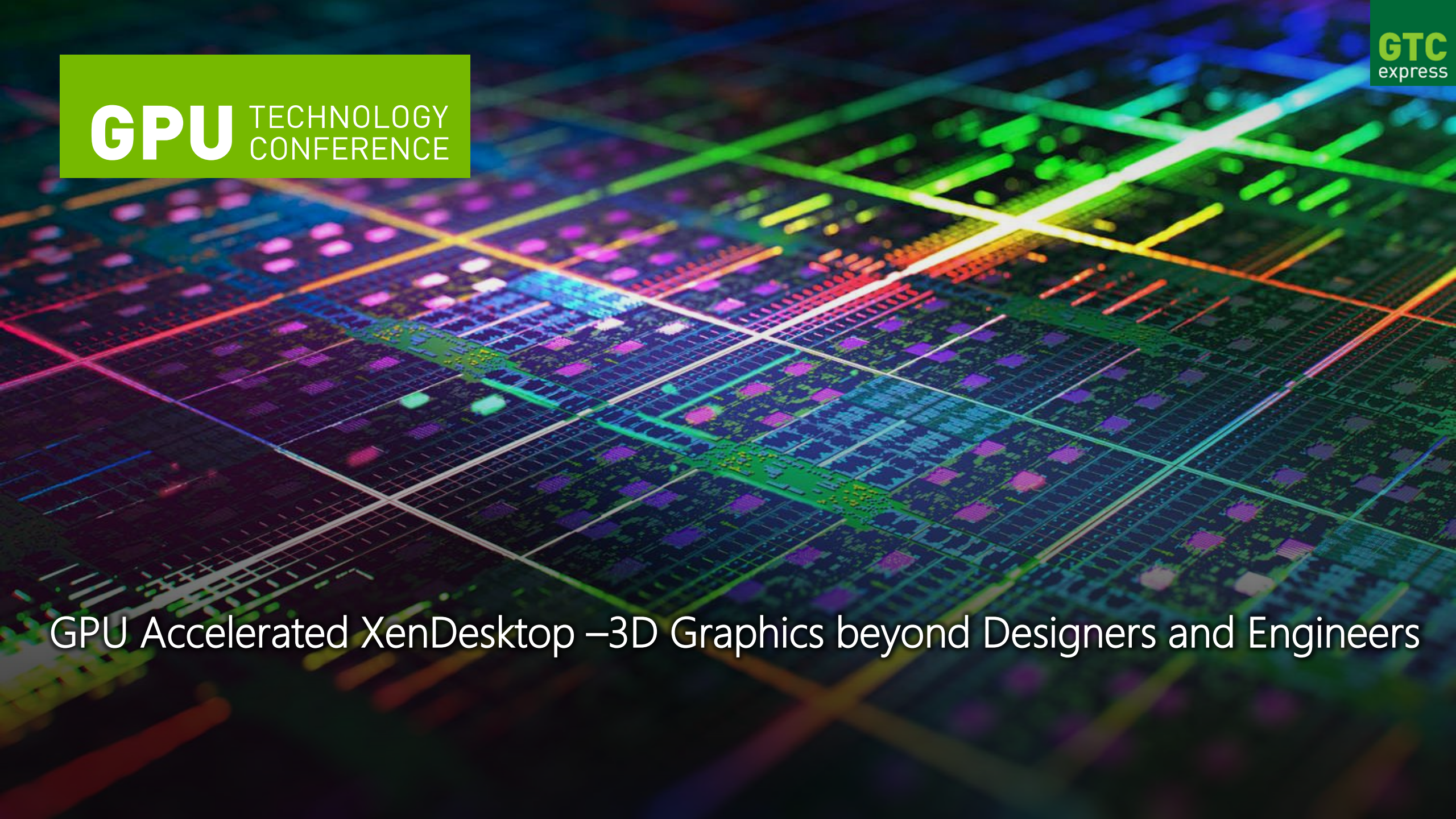
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GTC express
GPU Accelerated XenDesktop –3D Graphics beyond Designers and Engineers

GPU TECHNOLOGY CONFERENCE

GTC express

Thomas Poppelgaard

Technology Evangelist

_POPPELGAARD thomas@poppelgaard.com

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Agenda

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History of Virtualized Graphics

Business Drivers Leading to Virtualization

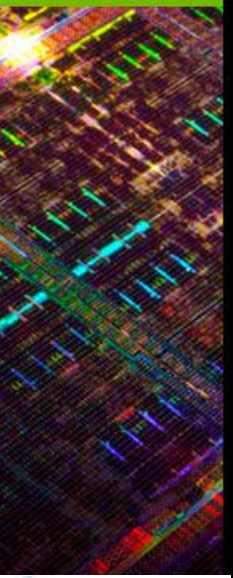
Citrix Solutions for Application & Desktop Virtualization

Customer Examples

New Technologies in Virtualization

- XenDesktop 7
- NVIDIA GRID vGPU

Q & A



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Citrix Synergy keynote – May 2013
Citrix/NVIDIA collaboration

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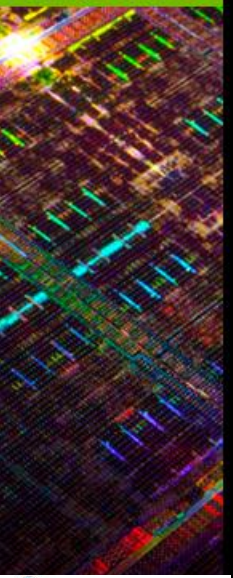

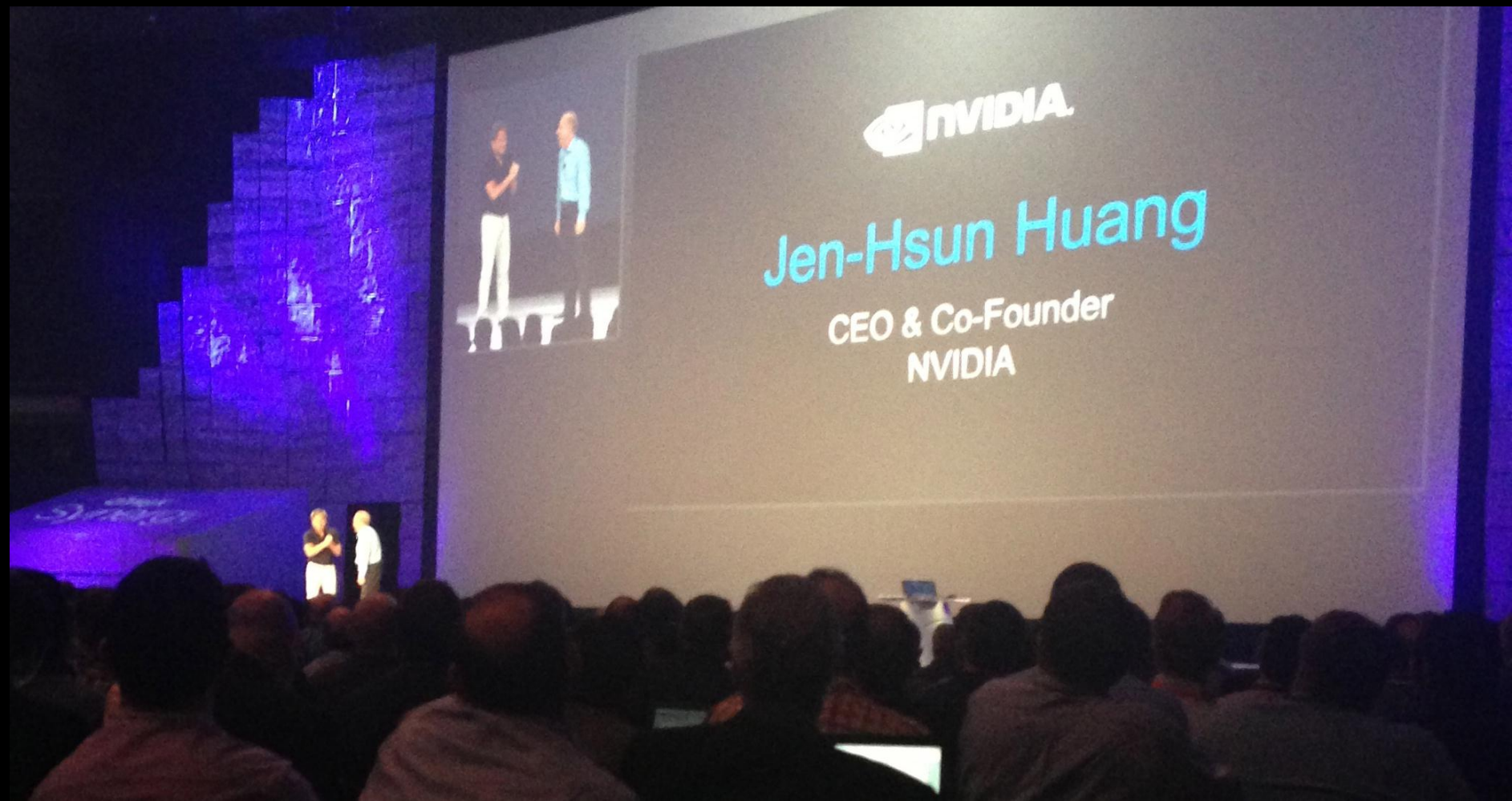

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GPU Milestones in 3D graphics remoting

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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

XenDesktop 7 GPU Sharing with high density GRID™ K1/K2 cards

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Industries that use 2D/3D professional graphics

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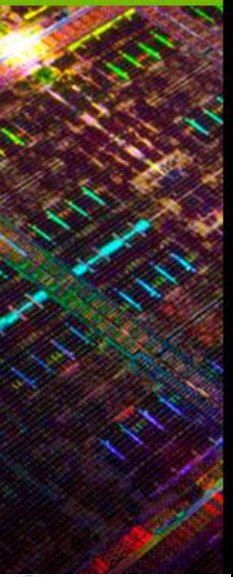
Aerospace

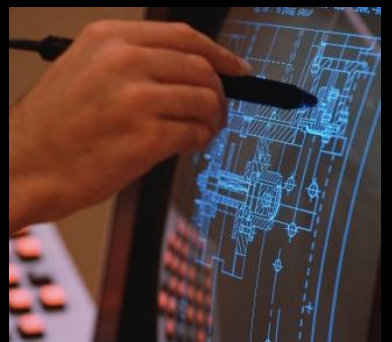
Automotive

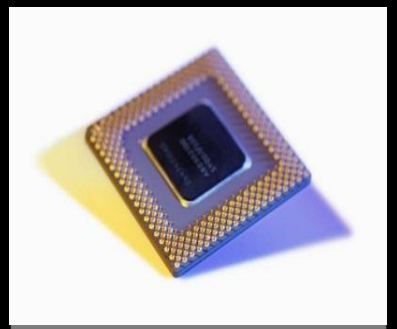
Construction

Energy

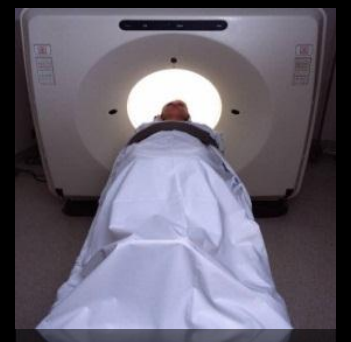
Broadcast and Film




Engineering Services


Hi Tech - Electronics

Industrial Equipment


Medical Equipment

Oil & Gas Exploration

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Time to satisfy the "end users" & IT

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Why cant i work from home with my Mac

I wish I could access the engineering data on my phone

How can I keep cost down and deliver IT more effeciant

I wish I could access my data from anywhere

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Business Drivers for virtualizing 2D/3D graphics apps & workstations

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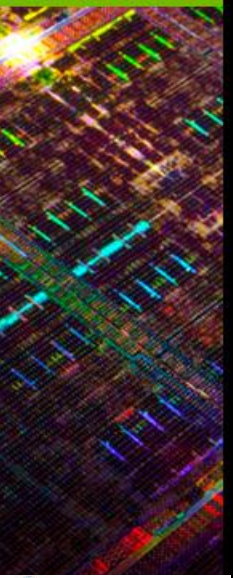

- Global talent base
- Secure IP
- Work-from-home
- Disaster recovery
- Mobile device access
- Collobrate share content and video
- Improve time-to-market
- Cost efficiency

