vLabs at UMass Lowell

IMPROVING THE ACCESSIBILITY OF EDUCATION

Who is this guy?

- Steve Athanas
  - Director of Platforms & Systems Engineering
  - UMass Lowell Alumni, 2004 & 2017
  - Boston VMUG Leader
  - Member of Global VMUG Board of Directors
  - VMware vExpert 2013 - 2017
  - VCP, MCITP, MCSE, MCSA, ITIL

- Reach me at
  - stephen_athanas@uml.edu
  - Twitter: @steveathanas
  - LinkedIn: www.linkedin.com/in/SteveAthanas
About UMass Lowell

- Mission: To provide an affordable and accessible education of high quality and to conduct programs of research and public service that advance the knowledge and improve the lives of the people of the Commonwealth, the nation and the world
- Founded in 1894 as Lowell Normal School
- Merged into University of Massachusetts in 1991

Quick Facts

- 17,184 students (Fall 2014)
- NCAA Division I Athletics
- 100+ Undergraduate Majors
- 40+ Graduate Programs
- Ranked 13th in U.S. for intellectual property generated
- Conferred 3,720 Degrees in May 2016
- National University Ranking: 152
- Public University Ranking: 78

How We Started in VDI

OR: HOW TO SAVE MONEY AND LOOK GOOD DOING IT
Challenges Facing the University (Circa 2013)

- Explosive growth – limited classroom space
- Strained lab technicians
- Large commuter population
- Enormous carbon footprint
- Aging classroom and lab PCs
- Students with multiple devices – who like using them
- Difficulty staffing labs 24/7

Forget Ready - Just Go!

- January 2013: New CIO appointed
- March 2013: Project kicked off
- April-May 2013: User testing
- May 2013: Production design
- June-July 2013: Ordered hardware & software
- July 2013: Build, test & deploy
- August 1-2, 2013: Final “flight test”
- August 5 2013: “Soft open”
- August 16, 2013: Fully production ready, Go-live.
Testing Before Design

- Before buying a ton of hardware and software we wanted to test with students – the ultimate consumer
- Borrowed a single server and spun up a small VMware Horizon View environment
- Stealth testing: getting oblivious users to test your product
  - Put 4 terminals into different labs and watched students use them
  - Concurrently tested endpoints, pool configuration, and performance

The Solution

Hardware

- Data Center
  - HP BL460c G8 Blades
  - EMC VNX 5300 Storage
    - Mix of 15K and SSD
  - KEMP Load Balancers
- Endpoints
  - Dell | Wyse P25
  - BYOD

Software

- Data Center
  - VMware Horizon View 6.1
  - vSphere 6.0
  - vCenter Operations Manager
- Endpoints
  - None, intentionally
  - BYOD: Horizon Client
Response & Results

- Survey distributed to students who had used vLabs at the end of the first semester
- Survey Results
  - 44% of responses said they had not used vLabs or didn’t know
  - 17% of remote (non vLabs terminal) users have used their iPhone
  - Most popular applications are Microsoft Office & web browsers
  - 65% of remote users are using it from off-campus home
  - 80% agree or strongly agree vLabs is easy to use
    - Remember: 44% didn’t even know they were using vLabs!!

Grade: A-

Response & Results

- 63% of respondents either agree or strongly agree that vLabs has helped their academic success
2013 - 2016

- The project was so successful that faculty and administration were coming to IT asking for more vLabs
- We continued deploying vLabs at an annual growth rate of 100%
- We started exploring AppVolumes
  - Realized quickly we could consolidate multiple pools into a single master pool
  - Greatly reduced administrative overhead
  - Improved student experience (less pools to wade through)
- We were driving efficiency like never before

- And then Engineering called...

But Can it Do SolidWorks?
OR: A MATTER OF PRIUSES AND FERRARIS
The Francis College of Engineering

- One of the fastest growing schools at UMass Lowell
- Running out of classroom space
- Aging computer labs with inconsistent and inadequate performance
- Key software
  - SolidWorks
  - AutoDesk Suite
  - MoldFlow
  - And over 70 other applications
  - MasterCam
  - Mathematica
  - Matlab

Anyone Have a Supercharger?

- Knew NVIDIA & VMware vGPU were out in the market
- Decided to give it a try
- Acquired 2 each NVIDIA GRID K2 and K1 cards
- Key application test results:
  - “This would be OK”
  - “It’s alright”
- And then NVIDIA released GRID 2.0 and the M60s...
Ever Seen a Prius Go 200 MPH?

- M60 Changed Everything
- Ran the same tests as with the K1 and K2 cards
- Feedback on key applications:
  - “I have a $10,000 workstation at work. This isn’t quite as good - but it’s close.”
  - “I want this. Now. I’m taking this with me.”
  - “Wow. I didn’t know SolidWorks could do this.”

The (New) Solution: vLabs:Workstation

**Hardware**
- Data Center
  - Dell | Compellent SC8000 All-Flash
  - Dell R730 Servers
  - NVIDIA M60 GRID Cards
  - KEMP Load Balancers
- Endpoints
  - Dell Wyse 5300
  - BYOD

**Software**
- Data Center
  - VMware Horizon 6.2
  - NVIDIA GRID
  - vSphere 6.0
  - vRealize Operations
- Endpoints
  - Still none, still intentional
  - BYOD: Horizon Client
Response & Results

- IT is a thankless business
- And yet, we’re getting “thank-yous” from the faculty
- Originally purchased 100 licenses
  - Hit 151 licenses on day 3
  - Explosive takeoff – technical users that get it immediately

Grade: A+

What’s Not To Love?

