Teradici Delivers High Performance Virtual Workstations

Enterprise 3D content creators need remote work solutions with the high performance, low latency, and security features offered by Teradici PCoIP® and Cloud Access Software running on Intel® Xeon® Scalable processors

Remote work can provide a number of challenges for any business, but for 3D content creators like creative directors, graphic artists, and video editors involved in television and film production or corporate 3D or graphics content creation, the challenges of remote work can be immense.

While for most corporate employees working remotely involves data sharing using email, collaboration platforms, or the exchange of documents through online file storage services, content creators are tasked with creating, editing, and exchanging very large, media-rich files. Typical video or 3D rendering environments comprise content ranging from gigabytes to terabytes in size.

The network bandwidth required to interact remotely in these environments is dependent on the use case. Boosting quality, performance and interactivity over any network is key for these remote workflows. Table 1 shows network throughput requirements for two typical office workers compared to a graphic artist on a dual 1920 x 1080 display. To be productive, this artist will need average bandwidth of 10 Mbps, while peak bandwidth can range between 30-120 Mbps, depending on content characteristics and use case.

EXAMPLE USER TYPE	AVERAGE BANDWIDTH	VIDEO CONTENT	PEAK BANDWIDTH
Task Worker	70-100 kbps	No video	0.5-1 Mbps
Knowledge Worker	100-500 kbps	5-10 Mbps	5-10 Mbps
Artists/Designers	10 Mbps	Included	**30 fps workload:** Typical 30-60 Mbps **60 fps workload:** Typical 60-120 Mbps

Table 1. Bandwidth consumption by user type (ref. Teradici PCoIP Session Planning Guide).

With creative directors and graphic artists located throughout the globe sharing work on the same content remotely without the need to move them around is important not only for securing the content but gaining efficiencies in creating color-accurate content in a timely manner.

Low Latency Is a Must

Depending on the display protocol in use, user experience issues such as image quality, interactive latency, or frame loss can begin to occur. For example, some display protocols may reduce image detail to limit bandwidth utilization, but this results in image distortion and the loss of accurate reproduction of colors. Often

the color the artist is seeing on the screen is not the true color being rendered by the graphics system of the remote workstation, so artists are left guessing as to what variation of the color they're actually using.

This is not acceptable in film and television—the content quality experienced by artists or editors needs to be exactly the same as if interacting with a local workstation. If quality is not preserved from start to finish, it can mean significant costs in additional edits and delays to productions.

Eliminate Frame Rate Glitches

Smooth frame playout in conjunction with high interactivity is also important for animators, visual effects artists, or video editors—if there is a glitch in playback of video, the user is faced with determining whether the issue is with the file itself or the display protocol in place. However, queuing of image frames to ensure smooth playout must be balanced against the need for high interactivity, for example as needed by editors taking the display image as a cue for rapid key stokes or artists using graphics tablets for intricate design work. Any loss of interactivity caused by the display protocol can make these devices difficult to use or inefficient because the user expects an instantaneous response on the screen.

Security Compliance

An additional critical factor is the security burden on having any content stored at the end point. For television and film studios, there are a great deal of compliance issues related to the accessibility of content outside a secured content network. For example, studios must conform with Motion Picture Association of America (MPAA) best practices for content security and achieve Trusted Partner Network (TPN) compliance in order to qualify for major production projects.

Intel® Network Builders ecosystem partner Teradici has solved these problems in remote workstations for high definition creative directors and graphic artist professionals. The company is enabling creators to use graphic intensive applications from datacenter or private/public clouds with servers based on Intel's Visual Cloud technologies, including Intel® Xeon® Scalable processors and client systems based on Intel® Core™ processors with its PCoIP® and PCoIP Ultra™ remoting protocol technology and Cloud Access Software to deliver artists a seamless content creation experience whether in the office or working remotely.

Teradici PC-over-IP (PCoIP)

Teradici PC-over-IP (PCoIP) enables intensive CPU and GPU (graphics processor unit) applications to run in the data center and any public/private cloud allowing access to programs from home or other remote locations. Teradici's PC-over-IP (PCoIP) remoting protocol enables organizations to use virtual workstations for a high-definition, high-quality, and highly responsive remote computing experience. PCoIP is a next-generation display compression technology that sends encrypted pixels generated from hybrid cloud-based virtual machines ensuring a like experience to working locally on those files from a traditional workstation.

The PCoIP technology utilizes an image that has been rendered on the host virtual machine, using Intel® Xeon® Scalable processors, that PCoIP can transmit as a pixel stream (using Advanced Encryption Standard (AES) 256)

across any network using dynamic and moderate bandwidth usage. The PCoIP protocol is configured to enable the display representation rendered by the workstation to be exactly reproduced virtually at the endpoint using lossless reproduction. From a content creation perspective, it means that whatever is used and produced using the powerful CPUs and GPUs is reproduced identically at the remote endpoint. This eases the creation and editing process and reduces the complexity of working with powerful, high performance graphics applications located in the closest data center or public cloud to the artist.

