



Microsoft SoftGrid

Application Virtualization: The Next Frontier

How SoftGrid technology can help organizations curb IT costs, boost user productivity, improve service levels, and increase business agility

Abstract

IT departments today are struggling to cut costs while increasing operational agility, delivering superior service, and maintaining high customer satisfaction. Application virtualization can help with all of these goals. By converting applications into virtual services that are managed and hosted centrally but run on demand locally, application virtualization reduces the complexity and labor involved in deploying, updating, and managing applications. In addition, because the virtualized applications run in their own environment on client machines, there is no possibility of application or operating system conflicts—and therefore no need for regression testing or for separate servers to host the various applications. Consequently, not only will hardware costs be much lower than they are today, but managing IT assets will be simpler, resulting in lower administrative costs. In short, by helping IT organizations decrease their total cost of ownership (TCO), increase service levels, and more easily respond to changing requirements, application virtualization can serve as a strategic tool that delivers significant competitive advantage.

January 2007

Omer Qureshi
Microsoft

Microsoft

Table of Contents

Application Virtualization: The Next Frontier	i
Table of Contents	i
Table of Contents	ii
Executive Summary	1
Virtualization Can Help Curb Rising IT Costs	4
Virtualization Already in Wide Use	4
Virtualization Technology Has a Long History	6
Microsoft Contributions to Virtualization.....	6
Advantages of Application Virtualization	8
Application Virtualization with SoftGrid	10
How SoftGrid Application Virtualization Works	12
SoftGrid Value Proposition for Enterprise Computing	13
Business Value and Return on Investment	16
Real-World Savings	19
Conclusion	21

Executive Summary

Information technology (IT) executives are under constant pressure to find ways to help their organizations reduce operating expenses and increase operational agility—while at the same time managing regulatory and security concerns, meeting stringent service levels, and maintaining high levels of customer satisfaction. The struggle to reduce costs is made even more challenging by the exponential growth in processing power that corporations have experienced in recent years. As hardware costs continue to decline, server and desktop sprawl results, adding such new concerns as excessive power utilization, data center overheating problems, and isolation of different types of information in server and desktop silos. And those are just the hardware problems.

On the software side, the increased frequency and complexity of application deployment is taking its own toll on IT departments. A recent survey by Gartner shows that organizations across the globe spend 70 percent of their IT budget maintaining what they have and only 30 percent on new initiatives.¹ Finding a way to curb the ever-increasing cost of maintaining existing application and systems has become the Holy Grail for the industry.

Together, these hardware and software trends are resulting in spiraling administration costs and reduced utilization of IT assets.

But there are bright spots on the horizon—technological innovations that promise to help IT departments cope with these challenges. Among these, virtualization technology is a top contender for providing relief. Aided by a new generation of dual-core processors and advances in grid and distributed computing, virtualization technology is poised for rapid growth. The technology takes several forms, including the use of virtual machines for server and desktop consolidation, software as a server (SaaS), and the new kid on the block, **application virtualization**. Among the most advanced application virtualization solutions is Softricity SoftGrid® technology, which Microsoft acquired in July 2006. With this acquisition, Microsoft will be taking a pioneering role in the application virtualization marketplace.

Application virtualization differs from other forms of virtualization (machine, storage, or network) because it does not require heavy investments in hardware, personnel, or core infrastructure. As implemented in SoftGrid, application virtualization enables applications running on the Windows® operating system to be converted into virtual services that are managed and hosted centrally, but run on demand locally—on client computers connected to intranet (LAN, WAN, VPN), Internet, or wireless networks.

Application virtualization with Microsoft® SoftGrid goes a long way towards helping IT shops reduce management costs. For example, it can help organizations comply with several of the

¹Source: http://www.gartner.com/4_decision_tools/measurement/measure_it_articles/july01/mit_spending_history1.html

best practices that IDC has identified as significantly reducing the cost of managing desktops and applications:^{2,3}

- **Standardizing on a single desktop operating system:** By eliminating issues of application compatibility, SoftGrid reduces the number of operating system builds and images required. **Savings:** U.S.\$52 per desktop per year.
- **Limiting users to IT-sanctioned software:** SoftGrid technology allows applications to be streamed only to sanctioned and approved users. **Savings:** \$50 per desktop per year.
- **Automating software distribution based on group membership.** SoftGrid streams applications to users based on their Active Directory® Group membership. **Savings:** \$26 per desktop per year.
- **Preventing users from changing PC settings that could compromise reliability or security.** Because, with SoftGrid, applications operate in a “virtual bubble,” IT administrators can reduce privilege levels on workstations to the minimum settings. **Savings:** \$30 per desktop per year.

In brief, Microsoft SoftGrid helps IT shops lower costs and enhance service by reducing the complexity and labor involved in deploying applications to desktops, laptops, and terminal servers, as well as the complexity of keeping applications up-to-date. The fact that SoftGrid runs applications locally is a key difference from past attempts at virtualization, based on technologies such as Microsoft Windows Server® Terminal Server or Citrix. Because that approach required applications to be centrally hosted and centrally run, it led to mushrooming growth in servers, along with an increase in both hardware purchase costs and hardware maintenance costs. Furthermore, to prevent application conflicts in multi-tenancy situations, IT shops had to create separate instances of servers to host the various applications—a practice that further encouraged the growth of server silos and that resulted in increased management complexity and higher administrative costs.

In contrast, SoftGrid technology offers the ability to host and manage applications centrally while allowing client computers to run the applications locally. This approach eliminates both hardware proliferation issues and multi-tenancy application conflicts. It also provides all the benefits of SaaS—such as ease of access, ease of distribution, and ease of management—to earlier client-server applications.⁴

SoftGrid technology offers IT professionals an innovative way to increase operational efficiencies in a short amount of time by reducing the direct IT costs of application deployment, service desk usage, other types of support, IT management, and regression testing. Using

²Source: Gillen, A., Broussard, F.W., Perry, R., and Dowling, S. “Optimizing Infrastructure: The Relationship Between IT labor Costs and Best Practices for Managing the Windows Desktop.” IDC. 2006.

