

WHITE PAPER

IBM Virtualization Services

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IDC OPINION

In the last major IT buildout, we saw IT organizations adding large numbers of small and medium-sized servers to host their rapidly expanding IT application portfolios. During this time, the best practices involved deploying a single application on each x86 server to avoid crashes or performance problems. However, this approach led to very low utilization and higher support costs, the most obvious of which are the acquisition costs associated with needing to overprovision servers. Additionally, there are the ongoing expenses; for example, a server operating at 10% utilization still requires the same amount of power and cooling as a server operating at 75% utilization. In the current state of the market, for every \$1.00 spent on new servers, the average enterprise spends \$0.50 on power and cooling. Further, for every new \$1.00 spent on infrastructure, the average enterprise spends \$8.00 on maintenance and operations, assuming a server to admin ratio between 20 and 30 to 1.

To address these concerns, many enterprises have turned to virtualization as a way of controlling costs and increasing the flexibility of IT. If implemented correctly, the technology can have spectacular results and reduce IT costs and improve flexibility. The results of a recent IDC survey showed that most customers that have deployed virtualization were able to reduce their hardware costs by 20%. This reduction resulted in a savings of, on average, 23% over the past 12 months due to lower hardware costs, power and cooling savings, and real estate expense savings. However, the survey also found that virtualization is not a simple technology to deploy throughout an enterprise datacenter. The most common problems that customers reported are associated with virtual machine sprawl, network and storage problems due to the deployment of virtualization, and changes in the underlying support and management of the virtual machines. Therefore, IDC recommends that enterprises consider the following actions when beginning an enterprisewide virtualization project:

- ☒ **Understand the complexities of deploying virtualization.** Proof-of-concept deployments or deployments on a handful of servers can be very simple. However, enterprisewide deployments can be very complicated and carry some considerable risks. Using an experienced services provider that has been involved in deployments of a similar scale can mitigate these risks.

- ☒ **Consider virtualization as part of an overall IT strategy.** Virtualization is a powerful technology and can have profound effects on the datacenter; however, it should be viewed as a component of an overall IT strategy that will be able to support the enterprise's needs. IDC recommends that enterprises look at the entire architecture and determine how to best deploy virtualization.

- ☒ **Identify areas of the enterprise that will be impacted by the virtualization project.** The most common area for virtualization is server virtualization. However, this is not the only part of the datacenter that can benefit from, or be impacted by, virtualization. IDC believes that enterprises also should consider storage, network, and desktop virtualization. Additionally, IDC believes that even if the enterprise does not deploy storage or network virtualization, the impact of a server virtualization project on the network and storage needs to be considered.
- ☒ **Consider the impact of virtualization on how the datacenter will be supported.** Virtualization will have an impact on the way that the IT staff and external services providers support and operate the datacenter. By developing a plan for support and operations before deployment, enterprises can avoid some of the common problems, such as virtual server sprawl and cascade failures.

SITUATION OVERVIEW

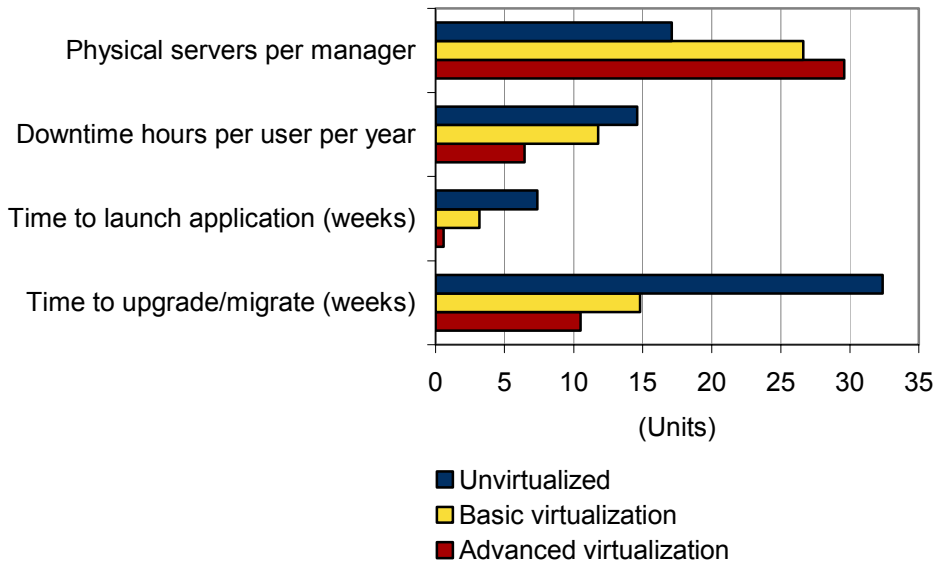
Value Proposition of Server Virtualization

