



What's New in SAS[®] 9.4 and SAS[®] Viya[®] 3.5

The correct bibliographic citation for this manual is as follows: SAS Institute Inc. 2019. *What's New in SAS® 9.4 and SAS® Viya® 3.5*. Cary, NC: SAS Institute Inc.

What's New in SAS® 9.4 and SAS® Viya® 3.5

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August 2025

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9.4_3.5-P1:whatsnew

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Using This Book

Audience

This document describes the new features and enhancements for products during the SAS 9.4 life cycle and for products in SAS Viya 3.5. The functionality available at your site depends on what you have licensed and installed. See the product-specific documentation for your SAS products.

Part 1

SAS 9.4

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Chapter 1

Introduction to SAS 9.4

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Overview of SAS 9.4

Initial Release of SAS 9.4

The initial release of SAS 9.4 was in 2013. SAS 9.4 includes features that are beneficial to all users at your site.

- For IT departments, SAS 9.4 provides a simplified architecture, increased security (including enhanced encryption algorithms), and deployment options that include running SAS on premises or on a cloud infrastructure.
- For SAS administrators, SAS 9.4 provides a broad suite of management capabilities that support management tasks, auditing, and software deployment and upgrades.

- For data administrators, the integration of the DataFlux products creates a more complete data management solution. Also, additional programming languages enable you to manipulate your data and access relational data from various data sources.
- For SAS programmers, high-performance analytics enable you to quickly analyze large amounts of data. Multi-threading capabilities enable you to perform analyses on single-machine deployments.
- For the business user, SAS 9.4 extends the options for mobile access and self-service options for data access, reporting, and exploration.

Enhancing SAS 9.4 through Maintenance Releases

Over the past several years, SAS 9.4 technology has advanced, and SAS has introduced SAS Viya. Both SAS 9.4 and SAS Viya are part of one SAS platform.

During the SAS 9.4 life cycle, maintenance releases enable us to continue delivering new functionality to our users.

SAS 9.4M9 (June 2025)

Here are some of the highlights in the SAS 9.4M9 release:

- Security enhancements include TLA automation and middle tier multi-factor authentication. For more information, see [“SAS 9.4 Intelligence Platform” on page 227](#).
- Support has been added for Windows Server 2025.

Support has been removed for these operating environments: Red Hat and Oracle Linux 7, Windows Server 2012 and 2012R2, AIX 7.1, and Solaris SPARC and X86.

- SAS 9.4M9 supports Java 21 and PostgreSQL 16.

SAS 9.4M8 (January 2023)

Here are some of the highlights in the SAS 9.4M8 release:

- Several SAS products and features have been retired. For a list of retired products, see [“January 2023 \(SAS 9.4, Rev. 940_23w05\)” on page 332](#).

If you order SAS 9.4M8, these products and features are not included in that order. A best practice is to unconfigure retired SAS products and features before you upgrade and to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products” in SAS Guide to Software Updates and Product Changes](#).

- Several SAS/ACCESS Interfaces are no longer supported. See [“SAS/ACCESS” on page 73](#).
- SAS 9.4M8 supports Java 11 and PostgreSQL 14.

SAS 9.4M7 (August 2020)

includes these security enhancements:

- update of third-party components: Java 8-based SAS Private JRE; Web server to Apache HTTP Server 2.4.43; Web application server to VMware tcServer 3.2.22 with Tomcat 8.5.54; SAS Messaging Engine to ActiveMQ 5.15.10; JDBC Driver; Postgres.
- support for Windows Defender Credential Guard (Constrained Delegation).
- Many SAS products such as SAS Environment Manager have removed Struts dependency and usage.

Operating environment support was added for Red Hat Enterprise Linux 8, Oracle Linux 8, SELINUX Enforcing for Red Hat Enterprise Linux 8, and for the Microsoft Edge on Chromium browser.

SAS examined the root causes of issues with upgrade in place and addressed many of these issues. For more information, see [“August 2020 \(SAS 9.4, Rev. 940_20w34\)”](#) in *SAS Guide to Software Updates and Product Changes*.

SAS 9.4M7 completes a multi-year effort to remove Adobe Flash dependencies from SAS offerings. Adobe announced that it will end support for Flash technology and cease to update and distribute the Flash Player at the end of 2020. Browser vendors disabled Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

Platform hot fixes, bug fixes, and enhancements accumulated since the delivery of SAS 9.4M6 (November 2018) are delivered with SAS 9.4M7.

SAS 9.4M6 (November 2018)

expands integration between SAS 9.4M6 and SAS Viya Cloud Analytic Services (CAS) engines. Security updates include upgrading to Java 8 runtime. This release includes programming and data access enhancements, new grid options for new customers, and accessibility enhancements.

Here are additional changes to the SAS Intelligence Platform:

- The SAS Web Server is now based on Apache Open Source HTTP server and it is completely built and packaged by SAS. It has also been upgraded from Apache HTTP server 2.2.34 to Apache HTTP server 2.4.34. As part of this upgrade, FIPS compliance is now supported.
- The SAS Web Application Server is updated from Pivotal tcServer 3.2.5 (or Tomcat 8.5.13) to Pivotal tcServer 3.2.11 (or Tomcat 8.5.32).

Note: Starting in February 2022, the SAS Web Application Server is based on Apache Tomcat 9.0.55.

- The SAS Messaging Engine now uses ActiveMQ 5.15.5.
- The SAS Cache Locator now uses GemFire 8.2.7.
- SAS 9.4M6 includes support for preserving SSL for ActiveMQ during an update in place.
- SAS 9.4M6 includes support for preserving SSL for GemFire during an update in place.

SAS 9.4M5 (December 2017)

provides greater integration with SAS Viya. This release includes several new and updated CAS-enabled procedures, new packages for accessing SAS Viya procedures, additional options for managing files in SAS Viya, and enhancements to DS2 actions and supported data types, and functions. SAS Studio 3.71 includes new tasks that support text analysis and forecasting in SAS Viya.

SAS 9.4M5 (September 2017)

includes new releases of SAS Studio and the SAS analytical products, such as SAS/STAT 14.3, SAS Enterprise Miner 14.3, SAS Contextual Analysis 14.3, SAS/ETS 14.3, and many more.

SAS 9.4M5 introduces procedures that can be used to connect to the CAS server, which is part of SAS Viya. Programmers can access CAS using familiar SAS programming interfaces, such as SAS Studio, SAS Enterprise Guide, SAS Enterprise Miner, and the SAS windowing environment. High-level changes also include security updates and integration between SAS 9.4 and SAS Viya.

SAS 9.4M4 (November 2016)

includes new releases of SAS Studio and the SAS analytical products, such as SAS/STAT 14.2, SAS Enterprise Miner 14.2, SAS Contextual Analysis 14.2, SAS/ETS 14.2, and many more. This maintenance release also includes bridges to SAS Viya.

SAS 9.4M3 (July 2015)

includes new releases of SAS Studio and the SAS analytical products, such as SAS/STAT 14.1, SAS Enterprise Miner 14.1, SAS Contextual Analysis 14.1, and SAS/ETS 14.1. This maintenance release also increases support for secure configurations of SAS. Starting with this maintenance release, you also have the ability to break up—or subset—your SAS software order. SAS is shipped with a trusted CA certificate bundle, which makes the secure deployment of SAS easier.

SAS 9.4M2 (August 2014)

includes new releases of the SAS analytical products, such as SAS/STAT 13.2, SAS Enterprise Miner 13.2, SAS Contextual Analysis 13.2, and SAS/ETS 13.2.

SAS 9.4M1

includes 32-bit Windows support for a broader list of products.

New HTML 5 User Interfaces

Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe announced that it intends to end support for Flash technology and will cease to update and distribute the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

Deploying and Administering SAS

Increasing Software Availability with More Deployment Options

To make SAS available to all users in your global organization, SAS 9.4 delivers tools and technologies that support deploying, managing, and maintaining your software in public and private cloud environments. To promote innovation, SAS provides a cloud development platform. With a cloud environment, your IT department can quickly meet the demands for increased computing capacity, which makes it easier for your software to grow as your business grows.

In addition, SAS continues to support deploying SAS at your site and as hosted solutions by using SAS Solutions OnDemand.

For more information, see [SAS Product Support for Virtualization Environments](#).

Reducing the Cost and Complexity of SAS Deployments

SAS 9.4 includes an embedded middle-tier server called SAS Web Application Server and an embedded Java Runtime Engine. In addition, a SAS Web Server is an optional component of a SAS 9.4 middle-tier deployment. As a result, you do not need to spend time or money acquiring, integrating, maintaining, and supporting third-party software. The SAS Web Application Server simplifies IT management and supports deploying SAS in a cloud environment.

SAS also delivers Java support as the SAS Private JRE. Security Updates are provided.

Subsetting SAS Software Orders

Starting in SAS 9.4M3, the SAS Deployment Wizard enables you to break up—or subset—your SAS software order. Subsetting your order makes it easier to provision individual SAS clients and conserves download time and disk space. When you subset your depot, you are creating a copy of your original depot with only those products that you designate based on criteria such as operating system, product type, and language.

Support for 32-Bit and 64-Bit Operating Environments

SAS applications are typically used to process large data sets. This processing benefits from higher performance environments. SAS 9.4 takes advantage of the additional memory and processing capability of the 64-bit Windows operating environments. If a middle tier is part of your deployment, SAS requires a 64-bit operating environment.

Starting in SAS 9.4M1, SAS includes 32-bit Windows support for a broader list of products.

Clustering the Metadata and Middle-Tier Servers to Improve Availability

To make your software more available to users in your organization, SAS 9.4 supports clustering the metadata and middle-tier servers. A metadata server cluster is a group of three or more nodes that are configured as identical metadata servers. If the servers are clustered and each server manages copies of the same data, you drastically reduce the threat of data loss. If one node in the cluster fails, users can continue working on the remaining nodes, thus reducing potential system downtime. Finally, clustering helps distribute the workload, which can result in improved performance.

Enhanced Management Capabilities for SAS Administrators with the SAS Environment Manager

SAS administrators have access to enhanced management capabilities with SAS Environment Manager, a web-based monitoring solution for a SAS environment. SAS Environment Manager enables you to administer, monitor, and manage SAS resources, including administering the SAS Web Application Server and monitoring SAS foundation servers. The application collects and charts data on metrics for monitored resources, providing a comprehensive view of resource health and operation. It provides functions such as auto-discovery of resources, monitoring of log events, and reporting of alerts. The application also enables administrators to manage access for metadata objects.

Increased Security

Security “hardening” is an industry phrase that is growing in use. It is the process of securing a system by reducing its surfaces of vulnerability.

SAS follows coding standards and performs reviews and testing to continually improve SAS products. For more information, see [SAS Software Security Framework: Engineering Secure Products](#).

For SAS software, security “hardening” includes upgrading third-party components, addressing vulnerabilities that have been flagged, closing loopholes, and ensuring that

credential information is appropriately encrypted. Security “hardening” also includes single sign-on connections, setting minimum cipher levels for encrypted connections, and ensuring that secure connections do not interfere with system or administrative tasks.

In SAS 9.4M5, changes include updates to the SAS Security Framework, the JRE, and several third-party components. Customers can upgrade the underlying components of the Web Infrastructure Platform Data Server.

SAS 9.4M5 also introduces enhanced encryption algorithms and certificate handling.

In SAS 9.4M4, changes include updates to third-party components, incorporating hot fixes, and updating security-related documentation. For more information about changes in default settings and the available configuration options, see [Encryption in SAS](#), [SAS Intelligence Platform: Security Administration Guide](#), and [SAS Intelligence Platform: Middle-Tier Administration Guide](#).

To help ensure that your system is protected from known vulnerabilities, SAS updates third-party components that are incorporated into SAS software with each maintenance release.

Starting in SAS 9.4M3, SAS is shipped with a trusted CA certificate bundle, which makes the secure deployment of SAS easier. Using this bundle simplifies the process for creating a secure deployment. After SAS installation, administrators can add and update trusted certificates by using the SAS Deployment Manager.

Starting in SAS 9.4, SAS/SECURE is shipped with Base SAS. You no longer need a separate license for SAS/SECURE. SAS/SECURE enables the protection of data and passwords with a range of encryption and encoding options.

As always, customers are encouraged to adopt processes that enable them to apply hot fixes and updates to SAS products on a regular basis. To stay current with information and updates, subscribe to the [Hot Fix Announcements community](#) and review [Security Bulletins from SAS](#).

Accessing SAS from Mobile Devices

SAS SDK for iOS and SAS SDK for Android are available for download from <http://developer.sas.com>. The SAS SDKs enable all customers to create custom mobile apps that embed SAS Visual Analytics content. You start by creating a personalized app that simply takes the SAS Visual Analytics App and adds a corporate icon and app name. You can progress to creating completely customized mobile apps that bring together multiple capabilities. With the SAS SDKs, customers can build the mobile apps that they need.

Often, the consumers of SAS reports are high-level executives who are in meetings, traveling, or otherwise away from the office. To meet the demands of these business professionals, SAS reports are now available on devices. In the SAS Output Delivery System, the new ODS EPUB destination creates SAS reports as e-books that work optimally with the Apple iBooks e-book reader on the iPad, iPhone, or iPod.

ODS also supports output to HTML5 and Microsoft PowerPoint.

SAS Visual Analytics Apps for iOS for Android and Windows 10 are available for no additional fee from the Apple App Store, Google Play, and Microsoft Store. Through these apps, you can subscribe to dashboards and reports on SAS Servers and interact with them through native apps on your mobile devices.

Using High-Performance Analytics

Analyzing Large Amounts of Data with High-Performance Analytics

If you are developing analytical models by using large amounts of data, SAS provides in-memory analytics that enable you to perform these analyses in a distributed environment. Because multiple nodes are working on the same tasks in parallel, in-memory analytics can provide significant gains in performance.

In SAS 9.4, five domain-specific high-performance analytics products are available:

- SAS High-Performance Statistics
- SAS High-Performance Data Mining
- SAS High-Performance Text Mining
- SAS High-Performance Econometrics
- SAS High-Performance Optimization

Using Multi-Threaded Capabilities on Single-Machine Deployments

In addition, the analytics procedures in these products are available from traditional SAS analytics products (such as SAS/STAT). Because these SAS High-Performance Analytics procedures are available from the traditional SAS analytics products, you can now run these high-performance analytics procedures on single-machine deployments.

- SAS Enterprise Miner
- SAS/ETS
- SAS Forecast Server
- SAS/OR
- SAS/STAT
- SAS Text Miner

Managing Your Data

Building an Integrated Information Management Platform

SAS has fully integrated the DataFlux suite of data quality, data integration, data governance, and master data management solutions. Incorporating the DataFlux brand into SAS helps customers build a more integrated information management approach that goes beyond data management and governance to support analytics and decision management.

Some DataFlux products have changed their names to SAS, and others will in the future. For example, DataFlux Federation Server is now SAS Federation Server. Instead of being licensed separately, DataFlux products are now being combined with SAS

software offerings that include other SAS products as well. Changes in offerings might affect your license renewals.

Performing Advanced Data Manipulation In-Database By Using DS2

DS2 is a SAS proprietary programming language that is appropriate for advanced data manipulation and applications. DS2 is included with Base SAS and is used in conjunction with the SAS DATA step. This language also includes additional data types, ANSI SQL types, programming structure elements, and user-defined methods and packages.

To allow SQL pre-processing on input tables, the SET statement for DS2 supports FedSQL syntax. The queries that are generated at run time can exchange data interactively between DS2 and any supported database. You can run your DS2 threaded packages on a database by using the SAS In-Database Code Accelerator.

Managing Relational Data Optimally By Using SAS FedSQL

SAS FedSQL enables you to access multiple data sources without performing a different SQL query for each data source. The same FedSQL query can be used on several data sources, and the results are presented in a single table. By using the FEDSQL procedure, you can submit FedSQL language statements in a Base SAS session.

SAS FedSQL is a SAS proprietary implementation of the ANSI SQL:1999 core standard. It provides support for new data types and other ANSI 1999 core compliance features and proprietary extensions. FedSQL provides data access technology that provides a scalable, threaded, high-performance way to access, manage, and share relational data in multiple data sources. When possible, FedSQL queries are optimized with multi-threaded algorithms to resolve large-scale operations.

Starting in SAS 9.4M5 (September 2017), FedSQL is a CAS-enabled procedure, which can be used to access SAS Viya resources that are licensed and accessible to a SAS 9 deployment.

Integration with SAS Viya

SAS 9.4M6 supports sessions between SAS and the SAS Viya CAS server. You can work with your SAS 9.4 and SAS Viya environments from the same familiar SAS interfaces, such as SAS Enterprise Guide, SAS Studio, and the SAS windowing environment.

Note: Your site must license and install both SAS Viya and SAS 9.4 to access the CAS functionality in a SAS 9.4M5 programming environment. The available procedures depend on the SAS Viya products licensed at your site. SAS 9.4M5 (September 2017) sites need to receive a new order to run these SAS Viya procedures. Packages are available for accessing SAS Viya procedures in a SAS 9.4M5 programming environment. Here are some of the available packages: SAS Visual Analytics procedures and SAS Viya procedures, SAS Econometrics procedures, SAS Optimization procedures, SAS Forecasting procedures, SAS Visual Data Mining and Machine Learning procedures, and SAS Statistics procedures.

- DATA step code can execute on a SAS 9.4 server and a CAS server. The new SAS Viya Analytic procedures execute only on the CAS server.

- The CAS LIBNAME engine enables you to load SAS data sets to a CAS table for processing on the CAS server using the DATA step and SAS Viya Analytic procedures.
- Several procedures can perform some processing on the CAS server: COPY, MEANS, REPORT, SUMMARY, TABULATE, and TRANSPOSE.
- In addition to processing NUMERIC and CHAR data, the CAS server supports the VARCHAR data type for DATA step processing.
- The CAS server processes only tables with an encoding of UTF-8. When SAS data sets are loaded to the CAS server, the data sets are automatically transcoded to UTF-8.
- You can use the CAS procedure and the CAS language (CASL) to program CAS actions.
- Many SAS language publications now include information that you need to process CAS tables. You will see both SAS 9.4 and SAS Viya documentation when it is appropriate to document how the language interacts with the CAS server.

Starting in SAS 9.4M5 (December 2017), several CAS-enabled procedures are available.

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Base SAS 9.4

Integration with the SAS Viya Platform

- SAS 9.4M9 shipped in June 2025.
- SAS 9.4M8 shipped in January 2023.
- SAS 9.4M7 shipped in August 2020 and provides further integration with SAS Viya 3.5.
- SAS 9.4M6 provides further integration with SAS Viya 3.4 and later, which shipped in July 2018.
- Beginning with SAS 9.4M5, you can submit code to SAS Viya 3.3 and later releases of Cloud Analytic Services (CAS).

In SAS Viya 3.3, new procedures are available. If you are currently running SAS 9.4M5, you need to order a new deployment to get these procedures. If you are getting SAS 9.4M5 for the first time, these procedures are automatically included.

- You can access the CAS server from all SAS programming environments, including SAS Studio, SAS Enterprise Guide, SAS Enterprise Miner, and SAS Display Manager.

Note: To connect to the CAS server, a valid certificate must be in place. For information about obtaining and configuring certificates, see [Configure SAS 9.4 Clients to Work with SAS Viya](#) in *Encryption in SAS*.

- DATA step code and new SAS Viya procedures execute on the CAS server. There are a few DATA step statements that do not run on the CAS server. If it is determined that the DATA step has code that does not run on the CAS server, the DATA step runs in SAS.
- The CAS LIBNAME engine enables you to load SAS data sets to a CAS table for processing on the CAS server using the DATA step and SAS Viya procedures. You can also use the CAS LIBNAME engine to process CAS tables using SAS procedures that run only in SAS and not on the CAS server. For example, when PROC PRINT DATA= specifies a libref that is associated with the CAS engine, the CAS table is downloaded from the CAS server to SAS for PROC PRINT to process.
- Several procedures perform some processing on the CAS server: COPY, MEANS, REPORT, SUMMARY, TABULATE, and TRANSPOSE.
- In addition to processing NUMERIC and CHAR data, the CAS server supports the VARCHAR data type for DATA step processing. VARCHAR data is based on the number of characters for a variable as compared to CHAR, which is based on the number of bytes for a variable.

Several procedures can read and process VARCHAR variable data in CAS tables: CONTENTS, COPY, DATASETS COPY and CONTENTS statements, EXPORT, IMPORT, PRINT, DOWNLOAD (SAS/CONNECT), and UPLOAD (SAS/CONNECT).

- The CAS server processes only tables with an encoding of UTF-8. When SAS data sets are loaded to the CAS server, the data sets are automatically transcoded to UTF-8. For DBCS data, SAS provides a CAS LIBNAME option and data set option, both with the name NCHARMULTIPLIER, and a system option, CASNCHARMULTIPLIER=, for you to specify a multiplier to increase byte size during transcoding.
- You can use the CAS procedure and the CAS language (CASL) to program using CAS actions.
- You can submit SAS DS2 language statements to the CAS server by using PROC DS2. Most of the functionality of the DS2 language is supported on the CAS server. You can submit a SAS FedSQL language statement to the CAS server by using PROC FEDSQL. FedSQL provides query and join functionality on the CAS server.
- Many SAS language publications now include information that you need to process CAS tables. You see both SAS 9.4 and SAS Viya documentation when it is appropriate to document how the language interacts with the CAS server.
- SAS 9.4 and SAS Viya programming documentation appear in these document collections:

- SAS 9.4 and SAS Viya Programming. For more information, see [SAS Programming Documentation](#).
- SAS Studio 3.8. For more information, see [A Guide to the SAS Studio 3.8 Documentation and Programming Documentation for SAS 9.4 and SAS Viya](#).
- Take some time to familiarize yourself with the contents. User feedback for the new look and feel of the SAS 9.4 programming documentation has been very positive—it just takes a little time to become used to it.

Cloud Analytic Services

What Are Cloud Analytic Services?

Cloud Analytic Services describes the CAS server that is available in SAS Viya. The CAS statement, CAS system options, and CAS macros enable SAS 9.4M5 programmers to directly reference CAS server resources. Starting in SAS 9.4M6, you can specify the WHERE statement in a DATA step that is running CAS.

Highlights

For a complete list of what is new in SAS Viya 3.5 Cloud Analytic Services, see the What's New section in [SAS Cloud Analytic Services: User's Guide](#). Here are some highlights:

- Support for Azure Data Lake Storage.
- Use PROC CASUTIL to perform these tasks:
 - rename tables
 - create table indexes
 - use a fileref to read external data
 - partition a table
 - update rows in a table
- New functions perform these tasks:
 - return session information
 - check for the existence of a particular caslib
 - obtain the CAS Server Monitor URL
- Use the credentials that are defined for your EC2 instance on S3.
- New CAS session options specify the following information:
 - whether to offload work to the Graphics Processing Unit (GPU), if it is available
 - the host and port for the SAS Code Debugger
 - the tenant ID to connect to an Azure storage system
- These are the new data connectors:
 - SAS Data Connector to MongoDB
 - SAS Data Connector to Salesforce
 - SAS Data Connector to ORC
- Here are enhancements to existing data connectors:

- Amazon Redshift: bulk unloading (data retrieval). Bulk-unloading support includes the new BULKUNLOAD= data connector option.
- PostgreSQL: bulk unloading (data retrieval). Bulk-unloading support includes these new data connector options: BULKUNLOAD=, BLDELDATFILE=, BLDELIMITER=, BLESCAPE=, BLFORMAT=, BLNULL, BLPSQLPATH=, BLQUOTE=, and LDPATH=.
- Teradata: support for the NUMBER data type.
- **PROC SORT** supports the ability to run the duplicate detection and manipulation options (NODUPKEY, NOUNIQUE, DUPOUT=, UNIOUT=) in CAS. This functionality is provided to facilitate migration of code for users of SAS Viya.

These enhancements are new in SAS 9.4M6:

- You can specify the **WHERE statement** in a DATA step that is running in CAS.
- To determine whether ASYNC processes are running in ASYNC actions or in a DATA step, use the **SESSBUSY function**.

CAS Statement

SAS 9.4M5 shipped in September 2017 and has these new options for the CAS statement:

- You can specify the location of the authinfo file that contains your credentials using the AUTHDOMAIN= system option.
- The CASSERVERMD= option specifies the name of a server object registered on the SAS Metadata Server that associates SAS Cloud Analytic Services connection parameters with a server name.

CAS System Options

For SAS 9.4M5 (September 2017), these system options were added to SAS Cloud Analytic Services:

- Data transfer of CAS tables can impede system performance if the CAS table is very large. You can use the CASDATALIMIT= system option to limit the amount of data in a single CAS table that can be transferred from the CAS server to SAS.
- When SAS reads a data set to be loaded to the CAS server, SAS makes a best guess at the number of bytes that are needed to transcode the data to UTF-8. You can use the CASNCHARMULTIPLIER system option to replace the best guess with an explicit value of the byte multiplier when you know the number of bytes that are needed to represent the data in UTF-8.
- By default, the DSCAS system option is set so that the DATA step runs on your CAS server without specifying a session reference option in the DATA statement. If NODSCAS is set, the SESSREF= DATA statement option is required for the DATA step to run on the CAS server.

CAS Functions

For SAS 9.4M6 (November 2018), the new SESSBUSY function determines whether a CAS session is busy processing actions.

These functions are new in SAS 9.4M5:

- CLIBEXIST indicates whether a caslib name exists.
- GETCASURL returns the CAS Server Monitor URL.

- GETLCASLIB returns the caslib that is associated with a CAS LIBNAME engine libref.
- GETLSESSREF returns the name of the CAS session that is associated with the CAS LIBNAME engine.
- GETLTAG returns the tag for a CAS LIBNAME engine libref that was specified by the TAB= LIBNAME statement option.
- GETSESSOPT returns the value of a CAS session option.
- SESSFOUND returns a value to indicate whether a named session that you started in your SAS session is found.

CAS Macros

User-defined formats are stored in a SAS catalog in SAS and a CAS library on the CAS server. To use your SAS user-defined formats on the CAS server, you can migrate them from SAS to the CAS server using the autocall macro %UDFSEL. This macro generates a SELECT statement that you can use with the FORMAT procedure to migrate only the user-defined formats that your data is using.

Create and Run Python Objects in SAS

In SAS Viya 3.5 and the November 2019 release of SAS 9.4M6, you can submit Python objects to the CAS server using PROC FCMP or the DATA step.

In the May 2019 release of SAS 9.4M6, you can create a Python object to execute a Python function using PROC FCMP. You execute Python objects using PROC FCMP or the DATA step. You cannot submit Python objects to the CAS server.

For more information about the Python object, see “Using PROC FCMP Python Objects” in [SAS Component Objects: Reference](#).

DS2 Language

About the DS2 Language

DS2 is a SAS proprietary programming language that is appropriate for advanced data manipulation and applications. DS2 is included with Base SAS and intersects with the SAS DATA step. DS2 also includes additional data types, ANSI SQL types, programming structure elements, and user-defined methods and packages. Several DS2 language elements accept embedded FedSQL syntax, and the run-time-generated queries can exchange data interactively between DS2 and any supported database. This action enables SQL preprocessing of input tables, which effectively combines the power of the two languages. The DS2 procedure enables you to submit DS2 language statements from a Base SAS session. In addition, by using the power of the SAS Embedded Process, the SAS In-Database Code Accelerator enables you to publish a DS2 thread program to the database and execute the thread program in parallel inside the database.

DS2 Language: SAS 9.4M8

SAS 9.4M8 shipped in January 2023.

DS2 Language: SAS 9.4M7

- Starting with the September 2024 update to SAS/ACCESS Interface to Google BigQuery on SAS 9.4M7, in order to improve read performance, the Google BigQuery NUMERIC and BIGNUMERIC data types are handled as DOUBLES by

default. The `FETCH_NUMERIC_TYPE=` table option enables you to revert to former `NUMERIC` handling. For more information, see [Data Types for Google BigQuery](#) and [FETCH_NUMERIC_TYPE= Table Option](#).

- Starting in SAS 9.4M7 and SAS Viya 3.5, Spark is supported as a data source with the SAS DS2 language when appropriate SAS/ACCESS software is installed. Access is read and write and on Linux only. You can submit requests to Spark through a SAS library and on the CAS server.
- In SAS 9.4M7 only, Yellowbrick is supported as a data source with the SAS DS2 language when appropriate SAS/ACCESS software is installed. Access is read and write through a SAS library only.

DS2 Language: SAS 9.4M6

Beginning in August 2019, PROC DS2 supports the Google BigQuery and Snowflake databases for SAS 9.4M6 and SAS Viya 3.4. Read and Write access is supported from a SAS library and from a CAS library. In CAS, DS2 creates in-memory tables from existing tables only. Appropriate SAS/ACCESS software must be installed.

In the April 2019 release of SAS 9.4M6, PROC DS2 includes connection options that enable you to connect to MongoDB and Salesforce databases.

SAS 9.4M6 (November 2018) has these changes and enhancements:

- The DS2 language supports these new data sources: Spark as well as databases (such as PostgreSQL) that are compliant with JDBC.
- Inline declarations can be specified for DO loop counters.
- The new \$UUID. format writes character data to the universally unique identifier (UUID) format.
- A RETAIN option has been added to the MERGE statement that produces a many-to-many match-merge that is similar to a DATA step merge.
- User-written DS2 methods that return a DOUBLE value now return the specified missing value. Previously, the regular SAS missing value (a period) was returned.
- These are the changes and enhancements for DS2 functions:
 - New functions are available: CMISS, LOGISTIC, SAVING, SHA256, and SYSGET.
 - The SCAN function supports a modifier.
 - In an effort to align the SUBSTR(right of =) function with DATA step behavior, a length of 0 is now considered invalid.
- PROC DS2 supports databases that are compliant with JDBC, as data sources. When SAS/ACCESS Interface to JDBC is installed, you can access data in a database that is compliant with JDBC by assigning and referencing a libref. Or, you can submit a fully qualified data source connection string by using the NOLIBS and CONN= procedure options.
- You can direct the PROC DSTODS2 output file to a directory using the OUTDIR= option.
- The SAS In-Database Code Accelerator can be executed on MapReduce or Spark. A new system option, HADOOPPLATFORM=, determines which execution platform is used. HADOOPPLATFORM= determines which execution platform is used. However, the HADOOPPLATFORM=SPARK option is not supported on the Windows operating system for the SAS In-Database Code Accelerator.
- The SAS In-Database Code Accelerator for Hadoop has these enhancements:

- Supports the SCRATCH_DB option for a Hive database that is used when a temporary table is created.
- SQL queries using a WHERE IN clause are now supported.
- CEDA processing of SPD Engine input files is supported. Previously, only SPD Engine data sets whose architectures matched the architecture of the Hadoop cluster (that is, 64-bit Solaris or Linux) ran inside the database.
- These are the changes and enhancements for the DS2 HTTP package
 - New methods are available for the HTTP package that enable you to specify a URL or proxy URL and a user name and password for those URLs, and to either specify an Open Authorization (OAuth) token or search for a token in the SAS environment.
 - If the content type is not set, the SETREQUESTBODYASSTRING method sets the default charset value to ISO-8859-1 (latin1) as specified by the 1.1 protocol.

DS2 Language: SAS 9.4M5

- The SCOREACCEL procedure provides an interface to the CAS server for DATA step and DS2 model publishing and scoring. Models can be published and run in CAS or in Hadoop or Teradata.
- You can use new DS2 actions to publish and run DS2 models in the CAS server, Hadoop, or Teradata. Alternatively, you can use the new SCOREACCEL procedure from the SAS client.
- The SAS In-Database Code Accelerator for Hadoop honors the SCRATCH_DB option for a Hive database that is used when a temporary table is created.
- DS2 supports BIGINT (INT64) and INTEGER (INT32) as well as CHAR, DOUBLE, and VARCHAR data types in the CAS server. Columns defined as SMALLINT and TINYINT data types in CAS are now created as INTEGER instead of DOUBLE.
- You can now pass SQL text in the SET statement if you run the DS2 program with the runDS2 action.
- The SCAN function supports a modifier. The modifier is supported only on the CAS server.
- These functions are new:
 - The CMISS function counts the number of missing arguments.
 - The LOGISTIC function returns the logistic transformation of the argument.
 - The SAVING function returns the future value of a periodic saving.
- When using the HTTP package, if the content type is not set, the SETREQUESTBODYASSTRING method sets the default charset value to ISO-8859-1 (latin1) as specified by the HTTP 1.1 protocol.

SAS 9.4M5 (September 2017) has these changes and enhancements:

- The DS2 language concepts have been moved from the [SAS DS2 Language Reference](#) to the new [SAS DS2 Programmer's Guide](#). In addition, to provide a more comprehensive user experience, information about using DS2 with the CAS server has been incorporated into this document.
- You can use PROC DS2 from SAS to execute on the CAS server. You connect to the CAS server using the SESSREF= or SESSUID= procedure option. The SESSREF=

option identifies the CAS session by its session name. The SESSUUID= option identifies the session by its universally unique identifier (UUID).

- The new procedure DSTODS2 translates a subset of your SAS DATA step code into DS2 code.
- Methods in thread programs now allow packages to be passed in as parameters.
- DS2 can access the Amazon Redshift, Microsoft SQLServer, and Vertica data sources.
- You can use the new predefined packages, PCRXFIND and PCRXREPLACE, for regular expression matching and substitution. These packages are based on the PCRE 2 open-source regular expression library.
- When a variable is used but not declared, a warning is sent to the SAS log. The warning now indicates the data type, length, and, in some cases, precision, that are assigned to the undeclared variable.

DS2 Language: SAS 9.4M4

SAS 9.4M4 (November 2016) has these changes and enhancements:

- The private access modifier is now supported for attributes or methods that are intended for internal use within the package.
- Two new functions, DIF and LAG, enable you to access previous values of a variable or expression. These functions are useful for computing lags and differences of series.
- The DO statement now enables you to use multiple index variable clauses separated by commas.
- The new INTNEST function calculates the number of whole periods of the smaller interval that fits into the period of the larger interval.
- Three new automatic variables, _HOSTNAME_, _NTHREADS_, and _THREADID_ enable you to subset a problem across a thread.
- The TIME and TIMESTAMP precision is now preserved across a THREAD and DATA boundary.

DS2 Language: SAS 9.4M3

SAS 9.4M3 (July 2015) has these changes and enhancements:

- The SAS In-Database Code Accelerator has these enhancements: , reads and writes HDFS-SPD engine file formats, and links to the MapReduce job log from the SAS log to find error messages that are related to Hadoop. The SET statement supports multiple tables and embedded SQL.
 - The SET statement supports multiple tables and embedded SQL.
 - The Code Accelerator reads and writes HDFS-SPD Engine file formats.
 - The SAS log links to the MapReduce job log to find error messages when a Hadoop data or thread program fails.
- You can change the default behavior of a DS2 program by using the DS2_OPTIONS statement:
 - Specify how DS2 processes a division by zero operation.
 - Specify to write a note instead of an error message to the SAS log when an invalid function argument generates a missing value.

- Specify how non-existent values are processed as ANSI SQL null values.
- Specify to create a trace of executed statements.
- You can override the default data source connection with the specified data source connection string by using the NOLIBS CONN= option in the PROC DS2 statement.
- You can obtain information about a format or informat by using the FMTINFO() function. The function can return the format or informat category, the description, format width values, and decimal place values.
- Three new SQLSTMT methods enable you to retrieve the number of columns, the name of a column by column number, and the type of column by column number.
- You can parse JSON text by using the JSON DS2 package.
- The TZ package enables you to perform time zone processing.
- You can compare two character strings including and excluding trailing blanks, respectively, by using the CMP and CMPT functions.
- You can match-merge data by using the MERGE statement.
- The SELECT statement in embedded SQL text supports the PARTITION BY, ORDER BY, INDSNUM, and WHERE clauses.
- You can create a US-locale-based value regardless of the current locale by using the BESTDOTX. format.
- You can partition tables by using the DBCREATE_TABLE_OPTS table option.

DS2 Language: February 2015 Release

In the February 2015 release, the SAS In-Database Code Accelerator for Hadoop uses HCatalog to process complex, non-delimited files. Using HCatalog enables the SAS In-Database Code Accelerator for Hadoop to support Avro, ORC, RCFile, and Parquet file types. In addition, you can now use the DBCREATE_TABLE_OPTS table option to specify the output SerDe, the output delimiter of the Hive table, the output ESCAPED BY character, and any other CREATE TABLE syntax allowed by Hive.

DS2 Language: SAS 9.4M2

SAS 9.4M2 includes the following DS2 changes:

- The SAS In-Database Code Accelerator for Hadoop runs the DS2 data program as well as the thread program inside the database.
- A new predefined HTTP package enables you to construct an HTTP client to access web services.
- A new logger enables logging of HTTP traffic through the SAS Logging Facility.
- A connection string parameter is available when instantiating an SQLSTMT package.
- The Getting Started section has been rewritten and contains new examples.

DS2 Language: SAS 9.4M1

SAS 9.4M1 (December 2013) includes the following DS2 changes:

- The PROC DS2 INDB= option has changed its name to DS2ACCEL. INDB= is still supported as an alias. However, the default value for the option has changed from YES to NO, which prevents DS2 code from executing in the database.

- The default behavior for the SAS In-Database Code Accelerator has changed. DS2 code is not executed inside the database, by default. You must set either the new DS2ACCEL system option or the PROC DS2 DS2ACCEL option to ANY to enable DS2 code to run inside the database.
- The SAS In-Database Code Accelerator for Teradata can now run the DS2 data program as well as the thread program inside the database.
- Five new DS2 configuration and run-time loggers have been added to the SAS Logging Facility.
- You can use formatted log messages.

Additional Information for DS2 Language

For more information, see [SAS DS2 Language Reference](#) and [Base SAS Procedures Guide](#).

FedSQL Language

About FedSQL Language

SAS FedSQL is a SAS proprietary implementation of the ANSI SQL:1999 core standard. It provides support for new data types and other ANSI 1999 core compliance features and proprietary extensions. FedSQL provides data access technology that brings a scalable, threaded, high-performance way to access, manage, and share relational data in multiple data sources. When possible, FedSQL queries are optimized with multi-threaded algorithms in order to resolve large-scale operations. For applications, FedSQL provides a common SQL syntax across all data sources. That is, FedSQL is a vendor-neutral SQL dialect that accesses data from various data sources without submitting queries in the SQL dialect that is specific to the data source. In addition, a single FedSQL query can target data in several data sources and return a single result table. The FEDSQL procedure enables you to submit FedSQL language statements from a Base SAS session.

In its initial release, FedSQL provided access to the following data sources: SAS data sets, SAS Scalable Performance Data Engine (SPD Engine) data sets, and the following databases: Aster, DB2 for UNIX and PC operating environments, Greenplum, MySQL, Netezza, ODBC databases, Oracle, SAP (Read-only), Sybase IQ, and Teradata. Additional database support has been added in subsequent releases.

FedSQL Language: SAS 9.4M8

SAS 9.4M8 shipped in January 2023.

FedSQL Language: SAS 9.4M7

- Starting with the September 2024 update to SAS/ACCESS Interface to Google BigQuery on SAS 9.4M7, in order to improve read performance, the Google BigQuery NUMERIC and BIGNUMERIC data types are handled as DOUBLES by default. The FETCH_NUMERIC_TYPE= table option enables you to revert to former NUMERIC handling. For more information, see [Data Types for Google BigQuery](#) and [FETCH_NUMERIC_TYPE= Table Option](#).
- Beginning with SAS 9.4M7 and SAS Viya 3.5, Spark is supported as a data source with the SAS FedSQL language when appropriate SAS/ACCESS software is installed. Access is read and write and on Linux only. You can submit requests to Spark through a SAS library and on the CAS server.

- In SAS 9.4M7 only, Yellowbrick is supported as a data source with the SAS FedSQL language when appropriate SAS/ACCESS software is installed. Access is read and write through a SAS library only.

FedSQL Language: SAS 9.4M6

Beginning in August 2019, PROC FEDSQL supports the Google BigQuery and Snowflake databases for SAS 9.4M6 and SAS Viya 3.4. Read and Write access is supported from a SAS library and from a CAS library. In CAS, FedSQL creates in-memory tables from existing tables only. Appropriate SAS/ACCESS software must be installed.

In the April 2019 release of SAS 9.4M6, PROC FEDSQL supports the MongoDB and Salesforce nonrelational databases. Access to both databases is Read-only and through a SAS library. Appropriate SAS/ACCESS software must be installed. In addition, explicit pass-through is supported.

SAS 9.4M6 (November 2018) has these changes and enhancements:

- PROC FEDSQL support for databases that are JDBC compliant, as data sources. When SAS/ACCESS Interface to JDBC is installed, you can access data in a database that is compliant with JDBC by assigning and referencing a libref. Or, you can submit a fully qualified data source connection string by using the NOLIBS and CONN= procedure options.
- The FedSQL language creates VARCHAR columns that contain more than 65,535 characters as type STRING in Hive.

FedSQL Language: SAS 9.4M5

The December 2017 release of SAS 9.4M5 and SAS Viya 3.3 has these enhancements:

- Full support for SAS libraries and CAS libraries.
- Implicit pass-through for SQL-based CAS libraries.
- You can specify optional control parameters for the FedSQL query planner in CAS using the PROC FEDSQL option, CNTL=.
- FedSQL reads the new native CAS data types INT64 and INT32.

SAS 9.4M5 shipped in September 2017 and has these FedSQL enhancements:

- You can use PROC FEDSQL to execute on the CAS server. You connect to the CAS server using the SESSREF= or SESSUID= procedure option. The SESSREF= option identifies the CAS session by its session name. The SESSUID= option identifies the session by its universally unique identifier (UUID).
- This release supports Amazon Redshift, Microsoft SQL Server, and Vertica data sources.
- New table options for Hive allow additional database-specific options to be placed before and after the table name when you are creating a table.
- You can query SAS Cloud Analytic Services (CAS) tables.
- The ENCRYPT= table option supports stronger AES encryption for SAS data sets.
- SAS Scalable Performance Data (SPD) Server tables can now also be encrypted with ENCRYPT= option.
- You can now get information about views from DICTIONARY.COLUMNS queries.
- This release adds support for numerous functions.

FedSQL Language: SAS 9.4M4

SAS 9.4M4 (November 2016) has these FedSQL enhancements:

- support for reading and writing SAS Scalable Performance Data (SPD) Server tables
- support for three-level names when creating access tables in Hive 0.14 and later
- a new DESCRIBE TABLE statement that writes a CREATE TABLE statement to the SAS log for the table specified in the DESCRIBE TABLE statement

FedSQL Language: SAS 9.4M3

SAS 9.4M3 has these FedSQL enhancements:

- Support for HAWQ and Impala distributions of Hadoop; support for Impala includes bulk loading.
- You can specify DBMS-specific syntax to append to the CREATE TABLE statement by using the DBCREATE_TABLE_OPTS= table option.
- You can set the encoding for a SAS data set by using the ENCODING= table option.
- You can use the DECIMAL/NUMERIC(p,s) data type for data definition and for reading in HDMD.
- You can use the DECIMAL/NUMERIC(p,s) data type and the VARBINARY data type for data definition and for reading in Hive.
- The Hive ARRAY, MAP, STRUCT, and UNION complex types read from Hive.

FedSQL Language: SAS 9.4M2

SAS 9.4M2 (August 2014) has the following FedSQL enhancements:

- Support for Hive, HDMD, and PostgreSQL data sources. Not all FedSQL statements are supported for each data source. See the documentation for FedSQL statements to determine statement support.
- The CAST function for ODBC enables you to convert a value from one data type to another.
- The DBCREATE_INDEX_OPTS=table option for SASHDAT enables you to add DBMS-specific clauses to the end of the CREATE INDEX statement.
- The SQUEEZE= table option enables you to write the SASHDAT files in compressed format.

FedSQL Language: SAS 9.4M1

SAS 9.4M1 (December 2013) has these enhancements:

- support for Memory Data Store (MDS), SAP HANA, and SASHDAT data sources.
- rename table and rename column functionality in the ALTER TABLE statement
- several new functions

Additional Information for FedSQL Language

For more information, see [SAS FedSQL Language Reference](#) and [Base SAS Procedures Guide](#).

For information about SAS Viya, see [SAS Viya: FedSQL Programming for SAS Cloud Analytic Services](#).

Hadoop Support

Hadoop Support: SAS 9.4M8

SAS 9.4M8 shipped in January 2023.

Hadoop Support: SAS 9.4M7

SAS 9.4M7 (August 2020) has these changes and enhancements:

- The `hadooptracer.py` script, which is used to manually run the Hadoop tracer script to collect JAR and configuration files, has been renamed `hadooptracer_py`. A new required option `-jsonfile <path>/driver.json` is added to the script. The `driver.json` file is supplied with the script.
- Two JRE options enable you to force a Transport Layer Security (TLS) version when you are using a Hadoop environment with more than one level of a distribution and multiple Java versions such as CDH 5 and CDH 6. When distributions use different Java and TLS versions, the highest TLS version supported by both sides should be used.

Hadoop Support: SAS 9.4M6

SAS 9.4M6 (November 2018) has these changes and enhancements:

- Information about IBM Big Insights and Pivotal has been removed from the *Hadoop Configuration Guide for Base SAS and SAS/ACCESS* documentation. These Hadoop vendors have asked their customers to move to Hortonworks.
- If you are using Hortonworks version 3.0, select **No Filter** when using SAS Deployment Manager to collect the Hadoop JAR files. This selection ensures that the correct jline JAR files are obtained for running PROC HADOOP Pig jobs successfully.

Hadoop Support: SAS 9.4M5

Starting in SAS 9.4M5, PROC SQOOP supports Linux clusters that are secured with Kerberos.

Hadoop Support: SAS 9.4M4

Starting in SAS 9.4M4 (November 2016),

- The default behavior of the `CFG=` option in the `FILENAME` statement, Hadoop access method has changed. If `CFG=` is not provided, the `SAS_HADOOP_CONFIG_PATH` and `SAS_HADOOP_JAR_PATH` environment variables are scanned for the location of the required configuration files. In addition, Knox security is supported.
- The SPD Engine Hive SerDe can be used by the SAS Code Accelerator.

Hadoop Support: SAS 9.4M3

SAS 9.4M3 has these enhancements:

- HADOOP Procedure
 - you can now connect to a Hadoop cluster by copying the Hadoop configuration files to a physical location that is accessible to the SAS client machine. Once the files are accessible to the client, you simply set the

SAS_HADOOP_CONFIG_PATH environment variable to the location of the configuration files.

- You can use wildcard characters when specifying HDFS files for several HDFS statement options.
- You can request recursive action to execute the operation on the specified directory as well as subdirectories for several HDFS statement options.
- New HDFS statement options display the contents of files (CAT=), change file access permissions (CHMOD=), and list HDFS files (LS=).
- You can submit a MapReduce program and Pig language code to a Hadoop cluster through the Apache Oozie RESTful API.

For more information about the HADOOP procedure, see [Base SAS Procedures Guide](#).

- FILENAME (Hadoop Access Method)
 - The Hadoop access method supports the SAS_HADOOP_CONFIG_PATH environment variable. You no longer have to merge properties from multiple Hadoop configuration files into a single configuration file and specify the CFG= option.
 - The CONCAT and DIR Hadoop options are now mutually exclusive because the SAS_HADOOP_CONFIG_PATH environment variable is available.

For more information about HDFS commands, see FILENAME (Hadoop Access Method) in [SAS Global Statements: Reference](#).

- SAS 9.4 SPD Engine: Storing Data in the Hadoop Distributed File System
 - WHERE processing is optimized for MapReduce to support more WHERE expression conditions.
 - Concurrent access to data stored in HDFS is enhanced with a new distributed lock manager.
 - Parallel processing is expanded to write data.
 - SPD data sets can be read in HDFS through Hive.

For more information, see [SAS SPD Engine: Storing Data in the Hadoop Distributed File System](#).

- The SAS FedSQL language has enhanced support for these data types:
 - The DECIMAL/NUMERIC(p,s) data type is supported for data definition and for reading in HDMD.
 - The DECIMAL/NUMERIC(p,s) data type and the VARBINARY data type are supported for data definition and for reading in Hive.
 - The Hive ARRAY, MAP, STRUCT, and UNION complex types read from Hive.

In addition, by using the SQOOP procedure, you can access Apache Sqoop within a SAS session to transfer data between a database and HDFS. For more information about the SQOOP procedure, see [Base SAS Procedures Guide](#).

Hadoop Support: SAS 9.4M2

SAS 9.4M2 (August 2014) has the following enhancements:

- [SAS Hadoop Configuration Guide for Base SAS and SAS/ACCESS](#) is available from [SAS 9.4 Guides, Papers, and Documentation for Hadoop](#) on support.sas.com. This

book explains how to configure SAS components so that you can use SAS technology to connect to Hadoop.

- SAS can write Hadoop MapReduce job information to the SAS log.
- The SPD Engine improves Hadoop performance in these ways:
 - Creating a large SAS index for a data set in HDFS is much faster because the index is partitioned.
 - The scope of the SPD Engine I/O block size is expanded; the default block size is 1 megabyte. The block size affects compressed, uncompressed, and encrypted data sets. The block size influences the size of I/O operations when reading all data sets and writing compressed data sets.
 - Expanded support for parallel processing enables you to request parallel processing for all Read operations of data stored in HDFS. Use the SPDEPARALLELREAD= system option, the PARALLELREAD= LIBNAME statement option, or the PARALLELREAD= data set option.
 - You can optimize the performance of WHERE processing by requesting that the subsetting of the data be performed in the Hadoop cluster. This takes advantage of the filtering and ordering capabilities of the MapReduce framework. Use the ACCELWHERE= LIBNAME statement option or the ACCELWHERE= data set option.
- If MSGLEVEL=I, SAS writes Hadoop MapReduce job information to the SAS log.
- You can submit HDFS commands through WebHDFS. The new SAS environment variable SAS_HADOOP_RESTFUL must be defined and set to the value 1. In addition, the Hadoop configuration file must include the properties for the WebHDFS location.

Hadoop Support: SAS 9.4M1

SAS 9.4M1 (December 2013) has these enhancements:

- The HADOOP procedure now provides the PROPERTIES statement to submit configuration properties to the Hadoop server.
- You can now specify the NOWARN option in the PROC HADOOP HDFS statement to suppress the warning message when there is an attempt to delete a file that does not exist.
- The SPD Engine is enhanced to read, write, and update data in a Hadoop cluster through the HDFS.
- The FILENAME Hadoop Access Method statement, which enables you to access files on an HDFS, has been enhanced. A new option, NEW, is used in output mode in conjunction with the DIR option to create the directory that is specified in the FILENAME Hadoop statement.

Additional Information about Hadoop Support

For more information, see the following documentation:

- For an overview of SAS and Hadoop, see [SAS and Hadoop Technology: Overview](#).
- To learn about common deployment scenarios, see [SAS and Hadoop Technology: Deployment Scenarios](#).
- For more information about [SAS/ACCESS Interface to Hadoop](#), see [SAS/ACCESS for Relational Databases: Reference](#).

- For more information about support for Hadoop and a list of the supported Hadoop distributions, see [SAS 9.4 Support for Hadoop](#) and [SAS 9.4 Guides, Papers, and Documentation for Hadoop](#).

Execute the DATA Step in New Supported Environments

In SAS 9.4M5, the DATA step can run on the CAS server.

In SAS 9.4M2 (August 2014), DATA step processing in Hadoop has moved from preproduction status to production status.

In SAS 9.4M1 (December 2013), the DATA step runs in-memory in the SAS LASR Analytic Server and inside Hadoop using SAS/ACCESS and the SAS Embedded Process, with limitations. Note that the DATA step processing in Hadoop is preproduction.

For more information, see [SAS LASR Analytic Server: Reference Guide](#) and [SAS In-Database Products: User's Guide](#).

Improved Performance

- On host platforms other than z/OS, SAS is more efficient in writing output data, especially large amounts of data, when the data is aligned on a page boundary. You can use the ALIGNSASIOFILES system option to align output data on a page boundary. ALIGNSASIOFILES is set by default.
- I/O between SAS and RAID devices can improve when you use the STRIPESIZE= system option. The STRIPESIZE= system option enables you to set the page size for a SAS library to be the same size as the RAID stripe.
- Optimization processes to determine page size and the default size of a logical record length have been enhanced. If the optimization processes are not ideal for your SAS session, you can use the DATAPAGESIZE= system option to revert to the settings that were in place prior to SAS 9.4.
- SAS uses temporary utility files for processing SAS data sets. I/O performance improves when the page size of the utility files is compatible with the page size for the data set. Two new system options, UBUFNO= and UBUFSIZE=, enable you to configure buffers for utility files.
- Processing a SAS view is improved using the VBUFSIZE= system option to set the size of the view buffer that holds output observations.
- The Scalable Performance Data Engine (SPD Engine) enables the caching of opened SPD Engine files.

In SAS 9.4M2 (August 2014), the SPD Engine enhances I/O control and efficiency, and improves Hadoop performance.

For more information, see [SAS System Options: Reference](#), [SAS Language Reference: Concepts](#), and [SAS Scalable Performance Data Engine: Reference](#).

Connecting to Microsoft Azure Storage

Starting in SAS 9.4M7, these system options are available:

- The AZUREAUTHCACHELOC system option specifies the location of a file that contains login information for connecting to a Microsoft Azure storage system. For

more information, see “[AZUREAUTHCACHELOC System Option](#)” in *SAS System Options: Reference*.

- The AZURETENANTID system option specifies the tenant ID for connecting to a Microsoft Azure storage system. For more information, see “[AZURETENANTID= System Option](#)” in *SAS System Options: Reference*.

Encryption

Encryption: SAS 9.4M9

Starting with SAS 9.4M9, SAS supports the following functionality:

- AES 256-bit encryption is used to encrypt PDF files that are generated by ODS when system option PDFSECURITY=HIGH. For more information, see “[Encrypting ODS Generated PDF Files](#)” in *Encryption in SAS*.
- The NETENCRYPTALGORITHM= (NETENCALG=) system option values of RC2, RC4, DES, TRIPLEDES, and AES are deprecated. These values will be removed in an upcoming SAS release. Change the option value to SSL to specify the use of the TLS protocol. [Configure TLS for Data in Motion \(Starting with SAS 9.4M9\)](#)

A WARNING message is generated when system option NETENCRYPTALGORITHM (NETENCALG)= is set to values AES, DES, RC2, RC4, or TripleDES. For more information, see [ACCEPT_RISK_ALLOW_INSECURE_HANDSHAKE](#) environment variable can be used to change the WARNING message to an INFO message.

