

Nuts and Bolts of SAS Patient Safety® User Interface

Jeff Sun, SAS Institute Inc., Cary, NC, USA
Eric Brinsfield, SAS Institute Inc., Cary, NC, USA

ABSTRACT

SAS Patient Safety® combines the advantages of the SAS Information Delivery Portal, SAS Stored Processes, SAS Output Delivery System, JavaScript, Java, and Flex to create an easy-to-use web user interface. Stored processes provide unlimited access to the full capabilities of SAS. As a result, the addition of new statistical analyses or other results to the user interface are completed very quickly.

This presentation will discuss the underlying SAS 9.2 framework used for SAS Patient Safety. Topics include:

- Integrating with SAS security:
 - Registering web application in the metadata
 - Managing the portal page security
- Using Model-View-Controller architecture to manage the workflow:
 - Applying business logic to dynamic view generation
 - Controlling the execution of SAS Stored Processes
 - Automating drill-down
- Customizing the application using SAS9.2 Web Infrastructure Platform (WIP) services/applications for patient safety investigation:
 - Configuration services

INTRODUCTION

As a new solution offering from SAS Health and Life Sciences, SAS Patient Safety performs many functions important for pharmacovigilance and drug safety surveillance. The web-based user interface provides the ease of use for reviewing and investigating safety signals that are generated on a schedule or on-demand.

Using the SAS Information Delivery Portal 9.2, available in SAS Enterprise Business Intelligence (EBI), we took advantage of new integration techniques for web applications within the Portal. Although users can utilize the default capabilities of EBI, requirements may dictate a need to embed custom applications within the SAS Portal environment. We will offer tips on how that works in SAS 9.2.

We explain the use and advantages of the model-view-controller (MVC) architecture used to manage execution of SAS stored processes and to enable workflow. We also discuss the two methods of portlet *customization* used in the SAS Patient Safety solution:

1. Using the portlet customizer window to select the web content at design time.
2. Using the more sophisticated portlet customizer to customize the web content at run time.

Note that this presentation uncovers only one of many features in SAS Patient Safety solution.

ARCHITECTURE OVERVIEW

SAS Patient Safety consists of components that are developed specifically for SAS Patient Safety that sit on top of the SAS Enterprise Business Intelligence architecture and SAS Data Integration. The solution utilizes shared services from EBI and the SAS foundation platform shown in Figure 1. SAS 9.2 technologies enable the use of custom portlets to render a variety of web content generated from external web applications on SAS Information Delivery Portal pages.

