Hosted Virtual Desktop Computing as a Managed Service in Higher Ed

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Chris Blackstone, CIO Spring Arbor University
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Spring Arbor University

access interactive
IT solutions for business, education, and government

Spring Arbor University

- Spring Arbor (SAU) has 3,400 students spread out across a main campus (Spring Arbor, MI).
  - 11 remote sites across Michigan, and online.
- SAU wanted a way to provide its non-residential students (~2,000) with access to academic computer applications.
- The first year of this effort was through Navisite, a DaaS vendor, and started in Summer 2015, before Chris Blackstone, current CIO, arrived.

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Spring Arbor UNIVERSITY

Access Interactive

- Access Interactive was founded in 1985 and has grown to over 55 employees worldwide with over $20 million in annual revenue.
- A local Michigan consulting company that uses technology to fix, accomplish, or avoid customer critical business initiatives.
- As Solution Architects, Access Interactive strives to learn the customer's business domain to make the best recommendations with the strongest ROI metrics.

The Problem Statement

- Spring Arbor University was experiencing ongoing stability and reliability issues with their current provider for VDI as a Service.
- SAU's network engineer had left the University.
- SAU's needs required a deeper level of managed service to keep Virtual Desktops available and performing well.
- SAU was seeking a partner that understood their environment.

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The Solution: Smart VDI as a Service

Smart VDI as a Service (aaS) is designed to take your computing environment anywhere. From students to faculty, your desktops will be in a robust and administration-free ecosystem.

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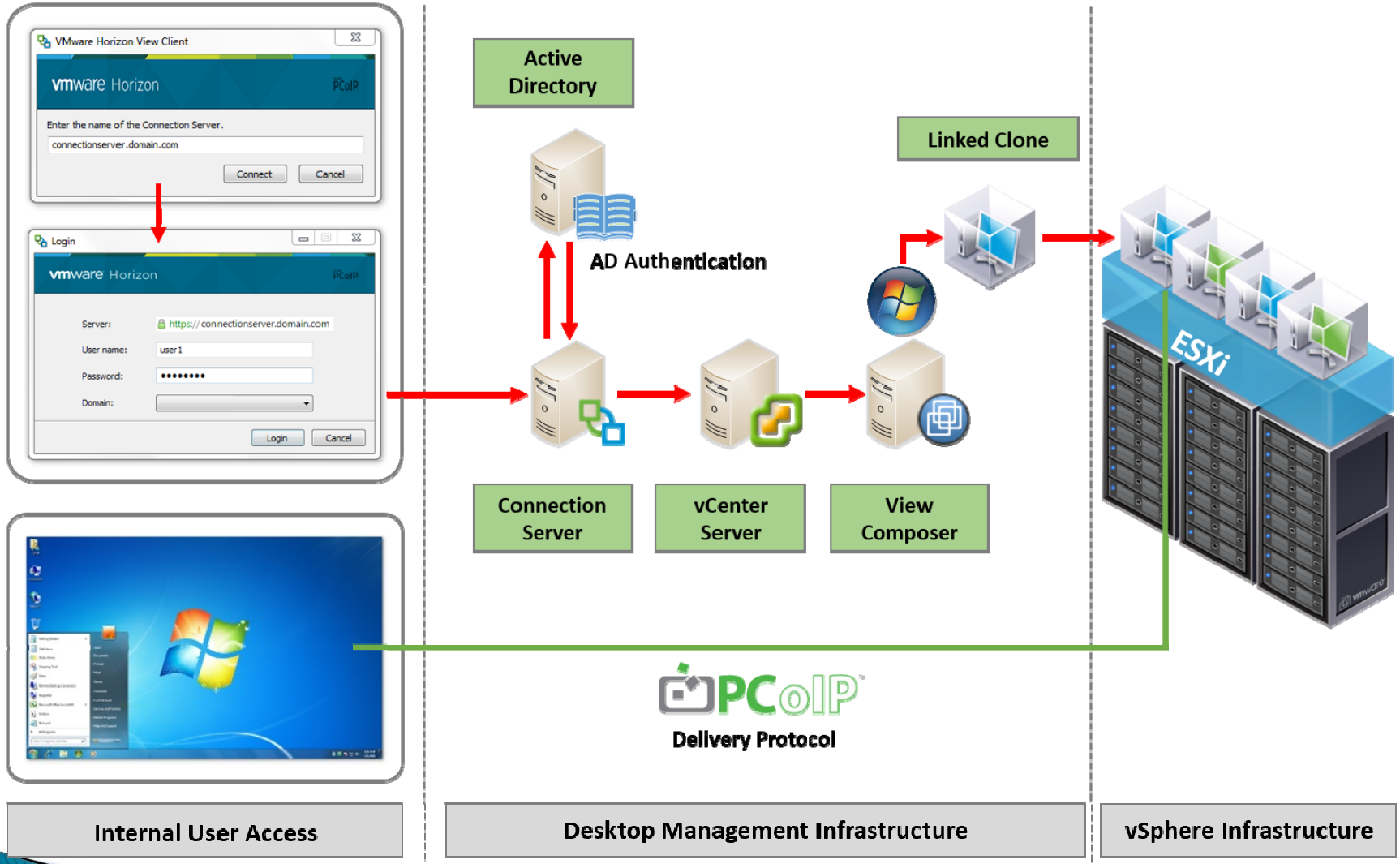
IT solutions for business, education, and government