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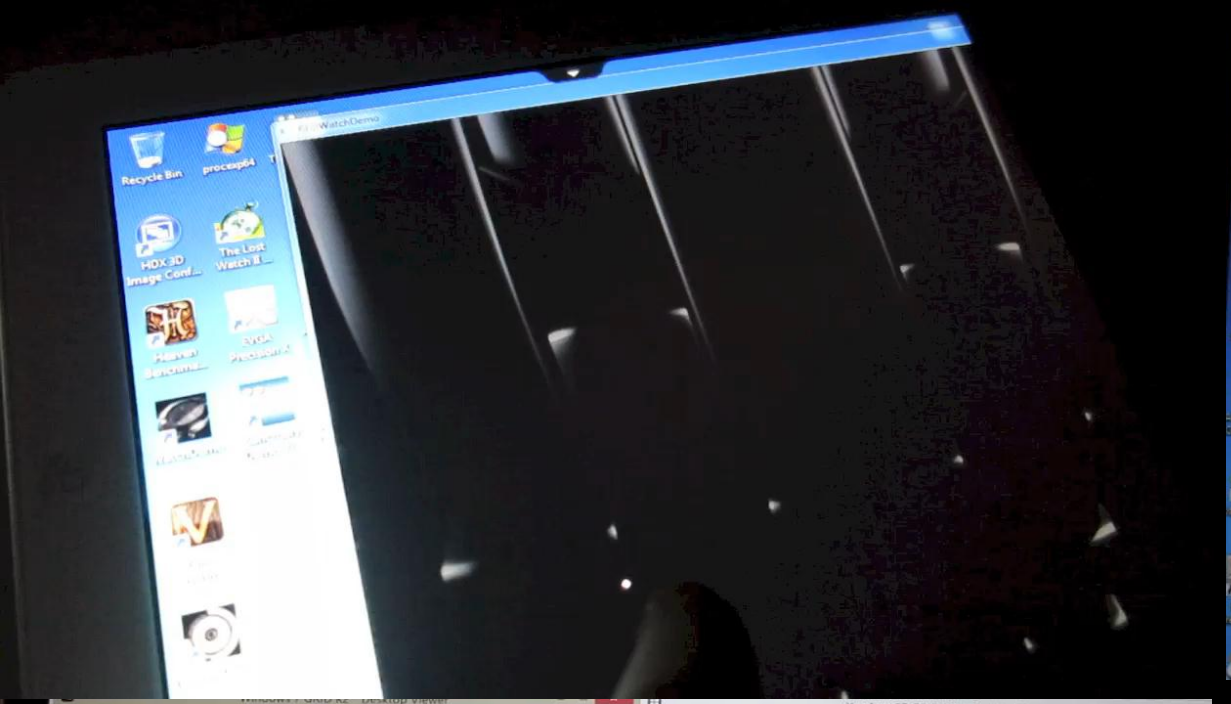
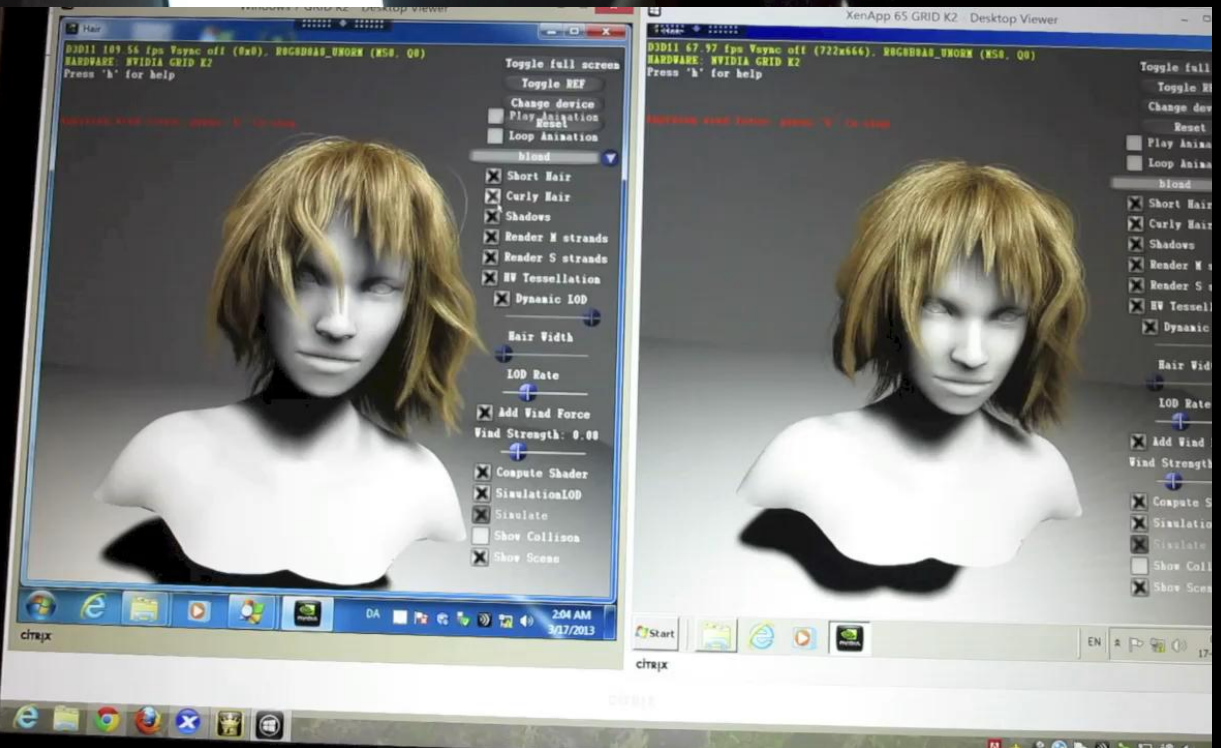
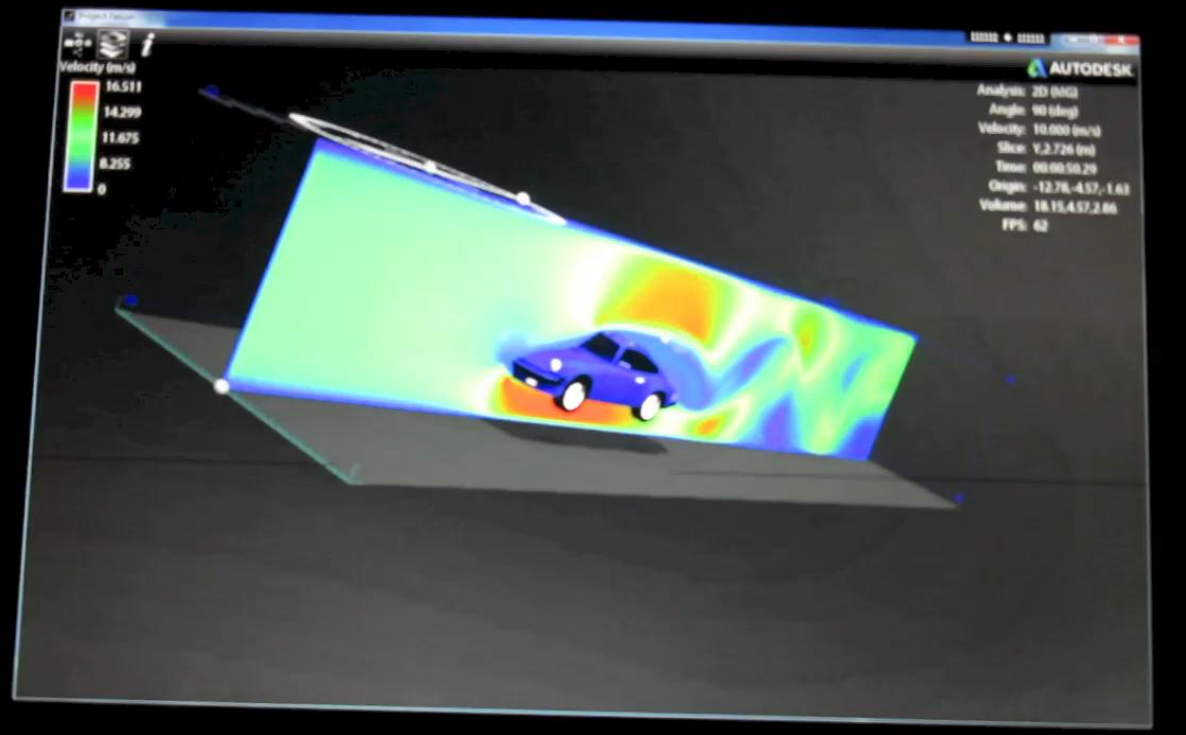

Recycle Bin
procexp64
HDX 3D Image Conf...
The Lost Watch II...
Heaven Benchma...
NVIDIA Photoshop...
Valley Benchma...
Tropics Demo v1...
New Doom Configura...
WatchDem...
Project Falcon

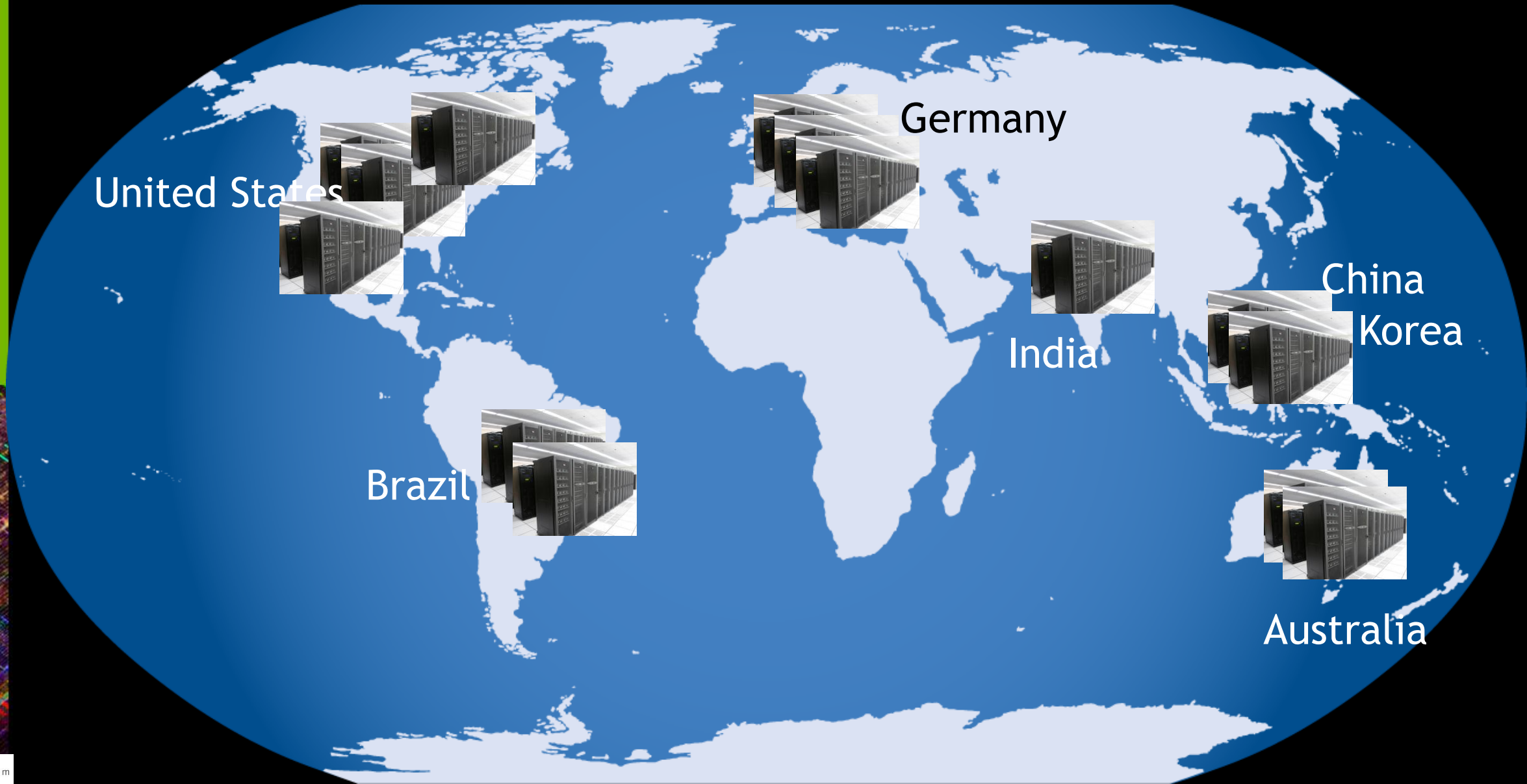
REDTurbineDemo
System Information
Summary
CPU
Memory
I/O
GPU
I/O
301.6 KB
Network
344.1 KB
Disk
2.1 MB
Read Delta 6
Read Bytes Delta 0 KB
Write Delta 185
Write Bytes Delta 328 KB
Other Delta 116
Other Bytes Delta 7 KB
Receive Delta 55
Receive Bytes Delta 0 KB
Send Delta 268
Send Bytes Delta 343 KB
Other Delta 0
Other Bytes Delta 0 KB
Read Delta 0
Read Bytes Delta 0 KB
Write Delta 21
Write Bytes Delta 2,114 KB
Other Delta 6
Other Bytes Delta 0 KB
OK


Hair
D3D11 109.56 fps Vsync off (0x0), RGGBDXA8_UNORM (MS8, Q8)
HARDWARE: NVIDIA GRID K2
Press 'h' for help
Toggle full screen
Toggle REF
Change device
Play Animation
Reset
Loop Animation
blond
Short Hair
Curly Hair
Shadows
Render M strands
Render S strands
HW Tessellation
Dynamic LOD
Hair Width
LOD Rate
Add Wind Force
Wind Strength: 0.00
Compute Shader
SimulationLOD
Simulate
Show Collison
Show Scene
2:04 AM
3/17/2013
citrix

XenApp 65 GRID K2 : Desktop Viewer
D3D11 67.97 fps Vsync off (722x666), RGGBDXA8_UNORM (MS8, Q8)
HARDWARE: NVIDIA GRID K2
Press 'h' for help
Start
EN
citrix


Velocity (m/s)
16.511
14.299
11.675
8.255
0
AUTODESK

Global product development teams – real example



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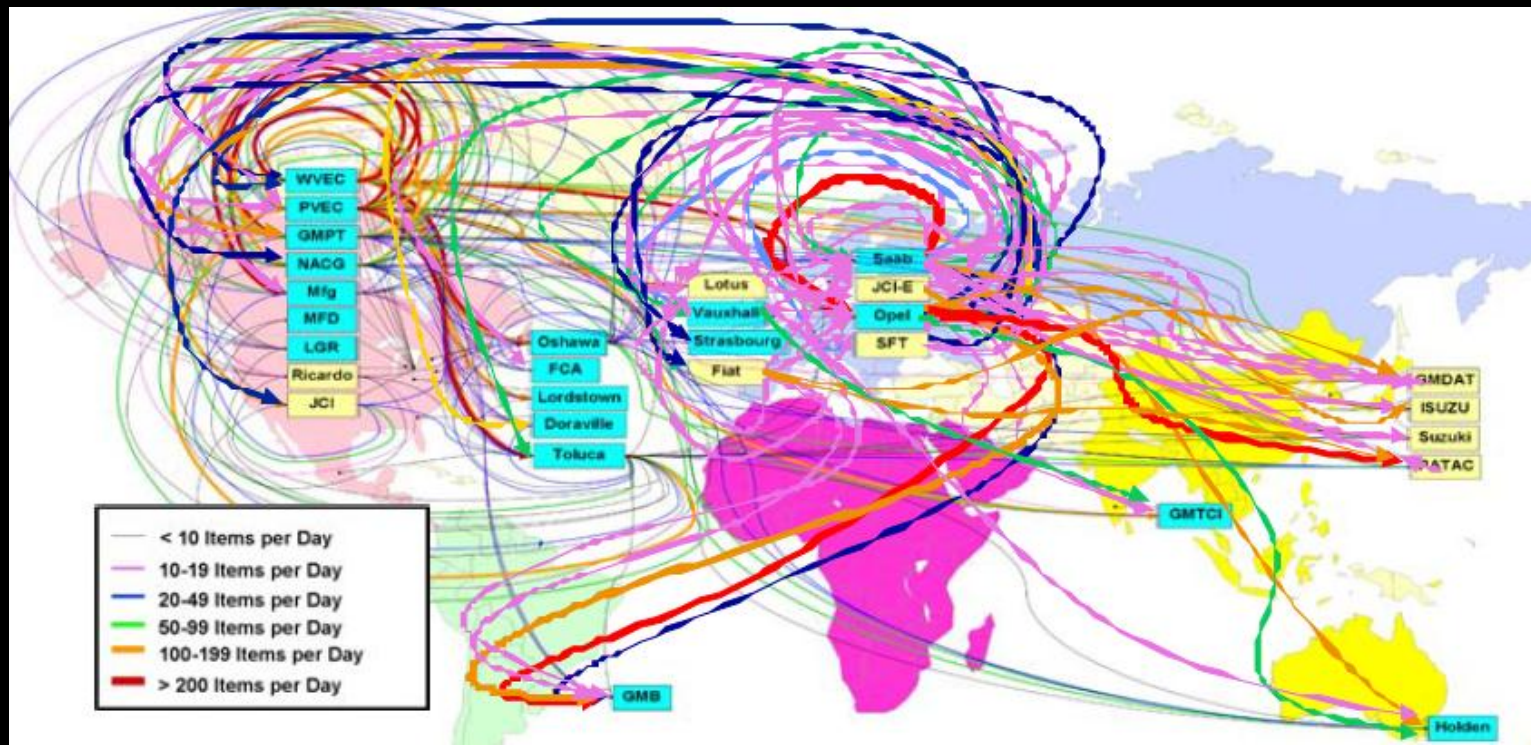
Global development effort – Real Example

- 30,000 CAD files or 70 GB of data to be synchronized every day
- Across 26 design centers (30,000+ users)
- Across 16 countries
- It took 2 weekends to sync all code updates!
- More challenging for 4,000+ suppliers and partners



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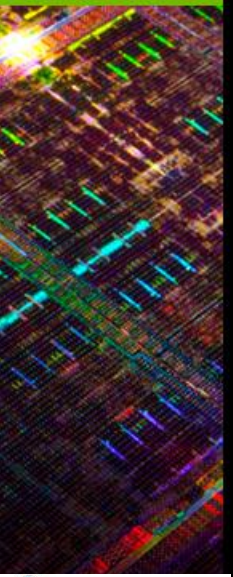