Over the past several years, x86 virtualization has become one of the most promising new technologies. This technology enables customers to virtualize servers and thus dramatically improve server utilization, thereby reducing capital and operating expense. In addition to the cost savings, virtualization enables customers to react better to changing market conditions by reducing the time required to deploy new servers and applications. The main reason for this is virtual machines are essentially files rather than physical devices. As files they can be replicated, copied, and deployed much faster than physical devices.

As the technology has matured, customers have moved from initial proof-of-concept deployments to full-scale, global production deployments. With these broader deployments, customers have begun to realize significant benefits. Figure 1 illustrates the impact of these deployments. In an advanced virtualization environment, the number of physical servers per manager nearly doubles, hours of downtime are approximately halved, time to deploy an application drops significantly, and the time required to upgrade is reduced by about two-thirds. Figure 2 depicts the measurable cost-saving metrics that come with a move to a virtualized infrastructure.

FIGURE 1

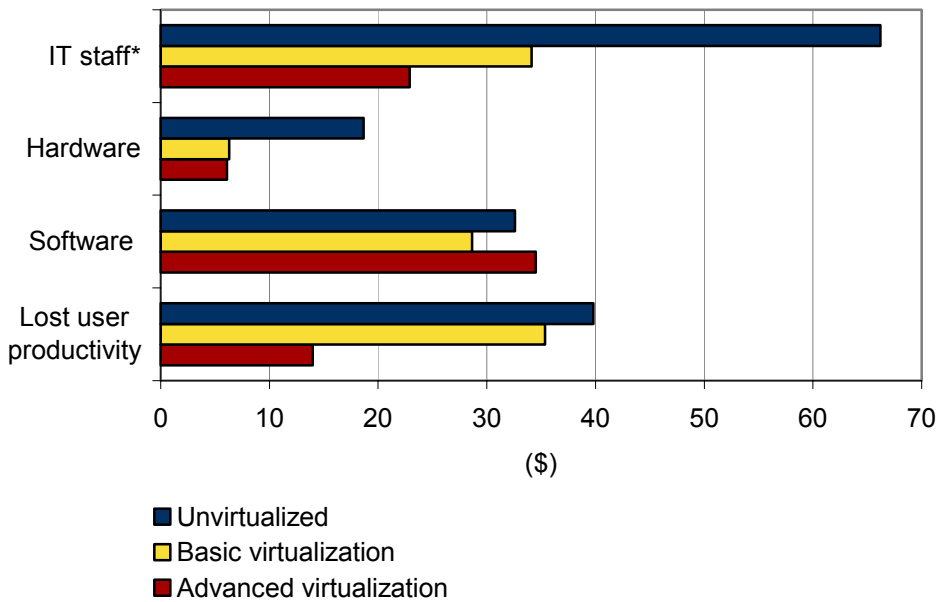
Business Value of Virtualized Server Deployment: IT Benchmarks



Source: IDC's Business Value of Virtualization Research, 2008

FIGURE 2

Business Value of Virtualized Server Deployment: Annual Costs per User



Note: IT staff costs include full life-cycle support and deployment for hardware, servers, storage, operating system, and applications.

Source: IDC's Business Value of Virtualization Research, 2008

Technology Overview

It has been said that everything old is new again, and nowhere is that more true than in the area of virtualization. Virtualization and system partitioning have existed for decades aboard mainframe and Unix-based systems. What is new is the concept of bringing this technology to x86-based servers, storage arrays, and distributed client environments. The increasing breadth of deployments is what enables customers to choose the infrastructure components that best meet performance, functionality, form factor, and price requirements for a large swath of the IT infrastructure.

