

The Dell take on client virtualization

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Agenda for this slot

Topics

- ✓ Challenges and opportunities for business
- ✓ Benefits
- ✓ WYSE portfolio
- ✓ Graphics stack
- ✓ Precision versus Poweredge
- ✓ Financing
- ✓ Secrets!!!
- ✓ Q&A



Key challenges for organizations today



Enabling workers to run graphically intensive applications remotely without compromising on security



Achieving higher resource utilization of existing assets and scaling efficiently to business demands



Deploying and managing distributed workstations and user desktops resulting in a huge burden for IT



Enabling collaboration on a centralized data set and need-based access to sensitive data for internal and external stakeholders



What can desktop virtualization do for **you**?

Centralizing desktops in the data center

Empower the workforce

Enable BYOD, improve user experience and manage any device, enhance user collaboration

Optimize IT resources

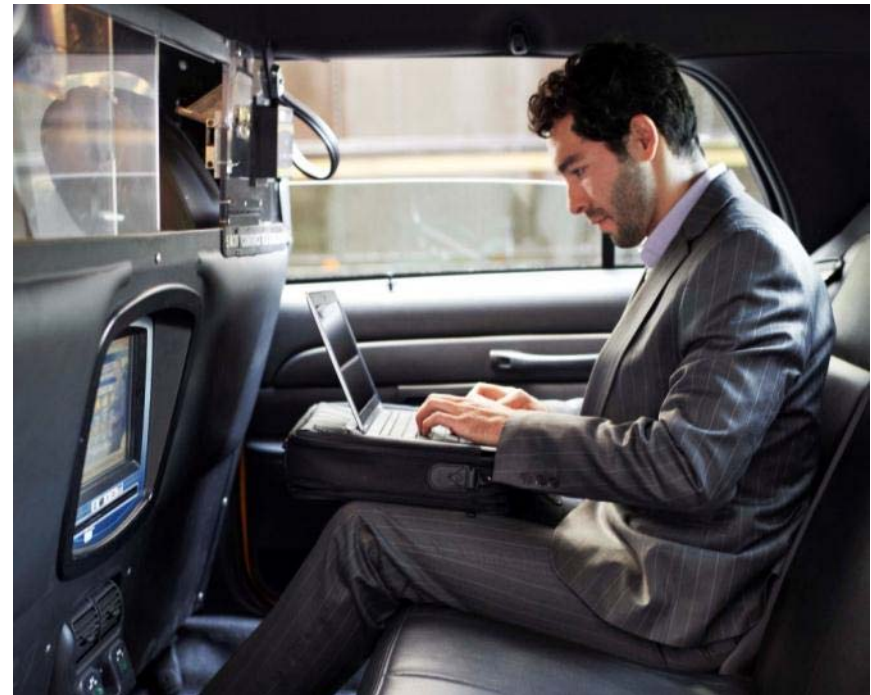
Reduce IT resources, scale and speed deployments, centralize management

