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Back to the future: virtualization pushes thin client computing into the enterprise mainstream

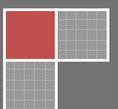
A white paper from VXL Instruments Ltd.

For many years, industry analysts predicted that thin clients would revolutionize enterprise computing, but it was a revolution that never quite happened. Until now. Finally, emerging technologies, such as virtualization, are enabling thin clients to move into the mainstream and businesses to reap the broad range of benefits which are associated with the thin client and server-based computing model.

This white paper, prepared for VXL Instruments, outlines the factors which have combined to make thin client computing a viable, more secure and less costly alternative to traditional desktop computing models.

About the authors

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Introduction

"The era of the PC is almost over, and the era of the thin client is about to begin," said Larry Ellison, the CEO of Oracle, in the mid-90's. He was wrong. PC's have continued to dominate while thin clients (TC's) have captured only a relatively small share of the market. But that might well be about to change.

As the costs and security challenges associated with maintaining traditional PC-based networks continue to escalate, more and more enterprises are now seeking mechanisms to drive out costs while simultaneously improving the manageability and security of their infrastructures. Increasingly, enterprises are looking to TC's and server-based computing (SBC) to provide that mechanism.

This paper will outline the factors which are driving TC's and SBC into the enterprise mainstream, explain the benefits of the TC and SBC model and discuss potential developments which may well result in this becoming the standard architecture in all enterprises across all sectors of industry.

What is a thin client? What is server-based computing?

Basically, a TC is a stripped-down computer without a hard disk. Alternatively known as a lean clients or network computers, TC's are designed for SBC: in other words, applications and data are not stored on the TC, but are instead stored on a central server. The server and TC interact by exchanging screen pixels, mouse movements and keyboard strokes. To ensure optimal performance, the data is exchanged using low bandwidth protocols such as RDP and ICA. Normally, end-users observe no performance difference between SBC and PC-based computing.

Virtualization: enhancing the server-based computing model

In a traditional TC and SBC environments, delivery systems such as Citrix Presentation Server¹ or Microsoft Terminal Services² are used to push data to TC's. However, the ramping popularity of server virtualization has opened new doors and new opportunities. Virtualization is a technology which enables a single machine to act as multiple machines. In a virtualized environment, a product such as Microsoft Virtual Server³ or VMware ESX Server is used to host multiple virtual machines on the same physical machine. Each virtual machine runs an operating system and applications on its own set of virtual hardware.

The primary benefit of virtualization is that it enables the workloads from underutilized servers to be consolidated to a fewer number of servers, resulting in improved server utilization ratios and reduced hardware, rack-space and HVAC costs. However, enterprises are now beginning to discover a secondary benefit of virtualization: that is, the ability to deliver virtual machines to devices such as TC's. Products such as VMware's Virtual Desktop Infrastructure and Citrix's Desktop Broker enable virtual machines to be personalized to match individual user settings and then delivered to devices such as TC's. For the end-user, the result is an experience which is identical to that of using any standard PC. For the IT manager, the result is centralized resources which can be more easily and more cost efficiently managed, reduced server TCO and the ability to leverage less costly hardware, such as TC's.

The potential to reduce the TCO of hardware and simplify management in this manner are the primary factors which have sparked the renewed interest in TC's and which is fast pushing the TC and SBC model into the enterprise mainstream.

What are the advantages of virtualization, thin clients and the server-based computing model?

An enterprise which switches to a TC and SBC model can expect to reap a broad range of benefits including:-

- **Enhanced security** - while mobile computing is a necessity in the modern business environment, it also makes protecting data much more difficult. On an almost weekly basis, the press reports an incident in which data has been lost or privacy breached as a result of a misplaced or stolen laptop.

Diskless TC's and the SBC model help mitigate such risks by keeping all data safely within the confines of the corporate data center. Not only does this boost the security and integrity of data, it also helps enterprises comply with the requirements of the Privacy Act, the Health Insurance Portability and Accountability Act (HIPAA), the Sarbanes-Oxley Act and the numerous other pieces of legislation which dictate the manner in which data must be held, processed and protected.

- **Simplified management** - industry analyst estimates as to the average total cost of ownership (TCO) of a PC vary wildly. This not particularly surprising as the environment into which a PC is placed will have a major impact on its TCO. That said, one thing upon which analysts do concur is that the costs associated with maintaining a PC account for far more of the TCO than the initial purchase price. The cost of deploying a PC plus

the cost of the time needed to patch and update the operating system and applications plus the cost of supporting the desktop throughout its life easily can increase the initial capital outlay by a factor of more than ten.

