



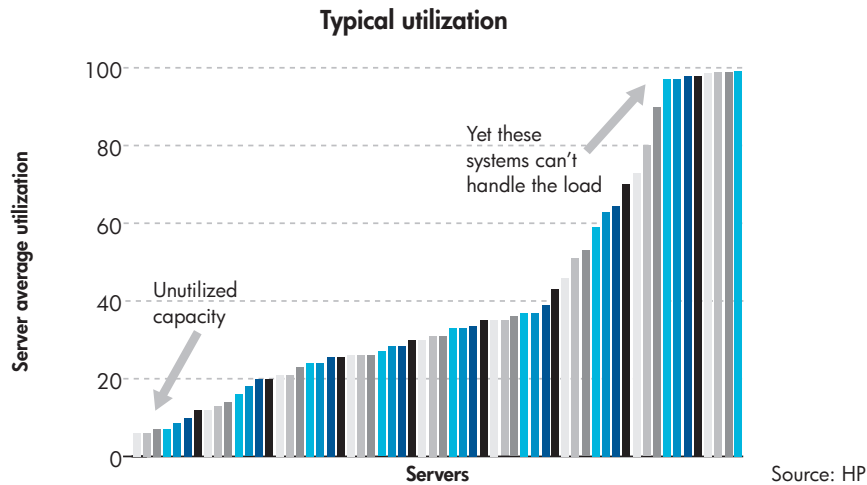
Virtualization delivers
real benefits for business
White paper



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Figure 1. Server utilization in an actual IT environment.



Virtualization

Despite its six syllables, “virtualization” is a straightforward concept. It can enable your organization to get more value not only from computer and storage hardware but also from the labor required to keep your systems up and running.

Virtualization is an approach to pooling and sharing IT resources so the supply of resources—processing power, storage, networking and so on—can flexibly and automatically meet fluctuating business demand. Virtualization can improve the quality of your IT services, enabling more consistency and predictability of operational availability.

If you are considering a new or expanded virtualization solution, HP has the technology and expertise to help your organization achieve real business benefits from virtualization today. We see virtualization as a key enabler of the transformation to an Adaptive Infrastructure, our way of delivering on the next-generation data center trend.

What’s all the fuss about?

Today, most of the IT infrastructure supporting an enterprise is provisioned and managed one machine at a time. PCs are typically dedicated to a single user; servers are typically dedicated to a single application. When it comes to storage, the situation is similar. Most enterprise data is used by single applications, or written to storage in proprietary formats. Thus, an application-specific focus often permeates the way storage is attached, configured and provisioned.

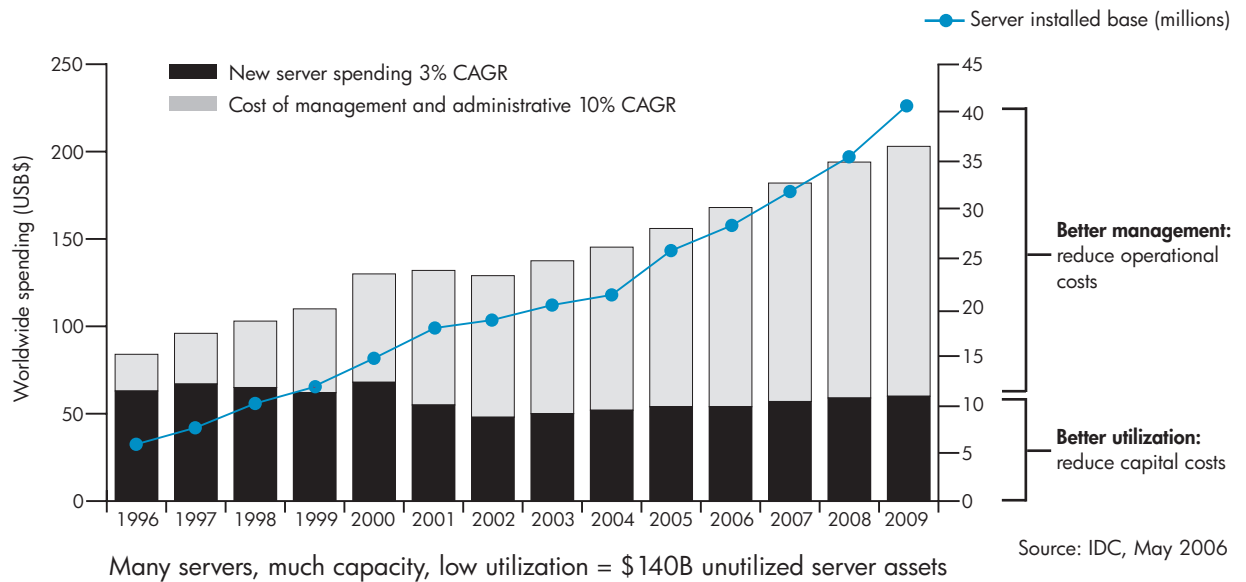
This physical approach to isolating applications has the advantages of enabling peak-load processing capability and reducing potential confusion in systems management. But these advantages come at a price that can be measured in terms of cost of available capacity, flexibility and quality of service.

