Enabling VDI for Engineers and Designers
Positioning Information

The ability to work remotely has been a critical business need for many years. Initially the focus was on employees travelling for work - sales reps and executives visiting customers, and employees attending conferences or other activities – but with the recent pandemic, the focus has shifted to supporting all non-essential employees to comply with stay-in-place restrictions by local governments.

Virtual Desktop Infrastructure (VDI) provides a robust solution for businesses, allowing their employees to access business data on any mobile device – be it a laptop, tablet, or smartphone – without risk of losing that business data if the device is lost or stolen. With VDI the data resides in the data center, behind company firewalls. VDI allows companies to implement flexible work schedules, where employees have the freedom to pick up the kids from school and log on later in the evening to finish up. VDI also provides for centralized management of security fixes and application upgrades, ensuring all workers are using the latest version of applications.

Although a great solution for your typical office workers, the benefits of VDI have largely been unavailable to another set of employees. Power users – engineers and designers using 3D or other graphics visualization applications – have generally been left out of these flexible arrangements. The graphics visualization applications they use are processor intensive, and the files they create and modify can be very large. The workstations that run the applications and the high-resolution monitors that display the designs are heavy and thus difficult to move. In order to have decent response times, power users have needed to be connected to a high-speed local area network.

Work has been underway for several years to expand the benefits of VDI to the power user, and today solutions exist to support the majority of visualization applications. In this paper, we will look at the enhancements made to the VDI broker software, storage, and GPU systems to make VDI for power users a reality.

Remote Work for All!

Power users are the core personnel at many companies. They are the designers and engineers creating the next product design, deciphering images of the earth to find hidden resources or unlocking the mysteries of the human body to power medical insight. Power users are present across multiple industries.

Some use cases include:

- **Energy / Oil & Gas** – oil & gas exploration
- **Media & Entertainment** – graphics rendering / video editing
- **Healthcare & Life Sciences** – digital body imaging
- **Major Manufacturing** – design & engineering
- **Architecture, Engineering & Construction** – building and system design
- **Financial Services** – trading visualization

They utilize a wide range of applications, including:

- Computer-aided design, manufacturing, and engineering (CAD/CAM/CAE) applications
- Geographical Information System (GIS) software
- Picture Archiving Communication System (PACS) for medical imaging
- Applications using the latest OpenGL, DirectX, NVIDIA CUDA, and OpenCL and WebGL versions
- Computationally intensive non-graphical applications that use NVIDIA Compute Unified Device Architecture (CUDA) GPUs for parallel computing

VDI offers several productivity benefits to power users. A core feature of VDI to just transmit design updates when a save is made instead of the whole file significantly reduces the amount of network traffic, enabling remote work. Additionally, power users gain the ability to access the applications anytime, anywhere, on any device. This enables collaboration with their team members wherever they are and whenever required, allowing them to make crucial business decisions efficiently.

Advances are being made on several fronts that are enabling more and more power users the capability of using VDI for increased flexibility and productivity. Visualization software is getting certified on VDI broker platforms, GPU and storage technology are advancing to provide greater efficiency and lower latency, and Lenovo Intel®-based servers are supporting a larger number of GPUs per node. This combination of factors is moving the graphics processing from the workstations to the more powerful data center servers, allowing the power user to use standard laptops and tablets. Initial implementations at customers sites have been well received.

VDI Broker Applications

Both Citrix Virtual Apps and Desktops and VMware Horizon support a growing portfolio of ISV certifications for leading graphics visualization applications. They have also provided software enhancements to improve the user experience.

Citrix Virtual Apps and Desktops include HDX (high definition experience) 3D Pro capabilities, enabling you to deliver desktops and applications that perform best using a graphics processing unit (GPU) for hardware acceleration. Cutting-edge display techniques ensure crystal-clear voice and video, enabling users to collaborate with pixel-perfect imagery even in the presence of packet loss, congestion, high-latency and jitter that’s commonly experienced with broadband wireless and mobile networks.

