IS&T Data Center Evolution & Server Hosting Services

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Presentation slides for IT Partners Conference Session on Wednesday, June 3.



A whirlwind tour…

- Data center facilities – renovations and new additions.
- Server platforms: hardware, OS, and databases.
- Virtualization.
- Storage and storage networking.
- Data networking.

…and a sales pitch.

- Find the IS&T hosting service that's right for the needs of you and your department:
  - DOST Co-location.
  - Windows Server Hosting for managed Windows systems.
  - Server Operations for managed UNIX/Linux systems.

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W91 Data Center: Before



W91 Data Center: During



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W91 Data Center: After



What we got for our trouble.

- Additional power: 240 kW
- Additional cooling: 2 new 150 ton chiller towers.
- Improved fire suppression.
- Improved cable management.
- Peace of mind.

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OC11: Our newest data center.



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A taste of things to come…



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E40: test, development and disaster recovery



Other IS&T Facilities of note: W92 and M24

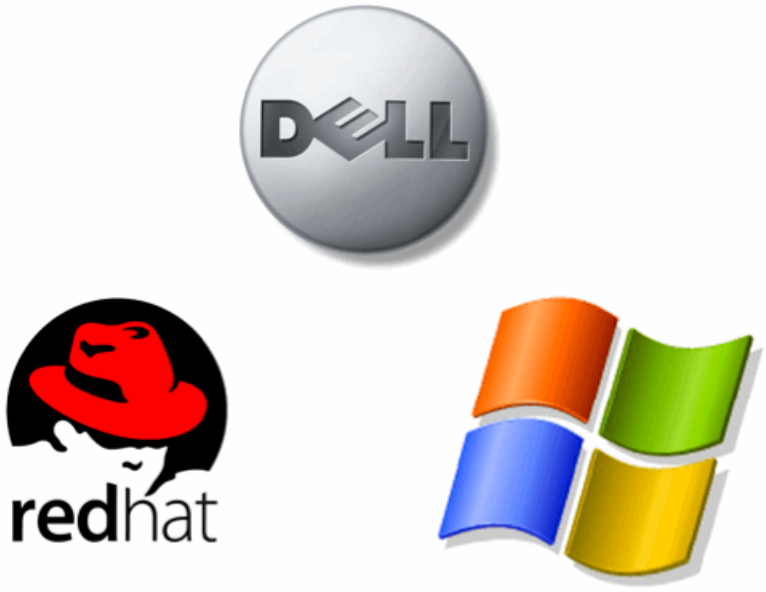
- Home to a variety of centrally managed services:
  - Enterprise Email servers.
  - Enterprise Web servers (web.mit.edu)
  - Wide area / regional network uplinks.
  - WIN.MIT.EDU environment servers.
- Primarily used by Network Infrastructure Service Team (NIST).
- W92: 3400 sq. ft. space.
- M24: 660 sq. ft. space.
- Both facilities are 24x7, continuously monitored, lights-out facilities.

Server Platform Consolidation: Before



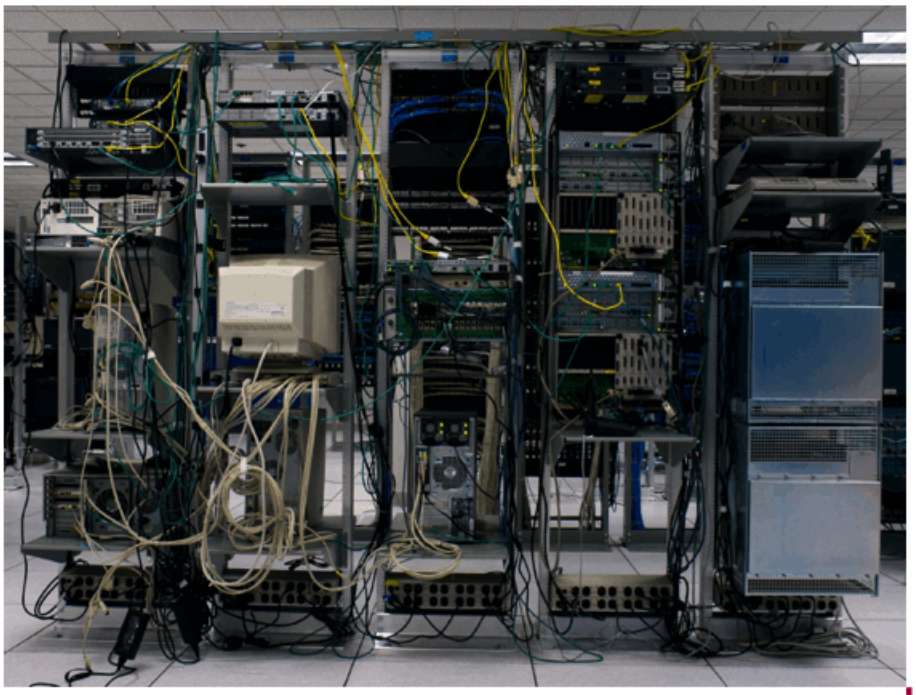
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…and after.



