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SCHOOLCRAFT COLLEGE VSI & VDI IT INFRASTRUCTURE OVERHAUL

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2016 VMware® CIO Symposium for Higher Education
3401 Hillview Avenue, Palo Alto
Building A - Sequoia Room



Agenda

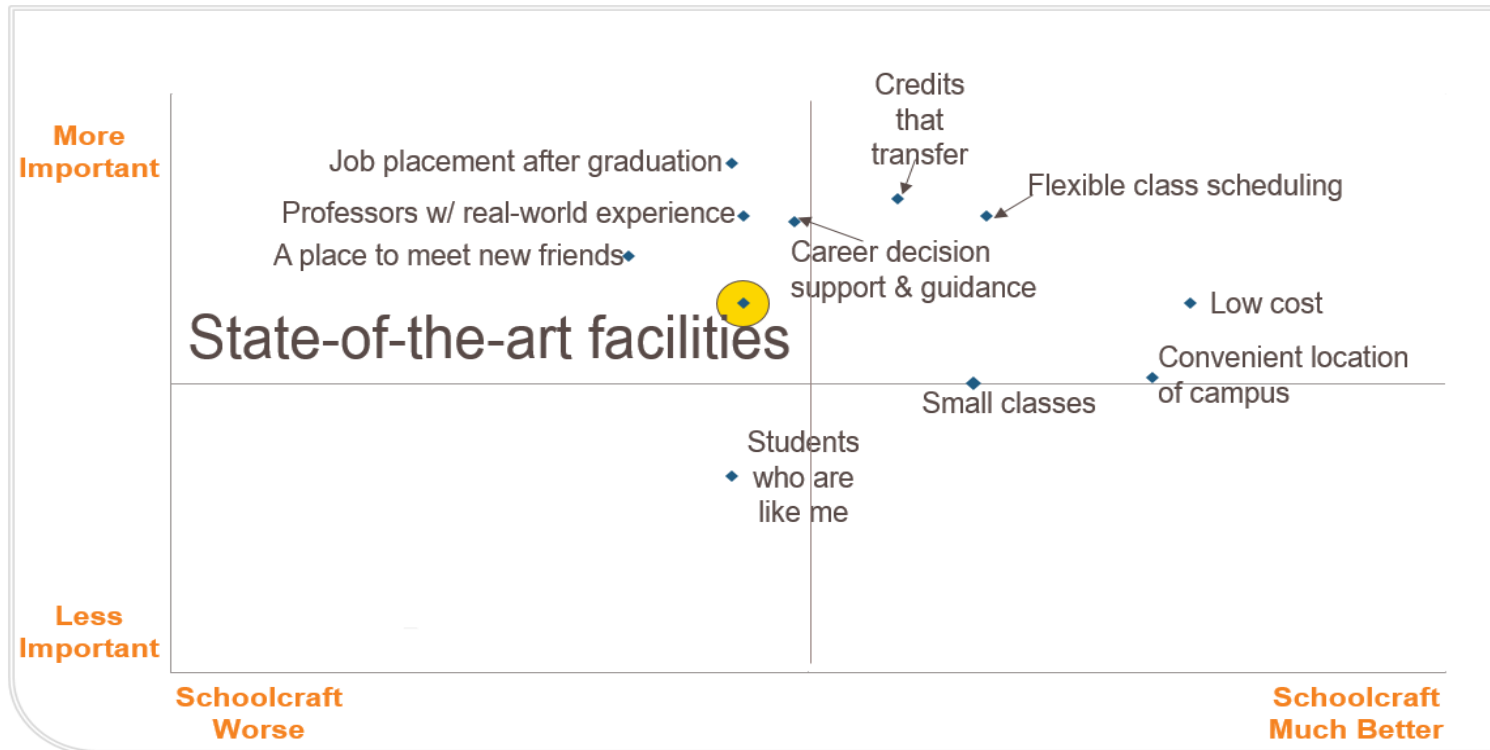
- Schoolcraft IT Infrastructure 2014
 - (12,000 full time and 25,000 part time students)
- 2014 ... Where we started...
- IT Overhaul – Strategy, Specifications, and Planning
- The VDI / VSI HW Architecture as Designed
- Schedule and Milestones
- Pre-amble and General Challenges
- VSI Challenges
- VDI Challenges
- Training Challenges
- Security Challenge – The Portfolio
- Current Status
- Plans for the future



