High Image Quality Now A Must – Thin Clients and Multimedia

The user experience with thin clients is very often judged by how well they handle multimedia content. Yet, in this case, not everything that is technically feasible also makes good economic sense. Instead, the critical factor is having the right interaction between server and client.
It all comes down to finally fulfilling a promise that’s been promised for years: The user experience with a thin client should be just as good as working with a PC running locally installed software. This expectation becomes most evident when it comes to using multimedia applications. In fact, the quality of video playback is frequently the key benchmark for new thin client models. In short, if a YouTube video doesn’t play smoothly and jitter-free, the device being evaluated fails the usability test. Many of the factors affecting this can be found on the server side of the system. In fact, with the correct combination of server hardware, virtual desktops and high-performance thin clients, it is even possible to run demanding, resource-intensive applications such as CAD in a thin client environment.

Multimedia Performance and IT Efficiency – A Contradiction?

Manufacturers of thin clients and makers of server software are continuously working together to improve the multimedia performance of their combined solutions, so that they can provide not only conventional workstations for regular users but also knowledge workers with centralized IT services. Depending on the performance required, virtual desktops, blade PCs or rack workstations are used to achieve this end. Computing power and graphics performance cost money and require resources. So, in essence, the situation for server-based computing is no different than that for a local, standalone PC. In each case it’s necessary to assess the level of user requirements and whether using a thin client will justify the added expenses for server hardware and software. On the other hand, there are also the typical advantages offered by thin clients such as desktop standardization, remote management, low maintenance and support costs as well as long service life. After examining both options, the Fraunhofer Institute for Environmental, Safety and Energy Technology (Fraunhofer UMSICHT) decided to go with thin clients in order to enjoy the many benefits of standardization. At Fraunhofer UMSICHT, applications are delivered to standard, medium-level users by means of Citrix XenApp. The institute also has two categories of power users, who work in places such as specialized departments, the PR department, in software development and with CAD. They use applications such as Adobe Creative Suite, Autodesk AutoCAD, Eclipse or Microsoft Visual Studio, which are provisioned via Citrix XenDesktop. All three user groups work with thin clients made by the German manufacturer IGEL Technology. Its powerful hardware, in combination with Citrix XenDesktop, reduces the computing workload on the system servers. In a recent economic analysis, Fraunhofer UMSICHT determined that with thin clients the costs of its desktops are 36% less than those for a PC-based infrastructure with locally installed applications used in an equivalent manner ¹.

Typical Areas of Application

The many promising announcements made by the server-based computing and thin client sector when it comes to user experience and graphics performance have raised some high expectations on the part of end users. However, if the company’s in-house TV broadcast of an address by its CEO is not rendered in smooth, glitch-free video right from the start, this alone could spell the end of an entire thin client project. More and more organizations are relying on online courses, webcasts and video conferences in order to cut travel time and costs. What’s more, with Microsoft Windows 7, Aero and 3D effects are becoming the norm. In many places, communica-

¹ Fraunhofer Institute for Environmental, Safety and Energy Technology (UMSICHT) / IGEL Technology: Thin Clients 2011 – Ecological and Economical Aspects of Virtual Desktops (http://it.umsicht.fraunhofer.de/TC2011/index_en.html); thin client in use: IGEL UD3 LX
tion via social networks such as XING or Facebook is also a regular activity. Many Internet sites are based on Adobe Flash or Microsoft Silverlight. In some cases, podcasts and/or playback of HD videos can even be an important, integral part of one’s work. Furthermore, the number of workstations with two or more monitors is increasing. Such dualview setups are often found in accounting, scheduling and ERP workstations as well as in production and logistics control stations. Other areas of application for high-performance multimedia are image editing in marketing departments, publishing houses and advertising agencies. Still others are CAD/CAM in engineering and medical applications such as in radiology. Beyond this, wide-screen displays with display ports and resolutions over 1920 x 1080 pixels are coming into much more frequent use.

Factors Influencing Performance
Whether a PC user can be given a thin client replacement depends on the client hardware and also the related server hardware, the virtualization solution employed and the associated software support provided by the thin client itself. On the hardware side, new thin client concepts based on multimedia-proven ARM architecture and system on chip (SoC) design are major leaps forward in device development. IGEL Technology, Germany’s leading manufacturer of thin clients, augments these systems with a digital signal processor (DSP) that has been specially optimized for decoding the latest remote protocols and video content. This feature allows a thin client costing only around 200 Euro to provide a level of playback quality, when displaying full-screen HD videos, approaching that of existing top-of-the-line X86-based models.

