Next-Gen Data Center

Virtualization:
Studies in Implementation

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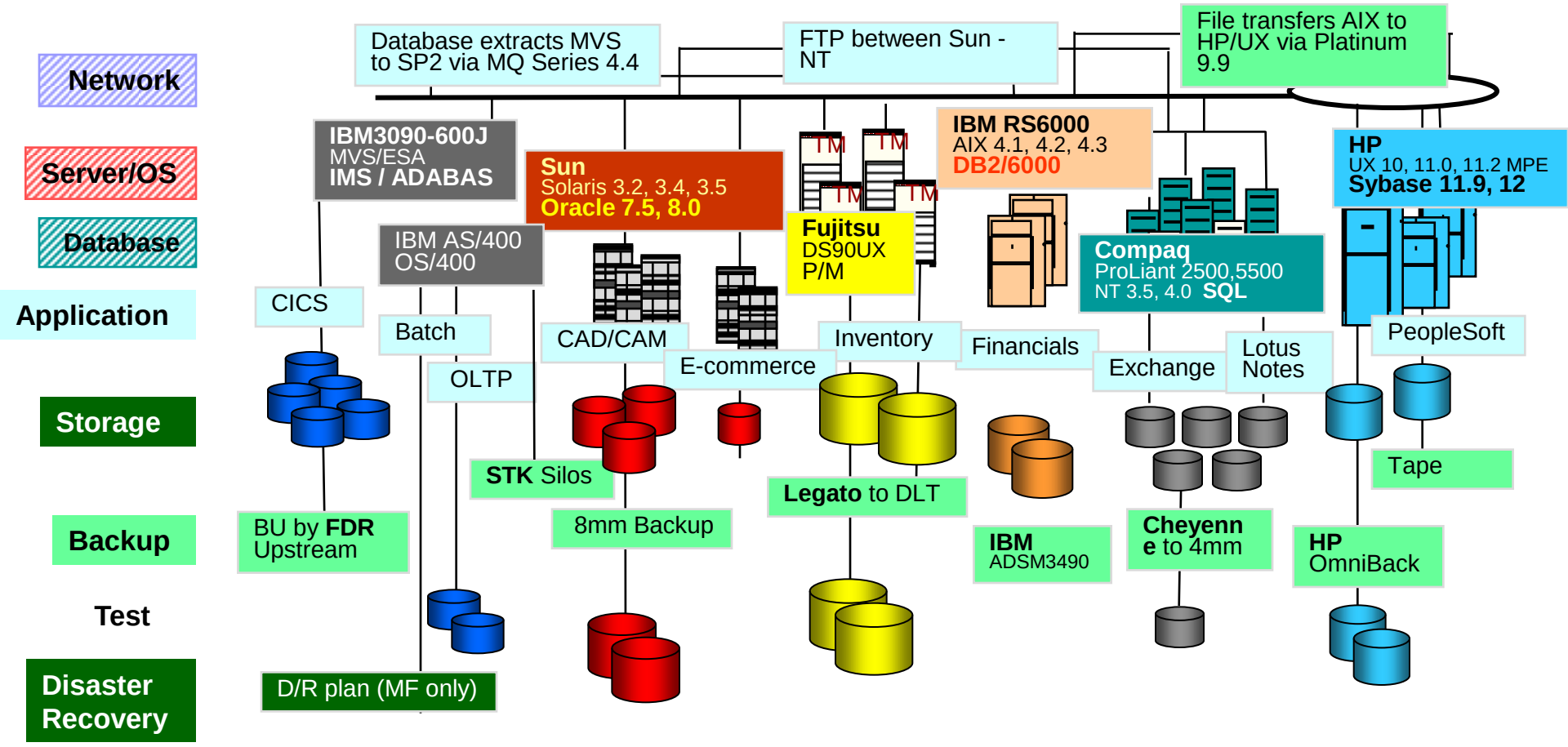
- **Markets Drivers / Industry Dynamics**
  - Mainframes to Blade Servers - Evolution in Tiered Computing
  - Segmenting Applications/IT Workloads – TC, HPC
  - Motivators, Inhibitors
  - Market Penetration
- **Virtualization Implementation**
  - Implementation At Various Levels – OS, Server, Network, Stg
  - Economics of Virtualization
- **Futures**
  - Next-Gen Data Center: Integration, Virtualization, Autonomics, Grids, Services

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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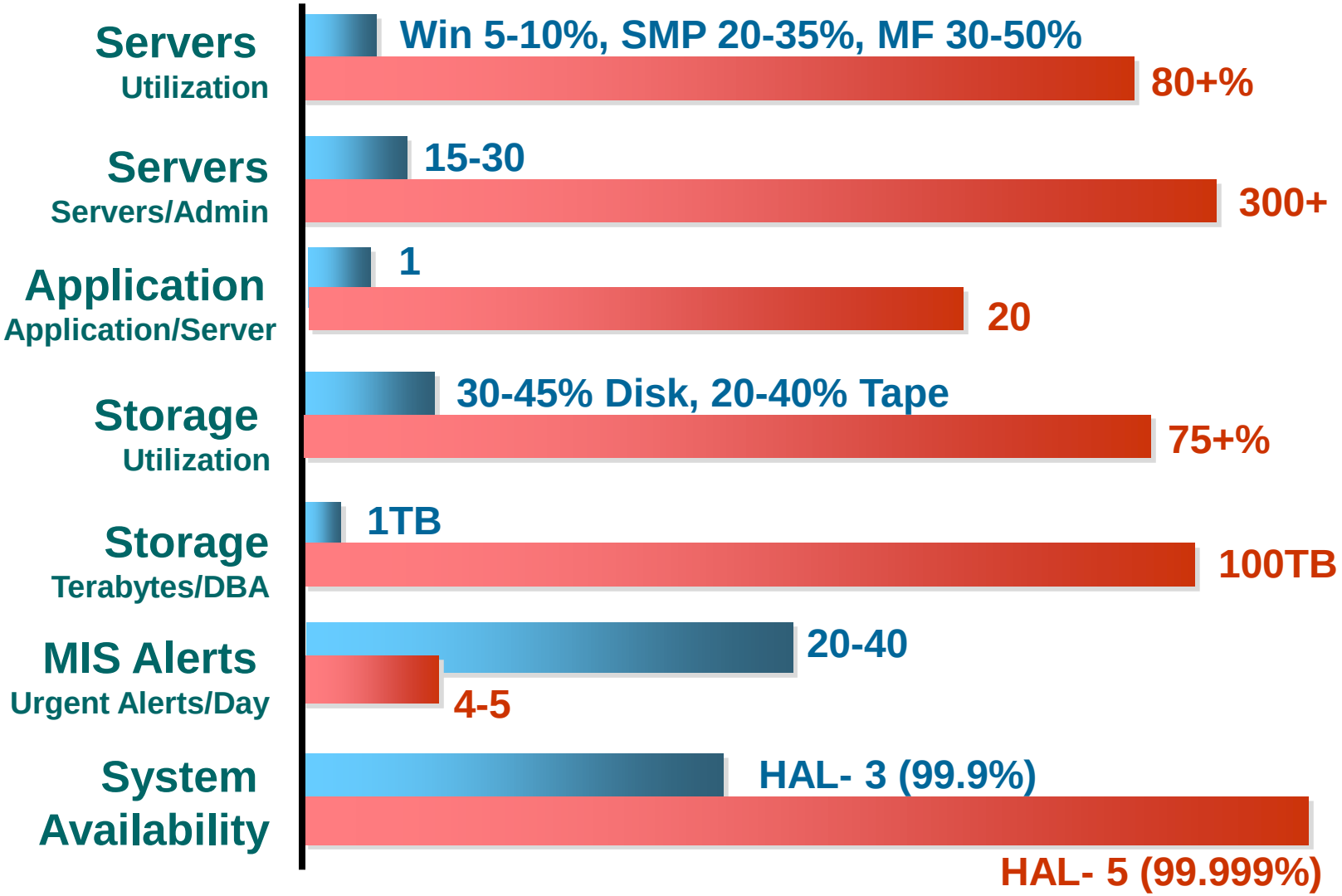
DC Mgmt Nightmares Driving Virtualization



