Elements of SAS Viya

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Elements of SAS Viya

Introduction

This section provides a concise summary for new administrators.

Here are related topics:

- To get started with SAS Viya administration, see SAS Viya Administration: Orientation.
- To learn about benefits of SAS Viya, see SAS Viya on the SAS website.
Key Components

Here are software components that might be of particular interest to administrators.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The analytics engine to SAS Viya</td>
<td>SAS Cloud Analytic Services: Fundamentals</td>
</tr>
<tr>
<td>A modular set of supporting services</td>
<td>SAS Viya Administration: General Servers and Services</td>
</tr>
<tr>
<td>A web application for basic administration</td>
<td>CAS Server Monitor</td>
</tr>
<tr>
<td>A web application for enterprise administration</td>
<td>SAS Viya Administration: Using SAS Environment Manager</td>
</tr>
<tr>
<td>A web application for writing and submitting code</td>
<td>Getting Started with Programming in SAS Studio</td>
</tr>
<tr>
<td>A web application for visual reporting, exploration, and modeling</td>
<td>SAS Visual Analytics: Overview</td>
</tr>
<tr>
<td>Multiple application programming interfaces</td>
<td><a href="http://developer.sas.com">http://developer.sas.com</a></td>
</tr>
</tbody>
</table>

For information about other components, search the SAS Viya administration documentation.

Cumulative Functionality

Among some of the products on SAS Viya, available functionality is cumulative.

- SAS Visual Analytics provides baseline functionality, including reporting and basic analytics.
- SAS Visual Statistics provides an additional set of advanced analytic functions.
- SAS Visual Data Mining and Machine Learning provides a second additional set of advanced analytic functions.

For example, if you have SAS Visual Data Mining and Machine Learning, the objects that are available in the SAS Visual Analytics web application are as follows:
Note: All three of the preceding products offer both programming and visual interfaces.

**Selective Deployment (Optional)**

By default, all of your software is deployed. As a convenience for special circumstances, it is possible to deploy only a subset of components. A programming-only deployment excludes general services and visual interfaces.
For example, a programming-only deployment of SAS Visual Analytics does not include the SAS Visual Analytics web application.

**Note:** SAS supplies two versions of SAS Studio, version 4 and version 5. SAS Viya programming-only deployments use SAS Studio 4. For a comparison of the two SAS Studio versions, see “SAS Studio 5.1 and 4.4” in What’s New in SAS 9.4 and SAS Viya.

## Diagrams by Deployment Type

### Full Deployment (Native Operating Systems)

The following diagram shows the components in a SAS Viya full deployment:

### Programming-Only Deployment (Native Operating Systems)

The following diagram shows the components in a SAS Viya programming-only deployment:
Security in SAS Viya

Authentication

*Authentication* is the aspect of security that verifies the identity of a user or service account.

When you sign in, one of the following authentication patterns is used:

