

Choosing the Best Fit for Your Client/Server Architecture: SAS® Studio versus SAS® Enterprise Guide®

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ABSTRACT

SAS® is often deployed in a client/server architecture in which SAS® Foundation is installed on a server and is accessed from each user's workstation. Many system administrators prefer that users not log on directly to the server to run SAS, nor do they want to set up a complex Citrix environment. SAS client applications are an attractive alternative for this type of architecture. But with the advent of multiple SAS® Studio editions and ongoing enhancements to SAS® Enterprise Guide®, choosing the most suitable client application presents a challenge for many system administrators.

To help guide you in this choice, this paper compares the administration of three SAS Foundation client applications that can be used in a client/server architecture: SAS Enterprise Guide, SAS® Studio Basic, and SAS® Studio Mid-Tier. The usage differences between SAS Studio and SAS Enterprise Guide have been addressed elsewhere. In this paper, we focus on differences that pertain specifically to system administration, including deployment, maintenance, and authentication. The information presented here will help system administrators determine which application best fits the needs of their users and their environment.

INTRODUCTION

Over the past 40 years, SAS has endeavored to provide ever more technologically advanced graphical user interfaces for its loyal customers. SAS Enterprise Guide, a long-popular and widely used SAS application, provides users with a powerful point-and-click interface and plenty of wizard-based options that help users to quickly and easily analyze data and generate reports based on that analysis. SAS Enterprise Guide is a Windows thick client application, meaning that it must be installed on a Windows workstation. SAS Studio—the latest addition to the SAS graphical user interfaces—is a web application that is considered a thin client because it requires only that workstations have a modern web browser installed. Although web applications are the hottest trend in enterprise solutions, native thick client applications still have their place, and SAS Enterprise Guide continues to add new features with every major release.

The purpose of this paper is to discuss the system administration aspects—deployment, maintenance, and authentication—of SAS Enterprise Guide, SAS Studio Mid-Tier, and SAS Studio Basic. Each of these applications has a range of options for configuration and management, which are presented here to help system administrators determine the best application or combination of applications for their specific environment, their users, and their enterprise technology infrastructure.

Products and approaches that might be of interest but which are not discussed in this paper include SAS Studio Single User; SAS client solutions that are included with SAS solutions; and third-party virtualization software such as Citrix.

SAS Studio Single User is not discussed in this paper because it cannot be configured to host multiple users. SAS Studio Single User is a Windows web application interface intended for single user workstation deployments and is installed by default on all Windows SAS Foundation installations.

Also not discussed in this paper are the SAS client applications included with SAS solutions. See the documentation for your specific solution for more information about available client applications.

Lastly, this paper does not address the use of third-party virtualization software like Citrix. However, this type of configuration is supported. If your users need some of the awesome features in their desktop SAS Enterprise Guide installations and you want to minimize maintenance of multiple workstations, consider a virtualization approach as outlined in the SAS Global Forum 2013 paper "[Tips and Techniques for Deploying SAS® in an Application Virtualization Environment](#)."

SYSTEM REQUIREMENTS AND DEPENDENCIES

Before selecting the software to use at a site, you need to ensure that the environment to which you plan to deploy the software is supported. Here, we briefly review the system requirements for the server and client machines as well as any dependencies required for SAS Enterprise Guide and SAS Studio Mid-Tier and Basic Editions.

SERVER REQUIREMENTS

All of the client applications discussed in this paper require that an instance of SAS Foundation has been installed on the server machine in the environment. SAS Foundation (and related products, such as SAS/GRAPH® and SAS/STAT®) must be installed on an operating system supported by the client application in order to enable users to submit SAS code for processing and receive results after the processing has completed.

