Designing Fast Virtual Desktops for Healthcare

What is VDI* and why is it important to healthcare?

=

Cost Savings

* VDI - Virtual Desktop Infrastructure

Shared computing resources

….. Ease of use
….. Quick app updates
….. Security
+ others

IDC ExpertROI® SPOTLIGHT

Metro Health Giving Time Back to Its Care Providers with VMware Horizon View

Sponsored by: VMware

Matthew Marden
Randy Perry

January 2014

"IDC estimates that Metro Health will realize almost $2.75 million per year in benefits from higher revenue and employee time savings that are being transformed into business benefits for the hospital."

Business Value Highlights

Organization: Metro Health

Location: Grand Rapids, Michigan

Challenge: To deploy a desktop virtualization solution in a cost-effective manner while providing diverse end users, including physicians, with instant and secure access to their active sessions and use of their desktop applications

Solution: VMware View

Cumulative Benefits:

- $14.3 million over five years
- ROI of 338%
- Payback in 9.8 months

Other Benefits:

- Lowered device subscription costs by 45%
- Reduced support calls per device by 37%

MetroHealth

MetroHealth

Metro Health Hospital is a non-profit **208-bed** general acute care hospital serving West Michigan.

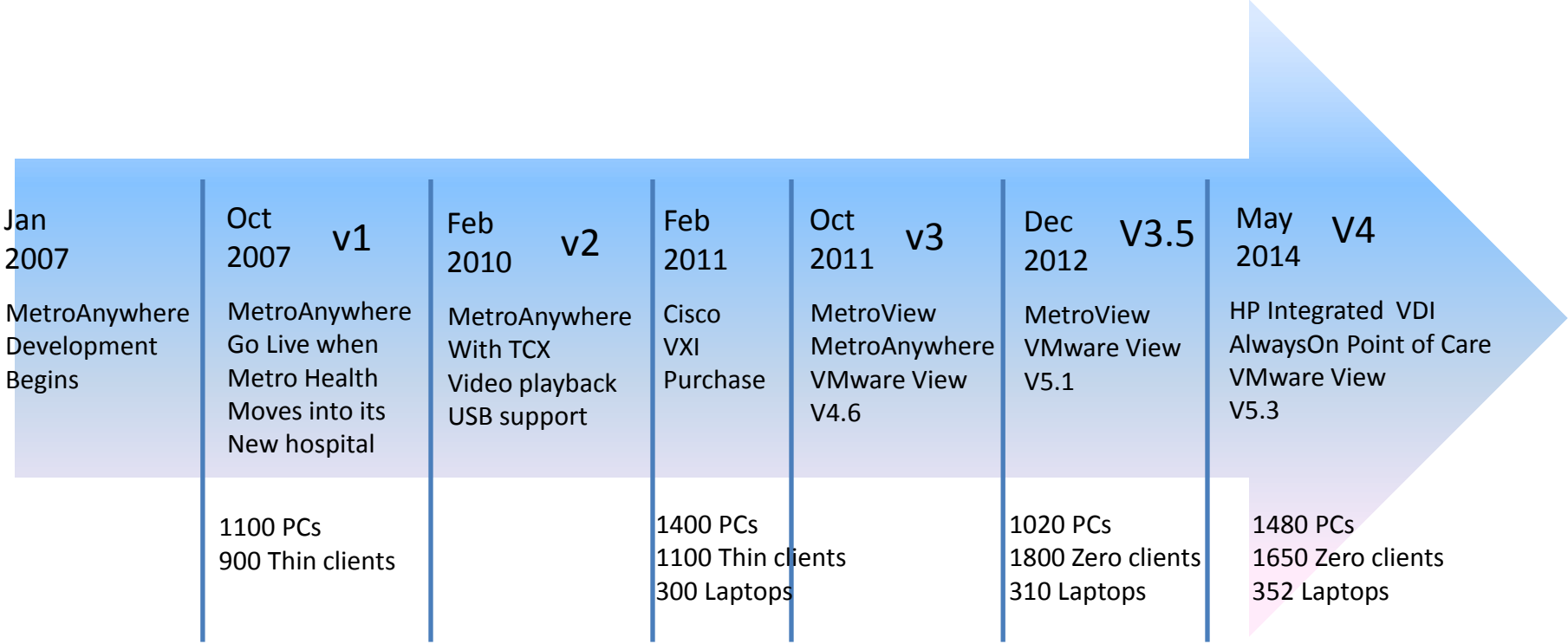
Hospital services include inpatient and outpatient services, emergency, surgery, intensive care, cancer, rehabilitation, childbirth and community education, among others.

Metro Health employs more than **2,325 full-time staff** members

Metro Health has more than **500 employed** and **independent physicians**

Metro Health Hospital's innovative approach to **health care**, **technology** and **green thinking** has earned it numerous awards, including the **100 Top Hospitals National Award** (teaching hospital category) from Thomson Reuters three years in a row.

Desktop Virtualization Timeline



MetroHealth

Metro Health IT Vision Statement:

"Our Passion is to Lead and Support the Improvement of the Health and Well Being of our Communities through Innovative and Efficient Information Technology"

Quantify the vision:

"Our VDI must perform equally or better than a standard PC – including graphics!"

There is one thing stronger than all the armies in the world; and that is an idea whose time has come.
Isaac Newton

Design Strategy

The solution must seamlessly empower the entire healthcare workforce .

http://www.projectcreate.com.au/category/blog/page/3/

It’s all about the application & enabling it to run on any device.

http://12b3059.wordpress.com/

Other Interrelated Strategies

Hardware Strategy

Graphics processing

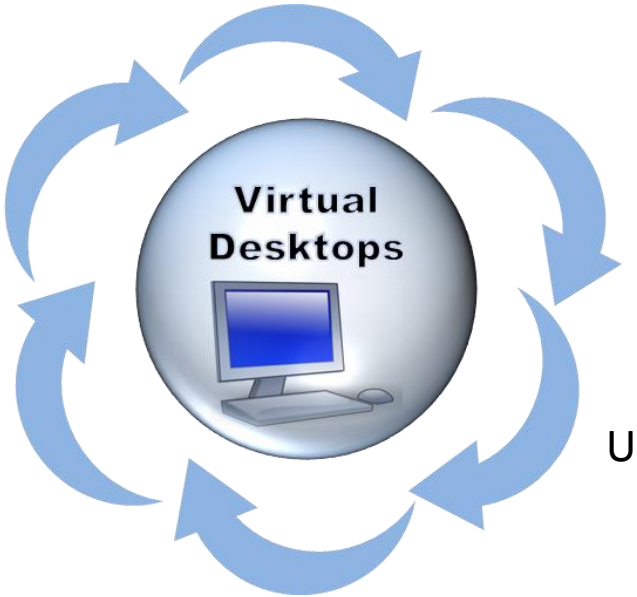


Image management

Printer management

User profiles & Personna mgmt

Application Management Strategy

New VDI Specs

Boring…..

