

Virtualization

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Abstract The paper is based on the discussion of 21st century emerging technology and how it can be an opportunity for developing enterprise. This paper will aim to create interest and underline basic concepts of Virtualization, by giving general information. Starting, by defining Virtualization, the paper illustrates the “history” and “pioneers” of Virtualization. It also reports tools and implementation of Virtualization and what are the hurdles to implement it. General suggestions are also included in this paper. It contains some discussions about Virtualization tools and methodologies being used. This paper also addresses the complexities face by enterprises and how they are being managed.

Keywords: Virtualization, Virtual Desktop Infrastructure (VDI)

1. INTRODUCTION

Ever since the advent of computer operating systems, desktop computing plays a big role. This aspect is often neglected but recently has been getting a lot of attentions from major market players. Owing to the recession, the organizations are looking to cut down their operational costs. DV is one of the many ways to achieve flexibility, mobility and ease of maintenance while keeping the costs to a negligible level.

To virtualize something means to simulate a condition that otherwise is not present physically. Virtualization has been in existence for a long time ever since the advent of PCs. An example of how every normal user has witnessed this phenomenon lies in the fact that a single hard disk is partitioned into 4 logical volumes whereas in reality it is just one single disk. [1]

Virtualization first came to the fore when IBM developed it as a way to logically partition hardware into separate virtual machines. These partitions allowed mainframes to run multiple processes at the same time, a process that is known as *multitasking*. [2] A virtualized desktop stores an *image* in a centralized server. When a user logs on to his/her PC or laptop, it fetches the image from the storage and loads it on the hardware. As a result, it allows the user great flexibility because the user can not only use his desktop from any device but it also offers a safety feature. If one device crashes, due to some unforeseen circumstances, the image is safe and can be loaded from another device and thus the user can continue his/her work. [3]

Microsoft has recently stepped into the virtualization race by introducing the Hyper-V technology. Until recently, it offered few popular products such as Virtual PC and Virtual Server. The limitations to these technologies were, however, the middle OS layer which limited the use of the virtual products. This limitation has been eliminated in this new technology thus allowing this virtual product to use OS kernel directly without having to go through the middle layer. Hyper-V involves a similar mechanism as mentioned earlier in that it stores VHD format images in a server running Windows Server 2008. Once a user connects via dumb terminal (thin client), he can use the image of his choice without wasting any of his personal resources. [4]

Virtualization is not limited to desktop only and largely owing to the recession, it has spread into areas such as storage, CPU processing etc.

2. VIRTUALIZATION

Virtualization is the act of separating recourses without inhibiting their usability. As mentioned previously, this was a problem with Microsoft’s previous products where they could not harness the power of the underlying hardware and had to be content with the facilities provided by the underlying layer i.e. the operating system. So rather than having tight coupling between adjacent layers, virtualization technologies aim for loose coupling between the layers [5].

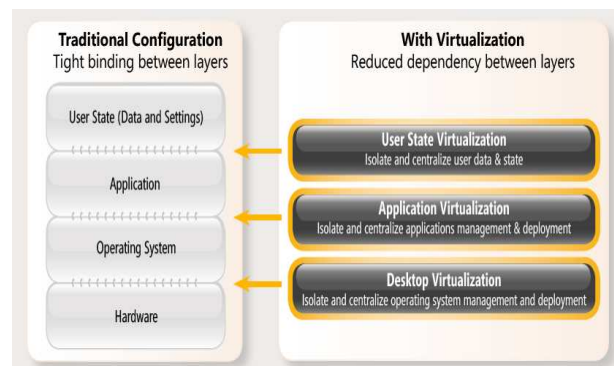


Fig1: Virtualization Technologies [6]

User state virtualization: User state virtualization individually maintains the state of every user and stores user data and settings on central server and making them accessible on any PC. It also simplifies the central backup of user data since data is already stored centrally on servers. [4]

Application virtualization: Application virtualization allows user applications run in their own isolated virtual spaces. It also solves application to application compatibility issues by allowing applications to run together even if they may need the same resources from the OS. Application virtualization reduces the effort of testing and deployment because all users' shares the application from central location so it is no longer needs to test that how different groups of application work together. Another benefit of application virtualization is that it eliminates the cost of application license because no user needs the separate application for his PC as he accesses the application from the central location. Application virtualization allows IT to store a smaller master image that is generic and not specific to a particular desktop and thus can be used by a variety of users. Not every application is suited for this category and there still may be some applications that might be better off being deployed locally on the PC. Application virtualization can be used together with deployment strategies available for both of these scenarios. [7]

Desktop Virtualization Desktop Virtualization is based on *client-server* computing model. It is a concept of separating Personal computer desktop environment as an image for every individual. User can access the resources of central server through any capable device such as personal computer, notebook, Smartphone or thin client. [8]

Client-Hosted Desktop Virtualization: There is one more type of machine virtualization technology (such as Microsoft Virtual PC) that is called Client hosted desktop virtualization that separates the operating system from the physical hardware. It allows a single PC to run virtual machines simultaneously with the host OS. Normally, companies will require enterprise management solution such as Microsoft Enterprise Desktop Virtualization (MEDV) to enhance deployment and management of Virtual PC images on a Windows Desktop, independent of the local desktop configuration and operating system, as also providing a flawless and simple experience for the end-users [9]

Server-Based Desktop Virtualization: Server based desktop virtualization solutions is a type of Desktop Virtualization which provide environment at one place and presentation of that environment or user interface at a different location. These usually use remote desktop protocols, such as RDP, to decouple the user interface location from the execution environment location. Remote execution enables organizations to use older PCs as "thin clients," giving users the advantage of newer applications and versions of Windows while helping save the environment by avoiding the removal of electronics into landfills. Server-based desktop virtualization technologies include:

- **Microsoft Terminal Services Remote Desktops.**

Microsoft Terminal Services Remote Desktops partitions a single OS into multiple user sessions in a cost effective manner. For this purpose Remote desktops use session virtualization.