SAS Enterprise Guide can connect to SAS Foundation installed on the three operating systems supported by SAS: Windows, UNIX, and mainframe (z/OS) operating systems. The server system requirements for SAS Foundation are discussed in depth in the system requirements documentation for the operating system and SAS version, which is [available on the SAS Support website](#). SAS Enterprise Guide does require network connectivity to submit code to the server. However, the client can still be used to write SAS programs even if connectivity is not available. SAS Enterprise Guide was architected for best performance over a local area network (LAN); performance might be slower if implemented on a wide area network (WAN).

SAS Studio Mid-Tier and Basic Editions are also supported on the same three major operating systems—Windows, UNIX, and z/OS. Since SAS Studio is a web application, the host servers need to have continuous intranet connectivity to the client machines—there is no way to run the SAS Studio client in offline mode. One of the benefits of the SAS Studio web applications is that they can be configured to work in a WAN, and as such can support geographically distributed teams.

SAS Studio Mid-Tier Edition uses the SAS Web Infrastructure Platform on the SAS middle tier and is installed as part of many standard deployment plans.

SAS Studio Basic installs and configures a small web application server and object spawner on the target machine in order to function as a stand-alone web application that does not require a SAS® Metadata Server or middle tier—nor does it require any additional licensed SAS software. SAS Studio Basic is delivered free with all SAS Foundation orders and can be deployed with or without a plan file; in either case, the application must be configured as a separate step from the installation.

It is important to understand that performance of processing SAS code from the client applications relies on the configuration and tuning of the SAS Foundation deployment on the server. Therefore, if your users complain about delays in receiving results on their client application, submit the same code directly to SAS Foundation on the server to see if the performance issue is reproducible when the client application is no longer part of the equation.

Both SAS Enterprise Guide and SAS Studio Mid-Tier Edition require that an additional SAS product be licensed for the site—SAS® Integration Technologies—which has an additional cost associated with it. SAS Enterprise Guide and SAS Studio Mid-Tier Edition also both require a SAS Metadata Server instance, which is used to authenticate users. However, there is likely no additional cost for the metadata server, depending on the type of software application you have purchased.

CLIENT REQUIREMENTS

While SAS Enterprise Guide has more client requirements, there are also benefits. SAS Enterprise Guide is a native Windows client application and is not supported on other operating systems. It is supported for installation on 32- and 64-bit Windows operating systems. See this [SAS Enterprise Guide products](#) page to see the system requirements for the specific SAS Enterprise Guide version and specific supported Windows operating systems. The Windows machine running SAS Enterprise Guide must have

400 MB of available space for installation plus at least 2 GB RAM. Although this represents much greater client system requirements than SAS Studio, the benefits of a native desktop application include:

- A rich and highly responsive user interface
- Excellent performance within the user interface because everything the application uses is installed locally on the same machine
- Offline capability; users can still create/modify SAS programs and view accessible SAS data sets

Supported browsers include:

- Microsoft Internet Explorer 9, 10, 11
- Mozilla Firefox 21+
- Google Chrome 27+
- Apple Safari 6.0+ (on Mac OS X)

Note: Browsers on tablets and other mobile devices are not currently supported.

SAS Studio Mid-Tier and Basic Editions use a web browser as the client software. As such, client connections to these applications are supported on a wider variety of operating systems, including Windows, UNIX, and Mac OS X. The only software required on the client machines for either SAS Studio edition is a modern web browser, which is usually already installed.

A potential downside to the web application is that SAS Studio does not offer an offline mode, which means there is no way to access the SAS Studio interface to write code without an active network connection to the server. This means that client machines must be connected to the server in order to write and submit SAS code from the SAS Studio interface.

Table 1 shows supported operating systems and dependencies for each application.