Improve security

Control data, apply policies, comply with regulations and monitor risk

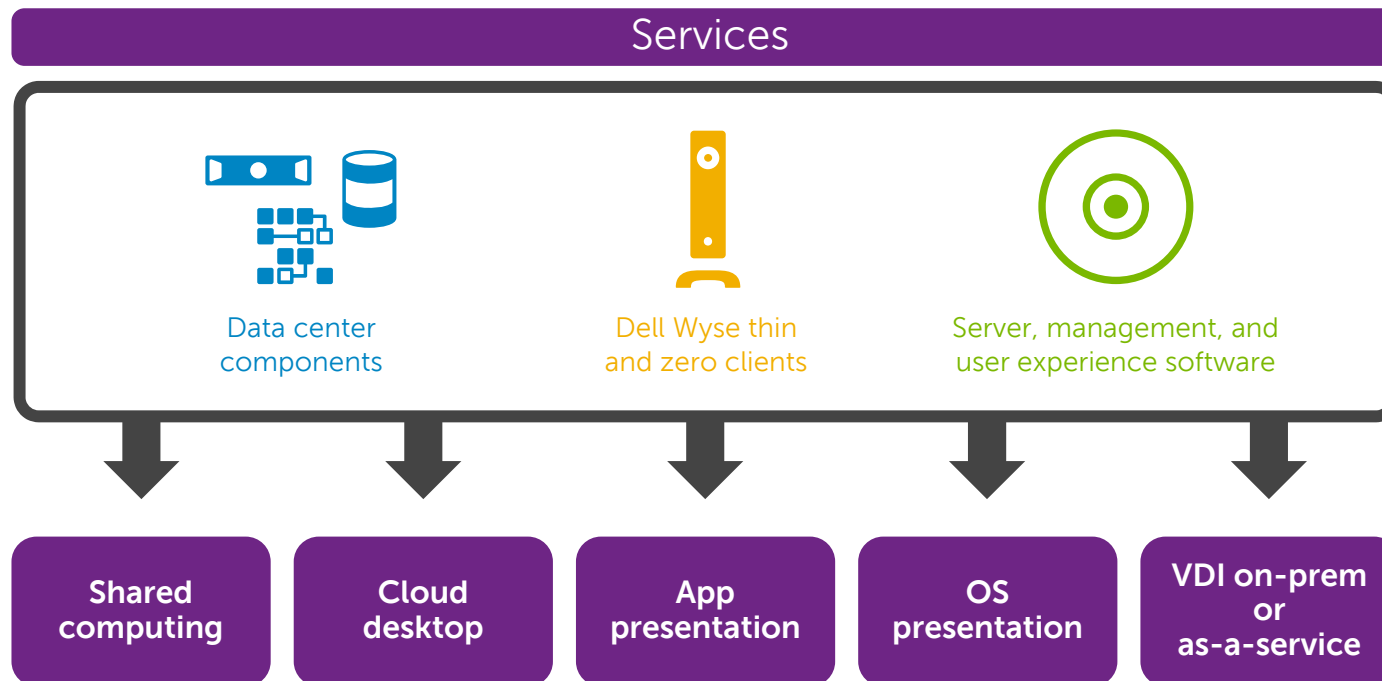
Manage costs

Monitor and optimize total cost of ownership, achieve greater utilization from infrastructure assets

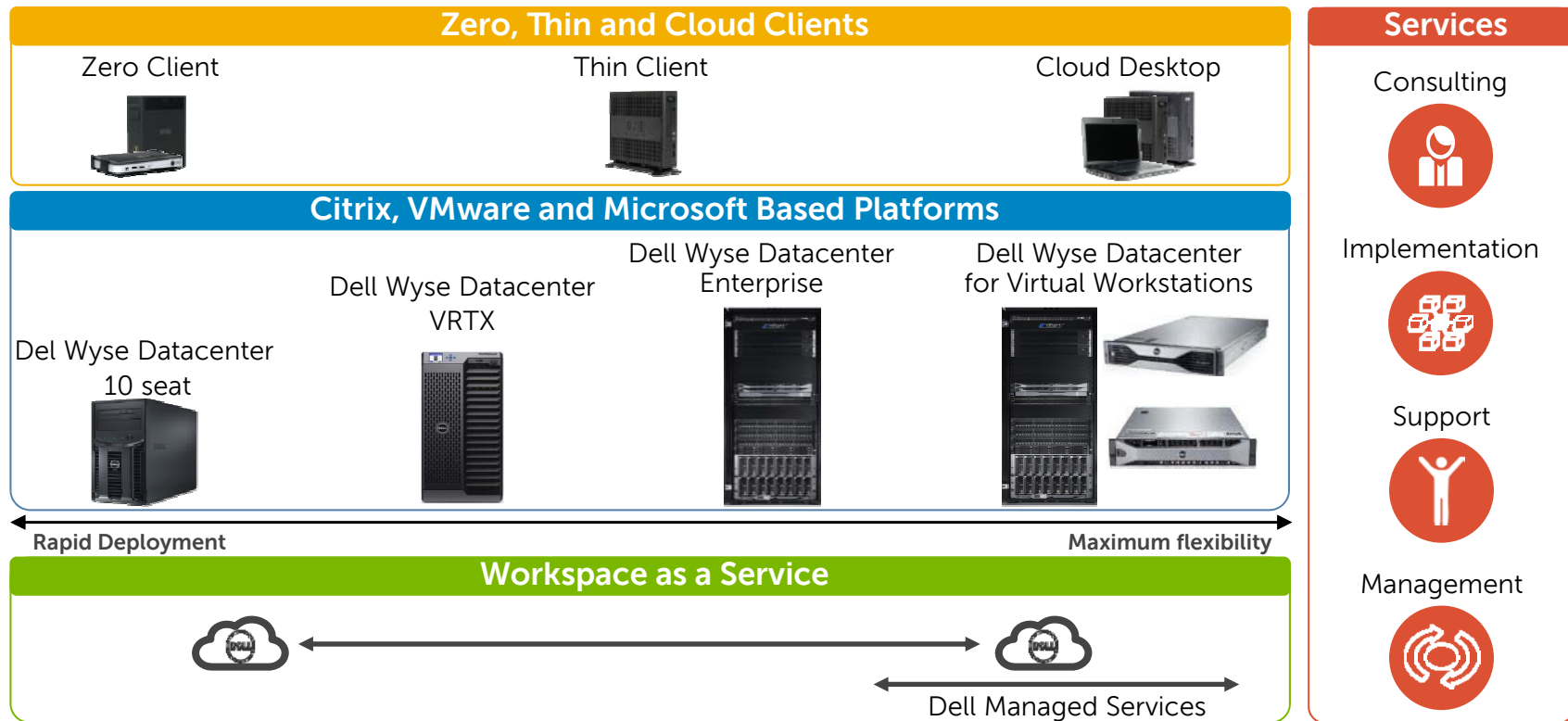


What is Dell Cloud client-computing?

A true solution: Data center, cloud clients, software and services



What is Dell Cloud client-computing?