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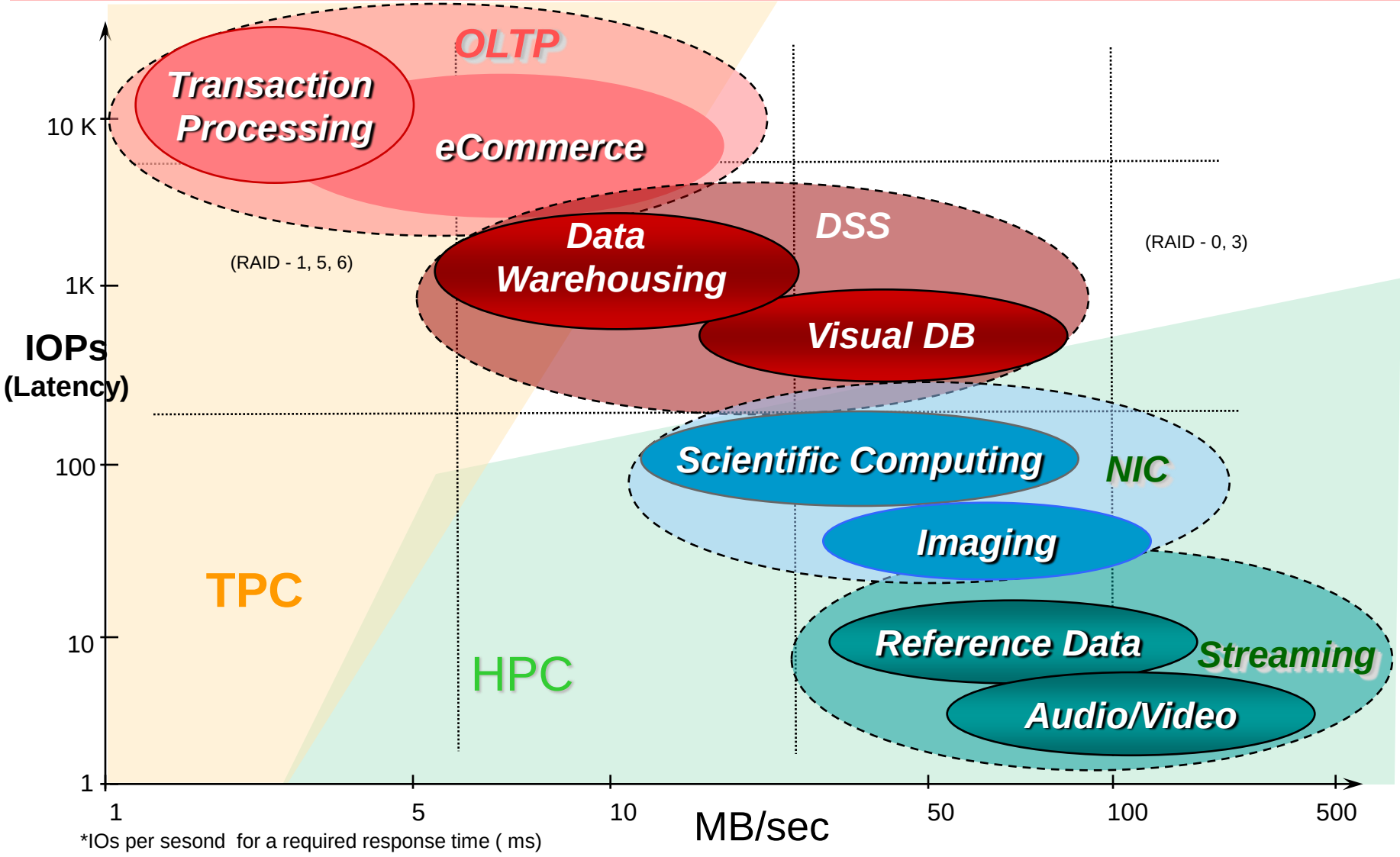
Market Segments by Applic./Workloads



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Genesis of VZ & Grid Computing

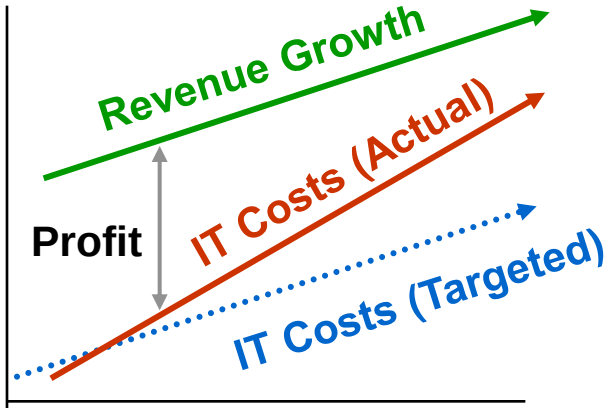
CFO vs. CIO - Shocking Observations

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

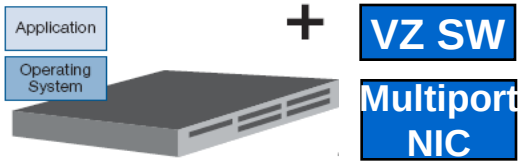
Reason – IT Spiral

- Web Growth > New Apps Mushroom > Lo Cost Win Servers Sprawl (Tier-1)
- Business Growth > Need More Computing Power > App/DB Servers (Tier-2,3)
- More Servers > ↑ Storage > ↑ DC Facilities > ↑ IT Support > ↑ IT Staff
- More Low Cost Servers > 5% Utilization >Scale Out Infrast. (Racks & Blades)
- IT Costs ≠ Business Growth