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Virtualization in the Data Center: Before…



…and after!



Virtualization in the Data Center: Why bother?

- Goal: As fully virtualized an enterprise environment as the present state of the art allows. Ambitious!
- Lots of benefits to be realized:
  - Ease of management.
  - Reduced power and cooling costs.
  - Reduced space utilization.
- But lots of challenges, too:
  - Building customer confidence in new technology.
  - Building staff confidence in new technology. ☺
  - Updating business model: accurately accessing costs.
  - How do you encourage your customers to try something new without encouraging virtual sprawl?

Virtualization at MIT: a brief history

- Began pilot offering of virtual server service in IS&T data centers in fall 2006, based on open source Xen product.
- Negotiated campus-wide license for VMware desktop and data center products December 2007:
  - VMware Workstation/Fusion
  - VMware Virtual Infrastructure
- VMware Workstation/Fusion distributed free of charge to MIT Community, including Lincoln Laboratory, since Q1 2008.
- VMware Virtual Infrastructure replaced Xen service in IS&T data centers Q1 2009.

MIT's VMware Deployment: an overview

- VMware "farm" divided between 2 sites: production (OC11) and BC/DR (E40).
- All hosts presented with shared EMC Clariion storage via 4Gbps Fibre Channel.
  - Future work: utilize iSCSI or NAS for VMs with lower performance requirements at lower cost?
- Dedicated VLANs for:
  - VMware management interface.
  - VMotion traffic.
  - Guest VM traffic (using 802.1q trunking).
- HA Clustering allows for automated recovery from the failure of any single hypervisor.

IS&T Enterprise Storage: today

EMC Clariion Cx700 – W91
Midrange



Purchased 2006.

150 drives.
36 TB capacity.

OpenAFS

Tivoli

Tivoli Storage Manager

EMC Symmetrix DMX800 – W91 & E40
High End



Purchased 2005.

120 drives.
20 TB capacity.

SAP®

MIT DATA WAREHOUSE

Student Information System MIT WebSIS

IS&T Enterprise Storage: coming in 2009!

EMC Clariion CX3-80 – OC11 and W92 (serving systems in E40) Midrange



Purchased 2008.

330 drives.
70 TB capacity.

vmware

OpenAFS

Tivoli

Tivoli Storage Manager

EMC Symmetrix DMX-3000 OC11 and W92 (serving systems in E40) High End



Purchased 2008.

120 drives.
25 TB capacity.

SAP

MIT DATA WAREHOUSE

Student Information System MIT WebSIS

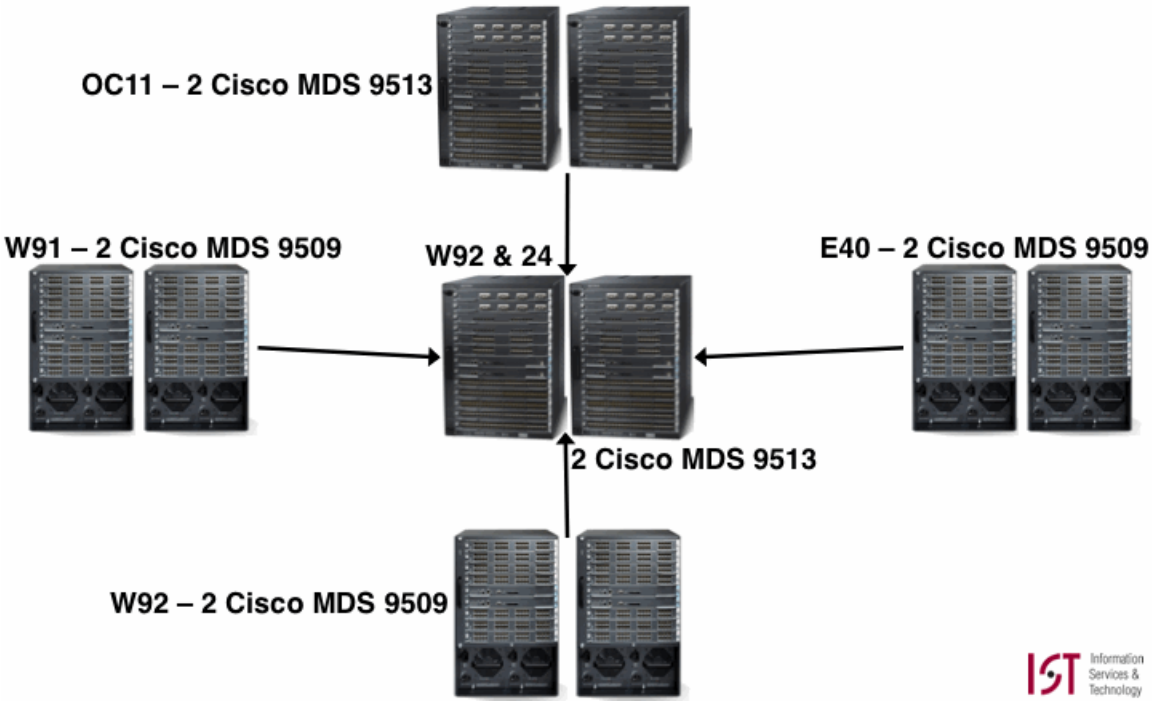
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SAN architecture, now and future

- Originally, Fiber Channel storage fabrics limited to single buildings.
- Deployed some point-to-point connections for specific applications, but no general solution for wide-area storage traffic distribution.
- In 2009, deploying comprehensive fiber channel network linking all IS&T data centers (W91, W92, E40, OC11) in star topology.
- Facilitates system/application mobility, high speed backups, data replication, etc.

