

**Best Practices for Integrating
Microsoft[®] SoftGrid[®] Application
Virtualization with Terminal Services
and Citrix[®] Presentation Server[®]**

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Introduction

This white paper discusses the use of Microsoft SoftGrid Application Virtualization, specifically, SoftGrid® for Terminal Services (TS), in an enterprise Terminal Services environment and how to use SoftGrid with Citrix Presentation Server in Application Isolation Environments (AIE). SoftGrid for TS provides:

- Policy-based universal access to applications from any source – desktop, web and terminal server – from anywhere, aggregated on a single web page and/or within a Windows desktop.
- Increase the number of applications that can run on a terminal server
 - Non multi-user aware applications
 - Applications that conflict with other applications
- Make more efficient use of a Terminal Services farm (reducing the total number of servers needed)
 - Multiple versions of a single application can run simultaneously on the same server
 - No siloing based on application conflict
 - Dynamic application deployment capacity
- Provide additional management effectiveness that accelerates Terminal Services deployments
 - Reduce scheduled downtime due to installations and upgrades
 - Better user profile management
 - Reduce testing time
 - Application conversion flexibility

In addition, this document points out situations where SoftGrid for Windows Desktop may be of use to complement server-based computing deployments for applications that are normally installed locally by extending the range of applications that can be centrally deployed and managed.

This document will discuss SoftGrid-TS's benefits and the technical background of the product. Case studies, conclusions, and recommendations are also provided.

Product Overview

SoftGrid is an application management platform that makes software instantly available and easy to use. SoftGrid includes application virtualization, policy-based management and dynamic streaming delivery; it changes applications into on-demand, centrally managed virtual network services that no longer need to be installed. The result is a highly scalable software environment that is securely deployed, managed and immediately available anywhere in the world at a fraction of traditional IT investments.

SoftGrid provides on-demand deployment of any application to terminal servers, eliminating the need to pre-populate terminal servers with applications. SoftGrid does this by deploying the application from the SoftGrid server to the terminal server when the Citrix ICA client requests a particular application. More importantly, the application executes inside a virtual environment. The sandbox enables most non-TS compliant applications to work on TS, and greatly reduces application conflict. SoftGrid-TS provides key benefits through two underlying technologies: "on-demand" application code delivery and the protective application sandbox called SystemGuard™.

A SoftGrid-deployed application is not installed on a target server. The application is delivered in ordered pieces whenever there is demand. This network delivery only occurs once. SoftGrid caches the application for all subsequent use.

SystemGuard is a technology that greatly reduces multi-user execution issues and application conflict. It also enables the “skipping” of an application’s installation phase and prevents the application from altering the operating system. SystemGuard’s virtualization enables SoftGrid to run multiple versions and configurations of the same application simultaneously on a single machine.

Reasons to Consider SoftGrid/Terminal Services Integration

SoftGrid allows more applications to run on Terminal Services, creates certain server farm efficiencies, and improves the management of applications.

More Applications

As customers move to centralize their Windows applications via Terminal Services, some of the biggest issues that they face are as follows:

- **DLL Hell:** Applications that conflict with each other on the same server;
- **Multiple versions:** Inability to run different application versions on the same server;
- **Multiple configurations:** Running the same application with different configurations;
- **Non-SBC applications:** Centralizing applications normally installed locally even though a TS environment is used

Technically, applications can interact with Windows in a variety of ways that lead to incompatibility issues. Applications may “misuse” HKEY_LOCAL_MACHINE Registry Settings, which will typically limit them to running only one instance of the application per server – when on a terminal server we need to run perhaps hundreds of instances. In other instances, an application installs a specific version of a DLL into a system folder while another application overwrites that DLL with a different version, causing the first application to execute improperly. For most applications, the installation of a different version will remove or conflict with prior versions.

SoftGrid resolves these issues by running each application within its own virtual environment providing, for example, a virtual registry. An example implementation is the need to support legacy applications, like custom Microsoft Access 2003 databases, in addition to the company’s current standard, Microsoft Access 2007. With SoftGrid, both versions can run on the same machine. A PeopleSoft (PS) environment represents another example where a user needs to access PS HRMS and PS Financials from a single machine. A PS client can only point to one database. Using SoftGrid, a user can run two simultaneous copies of PS, each one pointing to a different database.

