imexresearch.com
408-268-0800

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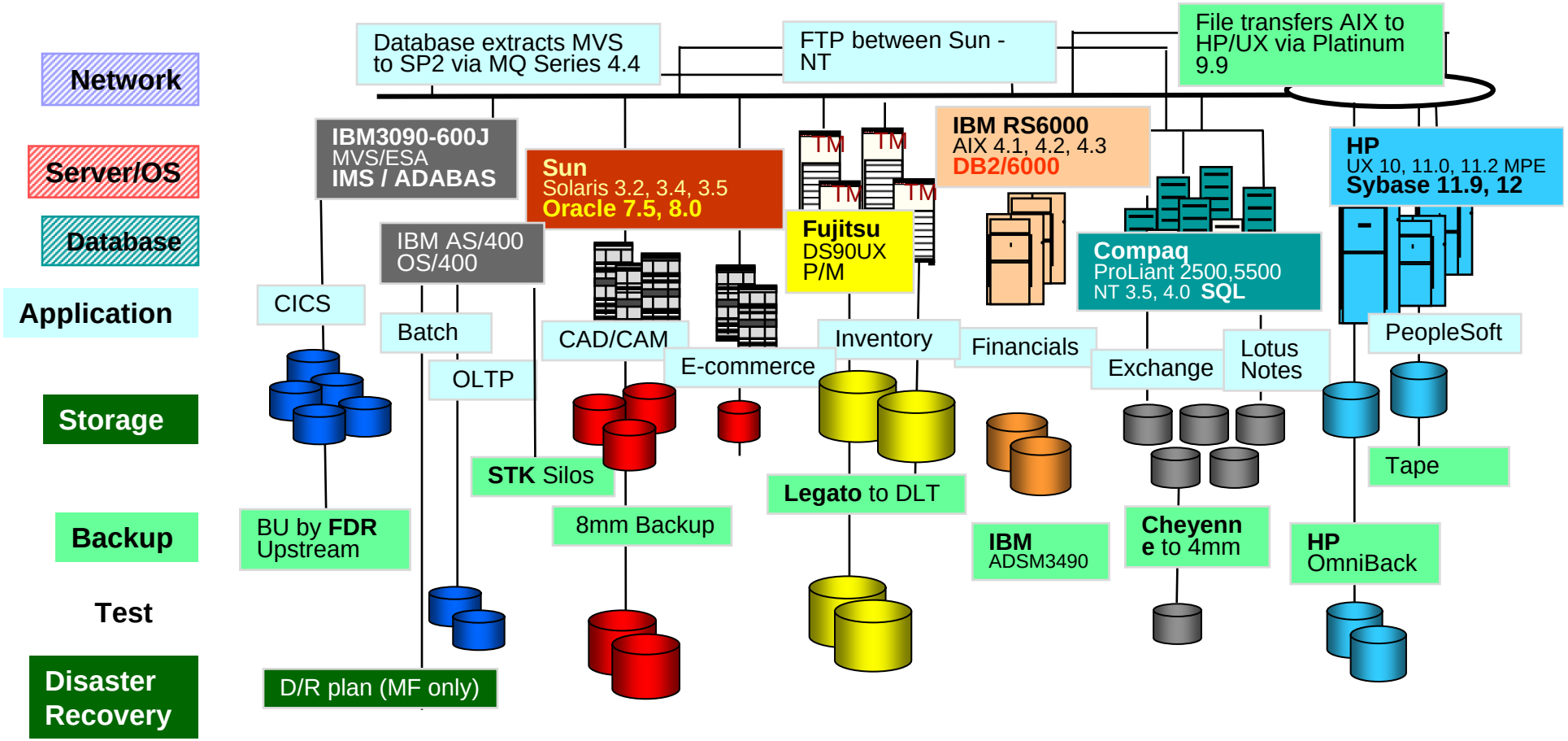
Chaos in the Enterprise . . .



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

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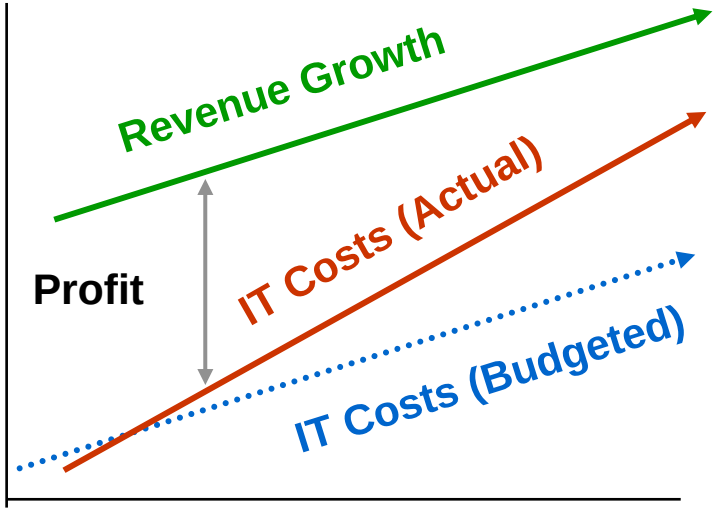
Genesis of NGDC

CFO vs. CIO - Shocking Observations

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



Reason – IT Spiral

- Web Growth → **New Apps Mushroom →**
  Low Cost Windows (Tier-1) Servers Sprawl
- Business Growth → **More Computing Power**
  →Applications/DB → (Tier-2,3) Servers Sprawl
- **More Servers →↑Storage →↑DC Facilities →↑ IT Support →↑ IT Staff**
- **IT Costs ≠ Business Growth**

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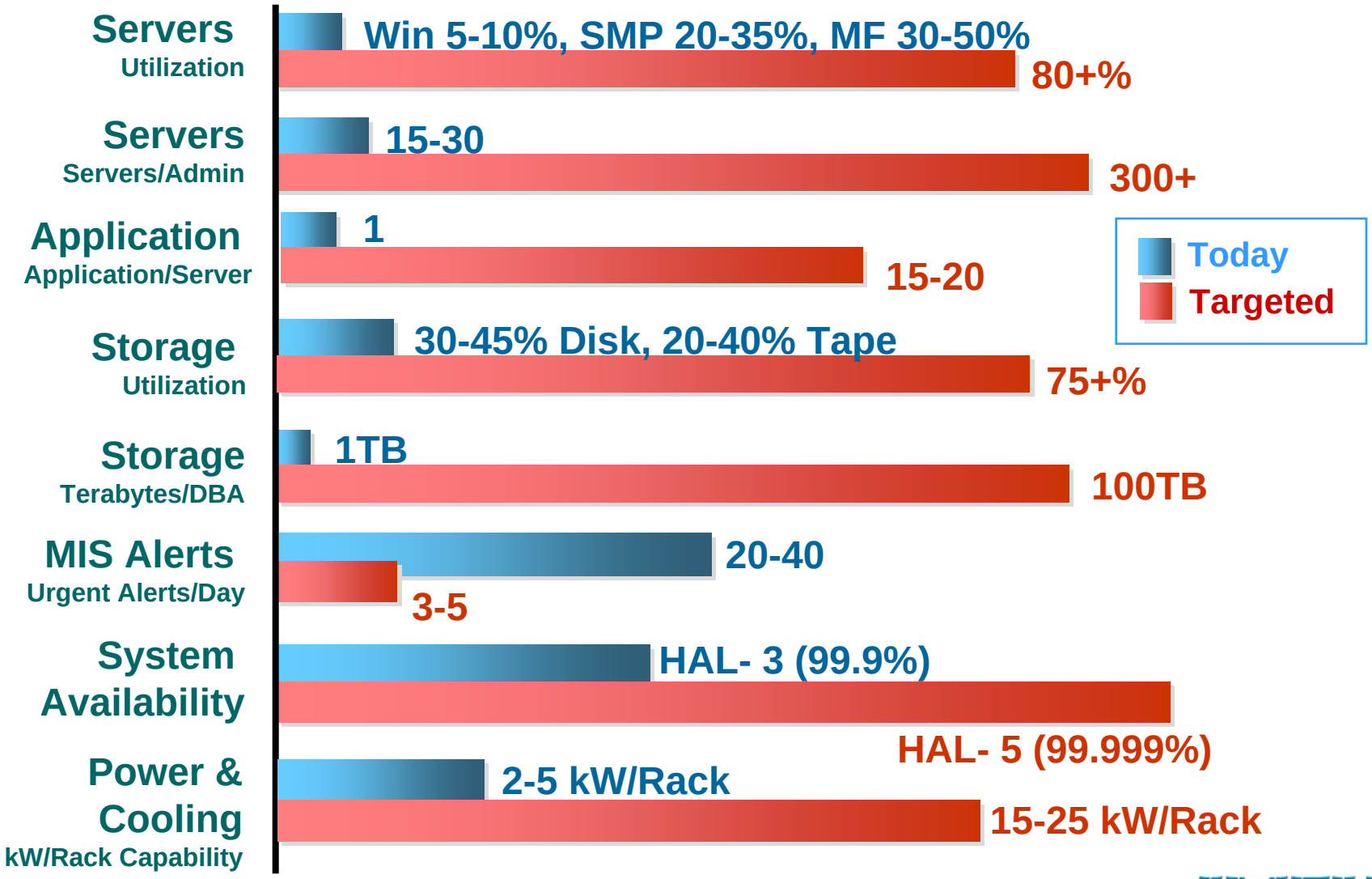
DC Infrastructure Nightmares of CIOs