A look at server utilization in many data centers illustrates the problems of today’s typical approach. Figure 1 shows average utilization levels for each server. The company that provided this information chose to remain anonymous, but the situation presented may be familiar. First, as is shown on the left-hand side of Figure 1, because servers are typically dedicated to one application and provisioned for its peak-load processing need, most of the servers are vastly underutilized most of the time.

Second, as is shown on the right-hand side of Figure 1, there are situations where the actual demand for processing power exceeds the forecasted peak. Users of these applications must put up with sub-standard service levels until more capacity can be added. Absent virtualization, there is no way to immediately take advantage of the excess capacity sitting idle. New capacity must be manually configured, tested and brought online, typically a matter of hours or days—or longer if new capacity must be procured.

It is also illuminating to consider this situation from the perspective of human resources. Each server requires management from a systems administrator. Typically, the greater the number of physical machines in a data center, the more costly it will be to manage. And there will be more things that can potentially go awry. Managers of large data centers may find themselves frustrated that they are not as fast as they want to be in responding to needed changes. There may be more room than is desirable for errors and omissions in manual processes—all with increased risk of unplanned downtime. When applications are tied to specific servers and management tasks are not automated, it is no wonder that personnel costs are escalating.

Figure 2. Worldwide expenditure growth.



Research from IDC, shown in Figure 2, provides an estimate of the financial implications for customers. The firm estimates that management and administrative expenditures in data centers around the world are growing more than three times as fast as expenditures on hardware.

Virtualization addresses both components of cost shown in Figure 2. Because it provides the basis for significant automation of management functions in addition to improving hardware utilization, virtualization can help stretch personnel resources and improve their effectiveness. In addition to reducing costs, virtualization distributes computing power with benefits analogous to those delivered by the grid to the distribution of electrical power. The electrical grid flows power flexibly where it's needed, when it's needed. It prevents brown-outs and interruptions of availability. Virtualization can deliver these power distribution benefits to the data center.

Delivering real benefits

By enabling your IT infrastructure to share the load intelligently, virtualization delivers three benefits to corporations and institutions. Virtualization:

- Reduces IT costs across the board
- Increases the agility of the IT infrastructure
- Delivers a higher quality of IT service with more consistent and predictable availability

Organizations are grasping the benefits of virtualization today. The University of Utah, for example, will save \$2.5 million over a three-year period by using virtualization to enable server consolidation. A midsize manufacturer, Polaris Industries, boosted its ability to respond to business changes by slashing the time

required to bring additional server capacity online. What used to take four to six hours prior to virtualization can now be done in minutes. German media giant Hubert Burda Media has achieved a new high in the quality of IT delivery, as measured by end-user service levels on key applications.

As a business, HP is also benefiting from virtualization. To support our mission-critical BEA WebLogic applications, HP IT implemented a Shared Application Server Utility (SASU)¹. This solution, based on the HP Virtual Server Environment, improved server utilization by 300 percent. Total cost of ownership has dropped by 70 percent. By streamlining the process of bringing new or modified applications online, the Shared Application Server Utility has shortened the turnaround time for needed changes and reduced errors.

In the development area, we implemented a Shared Test and Development Utility based on VMware that gives developers self-service access to needed capacity. Virtual servers are automatically allocated, configured and provisioned with the requested software. Developers now have a quick and easy way to get their code tested. Even without considering the benefit of accelerating our development cycle, the financial value of the Shared Test and Development Utility is impressive: 75 percent savings on hardware and software; 90 percent reduction in data center space and annual support; and 60 percent reduction in system management costs.²

¹ For more information on SASU, see: <http://h30067.www3.hp.com/AllEntries/wmv/41350011005.wmv>
 HP's Internal BEA Based Applications Successfully Share Servers, HP brochure number 5982-7748EN

² For more information on the use of VMware, see: <http://h71028.www7.hp.com/ERC/downloads/4AA0-5147ENW.pdf>

To achieve the promised financial benefits of sharing and reuse without losing control of the desired service levels, shared service utilities and SOA absolutely require virtualization to handle changes and spikes in demand.