As companies migrate their applications to a server-based computing model they are discovering that a small percentage of their applications are not functionally ideal for that environment. The following are some examples of these applications:

- Computer-based training that utilizes video and audio and other multimedia applications;
- High-end engineering applications that may be CPU intensive or use sophisticated graphic or 3D modeling applications (e.g. AutoCAD® 2002, Visual Nastran 2002); and
- Applications that utilize certain USB or other devices.

SoftGrid extends the centralized management of these applications using SoftGrid for Windows Desktops (SoftGrid-WD). For SoftGrid-WD, applications execute on the local desktop machine. From the same set of

SoftGrid servers, companies can deploy and centrally manage applications to both terminal servers and Windows desktops.

Server Farm Efficiency

By deploying SoftGrid within a terminal server and Citrix Presentation Server environment, the following benefits can be achieved:

- **Simplify farm design:** Simplify Terminal Services farms by reducing the number of server silos.
- **Use resources efficiently:** Better utilize server resources by reducing the number of servers.
- **Increase speed of delivery:** Eliminate the need for integration testing of different applications on the same terminal server and increase the speed of delivery for new applications.
- **Actively manage dynamic capacity:** Provide dynamic capacity management and increased redundancy since any SoftGrid-enabled applications can run on any of the terminal servers.
- **Reduce scheduled downtime:** Reduce scheduled downtime by eliminating the need to take terminal servers offline to deploy new applications.

In many instances, in order to deal with some of the application issues listed above, customers have deployed server silos (also referred to as farms or Load-Balanced Groups). Siloing is the concept of segmenting the terminal server farm into groups of servers that are identical to each other in configuration and installed applications in order to achieve application segregation.

Unfortunately, siloing often leads to underutilize terminal servers. For example, an administrator may set up two servers (one for redundancy) for a new application because of application conflict with existing applications or the other servers. Due to the lack of time to conduct regression testing with existing applications, some companies have chosen to deploy the new application to new servers no matter how few users end up using the application.

With SoftGrid, applications do not need to be installed on dedicated terminal servers. Each server within the TS farm would consist of the following components: Windows 2000 or 2003 Server with Terminal Services and appropriate service pack, Citrix Presentation Server and appropriate service release, and the SoftGrid-TS client. This turns the terminal servers into a dynamic system where any terminal server can be use to run any of the SoftGrid-enabled applications.

Customers may have applications that, at times, require significant short-term capacity. SoftGrid's on-demand dynamic architecture combined with its ability to use any terminal server as a generic resource, fit perfectly with this type of requirement.

One of the biggest issues for terminal server administrators is the ongoing management and maintenance of the Terminal Services environment. They are often asked to deploy new applications in a short time frame and, in a lot of cases, without an adequate test environment. When updating existing applications or deploying new applications, they need to take the terminal servers offline resulting in increased scheduled downtime. And this typically occurs during off-hours or weekends, adding to the TCO.

SoftGrid reduces the need to perform integration testing with other applications, the terminal servers do not need to go offline to deploy new applications, and multiple versions of the same application can execute simultaneously.

Application Management Improvements

Additional benefits of deploying SoftGrid include:

- **Improved profile management:** SoftGrid-TS allows an enterprise to deploy mandatory profile with folder redirection, yet gives users the ability to save their application and user customizations.
- **Increased version control:** Provides the capability to version application updates and quickly rollback application versions without reserving additional hardware.

Another issue that administrators face with a Terminal Services environment is the management of user profiles. To allow users' application and personal settings to persist across multiple terminal servers within the farm, most customers deploy roaming profiles. Unfortunately, administrators have experienced several issues with roaming profiles including profile corruption, slow login time, size of profiles, and last session to logout (for additional information on profile management, refer to the Citrix Consulting Services' whitepapers, "Top 10 Issues Encountered During Infrastructure Assessments" and "Policies and Profiles Standards.).

Currently, Citrix recommends that administrators implement mandatory profiles with folder redirection, if possible. Mandatory profiles are not susceptible to corruption, are typically smaller in size, and are more stable. Unfortunately, most administrators cannot implement mandatory profiles because it does not allow users the ability to save application and personal settings once the user has logged out of a session.

