VIRTUAL WORKSTATION 101:

THE WHATS, WHYS AND HOWS OF A NEW COMPUTING MODEL FOR PROFESSIONAL VISUAL APPLICATIONS

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Word is spreading fast about the unique value offered by the virtual workstation, and for good reason. While professionals that require high-performance graphical computing can and will still rely on traditional deskside and mobile workstations, there's now a new model to consider. It's one that merges the proven server-based computing model with modern platform virtualization, combined with one critical new piece of technology: the virtualized GPU. Businesses now have a compelling new tool to attack some of the most troublesome issues facing demanding visual computing applications. The virtual workstation has arrived.

TRADITIONAL COMPUTING MODEL COMING UNDER INCREASED PRESSURE

Today, the vast majority of professional, visually-intensive workflows run on a computing environment built on a distributed sea of physical deskside and mobile workstations. Users design, view, model, animate and simulate on their own machines, each responsible for computation, visualization and storage. It's the de facto solution for one simple reason: it does its job, and it does its job well. And for the majority of professionals that rely on high-performance visual computing — from CAD to AEC, from finance to energy, and from sciences to media and entertainment — the tried-and-true mobile and deskside workstations will effectively carry the workload well into the foreseeable future.
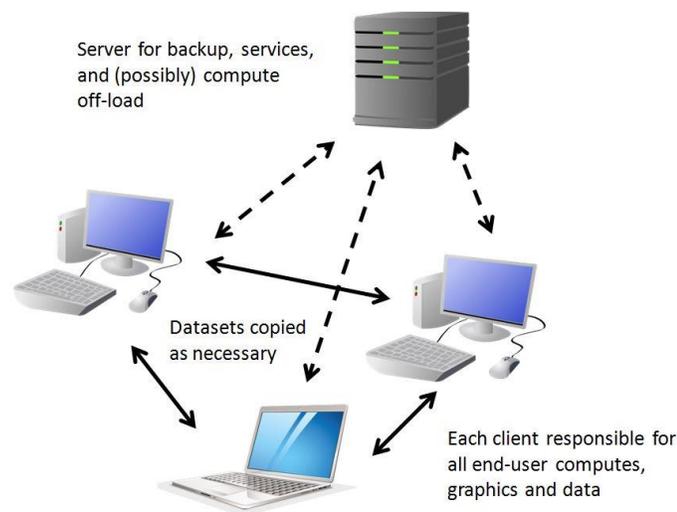

Figure 1 In the traditional client-side model, each physical workstation is responsible for all end-user computes, graphics and data

But some businesses are finding challenges with the traditional workstation model, challenges that aren't going away but instead intensifying over time. They're seeing visualization and computing, performed exclusively on clients spread across both the business and geography, starting to creak under increasing pressure — from datasets skyrocketing in size and heightened security concerns, to an increasingly distributed workforce that needs fast access to always up-to-date project databases. Huge files are no longer taking seconds to ship from client to client, but instead minutes or even hours. The risk of security breaches continues to climb, while maintaining that security in an increasingly mobile world gets harder and harder. And complex projects are more often requiring teams assembled not just from employees, but contractors and consultants who may not reside in the next cubicle, but on the other side of the globe. They might be in the office or out in the field. Yet, all need access to the same datasets, when they need it, from where they are and guaranteed up to date, with no waiting.

VIRTUAL WORKSTATIONS: A NEW TAKE ON PROVEN TECHNOLOGY AND INFRASTRUCTURE

For those cases, it's not the capabilities of a traditional workstation that presents issues, but rather *where* those capabilities reside and how they're accessed and shared. In the end, it's the environment and topology that's getting in the way for some, as a distributed sea of physical machines is fundamentally ill-equipped to address increasingly common challenges high-demand business are facing. Where to turn? More than a few are discovering the appeal of a centralized, server-side computing approach, one that merges the established foundation of platform virtualization technology but with one critical new addition: the virtualizable GPU. The combination opens up the advantages of a shared, centralized computing environment to an entirely new set of users: those whose jobs and business depend on interactive 3D graphical computing. Enter the *virtual workstation*.