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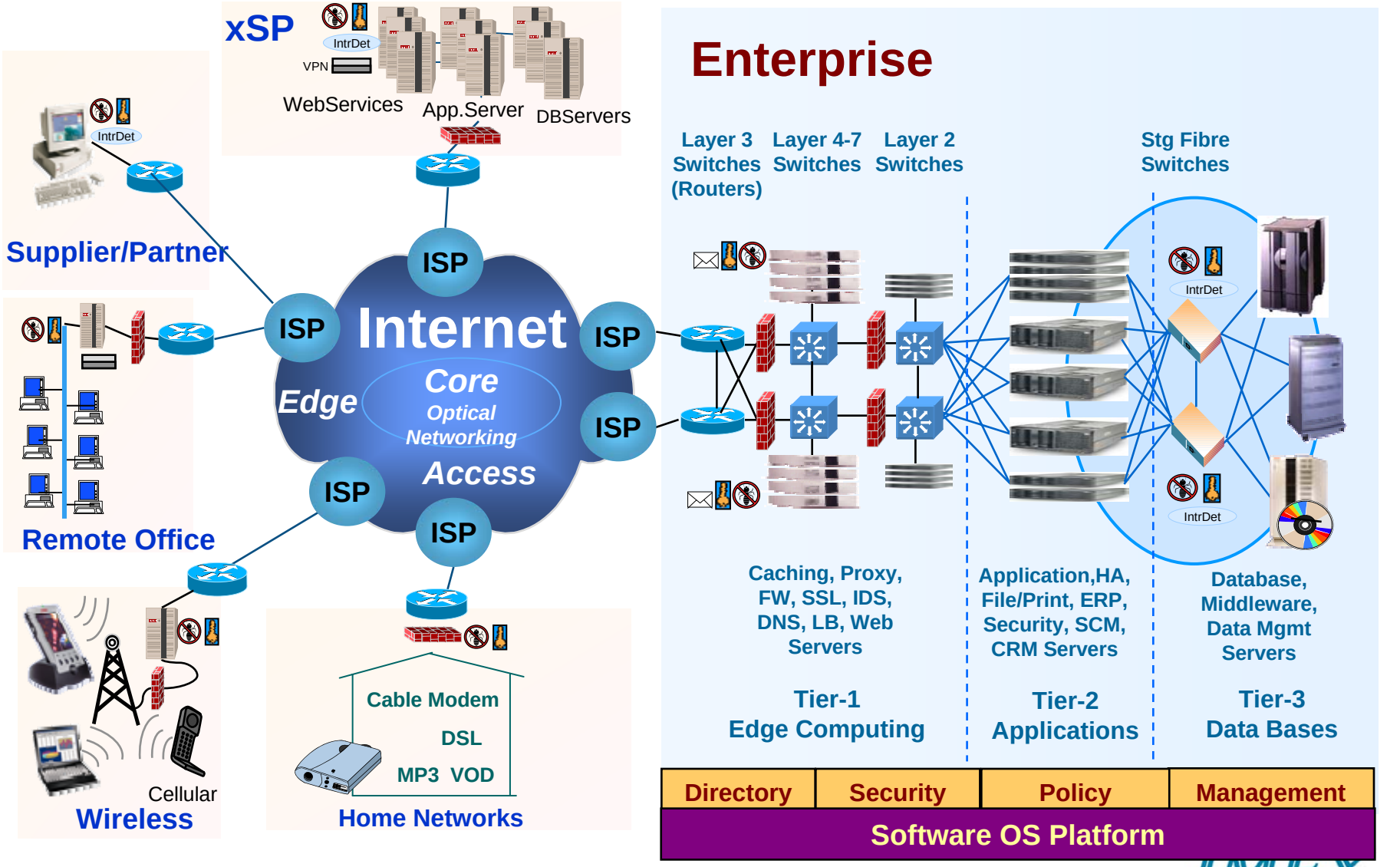
End to End IT Infrastructure *with HA & Security*



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Follow SIVA© for a Scalable & Dynamic NGDC

Automation

Automatically Maintains App Service Level Objectives using Policy Based ILM

Virtualization

Pools Resources, Optimally Provisions them for given Usage/Application to Deliver Business Service, Monitors Usage

Integration

Integrates physical infrastructure sing Scalable Blades to Optimize CAPSIMS:
Cost, Availability, Performance, Scalability, Inter-operability, manageability & Security

Standardization

Reduce CAPEX via using Industry Standard Infrastructure - HW, Interfaces, Open Source SW – OS, Middleware, and Shrink Wrap Applications > Reduced OPEX in Support, Training for Delivery of Business Services

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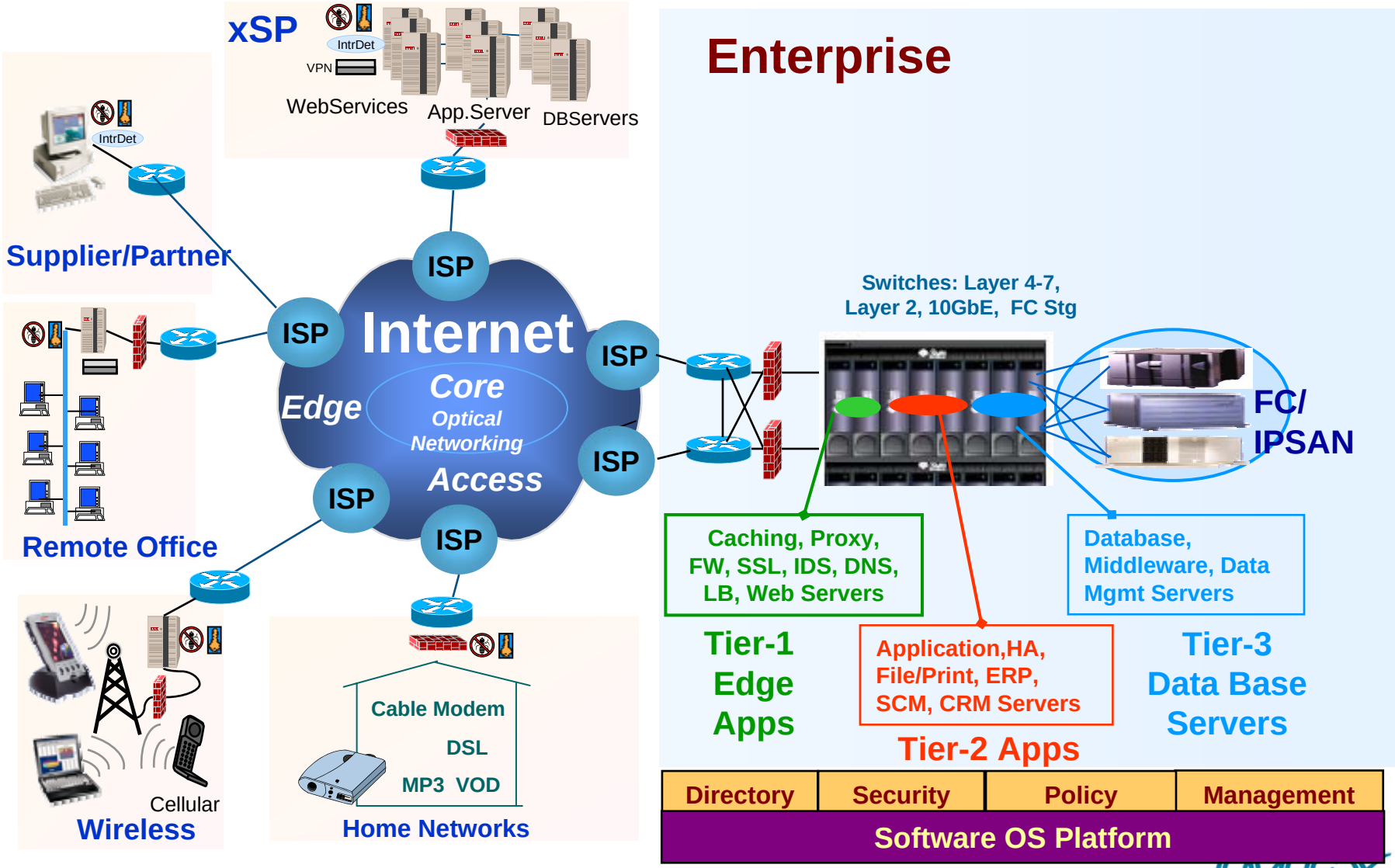
Consolidated Data Center



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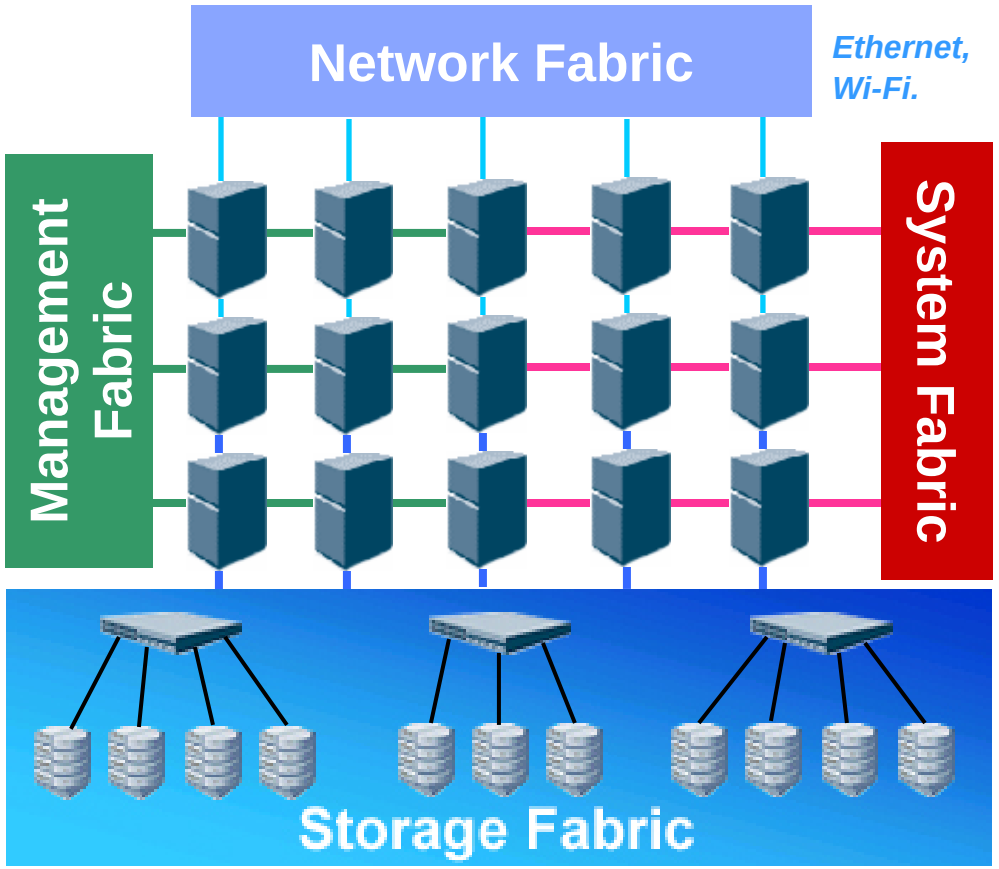
Key to Integration: Interconnect Fabrics