With SoftGrid, administrators can implement mandatory profiles and experience all of its advantages, but still allow users to save application and personal settings. This is accomplished by implementing the folder redirection of the "Application Data" folder in conjunction with a mandatory profile. When a user executes a SoftGrid-enabled application within a terminal server and makes application customizations, SystemGuard will intercept the calls and write the settings to a file within the "Application Data\SoftGrid Client" directory. With the redirection of the Application Data folder to the user's home directory, these settings will be available across Citrix sessions.

SoftGrid gives the administrator tremendous flexibility in deploying new versions, updates, and terminating applications. An administrator can deploy a new version of an application while still running the old version and allow the users a transition period to migrate to the new version.

SoftGrid/Citrix AIE Integration

Citrix Presentation Server includes technology called Application Isolation Environments (AIE). It is designed to help tackle the application conflict issues that result from installations. AIE is redirection technology and does not virtualize applications. This repairs some of the conflict problems after applications have been installed, however this doesn't solve all the issue SoftGrid addresses

Because AIE requires application installation, administrators must still contend with issues including:

- Servers must be taken off line while installing applications
- Regression testing is required to determine which applications to redirect
- Increased image size and complexity as more applications are installed to a single server
- Not all applications work in isolation environments:
 - Office XP and 2003 (because of COM issues), Adobe Acrobat 7, Java (web apps)
 - Applications with reboots in the installer & Wildcard redirection
 - Does not allow administrators to publish different web-based applications with different dependencies on the same server

- Supports server-based, not desktop, applications
- No application replication or disaster recovery because applications are not reduced to data (as they are with application virtualization)

IT Organizations that implement with AIE use SoftGrid to prevent the installation-related problems that AIE is unable to help with. Administrators leverage SoftGrid just as they would without AIE to: accelerate application deployment, increase the number and type of applications they can run in their environments, improve server farm efficiency, and improve overall application management.

SoftGrid Implementation Guidelines

Below are general guidelines for deploying SoftGrid within a Terminal Services environment and achieving simplified application deployment and integration.

Initial Deployment

1. SoftGrid 4.1SP1 works with Windows 2003 terminal services and Windows 2000.
2. SoftGrid-TS works with MetaFrame XP and Presentation Server families of products: SoftGrid does not support earlier MetaFrame versions.
3. Sequence one or more applications: The Sequencing produces several files: the .SFT file contains the application assets broken into blocks and a small .OSD file that is an XML-based launcher file that, among other things, points to the .SFT file. Most Windows applications can be sequenced on a Windows 2000 Professional and the resulting package can be deployed to both terminal servers and Windows desktop.
4. Deploy one or more SoftGrid servers: A single SoftGrid server on standard dual processor server hardware can support more than 500 concurrent connections. It is recommended that customers deploy at least two SoftGrid servers in order to eliminate a single point of failure.
5. (Optional) Store the sequenced applications (the SFT files) on a centralized file server or enterprise storage and configure all SoftGrid servers to reference that network share. Alternatively, a copy of the SFT files can be stored locally on each SoftGrid Server.
6. Install SoftGrid Management Server and the SoftGrid data store on a dedicated Windows 2000 or 2003* Server.
7. Deploy a standard terminal server image consisting of Windows 2000 or 2003 Server with Terminal Services with appropriate service pack, Presentation Server with the appropriate Feature Release, and the SoftGrid Client for Terminal Services.
8. Determine and deploy application icons for the SoftGrid-enabled applications. Icons can also be deployed to users via Program Neighborhood, PN Agent or Web Interface as published applications.

New Application

1. For a new application, sequence the application and deploy the sequenced file per the steps in the previous section. Configure the application, add users, and deploy the icons per the steps in the previous section.

Application Update

1. For an application update, one can start with original application sequencing (as input to the Sequencer), apply the update, and the Sequencer will produce a new SFT file. This is the Package Upgrade feature of the Sequencer. Copy the new SFT file to the content server.

2. Customers also have the options to deploy both versions simultaneously and allow users a transition period in which to begin using the new version.

Profile Implementation

1. Create and deploy a mandatory profile for users logging into the terminal servers.
2. Implement a policy to redirect the user's Application Data folder to a network share (e.g. the user's home directory) Customers now have the benefits of mandatory profile and yet still provide their users with the ability to save application and personal customizations via the "SoftGrid Client" directory under the redirected "Application Data" folder.