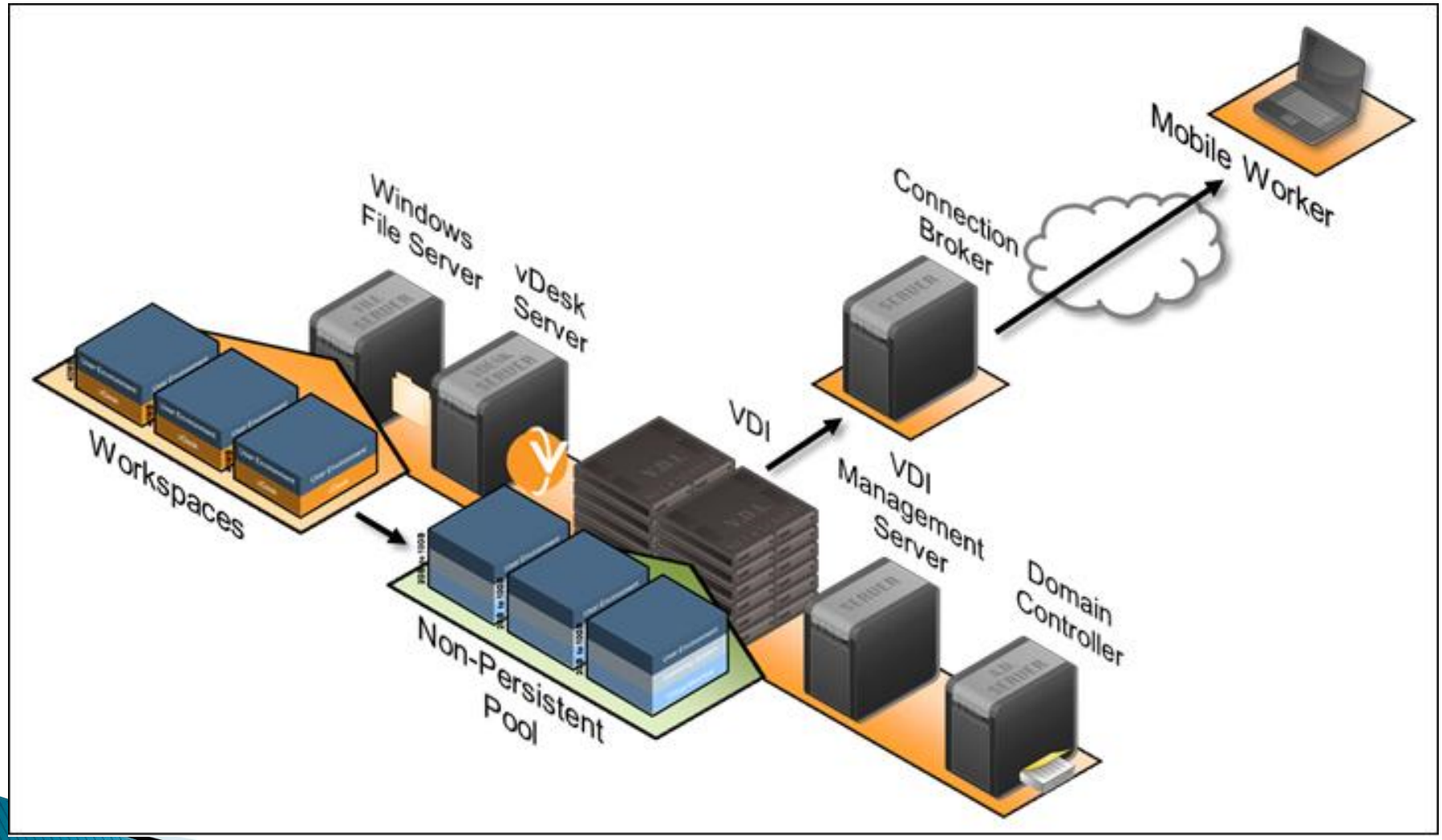
Smart VDI as a Service Benefits

- Faster setup for industry standard VDI.
- Eliminate hardware and administration overhead.
- Access applications and desktops from anywhere.
- Pay As You Go.
- Take advantage of a partner with dozens of installs.
  - Proper compute, storage, and network resources.
  - Every solution is custom designed for the customer's application and desktop delivery requirements.
  - Turnkey solution.
- Great for piloting or feasibility studies.
- Easily scales/expands to meet unique SAU needs.
- A complete VDI strategy to enhance student and faculty experience.

What the Users See and How it Works



Smart VDI as a Service



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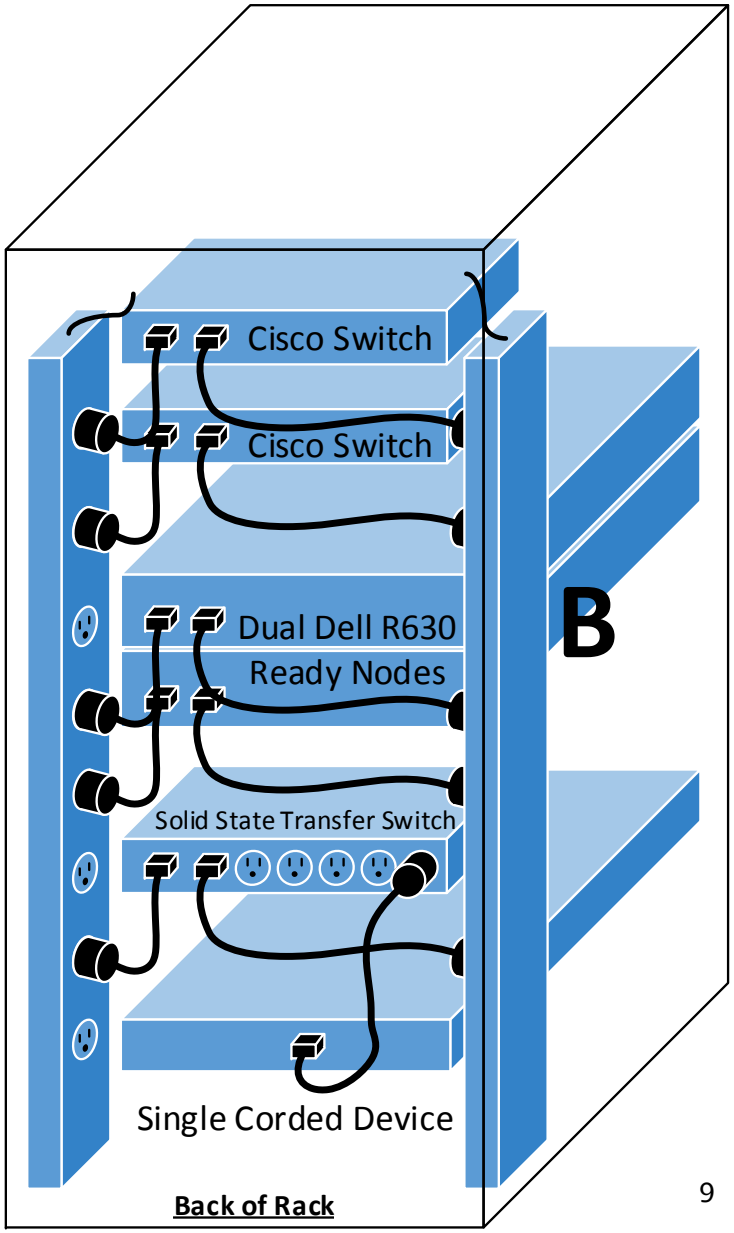
Smart VDI as a Service

