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Phase-II: Theme-Based Paper

ABSTRACT

•Virtualization can enable more dynamic centralized management by separating the elements of the traditional desktop computing. Many desktop virtualizations' forms can help organizations satisfy users' needs for mobility and flexibility by cutting costs, security and compliance of Information Technology (IT) departments. This paper focuses on database virtualization and making the organizations to move towards desktop virtualization quickly in easier way. This paper explains how virtualization can help organizations solve the desktop dilemma, and outlines the ways in which VMware is harnessing expertise and market leadership in desktop and server virtualization to deliver comprehensive database solutions for unified access to universal clients. This will allow the organizations to strike a balance between IT and user needs.

KEYWORDS

•OS
•Server-based computing
• VM
• Virtualized PCs
•Remote Display Protocol (RDP)
•Virtualized desktop infrastructure

The act of decoupling one computing resource from others without impacting the usability across these resources is called Virtualization. Virtualization has changed totally the way of running information systems through the permission of flexibility of hardware and software for the industry. Timely expansion of the resources of mostly available servers, the optimal utilization must be enabled without problems [1]. Virtualization technologies loosen the direct dependencies on the parts - the operating system (OS) to the hardware, the application to the OS, and the user interface and data to the local machine on each other rather than locking these layers together. Any organization responsible for more than one PC should seriously consider the advantages of moving to desktop virtualization. By taking advantage of today's low-cost yet ever more powerful computers, even the smallest organization can realize immediate benefits without the high expense of mainframe computing or the complexity and performance limitations of server-based computing [2]. Today's desktop is an end-user environment defined by a profile consisting of applications, documents and configuration data. As end users rely more and more on mobile devices such as laptops, smart phones and removable storage drives, they need desktop environments that they can access anytime and anywhere. IT administrators are cleaning up the debris from the patchwork client-server systems that were sewed together hastily in the traditional storm as the need for interoperability and flexibility has increased. IT organizations are under due pressure to reduce costs and increase productivity. They are strengthening security and tightening control over corporate information systems.

Some organizations use thin clients to centralize their desktop infrastructure, but traditional thin client models cannot accommodate mobile laptop users and present unique challenges in terms of application compatibility. The synergy of blade architectures and virtualization offers customers the ability to sudden increase utilization of their server investments; and thus provides a more resilient and available infrastructure. The model proposed through this paper roll out new infrastructure and services more quickly and skillfully. The same technologies also lower costs directly- through an immediate reduction in power and cooling costs, and indirectly- through a reduction in IT administrative costs associated with server hardware and the infrastructure software management.

Virtualization in Database

Virtualization considered for this paper uses three categories:

1. Operating system
2. Storage and
3. Applications

Operating system

Virtual operating systems (or virtual machines) are quickly becoming the most prevalent form of virtualization of the IT infrastructure today -the form of virtualization to which end-user is most familiar with. Virtual machines are the full implementations of standard operating systems, such as Windows Vista or RedHat Enterprise Linux, running simultaneously on the same physical hardware. Virtual Machine Managers (VMMs) manage each virtual machine individually;

each OS instance is unaware that on one hand it's virtual and on the other hand other virtual operating systems are running at the same time. Companies like Microsoft, VMware, Intel, and AMD are leading the way in breaking the physical relationship between an operating system and its native hardware, extending this paradigm into the data center. Data center consolidation is bringing the benefits of virtual machines to the mainstream market, allowing enterprises to reduce the number of physical machines in their data centers without reducing the number of underlying applications. This trend saves enterprises money on hardware, rack space, power, cable management, and more.

Server Virtualization:

The concept of application server virtualization is best seen with a reverse proxy load balancer which is an appliance or service that provides access to many different application services with transparency. In any deployment a reverse proxy will host a virtual interface accessible to the end user on the "front end." While on the "back end," the reverse proxy will load balance a number of different servers and applications like a web server. The virtual interface or Virtual IP or VIP represents itself as the actual web server, and manages the connections to and from the web server on need. This enables the load balancer to manage multiple web servers or applications as a single instance, providing a more secure and robust topology than one allowing users direct access to individual web servers. This is a one-to-many virtualization representation in which one server is presented to the world, hides the availability of multiple servers behind a reverse proxy appliance. Application Server Virtualization (Bury & Nelson 2004)[3] can be applied to any type of application deployments and architectures, from fronting application logic servers to distributing the load between multiple web server platforms. It can be applied to all the way back in the data center to the data and storage tiers with database virtualization.