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host authentication</td>
<td>Requests are sent to the appropriate host and processed by any authentication mechanism supported by that host.</td>
<td>When you sign in to SAS Studio 4 from a URL that is similar to <a href="https://reverse-proxy-server/SASSudio/">https://reverse-proxy-server/SASSudio/</a>, you are prompted for a user ID and password. The associated object spawner asks its host (which is also the host of the SAS Studio 4 web application) to validate your credentials. That validation enables the object spawner to launch a workspace server for you. When you access CAS from SAS Studio 4, you must authenticate to the host of the target CAS server. When you sign in to CAS Server Monitor, you must authenticate to the host of the target CAS server.</td>
</tr>
<tr>
<td></td>
<td>Programming-only deployments use this pattern exclusively. Other deployments use dual authentication for access to CAS from SAS Studio 4.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: You can configure the host to use pluggable authentication modules (PAM). SAS provides starter PAM configuration files for CAS and SAS Studio 4. You can create an authinfo file for use with PAM in command-line access and batch processing programs to CAS. Credentials for the user ID that runs the program are supplied from the authinfo file.</td>
<td></td>
</tr>
<tr>
<td>Pattern</td>
<td>Description</td>
<td>Usage</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Direct LDAP authentication</td>
<td>Requests are sent to and processed by your designated direct LDAP provider, unless you configure front-end single sign-on using Kerberos, Open Authorization (OAuth), or Security Assertion Markup Language (SAML). Kerberos, OAuth, and SAML are alternate mechanisms for identity verification by the logon service, not alternate sources of user and group information for the identities service. <strong>Note:</strong> User and group information is always obtained from your designated direct LDAP provider.</td>
<td>SAS Drive enables you to access the visual interfaces, for example, SAS Visual Analytics or SAS Environment Manager. When you sign in to SAS Drive from a URL that is similar to <a href="https://reverse-proxy-server/SASDrive/">https://reverse-proxy-server/SASDrive/</a>, a user ID and password are required to authenticate to SAS Logon Manager, using this pattern. Before you can submit a command-line request to a general service (for example, the backup service or the transfer service), you must authenticate using this pattern.</td>
</tr>
</tbody>
</table>
| Host and direct LDAP authentication | Requests are authenticated using both host authentication and direct LDAP authentication. If the `servicesBaseUrl` option is specified, CAS requires dual authentication. To facilitate this pattern, use one of these approaches:  
  - Ensure that all requests are ultimately processed by the same authentication provider. For example, configure the SAS Studio 5 and CAS hosts to use the same LDAP provider that is designated for direct LDAP authentication requests in your deployment.  
  - Ensure that each affected user has a single set of credentials that are valid for all applicable authentication providers. | In a full deployment, dual authentication occurs for access to CAS from SAS Studio 5.  
In a programming-only deployment, CAS Server Monitor provides a web-based interface for administration.  
**Note:** When you access CAS from a web application such as SAS Visual Analytics or SAS Environment Manager, your OAuth token is validated. |

The following high-level conceptual drawings illustrate key points from the preceding table:
After you sign in, you have seamless access to SAS Viya and, in some contexts, to external data sources. For more information, see the following documents:

SAS Viya Administration: Authentication
SAS Viya Administration: Identity Management
Authorization

Authorization is the aspect of security that determines which resources are available to which users. The SAS Viya authorization layer consists of two authorization systems:

- CAS authorization system
- General authorization system

Each system uses a distinct model to protect a distinct class of resources. The general authorization system is not applicable in a programming-only deployment.

Initial and default access are restrictive:

- Any access that is not granted is implicitly disallowed.
- Predefined objects are protected by predefined rules or access controls.
- Only members of special groups or roles have access to privileged administrative functionality.
- Access to objects that users add is managed by inheritance, other influencing rules, and any direct settings.
- Regular users have limited Write access. They can write to their personal folder, the shared Public folder, and the shared Public caslib.

**CAUTION!** An exception is that all authenticated users initially have Read and Write access to all registered models. See “Details for Models” in SAS Viya Administration: General Authorization.

For more information, see the following documents:

- SAS Viya Administration: Orientation to Authorization
- SAS Viya Administration: Cloud Analytic Services Authorization
- SAS Viya Administration: General Authorization
- SAS Viya Administration: Identity Management

Encryption

Encryption is the aspect of security that protects data by converting it into an unintelligible form in transmission or in storage.

For data in motion, SAS Viya is deployed with Transport Layer Security (TLS) to secure network connections. It is fully compliant with SAS security standards.

- In a full deployment of SAS Viya on Linux, almost all external network connections are secured by default. You can harden the full Linux deployment by blocking external connections to port 80, by adding custom certificates on all machines in the deployment, and by upgrading the security protocol and ciphers that are enabled by default. You can also configure TLS–encrypted connections between CAS workers and take additional steps to secure the SAS Embedded Process.

- In a SAS Viya programming-only deployment on Linux, the basic framework for security is included by default, but it is not enabled by default. You can enable TLS and harden the deployment by performing post-deployment tasks.
In a Windows deployment, the deployment provides a default level of encryption for data in motion. You can harden the deployment by blocking external connections to port 80, by adding custom certificates on Apache HTTPD, and by upgrading the security protocol and ciphers that are enabled by default. You can also upgrade to custom certificates on CAS and SAS/CONNECT.