Over the past few years, server virtualization technologies have moved into the mainstream. Recent IDC surveys found that over 50% of all customers that are virtualizing servers are employing the technology in support of production applications. Further, some of the most mission-critical applications, such as supply chain management and enterprise resource planning, have been migrated to virtualized servers. In fact, customers that are employing virtualization in their organizations reported that, on average, roughly one-quarter of their production applications are running on virtual machines. Within the next 12 months, these same users expect nearly 50% of their applications will be hosted on a virtualized server. IDC believes the two main reasons for this transformation are:

- ☒ **Cost control.** Enterprises are constantly looking for ways to reduce IT spending. One area that is a frequent target is hardware acquisition and operations costs. Often these costs can be addressed through server consolidation projects, which reduce server footprints and improve utilization and lower datacenter power consumption. According to a recent IDC survey, respondents believe they would be able to reduce their current installed base of servers by 20%, thus reducing the power and cooling needs of these servers, as well as the maintenance and the support for these devices.
- ☒ **Improved IT services.** In addition to the cost benefits, companies are looking to improve the deployment of new or enhanced IT services. Virtualization enables faster, more agile provisioning of systems, going from weeks to, in some cases, hours, or even minutes.

Today, the majority of virtualization implementations focus on lowering capital costs by improving utilization and reducing the number of managed objects through resource sharing. A clear example of this phase is server virtualization, which enables the hosting of multiple operating systems (OSs) and applications on a single server. Another example is using a virtual tape library (VTL) to consolidate multiple physical tape libraries. IDC terms this phase of adoption Virtualization 1.0.

The focus on improved service levels will be met through the integration of server, storage, and network virtualization technologies to enable application mobility in support of a host of new use cases.

Decoupling the application from the physical infrastructure also decouples it from the physical location, freeing up the IT organization to create more service-oriented infrastructures. This ability to deliver policy-based service levels in an automated fashion requires the virtualization and orchestration of the computing, networking, and storage environments in an integrated fashion.

IDC believes that customers are poised to move to Virtualization 2.0, as their motivations for the employment of virtualization shift to lower operational expenses, improved service levels, and better responsiveness to changing business needs. In this phase of virtualization — which leading virtualization adopters are already achieving — the business drivers for virtualization have expanded to encompass green IT, faster provisioning, business continuity, and ultimately, policy-based automation initiatives. As these new use cases are added to the fold, the adoption of virtualization technologies is expected to grow tremendously.

Driving this trend is the increasing customer realization that the IT organization can no longer afford to host discrete applications across discrete hardware for discrete business units or users. Although the distributed IT models have helped customers lower acquisition costs, the overhead associated with unused capacity, lack of organizational integration, and lack of service integration across multiple applications is driving up operational costs and thus changing the shape of the CIO agenda. Rather than viewing IT as a series of discrete silos of infrastructure, customers are increasingly viewing IT as a shared pool of resources that can be dynamically manipulated to align with application requirements. This requires the abstraction of applications and services from the physical infrastructure on which they are hosted and recognition that virtualization technologies are fundamental technologies for creating more effective, economic IT.

The key to these new use cases is the decoupling of application services and data services from the physical infrastructure, which allows these services to be provisioned, migrated, and scaled more transparently. While much of the focus today has been on Virtualization 1.0 and its characteristic static consolidation, as applications (because of virtualization) become portable, increasing emphasis is being placed on the network storage and client infrastructure to be virtualized as well. This combination of network, storage, server, and client virtualization and the ability to dynamically align these virtualized resources represents a foundation of the next-generation datacenter. As virtualization across all of these areas is forecast to grow dramatically over the next few years, customers are encouraged to continue examining virtualization solutions for a variety of business issues.

Services Overview

Based on IDC research, to be able to capitalize on the benefits of virtualization described earlier, enterprises will need to utilize an external services provider for several key portions of planning, implementation, and ongoing support.

Planning for Virtualization

For large enterprises with complex datacenters, deploying virtualization throughout their entire IT infrastructure can be a daunting task. While the technology is relatively straightforward and can be easily deployed in "pilot" or trial environments by the IT staff, enterprisewide deployments are a different situation. Introducing any type of new technology — regardless of whether it is server, networking, client, or storage virtualization — into this environment is highly challenging. Specific challenges in implementing virtualization are determining where the customer will realize the greatest benefit, what workloads can be deployed on a virtualized server, and what the impact of a deployment will be on the supporting IT systems.