³Source: Barna, William. “Infrastructure Optimization: Driving Down Costs of the Business Desktop.” Microsoft. April 2006.

⁴Source: Traudt, Erin and Amy Konary, “2005 Software as a Service Taxonomy and Research Guide.” IDC. June 2005.

SoftGrid also can help curb several indirect IT costs, such as software and regulatory policy management, license management, and customer satisfaction.⁵ In addition, because SoftGrid directly affects every stage of the application management life cycle, it can help IT organizations decrease TCO and increase service levels across the board. In this way, it can be a strategic tool for organizations seeking to gain a competitive advantage.

This white paper explains what application virtualization is, how it works, and how it can help senior architects and IT decision makers curb the exploding costs of application deployment and management. It concludes with examples of real-world savings that companies have realized by moving to application virtualization with SoftGrid technology.

⁵ Source: Return on Virtualization Case Study, <http://www.softricity.com/solutions/savings-scenario.asp>

Virtualization Can Help Curb Rising IT Costs

Today, IT organizations across the globe are dealing with new and extreme challenges, which they must overcome if they are to thrive and compete in the marketplace. Among these challenges are:

- An onslaught of security threats (including system breaches and data theft).
- The increasing cost of application support and deployment.
- Demands from both internal and external customers for higher-quality IT services and faster delivery of services.
- A proliferation of server and desktop systems, resulting in data center and desktop infrastructures that are overly complex and difficult to manage. Not only does this growth and complexity drive up management costs, but the inflexible nature of the assets means that costs tend to remain fixed regardless of changing business requirements.

Virtualization technology can help IT organizations overcome all of these challenges. The attractiveness of virtualization lies in its ability to create dynamic computing environments. Virtualization frees each element of the computing environment from the other elements. As a result, each layer of the system can use resources generically, without needing to be configured for a specific system. In addition, because each element of the computing environment no longer has an assigned identity or role (such as a server that runs only engineering data), a virtualized environment enables the organization to use its resources much more efficiently, dynamically assigning each element to whatever purpose or task most needs the resources⁶.

Today it's difficult to imagine an IT department that—if it hasn't already virtualized the commodity resources under its administration—is not at least considering such virtualization. The reasons for the increasing trend toward virtualization vary from one organization to the next. An organization may be motivated by the desire to employ new technology solutions, the need to increase hardware capacity, a requirement for better disaster recovery and fault tolerance abilities, or the need to simplify system and resource administration. Regardless of their individual reasons, all organizations deploying virtualization have in common one simple goal: the promise of tremendous cost savings.

Virtualization Already in Wide Use

Forms of virtualization that are already proliferating rapidly include networking, hardware, storage, machine, management, and session virtualization—and application virtualization is poised to join them. (See Table 1.) As an example of how the use of virtualization technologies is growing rapidly, consider server virtualization. IDC projects that, by 2009, as many as one

⁶Source: Microsoft SoftGrid, <http://www.softcity.com/solutions/utility.asp>

million servers will be virtualized.⁷ Server virtualization addresses the issue of resource allocation and balancing as well as application conflicts in multi-tenancy situations by spinning multiple instances or partitions of guest “virtual” operating systems on top of a single host physical system. This approach also provides such key capabilities as dynamic resource provisioning and disaster recovery.

However, it does have some drawbacks. First, setting up the virtual servers requires high-end hardware and involves administrative and set-up labor costs. Second, while server virtualization can save money by consolidating *physical* server silos, the proliferation of *virtual* server silos increases the management burden for IT staff. Third, the approach creates problems for users in that virtual servers do not support such resource needs as high-end graphics or USB ports, and they can also lead to performance degradation. Finally, the host operating system still represents a single point of failure, which can have ripple or cascade effects on the guest operating system.

Table 1. Virtualization Technologies Across Computing Resources

Technology Classification	Virtualization Component
Network Localizing dispersed resources inside and outside the network edge	<ul style="list-style-type: none"> • VPN (virtual private network) • VLAN (virtual local area network) and VWAN (virtual wide area network) • Virtual provisioning and security
Hardware (processors and capacity) Enables hardware to change computing tasks in real-time	<ul style="list-style-type: none"> • Intel VT and AMD-V • Grid and cluster computing • Distributed or P2P (peer-to-peer) computing
Storage Storage and backup over the network	<ul style="list-style-type: none"> • iSCSI • VSAN (virtual storage area network) • Microsoft Virtual Hard Disk (VHD) Image Format Specification
Machine/operating system (servers and clients) One machine; multiple operating systems	<ul style="list-style-type: none"> • One-to-many (host and guest operating systems)
Management and administration (servers and clients) Resource management and administration of virtual machines	<ul style="list-style-type: none"> • Virtual machine (server and client) management
Session One machine, multiple synchronous/asynchronous sessions	<ul style="list-style-type: none"> • Desktop or session streaming
Application Any application on any computer, on demand, via any network	<ul style="list-style-type: none"> • Application virtualization • Application streaming

⁷Source: IDC. “Server Virtualization Market Forecast and Analysis,” 2004–2009.

The last virtualization technology listed in the table—application virtualization—is the next frontier for IT decision makers. This form of virtualization eliminates many of the problems that server virtualization creates:

- It does not require high-end hardware—organizations can use their existing Windows-based desktop computers.
- It does not produce the decentralization created by having multiple guest operating systems. Because each application operates in its own virtual bubble, no secondary operating system partition is necessary.
- The management burden created by having multiple virtual machines does not exist because administrators are concerned about one physical operating system rather than multiple guest operating systems.