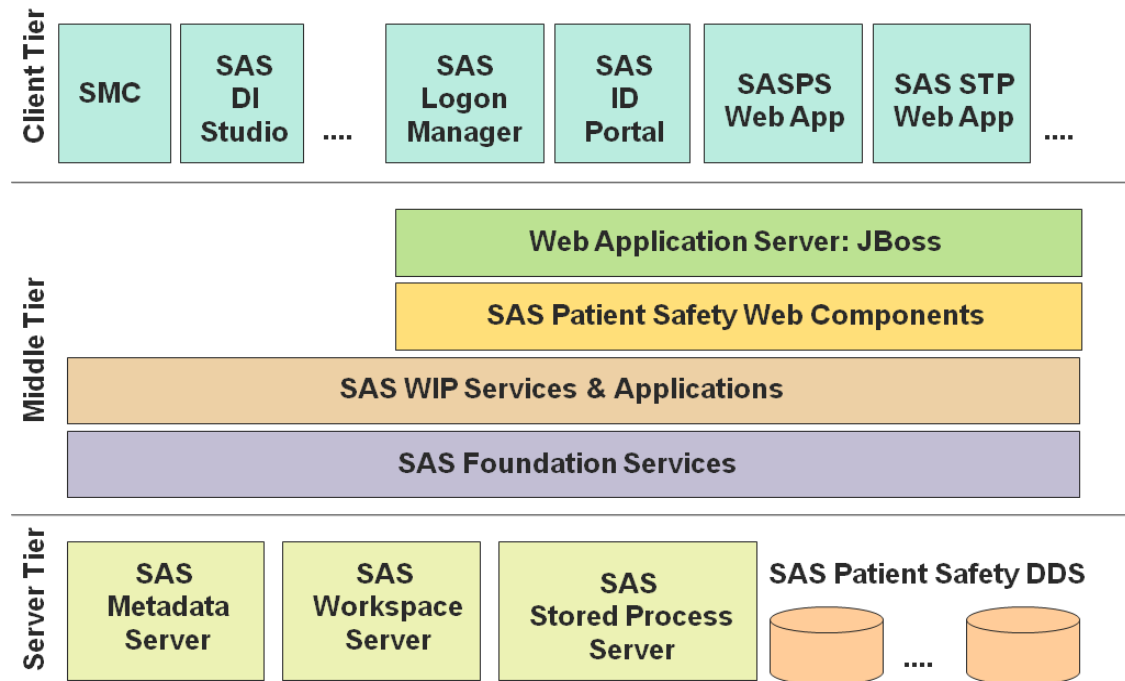


Figure 1 SAS Patient Safety Architecture

Figure 1 abbreviations:

- SMC = SAS Management Console
- SAS DI Studio= SAS Data Integration Studio
- SAS ID Portal = SAS Information Delivery Portal
- SAS STP Web App = SAS Stored Process Web Application
- SASPS Web App = SAS Patient Safety Web Application
- SAS WIP Services & Applications = SAS Web Infrastructure Platform Services & Applications
- SAS Patient Safety DDS = SAS Patient Safety Detailed Data Store

The SAS Patient Safety web application:

- Is based on SAS 9.2 technology and SAS Information Delivery Portal 4.2
- Utilizes a model-view-controller pattern of workflow
- Depends on WIP services and SAS foundation services
- Is registered in the metadata server
 - Enabling use of many services and application provided by WIP
- Generates web contents using data from safety detail data store (DDS) and data marts
- Uses the JDBC driver to connect to the SAS Workspace server to retrieve the data
- Generates some reports and output using SAS stored processes in the SAS stored process server
- Authenticates through SAS Logon Manager to direct a successful logon to the appropriate page

SAS Patient Safety provides many ways to view signal results and drill-down on data behind the signals. To optimize reusability and enable multiple pathways through the system, the model-view-controller was implemented as shown in Figure 2.