- PKCS#12 certificate files (file extension is .p12) are being provided instead of JKS formatted certificate files (file extension .jks). The trusted certificate files are trustedcerts.pem and trustedcerts.p12. It is recommended that customers provide certificate files in PKCS#12 format instead of JKS formatted certificates for use with Windows. JKS (.jks) formatted certificates are being deprecated in the near future.
- SAS now supports IBM System SSL on z/OS 64-bit SAS Metadata Server. The z/OS 64-bit SAS Metadata Server is used in a SAS Business Intelligence platform deployment. For more information, see *Configuration Guide for SAS 9.4 Foundation for z/OS*.

Encryption: SAS 9.4M8

Starting with SAS 9.4M8, SAS/SECURE is a retired feature. A best practice is to unconfigure retired SAS products before you upgrade and to uninstall them after you upgrade. For more information, see “[Unconfiguring and Uninstalling Retired Products](#)” in *SAS Guide to Software Updates and Product Changes*.

Starting with SAS 9.4M8, SAS provides the following support:

- IBM z/OS Pervasive Encryption on data sets. SAS direct access bound libraries and sequential access libraries can use Pervasive Encryption. See “[IBM z/OS Pervasive Encryption for Data Sets Starting with SAS 9.4M8](#)” in *Encryption in SAS*.
- IBM System SSL is used to provide TLS for z/OS. SAS no longer provides OpenSSL libraries to support TLS on z/OS, but instead uses System SSL. See “[IBM System SSL Provides OpenSSL Capabilities for z/OS \(Starting with SAS 9.4M8\)](#)” in *Encryption in SAS*.
- SAS supports IBM System SSL on z/OS 64-bit SAS Metadata Server through hot fixes. The z/OS 64-bit SAS Metadata Server is used in a SAS Business Intelligence

platform deployment. For more information, see [Usage Note 70504: Support for the IBM "System SSL" for 64-bit z/OS](#). For configuration information, see *Configuration Guide for SAS® 9.4 Foundation for z/OS*.

Because of this change, the following SAS system options have been deprecated and added.

- SAS system options that are deprecated for use with z/OS are SSLCACERTDATA, SSLCACERTDIR, SSLCALISTLOC, SSLCERTLOC, SSLCIPHERLIST, SSLCRLLOC, SSLPKCS12LOC, SSLPKCS12PASS, SSLPVTKEYLOC, SSLPVTKEYPASS, and SSLSNIHOSTNAME. See [“SAS System Options Deprecated Starting with SAS 9.4M8 on z/OS”](#) in *Encryption in SAS*.
- SAS system options that are new and are used with z/OS are SSLGSKTRACE, SSLHWDETECTMESSAGE, SSLICSFERRORMESSAGE, SSLGSKTRACEFILE, SSLKEYRINGFILE, SSLKEYRINGLABEL, SSLKEYRINGPW, and SSLKEYRINGSTASHFILE. See [“SAS System Options Used for IBM z/OS System SSL Starting with SAS 9.4M8”](#) in *Encryption in SAS*.
- SSLMINPROTOCOL= system option supports TLS 1.3. See [“SSLMINPROTOCOL= System Option”](#) in *Encryption in SAS*.
- SSLMODE= supports the most secure ciphers for TLS 1.2 and TLS 1.3. See [“SSLMODE= System Option”](#) in *Encryption in SAS*.
- In SAS 9.4M8, SAS Foundation servers use the cryptographic libraries that are provided and installed on the operating system to provide encryption for data at rest and data in motion. With this change, SAS no longer provides OpenSSL libraries for SAS Foundation servers.

Because operating system's OpenSSL libraries might not provide all of the encryption algorithms that were previously available in SAS (mainly because they are deemed insecure), a warning might be generated. See [“WARNING: The OpenSSL 3 "legacy" provider could not be loaded. Certain functions may not work without ciphers from the "legacy" provider”](#) in *Encryption in SAS*.

- Encrypted communication between SAS/ACCESS to Teradata and SAS Viya using TLS 1.2 is supported. See [“Configure TLS for SAS/ACCESS Connection to Teradata”](#) in *Encryption in SAS*.
- AES 256-bit encryption is used to encrypt PDF files generated by ODS when system option PDFSECURITY=HIGH. Prior to SAS 9.4M8, SAS encrypts PDF files using RC4 128-bit encryption. For more information, see [“Encrypting ODS Generated PDF Files”](#) in *Encryption in SAS*.

Encryption: SAS 9.4M7

In SAS 9.4M7, SAS encoded passwords (SAS001–SAS005) are supported for SAS system options SSLPVTKEYPASS= and SSLPKCS12PASS=.

In SAS 9.4M7, when lockdown is in effect, paths to SAS system options (or equivalent environment variables) SSLCALISTLOC=, SSLCACERTDIR=, SSLCERTLOC=, SSLPVTKEYLOC=, SSLPKCS12LOC=, and SSLCRLLOC= are added by default to the LOCKDOWN allowlist. These SAS system options can be specified in a SAS configuration file or as a SAS start-up command line option.

The environment variable SSLREQCERT= (added in SAS 9.4) allows you to specify checks to perform on server certificates in a TLS session. For the TLS session to continue, you can demand that certificates be provided. You can also allow the session to

continue when invalid certificates are provided or when no certificates are provided. This environment variable is used only for Linux and UNIX operating systems.

Encryption: SAS 9.4M6

SAS 9.4M6 (November 2018) has these changes and enhancements:

- TLS is supported on Integrated Object Model (IOM) servers and server processes that provide IOM Bridge access. On all IOM servers, the NETENCRYPTALGORITHM system option is specified to enable TLS encryption on these servers:
 - SAS Metadata Server
 - SAS Workspace Server
 - SAS OLAP Server
 - SAS Stored Process Server
 - SAS Pooled Workspace Server
 - Object Spawner
- The SSLCACERTDIR system option specifies the location of the trusted certificate authorities (CA) found in OpenSSL format. This option is valid on Linux, UNIX, and z/OS.
- PROC S3 has supports encryption when working with the Amazon S3 or Amazon Redshift environment . This support includes the new ENCKEY statement that enables you to register encryption keys. There are also new options available with the COPY, GET, GETDIR, INFO, PUT, and PUTDIR statements that enable encryption.

Encryption: SAS 9.4M5

SAS 9.4M5 (September 2017) includes these updates to encryption:

- New system options have been added for LINUX, UNIX, and z/OS:
 - SSLCACERTDATA specifies the trusted Certification Authority (CA) certificate in base64 encoded string.
 - SSLCIPHERLIST specifies a list of cipher suites to use.
 - SSLSNIHOSTNAME enables the client to use Server Name Indication (SNI) in the TLS handshake to identify the server name that it is trying to connect to.
 - SSLCACERTDIR specifies the location of the trusted Certification Authority (CA) certificates found in OpenSSL format.
 - SSLMINPROTOCOL specifies the minimum TLS protocol that can be negotiated when using OpenSSL.
- By default, the SNI is sent to the web servers in the TLS handshake.
- New encoding type SAS005 uses AES encryption with a 256-bit fixed key and a 64-bit random salt value. SAS005 increases security for stored passwords by using the SHA-256 hashing algorithm and is hashed for additional iterations.
- For more security, you can use SHA256-10000 for internal account passwords used in metadata. SHA256-10000 is the same as SHA256, but is hashed for additional iterations.

- To access SAS Viya services, use the SAS_VIYA_TOKEN environment variable. This environment variable provides the OAuth token that is needed for a user to access SAS Viya services.
- To allow a SAS 9.4 client to use the same TLS certificates as those used by SAS Viya, use the CAS_CLIENT_SSL_CA_LIST environment variable. The environment variable points to the path and file name of the file that contains the list of trusted certificate authority (CA) certificates.
- Beginning in the December 2017 release of SAS 9.4M5, on Linux, if the root CA is already in the OpenSSL trusted certificate store, Lua, Python, and SWAT clients should work without having to set the CAS_CLIENT_SSL_CA_LIST= environment variable.
- When encrypting data at rest, you can now specify data set option ENCRYPT=AES2. AES2 is another key generation algorithm for AES encryption. Using the PROC AUTHLIB CREATE statement, you can use AES2 key generation for libraries and data sets that are bound using metadata objects.

Encryption: SAS 9.4M4

In SAS 9.4M4, the OpenSSL libraries provided by SAS have been updated for UNIX and z/OS. For SAS 9.4 and all maintenance releases of SAS 9.4, updated versions of OpenSSL are provided and updated through hot fixes.

Encryption: SAS 9.4M3

SAS 9.4M3 (July 2015) has these changes and enhancements:

- The SAS Deployment Wizard automates the process of updating the TLS certificates in UNIX and z/OS environments and for Java applications on Windows and UNIX. In UNIX and z/OS environments, the installation process lays down a Mozilla bundle of trusted CA certificates. The installation also includes the files that are used as the trusted list of certificates. In UNIX environments, trusted certificates are now located in the trusted CA bundle in *SAS-installation-directory/SASSecurityCertificateFramework/1.1/cacerts/trustedcerts.pem*. During installation, the SAS Deployment Wizard sets the SSLCALISTLOC system option in the *SAS-installation-directory/sasv9.cfg* file to point to the *trustedcerts.pem* file.
- The SAS_SSL_CIPHER_LIST environment variable enables you to specify the ciphers that can be used for OpenSSL under UNIX and z/OS.

Note: This environment variable was made available in maintenance releases prior to SAS 9.4M3 through hot fixes. However, beginning with SAS 9.4M5, a best practice is to use the SSLCIPHERLIST= system option to specify the ciphers that can be used for OpenSSL under UNIX, and z/OS.

- You can add certificates to and remove those certificates from the trusted bundle of certificates by using the SAS Deployment Manager. New environment variables enable you to specify the minimum TLS protocol for OpenSSL and to specify OpenSSL ciphers.

Encryption: SAS 9.4M1

SAS 9.4M1 (December 2013) has these changes and enhancements:

- The default location for the TLS Certificate Authority changed for the UNIX and z/OS foundation servers. The default location is specified by the SSLCALISTLOC= option in configuration files.

- Subject Alternative Names (SAN) in TLS certificates are supported. Server Name Indications (SNI) in the TLS handshake between clients and servers are supported. These are now supported on UNIX and z/OS clients and servers.
- Environment variables SSL_CERT_DIR and SSLCACERTDIR can now be used to point to the location of certificates. These environment variables are supported on UNIX and z/OS servers.
- An administrator can store an AES encryption key for the metadata-bound library so that a user with access authorization can access the metadata-bound data set without supplying the key-in code.

Encryption: SAS 9.4

- SAS/SECURE is a product within SAS, and it is now included with Base SAS. In prior releases, SAS/SECURE was an add-on product that was licensed separately. A separate license for SAS/SECURE is no longer required. This change makes strong encryption available in all deployments (except where prohibited by import restrictions).
- SAS/SECURE increases the security by using the industry standard Advanced Encryption Standard (AES) with 64-bit salt. The components of the SAS language that support security use the AES encryption to encrypt and secure SAS data.
- SAS supports mixed-case passwords and the IBM standard for password phrases up to 100 characters.
- SAS data sets can be better secured by placing them in a metadata-bound library, which is a physical library that is tied to a metadata object.
- The SAS logging facility supports SAS/CONNECT spawner and encryption activity, and the auditing of logging configuration changes, SAS data set access, and access to metadata-bound libraries. Logger activity and level settings can be made secure.
- Email security has been enhanced.

Additional Information about Security

For more information, see [Encryption in SAS](#), [Base SAS Procedures Guide](#), [SAS Logging: Configuration and Programming Reference](#), [SAS System Options: Reference](#), and [SAS Guide to Metadata-Bound Libraries](#).

Enhance Your SAS Output

Output Enhancements: SAS 9.4M6

Here are the new features and enhancements in SAS 9.4M6 (November 2018):

- The default style for HTML 5.0 output has changed from HTMLBlue to HTMLEncore.
- The ODS destination for Word is preproduction. The ODS destination for Word enables users to customize different aspects of the document, such as themes, tables of contents, and orientation.
- The method that is used to build and compress PDF files has been enhanced, resulting in smaller file sizes. This change affects all PDF files, including tagged PDF files.
- In the Report Writing Interface TABLE_START method, you can add a visible caption before each table by using the CAPTION argument.

For more information about the new features for accessibility, see [“Creating Accessible Output: SAS 9.4M6” on page 41](#).

Output Enhancements: SAS 9.4M5

In the December 2017 release of SAS 9.4M5 and SAS Viya 3.3, you can enable wrapping text in a designated Excel worksheet area using the ODS EXCEL FLOW option.

SAS 9.4M5 (September 2017) includes these enhancements to output:

- Several new features support accessible graphs using ODS HTML5. For more information, see [“Creating Accessible Output: SAS 9.4M5” on page 42](#).
- You can use the ODS EXCEL OPTIONS suboption SHEET_INTERVAL="NOW" to create a new worksheet.
- The ODS PDF statement ACCESSIBLE option that enables accessible PDF documents is now fully supported.
- Table of contents metadata can be included in the body file using the ODS HTML5 OUTLINE= option.
- ODS RTF output can split table rows using the TRKEEP option.

Output Enhancements: SAS 9.4M4

SAS 9.4M4 (November 2016) has these enhancements:

- The new HEADING statement has been added to the ODSTEXT procedure. When you use the HEADING statement, SAS generates HTML heading tags and displays the text that you specify as standard HTML text headings in the output.
- The DESCRIPTION= option enables you to specify alternative text for layouts and layout regions.
 - The DESCRIPTION= option is new for several methods in the Report Writing Interface (RWI) and for the ODS LAYOUT and ODS REGION statements. The DESCRIPTION= option is new for these methods: IMAGE, LAYOUT_ABSOLUTE, LAYOUT_GRIDDED, REGION (absolute), REGION (gridded), and TABLE_START.
 - The DESCRIPTION= option is new for these ODS LAYOUT and ODS REGION statements: ODS LAYOUT ABSOLUTE, ODS LAYOUT GRIDDED, ODS REGION Statement, Absolute, and ODS Region Statement, Gridded.
- The ODS GRAPHICS statement supports these options:
 - NBINSMAX= specifies the maximum number of bins that are processed for histograms.
 - NXYBINSMAX= specifies the maximum number of bins that are processed for heat maps.
- The ODS HTML5 destination supports accessibility. The new preproduction ACCESSIBLE_GRAPH option has been added to the ODS HTML5 statement. The ACCESSIBLE_GRAPH option adds accessibility metadata to graphs that are created by ODS Graphics.

Users with visual impairments can access the graph using SAS Graphics Accelerator. The accelerator provides users with alternative presentations of SAS data visualizations that have been created with the metadata. For more information, see the software product page for [SAS Graphics Accelerator](#).

Output Enhancements: SAS 9.4M3

SAS 9.4M3 (July 2015) has these enhancements:

- You can use the ODS EXCEL statement to create output for native Microsoft Excel files in the SpreadsheetML format.
- The ODS POWERPOINT statement supports background color or images, several options to customize transitions between slides, and the dynamic or explicit population of gridded layouts by groups, tables, pages, or procedures.
- The default EPUB version is EPUB3.
- The ODS EPUB3 statement supports new EVENT= values for figures and custom entries in a table of contents.
- The ODS ESCAPECHAR statement supports new functions for use with the ODS EPUB3 statement:
 - Images and captions can be embedded in an EPUB3 e-book chapter. Audio and video are supported using the AUDIO and VIDEO functions, respectively.
 - You can include accessibility features for MathML by using the MATHML function.
 - You can create pop-up footnotes by using the NOTEREF function.
- A new procedure, MSCHART, creates charts that can be opened and manipulated in Microsoft Excel.
- The ODS EPUB and ODS EPUB3 statements no longer support the ENCODING= option. ODS uses the encoding that is specified in the SAS Registry.
- In ODS HTML5, embedded video and audio are supported. This functionality is provided using the Report Writing Interface.

Output Enhancements: SAS 9.4M2

SAS 9.4M2 (August 2014) has enhancements for the EPUB, EPUB3, and HTML5 destinations.

- For the ODS EPUB and ODS EPUB3 statements, the ODS ESCAPECHAR statement now supports these functions: BOLD, EMPHASIS, ITALIC, PDF, and STRONG.
- The ODS HTML5 statement supports these new options:
 - The SHOW_GRAPH_STYLES option specifies whether the output contains elements from the graph style that is specified.
 - The USE_CSS_RESET= option turns off the default CSS styles information.
- The following ODS tagsets have been deprecated: DOCBOOK, HTMLCSS, IMODE, MVHTML, PYX, SASREPORT family of tagsets, TPL_STYLE_LIST, TRPL_STYLE_MAP, WML, WMLLIST, and XHTML.

Output Enhancements: SAS 9.4M1

SAS 9.4M1 (December 2013) enables you to apply cascading style sheets and includes support for EPUB 3 standard.

- The following options are new for EPUB, MARKUP family, PRINTER family, and RTF ODS destinations:
 - The DOM option specifies that the ODS document object model is written to the SAS log or an external file.

- The CSSSTYLE= option specifies a cascading style sheet to apply your output.
- The ODS EPUB3 statement supports HTML5, CSS2, CSS3, SVG, and user-specified audio and video. Any e-book reader that supports EPUB3 supports ODS EPUB3 audio and video.
- You can apply cascading style sheets (CSS) to many types of ODS output.
- In the ODS GRAPHICS statement, the DATASKINMAX= option specifies the maximum number of skinned graphical elements. Also, the ODS GRAPHICS statement supports the BYLINE= option and the LOESSMAXOBS= option.

Output Enhancements: SAS 9.4

- The Output Delivery System (ODS) Report Writing Interface (RWI) enables you to create and manipulate predefined ODS objects in a DATA step to create highly customized output.
- Using new ODS destinations, you can create EPUB, HTML5, and Microsoft PowerPoint files.
 - The ODS EPUB statement creates e-books with the .epub extension. E-books that use the .epub format can be ready by a wide variety of e-book readers.
 - The ODS HTML5 statement creates HTML output by using the 5.0 version of HTML.
 - The ODS POWERPOINT statement creates PowerPoint slides. Slides can contain text, graphics, and tables.
- There are three new procedures:
 - The ODSLST procedure creates lists that can be customized and nested.
 - The ODSSTABLE procedure creates table templates and binds them with the input data set in one statement. You can also name your templates and store them in a template store.
 - The ODSSTEXT procedure creates lists and paragraphs for your output.
- You can arrange output on a page by using the ODS LAYOUT statement. Output can be arranged in an absolute location (absolute), or it can be arranged dynamically (gridded). Absolute layout enables you to specify an exact page location by using x and y coordinates. Gridded layout enables you to arrange output in a two-dimensional grid structure. Absolute layout is limited to one page and is supported by PRINTER destinations (PDF, PS, and PCL). Gridded layout is supported for HTML, POWERPOINT, and PRINTER destinations (PDF, PS, and PCL).
- The default style for all Printer family destinations (PDF, PS, and PCL) has changed from Printer to Pearl.
- The default HTML style for batch output on all hosts has changed from Default to HTMLBlue.
- The ODS GRAPHICS statement now supports ATTRPRIORITY= option and the DRILLTARGET= option. The default for ANTI_ALIASMAX= option has changed from 600 to 4000. In SAS 9.4M1, the DATASKINMAX= option specifies the maximum number of skinned graphical elements. Also, in SAS 9.4M1, the ODS GRAPHICS statement supports the BYLINE= option and the LOESSMAXOBS= options.
- The default device driver for the RTF and TAGSETS.RTF destination has changed to EMF.

- The BOX_SIZING option overrides the default value of BOX_SIZING for certain destinations.

Additional Information about SAS Output

For more information, see *SAS Output Delivery System: User's Guide*, *SAS Language Reference: Concepts*, and *SAS System Options: Reference*.

Enhanced ODS Statistical Graphs

ODS Graphics in SAS 9.4M8

- The MAPSGFK library is updated to the 2022 Q1 release from GfK GeoMarketing GmbH.
- The SASHELP.US_DATA data set is updated to include population data and voting apportionment data from the 2020 census.
- The SASHELP.ZIPCODE data set is updated to reflect updates from the U.S. Postal Service.

ODS Graphics in SAS 9.4M7

The ROTATEALWAYS suboption was added to the FITPOLICY option for all horizontal axes in the SGPLOT and SGPANEL procedures. When this suboption is used, the tick value text is always rotated, even when there is enough room to draw the text normally.

ODS Graphics in SAS 9.4M6

Starting in SAS 9.4M6 (November 2018), you can create pie charts and donut charts using the SGPIE procedure. This procedure is preproduction.

ODS Graphics in SAS 9.4M5

ODS Graphics provides enhanced support for vector graphics and now supports data tips and drill-down capability with HTML5 output. In addition, the ODS GRAPHICS statement provides a number of new features and options to control graphic output. Several of these options enable you to control the processing of large CAS in-memory tables. For example, the OBSMAX= option specifies the maximum number of observations that are processed.

For the SGPLOT and SGPANEL procedures, the new LEGENDITEM statement creates a legend item that can be included in the legend. For example, to display annotation text within the legend area, you can define a LEGENDITEM statement with TYPE=TEXT and specify the text in the TEXT= option.

Numerous plot and axis options were added to the SGPLOT and SGPANEL procedures to control and enhance the output of your graphs. These options affect a wide range of plot types. For example, you can display and change the appearance of line fill patterns in a number of plot types. This feature helps support accessibility. Graphs that use this feature do not rely on color alone to distinguish categories of data. Many other options were added to the procedures to facilitate enhanced output.

ODS Graphics in SAS 9.4M4

Starting in SAS 9.4M4 (November 2016), the following new functionality and enhancements are included:

- The ELLIPSE statement has been added to the SG PANEL procedure. The statement adds a confidence or prediction ellipse to another plot.
- A new ELLIPSEPARM statement has been added to the SG PLOT and SG PANEL procedures. The ELLIPSEPARM statement plots an ellipse with specified axis lengths, a specified slope for the major axis, and the ellipse center. The ELLIPSEPARM statement does not perform computations on input data to derive the location and shape of the ellipse.
- The NBINSMAX and NXYBINSMAX options have been added to the ODS GRAPHICS statement. These options specify the maximum number of bins that are processed for histograms and heat maps, respectively.
- The LINEJOIN option has been added to the Graph Template Language SERIESPLOT statement. This option enables you to specify how to shape the vertices of the series line.
- The accessibility topic in *SAS ODS Graphics: Procedures Guide* is enhanced with information about the accessibility of the graphs that you create with the ODS Graphics procedures.

ODS Graphics in SAS 9.4M3

In SAS 9.4M3 (July 2015), the SG PANEL and SG PLOT procedures have these enhancements:

- Five new plot statements enable heat maps, spline plots, and bar charts that are compatible with all basic plots.
- The attribute mapping feature maps ranges of continuous numeric values to graphical properties.
- A wide range of new options apply to plots, legends, axes, axis tables, and discrete attribute maps. These options enhance the ability to produce sophisticated graphs.

ODS Graphics in SAS 9.4M2

In SAS 9.4M2 (August 2014), ODS Graphics has a new text plot, a new gradient legend, and several new options for controlling legends, axis tables, and graphical output.

ODS Graphics in SAS 9.4M1

In SAS 9.4M1 (December 2013), the SG PANEL and SG PLOT procedures have these enhancements:

- The FRINGE statement creates a fringe plot on the X or X2 axis of a plot.
- DROPLINE creates one or more drop lines from data point or data points to one or both axes. The lines can be horizontal, vertical, or both.
- POLYGON creates a polygon plot from data that is stored in a data set.
- You can define your own marker symbols to be used in plots that contain markers. The SYMBOLCHAR statement defines a marker symbol by using a Unicode character. The SYMBOLIMAGE statement defines a marker symbol by using an image that exists in the local file system.
- You can use annotation macros within a DATA step to simplify the process of creating annotation observations.

ODS Graphics in SAS 9.4

- The ODS Graphics products provide several new plot types, including axis tables that create an axis-aligned row or column of textual data.

- Numerous plot layout, panel, and axis options have been added to control and enhance the output of your graphs. For example, you can now customize the appearance attributes for group values without changing the ODS style template. You can also now specify a color-priority rotation pattern for cycling graph data attributes.
- A new sub-pixel rendering feature provides smoother curves for line charts and more consistent spacing in bar charts.
- The ODS Graphics products provide more options for fitting or splitting data labels, curve labels, and axis tick values when there is not enough room to display the text normally. The data label positioning algorithm was improved to better position the data labels with their data markers. In addition, data markers can now be adjusted when multiple observations have the same response value.
- The ODS Graphics Designer introduces an Auto Charts feature that generates a variety of graphs automatically, based on your data.
- The ODS Graphics suite of products includes the Graph Template Language, ODS Graphics procedures, ODS Graphics Designer, and ODS Graphics Editor.
- The SGPANEL and SGPLOT procedures have new statements:
 - The new INSET statement in the SGPANEL procedure adds a text box to each panel cell of the graph.
 - The new BLOCK statement creates a plot that highlights ranges and creates rectangular blocks that contain text values.
 - The new STYLEATTRS statement specifies group attributes for a graph.
 - Two new statements in the SGPLOT procedure create an axis-aligned row or column of textual data. The XAXISTABLE and the YAXISTABLE statements place data values at specific locations inside or outside the axis.

Additional Information about ODS Graphics

For more information, see [SAS Graph Template Language: Reference](#), [SAS ODS Graphics: Procedures Guide](#), [SAS ODS Graphics Designer: User's Guide](#), and [SAS ODS Graphics Editor: User's Guide](#).

Creating Accessible Output Using ODS and ODS Graphics

Creating Accessible Output: SAS 9.4M6

These accessibility enhancements were added in SAS 9.4M6:

- New system options facilitate the creation of accessible content on a system-wide level. Here is a summary of the options:
 - The ACCESSIBLECHECK option checks your SAS programs for common violations of accessibility standards and writes messages to the SAS log if violations are found.
 - The ACCESSIBLEGRAPH option enables the ACCESSIBLE_GRAPH option in the ODS HTML5 destination by default.
 - The ACCESSIBLEPDF option enables the ACCESSIBLE option in the ODS PDF destination by default.
 - The ACCESSIBLETABLE option makes table captions visible and changes the layout of some tables to make them accessible. This option applies to tables that

are generated by the PRINT, REPORT, and TABULATE procedures as well as the Report Writing Interface.

- The CAPTION= option defines a visible table caption. The caption is displayed when the ACCESSIBLETABLE system option has been specified. This option applies to tables that are generated by the REPORT and TABULATE procedures as well as the Report Writing Interface. The CAPTION= option accepts #BY directives.
- Several enhancements affect PDF output.
 - The method that is used to build and compress PDF files has been enhanced, resulting in smaller file sizes. This change affects all PDF files including tagged PDF files.
 - You can specify the ACCESSIBLE_IDENTIFIER option in the ODS PDF statement to add an identifier to the metadata of the PDF file confirming that the PDF produced by SAS meets the PDF Matterhorn Protocol.
 - Support has been added for visual captions. The CAPTION= option, when used in the supported procedures, creates tables with captions that are visible and accessible in the PDF.
 - Alternative text for images that are created with the POSTIMAGE= and PREIMAGE= style options or with the Report Writing Interface IMAGE method appears in PDF output.
 - Images can be marked as artifacts in PDF output. For example, the following code creates an artifact: `preimage="file.jpg?desc="`
- The option ATTRPRIORITY=NONE in the ODS GRAPHICS statement is now the default setting for the Daisy ODS style. Daisy is the recommended style for accessible output. In addition, the Daisy, HighContrast, and HighContrastLarge styles include an enhanced FOCUSLINK indicator.

Creating Accessible Output: SAS 9.4M5

These accessibility enhancements were added in SAS 9.4M5 (September 2017):

- Image maps are supported with SVG output using HTML5. However, image maps are supported only when the HTML5 SVG mode is INLINE (the default value).
- You can customize the appearance of focus indicators. A new FOCUSLINK style element is available to be used in a style template. Three new style attributes enable you to customize the focus outline pattern, width, and color.
- You can specify line fill patterns for supported plot types with all styles. Previously, fill patterns were available only when you used certain gray-scale styles. You can also change the appearance of the fill patterns.
- Accessibility metadata can be added to graphs using the ACCESSIBLE_GRAPH option and the ODS HTML5 statement.

Creating Maps Using ODS Graphics and Mapping Procedures

These enhancements were added in SAS 9.4M6 (November 2018):

- PROC GINSIDE, PROC GPROJECT, PROC GREduce, and PROC GREmove have moved from SAS/GRAPH to Base SAS and use ODS Graphics to create graphs. They are documented in [SAS/GRAPH: Reference](#) and [SAS/GRAPH and Base SAS: Mapping Reference](#).

- The %CENTROID macro that supports the SGMAP procedure has moved from SAS/GRAPH to Base SAS and is now an autocall macro. Running the %ANNOMAC macro before using %CENTROID is no longer necessary.
- The SGMAP procedure has these enhancements:
 - You can use the NOAUTOLEGEND option on PROC SGMAP to suppress automatically creating a legend.
 - The SERIES statement and several of its options are added for plot creation. Examples of series plot lines are streets, railroads, and waterways.
 - The GRADLEGEND statement and several of its options are added for customizing legends with a numeric response variable. Only discrete key legends were created prior to SAS 9.4M6.
 - The PROC SGMAP CHOROMAP statement is at production level. The procedure now accepts numeric response values. Statement options DISCRETE and LINEATTRS= are new:
 - The DISCRETE option handles response variable values, and affects both the filled polygons and their respective legend entries.
 - The LINEATTRS= option on the CHOROMAP and SERIES statements enables the control of color, line style, and line thickness on polygon borders and series lines such as railroads, respectively.
 - The CHOROMAP statement now processes unprojected map coordinates (LAT, LATITUDE, LONG, LON, and LONGITUDE), in addition to the projected X and Y coordinates. Unprojected choromaps can be overlaid on Open Street Maps and Esri maps.
 - You can specify the percentage of transparency of a plot using the TRANSPARENCY option in the BUBBLE statement and in the CHOROMAP statement.
 - In the BUBBLE statement, you can specify bubble sizes with the BRADIUSMIN and BRADIUSMAX options.
 - The GROUP= option is added to the BUBBLE, SCATTER, and SERIES statements.
 - The NOMISSINGGROUP option is added to the BUBBLE, SCATTER, and SERIES statements. This option enables the use of groups when plotting multiple items that might not be at the same data points, and the skipping of missing plot values when the plot is being drawn.

For the full list of new features and enhancements, see [SAS/GRAPH and Base SAS: Mapping Reference](#).

These new features and enhancements were added in SAS 9.4M5 (September 2017):

- The new Base SAS SGMAP procedure uses the functionality of ODS Graphics to render maps. The SGMAP procedure works with map data sets prepared by a third party. It also works with map data sets prepared by the SAS/GRAPH procedures or by the GEOCODE and MAPIMPORT procedures that are now part of Base SAS.
- The maps data sets in the MAPSGFK library have been updated. The MAPSGFK= system option can now be updated using the APPEND= and INSERT= system options.

Locked-Down State

PROC XSL can now be controlled by LOCKDOWN in SAS 9.4M8 and SAS Viya 3.5. For more information, see [LOCKDOWN](#) in *SAS Programmer's Guide: Essentials*.

In SAS 9.4M7, when lockdown is in effect, paths to SAS system options (or equivalent environment variables) SSLCALISTLOC, SSLCACERTDIR, SSLCERTLOC, SSLPVTKEYLOC, SSLPKCS12LOC, and SSLCRLLOC are added by default to the LOCKDOWN allowlist.

In SAS 9.4M2 (August 2014), the LOCKDOWN statement is enhanced so that certain access methods and their related procedures are disabled by default when a SAS session is locked down. However, the SAS server administrator can re-enable one or more of these access methods.

In SAS 9.4M1 (December 2013), if you are running SAS in a client/server environment, the SAS Application Server administrator can create an environment where your SAS client has access to a specific set of directories and files if you are running in a client/server environment. All other directories and files would be inaccessible. When SAS is in a locked-down state, access to several SAS language elements is restricted.

For more information, see [LOCKDOWN](#) in *SAS Programmer's Guide: Essentials*. To determine whether your SAS product supports this functionality, see the Administrator's Guide for your SAS product.

Preserving the SAS Environment

When the PRESENV= system option is set, the Work library data sets and catalogs, and the values of global statements, macro variables, and system options can be preserved between SAS sessions. You use the PRESENV procedure to preserve your environment settings and variable definitions to be used in a subsequent SAS session.

Scalable Performance Data Engine

The Scalable Performance Data Engine (SPD Engine) enables the caching of opened SPD Engine files. New SPD Engine data set options enable AES (Advanced Encryption Standard) encryption. For more information about updating data using the SPD Engine in a Hadoop environment, see *SAS Scalable Performance Data Engine: Reference*.

SAS Scalable Performance Data Server (SPD Server) 5.6 is required in order to use SAS 9.4M9.

In SAS 9.4M7, the **-yarnrm** and **-host** options provide customizations to the **sashiveserdespde-install.jar.sh** script.

Beginning in SAS 9.4M6 and SAS Viya 3.3, for both HDFS and non-HDFS file systems, access is expanded to the FEDSQL procedure, FedSQL language, DS2 procedure, and DS2 language.

SAS 9.4M5 has the following enhancement:

- The SPD Engine supports cross-environment data access (CEDA) with additional restrictions. For more information, see “Accessing SPD Engine Files on Another Host” in *SAS Scalable Performance Data Engine: Reference*.

SAS 9.4M2 has the following changes and enhancements:

- SPD Engine does not support DLDMGACTION=NOINDEX, but does support ABORT, FAIL, PROMPT, and REPAIR.

- The new LIBNAME statement options enable you to do the following:
 - The IOBLOCKSIZE= option enables you to specify the size, in bytes, of a block of observations to be used in an I/O operation.
 - The COMPRESS= option enables you to compress an SPD Engine data set on disk as it is being created.

SAS LIBNAME Engine for SAS Federation Server

SAS LIBNAME Engine for SAS Federation Server: SAS 9.4M7

In SAS 9.4M7 (July 2021), bulk-loading functionality is now available in the LIBNAME engine for SAS Federation Server. You request this functionality by setting the BULKLOAD= LIBNAME statement option.

In SAS 9.4M7 (March 2021), the LIBNAME engine for SAS Federation Support is updated to support SAS Federation Server 4.4. This new server includes enhancements such as an additional remote driver for SAS clients connections and new LIBNAME statement options.

- The FSNET driver, requested through the new REMOTE_DRIVER=LIBNAME statement option, uses an HTTPS protocol that is based on SAS Federation Server FSNet libraries to connect to SAS Federation Server.
- Here are new LIBNAME statement options:
 - CONTEXTROOT= and PROXY=, which enable you to manage an optional proxy server
 - LOGIN_TIMEOUT=, which sets a login time-out period for server connections.
 - SSPI=, which enables single sign-on to SAS Federation Server, when the server is configured for single sign-on
 - REMOTE_DRIVER_OPTIONS=, which enables you to submit remote driver connections options to SAS Federation Server.

The COMPRESS= LIBNAME statement option, system option, and data set option are no longer supported.

In SAS 9.4M7, the LIBNAME engine for SAS Federation Support supports a new system option and five new LIBNAME statement options.

- The DBIDIRECTEXEC system option improves PROC SQL performance by passing certain statements to the database for processing.
- The DBCLIENT_MAX_BYTES= LIBNAME statement option enables you to specify the maximum number of bytes per single character in SAS session encoding when reading character data from a DBMS.
- A new performance feature speeds up fetch operations by beginning to cache data that is expected to be needed before the client requests it. Controlled with the PREFETCH= LIBNAME option, this feature is on by default. PREFETCHBYTES=, PREFETCHROWS=, and SERVERPREFETCH= LIBNAME statement options modify default settings for a new performance feature.

SAS LIBNAME Engine for SAS Federation Server: SAS 9.4M6

The documentation for READBUFF= LIBNAME statement option and the READBUFF= data set option was modified. The modifications clarify the default setting of the READBUFF= option.

SAS LIBNAME Engine for SAS Federation Server: SAS 9.4M4

The new APPLICATIONNAME= LIBNAME statement option enables you to specify the client application's name for auditing purposes.

Universal Printing

In SAS 9.4M5 (September 2017), new AvenirNextforSAS and HelveticaNeueforSAS fonts replace the Avenir Next LT W04, Avenir NextCyr W04, and Helvetica LT Pro fonts. For more information, see “Printing with SAS” in [SAS Language Reference: Concepts](#).

In SAS 9.4M4, Universal Printing supports these new fonts: Helvetica LT Pro and Symbola.

In SAS 9.4M3, Universal Printing supports Avenir Next TrueType fonts.

In SAS 9.4M2, if you specify italic or bold style on a universal printer font that does not have an italic or bold style, the font is now displayed as italic or bold.

Create Customized Attributes for Data Sets and Variables

You can create attributes for data sets and variables to contain information that you supply by using extended attributes. Extended attributes are part of a data set and are managed with the DATASETS procedure. The procedures that process data sets, such as CPORT, DOWNLOAD, and SQL, support extended attributes. For more information, see [SAS Language Reference: Concepts](#).

Preserve the SAS Environment between SAS Sessions

The Work library data sets and catalogs, and the values of global statements, macro variables, and system options can be preserved between SAS sessions. For more information, see [SAS Language Reference: Concepts](#), [SAS System Options: Reference](#), and [Base SAS Procedures Guide](#).

Write JavaScript Object Notation (JSON)

SAS data sets can be written to an external file in JSON representation.

In SAS 9.4M4 (November 2016), the JSON LIBNAME statement enables you to associate a libref with a JSON document. For more information, see the [LIBNAME Statement, JSON Engine](#) in [SAS Global Statements: Reference](#).

In SAS 9.4M3 (July 2015), you can create and parse JSON text by using the DS2 JSON package.

For more information, see the [DS2 Procedure](#) in [Base SAS Procedures Guide](#).

SAS Logging Facility

SAS 9.4M2 has these features and enhancements:

- ConsoleAppender has these new parameters:
 - The ImmediateFlush parameter enables you to force messages to be written to the console immediately as they are received.

- The Target parameter enables you to write messages to the console's standard error stream instead of the standard output stream. This parameter is valid only for Windows and UNIX environments.
- The new FilePermissions parameter of FileAppender and RollingFileAppender enables you to set permissions on log files.
- The default level for the root logger is INFO.

The SAS has this functionality in SAS 9.4:

- The SAS logging facility uses the ConsoleAppender to write messages to z/OS system consoles.
- You can specify whether a logger's additivity and level settings are permanent or can be modified programmatically by setting a logger's IMMUTABILITY setting.
- Three new loggers support auditing logging configurations.
- Two new loggers support auditing access to SAS data sets.
- Two new loggers support auditing access to metadata-bound libraries.
- You can specify the client ID in the DEFAULT and TRACE conversion patterns.

Application Response Measurement (ARM)

When you have an ARM appender that is defined in the XML configuration file, you no longer need to set the ARMAGENT= LOG4SAS system option. ARM sets ARMAGENT to LOG4SAS internally.

There are three new ARM metrics for the ARM_DSIO subsystem:

- NOBS reports the number of observations in the file.
- NVAR reports the number of variables in the file.
- NOBSREAD reports the number of observations read.

Email

When you send email by using SAS and an SMTP server, you can use the EMAILACKWAIT= system option to set the number of seconds to wait for an acknowledgment from the SMTP server.

The new EMAILHOST= system option arguments PORT, SSL, STARTTLS, USERID, PWD, and AUTH enhance email security.

In SAS 9.4M5, the FILENAME statement, EMAIL (SMTP) supports attaching more than one file using multiple !EM_ATTACH! directives. The FILENAME statement, ZIP access method supports GZIP files.

Beginning with SAS 9.4M4, you can set an email sensitivity flag on emails that originate from SAS logging facility using the FILENAME Statement, EMAIL (SMTP) access method.

View SAS Data Sets By Using JMP

SAS data sets can be converted to JMP files to view them by using JMP applications such as the JMP Graph Builder iPad application. For more information, see [Base SAS Procedures Guide](#) and [SAS Global Statements: Reference](#).

Process Streamed Data

- SAS 9.4 processes arbitrary text that contains SAS macro specifications in an input stream. The macro code in the stream can be expanded and stored in a file.
- Stream-record format can be processed by the SFTP access method. Data is transferred in image (binary) mode.

For more information, see [Base SAS Procedures Guide](#) and [SAS Global Statements: Reference](#).

Saving Macro Code from an Input Stream

The new STREAM procedure enables you to process arbitrary text that contains SAS macro specifications in an input stream. The procedure can expand macro code and store it in a file.

Write to a SharePoint Document Library

You can use the WebDAV access method to write a file to a SharePoint document library, specify the name of an authentication domain metadata object, and create and delete a directory. For more information, see [SAS Global Statements: Reference](#).

Read User Text

The DATAURL Access Method reads character and URL-encoded characters, and BASE64 data. For more information, see [SAS Global Statements: Reference](#).

Read ZIP Files

The new ZIP Access Method reads ZIP files. Starting in SAS 9.4M5, SAS supports GZIP files. For more information, see [SAS Global Statements: Reference](#).

Process Time and Datetime Values By Using Time Zones

The SAS language now supports time zones based on Universal Coordinate Time (UTC). Data sets and catalog time stamps can specify the time based on a specific time zone. You can specify a specific time zone, or you can specify an area of the world for SAS to determine the time for that area, taking into account Eastern Time.

SAS 9.4M2 (August 2014) includes several new time zone functions.

For more information, see [SAS Functions and CALL Routines](#), [SAS System Options: Reference](#), and [SAS National Language Support \(NLS\): Reference Guide](#).

National Language Support

National Language Support in SAS 9.4M6

In SAS 9.4M6, you can use modifiers to change the functionality of the KCOMPRESS function.

National Language Support in SAS 9.4M5

SAS 9.4M5 (September 2017) includes these enhancements:

- To avoid character truncation when you copy data to a new encoding, you can use the macro %COPY_TO_NEW_ENCODING.
- SAS supports the locale Tagalog-Philippines.
- The DTWEEKV format writes a week and datetime number in decimal format by using the V algorithm.
- The CALL KSCANX routine returns the position and length of the nth word from a character string.
- The KCOUNTC function counts the number of individual characters in a character string.
- The KCOUNTX function counts the number of times that a specified substring appears within a character string.
- The KCOUNTW function counts the number of words in a character string.
- The KFOUND function searches for a specific substring of characters within a character string.
- The KFOUNDC function searches a string for any character in a list of characters.
- The KFOUNDW function returns the character position of a word in a string or the number of the word in a string.
- The KSCANX function selects a specified word from a character expression.
- The NLSTRMON informat reads the month name in the specified locale and converts it to a numeric value.

National Language Support in SAS 9.4M3

SAS 9.4M3 has these enhancements:

- New locales are Kazakh_Kazakhstan (kk_KZ) and Basque_Spain (eu_ES).
- The ManxGaelic_UnitedKingdom (gv_GB) locale is deprecated.
- The KINDEXB function searches a character expression for a string of characters.
- The KINDEXCB function searches a character expression for a character string as a pattern for languages that use DBCS.
- The I18N level changed for numerous functions.
- Sorting by the SORT and S=QL procedures is based on the session locale when the SORTSEQ= system option is set to LINGUISTIC.

National Language Support in SAS 9.4M2

SAS 9.4M2 has the following changes and enhancements:

- Formats
 - The new BESTDOTX format specifies that SAS choose the best notation and use a dot as a decimal separator.
 - The country Latvia is added to these formats: NLMNIEUR and NLMNLEUR.
- Functions
 - The new KUPDATES function inserts, deletes, and replaces character value contents.

- The new TZONEDSTNAME function returns a Daylight Saving Time name.
- The new TZONEDSTOFF function returns the time zone offset value for the specified Daylight Saving Time time.
- The new TZONESSTNAME function returns a Daylight Saving time zone name.
- The new TZONESSTOFF function returns the time zone offset value for the specified Daylight Saving Time time.
- The KCVT function was updated with DBCS, SBCS, and MBCS information, and references to DBCSLANG and DBCSTYPE were removed.
- The KUPDATE function NLSCOMPATMODE option was removed.
- Informats
 - The country Latvia is added to the NLMNIEUR and NLMNLEUR informats.
 - The new NLDATEW informat reads the date value in the specified locale, and then converts the date value to the local SAS date and the day of the week.
 - The new NLDATMW informat reads the date value in the specified locale, and then converts the date value to the local SAS day of the week and the datetime.
 - The new NLDATMAP informat reads the date value in the specified locale, and then converts the date value to the local SAS datetime with a.m. or p.m.
 - Aliases were added to the NLDATE, NLTIME, and NLDATM informats.
- System options:
 - The new NLDECSEPARATOR system option specifies whether SAS produces locale-sensitive numeric output for the decimal separator or continues to format numbers with U.S. English preferences.
 - The DFLANG system option was enhanced to support the locale option.

National Language Support in SAS 9.4

SAS 9.4 adds the following support:

- You can create a data set that contains information about a locale. The data in the data set is used by SAS to process locale information. You use the LOCALEDATA procedure to manage and view the data, and to save the data to the SAS registry. You specify the name of the locale data set by using the LOCALEDATA= system option.
- SAS can now process data by using a time zone other than your local time zone. You use the TIMEZONE= system option to specify a time zone. New time zone formats use the ISO 8601 standard to format dates, times, and datetime values by using Universal Coordinate Time (UTC). New time zone functions enable you to determine time zones and time zone offsets, and to convert datetime values between SAS and UTC. A new SAS datetime constant enables a SAS datetime value to have a time zone offset.
- In addition to zone functions, there are new functions for these tasks:
 - converting characters to base characters by using the BASECHAR function
 - removing leading and trailing blanks from a character string by using the KSTRIP function
 - specifying the locale keys for the current SAS session by using the SETLOCALE function
- You can specify a translation table to transcode parts of SAS between EBCDIC and ASCII by using the MAPEBCDIC2ASCII= system option.

- To keep the language of the SAS log as English, set the ODSLCHANGE and LOGLANGCHG system options.
- Set the language for international date formats and informats to the locale that is specified by the LOCALE= system option. To do this, specify the LOCALE argument for the DFLANG= system option.
- SAS uses the value of the LOCALE= system option to set the PAPERSIZE= option to either LETTER or A4 when you specify the LOCALE argument for the PAPERSIZE= system option.
- SAS now supports the English_Malta (en_MT), Greek_Cyprus (el_CY), and Irish_Ireland (ga_IE) locales.
- ISO-8859-13 (Latin 7) and ISO-8859-15 (Latin 10) are new encodings that SAS supports.

Additional Information for National Language Support

For more information, see [SAS National Language Support \(NLS\): Reference Guide](#).

Audit and Report More about SAS and SAS Applications

- New loggers audit logging configurations, access to SAS data sets, and metadata-bound libraries.
- The ARM_DSIO subsystem has new ARM metrics that report data set information.

SAS 9.4M2 (August 2014) enables additional control over log file permissions and destinations.

For more information, see [SAS Logging: Configuration and Programming Reference](#) and [SAS Interface to Application Response Measurement \(ARM\): Reference](#).

Metadata Enhancements

Metadata Updates: SAS 9.4M7

The METALIB procedure now allows the creation of a table object name that is up to 60 characters. A table object's name includes the SAS table name and an optional prefix text string.

Metadata Updates: SAS 9.4M6

Database credentials that are specified in the PROC METALIB DBAUTH statement override any other predefined authentication types.

Metadata Updates: SAS 9.4M5

SAS 9.4M5 (September 2017) includes these enhancements:

- Using the PROC AUTHLIB CREATE statement, you can use AES2 encryption for libraries and data sets that are bound using metadata objects.
- PROC METALIB has changed how it handles case updates for DBMS columns. In previous releases, when a column name in a DBMS table's metadata definition matches a column name in the data source but the column name has a different case (for example, lowercase instead of uppercase), the column definition was deleted and re-created to match the case of the column name in the data source. Starting in 9.4M5, PROC METALIB updates the existing column definition. The change

preserves column mappings. Column definitions for SAS data sets are already updated instead of replaced.

Metadata Updates: SAS 9.4M3

SAS 9.4M3 has the following changes and enhancements:

- The METADATA procedure supports the <CLUSTER/> XML element, which can be used to direct the METHOD=STATUS query in the IN= argument to the metadata server cluster's controller node without knowing or specifying its connection parameters.
- Cluster synchronization checking is available in the SAS Management Console Metadata Manager Analyze/Repair wizard and the sas-analyze-metadata batch tool.
- The METALIB procedure statement DBAUTH enables you to specify database authentication credentials for libraries that have an authentication type of Prompt in their server definition, directly in the PROC METALIB request.
- The metadata engine enables you to specify database authentication credentials directly in the LIBNAME statement by using the DBUSER= and DBPASSWORD= LIBNAME options.
- The DATA step function, METADATA_GETURI, constructs a URL for SAS web applications by using information from the SAS Metadata Repository.

Metadata Updates: SAS 9.4M2

SAS 9.4M2 has the following changes and enhancements:

- The METALIB procedure checks for and updates a table definition's library ownership if the table definition being updated is using a different library definition than the one with which it was created. This is useful when importing and exporting data.
- The SAS Metadata Server sends alert email reminder messages after the initial notification of the alert condition "journal commit task stopped running." The server terminates itself if the alert condition is not addressed within a configured period of time.

Metadata Updates: SAS 9.4M1

SAS 9.4M1 has the following changes and enhancements:

- An administrator can use the AUTHLIB procedure to require that all data sets in a metadata-bound library be automatically encrypted using the REQUIRE_ENCRYPTION=YES option in the CREATE or MODIFY statements.
- The metadata server connection system options support use of a system connection profile to connect to the SAS Metadata Server.
- The METAOPERATE procedure and the METADATA procedure have been enhanced to operate in a clustered SAS Metadata Server configuration and in a single SAS Metadata Server configuration.
- The Metadata LIBNAME Engine supports extended attributes on SAS data sets and libraries.
- A new metadata DATA step function, METADATA_APPROP, returns the value of a specified property for a specified SoftwareComponent or DeployedComponent.
- Processing of the METAAUTORESOURCES system option has changed. Now, library assignments that are stored in metadata are always applied before library assignments in the AUTOEXEC file.

Configuring Your SAS Metadata Server in SAS 9.4

The SAS Metadata Server can be configured as a clustered metadata server or as a single metadata server in SAS 9.4. For more information about enhancements that enable you to monitor and manage the cluster from SAS, see [SAS Language Interfaces to Metadata](#).

Transporting SAS Files

These documentation enhancements were made in SAS 9.4M5 (September 2017):

- Information was added to the document about changes to PROC CPORT and PROC CIMPORT starting in SAS 9.4 that require source and target sessions to be compatible encodings unless the encoding value of the data set is ASCIIANY.
- Information was added to the document about migrating data to UTF-8 encoding in order to support multilingual data and SAS Viya. The section outlines the steps to take including how to determine the encoding of your data, storage issues, and whether CEDA is the appropriate conversion method; how to convert indexes, integrity constraints, and format catalogs; and how to read external files.

These new features were added in SAS 9.4M4 (November 2016):

- The %XPTCOMMN macro in the autocall library was updated so that when a data set conforms to the V5 specification and you use the %LOC2XPT macro to create a V5 or V6 transport file, PROC COPY and the XPORT engine can read this file.
- The %XPT2LOC macro in the autocall library was updated so that quotation marks are no longer part of the name in the transport file if a memname needs to be n-literalized. In addition, the n-literalization was changed to occur when generating DATA step code to convert to a local SAS data set.

Starting in SAS 9.4M3 (July 2015), PROC CIMPORT supports the ability to import data sets created in non-UTF-8 SAS sessions into UTF-8 SAS sessions.

Starting in SAS 9.4M2 (August 2014), you can read from and write to transport files in SAS Version 5 (V5) or SAS Version 8 (V8) formats by using these autocall macros: %LOC2XPT, %XPT2LOC, and %XPTCOMMN.

For more information, see [Moving and Accessing SAS Files](#).

General Enhancements to SAS Procedures

Procedure Enhancements: SAS 9.4M9

The following enhancements have been made for PROC S3:

- The ACL= option was added for the COPY, MKDIR, PUT, and PUTDIR statements. Use this option to specify a canned ACL value that applies to newly created objects.
- The REGION= option was added to the REGION ADD statement.

For more information, see the “S3 Procedure” in [Base SAS Procedures Guide](#).

The MAPREDUCE and PIG statements for the HADOOP procedure are considered deprecated. These statements continue to work, but support for them is likely to be removed in future updates. It is recommended you use Spark or Hive functionality as an alternative. For more information, see “HADOOP Procedure” in [Base SAS Procedures Guide](#).

Procedure Enhancements: SAS 9.4M6

In the May 2019 release of SAS 9.4M6 and SAS Viya 3.4, you can use PROC FCMP to create Python functions using the SAS Python component object. You execute these Python functions using PROC FCMP or the DATA step when you submit code to the SAS Workspace Server or the SAS Compute Server. You cannot submit Python functions using PROC FCMP or the DATA step to the CAS server. For more information, see [SAS Component Objects: Reference](#).