Virtualization Technology Has a Long History

Virtualization is not new: It's been employed in mainframe computers for decades. For example, IBM introduced its virtual machine (VM) Hypervisor technology back in 1968—and in 1988 it introduced Processor Resource/System Manager (PR/SM) technology, which enabled IT staff to create multiple logical partitions, so that several full-scale operating systems could operate concurrently on the same physical mainframe.⁸ Such virtualization enabled mainframes to get more done with fewer resources and less overhead.

Now, by applying these same virtualization concepts to application management on commodity servers, organizations can achieve similar increases in agility, improvements in service level, and cost reductions—without experiencing the server silo proliferation headaches created by server virtualization.

Microsoft Contributions to Virtualization

As Table 2 illustrates, Microsoft is no newcomer to virtualization: The company has long offered products that provide virtualization capabilities across a broad range of computing technologies, including networks, hardware, storage systems, operating systems, and sessions. Application virtualization via SoftGrid is one of the latest contributions from Microsoft to this growing field.

Virtualization is also one of the key building blocks of the Microsoft Dynamic Systems Initiative—a collection of products and services designed to help organizations be more agile and responsive to changing business needs. Virtualization technologies contribute to this initiative by providing such critical capabilities as dynamic resource provisioning, scalability, self-healing, and fault-tolerance.

⁸ Source: About IBM mainframe virtualization: <http://www-03.ibm.com/systems/z/virtualization/features.html>

Table 2. Microsoft Contributions to Virtualization

Technology Classification	Virtualization Component	Microsoft Product
Network Localizing dispersed resources inside and outside the cloud	<ul style="list-style-type: none"> • VPN • VLAN and VWAN • Virtual provisioning and security 	<ul style="list-style-type: none"> • Microsoft Internet Security and Acceleration (ISA) Server • Whale Intelligent Application Gateway • Network Access Protection (NAP)
Hardware (processors and capacity) Enables hardware to change computing tasks in real-time	<ul style="list-style-type: none"> • Intel VT and AMD-V • Grid and cluster computing • Distributed or P2P computing 	<ul style="list-style-type: none"> • Windows Vista™ and Windows Server code name “Longhorn” • Windows Server 2003 Datacenter Edition • Microsoft Windows Compute Cluster Server • High-performance computing (HPC)
Storage Storage and backup over the network	<ul style="list-style-type: none"> • iSCSI • VSAN • VHD 	<ul style="list-style-type: none"> • Microsoft Windows Unified Data Storage Server • Windows Server “Longhorn” • Microsoft Windows Storage Server • Microsoft System Center Data Protection Manager
Machine/operating system (servers and clients) One machine; multiple operating systems	<ul style="list-style-type: none"> • One-to-many (host and guest operating systems) 	<ul style="list-style-type: none"> • Microsoft Virtual Server and Microsoft Virtual PC • Windows hypervisor technology
Management and Administration (servers and clients) Resource management and administration of virtual machines	<ul style="list-style-type: none"> • Virtual machine (server and client) management 	<ul style="list-style-type: none"> • Microsoft System Center Virtual Machine Manager • Microsoft System Center Solution for IT Service Management code name “Service Desk”
Session One machine, multiple synchronous/ asynchronous sessions	<ul style="list-style-type: none"> • Desktop or session streaming 	<ul style="list-style-type: none"> • Terminal Services • Remote Desktop
Application Any application on any computer, on demand, via any network	<ul style="list-style-type: none"> • Application virtualization • Application streaming 	<ul style="list-style-type: none"> • Microsoft SoftGrid

Advantages of Application Virtualization

Traditionally, only server-based applications were considered to be mission-critical. Today, as more workers depend on desktop applications such as the Microsoft Office Outlook® messaging and collaboration client, Microsoft Office Word, and Microsoft Office Excel® spreadsheet software to carry out daily business, the line between server-based mission-critical applications and desktop-based applications is blurring. Consequently, issues such as fault tolerance, self-healing, disaster recovery, performance, and mobility that were once reserved for server applications are increasingly required on desktop computers.

Even though more enterprises are adopting *n*-tier Web-based systems, the era of thick-client and legacy client-server applications is nowhere near an end. In order to provide some level of resilience for desktop applications, IT shops are now seeking new approaches to the age-old problem of improving desktop reliability and security. Two such solutions are application or session streaming, which occurs when applications are hosted on Terminal Server or Citrix, and application virtualization, which can be achieved with SoftGrid.

Application or session streaming does go a long way toward solving centralized management and disaster recovery issues, but the technology does little to resolve compatibilities—both compatibilities between applications and compatibilities between applications and the operating system. The other problems with application or session streaming are that it can be a single point of failure and that it can create a resource bottleneck. To avoid these disadvantages, organizations build server silos to prevent conflicts between applications and operating systems, and set up multiple servers to provide scalability and avoid having a single point of failure. However, this approach increases the management burden on IT staff, resulting in increased labor costs.

Application virtualization with SoftGrid, however, delivers the best of both worlds, enabling applications to be managed, stored, and maintained centrally but distributed over a network and executed locally on client computers. In doing so, it not only reduces IT labor costs, but also provides a more flexible computing environment that enables businesses to respond more quickly to changing needs.

Application virtualization eliminates the traditional computing approach, in which systems are configured (usually manually) to be static environments that support a single solution, with all components treated as products that are installed and configured for specific computers. For example, in a traditional computing environment, hardware is dedicated to specific uses, such as a Web server or database; the operating system is tied to the hardware (one box runs Windows, the other UNIX); and storage is handled in specific locations. On top of all these layers are applications, which are installed to run inside this specific, static environment. This computing structure requires significant testing because all layers of the environment must be hard-coded to work together. The result is a tightly bound configuration that does not adapt well to changes in business needs or to the introduction of new and updated applications.