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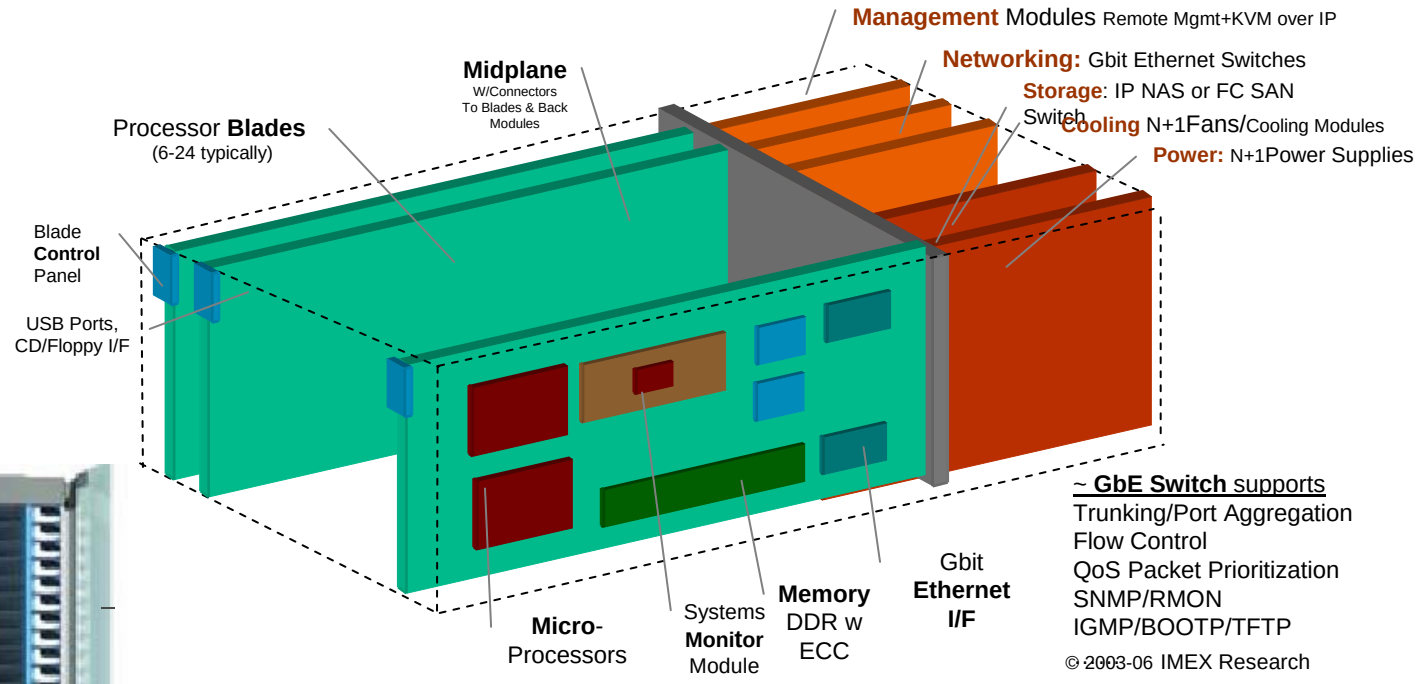
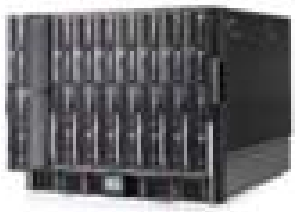
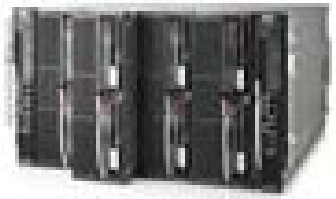
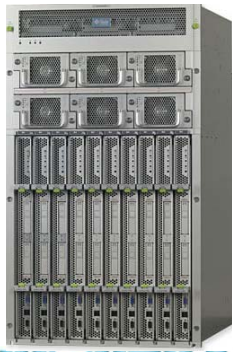
Blade Infrastructure:Local Area Grid (LAG©)









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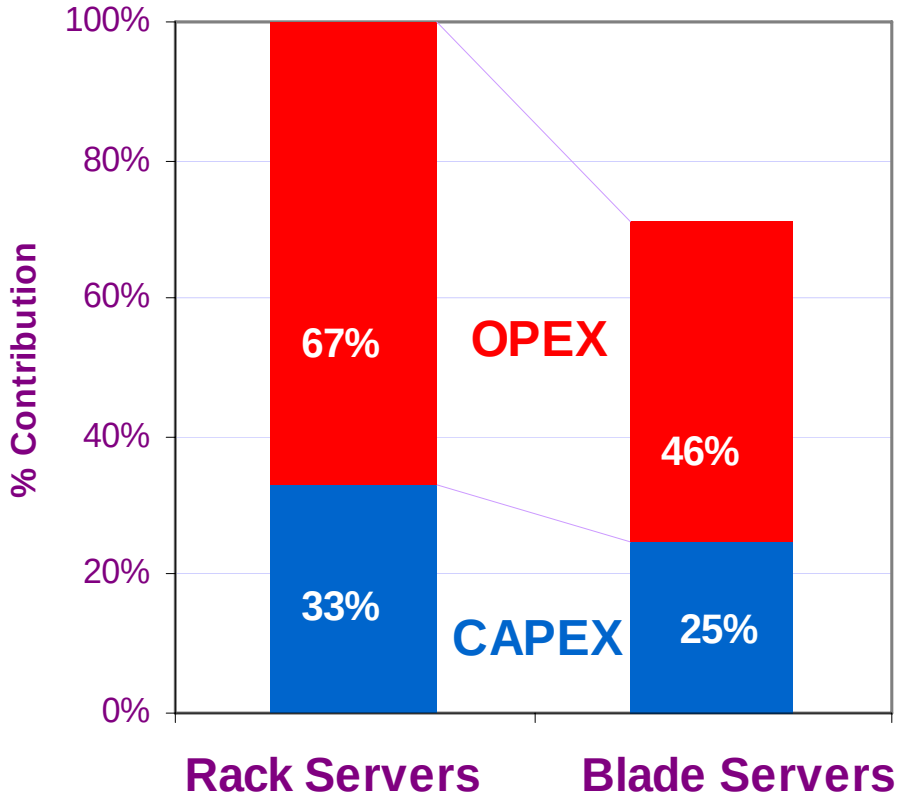
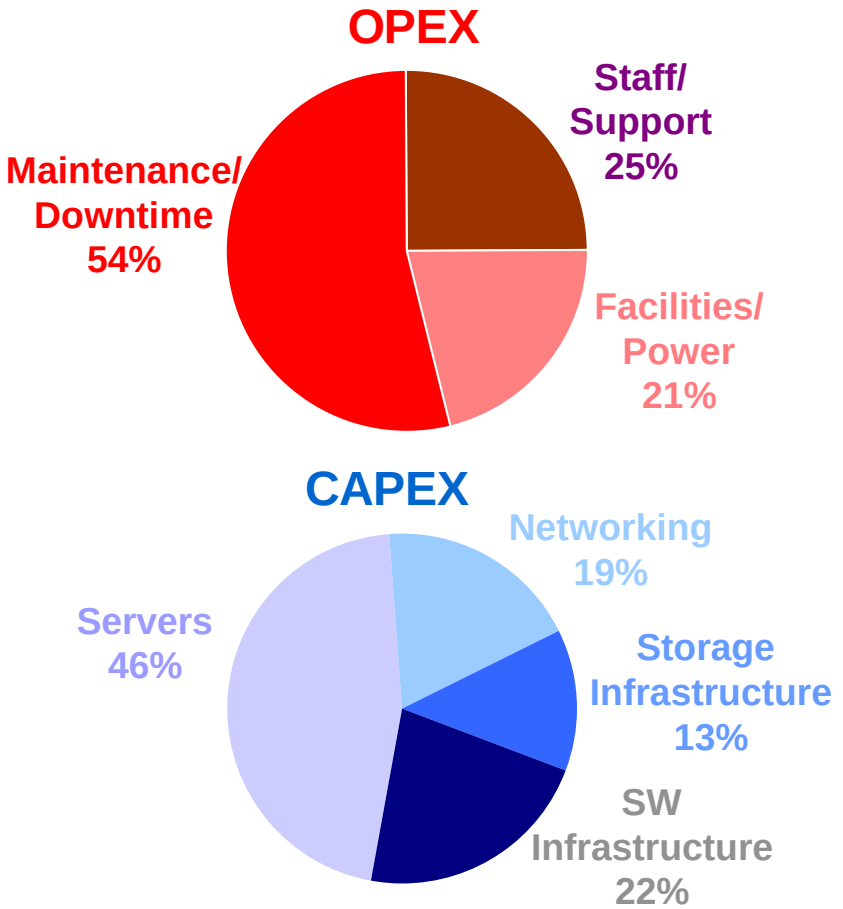
Blades - TCO Savings & ROI

3 Year TCO Savings
Rack vs. Blade Servers



TCO Savings in..