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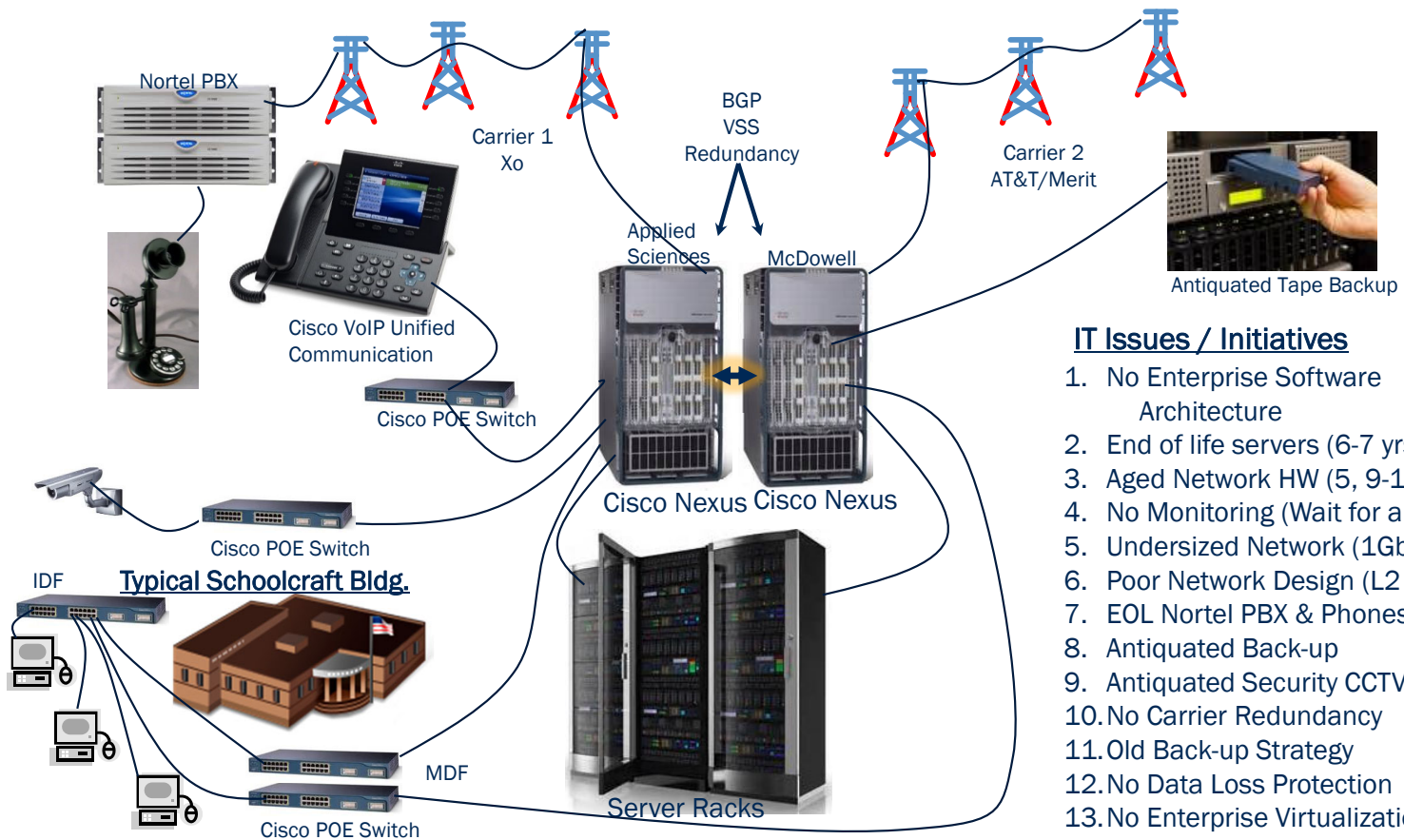
Where we started in 2014 / 2015

SCHOOLCRAFT COMPARED TO OTHER SCHOOLS





2014 Schoolcraft College IT Infrastructure



IT Issues / Initiatives

1. No Enterprise Software Architecture
2. End of life servers (6-7 yrs old)
3. Aged Network HW (5, 9-11 yrs old)
4. No Monitoring (Wait for a call)
5. Undersized Network (1Gbps & FE)
6. Poor Network Design (L2 only)
7. EOL Nortel PBX & Phones
8. Antiquated Back-up
9. Antiquated Security CCTV
10. No Carrier Redundancy
11. Old Back-up Strategy
12. No Data Loss Protection
13. No Enterprise Virtualization
14. No Disaster Recovery Plan