Where to get started technically

The business benefits of virtualization are compelling. And there are situations that lend themselves to particularly easy adoption.

For example, scheduled IT infrastructure refresh projects are a perfect opportunity to use virtualization to reduce the costs of server acquisition, floor space and labor. This is also an excellent time to think about storage consolidation into a storage area network (SAN) or other network storage deployment.

IT consolidation projects are also excellent opportunities to introduce virtualization. After all, once you have made the decision to modernize your infrastructure, you have the project team and the funding in place. You are then ideally positioned to take advantage of virtualization and make your investment go further and improve your ability to respond to business changes. For example, you could start by consolidating the work of many older servers into a smaller number of servers that are partitioned into virtual servers.

If the development cycle is a hassle at your organization, the Shared Infrastructure Utility for Development and Test is a straightforward way for your team to get acquainted with virtualization technology and prove the benefits in your own environment. The Shared Infrastructure Utility for Development and Test that we originally developed for our internal use was so popular that we have packaged it as a solution that delivers rapid results to our customers.

If your company is moving toward a shared services approach to delivering business applications and/or a service-oriented architecture (SOA) approach to developing and integrating applications, infrastructure flexibility is a mandatory requirement. To achieve the promised financial benefits of sharing and reuse without losing control of the desired service levels, shared service utilities and SOA absolutely require virtualization to handle changes and spikes in demand.

Finally, you can also begin experimenting with virtualization simply to gain more value from your existing hardware investment. For example, if you've got lots of underutilized servers, consider consolidating using HP Virtual Server Environment or VMware to share server resources.

Wherever you plan to get started with virtualization, HP Services can help you estimate your cost savings and expected outcomes, and will work with you as necessary to enable a smooth implementation.

Moving to pooled and shared equipment in the data center requires just that—sharing! Sharing means that a line of business, a department or an application team no longer has sole control over its own dedicated infrastructure.

How to get started organizationally

While the business benefits of virtualization are undeniable, some companies have found that it is more difficult than they expected to catalyze the organization into action.

From our experiences with our customers and our internal operations, we can share insights on how your organization can move forward smoothly in your early efforts to adopt virtualization.

First, moving to pooled and shared equipment in the data center requires just that—sharing! Sharing means that a line of business, a department or an application team no longer has sole control over its own dedicated infrastructure. In a virtualized world, the physical server is shared and the dedicated server exists in essence or effect, though not in actual fact. The new breed of virtualization software, such as HP Virtual Server Environment or VMware, creates a virtual server on a just-in-time basis.

Business managers, and the IT staff that supports them, may initially be skeptical of the shared infrastructure. They want to see virtualization proven before they entrust business-critical applications to a new environment. Their concerns are practical in nature:

- How can our complicated environment be made simpler to operate?
- How will a virtualized system actually perform when two or more business groups or applications are experiencing peak-load requirements at the same time?
- What new skills will be required?
- Will the old approaches to troubleshooting work? Will new approaches be adequate?

- Will we be able to maintain our security and compliance practices? If not, can we adjust them to be compatible with a virtualized environment?

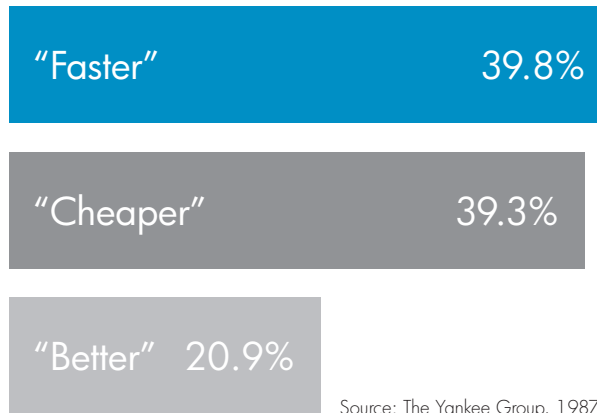
These questions must be answered before the organization can move forward. Our customers report that a test period is frequently required for the skeptical pragmatists in the organization to monitor how the virtualization technology works and accept that the automation will perform correctly.