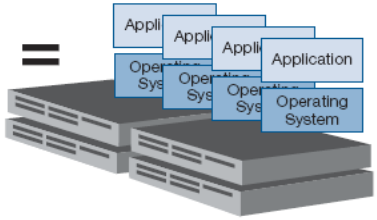
Problem



Solution



1 Physical Server



4 Virtual Servers

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Next Gen Data Center – Key Initiatives

Automation

Automatically Maintains Application Service Level Objectives

Provisioning

Provisions the Resources Required to Deliver a Business Service

Virtualization

Pools Resources. Allocates, Monitors, and Meters the Usage of Pooled Resources

Integration

Integrates physical infrastructure using standardized devices for CAPSIMS:
Cost, Availability, Performance, Scalability, Inter-operability, manageability & Security

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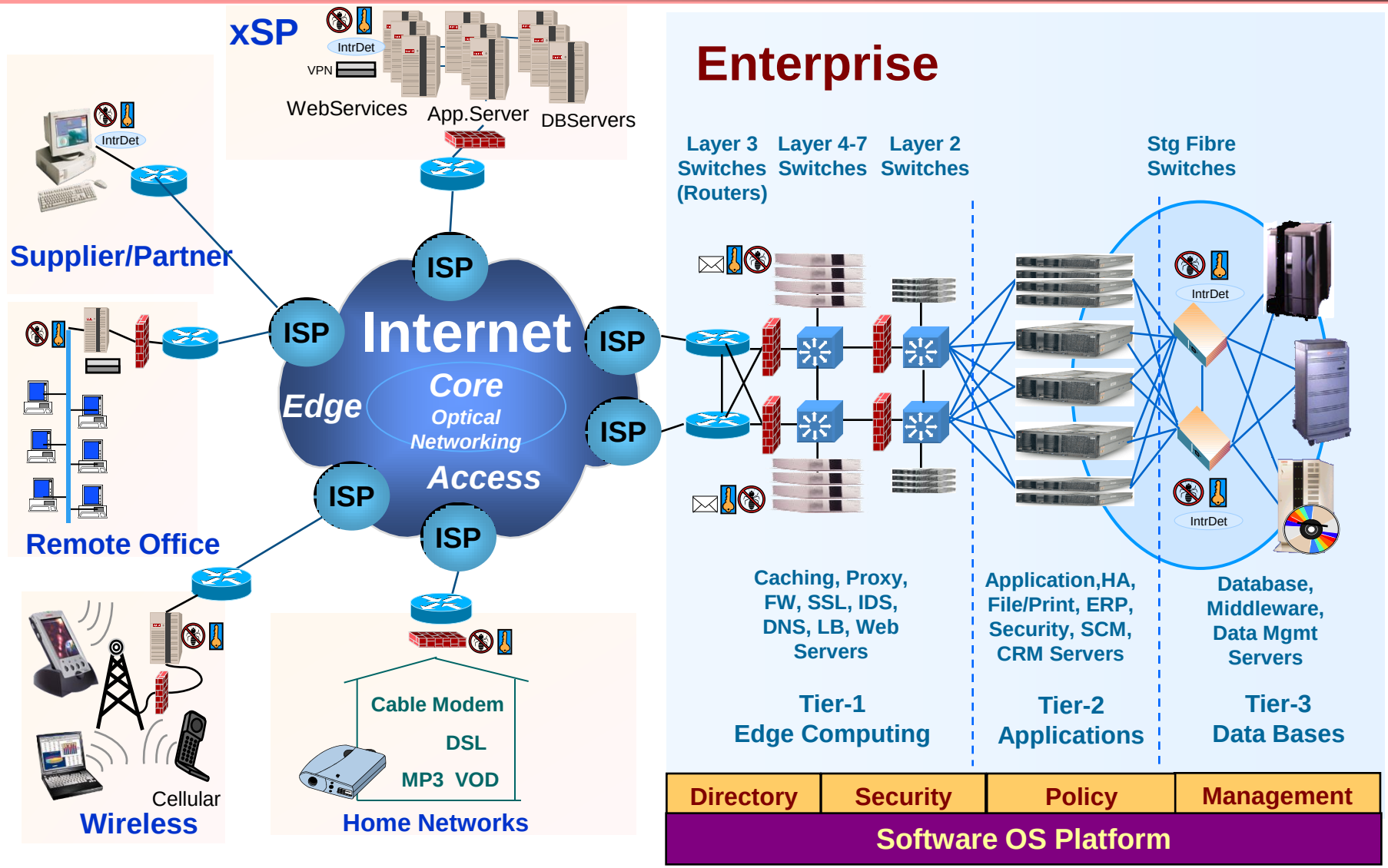
End to End IT Infrastructure *with HA & Security*