IDC has interviewed customers that have proceeded with large-scale implementations without proper planning. In most cases, these customers experienced problems of project delays and cost overruns, or the project failed to achieve all of its initial goals. In one extreme case, IDC interviewed a customer at an IDC virtualization forum that was in the process of "devirtualizing" its environment at a significant cost because it did not go through a robust planning process. As a result, the customer virtualized several applications that did not work well together onto the same physical server, which led to significant application performance problems. The situation deteriorated to such an extent that the customer determined that the best remedy was to devirtualize and then start again. These issues and others are significant, and IDC believes that enterprises need to enlist organizations that have performed complex virtualization implementations.

Implementation

Once the organization has developed a road map for deploying virtualization, it needs to undertake the implementation. Implementing any major change in a complex datacenter often requires that the organization have an external services provider that has performed similar implementations in the past. By using an IT services provider that has performed large, complex virtualization implementations, the enterprise can leverage the provider's experience in identifying the source of unexpected problems that occur during the implementation and the testing of the systems before go-live. Further, most IT services providers are available to answer questions and assist the client with problems that happen immediately following the implementation.

Ongoing Support

The customer needs to consider how it will support the new virtualized environment. By implementing virtualization, the customer will have changed the way it needs to support its environment. Prior to implementing virtualization, the customer could afford to approach support services by "attaching" support to an individual server, storage system, or network element. However, once virtualization has been implemented, and the workload or business process is no longer directly associated with that physical device, the approach to support needs to change. The customer can no longer think about supporting the device but rather needs to think about "attaching" support to a business process or to a datacenter. In this environment, the customer needs to consider using a support services provider that can look across the entire environment and support all the elements that are in the datacenter or all the elements that are required to ensure the business process is operating smoothly.

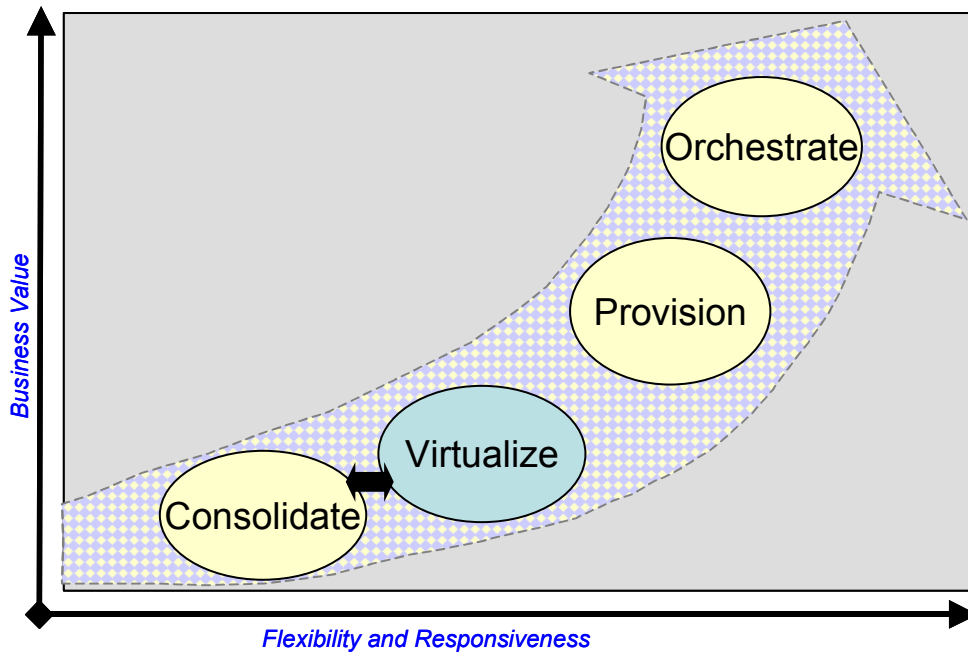
IBM OFFERINGS

For virtualization to be successful, IBM believes that customers need to consider their entire IT environment. This includes not only the traditional datacenter environment but also all of the distributed IT that most organizations rely on. While much of the activity for virtualization occurs in the datacenter, neglecting the impact of virtualization on the distributed environment could lead to suboptimal results. IBM's approach to virtualization services considers all aspects of the distributed environment.

IBM views virtualization as one of the key elements of a well-executed IT optimization strategy. By taking a methodical approach to providing services and optimizing the environment, IBM can provide customers with a comprehensive approach to virtualization. Figure 3 shows where virtualization fits into this strategy. To optimize a datacenter, enterprises usually have to focus on more than just server optimization. While servers are a critical part of IT optimization, enterprises need to focus on all aspects of their IT infrastructure, including storage, networking, and desktops. Because IBM views virtualization as an element of an overall IT optimization strategy, the term refers to not only traditional server virtualization but also the efficiencies that can be gained through storage, network, and desktop virtualization.

