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Green your IT with VDI

Executive Summary

IT contributes significantly to the environmental impact of most organizations with IT equipment consuming over 2% of the electricity in the US and that figure is growing each year.

One area of IT in particular, desktop computing, makes an especially large contribution to energy use, e-waste, and other areas of environmental impact. Converting some portion of the hundreds or even thousands of desktop PCs found in most organizations to use a virtual desktop infrastructure, or VDI, can be highly effective at reducing that impact if the correct architectures and technologies are employed.

VDI deployments that use true zero clients to radically centralize your desktop computing can have the greatest impact on reducing your environmental impact. Zero clients – which have no CPUs, RAM, or storage devices on user's desks – can also best deliver on the other promises of VDI including lowering your total cost of ownership (TCO) along with improving the user experience and reliability of desktop computing.

This whitepaper shows you how you can assess the current environmental impact of your use of desktop computing. It provides the tools needed to calculate the impact of purchasing, operating and disposing of desktop computing devices and infrastructure. And it shows how you can significantly reduce that impact by moving to virtual desktops delivered by a true zero client like the Pano Device from Pano Logic.

Assessing your Desktop Computing Impact

Moving towards Green IT, or Green computing, whether by deploying a virtual desktop infrastructure (VDI) or other means is necessary both because of the ecological realities in which we all live and because green computing is almost always synergistic with or complimentary to the growing need for businesses and governments to increase efficiency and reduce waste.

The first step in planning a greener future for your IT systems is to perform a thorough assessment of the environmental impact, or footprint, of your entire desktop computing infrastructure. To accurately measure this impact you must also look not just at what is required to operate the equipment but also across the entire lifecycle of the desktop devices and supporting infrastructure. The true impact extends from production, to shipping and distribution, through the operation during the useful life of the equipment, and on to disposal and recycling.

Each stage in this complete lifecycle can be assessed using the following factors:

1. **Production Impact – Green Design / Manufacturing:**
 - a. Energy used and toxic waste produced during manufacturing.
 - b. Consumption of nonrenewable mineral resources needed to manufacture electronic and other equipment components.
 - c. Energy and materials used to package and ship desktop devices from manufacturer to distributor to vendor to user, including the energy used to move component parts between suppliers and intermediate and final assembly locations.
 - d. Energy used and waste created when manufacturing repair parts and spare equipment purchased to cover the anticipated repair of faulty equipment or components.
 - e. The relative life span of the equipment – devices with a short life span cause additional or more rapid manufacturing impacts due to the need to purchase a replacement device much sooner.
2. **Operating Impact – Green Use:**
 - a. Energy used to directly run the IT equipment over its life span – this is a function both of the design of the equipment (designing in efficiency and power-management features) and also of how it is operated (i.e. by enabling power-management features).
 - b. Energy used in air conditioning to remove the waste heat of the IT equipment.
 - c. Energy used and pollution created by support staff travelling to and from the remote user's location to provision or troubleshoot a desktop device.
 - d. The relative carbon dioxide production footprint of the electricity or other energy sources used for any of the operating or manufacturing activities.
3. **Disposal Impact – Green Disposal:**
 - a. Recyclability or reuse of the IT equipment materials and components.
 - b. Disposal electronic waste (e-waste) volume and production of toxic by-products from non-recyclable components.

In addition to their contribution to the environmental impact, each of these factors can also be assessed as contributing to the cost, direct or indirect, of desktop computing. Some like utility payments for electricity used in running and cooling the devices are direct costs that can easily be calculated and potentially even

offset by savings from deploying virtual desktops or incentive payments from utilities. Others like costs from manufacturing or disposal are indirect and are passed along, to a greater or lesser extent, as part of what is paid for the equipment.

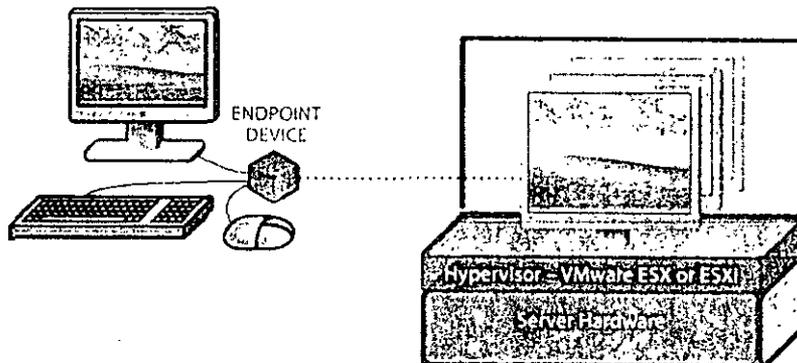
It is difficult to calculate an exact measure of the production and disposal impacts but it generally safe to assume that producing smaller and lighter devices consumes energy and produces waste in direct proportion to their size and number of components. So a desktop PC that weighs 15 pounds would use roughly 1500% the energy and materials compared to a 1 lbs Pano Device (of which most of the weight is the metal casing). Adding in an allowance for a portion of the shared server¹ and networking equipment required for VDI and the ratio of production and disposal impacts for a PC would still be 1000% or more compared to that of a VDI endpoint.

A final factor in assessing the environmental (and as carbon trading grows, economic) impact of the energy consumed, no matter where in the equipment's lifespan, is the carbon footprint, typically measured as tons of CO₂ (carbon dioxide) produced. The electricity CO₂ Emission Factor average used by the EPA's Climate Change Action Plan (CCAP¹¹) for 2009 is 1.54 lbs CO₂/kWh. Using this average and a calculation of the energy saved in converting 1,000 desktop PCs to VDI zero clients shows that moving to VDI can eliminate an average of 543 tons of CO₂ emissions per year – equivalent to the .

