CUSTOMER EXPERIENCES WITH GPU VIRTUALIZATION AND 3D REMOTING

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HDX 3D PRO - REAL CUSTOMER EXPERIENCES

- Industry leaders have been delivering centralized 3D graphics applications using Citrix XenDesktop HDX 3D Pro since 2009
- Range of software and GPU hardware technologies
  - “Software GPU”
  - Dedicated GPUs
  - Shared GPUs including GRID vGPU
CITRIX MILESTONES IN 3D GRAPHICS REMOTING

2006
Project K2 delivers CATIA to Boeing Dreamliner designers

2009
GA of XenDesktop HDX 3D Pro with Deep Compression

2011
XenServer 6.0 hypervisor introduces GPU Passthrough

2012
Higher fps via NVIDIA GRID™ API plus improved compression

2013
OpenGL & DirectX vGPU / GPU Sharing with NVIDIA GRID™ cards
**XenDesktop HDX 3D Pro**

**XenDesktop VDI**
- Single-user
  - Windows 7 or 8

**XenApp**
- Multi-user
  - Windows Server
  - 2008/2012 RDS

Any device

ICA

XenServer or vSphere/ESXi or Bare Metal

1 user/machine:
- XenServer/vSphere direct GPU passthrough or bare metal

N users/machine:
- XenServer NVIDIA GRID vGPU

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Insider tips: GPU passthrough is a great option for high-end users doing intensive simulations

- Servers like the HP ws460c Gen8 can take 8 GPUs, and even larger servers are coming this year
- Full CUDA and OpenCL support (not yet available with GRID vGPU)
- Well-established technology (XenServer and vSphere/ESXi)
- Can mix GPU passthrough with vGPU on NVIDIA GRID K2 and K1 cards
- High-end designers often require other parts of the HDX portfolio
  - 3D Space Mouse, printers, secure smart card access, etc.

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HDX 3D Pro client options
Desktop Virtualization for High-end Graphics Users

Content creation:

Content access:
Segmenting the user population

Tier 1: Professional users (e.g. design engineers, radiologists)
• Top performance (VDI with dedicated GPU or high-end vGPU profile)
• 3D mouse

Tier 2: Power users (users who need to view/edit large 3D models)
• GPU sharing (RDS or VDI)

Tier 3: Knowledge workers
• Software rasterizer or highly shared GPU
Why customers have adopted HDX 3D Pro

*Powerful business drivers*

Global workforce
Security of Intellectual Property
Work-from-home
Disaster recovery
Mobile device access
Faster time-to-market
Cost efficiencies
Citrix partner IMSCAD - Delivering Autodesk Applications using Citrix XenApp and GPU sharing

The Partner

IMSCAD are a specialist resource company for Autodesk users and partners; key business activity is the delivery and support of CAD applications virtualized on the Citrix platform.

Experience

- 24/7 support for mission critical, customer environments through global data centres since 2003
- Solutions include XenApp and NVIDIA GPU sharing
- Experienced with Architectural, Engineering and Construction AEC/BIM customers and their challenges:
  - Geographically diverse teams
  - Working in challenging remote locations
  - Need for mobility
  - Large scale architectural models and data transfer
Global Architecture

The Customer
Kohn Pedersen Fox Associates (KPF) is one of the world’s pre-eminent architecture firms, with 6 global office hubs and projects in more than 35 countries.

Challenge
• To virtualize Autodesk Building Design Suite 2013, Adobe Creative Suite 5.5, Rhino, MS Office.
• KPF wanted to offer mobile workers the same performance as a workstation in the office.
Global AEC/CAD

The Solution
- Citrix XenApp
- HP DL380p for most users
- NVIDIA GRID K1 cards
- 20 CAD users per HP DL380p
- HP ws460c Gen8 and NVIDIA GRID K2 and XenDesktop 7.1 with XenServer 6.2 vGPU for the heavy power users
- Citrix NetScaler for secure access by 3rd parties and remote staff

The Results
- “Within a short period of time users were logging on remotely on their iPad’s and using Revit, and one user even connected when on a plane flying from New York to London.”