- Rack, Power, Cooling
- 10Mbps Burstable BW
- Dual Dell R630 Ready Nodes dedicated to your Desktops
- Trend Micro™ Deep Security
- Microsoft Windows Virtual Desktop Access
- VMware® Horizon 7 View
- VMware® Horizon vSAN
- Image Management



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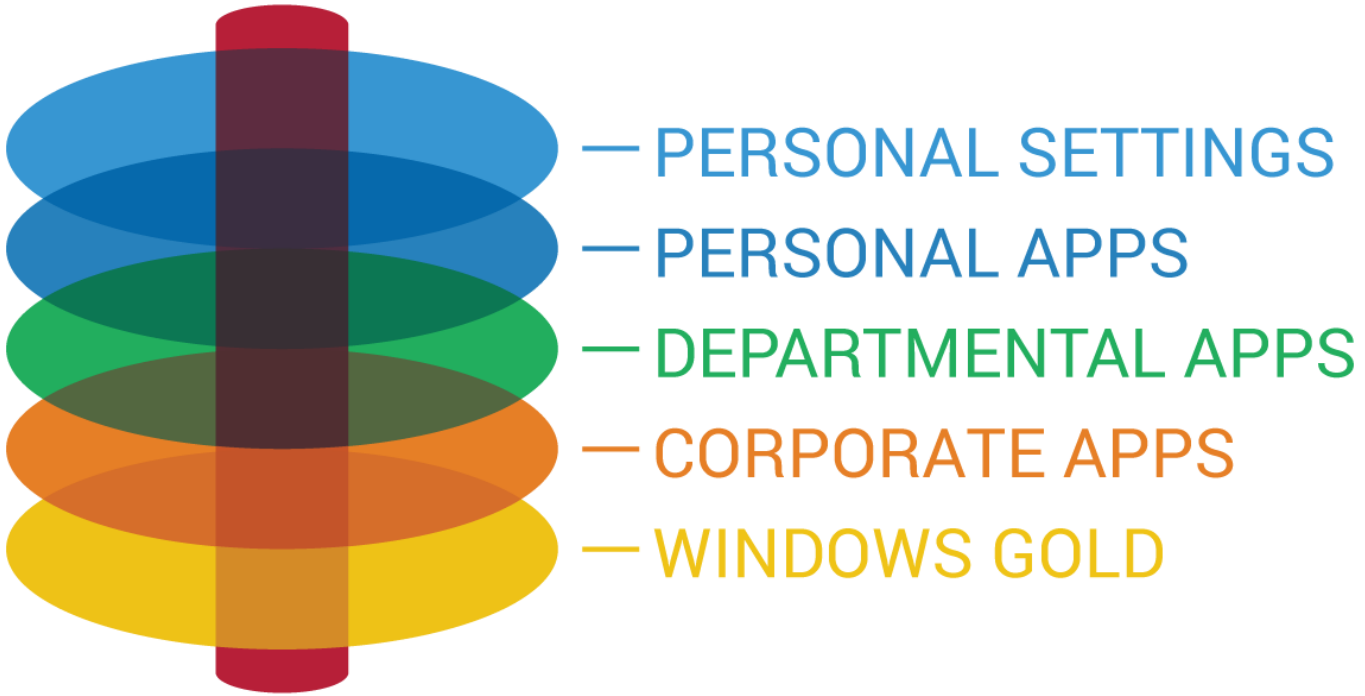
The Spring Arbor App Stack

- Windows 10 2016/2017 Academic Image
  - Adobe Reader
  - Alice
  - ArcGIS
  - BlueJ
  - Eclipse
  - Google Earth
  - iTunes
  - LadiBug
  - Maple
  - MicroLab
  - Overture
  - VLC
  - XviD
  - RosWin
  - MS Office
  - Chrome
  - Firefox ESR
  - TTERMPRO
  - AVG
  - Zoom
  - Audacity
  - Adobe AIR
  - Adobe Flash
  - QuickTime
  - Windows Live Essentials
  - Java (7.45/51/67 both 32/64 bit; 8 32/64 bit; 8.51 32/64 bit)
  - Lego Mindstorms
  - OBDC Driver CXConnect

The Application Delivery Experience

- VMware has mastered a layered approach to delivering applications to users.
- With a surgeons precision, we can change very small details, seamless to users.



Doing VDI Right – Some Best Practices

- Do your homework.
  - Access Interactive consumption analysis was leveraged to characterize desktop requirements across campus infrastructure (similar to DPACK (Dell Performance Analysis Collection Kit) for server analysis).
    - How much horsepower do you need?
    - Properly size the infrastructure – Storage, Memory, CPU, Network capacity, plan for growth.
  - Don't overpromise – "CAD runs great on these GPUs, let's try a couple CGT Labs."
  - Do some testing to make sure you know what apps can be thin-app'd, App Volume'd, etc. (# of Images).

Doing VDI Right – Some Best Practices

- Find an internal champion – someone who can share the vision; turn detractors into advocates.
  - Many ways to do it wrong – few to do it right.
  - Ultimately, can the user get their job done better…
  - Close interaction with end user is essential.
    - VDI gets blamed for everything, like: “It’s the Network!”
- Start with a lab – work with faculty expectations.