Application Virtualization:

The application virtualization is also called "thin clients". These implementations depend on the virtual application running locally and the management and application logic running remotely; for example Softgrid by Microsoft deploying application virtualization. Though it may be running Microsoft Word locally on a system, personal information, the binaries, and running state are all stored on, managed, and delivered by Softgrid. The local system/laptop provides the CPU and RAM required to run the software, but nothing is installed locally on the machine. Other types of Application Virtualization are Microsoft Terminal Services and browser-based applications.

What is Desktop Virtualization?

A hardware virtualization layer is added to the centralized database center server or servers in a typical desktop virtualization model. In a network the end user software is

distributed and packaged with application virtualization [4]. This goes with standardized web services initiative making the IT sector surprising. So many virtual machines (VMs) are hosted in this virtualization layer. Each virtual machine (VM) is associated with an operating system, applications, device configurations, and a unique desktop environment (or GUI). Every user uses the desktop for a given VM including customizations, such as Windows wallpaper and screen savers. The structure of a desktop virtualization solution is shown in Figure 1.

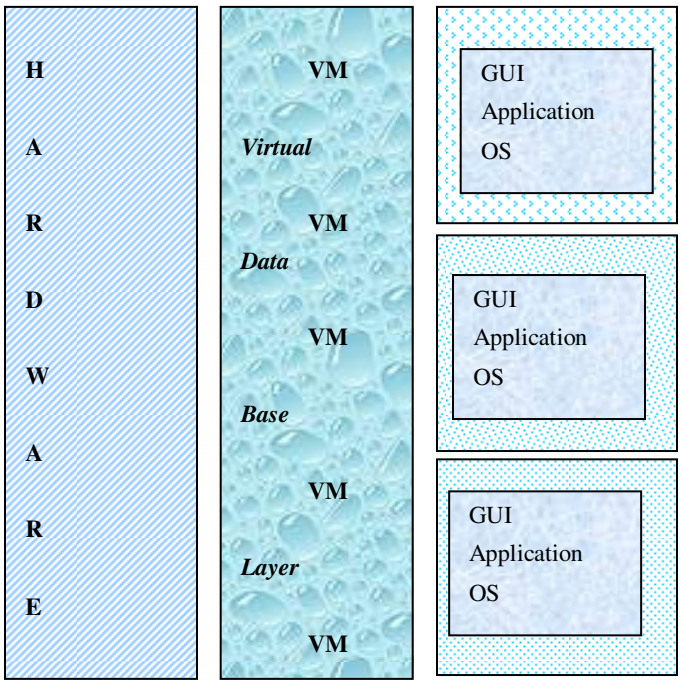

Fig.1 Desktop Virtualization

The virtualized PCs (workstations) running on the remote server constitute the desktop Virtualization. The centralized server hardware performs every computation work. The users get the user interface on client machines on the network. IT administrators create virtual machines on a central server for building a virtual desktop solution machine. Then a connection broker is installed. Now install desktop operating systems on the virtual machines like Windows® XP or Windows Vista®. Finally install the desktop applications.

Users will get fully devoted OS sessions on the shared central server as every virtual machine is a complete instance of a PC (the user session functions just as a locally run version of the operating system). The users access the virtual desktop remotely from a traditional PC, thin client. They can access otherwise from a repurposed computer directly or through a connection

broker connecting the user to the appropriate virtual machine. Each hosted VM runs freely on the server protecting from unauthorized access. The virtual desktop is delivered to the client using a remote presentation protocol, such as Remote Display Protocol (RDP) or Virtual Network Connection (VNC) resulting into the hosted desktop images, completely separated from each other on the secured database center server.

Current challenges:

Some organizations use thin clients to centralize their desktop infrastructure, but traditional thin client models cannot accommodate mobile laptop users and present unique challenges in terms of application compatibility and the overall end-user experience. The dilemma is how to accommodate user needs which may include freedom, flexibility, mobility, also to accommodate the needs of IT administrators including security, control, manageability, and compliance using a common framework. Virtualization connects all of the components utilized in delivering an application over the network, and includes the process of making all pieces of an application work together regardless of where those pieces physically reside. This paper explains how virtualization can help organizations in solving the desktop dilemma by delivering comprehensive solutions for unified access to universal clients, allowing organizations to strike a balance between IT and user needs while improving the bottom side.