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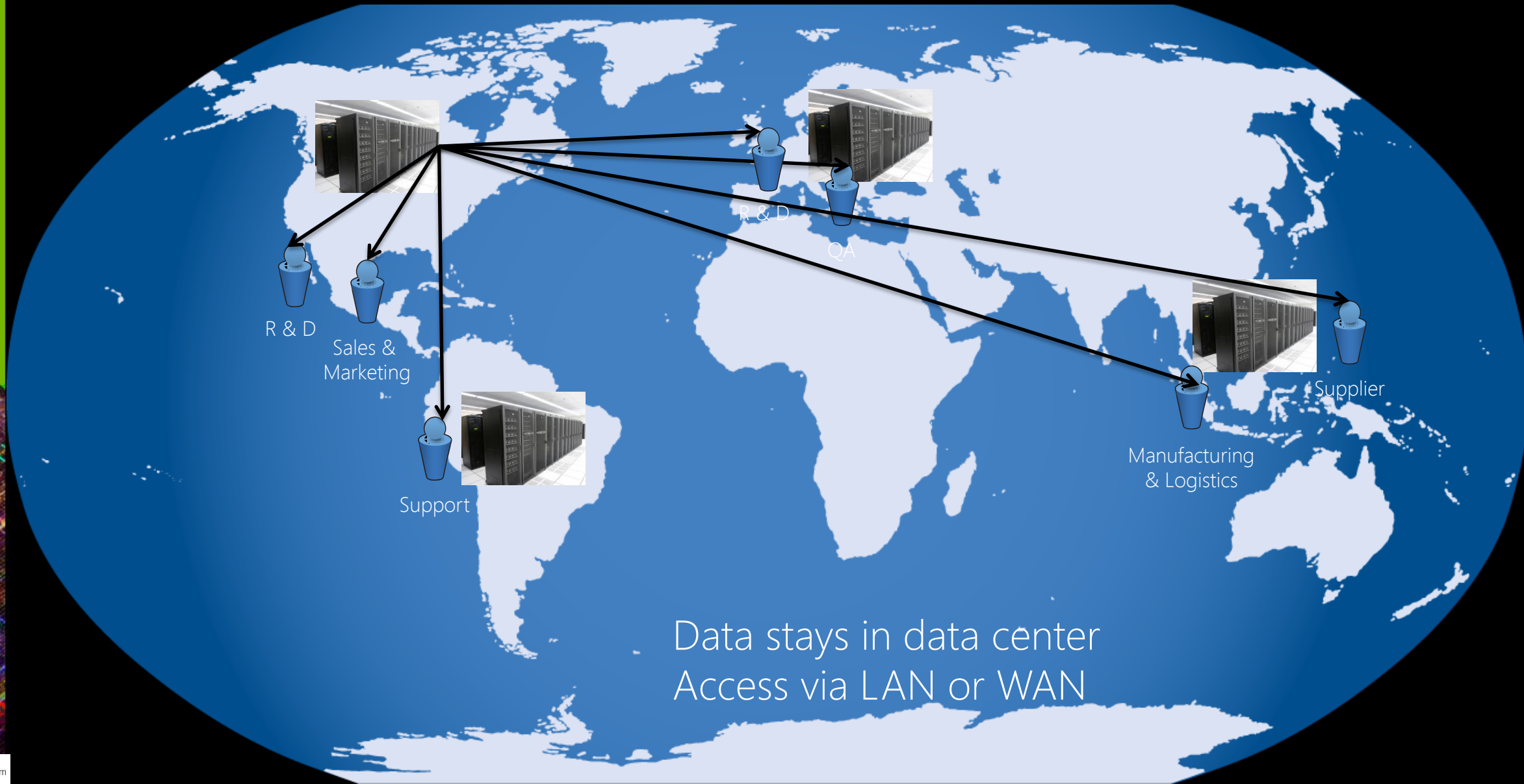
Enhances IP control, collaboration and global agility



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Citrix remote graphics solutions today

- Citrix XenServer – GPU Pass-through to virtual machines

  coming soon vGPU

- Citrix XenDesktop – Access to dedicated physical/virtual machine to any device

  coming soon vGPU ** supported only with XenServer

- Citrix XenApp – Access to shared physical/virtual machine to any device

  New!! OpenGL + coming soon deep compression codec

- Citrix RemotePC – Access to existing physical machine to any device

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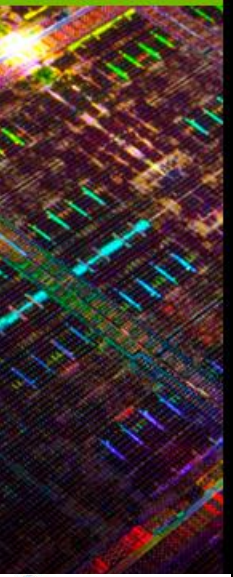

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Virtual Desktop vs. Virtual Application

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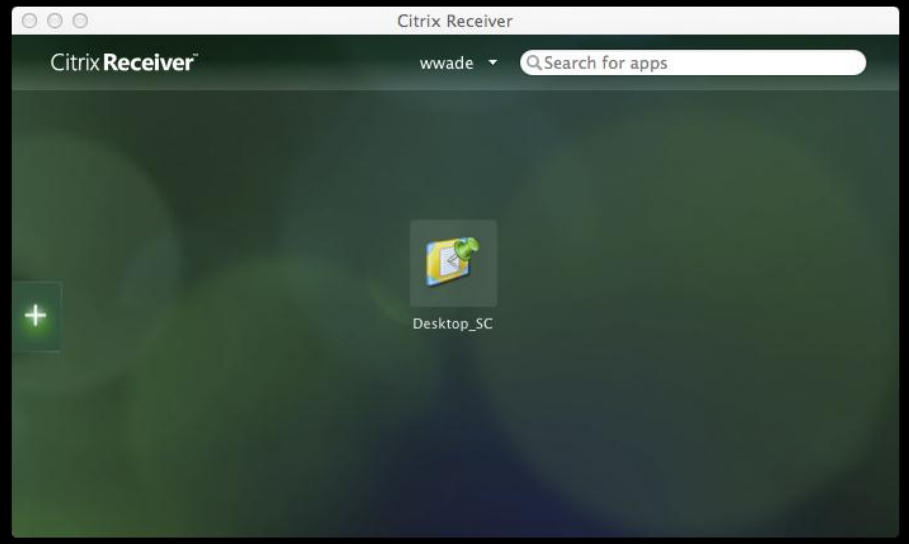
Virtual Desktop

- A full desktop OS (i.e. Win 7) per user, run on a data-center based server



Virtual Application

- Each application spawns a server hosted version of that app, running in Windows Terminal Services (Window Server OS)

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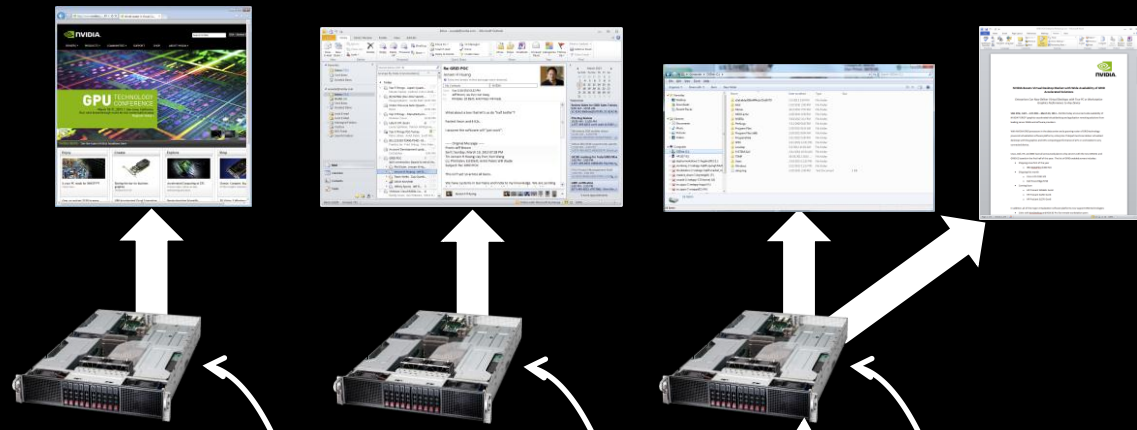
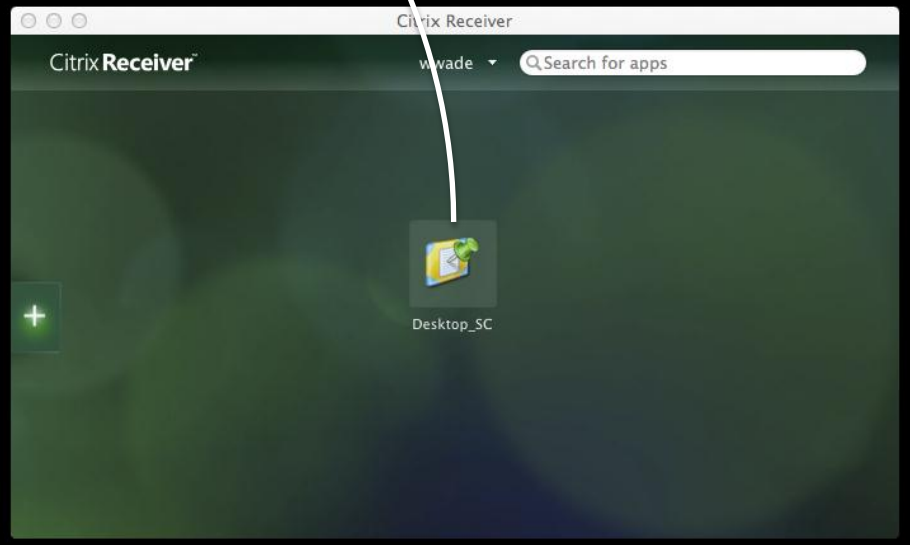
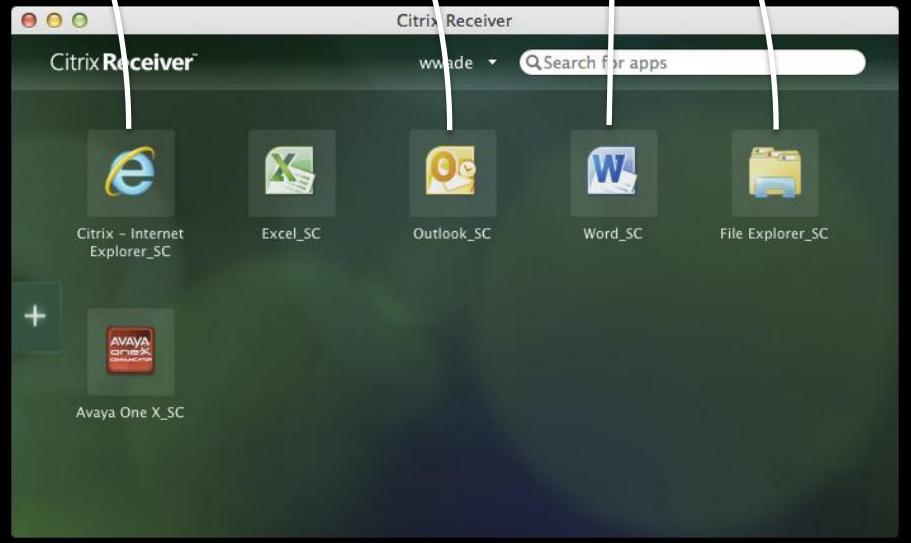
Virtual Desktop vs. Virtual Application







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Citrix XenDesktop HDX 3D Pro case study

- Below customers are pioneers implementing remote graphics solution
- Business challenges
- Solutions build w. remote graphics from Citrix/NVIDIA and benefits gained

VOLVO

Vestas®

MAERSK OIL

ABB

RAMBØLL

RaySearch Laboratories

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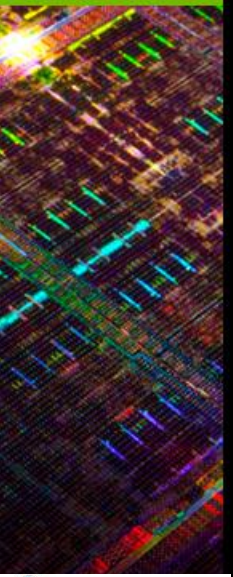

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Challenges

- Of course there were more than one…

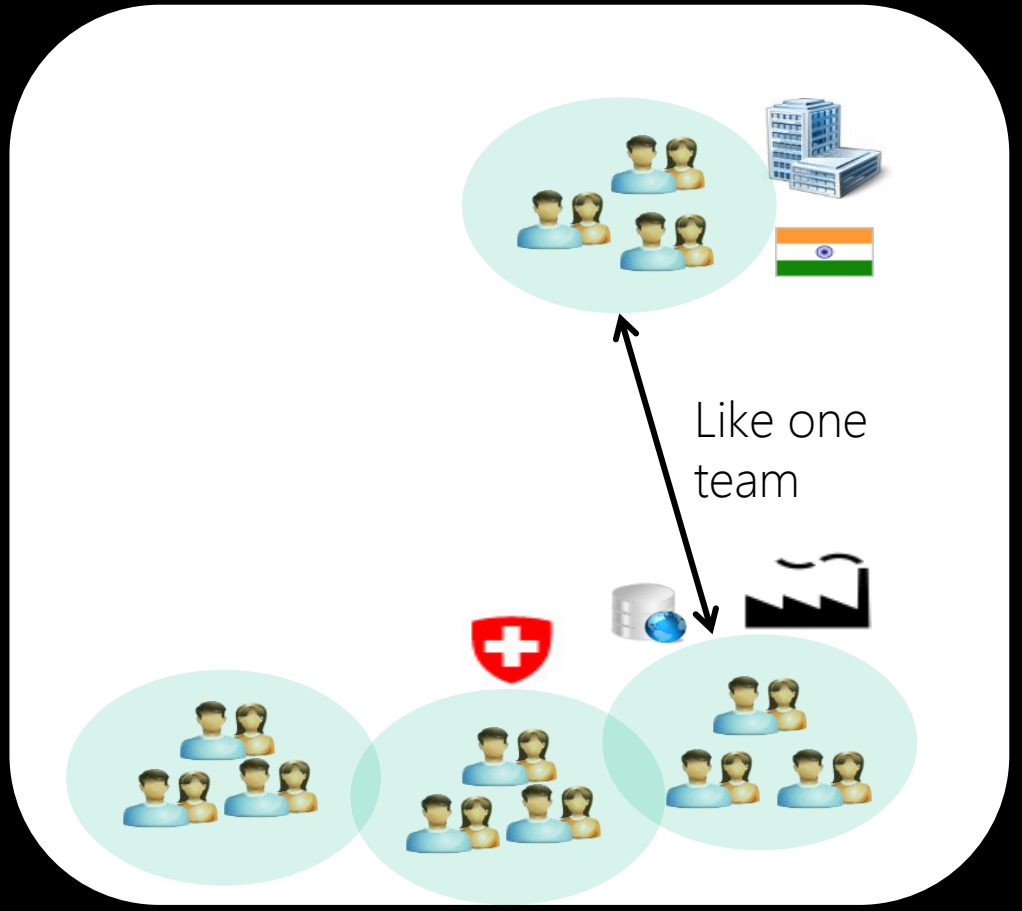
3D CAD data is large

- Transferring our largest assemblies

took 2.5 hours!