Doing VDI Right – Some Best Practices

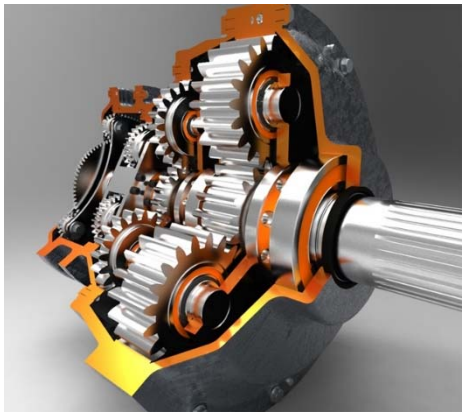
- Flash – GPUs – Cores – Auto Resource Management – make solutions not excuses.
- Be mindful of latency between SAN and CPU.
- Be mindful of network latency between data center and desktops.
- GPU (NVIDIA Tesla M60 GPU or NVIDIA Grid K2 GPU) – and remember VDI likes all Flash arrays!
- Be careful with thin provisioning – especially double-dipping with VMware and SAN – avoid weirdness.

Doing VDI Right – Some Best Practices

- Desktop warming strategy – classroom turnover and boot storms vs image explosion (use an N+1 Strategy).
  - SAN auto-tiering can be your enemy – pinning VDI provisioning to flash vs auto-tiering.
  - Resource Management (DRS vs other ways – need dynamic resource management not once per day).
- End user acceptance can hinge on USB drive, DVD Player, Doc Camera, or capture software for microscope.
- IOPS for VDI – different than VSI – separate the infrastructure.
- Look closely at vSAN and hyperconverged, performance.
- Pick a good implementation partner whose done many.

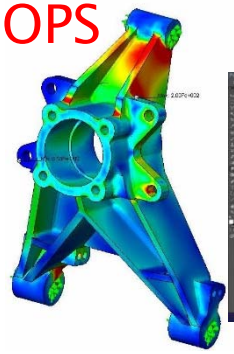
Doing VDI Right – Some Best Practices

The Challenges of Virtual Desktop Computing in Higher Ed



Finite Element Analysis

IOPS



Computer Aided Design

GPUs – Graphics Processing Units

Computer Graphics Technology

Document Cam

DVD Player

Projector

Mechatronics

Electron Microscope

Special Interfaces, Drivers, etc.

Emergency Room Operations

Nursing

Welding and Manufacturing

Machine Interfaces

Doing VDI Right – Some Best Practices

Explosion of Platforms when heavy lifting is in the Data Center



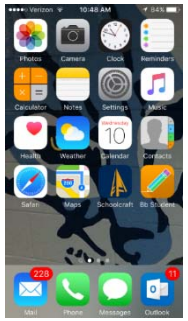










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Smart VDI ROI

- Embracing a BYOD.
- Transferring device management and troubleshooting to the users.
- Increase efficiency.
- Reduce Capital expenditures.
- Avoid capital spending with Smart VDI monthly payments.
- If you're licensing from Microsoft, you can enter an Enterprise Agreement to save money.
- Redeployment of IT staff to other projects creates a greater value for the organization.
- Increase global customer service.

The Right Data Center Infrastructure

SC Technologies Center, Inc.