The most challenging issues associated with traditional approaches to enterprise desktop computing are:

Security Risk:

Traditional desktop management solutions do not provide adequate security for endpoint data, especially when it is stored or accessed remotely or on mobile devices such as laptops and USB drives. Many organizations are looking for a fundamentally better solution. For organizations focused on data security as a top priority, Centralized Virtual Desktops have created a tremendous amount of interest.

Backup and Recovery:

The traditional desktop computing has the decentralized nature, due to these desktop applications, user data and documents are very difficult to back up. Backing up an entire office full of desktops is not practically possible for most of the organizations. In a condition if a desktop goes down or a laptop is lost, it can take hours or days to get the end user back up and recovery.

Patch and update management:

The hardware, operating system, applications and users are all tied to a single device with the traditional desktop computing. Updates to any of these can tend to cause conflictions.

Hardware refreshes can cause driver conflictions with the operating system. The operating system updates invariably can give rise to application incompatibilities and many more things can happen.

Compliance and Policy Enforcement:

The mobile devices and employee-owned PCs make it extremely difficult to enforce corporate policies, prevent data leakage. The organizations discovered that they rarely maintain the comprehensive audit trails necessary to demonstrate compliance with the ever growing number of government and industry regulations. The challenge is how to back up user data and settings scattered from PC to PC and restore users' productivity if a laptop is lost.

Costs Cutting:

It can be very costly and difficult to provisioning, managing and supporting traditional desktops. In large, geographically distributed environments that may include a mix of operating systems, devices and access points it becomes more and more expensive.

Moving from distributed to consolidated infrastructure:

As with the introduction of any new technology, the return always comes only after the investment, IT organizations face the challenge of generating executive backing for the initiating investment amount in moving from distributed to consolidate to save more amounts later after deployment of the technology.

These and many more reasons are keeping the organizations to move away from the traditional model to a better way to operate their end user environments. The Virtualization offers the better solution for the same.

Solving the Problem with virtualization:

According to Forrester "Organizations will instead identify their users by criteria like task-based, knowledge, or power users and will deliver dynamic desktops accordingly. After speaking to organizations looking at desktop and application virtualization, we know that client virtualization is not just an emerging trend, it's the future of the corporate PC." (Forrester 2008)[5]. The purpose of this paper is to make it easier for companies to move to Desktop Virtualization. Customers may choose to deploy some applications locally on the PC and some applications remotely using Terminal Services.

Application virtualization can be used with the deploy technologies available for both of these scenarios.

Virtualized desktop infrastructure (VDI), including server virtualization and some storage virtualization, used management tools and automation tools such as workload redistribution and automatic workload migration (>25%). These were used both on live VMs and on cold OS images for meeting service-level agreements and availability goals (systems achieve 40% to 60% or more capacity utilization)

Savings Versus Unvirtualized (%)	Total Costs per User per Year ($)	
Unvirtualized	165	NA
Basic virtualization	107	Up to 35
Advanced virtualization	80	Up to 52

Table 1: Business Value of Virtualized Deployment: Total Costs [6]

Integrated solutions from vendors such as HP, provide essentially all of the same benefits of a basic virtualization scenario through a hardware based solution, offers the HP Insight Dynamics - VSE in conjunction with the company's HP c-Class Blade System products (using the HP Virtual Connect technology). This is a means of virtualizing Ethernet and Fiber Channel network connectivity for blades. This solution can utilize a hyper visor to further extend customer benefits. In this scenario, it delivers some of the attributes IDC defines in an advanced virtualization scenario. Table 1 compares the annual costs per user for deployment of this technology. The reduction of staffing costs and increasing business agility can be changed into long-term benefits that for years to come will deliver ongoing returns on the investment required.