Physical Lab PCs
- Logon times of 4-6 minutes
- SolidWorks startup often crashed
- Rendering in SolidWorks rarely completed
- Sometimes it works, sometimes not
- 1000 people sneezed on this PC

vLabs:Workstation
- Logon times under 60 seconds
- Start SolidWorks in under 20 seconds
- Can do 5+ simultaneous render operations successfully
- Predictably stable performance
- It’s your laptop. Did you sneeze on it?
Current Status
SOME GREAT THINGS WE'RE DOING TODAY

It Keeps Getting Better

- We’re driving efficiency AND performance - and killing it
- Upgraded to GRID August 2016 release
  - 20-30% improvement in application performance
  - Simple upgrade – planned and executed in under a week
  - Non-disruptive to student work
Recent Changes and Updates

- Deep application use insight provided by StacksWare
- Windows 10 rolled out to most of the campus
  - Large performance difference between systems with GRID and without
- All VMs are non-persistent but have some quasi-persistence with VMware UEM

Key Benefits of Virtual Desktops

- Predictable performance
- Enhanced security
- Reduced student burden
- Better faculty flexibility
- Less IT effort required
- Transforming Education
Less effort required by IT at scale

- Reduced time deploying images
- Focus IT staff on more strategic priorities
- Opportunities for IT staff to grow modern skills
- Improved hardware lifecycle reduces deployment costs (operational & capital)

Predictable Performance

- Eliminates variance between desktops
- Student devices aren’t a factor in performance (academic or technical)
- No “computer rot” as semester/year go by
- Faculty can better time exercises to class
  - Better student experience
Enhanced Security

- Non-persistent desktops enable virus-free computing
- Malware protection at the server layer
- Patching is vastly simplified – better policy adherence
- Easily enforce proper logons for auditing

Reducing Barriers to Education: Reduced Student Burden

- Eliminates “Drive or Buy” decision
- Functions on virtually any hardware
  - Including a Chromebook.. Or an iPad..... Or even a Raspberry Pi!
  - Use equipment students have or can afford
- Promotes better school/work/life balance

It makes it so convenient to work from anywhere. Now I can easily start work in the computer labs and pick right back up where I left off at home. It's seamless."

-Joshua Zubricki
Master’s Candidate
Plastics Engineering
Transforming Teaching: Better Faculty Flexibility

- No need to explain technology – show it in the classroom
- Eliminates booking computer labs in advance
- Use any application in any room at any time
- Allows immediate recitation after lecture in student groups in the classroom
- With Chromebooks and BYOD, labs now come to the class instead of the other way around

"It has been a total game-changer. It not only allows us to maximize our computer lab facilities, but it changes the way people do work. It gives students a lot of flexibility."

-Stephen Johnston
Associate Professor
Plastics Engineering

Reducing Our Carbon Footprint

- vLabs uses 90% less energy than previous computer lab setups
- Students who live off campus needn’t come back to campus
  - Reduces carbon footprint and pressures on parking
- Faculty can use vLabs to telecommute when necessary
Novel Approaches To Old Problems

- Biology web labs
- Nursing testing rooms
- It’s not just academic
  - HVAC technicians
  - Police cruisers
  - Security cameras

Wash
Rinse
Repeat
Fixed
VDI

Challenges and Solutions
OR: HOW WE STEPPED UP OUR GAME SO STUDENTS CAN UP THEIRS
Students Don’t Read Release Notes

- First use case on Day #1 in 2013
  - Netflix
  - Used a ton of vCPU to render the video – degrading performance
  - Needed to add another vCPU
  - Decided against hardware PCoIP accelerator

- Students use video and audio heavily
  - Sometimes even for school

- End user experience is everything
  - Build for what they actually do

Getting Data In And Out is Critical

- Students primarily transport data on USB
- Teradici terminals have poor USB bandwidth
- Low power draw means no external HDDs
- OneDrive WebDAV integration works great for students
  - Not quite simulation-IO ready
- Provided some flash storage space for students to do computations
  - Shared space for group work
This Isn’t Disney World – No Waiting

Parent VM Size
- Engineering VM is roughly 280 GB
- Recomposes can take forever
- Moved many applications – even large ones into AppVolumes
- Didn’t lose any performance or GRID compatibility

User Environment Manager
- It can take 20 minutes to set up certain applications for use
- Saving those settings is key to improving user experience
- Except UEM likes to save Chrome cache as well
- Excluded Chrome from UEM and reduced logon times significantly

Creative Solutions for Creatives

Moldflow application runs massively complex simulations
- Designed to take up 100% of CPU resources
- Crowded out PCoIP service in View
- Solved with new 32 core solver node
- Amazing performance – AND ability to still use the system during simulations
Christmas Wish List

- vMotion for vGPU systems
  - Currently have some minor balancing issues which can crowd one host
  - Initial placement by VMware doesn’t look at host’s current load
  - More of an issue with rapidly churned non-persistent systems

- Solved by adding more hosts – losing some density

- Not by any means a show stopper or an impediment for us

Thank you!
KEEP IN TOUCH!

- stephen_athanas@uml.edu
- @steveathanas
- www.linkedin.com/in/SteveAthanas