Other factors influencing multimedia performance in server-based computing are the characteristics of the network. The key factors affecting network performance – bandwidth and latency – are of particular significance whenever images and sound need to be transmitted in sync or when a scanner connected to a thin client is supposed to work over the network with a centralized application. A good way to avoid wasting expensive server capacity while achieving good performance in rendering screen content is to have the virtualization solutions from Citrix, Microsoft and VMware allow the thin clients to assist in the delivery of multimedia content. For instance, with multimedia redirection (MMR), multimedia content, such as MPEG videos or Flash animations are sent unprocessed from the server to the thin client, where they are then locally run. This solution requires a local media player and local availability of the codecs required to decode the content.

High-Performance and Flexible: Citrix HDX
In order to optimize multimedia performance during remote access over a WAN, Citrix has developed HDX technology to enhance its standard ICA protocol, offering users a broad range of options and great flexibility in handling multimedia content. For instance, HDX Adaptive Orchestration enables variable and dynamic decoding of multimedia content that not only takes the available bandwidth into account but also cost, security and performance considerations. Depending on whether the thin client supports the required codecs, multimedia decoding can occur either locally at the thin client or centrally on the server. Additional features of HDX include Windows media redirection, Flash redirection, audio/real-time communications and HDX RichGraphics. Generally speaking, HDX RichGraphics optimizes the performance of graphics-intensive 2D and 3D applications and media-rich applications by using different technologies such as software/hardware-based rendering in the computer center and on the thin client. For delivering high-end applications, including OpenGL and DirectX applications, Citrix XenDesktop Enterprise and Platinum editions offer the feature Citrix HDX 3D for Pro Graphics. The requirements for HDX 3D are the following: The host/server workstation must be a physical machine as HDX 3D makes use of hardware acceleration provided by the underlying graphics processing unit (GPU); the WAN must have 2 to 5 Mbit of bandwidth and latency of 100 to 150 milliseconds.
Key Improvements: Microsoft RemoteFX and VMware View 5

VMware and Microsoft have also developed new protocols or protocol extensions designed to improve the user experience. Microsoft has enhanced its RDP (Remote Desktop Protocol) standard protocol with RemoteFX in order to improve the user experience when working with virtual desktops over a LAN. Thin clients bearing the “Microsoft RemoteFX Enabled” logo have been performance tested for their ability to deliver rich content, such as by means of YouTube videos (Flash), Microsoft Silverlight and the Windows Media Player. They also support Windows Flip 3D, which is part of the Windows 7 Aero experience and displays open task windows in a convenient 3D stack. VMware was able to get around the limitations of RDP by integrating the PCoIP protocol developed by Teradici. The VMware View 5 feature “View Media Services for 3D Graphics” enables View desktops to run basic 3D applications – such as Aero, Microsoft Office 2010, or those requiring OpenGL or DirectX – without specialized graphics cards or client devices (soft PCoIP). To further improve performance, starting with Version 5 VMware View also supports client-side caching of multimedia content. Similar to the situation with Citrix, high-end applications like CAD programs require a 1:1 dedicated relationship to a rack workstation or a blade PC with an integrated PCoIP host card from Teradici.

New and Punchy: SPICE

The latest truly high-performance, multimedia-related solution for centralized provisioning of virtual desktops is the combination of Red Hat Enterprise Virtualization for Desktops (RHEV-D) used with the SPICE multi-channel protocol. The Simple Protocol for Independent Computing Environments (SPICE) is an open-source solution for interacting with virtualized desktop devices. In addition to a virtual mouse, keyboard and audio channel it also contains a virtual graphics card. This virtual card transmits screen content created in different virtualized operating systems extremely efficiently and without codecs over a WAN to a thin client. For video streaming, SPICE uses various, sometimes even video-specific, compression algorithms. In this way, SPICE completely avoids the need for local rendering or decoding. However, it does support local caching (such as of image files and color palettes) on the client. This means that RHEV-D can fully utilize the local graphics power of the thin client itself and offer an overall performance level that is at least as good as those solutions already established on the market.