Cloud client-computing leadership

Product Innovation	Solution Innovation	Customer Experience
#1 in the cloud client market with 220+ patents	4 unique delivery models offering greater choice to customers	42K+ dedicated services professionals active in 90 countries
73% better desktop virtualization performance with Dell servers	88% less tools to provision a desktop	95% customer satisfaction with Dell ProSupport service
42% lower cost per desktop with Dell storage	1 point of support contact	#1 In customer satisfaction for IT Service & Support

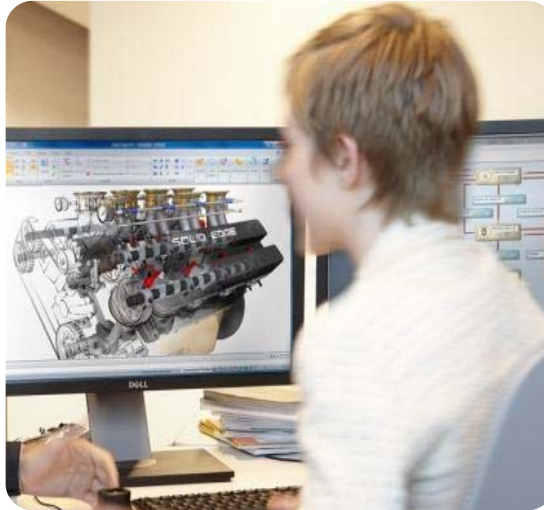
Cloud Client-Computing Customers



Workstation-class requirements for key industries



Media and Entertainment



Engineering and Oil & Gas



Others with large data and graphic intensive apps

- Improved data security and providing need-based access to data and apps
- High performance and reliability for demanding applications
- Greater IT efficiency through rapid deployment and centralized management
- Enablement of device independence and BYOD scenarios



Benefits of Data Center Workstations

- Increased Security
- Better manageability
- Improved ROI through better utilization of workstation resources



- More favorable work environment
- Increased flexibility of deployment
- Anytime, anywhere access
- Improved OS and application migration



Graphic options for workstation solutions

1:1 Assignment

Computing Node



Dedicated mobile, fixed or data-center based workstation

GPU Pass-Through

Computing Node



Direct assignment of GPU to user

Virtualized Graphics

Computing Node(s)



GPU is shared similar to CPU and Memory





Screen Images courtesy of Landmark Software and Services' DecisionSpace® Desktop application suite

- + Powerful
- + Dependable
- + Manageable

Precision.

Creation engines that enable professional users to work at the speed of thought.

Combining two market leading offerings



Dell Precision

- High performance
- High reliability
- Great user experience
- ISV certifications
- Top-notch service and support



Dell Cloud Client-Computing

- Optimized hardware, software and services
- Best-in-class thin clients
- Secure access to centralized data and applications
- Streamlined deployment and management

Dell Wyse Datacenter for Virtual Workstations

- Certified for key use cases
- Best-in-class data security, performance and reliability
- Centralized management
- Complete end-to-end optimized solution
- World class client devices and support



Dell Wyse Datacenter for Virtual Workstations

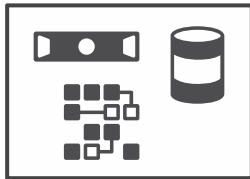
End to end solution for predictable desktop virtualization deployments

 AUTODESK

PTC

SIEMENS

 DASSAULT
SYSTEMES



Best in class datacenter
components & Precision
workstations



Leading GPU
technology



Dell Wyse
thin clients

 CITRIX
 vmware

Desktop
virtualization
software

Services

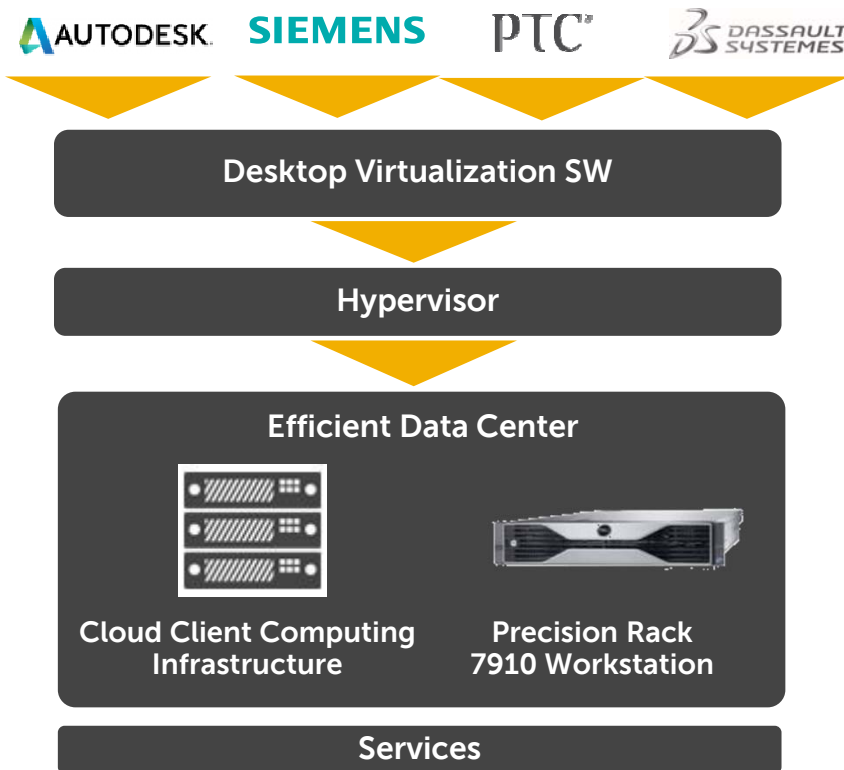
Reference architecture

1st end-to-end ISV-certified workstation virtualization solution

- Reference Architecture
- Fast deployment
- Fully supported
- Single point of accountability
- Predictable performance
- Predictable densities
- Siemens, PTC, Autodesk & Dassault Systemes certifications completed or in-progress