ABB's corporate network

- Latency
- Bandwidth



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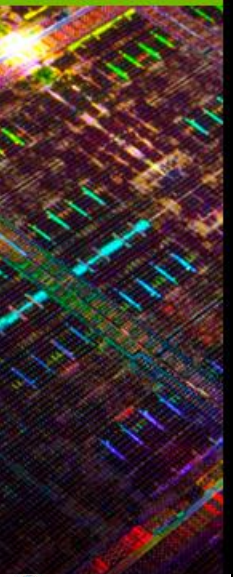

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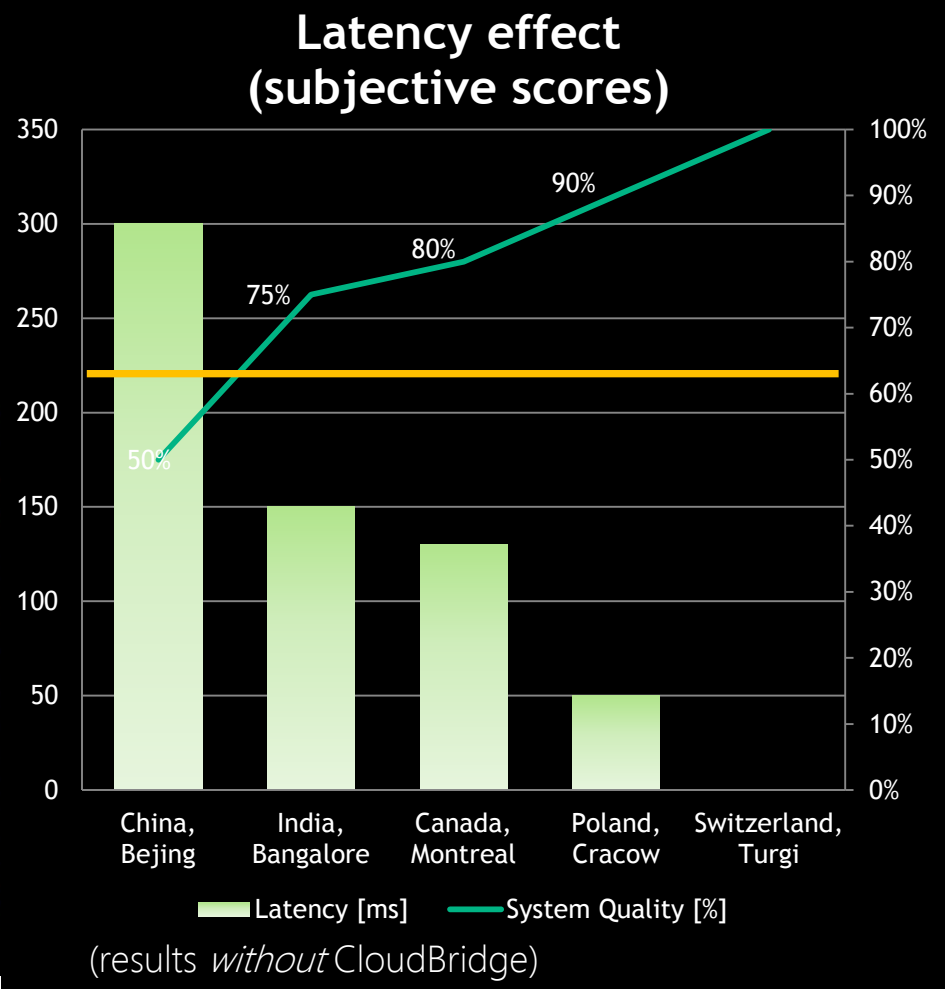
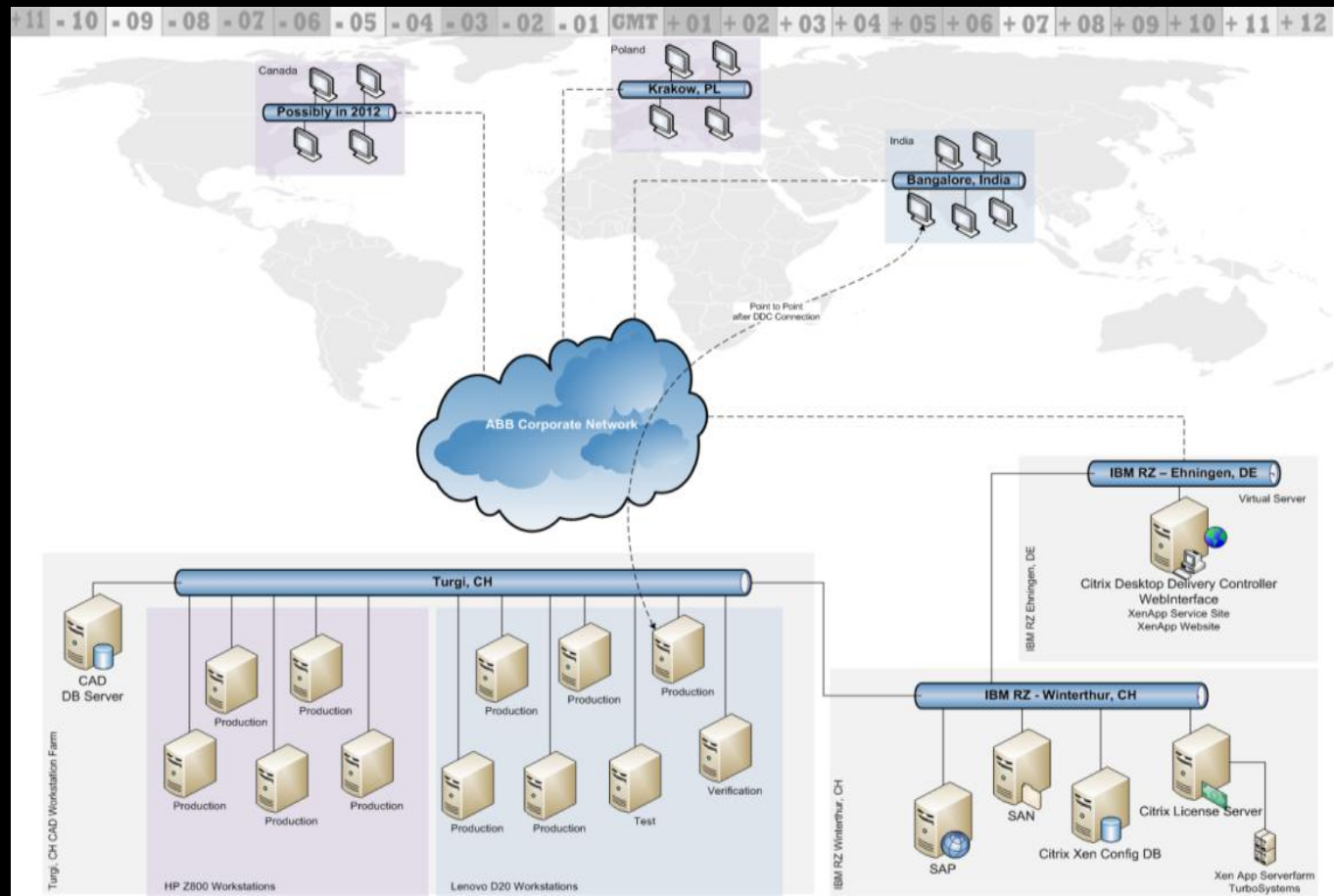
Learnings

Service quality is a subjective matter



(results *without* CloudBridge)

Using Dassault SolidWorks, 5-6 hours per day;
Designers can work from India as if in Switzerland!



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HDX 3D Pro case study

Vestas®

- Wind turbine manufacturer
  - Delivering PTC Pro/E and Dassault SolidWorks from Europe to other continents since 2008 (2,000 remote users)
- HDX 3D Pro protects Vestas' intellectual property, supports workforce globalization, eliminates inconsistencies in engineering design versioning and overcomes regulatory challenges
- Reduced cost per running hour by 30% from €416 (traditional CAD workstations) to €291 (data center blade workstations) via follow-the-sun utilization (Denmark, UK, US, India, China)

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HDX 3D Pro case study

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- Major European heavy vehicle manufacturer

- Access from Germany, Mexico and Brazil to Dassault CATIA apps hosted in Sweden
- At 220ms roundtrip latency, good performance working on models with 1500+ parts; bandwidth usage rarely reaches 2.5 Mbps
- Using 3D Space Mouse

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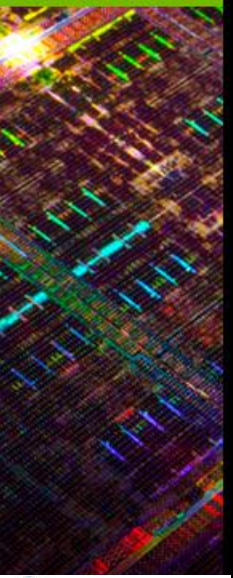
HDX 3D Pro case study

- Large engineering, design and consultancy company in 24 countries

- Bentley, Navisworks, Revit, AutoCAD, and more
- *"It's faster than local!"* (large 3D models no longer have to be transferred across the network)
- *"It even works on 3G!"* (800 Kbps)
- *"We reduced the number of PCs per user from 1.6 to 1.05"*
- *Virtual machines are used now 90% all the time 24-7*
- *200% Return-on-Investment*



RAMBØLL

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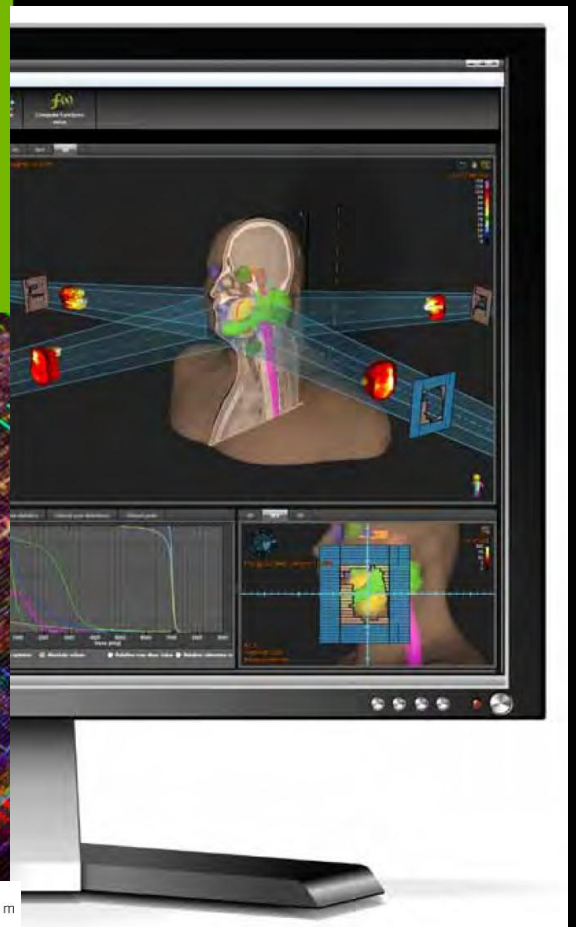
Customer Case

- RaySearch Laboratories

World leader in radiation therapy

Raysearch advanced software solutions for radiation therapy are used successfully in more than 2000 clinics



- Access to global talent
- Clinic had a large central datacenter located 25kms from the main facility.
- Customer didn't want to put the machines with RayStation on multiple desks, where the would access the system would never be more than the 10 licenses purchased (20 users
- This reduced the need for purchase and maintenance of 20 machines even though only one time.
- Users already had PCs for operations on other applications – PC is used as end point de
- The application is published seamlessly so settings on the host machine are preserved a restricted – meaning users have to use shared storage accessible from the hosts.
- Data is massive – overall average today 1GB per patient. In the future with 4D scans thi
- Connectivity to the databases is important for open and save operations – with Citrix thi

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Citrix XenApp GPU sharing + GRID K2

POC case study

- Oil & Gas company

MAERSK OIL

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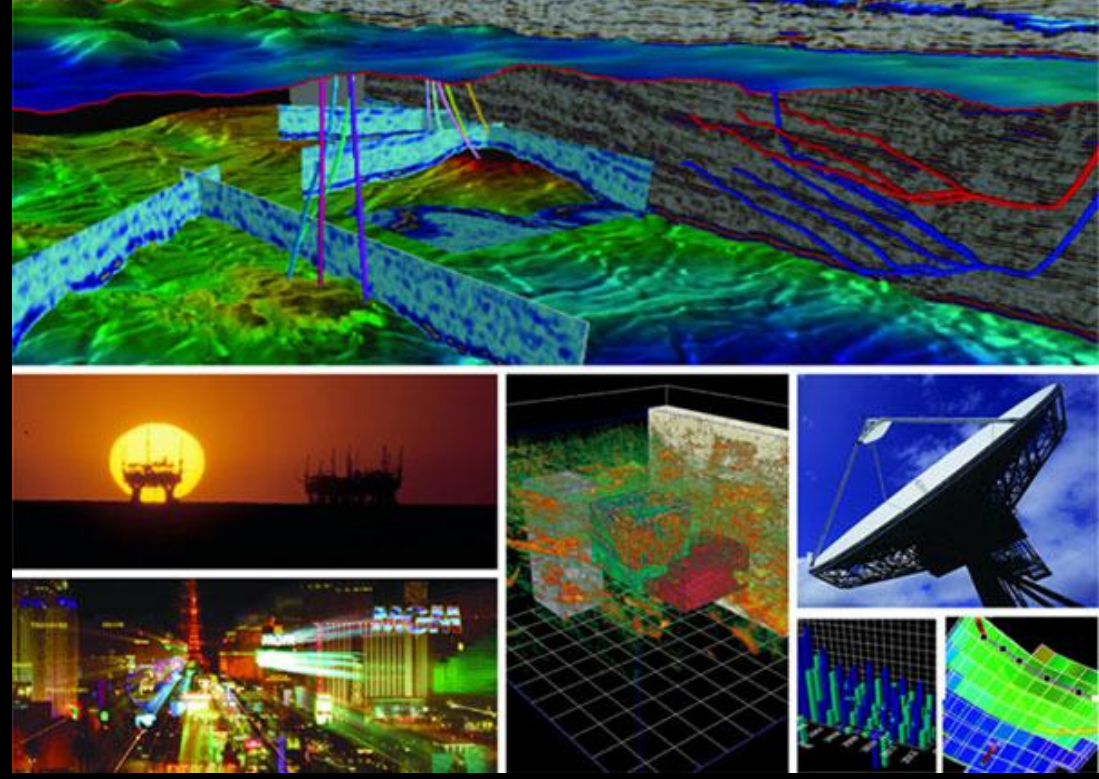
Business Challenges

- Colloboration room with thin clients connects up to multiple big screens, where the 2D/3D application needs to be shared to multiple users in a live video feed with CISCO UC/Tandberg systems.
- Work from any device, work from home, work remotely.



The Solution for the POC

Dell R720 server with 2x NVIDIA GRID K2

Virtualization of hardware with Citrix XenServer

Offer 2 VM with Citrix XenApp HDX 3D with GPU pass-through to a GRID K2 board, able to share the ressources to multiple users on each VM.

End devices Dell Wyse R90D7 with 2x24" displays

Workstations with Cisco UC client + Citrix Receiver

Ipad with Citrix Receiver

Petrel software + Autodesk + Bentley + Google Earth is offered remotely on any device even with CISCO UC

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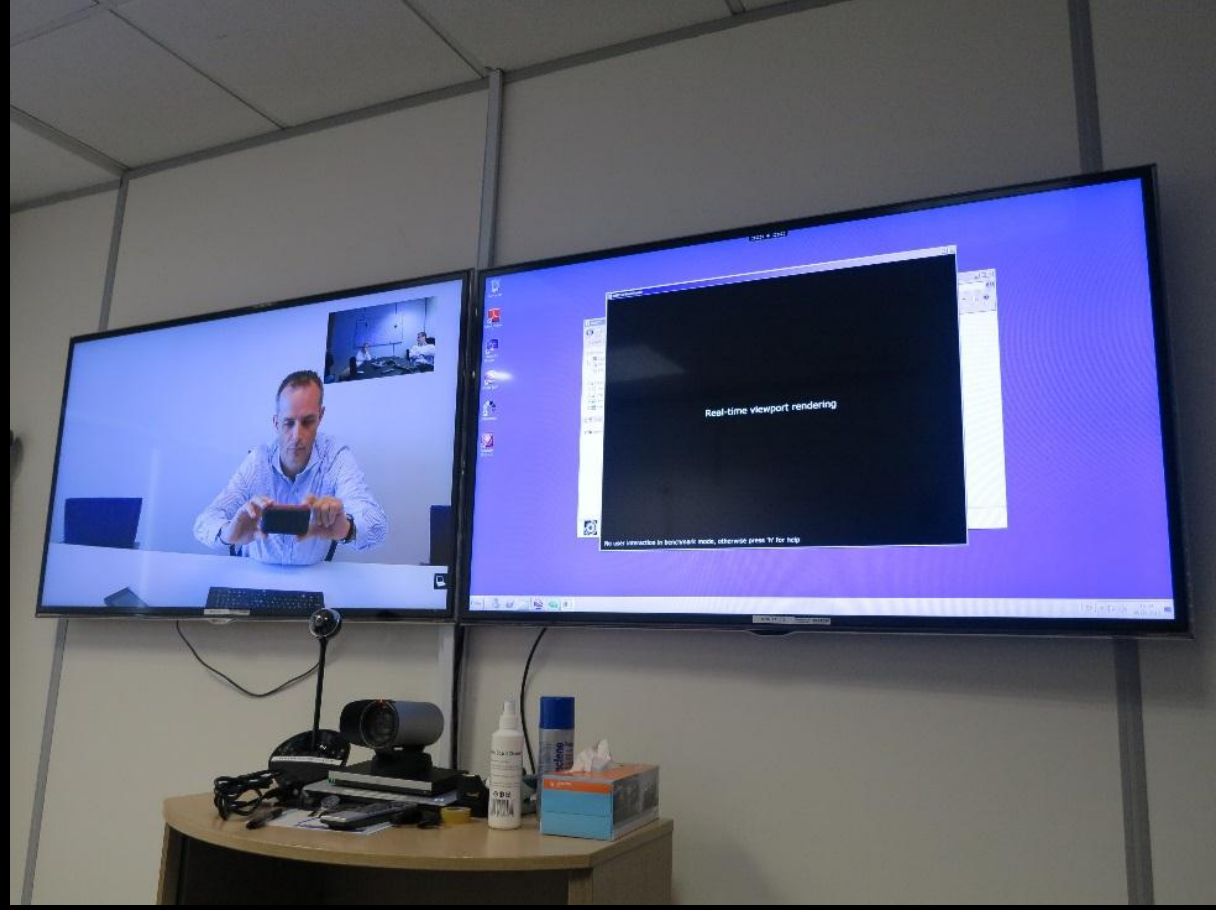
Technolog benefits