	SAS Enterprise	SAS Studio Edition	
	Guide	Mid-Tier	Basic
Server-Supported Operating Systems			
Windows	Yes	Yes	Yes
UNIX / Linux	Yes	Yes	Yes
Mainframe	Yes	No	No
Client-Supported Operating Systems			
Windows	Yes	Yes	Yes
UNIX / Linux	No	Yes	Yes
Mainframe	No	No	No
Mac OS X	No	Yes	Yes
Additional Required SAS Software			
SAS Integration Technologies (additional cost)	Yes	Yes	No
SAS Metadata Server (no additional cost)	Yes	Yes	No

Table 1. System Requirements Quick Reference

DEPLOYMENT CONSIDERATIONS

One of the first things that a SAS system administrator should do when selecting a SAS configuration is to consider the capabilities of the installation process. For example, can it support both quiet and interactive installations of the server and client software? Is a stand-alone installer available? This section details the deployment functionality available for SAS Enterprise Guide and SAS Studio Mid-Tier and Basic Editions.

In regard to deployment, the most significant difference between the two SAS Studio editions and SAS Enterprise Guide is that, as web applications, SAS Studio editions are deployed to only a single machine—the server hosting SAS. Workstations connecting to SAS Studio already have a modern, supported web browser installed, which is all that is needed to connect to the server hosting SAS. SAS Enterprise Guide, on the other hand, is a native workstation client that must be installed separately on each workstation. SAS provides several approaches to make deployments to large numbers of client workstation machines more feasible.

All three applications are, primarily, installed from a SAS® Software Depot via the SAS® Deployment Wizard. However, SAS Enterprise Guide can also be deployed via a stand-alone Windows Installer package (available in some server-based depots). While SAS Enterprise Guide is a Windows client, it can be installed from UNIX or z/OS SAS Software Depots. You do not need to download additional software to install the client to your Windows workstation machines.

It is important to know that the stand-alone installer cannot be used interchangeably with the SAS Deployment Wizard. The stand-alone installer does not have the ability to modify the SAS Deployment Registry, which is used by the wizard to ensure the integrity of the deployment. Because of this, if your site elects to use the stand-alone installer to deploy SAS Enterprise Guide, you will always need to use the stand-alone installers. Alternatively, you can use the Check for Updates feature to update the application in the future; this is discussed in the “Maintenance Releases for Your SAS Software” section, below.

The deployment registry is also not updated if SAS Enterprise Guide was deployed using the SAS Deployment Wizard and is then updated using the Check for Updates feature. For more information about using the stand-alone installer, see Appendix A — Independent Installation of SAS Products in the [SAS® Deployment Wizard and SAS® Deployment Manager 9.4: User's Guide](#).

The SAS Deployment Wizard can be run in interactive mode (where an installer is actively responding to prompts in the application), but also offers a “record and playback” option. This option enables you to record a response file that can then be used for silent installations in conjunction with provisioning software. The stand-alone installers make it even easier to quickly deploy SAS Enterprise Guide across many workstations as they can often be used in existing enterprise software deployment solutions for the common Windows Installer package. See “[So Much Software, So Little Time: Deploying SAS® onto Oodles of Machines.](#)”

SAS Studio Basic and Mid-Tier Editions do not offer or need a stand-alone installer because they are installed to only a single machine unless the environment is running a grid. The value of deploying SAS Studio Mid-Tier Edition to a grid environment is covered in-depth in “[Deep Dive with SAS® Studio into SAS® Grid Manager 9.4.](#)”

Table 2 shows the deployment functionality available in each application.

	SAS Enterprise Guide	SAS Studio Edition	
		Mid-Tier	Basic
Deployment Functionality			
Installation required to all client machines	Yes	No	No
Deploy with SAS Deployment Wizard	Yes	Yes	Yes
Silent installation available	Yes	Yes	Yes
Stand-alone installer available	Yes	No	No

Table 2. Deployment Quick Reference

MAINTENANCE RELEASES FOR YOUR SAS SOFTWARE

Your SAS software might be eligible for periodic updates, which are referred to as maintenance releases. Maintenance in SAS updates the software—within the same SAS version—to include new functionality or address software defects. Maintenance updates might include a revised product version. For example, SAS Enterprise Guide 7.12 and SAS Studio 3.5 were released as part of the SAS 9.4 maintenance 3 update (TS1M3). SAS system administrators are often tasked with updating software in order to provide users with the latest functionality. In addition to maintenance releases, SAS software might have hot fixes released, which address specific issues found within the current version. This section outlines SAS software maintenance procedures and reviews the approach for applying hot fixes.

