



Zero Clients – Is There Really Anything There?



Just a fleeting marketing fad or actually the ultimate thin client? What is the story behind the term “zero client”, how “zero” are they really, and how can users benefit from them?

With terms such as “zero OS”, “zero CPU” or “zero management”, many manufacturers claim to have finally come up with the ultimate thin client model. But when you take a closer look, it turns out that the various zero client concepts are so fundamentally different from each other that there is really no equal basis for comparing them and that they are actually meant for entirely different user groups. To begin with, when you finally cut to the chase you have to recognize that there are basically two different types of approaches to zero clients: zero clients for OS streaming and dedicated-hardware zero clients for accessing certain virtual desktops and physical workstations in a main computer center.

Zero Clients for OS Streaming

A typical feature of these devices is that they do not have a locally installed operating system, hence the name “zero OS”. Instead of having a thin client operating system (firmware) such devices have only a BIOS. After being switched on, the zero client uses PXE (Preboot eXecution Environment) to load a lean, minimal PC operating system from a server or PC over the network into its working memory (RAM). An example of such an operating system would be an appropriately adapted version of Microsoft® Windows® XP Professional. For instance,

Wyse Technology advertises such zero clients along with its Wyse Streaming Manager (WSM) solution. In order to provide performance comparable to that of a PC, the associated zero clients are equipped with fast processors and up to 2 GB of RAM, which is actually a relatively “fat” design. The problem is that they’re already too small for Microsoft® Windows® 7, which means that this approach can no longer be considered to be a viable one. The state-of-the-art in efficient provisioning of Windows 7-based desktops is the virtual desktop infrastructure (VDI).

Hardware Zero Clients (Pano Logic®)

Hardware zero clients are dedicated thin clients that work with specific hardware and a specific transmission protocol. Currently, there are two approaches to dedicated hardware zero clients. The first group comes from the company Pano Logic®. Zero clients with their technology, such as the Pano Device®, follow an approach stressing minimal hardware, with no CPU (at least in the strictest sense) and no RAM chips, hence their claims “zero CPU” and “zero RAM”. According to the manufacturer, these proprietary end-user devices are an extended data bus of a virtualized Microsoft® Windows® PC. Their operation requires the Windows system service Pano Direct Service (Pano DAS), which is installed inside the virtual target desktop, as well as the Pano Management Server, which searches for and manages the end-user devices as central components of the system in the network.

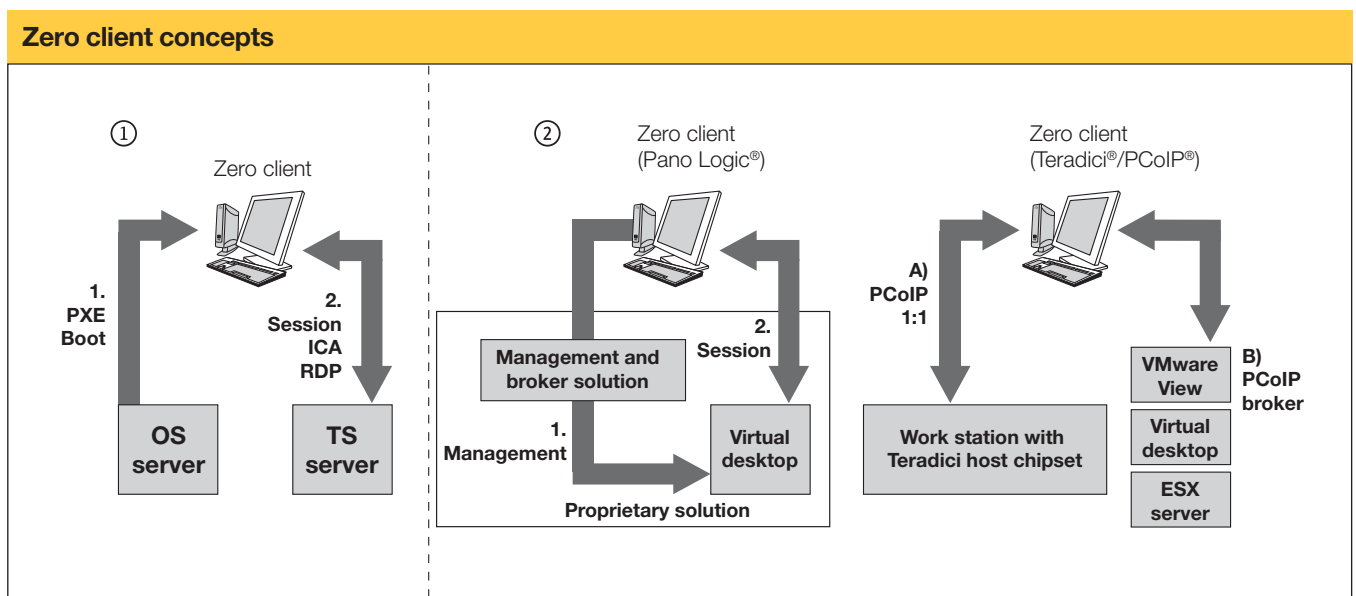


Fig. 1: OS streaming; Fig. 2: Hardware zero clients with Pano Logic® or Teradici®/PCoIP® technology