- PROC FCMP has these option enhancements:
 - Use the OUTFILE= option to write referenced functions and the main program to a text file. Programs that have been parsed by PROC, including macro variables, can be exported.
 - The OUTITEMSTORE= option exports symbols, referenced functions, and the main program to the specified item store.
- PROC HDMD supports managed, external, and transactional tables for Hive 3.0. By default, a table is created as managed and transactional.
- When you invoke a web service using PROC HTTP, you can set SSL options using the new SSLPARMS statement. This statement is not valid in SAS Viya 3.4 or SAS Viya 3.5
- The default behavior of the PROC HTTP DEBUG statement has changed. The HTTP request body and response body are now written as binary, instead of text. The DEBUG statement also has new options, in addition to Level=, to enable you to specify the parts of the HTTP request that you want to debug.
- Information about the scope of variables and other objects that are defined for PROC LUA is added to the documentation.
- When you use the PROC PROTO LINK statement to load modules that are written in C or C++, you can specify only load modules whose paths are registered by the administrator using the PROTOLIBS= system option.
- You can create a table of contents that contains #BY directives using the CONTENT= option in PROC PRINT, PROC REPORT, and PROC TABULATE when used with the ACCESSIBLETABLE system option.
- The CAPTION= option for PROC REPORT and the PROC TABULATE TABLE statement creates a visible and accessible table caption when used with the ACCESSIBLETABLE system option.
- PROC S3 supports server-side encryption in an Amazon S3 or Amazon RedShift environment. This support includes the new ENCKEY statement that enables you to register encryption keys. Support for server-side encryption was also added to the COPY, GET, GETDIR, INFO, PUT, and PUTDIR statements.
- If you use the V9 engine to create a PROC SQL view that contains a USING clause, the view is not accessible in SAS 9.4M5 or earlier releases.

Procedure Enhancements: SAS 9.4M5

The December 2017 release of SAS 9.4M5 (December 2017) and SAS Viya 3.3 has these enhancements:

- The FMTC2ITM procedure converts one or more format catalogs into a single item store that can be used with the CAS server. Use the item store as input to the CAS server addFmtLib action to add a format library to a session.
- PROC LUA supports the VARCHAR data type.
- You can manage objects in Amazon S3 using the S3 procedure.

- Publish and execute DATA step and DS2 models in CAS or an external database using the SCOREACCEL procedure.

SAS 9.4M5 (September 2017) includes these enhancements:

- PROC AUTHLIB supports AES2 encryption.
- PROC COPY copies data using CAS server actions when the IN= option and the OUT= option are both set to the CAS engine libref. No data is transferred to SAS to copy in SAS.
- PROC DS2 and PROC FEDSQL supports Amazon Redshift, Microsoft SQL Server, and Vertica data sources. These procedures are available in both SAS 9.4 and SAS Viya. You connect to the CAS server using the SESSREF= or SESSUID= options. The SESSREF= option identifies the CAS session by its session name. The SESSUID= option identifies the session by its universally unique identifier (UUID). The NOLIBS CONN= option includes connection parameters for SAS Scalable Performance Data (SPD) Server.
- The new DSTODS2 procedure enables you to translate a subset of your SAS DATA step code into DS2 code.
- These procedures support CAS tables that have variables with a data type of VARCHAR: CONTENTS, COPY, DATASETS COPY and CONTENTS statements, EXPORT, IMPORT, and PRINT. PROC CONTENTS reports the number of characters or bytes for a variable.
- PROC FCMP supports dictionaries and Analytic Store scoring models.
- PROC HTTP adds a DEBUG statement, the TIMEOUT= procedure option, and response status macro variables.
- PROC REPORT, TABULATE, MEANS, and SUMMARY can summarize data using CAS server actions.
- PROC SQOOP supports workflows and Kerberos on Linux, and the WFHDFS_PATH= option is now optional.

Note: You must license SAS/ACCESS Interface to Hadoop to run this procedure.

Procedure Enhancements: SAS 9.4M4

SAS 9.4M4 (November 2016) has these enhancements:

- PROC RANK and PROC SORT support the Hive database management system.
- PROC DS2 and PROC FEDSQL can be used to read, write, and update SPD Server tables.
- The S3 procedure enables you to perform object management for objects in Amazon S3. These objects include buckets, files, and directories.

Procedure Enhancements: SAS 9.4M3

SAS 9.4M3 includes these enhancements:

- The AUTHLIB procedure PURGE statement removes any retained metadata-bound library credentials older than a given date of replacement. The MODIFY statement PURGE= option can be used to remove all retained metadata-bound library credentials if all tables in the library are successfully modified to the newer credentials.
- The DATEKEYS procedure provides a way to create and manage date keys that are associated with time computations. A SAS date key is used to describe a date or time interval that is associated with special events such as holidays and sale periods.

- You can use the PROC FCMP STATIC statement to retain a variable's value from a previous call until the variable is assigned.
- PROC HADOOP
 - You can use wildcards in syntax in several HDFS statement commands such as COPYTOLOCAL.
 - You can request recursive action in an HDFS statement operation that executes the operation on the specified directory as well as subsequent directories.
 - There are new HDFS statement commands to list files (LS), list contents of files (CAT), and change permissions (CHMOD).
 - An alternate method to specify the location of the Hadoop configuration file is to specify the location by using the SAS_HADOOP_CONFIG_PATH environment variable.
 - You can submit a MapReduce program and Pig language code to a Hadoop cluster through the Apache Oozie RESTful API.
- PROC HTTP
 - Expands method support to include all methods that support the HTTP/1.1 standard and are supported by the target server.
 - Custom request headers can be specified as name=value pairs in a HEADERS statement or by submitting a fully formatted input file from a fileref.
 - Input data can be specified in a quoted string or submitted from a fileref.
 - For web servers that support it, the procedure uses connection caching and cookie caching by default. You can toggle the behavior of both types of caching and clear the caches within the procedure by specifying procedure arguments. Or you can turn cookie caching off by using a macro variable.
- Using the LUA procedure, you can run LUA code within a SAS session. The LUA procedure also enables you to call SAS functions from within blocks of LUA code.
- For the MIGRATE procedure, the default value of BUFSIZE has changed. The new default is the buffer page size of the current session. To continue using the previous behavior, which is to clone the page size of the members from the source library, specify BUFSIZE=KEEPSIZE.
- The PRINTTO procedure enables you to restore the previous location of the SAS log and LISTING output files. SAS saves the path of the SAS log and LISTING output files in automatic macro variables.
- The PRODUCT_STATUS procedure returns a list of the SAS Foundation products that are installed on your system, along with the version numbers of those products.
- PROC SQL supports linguistic collation with the SORTSEQ statement option.
- The following procedures support the Impala, HAWQ, and SAP HANA database management systems:
 - DS2 procedure
 - FedSQL procedure
 - MEANS procedure
 - RANK procedure
 - REPORT procedure
 - SORT procedure

- SUMMARY procedure
- TABULATE procedure

Procedure Enhancements: SAS 9.4M2

SAS 9.4M2 (August 2014) includes the following enhancements:

- The CIMPORT procedure SORT option causes the data set that is being imported to be re-sorted according to the destination operating system's collating sequence.
- The XCODE= option in the DS2 procedure and the FEDSQL procedure controls the behavior of the SAS session when an NLS transcoding failure occurs.

In addition, the SYSCC macro variable now contains the current SAS condition code that is returned to your operating environment.

- The OPTIONS procedure LISTOPTSAVE option lists the system options that can be saved by using the OPTSAVE procedure or the DMOPTSAVE command. The OPTIONS procedure now displays passwords in the SAS log as 8 Xs, regardless of the actual password length.
- The REPORT procedure supports statistical keywords P20, P30, P40, P60, P70, and P80.
- When SAS is in a locked-down state, the SOAP procedure is not available if the HTTP access method has not been re-enabled in the autoexec file.

Procedure Enhancements: SAS 9.4M1

SAS 9.4M1 (December 2013) has these features and enhancements:

- The CIMPORT procedure provides the ability to determine the encoding of data sets in a transport file through the ENCODINGINFO= option. The encoding information is displayed in the SAS log.
- The CIMPORT and CPORT procedures now transport data sets with time zone offsets. PROC CPORT must specify the DATECOPY option.
- A link and supporting text were added for Microsoft Excel functions that are available to PROC FCMP.
- The HTTP procedure now allows the HTTP_TOKENAUTH option to generate a one-time password from the metadata server to access the SAS Content Server, and supports user identity authentication. If the server that you are connecting to supports the NTLM (for the UNIVARIATE procedure in Windows only) protocol or the Kerberos authentication protocols, then you do not need to specify a user name and password. As long as your current user identity has permissions, authentication is established.

Procedure Enhancements: SAS 9.4

SAS 9.4 has these changes and enhancements:

- The DELETE procedure has been reinstated.
- The International Components for Unicode (ICU) version is used to sort data sets with a linguistic collating sequence. The CONTENTS procedure of DATASETS procedure CONTENTS statement output shows the ICU version number of a data set that is linguistically sorted. With the COPY or MIGRATE procedure, if a data set's ICU version number different from the current SAS session, the data set retains its sort order in the OUT= destination library, but the sort indicator is removed.

- JMP files that you specify in the IMPORT or EXPORT procedure, or in a LIBNAME statement, must be Version 7 or later. This enables you to export SAS data sets to JMP files for viewing in a variety of ways, such as with the JMP Graph Builder iPad application.
- With the FORMAT procedure, a month can be formatted using a shortened version by specifying the number of characters to use in the %nB directive. The range to specify a default length of an informat, picture, or format is 1-32767.
- With the OPTIONS procedure, you can list options that can be saved using the OPTSAVE procedure or the DMOPTSAVE command.
- The PRINT procedure enables you to specify labels for the sums and grand totals. For the PROC PRINT statement STYLE= option, style attributes for the HEADER location no longer affect the Obs column heading. You specify style attributes for the Obs column heading by using the OBSHEADER location.
- The PRINTTO PRINT= statement opens the LISTING destination. You no longer need to specify the ODS LISTING statement before you use the PRINTTO procedure.
- The QDEVICE procedure enables you to specify additional device libraries and catalogs. The NAMETYPE variable has been renamed to TYPE. The General and Font reports include new information. Character variable lengths in report output data sets have a fixed length of 128 characters. The LENGTH statement is no longer required when reports are merged or concatenated.
- The SQL IPONEATTEMPT option enables the termination of an SQL query if implicit pass-through fails. The BUFFERSIZE option for the PROC SQL statement has been replaced with the UBUFSIZE option. The BUFFERSIZE option that was used before SAS 9.4 is the same as the UBUFSIZE option and is still supported. As of SAS 9.4, UBUFSIZE is the preferred option.
- The XSL procedure now enables the PARAMETER statement to pass a parameter value to an XSL style sheet.

Additional Information about SAS Procedures

For more information, see [Base SAS Procedures Guide](#).

Enhancements to Base SAS Statistical Procedures

- The CORR procedure can now create an output data set that contains polychoric correlation statistics and an output data set that contains polyserial correlation statistics.
- The FREQ procedure now does the following:
 - supports Baker, exact mid- p , likelihood ratio, and logit binomial confidence limits
 - provides score confidence limits for the odds ratio and relative risk and displays them in the corresponding plots
 - provides Mantel-Haenszel, stratified Newcombe, and summary score estimates of the common risk (proportion) difference, which can be displayed in the risk difference plot
 - produces mid p -values for exact tests
 - colors mosaic plot tiles according to the values of the Pearson residuals or the standardized residuals

- displays the Pearson residuals in the CROSSTAB table
- The UNIVARIATE procedure now enables you to overlay histograms that are associated with different levels of a CLASS variable onto a single plot, offers improved maximum likelihood estimation for Johnson S_U distribution parameters, and calculates the geometric means of analysis variables.

For more information, see [Base SAS Procedures Guide: Statistical Procedures](#).

Data Set Options

Starting in SAS 9.4M5 (September 2017), the ENCRYPT= data set option supports AES2 encryption. For more information, see [SAS Data Set Options: Reference](#).

In SAS Viya 3.4, the WHERE= data set option is supported in CAS for input data sets and is not supported in CAS for output data sets.

In SAS Viya 3.3, to specify the maximum amount of memory in bytes that each thread should allocate for in-memory blocks before converting to a memory-mapped file, use the MAXTABLEMEM= data set option.

The December 2017 release of SAS 9.4M5 and SAS Viya 3.3 has these changes and enhancements:

- You can set the working directory using the DLBCDIR function.
- When you use the CAS LIBNAME engine, you can use the MAXTABLEMEM= data set option to specify the maximum amount of memory in bytes that each thread should allocate for in-memory blocks before converting to a memory-mapped file.

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In SAS 9.4, you can use the EXTENDOBSCOUNTER= system option to extend the observation count for the SAS session. The default value of the EXTENDOBSCOUNTER= data set option has been changed to YES.

Note: A SAS data set that is created with EXTENDOBSCOUNTER=YES is incompatible with releases prior to SAS 9.3.

Component Objects

In SAS Viya 3.5 and the November 2019 release of SAS (9.4M6), you can submit to the CAS server Python objects by using PROC FCMP or the DATA step.

The May 2019 release of SAS 9.4M6 has these changes and enhancements:

- You can use a Python function using PROC FCMP. You can execute the Python object using either PROC FCMP or the DATA step. You cannot submit Python objects to the CAS server.
- Use the keysum argument tag in the DECLARE statement or _NEW_ operator to specify the name of a variable that tracks the key summary for all keys.
- Use the DO_Over method in an iterative DO loop to traverse the duplicate keys.

Formats and Informats

- In SAS Viya 3.4, the \$UUID. informat converts a UUID to binary data.
- In SAS 9.4M4, the new ODDSRw.d format supports writing values as odds ratios.

- SAS 9.4M2 has these changes and enhancements:
 - New aliases were added for some time zone informats.
 - New ISO 8601 formats, B8601DX, B8601LX, B8601TX, E8601DX, E8601LX, and E8601TX can be used to format dates, times, and datetime values for time zones by using Universal Coordinate Time (UTC).
 - Some format values might differ slightly when the DECIMALCONV= system option is set to STDIEEE.

Functions

Functions: SAS 9.4M9

These functions were removed from SAS software for security reasons. They are no longer supported and should not be used. These functions should be removed from DATA step programs to prevent an error.

- **ADDR** Returns the memory address of a variable on a 32-bit platform.
- **ADDRLONG** Returns the memory address of a variable on a 64-bit platform.
- **CALL MODULE** Calls an external routine without any return code.
- **CALL POKE** Writes a value directly into memory on a 32-bit platform.
- **CALL POKELONG** Writes a value directly into memory on a 64-bit platform.
- **MODULE** Calls a specific routine or module that resides in an external dynamic link library (DLL).
- **MODULEC** Calls an external routine and returns a character value.
- **MODULEN** Calls an external routine and returns a numeric value.
- **PEEK** Stores the contents of a memory address in a numeric variable on a 32-bit platform.
- **PEEKC** Stores the contents of a memory address in a character variable on a 32-bit platform.
- **PEEKCLONG** Stores the contents of a memory address in a character variable on a 64-bit platform.
- **PEEKLONG** Stores the contents of a memory address in a numeric variable on a 64-bit platform.
- **PTRLONGADD** Returns the pointer address as a character variable on a 64-bit platform.

Functions: SAS 9.4M6

Starting in SAS 9.4M6 (November 2018), you can manage a GIT repository using a set of new GIT functions.

Functions: SAS 9.4M5

In the December 2017 release of SAS 9.4M5 and SAS Viya 3.3, you can set the working directory using the DLBCDIR function.

SAS 9.4M5 (September 2017) has these changes and enhancements:

- SAS supports three families of pseudorandom number generators: Mersenne twister generators, a permuted congruential generator (PCG), and two ThreeFry generators.

New random-number generators (RNG) generate numbers in parallel and distributed environments. You can select from a number of algorithms using the CALL STREAMINIT and CALL STREAM routines. A new best practice for generating random numbers is to use these routines. SAS also supports a hardware-based RNG on certain chipsets.

The older random-number functions (NORMAL, UNIFORM, RANBIN, RANCAU, RANEXP, RANGAM, RANNOR, RANPOI, RANTBL, RANTRI, and RANUNI) are deprecated. These functions are still supported in the DATA step but are not recommended for serious statistical analyses. Because the underlying algorithm is not appropriate for parallel computations, the legacy functions are not supported in new SAS procedures that are designed to execute in parallel on a grid of computers.

- Using the CALL STREAMINIT routine, you can specify the type of random-number generator that you would like to use.
- The CALL STREAM routine specifies a random-number stream to use for subsequent calls to the RAND function.
- The CALL STREAMREWIND routine rewinds a stream to its initial state for subsequent random-number generation.

Functions: SAS 9.4M4

In SAS 9.4M4, a reference to the ICSF cryptographic from IBM is added to the SHA256 function for the z/OS platform.

Functions: SAS 9.4M3

In SAS 9.4M3, these functions are new or enhanced:

- To determine the category of a format or informat, or to query decimal and width ranges for format or informat values, use the FMTINFO() function.
- The HOLIDAY functions are no longer experimental:
 - HOLIDAYCK returns the number of occurrences of the holiday value between two dates.
 - HOLIDAYCOUNT returns the number of holidays defined for a SAS date value.
 - HOLIDAYNAME returns the name of the holiday that corresponds to the SAS date or a blank string if a holiday is not defined for the SAS date.
 - HOLIDAYNX returns the nth occurrence of the holiday relative to the date argument.
 - HOLIDAYNY returns the nth occurrence of the holiday for the year.
 - HOLIDAYTEST returns 1 if the holiday occurs on the SAS date value.
- The SHA256MACHEX function returns the result of the message digest of a specified string by using the HMAC algorithm.

Functions: SAS 9.4

SAS 9.4 has several new functions:

- COT returns the cotangent.
- CSC returns the cosecant.
- DOSUBL imports macro variables from the calling environment, and exports macro variables back to the calling environment after the function invokes the SAS code in the text string.

- FCOPY copies a record from one fileref to another fileref, and returns a value that indicates whether the record was successfully copied.
- SEC returns the secant.
- The CALL IS8601_CONVERT routine allows the year, month, day, hour, minutes, and seconds to have missing values.
- The PUTC and PUTN functions can override the justification of your output. You can center, right-align, or left-align the output that you create.
- If the SCAN or KSCAN function returns a value to a variable that has not yet been a length, then that variable is given the length of the first argument.
- The DATE, DATETIME, TIME, and TODAY functions return date and time values for the time zone that is specified by the TIMEZONE= system option.
- In the Normal Mixture distribution for the CDF, PDF, SDF, LOGCDF, LOGPDF, LOGDSF, QUANTILE, and SQUANTILE functions, weights must be nonnegative. If the sum of the weights does not equal 1, they are treated as relative weights and adjusted so that the sum equals 1.

Additional Information

For more information, see [SAS Functions and CALL Routines: Reference](#).

Statements

Statements: SAS 9.4M9

Support was added for the ACL= and ENCODING= options in the FILENAME statement for S3. Use the ACL= option to specify a canned ACL value that applies to newly created objects. Use the ENCODING= option to specify the encoding to use when reading or writing in S3. For more information, see “[FILENAME Statement: S3 Access Method](#)” in [SAS Global Statements: Reference](#).

Statements: SAS 9.4M8

In the March 2024 update to SAS 9.4M8, the FILENAME Azure access method is enhanced to support all host environments supported by SAS, except z/OS.

Statements: SAS 9.4M7

SAS 9.4M7 has these changes and enhancements:

- The FILENAME Statement Azure Access Method enables access to data in Microsoft Azure Data Lake Storage Gen2.
- The FILENAME Statement S3 Access Method enables access to data in Amazon S3 files.

Statements: SAS 9.4M6

In the May 2019 release of SAS 9.4M6 and SAS Viya 3.4, you can use the STATUS option in the INFILE statement to specify a variable whose value contains the return status code from a URL request.

In SAS 9.4M6, you can enable the LIST statement to write log data in hexadecimal format for all lines of your input data using the HEXLISTALL argument in the DATA statement.

Statements: SAS 9.4M5

In the December 2017 release of SAS 9.4M5 and SAS Viya 3.3, you can store and retrieve files within the SAS Viya File Service using the FILENAME, FILESRVC access method.

These enhancements were added in SAS 9.4M5 (September 2017):

- Global statements now reside in a new document titled [SAS Global Statements: Reference](#).
- The FILENAME statement, EMAIL (SMTP) access method supports GZIP files and attaching more than one file using multiple !EM_ATTACH! directives.
- The FILENAME statement, ZIP access method supports GZIP files.
- The LIBNAME statement, JSON engine now supports an ALLDATA= “name” option. The ALLDATA= LIBNAME option enables you to specify a different name for the ALLDATA data set.

Statements: SAS 9.4M4

SAS 9.4M4 has these changes and enhancements:

- FILENAME, Hadoop access method
 - The default behavior of the CFG= option has changed. If CFG= is not provided, the SAS_HADOOP_CONFIG_PATH and SAS_HADOOP_JAR_PATH environment variables are now scanned for the location of the required configuration files.
 - Knox security is now supported.
- FILENAME Statement, EMAIL (SMTP) access method can set an email sensitivity flag on emails that originate from SAS.
- The JSON LIBNAME statement enables you to associate a libref with a JSON document.

Statements: SAS 9.4M3

SAS 9.4M3 has these changes and enhancements:

- FILENAME, FTP access method
 - File names can contain UTF-8 characters. Only hosts whose FTP servers support the OPTS UTF8 ON or OPTS UTF-8 ON FTP protocol commands can read these file names.
 - The FTP access method supports Secure FTP by using Transport Layer Security (TLS). There are three new statement options available:
 - The AUTHTLS option enables you to issue the FTP AUTH TLS command.
 - The PBSZ option enables you to specify the FTP Data Channel Protection Buffer Size.
 - The PROT option enables you to specify the FTP Data Channel security command.
- FILENAME, Hadoop access method
 - The Hadoop access method supports the SAS_HADOOP_CONFIG_PATH environment variable. You no longer have to merge properties from multiple Hadoop configuration files into a single configuration file and specify the CFG= option.

- The CONCAT and DIR Hadoop options are now mutually exclusive because the SAS_HADOOP_CONFIG_PATH environment variable is available.
- FILENAME, ZIP access method
 - You can specify an encoding for ZIP file entry names and comments that are different from the current session encoding by using the NAMEENCODING= option.
 - Wildcards (*) are supported in the MEMBER= syntax for reading or checking the existence of entries in the ZIP file.

Statements: SAS 9.4M2

SAS 9.4M2 has these changes and enhancements:

- Using the FILENAME Statement, EMAIL (SMTP) access method, you can embed attachments in an email by using HTML. In addition, you can now specify a message/rfc822 content type.
- Using the FILENAME Statement, Hadoop access method, you can now submit HDFS commands through WebHDFS. The new SAS environment variable SAS_HADOOP_RESTFUL must be defined and set to the value 1. In addition, the Hadoop configuration file must include the properties for the WebHDFS location.
- The following FILENAME statement access methods are not available when SAS is in a locked-down: EMAIL (SMTP), FTP, Hadoop, SOCKET (TCPIP), and URL (HTTP). However, the SAS server administrator can re-enable one or more of these access methods.
- FILENAME Statement, DATAURL access method enables you to read data from user-specified text.
- You can use the FILENAME Statement, Hadoop access method to create a directory.
- Stream-record format has been added to the RECFM= option for the FILENAME Statement, SFTP access method. Data is transferred in image (binary) mode.
- The FILENAME Statement, URL access method has new options to specify an Accept: header and to create connections when accessing a URL through a proxy.
- You can use the FILENAME Statement, WebDAV access method to specify the name of an authentication domain metadata object, create a directory, and delete a directory.
- The FILENAME Statement, ZIP access method enables you to access ZIP files.
- The LOCK statement NOMSG option disables errors and warnings to the SAS log.
- The MODIFY and SET statement option CUROBS creates and names a variable that contains the observation number that was just read from the data set. A new option, KEYRESET, controls whether a KEY= search should be at the top of the index for the data set that is being read.
- In SAS 9.4, the TERMSTR= option in the INFILE statement automatically normalizes imported copies of Windows files that are being read by SAS when in a UNIX environment. This enables easier sharing of files between the environments.

SAS System Options

SAS System Options: SAS 9.4M8

In the July 2021 update to SAS 9.4M8, the APPENDVARLENWARN system option enables you to control notes and warnings issued to the SAS log when the length of a variable in the target data set is longer than the length of the variable in the source data set.

SAS System Options: SAS 9.4M7

New system options in SAS 9.4M7 support connecting to a Microsoft Azure storage system.

- The AZUREAUTHCACHELOC system option specifies the location of a file that contains login information for connecting to a Microsoft Azure storage system.
- The AZURETENANTID system option specifies the tenant ID for connecting to a Microsoft Azure storage system.

Also, in this release, the default value for the YEARCUTOFF option has changed from 1926 to 1940.

SAS System Options: SAS 9.4M6

New system options in SAS 9.4M6 support accessible output.

SAS System Options: SAS 9.4M5

SAS 9.4M5 has these changes and enhancements:

- Instead of using DSACCEL system option to enable parallel processing of the DATA step on the CAS server, you use the DSCAS system option.
- Options that allow the K, M, G, or T numeric notation for kilo, mega, giga, or tera can now be specified as KB, MB, GB, or TB.
- The value of the MAPSGFK= system option can be modified using the APPEND= and INSERT= system options.

SAS System Options: SAS 9.4M4

SAS 9.4M4 has these changes and enhancements:

- The SVGTITLE= system option is enhanced for accessibility. If one or more TITLE= statements are specified before ODS GRAPHIC procedures that create SVG images, the values of the TITLE statements are added to the value of the SVGTITLE= option.
- The QUOTELENMAX system option displays a warning in the SAS log if a string in quotation marks is too long.

SAS System Options: SAS 9.4M3

SAS 9.4M3 has these changes and enhancements:

- You can control the locations of the SAS/IML package collections by using the IMLPACKAGEPRIVATE=, IMLPACKAGEPUBLIC=, and IMLPACKAGESYSTEM= system options.

- The UBUFNO=, UBUFSIZE, and VBUFSIZE= options are included in the PERFORMANCE PROC OPTIONS group. The FONTALOC= option is included in the ODSPRINT= PROC OPTIONS group.

SAS System Options: SAS 9.4M2

SAS 9.4M2 has these changes and enhancements:

- If MSGLEVEL=I, then SAS writes Hadoop MapReduce job information to the SAS log.
- On host platforms other than z/OS, the UTILLOC= system option accepts a file name as an argument. The file contains a list of directories that SAS can use to select the location for utility files. Allowing SAS to select utility file locations can help balance server I/O workloads.
- The OPTIONS procedure displays passwords in the SAS log as 8 Xs, regardless of the actual password length.

SAS System Options: SAS 9.4M1

SAS 9.4M1 has these changes and enhancements:

- The OPTMODEL procedure can now use the SAS language compiler for nonlinear statistical modeling or optimization in the CMPLIB= system option.
- The DSACCEL= system option enables you to specify whether a DATA step is enabled for parallel processing in supported environments. The DATA step can run, with limitation, in the SAS LASR Analytic Server and Hadoop environments.
- The DS2ACCEL system option specifies whether DS2 code is enabled for parallel processing in supported environments that use the SAS In-Database Code Accelerator.

SAS System Options: SAS 9.4

SAS 9.4 has these changes and enhancements:

- The default values of these system options have changed:
 - The default value of the CPUCOUNT= system option is ACTUAL or 4 for systems that have more than four processors.
 - The default value of the DMSOUTSIZE= system option is 2147483647.
 - The default value of the LRECL= system option is 32767.
 - The default value of the YEARCUTOFF= system option is 1926.
- You can specify the SAS Clinical Standards Toolkit global standards library by using the CSTGLOBALLIB= option. Use the CSTSAMPLELIB= option to specify the sample library.
- The DECIMALCONV= system option enables you to process floating-point numbers that follow the IEEE Standard for Floating-Point Arithmetic 754-2008.
- You can use the EXTENDOBSCOUNTER= system option to extend the observation count in 32-bit SAS data files.
- In the LOGPARM= system option, the file that is specified by the SYSIN option can be used in the log name by using the %P directive. ROLLOVER=n is not supported for logs in z/OS data sets.
- The SQLIPONEATTEMPT= system option enables the termination of an SQL query if implicit pass-through fails.

- Instead of a note, you can specify whether to issue a warning message or an error message to the SAS log when a variable is not initialized. You can also specify not to issue a note. You use the VARINITCHK= system option to specify what is written to the SAS log.

Macro Language

SAS Macro Language: SAS 9.4M5

These enhancements were added in SAS 9.4M5 (September 2017):

- These automatic macro variables are new:
 - Use SYSINCLUDEFILEDEVICE to determine the device type on the current %INCLUDE file.
 - Use SYSINCLUDEDIR to determine in which directory the current %INCLUDE file was found.
 - Use SYSINCLUDEFILEFILEREFS to determine whether a fileref was used to access the current %INCLUDE file.
 - Use SYSINCLUDEFILENAME to determine the name of the current %INCLUDE file.
 - Use SYSMAXLONG to return the maximum long integer value allowed under Linux.
- The SYSMAXLONG automatic variable returns the maximum long integer value allowed under Linux.

For more information, see [SAS Macro Language: Reference](#).

SAS Macro Language: SAS 9.4M3

The MVARSIZE system option now has a default value of 65, 534.

SAS Macro Language: SAS 9.4M2

Two new options were added to the %PUT statement:

- The _READONLY_ option lists all user-defined read-only macro variables, regardless of scope.
- The _WRITABLE_ option lists all user-defined read and write macro variables, regardless of scope.

SAS Macro Language: SAS 9.4

These automatic macro variables are new:

- SYSDATASTEPHASE ensures that the macro is being executed as part of the proper phase of a DATA step. The value indicates that current active phase of the DATA step.
- SYSHOSTINFOLONG contains the operating-environment information that is displayed when the HOSTINFOLONG option is specified.
- SYSPROCESSMODE contains the name of the current SAS session run mode or server type.
- SYSTIMEZONE contains the time zone name based on the current value of the TIMEZONE option.

- SYSTIMEZONEIDENT contains the zone ID based on the current value of the TIMEZONE option.
- SYSTIMEZONEOFFSET contains the time zone offset based on the current value of the TIMEZONE option.

XMLV2 Engine

In SAS 9.4M7 (August 2020), or if you apply a hot fix to SAS 9.4 or to SAS Viya, the behavior of the AUTOMAP= LIBNAME statement option is changed. Some XML entities are not supported.

In SAS 9.4M6, two LIBNAME statement options expand column variable lengths:

- The CHARMULTIPLIER= option expands column (variable) lengths by a default multiplier value that is based on the session encoding. These column (variable) lengths are specified in an XMLMap.
- The DERIVECHARMULTIPLIER= option expands column (variable) lengths by a default multiplier value that is based on the session encoding. These columns (variable) lengths are specified in an XMLMap.

In SAS 9.4M4, the new PREFIXATTRIBUTES= option specifies whether the element name is concatenated to the attribute name when generating each XMLMap COLUMN element.

In SAS 9.4, XMLV2 engine functionality for the z/OS environment changed from preproduction to production. The engine is production in all SAS 9.4 operating environments.

SAS under UNIX

SAS under UNIX: SAS 9.4M8

Beginning with SAS 9.4M8, the HP-UX platform is no longer supported. Also, the Syncsort utility is no longer supported by the SORT procedure.

SAS under UNIX: SAS 9.4M5

Starting in SAS 9.4M5 (September 2017), you can use the new environment variable AUTHINFO to specify the location of the authinfo file that you use to authenticate to a CAS server.

SAS under UNIX: SAS 9.4M4

SAS 9.4M4 (November 2016) has these new options in the CLEANWORK utility:

- The -V option supports the generation of verbose log output.
- The -LOG option enables you to save output to a log file.

SAS under UNIX: SAS 9.4M3

SAS 9.4M3 (July 2015) has these changes and enhancements:

- The default value for the MVARSIZE system option has changed from 32K to 65,534.
- You can run external Lua files from the command line by invoking the -SYSIN option. You can also run an external Lua file from within SAS by using an %INCLUDE statement.

- When you use the X command with the SETENV command to create an environment variable, the value of the environment variable is fully expanded before the environment variable is created.
- The CONTENTS procedure generates the size of file in KB, MB, or GB.

SAS under UNIX: SAS 9.4M2

SAS 9.4M2 (August 2014) has the following enhancements:

- It is no longer necessary to use the UUID Generator Daemon to generate UUIDs for SAS sessions that execute UNIX hosts.
- The BMDP procedure has been deprecated. If you call the BMDP procedure, SAS does not attempt to run BMDP software. However, the BMDP engine, which enables SAS to convert to and from BMDP files, is still available.
- The new PERMISSION= option for the FILE and FILENAME statements enables you to specify Read, Write, and Execute permissions for a fileref. You can also specify whether the permissions that you set apply to you, to the group owner of the file, or to other users.
- In a locked-down state, the following FILENAME statement access methods are not available: EMAIL, FTP, Hadoop, HTTP, SOCKET, TCPIP, and URL. However, the SAS server administrator can re-enable one or more of these access methods. For more information, see [“Locked-Down State” on page 44](#).
- The OPTLIST system option automatically masks any password values that are specified when invoking SAS. Only the masked values appear in the SAS log.
- You can expand the file name that is generated by the RTRACELOG system option to include the process ID, date, and system time. Include %p, %d, or %t, respectively, to include these values in the file name. Here is an example:
`mytrace.%d.%t.%p`
- If you set the PATHENCODING environment in your UNIX environment, any path you provide in a SAS program must include characters that are recognized by both the PATHENCODING environment variable and the SAS session encoding. Specifically, to specify a PATHENCODING value of UTF-8 in a SAS session that uses English (LANG=EN), you must specify a session encoding of UTF-8 or SAS_U8.

SAS under UNIX: SAS 9.4M1

In SAS 9.4M1 (December 2013), these access methods are new:

- ACTIVEMQ enables SAS programs to send messages to and receive messages from an ActiveMQ message broker through the HTTP protocol.
- JMS enables SAS programs to send messages to and receive messages from any JMS API-compliant message service.

SAS under Windows

SAS under Windows: SAS 9.4M8

Beginning with SAS 9.4M8 (November 2022), the Syncsort utility is no longer supported by the SORT procedure.

SAS under Windows: SAS 9.4M6

In the May 2019 release, SAS 9.4M6 adds support for Windows Server 2019.

SAS under Windows: SAS 9.4M5

SAS 9.4M5 (September 2017) adds support for Windows 2016. Also, JRE 1.7 Update 151 replaces previous versions of the JRE.

SAS under Windows: SAS 9.4M3

Starting in SAS 9.4M3 (July 2015), SAS deployments no longer require Windows 8.3 file name support. In previous releases, this file name convention had to be enabled before you could install SAS.

SAS under Windows: SAS 9.4M2

SAS 9.4M2 (August 2014) has the following enhancements:

- The Cleanwork utility is now a console-based application and is installed as part of Base SAS in the SASROOT directory.
- The new PERMISSION= option for the FILE and FILENAME statements enables you to specify Read, Writer, and Execute permissions for the specified fileref. You also specify whether the permissions that you set apply to you, to the groups that you are a member of, or to all users.
- In a locked-down state, these FILENAME statement access methods are, by default, not available: EMAIL, FTP, Hadoop, HTTP, SOCKET, TCPIP, and URL. However, the SAS server administrator can re-enable one or more of these access methods.
- You can expand the file name that is generated by the RTRACELOC system option to include the process ID, date, and system time. Include %p, %d, or %t, respectively, to include these values in the file name. Here is an example:
`mytrace.%d.%t.%p`

SAS under Windows: SAS 9.4M1

In SAS 9.4M1 (December 2013), details have been added in support of Windows 32-bit architecture.

SAS under Windows: SAS 9.4

- Beginning with SAS 9.4, Windows XP, Windows Server 2003, and Windows Vista are no longer supported.
- Additional operating-environment information can be written to the SAS log when the HOSTINFOLONG system option is set.
- You can set the number of seconds that SAS waits for a locked file to become available by setting the FILELOCKWAIT= system option.
- JRE 1.6.0_23 was replaced with JRE 1.6.0_24.
- In the SAS Help and Documentation, accessibility to many equations is improved. These equations are encoded using mathML. Screen readers can easily read equations, and low-vision users can enlarge equations.

Additional Information

For more information, see [*SAS Companion for Windows*](#).

SAS under z/OS

SAS under z/OS: SAS 9.4M9

In the June 2025 release of SAS 9.4M9, SAS under z/OS requires these versions of Java:

- Java 8 31-bit is requested for SAS Foundation 31-bit.
- Java 21 is required by SAS software that is written in Java.

SAS under z/OS: SAS 9.4M6

In the May 2019 release of SAS 9.4M6, the FILE statement and the INFILE statement cannot modify or override the device type that was set by an earlier FILENAME statement.

Starting in SAS 9.4M6, the MSYMTABMAX= system option default value has changed from 1,048,576 bytes to 2,097,152 bytes.

SAS under z/OS: SAS 9.4M5

SAS 9.4M5 (September 2017) has these enhancements:

- The FILEBUFNO system option specifies how many memory buffers to allocate for reading and writing.
- SAS supports eight-character TSO user IDs on z/OS V2R3.
- SAS supports the CSSTMP email server on z/OS V2R3.
- PROC RELEASE does not release unused space in a PDSE.

SAS under z/OS: SAS 9.4M4

SAS 9.4M4 (November 2016) has these new features:

- The .spds9 file extension is supported.
- The INFILE and FILE statements support BUFNO= processing.
- SAS added support for the IBM z/OS V2R2 Extended Format Generation Data Group (GDG), which allows up to 999 generation data sets to be associated with the GDG.
- The SHA256 function has been enhanced. A reference to the ICSF cryptographic software from IBM has been added for the z/OS platform.

SAS under z/OS: SAS 9.4M2

SAS 9.4M2 (August 2014) has the following enhancements:

- Large block size support for SAS libraries on tape devices improves performance and efficiency. To enable this capability for a particular library, specify DLLBI=YES in the LIBNAME statement. To enable this capability for all sequential libraries on tape, specify the DLLBI system option.
- The LOCKDOWN feature is supported for foundation servers. This allows the server administrator to specify a restricted set of z/OS data sets and UFS paths that are available to clients of the server. When SAS is in the locked-down state, access to certain system interfaces is also disabled.
- If the zHPF facility is enabled on the processor, on the desk device, and on the channels that connect them, then SAS generates TCW channel programs. These

programs execute in transport mode when reading direct access bound libraries that are residing in DSORG=PS data sets. This style of channel program can perform I/O in less elapsed time than the CCW channel programs (command mode) that are traditionally used by SAS. CCW channel programs are still used for Write operations, and they are also used for read processing if zHPF is not available or is disabled.

SAS under z/OS: SAS 9.4

- These SAS language elements are new:
 - The ZDSRATT function returns RACF security attributes for a z/OS data set name or returns UNIX security attributes (including ACL definitions) for a UFS file or directory.
 - The HOSTINFOLONG system option specifies to print additional operating-environment information in the SAS log when SAS starts.
 - The SORTCUT system option specifies a cutoff value that is the number of observations in a data set for which SAS sorts the data. If the number of observations is greater than the value of the SORTCUT system option, the host sort performs the sort.
- The SAS language elements have been enhanced:
 - The ZDSLST function supports the specification of up to 30 path components in a directory path.
 - The FILENAME statement supports the DATAURL, EMAIL, WebDAV, and ZIP devices.
 - The default value of the CARDIMAGE system option is NOCARDIMAGE.
- These system options have been deprecated: AUTHENCR, AUTHPROVIDERDOMAIN, and HELPCASE.
- The USEREXIT option specifies the name of the exec that the SASRX exit calls as a user exit instead of executing SASCP.
- Diagnostic messages can be created when utility file is closed if you set the TKOPT_TKIOP_DIAG_SPACE option in the TKMVSENV file. These messages detail the space allocation that is associated with the utility file association and the amount of space that the utility file actually used.

Additional Information

For more information, see [SAS Companion for z/OS](#).

Additional Information

For more information about changes from the previous release, see [Base SAS](#) in *SAS Guide to Software Updates and Product Changes*.

For more information, see these resources:

- [What's New in Base SAS 9.4: Details](#)
- [“What's New in Base SAS 9.4 Procedures” in Base SAS Procedures Guide](#)
- [What's New in Base SAS 9.4 Statistical Procedures](#) in *Base SAS Procedures Guide: Statistical Procedures*
- [“What's New in SAS 9.4 System Options” in SAS System Options: Reference](#)

- “What's New in Encryption with SAS 9.4” in *Encryption in SAS*
- “What's New in the SAS 9.4 Logging Facility” in *SAS Logging: Configuration and Programming Reference*
- “What's New in the Output Delivery System” in *SAS Output Delivery System: User's Guide*
- “What's New in SAS/GRAPH and Base SAS 9.4: Mapping Reference” in *SAS/GRAPH and Base SAS: Mapping Reference*
- “What's New in SAS 9.4 Graph Template Language” in *SAS Graph Template Language: Reference*
- “What's New in SAS ODS Graphics Procedures 9.4” in *SAS ODS Graphics: Procedures Guide*
- “What's New in SAS 9.4 ODS Graphics Designer ” in *SAS ODS Graphics Designer: User's Guide*
- What's New in SAS 9.4 ODS Graphics Editor in *SAS ODS Graphics Editor: User's Guide*
- “What's New in SAS 9.4 Global Statements” in *SAS Global Statements: Reference*
- “What's New in SAS 9.4 Functions and CALL Routines” in *SAS Functions and CALL Routines: Reference*
- “What's New in SAS 9.4 National Language Support” in *SAS National Language Support (NLS): Reference Guide*
- “What's New in SAS 9.4 Application Response Measurement” in *SAS Interface to Application Response Measurement (ARM): Reference*
- “What's New in SAS 9.4 Language Interfaces to Metadata” in *SAS Language Interfaces to Metadata*

SAS/ACCESS

New Interfaces in SAS/ACCESS 9.4

In SAS 9.4, there are several new SAS/ACCESS engines:

- SAS/ACCESS Interface to Amazon Redshift
- SAS/ACCESS Interface to Hadoop
- SAS/ACCESS Interface to HAWQ
- SAS/ACCESS Interface to Impala
- SAS/ACCESS Interface to PI System
- SAS/ACCESS Interface to PostgreSQL
- SAS/ACCESS Interface to SAP HANA
- SAS/ACCESS Interface to Spark
- SAS/ACCESS Interface to Vertica
- SAS/ACCESS Interface to Yellowbrick

Note: These products were added after the initial SAS 9.4 release.

- The SAS/ACCESS Interface to HAWQ was added in SAS 9.4M3 (July 2015). The SAS/ACCESS Interface to Amazon Redshift was added in April 2016.
- The SAS/ACCESS Interface to Impala and the SAS/ACCESS Interface to PI System were added in SAS 9.4M2 (August 2014).
- In April 2019, the SAS/ACCESS Interface to MongoDB and the SAS/ACCESS Interface to Salesforce were added to SAS 9.4M6.
- For the August 2019 release of SAS/ACCESS, support was added for the Google BigQuery LIBNAME engine and for the Snowflake LIBNAME engine. Both engines include a corresponding SAS Data Connector that enables data transfer between the DBMS and CAS.
- Starting in SAS 9.4M7 (August 2020), the Spark interface is supported.
- In SAS 9.4M7, support was added for the Yellowbrick interface on SAS 9.4M7. This is a new interface.

These new engines provide direct, transparent access to the engine through LIBNAME statements and the SQL pass-through facility. You can use various LIBNAME statement options and data set options that the LIBNAME engine supports to control the data that is returned to SAS.

For more information, see for more information, see [“What’s New in SAS/ACCESS 9.4 for Relational Databases” in *SAS/ACCESS for Relational Databases: Reference*](#) and [“What’s New in SAS/ACCESS for Nonrelational Databases” in *SAS/ACCESS for Nonrelational Databases: Reference*](#).

SAS/ACCESS 9.4 Interface to ADABAS

Starting with SAS 9.4M8 (January 2023), SAS/ACCESS Interface to ADABAS is no longer supported.

SAS/ACCESS 9.4 Interface to Amazon Redshift

In SAS 9.4M9, the following enhancements were made:

- Support was added for IAM roles when bulk loading to and from AWS. For more information, see [“BL_IAM_ASSUME_ROLE_ARN= LIBNAME Statement Option” in *SAS/ACCESS for Relational Databases: Reference*](#), and [“BL_IAM_ASSUME_ROLE_NAME= LIBNAME Statement Option” in *SAS/ACCESS for Relational Databases: Reference*](#).
- Support was added for the SKIP_IDENTITY_COL= LIBNAME option. For more information, see [“SKIP_IDENTITY_COL= LIBNAME Statement Option” in *SAS/ACCESS for Relational Databases: Reference*](#).

In SAS 9.4M8 (January 2023), support was added for the SAS_REDSHIFT_UPDATE_WARNING= environment variable to facilitate working with NLS data that would otherwise trigger errors in SAS.

In SAS 9.4M7 (August 2020), the default value for the INSERTBUFF= LIBNAME option is now 250.

In SAS 9.4M6 (November 2018), support was added for the SUB_CHAR= LIBNAME option.

Starting in SAS 9.4M4 (November 2016), the name of the Amazon Redshift engine is **redshift**. Support for bulk loading has been added. Support for the SQLGENERATION system option has been added. Support for pushdown of these

procedures to the database has been added: `FREQ`, `MEANS`, `RANK`, `REPORT`, `SORT`, `SUMMARY`, and `TABULATE`.

Starting in the April 2016 release of SAS/ACCESS 9.4, support was added for Amazon Redshift. This interface provides direct, transparent access to Amazon Redshift data through `LIBNAME` statements and through the SQL pass-through facility.

For more information, see [“SAS/ACCESS Interface to Amazon Redshift”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to Aster

Note: Starting with SAS 9.4M8 (January 2023), SAS/ACCESS Interface to Aster is no longer available. If you have an instance of SAS/ACCESS Interface to Aster and plan to upgrade to SAS 9.4M8 or later, SAS recommends that you unconfigure and uninstall it. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

In SAS 9.4M6 (November 2018), support was added for the `CONOPTS= LIBNAME` option and the `SUB_CHAR= LIBNAME` option.

For more information, see [“SAS/ACCESS Interface to Aster”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to DATACOM

Starting in SAS 9.4M7 (August 2020), SAS/ACCESS 9.4 Interface to DATACOM is no longer available.

SAS/ACCESS 9.4 Interface to DB2 under UNIX and PC Hosts

For SAS 9.4M9, the following enhancements were made:

- The default value for the `BL_METHOD=` data set option changed to `CLILOAD`. Previously, there was no default value for this option. For more information, see [“BL_METHOD= Data Set Option”](#) in *SAS/ACCESS for Relational Databases: Reference*.
- Support was added for the `UPDATE_SQL= LIBNAME` and data set options. For more information, see [“UPDATE_SQL= LIBNAME Statement Option”](#) in *SAS/ACCESS for Relational Databases: Reference*.

Starting with SAS 9.4M8 (January 2023), support was added for the `PRESERVE_COMMENTS= LIBNAME` option and `DB2_SQL_COMMENT` macro variable. These options enable you to pass comments down to your data source in a query.

Starting in SAS 9.4M7 (August 2020), the `BL_METHOD=` data set option now supports the values `IMPORT` and `LOAD` in addition to `CLILOAD`.

Starting in SAS 9.4M5 (September 2017), support has been added for these options:

- `DBNULLWHERE= LIBNAME` option and data set option
- `DBCLIENT_MAX_BYTES LIBNAME=` option and data set option

Starting in SAS 9.4M4 (November 2016), a new environment variable, `SAS_DB2_TS_REDUCE_SCALE`, has been added to maintain the numeric precision of the previous version of DB2 for `TIMESTAMP` values.

For more information, see [“SAS/ACCESS Interface to DB2 under UNIX and PC Hosts” in *SAS/ACCESS for Relational Databases: Reference*](#).

SAS/ACCESS 9.4 Interface to Google BigQuery

For SAS 9.4M9, the following enhancements were made: Support was added for the AUTHDOMAIN= LIBNAME option. Support was also added for the GCSDOMAIN= alias for AUTHDOMAIN=. For more information, see [“AUTHDOMAIN= LIBNAME Statement Option” in *SAS/ACCESS for Relational Databases: Reference*](#).

- Support was added for these performance-related options:
 - [IGNORE_FEDSQL_OBJECTS=](#)
 - [MODE=](#)
 - [PROJECT_LIST=](#)
- Support was added for threaded Reads that use the DBSLICEPARM= and DBSLICE= options. For more information, see [“Implementing Threaded Reads” in *SAS/ACCESS for Relational Databases: Reference*](#).
- The default value for INSERTBUFF= increased from 10 to 500.
- Support was added for the JSON data type.

In the September 2024 update of SAS/ACCESS for SAS 9.4M7, support was added for the FETCH_NUMERIC_TYPE= LIBNAME and data set options. Use these options to control how NUMERIC data is read into SAS. To preserve more than 15 digits of precision, set FETCH_NUMERIC_TYPE=NUMERIC and use the DBSASTYPE= data set option to store values as CHAR values. For more information, see [“FETCH_NUMERIC_TYPE= LIBNAME Statement Option” in *SAS/ACCESS for Relational Databases: Reference*](#).

In SAS 9.4M7, support for the SQLGENERATION system option has been added. SAS/ACCESS Interface to Google BigQuery has added support for bulk unloading (data retrieval) into SAS. Support has also been added for running these summary procedures in database: FREQ, MEANS, RANK, REPORT, SORT, SUMMARY, and TABULATE.

For the August 2019 release of SAS/ACCESS, support was added for the Google BigQuery LIBNAME engine and for the Snowflake LIBNAME engine. Both engines include a corresponding SAS Data Connector that enables data transfer between the DBMS and CAS.

For more information, see [“SAS/ACCESS Interface to Google BigQuery” in *SAS/ACCESS for Relational Databases: Reference*](#).

SAS/ACCESS 9.4 Interface to Greenplum

For SAS 9.4M9, these enhancements were made:

- Support was added for the DBCLIENT_MAX_BYTES= LIBNAME option. For more information, see [“DBCLIENT_MAX_BYTES= LIBNAME Statement Option” in *SAS/ACCESS for Relational Databases: Reference*](#).
- Support was added for the FETCH_TWFS_AS_TIME= LIBNAME option. For more information, see [“FETCH_TWFS_AS_TIME= LIBNAME Statement Option” in *SAS/ACCESS for Relational Databases: Reference*](#).
- Support was added for processing PROC COPY in-database. For more information, see [“Running PROC COPY In-Database for Greenplum” in *SAS/ACCESS for Relational Databases: Reference*](#).

In SAS 9.4M6 (November 2018), support was added for the CONOPTS= LIBNAME option and the SUB_CHAR= LIBNAME option.

For more information, see “[SAS/ACCESS Interface to Greenplum](#)” in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to Hadoop

For SAS 9.4M9, these changes and enhancements were made:

- The reference driver changed from the open-source Apache Hive driver to the Cloudera JDBC Connector for Apache Hive.
- Hadoop JAR files and third-party driver files have new required locations. Configuration changes are needed. For more information, see *SAS Hadoop Configuration Guide for Base SAS and SAS/ACCESS*.
- Bulk loading to ADLS Gen2 for Azure HDInsight is available with additional configuration.
- Support was added for several connection options that you can use instead of setting them in the hive-site.xml configuration file. For more information, see “[LIBNAME Statement for the Hadoop Engine](#)” in *SAS/ACCESS for Relational Databases: Reference*.
- Support for the following connection options changed:
 - CLASSPATH= now specifies an alternate location for third-party driver files.
 - The HDFS_DATADIR=, HDFS_METADIR=, and HDFS_TEMPDIR= connection options are deprecated.
 - The HIVE_PRINCIPAL= connection option is returned to support.
 - The URI= option is no longer required when you connect to Hive using Knox.
- The following LIBNAME and data set options were added or enhanced:
 - BATCH_UPDATE= LIBNAME option
 - DBCLIENT_MAX_BYTES= LIBNAME option
 - DBMAX_TEXT_TYPES= LIBNAME option and data set option
 - DRIVER_TRACE= LIBNAME option
 - DRIVER_TRACE_FILE= LIBNAME option
 - DRIVER_TRACEOPTIONS= LIBNAME option
 - INSERTBUFF= LIBNAME option and data set option
 - SASDATEFMT= data set option
 - BL_FORMAT= LIBNAME option and data set option (Parquet format added; ORC limitation noted)
 - TEMP_CTAS= LIBNAME (default changed to NO)
 - READBUFF= LIBNAME option (maximum value increased to 100,000)

Starting with SAS 9.4M8 (January 2023), the following enhancements and changes were made:

- ability to override the default read buffer size. Support has been added for the READBUFF= LIBNAME and data set options.

- ability to specify the default location to create external tables. Support has been added for the `DBC_CREATE_TABLE_LOCATION= LIBNAME` option. This option is used with the `DBC_CREATE_TABLE_EXTERNAL= LIBNAME` option.
- ability to specify the default file format of the Hadoop bulk load staging file. Support has been added for the `BL_FORMAT= LIBNAME` and data set options.
- support for JDBC drivers other than the Apache Hive open source driver. For more information, see [SAS Hadoop Configuration Guide for Base SAS and SAS/ACCESS](#).
- ability to specify additional resources to add to the JDBC class path. Support has been added for the `CLASSPATH= LIBNAME` option.
- The `CONFIG= LIBNAME` option and the `CONFIG=` data set option are deprecated. It is preferable to use the documented configuration steps and set the appropriate environment variables. For more information, see [“Running the Hadoop Tracer Script” in SAS Hadoop Configuration Guide for Base SAS and SAS/ACCESS](#).
- The `DRIVER= LIBNAME` option is now an alias for the `DRIVERCLASS= LIBNAME` option.
- The `HDFS_PRINCIPAL= LIBNAME` option is deprecated.
- The `HIVE_PRINCIPAL= LIBNAME` option is deprecated.

In SAS 9.4M7 (August 2020), support was added for the `DRIVERCLASS=` connection option.

In SAS 9.4M4 (November 2016), support was added for additional security features that use Knox, Kerberos, Sentry, or Record Service. Support was added for temporary tables. The `ANALYZE=` and `SCRATCH_DB= LIBNAME` options and data set options were added.

Starting in SAS 9.4M2 (August 2014), HiveServer2 is supported as the default Hive protocol. You can create and append to Hive tables by using the WebHDFS service. SAS supports Hive data types `TIMESTAMP`, `DATE`, and `VARCHAR` for Hive 0.12 and `CHAR` for Hive 0.13. Also, SAS supports Hive authorization and authentication by using IBM InfoSphere BigInsights 2.1. For more information, see [“Hadoop Support” on page 27](#).