BUT VITAL!

MUST HAVE “Snappy” Performance

< 10-second reconnects

VMware Always On Point of Care

Global Load Balancing

Full motion video support

Designed for Windows7 & Epic 2014

Multi-monitor support at 1920x1080 resolution

Cost is at or below current spend

Solution must scale in increments

Solution must be granular to support new technologies

Support 3GB RAM per session

Support a 30GB image

Must support 3D graphics and CPU offload capabilities

Must provide latest Intel Ivy Bridge processors

Full solution recomposes completed in 6 – 8 hours

SAN Storage is to be based on SSD to support linked clone performance

SAN solution must provide in-line deduplication to improve storage performance

Average 50 IOPS and <6ms latency per session

Plus more specs regarding video performance

And more specs for session performance

And more…..

And more…..

……

……

MetroHealth

Snappy!

- A right click on an icon opens up the context menu are less than one second.
- A right click on an email attachment opens up the context menu are less than one second.
- A virtualized application initiates the application to stream in less than one second.
- Average responses when Enter is pressed or the mouse is clicked are less than one second.
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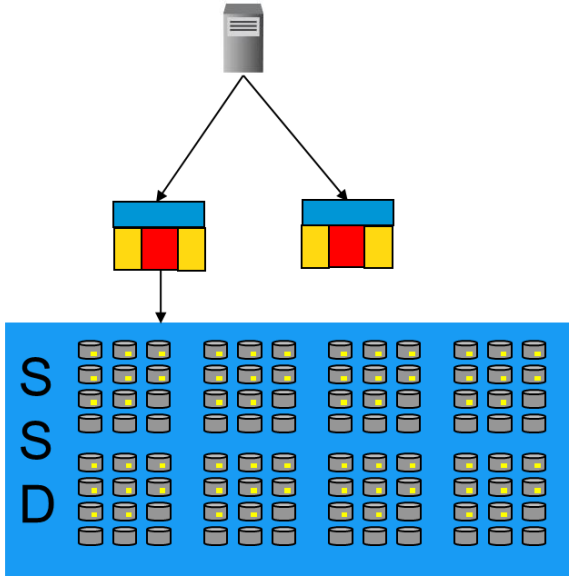
- A browser window opens up, not the actual web site or web app, are less than one second.
- A Windows Explorer window opens up when requested in less than one second.
- When a window is dragged, it moves smoothly, quickly without any ghosting or latency.
- When a window is resized, the action is performed with no user perceptible delay.

Things to focus on:

Interconnected flash memory chips
5 – 10ms vs ~ 0.1ms

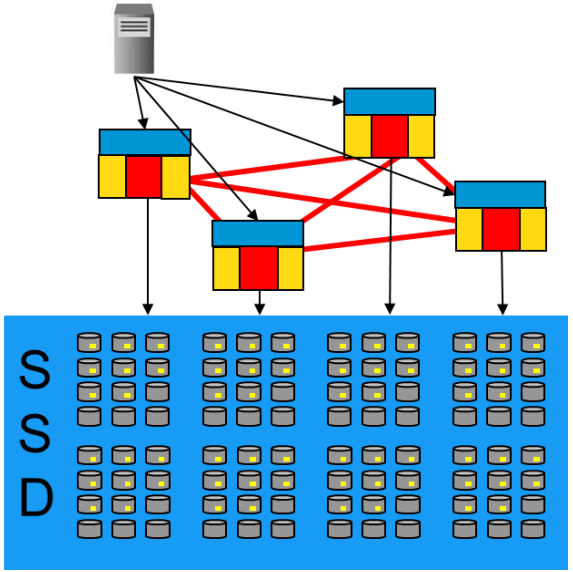
Typical Latencies	In milliseconds	In tens of micro-seconds
IOPS Density (IOPS/GB)	0.2 IOPS/GB (180 IOPS with 900GB 10K drive)	100 IOPS/GB (40,000 IOPS in 400GB)
$/GB	$0.8 - $1/GB	$10-$15/GB
Media Write Cycle	Virtually Unlimited (Hundreds of millions)	5000 to 15000 Write Cycles
Failure Modes	Mechanical/Electronic	Electronic/Flash

Things to focus on:



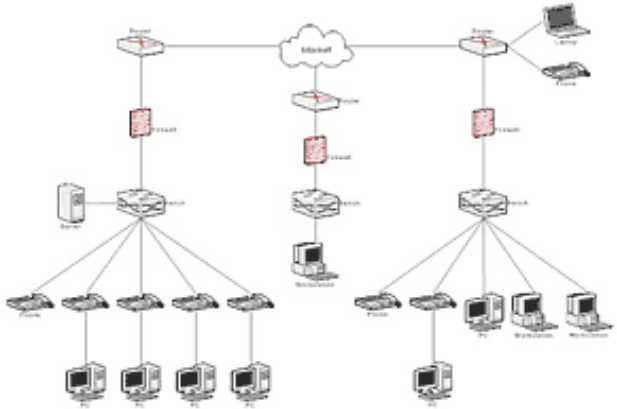
- 2-node, Active/Passive

Controller Multipathing



- 4-node, Active/Active
- Completely load balanced

Things to focus on:



The transport protocol that virtual desktops use requires network tuning to perform as expected.

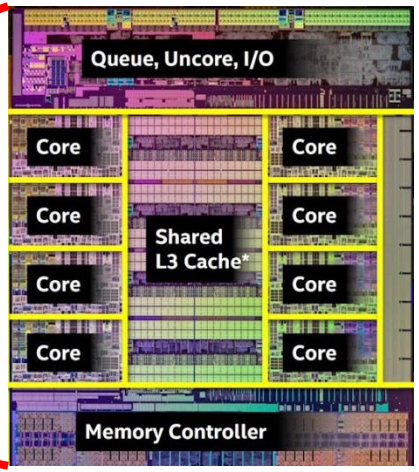
These protocols help provide the video, sound and peripheral experience for remote desktop users.

Network tuning and WAN optimizations need to be considered.
- Number of users
- Applications with graphics/video requirements must be known

Consult the protocol tuning guides!

Things to focus on:

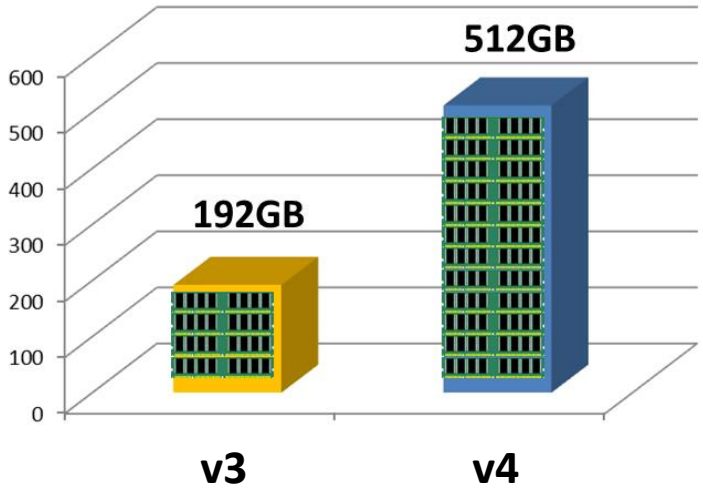
We have 20 cores/ server



Epic

* Effective immediately, Epic has updated its purchasing recommendation for hosts for running Hyperspace (either via VDI or via virtual Citrix XenApp servers) as well as multipurpose hosts for web and service servers. We recommend purchasing two-socket servers with Intel Xeon E5-2697 v3 processors for these purposes.

