Differences in the SAS®9 and SAS® Viya™ 3.2 Platforms
Contents
Chapter 1
Introduction

About the SAS Viya Platform: The Next Era of Analytics

SAS Viya is an open, unified, and powerful platform, adaptable to both BareOS and Cloud environments.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The analytics engine to SAS Viya</td>
<td>In SAS Viya, the SAS High-Performance Architecture and SAS LASR Analytic Server from SAS 9 are replaced by a unified third-generation high-performance analytics engine.</td>
</tr>
<tr>
<td></td>
<td>• The CAS In-Memory Engine continues the ability to perform processing in memory and the ability to distribute processing across nodes in a cluster. Because the data is loaded into memory, multiple users can collaborate using the same libraries and tables.</td>
</tr>
<tr>
<td></td>
<td>• The CAS In-Memory Engine adds highly efficient node-to-node communication and uses an algorithm to determine the optimal number of nodes for a given job. CAS provides resilience with worker node failover and user session independence.</td>
</tr>
<tr>
<td></td>
<td>The CAS In-Memory Engine also enables you to use distributed network file systems (NFS) storage in addition to storage based on Hadoop.</td>
</tr>
<tr>
<td>A modular set of supporting services</td>
<td>SAS Viya contains several services often referred to as microservices. A microservice is a small service that runs in its own process and communicates with a lightweight mechanism (HTTP). Some of the services in SAS Viya are Authorization, Backup, and CAS Management. Use SAS Environment Manager to see the complete list of SAS Viya services.</td>
</tr>
<tr>
<td>Component</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>A web application for basic administration</td>
<td>CAS Server Monitor is a web application that you use to monitor your CAS Server and to perform some administration tasks.</td>
</tr>
<tr>
<td>A web application for enterprise administration</td>
<td>SAS Environment Manager is a web application for managing a SAS Viya environment. It includes a dashboard, which provides an at-a-glance view of your environment’s health and status, as well as detailed views that enable you to examine and manage your environment in detail.</td>
</tr>
<tr>
<td>A web application for writing and submitting code</td>
<td>SAS Studio is a tool that you can use to write and run SAS code through your web browser. With SAS Studio, you can access your data files, libraries, and existing programs and write new programs.</td>
</tr>
<tr>
<td>Multiple application programming interfaces</td>
<td>SAS Viya uses PROC CAS to run CAS actions in SAS Cloud Analytic Services. You can use the REST APIs for any client language to access SAS analytics, data, and services. You can also use programming interfaces for Python, Java, and Lua to access this CAS functionality. In addition, you can continue to submit SAS code in batch mode.</td>
</tr>
</tbody>
</table>

For more information, see *SAS Cloud Analytic Services: Fundamentals*.

### Comparing SAS 9 and SAS Viya

<table>
<thead>
<tr>
<th>Item for Comparison</th>
<th>SAS 9 contains these servers:</th>
<th>SAS Viya contains these servers:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servers</td>
<td>• SAS Metadata Server</td>
<td>• SAS Cloud Analytic Services</td>
</tr>
<tr>
<td></td>
<td>• SAS Workspace Server</td>
<td>• SAS Workspace Server and Object Spawner</td>
</tr>
<tr>
<td></td>
<td>• SAS Pooled Workspace Server</td>
<td>• SAS Infrastructure Data Server</td>
</tr>
<tr>
<td></td>
<td>• SAS Stored Process Server</td>
<td>• SAS Configuration Server</td>
</tr>
<tr>
<td></td>
<td>• SAS OLAP Server</td>
<td>• SAS Message Broker</td>
</tr>
<tr>
<td></td>
<td>• SAS Web Infrastructure</td>
<td>• SAS/CONNECT Server and Spawner</td>
</tr>
<tr>
<td></td>
<td>Platform Data Server</td>
<td>• embedded web application server</td>
</tr>
<tr>
<td></td>
<td>• SAS/CONNECT Server and Spawner</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• SAS Content Server</td>
<td>• SAS LASR Analytic Server</td>
</tr>
<tr>
<td></td>
<td>• SAS Web Server</td>
<td>• embedded web application server</td>
</tr>
<tr>
<td></td>
<td>• SAS Messaging Engine</td>
<td>• SAS Web Server</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SAS Viya</td>
</tr>
</tbody>
</table>
### Item for Comparison