According Gartner research, virtualization will be the biggest driver for IT infrastructure and operations spending over the next several years. The report, "Virtualization Impact on x86 Server Shipments" [7], emphasizes that virtualization is the "highest-impact trend" for IT through 2012, predicting it will determine how IT administrators manage, buy, deploy, and plan their future strategies. Gartner projects that more than four million virtual machines will be installed on x86 servers by next year – which is almost as many virtual PCs in operation today. Clearly virtualization is a major technology shift. As a result, it requires visionary changes in thinking and operating procedures to better plan, manage, provision, and orchestrate resources throughout the enterprise.

"Many people feel that all they need to be successful is buy some virtualization software and install it. That might get them started on the virtualization life cycle, but doesn't complete it. You'll be more successful if you address all the steps in the life cycle." [8]

When planning the life cycle of desktop virtualization the organizations must measure the behavior and the resource consumption of each desktop application, over time, in order to properly assess the hardware resources necessary for migration. The performance of every critical application is evaluated by its performance in a virtualized environment to understand the impact upon user productivity. Analysis of each consolidation target platform needs to be ranked in a number of key areas, like CPU and memory utilization, to best determine the right virtualization broker for each organization's suite of virtualized applications (thin clients).

Today organizations are adopting VMware virtualization technology to increase freedom and flexibility while providing IT organizations with the centralized management and control. They need to lower costs and increase security and control in there database. The

virtualization breaks the bonds between these elements into isolated layers, enabling IT staff to change, update and deploy each component independently. End users is benefited from virtualization as they get the same rich desktop experience, but with the added ability to access that computing environment of devices and access points in the office, at home and on their journey. Desktop Virtualization solution can be used to provide access to applications and data to remote users who are not within the company firewall. For example take the case, when an IT department wants to support users who work from home or in other, geographically dispersed places. Supporting such users is a difficult task. In such case of problem, the user often sends their desktop or notebook to the main office for repair. Desktop virtualization solution to database centre makes the problems easier to fix since the virtual systems are maintained in the data center where there is an IT staff. Desktop virtualization is the act of decoupling the different computing layers and storing some / all of them in a data center figure shown below as-

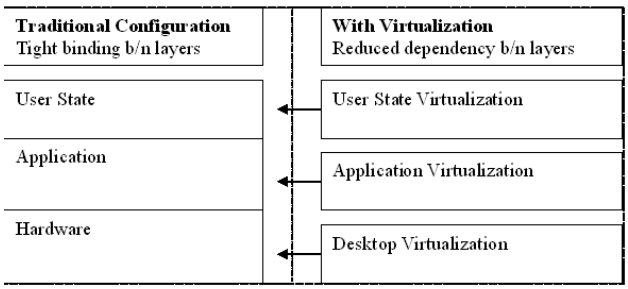

Fig.1: Desktop Virtualization in Database centre

Employees can access their applications and data very safely over a network and the risk of data loss is minimized through virtualization. Virtualization boosts deployment of new capabilities without needing to acquire new hardware and configure components and reduces application testing requirements and compatibility issues and simplifies disaster recovery and compliance. Virtualization of desktops is also heading over terminal services as they remove the headaches of application sharing and application compatibility. Instead of of sharing application and compatibility each end user gets a complete, standardized and customizable desktop computing environment which is nothing else but virtual machine. Each virtual desktop is completely isolated from other virtual machines. IT administrators have provision and manage OS and application software just as they do with a traditional PC.

Many competitive solutions have been introduced in the market which includes multiple implementations of the open source Xen hypervisor technology integrated into both main stream commercial Linux distributions and non paid Linux distributions. It has been commercially packaged into a standalone product. During 2008, Microsoft rolled out its Hyper-V hypervisor, replacing its Virtual Server product that has been used primarily for test and development purposes and low-scale with low-performance production deployments.

VMware has revolutionized server-based client computing with VMware Virtual Desktop Infrastructure (VDI) by delivering fundamental improvements over the legacy terminal services paradigm. The VMware deliver fully isolated virtual desktops from the database center, each with its own operating system, applications and user configuration data. VMware has established itself as the leader globally in both desktop and server virtualization. It is bringing together the best of its desktop and server virtualization technologies. VMware has expanded the VDI paradigm to include both server- and client-hosted virtual desktops to run on any desktop computer, providing unified access to centralized database resources, with or without a network connection, on the widest possible variety of endpoint devices. Now organizations can manage hardware, operating systems and applications independently of each other within a unified framework. This will result in a user-centric approach that improves desktop management by reducing costs, strengthening security and tightening control over corporate assets. On the other side it will provide end users with a flexible knowledge desktop experience. The main advantage of desktop virtualization is unified access to universal clients.

