



Transforming Healthcare IT

A Case Study

**Greg Johnson - CTO & Director
Technology & Engineering Services
VCU Health System
Richmond, VA**

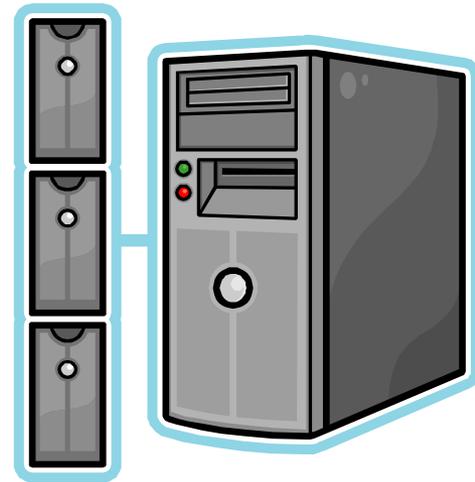
The VCU Health System

- **VCU Medical Center**
 - Nearly 8000 Employees
 - Only Academic Medical Center in Central Virginia
 - The region's only Level I Trauma Center
 - Referral center for the state and Mid-Atlantic
 - 779 licensed beds
 - ~200 Specialty Services
 - 80,000 patients/year treated in the ED
 - 31,000 admissions
 - >500,000 outpatient visits/year
 - Recognized as a “Most Wired” Hospital
 - Heavily dependant upon Technology
 - Teaching hospital of the VCU Health System
- **Critical Care Hospital (CCH)**
 - 15 stories
 - 376,000 sq. ft
 - 232 private beds
 - State-of-the-art IT Infrastructure
- **> 550 MCV Physicians**
- **Virginia Premier Health Plan (HMO)**



Technical Environment

- Data Centers
 - Two Centers, 1.5 mi apart
 - Owned and Leased space
- Network
 - >1M sq ft Cisco Wireless (WLAN) coverage
 - VoIP Clinical Communication Systems (Ascom & Vocera)
 - Multiple VLAN segmentation
 - Innerwireless DAS system at the CCH
 - Remote Site WAN
 - Related systems (e.g., Iron Port, Zix, F5, etc.)
- Storage
 - >500 TB managed storage using IBM XIV systems
 - Disk based Backup & Recovery using IBM TSM & ProtecTIER technologies
 - Growing at > 20%/year
- Servers
 - >750 WinTel servers heavily virtualized (approaching 70% of managed servers)
 - 2 redundant IBM P7 series systems (decommissioning ~ 15 older P-595s etc.)
 - Current server growth rate is >20%/year
- Client Presentation
 - Over 8000 end point computing devices including >500 Computers on Wheels
 - >500 PDAs and growing
- Hundreds of Clinical & non-Clinical systems



Mission: Interrupted!



“Excuse the interruption, but is now the right time for the surgeon to be looking to buy an automobile online?”

Our Mission:

“Ensure *Uninterrupted Access to the Data*”

With hundreds of integrated systems, there is

No Tolerance for Downtime

- Unwelcome, Unwanted, Inconvenient
 - Cause of an outage is unimportant
 - Clinicians only experience lack of access to the data
- Negatively impacts:
 - Clinical Workflow (Downtime Procedures)
 - Patient Care
 - Patient Safety
- Lost revenue opportunities
- Traditional Disaster Recovery not an option! Must be a BC environment





Biggest Issues we face are:

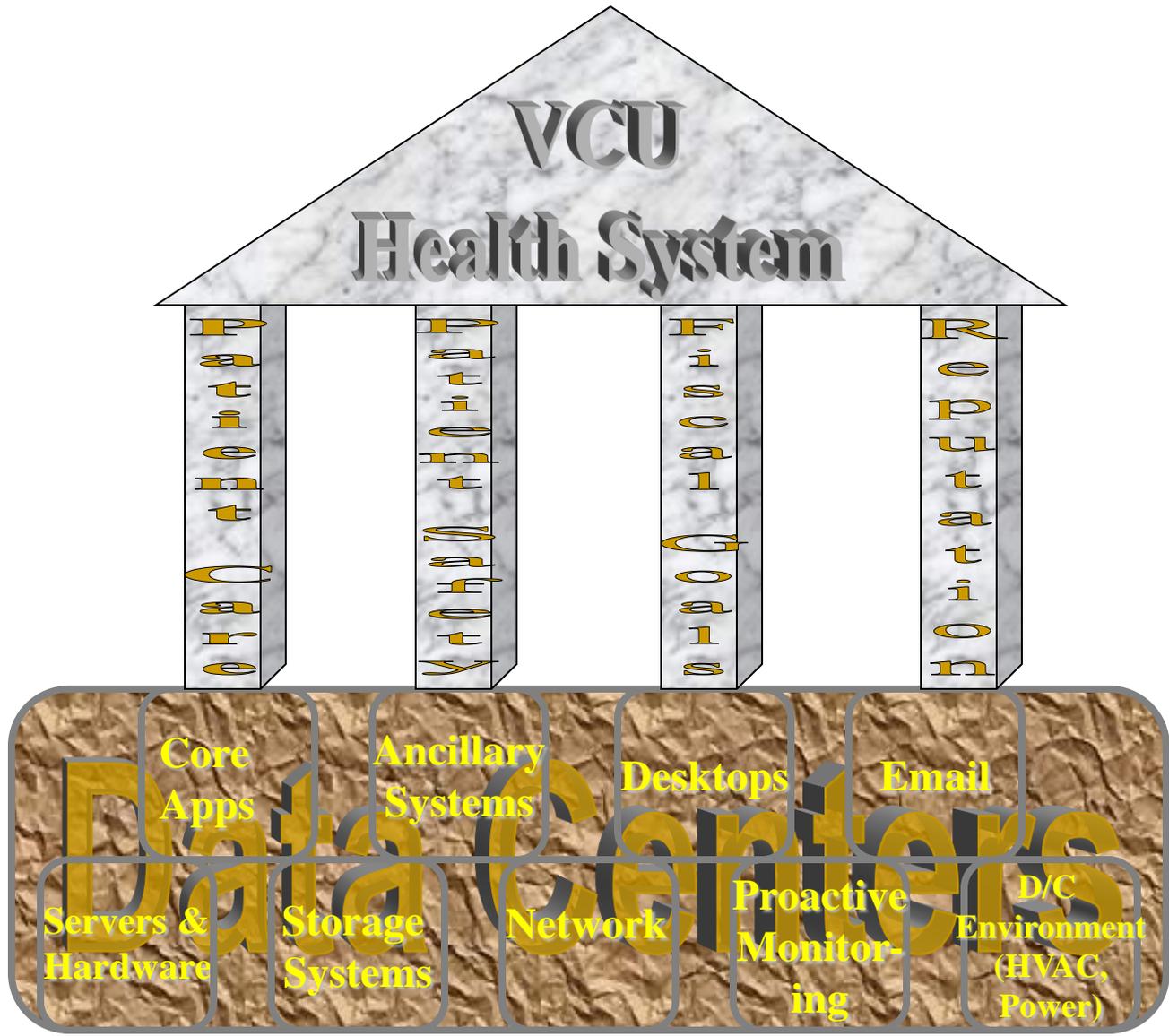
- Data Center environmental constraints
 - Straining against Power, Cooling, Growing Footprint, Leased vs. Owned Space, ...
- Constant growth demands (Servers, Storage, Network Bandwidth, ...)
- Relatively small technical staff
 - 3 Storage Engineers
 - Current staffing ratio in WinTel space is >120:1
 - 1M+ Sq Ft Cisco WLAN w/ 3 Engineers

Our Challenge:

How to meet current and future growth needs while maintaining High Availability to the data and the systems?



Solid Infrastructure is the Foundation



Move from Reactive to Proactive

A Multi-Year set of projects designed to:

- Standardize on Core Technologies
- Remote Host EMR (Cerner)
- Engineer out single points of failure
- Design in Business Continuity
- Virtualize Virtually Everything
 - Storage
 - Servers
 - End Points (Thin Client)
- Implement proactive monitoring and alert tools
- Provide ubiquitous Wireless coverage utilizing a DAS