IT Overhaul – Strategy, Specs, Planning

- Drive a complete IT overhaul via RFP & granular requirement specs
- R&V Plan (Requirements and Validation Plan)
- A.K.A – A Requirements Traceability Matrix
- Bidding, quoting, etc. logistics by RFP with the R&V Plan at its core
- Vendors told Primary driver for project acceptance was the R&V
- “We bought a solution, not a bucket of hours!”
- Having the solution correct was more important than having it fast
- 200 Hrs of VMware training and Prof. Service for knowledge xfer.
- Milestone based payments driven by requirement validation & CFO
- Milestone timing variations under sole control of the CIO



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Strategy, Specification, Planning

R&V Plan

Date: 7/3/2014		Project Name: Virtual Server Infrastructure			Project Number:	R&V Lead: Christopher C. Denny		
ID	Date Received	Source	Type (e.g., Business, GUI, etc.)	Requirement (Shall Statement)	Work Product/Use Case	Validation Method	Validation Date	Validated By Whom
78	7/3/2014	JB	Controller	The System "Shall" have Live Resource management for VMs	Vmware DRS provides the capability for dynamic resource allocation across solution	Demonstration of resource management in VMware.	7/15/2015	Jason Greifenberg
79	7/7/2014	JB	Software	The System "Shall" have Live VM Copy	Vmware vMotion and HA offers this functionality	Demonstration of Vmware vMotion and HA.	7/15/2015	Jason Greifenberg
80	7/3/2014	JB	Switches	The System "Shall" have Live VM Migration	Vmware vMotion and HA offers this functionality	Demonstration of Vmware vMotion and HA.	7/15/2015	Jason Greifenberg
81	7/11/2014	JB	Software	The System "Shall" have Personal desktop profiles for all users	VMware Horizon View supports personal desktop profiles.	A demonstration of personal profiles.	3/23/2015	Jeff Borton
82	7/11/2014	JB	Software	The System "Shall" have plug and play technology	Specific use cases need to be created to define plug and play requirements.	A demonstration of a plug and play printer.	7/15/2015	Jason Greifenberg
83	7/8/2014	CD	Security	The System "Shall" have Quick spin up of new Development servers	Vmware vSphere gold images, templates and linked clones allow for rapid deployment of VM's (servers)	A demonstration of server cloning.	7/15/2015	Jason Greifenberg
84	7/8/2014	CD	Security	The System "Shall" have Quick spin up of new production servers	Vmware vSphere gold images, templates and linked clones allow for rapid deployment of VM's (servers)	A demonstration of server rapid provisioning best practices.	7/15/2015	Jason Greifenberg
85	7/7/2014	CD	Security	The System "Shall" have Quota on folder structures	Quota's will be configured as part of Access's best practices included in bid	Demonstration of folder quotas.	9/25/2015	Jason Greifenberg
86	7/7/2014	CD	Hardware	The System "Shall" have scalability for additional drives.	Individual drives as well as full drive enclosure additions are inherent to	A review of the expansion options for the system.	12/16/2014	Patrick Turner

VSI
Requirements
& Validation
Plan

- Or -

Requirements
Traceability
Matrix

- "Shall" Statements
- Granular
- Singular
- 17 Pages

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Strategy, Specification, Planning