Data: IMEX Research 2004

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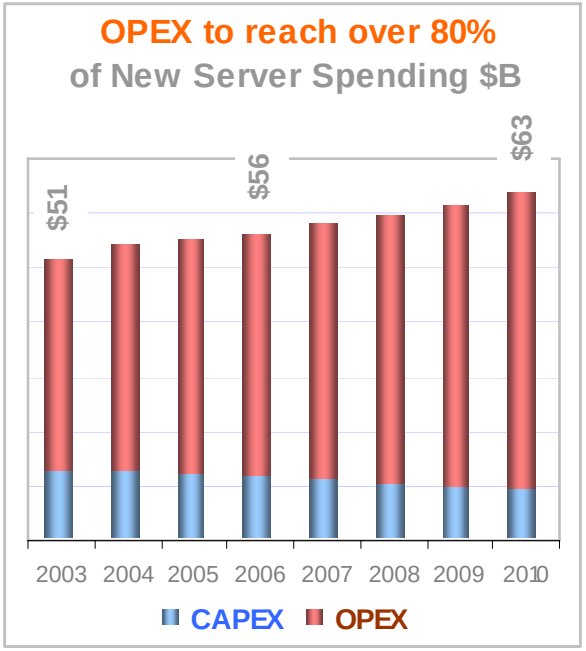
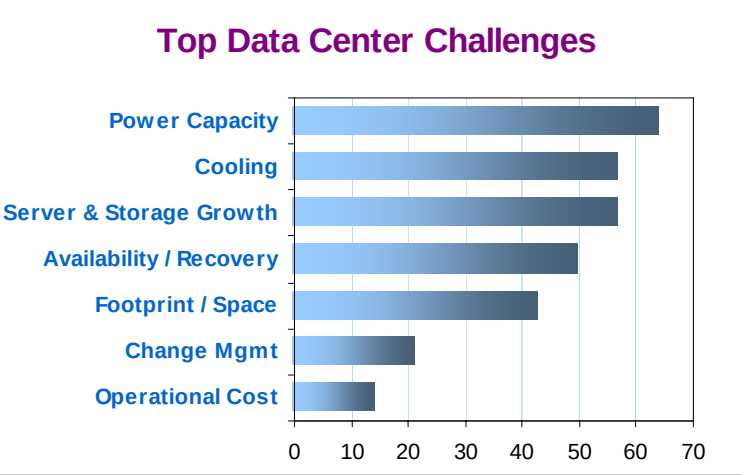
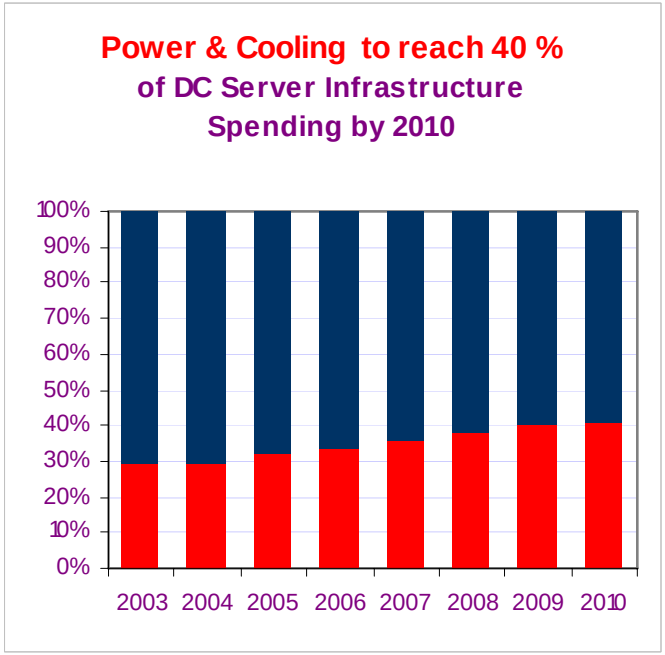
DC Power/Cooling Spending to rise dramatically

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







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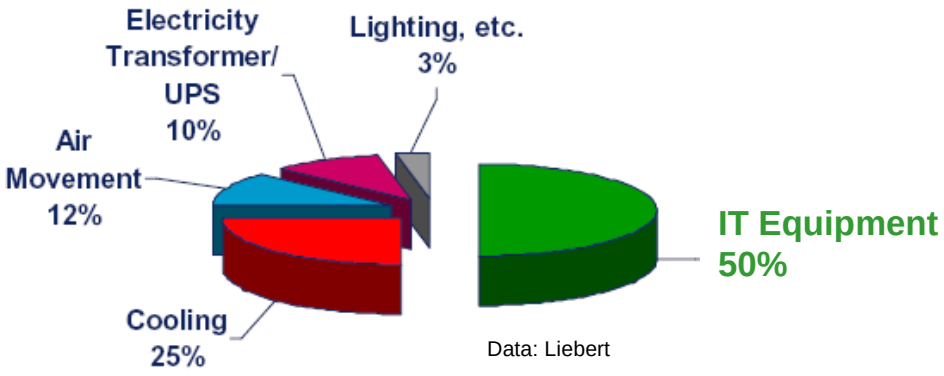
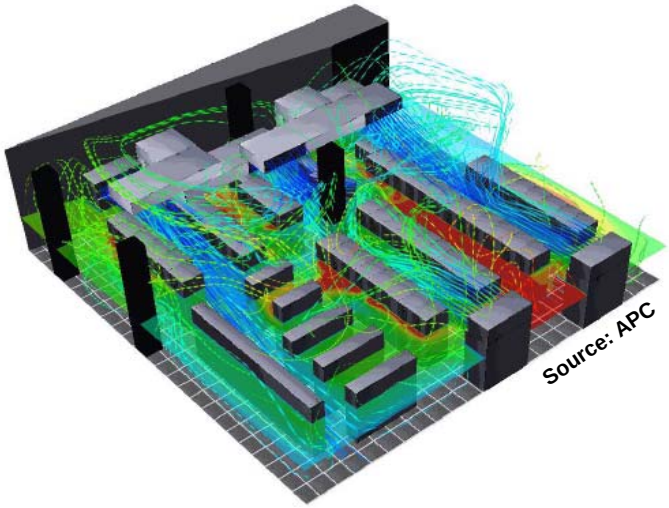
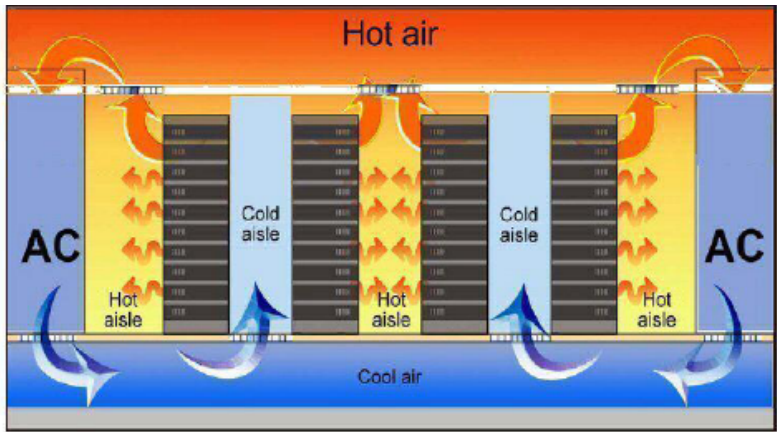
Data Center Cooling

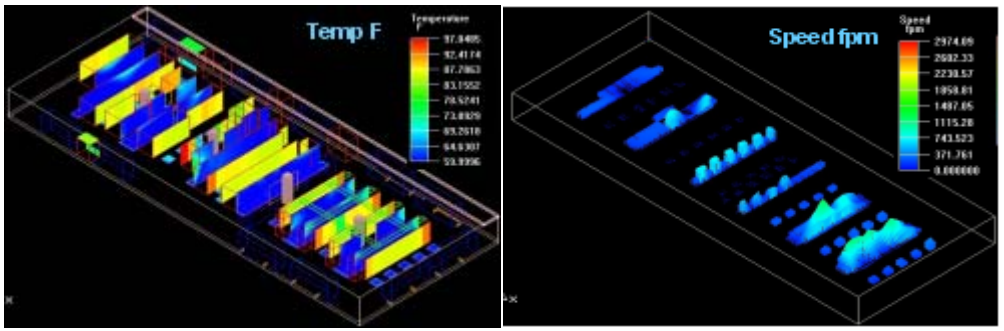
Where does the power go in Data Centers ?



Data: 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 and 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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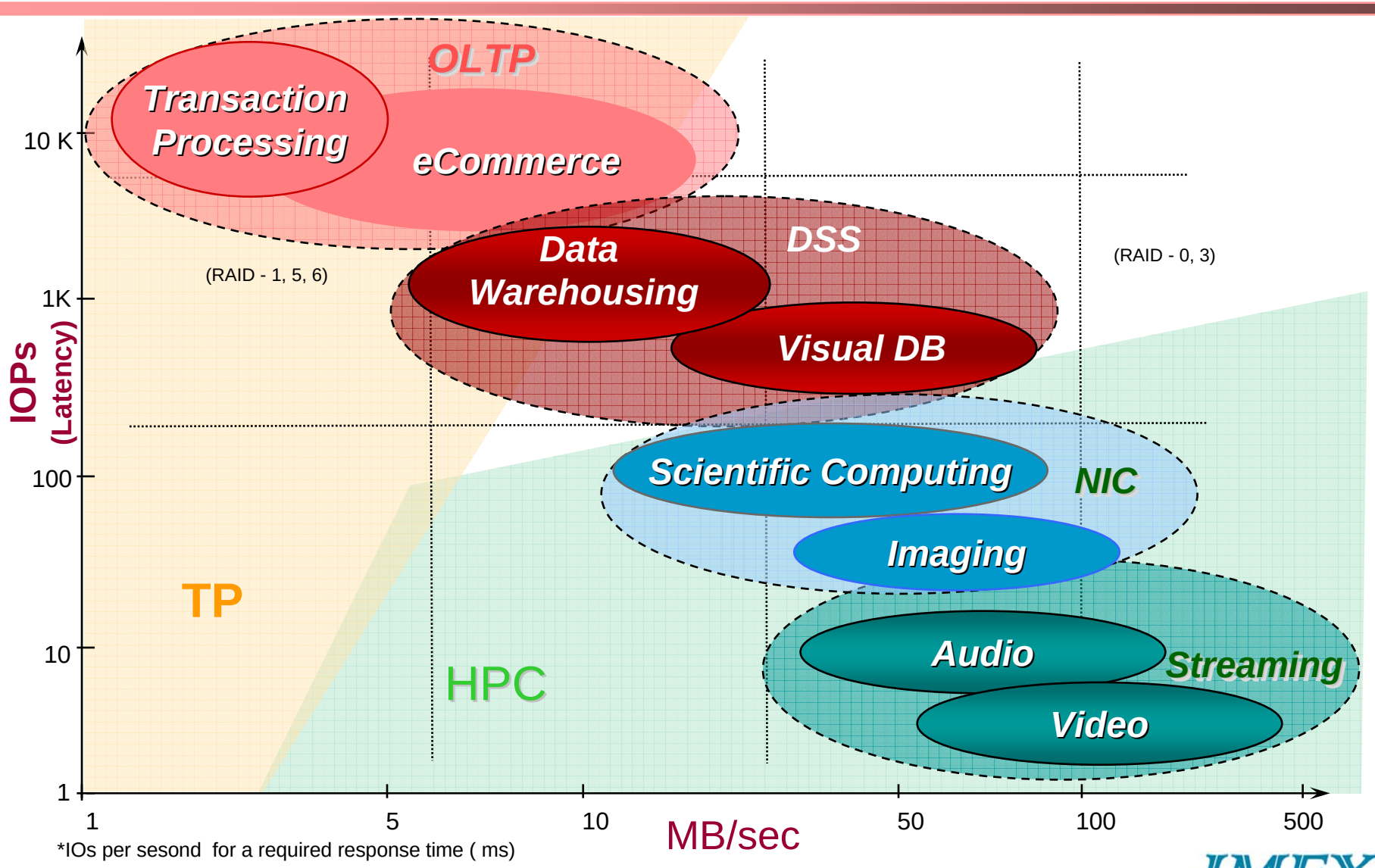
Market Segments by Applications