Elements of the solution



ISV Certified

- Siemens, PTC, Autodesk & Dassault Systemes certifications completed or in-progress

Desktop Virtualization broker

- Citrix XenDesktop
- VMware Horizon View

Hypervisor

- Citrix XenServer
- VMware vSphere

Datacenter components

- Precision Rack 7910 Workstation
- EqualLogic and Compellent Storage
- Force10 Networking
- NVIDIA K1 and K2 GRID Cards
- Wyse Thin and Zero clients

Services

- Consulting, Implementation, Support, Management



Benefits that customers can expect



Secure, reliable access to data and applications

- Secure need-based access to applications and data
- Improved data protection and disaster recovery
- Device independence and BYOD



High performance for graphic intensive workloads

- Workstation-class performance in-line with the Precision brand promise
- Centralized infrastructure that is easily scalable based on user and performance needs



Greater workforce productivity and IT efficiency

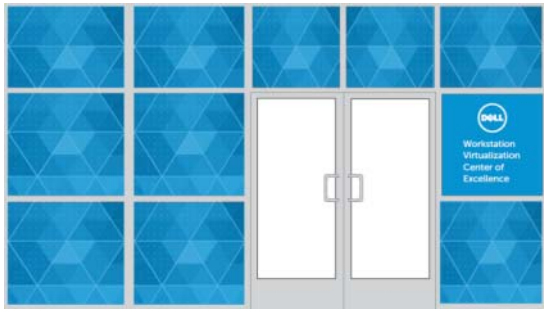
- Full end-to-end solution with certified configurations for workstation class apps
- Improved workflow through efficient sharing of data
- Centralized management of workstations and desktops

ISV Certified

- Dell works with many software vendors (ISVs) to verify application and system compatibility
- Rigorous testing helps to optimize performance and reliability
- Brings you a level of confidence you trust and value



Virtual Workstation Center of Excellence



Dell Wyse Datacenter for Virtual Workstations is staged in the Dell Solution Center with remote access capabilities and access to Dell & Industry Experts

Proof of Concepts for Customers and Channel Partners

- ✓ No fiscal outlay to evaluate the solution
- ✓ Shorter times for implementation
- ✓ No disruption to customer workflow
- ✓ Access to Dell resources

More Certifications from ISVs → future optimizations

- ✓ Dell certified status
- ✓ Quicker time to market on the solution
- ✓ ISV certification and best practice guideline development

ISV Partners



Best components in the industry

Pre-tested and optimized for desktop virtualization

Enterprise-class hardware

- **Compute:** Precision workstations, PowerEdge racks
- **Storage:** Compellent, EqualLogic
- **Networking:** Force10, PowerConnect

Leading hypervisors & software

- **Hypervisor:** VMware ESX, Citrix XenServer
- **VDI:** VMware Horizon View, Citrix XenDesktop

End-to-End solution

- Deployment & unified support services for infrastructure
- Flexible infrastructure configuration choices
- Thin Clients, Workstations, PCs

34%

Decrease in power consumption¹

12+

Reference architectures

5x

Faster time to value⁴

Source: (1) <http://bit.ly/XTbeVc> (2) <http://dell.to/15hteha> (3) <http://dell.to/12wgWjR>



Dell Wyse cloud clients

Most secure

Virus-immune
Dell Wyse ThinOS

- Zero attack surface
- Ultra-secure Windows Embedded Standard and Linux thin clients



Reduce risk

Easiest to manage

Automatic and cloud-based
endpoint management

- Self-managed clients
- Cloud Client Manager cloud-based fixed/mobile device management



**Empower IT,
embrace
BYOD**

Price/performance

Broadest portfolio of
endpoints and software

- Endpoints designed for Citrix, Microsoft and VMware
- Dell award winning Monitor and print solutions



**Price per
performance
for any
budget**



*220+ patents; global thin client leader, units and revenue, per IDC for calendar 2012



Attach the big 3 – Consult / Support / Manage



Dell Services
Accelerating innovation with
services *focused on your future*



5

Global Command
Centers

96%

Customer satisfaction
for end-user
deployment

60+

countries offering
Same Business Day
response

115+

million
systems supported

80

countries and 18
languages
supported



Virtual
Graphics
Architecture



NVIDIA Kepler™-based GRID Boards

Designed to enable rich graphics in virtualized environments

NVIDIA GRID™ technology offers the ability to offload graphics processing from the CPU to the GPU in virtualized environments, allowing the data center manager to deliver true PC graphics-rich experiences to more users for the first time.

GPU Virtualization

GRID boards allow hardware virtualization of the GPU. This means multiple users can share a single GPU, improving user density while providing true PC performance and compatibility.

Low-Latency Remote Display

NVIDIA's patented low-latency remote display technology greatly improves the user experience by reducing the lag that users feel when interacting with their virtual machine. With this technology, the virtual desktop screen is pushed directly to the remoting protocol.

