

STRETCH

the limits of your infrastructure.

How to get the most out of virtualization

Business white paper



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Executive summary

Virtualization can enable organizations to create more agile IT services, with greater resilience and availability, and lower cost. Both internal and external IT service providers can use virtualization to become more effective at meeting the needs and expectations of their customers, but some organizations get much greater value from their virtualization projects than others. This is because they understand the need for increased maturity of the processes used to manage IT in a modern complex data center.

This white paper shows why it is important to pay proper attention to all aspects of people, processes, tools, and knowledge, as well as the technology needed to get value from virtualization. It gives examples of how mature processes can create increased value and describes eight best practices that can help facilitate real business benefits from virtualization.

The benefits of virtualization?

Virtualization isn't a single technology; it is a way of designing technology solutions. Many different aspects of IT infrastructure can be virtualized. Products from many vendors can be used to create virtual servers, storage, networks, and clients, and these virtual elements can be combined together in similar ways to real servers, storage, networks, and clients to create end-to-end services that meet business needs.

Using virtual infrastructure this way can completely transform the way IT delivers services to the business and could replace alternative ways of service delivery. This is due to the following benefits that virtualization can deliver:

- **Enhanced agility**—The time taken to deploy a new server can be reduced from many days to a few minutes. This can enable the service provider to meet evolving business needs almost instantly.
- **Increased utilization**—When large numbers of virtual components are deployed across shared underlying physical resources, it is possible to make major reductions in the amount of spare capacity needed to support varying demand.

- **Improved availability**—Removing the direct connection between IT services and the underlying physical resources can enable very rapid failover, improving the availability of the IT services to the business.
- **Better continuity options**—The same technology that is used to increase availability can also support IT service continuity, providing effective low cost options for failing over services to alternative locations.
- **Reduced cost**—The reduction in unused capacity can result in a significant reduction in the total cost of physical components. This can also reduce data center costs, such as floor space, power, and air handling. The increased agility can result in reductions in project costs. The increased availability can result in reduced downtime (and thus reduced overall cost of downtime), and the improved continuity options can reduce the cost of implementing IT service continuity.

The overall impact of virtualization is to enable IT organizations to provide improved services at lower costs, and this could mean that organizations may find themselves at a significant competitive disadvantage without it.

How people and processes add value to technology

Virtualization can help IT organizations to achieve some improvements, but when it is managed with the right combination of people, processes, tools, and knowledge the benefits are much greater.

The following stories are based on real experiences of IT organizations. In each case there was an opportunity for good service management to work with virtualization to help create value for the business.

Many of the issues described in these stories are also possible in a non-virtualized environment, but they are much less likely. The combination of increased agility and greater resource sharing creates greater need for good processes, skills, knowledge, and tools. An IT organization that is better at routine consistent management of the IT services is an organization that creates more value for their business.

Story #1: Support staff didn't understand the big picture

An organization was running a large complex service. The service had many different interacting layers. Each of these layers had multiple virtual servers, lots of interfaces to other services, and complex load balancing at each layer to enable thousands of users from around the world to use the service.

One morning, the service desk received complaints about poor performance from some users. The incidents were passed to level 2 support, who had access to a tool for measuring end-to-end performance, but this tool reported that everything was running normally. Just to make sure, the support team logged in themselves and checked that the performance was fine. They then notified the users that this must have been a transient issue and closed all the incidents.

Some users logged further incidents the same day, but were again informed that the performance was fine, and the incidents were closed. This continued for a few days, with no performance problem visible to support staff, but significant numbers of users claiming that the performance was not acceptable. Level 2 support then restarted most of the virtual servers, causing further disruption to the business, and the performance returned to normal—until the same thing happened again a few weeks later.

Eventually, the level of impact on the business was so significant that the problem was escalated to senior management. Level 3 support put together a team to investigate the performance problems and after detailed investigation they found that one of the eight virtual servers in one layer was running slow, due to a process that had a memory leak. The design of the service assigned each user to a server in this layer when they first logged in and they remained with the same virtual server until they logged out. The performance monitoring software had been connected to a working server and level 2 support had also connected to a working server when they had tested the performance.

This IT organization could have delivered greater value in two different ways. Firstly, they could have implemented improved monitoring. The tool that measured end-to-end transaction performance did not test every possible path through the alternative components. Secondly, support personnel needed better understanding of how all the components interact to create the service. Without this big picture view they were dependent on a small number of highly skilled and knowledgeable Level 3 support personnel.