Things to focus on:



Increase RAM
- **option to add more**

Over 2.5x more memory/server

Epic

* For VDI hosts, we recommend you purchase servers with at least 512 GB of RAM.

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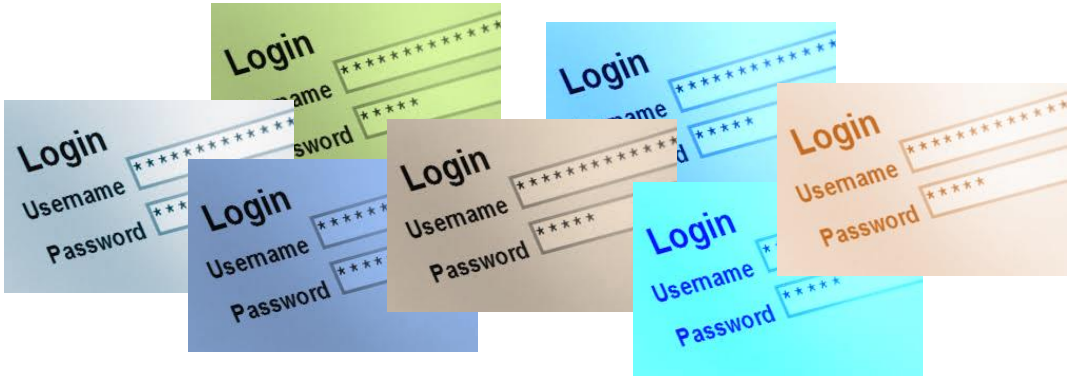
Things to focus on:

Single Sign-On

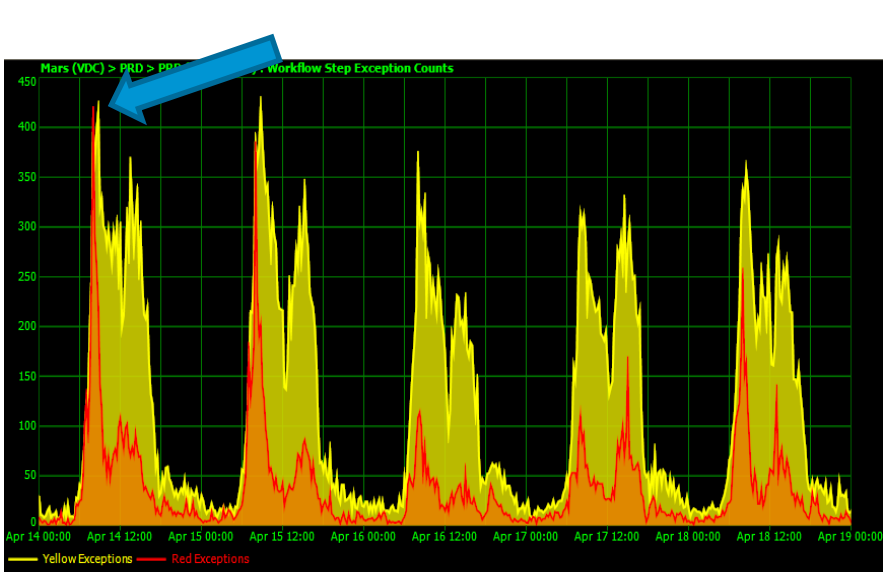


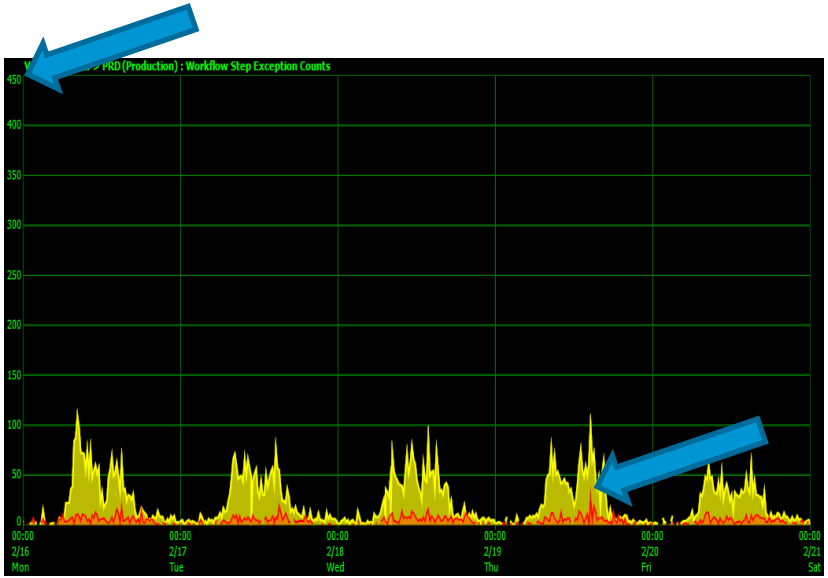
Persona Management

Application Packaging/Streaming

What Differentiators have we experienced:

EPIC System Pulse - Before and After





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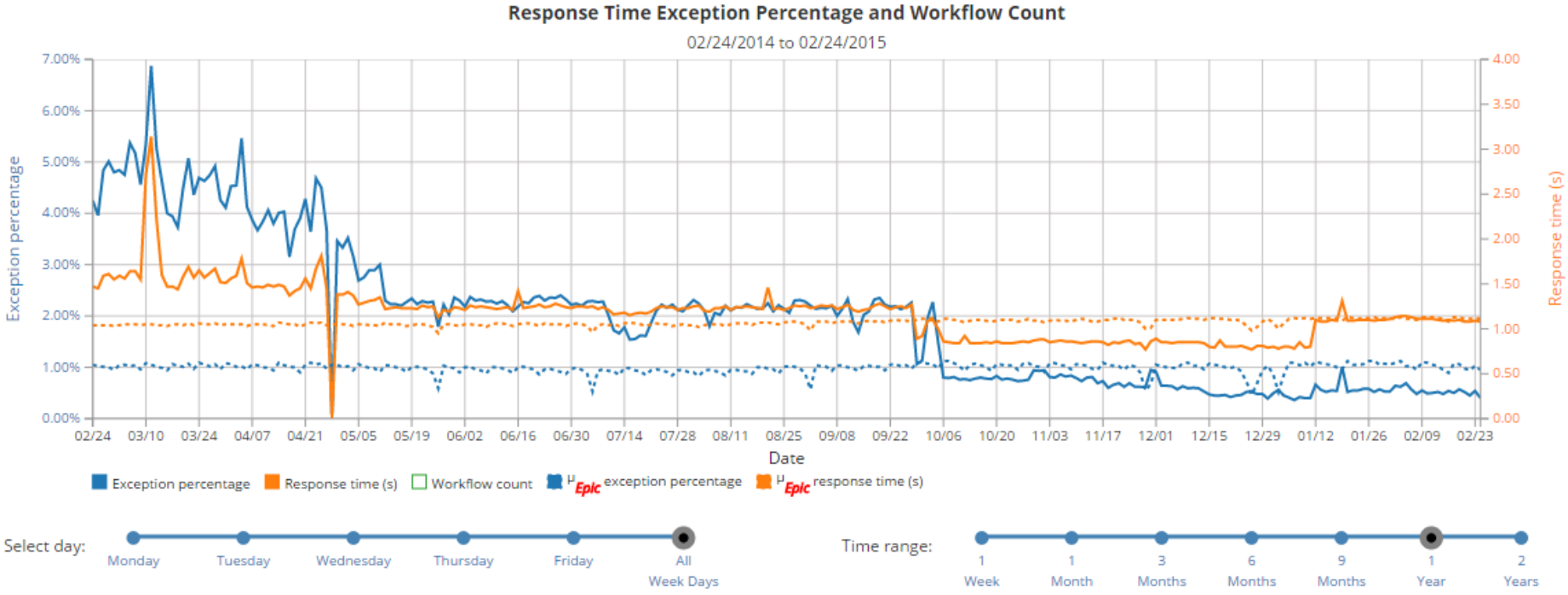
What Differentiators have we experienced:



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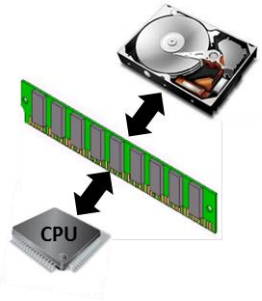
Near Future Performance Improvements:



Memory cache

Application distribution

Anywhere application computing

Graphics:

CPU & vGPU Offload

Video processing and graphics and Virtual Desktops
Resolution 1920 x 1080

Many healthcare apps are requiring graphics
Plus Browsers are evolving

Our PACS and Cardiology apps specify NVIDIA graphics support

Video playback?

Video conferencing needs to be fixed/improved.

Which healthcare dept apps require graphics support?

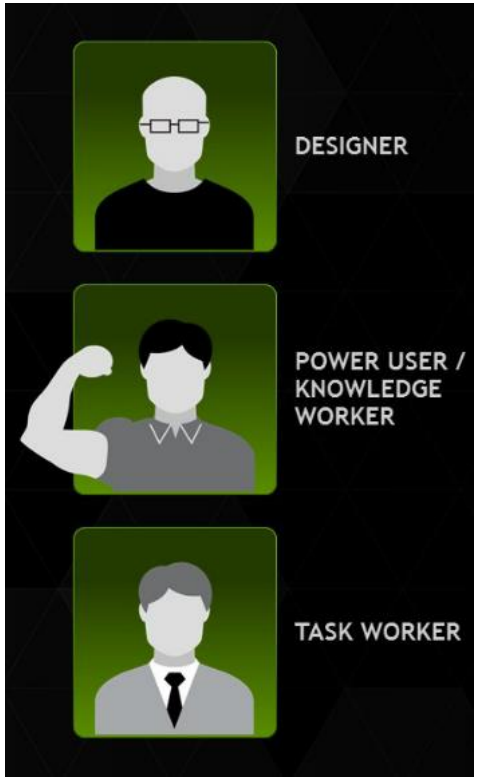
Obvious Departments:
Radiology
Cardiology
Laboratory/Pathology
Surgery
Sleep Lab
Neurology
PT/OT
Sports Medicine
Wound Clinic
Assisted Breathing Center
Endoscopy
Obstetrics
Oncology
Medical Education
Telemedicine

Non-Clinical Departments:
Marketing
Quality
Security
Facilities
Maintenance
IT
Training (Operational / Dept specific)

These common applications too:
Browsers – HTML5
Epic/Citrix
Microsoft Office – 2013
Email
Adobe Acrobat
Teleconferencing

40%-60% VDI users will require vGPU

Task worker & Power user



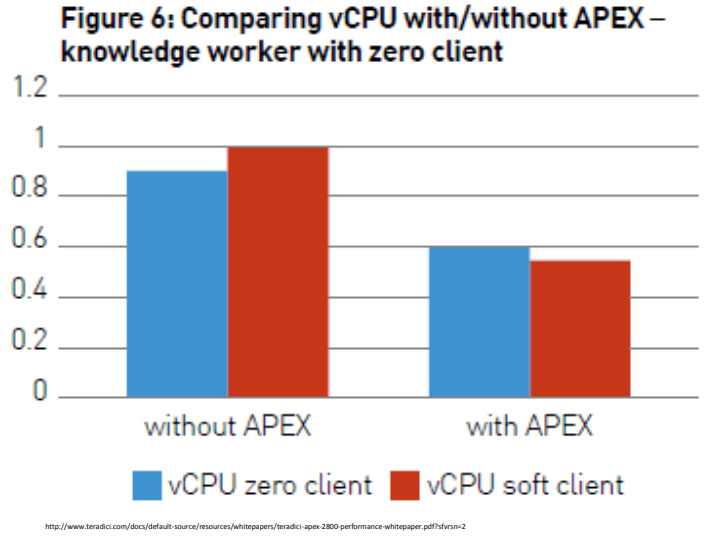
Healthcare

No Distinction

VNIDIA & VMware 3D Graphics Solutions Presentation 2/12/15

Things to focus on: CPU Offload - Hardware Acceleration cards

up to 44% reduction



http://www.teradici.com/docs/default-source/resources/whitepapers/teradici-apex-2800-performance-whitepaper.pdf?sfvrsn=2

No ESXi 6 driver for APEX offload card yet!