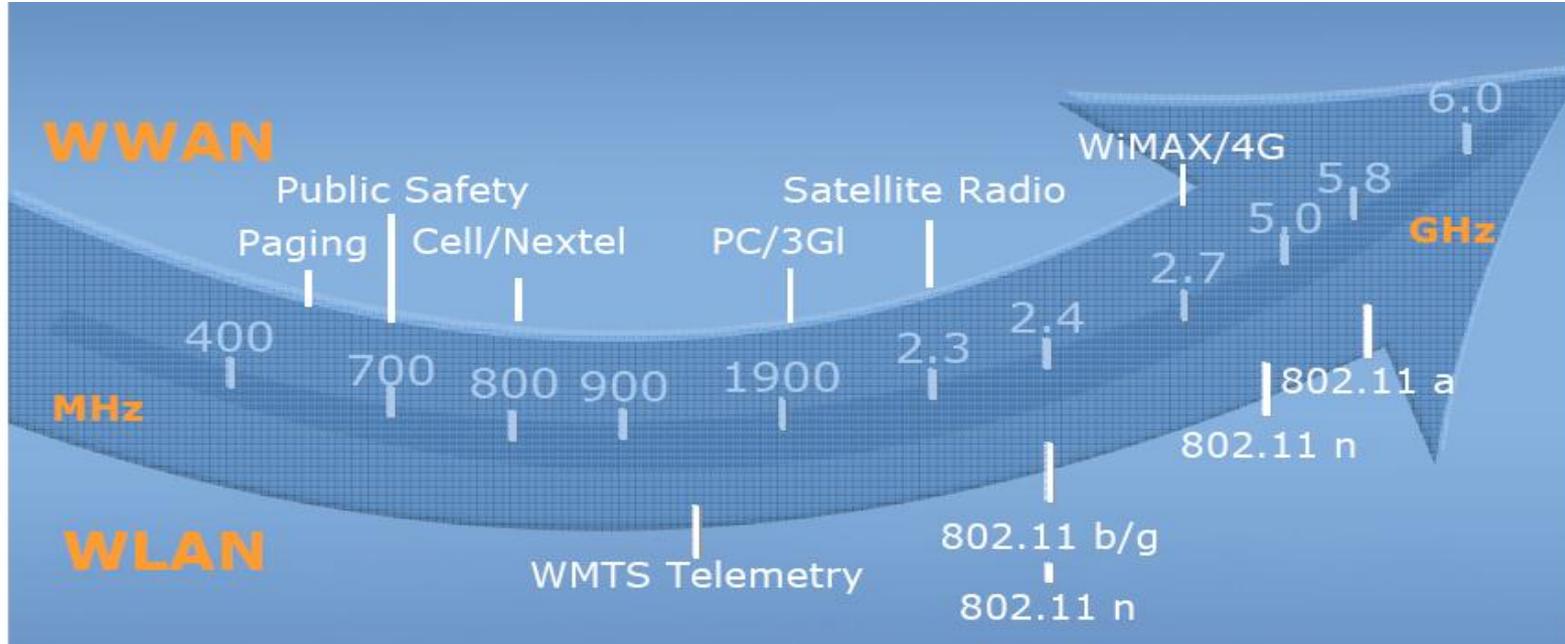
The Network is the Backbone

- Cisco: “VCUHS has one of the most complex Networks anywhere.”
- From Zero to > 1M Sq. Ft. of Wireless in 3 years
 - Clinicians are highly dependant upon mobility
 - Many clinical systems are wireless
 - EMR, Radiology, Phones, Refrigerators ...
- QOS implementation in progress
 - To Support TeleMedicine, video, etc.