Story #2: Where did all the licenses go?

In this organization, the virtualization project started with a large investment in new hardware. The infrastructure and supporting processes were designed to support projects that needed to provision virtual servers and storage very quickly, to increase their ability to respond to rapidly changing business needs. The virtualization project was a huge success and IT was able to support a great improvement in time to market for new business initiatives.

After about 12 months, an audit showed that there were many hundreds of virtual servers that had no clear ownership. Nobody knew which of these virtual servers were still needed, and which had been created to meet a short-term need. IT could not

decommission these virtual servers because they were not sure what the impact would be, and they could not identify anybody to ask for permission. Although these servers were not using significant physical resources, many of them were using expensive software licenses, which were, therefore, not available for use in new projects, and more investment was needed to purchase additional licenses.

To create greater value in this situation the IT organization needed interfaces from the technical tools used to create and deploy virtual servers to a request fulfillment process that manages the business rules, including financial and organizational decision making.

Story #3: It should have worked!

While implementing the virtualization project, each application was implemented in a way that would allow failover between the two data centers. New service level agreements (SLAs) were negotiated with much higher levels of availability for the key business services, and a service continuity plan was drawn up and agreed with the business.

Failover of each critical application was tested and everything worked well, until there was a real power failure in one data center. Some of the critical applications failed over seamlessly, but nobody

had defined and tested the correct order for starting everything in the event of a total data center failure. Many services tried to start before active directory, DNS, and other services that they depend on had restarted. This had worked fine during testing because this functionality was still available on the network, but when disaster struck it took many hours to recover the services.

This organization would have created more value for their business if they had used scenario-based end-to-end testing instead of just relying on component testing.

A better way to plan and implement virtualization

The lesson from these stories is that the technology is not sufficient by itself. It must be supported by appropriate processes, people, tools, and knowledge. There are many things to think about when implementing virtualization, and an organization that follows the eight best practices listed here will increase the value they create for their business.