<table>
<thead>
<tr>
<th></th>
<th>SAS 9</th>
<th>SAS Viya</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Location</strong></td>
<td>SAS 9 uses LIBNAME engines and librefs to refer to directories of SAS data sets, database servers, and so on. SAS reads the data before running the analysis or DATA step. Many data sources enable you to run summary procedures and functions in-database. You must aggregate the data in some way before running the analysis or DATA step.</td>
<td>SAS Viya still uses LIBNAME engines and librefs for traditional workloads. CAS adds caslibs—a server-side data access strategy. A caslib includes a data source such as a directory of files or a database server. When you access data from the caslib, the CAS server performs the data access rather than SAS. In contrast to SAS 9, it is not yet possible to run procedures or functions in-database. However, by using a SAS/ACCESS LIBNAME engine, it is possible to run queries and manipulate data in-database. In SAS Viya, SAS/ACCESS is available for the Hadoop and PC Files LIBNAME engines. For additional data sources, data connectors are available. For example, if you order the SAS/ACCESS interface to Oracle, you receive the data connector to Oracle. For distributed servers, your data can be distributed across various worker nodes, and the processing of that data occurs on that node. For massive parallel processing, CAS uses parallel file storage in HDFS, but also supports parallel file storage via network file systems. As a result, Hadoop is no longer a requirement.</td>
</tr>
<tr>
<td><strong>Management Tools</strong></td>
<td>SAS 9 uses a variety of management tools, such as SAS Management Console and SAS Deployment Manager.</td>
<td>SAS Viya consolidates administrative tasks into a completely rewritten SAS Environment Manager. CAS Server Monitor is also available to monitor your CAS server.</td>
</tr>
<tr>
<td><strong>Installation, Configuration, and Maintenance</strong></td>
<td>SAS 9 uses SAS proprietary tools, such as the SAS Deployment Wizard and SAS Deployment Manager. To apply updates and maintenance releases to your SAS 9 environment, you must take your system offline for a period of time.</td>
<td>SAS Viya uses industry-standard tools, such as Ansible, for installation and configuration. SAS uses RPM packages to deliver the software. At installation, these packages are downloaded either from an Internet repository or a mirror of this repository at your site.</td>
</tr>
</tbody>
</table>
### Item for Comparison

<table>
<thead>
<tr>
<th>Backups</th>
<th>SAS 9</th>
<th>SAS Viya</th>
</tr>
</thead>
<tbody>
<tr>
<td>In SAS 9, backups are created using SAS Environment Manager or SAS Management Console.</td>
<td>In SAS Viya, backups are performed using CAS actions and REST APIs. In this release, the backup service does not include a scheduling feature or an email alert feature.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Availability</th>
<th>SAS 9</th>
<th>SAS Viya</th>
</tr>
</thead>
<tbody>
<tr>
<td>In SAS 9, a failed LASR node or job could potentially impact everyone on that server.</td>
<td>In SAS Viya, CAS server processes and CAS session processes are independent of each other.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interfaces</th>
<th>SAS 9</th>
<th>SAS Viya</th>
</tr>
</thead>
<tbody>
<tr>
<td>In SAS 9, analytics procedures are accessed through SAS interfaces and REST-based services.</td>
<td>SAS Viya provides an open user experience. You can use your existing skill sets in SAS, Python, Lua, Java, or REST to access SAS analytics.</td>
<td></td>
</tr>
</tbody>
</table>

---

**Relationship between SAS 9.4 and SAS Viya**

**SAS Viya Augments SAS 9**

SAS 9 and SAS Viya are two unique platforms built for different use cases. However, these platforms share some functionality. For example, SAS 9 uses the SAS programming language, and SAS Viya uses the next generation of SAS programming with the new CAS programming language. The CAS language is very similar to the SAS language. Some procedures are available on both platforms, so some existing SAS code can be run on the SAS Viya platform. However, SAS Viya also contains new procedures that take advantage of the open, distributed environment. As a result, some SAS 9 procedures do not exist in the new SAS Viya environment.

Because of the advancement in technology and infrastructure since SAS 9 was released, the technology of SAS Viya is very different from SAS 9. Here are some examples:

- **SAS Cloud Analytics Services**, delivered in SAS Viya, is the third-generation of in-memory services from SAS. It replaces SAS LASR Analytic Server and the SAS High-Performance Analytics engine in SAS 9.