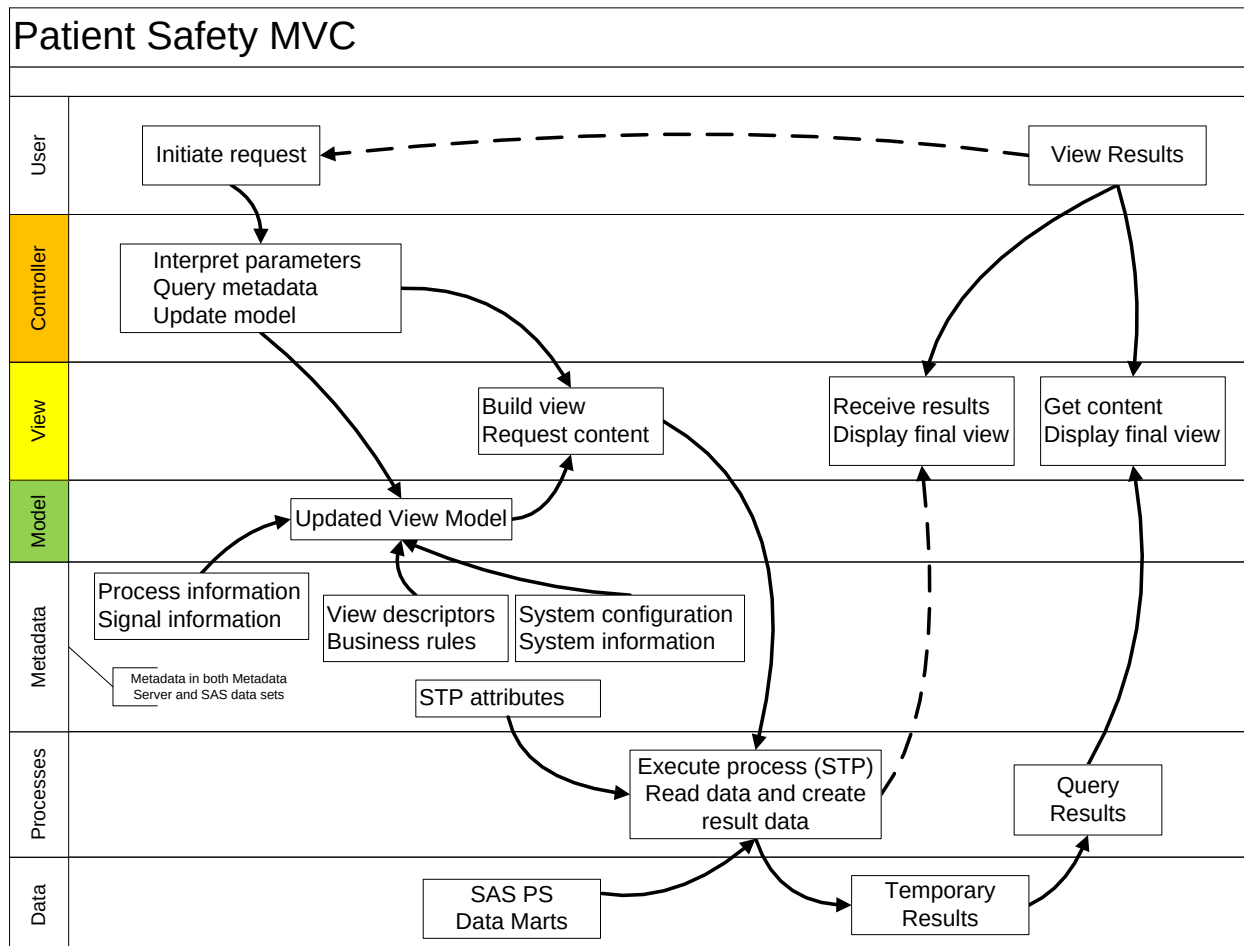


Figure 2 Depiction of MVC

As the diagram shows, we store most metadata in the SAS Metadata Server, but where frequent edits are possible by non-administrators, we store metadata in SAS datasets. When the application is ready to display results, we may utilize two different models to provide content:

1. Pushed directly from the SAS Stored Process
2. Pulled by the client viewer, such as a Flash-based portlet

We support this hybrid model to support backward compatibility as well as flexibility.

In this presentation, we will focus primarily on the creation of custom portlets within the SAS Information Delivery Portal. A portlet is a small object or window on a portal page that is used to receive and display content that is usually dynamically created at run-time. The SAS Patient Safety application creates results that are displayed within the SAS Information Delivery Portal within individual portlets. We use custom portlets to display different dashboard graphs, tables, or alert widgets. To send the dynamic contents to the portal (from an external web application such as SAS Patient Safety), portal integration is needed (see Figure 3).

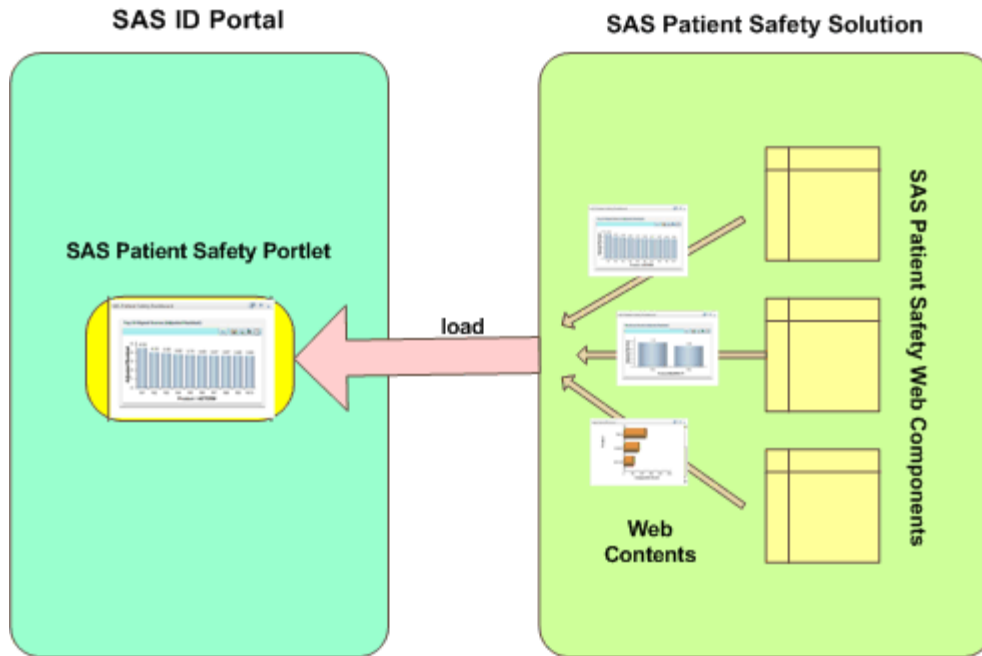


Figure 3 Information flow from application to SAS Information Delivery Portal

CUSTOMIZABLE PORTLETS

Portlet content can be rendered in many ways. For example, we can create:

- HTML-based content
- A bar chart generated from a SAS stored process
- A table from a JSP page
- A Flash-based content from a Flex component in an external web application
- Or other kinds of web contents, such as PDF or plain text files.