The TC and SBC model can help to drive down these costs. Because operating systems and applications are located on a central server and shared among users, maintenance becomes much easier and faster. Patches and updates need only be applied to the virtual machines which users access and not to numerous individual, and possibly geographically dispersed, PC's. Migrations also become much faster and less painful. Products such as Citrix's Presentation Server and Sun's Secure Global Desktop provide virtualization at the application level. In other words, applications become independent of the operating system and Windows, Linux, Solaris, AIX and HP-UX applications can all be simultaneously accessed by any TC. This solves the compatibility problems which enterprises often encounter when migrating to, for example, Windows Vista and also reduces the need for regression testing.

- **Reduced hardware costs** - TC's are less costly than desktop or notebook PC's; typically 40 to 60% less costly. This is because, as the majority of processing is devolved to the server, they do not require a high-end configuration. Also, TC's have no local storage and usually fewer components than PC's. This not only reduces up-front costs, it also reduces maintenance costs and results in TC's delivering a far better ROI than a desktop or notebook PC. Additionally, as already mentioned, virtualization enables servers to be consolidated enabling a business can do more with less. Ten servers may be able to deal with the workload which was previously distributed between 50 servers. This increased utilization means that businesses do not need to purchase so many servers – and can reduce the TCO of those which they do buy.
- **Reduced energy costs** – according to a study by the Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT which, reported by the European Commission, TC's use only 50% of the energy of desktop and notebook PC's. In a large enterprise where the utility bill for running the IT infrastructure may well run to thousands of dollars, this could translate to a substantial reduction in costs. Further reductions can be achieved if TC's are deployed as part of a virtualization program. As already mentioned, virtualization enables the workloads from underutilized servers to be consolidated to a fewer number of servers, and this results in reduced energy and HVAC costs. According to US utility company, PG&E, the savings can amount to \$300 to \$600 per year per server removed. So convinced are PG&E of the benefits of virtualization,

that they offer rebates to enterprises that undertake projects which result in a reduction in the number of servers.

In 2005, it cost US enterprises almost \$3 billion to power their IT infrastructures and, according to Dr. Jon Koomey, a consulting professor at Stanford University and expert on the electricity used by computer equipment, the amount of energy consumed by those infrastructures will have increased by about 75% by 2010.¹ In reducing its demand for power, an enterprise would not only be keeping down its costs and boosting its profits, it would also be helping to protect the environment.

The potential savings which an enterprise can expect to achieve from a switch to the TC and SBC model are difficult to estimate and will vary enormously according to the environment. Citrix's Application Computing Environment (ACE) Cost Analyzer¹¹ is an automated web-based tool which can be used to calculate the savings which would result from a switch to SBC using Citrix's products. The VMware TCO calculator¹² is also a web-based tool and can be used to calculate the financial benefits of virtualization. In either case, the potential reduction in costs is likely to be substantial.

But, as already mentioned, the benefits of the TC and SBC model are not purely financial; an enterprise can also enhance the security of its infrastructure and reduce its impact on the environment.

Examples of thin client and server-based computing deployments

"It's all that Sun once tried to promise us ('The Network is the Computer'), except that, unlike back then, it's actually an easily achievable goal now; it doesn't take a bunch of compromises to make it work," said Maggie McFee, the Senior Systems Administrator at Harvard University's Physics Department.

The Physics Department replaced 60 PC's used by students with thin client terminals linked to a dedicated Xeon terminal server and found that, as a result, at-desk visits reduced dramatically. "The ROI for us is immeasurable. We can now remotely handle most requests for these students (install software, modify settings) and a visit to the desk is usually only needed if there's a hardware issue or network issue or a printer is out of toner," said McFee.

The Physics Department also noted a substantial reduction in power consumption levels. "I can't tell you exactly how much energy consumption dropped, but it was significant enough to be noted by our local green initiatives

office and to contribute to us lowering our total building energy usage by 13.6% that year. I'd guess we account for at least ½ of that drop, if not ¾," said McFee.

Harvard are not the only organization to benefit from adopting the TC and SBC model; the U.S. Army have also enjoyed considerable success. "The Army estimates that for each individual implementation it will save anywhere between 8% to 40%. The savings really depend on the current PC environment," said Gary Winkler, Principal Director of the Army's Governance, Acquisition and Chief Knowledge Office.