VDI
Requirements
& Validation
Plan
– Or –
Requirements
Traceability
Matrix

- “Shall”
Statements
- Granular
- Singular
- 17 Pages

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R&V Plan								
Date: 7/3/2014		Project Name: Virtual Desktop Infrastructure			Project Number:		R&V Lead: Christopher C. Denny	
ID	Date Received	Source	Type (e.g., Business, GUI, etc.)	Requirement (Shall Statement)	Work Product/Use Case	Validation Method	Validation Date	Validated By Whom
13	7/3/2014	JM	Software	The System "Shall" have built-in or supported screen sharing / collaboration (IE instructor can	VMware Horizon View supports this functionality	Demonstrate screen sharing via Horizons View .	9/25/2015	Bill Fox
14	7/11/2014	JM	Software	The System "Shall" have business continuance in local campus weather, fire, security incidence	VMware HA, SRM and Compellent Live Volume are all features of an enterise business continuity strategy.	Demonstrate Horizons View Client access from both Data Centers validates this requirement	7/15/2015	Christopher C. Denny
15	7/11/2014	JM	Software	The System "Shall" have business continuance in pandemic outbreak work at home	Remote management and remote access is essential during a pandemic outbreak. Desktops (entire solution) accessible from home, limited by bandwidth.	Demonstrate Horizons View Client access from both Data Centers validates this requirement	7/15/2015	Christopher C. Denny
16	7/11/2014	JM	Software	The System "Shall" have capability of roaming document folders	Roaming profiles are an option and included in the expectation of services.	Demonstrate single, unique user access on multiple devices by recommendations from Access	9/25/2015	Bill Fox
17	7/3/2014	JM	Software	The System "Shall" have centralized security, activity reporting	VMware vCenter offers a centralized activity report.	Demonstrate how VMware vCenter and Trend micro updates via server	7/15/2015	Christopher C. Denny
22	7/7/2014	JG	Software	The System "Shall" have Data encryption between user and server	PCoIP supports encrypted connectivity.	Demonstrate that encryption is enabled.	9/25/2015	Bill Fox
24	7/7/2014	JG	Security	The System "Shall" have Desktops with a recommended time screen lock time out	VMware Horizon View and Time screen lockouts are supported.	Demonstrate settings on multiple devices by recommendations from Access Interactive or by means of AD Group Policies.	9/25/2015	Bill Fox
25	7/7/2014	JG	Security	The System "Shall" have Desktops shall have a virus scanner	Trend Micro Deep Security provides the ability for virus scanning.	Implemented through Trend Micro on the VSI project. Testing and demonstration will take place.	8/30/2015	Patrick Turner
26	7/7/2014	JG	Software	The System "Shall" have Desktops shall have restore points	Restore points are customized based on RPO and RTO objectives. An in-depth procedure is written upon selection.	Validate that user profile folders are redirected or roaming to prevent data loss and no longer require restore points for VDI.	7/15/2015	Jason Greifenberg
				Schoolcraft College Confidential			9/25/2015	Bill Fox
							9/25/2015	Christopher