Maintenance for SAS Enterprise Guide client applications must be individually applied to each client workstation on which SAS Enterprise Guide is installed. This can be done in these three ways:

- Interactively, using the SAS Deployment Wizard
- Silently, using the same “record and playback” functionality that can be used during the initial deployment (see “Deployment Considerations,” above)
- With the Check for Updates functionality within the application. Use of this feature requires that the user initiating the update have administrative rights on the machine **or** that the application has been launched “as administrator” (depends on the Windows User Account Control settings on the machine)

One of the unique features of SAS Enterprise Guide as a thick client application is that maintenance can be applied to the client workstations but does not have to be applied to the server on which SAS is configured. SAS Enterprise Guide usually supports connecting to older versions of SAS, but you must confirm this for the specific versions of SAS and SAS Enterprise Guide at your site. (See [SAS Note 34960](#): “SAS® Enterprise Guide® support matrix.”) This means that if there is a new feature in the client that some users want, you can update the SAS Enterprise Guide version for selected users without touching the server components and without modifying the version of SAS Enterprise Guide on other users’ machines. This can also make it easier to test a new version by updating on a few machines before you roll out the update to all machines in the environment.

In contrast, the software for SAS Studio editions resides exclusively on the server, so maintenance only needs to be applied to the server environment, which might be a single machine or multiple machines, depending on the deployment. While this is a simpler process, it also means that SAS Studio must be updated for all users at once, unless there is a separate test/staging server environment.

There are several options for updating SAS Studio edition installations:

- Apply maintenance interactively using the SAS Deployment Wizard.

Note: While silent installations using the “record and playback” functionality of the SAS Deployment Wizard are supported for SAS Studio, there is no value in using it because the update needs to be applied to only a single machine.

- Update the product version within the same SAS maintenance release by applying a hot fix. See, for example, [SAS Note 57898](#): “Upgrade SAS® Studio 3.4 or 3.5 to SAS® Studio 3.6 without upgrading other products.”
- For SAS Studio Basic only, update the product version without updating the SAS maintenance release.

- Maintenance for SAS Studio Is Applied Only to the Servers
- Applying maintenance or hot fixes to SAS Studio Mid-Tier Edition causes the middle tier to be unavailable until the update is complete

It is important to understand that applying maintenance for SAS Studio Mid-Tier Edition requires updating the entire SAS environment, because this edition has dependencies on the SAS Web Infrastructure Platform. Applying maintenance to a planned SAS deployment requires proper planning; see the documentation for your type of deployment for more information. (See the [Maintenance Releases and Product Upgrades](#) web page.)

The SAS Studio Mid-Tier Edition can be updated via hot fix (the second option, above) without impacting the rest of the SAS deployment under the following circumstances:

- There is a more recent product version of SAS Studio within the same SAS maintenance release (for example, SAS 9.4 TS1M3 had two SAS Studio releases available under it—3.4 and 3.5) **and**
- A hot fix has been released to perform this update.

Note that the post-installation steps for the hot fix to update from SAS Studio version 3.4 to 3.5 do require rebuilding and redeploying the SAS Studio Mid-Tier Edition web application, which in turn requires a restart of services on the middle-tier host.

HOT FIXES

In addition to applying maintenance, system administrators also need to consider how to apply hot fixes to address issues that occur between product versions. Because SAS Enterprise Guide is a thick client, you must apply hot fixes to each machine on which the application is installed, whereas with SAS Studio editions, you apply hot fixes only to the server machine. While it certainly seems easier to deploy hot fixes to the server environment, it is important to understand that applying hot fixes to a planned SAS deployment requires forethought and planning in order to ensure the functionality of the system. Because SAS Studio Mid-Tier is hosted on the SAS middle tier, hot fixes applied to this web application require that the entire middle tier be taken offline during the hot fix installation.