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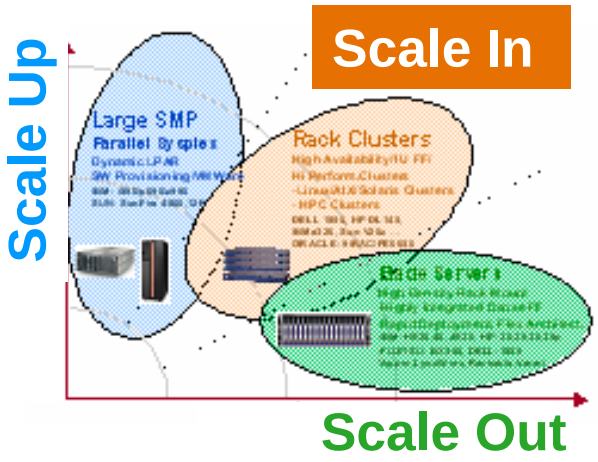
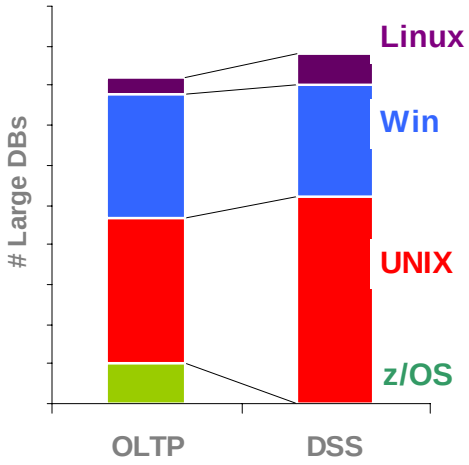
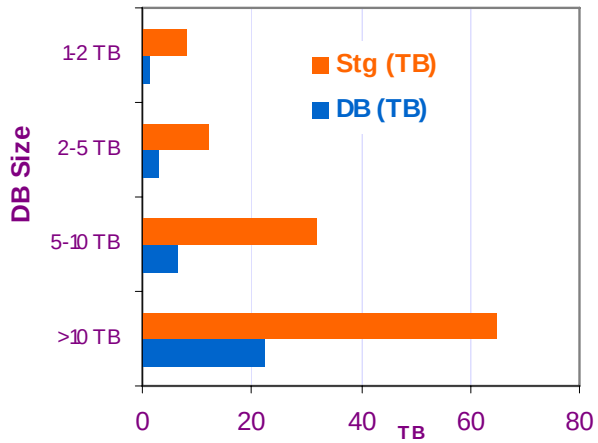
State of DB Applications



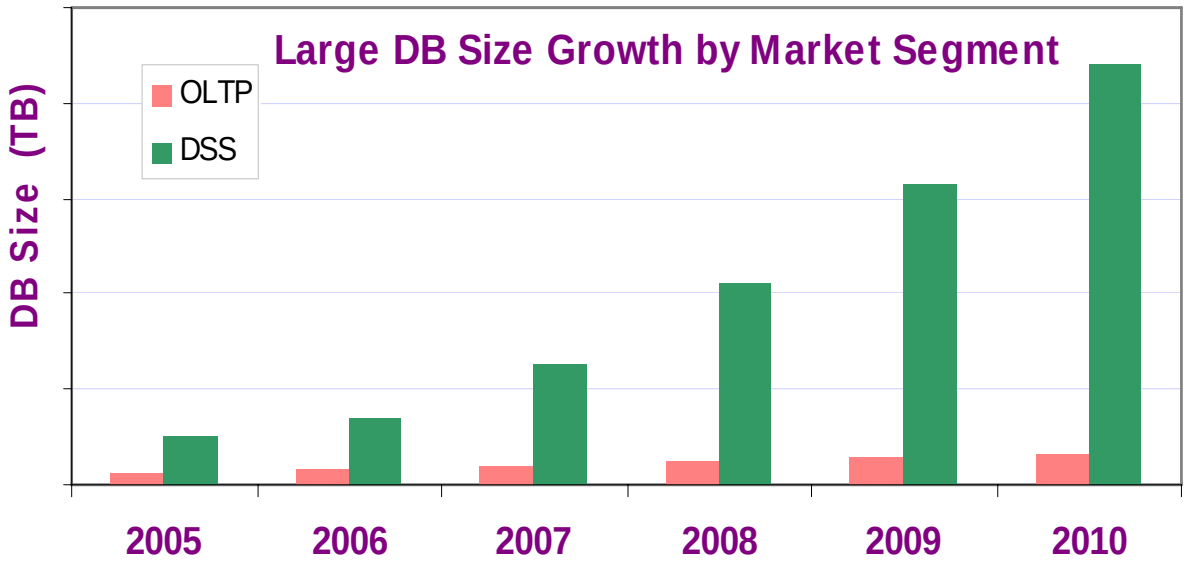
Large Databases by OS



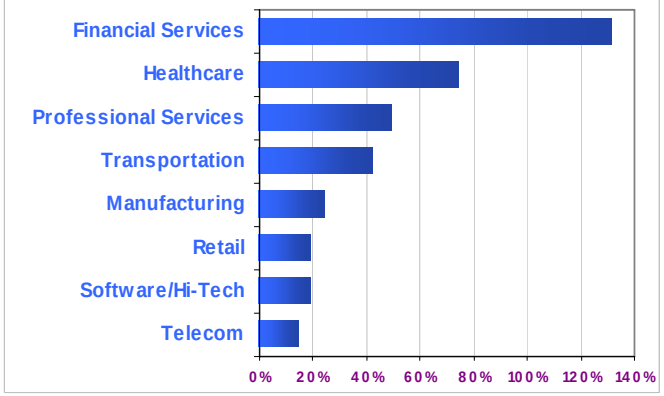
Storage Usage vs DB Capacity



Large DB Size Growth by Market Segment



Yearly Storage Growth % 2005-06



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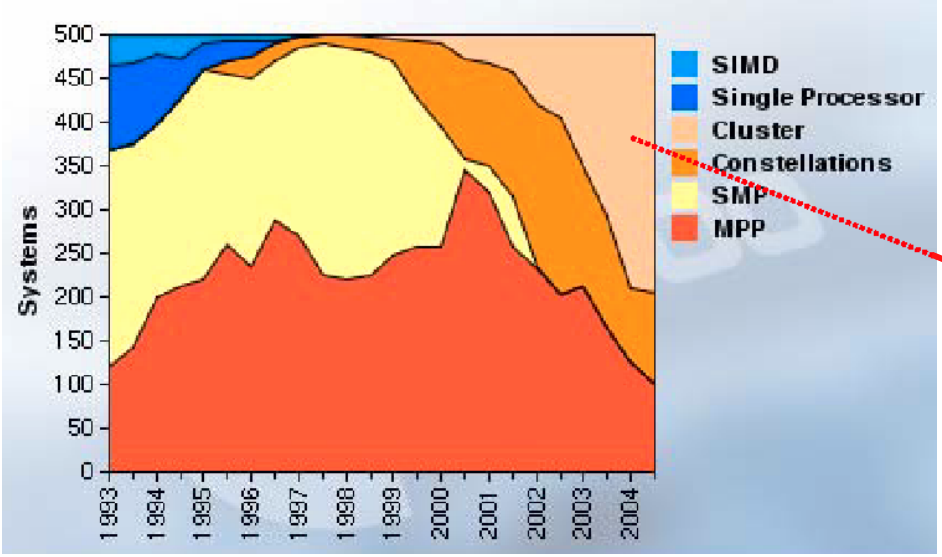
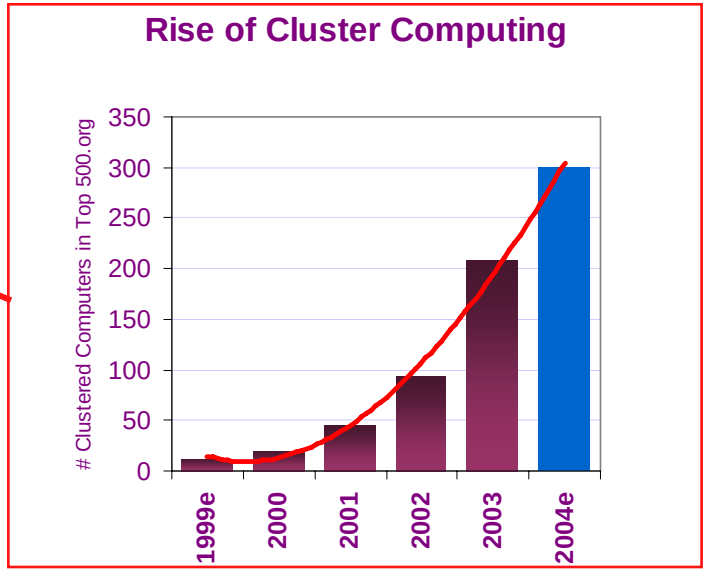
The rapid rise of Clusters in HPC