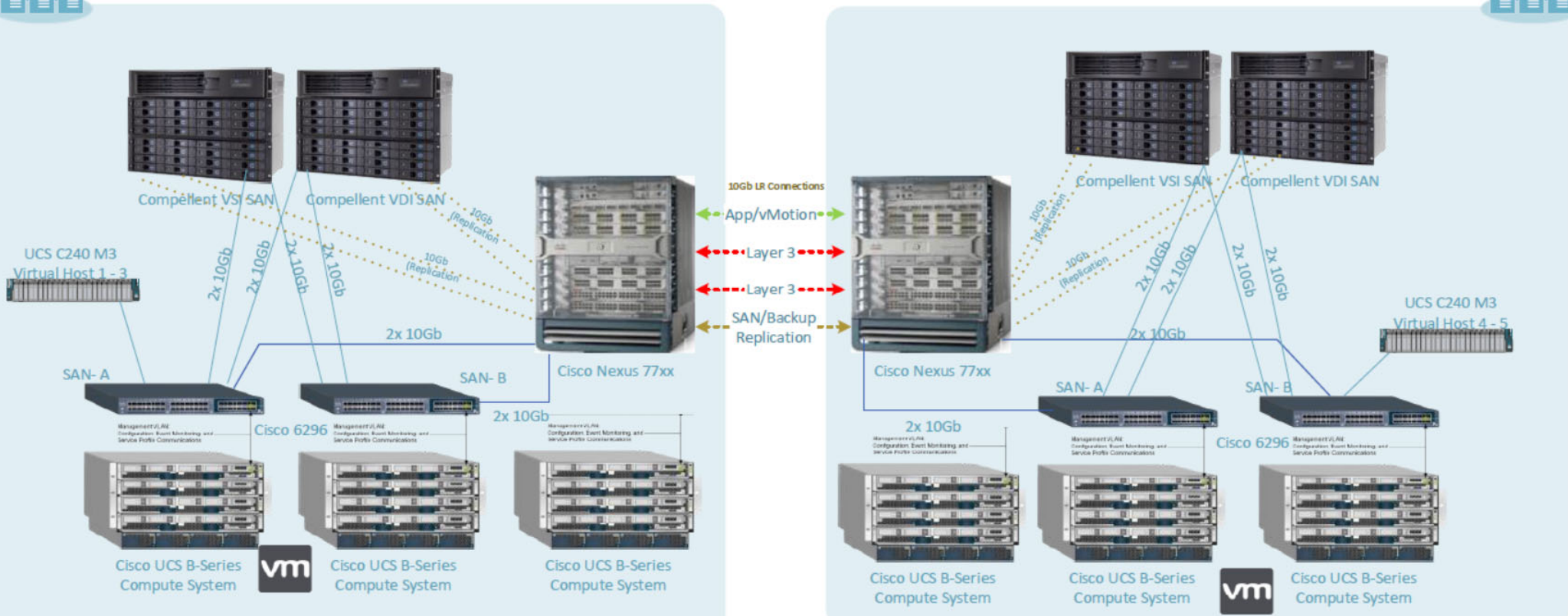


VDI/VSI Hardware Architecture As Designed

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Applied Sciences

McDowell Center



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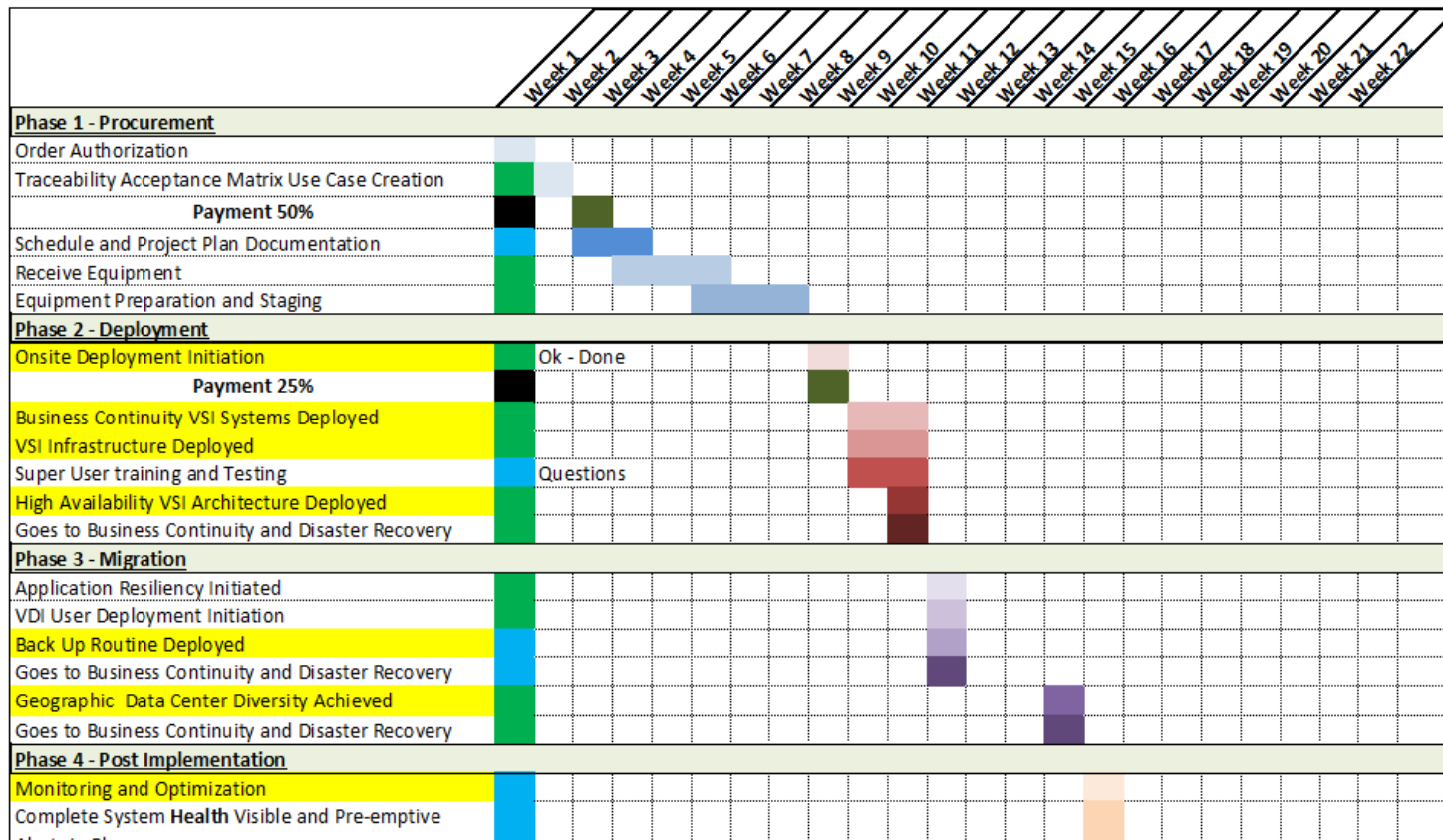
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Schedule and Milestones