Hot fixes for all products can be applied interactively using the SAS Deployment Manager, silently using the “record and playback” functionality available in the deployment manager, or using the SAS Hot Fix Analysis, Download, and Deployment (SASHFADD) tool, which generates a script that can be run silently. The SASHFADD tool can be used to determine what hot fixes are applicable to the product version and SAS version.

However, since the SASHFADD tool uses the SAS deployment registry to determine which hot fixes apply to your deployment, this tool cannot be used to identify hot fixes if you have deployed SAS Enterprise Guide using the stand-alone installer or if you have updated SAS Enterprise Guide using the Check for Updates feature. In this scenario, you can apply hot fixes in one of the following ways:

- Continue to use the Check for Updates feature within SAS Enterprise Guide
- Obtain an updated stand-alone installer from SAS
- Use the appropriate MSP files as outlined in Chapter 4: Finding and Applying Hot Fixes, in the [SAS® Deployment Wizard and SAS® Deployment Manager 9.4: User's Guide](#).

Table 3 provides an overview of the maintenance and hot fix features available in each application.

	SAS Enterprise Guide	SAS Studio Edition	
		Mid-Tier	Basic
Maintenance			
Apply maintenance via SAS Deployment Wizard	Yes	Yes	Yes
Apply maintenance outside of SAS Deployment Wizard	Yes, via Check for Updates functionality within client application	** In some cases, this can be achieved via hot fix	Yes
Update client without updating SAS Foundation	Yes	** In some cases, this can be achieved via hot fix	Yes
Hot Fixes			
Apply interactively via SAS Deployment Wizard	Yes **Not if stand-alone installer or Check for Updates feature were used	Yes	Yes
Supported for use with SASHFADD	Yes **Not if stand-alone installer or Check for Updates feature were used	Yes	Yes

Table 3. Maintenance Quick Reference

USER AUTHENTICATION

All three client options discussed in this paper require that users be authenticated before processing SAS code. This requirement to authenticate users gives system administrators more control over user access, which helps them to ensure resource availability. This section describes the user authentication methods available for SAS Enterprise Guide, SAS Studio Mid-Tier Edition, and SAS Studio Basic Edition.

SAS Enterprise Guide and SAS Studio Mid-Tier Edition authenticate users against the SAS Metadata Server, which can be used to limit access to certain application functions via role capabilities and group-based permissions. SAS Enterprise Guide currently has a much greater degree of granularity available to assign to roles within SAS Management Console. SAS Studio Mid-Tier Edition currently recognizes only a single role, which grants the user the right to log on to the web application.

In addition to being authenticated against the SAS Metadata Server, SAS Enterprise Guide and SAS Studio Mid-Tier Edition users must also have correct host operating-system permissions in order to allow the SAS Workspace Server to spawn sas.exe sessions under the user's operating system ID on the server.

SAS Studio Basic authenticates users against the host operating system rather than the SAS Metadata Server, so the additional step of setting up users in metadata is not required for this client deployment. However, all users of SAS Studio Basic must be set up with the correct permissions on the host operating system. (For example, in Windows, user ID must be given the "log on as batch" local privilege.) Users who do not have these local operating-system permissions correctly assigned to their user ID will receive an error when they attempt to log on to SAS Studio Basic.

SAS Studio Mid-Tier provides the ability to configure single sign-on authentication. In this configuration, SAS Studio Mid-Tier uses whatever authentication scheme you have set up in your web environment. For example, if your web environment is integrated with a third-party authentication provider, then SAS Studio Mid-Tier participates in that scheme.

SAS Enterprise Guide provides the ability to configure integrated Windows authentication so that users do not receive a logon prompt when they launch applications. Integrated Windows authentication is a Microsoft technology that generates and validates Windows identity tokens. All participating clients and servers must authenticate against the same Windows domain (or against domains that trust one another).