In a virtualized system, in contrast, applications become on-demand utilities that are as easy to use as electricity. No longer tied to specific systems and departments, they can be used on any system, in real-time, on an as-needed basis. Because this approach makes it easy to dynamically add, update, and support applications and systems, it creates the foundation for a much more nimble, competitive business environment—one that uses minimal time and resources.

As a result of the increased simplicity of IT environments that use application virtualization, IT organizations can significantly reduce their labor costs. For example, IDC has noted that virtualization can assist in curbing labor costs associated with supporting applications and desktop computers (see savings cited on p. 2 of the Executive Summary)—plus it can help IT organizations improve service levels and increase business agility.⁹

⁹ Source: Gillen, A., Broussard, F.W., Perry, R., and Dowling, S. "Optimizing Infrastructure: The Relationship Between IT labor Costs and Best Practices for Managing the Windows Desktop." IDC. 2006.

Application Virtualization with SoftGrid

Microsoft SoftGrid provides a single, unified platform for managing application virtualization so that applications can be deployed wherever they are needed, in real time. SoftGrid transforms Windows applications from products that must be installed locally into virtual services that are centrally configured, managed, and deployed on-demand to all Windows-based computers in the IT environment, whether desktops, portable computers, or Terminal Services or Citrix servers.

Figure 1 provides an overview of the physical components of the SoftGrid platform, which work together to ensure seamless application deployment and management. Key components include:

- **SoftGrid Virtual Application Server.** The SoftGrid Virtual Application Server streams applications to SoftGrid-enabled computers (both desktops and terminal servers). It authorizes and authenticates requests for application services and provides the necessary security, metering, monitoring, and data gathering for complete centralized management.
- **SoftGrid Client (SoftGrid for Windows Desktops).** The SoftGrid Client is installed once on the user's computer. It communicates with the SoftGrid server, receives streamed applications, and allows them to be locally and securely executed at the client—without requiring the applications to be physically installed on the user's machine.
- **SoftGrid Management Console.** The SoftGrid Management Console is the central management tool for setting up, administering, and monitoring one or more SoftGrid servers. Administrators can also use the Management Console to assign application rights and licenses to users and organizational units.
- **SoftGrid Sequencer.** The SoftGrid Sequencer is a wizard-based tool that automatically enables applications to work with the SoftGrid system—without making any changes to the application source code.

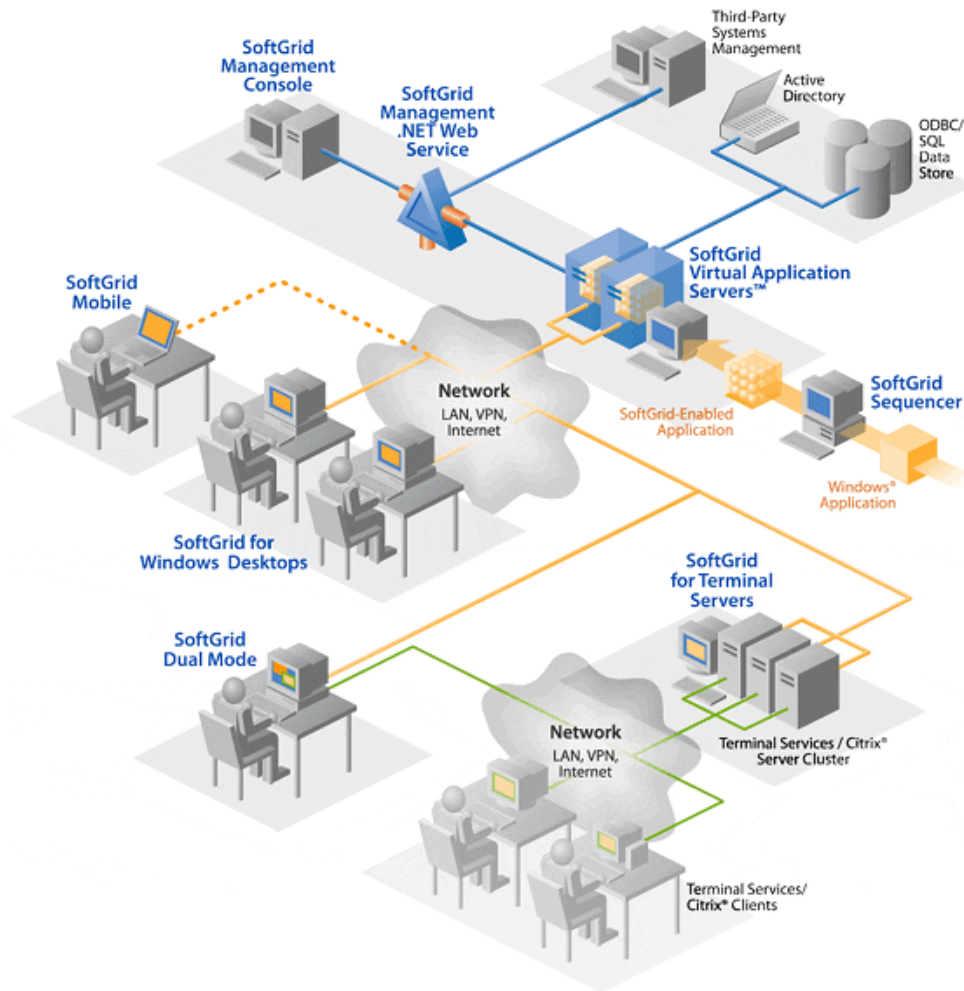


Figure 1. Overview of the SoftGrid platform

As illustrated in Figure 2, SoftGrid also includes several virtualized components that are part of the application binary package and are distributed to the client computers running the virtualized applications. By virtualizing these components, SoftGrid eliminates many of the pain points that today exist in the application management life cycle, such as the need for regression testing and for techniques to eliminate application conflicts (such as server silos). Virtualizing these components also reduces the registry stack—and therefore decreases boot time.