Data security is a key issue for the Army and the thin client and server-based computing model enables data to be better protected. "Only screen pixel information is transmitted to the end user device while sensitive Army data remains within a secured server facility," said Winkler.

The Army has also benefited from pairing thin clients with virtualization solutions. "The Army is very interested in virtualization/OS-streaming capabilities and already has several implementations of this technology. The key benefit to the Army from this technology is that it will support many of the Army's applications that would not run on some of the older thin client solutions," said Winkler.

The future outlook

The TC and SBC model now presents viable option for all enterprises, and it is an option which more and more enterprises are choosing to adopt. According to market intelligence company IDC, TC sales increased by 19.3% between 2005 and 2006. This trend is likely to continue: IDC predict a continued annual growth rate in TC sales of 22% until 2010.

Factors which previously acted as obstacles to the adoption of the TC and SBC model have now been removed. Applications which previously did not work with Presentation Server or Terminal Services have been made to work. Both Microsoft and Citrix have made significant headway increasing and improving application compatibility. The performance of applications has been improved. Virtualization solutions have reduced in price and are now within the budget of even small businesses. Vendors are amending software licenses to support virtualization – for example, with Windows Vista Enterprise, up to four virtual installations are permitted enabling enterprises to leverage virtualization in a cost efficient manner. For end-users, working within a TC and SBC environment is identical to working in a PC environment and no additional training is necessary.

There really are now no obstacles or disadvantages to the TC and SBC model; but the benefits can be substantial.

Future developments might result in the SBC model becoming an even attractive option. Companies such as ITonCommand¹³ already offer hosted desktop solutions which effectively enable enterprises to outsource their IT functions. How does it work? Basically, all of an enterprise's applications and data are hosted on ITonCommand' servers and delivered to any device in any location in the form of a virtual desktop. This not only increases the mobility of employees, it also enables an enterprise to drastically cut its hardware and IT management costs. Such solutions are likely to become increasingly mainstream and will provide additional opportunities for enterprises to drive out costs by moving away from expensive PC-based networks.

Summary

The combination of virtualization and TC's can address the most common concerns relating to today's infrastructures: cost and security. While a return to centralized computing may initially appear to be a step back to yesteryear, it is, in fact, a modern solution to modern problems and enterprises which have previously dismissed the TC and SBC model would be well advised to reevaluate.

"The era of the PC is almost over, and the era of the thin client is about to begin." The TC and SBC model is an old idea which has been updated to address challenges which modern enterprises face. Back to the future!

About VXL Instruments Ltd.

VXL is one of the world's premier providers of thin client devices and provides an innovative range of high-specification, well-built, customized systems at the lowest price point. Since 1976, this combination of quality and value has been helping companies around the globe build IT infrastructures that are flexible, secure, manageable and affordable.

VXL's sole focus is thin client technology. VXL design and build systems without compromising on quality and an ISO 9001:2000 status demonstrates a real commitment to quality manufacturing and design.

Through strong partnerships with leading software and hardware producers such as Microsoft and Citrix, VXL is able to build systems that will work both now and in the future. VXL's use of open technologies means that you can change systems without changing hardware.

VXL also offers the highest level of post-sales support. All VXL products are backed by a three-year warranty in Europe and a minimum of a one-year warranty in other regions.

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<http://www.microsoft.com/windowsserver2003/technologies/terminalservices/default.aspx>

³Microsoft Virtual Server:

<http://www.microsoft.com/windowsserversystem/virtualserver/default.aspx>

VMware ESX Server:

<http://www.vmware.com/products/vi/esx/>

VMware Virtual Desktop Infrastructure:

<http://www.vmware.com/solutions/desktop/vdi.html>

Citrix Desktop Broker:

<http://www.citrix.com/English/ms/level2.asp?contentID=38777>

Sun Secure Global Desktop:

<http://www.sun.com/software/products/sgd/index.jsp>

Thin clients use 50% less energy:

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PG&E High Tech Energy Efficiency Incentives:

http://www.pge.com/biz/rebates/hightech/htee_incentives.html

¹ Estimating total power consumption in the US and around the world, by Jon Koomey, Ph.D:

<http://enterprise.amd.com/Downloads/svrpwrusecompletefinal.pdf>

¹¹Citrix Application Computing Environment (ACE) Cost Analyzer:

<http://acecostanalyzer.com/>

¹²VMware TCO Calculator:

<http://www.vmware.com/products/vi/calculator.html>

¹³ITonCommand:

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