The Opportunity:

More applications use graphics

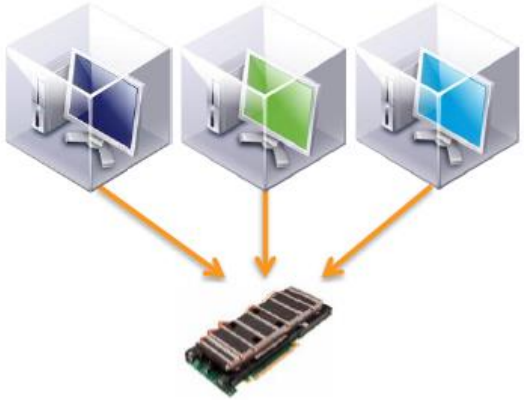
Requirement:

Must share 3D graphics compute resources

The Result:

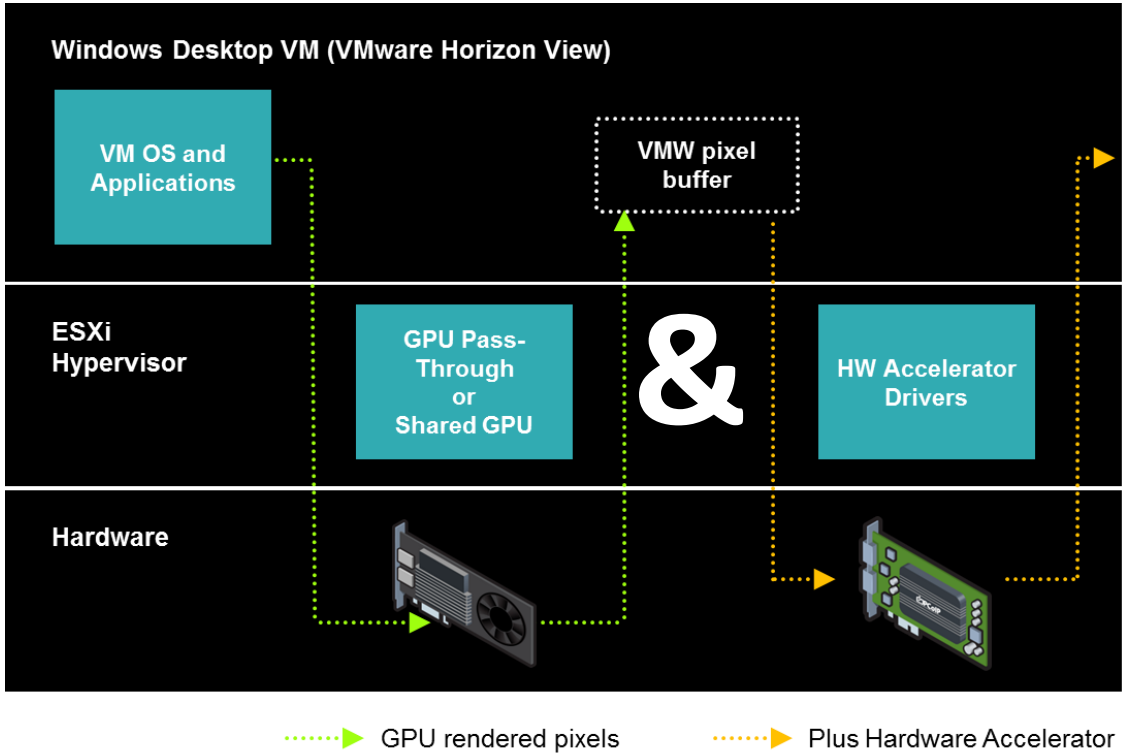
New cost savings

Reduced total cost of ownership



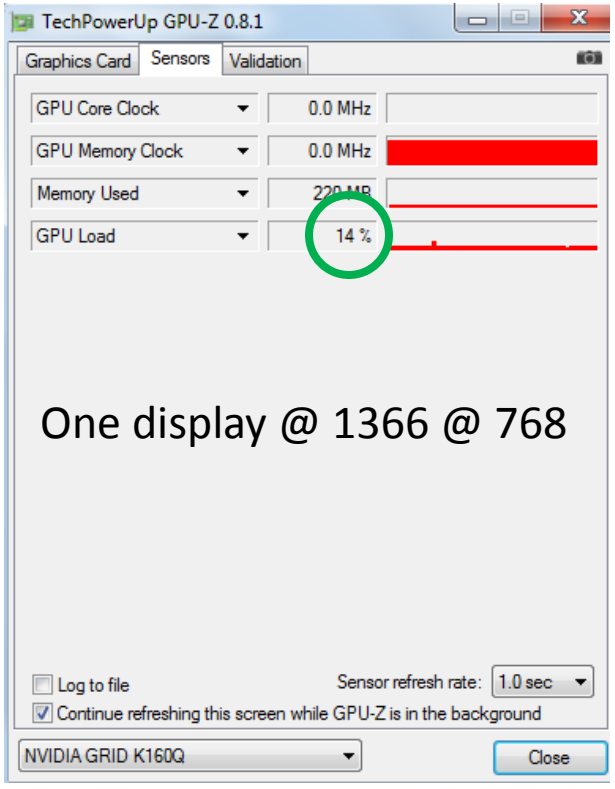
VDI = Shared computing resources

Better Together:

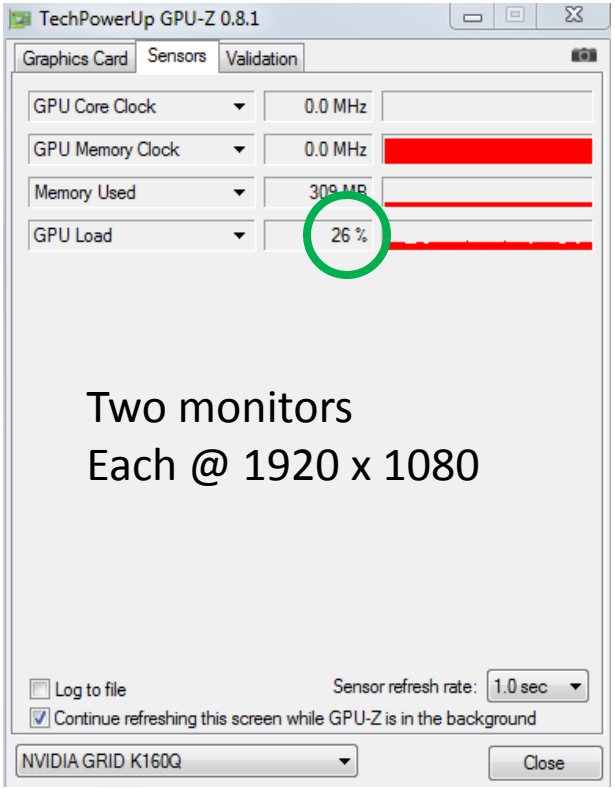


3D Virtual Workstation Set Up Doesn't Have to Be So Hard 2/11/15 Randy Groves – reprinted with permission