- For functionality other than CAS, the SAS 9 concept of governing roles and capabilities has been replaced with rules that target a service, a service endpoint, a media type, or a pseudo URL.

- Instead of the metadata-based authorization, SAS Viya maintains data access authorizations within Cloud Analytic Services.

- In SAS Viya, CAS uses a VARBINARY data type that enables image analysis. The CAS server supports the VARCHAR data type, which uses character semantics and varying length variables.
SAS Viya Interoperates with SAS 9.4

- You can make your SAS 9.4 data available to SAS Viya.
- You can migrate your user-defined format catalogs.
- You can remotely submit SAS 9 code to run in SAS Viya and remotely submit SAS Viya code to run in SAS 9.

SAS Viya is designed to coexist with SAS 9.4 solutions and the SAS 9 environment. SAS provides a client/server utility called SAS/CONNECT. The SAS/CONNECT toolset enables users to maintain SAS interoperability across architectures and SAS releases. SAS users can use SAS/CONNECT statements to create a virtual bridge between the two environments. The SAS/CONNECT bridge enables SAS 9.4 solution users to take advantage of SAS Viya performance while using familiar projects, interfaces, and SAS code.

For more information, see *SAS Viya: Platform Overview*.
Chapter 2
Administration

**SAS Environment Manager**

SAS Environment Manager 3.1 provides functions to monitor and administer SAS Viya. This application unifies administration and environment management for all components of SAS Viya. SAS Environment Manager 3.1 replaces an assortment of SAS 9 tools, such as SAS Management Console, SAS Visual Analytics Administrator, and SAS Deployment Manager.

SAS Environment Manager 3.1 provides better integration with corporate LDAP directories. You no longer need to create a separate metadata-based list of users. Instead, you can subset your existing corporate directory to govern SAS access. To help with security, you can also create custom groups.

SAS Environment Manager 2.6 provides functions to monitor and administer SAS 9.4. Because of the differences in the SAS Viya and SAS 9.4 environments, the administrative functions provided by SAS Environment Manager 3.1 are completely different from the functions provided by SAS Environment Manager 2.6. If you are a current user of SAS Environment Manager 2.6, you cannot transfer your administrative data or application knowledge to SAS Environment Manager 3.1.

These are some of the differences in the SAS Viya and SAS 9.4 environments that affect administration:

- SAS Viya does not use metadata. There is no SAS Metadata Server, and administration tasks do not involve editing metadata values. Configuration information is stored in the SAS Configuration Server, and user content (such as reports) is stored in the SAS Infrastructure Data Server.
- Just as SAS Environment Manager 2.5 enables you to manage the metadata-layer authorization in SAS 9.4, SAS Environment Manager 3.1 enables you to manage the two authorization systems in SAS Viya. However, SAS Environment Manager 2.5 uses roles and capabilities to manage authorization to SAS 9.4. SAS Environment Manager 3.1 uses rules to manage general authorization (access to objects such as folders and reports) and permissions to manage CAS authorization (access to CAS objects such as caslibs and tables). The authorization settings in SAS Environment Manager 2.5 cannot be applied or migrated to SAS Environment Manager 3.1.
- User and group identities are stored and managed by your organization’s identity provider (for example, Microsoft Active Directory). Read-Only access to the
provider enables SAS to authenticate users and obtain identity information at sign-in.
You can also add users to custom groups that are persisted in SAS Viya.

Here are some of the features in SAS Environment Manager 2.6 that are not yet available in SAS Environment Manager 3.1:

• You cannot perform server management functions, such as stopping or restarting servers.

• Alerts are not supported.

• Backups cannot be performed using SAS Environment Manager 3.1, but they must be performed using CURL commands. The scheduling of backups and email alerts is not provided.

• Promotion (import and export) is performed using a command-line interface.

• Metric information is not stored in a data mart.

• Log events are not monitored.
Chapter 3
Programming

UTF-8 Session Encoding

In SAS Viya, UTF-8 is the only available session encoding. UTF-8 is a variable-width multi-byte encoding that encompasses most character sets.