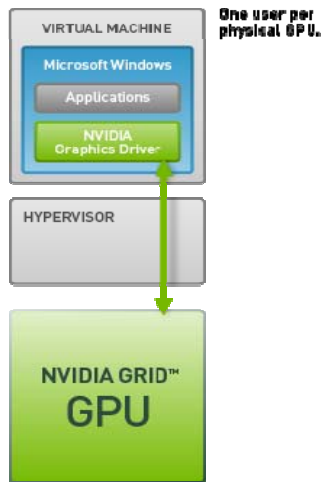
Maximum User Density

NVIDIA GRID boards have an optimized multi-GPU design that helps to maximize user density. GRID K1 boards, which include four Kepler-based GPUs and 16GB of memory, are designed to host the maximum number of concurrent users. GRID K2 boards, which include two higher end Kepler GPUs and 8GB of memory, deliver maximum density for users of graphics-intensive applications.



Solution Architecture

Virtual Shared Graphics Acceleration, Virtual Dedicated Graphics Acceleration, Virtual GPU



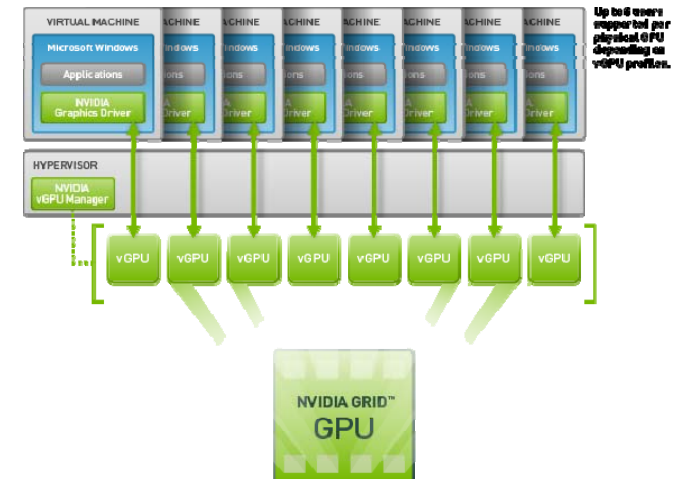
Virtual Dedicated Graphics Acceleration (vDGA)

vDGA, also known as pass through graphics support, refers to the technology of mapping a virtual desktop directly to a physical GPU on a high-end display adapter such as an NVIDIA GRID K1 or K2 card.



Virtual Shared Graphics Acceleration (vSGA)

vSGA provides the ability for multiple VMs to share physical hardware GPUs for 3D acceleration. vSGA supports a maximum of 512MB of virtual memory assignable to each VM, half of which comes directly from the physical GPU.



Virtual GPU (vGPU)

vGPU™ brings the full benefit of NVIDIA hardware-accelerated graphics to virtualized solutions. With GRID vGPU technology, the graphics commands of each virtual machine are passed directly to the GPU, without translation by the hypervisor. This allows the GPU hardware to be time-sliced to deliver the ultimate in shared virtualized graphics performance. Multiple vGPU profiles are available.

Dell Precision Rack 7910

Rack 7910 Features:

- Rack Workstation platform, 2U form factor
- Intel Haswell-EP architecture
- Dual socket CPU platform running Intel Xeon E5-2600 v3 family of processors up to 160W and 18 cores
- Support for up to 1.0TB* 2133MHz RAM
- Supports up to 8 x 2.5" SAS/SATA disks
- Support for up to 2 x nVidia GRID K2a (active) cards
- Support for up to 4 x discrete single width Gfx cards



* 1TB memory config requires 64GB RDIMMs – projected for March 2015



Rack 7910 position Vs PE R730 for VDI

- The Rack 7910 is leveraged from 13G R730 (has iDRAC!).
- It is differentiated by Windows Client OS, SKUs like graphics cards, hard drives (client HDDs and subset of Enterprise SAS drives.) add in cards like Teradici host cards, 1394 High end processor support etc.
- R7910 targets are traditional 1:1 rack WS customers like OEM running client OS.
- Common areas with R730 are support for Citrix and VMware (largest base)
- However Servers will not be qualifying Nvidia Quadro cards - only K2 and K1 for graphics enhanced VDI environments – not for WS virtualization
- WS ISV certs will be done only on the Rack 7910.



*Post RTS

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Why Dell?

Pretested, preconfigured solution stack

Complete hardware and software stacks for rapid deployment and optimized operations

Flexible delivery models

DIY or have Dell design, deliver and manage it

Open architecture

Uses mainstream desktop virtualization software and open standards based architecture

Vertical-specific platforms

Customized to meet the unique needs of certain use cases in education, healthcare and government

End-to-End solution

One vendor – Dell - from the datacenter to the endpoint



360 Integration Design – Right the 1st Time

Design &
Propose



Lay the path for
success

Gather data from desktops targeted for virtualization

Process steps

- Assess existing environment *
- Analyze existing Infrastructure
- Examine Customer IT Practices
- Determine integration requirements
- Propose integration plan

Deliverables

- Final Analysis Report
- Integration Plan
- Executive Briefing
- GICS Services mapping