For more information, see [“SAS/ACCESS Interface to Hadoop” in SAS/ACCESS for Relational Databases: Reference](#).

SAS/ACCESS 9.4 Interface to HAWQ

Note: Starting with SAS 9.4M8 (January 2023), SAS/ACCESS Interface to HAWQ is no longer available. If you have an instance of SAS/ACCESS Interface to HAWQ and plan to upgrade to SAS 9.4M8 or later, SAS recommends that you unconfigure and uninstall it. For more information, see [“Unconfiguring and Uninstalling Retired Products” in SAS Guide to Software Updates and Product Changes](#). As an alternative to HAWQ, consider storing your data on Greenplum and accessing it with SAS/ACCESS Interface to Greenplum.

Starting in SAS 9.4M3 (July 2015), the SAS/ACCESS Interface to HAWQ is a new interface. This interface provides direct, transparent access to HAWQ through `LIBNAME` statements and the SQL pass-through facility.

For more information, see [“SAS/ACCESS Interface to HAWQ” in SAS/ACCESS for Relational Databases: Reference](#).

SAS/ACCESS 9.4 Interface to IDMS

Starting in SAS 9.4M7 (August 2020), SAS/ACCESS 9.4 Interface to IDMS is no longer available.

SAS/ACCESS 9.4 Interface to Impala

For SAS 9.4M9, these changes and enhancements were made:

- Information was added about the configuration for the Impala interface. For more information, see [“Configuring Impala ODBC Driver” in SAS/ACCESS for Relational Databases: Reference](#).
- You can now pass these functions to Impala for processing: ATAN2, COALESCE, COSH, COT, DTEXTDATY, DTEXTMONTH, DTEXTWEEKDAY, DTEXTYEAR, LENGTHC, LOG2, MOD, QTR, REPEAT, SIGN, SINH, VAR, WEEKDAY
- SAS exports data that is formatted as DATE as a DATE value in Impala.

In SAS 9.4M8, the CONFIG= LIBNAME option and the CONFIG= data set option are deprecated. It is preferable to use the tracer tool to configure the appropriate environment variables. For more information, see [“Running the Hadoop Tracer Script” in SAS Hadoop Configuration Guide for Base SAS and SAS/ACCESS](#).

In SAS 9.4M6 (November 2018), support was added for the CONOPTS= LIBNAME option and the SUB_CHAR= LIBNAME option.

For more information, see [“SAS/ACCESS Interface to Impala” in SAS/ACCESS for Relational Databases: Reference](#).

SAS/ACCESS 9.4 Interface to Informix

For SAS 9.4M9, these changes and enhancements were made:

- The function of the SERVER= option changed. Support was added for the DSN= connection option. Replace the SERVER= option with DSN= in existing programs. Alternatively, you can connect to Informix without the DSN= option by specifying DATABASE=, HOST=, PORT=, and SERVER= (now the server name). For more information, see [“LIBNAME Statement for the Informix Engine” in SAS/ACCESS for Relational Databases: Reference](#).
- Support was added for bulk loading to and bulk unloading from an Informix data source. For more information, see [“Bulk Loading and Unloading with Informix” in SAS/ACCESS for Relational Databases: Reference](#).
- Support was added for the READBUFF= and INSERTBUFF= LIBNAME options.

SAS/ACCESS 9.4 Interface to JDBC

For SAS 9.4M9, these changes and enhancements were made:

- There is a new required location for third-party driver files. Driver files that are not installed in the required location are ignored.
- The CLASSPATH= connection option now specifies an alternate location for third-party driver files.

- The following options were added or enhanced:
 - BATCH_UPDATE= LIBNAME option (replaced BULKLOAD=)
 - DBCLIENT_MAX_BYTES= LIBNAME option
 - DBMAX_TEXT_TYPES= LIBNAME option and data set option
 - DRIVER_TRACE= LIBNAME option
 - DRIVER_TRACE_FILE= LIBNAME option
 - DRIVER_TRACEOPTIONS= LIBNAME option
 - SASDATEFMT= data set option
 - READBUFF= LIBNAME option (maximum value increased to 100,000)

For the JDBC interface, the following changes and enhancements were made in SAS 9.4M8:

- support for enhanced transaction logging. This is controlled with the DRIVER_TRACE= and related options.
- ability to override the default read buffer size. Support has been added for the READBUFF= LIBNAME and data set options.

In SAS 9.4M6 (November 2018), support was added for customers who run only SAS 9.4. For more information, see “[SAS/ACCESS Interface to JDBC](#)” in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to Microsoft SQL Server

For SAS 9.4M9, the following changes and enhancements were made:

- The default value for the INSERTBUFF= LIBNAME option is now calculated based on row size.
- Support was added for the SCANSTRINGCOLUMNS= LIBNAME and data set options.
- The value for the SCHEMA= option is now passed automatically to PROC FEDSQL.

In SAS 9.4M8, support was added for the PRESERVE_COMMENTS= LIBNAME option and the SQLSERVER_SQL_COMMENT macro variable. These options enable you to pass comments down to your data source in a query.

In SAS 9.4M7 (August 2020), support has been added for bulk loading to Azure Synapse Analytics (SQL DW).

Starting in SAS 9.4M5 (September 2017), support has been added for the DBNULLWHERE= LIBNAME option and data set option.

Starting in SAS 9.4M3 (July 2015), the SAS/ACCESS Interface to Microsoft SQL Server supports the Microsoft Windows for x64 platform and the Microsoft Windows x86 platform.

SAS 9.4M4 (November 2016) adds support for these items:

- the Microsoft Azure SQL database
- the SQLGENERATION system option, which enables SAS to generate SQL code for in-database processing
- the ability to run these procedures in-database: FREQ, MEANS, RANK, REPORT, SORT, SUMMARY, and TABULATE

For more information, see [“SAS/ACCESS Interface to Microsoft SQL Server”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to MongoDB

In the April 2019 release of SAS 9.4M6, support was added for SAS/ACCESS Interface to MongoDB. MongoDB is a nonrelational database that stores data in documents. For more information, see [“SAS/ACCESS Interface to MongoDB”](#) in *SAS/ACCESS for Nonrelational Databases: Reference*.

SAS/ACCESS 9.4 Interface to MySQL

Note: There is no longer support for SAS/ACCESS Interface to MySQL on the AIX platform. If you have an existing instance of SAS/ACCESS Interface to MySQL on AIX and plan to upgrade to SAS 9.4M8 or later, it is recommended that you unconfigure and uninstall it. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

For SAS 9.4M9, the following changes and enhancements were made:

- Support was added for the BL_USE_PIPE= LIBNAME and data set options.
- Support was added for the POST_COLUMN_OPTS= data set option.
- The DISK value was deprecated for the RESULTS= LIBNAME option.
- Support for accessing SingleStore data by using a MySQL LIBNAME statement is deprecated.

For the MySQL interface, support was added for the following features and enhancements in SAS 9.4M8:

- in-database processing of the FREQ, MEANS, RANK, REPORT, SORT, SUMMARY, and TABULATE procedures.
- The default value for the SQLGENERATION= system option was updated to include MySQL so that in-database processing is enabled automatically.

In SAS 9.4M7 (August 2020), the default value for the INSERTBUFF= LIBNAME option has changed from 0 to 1. A value greater than 0 causes the engine to calculate the number of rows that can be inserted at one time, based on row size.

In SAS 9.4M4 (November 2016), support was added for the SSL_CA=, SSL_CERT=, SSL_CIPHER=, and SSL_KEY data set options.

For more information, see [“SAS/ACCESS Interface to MySQL”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to Netezza

In SAS 9.4M6 (November 2018), support was added for the CONOPTS= LIBNAME option and the SUB_CHAR= LIBNAME option.

In SAS 9.4M5 (September 2017), support was added for the BL_DEFAULT_DIR= data set option. Documentation no longer includes support for the DELETE_MULT_ROWS= or UPDATE_MULT_ROWS= LIBNAME options.

In SAS 9.4M4 (November 2016), support was added for the PRESERVE_USER= LIBNAME option and the corresponding environment variable, SAS_NETEZZA_PRESERVE_USER.

For more information, see [“SAS/ACCESS Interface to Netezza”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to ODBC

For SAS 9.4M9, the following changes and enhancements were made:

- Support was added for the SCANSTRINGCOLUMNS= LIBNAME and data set options.
- The list of functions that are passed to an ODBC data source is updated.

In SAS 9.4M8, the following changes and enhancements were made:

- Support was added for the PRESERVE_COMMENTS= LIBNAME option and ODBC_SQL_COMMENT macro variable. These options enable you to pass comments down to your data source in a query.
- Support was added for ODBC for the DBIDIRECTEXEC system option.

In SAS 9.4M5 (September 2017), support was added for the DBNULLWHERE= LIBNAME option and data set option.

For more information, see [“SAS/ACCESS Interface to ODBC”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to OLE DB

In SAS 9.4M4 (November 2016), support was added for the CHAR_AS_NCHAR=LIBNAME option. For more information, see [“SAS/ACCESS Interface to OLE DB”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to Oracle

Note: SAS/ACCESS Interface to Oracle on the z/OS platform is no longer supported. If you have an existing instance of SAS/ACCESS Interface to Oracle on z/OS and plan to upgrade to SAS 9.4M8 or later, it is recommended that you unconfigure and uninstall it. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

For SAS 9.4M9, the following changes and enhancements were made:

- SAS uses the BL_PARFILE= data set option automatically when you set BULKLOAD=YES.
- Support was added for authentication with Oracle Wallet.

In SAS 9.4M8, support was added for these changes and enhancements:

- Support was added for the MAX_STRING_SIZE= LIBNAME option. This option enables you to explicitly specify the Oracle MAX_STRING_SIZE parameter value.
- Support was added for the PRESERVE_COMMENTS= LIBNAME option. This option enables you to pass comments down to your data source in a query.

Starting in SAS 9.4M5 (September 2017), support was added for these options:

- DBNULLWHERE= LIBNAME option and data set option
- POST_DML_STMT_OPTS= LIBNAME option and data set option

Starting in SAS 9.4M4 (November 2016), a new LIBNAME option, DBENCODIN, has been added so that you can change the encoding for a libref.

Starting in SAS 9.4M2 (August 2014), you can perform bulk loading by using the Oracle Direct Path API instead of the Oracle SQL*Loader utility. Starting with Oracle 12c, the default data type for SAS character variables in SAS output is either VARCHAR2 or CLOB, depending on the length of the variable.

For more information, see [“SAS/ACCESS Interface to Oracle”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to PC Files

SAS/ACCESS 9.4 Interface to PC Files enables you to exchange (import and export) PC files between the original source format and SAS data sets. Files are moved between the native PC format and SAS data sets by using the IMPORT and EXPORT procedures and wizards or by using LIBNAME statements.

SAS/ACCESS 9.4 has several enhancements to support Microsoft Excel XLSX files. For example, you can add a new Microsoft Excel XLSX worksheet to an existing workbook, and you can replace an existing worksheet in a workbook. You can export Excel XLSX files directly to UNIX. In this release, you can specify DBMS=XLSX to read and write to Excel workbooks under UNIX and Microsoft Windows directly without accessing the PC Files Server.

Certain statements used with the IMPORT and EXPORT procedures have been updated: RANGE=, SHEET=, GETNAMES=, GUESSINGROWS=. How RANGE= and SHEET= handle special characters in names has changed in Microsoft Excel XLSX files.

The EXPORT procedure supports the ENCRYPTKEY= option, which specifies the key value that is required for exporting an AES-encrypted SAS data set. Support for the Base SAS ENCRYPTKEY= data set option is also added.

SAS/ACCESS 9.4 imports data from JMP files saved with Version 7 or later formats, and exports SAS data to JMP files with Version 7 or later formats. Support for these newer file formats enables you to access JMP files from an application such as the JMP Graph Builder iPad. SAS/ACCESS 9.4 also supports importing and exporting JMP files with more than 32,767 variables. JMP variable names can be up to 255 characters in length.

Because you can use the Base SAS IMPORT and EXPORT procedures on JMP files without a SAS/ACCESS license, the preceding information applies to SAS 9.4 as well.

In earlier releases of SAS, the META statement was used for importing and exporting JMP files. In SAS 9.4, this statement is no longer supported. Instead, extended attributes are automatically used. If extended attributes are in a file, they are automatically transferred to the new file when that file is imported or exported. For example, when importing a JMP file with extended attributes, the attributes are automatically attached to the new SAS data set.

The ROWSTATE data type is generated by JMP and is used to store several row-level characteristics. If the JMP file contains row state information, PROC IMPORT stores this information as a new variable with the name _rowstate_. If the EXPORT procedure finds a column named _rowstate_, the procedure converts this column to the row state information in the output JMP file. For more information, see [“JMP Data Types”](#) in *SAS/ACCESS Interface to PC Files: Reference*.

Starting in SAS/ACCESS 9.4, when you import a Stata file, SAS can read multiple Stata missing values and map them to multiple SAS special missing values such as .a–.z or a single dot (.) for up to 27 missing values.

The PC Files Server can be operated as a Microsoft Windows service or as a Windows application on the 64-bit or 32-bit Windows operating system. Starting in SAS/ACCESS 9.4, if the machine does not have Microsoft Office or an ACE driver already installed on it, the 64-bit version of the SAS PC Files Server is the default. For more information, see [SAS PC Files Server: Installation and Configuration Guide](#). (This document was first available in SAS 9.4M2 (August 2014).)

Here are the features and enhancements that were introduced in a maintenance release:

- SAS/ACCESS 9.4M5 Interface to PC Files (September 2017)
 - SAS/ACCESS Interface to PC Files has merged with SAS Viya 3.2 documentation. For example, the CAS engine is supported with the IMPORT and EXPORT procedures in SAS 9.4M5. VARCHAR data types imported from SPSS, Stata, JMP, and XLSX data files can be stored in CAS tables as VARCHAR. When used with CAS tables, PROC EXPORT can store VARCHARs in SPSS, Stata, JMP, and XLSX files.
 - The following functionality is not valid in SAS Viya: SAS PC File Server, IMPORT and EXPORT Wizards and EFL.
 - For the IMPORT procedure, the specification DBMS=XLSX now supports storing currency values using the NLMNY format, which formats the value according to the locale.
- SAS/ACCESS 9.4M4 Interface to PC Files supports creation of Microsoft Excel files with the XLSX file format. This release shipped in November 2016.
- SAS/ACCESS 9.4M2 Interface to PC Files has added a new SAS LIBNAME engine called XLSX. It enables you to directly read and write data between Microsoft Excel XLSX files and SAS on Linux, UNIX, and Microsoft Windows operating environments.

For more information, see [What's New in SAS/ACCESS 9.4 Interface to PC Files](#) in *SAS/ACCESS Interface to PC Files: Reference*.

SAS/ACCESS 9.4 Interface to the PI System

In SAS 9.4M7 (August 2020), support was added for the following changes and enhancements:

- Attribute values up to 32767 bytes
- BASIC value for the SAS_PI_WEB_AUTH= environment variable, which enables authentication using a user name and password
- Modified syntax for accessing PI System tags in the Asset Framework

SAS 9.4M4 (November 2016) includes these new features:

- Support was added for the Picom_Summary virtual table for summaries of sensor data over time. The CALCULATION_BASIS= and MEDIAN= data set options pertain to the Picomp_Summary table.
- The MIXED= data set option enables you to merge data of different data types into the Picomp table.
- Support for the SHOWINDEX= and TAGLIST_JOIN data set options was added.

In the February 2016 release of SAS/ACCESS Interface to the PI System, these features are new:

- Support has been added for the PI System Asset Framework. The Asset Framework adds hierarchical organization to time series data.
- Support has been added for PI System event frames. An event frame tracks processing events that are important to your business.
- SAS/ACCESS Interface to the PI System can now run in UNIX environments.

For more information, see [“SAS/ACCESS Interface to the PI System”](#) in *SAS/ACCESS for Nonrelational Databases: Reference*.

SAS/ACCESS 9.4 Interface to PostgreSQL

For SAS 9.4M9, the following changes and enhancements were made:

- Support was added for the BL_WRITEBUFF= LIBNAME and data set options.
- Support was added for geometry and geography data and PostGIS functions. For more information, see [“Working with Geography and Geometry Data”](#) in *SAS/ACCESS for Relational Databases: Reference*.
- Support was added for the SAS_PG_FETCHSIZE and SAS_PG_USEDECLAREFETCH environment variables for working with large amounts of data.

In SAS 9.4M8, the following enhancements and changes were made:

- Support was added for in-database processing for PROC COPY.
- Support was added for the SAS_POSTGRES_UPDATE_WARNING= environment variable to facilitate working with NLS data that would otherwise trigger errors in SAS.

In SAS 9.4M5 (September 2017), the default value for the DBINDEX= LIBNAME option and data set option has been corrected in the documentation. The default value for both is NO.

SAS 9.4M4 (November 2016) adds support for these items:

- the SQLGENERATION system option, which enables SAS to generate SQL code for in-database processing
- the ability to run these procedures in-database: FREQ, MEANS, RANK, REPORT, SORT, SUMMARY, and TABULATE

For more information, see [“SAS/ACCESS Interface to PostgreSQL”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to R/3

In SAS 9.4M7 (August 2020), support was added for the INT8 data type, the WARN_BIGINT LIBNAME option, and the DBSASTYPE data set option.

Starting in SAS 9.4M3 (July 2015), two new CALLRFC procedure options and LIBNAME options are available. Use the NETWEAVER option to specify that the engine uses the SAP NetWeaver RFC libraries. Use the CLASSIC option to specify that the engine uses the SAP classic RFC libraries.

For more information, see [“What's New in SAS/ACCESS 9.4 Interface to R/3”](#) in *SAS/ACCESS Interface to R/3: User's Guide*.

SAS/ACCESS 9.4 Interface to Salesforce

In the April 2019 release of SAS 9.4M6, support was added for SAS/ACCESS Interface to Salesforce. Salesforce is a customer relationship management platform (CRM). For more information, see [“SAS/ACCESS Interface to Salesforce”](#) in *SAS/ACCESS for Nonrelational Databases: Reference*.

SAS/ACCESS 9.4 Interface to SAP ASE

Starting in SAS 9.4M4 (November 2016), the name of the Sybase product is SAP ASE. For more information, see [“SAS/ACCESS Interface to SAP ASE”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to SAP HANA

In SAS 9.4M6 (November 2018), support was added for the CONOPTS= LIBNAME option and the SUB_CHAR= LIBNAME option.

Starting in SAS 9.4M5 (September 2017), support was added for the DBNULLWHERE= LIBNAME option and data set option.

SAS 9.4M3 (July 2015) includes these new features and enhancements:

- When using analytic views in SQL statements, the measures have to be aggregated. Starting in SAS 9.4M3 (July 2015), the SAS/ACCESS engine generates a default statement with aggregated measures based on the metadata about the analytic view.
- SAP HANA has new PARMSTRING= and PARMDEFAULT= LIBNAME data set options. The PARMSTRING= options specify a quoted string of variable name and value pairs. The PARMDEFAULT= options specify whether the SAP HANA engine should use the defaults for variables and parameters as specified in the metadata.

For more information, see [“SAS/ACCESS Interface to SAP HANA”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to SAP IQ

In SAS 9.4M8, support was added for the DBCLIENT_MAX_BYTES= LIBNAME option.

In SAS 9.4M6 (November 2018), support was added for the CONOPTS= LIBNAME option and the SUB_CHAR= LIBNAME option.

Starting in SAS 9.4M4 (November 2016), the name of the Sybase IQ product is SAP IQ. For more information, see [“SAS/ACCESS Interface to SAP IQ”](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to Snowflake

For SAS 9.4M9, the following changes and enhancements were made:

- Support was added for bulk loading using PROC FEDSQL and PROC DS2.
- Support was added for bulk loading to and bulk unloading from Azure ADLS locations.

- Support was added for the BL_NUM_DATAFILES= LIBNAME and data set options.
- Support was added for the BL_NUM_READ_THREADS= LIBNAME option.
- Support was added for the QUERY_TAG= LIBNAME and data set options.

In SAS 9.4M8, the following enhancements were made:

- Support for the BL_FORMAT_OPT= data set option was added.
- Support for Snowflake was added to the SCANSTRINGCOLUMNS= LIBNAME option and data set option.

SAS/ACCESS 9.4 Interface to Spark

For SAS 9.4M9, here are the changes and enhancements:

- Hadoop JAR files that support access to Spark in HDFS have a new required location. Failure to install the JAR files in the required location results in an error. For more information, see *SAS Hadoop Configuration Guide for Base SAS and SAS/ACCESS*.
- There is a new required location for third-party driver files. Spark and Databricks driver files that are not installed in the required location are ignored.
- Support was added for several connection options that you can use instead of setting them in the hive-site.xml configuration file. For more information, see “LIBNAME Statement for the Spark Engine” in *SAS/ACCESS for Relational Databases: Reference*.
- The CLASSPATH= connection option now specifies an alternate location for third-party driver files.
- Bulk loading and bulk unloading (retrieval) to Databricks in Azure is available. The following options are supported:
 - AZURETENANTID= system option
 - AZUREAUTHCACHELOC= system option
 - BL_ACCOUNTNAME= LIBNAME option or data set option
 - BL_APPLICATIONID= LIBNAME option or data set option
 - BL_FILESYSTEM= LIBNAME option or data set option
 - BL_FOLDER= LIBNAME option or data set option
 - BULKLOAD= LIBNAME option or data set option
 - BULKUNLOAD= LIBNAME option or data set option
- Bulk loading to Databricks in Amazon Web Services is available. The following options are supported:
 - BL_AWS_CREDENTIALS_FILE= LIBNAME option or data set option
 - BL_BUCKET= LIBNAME option or data set option
 - BL_AWS_CONFIG_FILE= LIBNAME option or data set option
 - BL_AWS_PROFILE_NAME= LIBNAME option or data set option
 - BL_CONFIG= LIBNAME option or data set option
 - BL_ENC_KEY= LIBNAME option or data set option

- BL_IAM_ASSUME_ROLE_ARN= LIBNAME option or data set option
- BL_IAM_ASSUME_ROLE_NAME= LIBNAME option or data set option
- BL_IAM_ROLE= LIBNAME option or data set option
- BL_KEY= LIBNAME option or data set option
- BL_REGION= LIBNAME option or data set option
- BL_TOKEN= LIBNAME option or data set option
- BL_USE_SSL= LIBNAME option or data set option
- BULKLOAD= LIBNAME option or data set option
- The following bulk-load options are also supported for Databricks:
 - BL_COMPRESS= LIBNAME option or data set option
 - BL_DEFAULT_DIR= LIBNAME option or data set option
 - BL_DELETE_DATAFILE= LIBNAME option or data set option
 - BL_DELIMITER= LIBNAME option or data set option
 - BL_DNSSUFFIX= LIBNAME option or data set option
 - BL_FORMAT= LIBNAME option and data set option
 - BL_FORMAT_OPT= LIBNAME option and data set option
 - BL_NUM_DATAFILES= data set option
 - BL_TIMEOUT= LIBNAME option or data set option
- The following general LIBNAME options and data set options were added or enhanced:
 - BATCH_UPDATE= LIBNAME option
 - DBCLIENT_MAX_BYTES= LIBNAME option
 - DBMAX_TEXT_TYPES= LIBNAME option and data set option
 - DRIVER_TRACE= LIBNAME option
 - DRIVER_TRACE_FILE= LIBNAME option
 - DRIVER_TRACEOPTIONS= LIBNAME option
 - INSERTBUFF= LIBNAME option and data set option
 - SASDATEFMT= data set option
 - READBUFF= LIBNAME option (maximum value increased to 100,000 for Spark; the default is 100,000 for Databricks)
 - TEMP_CTAS= LIBNAME option (default changed to NO)

In SAS 9.4M8, the following changes and enhancements were made:

- ability to access data in Databricks. To connect to Databricks, you must obtain, install, and configure the Databricks JDBC driver. For more information, see [SAS Hadoop Configuration Guide for Base SAS and SAS/ACCESS](#).
- support for JDBC drivers other than the Apache Hive open source driver. For more information, see [SAS Hadoop Configuration Guide for Base SAS and SAS/ACCESS](#).
- ability to specify additional resources to add to the JDBC class path. Support has been added for the CLASSPATH= LIBNAME option.

- support for enhanced transaction logging. This is controlled with the DRIVER_TRACE= and related options.
- ability to override the default read buffer size. Support has been added for the READBUFF= LIBNAME and data set options.

In SAS 9.4M7 (August 2020), support was added for the Spark interface on SAS 9.4. For more information, see [“SAS/ACCESS Interface to Spark” in SAS/ACCESS for Relational Databases: Reference](#).

Note: SAS/ACCESS Interface to Spark is not supported on SAS Viya 3.5.

SAS/ACCESS 9.4 Interface to Teradata

For SAS 9.4M9, the following changes and enhancements were made:

- Support was reinstated for Teradata on the z/OS platform. Support for Teradata on z/OS remains unsupported for SAS/ACCESS on SAS 9.4M8. To use a Teradata data source on z/OS with SAS 9.4 Foundation, upgrade or migrate SAS Foundation to SAS 9.4M9. Contact your SAS representative for assistance.
- SAS/ACCESS supports only the Teradata Parallel Transporter API (TPT API) for loading data using MultiLoad (TPT UPDATE operator), FastLoad (TPT LOAD operator), and multi-statement inserts (TPT STREAM operator). The API also supports reading data using FastExport (TPT EXPORT operator). The TPT API is used by SAS/ACCESS to perform these load and export operations, even when TPT=NO.

Note: Documentation that describes the use of the Legacy Teradata Utility remains for users who have not upgraded to SAS 9.4M9. For more information about TPT API configuration, see [SAS 9.4 Foundation System Requirements and Configuration Guides](#).

- The default value for the TPT_PACKMAXIMUM= data set option is now YES.
- Starting in SAS 9.4M9, do not specify DBSLICEPARM=ALL (all platforms). SAS/ACCESS Interface to Teradata on z/OS does not support the DBSLICEPARM= options. Instead of using this option, set FASTLOAD=YES.

In SAS 9.4M8, support was added for the following changes and enhancements:

- Support was added for the [OVERRIDE_RESP_LEN= LIBNAME statement option](#).
- Support was added for the TD_1MB_ROW environment variable. This environment variable works with the TPT API and enables SAS/ACCESS Interface to Teradata to retrieve response rows up to 1MB. For more information, see [“Processing Large Response Rows” in SAS/ACCESS for Relational Databases: Reference](#).
- SAS/ACCESS Interface to Teradata on the z/OS platform is not available.

Note: Starting in SAS 9.4M9, support for Teradata on z/OS was reinstated. Support was not reinstated on SAS 9.4M8.

Starting in SAS 9.4M4 (November 2016), support is added for single sign-on (SSO) with Kerberos.

Starting in SAS 9.4M3 (July 2015), these features are new or enhanced:

- SAS/ACCESS supports object names that contain up to 32 characters for users who use Teradata 14.10 or later.
- Support was added for the Teradata Wallet security feature.

For more information, see “[SAS/ACCESS Interface to Teradata](#)” in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to Vertica

For SAS 9.4M9, the following changes and enhancements were made:

- Support was added for in-database processing with PROC COPY. For more information, see “[Running PROC COPY In-Database for Vertica](#)” in *SAS/ACCESS for Relational Databases: Reference*.
- The DATABASE= option is now required in a LIBNAME statement for Vertica.
- The Vertica interface does not support the INTERVAL, TIME WITH TIMEZONE, or the TIMESTAMP WITH TIMEZONE data types.

In SAS 9.4M6 (November 2018), support was added for the CONOPTS= LIBNAME option and the SUB_CHAR= LIBNAME option.

SAS 9.4M4 (November 2016) adds support for these items:

- the SQLGENERATION system option, which enables SAS to generate SQL code for in-database processing
- the ability to run these procedures in-database: FREQ, MEANS, RANK, REPORT, SORT, SUMMARY, and TABULATE

For more information, see “[SAS/ACCESS Interface to Vertica](#)” in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to Yellowbrick

Support for the Yellowbrick interface was added in SAS 9.4M7 (August 2020). This includes support for bulk loading, bulk unloading, and in-database processing of summary procedures, such as PROC MEANS. Support for the SQLGENERATION system option has been added.

Additional Information

For more information about changes from the previous release, see [SAS/ACCESS](#) in *SAS Guide to Software Updates and Product Changes*.

SAS/CONNECT 9.4

SAS/CONNECT 9.4 offers enhanced tools for managing the SAS/CONNECT spawner, including new spawner start-up options, a new spawner interface, and a new spawner executable file that is the same for each operating environment. SAS/CONNECT also features enhanced logging and messaging support, enhanced data transfer of encoded data, support for several new Base SAS language elements, and support for the upload and download of extended attributes that use the UPLOAD and DOWNLOAD procedures.

With the June 2023 hot fix, Telnet is deprecated and it is recommended to use SAS/CONNECT Spawner for client sign-ons. The -CLEARTEXT option has been deprecated and is no longer available. For more information, see [SAS Note 70114](#).

These updates were made in a maintenance release:

- SAS 9.4M9 shipped in June 2025.
- SAS 9.4M8 shipped in January 2023.
- SAS 9.4M5 (September 2017)
 - Support was added so that the user can supply credentials in an authinfo file instead of in a SIGNON statement. Use of an authinfo file is required if you want to connect to SAS Cloud Analytic Services.
 - The TCPPROXYLIST environment variable was added to support HTTP_CONNECT so that SAS clients outside of the cloud can sign on to SAS/CONNECT spawners. By setting the TCPPROXYLIST environment variable, you can connect to different clouds from the same client.
 - The default value for the TCPLISTENTIME option was changed to 300. Previously, the default value was 0, or no time limit. The TCPLISTENTIME option is the amount of time a SAS/CONNECT server listens for a SAS/CONNECT client to connect.
 - You no longer need to add the NOCLEARTEXT spawner option to increase security. The NOCLEARTEXT spawner option has been made the default value and is no longer valid as an option. The CLEARTEXT option has been added to be used only when absolutely necessary because credentials are transmitted unencoded.
 - Users who sign on from workspace servers that allow numeric session-ids now get an error message. The documentation has been updated to indicate that a server name must be eight characters or less and start with an alphabetic character.
 - The _USER_ option was added to the %SYSRPUT statement to enable user-defined macro variables to be pushed to the server.
- Starting in SAS/CONNECT 9.4M2 (August 2014), you can now use the wildcard character to specify 0 or more characters anywhere in the file name. This new pattern-matching capability enables you to more efficiently transfer data comprised of multiple files to and from remote sessions.
- In Base SAS 9.4M1 (December 2013), the LOCKDOWN statement and LOCKDOWN system option are new. With LOCKDOWN, the SAS server administrator can create a restricted environment in which the SAS/CONNECT client has limited access to a designated set of directories and files.

See these resources:

- For more information, see [What's New in SAS/CONNECT 9.4](#) in *SAS/CONNECT User's Guide*.
- For more information about changes from the previous release, see [SAS/CONNECT](#) in *SAS Guide to Software Updates and Product Changes*.

SAS/GIS 9.4

SAS/GIS 9.4 expands its import capability to include the U.S. Census Bureau's Topologically Integrated Geographic Encoding and Referencing (TIGER) shapefiles (.shp) that are dated 2007 to the present. You can now organize and analyze, either interactively or programmatically, the most current spatial data. You can also continue to work with TIGER Record Type (RT) files that are dated prior to 2007.

For more information, see [What's New in SAS/GIS 9.4](#) in *SAS/GIS: Spatial Data and Procedure Guide*.

SAS/GRAPH 9.4

SAS/GRAPH 9.4M9

SAS/GRAPH 9.4M9 shipped in June 2025.

SAS/GRAPH 9.4M8

- The ACTIVEX and ACTXIMG graphics devices are no longer supported. If DEVICE=ACTIVEX or DEVICE=ACTXIMG is specified, the JAVAIMG device is used instead.
- The JAVA and JAVAMETA graphics devices are no longer supported. If DEVICE=JAVA is specified, the JAVAIMG device is used instead, and if DEVICE=JAVAMETA is specified, the PNG device is used instead.
- The GAREABAR procedure no longer runs.
- The ACTIVEX, ACTXIMG, JAVA, and JAVAIMG devices are no longer supported in the z/OS operating environment.
- The GKPI procedure no longer runs in the z/OS operating environment.
- Several of the mapping data sets that are used by the GMAP procedure were updated.

SAS/GRAPH 9.4M7

Starting in SAS 9.4M7 (August 2020), the SAS/GRAPH Java applets are deprecated.

- JAVA and JAVAMETA graphics devices
- %DS2CONST and %DS2TREE macros
- Constellation applet
- Contour applet
- Graph applet
- Map applet
- Tile Chart applet
- Treeview applet

Existing programs that use these items still work. However, these items are no longer supported, and they might be removed in a future release.

The document *SAS/GRAPH: Java Applets and ActiveX Control User's Guide* is discontinued.

For more information about generating ActiveX output in SAS/GRAPH, see [“Generating Interactive ActiveX Graphics”](#) in *SAS/GRAPH: Reference*.

SAS/GRAPH 9.4M6

Starting in SAS 9.4M6 (November 2018), note these changes:

- PROC GINSIDE, PROC GPROJECT, PROC GREduce, and PROC GREMOVE have moved from SAS/GRAPH to Base SAS.
- The %CENTROID macro that supports the SGMAP procedure has moved from SAS/GRAPH to Base SAS and is now an autocall macro. Running the %ANNOMAC macro before using %CENTROID is no longer necessary.

SAS/GRAPH 9.4M5

Starting in SAS 9.4M5 (September 2017), the following new functionality and enhancements are included:

- Mapping procedures GEOCODE and MAPIMPORT are moved from SAS/GRAPH to Base SAS. Mapping procedures GINSIDE, GMAP, GPROJECT, GREduce, and GREMOVE remain with SAS/GRAPH.
- *SAS/GRAPH: Mapping Reference* is moved to the Base SAS documentation library. It documents the existing mapping procedures plus the new ODS Graphics SGMAP procedure.
- The GCHART procedure provides new options:
 - The new GROUPREF option on the HBAR and VBAR statements provides the ability to draw a dividing line between bars or groups of bars. In addition, three new options enable you to manage the appearance of reference lines: option CGROUPREF manages line color, option LGROUPREF manages line type, and option WGROUPREF manages line width.
 - Four new options enable you to draw a reference line between the midpoints of bars or groups of bars. Option MIDPOINTREF on the HBAR and VBAR statements provides the ability to draw a dividing line between the midpoints of bars or groups of bars. Three additional options enable you to manage the appearance of the midpoint reference line: option CMIDPOINTREF manages line color, option LMIDPOINTREF manages line type, and option WMIDPOINTREF manages line width.
 - The new frequency format option STATFMT= on the BLOCK, VBAR, VBAR3D, HBAR, HBAR3D, PIE, PIE3D, DONUT, and STAR statements applies a specified format to a calculated statistical value such as that specified with the frequency (FREQ=) option of the TYPE= option. This option overrides the GCHART procedure's default format of the displayed statistical value. Use this option to change the default format that might contain decimal points, percentages, or commas. The STATFMT= option does not control the format of the response axis tick marks.
- The GBARLINE procedure provides a new frequency format option STATFMT= on its BAR and PLOT statements. This option applies a specified format to a calculated statistical value such as that specified with the frequency (FREQ=) option of the TYPE= option. The STATFMT= option overrides the GBARLINE procedure's default format of the displayed statistical value. Use this option to change the default format that might contain decimal points, percentages, or commas. The STATFMT= option does not control the format of the response axis tick marks.

- The annotate IMAGE function STYLE= option provides a new value SINGLE that centers a single instance of an image on a specific coordinate.
- New graphics devices IMGPNG and IMGJIF provide improved graph-rendering performance over the PNG and GIF Universal Printer devices. The IMGPNG and IMGJIF devices can be used to improve the performance of SAS jobs that generate a large number of graphs in the PNG or GIF format.

Also starting in SAS 9.4M5, SAS/GRAPH Network Visualization Workshop is discontinued and no longer supported.

SAS/GRAPH 9.4M4

Starting in SAS 9.4M4, these SAS/GRAPH Mapping enhancements are included:

- For ease of use, the mapping functions are removed from *SAS/GRAPH: Reference* and placed in a new document, *SAS/GRAPH: Mapping Reference*. This new document includes the GEOCODE, GINSIDE, GMAP, GPROJECT, GREDUCE, GREMOVE, and MAPIMPORT procedures, and their supporting documentation
- Additional enhancements are made to street geocoding, including changing an example to show geocoding using the TYPE= option to create a custom GCTYPE lookup data set that contains an uncommon abbreviation for Boulevard. Street geocoding now obtains more accurate locations in areas where the U.S. Postal Service has reassigned local ZIP codes when modifying its delivery routes.

SAS/GRAPH 9.4M3

Starting in SAS 9.4M3 (July 2015), the following new functionality and enhancements are included:

- The CTEXT= option in the GPLOT procedure's PLOT statement now affects the color of POINTLABEL symbols.
- The SYMBOL statement's POINTLABEL COLOR= option is updated to show the sequential order of its color selection. The default color selection now aligns with the color that is specified for the axis label.
- The new GraphTitle1Text ODS style element is introduced. It controls and reduces the font size of the output of TITLE1 statements in order to improve graph title scaling.
- The maximum length for the annotate facility variables XC= and YC= is increased from 32 characters to 256 characters.
- Support is added for range geocoding with IPv6 addresses. A new version of the %MAXMIND autocall macro converts IPv6 geocoding data from MaxMind, Inc. to SAS data sets.

SAS/GRAPH 9.4M2

Starting in SAS 9.4M2 (August 2014), the following new functionality and enhancements are included:

- The GEOCODE procedure for city geocoding offers a new variable to handle nonstandard state values, changes requirements for the customized versions of the SASHELP.GCSTATE lookup data set, changes variable values within the

SASHELP.GCSTATE lookup data set, allows non-abbreviated state names, and offers an improved %TIGER2GEOCODE import program.

- The GRADAR procedure offers a new parameter on the SPKLABEL= option.
- The PowerPoint destination supports both the JAVAIMG device and the ACTXIMG device. The ZPNG device is disabled. Also, new HTML attributes are added to the SVG, SVGT, and SVGView devices.
- The GTILE procedure now supports the NOLEGEND option.

SAS/GRAPH 9.4M1

Starting in SAS 9.4M1 (December 2013), the following new functionality and enhancements are included:

- The GEOCODE procedure for street geocoding offers a new variable to handle multiple street type abbreviations, changes requirements for data set indexes, clarifies the text string requirements for the DIRECTION variable, and adds four note value tokens. In addition, the GEOCODE procedure adds two variables to the SASHELP.ZIPCODE lookup data set to support city geocoding.
- The CHORO statement in the GMAP procedure supports a production level of the OSM (OpenStreetMap) option when displaying maps using a JAVA or JAVAIMG device.
- To see a brief description of any SAS data set in the SASHELP library, as well as output displaying the first five observations in each data set, see [SASHELP Data Sets](#).

SAS/GRAPH 9.4

SAS/GRAPH 9.4 includes the following enhancements:

- The GEOCODE procedure now supports non-U.S. street geocoding. To support non-U.S. street geocoding, new lookup data sets are available, and the existing lookup data sets are reformatted. A new import macro program, %GEOBASE2GEOCODE, and an updated version of %TIGER2GEOCODE are available from the SAS Maps Online website. These macros create lookup data sets in the new format. The new DIRECTION= option enables you to specify an alternate data set of street direction names and abbreviations, such as northwest or NW. The new STATE= option enables you to specify an alternate data set that contains state or province character names rather than FIPS numeric codes. The STREET geocoding method now provides several new and changed values for the output variables _MATCHED_ and _NOTES_ to support U.S. and non-U.S. street geocoding.
- The map data sets in the MAPSGFK library have been updated.
- The GINSIDE procedure provides two new options to control whether to keep or drop map data set variables, KEEPMAPVARS and DROPMAPVARS.
- In the GMAP procedure, the new LATLON= option specifies that the unprojected LAT and LONG variables from the map data set are used for coordinate data instead of the Y and X variables. The new RESOLUTION= option specifies that the GMAP procedure use those map observations containing a resolution variable with a certain level (value). The new preproduction OSM option enables you to specify an OpenStreetMap style and project map data onto an OSM map.

- In the GPROJECT procedure, the LATLON= option specifies that the unprojected LAT and LONG variables from the map data set are used for coordinate data instead of the Y and X variables. The new FROM= and TO= options invoke the proj.4 projection and enable you to specify a coordinate system for the projection. These FROM= and TO= options can also be used together to reverse a projection.
- In the GREMOVE procedure, the new DROPVARS option drops all input data set variables from the output map data set.
- In the GPLOT procedure, the new CBASELINE= option specifies the color of the horizontal baseline for reference lines of a plot.
- The GCHART procedure provides new options. The PPERCENT= option modifies the font, height, and color of the percentages that are displayed in pie slice labels. When used with the PLABEL= option (which controls the text attributes of pie slice labels), you can easily differentiate between percentages and text labels. The EXPLODE=ALL option pulls all of the slices outward from the center of the pie.
- In the GKPI procedure, the FORMAT= option now accepts user-defined formats.
- The SVG and GIF devices now support animation. In addition, the GIF device now supports RGBA color mode (transparency) and anti-aliasing.
- The new TIFF and TIFFK devices produce TIFF images and support the RGBA and CMYK color modes, respectively.
- The new EMFDUAL device produces a graphics file that contains both EMF and EMF Plus records. It supports RGBA colors (transparency).
- The new %SHORTCUT autocall macro creates a shortcut device that is linked to the existing Universal Printers of the same name. It can also define a new Universal Printer and shortcut device and link the device to the Universal Printer.
- The Annotate Facility has several enhancements. The IMGPATH variable now accepts a URL location for graphics that are on web pages. The HTML= option enables you to animate text labels that are created with the LABEL function, and it has been added to the ARROW function. The %CENTROID macro has been enhanced to return more accurate centroid locations.
- The Tile Chart applet supports adding one or more custom menu items to the tile chart pop-up menu.
- The Treeview applet supports assigning multiple drill-down links for each node in the diagram.
- TITLE and FOOTNOTE statements now support the ALT= option, which specifies descriptive text for a URL to which a title or footnote links, or for the title or footnote itself.

Additional Information for SAS/GRAPH

For more information about this release, see [What's New in SAS/GRAPH 9.4](#) in *SAS/GRAPH 9.4: Reference* and [What's New in SAS/GRAPH 9.4 Mapping Reference](#) in *SAS/GRAPH 9.4 and Base SAS: Mapping Reference*.

For more information about changes from the previous release, see [SAS/GRAPH](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Grid Manager

SAS Grid Manager 9.4M9

SAS Grid Manager 9.4M9 shipped in June 2025.

SAS Grid Manager 9.4M8

SAS Grid Manager 9.4M8 shipped in January 2023.

SAS Grid Manager 9.4M7

SAS Grid Manager 9.4M7 shipped in August 2020.

In SAS 9.4M7, options were added to the SAS Grid Manager Client Utility to support digital certificates if you are using either of these configurations:

- a SAS Workload Orchestrator grid with TLS/SSL enabled
- a Hadoop cluster with TLS/SSL enabled

-SSLCALISTLOC

specifies the location of a single file that contains the public certificates for all of the trusted certificate authorities (CA) in the trust chain.

-SSLCERTISS

specifies the name of the issuer of the digital certificate that should be used by TLS.

-SSLCERTLOC

specifies the location of a file that contains a digital certificate for the machine's public key.

-SSLCERTSERIAL

specifies the serial number of the digital certificate that should be used by TLS.

-SSLCERTSUBJ

specifies the subject name of the digital certificate that should be used by TLS.

-SSLCLIENTAUTH

specifies that the server should perform client authentication.

-SSLCRLCHECK

specifies that certificate revocation lists (CRLs) are checked when digital certificates are validated.

-SSLCRLLOC

specifies the location of a file that contains a CRL.

-SSLPKCS12LOC

specifies the location of the PKCS #12 DER encoding package file that contains the certificate and the private key.

-SSLPKCS12PASS

specifies the password that TLS requires in order to decrypt the PKCS #12 DER encoding package file.

-SSLPVTKEYLOC

specifies the location of the file that contains the private key that corresponds to the digital certificate that was specified by using the SSLCERTLOC= option.

-SSLPVTKEYPASS

specifies the password that TLS requires in order to decrypt the private key.

SAS Grid Manager 9.4M6

Starting in SAS 9.4M6 (November 2018), SAS Grid Manager includes these changes:

- SAS Grid Manager uses a new grid provider, which consists of SAS Workload Orchestrator and SAS Job Flow Scheduler. SAS Grid Manager uses queues, host parameters, and user-specified limits to distribute jobs among hosts in the grid. High availability is supported through failover capability for the master host and defined services. The grid is configured and managed through the SAS Workload Orchestrator web interface.
- The product name for a grid that uses Platform Suite for SAS has been changed to SAS Grid Manager for Platform.
- The existing SAS Grid Manager agent plug-in for SAS Environment Manager has been renamed to SAS Grid Manager for Platform agent plug-in.
- A new SAS Grid Manager agent plug-in for SAS Environment Manager has been added to support the new grid provider.
- The existing SAS Grid Manager Module for SAS Environment Manager has been renamed to SAS Grid Manager for Platform Module. The user interface has completely changed, although the functions provided remain the same.

Note: Starting in SAS 9.4M6, Grid Management Services (GMS) is not updated to work with the latest release of Load Sharing Facility. Therefore, the SAS Grid Manager plug-in for SAS Management Console is no longer supported. However, the plug-in is included with SAS 9.4M6 if you want to upgrade to SAS 9.4M6 without also upgrading Platform Suite for SAS.

See these resources:

- For more information about this release, see [What's New in SAS Grid Manager 9.4](#).
- For more information about changes from the previous release, see [SAS Grid Manager](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Grid Manager 9.4M5

Starting in SAS 9.4M5 (September 2017), SAS Grid Manager includes these changes:

- An option has been added to the SAS Grid Manager Client Utility to submit a program that exists on a grid node, rather than being accessible to users on a client machine. The program is not copied to a grid share when it runs.
- Shortened option names are supported for the SAS Grid Manager Client Utility.
- The SAS Grid Manager Agent Plug-in for SAS Environment Manager provides metric data for grid queues.
- The SAS Grid Manager Module for SAS Environment Manager provides this functionality:

- new affinity and dependency configuration options for high availability (HA) applications
- the ability to reset the LSF password and to update the LSF license
- functions to terminate jobs, requeue jobs, change the position of jobs within a queue, and switch an uncompleted job to a different queue

For more information about this release, see [What's New in SAS Grid Manager 9.4](#) in *Grid Computing in SAS*.

SAS Grid Manager 9.4M3

Starting in SAS 9.4M3, SAS Grid Manager 9.4 includes these changes:

- SAS Grid Manager for Hadoop has been added. SAS Grid Manager for Hadoop enables you to apply all of the advantages of a SAS grid, including workload management, accelerated processing, and scheduling, to a Hadoop environment. SAS server definitions and grid options sets provide the connection between SAS and Hadoop. Users of SAS will not notice any difference in their operations. They will continue to submit jobs as they normally would, but those jobs will be processed on the Hadoop grid.
- An agent plug-in and a management module have been added to SAS Environment Manager. If your grid uses Platform Suite for SAS, these components enable you to monitor and manage a SAS grid cluster. Together, the agent plug-in and the module provide some of the same functions as Platform RTM, so you can monitor and manage your grid by using the same application that you use to monitor your SAS environment. However, the plug-in and module have different purposes:

Grid Manager Agent Plug-in

uses continuously collected metric data to monitor the performance of the grid and grid servers, graph changing metric data, and generate alerts.

Grid Manager Module

configures and controls grid resources, views current performance data, and configures grid resources and high-availability applications.

Note: The Grid Manager module replaces the Grid Manager server plug-in that was added to SAS Environment Manager in SAS 9.4M2.

- New functions have been added to return a list of hosts that are available to run grid jobs and to return a list of valid options sets.
- Support has been added for using an Oozie scheduling server. This server is used in a SAS Grid Manager for Hadoop environment.

SAS Grid Manager 9.4M2

Starting in SAS 9.4M2, a Grid Manager plug-in is available from SAS Environment Manager. This plug-in enables you to perform these tasks:

- view information about LSF clusters
- view information about and manage grid jobs, hosts on the grid, and queues
- view information about and manage high availability applications
- view audit records

SAS Grid Manager 9.4

SAS Grid Manager provides grid options sets and grid-launched workspace servers. A grid options set is a collection of grid options, SAS options, and required grid resources that can be assigned when a specified SAS application is used by a specified user or group. Using grid options sets enables you to map options for grid jobs to application users without creating a new SAS Application Server context for each option and without requiring input from the application users.

Using grid-launched workspace servers enables SAS Grid Manager to launch new workspace servers for load balancing. This capability enables the grid's management and policies to be applied to the workspace server and simplifies how some SAS applications, such as SAS Enterprise Guide, send jobs to a SAS grid.

SAS/SHARE 9.4

SAS/SHARE 9.4 features enhanced security with metadata-bound library support and a new USETRUSTEDUSER procedure option, as well as support for extended attributes in SAS data sets and SAS libraries. Also, SAS/SHARE naming conventions for user IDs and passwords have been enhanced to allow longer names (up to 256 characters), mixed case, spaces, and punctuation.

These updates were made in a maintenance release:

- In SAS/SHARE 9.4M9, Solaris on SPARC and Solaris on Intel operating environments is no longer supported.
- In SAS/SHARE 9.4M5 (September 2017), support was added so that the user can supply credentials in an Authinfo file instead of in a SIGNON statement.
- In SAS/SHARE 9.4M4 (August 2014), content from *Communication Access Methods for SAS/CONNECT and SAS/SHARE* relevant to SAS/SHARE software was moved to *SAS/SHARE User's Guide*. Now, you have easier access to all information related to SAS/SHARE software.

See these resources:

- For more information about this release, see [What's New in SAS/SHARE 9.4](#) in *SAS/SHARE User's Guide*.
- For more information about changes from the previous release, see [SAS/SHARE](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Scalable Performance Data Server

SAS Scalable Performance Data Server 5.4

SAS Scalable Performance Data (SPD) Server 5.4 (September 2017) has internal modifications to ensure interoperability with SAS 9.4M5. You must have the 5.4 release of both the server software and the SPD Server client software to be able to use SPD Server with SAS 9.4M5.

For more information, see [What's New in SAS Scalable Performance Data Server 5.4](#) in *SAS Scalable Performance Data Server: User's Guide*.

SAS Scalable Performance Data Server 5.3

SPD Server 5.3 supports secure sockets communication via Transport Layer Security (TLS). This release also includes a new language driver that enables you to read and write SPD Server tables with the SAS DS2 language and the SAS FedSQL language. You submit DS2 language statements by using PROC DS2. You submit FedSQL language statements by using PROC FEDSQL. SAS Federation Server 4.2 also supports access to SPD Server tables.

SAS Scalable Performance Data Server 5.2

To support enterprise computing environments that have existing authentication processes and password management systems, SPD Server 5.2 provides support for performing non-native user authentication via the SAS Metadata Server.

SAS Scalable Performance Data Server 5.1

SAS 9.4 includes a new SAS Scalable Performance Data Server engine that can connect with the SPD Server. This enhances the SPD Server experience and offers expanded support for regulatory, IT, and end-user features, such as the following:

- enhanced (AES-256) encryption for data at rest
- support for the Windows 64-bit Server
- SQL performance enhancements
- new SPD Server cluster features, including online cluster management and distributed cluster tables

SAS Studio

SAS Studio 3.83

SAS Studio 3.83 (June 2025) supports SAS 9.4M9 and later releases. For more information about changes from the previous release, see [SAS Studio](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Studio 3.82

SAS Studio 3.82 (January 2023) supports SAS 9.4M7 and later releases.

SAS Studio 3.81

SAS Studio 3.81 (August 2020) supports SAS 9.4M7 and later releases. This release contains recent hot fixes and security fixes.

SAS Studio 3.8

SAS Studio 3.8 (November 2018) supports SAS 9.4M6 and later releases.

- This release includes experimental support for Git integration.
Note: This functionality is production with the first 3.8 hot fix.
- The new **SAS member name policy** preference enables you to specify a set of rules for SAS data set names, SAS data view names, and item store names.
- In SAS Studio 3.8, FTP support is off by default. Administrators can turn on this functionality by using a new configuration property.
- You can now append new log information to the existing logs for programs and tasks. You can also automatically clear the log each time you submit code.
- This release also includes several new tasks:
 - The Combine Tables task provides a variety of methods for combining two data tables.
 - Several map tasks have been added: Bubble Map, Choropleth Map, Scatter Map, Series Map, and Text Map.
 - New econometrics tasks, Severity Model task and Spatial Regression Models task, have been added.
 - There are many new SAS Viya tasks.

SAS Studio 3.71

SAS Studio 3.71 (December 2017) supports SAS 9.4M5. New tasks for text analysis and forecasting were added for this release. To run these tasks, you must license and install these SAS Viya products: SAS Text Analytics and SAS Visual Forecasting.

SAS Studio 3.7

SAS Studio 3.7 (September 2017) supports SAS 9.4M5.

- New tasks and code snippets provide tighter integration with CAS in SAS Viya.
- You can open your existing SAS Enterprise Guide projects in SAS Studio. When opened, these SAS Enterprise Guide projects are converted to a process flow in SAS Studio.
- You can choose to display log updates as a procedure is processed. You can now see the progress of your SAS job without waiting for the procedure to complete.
- New SAS 9.4 tasks include Recode Values, Recode Ranges, Heat Map, Custom Tests for Power and Sample Size, and Equivalence Tests for Power and Sample Size. Also, the graph tasks (Bar Chart, Pie Chart, Scatter Plot, and so on) have been rewritten.

SAS Studio 3.6

SAS Studio 3.6 includes these new features:

- You can now create a SAS program from a process flow.