- Centralise data
- No data deduplication to multiple sites
- Share 2D/3D applications in colloboration rooms
- The users can log on any place and their 2D/3D workplace follows them
- Better user density (reduce amount of machines, centrally management)
- Reduce bandwidth
- Deliver any app to any device any where



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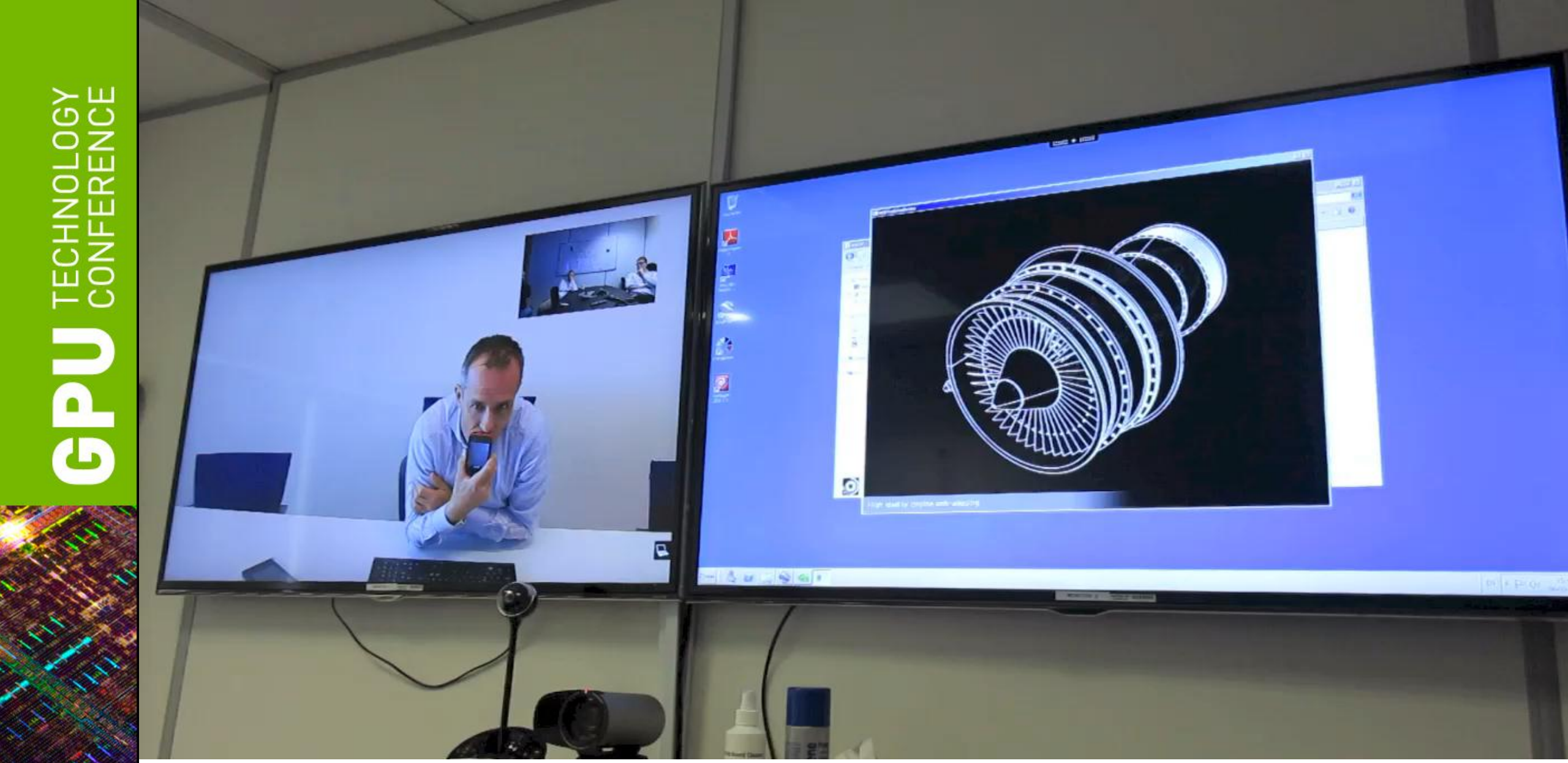
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CITRIX
CISCO
MAERSK OIL
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Remote graphics enable new workstyle

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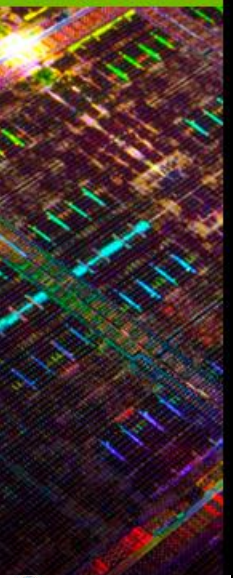

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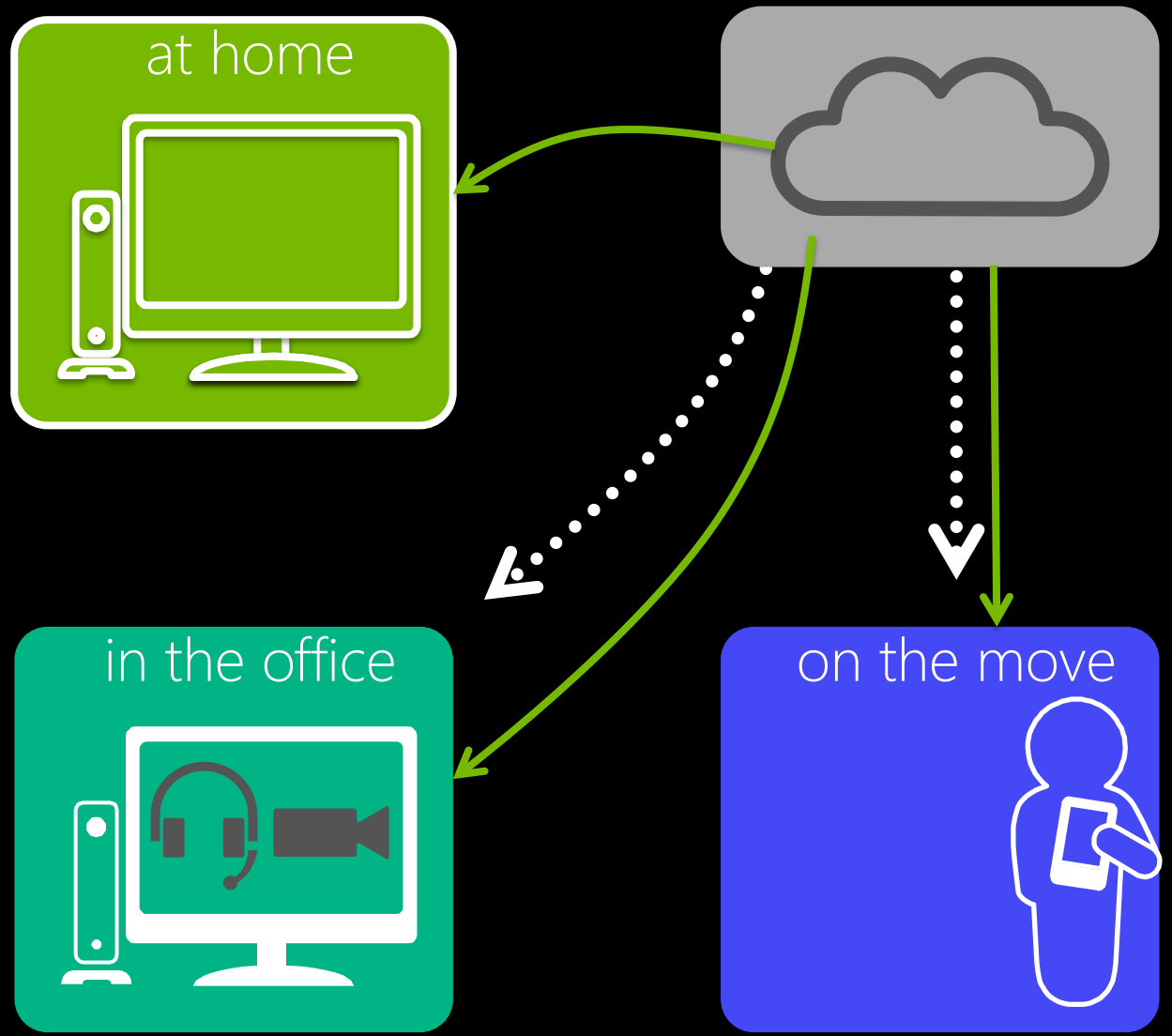

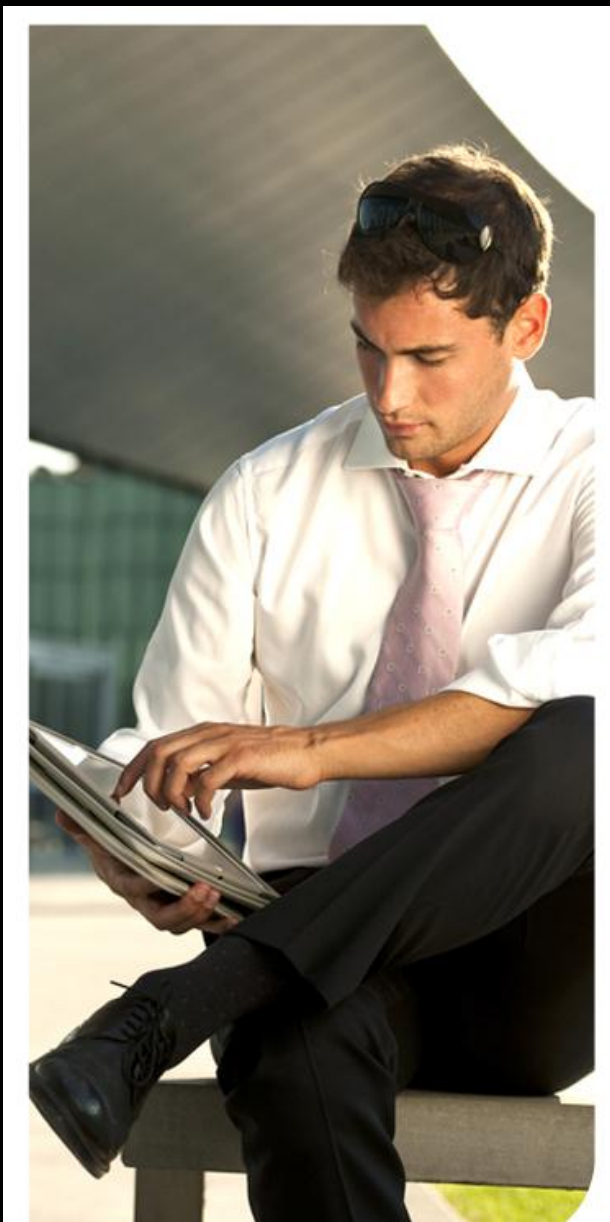

Segmenting the user population

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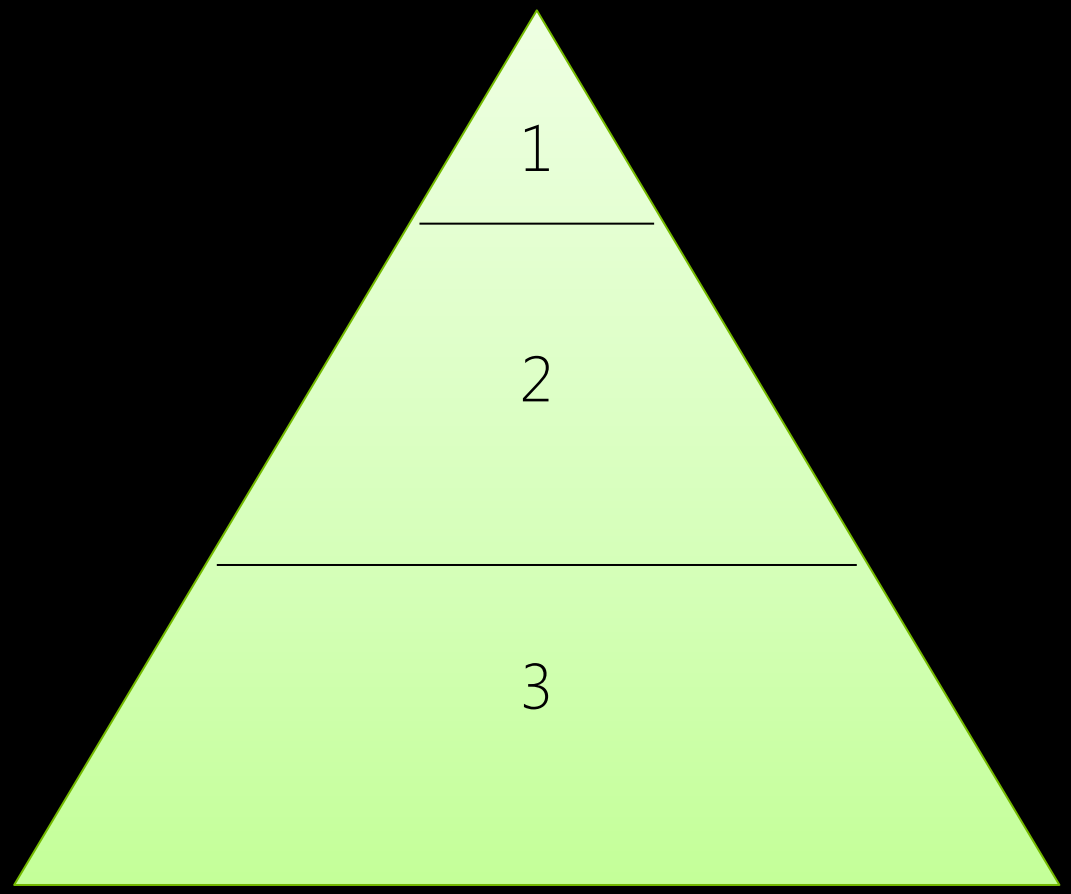

Tier 1 (e.g. design engineers)
- Top rendering performance (dedicated GPU)
- Deep compression on WAN links
- 3D SpaceMouse

Tier 2 (viewing/editing of large 3D drawings)
- GPU sharing

Tier 3 (typical knowledge workers)
- Software rasterizer or highly shared GPU

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Classification of 3D professional graphics users

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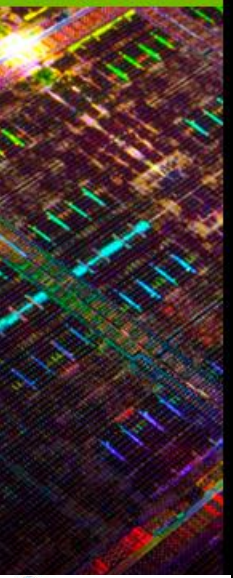

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XenDesktop VDI	XenDesktop Hosted-shared (RDS)	Knowledge & Task users
Create & manipulate large 3D models	View & edit 3D data	Business graphics apps
Dedicated GPU	Shared GPU	Shared GPU

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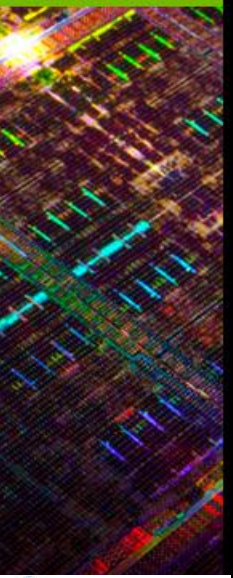
XenDesktop 7

Mobile

Simple

Secure



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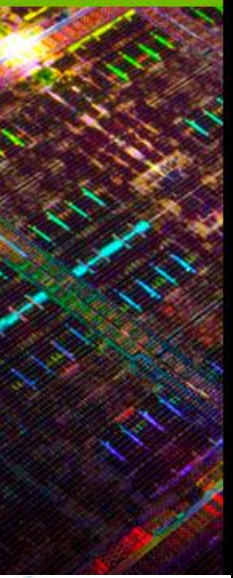
XenDesktop: Powerful and flexible infrastructure