HDX 3D Pro delivers a user experience equivalent to that of a local desktop on LAN connections and can deliver an interactive user experience over WAN connections with bandwidths as low as 1.5 Mbps. It is compatible with GPU passthrough and GPU virtualization technologies supported by Citrix Hypervisor in addition to bare metal.

VMware Horizon provides a comprehensive set of technologies called Blast Performance that are designed to ensure that end users have a consistently great experience across devices, locations, media, and connections. One of those technologies is Blast Extreme, a display protocol built by VMware to handle the most demanding graphical workloads. Blast Extreme delivers an immersive, feature-rich experience for end users across devices, locations, media, and network connections. Another technology is Blast 3D, which delivers immersive 2D and 3D graphics seamlessly rendered on any device, accessible from any location.

VMware Horizon supports a wide range of software and hardware-based graphics acceleration technologies, providing a full spectrum approach to enhancing user experience and accelerating application responsiveness. Horizon supports Soft-3D, vSGA, vDGA and NVIDIA virtual GPU (vGPU) software to deliver the right level of user experience and performance for every use case in your organization.

Storage

VDI requires different user profiles for office, knowledge and power users. Lenovo ThinkSystem DM Series storage arrays allow you to easily provision user profiles with industry leading data efficiency for all compute nodes delivering the appropriate resources required. Power users can be hosted on higher end compute that provide the necessary additional cores, memory, and GPU offerings, while office and knowledge workers can be hosted on more cost-effective compute nodes. The included QoS (quality of service) feature ensures power users always get the performance they need, while providing guardrails around user profiles and eliminating the risk of rogue workloads negatively affecting the overall performance of the VDI environment. DM Series also allows customers to seamlessly and non-disruptively scale storage capacity and performance independently of compute requirements.

Lenovo just recently launched a new fully enabled NVMe storage system, the Lenovo ThinkSystem DM7100F. Customers implementing NVMe will experience a massive performance increase, up to 84% and a latency decrease, up to 33%. When it comes to power users, performance of the storage is critical to their user experience. NVMe storage will provide them the performance they need while delivering features to simplify management and administration.

GPUs

Application and desktop virtualization solutions have been around for a long time, but their number one point of failure tended to be user experience. The reason is very simple. When applications and desktops were first virtualized, GPUs were not part of the mix. This meant that all of the capture, encode and rendering that was traditionally done on a GPU in a physical desktop or workstation, was being handled by the CPU in the host server. While it was functional for some of the more basic applications, it never truly met the native experience and performance levels that most users required.

Now with NVIDIA virtual GPU (vGPU) technology, NVIDIA data center GPUs can be virtualized and shared across multiple virtual machines (VMs) or aggregated so that multiple GPUs can be allocated to a single VM to power the most demanding workloads – opening up a whole new set of use cases that could leverage this technology.