- A new preference enables you to control the level of automatic refreshes that occur or to specify whether to refresh the file navigation tree manually.
- You can use the new Start-Up preferences to specify whether SAS Studio opens in the state that you closed it. For example, any tabs that you had open in a prior session will be open in the new session.
- For background submit jobs, you can now specify the location of the output and log files. You can also specify what action to take if an output or log file already exists.
- You can now generate HTML graphs in the SVG format.
- Many new analytical tasks for statistical process control, multivariate analysis, econometric analysis, and power and sample size are now available.
- This release includes new analytical tasks in these categories: power and sample size, cluster analysis, and network optimization.
- New code snippets and tasks enable you to connect to the SAS Viya environment and to use Cloud Analytic Services (CAS) tables.

SAS Studio 3.5

SAS Studio 3.5 includes these new features:

- The new batch submit feature enables you to run a saved SAS program while you continue to use SAS Studio.
- Results include a table of contents that you can use to navigate to different sections in your results.
- A new Messages window displays information about the programs, tasks, queries, and process flows that you run.
- Additional keyboard shortcuts make it easier for you to add and insert code snippets.
- Many new analytical tasks for statistical process control, multivariate analysis, econometric analysis, and power and sample size are now available.
- For administrators, new global settings enable you to define folder shortcuts and repositories for all users at your site. The addition of repositories makes it easier for you to share tasks and snippets with other users.

SAS Studio 3.4

SAS Studio 3.4 includes these new features:

- The new import data tool enables you to easily import your data from Microsoft Excel, delimited files (such as CSV), and other file types into SAS Studio.
- For server environments, the SAS Studio administrator can now control the starting point of the navigation tree.
- In the code editor, autocomplete is now available for librefs and table names.
- Several new analytical tasks enable you to prepare and explore your time series data and to perform modeling and forecasting.
- There are also enhancements to process flows.

SAS Studio 3.3

SAS Studio 3.3 includes these new features:

- The Basic Edition of SAS Studio is now supported in Windows and UNIX operating environments.
- The new Visual Programmer perspective enables you to use process flows to organize and run your work
- A new query feature enables you to extract data from one or more tables according to the criteria that you specify.
- SAS Studio 3.3 also includes several new tasks. The new Bubble Plot task enables you to explore the relationship between three or more variables. New analytical tasks include the Analysis of Covariance task, the Generalized Linear Models task, and the N-way ANOVA task. The new Combinatorics and Probability category includes a Combinations task, a Permutations task, two probability tasks, and two simulation tasks.

SAS Studio 3.2

SAS Studio 3.2 includes several new features for programmers.

- The SAS Program Package is a file that contains a snapshot of a SAS program along with its log and HTML results.
- The autosave functionality creates copies of each previously saved program so that you can recover files if your browser closes unexpectedly.
- You can create a summary page for code that you have written as well as for code that is automatically generated when you run a task.
- New code snippets show you how to use the SAS macro functionality.

Here are some of the additional new features in this release:

- In addition, you can now send a copy of your results, the associated code, and the log files to another user through email. You can also access files on an FTP server by creating a folder shortcut.
- Several new analytical tasks (Binary Logistic Regression, Linear Regression, and Predictive Regression Modeling) are available. The new Box Plot task enables you to easily create box plots, and the new Data Exploration task uses graphs to help you learn more about your data

SAS Studio 3.1

SAS Studio is a development application for SAS that you access through your web browser. With SAS Studio, you can access your data files, libraries, and existing programs, and you can write new programs. You can also use the predefined tasks in SAS Studio to generate SAS code. When you run a program or task, SAS Studio connects to a SAS server to process the SAS code. The SAS server can be a hosted server in a cloud environment, a server in your local environment, or a copy of SAS on your local machine. After the code is processed, the results are returned to SAS Studio in your browser.

SAS Studio supports multiple web browsers, such as Microsoft Internet Explorer, Apple Safari, Mozilla Firefox, and Google Chrome.

In addition to writing and running your own SAS programs, you can use the predefined tasks that are included with SAS Studio to analyze your data. The tasks are based on SAS System procedures and provide access to some of the most commonly used graph and analytical procedures. You can also use the default task template to write your own tasks.

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SAS Business Rules Manager

SAS Business Rules Manager 3.3

SAS Business Rules Manager 3.3M3 shipped in June 2025 and runs on SAS 9.4M9. This release include bug fixes and security enhancements.

SAS Business Rules Manager 3.3M2 shipped in January 2023 and runs on SAS 9.4M8. This release provides the following changes and enhancements:

- You can use the `brm.datagrid.filter.enabled` configuration option in SAS Management Console to specify whether rule flows that use data grid terms are included in the resulting list when users retrieve a list of rule flows. The process of applying a filter to the list can affect performance.

You can disable the ability to associate comments and attachments with vocabularies, entities, terms, lookup tables, rule sets, and rule flows.

SAS Business Rules Manager 3.3M1 shipped in August and runs on SAS 9.4M7. This release includes bug fixes and security enhancements.

The initial release of SAS Business Rules Manager 3.3 shipped in June 2019 and runs on SAS 9.4M6. Starting with this release, the user interface has been rewritten in HTML5. Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe announced that it intends to end support for Flash technology and will cease to update and distribute the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

New features and enhancements in this release enable you to perform the following tasks:

- edit rules in an improved, simplified rule set editor. The previous views in the rule set editor are no longer available.
- add a stand-alone assignment statement to a rule set.
- create, move, and rename folders in the Manage Folders window. This window is available from the **Actions** menu in each category view except My Tasks, Data, and Decisions. The Manage Folders window replaces the New Folder window.

It is no longer possible to create data libraries or register tables from within SAS Business Rules Manager. You must use SAS Management Console to create data libraries and register tables.

In the application bar, the name SAS Decision Manager has been changed to SAS Decision Management.

SAS Business Rules Manager 3.2

SAS Business Rules Manager 3.2 runs on SAS 9.4M4. SAS Business Rules Manager 3.2M1 shipped in November 2018 and runs on SAS 9.4M6.

SAS Business Rules Manager 3.2 provides new features and enhancements that enable you to perform these tasks:

- use data grid variables in rules
- generate DATA step (DS1) code for rule flows
- control the ability to import and export business rules content
- set Read-Only privileges for vocabularies and lookup tables
- define an administrator role for folders and set permissions on top-level folders
- set a default application server for testing rule flows
- delete published rule flows
- use Oracle Database 12c for the SAS Decision Manager database

SAS Business Rules Manager 3.1

SAS Business Rules Manager 3.1 runs on SAS 9.4M3.

SAS Business Rules Manager 3.1 provides new features and enhancements that enable you to perform the following tasks:

- view the relationships between data, rule flows, and the processes that consume the data and rules flows by using the features of SAS Lineage
- execute rule flows inside the Hadoop database
- lock rule set versions automatically when rule flows are published

- deploy rule flows dynamically so that SAS Data Integration Studio jobs always use the latest compatible version of a rule flow
- use the simplified list view in the rule set editor
- experience improved performance when generating rule-fired summary tables and generating rules from the New Discovery wizard
- use numeric lookup tables
- duplicate, delete, and move multiple folders, vocabularies, terms, lookup tables, rule sets, or rule flows at the same time
- use pre-existing vocabularies when you generate rules with rule discovery

SAS Business Rules Manager 2.2

SAS Business Rules Manager 2.2 runs on SAS 9.4M2. New features and enhancements in this release enable you to perform these tasks:

- create libraries and register tables in the SAS Metadata Repository
- send rule flows through approval workflows and track workflow tasks
- manage versions of rule sets and rule flows
- create rule flows as stored processes
- run a wizard to generate and import vocabularies, rule sets, and rule flows from an input data source by using the Decision Tree, Scorecard, Market Basket Analysis, or Recency Frequency Monetary discovery techniques
- execute rule flows inside the databases by using the SAS In-Database Code Accelerator for Teradata and Greenplum
- selectively include rule sets in a rule flow
- save rule flow tests and display the results of previous tests
- display the terms and lookup tables that are used in a rule set
- import terms from an input data table
- search for rule sets by term

SAS Contextual Analysis

Support for SAS Contextual Analysis

Starting in SAS 9.4M7 (August 2020), SAS Contextual Analysis is not available. To use SAS 9.4M7 or later for SAS products and solutions installed on machines with SAS Contextual Analysis, consider using SAS Visual Text Analytics on a separate SAS Viya deployment.

If you are currently running SAS Contextual Analysis and you plan to upgrade or migrate to SAS 9.4M7, contact your SAS account executive.

If you are performing an upgrade in place, see [“Support for SAS Contextual Analysis” in SAS Guide to Software Updates and Product Changes](#).

SAS Contextual Analysis 15.1

SAS Contextual Analysis 15.1 shipped in November 2018 and runs on SAS 9.4M6.

SAS Contextual Analysis 15.1 offers performance enhancements when creating projects, building models, and analyzing documents.

For more information about changes from the previous release, see [SAS Contextual Analysis](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Contextual Analysis 14.3

SAS Contextual Analysis 14.3 shipped in September 2017. This release runs on SAS 9.4M5 with some new and enhanced features:

- SAS Contextual Analysis 14.3 has added these languages to its support for project data:
 - Arabic
 - Croatian
 - Czech
 - Danish
 - Farsi
 - Greek
 - Hebrew
 - Hindi
 - Hungarian
 - Indonesian
 - Norwegian
 - Polish
 - Romanian
 - Slovak
 - Slovene
 - Thai
 - Vietnamese
- The sentiment analysis DS2 score code now includes information about product-level and feature-level sentiment. (Previous releases included document-level sentiment only).

SAS Contextual Analysis 14.2

SAS Contextual Analysis 14.2 runs on SAS 9.4M4 with some new and enhanced features.

- SAS Contextual Analysis 14.2 has added Swedish to its support for project data.

- *SAS Contextual Analysis 14.2 User's Guide* includes values for predefined concepts in all supported languages.
- The CLASSIFIER concept rule type now includes an option that returns canonical (full) forms for matched strings, when available.
- You can use a new option in the category score code to remove the subcategories that are created from automatically generated rules.
- Data tables that are created in the SAS Contextual Analysis project libraries are now written in compressed format.

SAS Contextual Analysis 14.1

SAS Contextual Analysis 14.1 runs on SAS 9.4M3 and is a major product release with new and enhanced features. SAS Contextual Analysis 14.1 provides support for project data in 13 languages, including English. New project features enable you to import and export SAS Contextual Analysis project models and to share projects with other users.

The categories pane has been redesigned and now includes document frequency counts and a tree view where you can build rules. Concept and category rules can be tested interactively with sample text. Enhanced documentation for writing rules can be accessed through the online Help. New properties in the concept task enable you to apply priority and case sensitivity to concept rules. New properties in the topics task enable you to specify term density and number of topics generated.

Rules are now generated using the HPBOOLRULE procedure. Multiple cores are now accessed during project processing. The score code that is produced by SAS Contextual Analysis has been modified to include the SAS DS2 programming language so that threaded processing is enabled.

SAS Contextual Analysis 13.2

SAS Contextual Analysis 13.2 runs on SAS 9.4M2 and is a major product release with an enhanced user interface. SAS Contextual Analysis 13.2 combines more of the machine learning capabilities of SAS Text Miner with the rules-based linguistic methods for categorization and extraction in SAS Enterprise Content Categorization. It is now also possible to import SAS Enterprise Content Categorization projects and create custom concepts in SAS Contextual Analysis. Generated category rules follow the SAS Enterprise Content Categorization category rules format (MCAT) and are fully supported. Document-level sentiment scoring is now available. A feature for viewing and downloading score code for concepts, sentiment, and categories enables you to leverage your model to score external documents. In addition, the interfaces for document viewing, project creation and editing, and the Properties page have been enhanced.

SAS Contextual Analysis 12.3

New for SAS 9.4, SAS Contextual Analysis is a web-based categorization application that combines the powers of SAS Text Miner and SAS Enterprise Content Categorization into a single user interface. Using SAS Contextual Analysis, you can build models that automatically categorize a set of input documents, identify key textual data in your document collections, remove meaningless textual data, categorize that data, and customize your models in order to realize the value of your text-based data.

SAS Decision Manager

SAS Decision Manager 3.3

SAS Decision Manager 3.3M3 shipped in June 2025 and runs on SAS 9.4M9. This release includes bug fixes and security enhancements.

SAS Decision Manager 3.3M2 shipped in January 2023 and runs on SAS 9.4M8. This release provides the following changes and enhancements:

- You can use the `brm.datagrid.filter.enabled` configuration option in SAS Management Console to specify whether rule flows that use data grid terms are included in the resulting list when users retrieve a list of rule flows. The process of applying a filter to the list can affect performance.
- You can disable the ability to associate comments and attachments with vocabularies, entities, terms, lookup tables, rule sets, and rule flows.
- If you are running SAS Decision Manager in a WebSEAL environment, you must set the `sas_decisionbuilder_base_url` environment variable.
- You can no longer clear the champion and challenger roles of models when a project version is locked.
- Starting with SAS 9.4M8, the SAS Micro Analytic Service is not supported on Solaris. You cannot deploy decisions to SAS Micro Analytic Service destinations on Solaris.

SAS Decision Manager 3.3M1 runs on the August 2020 release of SAS 9.4M7. This release includes bug fixes and security enhancements

The initial release of SAS Decision Manager 3.3 shipped in June 2019 and runs on SAS 9.4M6. Starting with that release, the user interface has been rewritten in HTML5. Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe has announced that it intends to end support for Flash technology and will stop updating and distributing the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

New features and enhancements in this release enable you to perform the following tasks:

- edit rules in an improved, simplified rule set editor. The previous views in the rule set editor are no longer available.
- add a stand-alone assignment statement for a rule set.
- create and manage folders in the Manage Folders window. This window is available from the **Actions** menu in each category view except My Tasks, Data, and Decisions. The Manage Folders window replaces the New Folder window and the previous **Actions** menu in the Projects and Portfolios category views.
- work with models in the Models category view. The Models category view replaces the Inventory category view, and provides a way to import models into a folder, as well as export models and manage models in one place.

It is no longer possible to perform these tasks:

- create data libraries or register tables from within SAS Decision Manager. You must use SAS Management Console to create data libraries and register tables.
- add model keywords.
- filter items by date modified in the Models, Projects, and Portfolios category views.
- filter the list of models by keywords and user-defined properties in the Models category view.
- duplicate or move a model from one folder to another folder.

In the application bar, the name SAS Decision Manager has been changed to SAS Decision Management.

See these resources:

- For more information about this release, see [What's New in SAS Decision Manager 3.3](#) in *SAS Decision Manager: What's New*.
- For more information about changes from the previous release, see [SAS Decision Manager](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Decision Manager 3.2

SAS Decision Manager 3.2 runs on SAS 9.4M4. SAS Decision Manager 3.2M1 shipped in November 2018 and runs on SAS 9.4M6.

SAS Decision Manager 3.2 provides new features and enhancements that enable you to perform these tasks:

- use data grid variables in rules
- generate DATA step (DS1) code for rule flows
- control the ability to import and export business rules content
- set Read-Only privileges for vocabularies and lookup tables
- define an administrator role for folders and set permissions on top-level folders
- set a default application server for testing rule flows
- delete published rule flows
- use Oracle Database 12c for the SAS Decision Manager database
- duplicate decisions
- import SAS analytic store models
- publish, score, and run performance or reports for SAS analytic store models
- publish models to Hadoop and Teradata using single sign-on authentication by Kerberos
- score SAS Factory Miner models within a SAS Model Manager portfolio using macros
- publish SAS Factory Miner models from within a SAS Model Manager portfolio to a database or Hadoop using macros

For more information about this release, see [What's New in SAS Decision Manager 3.2](#) in *SAS Decision Manager: User's Guide*

SAS Decision Manager 3.1

SAS Decision Manager 3.1 runs on SAS 9.4M3.

SAS Decision Manager 3.1 provides new features and enhancements that enable you to perform the following tasks:

- build decisions with the Decision Builder and deploy these decisions by using SAS Micro Analytic Web Service
- execute rule flows, models, and decisions inside the Hadoop database
- view the relationships between data, models, rule flows, and the processes that consume these data, models, and rule flows by using the features of SAS Lineage
- lock rule set versions automatically when rule flows are published
- deploy rule flows dynamically so that SAS Data Integration Studio jobs always use the latest compatible version of a rule flow
- use the simplified list view in the rule set editor
- use numeric lookup tables
- duplicate, delete, and move multiple folders, vocabularies, terms, lookup tables, rule sets, or rule flows at the same time
- use pre-existing vocabularies when you generate rules with rule discovery
- manage SAS Factory Miner models that are registered in the SAS Model Manager model repository
- manage model versions
- import, update, and export generic models at the folder level
- access the inventory of all models in the same category view
- add and edit model keywords
- add multiple user-defined properties to a model at one time
- search the model inventory with improved performance and also filter the search results by the date modified, model properties, and user-defined properties

SAS Decision Manager 2.2

SAS Decision Manager 2.2 runs on SAS 9.4M2. The full functionality of the SAS Model Manager Java Client application and the Workflow Console web-based application have been integrated into SAS Decision Manager 2.2.

New features and enhancements in this release enable you to perform these tasks:

- create libraries and register tables in the SAS Metadata Repository
- manage workflows and track workflow tasks
- manage versions of projects, rule sets, and rule flows
- publish models to Hadoop and SAP HANA
- create rule flows as stored processes

- run a wizard to generate and import vocabularies, rule sets, and rule flows from an input data source by using the Decision Tree, Scorecard, Market Basket Analysis, or Recency Frequency Monetary discovery techniques
- execute rule flows inside the databases by using the SAS In-Database Code Accelerator for Teradata and Greenplum
- selectively include rule sets in a rule flow
- save rule flow tests and display the results of previous tests
- display the terms and lookup tables that are used in a rule set
- import terms from an input data table
- search for rule sets by term

SAS Enterprise Miner

SAS Enterprise Miner 15.4

SAS Enterprise Miner 15.4 shipped in June 2025 and runs on SAS 9.4M9.

See these resources:

- For more information about SAS Enterprise Miner 15.4, see the software product page for [SAS Enterprise Miner](#).
- For more information about changes from the previous release, see [SAS Enterprise Miner](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Enterprise Miner 15.3

SAS Enterprise Miner 15.3 shipped in January 2023 and runs on SAS 9.4M8.

SAS Enterprise Miner 15.2

SAS Enterprise Miner 15.2 (August 2020) runs on SAS 9.4M7 and later releases.

A new application for client installation is now available.

In previous releases, SAS Enterprise Miner could be launched using Java Web Start. Java Web Start was deprecated in Java 9 and Oracle does not provide any support, updates, or security fixes. As a result, Java Web Start is no longer supported. The new installation allows users to download and install SAS Enterprise Miner from a web page. The new download application checks for available updates and provides an option to download the new version.

SAS Enterprise Miner 15.1

SAS Enterprise Miner 15.1 (November 2018) runs on SAS 9.4M6 and later releases.

Here is an overview of the new features and enhancements for this release:

- In the **Gradient Boosting Node**, the default value of the **Leaf Fraction** property is now **0.001**. (The previous default value was **0.1**.)

- In the **HP Text Miner Node**:
 - Support was added for 18 additional languages: Arabic, Croatian, Czech, Danish, Farsi, Greek, Hindi, Hebrew, Hungarian, Indonesian, Norwegian, Polish, Romanian, Slovak, Slovene, Swedish, Thai, Vietnamese.
 - All languages except Hebrew and Norwegian now support the **Find Entities** property.
 - For UTF-8 installations, default stop lists are available for most languages.

SAS Enterprise Miner 14.3

SAS Enterprise Miner 14.3 (September 2017) runs on SAS 9.4M5. In this release, the **SAS Viya Code** node was rewritten to better support CAS.

SAS Enterprise Miner 14.2

SAS Enterprise Miner 14.2 (November 2016) now includes the **SAS Viya Code** node. The **SAS Viya Code** node enables you to submit SAS Viya and Cloud Analytic Services (CAS) code directly through SAS Enterprise Miner. The **SAS Viya Code** node is similar in usage to the **SAS Code** node. You write your own SAS Viya or CAS code in a code editor window and submit that code to a SAS Viya or CAS server in SAS Enterprise Miner.

SAS Enterprise Miner 14.1

SAS Enterprise Miner 14.1 (July 2015) runs on SAS 9.4M3. Here are the new features and enhancements for the SAS Enterprise Miner core user interface:

- SAS Enterprise Miner now supports PMML 4.2.
- The **Incremental Response** node includes a new property that enables you to specify whether node variable selection is performed using net information value scores or adjusted net information value scores.

Here are the new features and enhancements in the SAS Enterprise Miner High-Performance Data Mining node:

- A new **HP Bayesian Network** node is available.
- The **HP Variable Selection** node adds a new tree-based selection method.
- The **HP Clustering** node is enhanced to enable automatic selection of the number of clusters, via the ABC criterion.
- The **HPSVM** and **HPForest** nodes now support the creation of an analytic store. An analytic store is a portable format of the model that can be used to score observations within a database.
- The **HPForest** node also includes a new variable importance method that can be used to perform variable selection.

Here are some of the new features in the SAS Enterprise Miner high-performance procedures:

- The HP4SCORE procedure offers a variable importance method that is similar to Breiman's method and Strobl's method.

- The HPFOREST procedure can now handle large amounts of distributed data and includes new methods for selecting splitting variables.
- The HPSVM procedure now supports the TEST option in the PARTITION statement and the VALIDATESET option in the SELECT statement.

SAS Enterprise Miner 13.2

SAS Enterprise Miner 13.2 (August 2014) runs on SAS 9.4M2.

SAS Enterprise Miner 13.2 creates a `metadcode.sas` file that enables you to specify global metadata changes. Also, the **Model Regression** node provides a new Mining Function property that enables you to specify the type of model to register.

Here are the new features and enhancements in the SAS Enterprise Miner High-Performance Data Mining node:

- The **HP Regression** node produces a new variance inflation factor (VIF) table that can be used to detect multicollinearity.
- The **HP Forest** node adds support for a partitioned validation data.
- SAS Enterprise Miner 13.2 adds support for SAP HANA and Scalable Performance Data Engine (SPD Engine).

Here are some of the new features in the SAS Enterprise Miner high-performance procedures:

- The new HPTSDR procedure reduces the dimensionality of time series (in transposed, transactional, and columnwise formats), enabling you to take advantage of fewer dimensions to perform tasks such as similarity and clustering.
- The HPCLUS procedure now uses the k -modes algorithm for clustering nominal input variables and enables you to specify the imputation method for nominal variables and the distance measure for similarity in the k -modes algorithm for nominal input variables.
- The HPFOREST procedure now enables you to create an ODS table that contains a variety of fit statistics for each target variable and enables you to specify the cosine activation function for both hidden layer neurons and target layer neurons.
- The HPSVM procedure now supports cross validation for penalty selection, the ID statement, training output, and a new ODS table that contains penalties and their corresponding fit statistics.

SAS Enterprise Miner 13.1

SAS Enterprise Miner 13.1 (December 2013) runs on SAS 9.4M1.

Here are some of the new features and enhancements in the core user interface:

- The **Open Source** node enables users to integrate R language code inside a SAS Enterprise Miner process flow diagram.
- The **Save Data** node provides users with a simple way to save training, validation, test, score, or transaction data from a SAS Enterprise Miner path to a user-defined path, or a previously defined SAS library.
- The **Decision Tree** node enables users to import a previously created model and apply this model to new data.

- The **Time Series Dimension Reduction** node extracts features from each time series and reduces the dimension of time.
- The **Time Series Correlation** node helps users perform correlation and cross-correlation analyses. It calculates numerous auto-correlation and cross-correlation statistics on time series data.
- The **Time Series Decomposition** node enables you to perform seasonal decomposition of time series.

Here are some of the new features and enhancements in the SAS Enterprise Miner High-Performance Data Mining nodes:

- The **HP Cluster** node uses the high-performance HPCLUSTER procedure to perform k -means clustering analysis in distributed computing environments.
- The **HP Forest** node provides users with a choice of variable selection methods: Out-of-Bag (OOB) Average Error for interval targets, or OOB marginal reduction for class targets.
- The **HP GLM** node uses the high-performance HPGENSELECT procedure to fit a generalized linear model in a distributed computing environment.
- The **HP Neural** node now provides a User-Defined Architecture.
- The **HP Principal Components** node performs principal component analysis by using the high-performance HPPRINCOMP procedure.
- The **HP Support Vector Machine** node uses the newly developed high-performance HPSVM procedure for binary classification problems.
- The **HP Tree** node adds support for models that have interval targets.

Here are some of the new features and enhancements in the SAS Enterprise Miner high-performance procedures:

- The new HPBNET procedure learns a Bayesian network from an input data set to create a predictive model in supervised data mining.
- The new HPCLUS procedure enables you to read and write data in distributed form and to perform clustering and scoring in parallel.
- The new HPSVM procedure executes the support vector machine (SVM) algorithm in multiple threads.
- The HPFOREST procedure offers enhancements to enable the training algorithm to use multiple concurrent threads, to segregate data for pruning and early stopping, and to generate an observation ID in scored data.
- The HPNEURAL procedures now enables you to use an arbitrary number of hidden layers to support deep learning, to specify the Poisson and gamma error function and the exponential output layer activation function to support modeling of count data, and to specify an activation function for hidden layers and for the output layer.

SAS Enterprise Miner 12.3

SAS Enterprise Miner 12.3 (July 2013) is a new release that runs on SAS 9.4. This major release includes new tools and significant updates to existing tools to enhance your data mining experience. Improved scalability emphasizes the ability to train high-performance data mining nodes on complex data that is used by existing personal SAS workstations or SAS servers.

Key updates to the core data mining tools include the following:

- link analysis for the visualization of translational data as a network of interconnected, linked entities
- updated decision tree node

Data mining application extensions include the following:

- support for time varying covariates with the **Survival Data Mining** node. Users can also set left-truncation and censor dates.
- treatment level selection for the incremental response node.
- interval target including loss given default support for the interactive grouping node of SAS Credit Scoring for SAS Enterprise Miner.

All of the high-performance data mining nodes are now available (at no additional licensing fee) for threaded parallel processing on your existing SAS Enterprise Miner desktop or server. High-performance *k*-means clustering and decision tree nodes have been added to SAS High-Performance Data Mining.

SAS Energy Forecasting

SAS Energy Forecasting 4.1

SAS Energy Forecasting 4.1 shipped in February 2018. Here are some of the new features in this release:

- To account for loads that are not influenced by temperature (such as some large industrial users), you can choose to remove the temperature effect from the model.
- You can select between multiple time intervals for a diagnose and forecast.
- You can run a diagnose or forecast for power (MW) or energy (MWh) data.
- You can choose to remove the trend from distribution phase-level forecasting to ensure that the phase does not diverge.
- The source file information that contains hierarchical information has been enhanced to enable you to define multiple hierarchies for the system.
- You can remove the economic trend from a medium-term or long-term forecast.
- You can perform a cross-hierarchy reconciliation between two different hierarchies.
- You can perform a temporal reconciliation.

See these resources:

- For more information about this release, see the software product page for [SAS Energy Forecasting](#).
- For more information about changes from the previous release, see [SAS Energy Forecasting](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Energy Forecasting 3.2M1

SAS Energy Forecasting 3.2M1 shipped in April 2017. Here are some of the new features in this release:

- New parameters for automated, event-triggered forecasting give you greater control when initiating a new forecast.
- A multi-zone diagnose instance significantly reduces the amount of processing time that is required when forecasting a large number of zones.
- You can choose to forecast using a model other than the best model from a diagnose instance.
- For a medium-term or long-term forecast, you can choose one or more specific economic scenarios instead of all economic scenarios.
- You can choose to delete the source data upon completion of the forecast. Deleting the source data reduces the accumulation of data.
- Report output includes more data so that you perform fewer calculations to produce a report.
- The **Zones** tab contains the hierarchy of all the zones in the input data. The **Instances** tab contains a list of all diagnose, reconciliation, and forecast instances that have been initiated.
- Batch API results appear in the user interface.

SAS Energy Forecasting 3.2

SAS Energy Forecasting 3.2 shipped in March 2016. Here are some of the new features in this release:

- backcasting, which is energy forecasting using actual weather data instead of predicted weather data
- point forecasting
- reconciliation of a geographical hierarchy
- performance-optimized forecasts
- sample reports for SAS Visual Analytics
- SAP HANA as an input data source

SAS Energy Forecasting 3.1

Leveraging the experience that SAS has with hundreds of utilities worldwide, SAS Energy Forecasting 3.1 improves forecast results by providing trustworthy, repeatable, and defensible energy forecasts for planning horizons ranging from very short-term (for example, an hour ahead) to very long-term (for example, 50 years ahead). It is designed to meet the energy forecasting needs of the entire enterprise by providing forecasts for Energy Trading, Marketing, Risk Management, Operations, Fuels, System Planning, Finance, and any other department that might have a need for an energy forecast.

SAS Energy Forecasting 3.1 runs on SAS 9.4M2 and later releases.

SAS/ETS

SAS/ETS 15.4

SAS/ETS 15.4 (June 2025) runs on SAS 9.4M9 and later releases.

Note: Starting in the 15.4 (SAS 9.4M9) release, Solaris X64 (SAX) and Solaris SPARC (S64) are no longer supported for modifying files or creating any new files, nor are they supported as environments from which to run the SASECRSP or SASEXCCM interface engine.

SAS/ETS 15.3

SAS/ETS 15.3 (January 2023) runs on SAS 9.4M8 and later releases.

SAS/ETS 15.2

SAS/ETS 15.2 (August 2020) runs on SAS 9.4M7 and later releases.

SAS/ETS 15.1

SAS/ETS 15.1 (November 2018) runs on SAS 9.4M6 and later releases. The SASEOECD interface engine has been added to the SAS/ETS software. This engine enables you to retrieve time series data from the Organisation for Economic Co-operation and Development (OECD) website.

New features have been added to these procedures:

AUTOREG

- The CLASS statement is now production.
- You can now output the standard errors of prediction intervals by specifying the STDERR= and STDERRM= options in the OUTPUT statement.

COUNTREG

- The NOSPLITEFFECTS option for variable selection requests that effects that involve class variables not be split into individual effects that correspond to class levels.
- The RETAINEFFECT option for variable selection requests that the effects named within parentheses be retained during the variable selection process.

COPULA

- A SIMULATE statement can be used with a BY statement, provided that a FIT statement precedes the SIMULATE statement.
- Multiple FIT and SIMULATE statements can be used with a BY statement.

SPATIALREG

Taylor and Chebyshev approximation techniques were added for spatial error models and spatial Durbin error models.

SSM

You can now request that parameter estimation be based on a new type of likelihood called marginal likelihood. For some model types, parameter estimation that is based

on marginal likelihood is preferred over parameter estimation that is based on diffuse likelihood, which is the default.

TMODEL

- Most features in the TMODEL procedure are now production. Only the RANDOM statement and the QUADHESS=ANALYTIC option remain experimental.
- The LUSOLVER= option has been added to provide better control over the solution of matrix equations that occur in FIT and SOLVE tasks.

UCM

- You can now add a transfer-function component in your model by using the new TF statement. A transfer-function component models the contribution of contemporaneous and lagged values of a predictor.
- You can now request that parameter estimation be based on a new type of likelihood called marginal likelihood. For some model types, parameter estimation that is based on marginal likelihood is preferred over parameter estimation that is based on diffuse likelihood, which is the default.

VARMAX

- Conditional forecasts and scenario analysis are supported for the vector autoregressive (VAR) model, Bayesian VAR model, vector error correction model (VECM), and Bayesian VECM, with or without exogenous variables. Conditional forecasts under both hard and soft conditions are supported. You can also obtain forecasts for different scenarios in only one call of PROC VARMAX. The simulated forecasts can be output to a data set for further analysis.
- You can now plot dynamic conditional covariances for DCC GARCH models by specifying PLOTS= CONDCORR.
- The OUTSTAT statement now includes the value of the log-likelihood function that is calculated at the parameter estimates.

For more information about this release, see [What's New in SAS/ETS 15.1](#) in *SAS/ETS 15.1 User's Guide*.

SAS/ETS 14.3

SAS/ETS 14.3 (September 2017) runs on SAS 9.4M5 and later releases.

These components have been added to SAS/ETS software:

- The SASEWBGO interface engine enables SAS programmers to retrieve time series data from the World Bank Group Open (WBGO) data website, which is hosted by the World Bank Group.
- The TMODEL procedure is a new, experimental version of the MODEL procedure. The code that you use to perform nearly all analyses in PROC MODEL can be used without changes in PROC TMODEL. However, PROC TMODEL incorporates high-performance computational techniques and offers new features that enhance the functionality of PROC MODEL.

New features have been added to these SAS/ETS components:

- In the PANEL procedure, dynamic panel estimation is now easier through the addition of new options and features.
- The no-U turn sampler (NUTS) of the Hamiltonian algorithm has been added to the QLIM procedure.

- New features have been added to the SASEFAME interface engine to support remote access to MarketMap's (FAME) master and MCADBS servers.
- For the SASEFRED interface engine, the USER= option is new.
- For the SASEQUAN interface engine, version 3 of the QUANDL API is now supported.
- In the SSM procedure, model-based temporal aggregation and temporal distribution are now possible for time series that have response variables of flow type. The BREAKPEAKS and ZSPARSE options in the PROC SSM statement are now production.
- In the UCM procedure, you can specify higher-order stochastic cycle components in your models.
- In the VARMAX procedure, confidence intervals and standard errors for impulse response functions of exogenous variables and for all impulse response functions of VARFIMA models now appear in corresponding plots and tables. The FI option is now production.

For more information about this release, see [What's New in SAS/ETS 14.3](#) in *SAS/ETS 14.3 User's Guide*.

SAS/ETS 14.2

SAS/ETS 14.2 (November 2016) runs on SAS 9.4M4 and later releases.

These components have been added to SAS/ETS software:

- The SASENOAA interface engine enables SAS users to retrieve severe weather data from the National Oceanic and Atmospheric Administration (NOAA) Severe Weather Data Inventory (SWDI) web service.
- The SASERAIN interface engine enables SAS users to retrieve weather data from the World Weather Online website.
- The SPATIALREG procedure analyzes spatial econometric models for cross-sectional data where observations in the data are spatially referenced or georeferenced.

New features have been added to these SAS/ETS components:

- HPCDM procedure
- HPSEVERITY procedure
- QLIM procedure
- SASEFAME interface engine
- SASEFRED interface engine
- SASEQUAN interface engine
- SASEXFSD interface engine
- SEVERITY procedure
- SSM procedure
- TIMESERIES procedure
- VARMAX procedure

For more information, see [What's New in SAS/ETS 14.2](#) in *SAS/ETS 14.2 User's Guide*.

SAS/ETS 14.1

SAS/ETS 14.1 (July 2015) runs on SAS 9.4M3 and later releases.

Here are some of the new features and enhancements:

- The COUNTREG procedure adds the TEST statement, three statements that enable you to include spatial effects in a model, and more Bayesian analysis features.
- The HPCOUNTREG procedure adds the TEST statement and support for the Conway-Maxwell distribution.
- The HPPANEL procedure adds support for the between-groups estimator, between-time-periods estimator, and pooled OLS regression.
- The MODEL procedure adds the %EQAR and %EQMA macros.
- The PANEL procedure adds more general Hausman specification tests, comparison tables for multiple models, and Hausman and Taylor (1981) and Amemiya and MaCurdy (1986) estimators.
- The QLIM procedure adds the RANDOM statement, which enables you to estimate the random-intercept models, and more Bayesian analysis features.
- The SASEFRED interface engine supports Linux X64 (LAX) hosts; real-time periods for Federal Reserve Economic Data (FRED) data; logging of diagnostics in the SAS log; requests for useful information about categories, tags, groups, and releases; and use of blanks in path names in options.
- The SASEXFSD interface engine supports Linux X64 (LAX) hosts, logging of diagnostics in the SAS log, the UNIVERSE= option on the ExtractFormulaHistory factlet, and use of blanks in path names in options.
- The SASEQUAN interface engine supports Linux X64 (LAX) hosts, up to nine Quandl codes, logging of diagnostics in the SAS log, and use of blanks in path names in options. It also ensures unique names by appending the variable number to names.
- The SSM procedure adds the DEPLAG statement, which simplifies the specification of models that have lagged values of response variables in the observation equation.
- The VARMAX procedure supports vector error correction models in ARMA-GARCH form, linear equality and inequality constraints in vector error correction models, covariance and standard errors of the parameter estimates of the adjustment coefficient matrix, covariance matrix of innovations in vector error correction models, outputs of parameter estimates of the long-run parameters and the error correction trend parameters, Wald tests on any parameters in vector correction models except the long-run parameters and the error correction trend parameters, specification of initial values, and a new estimation method, the conditional maximum likelihood (CML).
- The new X13 procedure incorporates the X12 procedure in response to the US Census Bureau's inclusion of the X-12-ARIMA methodology in the X-13ARIMA-SEATS program. PROC X13 also adds numerous options, displays additional tables, and changes the default value of the MAXITER= option to 1,500.

For more information, see [What's New in SAS/ETS 14.1](#) in *SAS/ETS 14.1 User's Guide*.

SAS/ETS 13.2

SAS/ETS 13.2 (August 2014) runs on SAS 9.4M2 and later releases.

Here are some of the new features and enhancements:

- The new SASEQUAN interface engine enables you to retrieve economic data from the Quandl website.
- The COUNTREG procedure now supports the following features:
 - A number of Bayesian estimation features are supported.
 - You can control the number of threads that are used during optimization.
 - You can store parameter estimates and other results on a per-BY-group basis in the item store so that they can be retrieved later for scoring the BY groups in another data set.
- The PANEL procedure now supports the following features:
 - first-differenced methods for one-way and two-way models
 - panel data cross-sectional dependence test
 - Lagrange multiplier (LM) test for cross-sectional and time effects
 - locally mean most powerful (LMPP) and standardized Lagrange multiplier (SLM) tests
 - Gouriéroux, Holly, and Monfort Lagrange multiplier test
 - tests for serial correlation and cross-sectional effects
- The QLIM procedure has added an automated algorithm to monitor the quality of the posterior representation through MCMC methods. In doing so, this algorithm can retune and/or reinitialize the MCMC methods until the posterior distribution representation is satisfactory.
- The SASEFRED interface engine now performs error checking to avoid incompatibility of various options.
- The SEVERITY procedure now supports the following features:
 - The CLASS statement is supported.
 - You can specify a wide variety of regression effects, such as singleton continuous effects, polynomial continuous effects, main CLASS variable effects, and more.
 - You can save estimation results in an item store and use them for parameter initialization in a subsequent run of the SEVERITY or HPSEVERITY procedure.
 - You can create scoring functions.
 - You can limit the number of observations that are used to prepare the empirical distribution function (EDF) estimates, enabling you to speed up the EDF estimation step for large data sets, especially when you specify censoring or truncation effects.
- The VARMAX procedure now supports the following features:
 - p -values for the Johansen cointegration rank test
 - multistep forecast for the multivariate GARCH model, enabling you to obtain the multistep forecast of conditional covariance matrices at any horizons ahead
- The X12 procedure now enables you to specify the following:
 - the size of forecast confidence limits
 - the difference in critical values for almost outliers
 - the alpha value for outlier detection

- the method of calculating the critical value for outlier detection based on the alpha value and the number of observations in the span that is used for analysis
- the number of level-shift outliers to consider for forming a temporary level shift
- the method of adding outliers at each iteration of model estimation
- the rate of decay for temporary change outliers
- the moving average filter for each period

For more information, see [What's New in SAS/ETS 13.2](#) in *SAS/ETS 13.2 User's Guide*.

Here are some new features in SAS/ETS high-performance procedures:

- The HPCOUNTREG procedure now supports panel data analysis.
- The HPSEVERITY procedure now supports the following features:
 - The CLASS statement is supported.
 - You can specify a wide variety of regression effects, such as singleton continuous effects, polynomial continuous effects, main CLASS variable effects, and more.
 - You can save estimation results in an item store and use them for parameter initialization in a subsequent run of the SEVERITY or HPSEVERITY procedure.
 - You can create scoring functions.
 - PROC HPSEVERITY supports the following functions, which were previously available only in the SEVERITY procedure: You can request a variety of plots in single-machine mode; you can create a SAS data set in single-machine mode that contains the EDF and CDF estimates of all distributions that do not fail to converge; you can specify the probability of observability; and you can specify the same options in the NLOPTIONS statement that you can specify in PROC SEVERITY.

For more information, see [What's New in SAS/ETS 13.2 High-Performance Procedures](#) in *SAS/ETS User's Guide: High-Performance Procedures*.

SAS/ETS 13.1

SAS/ETS 13.1 (December 2013) runs on SAS 9.4M1 and later releases.

Here are some of the new features and enhancements:

- The AUTOREG procedure now enables you to estimate GARCH models without constraints on parameters.
- The COPULA procedure now supports tail dependence plots.
- The COUNTREG procedure now supports the following features:
 - The STORE statement enables you to save your model parameter estimates and other statistics in item stores.
 - New options in the CLASS statement enable you to control parameterization methods, reference levels, and sort order for classification variables.
- The SEVERITY procedure now supports the following features:
 - The scale regression model can include offset variables.
 - The new OUTSCORELIB statement creates scoring functions.
- The PANEL procedure now supports the Blundell and Bond system GMM estimator.
- The QLIM procedure now provides the following features:

- Bayesian estimation is available for most of the multivariate models.
- Endogeneity issues can now be addressed in most models.
- Heckman's two-step procedure now enables the model for the selected sample to be a discrete choice or limited dependent variable model.
- The SSM procedure now supports the following features:
 - A more general state-transition equation permits inclusion of regression effects.
 - You can now search for structural breaks in any model component.
- The UCM procedure now provides a bootstrap-based procedure for computing standard error of a series and component forecasts.
- The VARMAX procedure now supports the following features:
 - huge performance and scalability improvements for VARMAX and VARMAX-GARCH models that are estimated by maximum likelihood
 - inequality constraints on parameters
 - initial values for parameters
 - matrix expressions, operators, and functions in the BOUND, INITIAL, RESTRICT, and TEST statements
 - multivariate DCC GARCH models
 - four new forms of univariate GARCH models: exponential GARCH (EGARCH), power GARCH (PGARCH), quadratic GARCH (QGARCH), and the threshold GARCH (TGARCH)
 - concentrated likelihood estimation for CCC and DCC GARCH models
- The new SASEFRED interface engine enables you to retrieve economic data from the FRED website, which is hosted by the Economic Research Division of the Federal Reserve Bank of St. Louis.
- The SASECRSP interface engine supports Linux X64 (64-bit), Solaris Sun UltraSPARC, Solaris on Intel x86, and Windows.
- The new SASEXFSD interface engine enables you to access FactSet data that are provided by the FactSet FASTFetch web service.

Here are some of the new high-performance features and procedures in SAS/ETS 13.1:

- The experimental high-performance HPCDM procedure estimates a compound distribution model, which is the distribution of an aggregate loss that you expect to see in a given period of time.
- The new HPCOPULA procedure is a high-performance version of the COPULA procedure, which enables you to simulate realizations of multivariate distributions by using the copula approach.
- The new HPPANEL procedure is a high-performance version of the PANEL procedure, which analyzes a class of linear econometric panel data models.
- The HPCOUNTREG procedure now supports the BY statement.
- The HPQLIM procedure now supports discrete choice models and the BY statement.
- The HPSEVERITY procedure now supports the following features:
 - BY statement
 - offset variables in the scale regression model

- a new OUTSCORELIB statement, which creates scoring functions

For more information, see [What's New in SAS/ETS 13.1](#) in *SAS/ETS 13.1 User's Guide*.

SAS/ETS 12.3

SAS/ETS 12.3 is essentially a maintenance release of SAS/ETS software that runs on SAS 9.4.

In addition, the procedures that make up the SAS High-Performance Econometrics product are available with SAS/ETS for use in single-machine mode. Depending on data characteristics and model complexity, you might see performance improvements over comparable SAS/ETS functionality that is not multithreaded.

For more information, see [Overview of SAS/ETS High-Performance Procedures](#) in *SAS/ETS User's Guide: High-Performance Procedures*.

SAS Factory Miner

About SAS Factory Miner

SAS Factory Miner is an easy-to-use application that enables you to build models to analyze data and examine results. You can build a model by creating a project, selecting data source configurations, choosing model templates, running your analysis, and viewing results.

You can use these models to analyze data in SAS Factory Miner:

- Bayesian Network model
- Decision Tree model
- Generalized Linear model
- Gradient Boosting model
- Neural Network model
- Random Forest model
- Regression model
- Support Vector Machine model

SAS Factory Miner helps you perform data mining model creation at a segment level. For example, you could use customer data to investigate which customers are most likely to respond to online offers. Furthermore, you could build separate models for each of the regions in which your clients live. You can run multiple models and examine results to determine which modeling algorithm was most effective for the data that you have and the goals of your investigation. Comparing modeling results can help you make more informed and effective business decisions.

SAS Factory Miner 14.1 runs on SAS 9.4M3 and later releases.

SAS Factory Miner 15.4

SAS Factory Miner 15.4 shipped in June 2025 and runs on SAS 9.4M9 and later releases.

SAS Factory Miner 15.3

SAS Factory Miner 15.3 shipped in January 2023 and runs on SAS 9.4M8 and later releases.

SAS Factory Miner 15.2

SAS Factory Miner 15.2 shipped in August 2020 and runs on SAS 9.4M7 and later releases.

SAS Factory Miner 15.1

SAS Factory Miner 15.1 shipped in November 2018 and runs on SAS 9.4M6 and later releases.

See these resources:

- For more information about this release, see the software product page for [SAS Enterprise Miner and SAS Factory Miner](#).
- For more information about changes from the previous release, see [SAS Factory Miner](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Factory Miner 14.2

SAS Factory Miner includes a new REST endpoint that can be called to automatically retrain a project with new data and give you the option to register the new models with SAS Model Manager. This update includes a SAS code template that can be used to invoke the new endpoint and a UI component that enables you to download the SAS code template for a particular project. You can use this code template and use your operating system's scheduler to invoke the REST endpoint periodically in order to automatically retrain your models.

SAS Forecast Server

SAS Forecast Server 15.4

SAS Forecast Server 15.4 shipped in June 2025 and supports SAS 9.4M9.

See these resources:

- For more information about SAS Forecast Server, see the software product page for [SAS Forecast Server](#).
- For more information about changes from the previous release, see [SAS Forecast Server](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Forecast Server 15.3

SAS Forecast Server 15.3 shipped in January 2023 and supports SAS 9.4M8.

SAS Forecast Server 15.2

SAS Forecast Server 15.2 shipped in August 2020 and supports SAS 9.4M7 and later releases.

SAS Forecast Studio has these changes and enhancements:

- Updates have been made to allow SAS Forecast Studio authentication to use Integrated Windows Authentication (IWA) when Windows Defender Credential Guard is enabled.
- A new installation is available for these client applications: SAS Forecast Studio, SAS Forecast Project Manager, and SAS Time Series Studio.

In previous releases, these applications could be launched using Java Web Start. Java Web Start was deprecated in Java 9, and Oracle does not provide any support, updates, or security fixes. As a result, Java Web Start is no longer supported. The new installation enables users to download and install the client applications from a web page.

SAS Forecast Server 15.1

SAS Forecast Server 15.1 shipped in November 2018 and supports SAS 9.4M6 and later releases.

SAS Forecast Server 14.3

SAS Forecast Server 14.3 shipped in September 2017 and supports SAS 9.4M5.

SAS Forecast Server 14.2

SAS Forecast Server 14.2 shipped in November 2016 and runs on SAS 9.4M4. This release includes several enhancements to the SAS Forecast Server procedures.

SAS Forecast Server 14.1

SAS Forecast Server 14.1 shipped in July 2015 and runs on SAS 9.4M3. This release includes the new SAS Forecast Server Client, which is a web-based interface that you can use to segment your time series data, create forecasts, and track the accuracy of your forecasts. With SAS Forecast Server Client, you have the option of writing custom code to segment and model your time series.

Note: The SAS Forecast Server Client is discontinued as of SAS Forecast Server 14.3.

SAS Forecast Server 13.1

SAS Forecast Server 13.1 shipped in December 2013 and runs on SAS 9.4M1.

Here are some of the new features and enhancements in this release:

- support for Integrated Windows Authentication, clustered servers, and grid computing environments
- new options for changing the ODS format and execution server when running a report or stored process

- the ability to create a forecast data set for independent variables

SAS Forecast Server 12.3

SAS Forecast Server 12.3 runs on SAS 9.4 and includes updates to the web infrastructure. SAS Forecast Server is now integrated with SAS Time Series Studio, which is now production software. SAS Time Series Studio enables you to analyze and structure your time-stamped data. You can export data from SAS Time Series Studio and import it into SAS Forecast Studio.

SAS/IML

SAS/IML 15.4

SAS/IML 15.4 shipped in June 2025 and runs on SAS 9.4M9 and later releases.

SAS/IML 15.3

SAS/IML 15.3 shipped in January 2023 and runs on SAS 9.4M8 and later releases.

SAS/IML 15.2

SAS/IML 15.2 shipped in August 2020 and runs on SAS 9.4M7 and later releases.

SAS/IML 15.1

SAS/IML 15.1 shipped in November 2018 and runs on SAS 9.4M6 and later releases.

Here are the new statements and functions:

- The CONTINUE statement stops the processing of the current iteration of a DO loop and resumes processing at the next iteration of the DO loop.
- The new digital filtering functions enable you to design digital filters and apply those filters to signals. Many of the digital filtering functions start with the 'DF' prefix. The new function and subroutines are CCEPSTRUM, DFCONV, DFDESIGN, DFFILT, DFFREQZ, DFFREQZZPK, DFMEDFILT, DFORDER, DFSOSFILT, DFSOSFREQZ, DFSOSFREQZZPK, ICCEPSTRUM, and RCEPSTRUM.
- The experimental KPCATRAIN subroutine computes a kernel principal component (kPCA) analysis from training data. The experimental KPCAScore function uses the kPCA model to score new data.
- The FEVAL function enables you to evaluate a function indirectly by specifying the name of the function and its arguments.
- The LEAVE statement exits the current DO loop and resumes processing at the statement that follows the DO loop.
- The MODULESTACK function returns the names of all modules in the module call stack.
- The SPECTROGRAM subroutine displays a spectrogram of a short-time Fourier transform of a time series signal.

- The TABLESORT subroutine sorts a table by one or more columns.

Several statements, functions, and subroutines have been enhanced.

- If the SAS VALIDVARNAME option is set to ANY, then you can use a name literal as the name of a SAS/IML symbol.
- The INV, ROOT, and SWEEP functions support multithreaded algorithms for large matrices.
- The CREATE FROM statement and the APPEND FROM statement accept multiple matrices, making it easier to write mixed data types to a SAS data set.
- The PRINT statement accepts numerical vectors for the ROWNAME= and COLNAME= options.
- The RANDGEN subroutine and RANDFUN function support new random number generators. You can use the RANDSEED subroutine to specify the following generators:

MTHYBRID

(Default) Hybrid 1998/2002 32-bit Mersenne twister

MT2002

2002 32-bit Mersenne twister

MT64

64-bit Mersenne twister

PCG

64-bit permuted congruential generator

TF2

Threefry 2x64-bit counter-based RNG

TF4

Threefry 4x64-bit counter-based RNG

RDRAND

Intel hardware-based RdRand instructions

- The VARMA SIM function enables you to use the INITIAL= option to specify a matrix that initializes a simulated VARMA time series.

See these resources:

- For more information about this release, see [What's New in SAS/IML 15.1](#).
- For more information about changes from the previous release, see [SAS/IML](#) in *SAS Guide to Software Updates and Product Changes*.

SAS/IML 14.3

SAS/IML 14.3 shipped in September 2017 and runs on SAS 9.4M5 and later releases.

Here are some of the new features and enhancements:

- The SAS/IML language supports new syntax for defining and manipulating lists. You can use square brackets to define a list, subscript notation to extract a sublist, a dollar sign (\$) to extract an item from a list, and the concatenation operator (||) to concatenate lists.
- You can transfer data between SAS/IML tables and R data frames by using the ExportTableToR subroutine and the ImportTableFromR function.

- You can analyze complex-valued time series data by using several new functions for time-frequency analysis.

For more information about this release, see [What's New in SAS/IML 14.3](#) in *SAS/IML 14.3: User's Guide*.

SAS/IML 14.2

SAS/IML 14.2 shipped in November 2016 and runs on SAS 9.4M4 and later releases.

Here are some of the new features and enhancements:

- The fundamental data type in the IML procedure is the matrix. Prior to SAS/IML 14.2, every symbol in a PROC IML program represented a matrix. A new feature in SAS/IML 14.2 is support for new nonmatrix data types: tables and lists.
- The RANDGEN subroutine supports new distributions and enhancements to many existing distributions.
- At the time of its release, SAS/IML 14.2 interfaces correctly with the most recent version of R, which is 3.3.1. You can contact SAS Technical Support for the latest information about support for newer versions of R.
- SAS/IML 14.2 also introduces several enhancements to the SUBMIT statement. Global SAS statements that are executed inside a SUBMIT block now also affect the SAS/IML program after the SUBMIT block.

For more information, see [What's New in SAS/IML 14.2](#) in *SAS/IML 14.2: User's Guide*.

SAS/IML 14.1

SAS/IML 14.1 shipped in July 2015 and runs on SAS 9.4M3 and later releases.

Here are some of the new features and enhancements:

- Large matrices (up to $2^{31} - 1$ elements, or more than 2 billion elements) are supported on the Windows operating system.
- The PACKAGE statement supports installing and using packages, which are ZIP files that contain source code, data sets, documentation, and sample programs. You can share and download packages from the [SAS/IML File Exchange](#) in the SAS Support Communities on support.sas.com.
- Eigenvalue computations use vendor-supplied math libraries, if available.
- The RANDSEED subroutine uses a different initialization algorithm for certain seeds.

For more information, see [What's New in SAS/IML 14.1](#) in *SAS/IML 14.1: User's Guide*.

SAS/IML 13.2

SAS/IML 13.2 shipped in August 2014 and runs on SAS 9.4M2 and later releases.

Here are some of the new features and enhancements:

- The new experimental EXECUTEFILE subroutine executes SAS/IML statements that are contained in a text file.