In addition, portlet customization is supported in two ways:

1. By customizing the content type.

Portlets expose “type property” so they can be customized at design time. It allows the end user to pick up a particular web content generated from SAS Patient Safety solution web application.

2. By customizing the content itself.

Users are given the ability to customize the web content once the content is loaded into the portlet.

CUSTOMIZING CONTENT TYPE

When the portal starts, portal services load a default or any persisted content into the SAS Patient Safety portlet; for instance, a Flash-based Monitored Events dashboard generated from the SAS Patient Safety solution (see Figure 4).

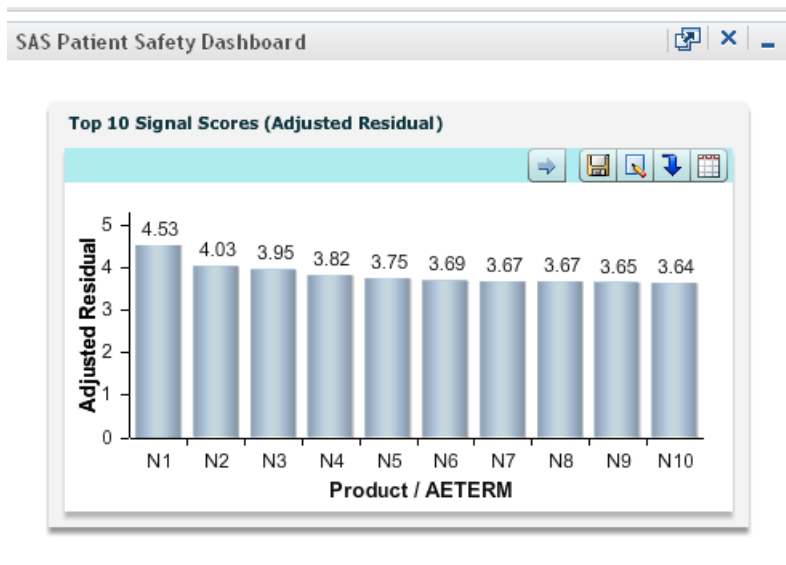


Figure 4 A Flash-based Dashboard Generated from the SAS Patient Safety Solution

The user can customize this by opening the Customize Portlet window (see Figure 5) and selecting different types of content (for instance, another Flash-based top 10 signal scores dashboard) from the drop-down list and load it into the portlet (see Figure 6 and 7).

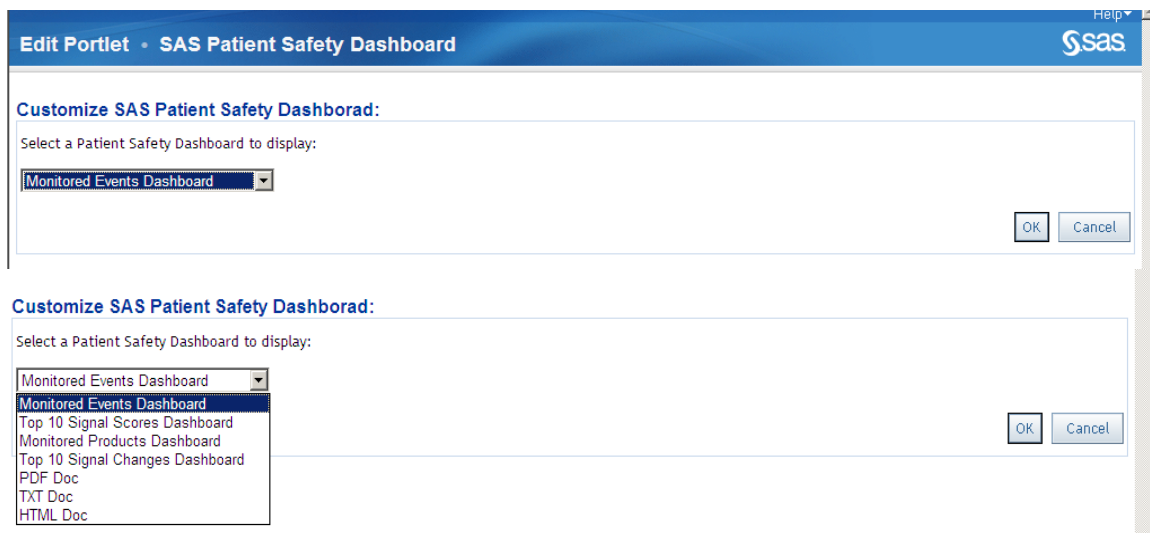


Figure 5 Customizing the Type of Web Contents Displayed in the SAS Patient Safety Portlet