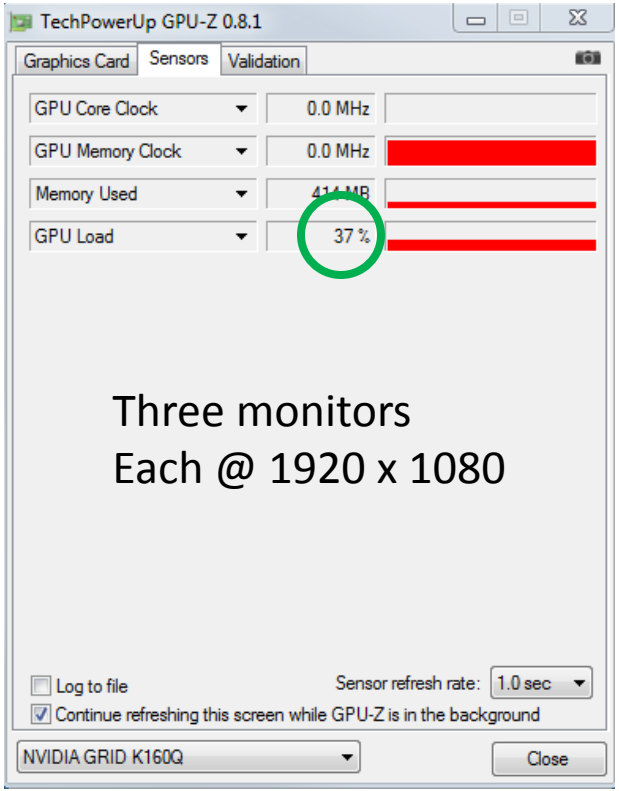
vGPU Experience:



One display @ 1366 @ 768

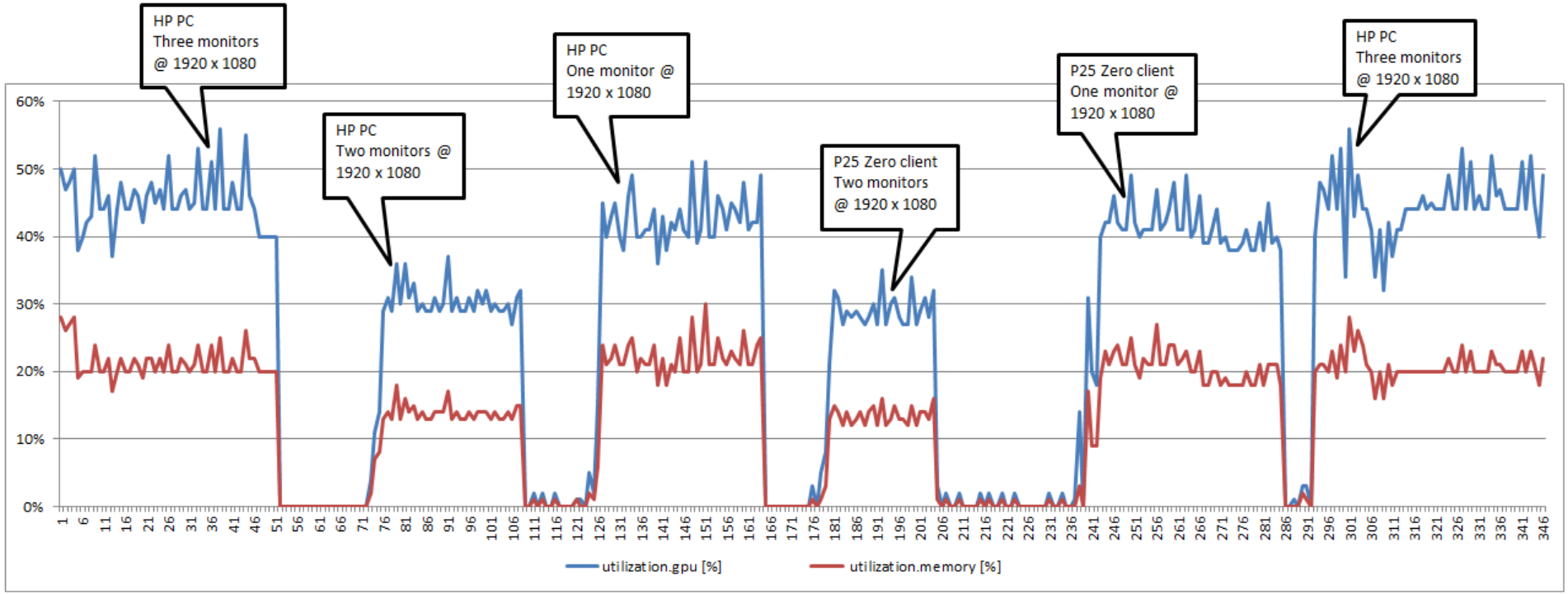


Two monitors
Each @ 1920 x 1080



Three monitors
Each @ 1920 x 1080

vGPU Experience - NVIDIA SMI



vGPU Experience:

iSite

Streaming Videos

NVIDIA_VMware

Challenges:

- Expand on 32 VM limitation per board
  - This is a Kepler architecture limitation
- 3D Graphics Setting Issue
  - Enable support for the RDP protocol at the session level
  - Currently RDP is disabled at the pool level for 3D graphics support 

- How successfully can a vGPU enabled VDI session be vMotioned?
  - vMotion is not supported at this time. 

- Enable dynamic VM vGPU allocation/use per board
  - Release vGPU when app shuts down, not at the session level
- When can a View session on one server be allocated unused vGPU on another server?

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QUESTIONS ?