Advantages:

The key advantages of desktop virtualization are-

United Equipment adoption of VMware server and desktop solutions improve disaster recovery, and enhance remote access to their Microsoft Dynamics ERP application.

The desktop virtualization standardizes their IT infrastructure, centralize management, tighten security, and make organization move in easier way. Each user can completely customize the desktop virtualization environment with different applications and settings.

Users can be provided more control of their own virtual desktops. They are enabled to install and modify applications. It is possible to mix several different operating systems or different versions of the same operating system within a single virtualized desktop environment. Example, some virtual desktops run Windows XP, while others run Linux—all comfortably hosted on the same central server. Desktop virtualization makes it possible to consolidate enterprise desktops. IT administrators can replace computer workstations with expendable, low-cost thin client terminals. This helps extend computer life cycles, as older computers can be repurposed for other duties. They can more easily manage large numbers of enterprise clients from the data center, rather than from each individual user's desk. Data can be made more secure, as user desktops— including operating system images— are running on servers within the walls of a centralized data center. Desktops are managed centrally in the virtualized desktop model, simplifying software installations, backups, and maintenance, as well as reducing technical support and administration. Desktop virtualization separates user desktops from specific hardware resources. Thus makes possible live migration of virtual machines among physical servers. A virtual machine can be suspended and the server can move the memory contents of the desktop virtual machine to a disk, another virtual machine can be provided on another physical hardware, and the virtual machine can then be brought back online. Once this penetration is completed, users can pick up right where they left. Computing resources can be conserved for autotime user sessions. The user's session can be disconnected from the client which can be still running on the server. The system can then suspend the session by moving the memory contents to disk and leaving the hardware for another user. Next time the first user logs in, his original session is re-connected and the user can continue work. Desktop virtualization can be an effective solution in scenarios that benefit from features such as reduced desktop administrative and management tasks like quick addition, delete, upgrade, and patch applications. The desktop virtualization can be more effective in centralized security, and the ability to safeguard and back up data.

Limitations:

The infrastructure supporting a virtualized desktop framework is comprised of enterprise-class server hardware which is connected to a storage area network (SAN), it may become a single point of failure though server hardware is typically very robust and fault-resistant. The failure of the server may take down client environments running on it. It is solved by putting the virtual machines, encapsulated as files, on the SAN for redundancy.

This failure extends to the network. The flexibility and management benefits of desktop virtualization require a low-latency connection between the client and virtual infrastructure. The client environment cannot operate without a network

connection. It is generally difficult to provide a rich graphical experience to the end user in virtualized desktop scenarios, because virtualizing the Graphics Processing Unit (GPU) is very complex and incurs significant overheads. Also delivering a rich graphical experience can consume significant network bandwidth. Therefore applications such as computer-aided design (CAD) tools and computer games may not be suitable in virtualized desktop environments. Server-based desktop virtualization is not the best solution for users who need the flexibility of being able to work offline, because of its heavy dependency on network connectivity,

Conclusion:

Desktop Virtualization solution offers the simplified desktop management, data protection, and cost savings through green technologies. Its success will be determined by the user experience that it can deliver. Existing distributed desktop computing model will continue to be around and adding new collaboration applications for the years to come. Using both existing and new technologies, the desktop virtualization can help scale and optimize virtual desktop delivery to improve the user experience and serve as a common platform for consistent policies in an increasingly heterogeneous desktop and application environment. In modern trend VMware is bringing virtualization to mobile phones through the new VMware Mobile Virtualization Platform (MVP), yet another step towards the vision of providing organizations with the means to deliver unified access to universal clients in a way that is completely hardware-independent. Desktop virtualization is not a substitute for today's PC technology, even today there are plenty of scenarios where Desktop is the better solution. There may be purely financial reasons, security-related regulations, flexible working models or a mixture of all of these. Desktop virtualization combines the inherent benefits of hardware virtualization like portability, isolation, and flexible use of operating systems with the power and adaptability of remotely hosting productivity computing on centralized servers. Users can access these virtual desktops using RDP, hosted from their desktop PC thin client.

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