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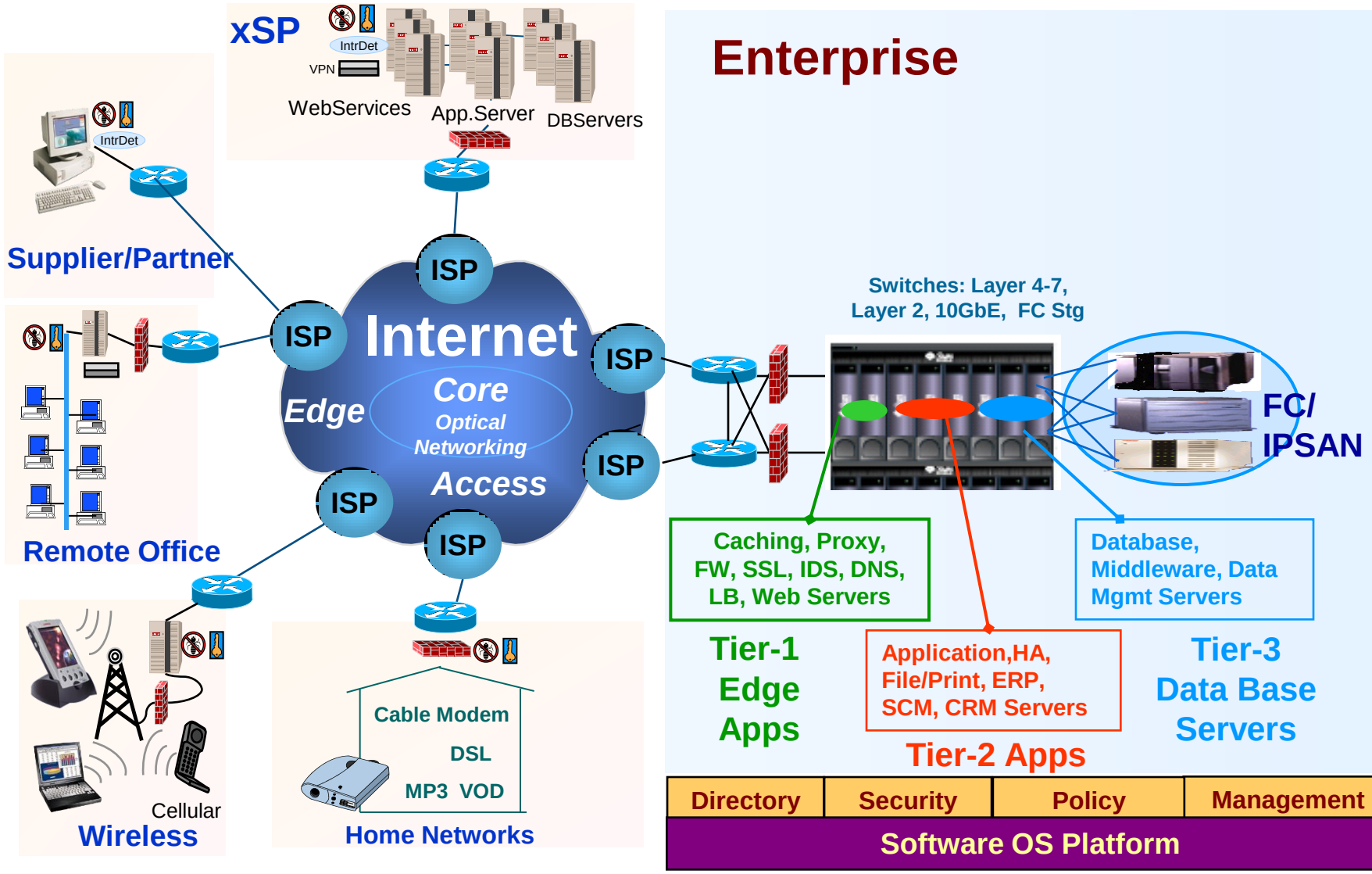
Consolidated Data Center



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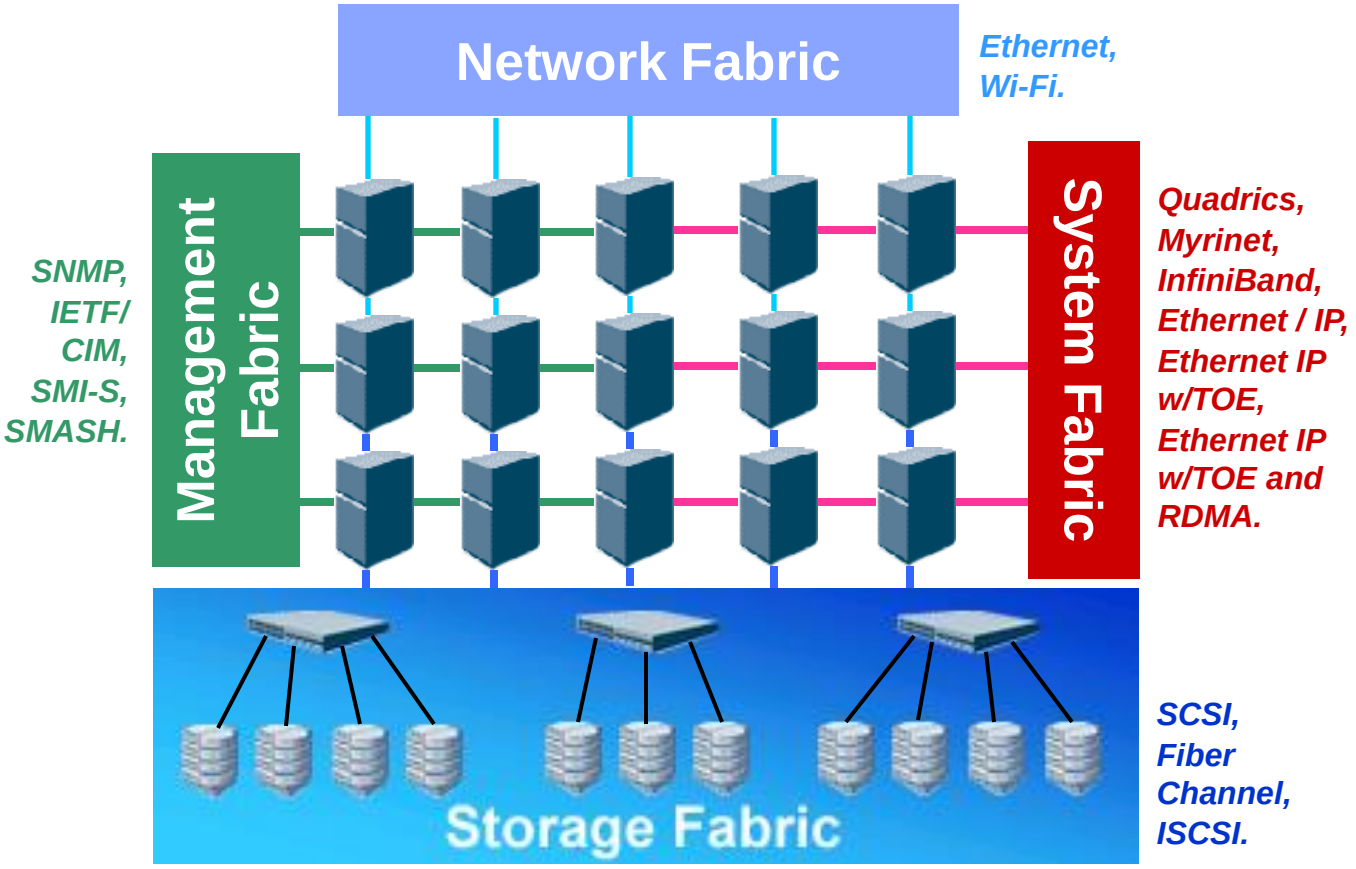
Fabric based Integrated Architecture