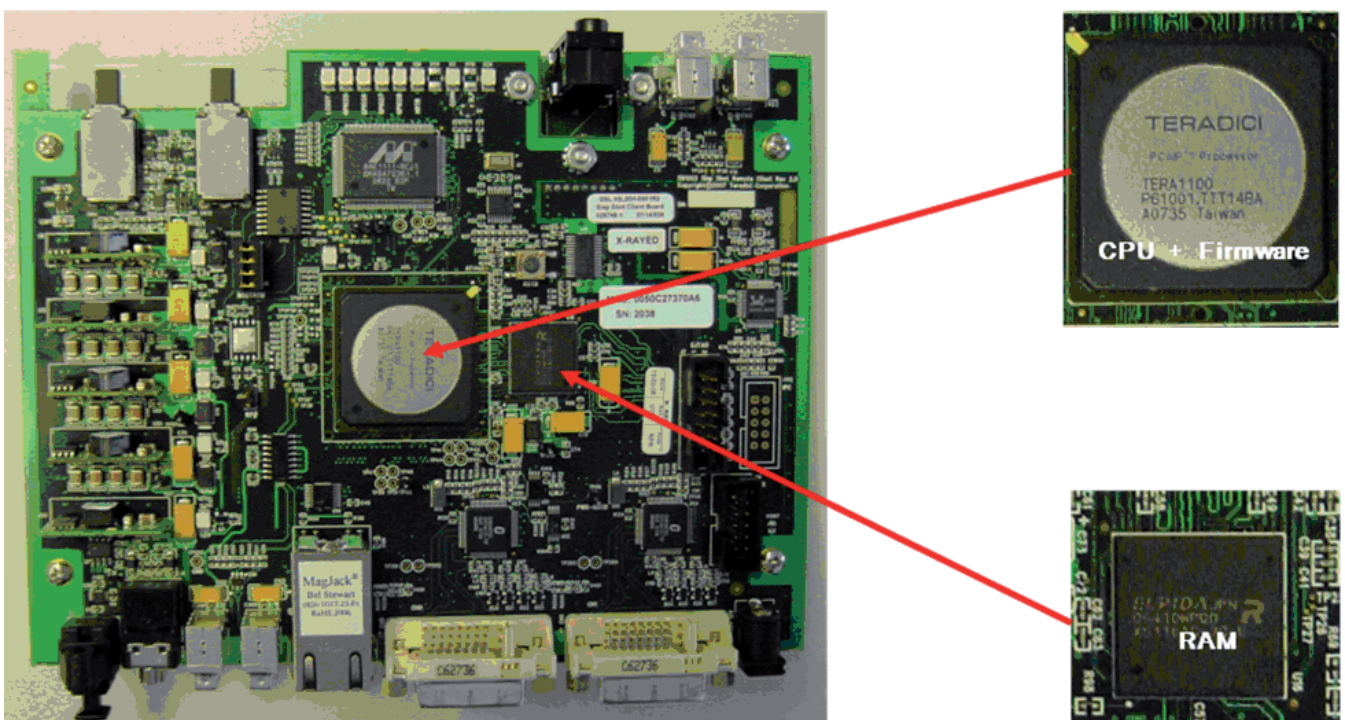
Hardware Zero Clients for PCoIP® (Teradici)

The second group of hardware zero clients is based on the Teradici® chipset “PCoIP Portal”, which is optimized for the PCoverIP (PCoIP) transmission protocol developed by Teradici. This chipset decodes the image information from a virtual desktop running in VMware View™ (as of Version 4 with PCoIP support) or from a physical workstation in the data center. In the case of VMware View, the host-side compression is a software-based one. If there is a 1:1 connection to a workstation, it is hardware-based using a host chipset from Teradici. The manufacturers of hardware zero clients for PCoIP or VMware View like to point out the advantage that these systems require remarkably little management (“zero management”). In view of the limited deployment scenarios, the claim for minimal updating of the Teradici Embedded OS operating system does sound plausible. Nevertheless, both Teradici and zero-client hardware manufacturers, such as Devon IT, also offer their own management solution (PCoverIP Management Console) whose configuration possibilities are comparable to those from other thin client manufacturers.