Even within HP IT, there was some initial skepticism about virtualization. The clearly documented financial benefits of virtualization were not sufficient to get the application teams to automatically accept virtualization as the new mode of operation. The teams had a strong sense of responsibility for keeping the businesses up and running. They wanted to see the technology proven every which way. Extensive tests were conducted to validate that mission-critical applications would perform as expected in the virtualized world.

Even when the technology is tested sufficiently to be deemed trustworthy, established metrics may get in the way. Some companies, for example, measure labor productivity in terms of the number of servers managed by each system administrator. Moving to a virtualized world reduces the number of physical servers that must be managed by each administrator. So administrators appear (erroneously) to be less productive when they preside over a virtualized infrastructure.

Given our positive experience with virtualization, we took a different approach to justification. HP IT has established that deploying new applications on to virtualized infrastructures can be done in a much shorter time at less than a third of the cost of dedicated approaches inside HP. Therefore, we're no longer asking business teams to justify why they should be in a shared services environment. Instead, we're asking them to justify why a shared virtualized environment will not work for their project.

Figure 3. Key business benefit of industrial automation technology.



Source: The Yankee Group, 1987

Paradigm shift ahead

Some early adopters of virtualization have confided the presence of another factor behind the discussions of how to prove and justify the move to a pooled and shared infrastructure approach. Moving from an environment of physical servers managed by people to virtual servers controlled automatically means moving to a new work paradigm. In the trenches, IT operations staff can be daunted by the requirement to tackle new learning requirements and grow into a more highly evolved role. It's human nature to shy away from change.

These concerns are not unique to the move to a virtualized infrastructure. If your organization is moving to adopt shared services or SOA, you will have seen, heard or felt similar fears. Because we're leading the way to the next-generation data center, some of the operations that support our business are feeling the same pain. But our CEO, CIO and CTO are absolutely committed to creating an IT environment where we can work smarter, not harder, and to proving that you can do the same.

Organizational and cultural resistance to automation and shared resources is something that the world has seen before. It's a problem the world has solved before, simply by aligning technology with the organization. Let's take a minute to revisit the lessons from the last major wave of productivity improvement.

The lessons of history

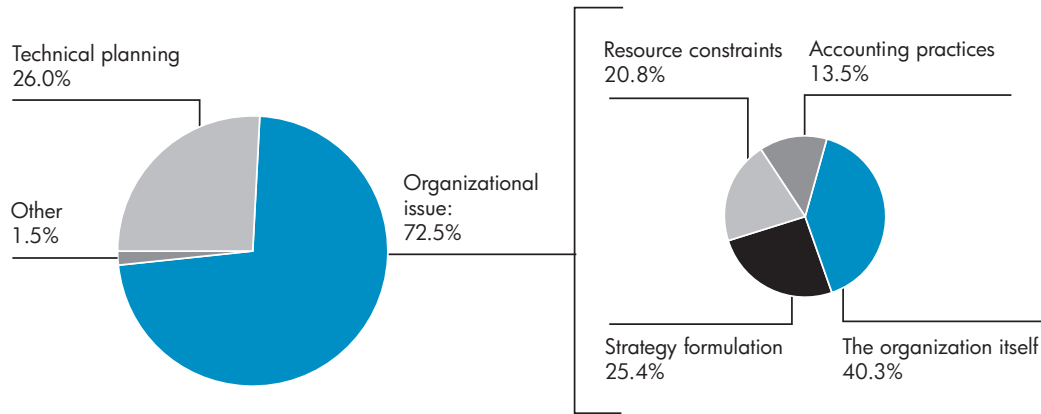
Twenty years ago, industrial corporations were contemplating a move to intelligent equipment and automated control. No longer would machine tools be manual and single purpose. Intelligent "Computer Numerical Control" machines would be able to perform many different tasks in many different sequences. No longer would automotive assembly lines be dedicated to a single model. Production capacity could be pooled and shared. Plant-floor workers would be relieved of repetitive labor. They would be required to become information workers. Work could be moved around the factory dynamically to adapt to changes in market demand.

The beginning of industrial automation was a time of enormous potential to gain business benefit. Figure 3, the results of a U.S. national survey of 573 industrial sites conducted by The Yankee Group, shows how manufacturing enterprises saw the promise of industrial automation back in 1987.³

In 1987, manufacturers hoped to get product to customers on time more often, to get product through the plant in less time than ever before, and to cut total elapsed time from design to ship. In 2007, IT executives are testing virtualization's ability to deliver greater agility for the IT infrastructure.