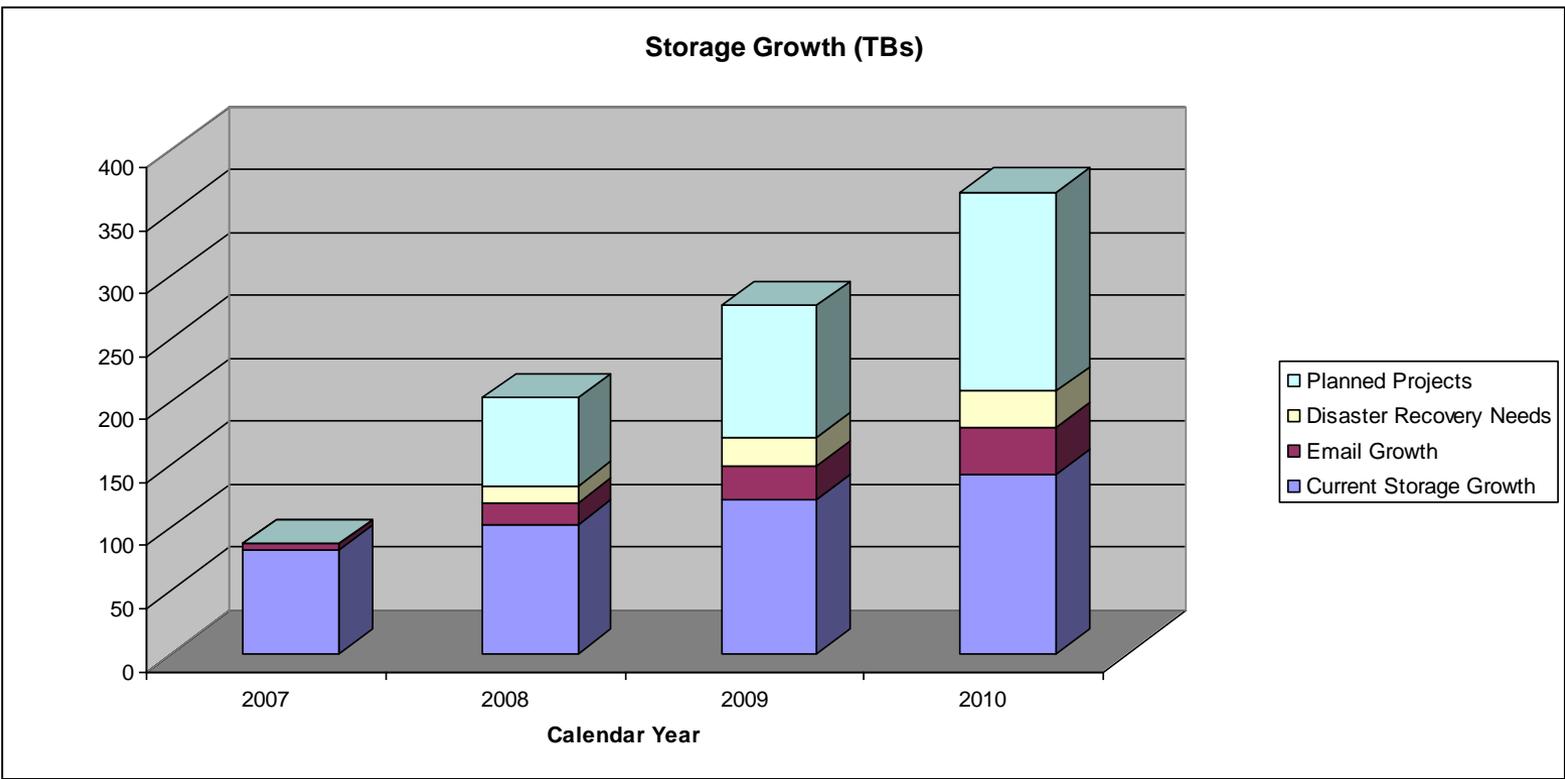


CCH Deploys a Unique Solution

- Distributed Antennae System (DAS)
- Multiple VoIP systems for Clinical Communication
- Integrated Paging, 3G Cellular, 802.11, Telemetry, Nurse Call System, NICU infant monitoring, etc.



Storage Growth



The Storage Challenge - Chaos

- **The Problem We Faced:**
 - Increasing amounts of data
 - Multiple outdated storage systems
 - Unreliable tape-based backup systems
 - High power consumption
 - A crowded data center
 - Lower than desired utilization
 - Time-consuming, complex storage management
 - Small Storage staff (3 Engineers)



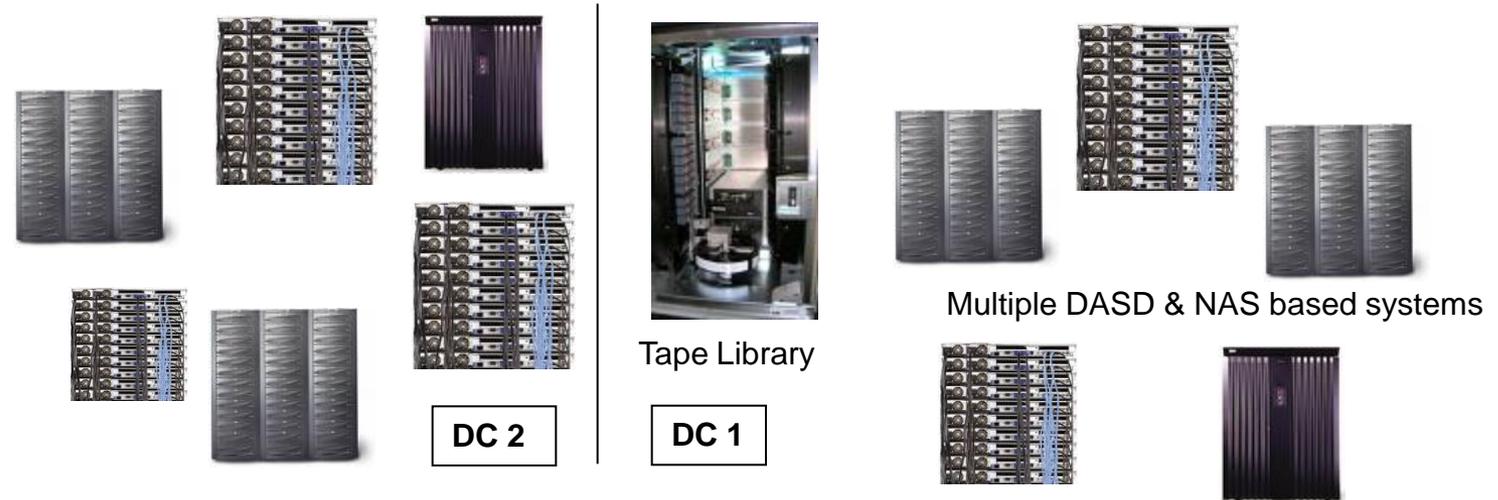
The Storage Solution - Order

The Requirements:



- Needed easy-to-manage, highly available, scalable storage that would enable high performance in a modest footprint.
- Needed a solution that could support growing storage demands now and into the future.
- Needed an overall architecture that maximizes availability while ensuring fiscal responsibility