- Although not formally a part of SAS/IML software, the new SAS/IML File Exchange in the SAS/IML Support Community enables you to share SAS/IML programs and download programs written by others. You can post SAS/IML functions, tag files, and rate files, and search for files by tags, content, or author.

For more information, see [What's New in SAS/IML 13.2](#) in *SAS/IML 13.2: User's Guide*.

SAS/IML 13.1

SAS/IML 13.1 shipped in December 2013 and runs on SAS 9.4M1 and later releases.

Here are some of the new features and enhancements:

- enhancements to the SAS/IML language syntax:
 - The NEXT keyword now supports expressions.
 - The STOP and ABORT statements now accept a default message that is displayed in the SAS log.
 - The parentheses in the RETURN statement are now optional.
- new support of the Tweedie distribution by the RANDGEN subroutine
- new statistical functions, subroutines, and modules:
 - The CV function returns the sample coefficient of variation for each column of a matrix.
 - The HEATMAPCONT call creates a heat map of a matrix whose values are visualized by using a continuous color ramp.
 - The HEATMAPDISC call creates a heat map of a matrix whose values are visualized by using a discrete color ramp.
 - The KURTOSIS function returns the sample kurtosis for each column of a matrix.
 - The LOGABSDDET function returns the logarithm of the absolute value of a matrix determinant.
 - The LPSOLVE call solves linear programming problems.
 - The MILPSOLVE call solves mixed-integer linear programming problems.
 - The PALETTE function returns a discrete color palette that is suitable for choropleth maps, heat maps, and other graphical visualizations that display a relatively small number of discrete values.
 - The PARENTNAME function returns the name of the matrix that was passed to a module.
 - The SKEWNESS function returns the sample skewness for each column of a matrix.

For more information, see [What's New in SAS/IML 13.1](#) in *SAS/IML 13.1: User's Guide*.

SAS/IML 12.3

SAS/IML 12.3 is essentially a maintenance release of SAS/IML software that runs on SAS 9.4.

For more information, see the software product page for [SAS/IML](#).

SAS Model Manager

SAS Model Manager 15.5

SAS Model Manager 15.5 runs on SAS Viya 3.5. This release includes bug fixes and security enhancements.

See these resources:

- For more information about this release, see [SAS Model Manager](#).
- For more information about changes from the previous release, see [SAS Model Manager](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Model Manager 14.3

The first maintenance release of SAS Model Manager 14.3 runs on the August 2020 release of SAS 9.4M7. The second maintenance release of SAS Model Manager 14.3 runs on the January 2023 release of SAS 9.4M8. The third maintenance release of SAS Model Manager 14.3 runs on the June 2025 release of SAS 9.4M9.

For the June 2019 release of SAS Model Manager 14.3, the user interface was rewritten in HTML5. Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe announced that it intends to end support for Flash technology and will cease to update and distribute the Flash Player at the end of 2020. Browser vendors disabled Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

Here are some differences between SAS Model Manager 14.2 and 14.3:

- SAS Management Console replaces the Data category as the way to create data libraries and register tables.
- The Manage Folders feature replaces the New Folder window and Actions menu options for managing folders. The Manage Folders feature enables you to create and manage folders from within the Models, Projects, and Portfolios category views.
- The Models category view replaces the Inventory category view, and provides a way to import models into a folder, as well as export models and manage models in one place.
- In the application bar, the name SAS Decision Manager has been changed to SAS Decision Management.

It is no longer possible to do the following:

- Add model keywords
- Filter items by date modified in the Models, Projects, and Portfolios category views
- Filter the list of models by keywords and user-defined properties in the Models category view
- Duplicate or move a model from one folder to another folder

SAS Model Manager 14.2

SAS Model Manager 14.2 runs on SAS 9.4M4. SAS Model Manager 14.2M1 shipped in November 2018 and runs on SAS 9.4M6 and later releases.

New features and enhancements in this release enable you to perform these tasks:

- import SAS analytic store models
- publish, score, monitor performance, or run reports for SAS analytic store models
- publish models to Hadoop and Teradata using single sign-on authentication by Kerberos
- run scoring tests in a High-Performance Analytics production environment
- score SAS Factory Miner models from within a SAS Model Manager portfolio by using macros
- publish SAS Factory Miner models from within a SAS Model Manager portfolio to a database or Hadoop using macros

SAS Model Manager 14.2M1 on SAS 9.4M6 enables you to perform these tasks:

- compute the feature contribution indices for interval and nominal predictors using the feature contribution index (FCI) program
- convert and export a model's DS2 score code using the %MM_GetModelDS2Code macro
- configure support for executable attachments

For more information about this release, see [What's New in SAS Model Manager 14.2](#) in *SAS Model Manager: User's Guide*.

SAS Model Manager 14.1

SAS Model Manager 14.1 runs on SAS 9.4M3.

New features and enhancements in this release enable you to perform these tasks:

- manage SAS Factory Miner models that are registered in the SAS Model Manager model repository
- add model dependencies and view the relationships by using SAS Lineage
- manage model versions
- import, update, and export generic models at the folder level
- access the inventory of all models in the same category view
- add and edit model keywords
- add multiple user-defined properties to a model at one time
- search the model inventory with improved performance and filter the search results by the date modified, model properties, and user-defined properties

For more information, see [What's New in SAS Model Manager 14.1](#) in *SAS Model Manager: User's Guide*.

SAS Model Manager 13.1

SAS Model Manager 13.1 runs on SAS 9.4M2. The SAS Model Manager Java Client application and the Workflow Console web-based application have been replaced with an integrated web-based application. The SAS Model Manager Client installation is no longer required on a user's desktop. New features and enhancements in this release enable you to perform the following tasks:

- create libraries and register tables in the SAS Metadata Repository
- manage workflows and track workflow tasks
- publish models to Hadoop and SAP HANA
- manage all versions within a project in one place
- schedule recurrent jobs
- retrain models based on the dashboard project status
- specify performance options for using dynamic data sources and generating dashboard reports
- specify additional reporting options
- attach documents and add comments

For more information, see [What's New in SAS Model Manager 13.1](#) in *SAS Model Manager: User's Guide*.

SAS Model Manager 12.3

SAS Model Manager 12.3 runs on SAS 9.4. Major themes for this release include the ability to manage projects collaboratively as one control group, to support additional model classes, and to perform more activities from within SAS Model Manager Workflow Console. New features and enhancements in this major release enable you to perform the following tasks:

- create and manage multiple projects in a control group
- monitor performance of champion models for all projects within a control group and publish the champion models to the SAS Metadata Repository
- schedule performance monitoring tasks.
- specify multiple data sources and collection dates when defining performance monitoring tasks.
- remove models that are published to a database.
- create folders, projects, and versions by using macros. You can also set project properties.
- create and view reports within a workflow activity.
- view the process flow diagram for a workflow.

In addition, SAS Model Manager 12.3 provides support for these areas:

- SAS Enterprise Miner Random Forest (HPFOREST), as well as the SAS/ETS COUNTREG and SEVERITY models
- multiple SAS application servers when scoring or retraining a model, and monitoring performance of champion and challenger models

SAS/OR

SAS/OR 15.4

SAS/OR 15.4 shipped in June 2025 and runs on SAS 9.4M9 and later releases.

SAS/OR 15.3

SAS/OR 15.3 shipped in January 2023 and runs on SAS 9.4M8 and later releases.

SAS/OR 15.2

SAS/OR 15.2 shipped in August 2020 and runs on SAS 9.4M7 and later releases.

SAS/OR 15.1

SAS/OR 15.1 shipped in November 2018 and runs on SAS 9.4M6 and later releases.

SAS/OR 15.1 includes improvements to its optimization procedures, solvers, and algorithms, along with interface and performance improvements to SAS Simulation Studio.

SAS Simulation Studio 15.1, a discrete-event simulation component of SAS/OR15.1 for Windows and Linux environments, extensively revises and enhances its graphical user interface, improves its performance, and streamlines authentication when executing simulation models in batch mode.

SAS/OR 14.3

SAS/OR 14.3 shipped in September 2017 and runs on SAS 9.4M5 and later releases.

Several optimization solvers have been updated in SAS/OR 14.3 and improve their performance. The LP, MILP, QP, and NLP solver algorithms all reduce the time they require to solve benchmark optimization problems. These improvements also include the decomposition (DECOMP) algorithm for LP and MILP.

SAS Simulation Studio 14.3, a component of SAS/OR 14.3 for Windows environments, adds Linux support (on an experimental basis) and also adds an alternative user interface design.

For more information, see [What's New in SAS/OR 14.3](#) in *SAS/OR 14.3 User's Guide: Mathematical Programming*.

SAS/OR 14.2

SAS/OR 14.2 shipped in November 2016 and runs on SAS 9.4M4 and later releases.

SAS/OR 14.2 includes performance improvements in the LP, MILP, and NLP solvers.

SAS Simulation Studio, a component of SAS/OR 14.2 for Windows environments, now includes these modeling blocks:

- The new Caster block makes it easier to transfer complex objects (entities, observations, and so on) within a model.
- The Queue block adds extended queueing controls that you can use to help prevent a queue from becoming blocked.

For more information, see [What's New in SAS/OR 14.2](#) in *SAS/OR 14.2 User's Guide: Mathematical Programming*.

SAS/OR 14.1

SAS/OR 14.1 shipped in July 2015 and runs on SAS 9.4M3 and later releases. It adds a number of new optimization capabilities that shorten optimization time, increase diagnostic capabilities, and make the software easier to use.

Here are some of the new features and enhancements:

- Several solvers improve their performance.
- The concurrent FOR loop (the COFOR loop) in PROC OPTMODEL can run in distributed mode.

Note: Distributed mode requires SAS High-Performance Optimization.

- PROC OPTMODEL adds a profiler that tracks the amount of time spent in problem generation, presolve, and various stages of the solution process.
- PROC OPTNET enables parallel computing, provides faster graph data input, and adds enhancements to three of its algorithms.
- The quadratic and nonlinear solvers add irreducible infeasible set (IIS) diagnostics.
- The decomposition algorithm expands the range of constraint matrix structures that it can detect automatically.
- The CLP procedure adds more variable selection strategies.

SAS Simulation Studio 14.1, a component of SAS/OR 14.1 for Windows environments, adds features that improve the accuracy of your models and give you additional controls on model execution. Highlights include the following:

- controls on the order in which dynamically created data input and output ports on blocks execute during the run of a model
- centralized controls on the ranking of blocks in a model, which determines the order of execution for events that are scheduled for the same simulation clock time
- expanded and improved controls on the allocation of resource units among resource entities when there is a scheduled adjustment
- automatic launching of the SAS server on your local PC

For more information, see [What's New in SAS/OR 14.1](#) in *SAS/OR 14.1 User's Guide: Mathematical Programming*.

SAS/OR 13.2

SAS/OR 13.2 shipped in August 2014 and runs on SAS 9.4M2 and later releases.

Here are some of the new features and enhancements:

- Several optimization solvers improve their performance.
- PROC OPTMODEL adds the experimental constraint logic programming (CLP) solver.

- The nonlinear programming (NLP) solver adds output of the covariance matrix for the decision variables (parameter estimates).
- The decomposition (DECOMP) algorithm adds new block detection features.
- For the linear programming (LP) interior point solver, the crossover algorithm is applied by default.
- The network solver is now production.
- The parallel implementation of the mixed integer linear programming (MILP) solver is now production.
- SAS Simulation Studio 13.2 provides a new optional parallel mode that executes design points and replications simultaneously on multiple computational cores, a central facility in the new Data Trimmer block to control data collection, and added control on the precision of the numeric values that the Formula block produces.

For more information, see [What's New in SAS/OR 13.2](#) in *SAS/OR 13.2 User's Guide: Mathematical Programming*.

SAS/OR 13.1

SAS/OR 13.1 shipped in December 2013 and runs on SAS 9.4M1 and later releases. It includes new features and enhancements to current features in optimization, discrete-event simulation, and constraint programming.

Here are some of the new features and enhancements:

- The OPTMODEL procedure now supports:
 - direct access to network optimization and analysis algorithms (Experimental)
 - parallel execution of solver invocations in a COFOR loop
 - support for function definition via PROC FCMP in Base SAS software
- The OPTLSO procedure now provides:
 - multiobjective optimization
 - support for the use of array-structured data in function definition (via PROC FCMP)
- The mixed integer linear programming (MILP) solver adds the option to execute in parallel on multiple computational cores. (Experimental)
- SAS Simulation Studio adds:
 - support for custom block icons
 - improvements to the simulation clock display
 - enhancements to the Submodel block interface
 - other interface improvements

For more information, see [What's New in SAS/OR 13.1](#) in *SAS/OR 13.1 User's Guide: Mathematical Programming*.

SAS/OR 12.3

SAS/OR 12.3 is largely a maintenance release of SAS/OR software that runs on SAS 9.4. The most significant addition is PROC OPTLSO for parallel hybrid local search optimization. This procedure, formerly named PROC HPLSO, previously was included

only in SAS High-Performance Optimization but is now available with SAS/OR for use in single-machine mode.

For more information, see the software product page for [SAS/OR](#).

SAS/QC

SAS/QC 15.4

SAS/QC 15.4 shipped in June 2025 and runs on SAS 9.4M9 and later releases.

See these resources:

- For more information about this release, see [What's New in SAS/QC 15.1](#) in *SAS/QC 15.1 User's Guide*.
- For more information about changes from the previous release, see [SAS/QC](#) in *SAS Guide to Software Updates and Product Changes*.

SAS/QC 15.3

SAS/QC 15.3 shipped in January 2023 and runs on SAS 9.4M8 and later releases.

SAS/QC 15.2

SAS/QC 15.2 shipped in August 2020 and runs on SAS 9.4M7 and later releases.

SAS/QC 15.1

SAS/QC 15.1 shipped in November 2018 and runs on SAS 9.4M6 and later releases.

Here are some of the new features and enhancements in this release:

- The harmonic mean is included in the summary statistics that the CAPABILITY procedure computes. It is included by default in the data set that is created in the OUTTABLE= option in the PROC CAPABILITY statement, and you can include it in data sets that are requested in the OUTPUT statement. You can also display the harmonic mean in graphical output by using the INSET statement.
- The RAREEVENTS procedure enables you to apply tests for special causes to rare events charts. These tests can improve the sensitivity of rare events charts by detecting patterns of measurements that might indicate unusual variation. The CHART statement supports new options related to tests for special causes. The CHART and COMPARE statements support the new ENDOBS option, which specifies that the last observation in the input data set represents the interval between the most recent event and the end of data collection. This measurement is not used in distribution fitting, but it can be displayed on a comparison plot or rare events chart.
- The CCHART, NPCHART, PCHART, and UCHART statements in PROC SHEWHART support the new LANEY option, which computes control limits.
- The EWMACHART and MACHART statements in PROC MACONTROL support the new LABASYMPTOTIC option, which labels varying control limits with asymptotic limit values.

- The SHEWHART, ANOM, CUSUM, and MACONTROL procedures recognize new macro variables that you can use to control details of ODS Graphics output more conveniently. Each chart statement in these procedures also supports the new QCSYMBOLS= option, which specifies a set of symbol markers to use to plot points on the charts.

SAS/QC 14.3

SAS/QC 14.3 shipped in September 2017 and runs on SAS 9.4M5 and later releases. In this release, the RAREEVENTS procedure can produce rare events charts with distinct sets of probability limits for different phases of observations.

For more information about this release, see [What's New in SAS/QC 14.3](#) in *SAS/QC 14.3 User's Guide*.

SAS/QC 14.2

SAS/QC 14.2 shipped in November 2016 and runs on SAS 9.4M4 and later releases. SAS/QC 14.2 includes enhancements to the ANOM, CAPABILITY, CUSUM, MACONTROL, RAREEVENTS, and SHEWHART procedures.

For more information, see [What's New in SAS/QC 14.2](#) in *SAS/QC 14.2 User's Guide*.

SAS/QC 14.1

SAS/QC 14.1 shipped in July 2015 and runs on SAS 9.4M3 and later releases.

Here are some of the new features and enhancements:

- The new, experimental RAREEVENTS procedure produces control charts for rare events. A rare event is one that occurs infrequently, with a low probability. A rare events chart is better suited than traditional control charts to detecting changes in the frequency of low-probability events.
- The ANOM, CUSUM, MACONTROL, and SHEWHART procedures are now capable of producing graphs that you can edit by using the ODS Graphics Editor.

For more information, see [What's New in SAS/QC 14.1](#) in *SAS/QC 14.1 User's Guide*.

SAS/QC 13.2

SAS/QC 13.2 shipped in August 2014 and runs on SAS 9.4M2 and later releases.

Here are some of the new features and enhancements:

- The ANOM, CUSUM, MACONTROL, and SHEWHART procedures now use templates that are written in the Graph Template Language to produce ODS Graphics.
- The CAPABILITY procedure now calculates the geometric means of analysis variables and can save them in an output data set or display them in a graph (or both).
- The MVPMONITOR procedure now includes an option that enables you to specify the distribution that is used to compute control limits.
- The RELIABILITY procedure can now produce confidence bands for stress-lifetime plots that are produced by the RELPLOT statement.

For more information, see [What's New in SAS/QC 13.2](#) in *SAS/QC 13.2 User's Guide*.

SAS/QC 13.1

SAS/QC 13.1 shipped in December 2013 and runs on SAS 9.4M1 and later releases.

Here are some of the new features and enhancements:

- The CAPABILITY procedure now provides the following:
 - improved parameter estimation for the Johnson S_U distribution
 - support for the OVERLAY option, which overlays, onto a single plot, histograms that are associated with different levels of a CLASS variable
- The MVPMONITOR procedure supports the new SCORECHART statement, which produces control charts of principal component score.
- The RELIABILITY procedure now supports the following features:
 - horizontal plots of failure and censoring times for recurrent events data
 - parameter estimation and probability plotting for the Gompertz and Gompertz-Makeham distributions
- The SHEWHART procedure has several new options:
 - The ACTUALALPHA option displays the effective α value, which might not be the same as the requested α value, in the limits legend of an attribute chart. This option is available in the CCHART, NPCHART, PCHART, and UCHART statements.
 - The IDSYMBOLHEIGHT= option controls the size of the symbols that are used to plot outliers in box plots that are produced by the BOXCHART statement.
 - The PROBLIMITS=DISCRETE option requests discrete control limits for attribute charts. This option is available in the CCHART, NPCHART, PCHART, and UCHART statements.
 - The WESTGARD= option applies Westgard rules to a Shewhart chart for quality control in health care laboratories.
 - The WHISKERPERCENTILE= option requests that the whiskers of the box plots that are produced by the BOXCHART statement be drawn to percentile values.

There are four new macros for measurement system analysis:

- The %basicEMP macro performs a basic evaluating-the-measurement-process (EMP) analysis.
- The %shortEMP macro performs the eight steps for characterizing relative utility.
- The %gaugeRR macro performs a traditional gauge repeatability and reproducibility analysis.
- The %honestGaugeRR macro creates an “honest” gauge repeatability and reproducibility report.

For more information, see [What's New in SAS/QC 13.1](#) in *SAS/QC 13.1 User's Guide*.

SAS/QC 12.3

SAS/QC 12.3 is essentially a maintenance release of SAS/QC software that runs on SAS 9.4.

For more information, see the software product page for [SAS/QC](#).

SAS/STAT

SAS/STAT 15.4

SAS/STAT 15.4 (June 2025) runs on SAS 9.4M9 and later releases.

SAS/STAT 15.3

SAS/STAT 15.3 (January 2023) runs on SAS 9.4M8 and later releases.

SAS/STAT 15.2

SAS/STAT 15.2 (August 2020) runs on SAS 9.4M7 and later releases.

SAS/STAT 15.1

SAS/STAT 15.1 (November 2018) runs on SAS 9.4M6 and later releases.

- The new BGLIMM procedure provides full Bayesian inference for generalized linear mixed models (GLMMs). It models data from the exponential family distributions that have correlations or nonconstant variability.
- The new CAUSALGRAPH procedure examines the structure of graphical causal models and suggests statistical strategies that enable researchers to compute unbiased estimates of causal effects.
- The new RMSTREG procedure analyzes time-to-event data by using regression with respect to the restricted mean survival time (RMST), using specialized methods.
- In the ANOVA procedure, you can specify the EFFECTSIZE option in the MODEL statement to add measures of effect size to each analysis-of-variance table.
- The CAUSALMED procedure enables you to input observational weights in the WEIGHT statement and to input the standard deviations of continuous variables in the STD statement.
- The FMM procedure supports random starting values for maximum likelihood estimation.
- The FREQ and SURVEYFREQ procedures offer the SENSPEC option in the TABLES statement to provide estimates and confidence limits for sensitivity, specificity, positive predictive value, and negative predictive value.
- The ICPHREG procedure fits the semiparametric proportional hazards model to interval-censored data.
- The MCMC and NLMIXED procedures support a steady state option for one-, two-, and three-compartment models.
- The PSMATCH procedure provides a PSWEIGHT statement to compute weights for observations on the basis of propensity scores.
- The QUANTREG procedure enables you to perform observationwise conditional distribution analysis.

- The SURVEYFREQ, SURVEYLOGISTIC, SURVEYMEANS, and SURVEYREG procedures provide two methods of computing the deviations for the replication variance estimation methods.
- The TTEST procedure produces graphs of bootstrap distributions and confidence intervals.

For more information about this release, see [What's New in SAS/STAT 15.1](#).

SAS/STAT 14.3

SAS/STAT 14.3 (September 2017) runs on SAS 9.4M5 and later releases.

Here are some of the enhancements for this release:

- The new CAUSALMED procedure estimates causal mediation effects from observational data.
- The GAMPL procedure now supports the Tweedie distribution.
- In PROC FREQ, the COMMONRISKDIFF option in the TABLES statement provides estimates, confidence limits, and tests for the overall risk (proportion) difference for multiway tables.
- The IRT procedure now supports the nominal response model, which enables you to perform item analysis of nominal responses.
- The NLMIXED and MCMC procedures add a CMPTMODEL statement that fits compartment models in pharmacokinetic analysis.
- The PHREG procedure provides cause-specific proportional hazards analysis for competing-risks data.
- The QUANTREG and QUANTSELECT procedures provide fast quantile process regression.
- The VARMETHOD=BOOTSTRAP option provides variance estimation by the bootstrap method for the survey data analysis procedures.
- The TTEST procedure provides bootstrap standard error, bias estimates, and confidence limits.

See these resources:

- For more information about this release, see [What's New in SAS/STAT 14.3](#) in *SAS/STAT 14.3: User's Guide*.
- For more information about changes from the previous release, see [SAS/STAT](#) in *SAS Guide to Software Updates and Product Changes*.

SAS/STAT 14.2

SAS/STAT 14.2 (November 2016) runs on SAS 9.4M4 and later releases.

This release contains two new procedures:

- The CAUSALTRT procedure estimates the average causal effect of a binary treatment variable T on a continuous or discrete outcome Y.
- The PSMATCH procedure provides a variety of tools for propensity score analysis, which is a general strategy for reducing the effects of confounding in observational studies, where the subjects are not randomly assigned to the treatment and control groups.

Here are some of the enhancements in this release:

- The FREQ and SURVEYFREQ procedures provide additional agreement statistics.
- The NLIN procedure now provides ESTIMATE and CONTRAST statements.
- The NLMIXED procedure supports multithreading in models that have more than one RANDOM statement.
- The PHREG procedure now provides time-dependent ROC analysis.
- The POWER procedure now provides extensions of existing power analyses that are applicable to various generalized linear models.
- The SURVEYIMPUTE procedure provides two-stage fully efficient fractional imputation and fractional hot-deck imputation.
- The SURVEYSELECT procedure now provides balanced bootstrap selection and sequential Poisson selection.

For more information, see [What's New in SAS/STAT 14.2](#) in *SAS/STAT 14.2: User's Guide*.

SAS/STAT 14.1

SAS/STAT 14.1 (July 2015) runs on SAS 9.4M3 and later releases.

Here are some of the new features and enhancements:

- The new GAMPL procedure is a high-performance procedure that fits generalized additive models by penalized likelihood estimation.
- The new SURVEYIMPUTE procedure imputes missing values of an item in a sample survey by replacing them with observed values from the same item. Imputation methods include single and multiple hot-deck imputation and fully efficient fractional imputation.
- The BCHOICE procedure allows varying numbers of alternatives in choice sets for logit models.
- Exact mid-p, likelihood ratio, and Wald modified confidence limits are available for the odds ratio produced by the FREQ procedure.
- The GLIMMIX procedure provides the multilevel adaptive Gaussian quadrature algorithm of Pinheiro and Chao (2006) for multilevel models, which can greatly reduce the computational and memory requirements for these models with many random effects.
- The GLMSELECT procedure supports the group LASSO method.
- The IRT procedure fits generalized partial credit models.
- The LIFETEST procedure performs nonparametric analysis of competing-risks data.
- The LOGISTIC procedure fits an adjacent-category logit model to ordinal response data.
- The MCMC procedure adds an ordinary differential equation (ODE) solver and a general integration function, enabling the procedure to fit models that contain differential equations (for example, PK models) or models that require integration (for example, marginal likelihood models).
- The NPAR1WAY procedure performs stratified rank-based analysis for two-sample data.
- The POWER procedure supports Cox proportional hazards regression models.

- The HPSPLIT procedure for classification and regression trees has been updated to include the MODEL and CLASS statements and tree plots, cross validation plots, and ROCS curves.
- The HPGENSELECT procedure for model selection for generalized linear models now provides the LASSO method.

For more information, see [What's New in SAS/STAT 14.1](#) in *SAS/STAT 14.1 User's Guide*.

SAS/STAT 13.2

SAS/STAT 13.2 (August 2014) and runs on SAS 9.4M2 and later releases.

Here are some of the new features and enhancements:

- The new ICPHREG procedure fits proportional hazards regression models to interval-censored data.
- The new SPP procedure analyzes spatial point patterns.
- The experimental GEE procedure fits generalized linear models for longitudinal data by using the generalized estimating equations (GEE) estimation method of Liang and Zeger (1986). It also provides weighted GEE analyses.
- The FACTOR procedure generates path diagrams.
- The FMM procedure fits multinomial models.
- The IRT procedure generates polychoric correlation matrices, item characteristic curves, and test information curve plots.
- The MCMC procedure supports a categorical distribution in the MODEL, RANDOM, and PRIOR statements.
- The NLMIXED procedure enables you to specify more than one RANDOM statement in order to fit hierarchical nonlinear mixed models.
- The SEQDESIGN procedure enables you to create a ceiling-adjusted design that corresponds to integer-valued sample sizes at the stages for nonsurvival data.
- The LOGISTIC procedure enables you to add or relax constraints on parameters in nominal response and partial proportional odds models.
- The FREQ procedure now provides score confidence limits for the odds ratio and the relative risk.
- The GLMSELECT procedure enables you to apply safe screening and sure independence screening methods to reduce a large number of regressors to a smaller subset from which model selection is performed.

For more information, see [What's New in SAS/STAT 13.2](#) in *SAS/STAT 13.2 User's Guide*.

SAS/STAT 13.1

SAS/STAT 13.1 (December 2013) runs on SAS 9.4M1 and later releases.

Here are some of the new features and enhancements:

- The experimental BCHOICE procedure performs Bayesian analysis for discrete choice models.

- The new ICLIFETEST procedure performs nonparametric survival analysis for interval-censored data.
- The experimental IRT procedure fits item response models.
- The MI procedure now provides the MNAR statement to facilitate sensitivity analysis.
- The Tweedie distribution is now supported by the GENMOD procedure.
- The competing risk model of Fine and Gray (1999) is available in the PHREG procedure.
- With the NLIN procedure, you can generate both bootstrap estimates of confidence intervals for the parameters and bootstrap estimates of the covariance matrix and correlation matrix of the parameter estimates.
- The MCMC procedure is now multithreaded.
- Path diagrams are available with the CALIS procedure.
- You can now compute power for PROC GLM-type MANOVA and repeated measurements with the GLMPOWER procedure.
- The SURVEYMEANS procedure produces domain quantile estimates.

Here are some new high-performance features and procedures in SAS/STAT:

- The new HPCANDISC procedure performs high-performance canonical discriminant analysis.
- The new HPFMM procedure performs high-performance finite mixture model analysis.
- The new HPPRINCOMP procedure performs high-performance principal component analysis.
- The SCREEN option in the SELECTION statement for the HPREG procedure requests screening stages that reduce a large number of regressors to a much smaller subset from which the final model is chosen.

For more information, see [What's New in SAS/STAT 13.1](#) in *SAS/STAT 13.1 User's Guide*.

SAS/STAT 12.3

SAS/STAT 12.3 is essentially a maintenance release of SAS/STAT software that runs on SAS 9.4.

In addition, the procedures that make up the SAS High-Performance Statistics product are available with SAS/STAT for use in single-machine mode. Depending on data characteristics and model complexity, you might see performance improvements over comparable SAS/STAT functionality that is not multi-threaded. Also, these procedures provide some new features; for example, the HPGENSELECT procedure provides model selection for generalized linear models.

For more information, see [Overview of SAS/STAT High-Performance Procedures](#) in *SAS/STAT User's Guide: High-Performance Procedures*.

SAS Text Miner

SAS Text Miner 15.4

SAS Text Miner 15.4 shipped in June 2025 and runs on SAS 9.4M9 and later releases.

See these resources:

- For more information about the new features and enhancements in SAS Text Miner 15.4, see the software product page for [SAS Text Miner](#).
- For more information about changes from the previous release, see [SAS Text Miner](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Text Miner 15.3

SAS Text Miner 15.3 shipped in January 2023 and runs on SAS 9.4M8 and later releases.

SAS Text Miner 15.2

SAS Text Miner 15.2 shipped in August 2020 and runs on SAS 9.4M7 and later releases. SAS Text Miner 15.2 offers performance enhancements to previously existing features.

SAS Text Miner 15.1

SAS Text Miner 15.1 shipped in November 2018 and runs on SAS 9.4M6 and later releases. SAS Text Miner 15.1 offers performance enhancements when running text mining nodes and viewing results. In addition, new stop lists are available on WLATIN1 and UTF-8 installations from the SASHELP library. These stop lists can be specified using the **Text Parsing** node's **StopList** property.

SAS Text Miner 14.3

SAS Text Miner 14.3 shipped in September 2017 and runs on SAS 9.4M5 and later releases. SAS Text Miner 14.3 offers performance enhancements when running text mining nodes and viewing results. It also offers improved parsing performance for these languages: Arabic, Czech, Danish, Greek, Hebrew, Hungarian, Indonesian, Norwegian, Polish, Romanian, Slovak, Swedish, Thai, and Vietnamese. These languages now use the HPTMINE procedure, which allows for multi-threaded parsing.

These languages continue to use the HPTMINE procedure: Chinese, Dutch, English, Finnish, French, German, Italian, Japanese, Korean, Portuguese, Russian, Spanish, and Turkish.

SAS Text Miner 14.2

SAS Text Miner 14.2 shipped in November 2016 and runs on SAS 9.4M4 and later releases. SAS Text Miner 14.2 offers performance enhancements when running nodes and viewing results. In addition, the high-performance HPTMINE procedure now enables you to parse text data in another language, Swedish.

SAS Text Miner 14.1

SAS Text Miner 14.1 shipped in July 2015 and runs on SAS 9.4M3 and later releases.

Here are some of the new features and enhancements in SAS Text Miner 14.1:

- A new HPBOOLRULE procedure replaces macros in the **Text Rule Builder** node.
- Enhancements to the HPTMINE procedure enable you to select or ignore parts of speech, attributes, and entities, as well as to build a search index.
- The **HP Text Miner** node now uses PROC HPTMINE to perform topic rotation and to create the topic table.
- Eleven parsing languages have been added to the **Language** property in the **HP Text Miner** node. The complete list of parsing languages includes Chinese, Dutch, English, Finnish, French, German, Italian, Japanese, Korean, Portuguese, Russian, Spanish, and Turkish.
- The new macro variable EM_TERM_LOC enables users to specify a location for SAS Text Miner nodes to write output data sets. These data sets are needed as input to SAS Text Miner score code.
- An **_item_** variable with term | role information has been added to the transaction output that is exported from the **Text Topic** node and the **Text Filter** node. This variable is added to the transaction tables valid_trans and test_trans when a **Data Partition** node is used in a process flow diagram, such as **Input Data** node (for example, NEWS) > **Data Partition** node > **Text Parsing** node > **Text Filter** node.

One benefit of exporting term | role information in the transaction table is that the **Association** node shows this information in the rules that it generates if the node is used in a process flow diagram, such as **Input data** node (for example, ABSTRACT)> **Text Parsing** node > **Text Filter** node > **Association** node.

Here are some of the new features and enhancements in the high-performance procedures for SAS Text Miner:

- The new HPBOOLRULE procedure enables you to extract Boolean rules from large-scale transactional data. PROC HPBOOLRULE adds essential capability to high-performance text mining for supervised rule-based modeling. In the current release, you can use the HPBOOLRULE procedure to read data and extract rules only in single-machine mode. The HPBOOLRULE procedure can automatically generate a set of Boolean rules by analyzing a text corpus that has been processed by the HPTMINE procedure and represented in a transactional format.
- The HPTMINE procedure supports the following new languages, statement, and options:
 - You can parse text data in the following newly supported languages: Chinese, Dutch, Finnish, French, Italian, Japanese, Korean, Portuguese, Russian, Spanish, and Turkish.
 - You can use the HPTMINE procedure to generate a search index for a text corpus. Use the index in the TMUTIL procedure to query the text corpus.
 - You can use the new SELECT statement to specify the parts of speech, entities, or attributes that you want to include in or exclude from your analysis.
 - You can specify a terms table when running the HPTMINE procedure in SVD-only mode. The terms table is required by topic discovery.

SAS Text Miner 13.2

SAS Text Miner 13.2 shipped in August 2014 and runs on SAS 9.4M2.

Here are some of the new features and enhancements in the high-performance procedures for SAS Text Miner:

- The HPTMINE procedure supports the following new functionality:
 - You can parse text data in the German language, and you can specify which language is used in the input data set of documents.
 - You can parse documents that contain more than 32K characters.
 - You can run in SVD-only mode, which enables you to parse documents and compute the singular value decomposition (SVD) separately in two procedure calls when you want to try different parameters for SVD computation after document parsing.
 - You can discover topics that exist in your text corpus.
 - You can store the term-by-document matrix in the Base64-encoded sparse rows (BESR) format.
 - You can use either the default coordinate list (COO, or transactional) format or the Base64-encoded sparse rows (BESR) format to store the term-by-document matrix.
 - You can specify custom LITI files for custom entity and noun group extraction.
 - You can specify whether to include terms that have `_keep=N` in the `OUTTERMS=` data set and in the `OUTCHILD=` data set.
- The HPTMSCORE procedure supports the following new functionality:
 - You can parse text data in the German language.
 - You can parse documents that contain more than 32K characters.
 - Custom LITI files for custom entity and noun group extraction are supported.

SAS Text Miner 13.1

SAS Text Miner 13.1 shipped in December 2013 and runs on SAS 9.4M1 and later releases. This release includes the new **Text Profile** node, enhancements to node performances and results, and an enhancement to the high-performance HPTMINE procedure.

- The new **Text Profile** node enables you to profile a target variable by using terms that are found in the documents.
- The **Text Parsing** node contains a new **Select Languages** property, which enables you to specify the languages to keep in the document collection.
- The results for the **Text Topic** node contain these new items:
 - a **Terms** table, which shows terms and their weights for each topic
 - a **Topic Terms** matrix graph, which shows the topic values across terms.
- The high-performance HPTMINE procedure now supports the NONORMDOC keyword in the OUTDOCPRO= option in the SVD statement to control whether document projections are normalized.

SAS Text Miner 12.3

SAS Text Miner 12.3 includes enhancements to node performance and results. When importing table information in various dialog boxes, the **Import** button has been replaced with the **Replace Table** and **Add Table** buttons. You can choose whether to replace the currently selected table or add to the currently selected table. Results for the **Text Rule Builder** node include a new Document Rules table and a Rule Success graph.

You can use SMP mode in SAS 9.4 on a properly enabled SAS Server to deploy the **HP Text Miner** node in a process flow diagram, and use the HPTMINE and HPTMSCORE procedures. Using the **HP Text Miner** node in a process flow diagram can lead to multi-threaded processing gains in many cases. For more information, see the HP Text Miner Node chapter in *SAS Enterprise Miner High-Performance Data Mining Node Reference*.

Chapter 4

In-Memory Analytics

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SAS In-Memory Statistics

SAS In-Memory Statistics provides a single, interactive programming environment for the entire analytical life cycle inside the Hadoop environment.

- Interactive programming enables you to move through the entire analytical life cycle in Hadoop with an extremely fast, multi-user environment.
- In-memory analytical processing enables you to get fast analytic computations that are optimized for multiple passes across distributed clusters.

- Because data is held in-memory, you can increase speed and reduce latency.
- Analytical data management enables you to prepare data for modeling with data integration, variable transformations and creation, and exploratory analysis.
- You can quickly create, evaluate, and compare multiple statistical models.
- With statistical algorithms and machine-learning techniques, you can uncover patterns and trends faster.
- You can analyze your unstructured and structured data by using a wide range of text analysis techniques.
- You receive personalized, meaningful recommendations in real time with a high level of customization.

SAS High-Performance Analytics Infrastructure

About the SAS High-Performance Analytics Infrastructure

The SAS High-Performance Analytics Infrastructure consists of these products:

- SAS High-Performance Computing Management Console
- SAS High-Performance Deployment of Hadoop
- SAS High-Performance Analytics environment

SAS High-Performance Analytics Infrastructure 3.9

SAS High-Performance Analytics Infrastructure 3.9 supports SAS 9.4M9 (June 2025).

- The JRE that is used by the analytics environment must match the version of the JRE used by your Hadoop cluster. These versions of Java might not be the same as the version of Java that is included with your SAS 9.4 Foundation deployment. Cloudera distributions of Hadoop are compatible with Java 8, but SAS 9.4M9 requires Java 21. SAS recommends installing Java 11 in both clusters for better compatibility with SAS 9.4M9.
- Starting with SAS 9.4M9, the SAS High-Performance Analytics Infrastructure is supported only with the HADOOPPLATFORM=SPARK option. Version 40 or later of the SAS Embedded Process for Hadoop is required. Multiple changes to Hadoop support occurred with SAS 9.4M9. For a full summary of Hadoop support, see the [SAS 9.4 Support for Hadoop](#) page.
- Version 1.08 of SAS Plug-ins for Hadoop for SAS 9.4M9 (SAS Foundation and solutions), became available in 2025 and contains multiple fixes. It is compatible with SAS Visual Analytics 7.53.
- Starting with SAS 9.4M9, setting the GRIDRSHCOMMAND= environment variable for the connection is now required. For more information, see Analytics Environment Client-Side Environment Variables. For more information, see [“Analytics Environment Client-Side Environment Variables” in SAS High-Performance Analytics Infrastructure: Installation and Configuration Guide](#).

SAS High-Performance Analytics Infrastructure 3.9 shipped in August 2020.

SAS High-Performance Analytics Infrastructure 3.8

SAS High-Performance Analytics Infrastructure 3.8 shipped in November 2018.

SAS High-Performance Analytics Infrastructure 3.7

SAS High-Performance Analytics Infrastructure 3.7 shipped in September 2017.

This release includes the following changes and enhancements:

- There is a new SAS Plug-in for Hadoop installation. The script automates tasks that in the past required manual steps.
- You can now use separate networks for internal and external communication.

For more information about changes from the previous release, see [SAS High-Performance Analytics Infrastructure](#) in *SAS Guide to Software Updates and Product Changes*.

SAS High-Performance Analytics Infrastructure 3.1

In release 3.1, the SAS High-Performance Analytics environment supports a remote parallel connection with MapR.

SAS High-Performance Analytics Infrastructure 2.94

The SAS High-Performance Analytics 2.94 environment supports reading and writing files by using AES encryption with 256-bit keys.

SAS High-Performance Analytics Infrastructure 2.91

SAS High-Performance Analytics Infrastructure 2.91 includes a new environment variable that helps you decide how much memory to request. During installation, you can now specify whether the SAS High-Performance Analytics environment reads and writes MapR data directly. Finally, enhancements have been made to the prompts in the installation script for the SAS High-Performance of Hadoop.

SAS High-Performance Analytics Infrastructure 2.8

In this release, the SAS High-Performance Deployment of Hadoop has been upgraded to Apache Hadoop version 2.4.

The SAS High-Performance Analytics environment now supports Cloudera CDH 5 and IBM BigInsights as co-located data sources. The environment can also read data from SAP HANA in parallel. This environment also now includes a resource management template and support for YARN.

SAS High-Performance Analytics Infrastructure 2.4

In SAS High-Performance Computing Management Console 2.4, you can use the RPM installer to install the console into any directory that contains the `-prefix` option. SAS High-Performance Computing Management Console 2.4 also includes a tarball installer. Use this tarball installer when a non-RPM installer is desired or the RPM version on the machine is not compatible with the console.

In the SAS High-Performance Analytics environment, a new installation script supports the new word cloud feature in SAS Visual Analytics. Also, the simultaneous utilities commands (`simcp` and `simsh`) are installed with the SAS High-Performance Analytics environment.

SAS High-Performance Analytics Infrastructure 2.1

SAS High-Performance Analytics Infrastructure 2.1 supports Kerberos. This release also provides a way to configure SAS High-Performance Deployment of Hadoop with multiple data devices. Finally, SAS supplies a security wrapper that you can use to limit the use of `sudo` commands to specific directories.

SAS High-Performance Computing Management Console

About SAS High-Performance Computing Management Console

The console is a web application that is used by system administrators to manage high-performance computing environments that use SAS software. Maintaining high-performance computing (HPC) environments is challenging because of the large number of machines that are used in the distributed computing environment. The console eases this challenge by propagating changes, such as adding user IDs, to all the machines in the environment.

SAS High-Performance Computing Management Console 2.4

The installation process for the console is enhanced to support a relocatable RPM so that you can install the console in any directory that you choose. The console can also be installed from a tarball (TAR file). This installation method also enables you to install the console in any directory that you choose.

Other than the enhancements to the installation process, the console has no other customer-visible features for the 2.4 release.

SAS High-Performance Computing Management Console 2.1

The console is enhanced to support machine groups. It is now possible to perform operations on groups of machines rather than all of the machines in the SAS High-Performance Analytics environment. The simultaneous copy (`simcp`) command is enhanced to support return codes. Return codes can be used to provide error checking in scripts.

SAS LASR Analytic Server

SAS LASR Analytic Server 2.83

SAS LASR Analytic Server 2.83 (August 2020) includes these changes:

- The PROC LASR documentation is updated to indicate that the IMSTAT procedure is used to set the CONCURRENT value for a distributed server. You must use the SERVERPARM statement with the IMSTAT procedure for a distributed server.
- The TAG= option is added to the LASR procedure. When you load data and specify the ADD and DATA= options, you can also specify a TAG= option that sets the server tag for the in-memory table.
- For a distributed server, you can enable an option in the resource settings file that makes the server less vulnerable to failures introduced by network port scanning software.

For more information, see the product documentation page for [SAS LASR Analytic Server](#) and the software product page for [SAS Visual Analytics](#).

SAS LASR Analytic Server 2.82

SAS LASR Analytic Server 2.82 (November 2018) includes these changes:

- The TAG= option is added to the LASR procedure. When you load data and specify the ADD and DATA= options, you can also specify a TAG= option that sets the server tag for the in-memory table.
- For a distributed server, you can enable an option in the resources.settings that makes the server less vulnerable to failures introduced by network port scanning software. For more information, see Resource Management for the Analytics Environment in *SAS High-Performance Analytics Infrastructure: Installation and Configuration Guide*.

SAS LASR Analytic Server 2.81

SAS LASR Analytic Server 2.81 (September 2017) includes these changes:

- Distributed servers can use separate networks for internal and external communication. This enhancement is provided by the SAS High-Performance Analytics Infrastructure that is used by the server.
- The IMSTAT procedure is enhanced to provide error messages when unsupported data set options are specified.

SAS LASR Analytic Server 2.8

SAS LASR Analytic Server 2.8 (November 2016) includes these changes:

- The RECOMMEND procedure is enhanced to support a SIGNER= statement option.
- A FORCESIGNER= option is added to PROC LASR and the SAS LASR Analytic Server engine LIBNAME statement.
- The SAS Plug-ins for Hadoop replace the delivery of the SAS High-Performance Deployment for Hadoop.

SAS LASR Analytic Server 2.7

SAS LASR Analytic Server 2.7 (March 2016) is enhanced to support additional languages for text analytics. The TEXTPARSE statement in the IMSTAT procedure is enhanced to support a LANGUAGE= option.

SAS LASR Analytic Server 2.6

SAS LASR Analytic Server 2.6 (May 2015) includes these changes:

- Encryption for SASHDAT tables.
- Enhancements to the IMSTAT procedure.
 - The HYPERGROUP statement can perform a number of analytics on data interpreted as a graph (vertices and edges). Features include several forms of structural analysis, the calculation of vertex centrality measures, and layout in 2-D or 3-D space.
 - The TRANSFORM statement can perform a variety of analytic data preparation tasks. The features include imputation, outlier treatment, functional transformation, binning, and output.
- Enhancement to distributed servers for high-volume access to smaller tables.
- Support for the MapR Distribution for Apache Hadoop.
- Support for Teradata with SAS In-Memory Statistics.

SAS LASR Analytic Server 2.5

SAS LASR Analytic Server 2.5 (November 2014) includes many updates, including the following:

- The server has two automatic tables that you can use to monitor server and table memory use. The two tables are named `_T_LASRMEMORY` and `_T_TABLEMEMORY`. The tables are automatically available in a SAS LASR Analytic Server library.
- The IMSTAT procedure is enhanced as follows:
 - The AGGREGATE statement is enhanced to support the `KEEPRECORD` option and the `KEEP=` option. The `KEEPRECORD` option is used to add an aggregated value for each input observation by aggregating the input observations with `ID=` values that are specified in the `INTERVAL=` option and the `WINDOWINT=` option. The `KEEP=` option is used to transfer variables from the active table to the ODS table output or temporary table.
 - The NEURAL statement is added to the IMSTAT procedure. The statement is used to train feed-forward artificial neural networks (ANN). The statement can also use the trained networks to score data sets.
 - The SAVE statement is enhanced to support a CSV option. This option enables saving in-memory tables to HDFS in comma-separated value format.
 - The SERVERPARM statement is enhanced to support the `TABLECEILING` option. This option enables an administrator to set a soft limit for memory use by tables.
 - The analytic statements that support generating SAS DATA step code with a `CODE=` option are enhanced. If the active table that is analyzed includes columns with special characters or international characters that require the name literal syntax for a column such as `'profit (%)'n`, then the generated code also uses the name literal syntax. The enhancement applies to the following statements:
 - CLUSTER

- DECISIONTREE
- GENMODEL
- GLM
- LOGISTIC
- NEURAL
- RANDOMWOODS

SAS LASR Analytic Server 2.4

SAS LASR Analytic Server 2.4 (August 2014) includes many updates, including the following:

- The server supports compressed in-memory tables. The SAS Data in HDFS engine also supports adding tables to HDFS in compressed form.
- The IMSTAT procedure is enhanced as follows:
 - The AGGREGATE statement is new. It is used to aggregate values of one or more variables. Many aggregation methods are available, including quartiles and distinct counts.
 - The FORECAST statement is enhanced to support goal-seeking analysis.
 - The DROPCOLUMN statement is added to remove a column that was added with the COMPUTE statement.
- The RECOMMEND procedure is enhanced to support storing recommendations in a temporary in-memory table. The procedure is also enhanced to support reading transaction data from an in-memory table. This can be used for the ARM method to recommend new items based on recent activities.

SAS LASR Analytic Server 2.3

SAS LASR Analytic Server 2.3 (March 2014) includes many updates, including the following:

- The new RECOMMEND procedure enables you to develop a recommender system. A common goal for a recommender system is to make personalized recommendations.
- The IMSTAT procedure is enhanced to enable in-memory statistical programming. The procedure statements that enable statistical programming are licensed separately from the statements for data and server management. SAS In-Memory Statistics for Hadoop is an offering that includes the statistical statements.
- The TEXTPARSE statement is added to the IMSTAT procedure to support in-memory text analysis. This statement is licensed separately from the data and server management statements.

SAS LASR Analytic Server 2.1 and 2.2

SAS LASR Analytic Server functions as an analytic platform, providing speedy, secure, multi-user access to in-memory data. For smaller data sets, the server can be deployed on a single machine. For larger data volumes, the server can be deployed on a distributed computing environment.

In SAS LASR Analytic Server 2.1 (July 2013), the server is enhanced to offer administrators controls for enforcing memory utilization limits for distributed deployments. The IMSTAT procedure is enhanced to enable administrators to manage in-memory tables.

In SAS LASR Analytic Server 2.2 (December 2013), the IMSTAT procedure is enhanced to support joining in-memory tables in a simple star schema and appending the entire in-memory tables. The DATA step is enhanced to support running in-memory for scoring.

Chapter 5

SAS Business Intelligence Products

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SAS Add-In for Microsoft Office

SAS Add-In 8.6 for Microsoft Office

SAS Add-In 8.6 for Microsoft Office shipped in June 2025 and supports SAS 9.4, 9.3, and 9.2. This release supports Microsoft Office 2024. It also supports the SAS Viya platform. This release includes bug fixes and recent hot fixes.

For more information about changes from the previous release, see [“SAS Add-In for Microsoft Office”](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Add-In 8.5 for Microsoft Office

SAS Add-In 8.5 for Microsoft Office shipped in December 2024 and supports SAS 9.4, 9.3, and 9.2. This release supports Microsoft Office 2024. It also supports the SAS Viya platform. This release includes bug fixes and recent hot fixes.

SAS Add-In 8.4 for Microsoft Office

SAS Add-In 8.4 for Microsoft Office shipped in March 2024 and supports SAS 9.4, 9.3, and 9.2. This release supports Microsoft Office 2024. It also supports the SAS Viya platform. This release includes bug fixes and recent hot fixes.

SAS Add-In 8.3 for Microsoft Office

SAS Add-In 8.3 for Microsoft Office shipped in August 2020 and supports SAS 9.4, 9.3, and 9.2. It also supports SAS Viya 3.4 and 3.5. This release includes bug fixes and recent hot fixes.

SAS Add-In 8.32 for Microsoft Office shipped in January 2023 and runs on SAS 9.4M8.

SAS Add-In 8.2 for Microsoft Office

SAS Add-In 8.2 for Microsoft Office shipped in November 2019 and supports SAS 9.4, 9.3, and 9.2. It also supports SAS Viya 3.4 and 3.5. Here are some of the new features in this release:

- integration with SAS Visual Analytics 8.5 and earlier releases
- ability to connect directly to workspace servers, including the workspace server on SAS Viya
- accessibility improvements such as the support for high contrast

For more information, see [What’s New in SAS Add-In 8, 8.1, and 8.2 for Microsoft Office](#).

SAS Add-In 8.1 for Microsoft Office

SAS Add-In 8.1 for Microsoft Office shipped in June 2019 and supports SAS 9.4, 9.3, and 9.2. In this release, if your site does not have web access, you have the option of

downloading the PDF files to your local computer or network and accessing them locally.

For more information about this release, see [What's New in SAS Add-In 8.1 for Microsoft Office](#).

SAS Add-In 8 for Microsoft Office

SAS Add-In 8 for Microsoft Office shipped in June 2018 and supports SAS 9.4, 9.3, and 9.2. This release includes a new user interface. From the SAS panel, you can quickly and easily access reports, data sources, SAS tasks, any generated results, and SAS programs. The SAS tab in the Ribbon has also been simplified. In addition, this release provides integration with SAS Visual Analytics 8.3 and earlier releases.

For more information about this release, see [What's New in SAS Add-In 8 for Microsoft Office](#).

SAS Add-In 7.15 for Microsoft Office

SAS Add-In 7.15 for Microsoft Office shipped in September 2017 and supports SAS 9.4, 9.3, and 9.2. This release provides integration with SAS Viya. SAS Add-In for Microsoft Office enables you to run SAS Viya tasks from SAS Studio. You can also submit Cloud Analytic Services (CAS) code from the program window. Starting in this release, you can also open data sets that are saved as a server file.

SAS Add-In 7.14 for Microsoft Office

SAS Add-In 7.14 for Microsoft Office shipped in April 2017. This release provides integration with SAS Visual Analytics 7.4 and 8.1. A new connections dialog box makes it easier for you to select an active SAS 9 metadata profile and to add connections to SAS Visual Analytics servers.

SAS Add-In 7.13 for Microsoft Office

SAS Add-In 7.13 for Microsoft Office shipped in November 2016 and includes these new features:

- You can submit SAS code directly from the Office document by using the SAS Program Editor. Using the Program Editor, you can define a LIBNAME, write a program, submit the code, and manage the results within the Microsoft Office document. You can also open an existing SAS program. When you run the SAS program, the results are added to the specified location in the Office document.
- You can upload your existing SAS 9.4 data to SAS Cloud Analytic Services (CAS) by using the new Upload to CAS task.
- Many accessibility enhancements improve the experience for users who depend on screen readers such as JAWS.
- Server file navigation now defaults to your **Documents** folder on Windows servers. In addition, the file navigation now contains folder shortcuts.

This release also includes several minor enhancements to the user interface. In the Manage Content dialog box, you can now delete multiple items at one time. In the Add Profile dialog box, you can specify whether to automatically connect to the server after you create or modify a profile. When you refresh SAS Visual Analytics reports that

contain tables with additional rows and columns, these new rows and columns automatically inherit the Microsoft Excel format, alignment, and conditional formatting.

SAS Add-In 7.12 for Microsoft Office

SAS Add-In 7.12 for Microsoft Office adds support for Microsoft Office 2016. Starting with this release, SAS provides two add-ins for Microsoft Office: SAS Add-In for Microsoft Office and SAS Visual Analytics Add-In for Office. SAS Visual Analytics Add-In for Office enables you to open, interact, and refresh SAS Visual Analytics reports in Microsoft Excel and Microsoft PowerPoint. SAS Visual Analytics Add-In for Office is not available in Microsoft Word or Microsoft Outlook. This add-in works only with SAS Visual Analytics content.