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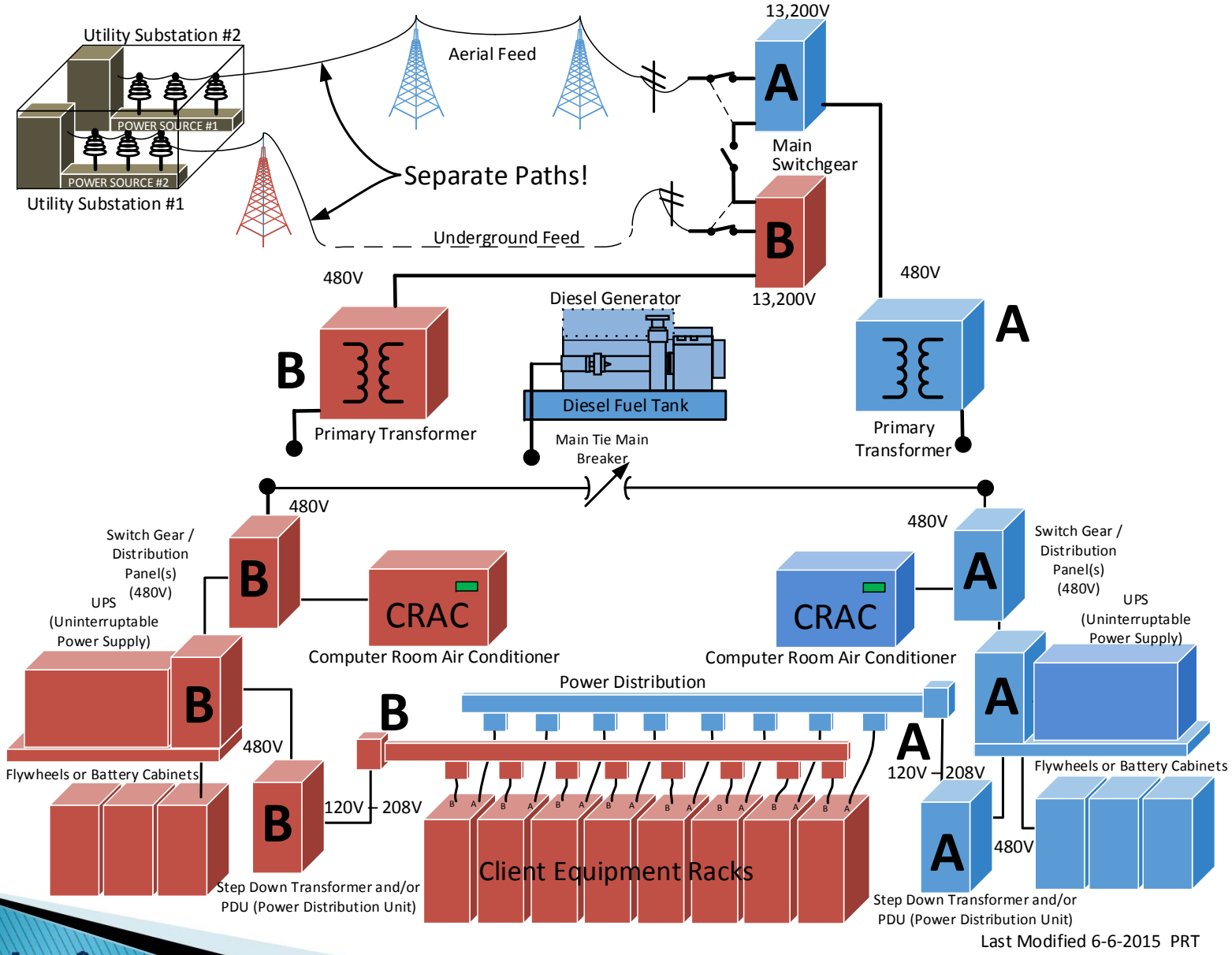
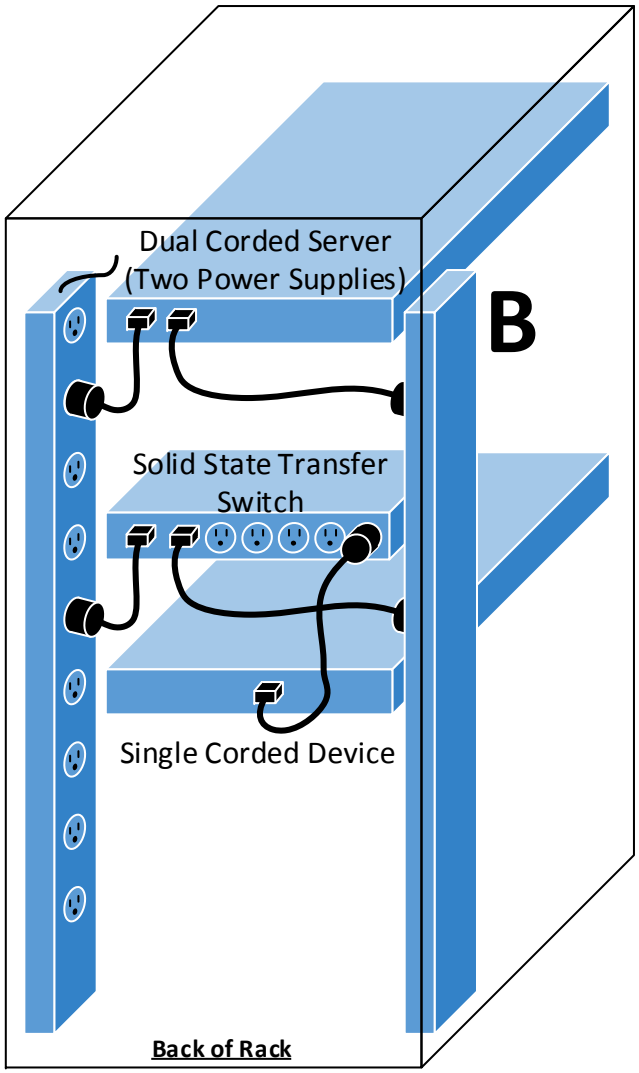
Data Center Power Design

- Dual utility feeds.
- Generator backup power with minimum of 48hrs of diesel fuel.
- Dual UPS (Uninterruptable Power Supply).
- 8KW/rack – 208V/30A/3ph.

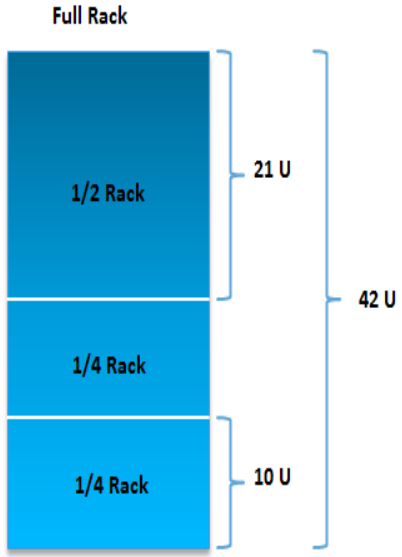
Data Center Power Plant



Power Deployment

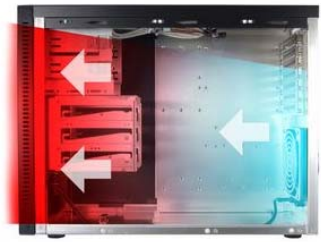


Redundant 3-Phase Power



Cooling Considerations

- Cooling 101 – Device Fans pull air through.
- Avoid air mixing as much as possible.
- Cooling is largest "non-IT" power usage; therefore, efficiency is paramount.
- Leakage – open spaces create air mixing, low air velocity, turbulence; equals loss of efficiency.
- N+1 cooling capacity.
- Goal PUE (Power Utilization Effectiveness)<= 1.5.