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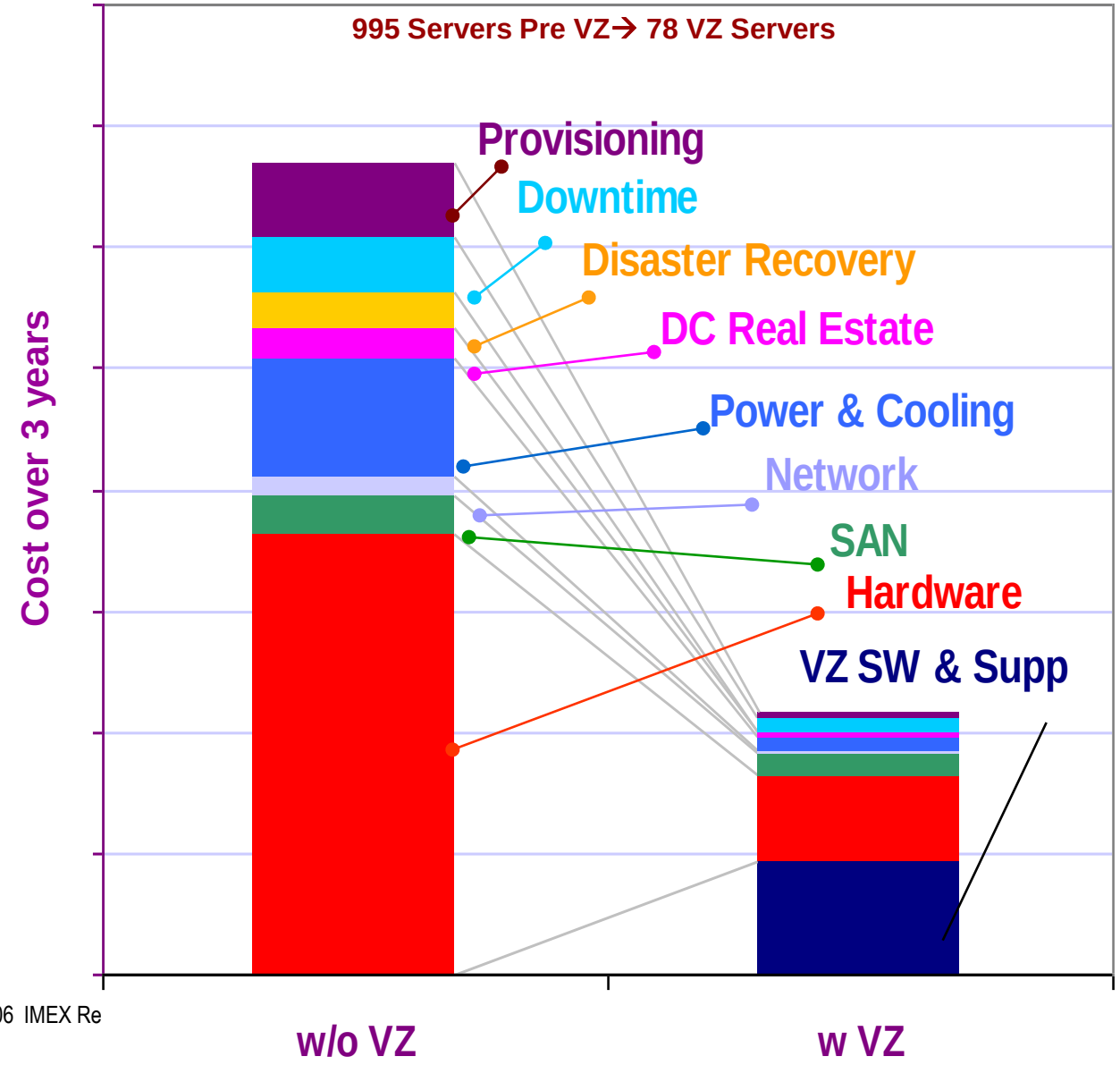
TCO Savings with Virtualization



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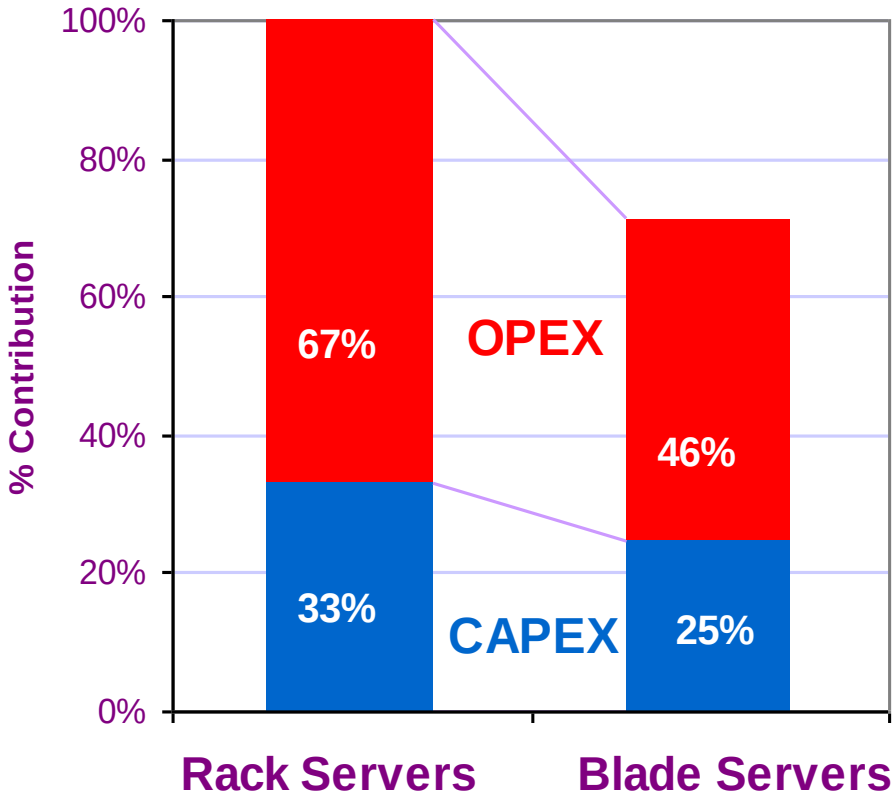
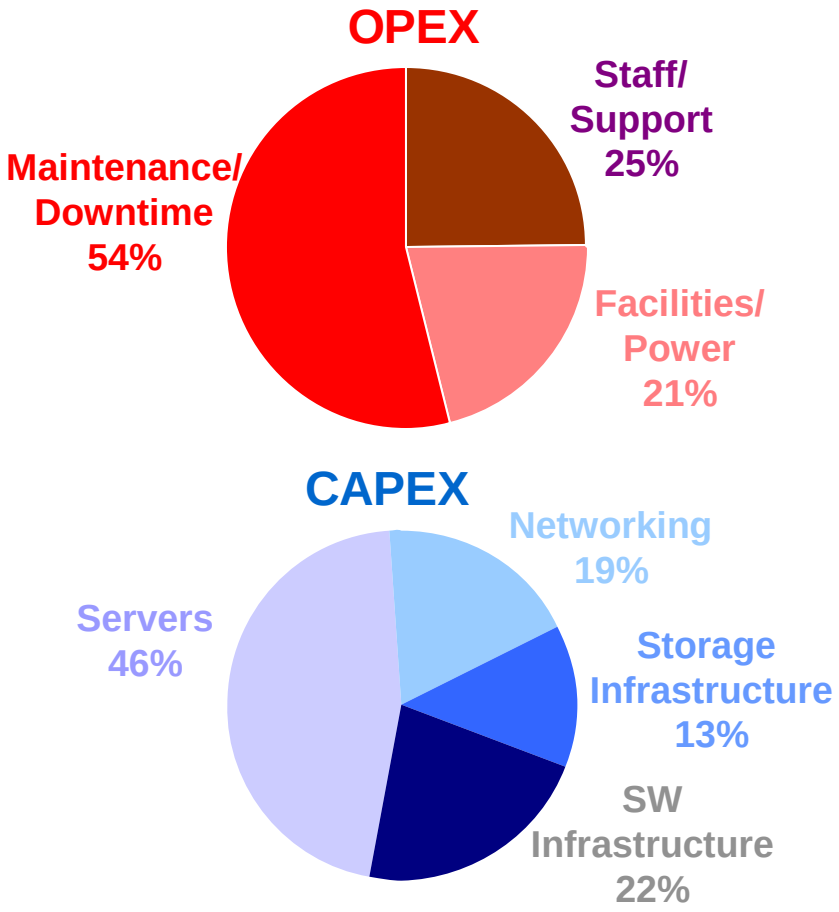
Servers - TCO Savings & ROI w Blades