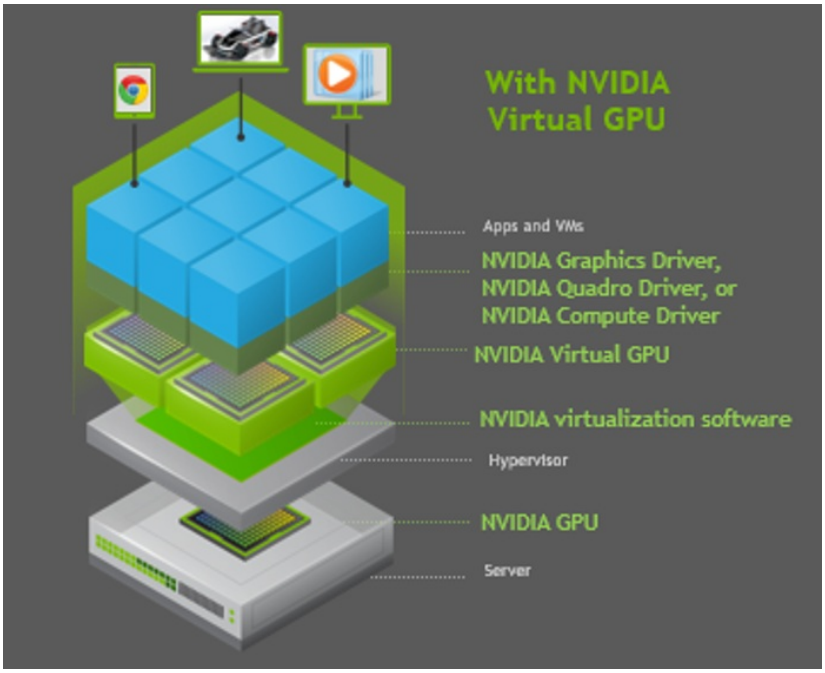

Figure 1. With NVIDIA Virtual GPUs

In an NVIDIA virtual GPU-accelerated VDI environment, an NVIDIA data center GPU is installed in the server. In addition, NVIDIA vGPU software is installed at the virtualization layer, along with the hypervisor and VDI broker. The NVIDIA vGPU software creates virtual GPUs, enabling multiple VMs to share the physical GPU installed on the server, or a single VM to harness the power of multiple aggregated physical GPUs in the server. This enables every VM to achieve the benefits of GPU acceleration, just like a physical desktop or workstation does. Because work typically done by the CPU in the server is offloaded to the GPU, users have a much better VDI experience.

NVIDIA provides a choice of four vGPU software options. For power users, the following two software licenses are offered:

- NVIDIA Quadro Virtual Data Center Workstation (Quadro vDWS) software, along with Quadro RTX GPUs or NVIDIA data center GPUs, enable creative and technical professionals to access the most demanding visualization applications on any device.
- NVIDIA Virtual Compute Server (vCS) software provides the ability to virtualize NVIDIA data center GPUs and accelerate compute-intensive workloads, including AI, Deep Learning, data science and HPC.

Implementing the Solution

An automotive company recently implemented a VDI solution for their design group with the help of Lenovo. Several thousand users were transitioned from workstations to laptops. Lenovo ThinkAgile HX systems, factory configured with Nutanix HCI software, NVIDIA GPUs and vGPU software, were selected as the data center servers to handle the graphic visualization workload, while users were now free to use laptops or tablets as their endpoint devices.

The cost of the two solutions (workstation vs. VDI) was similar, but the business experienced greater worker efficiency with the VDI solution. Before the VDI solution was implemented, users would spend time taking screen shots of their designs in advance of meetings. After the meeting, the user would update the design based on notes taken at the meeting. At the end of the day, the user made sure the designs were backed up to the SAN. VDI changed all of that. Screen shots were no longer required, and users could update their designs in real time during the meeting. Backups were automatically done by the VDI system, thus eliminating the need for individual backups. The company estimated they saved an hour per day per user.

A North American University recently expanded its VDI environment to deliver CAD (Computer Aided Design) virtual workstations to its Engineering Department. The existing VDI environment with VMware Horizon on VMware vSAN-based ThinkAgile VX systems was exceeding expectations with performance and reliability. The University wanted to stay on a consistent platform they could trust so expanded the existing environment with additional server nodes.

Another Option

Another solution available through Lenovo is the **Remote Visualization Solution** running on Lenovo Intel-based servers with Red Hat Enterprise Linux and Red Hat Virtualization and accelerated by NVIDIA vGPU technology. The open turnkey solution is both application an operating system agnostic, and offers remote access to graphic intensive application software, enabling workflow-based collaboration. It provides a connection between local resources, cloud and containers that scales with business needs.