FIGURE 3

IBM's Life-Cycle Approach



Source: IBM, 2008

To help customers identify the business benefits associated with virtualization, IBM offers six services lines that address customers' virtualization services needs. The services are described in the following sections.

IT Strategy and Architecture

The IT strategy and architecture consulting services are intended for customers that want to take a holistic look at their IT environment. These customers understand that they need to optimize the IT environment but do not necessarily know the most effective place to focus for business return.

There are two primary aspects to IBM's consulting and design service portfolio that can assist with a client's virtualization initiatives: IT transformation and optimization consulting services and IT management consulting services.

IT Transformation and Optimization Consulting Services

These services are for organizations seeking to take a holistic view of how best to optimize their current infrastructure. These services often include how to deploy virtualization technologies to suit the specific needs of the business. By working directly with clients to evaluate the current state of their environment compared with the desired state, IBM can help organizations invest in new technologies for the best business return. These services are available at a variety of levels and can be oriented to building just a strategy all the way to creating a comprehensive infrastructure design and road map.

By creating a comprehensive strategy and design, many clients can save money and increase efficiencies by integrating and timing new capabilities in one plan versus retrofitting or integrating on a project-by-project basis.

IT Management Consulting Services

Additionally, IBM offers consulting and design services that help organizations ensure that they have an effective management strategy over their IT infrastructure. As environments become increasingly complex due to new technologies, the need for a clear strategy and line of sight to how the IT infrastructure supports and provides the right services to the business becomes increasingly important. Ensuring appropriate adoption and leverage of industry frameworks and best practices such as ITIL and CobiT helps maintain continued alignment with and governance over the infrastructure to adapt as business needs change.

Like IT transformation and optimization services, consulting and design services are available at a variety of levels.

IBM's IT strategy and architecture consulting services are based on a core set of intellectual property and tools that have been developed based on experience with thousands of clients. These services are regularly maintained and updated to ensure the methodologies leverage the best technologies and new industry standards that are available.

Server Services

Server virtualization is probably the most common topic customers think of when considering virtualization and consolidation. This is for a good reason, as x86 server virtualization has become a cornerstone of most IT consolidation projects. By consolidating workloads, customers can increase server utilization, gain increased flexibility, and reduce the costs of their IT environment.

However, simply installing virtualization software and starting to consolidate workloads can result in more problems than the technology can solve. Customers need to take a deliberate approach to implementing virtualization to realize all of the benefits listed earlier. To assist customers with the implementation, IBM takes the following three-step approach to providing services:

Solution Framing

IBM conducts a readiness assessment of the client's datacenter and business environment to build a case for change to support the virtualization initiative. Since virtualization introduces the shared computing model to the enterprise, an IBM architect must evaluate what changes are necessary. For instance, a model where various business units have their own capital budgets to purchase their own segregated IT resources could limit the potential of virtualization. The IBM architect would make recommendations in this regard.

The architect also evaluates and makes recommendations on back-end infrastructure components — including storage, network, backup, systems management, security, and time synchronization — to make certain they are in harmony with the virtualization products. IBM then uses industry-leading data collection and analysis tools to understand various systems configurations, utilization rates, and workloads to calculate the size of a potential virtualization platform.

At the end of this phase, the client receives a report that includes a readiness assessment, high-level transition plan, and business case that includes return on investment and total cost of ownership analyses.

Planning and Design

To say that virtualization changes an IT environment is an understatement. This phase is designed to ensure that the virtualization platform can coexist and interact with the existing infrastructure. Naming and security standards are established, the disk and network structure is defined, system elements are fine-tuned, and a virtual infrastructure is designed to satisfy each customer's unique requirements.

Implementation

Adoption begins with building a pilot virtualized environment as documented during the detailed design phase. The pilot is tested, and the results are analyzed to make certain that the physical and virtual environments operate according to the design. At this point, modifications can be made to ensure performance is as expected. Once the pilot is complete, virtualization is introduced into the production environment, and workloads are migrated. Throughout the process, IBM actively involves the client's staff to empower it with skills that otherwise would be attainable only through extensive theoretical training.