	Ten years ago	Five years ago	Today
Largest system	143 Gflops	2.1 Tflops	70.7 Tflops
Teraflop systems	0	2	398
Research/Academic	60%	48%	41%
Industry	24%	46%	55%
Linux clusters	0	6	294





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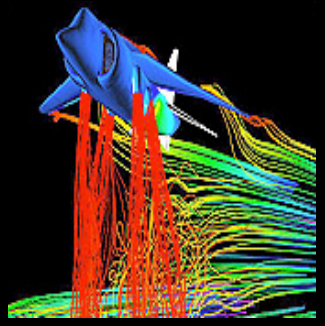
HPC – From Academia to Wall St. to Hollywood

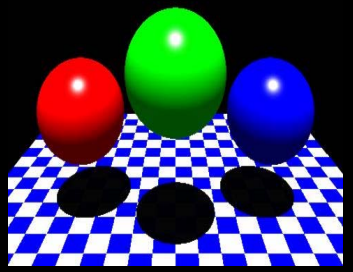
High Performance Computing



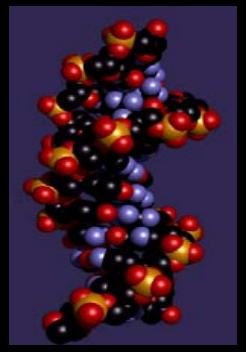
Data: IMEX Research & Panasas

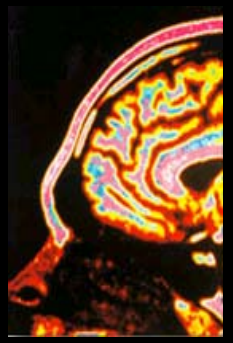
- 100+ Teraflops
- Throughput = 100 GB/s

Commercial Visualization



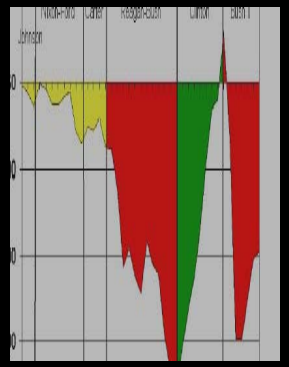
Bioinformatics





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

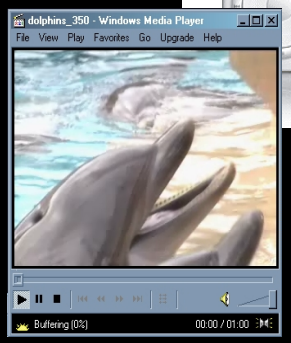
Decision-Support Systems



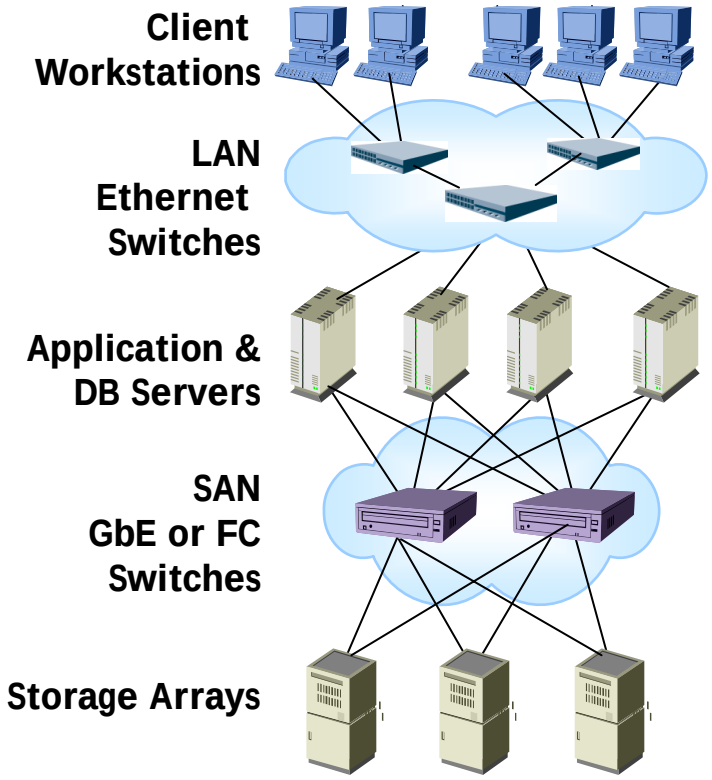
- Data rate & capacity
- Throughput : DSL/Cable

Entertainment

Audio/Video OnDemand



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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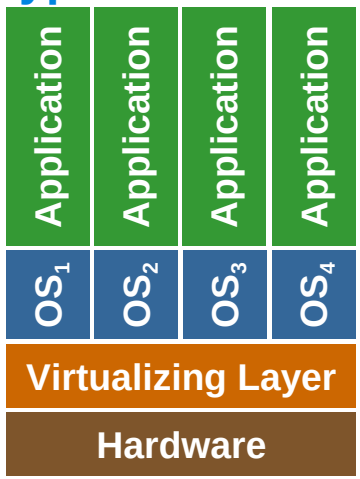
Virtualization Models

Hypervisor Model



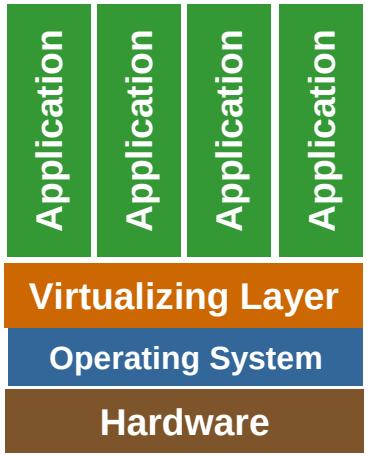
Features

- Guest OS - Each app contained by its own OS instance
- VZ layer spoofs each OS into believing as if its 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, XenSource

OS Virtualization



Info:: Dan Olds

Features

- A single OS hosts multiple applications.
- VZ layer handles resource allocation between apps
- 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

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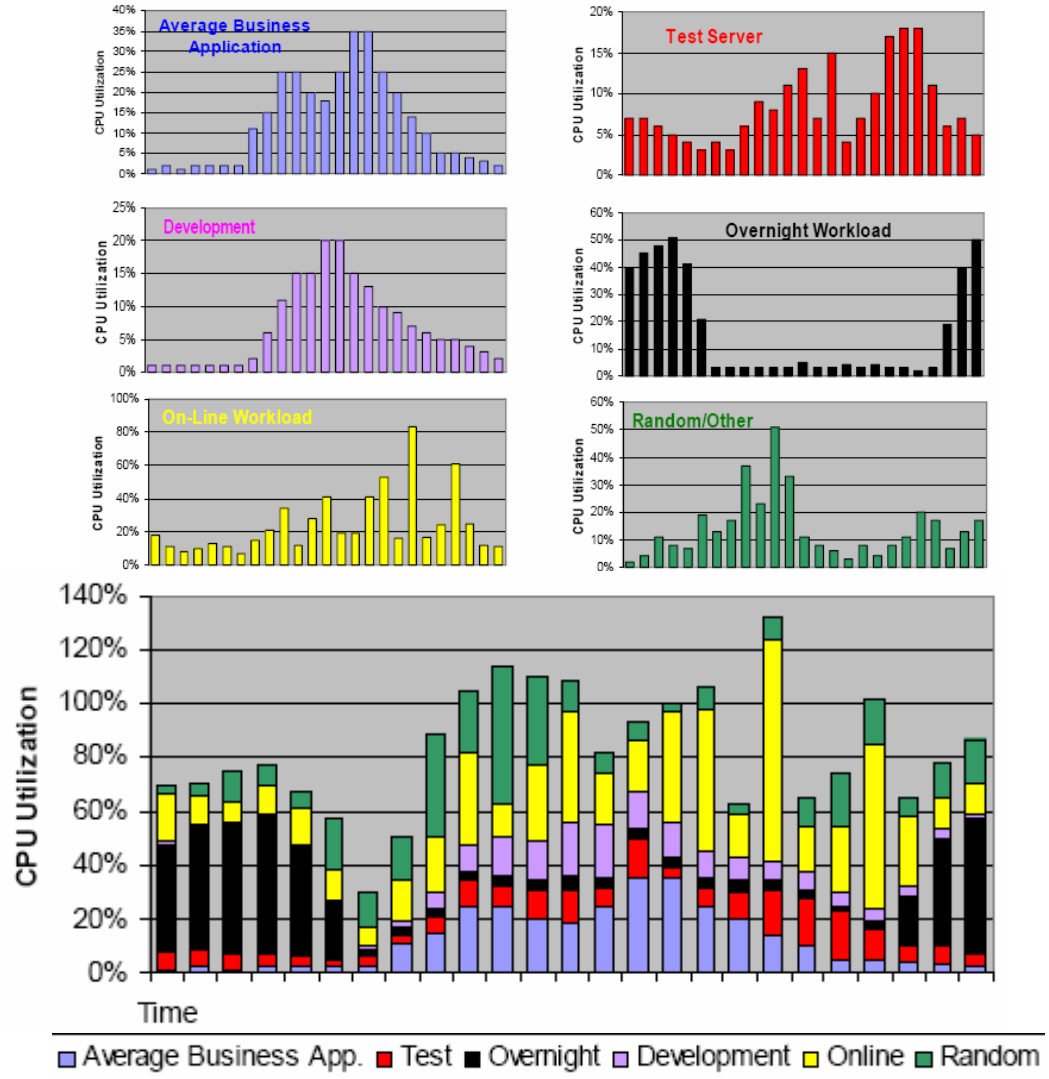
Workloads Consolidation using VZ