Contact Information:
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Technology Strategist
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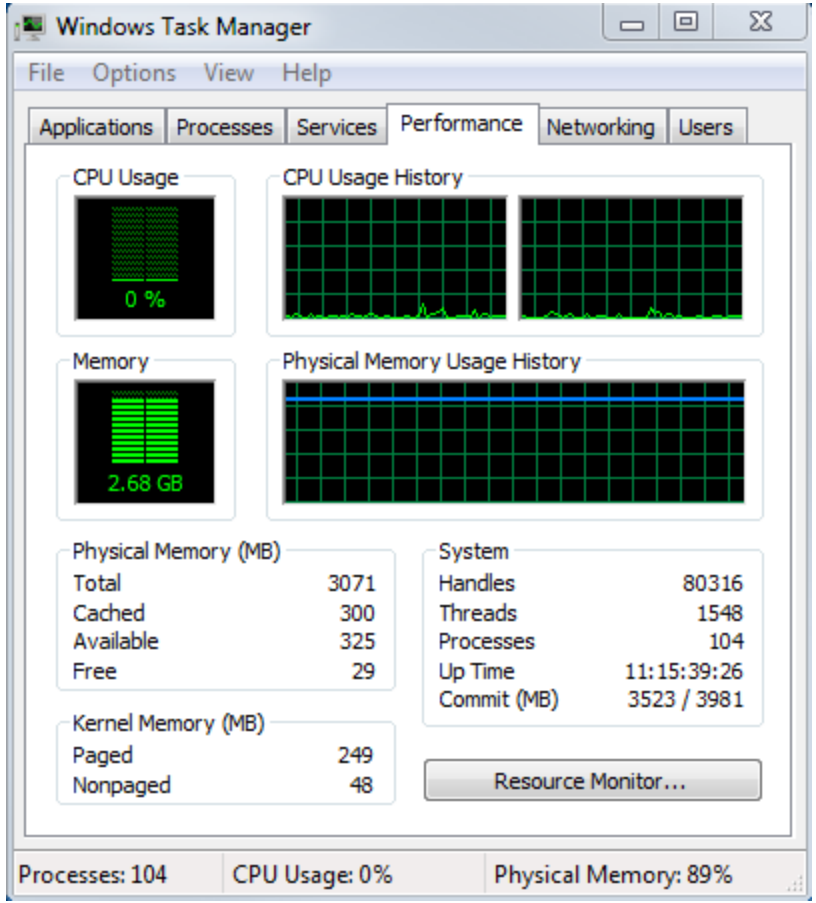
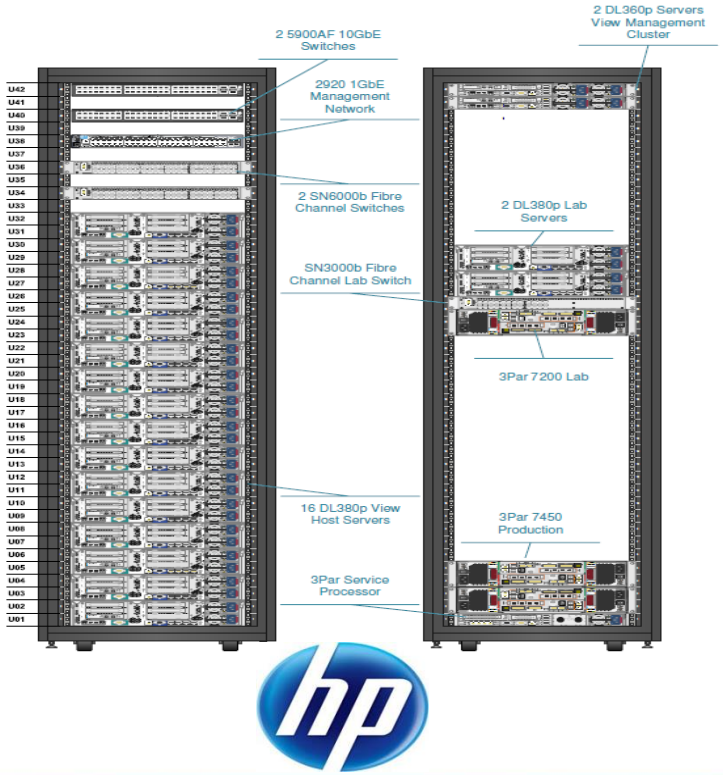

Windows Task Manager
File
Options
View
Help
Applications
Processes
Services
Performance
Networking
Users
CPU Usage
0 %
CPU Usage History
Memory
2,68 GB
Physical Memory Usage History
Physical Memory (MB)
Total 3071
Cached 300
Available 325
Free 29
Kernel Memory (MB)
Paged 249
Nonpaged 48
System
Handles 80316
Threads 1548
Processes 104
Up Time 11:15:39:26
Commit (MB) 3523 / 3981
Resource Monitor...
Processes: 104
CPU Usage: 0%
Physical Memory: 89%

HP Multi Site Solution – Each Site



Solution Base Includes:

- HP 3PAR StoreServe 7450
  - **4 x 7450 Controller Nodes**
    - 32 GB Cache
    - (8) 8GB FC ports
  - **32 x 920GB SSD Drives**
  - **28TB Usable capacity**
- View Session hosts
  - (16) DL380 Rack Servers E2697v2
    - **Dual 10 Core 2.8 GHz Ivy Bridge procs**
    - **512 GB Memory – expandable to 768GB**
    - 4 GB micro SD Boot
    - ESX 5.5
    - (8) **Teradici Apex 2800 CPU offload cards**
    - (8) **NVIDIA K1 cards**
- Management hosts
  - (2) DL380 Rack Servers E2697v2
    - **Dual 10 Core 2.8 GHz Ivy Bridge procs**
    - **192 GB Memory – expandable to 768GB**
    - 4 GB micro SD Boot

(1) HP 2920-24G switches
- (24) 1GB ports

(2) HP 5900-48 switches
- (48) 10GB ports

(2) HP SN6000B switches
- (?) 16GB FC ports
- (24) 8GB SFPs

(2) F5 Loadbalancers

Stratusphere UX
- (1250) licenses

Test System

(2) VDI Hosts - HP DL380 Gen8 svrs
- (10) core Ivy Bridge 2.8GHz procs
- Each with 512GB RAM
- (4) GB Flash media - ESXi local boot

Each server will have one each:
- Teradici Apex 2800 CPU offload card
- NVIDIA K1 card