Built on the PCoIP technology, Teradici Cloud Access Software enables enterprises to leverage public cloud GPU instances to confidently "lift and shift" graphics-intensive Windows or Linux applications to the public cloud, avoiding costly application rewrites.

Cloud Access Software clients are available for Windows, macOS, Chromebook, and Linux and can be installed on laptops or PCs. Standalone hardware clients such as PCoIP Zero Clients and PCoIP thin clients are offered by many vendors. PCoIP Zero Clients are endpoints that use a highly integrated, purpose-built processor to transmit pixels instead of data to a user's desktop.

To support 4K graphics applications, Teradici has developed PCoIP Ultra, a protocol enhancement that provides additional support to Cloud Access Software users who need to work with high frame rate content. For efficient scaling across multicore CPUs, PCoIP Ultra leverages Intel® Advanced Vector Extensions 2 (Intel® AVX2) instruction sets and expanded multi-codec architecture for third party codecs, including H.264.

Intel AVX2 is also used to enable the Cloud Access Software clients to offer a viable alternative to a Teradici solution that utilizes the company's PCoIP Remote Workstation Card.

Intel AVX2 is available on Intel® Core™ processors and Intel Xeon Scalable processors and accelerates some of the PCoIP and PCoIP Ultra protocols' need for heavy CPU utilization. Intel AVX2 helps improve application performance by enabling wider vectors, new extensible syntax, and rich functionality. Intel AVX2 is useful in processing the visual data commonly encountered in imaging and video processing workloads. With Intel AVX2, CPU utilization from running PCoIP Ultra is more efficient, freeing up compute power for the user's graphic development applications.

Because the PCoIP protocol only transfers pixels and not any data over the network, it ensures an "air gap" is maintained between the secured content network in the cloud or data center and the remote endpoint. This centralized architecture also facilitates more secure collaboration amongst creative teams by eliminating the need to transfer large files, which is both time consuming and insecure.

PCoIP Ultra offers the choice between CPU and GPU optimizations. The CPU optimization mode targets up to dual 4K/UHD display resolutions, leveraging Intel AVX2 to provide efficient content encoding at very high color accuracy, including the option for build-to-lossless image quality. The GPU optimization modes leverage a GPU hardware encoder when present to also target 4K/UHD workloads, and provide CPU relief for applications such as interactive rendering where CPU clock cycles may be at a premium. GPU encoding also offers a chroma-subsampling option which is helpful for reducing bandwidth consumption on constrained WAN networks.

Remote Workstation Configurations

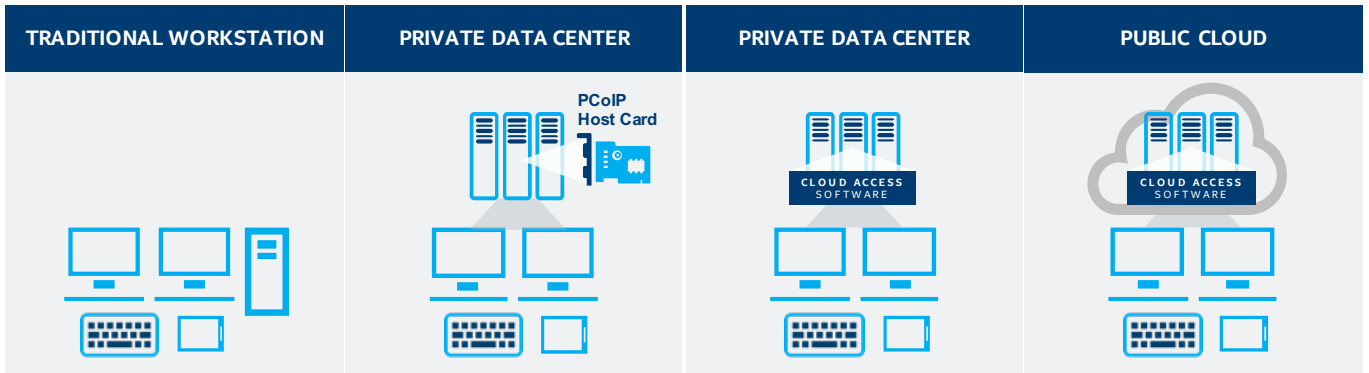| TRADITIONAL WORKSTATION	PRIVATE DATA CENTER	PRIVATE DATA CENTER	PUBLIC CLOUD

Figure 1. Cloud Access Software workstation configurations.

There are a number of configurations (see Figure 1) that Teradici users may utilize to enable remote work connectivity, depending on whether their work is done on a high-performance desk-side workstation, or accessed from a server in the data center, the public cloud or any combination of these three.