“We were impressed with the performance of all the applications, in particular when accessing from home... It doesn’t matter what type at device our architects are using. Using any hardware from anywhere.”
--- Ryan Gyselinck, KPF IT manager
FOLLOW-UP

- [http://imscadglobal.com](http://imscadglobal.com) or Adam.Jull@imscadglobal.com

- UK based Open Boundaries are looking for AutoCAD users for a large scale user trial, try the technology with no hardware outlay: info@openboundaries.co.uk

Insider tips: Autodesk applications

- Check out the Autodesk support matrix: www.autodeskandcitrix.com
- Many Autodesk applications require you to explicitly turn on “hardware acceleration”
- Turning hardware acceleration off can be useful for investigations
- Autodesk can be CPU intensive depending on users’ workflows
  - Check the CPU and GPU usage
- XenApp 7.5 includes experimental support for CUDA and OpenCL; deployments of Autodesk and Adobe seem to benefit; feedback welcome!
Knightec AB - Citrix XenDesktop and GPU passthrough enabling high-end CAD and CAE simulations for Enterprise Manufacturing

The Customer
Knightec AB leading Scandinavian technical consultancy in product and production development. The firm’s 350 engineers collaborate from throughout Sweden advising and implementing solutions for tier 1 European design and manufacturing companies.

The Partners
Knightec worked with AceIQ and IMSCAD

The Challenge
• Geographically distributed project teams
• Tim and cost to provision professional CAD workstations and software
• Multiple versions of demanding CAD modelling and CAE simulation packages including Dassault CATIA, Autodesk Inventor, PTC Pro/E and Ansys
• Client locations and legacy infrastructure were often not ideal
Knightec AB - Citrix XenDesktop and GPU passthrough enabling high-end CAD and CAE simulations for Enterprise Manufacturing

The Solution
Citrix XenDesktop with HDX 3D Pro and GPU passthrough
Citrix NetScaler Access Gateway

The Results
Enabling CAE engineers to work and collaborate from anywhere

- Reducing project lead time from three weeks to 1-2 days
- Accelerating FEA calculations by an average of 400 percent
- Reducing the need for high-end CAD stations
- Recruiting the best engineers in any location
- Significant cost savings

“For Ansys, our finite element application, we have seen a 400% decrease in calculating time, from three hours with a top-notch workstation to 0.71 hours with XenDesktop”

--- Jörgen Norman, CIO of Knightec.
Citrix Technology Professional (CTP), Thomas Poppelgaard - GPU passthrough for critical medical diagnostics

The Partner

Thomas Poppelgaard is a Citrix Technology Professional specializing in enterprise and HDX deployments.

The Customer

RaySearch advanced software solutions for radiation therapy are used in more than 2,000 hospitals and clinics

- RayStation released 2010 using Citrix
- Solutions include XenApp, XenDesktop and XenServer
- GPU passthrough
- Pixel-perfect lossless detail is vital to the correct interpretation of the images
- RayStation applications FDA approved in US
The Solution and Benefits

• Access to global talent pool of clinicians
• Reduced the need for purchase and maintenance of hardware
• Leveraged existing regular PCs is used as end point device
• App is published seamlessly so settings on the host machine are preserved and local host disk access is restricted – meaning users have to use shared storage accessible from the hosts.
• Fast access to huge files (1 GB and growing)
Roger Williams University - GRID vGPU augmenting Citrix’s unrivalled portfolio for virtualization in education

The Customer
Roger Williams University (RWU) is world renowned for its architecture program.

The Challenge
• Eliminate cumbersome workstations from the classrooms
• Virtualize demanding graphical applications including Autodesk’s AutoCAD® and Revit®, and Adobe® Creative Suite® 6
• GPU sharing essential to be cost effective
• Needed a solution in Q4 2013

“Before we started testing VDI with NVIDIA GRID, we were seeing many problems; many solutions just didn’t work well with the intense graphics and video environment that an architecture department needs.”
--- James Galib, IT Director, RWU

“Previously, as soon as we had more than 8-10 people connected, the frame rates in 3D renderings would go way down and get jumpy. The software applications became very clunky to use and it just wasn’t conducive to architecture work at all and students weren’t able to maintain a good project flow.”
--- Ryan Tiebout, Systems Operations Manager, RWU
XenDesktop and NVIDIA GRID vGPU
Roger Williams University

The Solution
12 x Dell R720
12 x NVIDIA GRID K2 GPU
2 x Dell R620
Dell EqualLogic PS6510X Storage
Citrix NetScaler
Citrix XenDesktop 7.1 Enterprise Education
Citrix XenServer 6.2 SP1
Citrix Receiver 4

The Results - rCloud
• Access to the software students need 24/7 from their own computer or mobile device
• Every space becomes a collaborative learning/work space
• Consistent desktop environment regardless of local hardware/software – everyone has the same applications in the same versions
• Ability to supply software updates throughout the year
• Easier backup and recovery of full desktops and personalized settings
• rCloud currently can support up to 192 concurrent graphics users (8 per GPU)
Citrix XenDesktop and NVIDIA GRID vGPU
Roger Williams University

Right now 1,000 RWU students have access to rCloud, with varying levels of graphics power allotted based on their area of study.