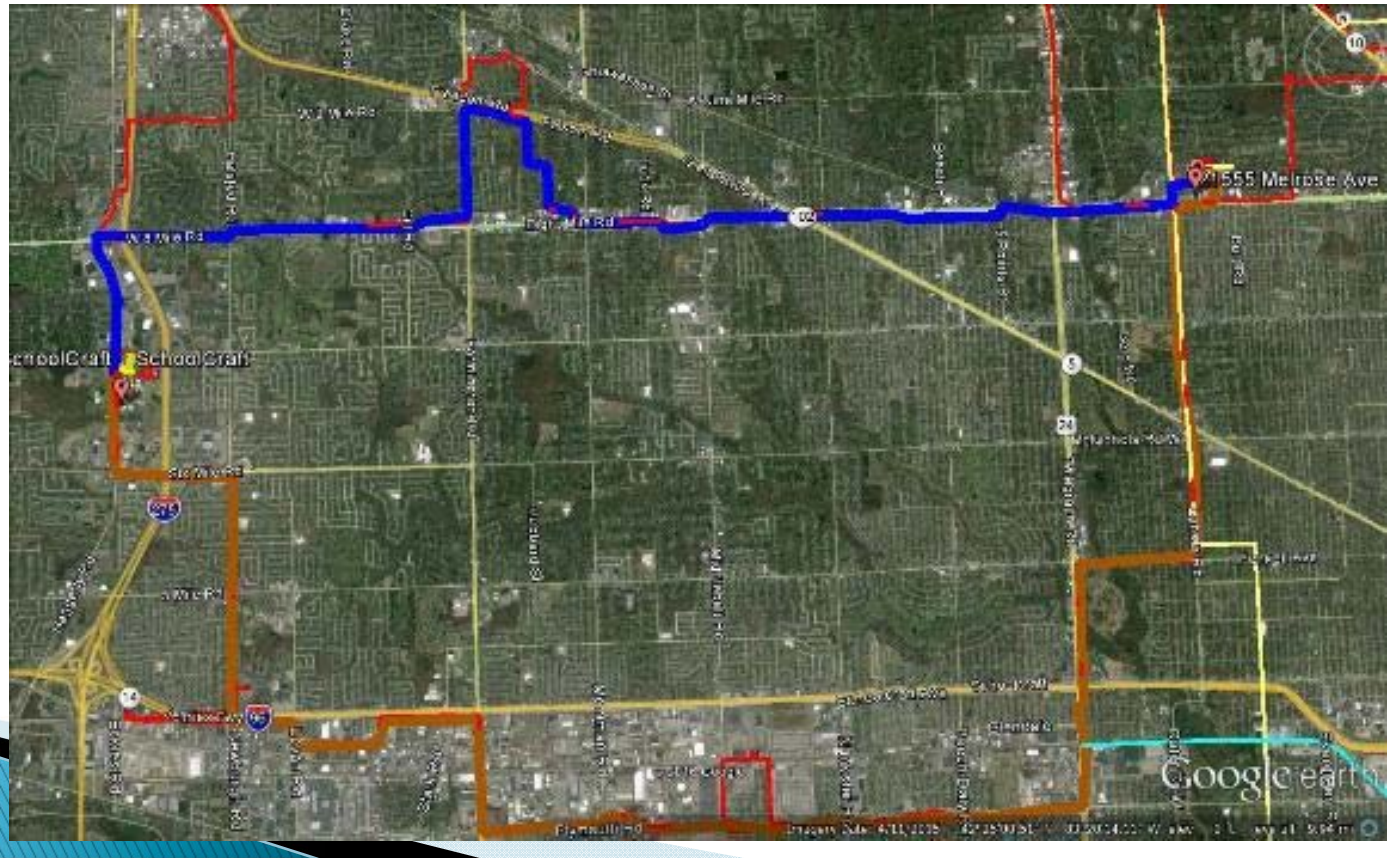


$$PUE = \frac{\text{Total D. C. Power}}{\text{Power to Racks}}$$

Computer Room Air Conditioner

Network

- It is important to be able to offer multiple carriers to potential customers to interface with their HQ.
- Another consideration is to have those carriers coming in through diverse entry points and giving them diverse paths; giving customers redundancy via carriers.
- The connection between customer and carrier should also be multi-carrier.



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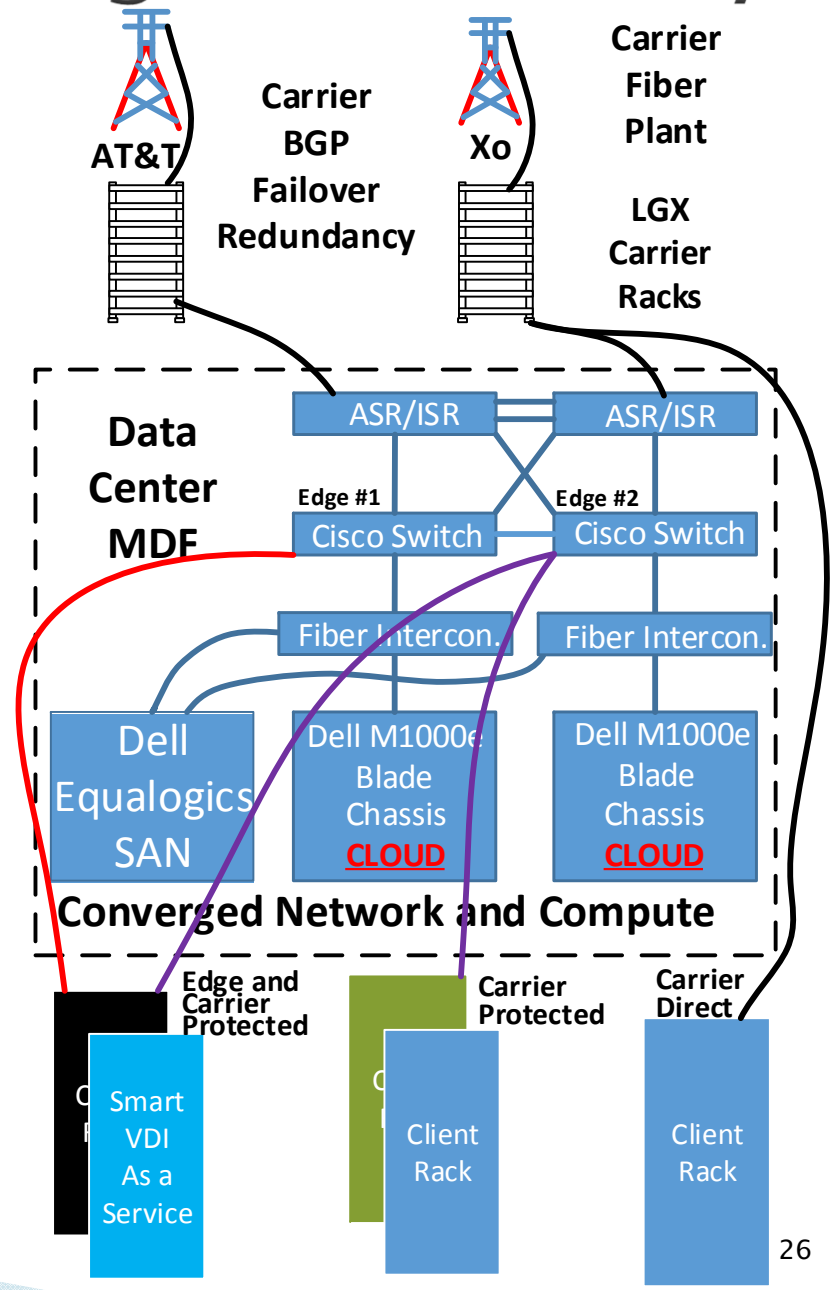
Network Design

- Entry pathways owned by Schoolcraft.
- Dual Cisco ASR 1000 carrier routers to MDF.
- Dual edge switches (HSRP, VSS, VDC).
  - Cisco 3750 or better to start.
- Power via A-B UPS.
- Dual Carriers XO and AT&T.