SoftGrid for Windows® Desktops

1. Deploy the SoftGrid client to the Windows workstations that need to run applications locally.
2. Sequence the applications on a clean machine with the same operating system (e.g. Windows 2000 Professional, Windows XP and Windows Vista as the target devices.)
3. Deploy the sequence files to the SoftGrid server.
4. On a web server, create an OSD virtual directory.
5. Place the .OSD files targeted for Windows workstations within the OSD virtual directory.
6. Using the MetaFrame Secure Access Manager Published Content feature, create a Published Application by specifying a URL (e.g., <http://webserver/osd/autocad2002.osd>) for each application that will be executed locally on each workstation.
7. Users can access both Terminal Services applications and local SoftGrid-enabled applications from a single point of access, MetaFrame Secure Access Manager. A SoftGrid CDA for MetaFrame Secure Access manager (formerly NFuse Classic and Elite) has also been developed. Customers can use a single point of access to both Terminal Services applications and SoftGrid-WD applications.

Case Studies

Several case studies have been written with respect to the solutions. Below is a summary of several. Please see <http://www.microsoft.com/casestudies/> for more information.

Russell Investment Group

- Situation:** Russell IT manages 300 Applications for 1,700 global employees. They wanted to drive standardization and reduce IT costs throughout the organization. They needed to eliminate application conflicts, reduce server siloing and enable a unified computing environment.
- Objective:** Optimize server utilization; reduce server proliferation for more efficient servicing of diverse user base.
- Solution:** SoftGrid enables Russell to run any application in a Citrix environment. By eliminating conflicts, they can run more applications on each server without siloing; resulting in a 40% reduction in application servers and significant IT cost savings.

"SoftGrid enabled a paradigm shift in our application delivery and support. Moving to a virtualized system helped us adopt a proactive, problem-management based framework, rather than being reactive. It's a much more dynamic way of operating and enables us to be much more agile."

Gregory Nelson, Senior Technology Consultant, Russell Investment Group

Scotland's Dundee City Council

- Situation:** Dundee City Council's IT division manages 8,000 desktops within Council departments and in the schools. It wanted to reorganize itself from a departmental structure into a unified, more customer-responsive entity. The IT infrastructure was critical to facilitating this transformation. However, instead of enabling it, it was slowing it down.
- Objective:** Transform a costly, departmentally-run IT infrastructure into an efficient, centrally managed environment
- Solution:** SoftGrid enables Dundee to save more than \$290,000 U.S. every year on IT support, replacement costs, server consolidation and license reductions. Dundee turned IT into a centrally managed, reliable environment; accelerated deployments by 50% due to eliminating application conflicts, regression testing and desk-side installations; and consolidated servers by 60%.

"SoftGrid is a truly unique solution. We can implement and migrate new users faster, deploy applications very efficiently, and invest our savings in critical, strategic IT projects."

- - Ged Bell, Head of Technology, Scotland's Dundee City Council

Conclusions and Recommendations

SoftGrid simplifies the deployment and management of applications to terminal servers. With its SystemGuard™ technology, SoftGrid greatly reduces application conflicts and allows multiple versions of the same application and most multi-user incompatible applications to run within a terminal server. It also delivers applications on-demand and thus eliminates the need to pre-populate these servers with applications, greatly simplifying terminal server farm management.