Storage - Where We Started

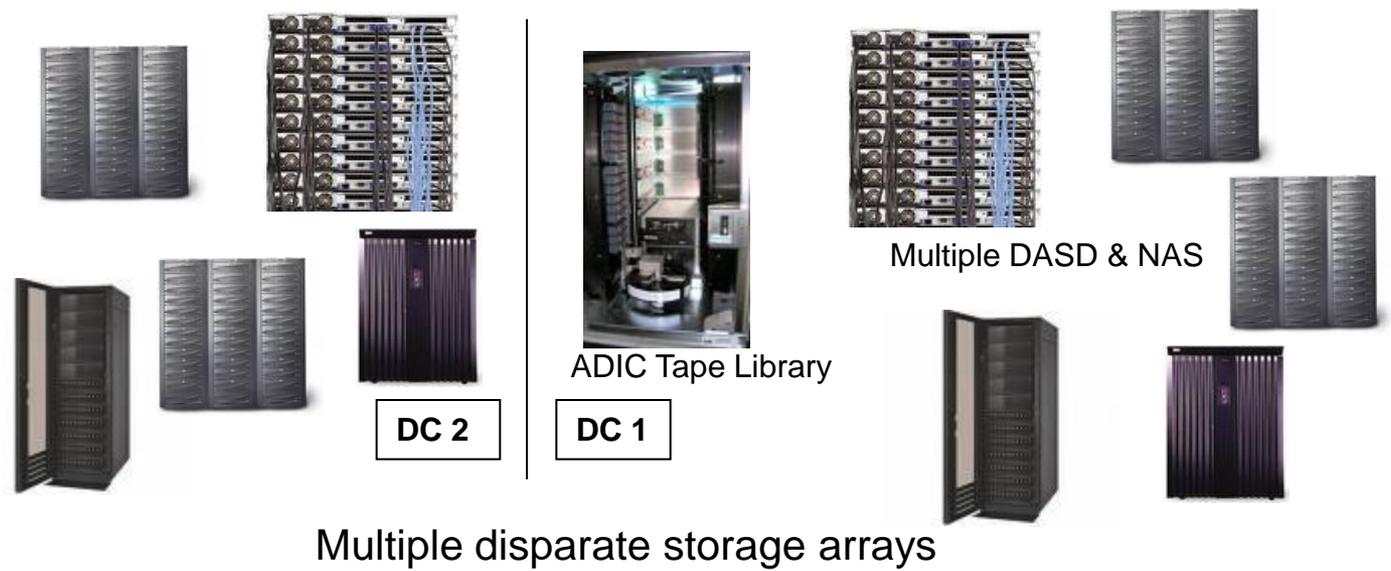


Multiple disparate storage arrays

- Mixed & Aging Systems
- Insufficient capacity
- Very expensive (\$\$\$) to maintain
 - Maintenance costs
 - Engineering time and effort – support and maintaining
- Very difficult to manage (no unified management interface)
- No Site redundancy (all primary storage)
- Tape based Backup & Recovery
 - Very slow, unreliable
 - Two different systems, highly time intensive and prone to failure

Storage: Step One - Virtualization

SAN Controller



- **A single administrative interface for mixed storage arrays**
- **Improved utilization**
 - Flexible and robust platform
 - Provides portability and scalability
 - Reliable, manageable, highly available on-demand storage
- **Complements Server virtualization**
 - Makes provisioning of VMs easier, quicker, less expensive
 - Complements Server virtualization technology

Storage: Step Two - Standardization

- Disk Solution: **Grid Based Disk Storage System**
 - One each at primary and secondary site
 - Overarching control system virtualizes cross-platform
- Benefits
 - Highly available, “self healing” architecture
 - Easy to use management GUI
 - Lower power consumption
 - Smaller foot print

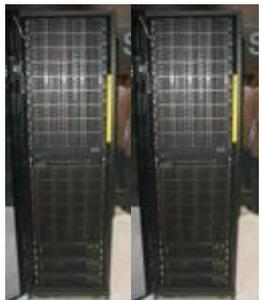


Step Three – Building Capacity

SAN Controller

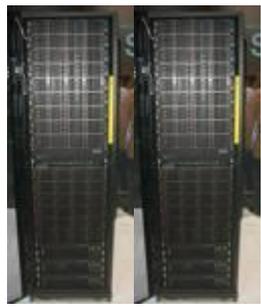


Traditional Tape Library



Storage Systems

DC 2



Storage Systems

DC 1



Virtual Tape Library

- Largely Standardized Systems
 - Internally redundant systems
 - Grid based technology
- Backup Control System & Virtual Tape Library (VTL)
 - Disk based Backup & Recovery (fast, reliable, efficient)
 - Tape is tertiary (fewer tapes needed)