If SAS Viya can determine the data encoding, it automatically transcodes non-UTF-8 encodings to UTF-8 when it reads data. If a data set character encoding does not match the SAS session encoding, the data set must be transcoded to UTF-8 before it can be used in SAS Viya. If the encoding cannot be determined, data sets must be transcoded programmatically. Caution is necessary to ensure that columns are wide enough for UTF-8 encodings. If the columns are not wide enough, data truncation might occur. You can use the CVP engine to enlarge character columns.

See Also

Migrating Data to UTF-8 for SAS Viya

SAS Cloud Analytic Services (CAS)

SAS Cloud Analytic Services, the CAS server, is the next step for SAS in the evolution of SAS Analytics high-performance distributed processing on single or multiple machines.

The following list highlights how the CAS server is different from the SAS LASR Analytic Server:

- Fault tolerance on the CAS server detects when a node no longer operates and distributes that node’s work to other nodes.
• Processing occurs in CAS server sessions and not in server processes, enabling CAS session monitoring, resource tracking, and resource management.

• In-memory tables can have local (session) or global scope.

• The CAS server is able to continue to process tables when memory capacity is exceeded.

• The CAS server interfaces with third-party software such as Python, Lua, Java, and REST APIs.

• All table operations are performed in a caslib. A caslib is an in-memory space to hold tables, access control lists, and data source information.

• PROC CASUTIL is a new procedure to manage CAS server tables, including loading and saving tables. Data in tables can be loaded serially or in parallel.

• The CHARACTER data type in SAS 9 uses byte semantics and supports fixed widths. The CAS server supports the VARCHAR data type, which uses character semantics and varying length variables.

• Similar to the SAS LASR Analytic Server, the basic unit of work is an action, which performs a single task. You submit actions to the CAS server either by using PROC CAS and the CAS language (CASL), or by using third-party software.

• The SAS Analytic procedures and the DATA step have been rewritten for parallel processing in multiple cores or server nodes. The DATA step has some language element restrictions.

• DS2 and FedSQL run on the CAS server. FedSQL has some restrictions.

• Catalogs are not supported on the CAS server. To support user-defined formats, format libraries are associated with caslibs.

• Some utility procedures, such as the PRINT procedure pull data from the CAS server to process, but run on the SAS Workspace server.

See Also
• An Introduction to SAS Viya Programming for SAS 9 Programmers
• SAS Cloud Analytic Services: Fundamentals

SAS Programming Interfaces

SAS Studio is the SAS language code editor in SAS Viya. The SAS windowing environment and SAS Enterprise Guide are not available in SAS Viya. You can also submit SAS code by using batch mode or line mode processing. Python, Lua, and Java programmers can submit code to the CAS server using their respective programming environments.

In addition to the procedures that are introduced for SAS Viya, programmers can run the CAS actions that underpin many of the procedures. Running CAS actions is supported from these programming languages:

• CASL—SAS Studio provides the CAS procedure and the CAS language.

• Python 2.7+, Python 3.4+—SAS provides the SAS wrapper for analytics transfer (SWAT) that enables Python to communicate with CAS and run actions.
• Lua 5.2+, 5.3+—Similar to Python, SAS provides a SWAT library that enables Lua to communicate with CAS and run actions.
• Java 8—SAS provides a client JAR file that enables any environment that is Java 8 compliant to communicate with CAS and run actions.
• REST—CAS offers an embedded HTTP server that can be accessed for running actions.

See Also

• Getting Started with Programming in SAS Studio 4.2
• SAS Studio 4.2: User’s Guide
• Batch and Line Mode Processing in SAS Viya
• Programming with Actions in the SAS Viya Data Mining and Machine Learning Help Center
• http://developer.sas.com

SAS Analytic Procedure Results

The SAS Analytic procedures create in-memory output tables that contain the procedure results. Some of these tables are used as input for scoring, and some are the results of scoring. Several of these procedures save their models as an analytic store, which is a binary object that contains that procedure’s state after the procedure completes the training phase of data analysis. You use an analytic store as input to the ASTORE procedure to score data at a later time.

You can save in-memory tables in a path-based caslib to disk. By default, the suffix is .sashdat. For smaller in-memory tables, you can also use a DATA step to save data as a client-side data set in a physical location that is associated with a libref. If you specify a .csv suffix, a CSV file is saved. In-memory tables persist until they are dropped.