- 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

Source: Dan Olds

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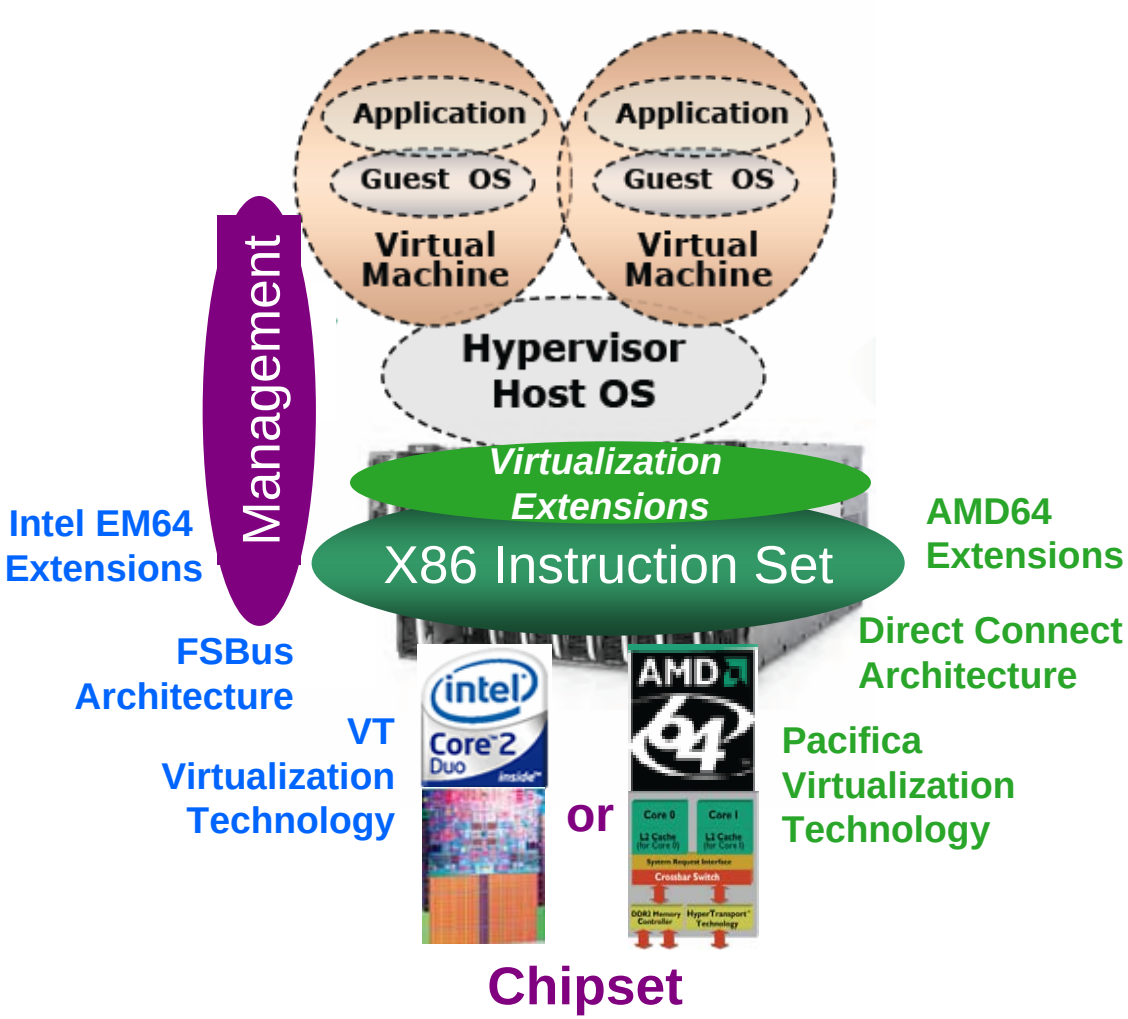
HW Assisted Virtualization



VZ Extensions at Processor

- Guest OS's run unmodified for a larger base of virtualization software
- Increased isolation to improve security of virtual machines
- Offers architectural enhancements to improve efficiency of switching between hypervisor and the guest OS's
- Implemented primarily in I/O bridges and other system core logic
- Enables virtualization software to map devices directly to virtual machines

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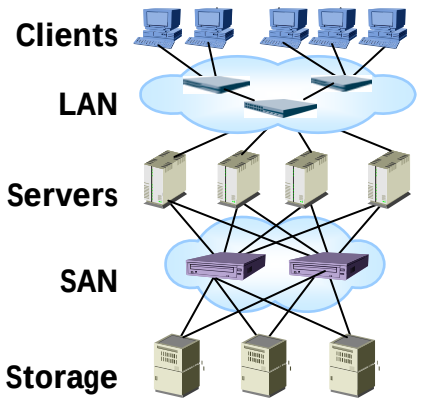
Storage Virtualization – Desired Features

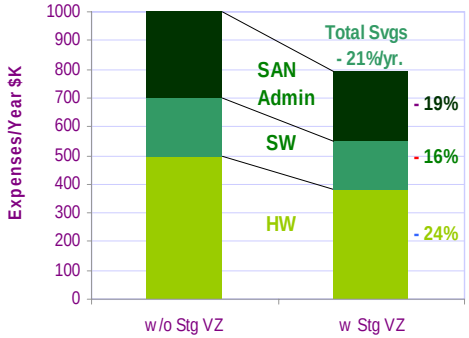


Storage VZ - Must Have Features

Scale Non-Disruptively in Capacity

- ***Snapshot Point-In-Time across Stg.devices***
- ***Remote Replication across Heterogeneous Stg. Devices***
- ***Policy Based Non-Disruptive Data Migration between Heterogeneous Stg Systems & Between Stg Tiers***
- ***Centralized Mgmt of all Stg.VZ under Single Image***
- ***Support Tiered Storage***
- ***Volume Management for Multivendor Stg. Systems***
- ***Common Set of Tools: Provisioning, Mgmt & Replication***

Savings achieved through Storage Virtualization



Storage VZ - Vendors

- ***Cloverleaf, Datacore, EMC***
- ***FalconStor, Fujitsu Computer Systems***
- ***Hitachi Data Systems***
- ***IBM, Network Appliance***
- ***StorageAge, Sun***
- ***Symantec/Veritas …***

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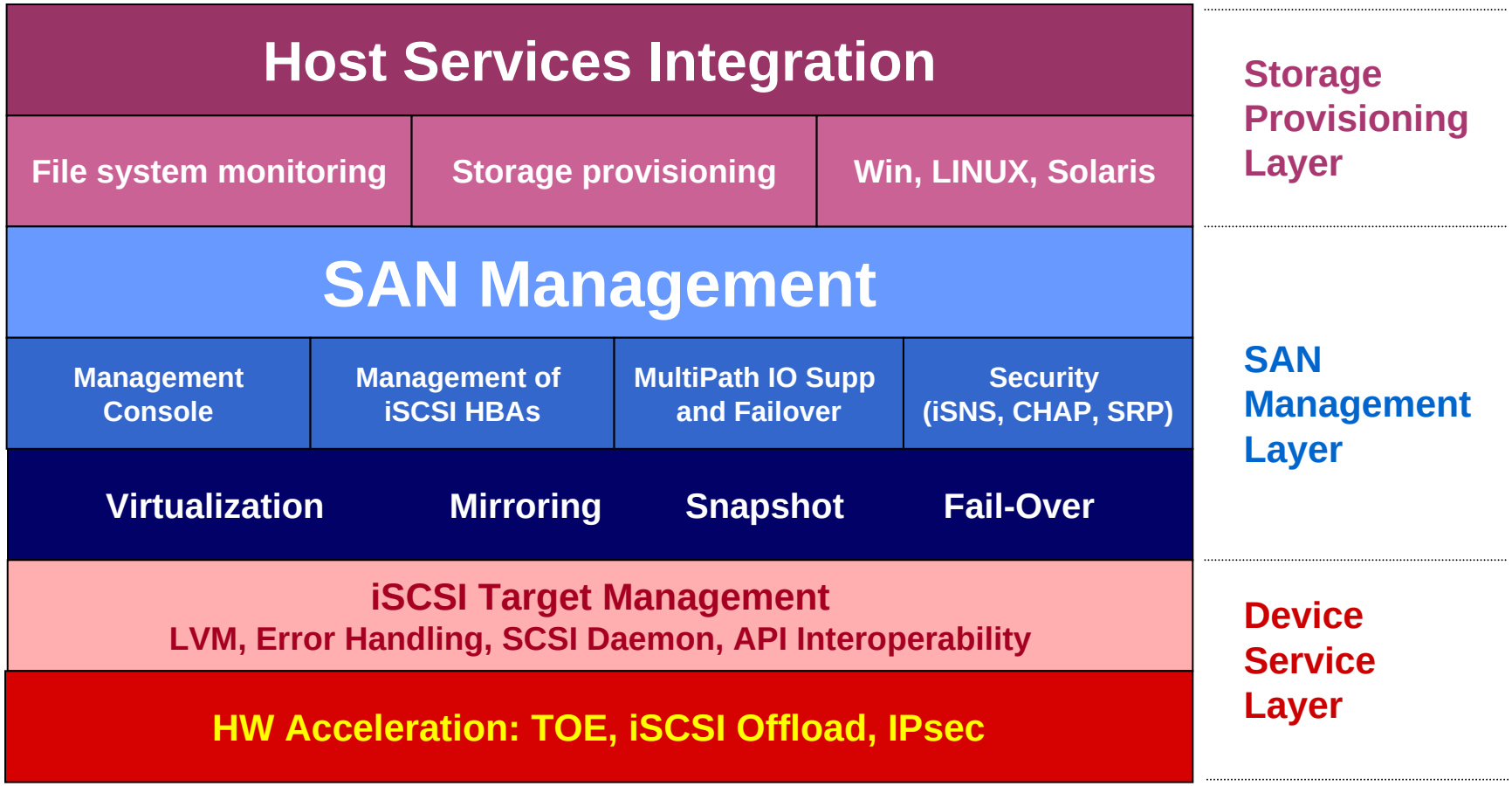
Future: Storage Management