This release of SAS Add-In for Microsoft Office also provides additional integration with SAS Visual Analytics 7.3.

- You can now refresh any SAS Visual Analytics reports that you send from SAS Enterprise Guide to a Microsoft Office document.
- You can specify whether to save the full report state within the Office document.
- Any exported data is automatically refreshed when the SAS Visual Analytics report is refreshed.
- When you refresh a SAS Visual Analytics report, you can reset all interactions so that the refreshed report displays the default values.

SAS Add-In 7.11 for Microsoft Office

SAS Add-In 7.11 for Microsoft Office shipped in May 2015. This release provides additional support for SAS Visual Analytics to include the 7.2 and 7.3 releases. Here are some of the new features and enhancements for this release:

- Better integration with SAS Visual Analytics results in the ability to remove and find report elements in your Microsoft Office document.
- Using the SAS add-in in Microsoft Outlook, you can export a SAS Visual Analytics report to PDF.
- If your SAS Visual Analytics report contains sparklines, these lines are available when you open the report in Microsoft Excel.
- You can enable SAS Add-In for Microsoft Office to automatically check for software updates.

SAS Add-In 7.1 for Microsoft Office

SAS Add-In 7.1 for Microsoft Office runs on Microsoft Office 2013, 2010, and 2007, and can be run with a SAS 9.2, a SAS 9.3, or a SAS 9.4 server.

A key feature in this release is integration with SAS Visual Analytics 6.2, 6.3, 6.4, and 7.1.

- Starting with this release, SAS Add-In for Microsoft Office supports SAS Visual Analytics reports that enable you to brush, filter, drill, expand, and collapse elements. You can interact with this functionality in Microsoft Excel, Microsoft Word, Microsoft PowerPoint, and Microsoft Outlook.

- You can preview the contents of a SAS Visual Analytics report before inserting any objects into your Microsoft Office document. You can select the specific objects to include, or you can insert the entire report.
- You can specify whether to display any specified filters before an object in a SAS Visual Analytics report. If you are opening a crosstabulation report, the filter also includes any breadcrumbs.
- You can also view and add comments to a SAS Visual Analytics report. You can view the rules for conditional highlighting. (These rules were defined when the report was created in SAS Visual Analytics.) You can also view the aggregated data that was used to create a graph in a SAS Visual Analytics report.

Another key feature in this release is the new task interface and integration of tasks that are shipped with SAS Studio. The redesigned task interface displays your recent and favorite tasks. Categories, filters, and searching functionality enable you to quickly find the task that you need. From this interface, you can access SAS Add-In for Microsoft Office tasks and SAS Studio tasks.

Additional new features include the availability of SAS Central in Microsoft Excel, Microsoft Word, Microsoft PowerPoint, and Microsoft Outlook. Using SAS Central (a view similar to the Hub in SAS Visual Analytics), you can easily access your SAS Visual Analytics reports and SAS Stored Processes.

Also, SAS Add-In 7.1 for Microsoft Office includes the new Upload to LASR task that enables you to upload data to SAS LASR Analytic Server so that you can access the data in SAS Visual Analytics.

SAS Add-In 6.1 for Microsoft Office

SAS Add-In 6.1 for Microsoft Office provides integration with SAS Visual Analytics 6.1. (SAS Add-In 6.1M1 for Microsoft Office provides integration with SAS Visual Analytics 6.2 and 6.3.) Because of this integration, you can use the SAS add-in to open and refresh reports that were created using SAS Visual Analytics Designer and SAS Visual Analytics Explorer. You can access and manage favorites that were created in SAS Visual Analytics. In Microsoft Outlook, the SAS add-in also provides a view similar to the Hub in SAS Visual Analytics. This view enables you to easily access and comment on your favorite and recently opened SAS Visual Analytics reports.

A new stand-alone installer is also available for SAS Add-In for Microsoft Office. The new installer is much smaller, thereby making it easier to install over a distributed deployment, especially using provisioning tools such as Microsoft System Center Configuration Manager (SCCM). For more information, see *SAS Deployment Wizard and SAS Deployment Manager 9.4: User's Guide* at <http://support.sas.com/deploywizug94.html>.

SAS BI Dashboard 4.41

Important: SAS BI Dashboard 4.41 designer has been discontinued. Users can continue to view existing dashboards and indicators that were created in SAS BI Dashboard designer with the SAS BI Dashboard 4.41 viewer or SAS BI Dashboard 4.41 portlets.

The SAS BI Dashboard 4.41 viewer user interface has been rewritten in HTML5.

In addition, SAS BI Dashboard 4.41 portlets can be seen in SAS Information Delivery Portal 4.4, which has also been rewritten in HTML5. SAS BI Dashboard 4.41 continues

to use the Adobe Flash Player to provide interactive user interfaces. Adobe announced that it intends to end support for Flash technology and will stop updating and distributing the Flash Player at the end of 2020. Browser vendors disabled Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

In addition, Internet Explorer 11 is not a supported browser for SAS BI Dashboard 4.41.

For more information, see “Exceptions in SAS BI Dashboard 4.41 Viewer” in *SAS BI Dashboard: User’s Guide*.

SAS Enterprise Guide

SAS Enterprise Guide 8.6

SAS Enterprise Guide 8.6 shipped in June 2025 and is supported on SAS 9.4, 9.3, and 9.2. It also supports SAS Viya 3.4, 3.5, and 4.

For more information about changes from the previous release, see [SAS Enterprise Guide](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Enterprise Guide 8.5

SAS Enterprise Guide 8.5 shipped in December 2024 and is supported on SAS 9.4, 9.3, and 9.2. It also supports SAS Viya 3.4, 3.5, and 4.

SAS Enterprise Guide 8.4

SAS Enterprise Guide 8.4 shipped in March 2024 and is supported on SAS 9.4, 9.3, and 9.2. It also supports SAS Viya 3.4, 3.5, and 4.

SAS Enterprise Guide 8.3

SAS Enterprise Guide 8.3 shipped in August 2020 and is supported on SAS 9.4, 9.3, and 9.2. It also supports SAS Viya 3.4 and 3.5. This release contains bug fixes and hot fixes.

SAS Enterprise Guide 8.31 shipped in August 2020 and runs on SAS 9.4M7. SAS Enterprise Guide 8.32 shipped in January 2023 and runs on SAS 9.4M8.

SAS Enterprise Guide 8.2

SAS Enterprise Guide 8.2 shipped in November 2019 and is supported on SAS 9.4, 9.3, and 9.2. It also supports SAS Viya 3.4 and 3.5.

SAS Enterprise Guide 8.2 includes these new features and enhancements:

- more robust integration with Git, including cloning, pulling, pushing, and branching
- ability to access and run tasks from SAS Studio 5.2
- support for connecting directly to a workspace server, including the workspace server on SAS Viya
- ability to manage keyboard shortcuts

For more information, see [What’s New in SAS Enterprise Guide 8.2](#).

SAS Enterprise Guide 8.1

SAS Enterprise Guide 8.1 shipped in June 2019 and is supported on SAS 9.4, 9.3, and 9.2. SAS Enterprise Guide 8.1 has been redesigned to include a modern and flexible user interface with tab-based organization of content and flexible window management.

SAS Enterprise Guide 8.1 includes these new features and enhancements:

- an updated user interface. The new SAS Enterprise Guide user interface provides a more flexible space in which to write programs, build process flows, as well as access and browse your files and project. The navigation area includes the panes that you expect to see such as Project, Tasks, Servers, SAS Folders, and the Prompt Manager. There is also a new Open Items pane that enables you to view a list of all your currently open items.
- optional use of projects. SAS Enterprise Guide no longer requires you to use a project to manage all of your data, tasks, programs, and results. You can still use projects, if you like, or you can use SAS Enterprise Guide as a tool to open and work on individual files.
- new appearance theme. SAS Enterprise Guide 8.1 enables you to choose between a light theme (Illuminate) and a dark theme (Ignite). SAS Enterprise Guide also honors the Windows High Contrast themes.
- a new documentation interface. All SAS Enterprise Guide documentation is now available in Help Center on support.sas.com. Sites without web access can download the documentation as PDF files and create a local help center for their site.

For more information about this release, see [What's New in SAS Enterprise Guide 8.1](#).

SAS Enterprise Guide 7.15

SAS Enterprise Guide 7.15 shipped in September 2017 and is supported on SAS 9.4, 9.3, and 9.2.

SAS Enterprise Guide 7.15 includes these new features:

- integration with SAS Viya. SAS Enterprise Guide enables you to run SAS Viya tasks from SAS Studio. You can also submit Cloud Analytic Services (CAS) code.
- integration with SAS Visual Analytics 7.4.
- a new option that enables you to create accessible PDF files.
- the ability to open script files in the text editor.
- support for project log operations (such as clear, export, and send via email) using automation.

SAS Enterprise Guide 7.13

SAS Enterprise Guide 7.13 shipped in November 2016 and is supported on SAS 9.4, 9.3, and 9.2.

SAS Enterprise Guide 7.13 includes these new features:

- The new DATA Step Debugger is a tool that enables you to find logic errors in a DATA step program. With the DATA Step Debugger, you can watch the variable

values in a program change as the program runs. You can execute the program line by line, and you can also set specific breakpoints in the program.

- You can now transfer files from your local computer to a SAS server or from a SAS server to your local computer by using the Copy Files task. The Copy Files task works in a similar way to an FTP application. However, this task relies on the SAS protocols to complete the file transfers and does not require an FTP server.
- You can upload your existing SAS 9.4 data to SAS Cloud Analytic Services (CAS) by using the new Upload to CAS task.
- Starting with this release, the default graph format is PNG. Use the new Graph Format for Built-in Graph Tasks option to set the default format for the graph tasks, such as Bar Chart, Line Chart, and Pie Chart.
- You can specify whether to continue executing a process flow if an error is encountered.
- Server file navigation now defaults to your **Documents** folder on Windows servers. In addition, the file navigation now contains folder shortcuts.

SAS Enterprise Guide 7.12

SAS Enterprise Guide 7.12 shipped in February 2016. Here are some of the new features and enhancements:

- The save functionality has been updated to include a new Save All option. The default behavior of the save option now saves the active item in the project.
- You can generate results in Microsoft Excel and Microsoft PowerPoint formats and specify options for those formats.
- You can zoom the contents of items in the workspace, such as programs, data, HTML results, and process flows.
- You can open externally referenced files in their default associated applications.
- You can open the file location of externally referenced files in Microsoft Windows Explorer.

SAS Enterprise Guide 7.11

SAS Enterprise Guide 7.11 shipped in May 2015. This release provides additional support for SAS Visual Analytics by including the 7.2 and 7.3 releases. Here are some of the new features and enhancements in this release:

- You can quickly filter your data by using a WHERE expression.
- You can enable SAS Enterprise Guide to automatically check for software updates.
- You can export a SAS Visual Analytics report to PDF.
- You can copy and paste prompts within the same project or into another SAS Enterprise Guide project.
- You can add data and reports to your list of favorites.
- You can create case-insensitive filters in the Query Builder or when you filter and sort your data by using the Filter and Sort task.

SAS Enterprise Guide 7.1

SAS Enterprise Guide 7.1 is supported on SAS 9.4, 9.3, and 9.2. Some of the new features and enhancements include the following:

- SAS Enterprise Guide 7.1 supports integration with SAS Visual Analytics 6.2, 6.3, 6.4, and 7.1.
- The new program history feature enables you to track the changes that you and other programmers make to programs in SAS Enterprise Guide.
- You can search your project for text that you specify.
- In the Tasks pane, you can now search for a task by name, SAS procedure, or keyword. You can filter the list of tasks by predefined categories or by SAS procedure. You can also quickly access any tasks that you recently opened or that you marked as favorites.
- If you have SAS Studio and Microsoft Internet Explorer 11 (or later) installed on your machine, you can also run SAS Studio tasks in SAS Enterprise Guide.
- SAS Enterprise Guide 7.1 includes the new Upload to LASR task that enables you to upload data to SAS LASR Analytic Server so that you can access the data in SAS Visual Analytics.
- The new Project Log Summary window is displayed with the Project Log window and includes an aggregated list of all the messages that have been generated in the project log.
- The SAS Macro Variable Viewer enables you to view all of the SAS macro variables that are defined in your current SAS session. You can use this window to see changes to the macro variables while you work in SAS Enterprise Guide and to quickly evaluate a macro expression.
- The SAS System Options Viewer enables you to view all of the SAS system options that are defined for your current SAS session.
- Smart highlighting is available in the Program Editor. By default, when you select or search for a word in the Program Editor, all other occurrences of that word are also highlighted.
- You can now open the Query Builder with multiple tables selected. The Query Builder automatically joins the tables if the tables include columns with matching names and data types.
- You can now copy and paste process flows.

SAS Enterprise Guide 6.1

SAS Enterprise Guide 6.1 is supported on SAS 9.4, 9.3, and 9.2. Enhancements for this release include the following:

- integration with SAS high-performance tools with the addition of the High-Performance Logistic and High-Performance Linear Regression tasks.
- improved programmer productivity with the new Log Summary window, which lists all the errors, warnings, and notes that were generated when the program ran, as well as related line numbers and a sample of the affected code.
- the ability to analyze a SAS program to determine whether there are any possible internationalization issues. Internationalization is the process by which a program is

optimized so that it can be adapted to any language and region without being rewritten. When you analyze a program for internationalization, SAS Enterprise Guide lists the lines of code that might be affected and suggests substitutions when possible.

- the ability to use notes to add information to a process flow or to specific objects in the process flow.
- administration enhancements, such as the new stand-alone installer and application streaming support. The new installer is much smaller, thereby making it easier to install over a distributed deployment, especially using provisioning tools such as System Center Configuration Manager (SCCM). For more information, see *SAS Deployment Wizard and SAS Deployment Manager 9.4: User's Guide* at <http://support.sas.com/deploywizug94.html>.

SAS Enterprise Guide 6.1M1 (which shipped in December 2013) provides integration with SAS Visual Analytics 6.2 and 6.3. Because of this integration, you can open and refresh reports that were created using SAS Visual Analytics Designer and SAS Visual Analytics Explorer. You can also save a SAS Visual Analytics report with your SAS Enterprise Guide project.

SAS Visual Analytics App

About the SAS Visual Analytics App

SAS SDK for iOS and SAS SDK for Android are available from developer.sas.com to allow customers to create custom mobile apps that embed SAS Visual Analytics content.

You can use the free SAS Visual Analytics Apps (previously called SAS Mobile BI) to view SAS Visual Analytics reports. The app is supported on these devices:

- Apple iPhones and iPads
- Android smartphones and tablets
- PCs and tablets running Microsoft Windows 10

For more information, see the [SAS Visual Analytics Apps documentation](#).

SAS Visual Analytics App 8.31 for iPad and iPhone

SAS Visual Analytics App 8.31 for iPad and iPhone (August 2018) provides an enhancement to the tray feature in the report viewer when used on iPads.

You can download the free iPad and iPhone app from [Apple iTunes store](#).

SAS Visual Analytics App 8.3 for Android

SAS Visual Analytics App 8.3 for Android (July 2018) provides these updates:

- new tray feature in the report viewer replaces the context menus and Information view
- new magnifier tool makes it easy to view data in a report
- new sample reports and sample reports server
- support for SAS Visual Analytics 8.3, 8.2, 8.1, 7.4, and 7.3 servers

You can download the free Android app from [Google Play](#).

SAS Visual Analytics App 8.3 for Windows 10

SAS Visual Analytics App 8.3 for Windows 10 (July 2018) provides these updates:

- new sample reports and sample reports server
- support for SAS Visual Analytics 8.2, 8.1, 7.4, and 7.3 servers

You can download the free Windows app from [Microsoft Windows store](#).

SAS 9.4 OLAP Server

The SAS 9.4 OLAP Server has several new features for 9.4:

- new OLAPCONTENTS procedure for generating reports of OLAP cube information
- new OLAPCONFIG method for setting SAS OLAP Server options in batch mode
- updated OLAPOPERATE procedure
- new MDX Case statement
- new VISUALTOTALS_BEHAVIOR option for calculated measures

In addition, properties for multilingual cubes are automatically updated in multiple languages when reports are generated. And, the SQLRC macro can be used with the SQL pass-through facility for OLAP.

In SAS 9.4M1 OLAP Server, these new features and enhancements were added:

- A new LOGICALSERVERNAME option was added to the OLAPOPERATE procedure.
- You can enable execution of user-defined (FORMAT procedure style) formats in the SPD Server. For more information, see *SAS 9.4 OLAP Server: User's Guide*.
- A new INSTR MDX function was added. For more information, see [SAS OLAP Server: MDX Guide](#).
- The LOCKDOWN option and statement are supported by the SAS OLAP Server.

In SAS 9.4M3, the *SAS 9.4 OLAP Server: User's Guide* includes information about SAS OLAP variations, MDX function behavior and ragged or unbalanced hierarchies, and the new THREADPOOLQRY option.

- For more information about this release, see [What's New in SAS 9.4 OLAP Server](#) in *SAS 9.4 OLAP Server: User's Guide*.
- For more information about changes from the previous release, see [SAS OLAP Server](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Web Parts 6.1 for Microsoft SharePoint

Note: Starting with SAS 9.4M8, SAS Web Parts for Microsoft SharePoint is a retired product. If you order SAS 9.4M8, SAS Web Parts for Microsoft SharePoint is not included in that order. A best practice is to unconfigure retired SAS products before

you upgrade and to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

Web Parts are an integrated set of controls that enable you to provide customized, dynamic content on your website. By using Microsoft Windows SharePoint Services, you can add SAS content directly to your website.

In SAS Web Parts 6.1 for Microsoft SharePoint, administrators can create connection profiles for the SharePoint users at your site. Two SAS Web Parts are now available:

- The SAS Central Web Part lists any SAS Visual Analytics reports that you recently opened and any favorites that you have created. It also enables you to open additional reports. These reports open in a new web browser.

Note: The SAS Central Web Part is available only if your site licenses SAS Visual Analytics.

- The SAS Content Viewer Web Part enables you to add SAS content such as reports, the results from a stored process, or a dashboard to your SharePoint site.

For more information about changes from the previous release, see [SAS Web Parts for Microsoft SharePoint](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Web Report Studio 4.4

Note: Starting with SAS 9.4M8, SAS Web Report Viewer is a retired feature. If you order SAS 9.4M8, SAS Web Viewer is not included in that order. A best practice is to unconfigure retired SAS products and features before you upgrade and to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Web Report Studio 4.4 provides enhanced totals and subtotals. It also supports several additional browsers.

For more information about changes from the previous release, see [SAS Web Report Studio](#) in *SAS Guide to Software Updates and Product Changes*.

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Data Management and Integration

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SAS Data Management Standard

Starting with SAS 9.4, the SAS Data Management Standard 2.41 (or later) offering replaces the SAS Enterprise Data Integration Server offering. The SAS Data Management Standard offering includes a mix of DataFlux products, such as DataFlux Data Management Studio, DataFlux Data Management Server, and DataFlux Authentication Server, as well as SAS products, such as SAS Data Integration Studio and SAS/ACCESS. For a list of the products in this offering and its Advanced version, see the software product page for [SAS Data Management](#).

DataFlux Authentication Server

Support for DataFlux Authentication Server

Note: Starting with SAS 9.4M8, DataFlux Authentication Server is a retired product. If you order SAS 9.4M8, these products are not included in that order. A best practice is to unconfigure retired SAS products before you upgrade and to uninstall them after you upgrade. For more information, see “[Unconfiguring and Uninstalling Retired Products](#)” in *SAS Guide to Software Updates and Product Changes*.

As of SAS 9.4M7 (August 2020), DataFlux Authentication Server is no longer available with SAS offerings. For more information, see “[DataFlux Authentication Server](#)” in *SAS Guide to Software Updates and Product Changes*.

DataFlux Authentication Server 4.1

The installation process for the UNIX and Linux operating environments now automates the configuration process for host authentication. In earlier releases, this configuration process occurred after installation. After installation, authentication can be reconfigured in any operating environment.

The configuration option AdminLoginManagementPolicy now defines an administrator’s ability to add, modify, or delete users with the ASBATCH utility.

Starting with the first maintenance release, DataFlux Authentication Server 4.1 is required only by DataFlux Web Studio and DataFlux Web Studio Server.

DataFlux Authentication Server 4.1: Administrator’s Guide, Second Edition now describes how to display user names in log files, rather than login names..

See these resources:

- For more information, see the product documentation page for [DataFlux Authentication Server](#)
- For more information about changes from the previous release, see [DataFlux Authentication Server](#)

DataFlux Authentication Server 3.2

DataFlux Authentication Server supports authorization and authentication for the DataFlux Data Management products in certain SAS software offerings, such as the SAS Data Management offerings. Some components in the offerings are now configured by default to use a SAS Metadata Server instead of the Authentication Server. Other components, such as the optional SAS Federation Server, are required to use the DataFlux Authentication Server. For more information, see *DataFlux Authentication Server: Administrator's Guide*.

DataFlux Data Management Server

DataFlux Data Management Server 2.10

Support for OpenSSL 3.x

Starting in June of 2025, DataFlux Secure 2.10 includes the libraries that support OpenSSL 3.x. DataFlux Data Management Server 2.10 includes the gSOAP libraries that comply with OpenSSL 3.x. To enable the gSOAP libraries, see "Enable OpenSSL 3.x and gSOAP" in the *DataFlux Data Management Server 2.10: Administrator's Guide*.

End of Support for NCOA, CASS, SERP, and Geocode Data Packs

Support for NCOA, CASS, SERP, and Geocode Data Packs ended July 31, 2023. Jobs should be migrated to the Loqate data packs. For more information, see the *DataFlux Data Management Studio 2.10: User's Guide*.

DataFlux Data Management Server 2.9

DataFlux Data Management Server 2.9 runs on SAS 9.4M7. The August 2020 update for DataFlux Data Management Server 2.9 includes changes to remove references to discontinued applications, such as SAS Business Data Network, SAS Visual Process Orchestration, SAS Data Management Console, DataFlux Web Studio and Server, and DataFlux Authentication Server.

Here are some of the general enhancements in this release:

- To enhance testing, you can now generate profile data for each node that runs in a server job.
- To configure multiple server instances on a single host, separate SAS Home paths are required.
- The supported databases for data storage have been updated.

See these resources:

- For more information, see the software product page for [DataFlux Data Management Studio](#), [DataFlux Data Management Server](#), and [DataFlux Expression Language](#).
- For more information about changes from the previous release, see [DataFlux Data Management Server](#) in *SAS Guide to Software Updates and Product Changes*.

DataFlux Data Management Server 2.7

DataFlux Data Management Server 2.7 runs on SAS 9.4M3 and later releases.

Here are the primary enhancements in DataFlux Data Management Server 2.7:

- DataFlux Data Management Server 2.7 uses the SAS Metadata Server exclusively to support authentication and authorization. DataFlux Data Management Server 2.7 also includes support for accessing a clustered SAS Metadata Server.
- FIPS compliance for SOAP client connections is now available as a security enhancement for the DataFlux Data Management Server.
- SAS Data Management Server 2.7 also allows web service calls through a REST API for batch jobs, real-time data services, and process services.

DataFlux Data Management Server 2.6

DataFlux Data Management Server 2.6 runs on SAS 9.4M1 and later releases.

Here are the primary enhancements in DataFlux Data Management Server 2.6:

- When you import objects that replace existing objects, you can now apply the permissions from the existing object to the new object.
- Objects, jobs, and services receive a default access control list (ACL) when they are added to the DataFlux Data Management Server. In the 2.6 release, the default ACL contains ALLOW or DENY permissions for lists of users and groups.
- To make batch and profile job logs more accessible to administrators and to the SAS Job Monitor, you can now specify a separate storage location for those log files.
- When you run jobs with the **dmpexec** command, you can now configure the log files that are generated by those job runs.
- You can now enable the capture of log data for the SOAP packets that are received and transmitted by the DataFlux Data Management Server.
- You can now validate XML in output data from real-time services.

DataFlux Data Management Server 2.5

DataFlux Data Management Server runs jobs and real-time services in response to requests that are submitted by authorized SOAP/HTTP clients. DataFlux Data Management Server 2.5 runs on SAS 9.4.

Here are the primary enhancements in DataFlux Data Management Server 2.5:

- The DataFlux Data Management Server has a new server configuration and security.
- The SAS Metadata Server is configured by default for security.
- The SAS Metadata Server provides configuration options when the server starts.

- SAS Job Monitor collects job status and statistics.

DataFlux Data Management Studio

DataFlux Data Management Studio 2.10

DataFlux Data Management Studio 2.10 supports OpenSSL 3.x cryptographic libraries and TLS 1.2 and TLS 1.3 protocols.

DataFlux Data Management Studio 2.9

DataFlux Data Management Studio 2.9 shipped in August 2020. Here are the main enhancements for DataFlux Data Management Studio 2.9:

- New databases for data storage have been added.
- DataFlux Web Studio is no longer available with SAS offerings as of SAS 9.4M7, due to the end-of-life for Adobe Flash. The latest SAS offerings include replacements for DataFlux Web Studio components that were to manage reference domains and to monitor the quality of data jobs. If you are upgrading to SAS 9.4M7, see [“Support for DataFlux Web Studio and Server” in SAS Guide to Software Updates and Product Changes](#) for more information.
- These United Kingdom specific output fields have been added to the Loqate node: AddressKey, DPS, OrganizationKey, TradCountry, and TradNumber. The ENHANCED advanced property has also been added to the node.
- DataFlux Data Management Studio 2.9 requires Java 8.

Note: As of January 2022, the Address Update functionality (which was available as a separate download) is no longer available from SAS. Starting in August 2023, SAS will no longer be listed by the USPS as an NCOA (National Change of Address) provider on [NCOALink Certified Software Developers](#). For more information, see [“Address Update” in DataFlux Data Management Server: Administrator’s Guide](#).

See these resources:

- For more information, see the software product page for [DataFlux Data Management Server](#).
- For more information about changes from the previous release, see [“DataFlux Data Management Studio” in SAS Guide to Software Updates and Product Changes](#).

DataFlux Data Management Studio 2.7

Here are the main enhancements for DataFlux Data Management Studio 2.7:

- This release includes several enhancements for customizing quality knowledge bases. You can now copy and paste regular expressions in the Regex Library Edition. You can import word, category, and likelihood values from external files in the Vocabulary Editor. You can copy and paste rules and categories in the Grammar Editor.
- You must log on to a SAS Metadata Server when you need to access DataFlux Data Management Servers or SAS Federation Servers.

- Netezza 7.2.0.5 has been added to the list of supported databases for data storage in DataFlux Data Management Studio.

In the June 2017 release, additional databases are supported for data storage and DataFlux repositories.

DataFlux Data Management Studio 2.6

Here are the main enhancements for DataFlux Data Management Studio 2.6:

- enhanced interface for customizing quality knowledge bases
- new ODBC drivers for Apache Hive and Cloudera Impala
- changes to clustering
- support added for SAS Lineage Viewer
- support added for SAS Business Data Network

DataFlux Data Management Studio 2.5

Here are the main enhancements for DataFlux Data Management Studio 2.5:

- SAS Metadata Servers can now authenticate connections to DataFlux Data Management Servers.
- The job logs now provide run-time statistics for nodes within jobs.
- If your site has licensed SAS Environment Manager and SAS Job Monitor, then you can use a web browser to display run-time statistics for Data Management Studio jobs and the nodes within those jobs.

DataFlux Secure

DataFlux Secure 2.10

DataFlux Secure 2.10 runs on SAS 9.4M9 and later releases. DataFlux Secure 2.10 supports OpenSSL 3.x.

DataFlux Secure 2.7

DataFlux Secure 2.7 runs on SAS 9.4M3 and later releases.

DataFlux Secure now offers FIPS compliance for SOAP client connections in DataFlux Data Management Server and DataFlux Data Management Studio.

See these resources:

- For more information about this release, see *DataFlux Secure: Administrator's Guide* from the product documentation page for [DataFlux Secure](#).
- For more information about changes from the previous release, see [DataFlux Secure](#) in *SAS Guide to Software Updates and Product Changes*.

DataFlux Secure 2.5

DataFlux Secure enables the enhancement of security for components in certain SAS software offerings, such as the Data Management offerings. The DataFlux Secure software is now installed by default, in a disabled state, together with these components. You can enable enhanced encryption, SSL/TLS protection, and FIPS compliance on your platform components. Starting with the May 2014 release, the keyconfig utility is available to assist with the configuration of SSL on the SAS Federation Server Manager.

SAS Business Data Network

SAS Business Data Network 3.5

SAS Business Data Network 3.5 shipped in June 2025 and runs on SAS 9.4M9 and later. SAS Business Data Network has been updated to improve performance and stability.

For more information about changes from the previous release, see [SAS Business Data Network](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Business Data Network 3.4

SAS Business Data Network 3.4 shipped in January 2023 and runs on SAS 9.4M8 and later. SAS Business Data Network has been updated to improve performance and stability.

SAS Business Data Network 3.3

SAS Business Data Network 3.3 shipped in June 2019 and runs on SAS 9.4M6 and later.

Starting with this release, the user interface has been rewritten in HTML5. Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe has announced that it intends to end support for Flash technology and will stop updating and distributing the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

SAS Business Data Network 3.2

SAS Business Data Network 3.2 shipped in April 2017 and runs on SAS 9.4M4 and later.

Here are some of the new features and enhancements in this release:

- You can now create a snapshot to save a read-only view of your data.
- The SAS Business Data Network Application Programming Interface (API) has been approved for public distribution.
- In the SAS Lineage 3.2 main window, you select the object to open in SAS Business Data Network.
- You can now import terms from CSV files.
- You can publish import results to a relationships service.

- URL, Date, and RTF are new attributes that are available for term types.

For more information, see [What's New in SAS Business Data Network 3.2](#).

SAS Business Data Network 3.1

A business data term list is an authoritative vocabulary that promotes a common understanding between stakeholders in an organization. SAS Business Data Network 3.1 is an application that enables you to manage a business data term list. It supports a collaborative approach to managing the following information:

- Descriptions of business terms, including their requirements and attributes
- Related source data and reference data
- Contacts (such as technical owners, business owners, and interested parties)
- Relationships between terms and processes (such as Data Management Studio jobs, services, and business rules)

By linking terms to business rules and data monitoring processes, SAS Business Data Network provides a single entry point for all data consumers to better understand their data. Data stewards, IT staff, and enterprise architects can use the terms to promote a common vocabulary across projects and business units. Permissions can be set to allow only specific users to access and control the data in SAS Business Data Network.

SAS Data Loader

SAS 9.4M9 Requirement: Hadoop JAR and Configuration Files

For 9.4M9, the Hadoop JAR and configuration files must be copied to each client machine after SAS Data Loader for Hadoop is installed or redeployed. For more information, see [“Copy the Hadoop JAR and Configuration Files to Each SAS Client Machine”](#) in *SAS Data Loader for Hadoop: Installation and Configuration Guide*.

SAS 9.4M8 Retired Product: SAS Data Loader for Hadoop Spark Engine

Starting with SAS 9.4M8, SAS Data Loader for Hadoop Spark Engine is a retired product. If you order SAS 9.4M8, SAS Data Loader for Hadoop Spark Engine is not included in that order. A best practice is to unconfigure retired SAS products before you upgrade and to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Data Loader 3.1

SAS Data Loader 3.1 runs on SAS 9.4M4. SAS Data Loader 3.1M1 shipped in September 2017 and supports SAS 9.4M5.

Here are the main enhancements for this release:

- Multiuser web application is now based on the SAS Intelligence Architecture.
- Centralized administrative support now manages servers, access, directives, and QKB updates.

- New IT-friendly administrative deployment process uses SAS deployment tools.
- Additional connectivity options provide direct access to external data sources.
- Updated support enables the latest Hadoop technologies.
- Improved integration with SAS data management software enables remote directive execution.

For more information about changes from the previous release, see [SAS Data Loader](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Data Loader 2.4 for Hadoop

Here are the main enhancements for SAS Data Loader 2.4 for Hadoop:

- new trial version of SAS Data Loader for Hadoop is available.
- new Match-Merge Data directive enables you to combine columns from multiple source tables into a single target table. You can also merge data in specified columns when rows match in two or more source tables.
- new Chain Directives directive enables you to run two or more saved directives in series or in parallel.
- increased performance using Apache Spark and Cloudera Impala.
- support for the Hadoop distributions Pivotal HD and IBM Big Insights. New versions of Cloudera, Hortonworks, and MapR are supported. Kerberos is not supported in combination with MapR or IBM Big Insights.

SAS Data Loader 2.3 for Hadoop

Here are the main enhancements for SAS Data Loader 2.3 for Hadoop:

- support for importing delimited files into Hadoop.
- enhanced support for SAS LASR Analytic Server. The directive Load Data to LASR now supports symmetric multiprocessing (SMP) with the SASIOLA engine when loading data into non-grid configurations of the SAS LASR Analytic Server software.
- new features in data quality analysis now provide these transformations: Change Case, Gender Analysis, Pattern Analysis, and Field Extraction.
- enhanced support for Hadoop. New versions of Cloudera and Hortonworks are supported. Support for MapR has been added. Kerberos is not supported in combination with MapR.
- enhanced support for Apache Hive enables you to paste and edit existing Hive programs, and then run those programs in Hadoop.

SAS Data Loader 2.2 for Hadoop

SAS Data Loader for Hadoop provides self-service big data preparation, data quality, and data integration for business analysts and data scientists. The point-and-click user interface enables users to prepare, integrate, and cleanse big data faster and easier without writing code. In addition, power users can run SAS code and data quality functions faster on Hadoop for improved productivity and reduced data movement.

SAS Data Loader for Hadoop 2.2 runs on SAS 9.4M2. In this release, SAS Data Loader for Hadoop enables you to query, join, profile, and transform data on Hadoop. You can move relational data sources and SAS data sets to and from Hadoop. You can parse and standardize your data inside Hadoop. Using SAS Data Loader for Hadoop, you can load data into memory for visualization or analysis. You can also run SAS code and data quality functions in parallel on Hadoop.

SAS Data Integration Studio

SAS Data Integration Studio 4.910

SAS Data Integration Studio 4.910 (June 2025) runs on SAS 9.4M9. For more information about changes from the previous release, see [SAS Data Integration Studio](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Data Integration Studio 4.906

SAS Data Integration Studio 4.906 (January 2023) runs on SAS 9.4M8. Here is an overview of the changes for this release:

- Several transformations have been archived and are no longer supported.
- Two new options control the use of CONNECT USING instead of CONNECT TO in generated code.
- The option **Use the target table library for the connect statement** enables users to specify whether to use the target table's connection information for the explicit pass-through connect statement.

For more information about this release, see [What's New in SAS Data Integration Studio 4.906](#) in *SAS Data Integration Studio: User's Guide*.

SAS Data Integration Studio 4.905

SAS Data Integration Studio 4.905 (August 2020) runs on SAS 9.4M7.

Here are the main enhancements in SAS Data Integration Studio 4.905:

- Support was added for these source designers: BigQuery, JDBC, JSON, MongoDB, Salesforce, Snowflake, Spark, and Yellowbrick.

Note: MongoDB and Spark are not supported in the SQL Delete, SQL Insert Rows, or SQL Update transformations. They are also not supported in jobs that use the SCD Type 1 Loader or SCD Type 2 Loader transformations.

- For this release, new metadata bridges are available for Qlik, Talend, Alteryx, PowerBI, Snowflake, and Amazon S3. For more information, see [SAS Metadata Bridges](#) on support.sas.com.

SAS Data Integration Studio 4.904

SAS Data Integration Studio 4.904 (November 2018) runs on SAS 9.4M6.

Here are the main enhancements in SAS Data Integration Studio 4.904:

- new GIT Version Control Plug-in

- new JDBC source designer
- support for Oracle Hints
- new options for the SCD Type 2 Transformation
- new option to generate macro variables for external files
- new LOAD statement option for the Cloud Analytic Services transformation
- macro variables as input for Amazon S3 transformation

[What's New in SAS Data Integration Studio 4.904](#) in *SAS Data Integration Studio: User's Guide*.

SAS Data Integration Studio 4.903

SAS Data Integration Studio 4.903 runs on SAS 9.4M5.

Here are the main enhancements in SAS Data Integration Studio 4.903:

- new Cloud Analytic Services Table Loader transformation. This transformation replaces the Cloud Analytic Services Transfer transformation. Existing jobs that use the Cloud Analytic Services Transfer transformation should continue to work.
- new Table Maintenance transformation.
- support for K-functions in code generation.
- enhanced support for Hadoop code generation.
- enhanced support for Hive transformation.
- new parameter used by the Command Line Batch Deployment Tool.
- new option that generates JCL-friendly code on z/OS systems when using user-written code.
- new macro variables for generated transformations.

For more information about this release, see [What's New in SAS Data Integration Studio 4.903](#) in *SAS Data Integration Studio: User's Guide*.

SAS Data Integration Studio 4.902

SAS Data Integration Studio 4.902 runs on SAS 9.4M4.

Here are the main enhancements in SAS Data Integration Studio 4.902:

- These new transformations are available: sFTP, Amazon S3, Cloud Analytic Services Transfer, and Data Loader Directive.
- A new RedShift source designer is supported.
- A new source designer in Data Integration Studio supports the new LIBNAME template that represents the Cloud Analytic Services engine (CAS Source Designer).
- The SCD Type 2 Loader transformation now supports a Netezza target for SQL pass-through.
- The Transpose transformation supports running an in-database version of PROC TRANSPOSE that can be executed inside HADOOP and TERADATA.

For more information, see [What's New in SAS Data Integration Studio 4.902](#) in *SAS Data Integration Studio: User's Guide*.

SAS Data Integration Studio 4.901

SAS Data Integration Studio 4.901 runs on SAS 9.4M3.

Here are the main enhancements in SAS Data Integration Studio 4.901:

- Three new transformations are available: **Fork**, **Fork End**, and **Wait For Completion** nodes.
- This release includes updated support for the Hadoop (Hive), HAWQ, Impala, LASR, PI, and SASHDAT engines.
- The PI LIBNAME engine is supported.
- A new HAWQ source designer is available.

For more information, see [What's New in SAS Data Integration Studio 4.901](#) in *SAS Data Integration Studio: User's Guide*.

SAS Data Integration Studio 4.9

SAS Data Integration Studio 4.9 runs on SAS 9.4M2.

Here are the main enhancements for SAS Data Integration Studio 4.9:

- A new source designer wizard is available for Cloudera Impala.
- The High-Performance Analytics Transformations and Enterprise Decision Management transformation are now production.

For more information, see [What's New in SAS Data Integration Studio 4.9](#) in *SAS Data Integration Studio: User's Guide*.

SAS Data Integration Studio 4.8

SAS Data Integration Studio 4.8 runs on SAS 9.4M1.

Here are the main enhancements for SAS Data Integration Studio 4.8:

- new transformations that support conditional processing in jobs
- new source designer wizards for Vertica and SAP HANA
- a new, experimental transformation that incorporates SAS Decision Manager flows into jobs

SAS Data Integration Studio 4.7

SAS Data Integration Studio runs on SAS 9.4. Starting with this release, you can access third-party web clients from SAS Data Integration Studio jobs. This feature enables you to programmatically access the information from these clients and use it in your data integration projects. You can also deploy many jobs at once through a new command-line interface.

SAS Data Management Console

About SAS Data Management Console

SAS Data Management Console is a central, web-based environment that enables you to open data management and data governance products that are installed on your system. The console enables you to set preferences for these products and to view information from them. The console's home page displays SAS products, components, and features based on the roles and capabilities that are associated with your logon.

SAS Data Management Console is included in a number of SAS Data Management and SAS MDM offerings. For more information, see the product documentation page for [SAS Data Management Console](#).

Support for SAS Data Management Console

As of SAS 9.4M7 (August 2020), SAS Data Management Console is no longer available with SAS offerings due to the end-of-life for Adobe Flash. Adobe announced that it intends to end support for Flash technology and will stop updating and distributing the Flash Player at the end of 2020. Any SAS Data Management Console releases prior to SAS 9.4M7 might not work as expected starting January 1, 2021. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

SAS Data Quality Accelerator for Teradata

SAS 9.4 Data Quality Accelerator for Teradata: November 2019 Release

Beginning in SAS Viya 3.5 and the November 2019 release of SAS 9.4, the `qkb_pack` script that is used to package a QKB for deployment in the Teradata database for SAS Data Quality Accelerator for Teradata is available as a download. The download enables you to package a QKB on a computer other than the one on which SAS Data Quality Accelerator for Teradata is installed.

In addition, the documentation is updated to clarify the requirements for obtaining a QKB for use in SAS Viya. For more information, see “Obtaining and Deploying a QKB” in the “SAS Data Quality Accelerator for Teradata” chapter of “Administrator’s Guide for Teradata” in *SAS and SAS Viya In-Database Products: Administrator’s Guide*.

SAS 9.4 Data Quality Accelerator for Teradata

SAS 9.4 Data Quality Accelerator for Teradata contains general fixes and enhancements to in-database data quality operations.

In addition, the release numbering of the SAS Data Quality Accelerator for Teradata product has changed from SAS Data Quality Accelerator 2.7 for Teradata to SAS 9.4 Data Quality Accelerator for Teradata. The new numbering is a result of the company’s recent integration of DataFlux Data Management Studio into the SAS suite of data quality, data integration, data governance, and master data management solutions. In

keeping with this change, *SAS Data Quality Accelerator 2.7 for Teradata: User's Guide* has been retitled as *SAS 9.4 Data Quality Accelerator for Teradata: User's Guide*.

See these resources:

- For more information about this release, see [What's New in SAS 9.4 Data Quality Accelerator for Teradata](#) in *SAS Data Quality Accelerator for Teradata: User's Guide*
- For more information about changes from the previous release, see [SAS Data Quality Accelerator for Teradata](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Data Quality Accelerator 2.7 for Teradata

SAS Data Quality Accelerator 2.7 for Teradata includes enhancements that make it compatible with the most recent versions of underlying SAS in-database technologies. As a result, the way that the software is installed in the Teradata database has changed.

The documentation has also changed. Post-installation configuration and administration instructions for the accelerator are now published in the “Administrator’s Guide for Teradata” section in *SAS and SAS Viya In-Database Products: Administrator's Guide* instead of in *SAS Data Quality Accelerator for Teradata: User's Guide*.

SAS Data Quality Accelerator 2.6 for Teradata

SAS Data Quality Accelerator 2.6 for Teradata includes internal enhancements that provide improved memory management and streamline the software infrastructure.

SAS Data Quality Accelerator 2.5 for Teradata

SAS Data Quality Accelerator 2.5 for Teradata includes new stored procedures and changes to existing stored procedures.

SAS Data Quality Accelerator 2.5 for Teradata expands its data quality offerings by adding parsed variants of the DQ_GENDER(), DQ_MATCH(), and DQ_STANDARDIZE() stored procedures. The new DQ_GENDER_PARSED(), DQ_MATCH_PARSED(), and DQ_STANDARDIZE_PARSED() stored procedures accept pre-parsed data as input instead of a single input string.

This release also adds pre-parsed support, informational, and session-management stored procedures.

- The pre-parsed support stored procedures create and manage token-to-column mappings that serve as input to the DQ_OPERATION_PARSED() stored procedures.
- The informational stored procedures list the locales and SAS Quality Knowledge Base definitions that are available to the SAS Data Quality Accelerator for Teradata session.
- The stored procedure for session management can cause the stored procedures to overwrite existing output tables instead of appending data to them.

SAS Data Quality Accelerator 2.4 for Teradata

SAS Data Quality Accelerator for Teradata is a new product that provides in-database data quality functionality. The data quality functionality is provided as Teradata stored

procedures, which enable you to perform a number of tasks, such as parsing, analyzing patterns, and generating match codes. Executing data quality operations inside the database, rather than as a separate utility outside of the database, provides the following benefits: eliminates network I/O performance, leverages multi-node architectures for linear performance gains, and makes information more secure because it never leaves the database. This product includes a Quality Knowledge Base (QKB) and tools for transferring and deploying the QKB in the Teradata database.

SAS 9.4 Data Quality Server

SAS Data Quality Server consists of SAS language elements that perform data quality operations (matching, standardization, and so on), as well as elements that interoperate with the DataFlux Data Management Server. SAS Data Quality Server is delivered with a sample Quality Knowledge Base (QKB), which is available from SAS.

SAS 9.4 Data Quality Server communicates with components in certain SAS offerings, such as the SAS Data Management offerings, 2.41 and later, to provide an integrated system. SAS Data Quality Server is also a key component of the SAS Data Quality offerings.

SAS has shipped these maintenance releases:

- SAS 9.4M1 shipped in December 2013.
- SAS 9.4M2 shipped in August 2014.
- In SAS 9.4M3 (July 2015), the SAS Data Quality Server is enhanced with the DQLOCLST procedure. The DQLOCLST procedure creates a data set that includes the list of locales in the Quality Knowledge Base that is named by the SAS option DQSETUPLOC. Also, the SAS Data Quality Server is upgraded to synchronize results with DataFlux Data Management Studio 2.7.
- In SAS 9.4M4 (November 2016), SAS Data Quality Server interoperates with SSL-enabled DataFlux Data Management Server 2.1 and later. Relevant language elements in SAS Data Quality Server can now use HTTPS URLs to communicate with the secured server software to run jobs and services. Also, the DQLOCLIST procedure creates a data set that includes the list of locales in the SAS Quality Knowledge Base.
- The first release of SAS 9.4M5 shipped in September 2017.
- The second release of SAS 9.4M5 shipped in December 2017 along with SAS Viya 3.3. The documentation for SAS Data Quality 3.3 and SAS 9.4M5 Data Quality Server was combined into a single document.

The new function DQLOCALESCORE returns an integer confidence score for a source string and a locale.

- SAS 9.4M6 shipped in November 2018.
- SAS 9.4M7 shipped in August 2020.
- SAS 9.4M8 shipped in January 2023.

See these resources:

- For more information about this release, see [What's New in SAS Data Quality](#) in *SAS Data Quality and SAS Data Quality Server: Language Reference*.
- For more information about changes from the previous release, see [SAS Data Quality Server](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Data Remediation

SAS Data Remediation 2.6

SAS Data Remediation 2.6 shipped in June 2025 and runs on SAS 9.4M9.

For more information about changes from the previous release, see [SAS Data Remediation](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Data Remediation 2.5

SAS Data Remediation 2.5 shipped in January 2023 and runs on SAS 9.4M8.

SAS Data Remediation 2.4

Starting with this release, the user interface has been rewritten in HTML5. Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe has announced that it intends to end support for Flash technology and will stop updating and distributing the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

SAS Data Remediation 2.4 is no longer accessed from SAS Data Management Console. Instead, sign in to SAS Data Remediation directly.

Deep linking refers to constructing a URL (link) that, when initiated, takes a user directly to an issue in SAS Data Remediation rather than requiring the user to search for it. The URL syntax has changed in this release.

SAS Data Remediation 2.3

SAS Data Remediation 2.3 shipped in April 2017 and runs on SAS 9.4M4 and higher.

SAS Data Remediation 2.2

SAS Data Remediation 2.2 now includes a group-by functionality. There were enhancements to the remediation plug-in. SAS Data Remediation 2.2 includes a new overview portlet and the ability to view reports for SAS Visual Analytics. You can now save your preferences in SAS Data Remediation 2.2.

SAS Data Remediation 2.1

SAS Data Remediation enables users to manage and correct issues that are triggered by business rules in SAS MDM batch jobs and real-time processes. Data remediation allows user- or role-based access to data exceptions, which are categorized by application and subject area. Once data remediation issues have been reviewed, they can be corrected through the same application, eliminating the need for another user to complete the correction process.

SAS Data Remediation works in conjunction with SAS MDM, SAS Task Manager, and other SAS data management products.

SAS Data Surveyor for SAP

SAS Data Surveyor 5.1 for SAP includes new functions for semantically partitioned objects (SPOs) and InfoCubes that are optimized by SAP HANA.

SAS Data Surveyor 5.3 for SAP shipped in November 2016 and runs on SAS 9.4M4.

For more information, see the software product page for [SAS Data Surveyors](#).

SAS Federation Server

About SAS Federation Server

SAS Federation Server provides the business ability to quickly build virtual views of data from multiple sources, without moving or copying the data. It also supports data caching for frequently used data, which can result in improved query performance. The security features for SAS Federation Server include data masking, row-level security, and centralized access for improved governance.

SAS Federation Server 4.5

- Migration from SAS Federation Server 4.1 is no longer supported.
- SAS Federation Server no longer supports H6I, SAX, S64, and W32.

SAS Federation Server 4.4

Here are the new features in SAS Federation Server 4.4:

- SAS Federation Server 4.4 includes stateless and stateful pagination for REST API.
- SAS Federation Server 4.4 supports single sign-on (SSO) connections from the ODBC and JDBC (Windows only) client interfaces and with the FEDSVR LIBNAME engine.
- New HASH methods include CRC, CRC-[modelname], BLAKE2, SHA384, and SHA512.
- SAS Federation Server 4.4 supports connectivity to any data source that uses a vendor-supplied or third-party JDBC driver.
- SAS Federation Server 4.4 adds a prefetch capability for improved read performance, and a bulk load capability for improved write performance. Prefetch and bulk load use asynchronous threads to reduce run-time latencies between client and SAS Federation Server, and between SAS Federation Server and back-end data sources.
- SASHDAT is no longer supported.

For more information, see [What's New in SAS Federation Server 4.4](#) in *SAS Federation Server 4.4: Administrator's Guide*.

SAS Federation Server 4.2

Here are the main enhancements for SAS Federation Server 4.2:

- SAS Metadata Server replaces DataFlux Authentication Server for authentication and persistence of users, groups, logins (for example, personal, group, and shared) and domains.
- New data masking rules provide additional encryption support.
- SAS Federation Server now supports the DATA Step 2 (DS2) language.
- The new data quality and cleansing functionality is implemented using SAS Quality Knowledge Base (QKB) with FedSQL and DS2.
- SAS Federation Server now has the capability of persisting a data cache in memory through the MDS data store.
- You can now use the SAS Federation Server Driver for Apache Hadoop for read/write access to Hadoop (HIVE).
- A new Federation Server driver enables you to share data sources across multiple SAS Federation Servers.

For more information, see [What's New in SAS Federation Server 4.2](#) in *SAS Federation Server 4.2: Administrator's Guide*.

SAS Federation Server 4.1

Here are the main enhancements for SAS Federation Server 4.1.

- There are four new drivers:
 - SAS Federation Server Driver for SAP HANA
 - SAS Federation Server Driver for Netezza
 - SAS Federation Server Driver for PostgreSQL
 - SAS Federation Server SASHDAT Data Source Driver
- SAS Federation Server delivers a new data masking function as a method of 'de-identifying' sensitive information within data sources.
- The SQL language scripting capabilities handle administrative needs for start-up and shutdown events.
- New API (which is implemented as a REST interface) supports interacting with and managing SAS Federation Server.

For more information, see [What's New in SAS Federation Server 4.1](#) in *SAS Federation Server 4.1: Administrator's Guide*.

SAS Federation Server 3.2

DataFlux Federation Server is now SAS Federation Server. This renaming is a result of the recent integration of DataFlux products into the SAS suite of data quality, data integration, data governance, and data management solutions.

In-Memory Data Store (MDS) is a transactional in-memory data store that can be implemented on SAS Federation Server.

Privilege caching is offered as a tool for streamlining privilege determination, which results in improved performance.

For more information, see [What's New in SAS Federation Server 3.2](#) in *SAS Federation Server 3.2: Administrator's Guide*.

SAS Job Monitor

SAS Job Monitor 2.2

Job Monitor 2.2 provides additional parameters to configure an environment locale.

The Job Monitor agent plug-in uses its language and country settings to parse the log for SAS Data Integration Studio. (The default values for the language and country settings come from the machine on which the agent is running.) The language and country settings have to match between the Job Monitor agent and SAS Data Integration Studio. To override the language, country, and variant used by the Job Monitor agent plug-in, new options were added to the user interface. These options override the agent plug-in's settings for Data Integration Studio. In addition, an encoding option was added for both SAS Data Integration Studio and SAS Data Management Server jobs, to override the agent plug-in's setting.

Job Monitor 2.2M1 shipped in April 2017 and runs on SAS 9.4M4 and later releases.

SAS Job Monitor 2.1

SAS Job Monitor is a plug-in for SAS Environment Manager that integrates information from SAS Data Integration Studio, DataFlux Data Management Server, and specific jobs from DataFlux Data Management Studio. Using SAS Job Monitor, you can oversee the state of jobs that are run from these applications.

SAS Job Monitor reads job logs at specified locations and displays run-time statistics from the logs, enabling you to monitor status information and performance statistics. Using the jobs table, you can view historical run times and also drill down to a job for details, trends, and status.

Help is available from within the product.

SAS Lineage

SAS Lineage 3.5

SAS Lineage 3.5 shipped in June 2025 and runs on SAS 9.4M9.

See the resources:

- For more information, see the product documentation page for [SAS Lineage](#).
- For more information about changes from the previous release, see [SAS Lineage](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Lineage 3.4

SAS Lineage 3.4 shipped in January 2023 and runs on SAS 9.4M8.

SAS Lineage 3.3

Starting with this release, the user interface has been rewritten in HTML5. Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe has announced that it intends to end support for Flash technology and will stop updating and distributing the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

The HTML5 interface for SAS Lineage is displayed in a window that contains these components:

- Diagram Pane
- Manage Views Pane
- Details Pane
- Filter Pane

SAS Lineage 3.2

SAS Lineage 3.2 shipped in April 2017 and runs on SAS 9.4M4 and higher. For this release, the main enhancement is the Open Link function. When you select an object and click **Open Link**, the object is opened in SAS Business Data Network.

SAS Lineage 3.1

SAS Lineage 3.1 is a web-based diagram component for visualizing relationships between objects. It is used as a stand-alone lineage and relationship viewer that can be accessed by SAS database management and business intelligence applications. The component has two modes: first, a network diagram displays all relationships. Second, two left-to-right dependency diagrams are available: one that displays data governance information (governance) and another that displays parent and child relationships only (impact analysis). The relationship information displayed in these diagrams is drawn from the Relationship database that is a part of the Web Infrastructure Platform Data Server.