SoftGrid virtualized components include:

- Virtualized data, such as user profiles and documents
- Virtualized system services, such as Windows services, COM (component object model), OLE (object linking and embedding), printers, fonts, and cut-and-paste capabilities

- Virtual configurations, such as registry, .ini files, and DLLs (dynamic-link libraries)

Currently, SoftGrid does not virtualize or package any kernel-level components or device drivers.

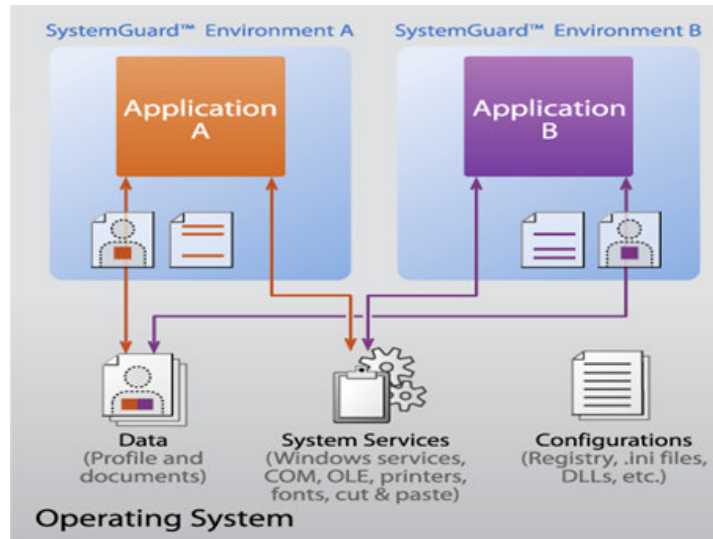


Figure 2. Virtualized SoftGrid components

How SoftGrid Application Virtualization Works

SoftGrid employs an innovative system for centrally deploying applications. Rather than installing entire applications, the first time a user requests an application, the SoftGrid client rapidly “pulls” the necessary software package from a central SoftGrid server to the user’s Windows-based desktop computer or terminal server. This happens without degradation in functionality or response time: Applications launch within seconds, with the exact time depending on application size and connection speed.

When the virtualized application is launched by the user, it runs in a “bubble” (SystemGuard), which isolates it both from other applications and from the computer’s operating system. As the user modifies application settings, the changes are stored in the user’s profile, so that the next time the user launches the application it will launch with the user’s preferred settings.

When a SoftGrid session terminates, the user’s settings and profiles are cached on the local computer, providing instant access for subsequent use with little impact on bandwidth—even if the network goes down or users detach from the network. Users enjoy continual access because the code SoftGrid sends to the client computers enables applications to run locally with full functionality, whether connected or disconnected from the networks and the SoftGrid server.

Figure 3 shows the steps involved in deploying a virtualized application.