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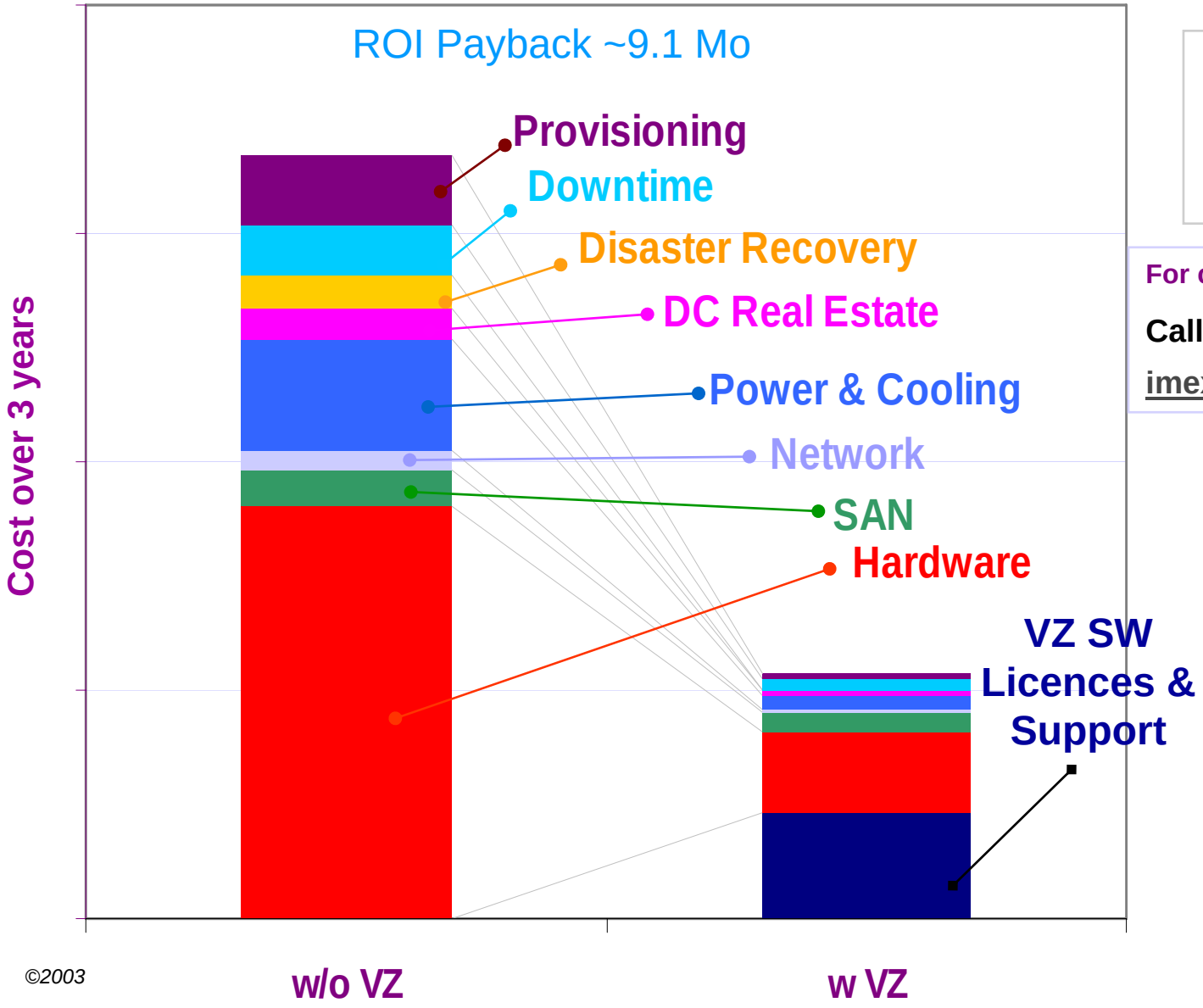
TCO Savings with Virtualization



Servers Consolidation
Pre-VZ = 995
→ After VZ=78

For copy of TCO Analysis

Call (408) 268-0800 or

imex @ imexresearch.com

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Data Center Trends - Summary

- **WW 5.1 million data centers, Costs $100-175M to build a large DC** 2007
  - ~$1005/Sqft, $40,000/Rack, $2,500/Server, 2.5U
  - 82% of installed equipment (Server, Storage, Network) has only10% utilization
  - For every $1 invested in new IT infrastructure, $7 spent to maintain
  - For every $1 in new Server spending, 42c spent on Power & Cooling /2006
  - Virtual Servers growth outstrip Physical servers by 50% > Rise in managing VM
  - Blades increasing Power/Rack by 10x Need Power/Cooling, Weight, Solutions to pursue
- **Consolidation**
  - IT in Mega Data Centers, Data & Video Info Vaults at SPs
- **New Technologies Adoption Necessary – as a Competitive Weapon**
  - Hi Density Blades, Multicore CPUs, Industry Std Computing Infrastructure, TB Disks,
  - Fast Networks: 10GbE, MPLS; Global Reach
  - Convergence (Voice Video, Data): Unified Communications, VoIP
  - Mobility & Wireless
- **Focus On**
  - Consolidation & Virtualization
  - IT Services and not IT Resources or Infrastructure
  - Rise of Cloud Computing and SaaS, SOA in its wake
  - Control over Complex Systems Interdependencies to avoid creating system wide instabilities
  - Automation of Low-Level Risks to free up on Initiatives aligning IT (CIO) to Business (CEO)

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Summary - Virtualization & Automation

- **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)
- **Server Virtualization (VZ) now a mainstream technology**
  - VZ turning DC 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)
  - Combined with VZ & Consolidation TCO Reduction of 60-70% over 3 years, ROI >58%

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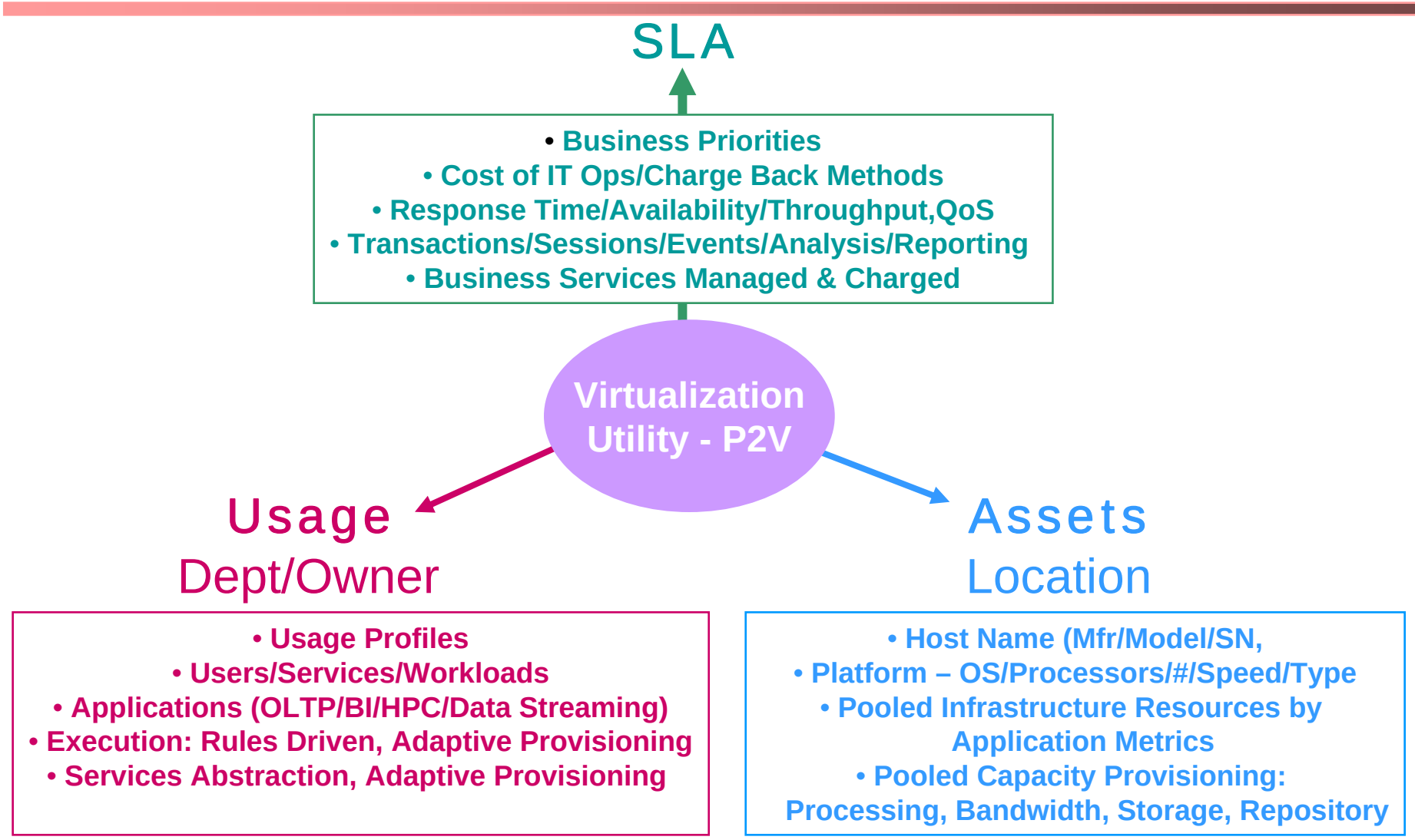
Virtualizing your IT Infrastructure



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

Next-Gen Data Center

Improving TCO & ROI in Data Centers thru Virtualization and Blade Servers

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Email: imex@imexresearch.com

Tel:(408) 268-0800

Anil Vasudeva
Chief Analyst & President
vasudeva@imexresearch.com
408-268-0800

IMEX RESEARCH.COM