Cloud or Data Center Workstation Access

Using Cloud Access Software, a small software agent is installed on the "host" computer, which then uses the Teradici PCoIP protocol to communicate with a client device in a remote location over a LAN, WAN, or public internet. The client device allows user interaction via a display, keyboard, mouse, and other peripheral devices.

For many graphics intensive use cases, it is critical for peripheral devices to remain highly responsive independent of network conditions. PCoIP technology provides accelerated interactivity for devices using a feature known as local termination. Local termination provides users with immediate visual feedback of drawing actions, even over high latency connections. This feedback ensures that devices like Wacom tablets remain delicately responsive when using PCoIP Zero Clients, thin clients, or software clients.

In a virtualized application environment, the program and data files reside on an Intel Xeon Scalable processor-based server in either a data center or on a public or private cloud server. Intel Xeon Scalable processors support simultaneous high-performance compute for multiple users all sharing processing cores and memory access.

Intel Xeon Scalable processors have broad support for virtualization and work with all public cloud server infrastructures. With Intel® Virtualization Technology (Intel® VT), multiple workloads can share a common set of resources. On shared, virtualized hardware, a variety of workloads can co-locate while maintaining full isolation from each other, freely migrating across infrastructures, and scaling as needed.

Teradici Cloud Access Manager simplifies and automates public cloud access to remote workstation deployments. Teradici is agnostic to cloud provider and has partnerships with AWS, Google Cloud and Microsoft Azure. A Cloud Access Connector component enables the Cloud Access Manager

to broker desktops or workstations located in AWS, Google Cloud, Microsoft Azure and on-premises environments. The Cloud Access Connector operates in conjunction with Cloud Access Manager to provide user authentication, including MFA, in addition to remote workstation access entitlements and power management services.

Remote Workstation Access

For some television and film studios, creative directors and graphic artists have powerful, dedicated workstations in their workspace configured with Intel Xeon Scalable processors or Intel Core processors to support content production and editorial applications. Cloud Access Software can be configured to enable access to these stand-alone office workstations in much the same way it does in a cloud deployment.

Popular Use Cases

Remote workstations are rapidly emerging as a popular choice for the visual effects (VFX) and video editorial sectors of the media and entertainment industry.

Visual effects (VFX) artists use a broad variety of software applications and render technologies, many reliant on the Linux operating system. While most of the VFX workflow involves scripting and node graphs at relatively low pixel rates, high image quality and high interactivity for both text and graphics is a key requirement. However, some roles such as rigging or animation demand high and consistent frame rates, typically up to 60 frames per second. The need for CPU or GPU resources is dependent on software application and local objectives within the workflow.

For example, artists involved in interactive look development benefit from a critical balance of CPU and/or GPU resources allocated between remote protocol encoding support and real-time rendering to ensure both high interactivity and accurate representation of scenes. Other parts of the workflow such as final rendering demand the maximum allocation of resources for the application, while interactivity may be less important. The tail end of the VFX workflow, which involves coloring, finishing, and content review, demands pristine content playback and a high degree of color reproduction.

Remote video editorial workflows are typically based on Microsoft Windows applications such as Adobe Premiere, Avid Media Composer, and DaVinci Resolve. Front-end tasks such as processing dailies or producing rough cuts require high keyboard interactivity and efficient network bandwidth consumption, especially when conducted from field sites. While high image quality and frame rate consistency is less important to these tasks, accurate frame playout, high image quality, and color accuracy are critical to post-production tasks such as finishing, content review, or broadcast quality control.

Conclusion

In 2020, many industries saw the importance of being able to have their employees work remotely at a moment's notice. For demanding users like content creators, maintaining a seamless work experience is of utmost importance for delivering high quality, media rich content. Teradici's PCoIP remoting protocol technology and Cloud Access Software, along with servers based on Intel Core processors or Intel Xeon processors and Intel AVX2 enable creative directors and graphic artists to access the same high-quality creation and editing experience whether sitting at their desk at the office or hundreds of miles away.

About Teradici

Teradici is the creator of the PCoIP remoting protocol technology and Cloud Access Software. The company's core mission is seamless and secure delivery of workstations and applications for end users. Teradici PCoIP technology and Cloud Access Software offer remoting solutions for public, private, and multicloud environments, enabling visualization of even the most graphics-intensive applications. The company's solutions are deployed by Fortune 500 enterprises, government agencies, and service providers around the world.

About Intel® Network Builders

Intel Network Builders is an ecosystem of infrastructure, software, and technology vendors coming together with communications service providers and end users to accelerate the adoption of solutions based on network functions virtualization (NFV) and software defined networking (SDN) in telecommunications and data center networks. The program offers technical support, matchmaking, and co-marketing opportunities to help facilitate joint collaboration through to the trial and deployment of NFV and SDN solutions. Learn more at http://networkbuilders.intel.com.