3 Year TCO Savings Rack vs. Blade Servers



TCO Savings in..



Data: IMEX Research 2005

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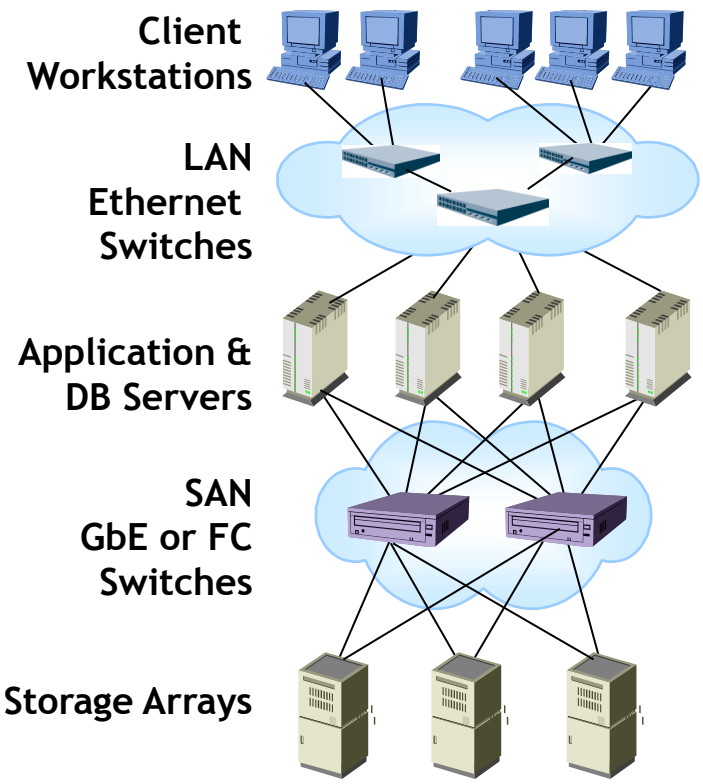
Implementing Virtualization



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 NICs*

Storage

- *Host, SAN, Controller*
- *In-Band, Out-of-Band Management*

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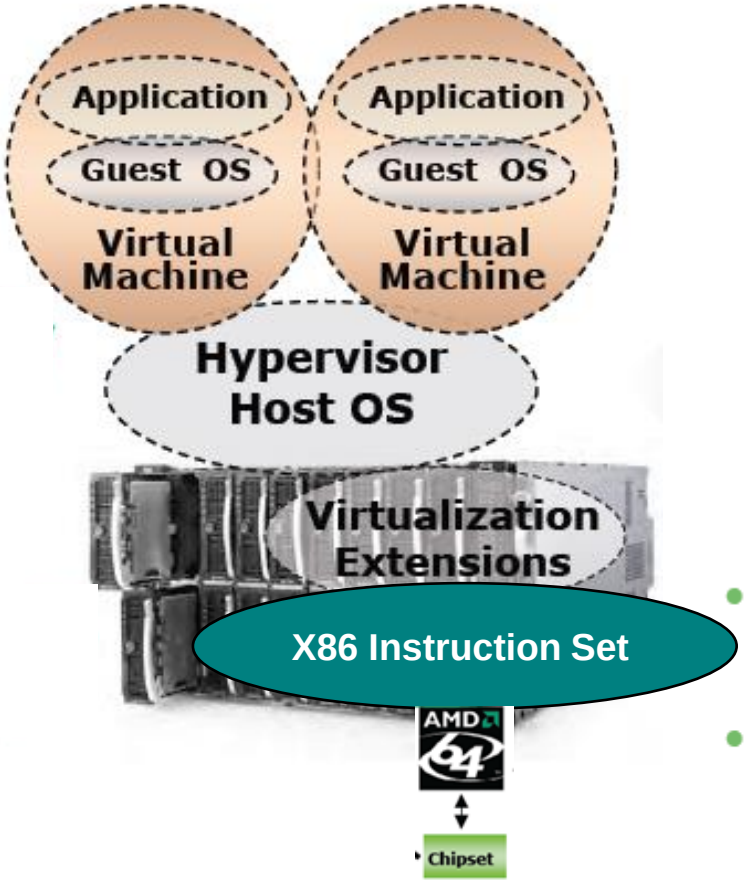
Processor Virtualization