GPU TECHNOLOGY CONFERENCE



Universal client

High-Definition User Experience

Enterprise app store

Flexible Desktop and App delivery

PC
Mac
tablet
smartphone
thin client

Citrix Receiver

HDX

NetScaler Gateway

FlexCast DELIVERY TECHNOLOGY

XenDesktop

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VDI versus RDS (hosted shared) workloads

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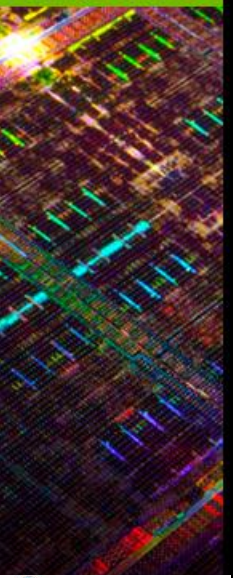

- Tier 1: HDX 3D Pro on VDI

- GPU acceleration of Direct3D, OpenGL, CUDA, OpenCL
- H.264-based Deep Compression
- One user per GPU (but ready for use with VGX™ hardware vGPU)
- 3D SpaceMouse support

TOP PERFORMANCE SOLUTION

- Tier 2: HDX 3D Pro on RDS

- GPU acceleration of Direct3D, OpenGL, CUDA, OpenCL
- H.264-based Deep Compression
- High performance GPU sharing
- Lower cost Microsoft licensing
- Apps must be RDS compatible

MOST COST-EFFECTIVE SOLUTION

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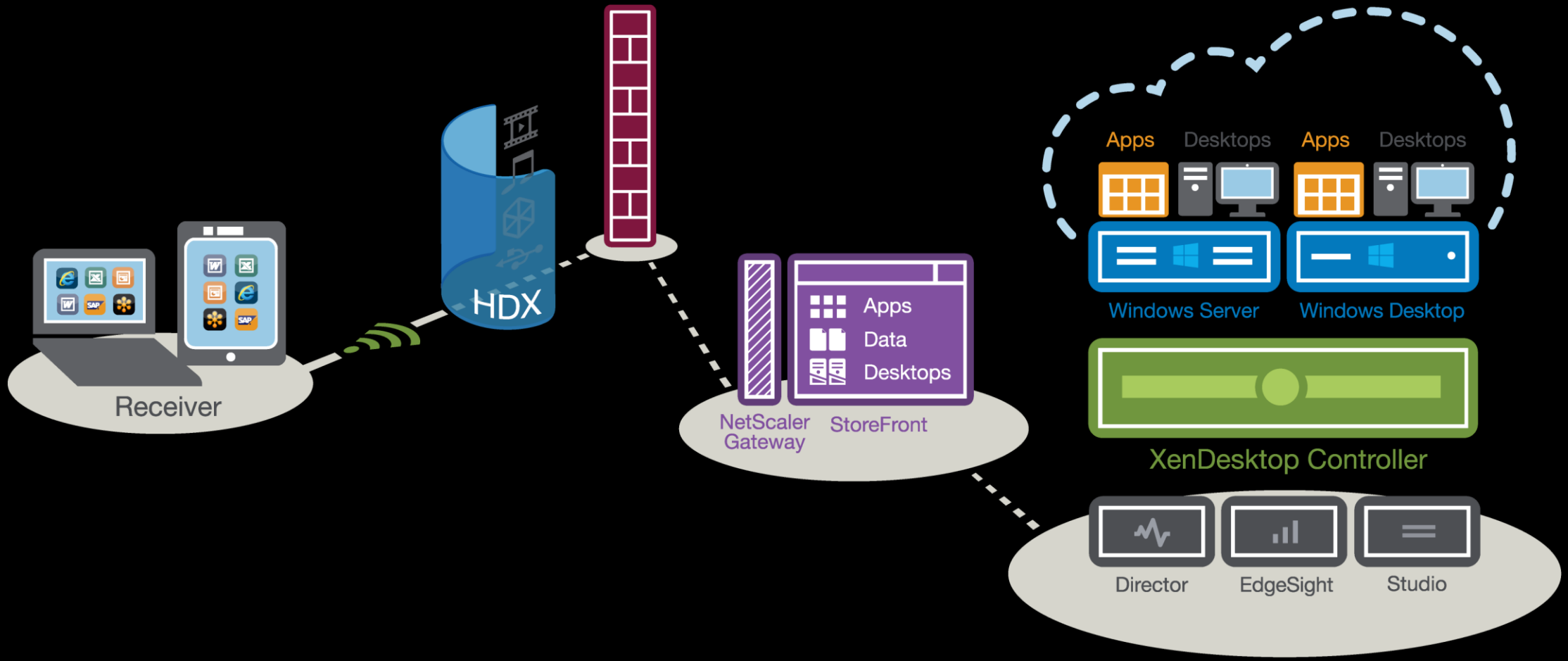
XenDesktop architecture

Windows Apps and Desktops as Mobile Services



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HDX 3D Pro license

- Feature of Citrix XenDesktop App/Enterprise/Platinum license and Citrix XenApp Enterprise/Platinum license

HDX high-definition, mobile user experience

	XenDesktop Editions				XenApp Editions	
Feature	VDI	App	Enterprise	Platinum	Enterprise*	Platinum*
App Mobilization SDK (HDX Touch SDK)		✔	✔	✔	✔	✔
Multimedia support	✔	✔	✔	✔	✔	✔
Point to Point Unified Communications support		✔	✔	✔	✔	✔
Lync 2010, 2013 Optimization		✔	✔	✔	✔	✔
Client-side hardware acceleration	✔	✔	✔	✔	✔	✔
Multicast Video Support	✔	✔	✔	✔	✔	✔
Client Drive Mapping	✔	✔	✔	✔	✔	✔
Multi-monitor support	✔	✔	✔	✔	✔	✔
Application Multi-Tasking	✔	✔	✔	✔	✔	✔
3D Graphics Business Apps Support (HDX 3D Pro)		✔	✔	✔	✔	✔
3D Graphics Professional Applications Support (HDX 3D Pro)		✔	✔	✔	✔	✔

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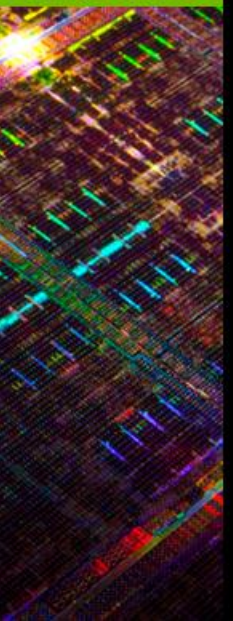
Deep Compression codec technology

- 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 ☺



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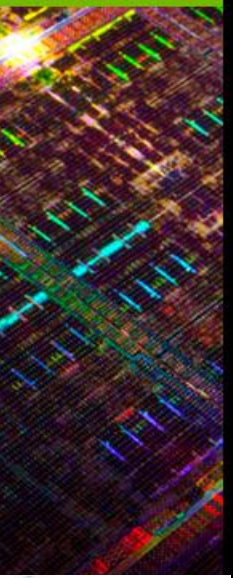
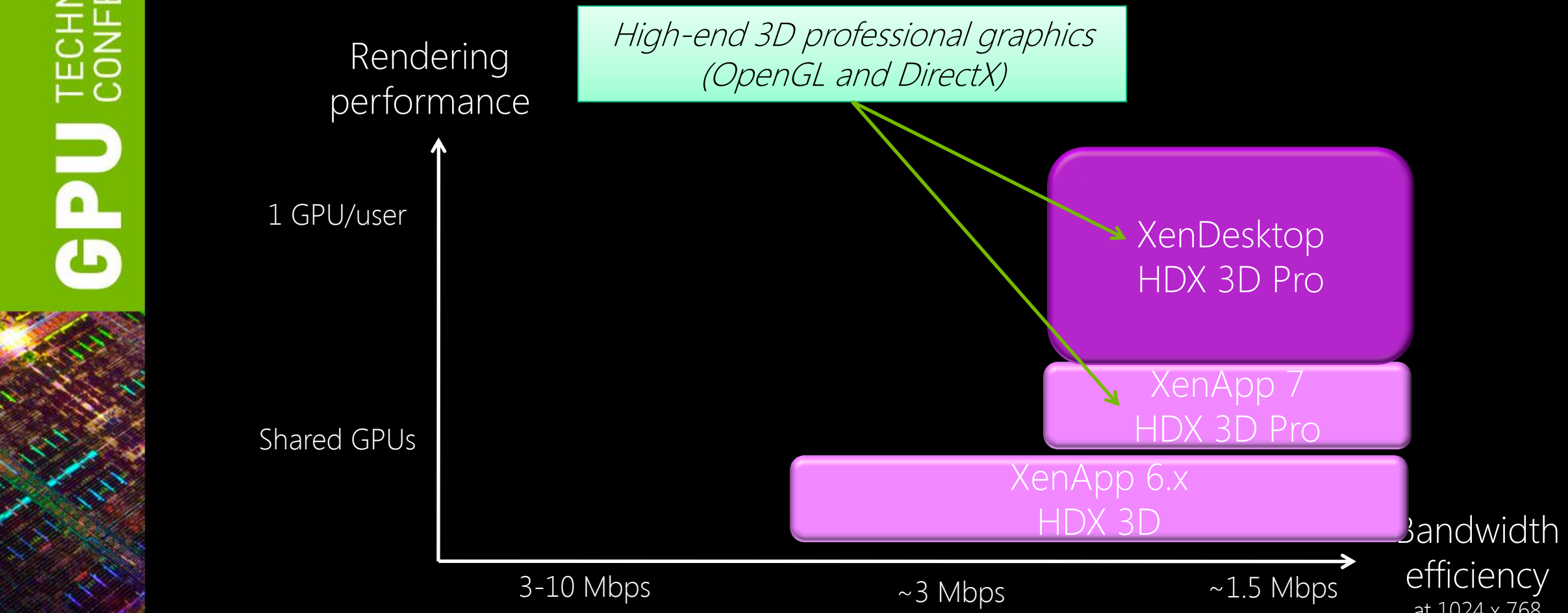
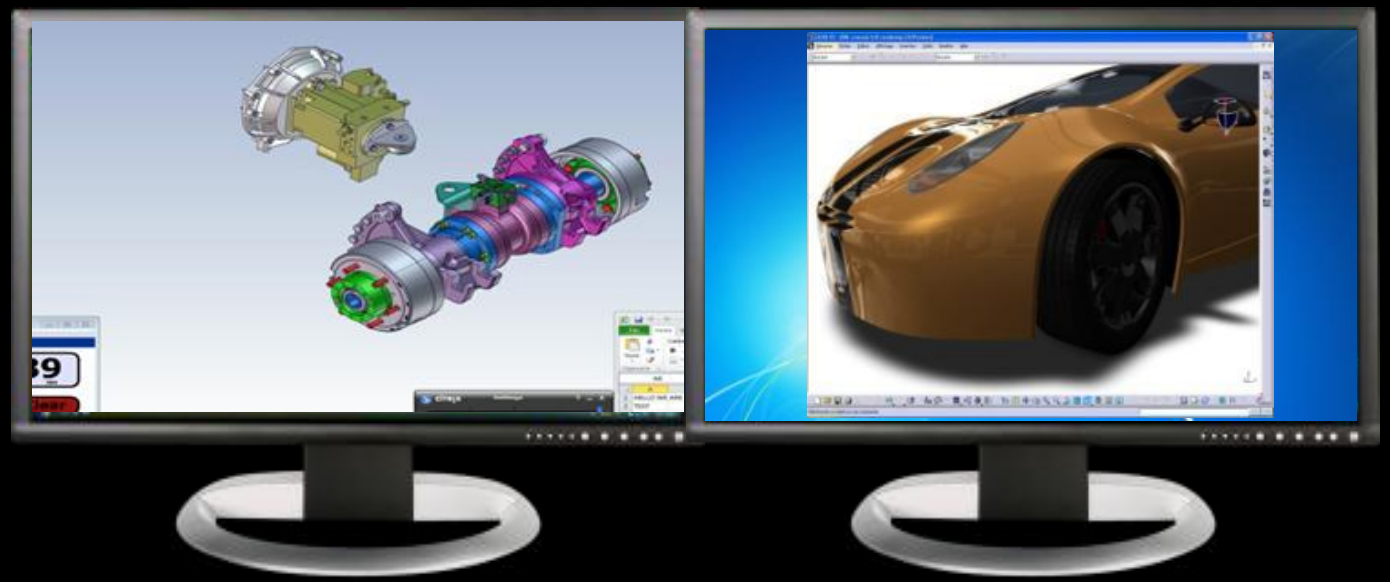
3D graphics acceleration options from Citrix





Supports up to 4 monitors

- Citrix Receiver for Windows or Linux
- Efficient use of bandwidth



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3D mouse support available on VDI

USB redirection for 3D Space Mouse and similar devices

Virtual Channel can be prioritized
to maximize responsiveness

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Citrix CloudBridge for WAN optimization

- Ideal for low bandwidth and high latency connections

- Improves responsiveness of apps delivered via HDX 3D Pro over high latency connections
- Reduces bandwidth consumption, enabling more users to share a given size of pipe (e.g. ABB reports 3:1 improvement at just 5 users)

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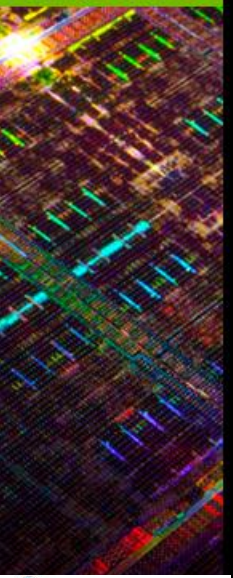

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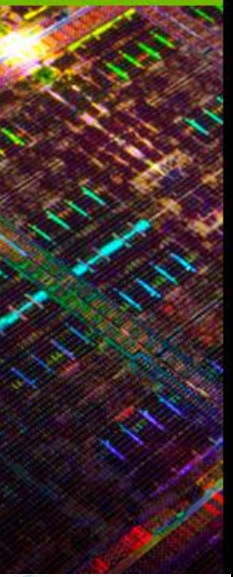
XenApp GPU sharing scalability

- *With two NVIDIA Quadro 4000 cards we ran **9 users per GPU** using a test app that works with ESRI ArcGIS, and we still had space for more*
- *Running Dassault SolidWorks, Ansys Workbench and Fluent, scalability was **6 to 10 users** per Quadro 4000*
- *The Quadro 6000 was able to support **30 users** running Dassault 3DVIA Composer Player with only minor slowdown; and this test was harder on the graphics card than the real world is!*
- *We are getting **30 users** of SAP Right Hemisphere 3D on a physical XenApp 6.5 server with a Quadro 2000 card*

New NVIDIA GRID K1 & K2 introduces even higher user densities!