For data at rest in a new deployment, encryption is not automatically enabled. You can configure encryption of data that is added to PATH, HDFS, and DNFS caslibs.

For more information, see the following documents:

- Encryption in SAS Viya: Data in Motion
- Encryption in SAS Viya: Data at Rest

**Web Security**

Web security is the aspect of security that deals with securing against certain types of attacks on web applications and using the security features that are available in modern web browsers.

SAS Viya provides properties that are configured, by default, to protect against the web security risks that are listed below. You can disable or change the properties, based on your environment. For example, you might have to configure Cross-Origin Resource Sharing (CORS) to allow origins in your company's domain. This allows SAS web pages to be included in other web pages inside your company’s network.

For more information about the SAS Viya configuration properties, see the following:

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
<th>Default Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-Origin Resource Sharing</td>
<td>Technique for relaxing the browser same-origin policy, allowing Javascript on a web page to consume a REST API served from a different origin.</td>
<td>The following cross-origin requests are configured:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- User credentials are used</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- All HTTP headers are allowed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- All HTTP methods are allowed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Same origins are allowed</td>
</tr>
<tr>
<td>Cross-Site Request Forgery (CSRF)</td>
<td>Prevents attacks that force a user to execute unwanted actions on a web application in which they are currently authenticated.</td>
<td>The following options are configured:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- All requests that use an authenticated HTTP session, except GET and HEAD requests, must pass a CSRF token specified by the server.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Referrers internal to the deployment are allowed</td>
</tr>
<tr>
<td>X-Frame-Options</td>
<td>Avoids clickjacking attacks by making sure that your content is not embedded in other sites.</td>
<td>Same origin</td>
</tr>
</tbody>
</table>
### Property | Description | Default Settings
---|---|---
Content-Security-Policy | Exposes and reduces the risk of data injection and cross-site scripting (XSS) attacks. | `default-src 'self'; script-src 'self' 'unsafe-inline' 'unsafe-eval'; img-src 'self' *.sas.com blob: data:; style-src 'self' 'unsafe-inline'; child-src 'self' blob: data: mailto:;`

X-Content-Type-Options | Prevents the browser from interpreting files as something other than what is declared by the content type in the HTTP headers (content sniffing). | `nosniff`

X-XSS-Protection | Stops web browser from loading pages when XSS attacks are detected. | `1; mode=block`

For information about these web attacks, see the following OWASP pages:
- Category:Attack
- OWASP Secure Headers Project
- Cross-Site Request Forgery (CSRF)
- Cross-Origin Resource Sharing

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### SAS 9 and SAS Viya

#### Summary

SAS 9 customers continue to benefit from their investment in SAS 9 as they begin to make use of SAS Viya functionality and features. From within familiar SAS 9 interfaces, projects, and code, customers can access the performance enhancements that SAS Viya provides.

- On most hosts, SAS 9.4M5 is tightly integrated with SAS Viya. See SAS 9.4M5 Integration with SAS Viya in What’s New in Base SAS: Details. (The exceptions are z/OS and 32–bit Windows.)
- All releases of SAS can use SAS/CONNECT as a bridge to SAS Viya. See the appendix Sharing Data Between SAS 9 and SAS Viya using SAS/CONNECT in SAS/CONNECT for SAS Viya User’s Guide.
- SAS Viya visual web applications share a single sign-on and logout with the SAS 9 environment.

Here are some of the methods for accessing SAS 9 data from SAS Viya:
- In SAS Environment Manager, interactively load data. See Data Administration: How to (SAS Environment Manager) in SAS Viya Administration: Data.
- In SAS Enterprise Guide or SAS Add-In for Microsoft Office (7.13 or later), move data from SAS 9 to CAS. See the topic "Configure Your Environment to Use the Upload to CAS Task" in the SAS Enterprise Guide or SAS Add-In for Microsoft Office chapter in SAS Intelligence Platform: Desktop Application Administration.
- In any programming interface, write code to load data. See Programming Interfaces in An Introduction to SAS Viya Programming.
If a more seamless method is not available, use SAS/CONNECT for SAS 9 and SAS Viya to move and share data. See the appendix Sharing Data Between SAS 9 and SAS Viya using SAS/CONNECT in SAS/CONNECT for SAS Viya User’s Guide.