Storage - Where We Are Today



Tape Library



Storage Grid

DC 2



Storage Grid

DC 1



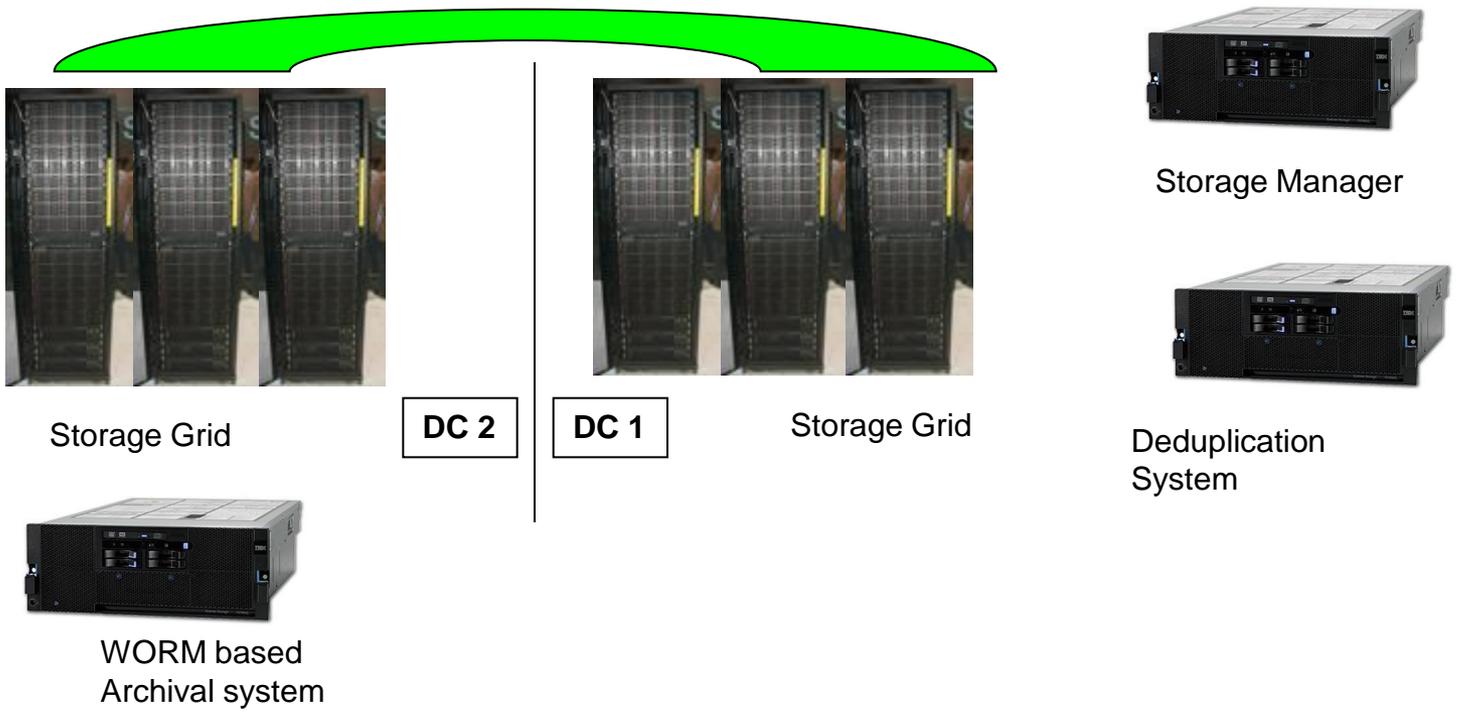
Backup Controller



Backup System

- 100% Standardized Storage Systems
- Native unified management system
- Disk based Backup & Dedupe (5-8X)
- Fast, reliable, efficient
- Tape used only as tertiary archival

Storage - Where We Are Headed



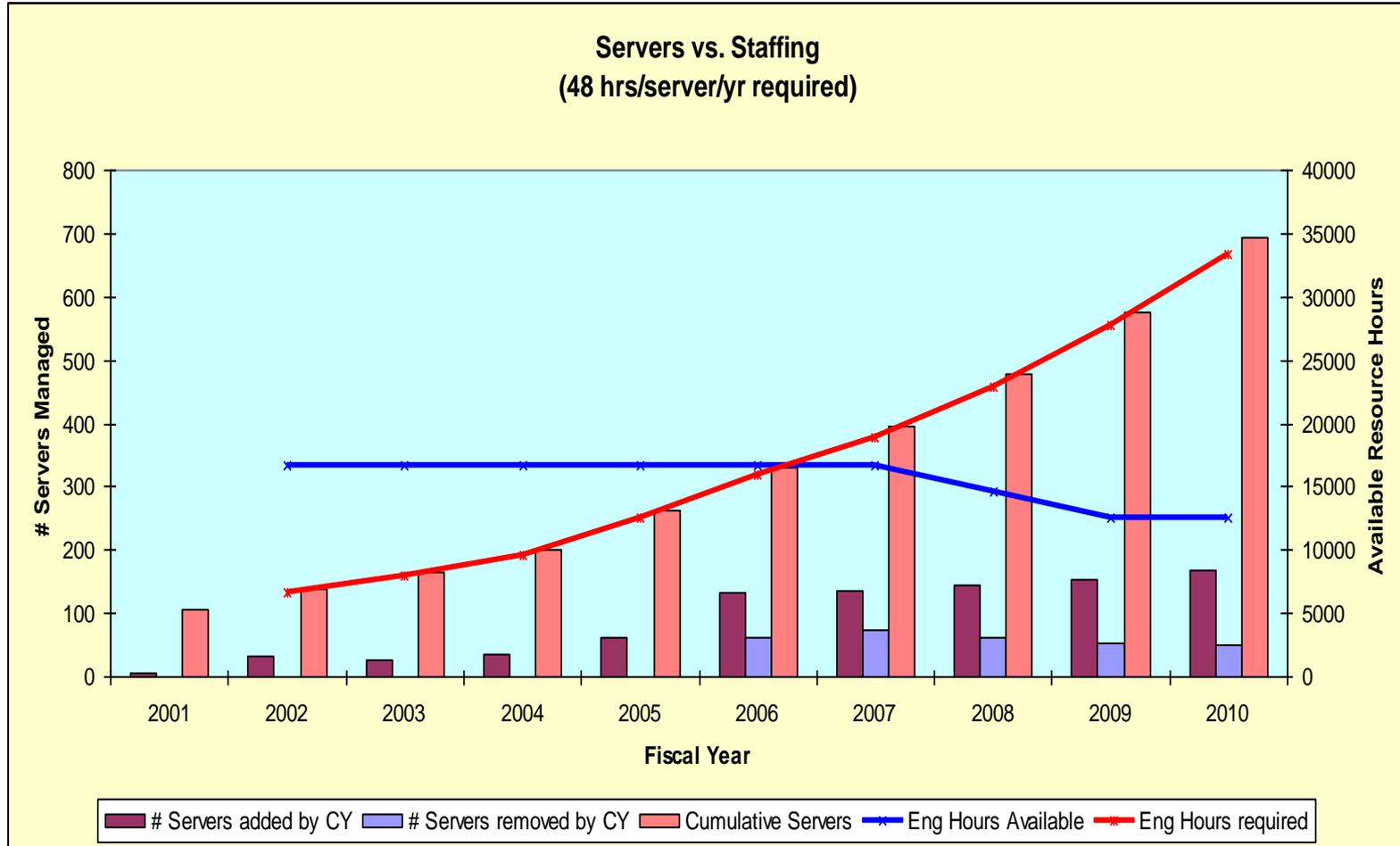
- Fully Mirrored Storage Systems
- Redundant backup and archival system
- Complete elimination of Tape