With the traditional, distributed client-side model that now dominates professional, visually-intensive computing, all user processing and rendering is performed locally by the client. But with a virtual workstation approach, a remote server hosts a virtual representation of that machine, performing not only the computation but the graphics processing as well. Only the final displayed image — the pixel stream — traverses the network, to a simple client that need only display those pixels and capture user I/O.
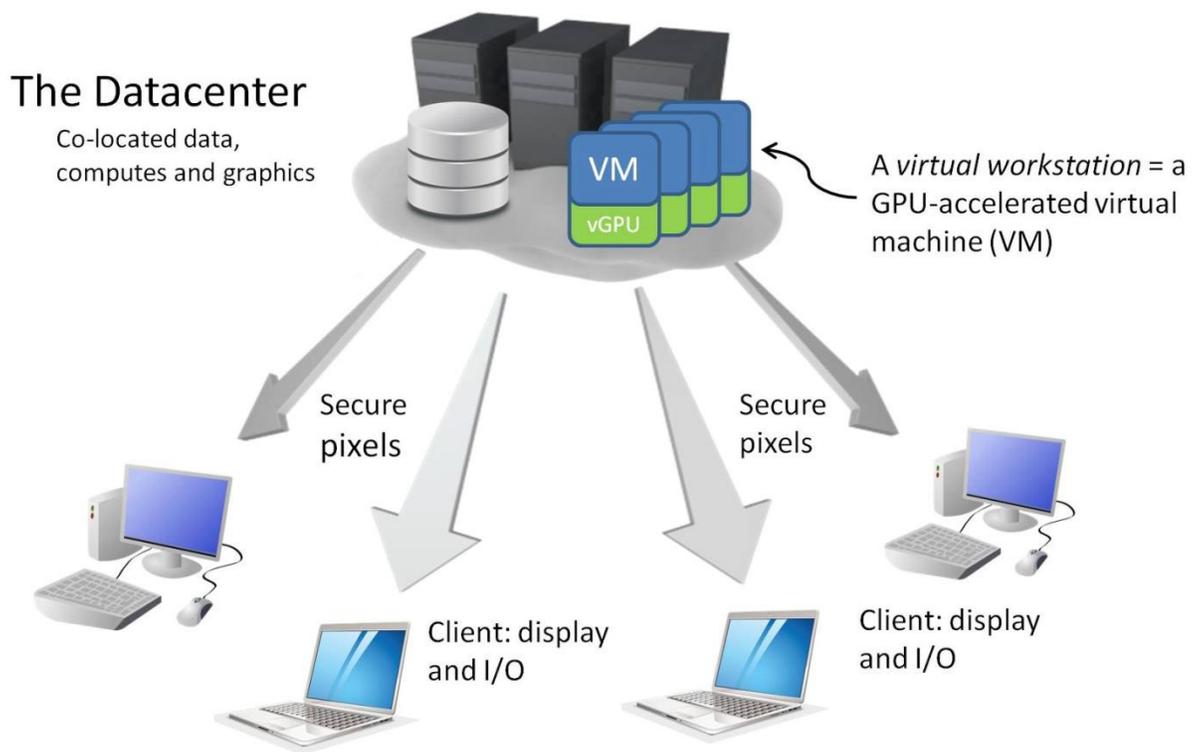
Figure 2 With virtual workstations hosted in the datacenter, all compute, data and graphics reside on the server and clients receive only the pixel streams

NVIDIA® Quadro® Virtual Data Center Workstation (Quadro vDWS) turns the standard virtual desktop into a 3D virtual workstation

Now virtualization technology and virtually hosted desktops aren't particularly new. Business executives and IT administrators alike have been long enamored with platform virtualization technology, and rightfully so, replacing PCs with very modest graphical demands with virtual desktops. The advantages of hosting virtual desktops remotely in the data center are well-known and precisely the reason the most common form, VDI (Virtual Desktop Infrastructure) has grown from nothing to a multi-billion dollar business in short order.

What is new in the field of platform virtualization, however, is the ability to deliver workstation-caliber, GPU-accelerated 3D graphics performance. NVIDIA Quadro vDWS allows host servers to now render 3D graphics for multiple hosted machines far faster than a conventional CPU-only server. Virtualized GPU processing turns a general-purpose virtualized server into one capable of a hosting workstation-caliber virtual machine, what is better called a virtual workstation.