Best practice #1: Monitor and manage every component	<p>You must monitor and manage every component of your solution; this includes all of the virtual components as well as all of the physical ones.</p> <p>In a virtual environment there may be many hundreds, or even thousands, of things to be monitored. This means it is essential to have effective filtering and correlation of events, and that all events must be associated with appropriate responses. In practice, the monitoring, filtering, correlation, and initial response may probably need to be automated.</p> <p>Management of components includes activities such as startup and shutdown, making security changes, backing up and restoring data and settings, and responding to routine expected events. All of these activities should be documented in standard operating procedures (SOPs) that are fully tested and are well communicated. Many environments have large numbers of virtual components, and support of these will require an integrated set of tools that can manage and automate the SOPs.</p> <p>In a traditional data center it is very easy to make sure that every physical component is monitored and managed correctly. If it takes many days to provision a server then there is plenty of time to add it to your monitoring system and configure your management tools to support it. If your virtual environment allows you to provision a server in just a few minutes then you must also carry out these supporting activities in those same few minutes.</p>
Best practice #2: Standardize and automate	<p>Increased agility and speed can result in increased numbers of mistakes. If there are large numbers of components it is essential to automate all routine activities, using well-tested procedures that work across the environment. Wherever possible, components should be configured to well-defined standards, so that you don't have small differences between otherwise similar components. Standard builds and configurations enable support staff to work effectively, based on an understanding of how things are configured, without constantly needing to refer to detailed documentation.</p> <p>Most virtualization products have dedicated tools for managing configuration, deployment, and failover, but these need to be integrated with each other and with the higher level management processes such as change and configuration management, release management, and request fulfillment.</p> <p>The best approach is to start with a description of each scenario you want to support; for example, creation and deployment of a new virtual server, including network connections, virtual storage, and operating system. Then identify the process for authorizing and recording this, and finally create the supporting standards, scripts, and automation.</p>
Best practice #3: Verify change and configuration management are robust and scalable	<p>The ability to make very rapid changes is one of the big benefits of virtualization, contributing to the increased agility and availability which the business needs.</p> <p>In many organizations, the change and configuration management processes were designed to meet the needs of a much lower rate of change, and these processes are not able to cope with the number and speed of changes that occur in the new environment. For example it may not be appropriate to submit a change request to a Change Advisory Board (CAB) meeting that will take place in five day's time, when the change itself will take five minutes and is needed instantly.</p> <p>The key to making change management scale well is to define standard changes that are well tested and include all of the checks and balances needed. Each standard change should allow approval to be given by an appropriate authority in the required times, and change implementation should make use of the standardization and automation described above.</p> <p>It is important that all configuration documentation is up to date and provides the information needed to manage the IT services. For example, if someone needs to make an emergency change to a network switch or router then they must be able to identify all the IT services, which run on all the virtual servers that have their data routed via that component. Much of this configuration information can be automated, but it is not sufficient to simply record how things are actually configured, there also needs to be an ability to compare this with how they should be configured, otherwise unauthorized changes will not be detected and errors will build up in the environment.</p> <p>Configuration data should be updated as part of the implementation of standard changes, and ideally this updating will be automated using the scripts and tools that also implement the change. It is also important that all automated configuration changes, such as failover of a virtual server, are fully documented in the configuration management system. This usually includes documentation of all allowed configurations and of preferred configurations, and the ability to discover the current status.</p>
Best practice #4: Provide IT staff with the knowledge they need to be effective	<p>Many of the issues identified in the stories above could have been avoided if IT staff had better knowledge of the environment, how it is configured, how the environment is supposed to function, how to make effective use of the tools, and how to interpret the data that is available to them.</p> <p>Moving from a physical infrastructure to a virtual one is a big change for the support staff and it is important to develop their skills and to provide them with the knowledge they need to support the services.</p> <p>Implementation of a huge and expensive knowledge management system is not the only way to provide staff with the knowledge they need. Encouraging knowledge sharing and providing structured, managed repositories for useful documentation can be very inexpensive and effective. Some staff will require formal training, but this should be supplemented with less formal learning opportunities, such as internal discussion forums, webinars, and opportunities for them to practice in a safe environment.</p>
Best practice #5: Integrate and automate request fulfillment and deployment	<p>A deployment process is used to create a new virtual component, based on a standard build. A request fulfillment process allows someone to request a standard change and then fulfills that request.</p> <p>Many vendors provide deployment tools as part of their virtualization products, and these tools can be very efficient at automating the deployment process. It is essential that this deployment process is fully integrated with a request fulfillment process, which will:</p> <ul style="list-style-type: none">• Validate each request and verify that all required information has been provided• Check that appropriate business and financial approval have been given• Prioritize the request and see to it that it is fulfilled within agreed times and to agreed quality• Log and track the request and its fulfillment to enable reporting• Provide an audit trail to provide full accountability for actions and ownership of all assets

<p>Best practice #6: Integrate capacity, demand, and financial management</p>	<p>In a traditional environment, each project usually funds the infrastructure that it needs. Virtualization enables projects to deploy components very quickly, without the need to purchase new hardware. This can lead to problems when the underlying hardware needs to be upgraded, as it can result in a very large financial cost to the next project, unless there has been the right planning to provide funding for the upgrade.</p> <p>There are many different ways that this planning and funding can be managed. The two extreme cases are an internal “cloud” solution where virtual infrastructure is provided on a pay-per-use model to internal consumers, and a centrally funded model where the IT organization works with the business to plan central funding. In either case, IT must work with each project to understand their future needs and create capacity plans to enable sufficient infrastructure to meet these needs.</p> <p>It is important to decide how future upgrades to the physical infrastructure will be funded and how future capacity requirements will be predicted, before the first live use of a new virtual environment. These decisions should then be integrated into the detailed design of the processes for change and release management, and request fulfillment.</p> <p>Management of capacity in a virtual environment requires all of the activities that are needed in a traditional environment, but there are additional options for understanding and moving workloads to support variations in demand. It is also important to understand how variations in the workload for one virtual component may impact the performance of other virtual components sharing the same infrastructure. Capacity management in a virtual environment will require investment in additional tools and skills to manage these issues.</p>
<p>Best practice #7: Verify processes work for both physical and virtual components</p>	<p>Most organizations have documented processes and procedures for managing IT services. These may include things such as how to deploy a new server, how to manage firmware updates and software patches, how to backup and restore, how to log and manage incidents and problems. These processes and procedures should be reviewed and modified to ensure they work correctly for virtual components, as well as physical ones.</p> <p>As the processes and procedures are updated there will probably need to be changes to service management tools, to check that appropriate categories and configuration items have been defined, and there will also be a need to communicate the changes and verify that all staff have the knowledge they need to follow the updated processes.</p>
<p>Best practice #8: Test and test again</p>	<p>It is very common to implement a small scale virtualization project, and to use this to test the technical capability of the products and how these interact with the applications. This level of testing is essential but it is not sufficient to verify that virtualization will deliver the expected business benefits.</p> <p>To verify that testing is sufficiently comprehensive it is essential to carry out the following kinds of test:</p> <ul style="list-style-type: none"> • Component testing—do the individual components perform as expected? • Operational testing—do the operational processes work correctly? • Scenario-based testing—do complex interactions between components work as expected in real-life scenarios? • Service acceptance testing—does the service meet the needs of the business?