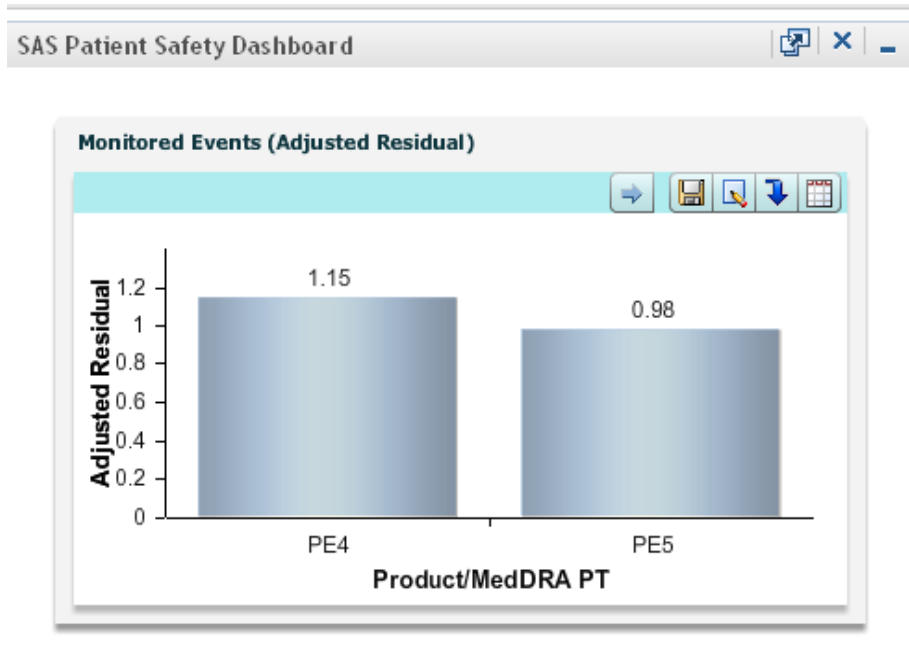


Figure 6 Loading Different Content

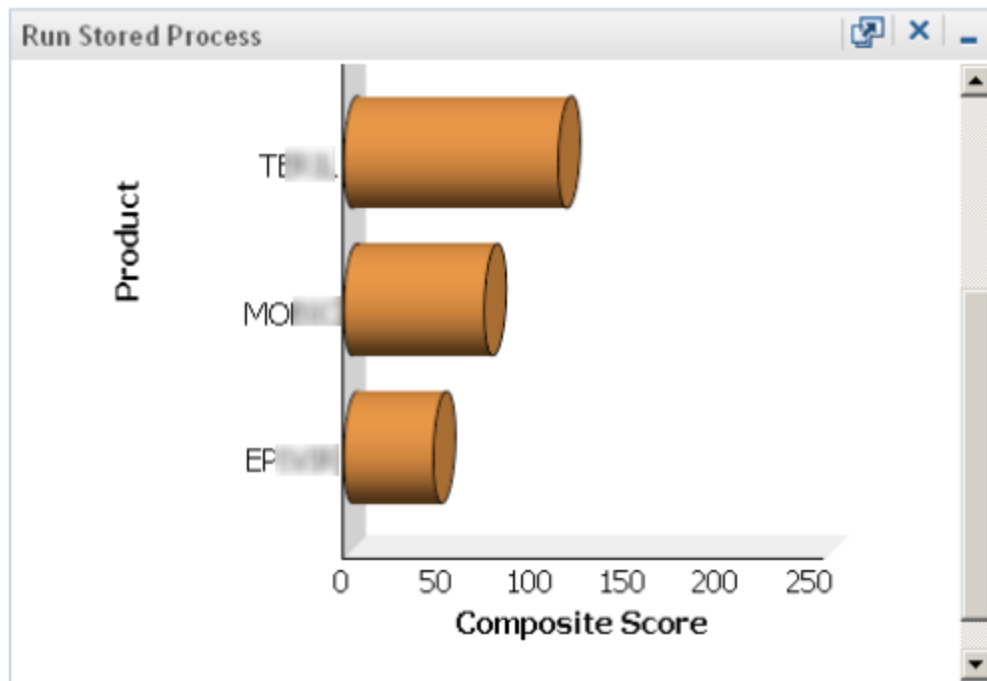


Figure 7 Content Created by a Stored Process with SAS/GRAPH

You can also load other kinds of web contents, such as a PDF file or a plain text file.