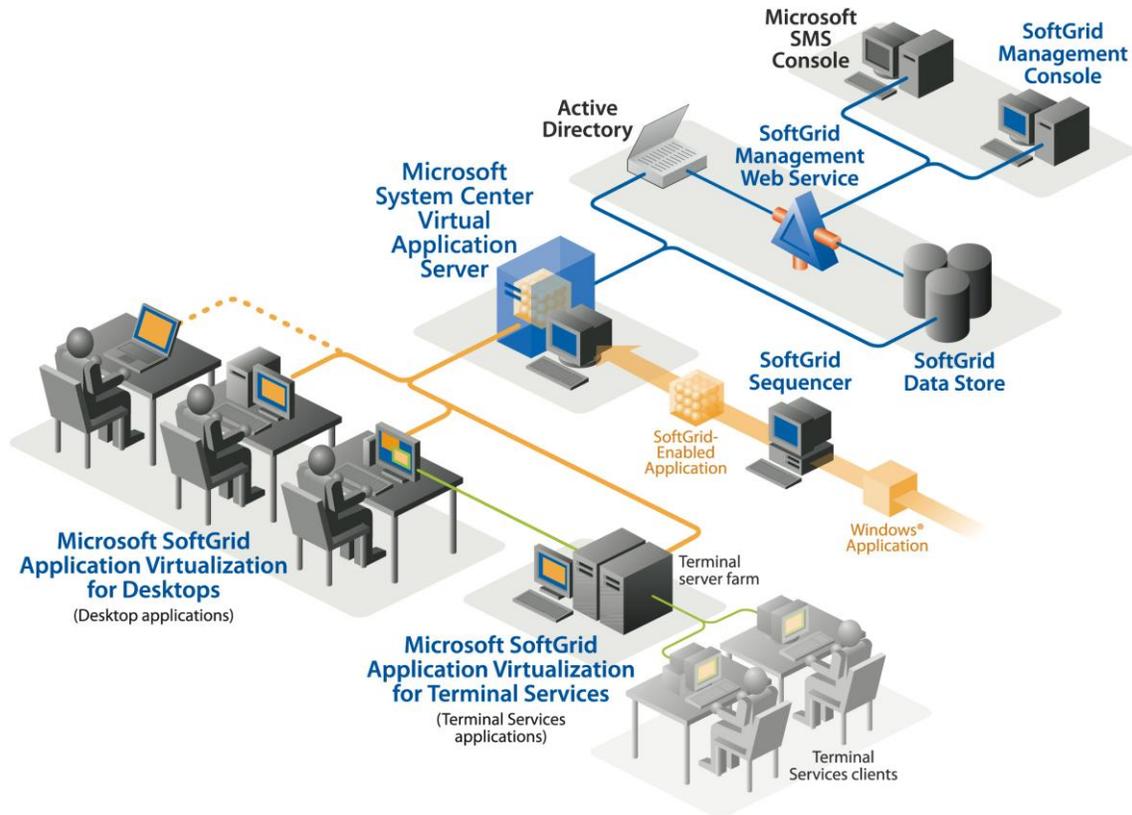
SystemGuard provides a virtual environment, within which an application executes. This virtual environment sits between the application and the operating system and isolates the application from other applications. Although running locally on the Citrix server, the 'SoftGrid-Enabled' application is never installed on the server.

Certain customer red flags, listed below, may lead to instances where the combination of Terminal Services and SoftGrid can solve application deployment and management issues:

- Applications that only work with one user instance on a terminal server
- Applications that interfere with each other on the same server
- The need for multiple versions of an application on the same server
- The need to run two instances of the same application (for one user) with different configurations
- Applications that have frequent update needs
- Applications that are normally installed locally even though a TS environment is used

Appendix: The SoftGrid Platform

The SoftGrid Platform turns applications into centrally managed virtual services that are delivered on-demand; it includes the following key technologies:



The System Center Virtual Application Server delivers applications on-demand to SoftGrid clients. The Server authorizes and authenticates requests and provides the necessary security, metering, monitoring and data gathering complete with centralized operations support.

The SoftGrid Management Web Service is the central application for setting up, administering and monitoring one or more SoftGrid Servers. Administrators can also use the service to assign user and organizational unit's application rights and software licenses. In addition, SoftGrid supports Active Directory.

The SoftGrid Sequencer is a wizard-based tool that automatically turns Windows® programs into virtualized applications for on-demand delivery without changing their source code.

The SoftGrid Clients are small programs that reside on desktops, laptops and terminal servers. The clients communicate and authenticate with the SoftGrid Server, receive the application code and allow it to be locally and securely executed – using SoftGrid's SystemGuard.

Technical Overview

The following steps detail application use within SoftGrid deployment:

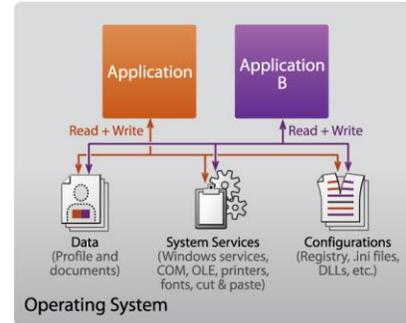
- **Sequencing:** First, applications are packaged for the SoftGrid environment through a one-time, off-line process called Sequencing. The SoftGrid Sequencer software, installed on a clean machine, monitors and captures all the components installed during the setup of an application. The Sequencer then breaks the application into ordered blocks (which are intelligently delivered to the terminal server in a later step). The Sequencing process results in several files: the .SFT file contains the application assets broken into blocks and a small .OSD file that is an XML-based launcher file that, among other things, points to the .SFT file. These files are then copied to the SoftGrid server. An administrator logs into a SoftGrid Management Console, creates an entry for the application and assigns the applications to any number of users or groups of users.
- **Application Icon Deployment:** There are multiple ways to deploy the icons to the terminal servers.
 - Desktop Integration. Customers can utilize the SoftGrid client to deploy icons to the Start Menu and Desktop within the terminal server desktop.
 - Published Applications. Customers can also deploy SoftGrid-enabled applications as Published Applications by publishing the SoftGrid client passing the application's OSD file (a SoftGrid file that points to the sequenced application) as the parameter. These Published Applications can be accessed using the standard Citrix methods such as MetaFrame Secure Access Manager or Program Neighborhood.
- **First Launch (on-demand application code delivery):** A user executes an application using one of the icon deployment methods described above. The launch, however, invokes the SoftGrid client, which resides on the terminal server. None of the application exists on the terminal server at this point. The SoftGrid client authenticates the user's authority to access the application and then delivers a portion of the application to the terminal server, typically 20-40%. This portion is enough so that the application can launch and the user can immediately begin using the application. The application, in fact, executes on the terminal server in the SystemGuard environment but is not installed locally. Also, the user is not exposed to any of the application installation. Once delivered, the application is cached on a server's local disk for subsequent use. There is also an option to pre-cache the applications on the servers.
 - *Caching:* The SoftGrid client caches the application blocks on the terminal server local disk. Subsequent requests for application blocks are satisfied via the cache allowing the application to launch as fast as if it were locally installed. Code is never delivered twice. The cache persists across reboots and is accessed by all users logging into the terminal server.
- **Execution within SystemGuard:** Once delivered to the terminal server, the SoftGrid client builds the virtual environment that includes program files, registry settings, environment variables, fonts, etc. used by the application (i.e. captured during sequencing) and then launches the application. See more on SystemGuard in the following section.
- **Subsequent Use of Application:** For any subsequent user who accesses the same application on that server, SoftGrid will first authenticate and then launch the application from cache.
- **Application Updates:** To deploy an application update, the administrator simply opens the SFT file in the Sequencer, applies the update and moves the output to the SoftGrid Server – and that is it. No scheduled downtime. No series of installations.

SystemGuard™

The heart of the SoftGrid platform is SystemGuard™, a technology that enables applications to run without the need to install them locally – and without altering the host operating system. Because applications bring their own set of configurations and run within a protective virtual run-time “sandbox,” there is no dependency or effect on the configuration of the machine running them. As a result, SoftGrid allows any application to run side-by-side with any other application on the same computer without any conflicts. However, since applications execute locally, they run with full performance, functionality, and access to local services – including cut and paste, OLE, printing, network drives and attached devices.

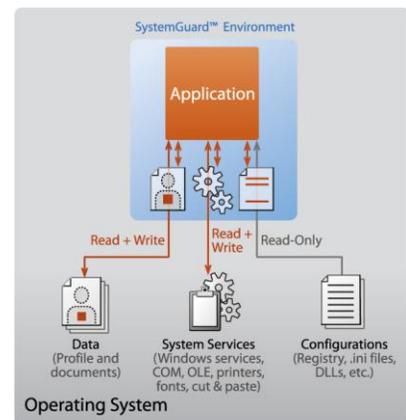
Standard Operating System Environment:

Under standard environments, applications hard-code their settings onto the host operating system. Other applications’ settings can be overwritten, causing them to malfunction or break. This is the key reason that enterprises must spend hours testing each application against every other to make sure that they do not conflict before committing applications into production environments.



The Virtual Application Environment:

With SystemGuard, each application executes in a way so that only it sees its own settings, leaving the host OS and existing settings unaltered. SystemGuard provides the most extensive application virtualization on the market. In addition to virtualizing Windows Services, it virtualizes per user, per application instance, every critical application component.



Side-by-Side Application Virtualization:

Each SoftGrid-enabled application brings down its own set of configurations and can run side-by-side without the settings conflicting with each other – or the host operating system. Despite this separation, inter-application communication with other SoftGrid applications and those installed locally is preserved, allowing for cut and paste, OLE, and all other standard operations.