So, How “Zero” are Zero Clients Really?

Of course, even so-called zero clients need electronic components in order to exchange monitor data and other data with a central server or a virtual machine over a network. On the chipset used in Teradici hardware zero clients (e.g. Wyse P20, Dell FX100, DevonIT TC10), the word “processor” is clearly evident, and right next to it there is a RAM chipset. Instead of a processor, zero clients with Pano Logic technology have what is called a “field programmable gate array” (FPGA). In this case, the thin client firmware, which usually is located in flash memory, is embedded in an integrated circuit (IC) and is thus “etched in stone” and cannot be updated. Among other things, the FPGA is connected to a LAN adapter for the network connection with the host system and to a subsystem for video, audio and USB functions.

Zero client with Teradici board



Zero versus Thin Client

In a specifications table, the zero client provider Pano Logic claims to show that its own concept is, despite its emphasis on client minimalism, superior to a standard thin client. However, no information is given as to which thin client model they're referring to in their comparison. Another picture becomes quite evident when you compare their solution to a modern general-use thin client (see table 2). With a conventional connection comprised of space-saving, energy-efficient hardware and the most universally applicable thin client software, these devices represent a wholly different philosophy. With this broader approach, typical manufacturers such as IGEL Technology (Bremen, Germany) want to be able to reach the broadest possible user group and meet the needs of different IT environments and deployment scenarios – including VDI, server-based computing (SBC) and direct access to IBM mainframes or host systems as well as provide multimedia, VoIP or cloud-computing services.

When making a comparison between thin clients and zero clients, it is important to keep three criteria in mind: economy, future-readiness and performance. In doing so, the important thing is, however, not to just look at the end device itself but the entire system composed of the thin client and the server-side software solution for centralized IT provisioning.

The Economics of a Comprehensive Solution

According to a study conducted by the market analysts at Gartner, the greatest potential for savings in centralized IT infrastructures can be achieved with server-based computing. This method of IT provisioning, usually with Citrix XenApp™ or the Remote Desktop Services (RDS) included in the latest Microsoft® Windows Server™ 2008 R2, reduces the total cost of ownership (TCO) by around 50% compared to an unmanaged PC. In fact, according to the Fraunhofer Institute for Environmental, Safety and Energy Technology (UMSICHT), this TCO saving can even be 70%. According to Gartner, in contrast, the potential savings with VDI are at most 10%, mostly because of the time and effort that has to be spent managing and updating the virtual desktop images. Users of zero clients with Pano Logic or Teradici hardware are limited to VDI and thus, by definition, have far less potential to save money than with modern thin clients.

Even the power savings are not as great as one might perhaps assume. A Pano-Logic-based zero client using 5 W consumes about half as much power as a modern thin client with a CPU, RAM chipset and a Flash memory. However, you must not lose sight of the fact that it leaves all the computing work to the virtual machine and thus to the server. So, depending on the user scenario, the usage of power and resources will increase in the backend and, given this, the maximum number of virtual desktops that can be handled by a server will drop accordingly.

Standards Ensure Future-Readiness

To cover the broadest possible spectrum of users, the firmware of universally deployable thin clients contains numerous standard protocols and software clients, such as Microsoft® RDP and Citrix® ICA, as well as PCoIP or terminal host emulations. A major advantage of this approach lies in the ability to readily update the local firmware. In order to keep up with the rapid technological developments in the IT sector, the firmware is kept up to date with new versions of protocols and software clients. Because this support option exists, thin clients can have a typical service life of from six to eight years. With Pano-Logic-based hardware zero clients, things look quite a bit different. That is because the logic system permanently installed in the device hardware cannot be updated. The result of this is that communication and end-device management can solely take place through the proprietary Console Direct protocol. Similarly, the chipsets for the Teradici-based hardware zero clients are optimized for the PCoIP protocol. This means that the ability to safeguard an investment and to ensure the future-readiness of hardware zero clients is simply not there, or at least only in a very limited sense.

Performance: Put all the Load on the Server?

The performance and the highly praised user experience in connection with VDI must also be evaluated within the actual overall context. Hardware zero clients with Teradici chipsets offer very good performance for knowledge-workers using demanding graphics applications such as Adobe® Photoshop, InDesign® or 3D CAD, especially when set up as a 1:1 connection with a Teradici host card that is installed using a PCI Express interface in the server or a workstation. But this gain in performance comes at quite a price: The Teradici EVGA PD01 PCoIP host card costs about 430 Euros.