³ *Computers in Manufacturing: Toward 1992*, published November 1987 by The Yankee Group's Manufacturing Automation Planning Service.

Figure 4. The most difficult issue in planning industrial automation.



Source: The Yankee Group, 1987

In 1987, manufacturers planned to cut cost via increased capacity and labor utilization, lower work-in-process and raw materials inventory, and decreased costs of scrap, rework, downtime and maintenance. In 2007, IT executives expect virtualization to reduce costs across the board by improving capacity utilization and reducing redundant effort.

In 1987, manufacturing executives looked forward to making the business perform better by producing a wider variety of products with more consistent quality, while cutting down the number of customer complaints. In 2007, IT executives are looking at virtualization as a means to deliver a higher quality of IT service with more consistent and predictable availability

In the early days of industrial automation, enterprises were looking to the new technology to help them do business better, cheaper or faster. What actually happened was something far more powerful. For example, with the Corolla, Toyota proved that high quality and low cost were no longer a contradiction in terms. Industrial automation made it possible to make things better, cheaper and faster.

Despite the compelling business benefits of industrial automation technology and the growing realization that the benefits compounded over time, some organizations were slow to adopt. Figure 4 sheds light on why this was so.

In the days before open standards became pervasive, it was important to make the right technical decision to avoid vendor lock-in. Even so, more than seven out of ten organizations reported that technology was not the main problem in planning for industrial automation.

Twenty years ago, enterprises trying to harness the power of industrial automation were primarily bedeviled not by technical planning issues but by organizational issues. The benefit of hindsight shows us that survey respondents assessed the issue correctly. Very few companies failed to make the transition to the new approach because they chose the wrong technology. Almost universally, the companies who didn't survive the change were the ones who could not make the needed organizational changes. These companies were acquired and change was forced on them, or they simply ceased to exist.

The organizational structure itself was the first barrier to planning for industrial automation. Why? The big idea was to automate the flow of information and materials from product development through detailed design through production into distribution and sales, all customized and timed to coincide with and adapt to local demand around the world. Yet most companies had no appropriate forum even to discuss such an idea across the silos, let alone to make detailed plans.

Today, enterprising IT staff members face an analogous challenge in harnessing the benefits of virtualization, shared services or SOA. The big idea common to these approaches is to share resources across silos. The requirement for sharing may come at a level unanticipated by the current organizational structure. If this is the case, the IT staff requires executive support to create the appropriate planning and budgeting forum. Absent a forum for governance, it is hard to progress beyond tactical efforts at virtualization. With appropriate organizational support, IT staff can create a meaningful strategy for virtualization, justify the approach, establish the metrics for evaluating success and gain the appropriate resources.

The lessons of experience

At HP, we've lived the industrial automation story. Our product design process, supplier network, factories and delivery systems have been transformed over the past two decades. From inventing whole new product categories and supply chain models to off-shoring and outsourcing, we've done it all.

We expect the transformation to the next-generation data center to happen faster than the transformation to industrial automation. Virtualization and automation technologies are here today and are advancing rapidly. We have seen strong benefits demonstrated both internally and at customer sites. The lessons of history are there to teach us how to move forward by engaging the organization.

At HP, we know from experience that organizational transformation is built not bought. Even a technology vendor such as HP cannot reap the dramatic benefits from virtualization, shared services and SOA without thought and attention to change management. That's why we are working actively to align technology with the organization. This is a key to success.

Based on our own experience as well as working with customers across the globe, to realize the potential benefits of virtualization, we recommend a governance approach involving:

- Standardization of infrastructure configurations to facilitate sharing
- Education, collaboration and enforcement
- Strong IT executive support to make the shared infrastructure the default choice

Governance plays an essential role in empowering the IT organization to achieve the benefits of virtualization, shared services and SOA. HP IT is leading by example. And HP Services can help you with disciplined and practical approaches to developing and implementing a transformational IT strategic plan.

HP can help

Virtualization is a key enabler of the Adaptive Infrastructure. It lets IT supply meet fluctuating business demand. HP has the technology and expertise to help you achieve real business benefits from virtualization today. Our virtualization solutions and services can help you reduce IT costs across the board, increase the agility of your IT organization and deliver a higher quality of IT service with more consistent and predictable availability.

For more information about HP virtualization solutions, go to hp.com/go/virtualization.

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