- **Virtualized Desktop Infrastructure (VDI).**

VDI forces machine virtualization technologies to permit a single server to run many virtual machines. With VDI, organizations can run multiple desktops, each in a virtual machine, on the same server in a datacenter and use remote desktop protocols to allow a user to access the desktop outside the data center.

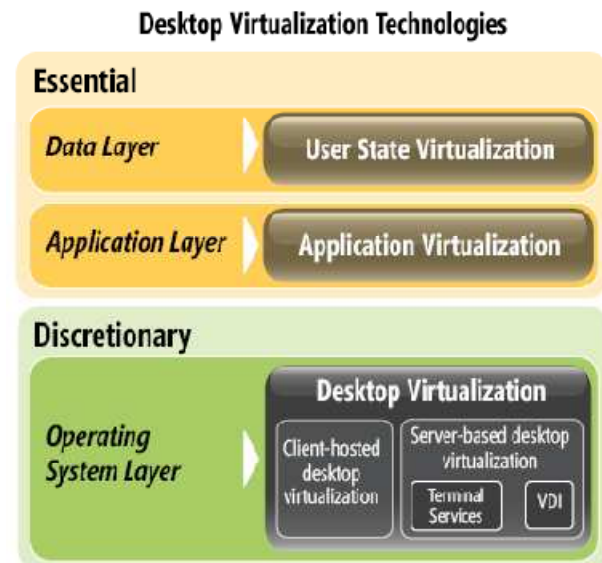


Fig2 [6]

3. How Does Virtualization Create an Independent Computing Environment?

"Independent Computing" is a paradigm shift from traditional computing. While each application would be hosted in a virtual environment, the user is under the impression that he/she is working in a traditional PC environment. The key driver is to keep the underlying architecture transparent from the user therefore hiding the fact whether the processing is being done on the local machine or some other wide area network. [10] Mentioned below are some of the advantages of this strategy.

- Users can be given the impression that they are utilizing PCs hosted heterogeneously, each of them specializing in a unique function.
- Access to the VDs is also controlled by the organization's policy regarding the physical machines.
- Loss or damage to a VD leads to negligible downtime and can be easily replaced.

- Updates or patches can be applied without requiring significant supervision and without a visit to each machine therefore saving on resources and costs.

Unlike server-based access virtualization technology that offers access to individual applications, an independent computing environment offers access to a complete desktop environment. Staff members are not expected to learn how to navigate through different system environments in order to do their work.

4. HURDLES TO IMPLEMENT VIRTUALIZATION

Owing to the advancements in the application graphics, potential networks for hosting desktops should be powerful enough

While virtual desktops take care of a failure of a client, another aspect to consider is the failure of the network because if it goes down then this whole technology will crash

Virtual hosted desktops require significant bandwidth, and the ratio of users to servers is not as high as in other client computing models. As a result, some organizations may need to make costly upgrades to their servers, storage, and network infrastructure before rolling out desktop virtualization.

Another downside is that the user experience is inversely proportional to the size of the network. The greater the distance between the server and the client, the greater the latency and hence a bad user experience.

Virtualization implementation is challenging due to the lack of co-operation and co-ordination between the IT department and other business-related departments.

The reluctance of the higher management to incur the up-front investment is also a challenge and requires some convincing of the benefits that would be achieved once it is done.

5. OVERCOME VIRTUALIZATION CHALLENGES

The best way to deal with the mentioned challenges is to deploy desktops only to users who use their PCs for specific purposes rather than knowledge intensive ones. A prime example of this might be call centers where most PCs are used for client calls only and thus are targets to become thin clients. In this case only a single viable server running an OS such as Windows server 2008 would go a long way in reducing the cost.

The initial push to the management needs to be carefully handled as management is very eager to see the results before they can invest whole-heartedly into a strategy. One possible way might be to separate teams into 2 groups

where one is taken to be a control group i.e. follows a normal scheme of things whereas another team is forced to work on the virtual desktop environment. This would allow for gauging the effectiveness of the strategy.

6. CONCLUSION

Organizations which were interested in deploying virtual desktop environments have experience mixed reactions till yet mainly owing to the immaturity of the products available and higher costs incurred due to the low availability of specialized resources. But owing to the recession and the inclination of the organizations to lower costs while maintaining the competitive advantage, has led them to explore new avenues and as a result the virtualization technologies are getting considerably more attention. As more money is being pumped into the market, the big players such as Microsoft have started throwing in their weight behind the technology. This would result not only in more better and competitive products but would also increase the availability of trained resources thus leading to an overall cost reduction for the organizations. Sooner or later, organizations of all sizes would feel that they need to deploy some sort of virtualization techniques.

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