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Chapter 1

SAS Viya 3.2 Platform

New Features and Enhancements for SAS Viya 3.2

Support for Cloud Foundry Deployment

New Features and Enhancements for SAS Viya 3.2

Here are some of the new features in SAS Viya 3.2:

- multi-tenancy support (available from SAS Visual Investigator 10.2).
- more HTML5-based visual interfaces such as SAS Visual Analytics. This release of the platform also includes a new release of SAS Studio.
- a common microservices-based architecture across SAS Viya products.
- centralized administration using SAS Environment Manager.
- a customizable interface called SAS Home where you can quickly access the items and applications that you work with.
- customizable authentication rules that govern content and capabilities.
- support for authentication through corporate directory services, Kerberos, or external providers via SAML or OAuth/OpenID Connect.
- integration with corporate directory services for user and group identity management.
- Enhancements for encryption for data in motion include these:
  - On the Apache HTTP Server (web server), the module called mod_ssl provides TLS support.
  - The Apache HTTP Server has localhost certificate and key files laid down during installation of SAS Viya.
  - Each machine in the deployment has a Mozilla bundle of trusted CA certificates laid down as part of the SASSecurityCertificateFramework that is used by SAS and Java processes for configuring TLS for CAS.
  - The Mozilla bundle of trusted CA certificates now includes self-signed certificates for the CAS controller machine. These self-signed certificates are added during the deployment to turn on TLS for CAS.
• Encryption for data at rest can now be managed using the SAS Environment Manager.

• The documentation for encryption has been separated into two documents: *Encryption in SAS Viya: Data at Rest* and *Encryption in SAS Viya: Data in Motion*.

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**Support for Cloud Foundry Deployment**

SAS Viya for Cloud Foundry has been tested by SAS on Cloud Foundry running on OpenStack and on Amazon Web Services (AWS). Delivered as a collection of Cloud Foundry BOSH Releases, the SAS Viya offerings provide customers with the ability to natively deploy, orchestrate, and manage their SAS analytics environment on their Cloud PaaS running on the infrastructure of their choosing.

*Note:* Based on the Cloud Foundry Platform as a Service (PaaS) Certification program, SAS Viya offerings will run on Cloud Foundry Certified Platforms and Cloud Foundry Open Source Software (CF-OSS) IaaS environments that meet the minimum requirements outlined in *SAS Viya 3.2 for Cloud Foundry: Deployment Guide*. For more information about the Cloud Foundry PaaS Certification Program, see [https://www.cloudfoundry.org/certified-platforms/](https://www.cloudfoundry.org/certified-platforms/).

For additional information, see *SAS Viya for Cloud Foundry: Operations*.
Chapter 2
SAS Cloud Analytic Services

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Enhancements to Data Access

- The new AUTHENTICATIONDOMAIN= parameter specifies an authentication domain that enables you to connect to an external data source. Support for this parameter was added to data connectors for the following interfaces:
  - Hadoop
  - Impala
  - LASR
  - ODBC
  - Oracle
  - PostgreSQL
  - Teradata
- Fault tolerance for DNFS caslibs is new. If you update or append a table in a caslib that uses DNFS as a data source, redundant copies of the changes are transferred to other hosts. This enhancement provides fault tolerance for the changes if a host in a distributed server fails.
- Hidden caslibs for SAS solutions is new. A hidden caslib provides a data source for use by SAS solutions to store solution-specific data. These are not general-purpose caslibs for organizing data for analysis.
New Session Options

The session options shown in the following table are new.

<table>
<thead>
<tr>
<th>Option Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATASTEPFMTERR</td>
<td>Specifies how the DATA step reacts when SAS cannot find a specified variable format</td>
</tr>
<tr>
<td>EVENTDS</td>
<td>Specifies one or more data sets that define events</td>
</tr>
<tr>
<td>INTERVALDS</td>
<td>Specifies one or more <code>interval-name=value</code> pairs, where the value is the name of a data set that contains user-defined intervals</td>
</tr>
</tbody>
</table>

Maximum Number of Concurrent Sessions

A maximum number of concurrent sessions is now enforced in SAS Cloud Analytic Services for non-administrative users. Configuration option MAXSESSIONS specifies the maximum. The default is 5000. Administrative users are exempt from this limit. When the limit is reached, non-administrative users are denied access until the number of sessions drops below the maximum. For information about configuration option MAXSESSIONS, see “Configuration File Options Reference” in SAS Viya for Cloud Foundry: Operations.