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Fiber Channel network layout



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Data Networking: the old way

- One /16 per data center, similar to how wired MITnet service looks in most MIT buildings.
- No unified IP space between buildings.
- Firewalls were a dirty word.
- Routers and switches were single points of failure.
- Cable management was something that happened to other people.

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The bad old days…



…and the better way.

- Deploying VLAN-capable network equipment everywhere possible.
- Segregate enterprise apps by VLAN for additional security and configurability.
- HSRP (Hot Spare Router Protocol) and VPC (Virtual Port Channel) to protect against router/switch failures.
- One switch per rack to minimize under-the-floor cable disasters.
- Coming soon: Unified IP address space across multiple data centers.

So what?

Our vision:

Real-time migration of running applications between data centers.

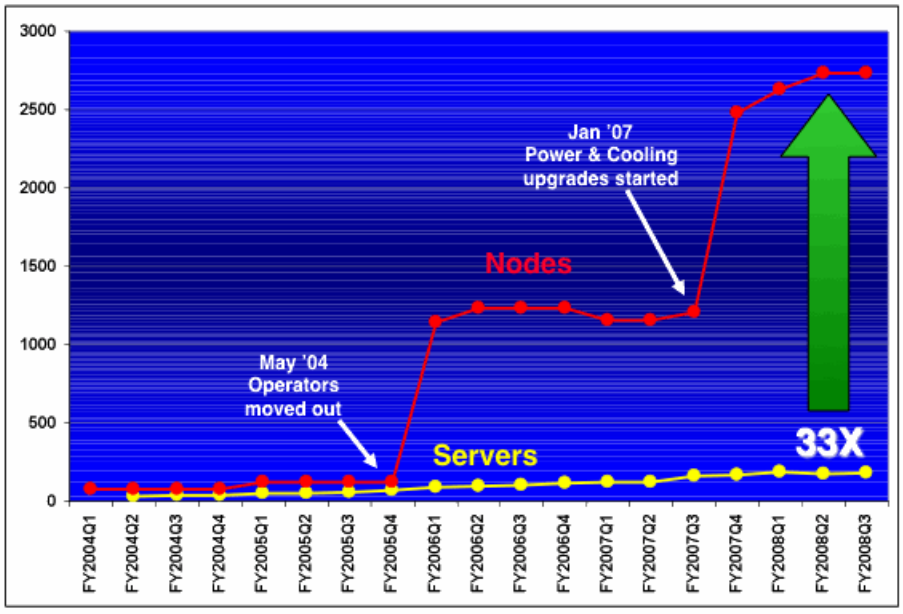
Doesn't that sound cool?

IS&T Server Hosting Services

- Three different services depending on your needs:
  - Co-location: physical housing only; no system administration support.
  - Server Operations: managed UNIX/Linux systems.
  - Windows Server Hosting: managed Windows systems.
- Need help deciding?

  http://web.mit.edu/ist/topics/servers

Co-Location Growth 2004-2008



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Why use WSH?

??

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Windows Server Hosting Team



Barry Stoelzel



Rich Ledoux



John Doherty



Peter Carrier

Pricing



Replace this….



…. with this!



Server Operations: facts & figures

- 500 managed servers
  - 32% virtual, 67% physical.
  - 61% Linux, 39% Solaris.
  - 39% use SAN storage.
- 210 TB of SAN storage.
- 1.2 PB of tape storage.
- 154 database instances.
  - 84 Oracle.
  - 70 MySQL.

Server Operations: What you get.

- SLA-based UNIX/Linux system administration services.
- Hardware platform selection assistance based on stated performance needs.
- OS installation/upgrade maintenance support.
- Database and web server configuration assistance and support.
- Incident response during periods specified in SLA.

Server Operations: Cost structure

- Points assigned based on multiple factors:
  - Physical size of machine (.5 pts/rack unit)
  - OS support status (supported = 1 pt, unsupported = 2 pts)
  - Availability level (9x5 = 1 pt, 24x7 = 2 pt, “pageable” = 4 pts)
  - Storage (1 pt/100GB EMC Clariion or direct attached SCSI, 2 pt/ 100GB EMC Symmetrix)
  - Backup method (supported (TSM) = 1 pt, other = 2 pts)
  - Age (1 point/year of hardware age over 4 years)
- In addition, customer pays 25% initial purchase price of hardware per year as rental fee.
- Point initially assigned a value of $1155/year for FY10.

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For More Information and Questions

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- Windows Server Hosting: Rich Ledoux rledoux@mit.edu]
- Server Operations: Garry Zacheiss zacheiss@mit.edu