GPU TECHNOLOGY CONFERENCE



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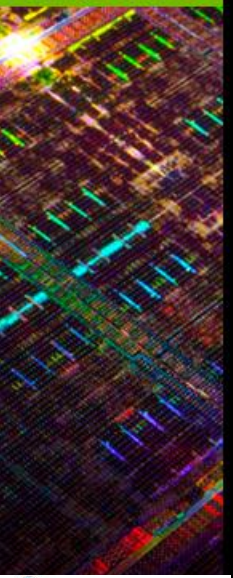
Client options

for Citrix XenApp HDX 3D and XenDesktop HDX 3D Pro



Optimized with special codecs for HDX 3D Pro

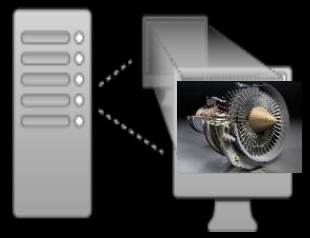
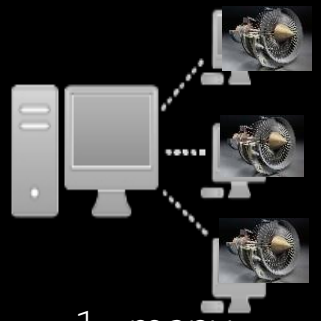
Optimized with special codecs for HDX 3D Pro

Optimized with special codecs for HDX 3D Pro

Any Device – Business or Personal

Universal Access to Desktops, Apps and Data From Any Device

Optimized with special codecs for HDX 3D Pro

VDI	Shared
Citrix XenDesktop	Citrix XenApp
	
1-1	1- many

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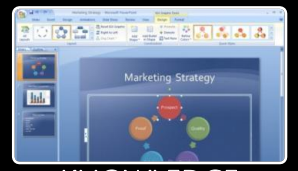
Future proven GPU options for remote graphics

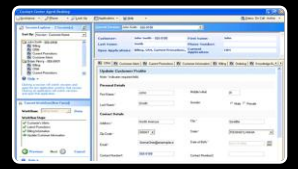
Citrix XenApp, XenDesktop, XenServer

DESIGNER

POWER USER



KNOWLEDGE WORKER



TASK WORKER

GPU Performance

GRID K2

GRID K1

GPU Memory *16GB* *8GB*

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Virtualized Desktops

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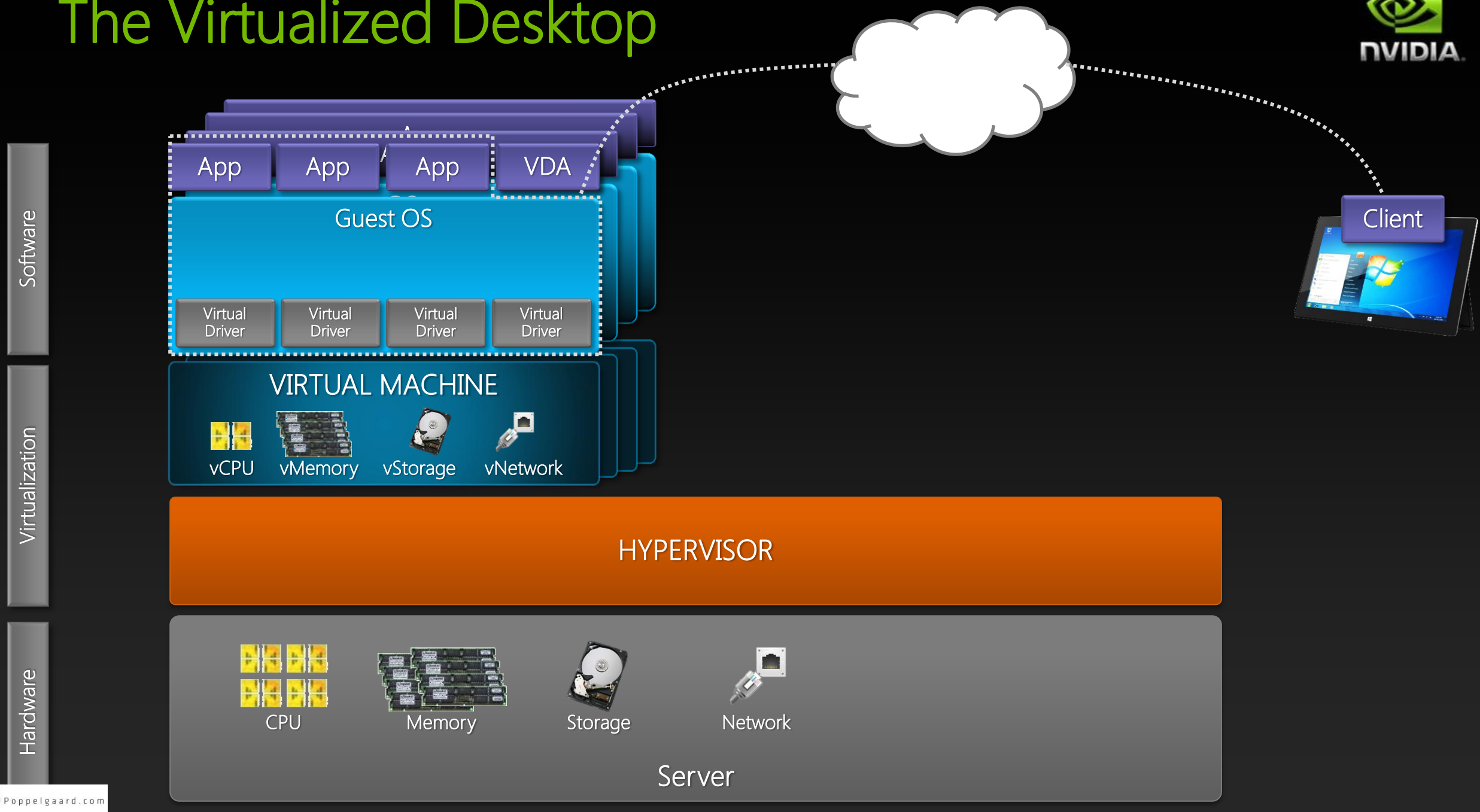
The Virtualized Desktop



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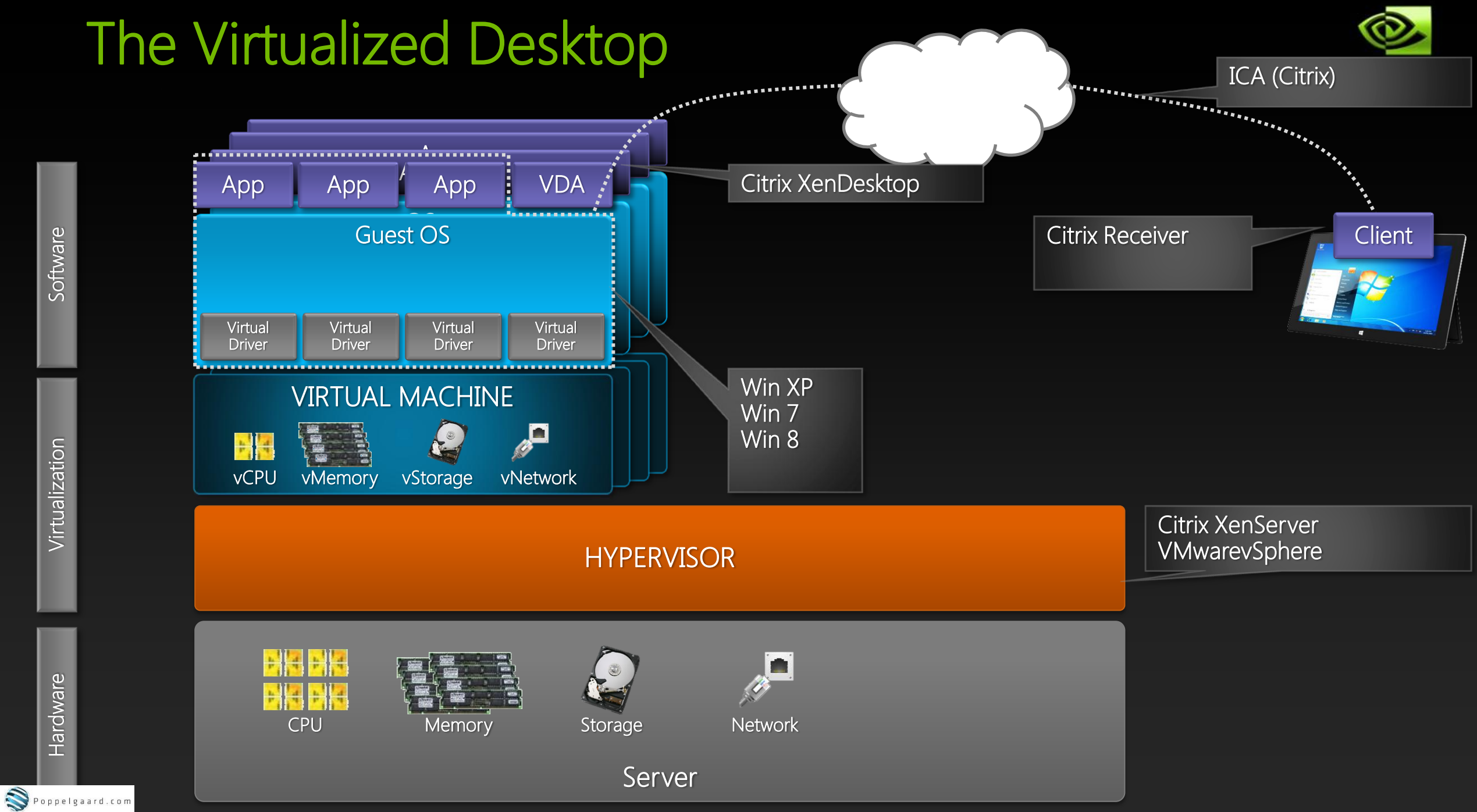
The Virtualized Desktop



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GPUs in a Virtual Desktop

- GPU pass-through — 1:1 dedicated GPU to user
- Shared GPU — *Software* virtualization of the GPU
- Virtual GPU — *Hardware* virtualization of the GPU through the NVIDIA GRID software

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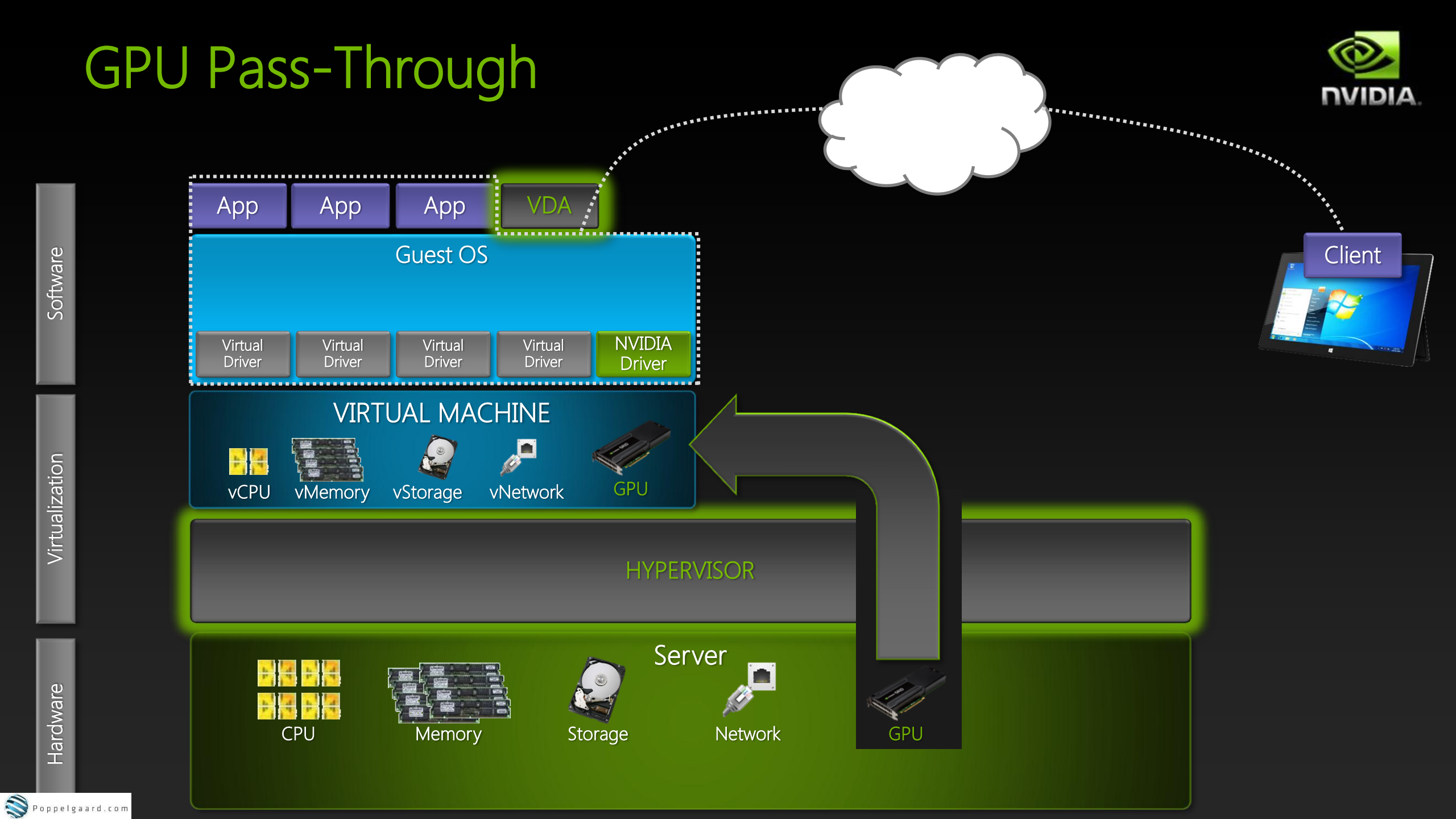
GPU Pass-Through



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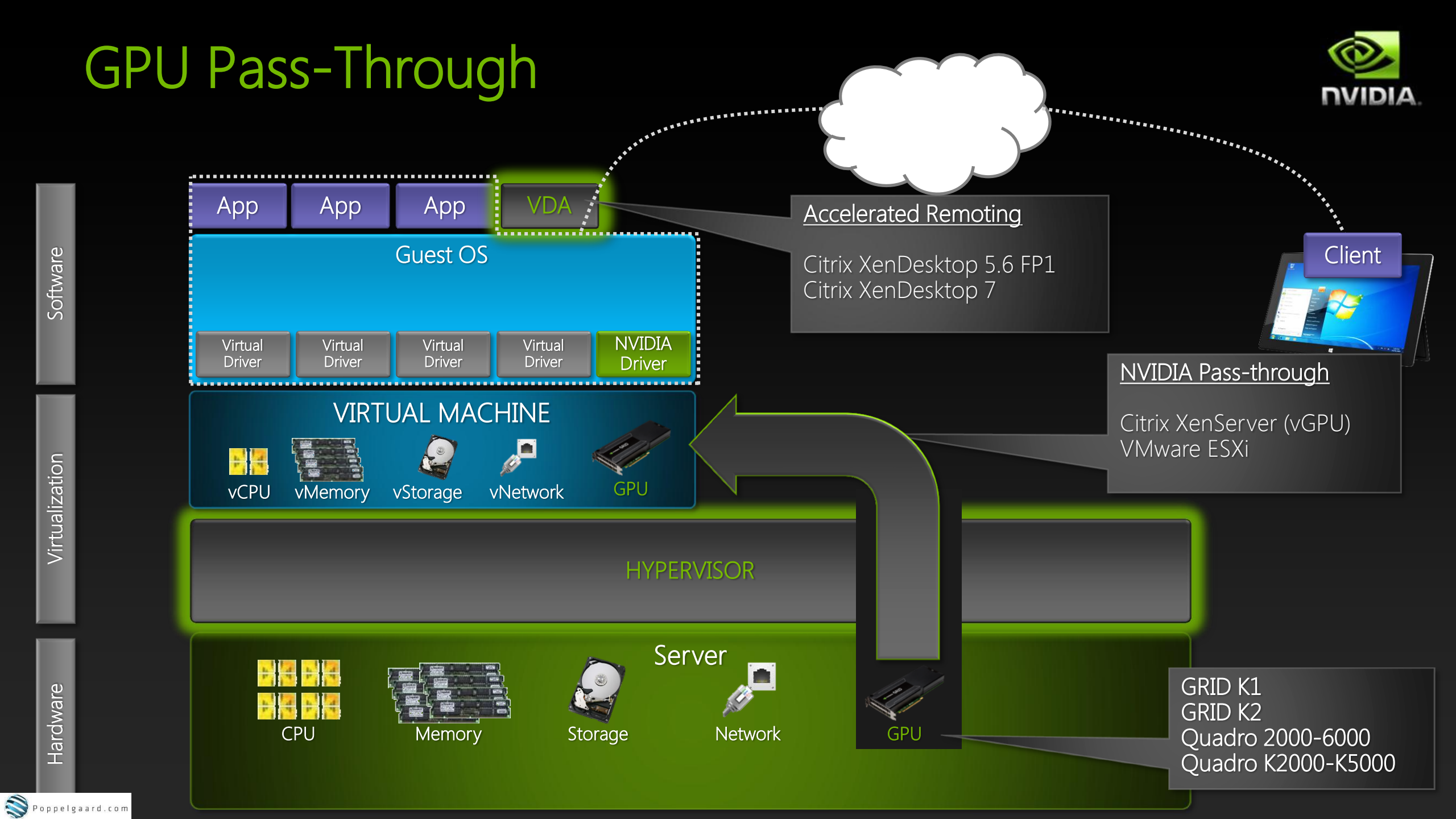
GPU Pass-Through



