

## Virtualization: Déjà vu All Over Again?

By Pete Privateer

Have you ever noticed that Information technology seems to go through cycles? In each cycle we seem to reinvent the same computing paradigms from previous eras. Most of you will find it hard to believe, but when I started college in 1972 there were only a handful of full sized computers in the entire state of Florida. They were room sized machines that took 3 inch water pipes to cool them. Computers were so rare and expensive, few could afford their own. Therefore universities and large corporations had to share them. Every computing cycle on these early machines was precious and not a CPU second was wasted.

IBM developed an operating system for its mainframes which made sharing computing resources common place. It was at first called OS/VS1 which stood for “operating system/virtual storage”. Later operating systems for IBM’s system 370 mainframes came to be known as OS/VS2, which later evolved into OS/MVS (Multiple Virtual Storage) by the mid 70’s. By the early 80’s the mainframe operating systems allowed you to partition a single mainframe or group of mainframes into many logical partitions (LPARS in the vernacular of the time) each running its own version of the operating system. A partition would operate like a virtual computer, each one dedicated to a specific program, individual user or task. Even as mainframe computers became more ubiquitous and individual corporations could afford their own machines, OS/MVS enabled them to run many jobs simultaneously squeezing every drop of processing power out of the CPU.

Although the first IBM personal computer hit the market in 1981, it wasn’t until the late 80’s that 2<sup>nd</sup> generation X86-class PC’s started to be used for more than word processing or manipulating spread sheets. PC’s began to run less critical applications (email, scheduling, project management, etc.) or to provide a front end for established mainframe applications. Mainframes were still the processing and data storage backbone of the enterprise, but by the early 90’s the “client/server” computing began to replace the mainframe computing model - the hallmark of data centers for the past 30 years.

To provide the equivalent horsepower to the mainframe we chained 100’s or even 1000’s of PC’s (which we called servers) together to create “farms” of x86 PCs. Eventually the mainframe gave way to rooms full of individual computers each dedicated to a specific task or application. Of course by the mid ‘90s the Internet had changed the way we think about networks and computing. By the middle of this decade server farms were support Web-based applications as well as more conventional client/server applications. However the servers were still running as individual computers.

Sometime in the last couple of years it dawned on us that these thousands of servers had vast amounts of processing power that was highly underutilized (only 5-15% in most cases). Powerful chips, multitasking operating systems, and high speed network connections led to CPU’s being able to do their job with plenty of time left over. Even with all this extra capacity we were constantly adding new servers when more processing power was needed. Eventually we began to run out of rack space to add new servers. Worst yet, the server farms were generating more heat than we could remove from the data center. In some cases we were simply running out of the electrical power to turn on a new server. It was time to bring back an old idea from the 70’ and 80’s – virtualization.

Using a layer called a “hypervisor”, which abstracts the server operating systems, we can now partition physical servers into multiple virtual computers – sound familiar? Now server CPU cycles can be efficiently utilized to support shared applications (60-80% instead of 5-15%). With more efficient use of servers we can dramatically reduce the number of servers needed, which in turn reduces heat and power requirements while dramatically

reducing the manpower required to manage the data center. In fact, with virtualization, a data center full of X86 computers can now be viewed on single monolithic source of processing power partitioned into many virtual machines. Add to this the trend towards virtualizing the desktop and we have come full circle back to centralized computers connected to remote terminals. Déjà vu all over again.

As we approach the end of the decade, virtualization is proving to be the next major paradigm shift in enterprise computing. Instead of racks upon racks of individual servers, each one dedicated to a specific task, we will have an “on demand” pool of processing power that can be shared across applications and services. This will fundamentally change the way we organize, manage and control the next generation data center. In fact, the only thing slowing down this transformation is the tools necessary to manage and secure a virtual infrastructure.

No matter what computing platform you are using, computers do not manage or secure themselves. In the mainframe era a host of software tools evolved to manage everything from storage and scheduling, to performance and security. Of course the mainframe vendors supplied some of these tools, but innovative start-up companies came up with newer and better ways to manage data center operations. Companies like Computer Associates, Legent, Sterling Software and BMC built very successful businesses out of providing 3<sup>rd</sup> party management and security tools for IBM mainframe environments.

One of the early obstacles to moving mission critical applications to a client/server platform was the tools to manage and secure the environment. Mainframe management and security tools from companies like IBM, BMC and CA were simply not designed to for a distributed, heterogeneous client/server environment. Anyone ever try to use IBM’s RACF to secure a client/server platform?

A few management and security tools for client/server were developed by the platform vendors – Microsoft, Novell, IBM, Sun, HP etc. However most management and security tools were provided early on by start-ups like Tivoli, Legato, OpenVision, Patrol, Platinum, AXENT, ISS, Security Dynamics, and many others. Of course most of these early stage companies were eventually acquired by established systems management companies; IBM acquired Tivoli, EMC acquired Legato, BMC acquired Patrol, CA acquired Platinum, Symantec acquired AXENT and so on. Today those companies supply the bulk of client/server and Web management tools.

Now we face a similar challenge in managing and securing the new virtual computing paradigm. Organizations hesitate to move mission critical applications to a virtualized infrastructure because they lack the visibility, management and security software necessary to see, understand and control increasingly complex virtual environments. Security professionals are reluctant to sign-off on virtualization projects because the tools from the virtualization platform vendors (VMware, Microsoft, Citrix, etc.) cannot adequately monitor or protect a virtualized environment. Likewise auditors and compliance officers often slow down the migration of mission critical applications to virtualization because existing tools give them little visibility into the virtualized world.

Just like mainframe management tools could not be used to manage client/server and Web environments, existing management tools from the big systems management vendors cannot adequately manage the virtualized data center. Client/server management tools revolve around physical server or physical network. They can’t understand a world where servers, switches and networks can pop up at the click of a mouse. They do not understand things like running applications moving seamlessly from one physical server to another. Client/server management tools cannot grasp an environment where servers, storage, and networks can be dynamically managed as a single pool of resources.

As in the early days of mainframe and client/server computing, the virtualization platform vendors will supply some of the key management and security tools. But history has shown us that systems management is not the

forte of the platform vendors. Otherwise all of our management and security tools would have come from IBM, Sun, HP, Novell, and Microsoft and there would be no third-party management and security companies.

To fully realize the promise of virtualization, IT organizations need a new breed of management and security tools which understand and take advantage of virtualization's unique requirements and capabilities. Purpose-built virtualization management and security tools will enable next generation data centers to enforce IT policies, ensure compliance with government mandates, and manage and protect virtual servers, desktops, and networks across VMware, Microsoft and Citrix platforms.

Over the next few years most of the really ground-breaking tools will undoubtedly be built by a new crop of innovative, early-stage companies which have the vision and creativity to chart new territory and help transform enterprise computing.

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