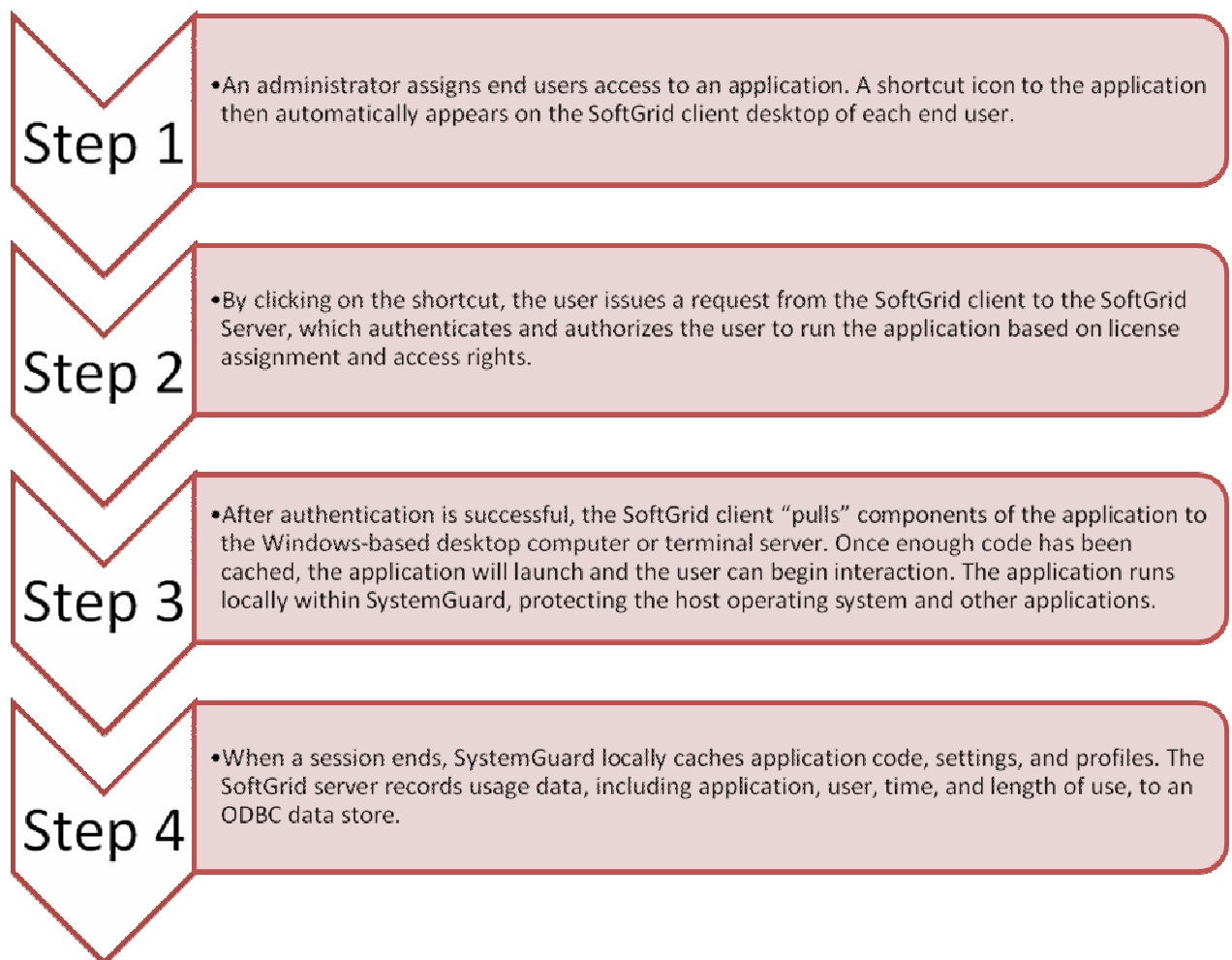


Figure 3. How SoftGrid on-demand application delivery works

SoftGrid Value Proposition for Enterprise Computing

Microsoft SoftGrid can help reduce the complexities inherent in deploying and updating applications to desktop computers, portable computers, and terminal servers, eliminating many of the tedious, labor-intensive steps involved in the application management life cycle. Through application virtualization and on-demand streaming, SoftGrid enables applications to run without their ever having to be installed on a desktop, portable computer, or server. Instead, it instantly delivers applications to the desktop resource that needs them, upon user demand and without an impact on the host operating system or other applications. One of the most comprehensive virtualization technologies on the market, SoftGrid virtualizes user sessions, user profiles, application instances, and Windows services, as well as other subsystems, such as registries, .INI files, and DLLs.

Figure 4 summarizes SoftGrid benefits, which include:

- **Ending application conflicts and regression testing.** Because SoftGrid runs applications within the isolated SystemGuard environment, it prevents applications from conflicting with each other or with the underlying operating system. As a result, it eliminates the need for time-consuming regression testing.
- **Improving server utilization and management.** This same isolation from other applications eliminates the need for server silos, increasing server utilization and return on investment while dramatically streamlining server management.
- **Managing software assets.** Because SoftGrid hosts applications centrally, it makes it easy for companies to add and remove software assets from their portfolio.
- **Stabilizing Windows profiles.** SoftGrid writes user preferences and settings to a separate SoftGrid profile, rather than to the Windows user profile. By minimizing changes to the Windows profile, it reduces the likelihood of profile corruption.
- **Tracking application usage.** Every time a user initiates an application, the SoftGrid client communicates with a centralized server, making it possible to track application usage in real time. The ability to easily see how applications are—or are not—being used helps IT departments to better manage license compliance.
- **Consolidating applications.** By ensuring that all versions and updates of an application are consolidated in a self-contained package, SoftGrid makes it easier for IT departments to optimize their libraries of Microsoft Windows Installer (MSI)–based applications.
- **Providing centralized, policy-based management.** SoftGrid manages application deployment, updates, and termination for all users—including mobile, branch office, and disconnected users—through policies administered from a single console. It also enables remote management of SoftGrid clients, active upgrade of virtualized applications, one-click migration of software policies to users, and real-time concurrent user session management.
- **Consolidating and standardizing operating system images.** By decoupling applications from the operating system, SoftGrid minimizes their footprint on the operating system. As a result, it reduces the complexity of the operating system image and minimizes the number of such images that are needed.
- **Providing business continuity in the event of a failure.** SoftGrid enables applications and updates to be automatically replicated to backup servers—just like data. As a result, it cuts user downtime in the event of a server or desktop failure from hours or days to just minutes.
- **Providing support for branch office server infrastructures.** SoftGrid enables application updates to be automatically replicated to branch office servers, which then serve the

changes to local end-users. This approach greatly reduces WAN traffic and enables IT organizations to update applications for an entire global organization with one change to the central SoftGrid server.