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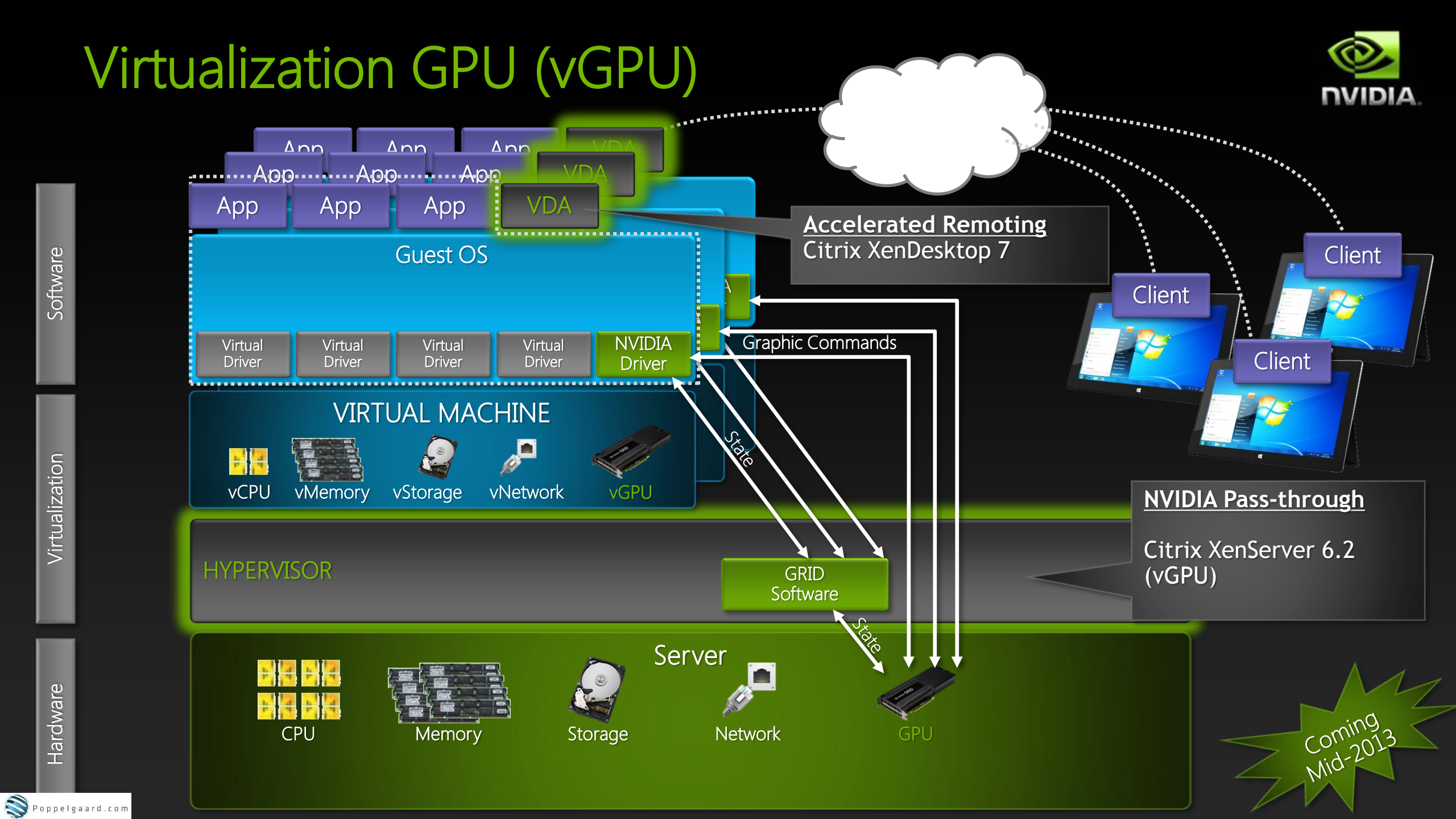
Virtualization GPU (vGPU)



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Virtualized Applications

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CITRIX XenApp

POWERED BY
NVIDIA GRID™

Windows Server

App	App	App	App
XenApp Session	XenApp Session	XenApp Session	XenApp Session

NVIDIA Driver

NVIDIA GRID GPU

Virtual Applications

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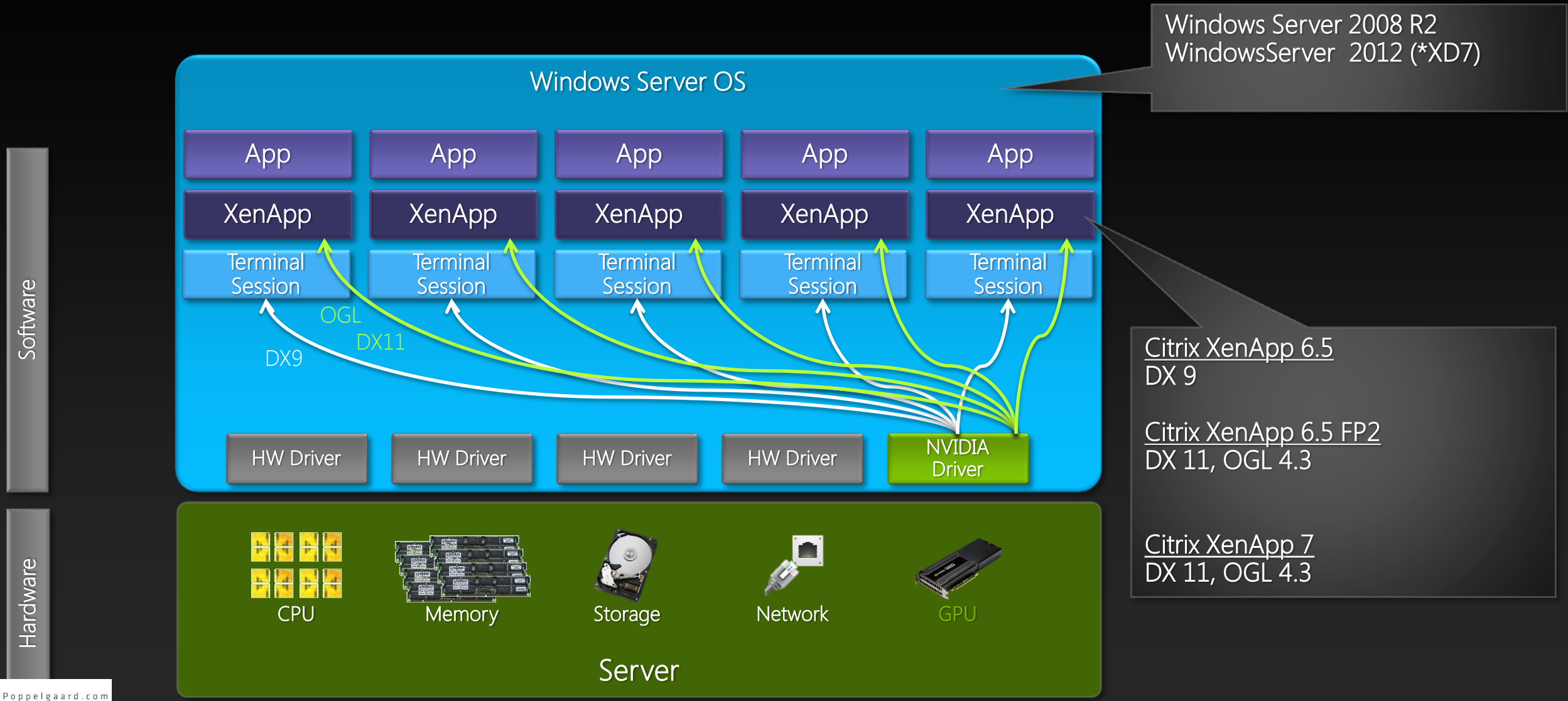
XenApp on Bare Metal



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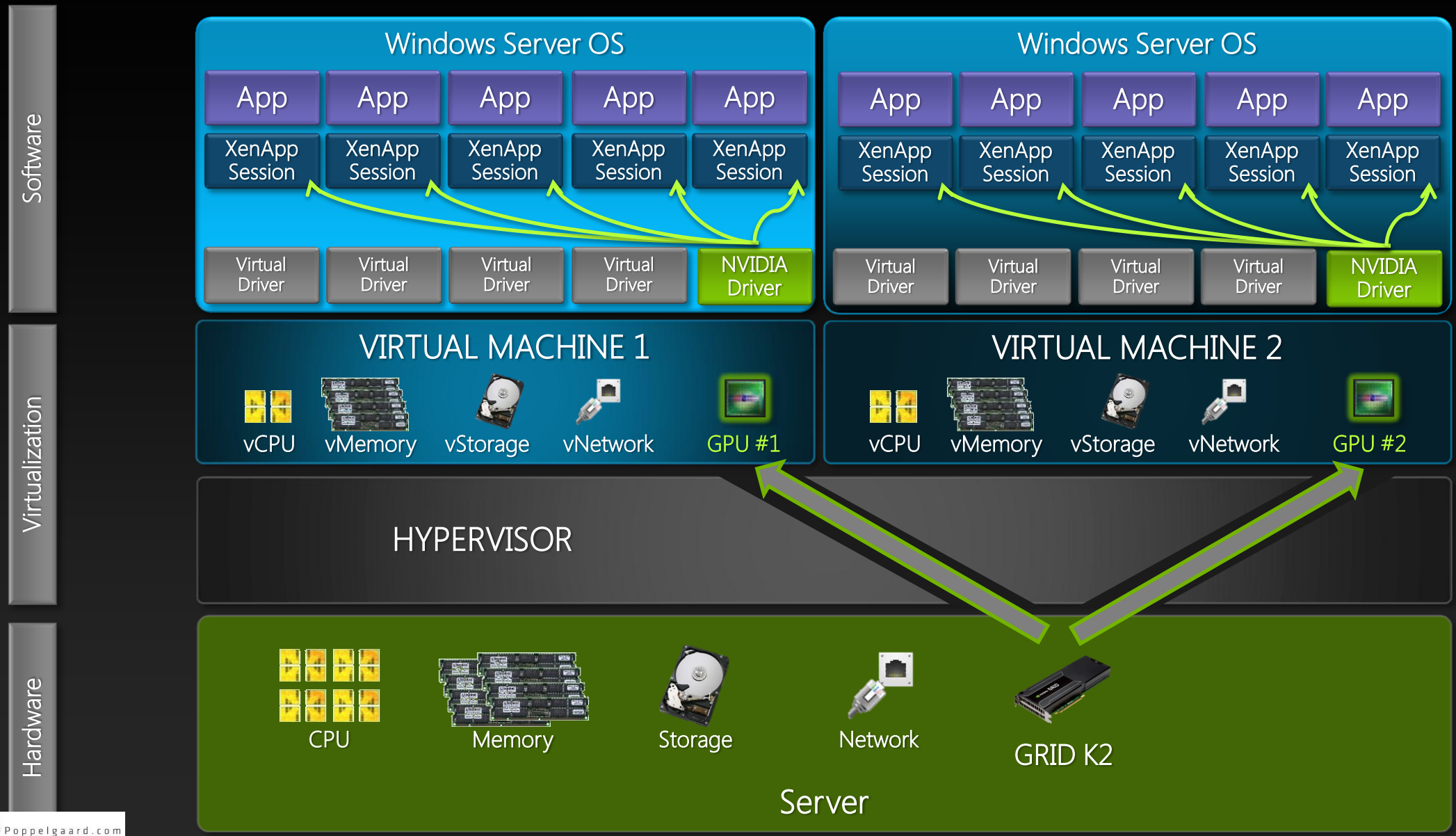
XenApp in a Virtual Machine



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GRID Enabled OEM Platforms

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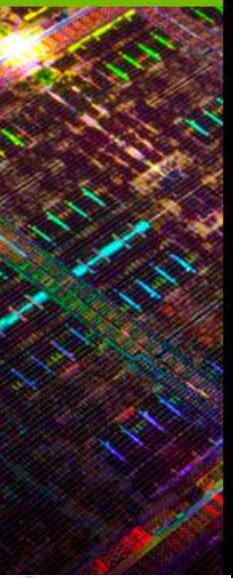

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Available Today

- IBM iDataPlex dx360 M4
  2 GRID K1 or 2 GRID K2
- Dell PowerEdge R720
  2 GRID K1 or 2 GRID K2
- Cisco UCS C240 M3
  2 GRID K1 or 2 GRID K2
- SuperMicro SYS-1027-TRF
  2 GRID K1 or 3 GRID K2
- SuperMicro SYS-2027-TRF
  2 GRID K1 or 3 GRID K2
- Asus ESC 4000 G2
  3 GRID K1 or 4 GRID K2

Available Q2 2013

- HP ProLiant SL250 Gen8
  2 GRID K2
- HP ProLiant SL270
  4+ GRID K2
- HP ProLiant WS460c Gen8
  1 GRID K1 or 1 GRID K2

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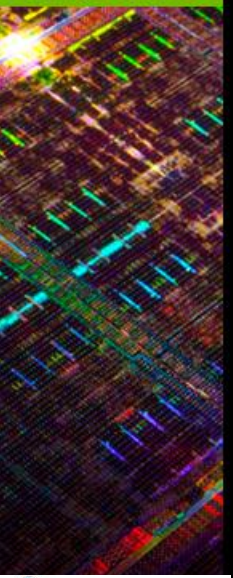

CAD VENDOR LICENSE

NETWORK

iOPS

GPU

3D App

SECURITY

CPU

MEMORY

STORAGE

DISASTER RECOVERY PLAN

IMAGE MANAGEMENT

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RECAP

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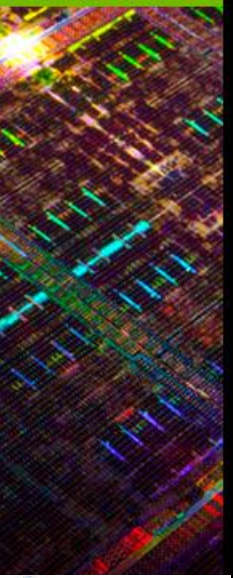

Citrix XenDesktop/XenApp HDX 3D Pro & XenServer w. NVIDIA GRID

Best WAN performance on the market

First SBC/VDI solution with direct hardware GPU acceleration

First SBC solution with GPU sharing

First to market with Nvidia VGX API support

First Hypervisor to market with Nvidia vGPU sharing with GRID

Lowest cost per user

Any device

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Q&A

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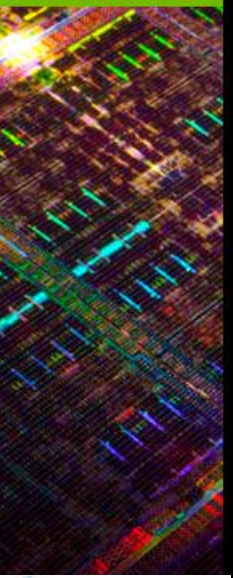

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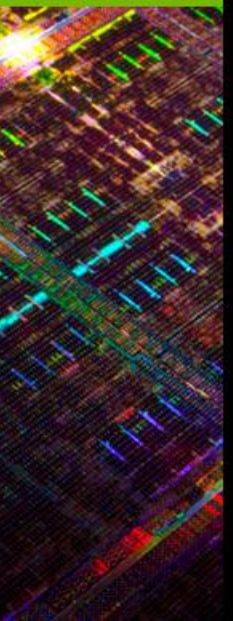

Upcoming GTC Express Webinars

July 9 - NVIDIA GRID VCA: A Turnkey Appliance for Design and Engineering Applications

Presented by Ankit Patel, Sr. Product Manager, NVIDIA

July 17 - Delivering 3D Graphics from the Private or Public Cloud with XenDesktop and GRID

Presented by Derek Thorslund, Director, Product Management, Citrix

Register at www.gputechconf.com/gtcexpress