Virtualization (VSI/VDI)
Implementation Timeline



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Challenges Pre-able...

VMware personnel smile at me now, before I go to the next slide!

I want to be clear...

- I do not regret for one minute using VMware, the advantages your virtualization system brings to a traditional IT infrastructure is **REVOLUTIONARY!**
- vMotion alone opens the way for an infinitely superior level of uptime, reliability, redundancy, and stability.
- We went from zero VMware to 95% in 8 months and I expected some challenges as a result. **WE ARE WINNING!**



General Challenges

- Lack of cooperation between Networking and Virtualization Vendors
 - Matching networking topology re: physical vs virtual networks – VLANs, IPs
 - Pointing fingers regarding implementation challenges – re-IPing all servers
 - Wake-On-LAN server recovery
- Confusion regarding DMZ design / security segmentation between traditional physical and virtual design – no trust in “tagged” separation
- Changing Prof. Services Personnel between project specification, sales, award and contract signing lead to VSI & VDI SOWs not signed until after project completion. VMware refused the importance of my R&V Plan.
- Bought SRM (25 servers) & “vCloud Hybrid Service” for eMail, ERP, and LMS DR and got vCloud Air and vCloud AIR DR – yet to have one server work in cloud



Virtual Server Infrastructure Challenges

- DRS vMotion caused core application server reboots – don't know why
- Affinity rules used to keep a multi-server app environments in same data center hampers desired redundancy provided by DRS
- Not enough clear and simple analogies on how traditional networking concepts translate to the virtual world (e.g., physical separation, VLANs, IPs /NICs)
- Difficulty in P2V process for some servers: failure causes of storage or compute allocation vs. OS, application, environment causes
- P2V just moves sins-of-the-past to new environment – wasn't clear we were trading a shorter migration time against sacrificing best-practices.
- Re-IP'ing server infrastructure as part of project was complex, tedious (finding embedded IPs in configs; both OS & App related, re-IP before P2V)



Virtual Desktop Infrastructure Challenges

Environmental Difficulties

- vRealize Monitoring licensing – got 300 expected 1600 (1300 Adv & 300 Ent.)
- Making Lab Desktops (no login) available off campus (student login)
- Desktop Supplicant Agent deployed via Windows GP removed and not re-deployed at next session
- Config. GPU for CAD & Adobe CS
- Properly configuring the Security and Composer servers.

Desktop Image/Pool Mgt. Difficulties

- When to use ThinApp, vs. AppVolumes, vs. Workspace, vs. Mirage – none worked fully
- ThinApp/AppVolume limitations compared to Uni-Desk – adds images.
- Interfacing vDesktops to lab microscopes, medical monitors, and other device – adds images
- Support of faculty podium systems, DVD players, etc.



Training Challenges – 6 classes, 200 hours

- I personally sat through all the training with my team. All on-site.
- Horrible Lab Environments – problems always blamed on VMs in VMs that are in VMs... The world leader should have the best systems
- Material in electronic/non-printed format negates taking of notes that result in a reference document with personal context clarity.
- All classes should have a high level product slide showing how the different products relate – referred to often to give students context
- All classes should have a Visio like slide that diagrams the product components to define context between them and the instructor should reference it at the beginning of each new module in the class.
- STOP CHANGING PRODUCT NAMES! – Who ever thought this was a good idea? A student spends most of the first day getting their arms around names and acronyms only to have them change before they actually use the product. – FWIW, I feel you ruin the “reference sale” too.
- Personal opinion, “Training should be a high quality “loss leader” – educate the masses and you become the defacto standard that will spread like wildfire.”



The Security Challenge – The Portfolio...