Security Assertion Markup Language (SAML) authentication is not directly supported within either SAS Studio or SAS Enterprise Guide at this time, but there is a SAS paper that contains an example of implementing an open-source SAML 2.0 authentication module in a SAS 9.4 environment (applicable to SAS Studio Mid-Tier Edition only): "[Federated Security Domains with SAS® and SAML.](#)"

Table 4 shows the types of user authentication available in each application.

	SAS Studio Edition		
	SAS Enterprise Guide	Mid-Tier	Basic
Setup users in SAS Metadata	Yes	Yes	No
Operating System authentication	No	No	Yes
Single sign-on - Integrated Windows authentication support	Yes	Yes	No
SAML	No	** No direct support	No

Table 4. User Authentication Quick Reference

CUSTOMIZATION

SAS users have the ability to customize their SAS environment, and SAS system administrators have the ability to control or restrict that customization. All three of the products discussed in this paper offer ways to customize SAS to varying degrees. As a system administrator, you might need to customize the way that the application displays information to the users, or you might need to limit the extent of customization available to users of your system. This section discusses the various system customization options available in SAS Enterprise Guide, SAS Studio Mid-Tier, and SAS Studio Basic.

SAS CONFIGURATION AND AUTOEXEC

Each of the applications executes SAS code on the SAS Workspace Server. Standard methods of customization available across all applications are to modify the `sasv9_usermods.cfg` file and/or the `autoexec_usermods.sas` file for the workspace server; these files are both located in ***SAS-configuration-directory\Lev1\<Application-Server>\Workspace***. This is a useful feature if your site is interested in using or testing SAS Enterprise Guide and SAS Studio Mid-Tier Edition side-by-side, because it represents a single location where customizations for both applications can be made. The `sasv9_usermods.cfg` is a SAS configuration file in which SAS system options can be modified for workspace server sessions. The `autoexec_usermods.sas` file contains SAS statements that are automatically executed when a new workspace session is started. These files are also available specifically in SAS Studio Basic under the `studioconfig/workspaceserver` directory.

In addition to the workspace server autoexec, there are also individual user-defined autoexec options for these applications. SAS Enterprise Guide provides the ability to set up automatically executable code at the application level (**Tools ► Options ► SAS Programs**) or the project level (Autoexec process flow). SAS Studio Mid-Tier and Basic Editions both offer a single autoexec file per user that can be created, modified, and tested from the SAS Studio web application.

System Options That Are Set Outside of Configuration and Autoexec Files

A few SAS system options are handled a bit differently and need to be set outside of the server configuration or autoexec files. SAS Enterprise Guide in particular has initialization code that it runs when connecting to the SAS server, and options set within this code cannot be modified via the SAS configuration file or the SAS autoexec file. SAS Studio, on the other hand, has moved a few options into the web application's configuration properties file.

In SAS Enterprise Guide, the following options have to be set within the SAS Enterprise Guide user interface:

- VALIDVARNAME (default value is ANY)
- FORMCHAR (default value is |----|+|----+=|-/<>*)
- FMTERR (default value is NOFMTERR)

The above options are modified by selecting **Tools ► Options ► SAS Programs** and then adding a SAS statement to modify the value in **Additional SAS code – Submit SAS Code when server is connected**. Because these are set within the user interface, there is no way to set these values across multiple SAS Enterprise Guide installations systematically:

The following options in the SAS Studio editions can be modified for all users via the web applications `config.properties` file. Note that changes to this file require a restart of the web application server hosting SAS Studio in order to take effect:

- VALIDVARNAME – property is `webdms.defaultVVN` (default value is ANY)
- ENCODING – property is: `webdms.defaultEncoding` (default value is UTF-8)

SAS Studio users also have the ability to set these properties for their own sessions from the **Preferences** menu within the SAS Studio web application user interface.