Customer gains a clear roadmap to
successfully integrating VDI into
environment

Confirm environment to
fully optimize
implementation

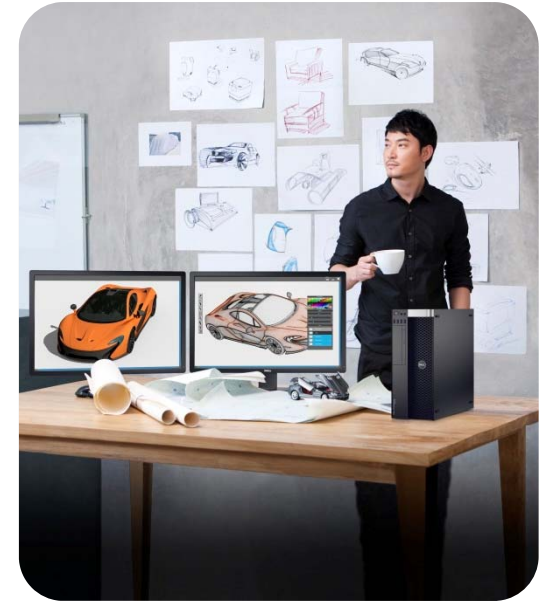
Uncover VDI adoption
blind spots

Blueprinting process is
CRITICAL to a
successful virtualization
deployment



* Can be paired with DVS Blueprint FIT Assessment

Businesses are **built** on workstations



Dell has a long history of **workstation leadership**



1997

Dell enters the personal workstation market



2001

First to launch a mobile workstation



2005

First tier 1 vendor to launch dual-core workstation



2008

First to introduce 2U rack workstation



2012

Announced award-winning tower & mobile chassis design & world's most powerful 15" and 17" mobile workstations



2013

Launched smallest tower, most powerful rack, first automated workstation performance tool, and world's thinnest and lightest mobile workstation



2014

Introduced new mobile workstation category, and industry-first workstation virtualization solutions

Dell Precision workstations



Dell Precision **leads by innovating**

#1

monitor
brand
worldwide



Powering Emmy & Academy
award-winning productions



World's thinnest, lightest
15" mobile workstation

**#1 leader in
rack based
workstations**



Pioneering virtual workstation
adoption

"Dell has become the new yardstick
for comparisons with Apple" -
Forbes

Dell Precision is the **most comprehensive** workstation solutions portfolio

Products + Software + Accessories + Services



Entry mobile

Dell Precision M2800



Thin & light

Dell Precision
M3800



**Powerful, single &
dual core mobile**

Dell Precision
M4800 & M6800



**Entry & small form
factor, to full power,
fully expandable towers**

Dell Precision T1700,
Tower 5810, 7810, 7910



1:1

Rack workstation

Dell Precision
Rack 7910



1 to many

Dell Wyse
Datacenter for
virtualized
workstations

Dell Precision Optimizer

| Intel CAS-W

| Reliable Memory Technology (RMT)

most **secure** | most **manageable** | most **reliable**
backed by ProSupport

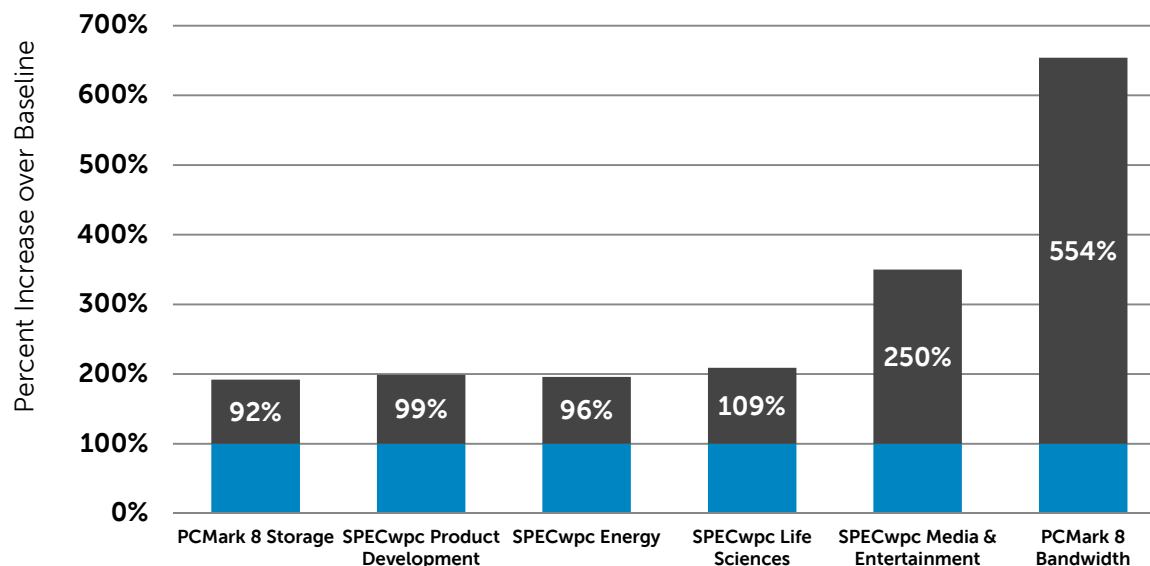
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Eliminate the bottleneck you never knew you had:

Intel CAS-W

Increased Storage Performance with CAS-W



- **Exclusive** Dell Software
- Cache acceleration software for workstations
- Gives large capacity, rotating disk drive high performance up to & exceeding, SSD

*T3610 with Xeon E5-1650 v2, 64GB memory (4x16GB), 500GB 7200RPM SATAIII boot drive, 128GB cache drive, CAS-W build 10301-2017