Does it integrate with the hypervisor?

1. Sophos™ – TrendMicro™ Virus Protection
2. Cisco® ASA 5525™ Firewall
3. SSL (Secure Socket Layer) certificates and CA (Certificate Authority)
4. SolarWinds™ Monitoring – SNMP, ICMP, etc.
5. Cisco® ISE™ (Identity Services Engine) dynamic port level security
6. Cisco® SourceFire™/firePOWER™ IPS – Intrusion Protection System
7. Qualys™ Penetration Testing – Outside-in server hardening
8. ForcePoint™ (formerly Websense™) DLP (Data Loss Prevention)
9. Palo Alto Systems® NGFW – APT (Advanced Persistent Threat) –zero day threats
10. SAML SSO (Single Sign On)
11. Secret Server™ / Password Locker with dual authentication
12. Active Directory & Group Policy systems.



2015/2016 VSI/VDI & IT Overhaul Status

Look How Far We Have Come:

IT Academic and Admin Initiatives

1. BlackBoard™ LMS to latest version
2. Solution Pro™ Reports, Automated, Workflows, and Documentation
3. Retention Alert™
4. Student Self Service Finance™
5. Student Self Service Financial Aid™
6. Entrinsic Informer™ Reporting
7. SC Reports Improvements
8. ODS SQL improvements
9. Colleague Patch Current (1 ½ yrs)
10. Colleague Redhat Linux Migration
11. Elimination of EOL Desktop UI
12. Upgrade to latest UniData DBMS
13. Colleague Monthly News Letter
14. Personal Information Update Process
15. .Net Based PO/Req. Database
16. Training and Process Documentation
17. Recent Ticket Clean up nearly 300 Tickets above the daily run rate
18. Recruiter™ CRM and Online App
19. Elevate™ CEPD Registration Mgmt.
20. Enterprise Software Architecture
21. More...

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IT Virtualization, Compute, & Storage Initiatives

1. 95% VMware® Server Virtualization
2. Deployment of VMware Enterprise Tools
 1. 2 independent VMware vSphere vCenters (VDI/VSI)
 2. vRealize Monitoring for both VSI and VDI
 3. DRS and vMotion
 4. vCloud AIR, vCloud DR in process
3. ~700 Virtual Desktops deployed with Horizon View™
4. Deployed xx applications with VMware AppVolumes™
5. Deployed xx ThinApp'd Applications
6. Deployed VMware Workspace™ and Mirage™
7. Deploying VMware® Disaster Recovery
8. Over 200 Hours of VMware Training
9. 46 Cisco UCS M4 Blade Servers Deployed
10. 180Tb Dell Compellent SAN Storage
11. Completely New IP Strategy
12. BlueCat™ IPAM and Secure DNS
13. App Assure Next Gen Backup System

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IT Network & Security Initiatives

1. Cisco Nexus 7706 Core Switches.
2. ~180 Cisco Closet Switches on a 20Gbps layer 3 backbone
3. SourceFire™ Intrusion Detection
4. ISE Identity Services Engine
 1. Wireless Self Service Portal
 2. Wired Automated Port Security
5. Qualys® Vulnerability Scans
6. TrendMicro® Virus Protection
7. Centralized SSL CA (Cert Auth)
8. Draft Enterprise Security Policy
9. Password Update Policy
10. POC on Websense™ DLP Data Loss Prevention System
11. POC on Palo Alto™ next gen Firewall with APT mitigation
12. 1Gbps Xo & AT&T Carrier Redundancy
13. 500Mbps Radcliff & PSTC Connection Redundancy
14. ONSSI CCTV Security Improvements
15. Biometric Fingerprint Scanning in AS
16. Campus Wide Cisco UCS VoIP Phones
17. Solar Winds Enterprise Monitoring
18. More...

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Future Plans

- Complete Campus Coverage with Horizon View VDI (2500 desktops)
- Off Campus Virtual Desktop access to Campus Labs (ERP and AD Integration) – VMware projects “Kick Start” and/or “LMS Link”
- PoC with VMware NSX™ and Micro Segmentation – have test env.
- ESXi integration with Palo Alto™ or CheckPoint™ NGFW
- Tighter Integration between Colleague™ ERP and Blackboard™ LMS
- Schoolcraft College Branded Mobile App (Summer 2016)
- Improved Campus Wireless Network and MDM



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QUESTIONS?