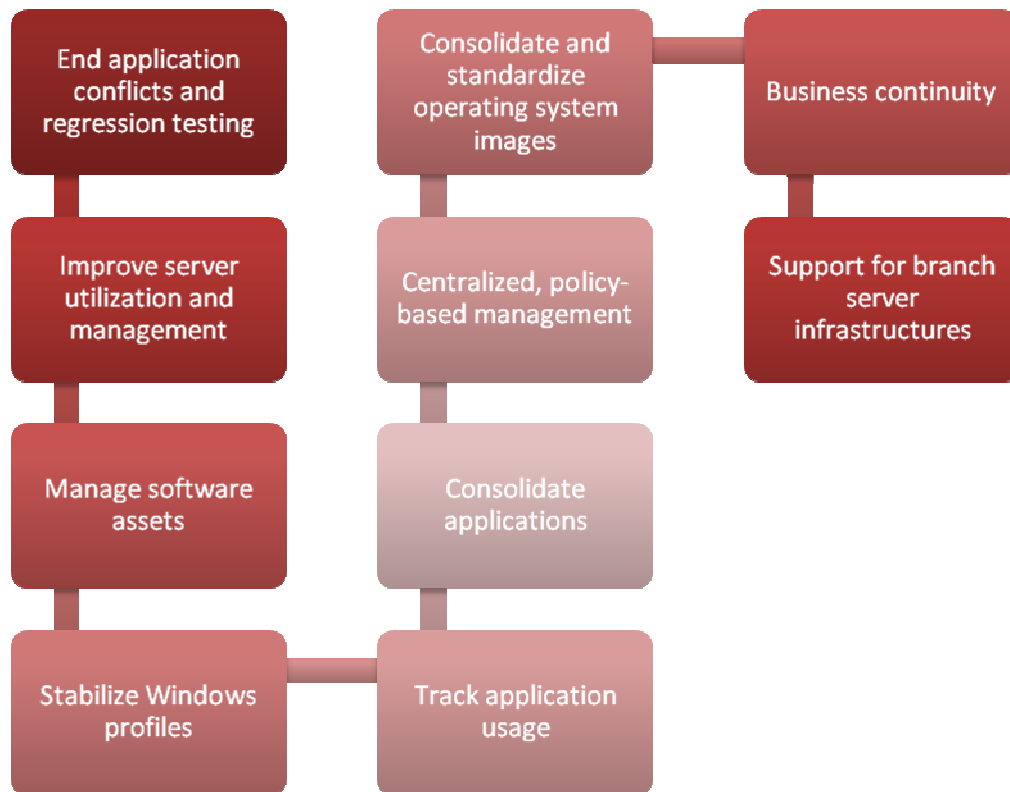


Figure 4. SoftGrid value proposition for enterprise computing

Business Value and Return on Investment

As illustrated in Figure 5, SoftGrid helps IT departments streamline and simplify each stage of the application management life cycle, from packaging to termination. In doing so, it speeds service time to market, increases the organization's flexibility and agility, and brings IT environments closer to a utility computing model—that is, one in which software applications are as simple to access and use as electricity is today.

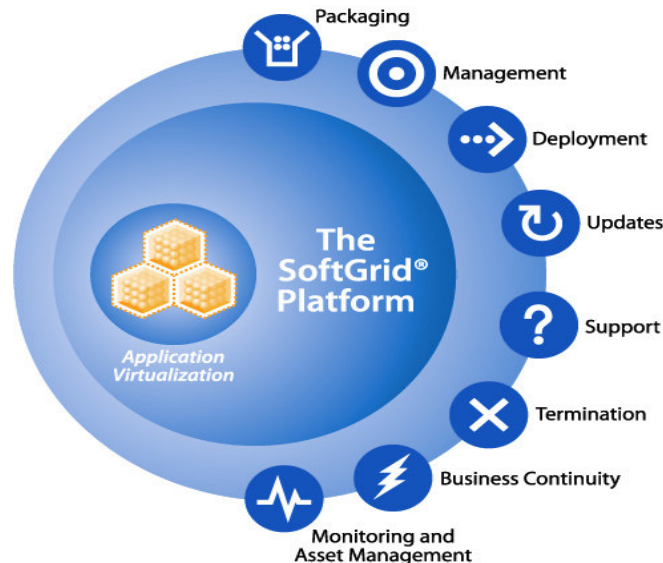


Figure 5. Application management life cycle stages streamlined by SoftGrid

The time and cost savings that an IT organization can achieve by streamlining and simplifying the application management life cycle depend on many factors that are specific to each organization. That's why we have developed a SoftGrid ROV (Return on Virtualization) Calculator—a tool that organizations can use to calculate what application management is costing them today, compared to what it would cost if they implemented SoftGrid. The Calculator includes a comprehensive questionnaire that gathers detailed data about the company's business and technology environment, examining every step in the application management life cycle in order to determine its true costs to the organization. It includes the time and associated costs not only of IT staff, but also of users who experience downtime during the various processes. It then calculates how much time and money can be saved through application virtualization with SoftGrid. No numbers in the Calculator are hard-coded: Every assumption and number can be changed to reflect the reality of a company's operations.

Measurable benefits provided by SoftGrid include the resource savings achieved by deploying applications as virtual services, plus the increased speed with which applications can be deployed using SoftGrid. Analyses of SoftGrid customer environments have shown on average:

- A 30 percent reduction in application-related help-desk call volume and time

- A reduction of more than 80 percent in overall application life cycle costs
- A 40 percent consolidation of servers, as well as increased consolidation of application images and terminal server silos
- A fourfold increase in user uptime
- A payback period of 4 to 10 months

SoftGrid also generates savings from:

- Centralized license enforcement and usage metering
- Better application security, due to centralized policy management
- Greater business continuity and faster disaster recovery
- Support for branch offices (servers and desktops) as a result of centralized application management and application replication capabilities
- Support for multiple versions of an application running simultaneously on the same desktop
- Greater ease in providing application access to roaming and mobile workforce
- Easier operating system migrations as a result of consolidation of operating system images and elimination of the need for regression testing
- Increased efficiency and scalability of Terminal Services and Citrix server farms, due to consolidation of servers

For examples of the specific savings that can be achieved with SoftGrid, see the next section, “Real-World Savings.”

Figure 6 illustrates the many steps typically performed as part of application deployment, update, support, and termination that can be eliminated through use of SoftGrid, resulting in a dramatic reduction in the time and cost of managing applications over their life cycle.