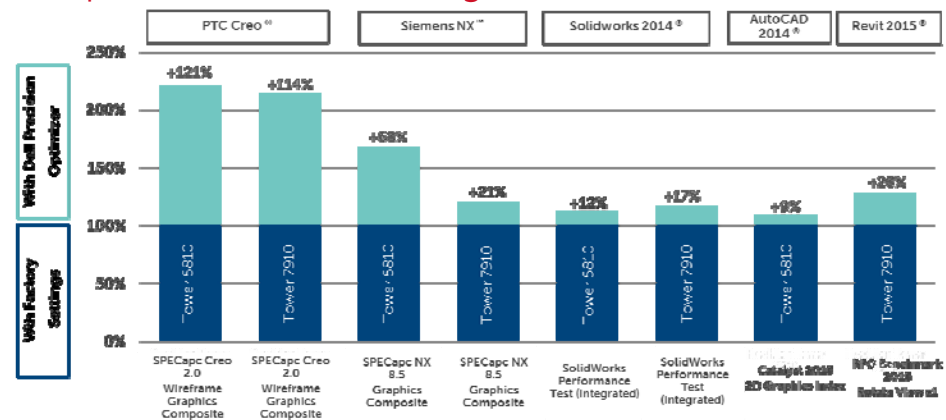
Dell Precision Optimizer

Automated software tool that dynamically adjusts settings to intelligently deliver the system resources you need to run your software applications at their maximum potential, and manages system updates and utilization

- Performance profiles automatically adjust Intel® Hyper-Threading, # of CPU cores, graphics, and power settings
- Included free with your Precision system
- **Support** for Autodesk 3ds Max and Inventor! Now with 13 total performance profiles
- **Enhanced system management** monitors workstation utilization with graphs and reports, compare workloads
- **Connect to Dell** for system upgrades and provide product input
- English, German, French, Japanese, Simplified Chinese



Optimizer 2.0 delivers significant Performance Gains



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* Test results are a weighted geometric mean of optimized configuration samples, compared to factory-installed default settings.

** Benchmarks are industry standard applications using SPEC committee and other industry standard benchmarks.



Dell Precision Optimizer



Dell Precision Optimizer

v2.5 launches 3/6/15!

- **AMD GPU support, new icons, desktop notification**
- **No need for admin rights** to use
- **4 new application profiles**

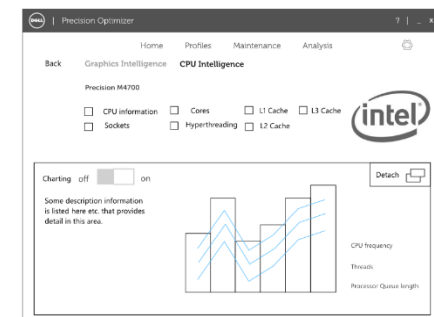
v3.0 launches 9/1/15!

- **New application profiles** for ANSYS and more! (TBD)
- **Enterprise-ready for Microsoft System Center Configuration Manager (SCCM)** with client headless mode, set up manuals, reporting package. Admins can engage profiles for end users, collect analytics on performance.
- **Graphics and CPU intelligence** displaying real-time analytics, graphs, with an over-application performance widget.
- **Performance insights** based on application usage from Dell Performance Engineering
- Adding **Windows 10** and support for **all shipping Dell Precision platforms including Rack 7910 (except M3800)**
- Localized in English, French, German, **Spanish**, Japanese, **Brazilian Portuguese**, Korean, Simplified and **Traditional Chinese**

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Confidential

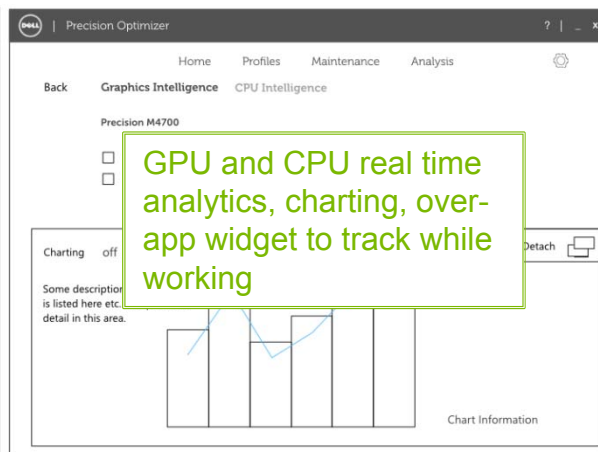
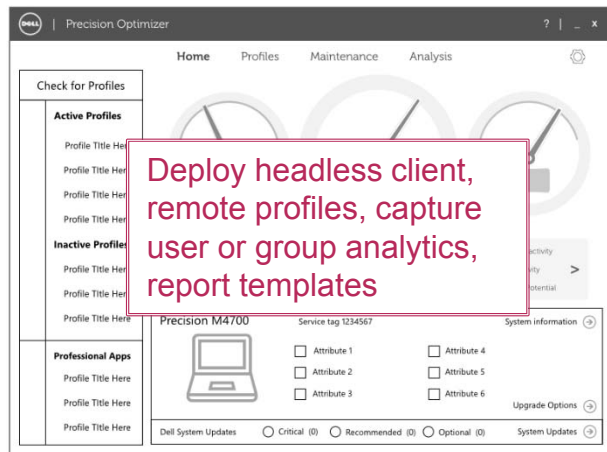
v3.0 mockups