The Server Problem - Proliferation

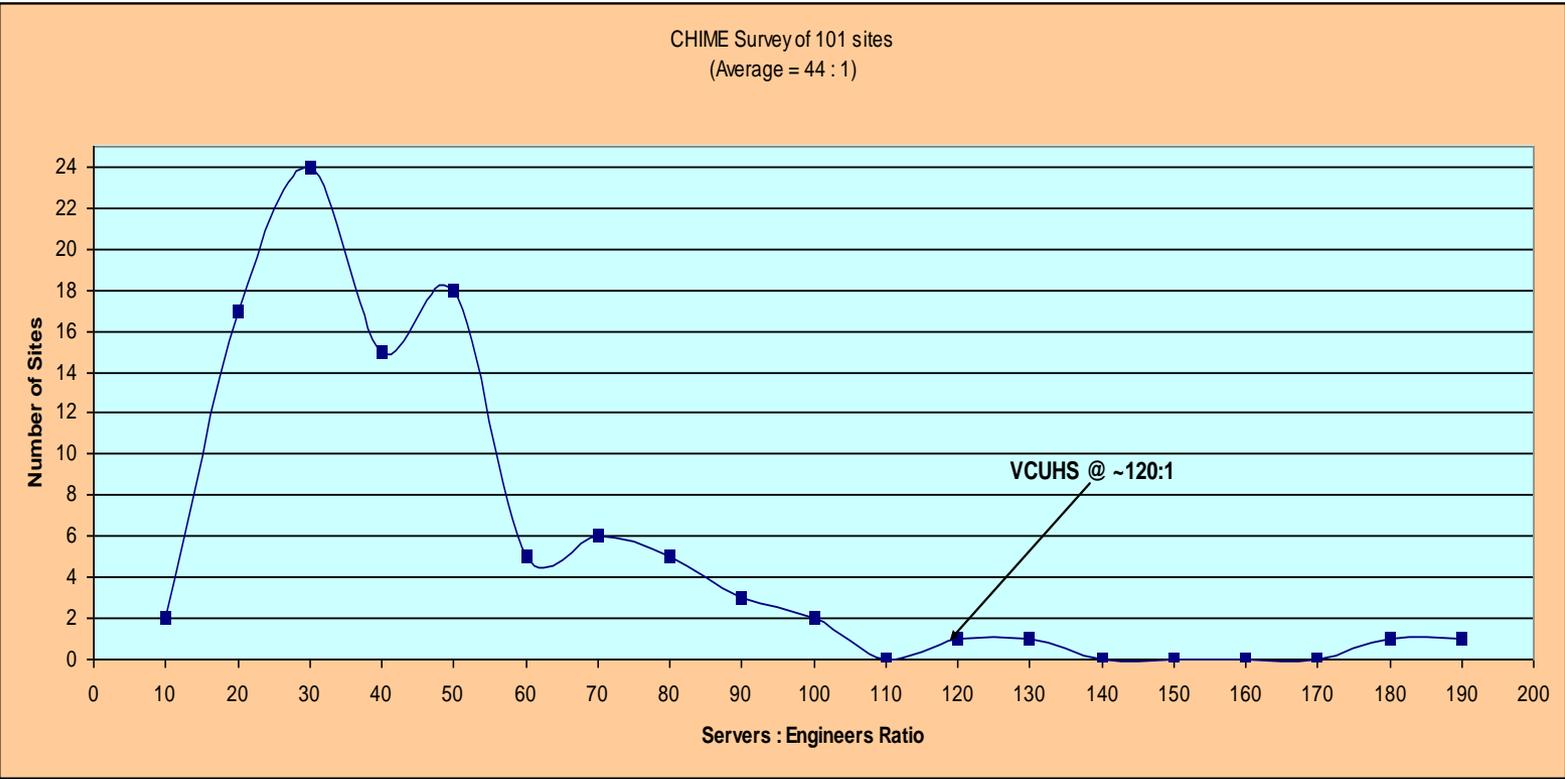
- Rapid growth in demand for servers
 - Upgraded systems grow from one to many
 - All clinical systems have some IT footprint
- Severe impact on Data Center Environment
 - Power utilization
 - Cooling
 - Footprint
- Strains staffing efficiency
 - Long times to install
 - No unified administrative system