APPLICATION CUSTOMIZATION

In addition to providing methods to customize SAS processing, these powerful clients also offer many options to customize the application for both end users and system administrators. End users have a variety of application customizations available to them in SAS Enterprise Guide and in both SAS Studio editions. In this section, we focus on the customizations that system administrators can make in order to give end users a productive and efficient SAS experience. As a thick client, SAS Enterprise Guide in particular has a wealth of end-user application customizations available. If your site is considering moving from SAS Enterprise Guide to SAS Studio, make sure you ask your users about their must-have features in order to ensure that similar features are available in SAS Studio.

SAS Workspace Servers do not, by default, allow X commands, which include the SYSTEM function, the X command, shell escapes, and the PIPE option in a FILENAME statement. If users at your site need to use X commands from within their SAS programs, the XCMD option needs to be enabled on the workspace server for both SAS Studio Mid-Tier and SAS Enterprise Guide. You can accomplish this from within the properties for the workspace server in SAS® Management Console. SAS Studio Basic does not currently have a native method to enable the XCMD option, but there is an untested workaround that can be used if needed. Contact SAS Technical Support for more information.

A customization that Windows administrators often want to add is to make mapped drives available. You can do this at the workspace server level, meaning that it can be implemented for both SAS Enterprise Guide and SAS Studio Mid-Tier Edition in one file, adding a **net use** command to the `workspaceserver_usermods.bat` file.

Note: The mapped drive is shown in the `servers` list in SAS Enterprise Guide only if the file navigation on the workspace server is set to `System Root`.

In SAS Studio Basic, the `workspaceserver_usermods.bat` file is located in the `studioconfig/workspaceserver` directory. Here is an example of a **net use** command mapping a UNC path to the Q:\ drive for a Windows environment. Note that you would replace `machine-name\path` with the name of the machine and the path you would like to map the drive to this:

```
net use Q: \\machine-name\path
```

Note: This path is specific to Windows. UNIX servers cannot honor UNC paths, which would need to be represented as another file system.

While **net use** commands are possible to implement, SAS recommends using UNC paths in SAS code to ensure portability. If your users cannot modify their code to remove mapped drive references, the **net use** command is a viable option that enables references to mapped drives in SAS code to work as expected.

Another common request is to make a set of storage locations, or folder shortcuts, available to all users of the application. This feature is not available in SAS Enterprise Guide. In SAS Studio, you can accomplish this by configuring global folder shortcuts, which is outlined in the [SAS® Studio Administrator's Guide](#).

SAS Studio has quite a few options built into the configuration properties that can be modified by system administrators in order to provide the best SAS experience for their users, so be sure you review the full list of configurable properties in the “General Configuration Properties for SAS Studio” in the [SAS® Studio 3.6: Administrator's Guide](#).

Table 5 shows the types of customization that are supported in each application.

	SAS Enterprise Guide	SAS Studio Edition	
		Mid-Tier	Basic
Autoexec – workspace server	Yes	Yes	Yes
Autoexec – project	Yes	No	No
Autoexec – session	Yes	Yes	Yes
Windows mapped drives configurable	Yes	Yes	Yes
Global folder shortcuts configurable	No	Yes	Yes

Table 5. Customization Quick Reference

APPLICATION FEATURES/FUNCTIONALITY

Thus far, the primary focus of this paper has been on the issues that system administrators need to manage. But for end users, the features and functionality available within the application have a greater impact on their SAS coding environment. While this paper cannot provide an exhaustive comparison of the feature sets in each of the applications, the following section does cover some of the key features and differences in functionality between them.

SAS Studio can be accessed from any machine with a web browser and access to the network on which the SAS Studio web application server is hosted. The advantage of this is that users can interact with the same SAS interface from their desktop, laptop, or loaner workstation without having to install any software.