VIRTUAL WORKSTATION DEPLOYMENT: CONSIDERATIONS AND CAVEATS

The ability of a virtualized workstation environment to keep one set of data safely in one place, accessible by anyone who needs it and authorized to have access, gets really attractive when you think about the explosion in the size of project datasets many are struggling with. With a virtualized, centralized IT environment, your workforce doesn't need to be in the same building or even in the same country or time zone. With potentially massive, global teams comprised of employees, contractors and partners alike, success hinges on the ability for IT to efficiently connect people to the data, without costly, time-consuming copies and downloads.

Since machines don't get physically moved around — instead just virtually and dynamically allocated — IT administration gets faster, simpler and less error-prone. Deprovisioning one user while provisioning another is fast, making rapid expansion and contraction over a project's life far less problematic. The centralized control and management consoles can dramatically simplify and streamline administration overhead, particularly for geographically dispersed enterprises. And orchestrating a disaster-tolerant environment (with a remote shadow datacenter, for example), avoids the risk of a single outage in some satellite office shutting down an entire global enterprise.

By its very design, the use of virtual workstations instantly hardens corporate security. No longer will staff be taking source data out of the office on laptops and flash drives. Only the pixels cross corporate firewalls, and those pixel streams can be (and typically are) encrypted. Better still, most any device is theoretically capable of receiving that stream, allowing staff to safely employ personal devices like smartphones, tablets or Macs.

But while the benefits of the virtual workstation make it a compelling option for all who rely on professional computing spaces to consider, it's neither a universal answer nor a one-size-fits-all solution. Virtual workstations might represent a replacement to deskside machines, an add-on to a traditional client-side environment, or none of the above. Which situations call for virtual solutions, and which are probably best left (at least for now) to physical ones? Ultimately, answers to these questions depend largely on who you are, what you do, and how you work. Some key decision criteria to consider involve the size and organization of staff, dataset characteristics, network infrastructure, the makeup and requirements of your current IT environment, and the priority of issues like security and disaster recovery.

- **A physically scattered workforce**

  The more physically scattered your workforce, be it global, at the office, home or on the road, the more appealing a virtual workstation solution.

- **Frequent third-party contributors**

Businesses frequently bringing in contractors and consultants in and out of the workflow will value the 24/7 remote access and ability to dynamically provision and deprovision virtual workstations.

- **Big datasets with many collaborators**

  Workflows with big datasets and many contributors are more likely to value the 24/7 remote access to centralized data.

- **More vulnerable to security breaches with catastrophic consequences**

  Every business is concerned about security of IP, but companies more vulnerable, and for whom a breach would be catastrophic, particularly value the inherent security of a virtual solution, where data never strays beyond corporate or cloud firewalls.

- **Very low disaster tolerance**

  No business wants outages and long recovery times due to natural disaster, but for some the probability might be substantially higher and the penalties far more severe.

- **Access to high-performance network infrastructure**.

  Moving to a remotely-hosted virtual workstation environment places a different burden on a network, and not just any will suffice. High, reliable bandwidth and consistent low round-trip latencies are key.

- **Certification for mission-critical software**

  Since most virtual workstations run a native binary for client operating systems like Windows, they are inherently compatible with applications that run on those operating systems. However, you'll want to make sure your mission-critical applications are certified and supported for use on virtual workstations. For a list of workstation applications certified for NVIDIA virtual GPU-powered environments, see NVIDIA Virtual GPU Technology.

- **Little reliance on exotic or high-performance peripherals**

  Virtual platforms have a more difficult time supporting the full range of peripherals, and high-demand I/O can impact visual performance. Tasks and workflows with more pedestrian peripheral requirements are a better fit for virtual workstations.

Don't feel this describes your organization and workflow? Then you're probably better off sticking with traditional physical workstations, at least for now. But if you find you're checking off most items, and more than a few represent hot-button issues, then it's probably worth dipping your toes in virtual waters, gradually and judiciously.

Whether to adopt virtual workstations — and if so, which types — depends on a business's computing needs, priorities, resources and philosophy. For most, the virtual workstation won't represent a rip-and-replace proposition but rather a compelling complement to the existing and capable means we already have at our disposal. Ultimately, the advent of the virtual workstation adds another powerful weapon to IT arsenals, one that can be used to replace or complement physical workstations for situations that warrant the move, while allowing visual professionals to continue relying on traditional workstations for situations that don't.