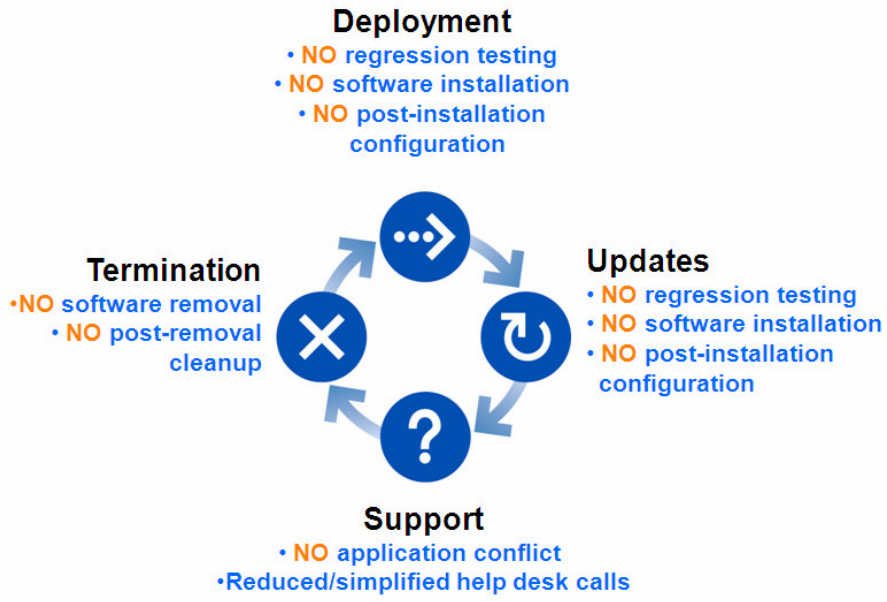


Figure 6. Time-consuming application management steps eliminated by SoftGrid

Real-World Savings

Companies that have deployed SoftGrid have significantly reduced application management costs while also dramatically decreasing the time required to deploy, migrate, and update applications. In addition, SoftGrid has enabled companies to consolidate their servers; enhance desktop security; and more efficiently support branch offices. Consider the following examples:

- **Reduction of application management costs**
 - Scotland's **Dundee City Council** saved USD \$290,000 (£155,000) in one year on IT support, replacement, server consolidation, and license agreements.
 - **University of Illinois Medical Center** estimates that it has cut per-year deployment costs for 75 applications from \$43,000 to just under \$1,500; reduced update costs from \$137,000 to \$5,900; and slashed termination costs from \$13,000 to under \$500. (All figures in U.S. dollars.)
 - **Heartland Financial**, with headquarters in Dubuque, Iowa, has reduced its help desk calls from two hours to ten minutes, resulting in significantly lower support costs.
 - Stockholm, Sweden-based **Feelgood** healthcare provider has reduced the volume of help desk calls from 350 calls per month to less than 150.
- **Acceleration of application availability and elimination of tedious processes**
 - **University of Illinois Medical Center** has eliminated the 100 hours of testing previously required for deploying a single application.
 - Frankfurt, Germany-based **Sanofi-Aventis Deutschland GmbH** has cut application deployments and updates from two weeks to three hours.
 - Seattle's **Swedish Medical Center** has cut per-application migration time from 40 days to just four hours.
 - **Free University of Amsterdam** previously required at least three to five days to package an application for electronic software delivery. Now it takes them only two days to sequence an application.
 - **TNT Express Belux**, based in Brucargo, Belgium, reduced application refresh time to just seconds.
- **Consolidation of terminal servers**
 - Jacksonville, Florida-based **Fidelity National Financial** was able to eliminate 13 terminal servers.
 - Tacoma, Washington-based **Russell Investment Group** and Dallas, Texas-based **ACS Healthcare Services** each reduced their servers by 40 percent.
 - **Purdue Pharma** expects its adoption of SoftGrid to reduce its 90 terminal servers to just 45.

- **TNT Express Belux** has consolidated its servers by 30 percent. It now uses just 13 servers to run 80 applications.
- **Improved desktop security**
 - **British Columbia School District** now needs only four IT staff members to secure applications on 2,000 computers, shared by 7,800 students.
 - Dallas, Texas-based **ACS Healthcare Services** has improved its operating system security by enabling applications to be run on “plain vanilla” servers, without having to install them to the operating system.
- **More efficient branch office support**
 - From its Vienna headquarters, **AWD Austria** is able to more efficiently service its 800 laptops and 200 desktops, which are distributed across 30 financial services sites.
 - **Northeastern University** has eliminated the need to send IT staff to remote campus locations for new deployments, upgrades, and patching. Everything can now be handled from a central location.

Conclusion

The landscape of enterprise computing is constantly changing, and the stakes and demands continue to rise exponentially. As IT departments struggle to balance the cost of application management against ever-increasing demands for higher service levels and improved business agility, application virtualization with SoftGrid offers an attractive solution—one that significantly simplifies the burden of managing the application life cycle. By drastically reducing such direct IT costs as application deployment, regression testing, service desk usage, other types of support, and IT management, SoftGrid enables IT departments to meet the seemingly contradictory goals of cutting costs while improving service levels.

With SoftGrid, applications can become on-demand utilities that are as easy to use as electricity. Rather than being tied to specific systems and departments, virtualized applications can be deployed in real-time wherever they are needed. And because SoftGrid enables IT organizations to easily add, update, and support applications, it can serve as a strategic tool, enabling businesses to be more nimble in reacting to changing market conditions.

IDC has the following to say about virtualization: “Virtualization should be seen not as a technology that creates migration and consolidation work, but rather as a game-changing technology that enables dramatically different deployment scenarios for IT professionals, enabling them to break the historical bond between operating systems, applications, and the underlying hardware platform”¹⁰.

The move to application virtualization has already begun. The choice for IT decision makers is to be left behind or tackle the issue head on.

¹⁰ Source: Gillen, A., Broussard, F.W., Perry, R., and Dowling, S. “Optimizing Infrastructure: The Relationship Between IT labor Costs and Best Practices for Managing the Windows Desktop.” IDC. 2006.

This is a preliminary document and may be changed substantially prior to final commercial release of the software described herein.

The information contained in this document represents the current view of Microsoft Corporation on the issues discussed as of the date of publication. Because Microsoft must respond to changing market conditions, it should not be interpreted to be a commitment on the part of Microsoft, and Microsoft cannot guarantee the accuracy of any information presented after the date of publication.

This white paper is for informational purposes only. MICROSOFT MAKES NO WARRANTIES, EXPRESS OR IMPLIED, IN THIS DOCUMENT.

Complying with all applicable copyright laws is the responsibility of the user. Without limiting the rights under copyright, no part of this document may be reproduced, stored in, or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose, without the express written permission of Microsoft Corporation.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.