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

Source: AMD

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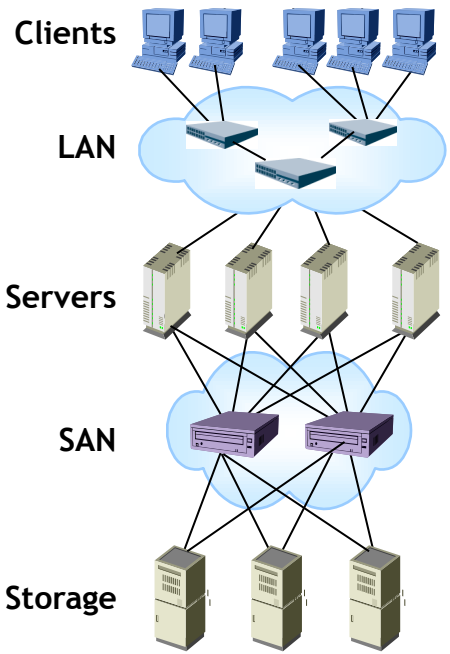
Storage Virtualization



Storage Virtualization Implementations

	Host	SAN	Cntrllr.
Out-of-Band	Symantec, StorageAge	EMC, Fujitsu	
In-Band		Cloverleaf, IBM, DataCore, FalconStor	HDS, NetApp, Sun

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*

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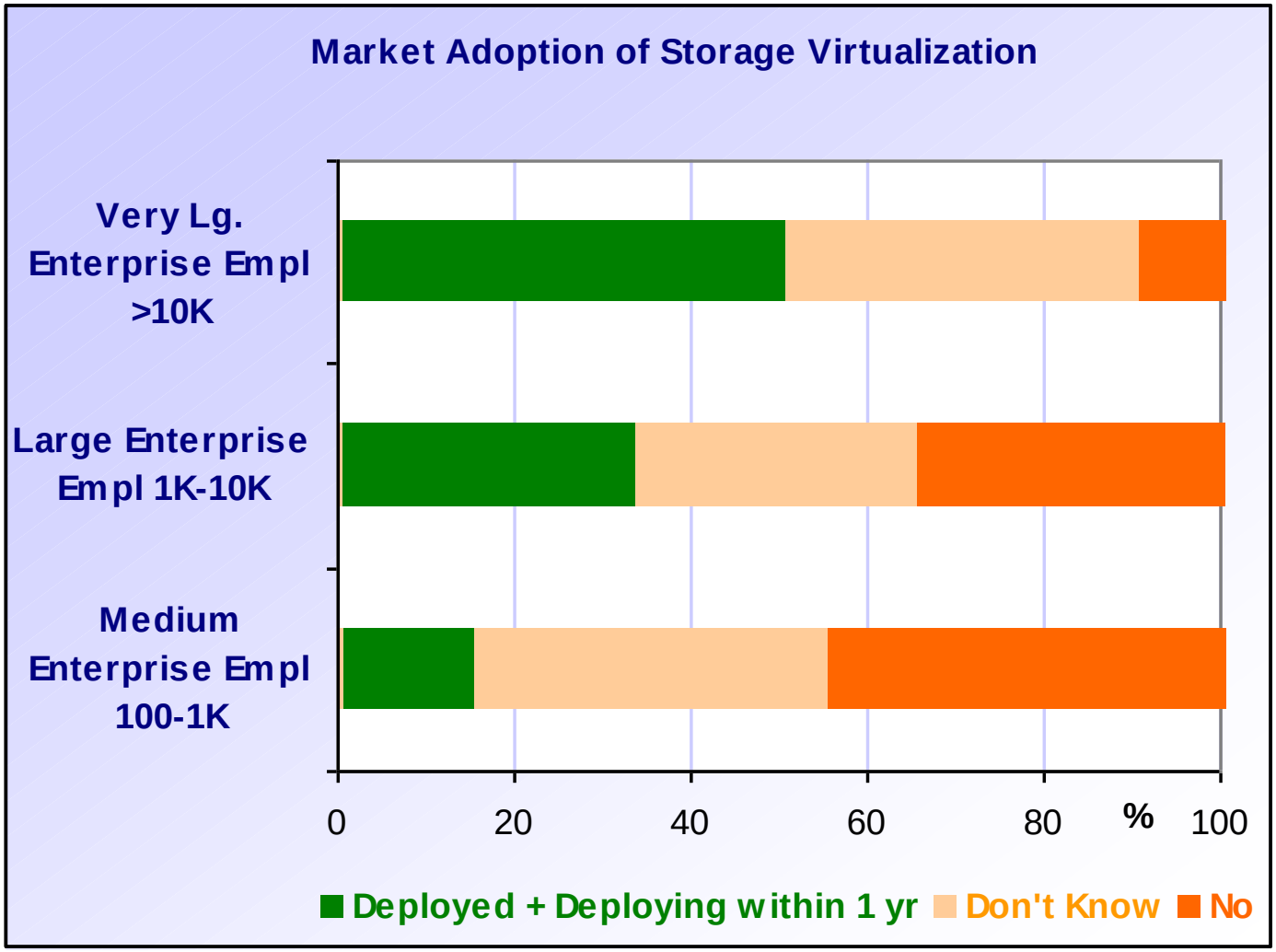
Market Adoption of Storage Virtualization