Enhancements to the CAS Procedure

New PROC CAS Statements

The CAS procedure statements shown in the following table are new.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTINUE</td>
<td>Enables the next iteration of the loop to process without skipping any code in between</td>
</tr>
<tr>
<td>DEPORT</td>
<td>Unloads the functions previously loaded with import</td>
</tr>
<tr>
<td>FUNCTIONLIST</td>
<td>Prints a list of available functions</td>
</tr>
<tr>
<td>Statement</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>IMPORT</td>
<td>Loads the function in the specified extension and adds to the list of available functions</td>
</tr>
<tr>
<td>LEAVE</td>
<td>Stops processing the current loop and resumes with the next statement in sequence</td>
</tr>
</tbody>
</table>

**WHERE Expression Processing**

WHERE expression processing for PROC CAS is new. You can use WHERE expression processing to conditionally select a subset of observations so that SAS processes only the observations that meet a set of specified conditions.

**Session Variables**

The SESSION statement has been enhanced to enable you to create session variables. When using parallel sessions, you do not have to specify the name of the session, but you can specify the session variable and have access to either session.

**DATA Step Action Set**

The runCode action includes the new single= parameter. The parameter enables you to run the DATA step in a single thread, in multiple threads, or in a single thread when there is no input table.

**Tables Action Set**

The new shuffle action enables you to redistribute the rows of a table randomly and create a new in-memory table. The randomness is useful or required for some modeling algorithms. On a distributed server, rows are exchanged between worker nodes. On a single-machine server, the order of data access to rows is randomized. You might want to drop the original table if subsequent programming statements do not use it.

**Support for R Programming**

SAS provides an interface for you to use the R language for in-memory analytic processing of data using CAS actions. See *SAS Viya: System Programming Guide*. 
Chapter 3
SAS Viya Products

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Working with Hadoop

SAS/ACCESS Interface for Hadoop

PROC HADOOP

SAS Econometrics 8.1

SAS Environment Manager

SAS Optimization 8.1

SAS Studio 4.2

SAS Visual Analytics 8.1 and SAS Visual Statistics 8.1

SAS Visual Data Mining and Machine Learning 8.1

SAS Visual Forecasting 8.1

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Working with Hadoop

**SAS/ACCESS Interface for Hadoop**

SAS/ACCESS Interface for Hadoop has been added in SAS Viya 3.2. SAS/ACCESS Interface to Hadoop enables you to interact with data in a Hadoop environment by running SQL queries or by manipulating data using a DATA step. Set connection parameters by using different options in a LIBNAME statement. You can also set connection parameters for individual files by using data set options.

In a SAS Viya deployment, you can write a program that uses a CAS LIBNAME engine libref and a Hadoop engine libref so that SAS can exchange data between in-memory tables in SAS Cloud Analytic Services and Hadoop.

For more information about SAS/ACCESS Interface to Hadoop, see *SAS/ACCESS for Relational Databases: Reference*.

**PROC HADOOP**

PROC HADOOP is available on SAS Viya to enable a site that is skilled with Pig, MapReduce, and HDFS to trigger jobs that create files in HDFS. Then, either CAS can read a CSV file itself, or Hive can be used to offer the file as a table that the data connector can read. The HADOOP procedure enables SAS to interact with Hadoop data...
by running Apache Hadoop code. For more information, see HADOOP Procedure in SAS Viya Visual Data Management and Utility Procedures Guide.

SAS Econometrics 8.1

SAS Econometrics is a new SAS product that runs on the SAS Viya platform. It provides a new, resilient, distributed, and scriptable method of conducting advanced econometric modeling and time series analysis. It also provides a programming entry point for econometricians in government, academics, and industry (especially banking, insurance, and other financial services). SAS Econometrics leverages the speed, scalability, and elasticity of the SAS in-memory environment.

SAS Econometrics requires SAS Visual Analytics.

This release is SAS Econometrics 8.1. Key features include five procedures that run on SAS Viya and offer the same functionality as the procedures shown in parentheses:

• CCOPULA (HPCOPULA)
• CNTSELECT (HPCOUNTREG)
• CPANEL (HPPANEL)
• CQLIM (HPQLIM)
• SEVSELECT (HPSEVERITY)

For more information, see these resources on the product documentation page for SAS Econometrics:

• SAS Econometrics: Programming Guide
• SAS Econometrics: Econometrics Procedures

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 Optimization 8.1

SAS Optimization is a new SAS product that runs on the SAS Viya platform. It provides a means to access the LP, MILP, network, and QP optimization solvers from clients other than SAS (Python, Lua, Java, and R). It also provides a programming entry point for
optimization professionals, more general analysts, and data scientists. SAS Optimization leverages the speed, scalability, and elasticity of the SAS in-memory environment.