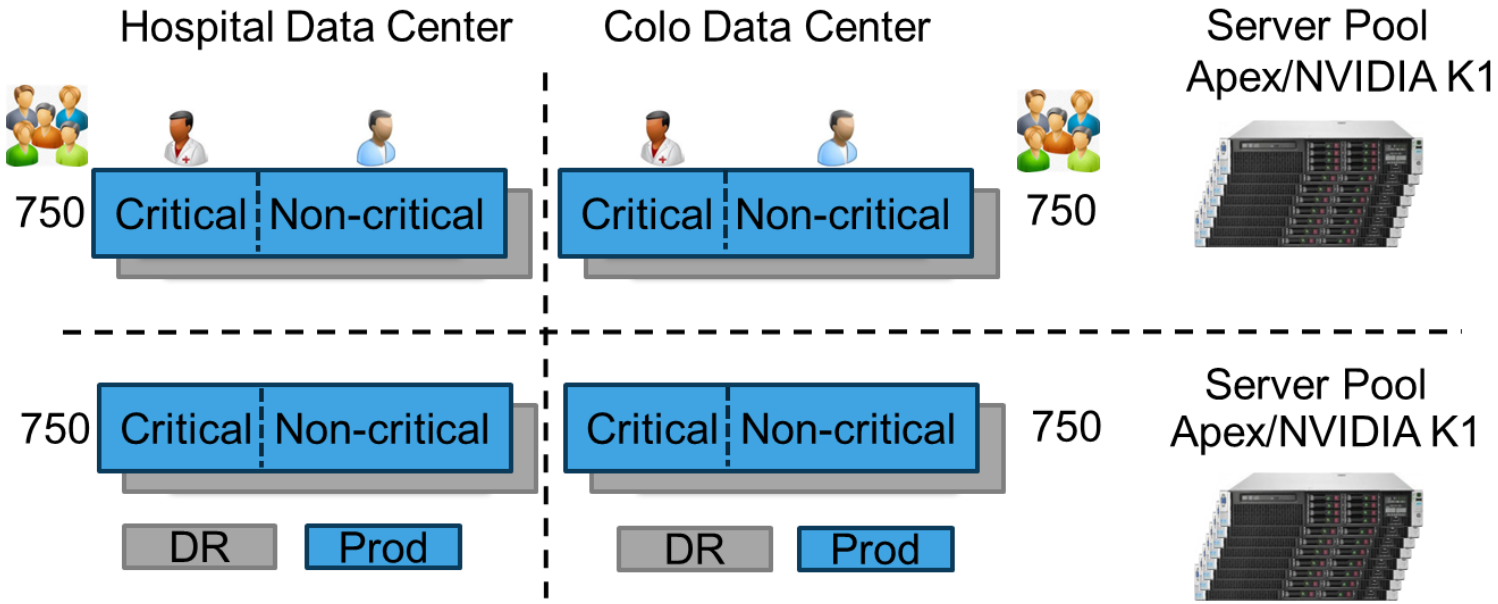
(1) 3PAR 7200 array

(1) HP SN3000B 24/12 FC switch

MetroHealth

Design Focus

VDI Pool Design



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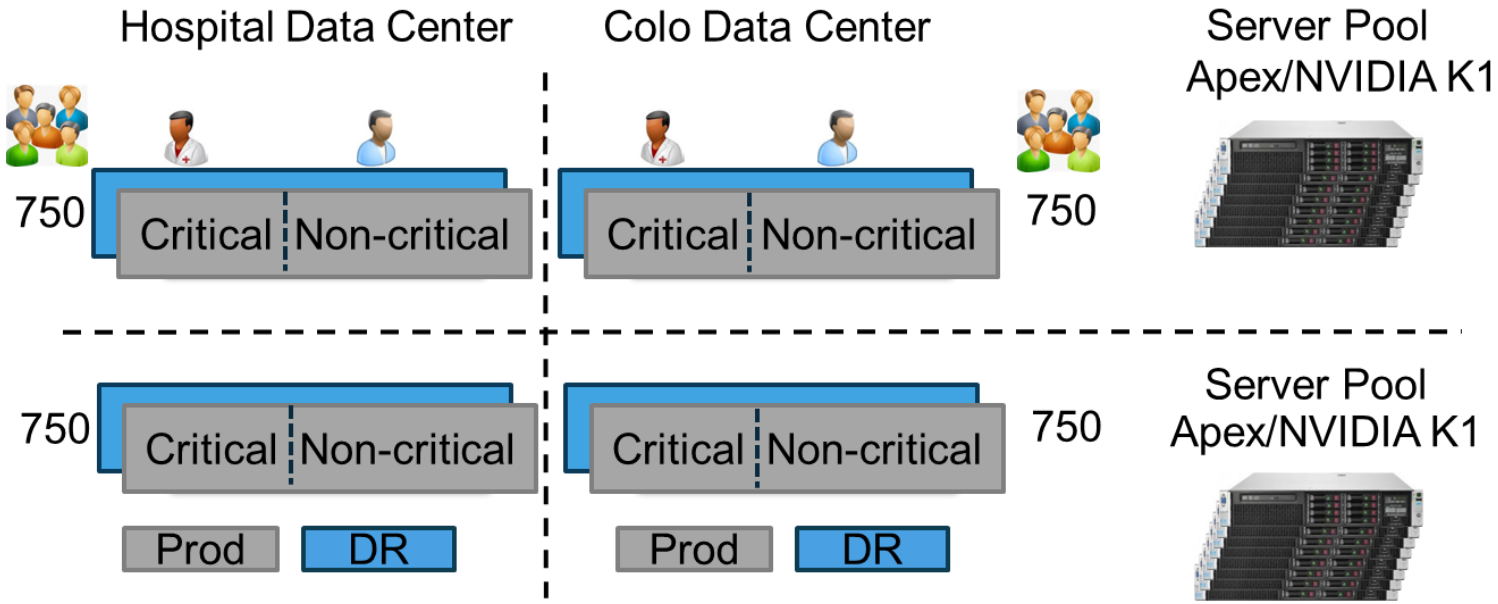

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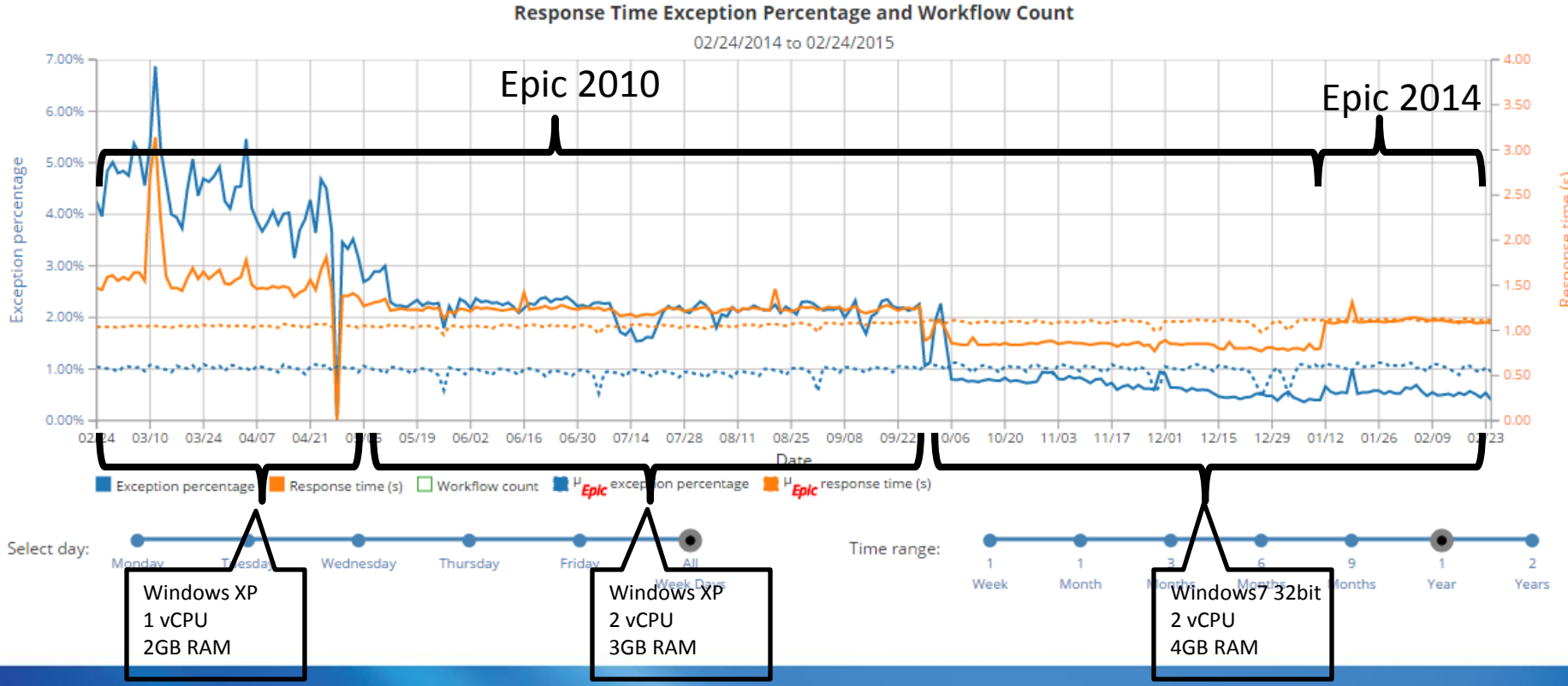

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