“We are definitely going to ramp up rCloud by bringing in more GRID K2 boards, as well as introducing GRID K1 boards to increase our density and cater to less-heavy graphics users.....The K2 boards will be dedicated to graphics power users like the Architecture and Engineering students, while the K1 boards will ensure that any student can experience seamless graphics performance even on more basic applications like Microsoft® Office and Internet Explorer. This means that students can truly use any application, anywhere — giving each student the flexibility to work outside of a computer lab or library, no matter what they’re working on.”
Insider tips: Understand your user demographics and your applications when benchmarking and designing your solution

- Virtualization allows server consolidation when multiple users use resources like CPU and GPU in bursts
- Most AEC, CAE and CAD applications work best with >1 vCPU per VM
- Some CAE products have license restriction on vCPUs and require HPC packs
- XenServer presents 1 core per socket by default; you can override this to present multiple cores per socket allowing more vGPUs on Windows OSes
- The vGPU and Solutions teams have published a lot of information on automating benchmarks
- FRAPS is a useful tool to measure frame rates as seen by the user
- You can never beat the speed of light or latency, but you can mitigate the impact
- Some server OEMs have already published Reference Architectures for vGPU; HP for the ws460c Gen8 and Dell for the R720; more are in the pipeline
Aerospace: heavyweight designer CAD and PLM access with Citrix XenDesktop and NVIDIA GRID vGPU - Turkish Aerospace Industries

The Customer
Turkish Aerospace Industries
- Over 1,500 engineers, 850 in military R&D
- TAI’s contracts include the licenced production of F-16 Fighting Falcon jets with rigorous data control requirements

The Challenge
- Fast growing user base with applications ranging from PLM viewers to high-end CAD software
- Already adopted Citrix XD and XA but user density and latency issues on virtual machines prevented from expanding deployment
Aerospace: heavyweight designer CAD and PLM access with Citrix XenDesktop and NVIDIA GRID vGPU

Solution
Citrix XenDesktop 7.1, XenServer 6.2 SP1 and NVIDIA GRID K1 and K2 running mainly Dassault Catia, Siemens NX and TeamCenter. Adopted the solution within weeks of vGPU release!

Impact
• **Increased GPU user density** without raising hardware costs or compromising performance
• **Enhanced user experience** by eliminating latency issues on both graphics-intensive applications such as Siemens NX, and viewing applications and office productivity applications
• **Reduced existing hardware costs** through GPU sharing and centralizing workstations
Insider tips: Heavy CAD designer software often likes a single core - try Intel Turbo Boost

• Turn the server fans up! The servers need fan power to be allowed to Turbo!

• Make sure the server BIOS is configured for maximal performance; e.g. on the Dell R720 you need to set the BIOS setting System Profile to "Performance Per Watt (OS)"

• Configure your Hypervisor (e.g. XenServer) to allow Turbo Boost
  • http://bs.citrix.com/2013/12/16/configuring-xenserver-to-use-turbo-mode-including-for-3-d-graphically-intense-applications/

• Be careful how you check CPU frequency; use a tool like CPU-Z in the guest VM!
Adaptive H.264 Deep Compression
Customer-reported bandwidth utilization on long-haul connections

• First user requires 1.5 to 2 Mbps minimum

• Heavy equipment manufacturer:
  Branch with 12 concurrent users requires 700-800 Kbps per user

• Control valves manufacturer:
  20 Mbps WAN link serves branch with 17 users, i.e. 1.2 Mbps/user

→ Bandwidth requirement does not scale linearly 😊
ADDITIONAL CASE STUDIES ON THE WEB

- ABB (energy and automation)
  https://www.citrix.com/customers/abb_schweiz_en.html

- Brückner (plastic film company)
  http://www.sealsystems.de/fileadmin/mediaFiles/Case_Studies/Brueckner_PLM.pdf

- Wiha (professional hand tools manufacturer)

- Intensive-Filter
  https://www.citrix.com/customers/intensiv_filter_en.html
SOME OTHER PRESENTATIONS AT GTC

- S4666 - Next Technology Steps for Applied Materials Global Engineering Collaboration Using CAD in the Cloud
- S4735 - Remote Graphics VDI for the Digital Factory at Gulfstream
- S4782 - Anatomy of an Aerospace VDI Project: Discover, Plan and Implement a Large Scale VDI 3D GPU Project
- S4278 - How to Virtualize 3D Workstations? High-End Graphics for VDI in 10 Easy Steps
- S4725 - Delivering High-Performance Remote Graphics with NVIDIA GRID Virtual GPU
SUMMARY

- This is real; customers around the world are already realizing the benefits of 3D remoting
- Not limited to the LAN; deep compression enables access from anywhere, on any device
- GPU sharing, new GRID cards and increased hardware utilization have driven down the cost per user
Work better. Live better.