Note: Not all deployments and releases include all products and support all methods.


Considerations: Interacting with SAS 9 Data

Use UTF-8 Encoding
If you access SAS 9 data from SAS Viya, be aware that SAS Viya operates with UTF-8 encoded data. If your SAS 9 data is not UTF-8 encoded, you might need to re-create your data sets. See Migrating to UTF-8 for SAS Viya.

Manage User-Defined Formats
If you access SAS 9 data from SAS Viya, you must make any user-defined formats available to your CAS session. See SAS Cloud Analytic Services: User-Defined Formats.

Considerations: Accessing CAS from SAS 9.4M5

Find CAS
If a SAS 9.4M5 client session cannot find CAS, make information about the host and port of the CAS server available. For example, add the following line to your SAS Application Server sasv9_usermods.cfg or appserver_autoexec_usermods.sas file:

```
CASHOST=('primary-controller-host-name' "<"backup-controller-host-name">) CASPORT=port;
```

Here is an example with a CAS backup controller:

```
CASHOST=('mysrv01' "mysrv02") CASPORT=5570;
```

Here is an example without a CAS backup controller:

```
CASHOST=('mysrv01") CASPORT=5570;
```

For more information, see CASHOST= System Option.

Authenticate to CAS
If a SAS 9.4M5 client session cannot authenticate to CAS, create an authinfo file, store CAS credentials in the SAS 9 metadata, or use a different authentication mechanism. See SAS Viya Administration: Authentication.

Conform to CAS Encryption Requirements
If a SAS 9.4M5 client session does not meet the encryption standards of the CAS server, make an appropriate certificate available. See “Configure SAS 9.4 Clients to Work with SAS Viya” in Encryption in SAS Viya: Data in Motion.
SAS Visual Analytics Administration

Tasks
SAS Viya Administration documentation is applicable to SAS Visual Analytics. Links to specific SAS Visual Analytics topics that deserve special attention are included here:

- Promoting data and report content
- Granting guest access
- Managing user-defined formats
- Loading geographic polygon data as a CAS table
- Loading data for reports
- Making data available to CAS
- Using the report data service
- Using the report packages service
- Using the report renderer service
- Understanding identity management concepts
- Modifying rules that affect access to functionality
- Using the Maps service to obtain polygon information

Samples
Sample data and reports are provided to help you get started.

The sample data is located by default in /opt/sas/viya/config/cas/default/samples/. Access it from the Data Sources tab in the Open Data Source window. Double-click on cas-shared-default (or the name of your default CAS server), and double-click on Samples.

The six sample data sets are as follows:

- COSTCHANGE.sashdat provides historical data on vehicle maintenance to monitor changes in costs
- PROMO_EFFECTIVENESS_X_EFFECTS_2.sashdat provides data on the impact of a 25% discount on dog food sales
- RAND_RETAILDEMO.sashdat provides retail sales information for customer purchases across multiple sales departments and stores
- SW_LAKE_RT_SENSOR_WATERQUALITY.sashdat provides a wide range of water-quality metrics for lake water
- WARRANTYCLAIMS_0117.sashdat provides data on warranty claims for car repairs
- WATER_CLUSTER.sashdat provides data on home water consumption

The sample reports are based on some of the sample data. Access these reports by selecting Open from the Menu, and expand: Products ➔ SAS Visual Analytics ➔ Samples. The three sample reports are as follows:
Retail Insights
  report generated for the RAND RETAILDEMO.sashdat and PROMO_EFFECTIVENESS_X_EFFECTS_2.sashdat sample data

Warranty Analysis
  report generated for the COSTCHANGE.sashdat and WARRANTY_CLAIMS_0117.sashdat sample data

Water Consumption and Monitoring
  report generated for the SW_LAKE_RT_SENSOR_WATERQUALITY.sashdat and WATER_CLUSTER.sashdat sample data