See Also

SAS Cloud Analytic Services: Fundamentals
Chapter 4

Visual Interfaces

SAS Studio

If you are a current SAS Studio user, here are some differences between SAS Studio 3.6 (which runs on SAS 9.4) and SAS Studio 4.2 (which runs on SAS Viya):

• Only the SAS Programming perspective is available in SAS Studio 4.2. The Visual Programming perspective is not available.

• The list of tasks and snippets differs. SAS Studio 4.2 lists tasks that are specific to the SAS Viya platform.

• When saving output data in SAS Studio 4.2, you must specify a CAS engine libref.

In addition, SAS Studio 4.2 does not support this functionality:

• process flows

• the query tool

• the import tool

• SAS Studio repositories

• the ability to export tables

• the ODS Graphics Designer and the ODS Graphics Editor

• FTP shortcuts

• extended attributes in the SAS Table Properties and Column Properties windows

SAS Visual Analytics

SAS Visual Analytics enables users to design reports for SAS Viya. It also provides the primary user interface for SAS Visual Statistics and SAS Visual Data Mining and Machine Learning for sites that have licensed these products.
If you are a current SAS Visual Analytics user, there are some differences between SAS Visual Analytics 7.3 (which runs on SAS 9.4) and SAS Visual Analytics 8.1 (which runs on SAS Viya):

- SAS Visual Analytics 7.3 and earlier releases use the SAS LASR Analytic Server. SAS Visual Analytics 8.1 uses SAS Cloud Analytic Services (CAS), which is a server that provides the cloud-based run-time environment for data management and analytics with SAS.

- The SAS Visual Analytics Explorer (the explorer) and SAS Visual Analytics Designer interfaces have been combined into a single user interface, which contains many of the features that were available in SAS Visual Analytics 7.3 and earlier releases.

- Tasks that were accomplished in the explorer are available in a new explore mode, which enables you to explore your data and create analytical models.

- The undo and redo feature that was available only in the explorer is now available for all reports and report objects.

- SAS Visual Analytics Viewer (the viewer) is now SAS Report Viewer.

- The following changes to reports are differences from SAS Visual Analytics 7.3 and earlier releases:
  - There is only one report theme, which is called Umstead.
  - Sections are now called pages.
  - Report interactions are now called actions, and the data brushing feature is now called a linked selection.
  - Reports can be printed or emailed only from SAS Report Viewer.
  - Text analytics was a mode for the word cloud. It is now a new object called text topics.
  - The network diagram is now called network analysis.
  - Forecasting has moved from the line chart to the time series plot.

- SAS Visual Analytics Administration is now part of SAS Viya Administration.

There are features that were in the 7.3 release that are not available in the 8.1 release. Many of the following missing features will be added in a future release of SAS Visual Analytics:

- alerts
- auto-refresh for reports cannot be specified in the settings
- changing a data source
- classic mode for the viewer
- comments (these can be added or read only in the viewer)
- custom graphs created with SAS Visual Analytics Graph Builder
- custom sorts
- dragging and dropping additional columns on a crosstab or a graph
- drilling into any level within a hierarchy
- guest access
- hiding items in the Data pane
• high-contrast report theme
• horizontal and vertical containers
• importing objects from an existing report
• lattice of gauges
• modify sorting in a crosstab while designing a report
• parameterized display rules
• printing while designing a report
• reorder columns by dragging and dropping them in a table
• report refresh in the viewer
• report localization
• right-to-left support
• Sankey diagram
• scheduled report distribution
• selecting all or sorting all for graphs
• showing or hiding object types
• some style options for reports, including color gradients
• sparklines in list tables
• stored processes

For more information, see the software product page for SAS Visual Analytics.
Recommended Reading

- *SAS Viya: Platform Overview*
- *SAS Viya Quick Start*
- *SAS Cloud Analytic Services: Fundamentals*
- *SAS Viya: Deployment Guide*
- *Getting Started with SAS Visual Data Mining and Machine Learning*

For a complete list of SAS publications, go to [sas.com/store/books](http://sas.com/store/books). If you have questions about which titles you need, please contact a SAS Representative:

SAS Books
SAS Campus Drive
Cary, NC 27513-2414
Phone: 1-800-727-0025
Fax: 1-919-677-4444
Email: sasbook@sas.com
Web address: sas.com/store/books
Gain Greater Insight into Your SAS® Software with SAS Books.

Discover all that you need on your journey to knowledge and empowerment.

support.sas.com/bookstore for additional books and resources.