In SAS Enterprise Guide, you can build SAS programs as single program files, or as projects. SAS Studio does not provide the ability to save multiple programs in a single project-type file, but it does offer a process flow interface that you can use to connect individual programs in a manner very similar to SAS Enterprise Guide projects. SAS Studio 3.6 has an experimental feature that extracts process flows from SAS Enterprise Guide project (EGP) files and converts them to SAS Studio process flows when an EGP file is opened. You can also export the code from SAS Enterprise Guide to a SAS program that can be run in SAS Studio.

Stored processes serve a vital function in many enterprise SAS deployments, providing the ability to run SAS programs from a variety of SAS applications for immediate access to reporting and analytics. A stored process is a SAS program that is stored on a server and registered in metadata. SAS Enterprise Guide contains both a development environment to easily create and register stored processes in metadata, and an interface to execute stored processes. The creation, modification, and browsing of stored processes in SAS Enterprise Guide can be controlled via roles.

SAS Studio has an experimental feature to run stored processes, and you can create code using the editor window. SAS Studio, however, does not have a way to register a stored process in metadata from the user interface. Stored processes can be registered in metadata from SAS Management Console.

Versioned code repositories are quickly becoming indispensable for managing programs in an efficient manner, and SAS Enterprise Guide offers a commit feature that integration with common third-party version control software like Git and Subversion (SVN). SAS Studio does not support integration with external version control systems as of the 3.6 release.

Since SAS Studio tasks use the newer ODS Graphics for producing graphical output, the results are better-looking graphs than those produced by SAS Enterprise Guide tasks that use SAS/GRAPH procedures. SAS Enterprise Guide has a wider variety of report options available to users versus what is available in SAS Studio.

As of the 3.5 release, SAS Studio includes developer repositories that enable developers to create and share custom tasks and snippets with other users. Repositories need to be hosted on a web server, but the SAS web server cannot be used for this purpose.

Both SAS Enterprise Guide and SAS Studio offer predefined tasks that provide a user interface to guide users through an analytical process and generate their SAS code. SAS Enterprise Guide has a larger library of tasks shipped with the software, but SAS Studio continues to add new tasks with each major release. SAS Studio tasks are available from within SAS Enterprise Guide. Each application also offers the capability to develop new tasks, and SAS Studio’s developer repositories feature provides native support for sharing custom tasks with other SAS Studio users.

If your site processes large data sets, users might need to view and interact with the data from their SAS coding interface. SAS Enterprise Guide has a fully featured data grid that displays full data sets and allows updates. However, SAS Studio’s data viewer is currently Read-only and loads into memory only 100 rows of data at a time in order to ensure that the web application continues to perform. This is a limitation of web applications in general; one potential workaround is to install the SAS Universal Viewer on workstations so that users can open data locally and view any size data set.

ADDITIONAL RESOURCES

If you are looking for more in-depth information about the features and functionality available in SAS Studio and SAS Enterprise Guide, the following resources delve more deeply into the usage differences between the two applications:

- [“SAS® Enterprise Guide® or SAS® Studio: Which is Best for You?”](#)
- [“Cage Match: SAS Studio versus SAS Enterprise Guide”](#)

Table 6 compares some of the features and functionality available in each application.

	SAS Enterprise Guide	SAS Studio Editions	
		Mid-Tier	Basic
Features			
Save as project	Yes	No	No
Stored process – modify and register	Yes	No	No
Integration with external version control	Yes	No	No
Repositories	No	Yes	Yes
Tasks	Yes	Yes	Yes

Table 6. Application Features/Functionality Quick Reference

CONCLUSION

After all this information, you might be thinking, “What does SAS recommend?” Of course, SAS recommends all of the applications we discuss in this paper, but only you can determine which application is the right fit for your environment, your users, and your infrastructure. Use the information presented here and in the References section to make a critically informed decision in order to provide the best SAS experience at your organization!

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RECOMMENDED READING

- *Base SAS® Procedures Guide*
- *SAS® For Dummies®*

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