IBM utilizes this approach for IT optimization and integration projects, server consolidation efficiency studies, and VM server services projects. These projects address the "consolidate" and "virtualize" areas in the IBM business life-cycle approach shown in Figure 3. Once customers have completed the consolidation and virtualization steps in the life cycle, IBM offers services that can enhance their virtualized environment, such as virtualized systems management design and

implementation services, virtualization image management services, and remote management services and security services. These offerings are intended to help customers automate and orchestrate their newly virtualized IT systems. Regardless of the project, the strict methodology that IBM follows of solution framing, planning and design, and implementation helps ensure successful and secure IT optimization

Desktop Virtualization Services

Desktop virtualization is an emerging area of virtualization that has begun to gain increased interest among enterprises. It enables enterprises to deploy virtualized desktops across the enterprise. This technology limits the need for enterprises to deploy traditional PCs to every employee, thus reducing costs and potentially improving security. While the solution is not acceptable for all employees, in many situations, the technology can be very powerful. Additionally, the virtual desktops can be delivered either as an on-premises solution or as a hosted solution.

However, because of the variety of applications and solutions available for desktop virtualization, the technology is not "one size fits all," and enterprises need to focus on identifying the correct use cases for desktop virtualization. To assist with this process, IBM will work with a client first to determine the use cases that will provide the customer with the greatest return on the technical requirements of that use case. Once these use cases have been identified, IBM and the customer evaluate the various desktop virtualization technologies that meet the technology requirements to optimize the use cases. This can be a more complex process for desktop virtualization than for server virtualization as different software vendors have taken different approaches. IBM will then deploy and integrate the technology into the customer's environment and can even manage the newly virtualized environment if needed. Finally, desktop virtualization can change the security and disaster recovery requirements for the environment from both a technical perspective and a business process perspective. IBM also can assist in addressing those concerns.

From a technical standpoint, the deployment of desktop virtualization poses several challenges, but nontechnical challenges often come up during the deployment and after go-live. One of the more common nontechnical challenges that organizations face is employee pushback against the deployment. Employees have become accustomed to having and customizing "my PC (or laptop)." Once the enterprise moves to a virtualized desktop environment, the employees may become concerned that they will lose their PC. By engaging with a services provider such as IBM early in the process, the enterprise can leverage its strengths to prepare users for the change and to ensure that the environment still meets employees' needs.

Storage Virtualization Services

As customers continue to deploy server virtualization, the impact on the storage environment continues to grow. This complexity, coupled with the ever-increasing data storage requirements, has increased enterprise interest in storage virtualization. Because of these factors, when enterprises are considering a virtualization project, part of the project should include investigating the impact of the project on the production storage environment. Often this impact is significant.

IBM's services organization is able to provide the services to address enterprises' storage concerns. Because virtualization is a staged process, initially IBM recommends that enterprises evaluate their storage environment to determine if that environment needs to be consolidated to be able to support a virtualized server environment. To accomplish this, IBM begins by evaluating the current storage systems and develops a high-level overview of the customer's storage architecture and defines the ideal state for that architecture. During this process, IBM helps the customer not only identify areas of the current storage systems that need to be updated but also determine if it can virtualize its storage environment and, if so, what types of storage virtualization to use. Block/file virtualization provides the best benefit for the customer. After completing this process, IBM will assist the customer in identifying technologies and developing a road map to achieve the ideal state that will support the virtualized environment.

To be able to provide these services, IBM has been investing in its storage services practice over the past several years. These investments include two key acquisitions, the first of which was the acquisition of Softek, a data mobility software vendor. Through this acquisition, IBM was able to improve its data migration services by integrating the Softek solution into the IBM suite of hardware, software, and services capabilities. The second acquisition was NovusCG, a storage services vendor. Novus had developed a suite of tools that enabled it to quickly assess the complexity of a client's storage environment against several metrics. These two acquisitions, combined with internal investment in storage services, have improved IBM's capabilities in delivering the services clients need to successfully deploy virtualization in their environment.

Network Virtualization Services

Networking virtualization services help customers with two key aspects of virtualization: virtualizing the network itself and ensuring that the enterprise's data network is ready for server virtualization.