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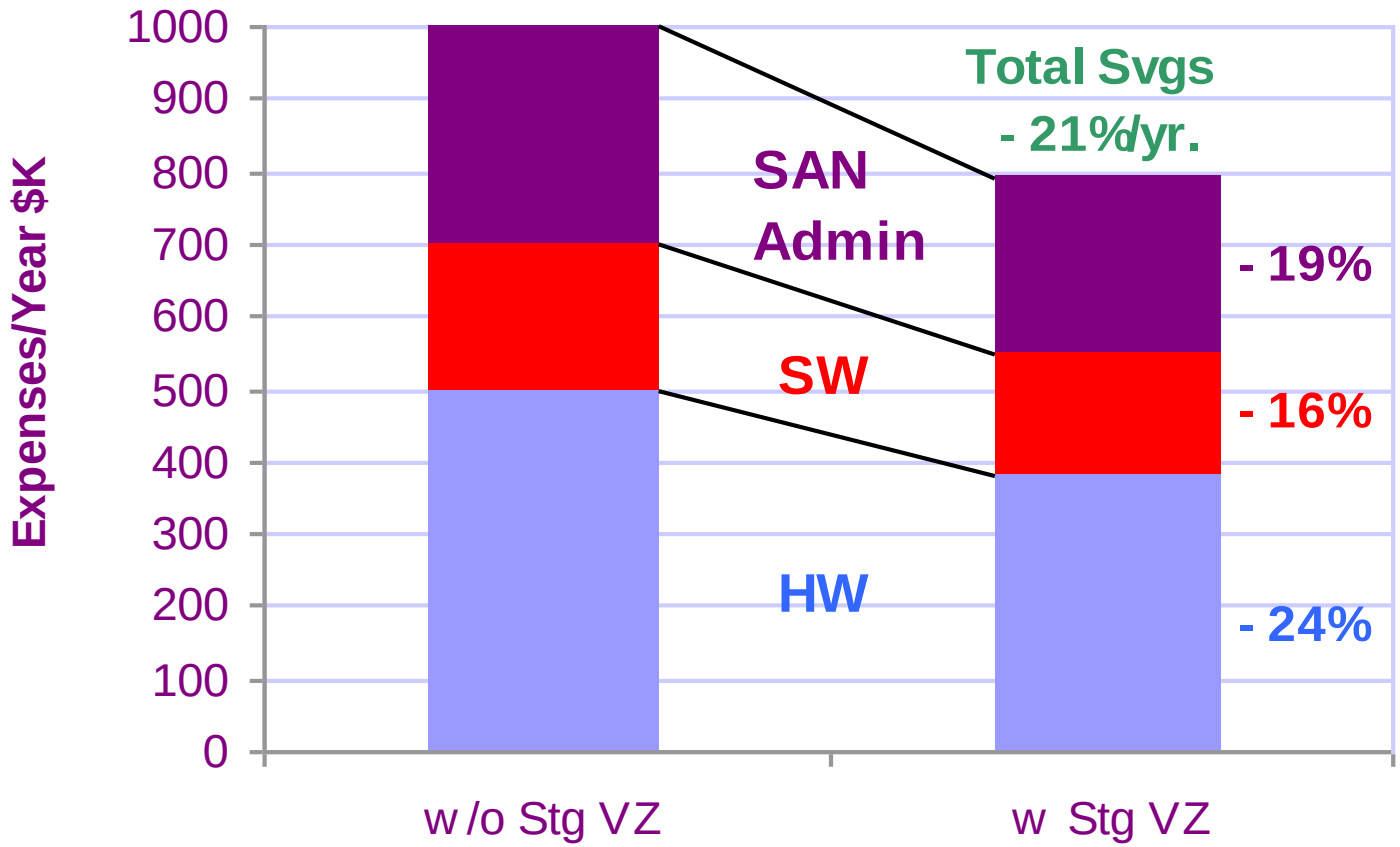
Economics of Virtualization

Virtualization results in overall cost reduction 35-60%
Storage VZ alone has produced ~20% cost reductions

Savings achieved through Storage Virtualization



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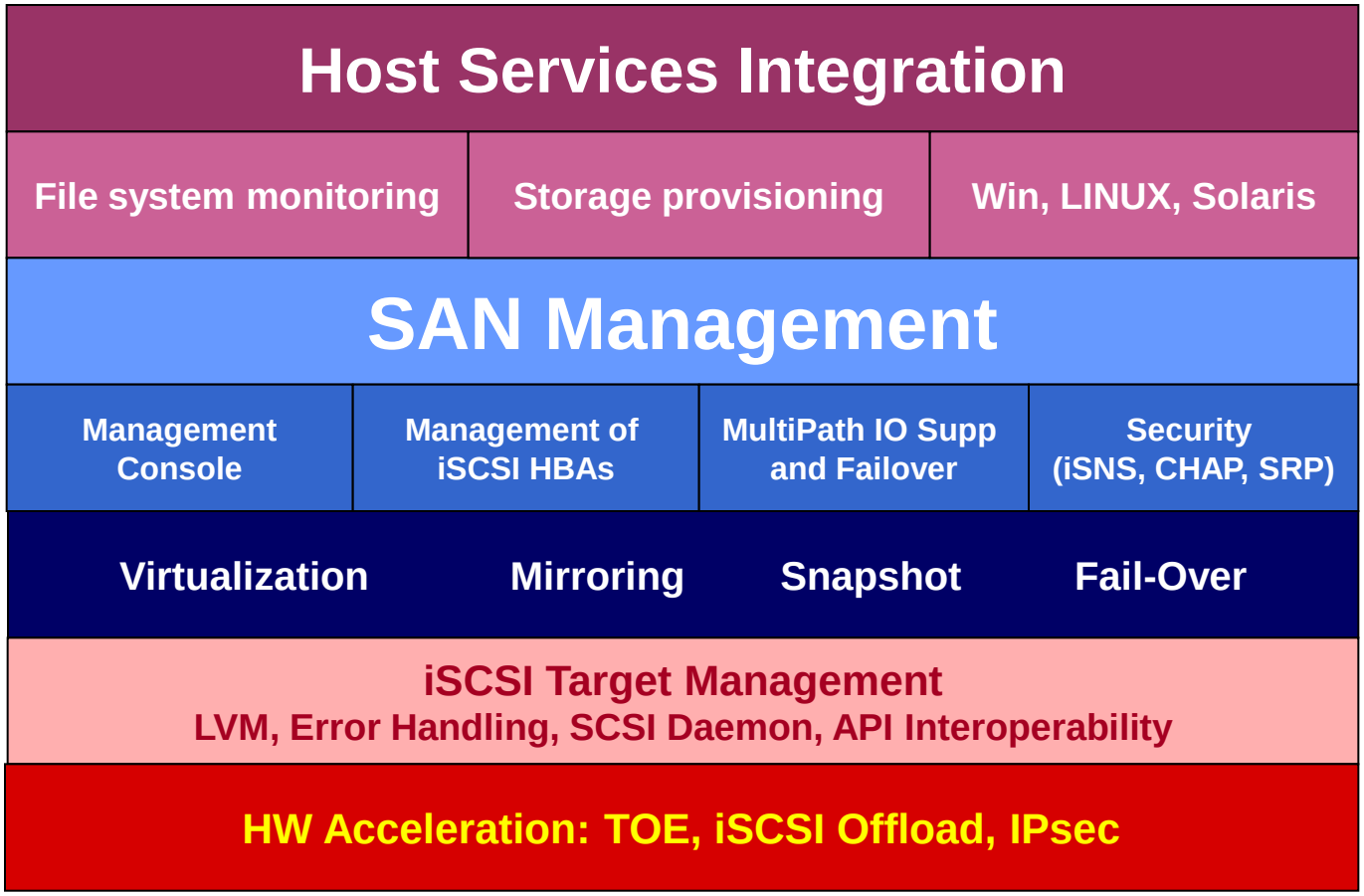
Future: Storage Management on a chip



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