SAS Optimization requires SAS Visual Analytics.

This release is SAS Optimization 8.1. Key features include:

- procedure-based access via SAS Studio
- PROC OPTLP, PROC OPTMILP, and PROC OPTQP call the optimization action set
- PROC OPTNET calls the networkCommon and networkOpt action sets
- PROC OPTMODEL: all modeling is performed on the SAS client; all solver calls run on CAS
- action sets: APIs via Python, Lua, Java, and R

For more information, see these resources on the product documentation page for SAS Optimization:

- SAS Optimization: Mathematical Optimization Programming Guide
- SAS Optimization: Network Optimization Programming Guide
- SAS Optimization: Mathematical Optimization Procedures
- SAS Optimization: Network Optimization Procedures

**SAS Studio 4.2**

SAS Studio 4.2 runs on the SAS Viya 3.2 platform. This release of SAS Studio includes new analytical tasks for econometrics and network optimization. This release also includes these new unsupervised learning tasks: Moving Window Principal Component Analysis, Support Vector Data Description, and Robust Principal Component Analysis. For text mining, SAS Studio now includes the Text Parsing and Topic Discovery task and the Boolean Rules task.

**SAS Visual Analytics 8.1 and SAS Visual Statistics 8.1**

SAS Visual Analytics 8.1 and SAS Visual Statistics 8.1 have been completely rewritten in HTML5. They run on SAS Viya, which is a new, high-performance in-memory architecture, to provide relevant answers to a range of business questions in a single, scalable, and governed environment. These products are well-suited for mainstream business users, business analysts, and citizen data scientists. They are designed for resilient, scalable, distributed processing and for organizations to start with a small deployment and quickly expand as needed. A transfer tool is available to move SAS Visual Analytics 7.3 reports to SAS Visual Analytics 8.1. For more information, see the product documentation page for SAS Visual Analytics.

SAS Visual Statistics 8.1, which is an add-on to SAS Visual Analytics, provides flexibility to build and refine models by granular segments or group to pursue unknown opportunities or reduce risks. It is well-suited for data scientists and business analysts to easily collaborate and refine models to make decisions based on highly accurate insights. For more information, see the product documentation page for SAS Visual Statistics.
SAS Visual Data Mining and Machine Learning is an add-on to SAS Visual Analytics, which enables users to work with five new models.

SAS Visual Data Mining and Machine Learning 8.1

SAS Visual Data Mining and Machine Learning is a new SAS product that runs on the SAS Viya platform. It combines data wrangling, exploration, feature engineering, and modern statistical, data mining, and machine learning techniques in a single, scalable in-memory processing environment. This release is a programming-only version of the product.


This release is SAS Visual Data Mining and Machine Learning 8.1. Key features include:

• regression trees
• variable importance plot for trees
• group-by clustering using controls
• group-by decision trees using controls
• observation influence plot now optional
• group-by modeling output that is easier to read
• ability to filter models by graphs and controls like normal report objects

For more information, see these resources on the product documentation page for SAS Visual Data Mining and Machine Learning

• SAS Visual Data Mining and Machine Learning: Programming Guide
• SAS Visual Data Mining and Machine Learning: The NETWORK Procedure
• SAS Visual Data Mining and Machine Learning: Procedures

SAS Visual Forecasting 8.1

SAS Visual Forecasting is a new SAS product that runs on the SAS Viya platform. It provides a new, resilient, distributed time series analysis and scripting environment for cloud computing. It provides automatic forecast model generation, automatic variable and event selection, and automatic model selection. It provides advanced support for time series analysis (time domain and frequency domain), time series decomposition, time series modeling, signal analysis and anomaly detection (for IoT), and temporal data mining. It provides a programming entry point for forecast analysts and data scientists. SAS Visual Forecasting leverages the speed, scalability, and elasticity of the SAS in-memory environment.


This release is SAS Visual Forecasting 8.1. Key features include:

• procedure-based access via SAS Studio
• PROC TSMODEL with six packages
• PROC TSRECONCILE for hierarchical reconciliation—top-down only

A visual interface will be provided in the next release, along with reconciliation enhancements and override capabilities.

For more information, see these resources on the product documentation page for SAS Visual Forecasting:

• SAS Visual Forecasting: Programming Guide
• SAS Visual Forecasting: Forecasting Procedures
• SAS Visual Forecasting: Time Series Packages
Recommended Reading

For a complete list of SAS publications, go to 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
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Fax: 1-919-677-4444
Email: sasbook@sas.com
Web address: sas.com/store/books
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