Network virtualization can be done either at the device level, which reduces the number of physical network devices, or at the network level, by creating multiple logical networks utilizing one physical network. Network virtualization services help the customer plan for future network convergence and network virtualization. To date, the majority of network consolidation has taken place without utilizing network virtualization technology. The general practice has been to combine logical networks that often lead to compromised performance. However, as the network continues to evolve and the demands of data, voice, video, real-time collaboration, and storage increase, virtualization of the physical network nodes into several virtual nodes to increase network capacity becomes more attractive. Additionally, network virtualization has the potential to reduce the complexity of the network by combining multiple switches into a single virtual node. All of these technologies, however, require that the enterprise network be prepared for the transition. As part of its network virtualization services, IBM assists customers with the preparation and implementation of the network.

To support server virtualization at the enterprise level, customers need to determine if their current network can handle the changes in load and network traffic. An enterprise network that is capable of performing well while the servers are operating at below 20% utilization often is not capable of handling the increase in traffic once those servers are virtualized and utilization is significantly higher. Additionally, as server virtualization technology increases, and the ability to move workloads depending on server performance and business conditions becomes more prevalent, the demands on the network become more challenging.

When performing an enterprise virtualization project, IBM evaluates network readiness for virtualization. During this evaluation process, the customer and IBM review the server and network architecture and identify aspects of the proposed architecture that will have an impact on network performance. The network assessment considers not only the impact of the proposed server architecture but also the server virtualization road map so that potential future gaps can be identified early in the process and the customer can plan for future network enhancements.

Maintenance and Support Services for a Virtualized Environment

After customers have deployed one or more of the virtualization technologies, they need to focus on how to support and manage the environment. A virtualized environment requires enterprises to take a different approach to support services.

Customers with smaller IT environments (a few servers) need to consider the increased importance of each device in a virtualized environment. A physical device that has been virtualized into many virtual devices requires a higher level of support than one that has not. The reason is that while no one workload, in the case of a server, may be critical, when multiple workloads are combined onto the same device, the importance of that device increases. As a result, enterprises need to consider supporting that device at a higher level than they ordinarily would.

Customers with larger IT environments, however, face much greater challenges. As these customers deploy virtualization throughout their complex IT environments, they need to find a support services provider that can look across the entire environment and provide support for the business process rather than just the underlying technology. Because the physical hardware has been disaggregated from the virtual device, focusing on an individual device will not result in the level of support that customers require. Additionally, supporting a large virtualized environment must involve more than basic break/fix services. Truly supporting a virtualized environment means ensuring that the environment is continuously optimized and meeting the needs of the enterprise.

To address these concerns, IBM offers maintenance and support services that focus on supporting the customer's entire virtualized environment. These services include proactive monitoring of the environment to ensure it is meeting the customer's needs. The support services are backed by IBM's global reach through 51 client service centers, with support available in 200 countries and 165 languages. In addition to the support services, IBM offers managed support for customers that want a higher level of support. This offering provides customers with a single point of contact for all of their support needs, which can help alleviate the demands on the internal support staff, thus freeing those employees to pursue other tasks that are of more value to the enterprise.

Finally, IBM also offers customers a managed security service that can assist with the ongoing security requirements. Due to the ever-changing nature of the threat environment, organizations need to ensure not only that they have developed a secure IT environment but also that the environment remains secure. In a traditional environment, organizations have generally developed robust processes to ensure that their environment remains secure. A virtualized environment can increase the challenges of maintaining the secure environment due to the increased complexity of the environment.

CHALLENGES/OPPORTUNITIES

IDC believes that IBM is one of the two main IT vendors that can provide enterprises with the end-to-end solutions they require. Although IDC believes both vendors will find it challenging to differentiate between themselves in this space, there are several other areas where they will need to focus.

Although IBM has the breadth and depth of skills required to provide the IT strategy and planning, implementation, and ongoing management and support services, it will have to differentiate itself from a suite of aggressive "niche" services providers that do not provide all of the services but rather focus on a more limited suite of services offerings. Further, IDC believes that IBM will need to demonstrate to customers that its services organization is vendor neutral and is not just trying to facilitate the sales of additional IBM server or storage equipment.

CONCLUSION

In conclusion, IDC believes that virtualization is a very powerful tool that will have significant benefits for the enterprises that deploy it. However, deployments in an enterprise setting can be very complicated and, if not done correctly, can lead to problems. To address these concerns, enterprises should approach the deployment carefully and consider using a seasoned external services provider to assist in the deployment. By taking this approach, enterprises can evaluate the impact of virtualization on the entire datacenter, as well as the end-user population, to avoid some of the potential pitfalls described in this white paper.

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