Cisco Nexus Core Network

Data Center Networking Redundancy

- Multiple carriers.
- Multiple entry points (Diverse Entry).
- Multiple carrier paths (Diverse Path).
- Dual lateral connection for primary carriers.
- BGP (Border Gateway Protocol) exterior gateway protocol designed to exchange routing.



Security

- Alarm is active 24/7.
- Dual authentication with Prox Card and Biometrics.
- 24/7 monitored.
- CCTV mega pixel security cameras with remote viewing.
- Motion activated video recording with 30-day retention minimum.
- Non-Clients/Vendors - 100% escorted.

Security Video
Motion Recorded

Dual Authentication Access
Biometric & Proximity Card

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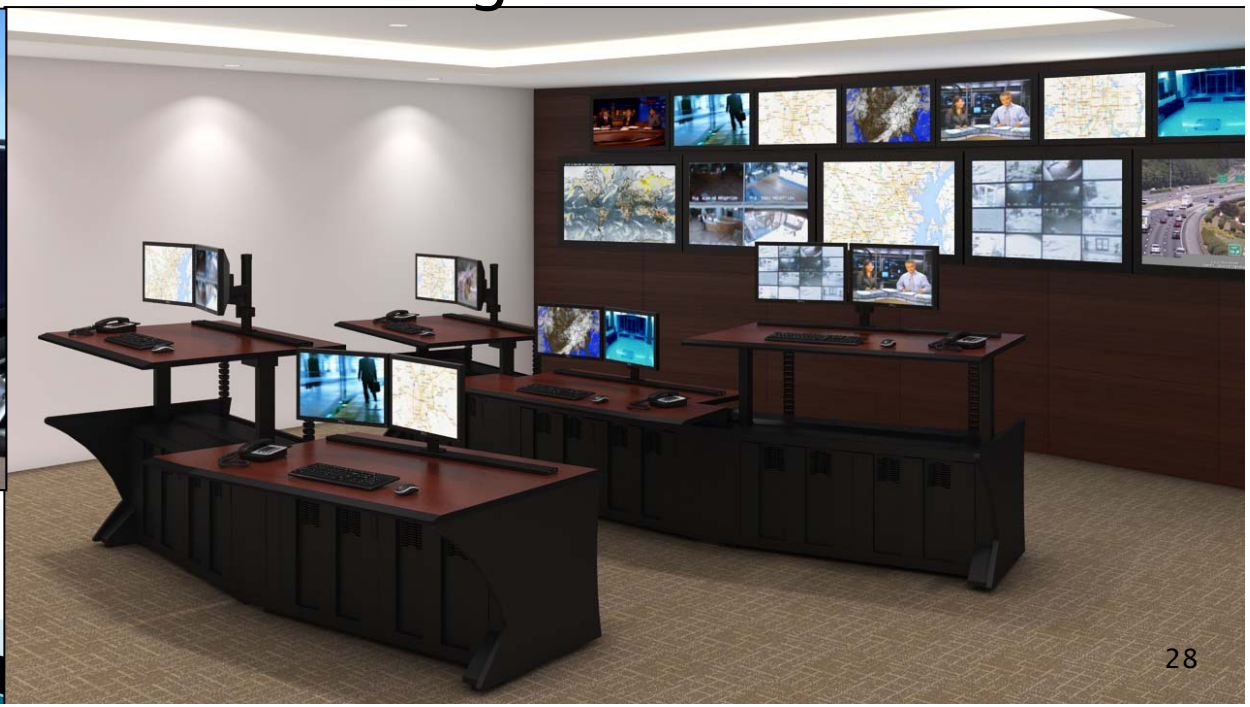
Security

- State-of-the-art IOC (Intelligence Operations Center).
- Operated by the certified PA331 Police Force.
- Connected to CLEMIS – Courts and Law Enforcement Management Information System of Oakland County.
- Municipal Grade RF Com Capable for Dispatch.
- EOC (Emergency Operations Center) ready.
- Social Media Keyword Monitoring.



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EPO – Emergency Power Off

- Building vs Room.
- UPS vs Feeder Breakers.
- General vs First responder activation.
- Fire Suppression Activation.
- Code requirements… Equipment servicing room.
- CRAC's and IT equipment vs. CRAC's only
- EPO
  - First responder only
  - Equipment servicing room – CRAC's – Agent effectiveness
  - IT Equipment power – optional
  - Power for lighting & utility outlets

NEC
Article 645 – B

Disconnection Means (Emergency Power Off) Section 645.10 of the 2008 *NEC* requires that there be disconnecting means for each zone in the IT room. Section 645.10 of the 2011 *NEC* has two alternatives for the disconnecting means, (A) covers remote disconnect controls with requirements the same as the 2008 *NEC* and (B) covers critical operations data systems. Critical operations data systems (defined in 645.2) are permitted to have alternate disconnecting means provided that five additional conditions are met:

(1) An approved shut down procedure has been established
(2) Qualified personnel are continuously available 24/7
(3) Smoke sensors are in place.
(4) A fire suppression system is in place.
(5) Plenum cables are used for signaling.