Conclusion

Virtualization is a great set of technologies that can reduce costs and improve service levels, at the same time as providing a major improvement in agility and the ability to meet the changing needs of the business. The potential benefits of virtualization are so large that it is a disruptive technology that is likely to replace competing alternatives.

Organizations that want to get the benefits of virtualization need mature processes that can support complex services built from many components and can handle the high rate of change associated with the new environment. The challenges are not new, IT organizations have been solving these problems for many years, but virtualization creates an environment where meeting these challenges is urgent, and the consequences of business-as-usual can be catastrophic.

Following a simple set of best practices can significantly improve the chances of success in a virtualized environment and organizations that appreciate this will have a significant competitive advantage.

Appendix

Each organization that implements virtualization starts from a different place, has a different set of goals, and brings a different set of existing skills and tools to the project.

Some organizations will need to implement many of the best practices outlined in this white paper, but others will only have to make incremental improvements to existing practices. Some organizations have the expertise, resources and time needed to make these changes on their own, but others may prefer to engage external experts to assist them.

HP has a comprehensive range of products and services that can help you to get value from your virtualization project, backed up by highly skilled service professionals and supported by many industry partners.

How HP Technical Services can help you succeed

A number of our Mission Critical and Proactive Services combine the capabilities below into one convenient service. For more information,

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1. Continual service improvement planning—identifies gaps between current practice and what is needed to meet your business goals and works with you to plan the improvements needed. The planning could include improvements in processes, technology, skills, knowledge, or any other area.
2. Ongoing operational service management support provides expert assistance in planning and implementing improvements to service management processes, based on ITIL and other leading standards and best practices.
3. Custom proactive services enables effective configuration of HP technology and helps prevent avoidable downtime.
4. Custom reactive services—ranges from simple 24x7 response to full mission-critical support with repair and restoration time commitments that suit your business requirements and IT strategy.
5. Assistance in periodically reassessing your ability to meet business needs—gauges your progress and accommodates business and technology change, this range of assessments includes “ITSM Assessment for Virtualized Environments”
6. HP Data Center Services helps transform the data center and removes barriers to business growth. These services address data center design, operations, and optimization.
7. Energy use is a critical cost factor, so HP has developed a specialized set of Energy Efficiency Services that assesses current consumption and improves power usage effectiveness.

8. HP has a number of services that provide personalized, proactive support from an assigned support team managed by your account support manager. This team keeps you updated with the latest best practices. This personalized approach also helps you to implement measures to prevent future problems and gives you specialized advice on topics such as power and cooling, blade technology, security, and IT service management that are particularly relevant to virtualized environments.

Other products and services from HP that you may want to consider

HP has a wide range of products and services that can help you to succeed with your virtualization project.

Services you should consider include HP education services, to facilitate that your people have the skills they need; HP virtualization planning and design service, to help you get started; and HP installation and startup services to deploy your infrastructure.

HP hardware products that support virtualization include HP BladeSystem Matrix, a pre-integrated platform that creates pools of server, network, and storage capacity that can be dynamically provisioned; HP Virtual Connect, to virtualize SAN and LAN connections from your HP servers; HP EVA, XP, and LeftHand SAN IQ storage products to provide virtual storage; and the HP Blade Workstations solution, to provision client computing from the data center.

HP has a very wide range of software products to help your virtualization project succeed. This includes products to support every aspect of your IT services and every stage of the service lifecycle.

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