v3.0 delivers the following

Enterprise-ready for SCCM

Graphics & CPU intelligence



Dell Performance insight

Dell Performance Engineering configuration recommendations per application

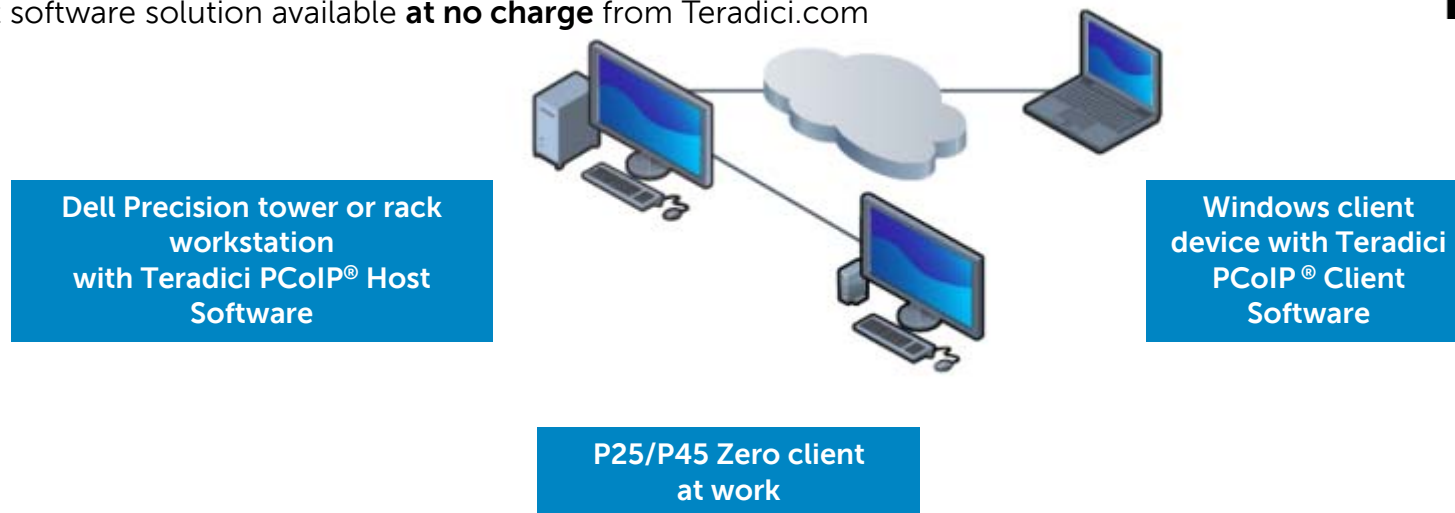
<SAMPLE> PTC Pro/E Creo 3.0
Optimal performance with Creo 3.0 typically depends on both the class of GPU and the CPU peak Turbo frequency. Creo's interactive modes are very lightly threaded, and the thread that is controlling the on-screen rendering through OpenGL requires the highest frequency within a CPU family to keep the GPU busy rendering frames instead of waiting for instructions. Unless the workstation is used for computational work (i.e. solvers, simulations, renderers, etc.), it is best to focus on fewer cores and the highest Turbo frequency from the latest Intel microarchitecture generation. Further, unless computational work represents a large amount of CPU time (such as overnight computational jobs being scheduled), it is better to use a single socket platform.

- Windows 10 support with 8.1 and 7
- Across Precision - adding M3800 follow on, Rack 7910 support
- 9 Tier 1 language support - adding Korean, Trad. Chinese, Spanish, Brazilian Portuguese
- Smart application resizing – adjusts for screen resolution



Meet New Teradici PCoIP® Workstation Access Software

- Completely host **software**-based solution enabling **secure remote connection** to a Precision tower or rack workstation with any PCoIP® enabled client device
- **Enables seamless productivity solution**
- Provides **mobility** and **flexible** working environment for occasional users
- Host software solution available on **Dell Precision tower or rack workstations**
- **One year of 24x7x365 support** provided by Teradici (with support SKU)
- Client software solution available **at no charge** from Teradici.com



New Precision workstations Coming Soon



Fixed Precision portfolio – 2HCY15



**Dell Precision Tower
3420/3620**

October 2015

**Professional
performance meets
affordability**

- Fully configurable small form factor and mini tower workstations
- Focused on competing in lower price bands and attracting non-workstation users into the workstation market



**Dell Precision Tower
5810**

Shipping

**Big power in a compact,
innovative design**

- Mission critical performance and reliability with Intel Xeon processors and optional dual graphics. Perfect for people who require professional graphics for 2D or 3D applications



**Dell Precision Tower
7810/7910**

Shipping

**The most powerful, scalable
Dell Precision tower ever**

- 7810 - Incredible performance with optional dual Xeon processors and graphics. Perfect for people who use professional applications and want to maximize their productivity.
- 7910 - The ultimate in performance and expandability with dual Xeon processors and graphics and most substantial memory and hard drive options available



**Dell Precision Rack
7910**

Shipping

**Ultimate workstation
performance and
security**

- Experience the highest level of workstation performance for 1:1 or 1:many
- Dual Intel Xeon processors, professional graphics, high performance storage controllers make this workstation the most powerful and scalable Precision ever.

Thank You!