Pano Logic also provides a TCO calculator that among other things can help you determine the level of savings from energy conservation with VDI. The TCO calculator can be found at: www.panologic.com/tco-calculator

Figure 1:

VDI endpoints on the user's desk connect over a local area network to desktop virtual machines running in hypervisors on servers in the data center



Five Ways that VDI can Green your IT

Virtual desktop Infrastructure, or VDI as it is commonly termed, is a desktop computing architecture that centralizes the desktop operating system and applications on desktop virtual machines (or DVMs) running on a hypervisor on a shared physical server in the data center. VDI promises significant benefits in

containing and reducing the management and support burden of delivering desktop computing. VDI, unlike earlier end-user virtualization approaches like terminal services and application virtualization, is intended to deliver the full capabilities of a native Windows desktop to users.

VDI can help deliver many reductions in environmental impact, reducing your carbon footprint, consumption of nonrenewable resources and production of e-waste.

Five key areas where VDI can help green your IT include:

1. **Increased Energy Efficiency:** VDI endpoints use just a few percent of the electricity consumed by traditional desktop PCs, saving substantially on energy bills both to power the devices and for cooling needed to remove the resulting waste heat – potentially saving enough to pay for the VDI deployment itself in just a few years.
2. **Improved Utilization:** Desktop PCs are typically used only 5-10% of the time – most of the time they sit idle – while PC storage is typically used to only 30-40% of capacity. VDI hardware, largely in the form of shared servers and storage networks, is utilized at a much higher level. And finally hardware upgrades are also much easier to leverage across concurrent users on VDI systems compared to upgrades made to physically distributed PCs assigned to individuals.
3. **Reduced Waste:** VDI endpoints are far smaller than desktop PCs, with fewer parts and containing less metal, plastic and electronic components. This reduces the energy used and potential toxic materials generated both during production and, at the end of the device's lifecycle during disposal, potentially avoiding costs from states that have passed e-waste fee laws (usually in the form of producer responsibility feesⁱⁱⁱ). Purchasing devices that are compliant with ROHS (Reduction of Hazardous Substances^{iv}) guidelines and which contain a high level of recyclable materials also helps reduce your environmental impact.
4. **Lower Operating Overhead:** The ease of supporting and deploying VDI desktops translates into both reduced user downtime and increased IT productivity, bringing substantial savings that can be applied to increasing efficiencies in other areas of the business. This also keeps users more productive to achieve greater results from the energy consumed by equipment and buildings.
5. **Longer Lifespans:** Finally, the longer lifespan of VDI devices, as much as 3 times that of a desktop PC, bring further reductions in production energy use and waste along with lowering the rate of disposal e-Waste. And VDI systems typically have much greater reliability and up-time than desktop PCs, reducing or eliminating the need to stock repair parts or redundant devices.

These five areas are the key drivers for the return on investments and reduced environmental impacts you can expect to realize from deploying VDI in place of traditional PCs. As with any advanced technology, you need to make careful choices of the both the technical architectures and the products and vendors you include in your VDI deployment plans to achieve optimal results.

Zero Clients for near Zero Impact

One VDI endpoint alternative to thin clients or PCs is a "zero client" where the term "zero" refers to the complete lack of any client-side processing or management. Zero client hardware includes only the simple logic needed for the IP and Ethernet network stack, along with the logic needed to support the USB, video, and other peripheral ports on the endpoint.

VDI delivered via zero clients promises to deliver the greatest reduction in environmental impact compared to that of thin clients or other VDI architectures in a number of ways:

- **Much Lower Energy Use:** As previously discussed, the energy use of VDI endpoint devices can be a fraction of that of a typical business desktop PC. But compared to thin client endpoints, which can consume 12 to 20 watts (average of 13.9 watts^v), zero clients can further cut the energy use to as little as 3.5 watts – roughly 1/3 to 1/5 that of thin clients.
- **Even Fewer Components:** Zero clients have a fraction of the electronic components of thin clients which are often, especially in the case of those used for VDI, close to the complexity of small PCs.
- **Greater IT Productivity:** zero clients are entirely stateless and require no configuration when provisioning new users or replacing a device during troubleshooting. This means IT staff doesn't need to travel out to user locations or have equipment shipped to the data center, reducing energy used and pollution produced.
- **Far Greater Durability:** zero clients lack fans, rotating hard drives or any other moving parts unlike many thin clients used for VDI. This simplicity of design adds to energy conservation both in production and during operation but it also contributes to a much longer lifespan and better durability in harsh environments, further reducing the production impact.

Many vendors claim that they offer zero clients in one form or another, but these are usually just thin clients that need additional hardware and software for streaming delivery of the endpoint's operating system. This creates a system that is even less "zero", in both environmental impact and operating overhead, than just using a regular thin client. The only vendor offering a true zero client endpoint specifically designed for VDI is Pano Logic.

For More Information

For more information visit www.panologic.com, email sales@panologic.com or call 650-454-8940 / 877-677-PANO.

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ⁱ http://www.spec.org/power_ssi2008/results/res2008q1/power_ssi2008-20080212-00036.html

ⁱⁱ <http://www.epa.gov/climatechange/index.html>

ⁱⁱⁱ http://www.computertakeback.com/legislation/state_legislation.htm

^{iv} <http://www.rohs.eu/english/index.html>

^v http://www.eu-energystar.org/en/en_008b.shtml