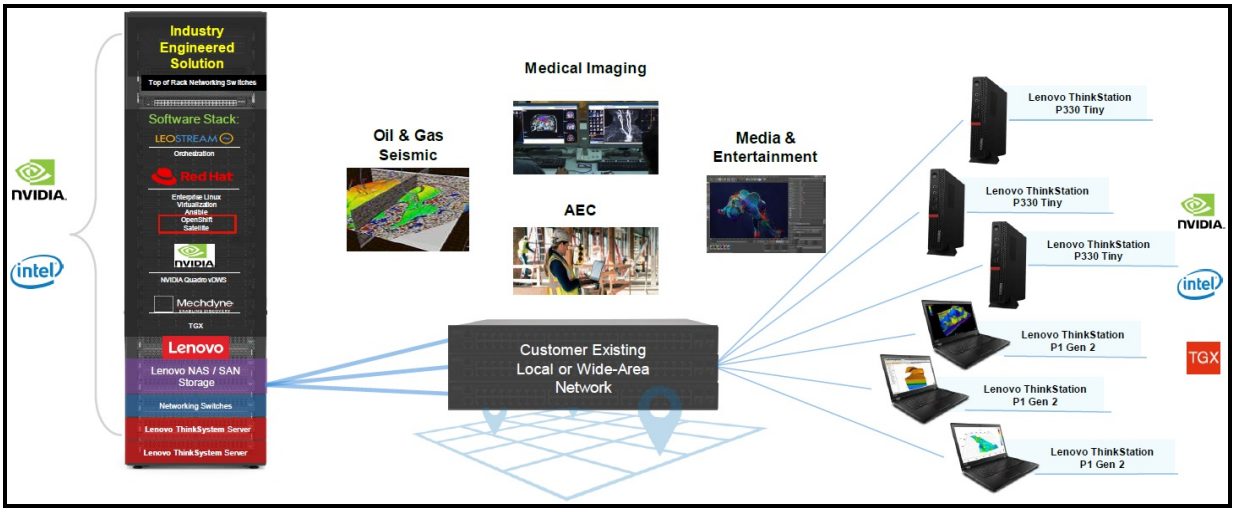

Figure 2. Remote Visualization Solution (click the image to zoom in)

An Oil and Gas company wanted to increase its exploration productivity by providing petrotechnical applications to users via hybrid and public cloud. The customer implemented the Lenovo Remote Visualization Solution and experienced the following benefits:

- Users can remotely work on high performance systems delivered via remote 3D technology that is directly connected to numerous data sources.
- Administrators can utilize centrally located user templates to update, patch and integrate security features at a single point, simplifying maintenance and reducing overhead.
- Geoscientists can use Microsoft Windows or Linux with remote access to high-end exploration software, enabling workflow-based collaboration and a connection between local resources, cloud and containers.

With their new capability to work remotely from anywhere at any time of day, the geoscientists have been much more productive, contributing to good financial returns for the company.

Tying it all Together

As with all VDI implementations, getting the design right is critical for implementation success. It is important to understand what applications are used and how power users are accessing those applications. Lenovo offers a VDI workshop, where Lenovo VDI experts conduct a white-boarding session to map out your VDI requirements. These workshops are valued at $4,000 but invested by Lenovo to help you achieve your VDI objectives. Lenovo Professional Services have implemented over 800 VDI environments in the past 2 years and can help you no matter what your environment. With a wide range of technology options available, Lenovo can provide the best solution for your business requirements. For more information, please reach out to your Lenovo sales rep or business partner.

Summary

With recent technology advances and close collaboration between VDI broker and graphic visualization software companies, the benefits of VDI are now available to power users. Engineers and designers are no longer tethered to their workstations and can instead work on their 2D or 3D designs on a standard laptop or tablet computer from the comfort of their home or other remote locations (with wi-fi connectivity). They can collaborate real-time with colleagues, improving productivity and speeding development.

More information

For more information, please visit the following:

- Lenovo Client Virtualization Solution home page:
  https://www.lenovo.com/businesscontinuity
- Remote Visualization Solution Brief
  https://www.redhat.com/cms/managed-files/pa-remote-biz-mkt-brief-f24433wg-202008_0.pdf

Related product families

Product families related to this document are the following:

- VMware Horizon

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