Fire Suppression

- New evaporative particulate.
- Inert gas HFC-125 extinguishing system – detection at 165°.
- Dry pipe – dual action – activates at185°.
  - 2 detectors active to charge lines.
  - Pellet melt in water zone.
- First Responder training to educate – “water and axes are not needed!”

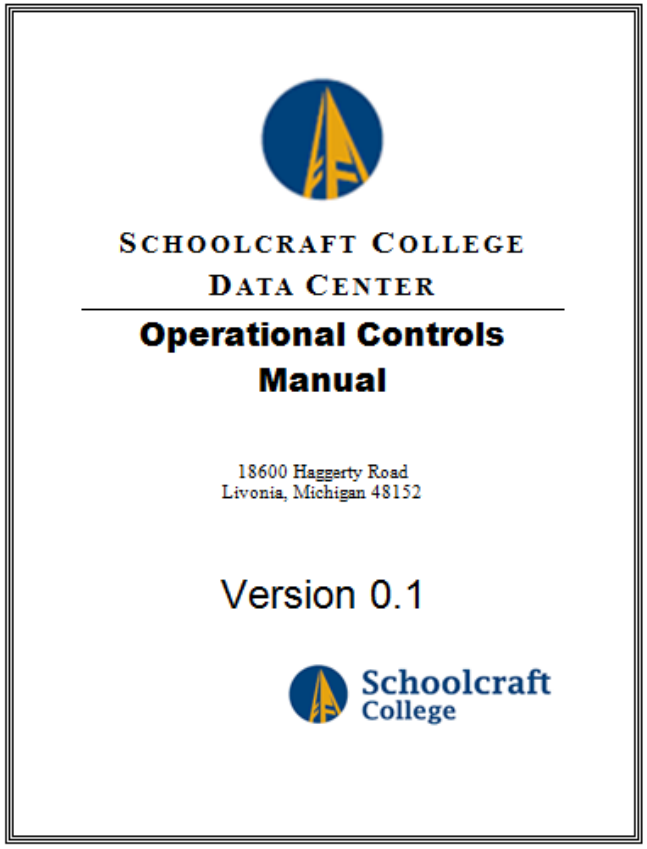
HFC-125 Fire Suppression

Monitoring

- Preventative vs Reactive
- How much – Granular view vs Sensory Overload
- Methods & Protocols
  - SNMP
  - BACnet
  - Mod bus
  - Dry Contact
- Alerting
  - emails
  - text messages
  - phone calls
  - audible alarms
- Response Policy
- Differentiate Infrastructure HW vs Network

Management Control Points

- Policy Compliance – SSAE16 SOC2, HIPAA, PCI, etc.
- ~100 Control policies with Quality Control repository.
- Operations guide.
- Risk Analysis & Mitigation Plan with over 100 validation points.
- Disaster Recovery Plan – First Responder Guide.
- Employee Handbook.
- DCIM & asset management.
- Incident management & ticketing system.


SCHOOLCRAFT COLLEGE
DATA CENTER

Operational Controls Manual

18600 Haggerty Road
Livonia, Michigan 48152

Version 0.1

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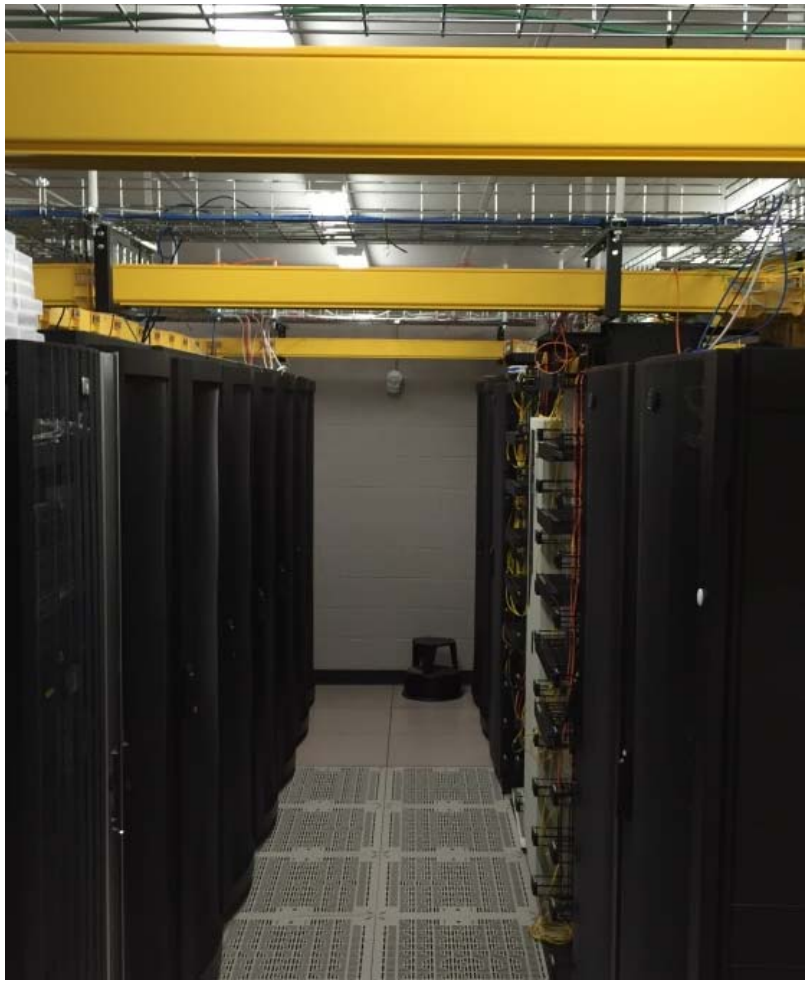
Maintenance

- Preventative
- Service-effecting or Non-service-effecting
- Notification of Clients (2-3 weeks in advance)
- Network and compute redundancy, and Disaster Recovery testing
- CRAC's and Condensers
- Primary Transformer
- Generator – Switchgear
- UPS – using wrap around maintenance bypass
- Breakers (ARC Flash) and Coordination analysis
- Fire suppression and EPO
- Transfer switches and Control logic

Data Center Footprint



Combo Rack Locks

Fiber

Questions…?