Server Growth

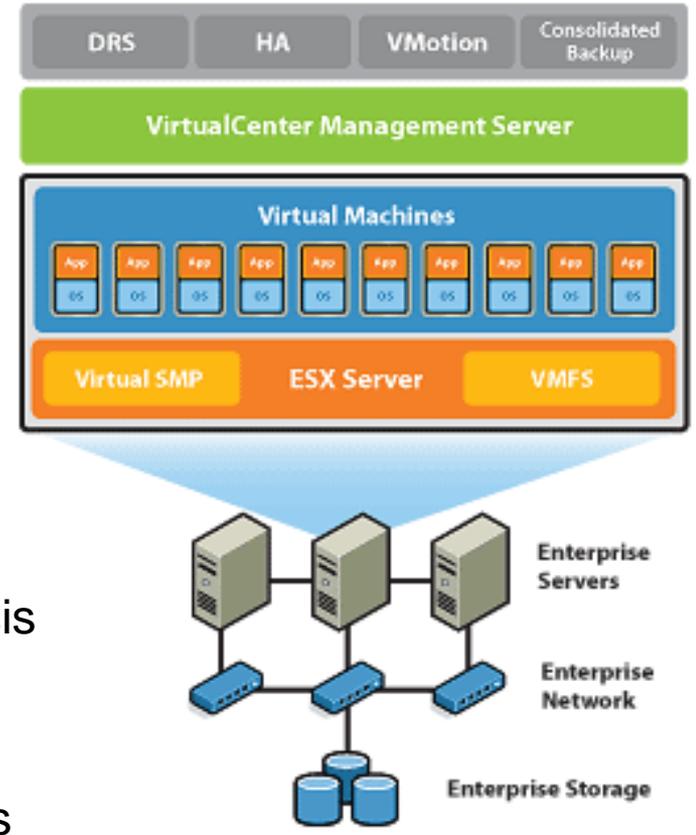


Staffing Challenges



The Server Solution - Virtualization

- Server Virtualization
 - Significantly Smaller footprint
 - Approaching 70% virtualization on managed Servers
 - “Greener” power consumption
 - Rapid failover transparent to end-user
 - Automatic load balancing, failover, etc.
- Standardized on Blades
 - Unified management system
 - Highly fault tolerant (zero chassis failures in 8+ years)
- Virtualized UNIX environment
 - Consolidated older technologies to new systems utilizing advanced UNIX virtualization



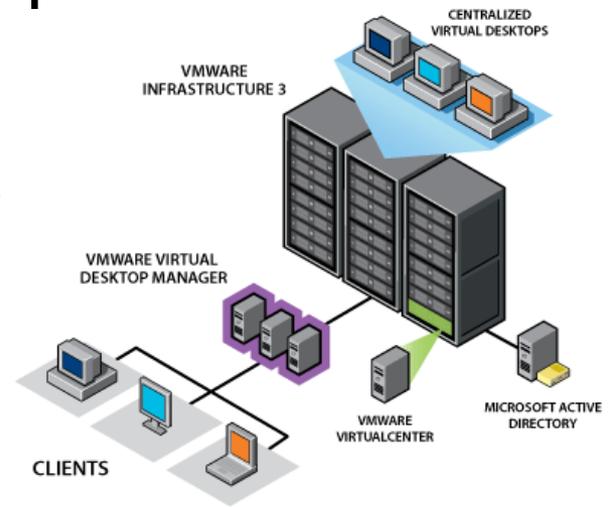
The Final Frontier – Virtual Desktop Infrastructure (VDI)

Clinicians Require:

- Any Device Anywhere Independence
- Improved clinical workflow
- Reduced number of logins
- Use of Proximity cards

IT Benefits:

- Decreases number of images
- Improves staffing efficiency



Summary

Technology is the Foundation for Clinical Transformation (i.e., “Wired” Healthcare)

- Clinicians need ubiquitous access to the data
- Critical Technical Success Factors include:
 - Standardization
 - Virtualization
 - Ease of Administration
 - Redundancy
 - Proactive Monitoring & Response
- Results in
 - Improved patient care, safety, & outcomes
- Enables advanced research leading to:
 - Patents, Advanced Protocols & Procedures
- Improves Fiscal position
- Makes IT's life easier



Questions?