Today’s Higher Requirements of Thin Clients

With all the leading desktop virtualization solutions, one thing is quite apparent: They all make use of the local computing power available right at the thin client, whether it be through multimedia redirection, local rendering or caching. In light of this development, when it comes to ensuring their cost-effectiveness and future-readiness the following requirements apply when selecting a thin client solution: The firmware should support as many protocols and functional enhancements as possible, be able to be updated and allow standardized remote device management. This also applies to all multimedia-related settings, such as monitor resolutions or options for dualview or multiview.
monitor setups, which should be able to be centrally configured. To achieve the greatest flexibility in utilizing server resources it should also be ensured that the thin client has sufficient graphics performance capability or all the codecs necessary to locally decode video streams. For multimedia redirection, the thin client must have a locally installed multimedia player. This means that “zero clients,” which have minimal hardware and software or exclusive, proprietary designs and/or features, are of only limited suitability for multimedia use. On one hand, hardware zero clients – often touted as having “zero CPU” and “zero RAM” – cannot provide the local computing and graphics performance or software tools necessary to reduce server workloads. On the other hand, hardware zero clients for PCoIP lock users into inflexible proprietary hardware and software solutions. In contrast, technologically open and flexible thin client approaches such as the Universal Desktop concept from the German manufacturer IGEL Technology inherently offer greater future-readiness, safeguarding the continued future viability of the investment. They can provide all types of support for client-side multimedia playback, such as rendering on the client side by means of local caching and/or multimedia redirection.

Making a Cost-Effective and Future-Ready Choice
Those wanting to provision multimedia content or applications by means of thin clients need to have a powerful yet economical, comprehensive system composed of server hardware, a desktop virtualization solution and end-user devices. The major benefits behind the success of server-based computing – efficiency, standardization and investment protection – may even end up compensating for the initial added cost of acquiring an SBC solution compared to a conventional PC-based one. The greatest-possible flexibility in handling multimedia requirements is provided by thin clients, which offer both high performance and energy efficiency. In addition, they can reduce the workload on the server side, and their hardware and software can readily adapt to the continuous improvements occurring in the SBC sector. In fact, the next version of RemoteFX for WANs has already been announced.

### OVERVIEW: MULTIMEDIA SOLUTIONS FOR SERVER-BASED COMPUTING – SERVER AND THIN CLIENT

<table>
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<tr>
<th>Solution</th>
<th>Citrix XenApp / XenDesktop</th>
<th>VMware View</th>
<th>Microsoft VDI Suite</th>
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<tr>
<td>Basic protocol</td>
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<td>Additional features / extensions for multimedia</td>
<td>HDX / HDX 3D</td>
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<td>LAN / WAN</td>
<td>LAN + WAN</td>
<td>LAN + WAN</td>
<td>LAN (as of Windows Server 8)</td>
<td>LAN + WAN</td>
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<tr>
<td>Method used (rendering, decoding, client-side caching, etc.)</td>
<td>Adaptive Orchestration: variable decoding and rendering (client-side or server-side), depending on whether or not the client supports codecs.</td>
<td>Server/client-side rendering: with Windows, client-side rendering possible with PCoIP and RDP, with Linux, only possible with PCoIP.</td>
<td>Server-side rendering with RemoteFX allows lean clients, server-side GPU increases graphics performance and the number of desktops per server.</td>
<td>Rendering occurs only on the server side. With a high-quality, emulated graphics card (OpenGL), all operating systems can be virtualized and screen content efficiently transmitted.</td>
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<td>Technical requirements (server and client)</td>
<td>Client-side rendering: codecs local on the client Server-side rendering: codecs local on the server</td>
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<td>Server-side rendering: special graphics card for RemoteFX and codecs on the server</td>
<td>Codecs on the server</td>
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**IGEL’S UNIVERSAL DESKTOP CONCEPT**

- Whether it is server-based computing, virtual desktops or cloud computing – IGEL’s Universal Desktops work well together with the greatest variety of centralized IT infrastructures. In particular, their powerful hardware and excellent graphics performance, along with continuously developed firmware, provide future-readiness that safeguards this major investment. Thanks to different device designs, operating systems, alternative firmware features (tools, clients and protocols) and a wide range of hardware options, the selection of a suitable model can be tailored to meet the exact needs of the installation and ensure cost efficiency. Other but no less important considerations are that IGEL Universal Desktops use minimal energy, have long service lives and come standard with the IGEL Universal Management Suite, a proprietary remote management solution.

**FULL SUPPORT OF PERIPHERALS**

- IGEL Universal Desktops can be integrated into a vast variety of peripheral-device environments. That is because several USB ports, audio inputs/outputs as well as at least one DVI-I interface all come as standard equipment. With an optional “Y” video cable, all models can even accommodate dualview monitor setups. They also support widescreen formats. Beyond all this, IGEL offers USB serial or parallel adapters, optional mounting bases, integrated smartcard readers and supports external security solutions. The optional bases with their WLAN capability and/or an additional integral serial or parallel port greatly enhance system connectivity. To conserve desktop space, VESA monitor mounting systems are available along with rubber bases allowing horizontal positioning of thin clients for an even smaller device footprint.