CUSTOMIZING CONTENT

After specific web content is loaded into the portlet, users can customize that content by using the built-in customization facility. For example, the flash-based dashboard has a powerful built-in customization facility to allow you display the data in different views.

TECHNICAL HIGHLIGHTS

To implement portlets as described above, the user would complete the following steps.

WEB INFRASTRUCTURE PLATFORM INTEGRATION (WIP)

The SAS Web Infrastructure Platform Integration needs to be used so that common functionalities in SAS 9.2, such as services and applications that provide common infrastructure and integration features, can be consumed in the custom portlet implementation. For more details, please refer to SAS 9.2 Intelligent Platform: Web Application Administration Guide referenced below.

PORTAL INTEGRATION

SAS Patient Safety starts in the SAS Information Delivery Portal. Session context may be passed between the portal and the SAS Patient Safety solution. A set of links to the web contents generated from the SAS Patient Safety solution are dynamically created in the portlet. Instead of taking the user directly to that web content, the request first comes through the SAS Logon Manager to ensure proper authentication. Also, the Logon Manager's redirection capability is used to handle all links from web contents if users want to implement the drill-down ability to drill back into the details in the SAS Patient Safety solution.

IMPLEMENT THE PORTLET AS A LOCAL PORTLET

The portlet is implemented as a local portlet and deployed within the SAS Information Delivery Portal that displays the portlet.

IMPLEMENT THE PORTLET AS AN IFRAME PORTLET

In addition, we create the portlet as an intra frame (iFrame). The Iframe portlet makes it possible to embed another HTML page inside the current page. Furthermore the user can navigate through the embedded page without losing the context of the portal page. The iframe portlet will adjust to the size of the HTML page if that page is hosted in the same server. The browser will take care of adding scrollbars if the embedded page does not fit within the size of the iframe.

The size of the iframe portlet will automatically adjust to the size of the HTML page displayed if this page is in the same server. However, if you manually set the attributes *width* or *height* , the portlet will not automatically resize.

CREATE WEB CONTENTS USED TO FEED PORTLET

As we mentioned earlier, we can render the following type of web content generated from the SAS Patient Safety solution, such as:

- Static HTML/PDF/TXT
- Web content generated by a SAS stored process
- JSP pages
- Flash-based objects

ADD NEW WEB CONTENT TYPE TO THE SELECTION LIST

There are several ways to add a custom web content type and make it available to the portlet customizer window.

- Use an .xml file to provide a list
- Add metadata in the SAS metadata server by using the SAS Management Console

CONCLUSION

In summary, the custom portlet built in the SAS Patient Safety solution provides an easy way to customize the type of web contents a user wants to load into the portlet and be able to customize the web content once the content is loaded into the portlet.

Once set up, this portlet greatly simplifies the integration between SAS Information Delivery Portal and external web application. The end user can feed the portlet with all kind of web contents from external web application.

REFERENCES

[1] Developing Custom Portlets

(http://support.sas.com/rnd/itech/doc9/portal_dev/portlets/dg_portlets.html)

[2] SAS Web Infrastructure Platform

(<http://support.sas.com/documentation/cdl/en/itechov/60309/HTML/default/a003288350.htm>)

[3] Web Application Administration Guide: SAS Web Infrastructure Platform

(<http://support.sas.com/documentation/cdl/en/biwaag/61238/HTML/default/a003267716.htm>)

[4] Foundation Services

(<http://support.sas.com/documentation/cdl/en/itechov/60309/HTML/default/a003260773.htm>)

[5] Stored Processes

(<http://support.sas.com/documentation/cdl/en/itechov/60309/HTML/default/a003260785.htm>)

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

Jeff Sun	Eric Brinsfield
SAS Institute Inc.	SAS Institute Inc.
SAS Campus Drive	SAS Campus Drive
Cary, NC 27513	Cary, NC 27513
USA	USA
Email: Jeff.Sun@sas.com	Eric.Brinsfield@sas.com
www.sas.com	www.sas.com

Brand and product names are trademarks of their respective companies.