When it comes to multimedia, the Teradici system is really only somewhat successful. In this case, thin clients with multimedia redirection with VMware View™ produce far better results. The same thing applies to the Citrix XenDesktop™ with HDX™ technology. Even purely Microsoft® environments are going to get faster soon, thanks to RemoteFX™. The higher video performance in thin client computing is due to the fact that the image data is only decoded once, locally in the thin client. In contrast, with PCoIP the video data is first decoded on the server and then compressed for transmission. The data is then streamed to the zero client, where it is decompressed. In actual practice, this process uses about five times as much server resources as multimedia redirection. Beyond this, thin clients can actually reduce the load on the servers by provisioning frequently used applications locally as part of the thin client software. For instance, users can use a locally installed Internet browser including Java Runtime Environment (JRE) to directly access cloud-computing services without having to demand any of the server capacity in the actual computer center.

The Possibilities and Limits of Zero Clients

As different as the concepts behind the term “zero clients” are, so too, are their deployment scenarios. Zero clients with the Teradici chipset show their strengths in environments where knowledge workers need high-performance units for resource-intensive graphics and video work. However, for standard users this relatively expensive and resource-intensive comprehensive solution made up of a workstation and a zero client is unsuitable, actually untenable. Purely VDI environments with VMware View and PCoIP hardware zero clients are also relatively unlikely to be encountered in actual practice. As a rule, the general solution will be a mixture of server-based computing for task workers, VDI with standardized protocols (RDP, ICA) for standard and knowledge workers and VDI with PCoIP (software and hardware clients) for power users. According to Gartner, when all is said and done SBC is still the method of provisioning with the greater potential for savings. In their view, compared to an unmanaged PC environment the savings amount to 50%, while

they see VDI yielding savings of only 2% to 10%. In addition to the economic limits on the use of zero clients there are also technological ones. Because the IT market is constantly bringing out new technologies along with protocols and software clients, proprietary solutions are always risky investments. Now, from today’s perspective, the Pano Logic solution may seem to be the right way to go. However, because its zero clients cannot be changed on the software side, it is really only suitable for those VDI environments for which no fundamental technological changes can be expected for several years.

Summary: Look carefully before you leap; look closely at the long-term implications.

A close analysis shows that none of the zero-client concepts discussed in this report promise unlimited suitability for mainstream use. In particular, the critical question that needs to be carefully answered concerns future-readiness of the technology. Smaller investments in desktop hardware do not support the selection of zero clients. If you want to avoid such investments entirely or at least put them off for a while, then you are better off sticking with your existing end-user devices – PCs or thin clients – and then upgrading them with universally applicable thin client conversion software and then continuing to operate them as remotely manageable, VDI-capable end devices. This extended service life can then be used to deploy the most efficient provisioning system on the server side and to find the most suitable end-user device for the second step of your gradual migration program.

Pros and cons of different thin client categories

Thin client category	Universal thin client (e.g. IGEL UD3 ES)	Pano Logic hardware zero client (e.g. Pano Device)	PCoIP / VMware View hardware zero client (e.g. DevonIT TC10)	Zero client for OS streaming, (e.g. Wyse R00L for WSM)
Typical features	Updateable firmware with standard protocols, local software clients/tools	Access to virtual desktop by means of proprietary protocol	Access to virtual desktop by means of PCoIP	Works like a "fat client" with local OS in RAM, such as Windows XP Pro
Cost-effectiveness				
Green IT (comprehensive solution including server share)	+	+	--	+
Scalability for various user scenarios	++	-	-	-
Centralized thin client management	+	+	+	Does not apply
Short boot-up times	+	+	+	-
Future readiness				
Safeguarded investment / technological independence	++	-	-	-
Updating of thin client protocol/new protocols	+	-	+	Does not apply
Multifunctional (independent of VDI environment), with direct access to several IT environments: SBC in Citrix® and Microsoft®, IBM mainframes, SAP, VoIP, Cloud Services, etc.	++	-	-	-
Supports virtual desktops in VMware®	+	+	+	Does not apply
Supports additional VDI solutions (e.g. Citrix XenDesktop™)	+	-	-	Does not apply
Direct access to cloud services through a local browser	+	-	-	Does not apply
Performance				
Multimedia redirection: local decoding of video streams (reduction of server and network load)	+	-	+	Does not apply
Further reduction of the burden on central IT resources through local clients and tools for direct access to cloud services, VoIP, etc.	+	-	-	Does not apply

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