SAS Quality Knowledge Base

SAS Quality Knowledge Base for Contact Information

SAS Quality Knowledge Base for Contact Information 33

SAS QKB CI 33 includes updates for these locales and definitions:

Danish, Denmark; English, Canada; English, United Kingdom; English, United States; French, Canada; French, France; Norwegian, Norway; Swedish, Sweden

Field Content identification analysis definition updated

All Locales

- Field Content (Global) identification analysis definition added
- Field Name identification analysis definition updated

For more information, see the product documentation for [SAS Quality Knowledge Base \(QKB\)](#).

SAS Quality Knowledge Base for Contact Information 32

SAS QKB CI 32 includes updates for these locales and definitions:

Dutch, Belgium; English, Canada; French, Belgium; French, Canada; and Swedish, Sweden

Field Content identification analysis definition added

English, United Kingdom; and English, United States

Field Content identification analysis definition updated

Japanese, Japan

Name and Organization match, parse, and standardization definitions updated

All locales

- Data masking standardization definitions added
- Field Name identification analysis definition updates to add support for Dutch, Italian, Japanese, Norwegian, Spanish, and Swedish

The definitions from the SAS QKB for Product Data 5 have been added to SAS QKB CI 32.

SAS Quality Knowledge Base for Contact Information 31

SAS QKB CI 31 includes updates for these locales and definitions:

Danish, Denmark; English, United States; French, France; German, Germany; and Italian, Italy

Field Content identification analysis definition updated

English, United Kingdom and Norwegian, Norway

Field Content identification analysis definition added

Japanese, Japan

Address (Full) match definition updated

All locales

These definitions have improved leap-year processing:

- Date (DMY Validation - Numeric Only) identification analysis definition
- Date (MDY Validation - Numeric Only) identification analysis definition
- Date (YMD Validation - Numeric Only) identification analysis definition

Field Name identification analysis definition is now available for all locales:

- Languages supported are English, Danish, French, German, Hebrew, and Chinese.
- The identities were synchronized with the Identity names produced by the Field Content identification analysis definitions.

SAS Quality Knowledge Base for Contact Information 30

SAS QKB CI 30 includes updates for these locales and definitions:

Danish, Denmark

- Field Content identification analysis definition

English, United States

- Address match, parse, and standardize definitions
- Field Content identification analysis definition

French, France

- Country standardization definition
- Field Content identification analysis definition

Japanese, Japan

- Address (Full) parse and standardization definitions

All English locales plus Afrikaans, South Africa, and French, Canada

- County standardization definition
- County (Region) standardization definition
- Country (Sub-Region) standardization definition

All locales

- Country match definition
- Country (ISO 2 Char) standardization definition
- Country (ISO Number) standardization definition
- IBAN parse definition

SAS Quality Knowledge Base for Contact Information 29

SAS Quality Knowledge Base for Contact Information 29 introduces support for these definitions.

English, United States

- Address (PO Box only) match definition
- Address (Street only) match definition
- Field content identification analysis definition

French, Canada

- Country standardization definition

Danish, Denmark; French, France; German, Germany; Italian, Italy

- Field Content identification analysis definition

All locales

- HTML Character Reference Conversion standardization definition
- Symbol Removal standardization definition
- Symbol Space Replacement standardization definition

SAS Quality Knowledge Base for Contact Information 28

SAS Quality Knowledge Base for Contact Information 28 includes updates for these locales:

- English, Philippines
- English, United States

It also includes updates to these definitions in all locales:

- Country and Phone locale guess definitions
- Country match and standardization definitions
- Date match, parse, and standardization definitions
- Email identification analysis, match, parse, and standardization definitions

For more information, see the software product page for [Quality Knowledge Base \(QKB\) for SAS and DataFlux](#).

SAS Quality Knowledge Base for Contact Information 27

SAS Quality Knowledge Base for Contact Information 27 includes updates for these locales:

- English, Philippines
- English, United States
- Portuguese, Brazil
- Spanish, Mexico
- Spanish, Spain

SAS Quality Knowledge Base for Contact Information 26

SAS Quality Knowledge Base for Contact Information 26 includes updates for these locales:

- English, Philippines
- Portuguese, Brazil
- Spanish, Mexico

New email identification, match, parse, and standardization definitions are available for all locales.

SAS Quality Knowledge Base for Contact Information 25

SAS Quality Knowledge Base for Contact Information 25 introduces support for the English, Philippines locale.

SAS Quality Knowledge Base for Contact Information 24

SAS Quality Knowledge Base for Contact Information 24 includes updates for these locales and definitions:

- Portuguese, Brazil
- Spanish, Mexico
- Spanish, Spain

SAS Quality Knowledge Base for Contact Information 23

SAS Quality Knowledge Base for Contact Information 23 introduces support for Hebrew, Israel **Date** definition.

This release also includes updates for these locales:

- Portuguese, Brazil
- Spanish, Mexico

- Turkish, Turkey

For all locales, these definitions are updated:

- **Address (Global)** parse definitions
- **E-mail** match definitions

SAS Quality Knowledge Base for Contact Information 23 also includes updates for **Field Name** identification analysis and match definitions for these locales:

- All English locales
- Chinese, China
- Danish, Denmark
- German, Germany
- French, France
- Hebrew, Israel

SAS Quality Knowledge Base for Contact Information 22

SAS Quality Knowledge Base for Contact Information 22 includes updates to the E-mail Parse and Standardization definitions for all locales.

In addition, these languages and locales have updates:

- English, New Zealand
- English, United States
- Danish, Denmark
- French, France
- Portuguese, Brazil

Quality Knowledge Base for Contact Information 2013A

Quality Knowledge Base for Contact Information 2013A introduces support for the Hebrew, Israel language and locale.

Support is updated for address-related definitions for the English, New Zealand language and locale.

SAS Quality Knowledge Base for Product Data

SAS Quality Knowledge Base for Product Data 5

SAS Quality Knowledge Base for Product Data contains extraction, parsing, standardization, and pattern analysis definitions for attributes in generic product data. This release also contains additional generic character-based standardization definitions.

Quality Knowledge Base for Product Data 2013A

Quality Knowledge Base for Product Data 2013A introduces support for the Italian, Italy language and locale.

Support is updated for the French and German Packaging/UOM Standardization definitions.

SAS MDM

SAS MDM 4.3

SAS MDM 4.3 shipped in April 2017 and runs on SAS 9.4M4 (and earlier releases).

SAS MDM 4.3 includes new features and enhancements in these areas:

- support for SQL Server 2014
- configurable limits to the number of records presented when viewing clusters
- automated cleanup of remediation issues
- creation of new survivors when clusters change due to retirement
- control access to hierarchies

See these resources:

- For more information about this release, see the product documentation page for [SAS MDM](#).
- For more information about changes from the previous release, see [SAS MDM \(Master Data Management\)](#) in *SAS Guide to Software Updates and Product Changes*.

SAS MDM 4.2

SAS MDM 4.2 includes new features and enhancements in these areas:

- reports for SAS Visual Analytics
- source system management functionality
- process control enhancements
- relationship type attributes
- cross-field clustering
- source system harmonization

SAS MDM 4.1

SAS MDM is a product that integrates master data management technologies with those in SAS 9.4. SAS MDM is a web-based application that provides a single, accurate, and unified view of corporate data, integrating information from various data sources into one master record. SAS enables you to develop master data management processes. SAS provides the technology required to analyze existing data resources, build a unified view of that information, and manage that master view of data over time. The latest release features performance enhancements and integration with SAS metadata.

SAS MDM works in conjunction with SAS Data Remediation, SAS Task Manager, SAS Visual Process Orchestration, and other SAS data management products.

SAS Task Manager

SAS 9.4M8 Retired Product: SAS Task Manager

SAS Task Manager is part of SAS MDM, which retired in SAS 9.4M8.

SAS Task Manager 2.4

SAS Task Manager 2.4 shipped in June 2019.

Starting with this release, the user interface has been rewritten in HTML5. Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe announced that it intends to end support for Flash technology and will cease to update and distribute the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

SAS Task Manager 2.2

The main enhancement for SAS Task Manager 2.2 is four new user preferences.

See these resources:

- For more information about this release, see [What's New in SAS Task Manager 2.2](#).
- For more information about changes from the previous release, see [SAS Task Manager](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Task Manager 2.1

SAS Task Manager is a complementary application to others, such as SAS MDM, that integrates with SAS Workflow technologies. It gives users direct access to a workflow that might have been initiated from another SAS application. Users can start, stop, and transition workflows that have been uploaded to the SAS Workflow server environment.

SAS Task Manager works in conjunction with SAS MDM, SAS Data Remediation, and other SAS data management products.

SAS Visual Process Orchestration

SAS Visual Process Orchestration Is Not Available in SAS 9.4M7

As of SAS 9.4M7 (August 2020), SAS Visual Process Orchestration is no longer available with SAS offerings due to the end-of-life for Adobe Flash. Adobe announced that it intends to end support for Flash technology and will stop updating and distributing the Flash Player at the end of 2020. Any SAS Visual Process Orchestration releases prior to SAS 9.4M7 might not work as expected starting January 1, 2021. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

If you are upgrading to SAS 9.4M7, see “[SAS Visual Process Orchestration](#)” in *SAS Guide to Software Updates and Product Changes* for steps that you might need to perform during your upgrade.

SAS Visual Process Orchestration 2.2

SAS Lineage is a web client that enables you to view the lineage of sources and targets in a job. If the SAS Relationship Content Service has been enabled, you can export lineage metadata from SAS Visual Process Orchestration to the service, where it can be accessed by SAS Lineage.

The documentation for SAS Visual Process Orchestration has been enhanced for these topics:

- logging on to SAS Data Management Console. The logon topic now describes a number of ways to access that application.
- configuring SAS Job Monitor for SAS Visual Process Orchestration jobs. If your site has licensed SAS Environment Manager and SAS Job Monitor, then you can use a web browser to display run-time statistics for SAS Visual Process Orchestration jobs. The topic for SAS Job Monitor now includes more details about configuring that application for Orchestration jobs.
- For more information about this release, see [What’s New in SAS Visual Process Orchestration 2.2](#).
- For more information about changes from the previous release, see “[SAS Visual Process Orchestration](#)” in *SAS Guide to Software Updates and Product Changes*.

SAS Visual Process Orchestration 2.1

SAS Visual Process Orchestration is a web authoring environment that is launched from SAS Data Management Console. The authoring environment provides nodes that can be used to build orchestration jobs, which are process jobs that run other jobs.

An orchestration job can integrate executable files from various systems into a single process flow. A single orchestration job can run one or more executable files, such as SAS Data Integration Studio jobs, DataFlux Data Management Studio jobs, SAS code files, third-party programs, scripts, and web services. SAS Visual Process Orchestration can execute referenced jobs in parallel; apply control logic such as looping and IF/THEN/ELSE handling; and handle events, error-checking, and run-time statistics for each node in the orchestration job.

SAS Visual Process Orchestration Server provides a Design Server and a Run-time Server to coordinate enterprise development and execution of orchestration jobs. The Design Server supports the development of orchestration jobs by using separate threads, file locking, and test execution. The Run-time Server triggers the execution of orchestration jobs in response to requests that are submitted by authorized SOAP/HTTP clients.

Chapter 7

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SAS Customer Link Analytics

Starting in SAS 9.4M7, SAS Customer Link Analytics is no longer available. Consider modernizing with other SAS Customer Intelligence solutions or SAS Visual Data Mining and Machine Learning. For more information, see [“SAS Customer Link Analytics” in SAS Guide to Software Updates and Product Changes](#).

SAS Digital Marketing

The last release is SAS Digital Marketing 6.5. Starting in SAS 9.4M7, SAS Digital Marketing is no longer available. This product is replaced by Engage Email 19.03 or later. For more information, see [“SAS Digital Marketing” in SAS Guide to Software Updates and Product Changes](#).

SAS Marketing Automation

SAS 9.4M8 Products Not Available: SAS Marketing Automation

SAS Marketing Automation is not available in SAS 9.4M8 or later. If you order SAS 9.4M8 or later and your site has licensed SAS Marketing Automation 6.6 or earlier, SAS Marketing Automation will not be included in that order and will no longer function after upgrading to SAS 9.4M8. If you plan to upgrade or migrate to SAS 9.4M8 or later, we recommend that you instead consider SAS Customer Intelligence 360 for your business needs. Contact your SAS representative for more information.

SAS Marketing Automation 6.6

SAS Marketing Automation provides these new features:

- HTML5 user interface
- removal of completed campaigns from a campaign group
- subject restriction in the output for a Map node
- specification of subject labels in the information map for SAS Customer Intelligence 360

See these resources:

- For more information about this release, see the software product page for [SAS Marketing Automation](#).
- For more information about changes from the previous release, see [SAS Marketing Automation](#) in *SAS Guide to Software Updates and Product Changes*.

Note: The documentation for SAS Marketing Automation is available only to customers who license this product.

SAS Marketing Automation 6.5

SAS Marketing Automation 6.5 has changes and enhancements in these areas:

- integration with SAS Customer Intelligence 360
- optimization for customer contacts at each treatment level
- Prioritize node rules

SAS Marketing Automation 6.4

SAS Marketing Automation 6.4 has changes and enhancements in these areas:

- publishing campaigns
- refining output
- staging treatments
- additional supported databases

SAS Marketing Automation 6.3

SAS Marketing Automation 6.3 has changes and enhancements in these areas:

- fault tolerance through middle-tier clustering
- multiple SAS Customer Intelligence Studio windows
- business context database upload options
- Reports workspace
- diagram nodes
- previewing export files
- generating diagram documents

SAS Marketing Optimization

SAS 9.4M8 Products Not Available: SAS Marketing Optimization

SAS Marketing Optimization is not available in SAS 9.4M8 or later. If you order SAS 9.4M8 or later and your site has licensed SAS Marketing Optimization 6.6 or earlier, SAS Marketing Optimization will not be included in that order and will no longer function after upgrading to SAS 9.4M8. If you plan to upgrade or migrate to SAS 9.4M8 or later, we recommend that you instead consider SAS Customer Intelligence 360 for your business needs. Contact your SAS representative for more information.

SAS Marketing Optimization 6.6

SAS Marketing Optimization 6.6 has changes and enhancements in these areas:

- HTML5 user interface
- identifiers in a self-learner process

See these resources:

- For more information, see the software product page for [SAS Marketing Optimization](#).
- For more information about changes from the previous release, see [SAS Marketing Optimization](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Marketing Optimization 6.5

SAS Marketing Optimization 6.5 has these new features:

- SAS Marketing Optimization REST API
- high-performance distributed node
- automated scenario tuning

SAS Marketing Optimization 6.4

SAS Marketing Optimization 6.4 has changes and enhancements in these areas:

- publication of solution tables to the SAS Marketing Optimization LASR Analytic Server
- editable pre-populated constraints
- score code generation for some types of scenarios
- optimization of prioritization scenarios
- improved implementation of the optimization algorithm

SAS Marketing Optimization 6.3

SAS Marketing Optimization 6.3 has changes and enhancements in these areas:

- double-byte character support for input data tables
- enhanced agent scalability option for scenarios
- enhanced reporting data output options
- consistent scaling for sensitivity analysis
- SAS Visual Analytics reporting services

SAS Real-Time Decision Manager

SAS 9.4M8 Products Not Available: SAS Real-Time Decision Manager

SAS Real-Time Decision Manager is not available in SAS 9.4M8 or later. If you order SAS 9.4M8 or later and your site has licensed SAS Real-Time Decision Manager 6.6 or earlier, SAS Real-Time Decision Manager will not be included in that order and will no longer function after upgrading to SAS 9.4M8. If you plan to upgrade or migrate to SAS 9.4M8 or later, we recommend that you instead consider SAS Customer Intelligence 360 and SAS Intelligent Decisioning for your business needs. Contact your SAS representative for more information.

SAS Real-Time Decision Manager 6.6

SAS Real-Time Decision Manager 6.6 has changes and enhancements in these areas:

- HTML5 user interface
- identifiers in Self-Learner process

See these resources:

- For more information about this release, see the software product page for [SAS Real-Time Decision Manager](#).
- For more information about changes from the previous release, see [SAS Real-Time Decision Manager](#) in *SAS Guide to Software Updates and Product Changes*.

Note: The documentation for SAS Real-Time Decision Manager is available only to customers who license this product.

SAS Real-Time Decision Manager 6.5

SAS Real-Time Decision Manager 6.5 has changes and enhancements in these areas:

- Assignment node
- comparing values of variables
- contact rules
- event stream processing
- global variables for business contexts
- lineage relationships
- node counts in remote environments
- SAS Business Rules Manager flows
- self-learner processes

SAS Real-Time Decision Manager 6.4

SAS Real-Time Decision Manager 6.4 has changes and enhancements in these areas:

- campaign deployment
- configuration of run-time services
- documents and reporting
- treatments
- variables and custom processes

SAS Real-Time Decision Manager 6.3

SAS Real-Time Decision Manager 6.3 has changes and enhancements in these areas:

- fault tolerance through middle-tier clustering
- multiple SAS Customer Intelligence Studio windows
- diagram nodes
- campaigns
- treatments
- calculated variables

Chapter 8

SAS Financial Management

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SAS Cost and Profitability Management

SAS Cost and Profitability Management 8.4

SAS Cost and Profitability Management 8.4 shipped in June 2019 and runs on SAS 9.4M6.

Many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe has announced that it intends to end support for Flash technology and will stop updating and distributing the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

Because Adobe is discontinuing support for Flash Player, the Survey and What-If and Scenario Builder applications, which are based on Flash, have been removed from Cost and Profitability Management.

SAS Cost and Profitability Management supports more current versions of Red Hat Linux (RHEL) and Java.

- For RHEL 6.X: Up to RHEL 6.10 is tested and supported.
- For RHEL 7.X: Up to RHEL 7.6 is tested and supported.
- JAVA 8 is now supported.

See these resources:

- For more information about this release, see [What's New in SAS Cost and Profitability Management 8.4](#).

- For more information about changes from the previous release, see [SAS Cost and Profitability Management](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Cost and Profitability Management 8.3

SAS Cost and Profitability Management 8.3 shipped in May 2018. In this release, you can now export model data for various periods and scenarios to generate these reports:

- Destination Furthest
- Driver – Cost and Rate
- Multi-Level Contributions
- Resource Contributions
- Unassigned Costs
- Unit Cost
- Dimensional Attribute Cost

SAS Cost and Profitability Management contains a template for each report type. SAS Cost and Profitability Management exports the model data in a table in the database. Use the database tables to view, share, and analyze the report.

For more information, see [What's New in SAS Cost and Profitability Management 8.3](#).

SAS Cost and Profitability Management 8.1

Here are some of the enhancements in SAS Cost and Profitability Management 8.1:

- Using memory-mapped files managed directly by the operating system rather than database tables managed by a database management system, the new architecture of SAS Cost and Profitability Management 8.1 performs calculations in a fraction of the time required by previous releases as well as significantly decreasing the time required for import and export.
- With SAS Cost and Profitability Management 8.1, you can push your model data and fact tables to the SAS LASR Analytic Server for viewing with SAS Visual Analytics. You are no longer limited to OLAP technology for the analysis of data but can avail yourself of the power of in-memory architecture to explore your data in real time.
- A new Web application allows you to take advantage of high performance calculation to explore the effect of modifying the value of selected variables on selected account measures. Use the SAS Cost and Profitability Management 8.1 client to mark variables (such as cost elements and numeric attributes) and accounts for analysis, and then use the new "What-If" Web application to explore the effect of changing the values of those variables on the selected accounts. When you change the value of a variable, fast calculation shows you the effect on the selected measures for the selected accounts.
- Rather than restricting users to the traditional ABC modules (Resource, Activity, Cost Object, and External Unit), SAS Cost and Profitability Management 8.1 allows you to create a model with anywhere from 2 to 10 modules with whatever name you choose. And, of course, you can still define stages within and across all those modules.

SAS Financial Management

SAS Financial Management 5.6

SAS Financial Management 5.6 shipped in June 2019 and runs on SAS 9.4M6.

Starting with this release, the user interface has been rewritten in HTML5. Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe has announced that it intends to end support for Flash technology and will stop updating and distributing the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

You can now edit the form data only through SAS Financial Management Add-In for Microsoft Excel. You cannot edit the forms in the Forms workspace.

In the HTML5 user interface, the Administration and Processes Workspace is not provided. You can complete the tasks related to administration and business processes through SAS Financial Management Studio.

See these resources:

- For more information about this release, see [What's New in SAS Financial Management 5.6](#).
- For more information about changes from the previous release, see [SAS Financial Management](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Financial Management 5.5

SAS Financial Management 5.5 includes several performance improvements, such as leveraging standby and failover support. This support is provided by the SAS Web Server to implement a high availability configuration.

SAS Financial Management 5.5 now includes SAS Visual Analytics Viewer from which you can launch your reports. Content promotion has been expanded to support the promotion of several new objects. This release includes enhancements to forecasting and expanded auto-allocation functionality.

For more information about this release, see [What's New in SAS Financial Management 5.5](#).

SAS Financial Management 5.4

SAS Financial Management 5.4 introduces process management support, data validation, and enhanced data entry and reporting options. Process Management is a new SAS Financial Management framework that enables administrators and users to perform these tasks

- define and manage company-specific business processes
- automate key Financial Management tasks
- view the status of processes and tasks, and identify and resolve delays and other problems

Process management also includes user notification at the business process and task levels, commenting, and audit history.

SAS Visual Scenario Designer

SAS Visual Scenario Designer 6.3 on SAS 9.4M6 is the last release of the product. If you order SAS 9.4M7, SAS Visual Scenario Designer will not be included in that order.

If you have SAS Visual Scenario Designer in your order and you plan to upgrade to SAS 9.4M7, unconfigure and uninstall SAS Visual Scenario Designer before upgrading or migrating to SAS 9.4M7.

Chapter 9

SAS Fraud and Compliance Products

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SAS Anti-Money Laundering

SAS Anti-Money Laundering 7.1

SAS Anti-Money Laundering 7.1 shipped in July 2016. In this release, scripts are provided so that you can quickly add new banks to the application. There is a separate schema for each bank as well as a separate alert generation process. The new and improved user interface enables you to triage Entities more efficiently and effectively. All alert types now roll up to an Entity. Triage is now performed at the Entity level while still providing granular level alert disposition. The Funds Tracker now provides a graphical view of the investigation.

SAS Anti-Money Laundering 6.3

SAS Anti-Money Laundering 6.3 includes SAS Visual Analytics Administrator and Reporting, which enables out-of-the-box reporting for alerts. Starting with this release, regulatory reports are pre-populated with subject information, and the process for electronically filing reports is automated. In addition, user interface enhancements enable you to page all data grids, export transactions to a CSV file, work with a redesigned interface for entering notes, and perform multi-column sorting. Also, the integration of Apache Solr enhances search capabilities.

In January 2016, SAS Anti-Money Laundering 6.3M1 shipped.

Here are some of the new features in this release:

- The new streamlined user interface called Entity Triage enables you to review and disposition alerts by entity.
- New Currency Transaction Reporting scenarios can be used in the alert generation process. These scenarios are for cash monitoring within a 24-hour period.
- You can create Currency Transaction Reporting reports and Designation of Exempt Person reports. Both reports support e-filing.
- The Regulatory Report 90D Review automatically creates a case for the mandatory continuous review after the initial filing of the Regulatory Report (after 90 days).
- Visual Scenario Designer is now integrated with SAS Anti-Money Laundering. You can develop and test scenarios in Visual Scenario Designer and then import these scenarios into SAS Anti-Money Laundering to be used in the alert generation process.

See these resources:

- For more information about this release, see the software product page for [SAS Anti-Money Laundering](#).
- For more information about changes from the previous release, see [SAS Anti-Money Laundering](#) in *SAS Guide to Software Updates and Product Changes*.

Note: The documentation for SAS Anti-Money Laundering is available only to customers who license this product.

SAS Anti-Money Laundering 6.2

SAS Anti-Money Laundering 6.2 has new sample scenarios for Correspondent Banking to take advantage of the enhancements to the SAS Anti-Money Laundering data model. This release also includes a new relationship grid to quickly assess details about parties that are associated with the Correspondent Banking behavior.

SAS Anti-Money Laundering 6.1

SAS Anti-Money Laundering 6.1 runs on SAS 9.4 and has these new features:

- streamlined user interface to provide consistent user experience throughout the portfolio and improved integration among the applications.
- scenario promotion that enables the user to export and import scenarios and associated headers, to download .spk (SAS package) files to a local machine, and to import to a separate system.
- configurable workflow that displays a task list with available transitions and a visual diagram of the workflow states and transitions. The workflow also provides task lists that are shown on the Investigator and Manager Home screens and a completion report that indicates which rules were updated and created.
- Related Entities Visualization that enables additional regulatory reporting support for select forms within the FinCEN, FinTRAC, and AUSTRAC regulatory agencies.
- integration with the SAS Customer Due Diligence solution. This feature provides transparency between an institution's SAS Anti-Money Laundering and Customer Due Diligence activities.

SAS Customer Due Diligence

SAS Customer Due Diligence 6.3

SAS Customer Due Diligence 6.3 includes a new strategy rule to incorporate the scoring of regulatory reports. The integration of Apache Solr enhances search capabilities. In addition, user interface enhancements enable you to page all data grids, export transactions to a CSV file, work with a redesigned interface for entering notes, and perform multi-column sorting.

SAS Customer Due Diligence 6.3M1 includes an enhanced user interface.

See these resources:

- For more information about this release, see the software product page for [SAS Customer Due Diligence](#).
- For more information about changes from the previous release, see [SAS Customer Due Diligence](#)

Note: The documentation for SAS Customer Due Diligence is available only to customers who license the product.

SAS Customer Due Diligence 6.2

SAS Customer Due Diligence 6.2 includes a new strategy rule to incorporate the scoring of new customers. This release also includes an improved manual case creation process and case links to previously created parties.

SAS Customer Due Diligence 6.1

SAS Customer Due Diligence enables you to understand a customer's profile and to establish an expectation about the customer's behavior. SAS Customer Due Diligence collects data and performs risk rating and profiling on customers who are at risk to be involved in fraud, money laundering, or other illegal activities. Risk rating helps financial institutions meet the compliance requirements that are set by government and regulatory organizations.

SAS Enterprise Case Management

Starting in SAS 9.4M7, SAS Enterprise Case Management is no longer available.

SAS Peer Group Analysis 6.1

SAS Peer Group Analysis compares an entity's (account or party) current behavior with that of its historical behavior and also its peers' behavior. SAS Peer Group Analysis provides a process to build a prep data set, which can be used by SAS Peer Group

Analysis headers and scenarios. Alerts that are generated by SAS Peer Group Analysis scenarios can be displayed in the user interface and can include fields that are specific to SAS Peer Group Analysis in the alert details screen.

SAS Peer Group Analysis is an add-on to SAS High-Performance Anti-Money Laundering.

For more information, see the software product page for [SAS Anti-Money Laundering](#).

SAS Social Network Analysis Server 6.2

Note: Starting with SAS 9.4M7, SAS Social Network Analysis Server is a retired product. If you order SAS 9.4M7, SAS Social Network Analysis Server is not included in that order. A best practice is to unconfigure retired SAS products before you upgrade and to uninstall them after you upgrade. For more information, see “Unconfiguring and Uninstalling Retired Products” in *SAS Guide to Software Updates and Product Changes*.

SAS Social Network Analysis Server 6.2 includes performance enhancements and updates. Here are some of the updates in this release:

- performance enhancements to the social network analysis diagram
- administrator-enabled network legend for the social network analysis diagram

SAS Social Network Analysis Server 6.2M1 includes the addition of an export feature that enables users to export alerts and designated columns directly from the Alerts window.

This release also includes expanded development and configuration features for analysts, administrators, and installers. Here are some of those features:

- a new method of plug-in development
- integration with SAS Management Console Configuration Manager and SAS Preferences to promote ease of configuration and management, and the addition of new configuration parameters to control the user experience
- streamlined post-installation and configuration process

In SAS Social Network Analysis Server 6.2M1, you can now use a custom URL to direct users to a specific Alert Details window within a defined alert series.

SAS Social Network Analysis Server 6.2M2 includes these enhancements and operational changes:

- You can easily adjust the column widths for all of the table data.
- In the Alerts window, you can save multiple custom views that are related to a specific alert series. You can also manage the views through the solution interface.
- The Export feature now includes alert details.

See these resources:

- For more information about this release, see the software product page for [SAS Social Network Analysis](#).
- For more information about changes from the previous release, see [SAS Social Network Analysis Server](#) in *SAS Guide to Software Updates and Product Changes*.

Note: The documentation for SAS Social Network Analysis is available only to customers who license this product.

Chapter 10

SAS In-Database Products

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SAS 9.4 In-Database Products

SAS 9.4M9

SAS In-Database Technologies 9.4M9 shipped in June 2025.

- For in-database processing in Hadoop, security policies have been introduced by a newer version of the Java Runtime Environment. With this update, SAS In-Database Technologies no longer uses the Java API that is provided in the set of Hadoop JAR files. SAS Embedded Process jobs now run on Spark only. Jobs on Hadoop are always dispatched using the REST API that is provided by Apache Livy. The execution of SAS Embedded Process jobs on MapReduce is no longer supported. The update affects processing in Hadoop for SAS Scoring Accelerator, SAS Code Accelerator, and PROC TRANSPOSE. Changes are required in configuration and usage. For more information, see *SAS and SAS Viya Embedded Process: Deployment Guide* and *SAS In-Database Products: User's Guide*.
- In-database DATA step in Hadoop is not supported.
- SAS Embedded Process for Teradata and SAS Embedded Process for Hadoop are now delivered from a SAS Viya platform repository in the SAS Viya platform cadence. In earlier releases, this software was delivered from a SAS Viya 3.5 repository. You still receive a Software Order Email (SOE) for SAS Embedded

Process. Authorized users can access the deployment assets in my.sas.com. Always use the latest version that is available for your data source.

- SAS Embedded Process for Hadoop has other deployment changes beginning with the September 2023 release. Instead of four RPM files, you install one. In addition, only manual installation is supported. If you previously used a parcel (Cloudera Manager) or a stack (Ambari) to deploy SAS Embedded Process in the cluster, you cannot use that method to update to the latest release. However, you must use that method to uninstall the software. Then use the manual deployment method to install the latest release.
- SAS Embedded Process for other data sources can release new versions asynchronously as hot fixes.

January 2023 Release: SAS 9.4M8

SAS 9.4M8 In-Database Technologies shipped in January 2023.

See these resources:

- For more information about this release, see [What's New in the SAS 9.4 In-Database Products](#) in *SAS In-Database Products: User's Guide*.
- For more information about changes from the previous release, see [SAS In-Database Technologies](#) in *SAS Guide to Software Updates and Product Changes*.

August 2020 Release: SAS 9.4M7

SAS 9.4M7 In-Database Technologies shipped in August 2020.

November 2018 Release: SAS 9.4M6

These features or changes were added in SAS 9.4M6 (November 2018):

- The delivery, installation, and deployment process for the SAS Embedded Process has changed. The SAS Embedded Process is now being delivered using a link in your Software Order Email (SOE) and the deployment process is the same for both SAS 9.4 and SAS Viya. When you license a SAS product that requires the SAS Embedded Process, you will receive two SOEs:

- One email is for your SAS 9.4 or SAS Viya software offering.
- A second email is for the SAS Embedded Process.

The SAS Embedded Process is delivered from a SAS Viya repository whether your software order includes SAS 9.4 or SAS Viya. Prior to this release, the SAS Embedded Process for SAS 9.4 software was delivered from the SAS 9.4 Software Depot. For SAS Viya, the SAS Embedded Process was delivered from a SAS Viya repository.

- Due to changes to the deployment of the SAS Embedded Process, install scripts for SAS Data Quality Accelerator for Teradata stored processes and the script to deploy SAS Contextual Analysis text analytics models to the Hadoop nodes are delivered in a different location.
- The SAS Embedded Process is now installed on all YARN Node Manager nodes.
- The `sasep-admin.sh` script to manually install the SAS Embedded Process has several new options (`-yarnnodes`, `-yarnrm`, and `-nohostcheck`) and several options

have been removed (**-x**, **-epconfig**, **-linklib**, and **-unlinklib**). The **-maxscp** option has changed to **-maxparallel**. In addition, you no longer need sudo access to run the script.

- The SAS Deployment Manager is no longer used to deploy the SAS Embedded Process for Hadoop. The SAS Embedded Process files are delivered using RPM files.
- Any program that uses the SAS Embedded Process, such as the SAS Scoring Accelerator, can be executed as either a MapReduce job or as a Spark application. A new system option, HADOOPPLATFORM, determines which execution platform is used. However, note that the HADOOPPLATFORM=SPARK option is not supported on the Windows operating system with the SAS In-Database Code Accelerator.
- In-database scoring for the SAS Scalable Performance Data Server is no longer supported.
- Information about IBM BigInsights and Pivotal has been removed from the documentation. These Hadoop vendors have asked their customers to move to Hortonworks.
- The following enhancements were made to the SAS In-Database Code Accelerator:
 - CEDA processing of SPD Engine input files is supported by the SAS In-Database Code Accelerator for Hadoop. Previously, only SPD Engine data sets whose architectures matched the architecture of the Hadoop cluster (that is, 64-bit Solaris or Linux) ran inside the database.
 - The SAS In-Database Code Accelerator for Hadoop supports the SCRATCH_DB option for a Hive database that is used when a temporary table is created.
 - SQL queries using a WHERE IN clause are now supported by the SAS In-Database Code Accelerator for Hadoop.
 - The SAS In-Database Code Accelerator for Hadoop supports the SCRATCH_DB option for a Hive database that is used when a temporary table is created.
- The scoring functions and user-defined format functions for Teradata are now deterministic.
- The following changes have been made to the SAS Deployment Manager when you configure Base SAS and SAS/ACCESS for Hadoop:
 - If your Hive service is enabled with both Kerberos and TLS, the SAS Deployment Manager cannot validate the SAS/ACCESS configuration. The LIBNAME connection test fails. Deselect the validation box and click **Next** to collect the JAR and configuration files without validation. You have to validate the SAS/ACCESS configuration manually after the SAS Deployment Manager steps are complete.
 - If you are using Hortonworks version 3.0, select **No Filter**. This selection ensures that the correct jline JAR files are obtained for running PROC HADOOP Pig jobs successfully.
 - If you are using Advanced Encryption Standard (AES) encryption with Kerberos, you are no longer required to manually copy the Java Cryptography Extension local_policy.jar file or the US_export_policy.jar file to your JAVA home directory.

December 2017 Release: SAS 9.4M5

These features were added in SAS 9.4M5 (December 2017):

- The SAS In-Database Code Accelerator now honors the ACCESS LIBNAME and data set option, SCRATCH_DB, for a Hive database that is used when a temporary table is created.
- The SAS In-Database Code Accelerator for Hadoop now supports the SCRATCH_DB option for a Hive database that is used when a temporary table is created.
- The RETAIN statement is now supported when processing DATA step programs in Hadoop. Variable lists in the RETAIN statement have limited support.

For more information about this release, see [What's New in the SAS 9.4 In-Database Products](#) in *SAS In-Database Products: User's Guide*.

September 2017 Release: SAS 9.4M5

Starting in SAS 9.4M5 (September 2017), these features are new:

- The SAS Deployment Manager can now be run if the cluster manager is enabled with Transport Layer Security (TLS). The SAS Deployment Manager validates if the Certificate of Authority (CA) exists for the host that you are trying to access. If the CA does not exist, a warning message is issued and asks to run another SAS Deployment Manager task to add the CA.

Note: All discussion of TLS is also applicable to the predecessor protocol, Secure Sockets Layer (SSL).

- You now have the option of manually collecting the JAR and configuration files with the Hadoop tracer script while using the SAS Deployment Manager.
- Three new options have been added to the hadooptracer.py script. One option collects the correct files when running the Hadoop tracer script from a Windows client. The second new option produces version and debug logging information. Postprocess, the third new option, removes version numbers from any configuration files that are collected.
- The SAS In-Database Scoring Accelerator for Hadoop now supports a cluster that has Sentry RecordService enabled. Apache Sentry is a system for enforcing fine-grained role-based authorization to data and metadata stored on a Hadoop cluster. RecordService is a core security layer that centrally enforces fine-grained access control policy. The combination allows security administrators to deliver unified row-based and column-based security, and dynamic data masking.
- If you license SAS Data Loader for Hadoop, you can now deploy the SAS Embedded Process and the SAS Data Quality Accelerator, the SAS Data Loader for Hadoop Spark Engine, and the SAS Quality Knowledge Base individually, all together, or in any combination at one time.

For more information, see [What's New in the SAS 9.4 In-Database Products](#) in *SAS In-Database Products: User's Guide*.

November 2016 Release: SAS 9.4M4

Starting in SAS 9.4M4, these features are new:

- The SAS Deployment Manager can now be used to pull Hadoop JAR and configuration files when configuring Base SAS and the SPD Engine for use with Hadoop. Previously, pulling these files was a manual process.
- The installation and configuration of the SAS Embedded Process for Aster, DB2, Greenplum, SAP Hana, Oracle, and Netezza has been improved and simplified. The in-database deployment package is delivered to the client from the SAS Install Depot in a ZIP file. The new process has a smaller client footprint and is a faster installation process.
- If you license SAS Data Loader for Hadoop, SAS Data Quality Accelerator for Teradata, or SAS Contextual Analysis In-Database Scoring for Hadoop, these components are included in the in-database deployment package for Hadoop and Teradata, respectively.
- The Base SAS procedures that are enhanced for in-database processing can now be run inside PostgreSQL, Redshift, and Microsoft SQL Server.
- PROC RANK and PROC SORT now support in-database processing on Hadoop with Hive .13 or later.
- If you use the SAS In-Database Code Accelerator for Hadoop, the SPD Engine SerDe can be used to access Hive tables.
- Several new configuration properties that enable you to adjust performance have been added for SAS Embedded Process.
- For SAS Embedded Process, the number of JAR files that are installed during deployment has been reduced from six to one.
- SAS in-database processing supports single sign-on to Teradata with Kerberos authentication.

July 2015 Release

In the July 2015 release, the SAS In-Database Scoring Accelerator for Hadoop now supports the SPD Engine HDFS file format. All of the SAS In-Database Code Accelerators support a SET statement with embedded SQL, a SET statement with multiple input tables, and a MERGE statement. The run and publish model macros for the SAS Scoring Accelerator for Hadoop now support the SAS_HADOOP_CONFIG_PATH environment variable. This support eliminates the need for a merged configuration file. The SAS Scoring Accelerator for Hadoop, SAP HANA, and Teradata supports model scoring by using item stores.

The installation and configuration of the SAS Embedded Process for Hadoop has been improved and simplified:

- For Cloudera and Hortonworks, Cloudera Manager and Ambari are used to install the SAS Embedded Process and the SAS Hadoop MapReduce JAR files.
- For IBM BigInsights, MapR, and Pivotal HD, the in-database deployment package is delivered to the client from the SAS Install Depot.

In addition, the SAS Embedded Process and the SAS Hadoop MapReduce JAR files are installed with one script instead of two separate scripts. The new process has a smaller client footprint and is a faster installation.

The SAS Embedded Process for Hadoop has been rewritten and no longer runs as a Linux service. The SAS Embedded Process for Hadoop now supports IBM BigInsights, MapR, and Pivotal HD Hadoop distributions. The installation and configuration of the SAS Embedded Process for Teradata has been improved and simplified. The in-database

deployment package is delivered to the client from the SAS Install Depot. The new process has a smaller client footprint and is a faster installation.

February 2015 Release

In the February 2015 release, the SAS In-Database Code Accelerator for Hadoop uses HCatalog to process complex, non-delimited files. Using HCatalog enables the SAS In-Database Code Accelerator for Hadoop to support Avro, ORC, RCFile, and Parquet file types. In addition, you can now use the DBCREATE_TABLE_OPTS table option to specify the output SerDe, the output delimiter of the Hive table, the output ESCAPED BY character, and any other CREATE TABLE syntax allowed by Hive.

August 2014 Release

In the August 2014 release, the SAS Scoring Accelerator for SAP HANA is now available, and running limited DATA step scoring programs in Hadoop is now production. Also, numerous changes were made to the installation and configuration script for the SAS Embedded Process for Hadoop.

December 2013 Release

In the December 2013 release, the SAS In-Database Code Accelerator for Teradata now can run the DS2 data program as well as the thread program inside the database. Also, for the SAS In-Database Code Accelerator, the default behavior has changed from the 9.4 release. DS2 code no longer executes inside the database by default. The DS2ACCEL system option and the PROC DS2 DS2ACCEL option control this behavior. DATA step processing in Hadoop is now preproduction, so limited DATA step programs can be run inside Hadoop for scoring.

September 2013 Release

In the September 2013 release, in-database processing for Hadoop was enhanced by the addition of the SAS Scoring Accelerator for Hadoop. Also, in the September 2013 release, the autocall macros that initialized the publishing macros are no longer needed for any DBMS. However, the autocall macros are still supported.

July 2013 Release

In the July 2013 release, in-database scoring is supported for the SAS Scalable Performance Data Server.

SAS 9.4

Starting in SAS 9.4, in-database processing has been enhanced by the addition of the SAS In-Database Code Accelerator. The SAS In-Database Code Accelerator enables you to publish a DS2 thread program to the database and execute the thread program in parallel inside the database.

In-database scoring for Netezza has been enhanced by the addition of the SAS Embedded Process. The SAS Embedded Process is a SAS server process that runs within Netezza to read and write data.

Chapter 11

SAS Integration Technologies

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SAS 9.4 Integration Technologies

SAS Integration Technologies includes the following enhancements:

- SAS Stored Processes introduces new features for the STP procedure and the SAS Stored Process Web Application, as well as general enhancements. For more information, see [SAS Stored Processes: Developer's Guide](#).
- SAS BI Web Services includes an update for RESTful web services.
- SAS Publishing Framework has added support for circular integrity constraints and extended attributes. If you are publishing to SharePoint or WebDAV, SSL setup can be done using TKESSL. In addition, event publishing is obsolete, and the event publishing documentation has been removed.
- Directory Services includes new TLS_MODE_ON and TLS_MODE_OFF options for the LDAPS_OPEN CALL routine.

In SAS 9.4M1 Integration Technologies, the new PagedResults argument for the LDAPS_SEARCH CALL routine can be used to specify the number of results on a page of output.

In SAS 9.4M5 Integration Technologies, the LDAPS_SEARCH_PAGE CALL routine is new. The LDAPS_SEARCH_PAGE CALL routine enables you to search and retrieve paged information from the specified LDAP directory.

- Application messaging provides a new ACTIVEMQ file access method and two new arguments for the CLOSEQUEUE CALL routine.
- In SAS Foundation Services, the Event Broker Service is no longer available.

See these resources:

- For more information about this release, see the software product page for [SAS Integration Technologies](#).
- For more information about changes from the previous release, see [SAS Integration Technologies](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Workflow Studio 1.3

SAS Workflow Studio 1.3 has the following enhancements:

- support for SAS Web Infrastructure Platform privileges and roles and for web-layer permissions. Run-time access control is no longer dependent on SAS metadata and has been updated to support more granular privileges.
- a new dialog box that enables workflow template owners to specify permissions for individual templates.
- improved workflow template validation, such as verification of mandatory policy properties.
- a new dialog box that displays the workflow tree for two versions of a template side-by-side. This dialog box enables you to easily evaluate the differences between the two versions of the template.
- a new policy, Submit a JES Job, that enables you to execute code that has been registered with the SAS Job Execution Service.
- a new policy action, Invoke REST Web Service.
- two new properties, Error Code and Error Message, for the Invoke Web Service policy, which supports business logic based on potential error conditions.
- support for Date data objects in timer expressions. Using Date data objects allows the dynamic use of datetime values at run time. Also, with Date data objects, you can now enter negative relative offsets, which trigger actions prior to the date that was specified by the data object.
- support for a new TODAY function in decision gateway expressions. This function retrieves the current datetime system value, which enables you to specify a specific date offset from the current date.

Chapter 12

SAS Intelligence Platform

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SAS Environment Manager

About SAS Environment Manager

SAS Environment Manager is a monitoring and management system for SAS deployments. Features include automatic resource discovery, monitoring of remote systems, personal and role-based dashboards, alerting, and visualization. The application provides web-based management, operation, and proactive monitoring of servers on both

the middle tier and the SAS server tier. SAS Environment Manager incorporates some of VMware's Hyperic technology in order to offer enterprise-class operational features.

SAS Environment Manager 2.6

SAS Environment Manager 2.6 shipped in June 2025 and runs on SAS 9.4M9.

SAS Environment Manager 2.5 with SAS 9.4M8

SAS Environment Manager supports SAS 9.4M8, which shipped in January 2023.

SAS Environment Manager 2.5 with SAS 9.4M7

In SAS 9.4M7 (August 2020), here are the new features and enhancements:

- In the SAS Environment Manager Data Mart, the ACM.IOMSERVERS table has been replaced by the ACM.SASAPPSERVERS and ACM.SASLOGICALSERVERS tables.
- The stored process reports in the Report Center have been replaced with stored process prompts. Using stored processes enables you to generate reports based on criteria that you select, and provides for greater customization of the report parameters.
- The new SAS Backup Manager is available on the **Administration** tab. For more information, see [“Backup Tools” on page 231](#).

Starting in the May 2019 update to SAS 9.4M6, the 2.6 release of SAS Environment Manager Administration is available.

This release provides an updated interface and incorporates features that were previously in SAS Visual Analytics Administrator.

For more information, see [What’s New in SAS Environment Manager Administration](#). For more information about changes from the previous release, see [SAS Environment Manager](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Environment Manager 2.5

Starting in SAS 9.4M5, SAS Environment Manager requires less manual configuration for HTTPS. For more information, see [SAS Intelligence Platform: Middle-Tier Administration Guide](#).

SAS Environment Manager 2.5 runs on SAS 9.4M3 and later releases. SAS Environment Manager 2.5M1 was shipped in November 2016 and runs on SAS 9.4M4.

Here are some of the new features and enhancements for this release:

- Log collection and discovery has been improved. Rather than relying on log locations that are stored in metadata, the ETL processes look through the directory structure of a SAS deployment to find log files.
- Support has been added for collecting metric data from a SAS grid. Metric data is collected and reported upon for the grid and for individual grid nodes.
- Support has been added in SAS Environment Manager Administration for managing metadata definitions for SAS users, servers, and libraries. User definitions can be viewed, created, and edited. Server and library definitions can be viewed, and SAS LASR libraries and servers and Base SAS libraries can be created and edited.

- The SAS Environment Management Data Mart now supports a federated data mart. A federated data mart enables you to collect metric data in data marts for several SAS deployments, copy that data to a single collector deployment, and view the collected metric data in one place.

SAS Environment Manager 2.4

SAS Environment Manager 2.4 runs on SAS 9.4M2 and later releases.

Here are some of the new features and enhancements for this release:

- The SAS Environment Manager Service Management Architecture provides functions and capabilities that enable SAS Environment Manager to fit into a service-oriented architecture (SOA). These functions include SAS Environment Manager Extended Monitoring, Audit, Performance, and Measurement (APM) ETL; Agent-Collected Metric (ACM) ETL; and a solution kit framework.
- SAS Environment Manager provides services that enable you to import and export event data.
- Environment Snapshot contains a comprehensive list of the system information in the SAS Environment Manager database. This snapshot provides you with valuable information about your system.
- SAS Environment Manager 2.4 also includes a facility that enables you to manage user definitions in SAS metadata. The user administration features in SAS Environment Manager enable you to create and maintain users, groups, and roles. You can also manage memberships, logins, and internal accounts.

SAS Environment Manager 2.3

In SAS 9.4M1, SAS Environment Manager includes the ability to manage folders and to view and change authorization settings in SAS metadata.

In SAS 9.4M2, SAS Environment Manager includes the ability to create and update access control templates (ACTs). ACTs enable you to avoid repeatedly adding the same explicit controls for the same identities on multiple objects. When you apply an ACT to an object, the pattern settings in an ACT are added to the direct controls of an object.

SAS 9.4 Intelligence Platform

Installation and Configuration

For SAS 9.4M9:

Important: SAS recommends that you perform a new installation of your SAS software starting at SAS 9.4 M9 in order to automate multifactor authentication (MFA) configuration for SAS Logon Manager and TLS configuration for all of the middle-tier servers. This new installation eliminates numerous manual steps.

- You can configure TLS for internal connections through SAS Deployment Wizard. This includes the processes between SAS Web Server, SAS Web Application Server, JMS Broker, and Cache Locator. For more information, see [\(SAS 9.4M9\) Use TLS for Internal Connections](#).

If you choose to configure TLS for internal connections, you must also configure SAS Web Server and SAS Environment Manager for HTTPS through SAS Deployment Wizard. The deployment wizard dialogue for configuring [HTTPS for SAS Web Server](#) does not give you an option.

- Multifactor authentication (MFA) is supported for SAS Logon Manager. It can be configured automatically through SAS Deployment Wizard. SAS web applications that use SAS Logon Manager are protected by MFA. For more information, see [Configure Multifactor Authentication \(MFA\) for SAS Logon Manager](#).
- You can no longer configure encryption options and FIPS through SAS Deployment Wizard for server encryption. Use post-deployment manual steps to secure your IOM servers. For configuration information, see [Configuring FIPS in Configuring TLS and Enabling FIPS](#).
- SAS 9.4M9 supports PostgreSQL 16.
- SAS 9.4M9 supports Java 21. Deployments on z/OS also require Java 21. For more information, see the [System Requirements for SAS 9.4 Foundation for z/OS](#).

Security Enhancements

SAS 9.4M9

The following changes have been made:

- The SAS Metadata Model has been modified to secure pre-code and post-code that is created for a job. The pre-code and post-code are created at the same level as defined for the job. For complete details, see “[Changes to the SAS Metadata Model](#)” in *SAS Open Metadata Interface: Reference and Usage*.
- SAS Web Apps can now use multi-factor authentication to enhance security. For more information, see [Multifactor Authentication \(MFA\) in SAS 9.4M9](#) in *SAS 9.4 Intelligence Platform: Middle-tier Administration Guide*.
- You can configure SAS Web Application Server, JMS Broker, and Cache Locator for TLS during the deployment process. For more information, see [Configure TLS for Middle-tier Servers](#) in *SAS 9.4 Intelligence Platform: Installation and Configuration Guide*.
- MFA is supported for z/OS using IBM Z Multi-Factor Authentication. To apply MFA to SAS/CONNECT and SAS/SHARE on z/OS, see [About IBM Z Multi-Factor Authentication \(MFA\)](#).
- The NETENCRYPTALGORITHM= (NETENCRLG=) system option values of RC2, RC4, DES, TRIPLEDES, and AES are deprecated. These values will be removed in an upcoming SAS release. Change the option value to SSL to specify the use of the TLS protocol. [Configure TLS for Data in Motion \(Starting with SAS 9.4M9\)](#)

A WARNING message is generated when system option NETENCRYPTALGORITHM (NETENCRLG)= is set to values AES, DES, RC2, RC4, or TripleDES. For more information, see [ACCEPT_RISK_ALLOW_INSECURE_HANDSHAKE](#) environment variable can be used to change the WARNING message to an INFO message.

- PKCS#12 certificate files (file extension .p12) are now provided. The trusted certificate files are trustedcerts.pem and trustedcerts.p12. SAS recommends that you provide certificate files in PKCS#12 format instead of JKS formatted certificates for use with SAS on Windows.

- The SAS Middle Tier is now configured with OpenSSL 3.0 and the Java TLS implementation that supports TLS 1.3 and FIPS. For more information, see [What's New in Middle-Tier Administration for the SAS 9.4 Intelligence Platform](#) in *SAS Intelligence Platform: Middle-Tier Administration Guide*.

SAS 9.4M8

The following changes have been made to Encryption in SAS:

- SAS no longer provides SAS/SECURE. See [SAS/SECURE with SAS 9.4M8](#) in *Encryption in SAS*.
- SAS no longer provides cryptographic libraries for SAS Foundation servers. For more information, see [Cryptographic Library Support Starting with SAS 9.4M8](#) in *Encryption in SAS*.
- SAS no longer provides OpenSSL libraries to support TLS on z/OS. For more information, see [IBM System SSL Provides OpenSSL Capabilities for z/OS in 9.4M8](#) in *Encryption in SAS*.
- SAS supports IBM System SSL on z/OS 64-bit SAS Metadata Server through hot fixes. The z/OS 64-bit SAS Metadata Server is used in a SAS Business Intelligence platform deployment. For more information, see [Usage Note 70504: Support for the IBM "System SSL" for 64-bit z/OS](#). For configuration information, see *Configuration Guide for SAS® 9.4 Foundation for z/OS*.
- z/OS Pervasive Encryption is available for SAS direct access bound libraries and sequential access libraries. For more information, see [IBM z/OS Pervasive Encryption for Data Sets with SAS 9.4M8](#) in *Encryption in SAS*.
- The SAS Middle-Tier is configured with OpenSSL 3.0 and the Java TLS implementation that supports TLS 1.3 and FIPS. For more information, see [What's New in Middle-Tier Administration for the SAS 9.4 Intelligence Platform](#).
- The SAS Web Server supports only TLS v1.3 and TLS v1.2.

SAS 9.4M7

Support for Microsoft Windows Defender Credential Guard (Credential Guard) is available. SAS supports constrained delegation, which is a requirement for Credential Guard. To prevent threat and security risks, Credential Guard isolates logon information for users from the rest of the operating system by using virtualization to store credentials in protected containers that are separated from the operating system.

SAS 9.4M6

SAS 9.4M6 continues to deliver security updates for SAS code and for third-party components. The SAS Private JRE is updated to a Java 8 baseline.

SAS 9.4M5

New encoding type SAS005 uses AES encryption with a 256-bit fixed key and a 64-bit random salt value. SAS005 increases security for stored passwords by using the SHA-256 hashing algorithm and is hashed for additional iterations. You can configure the metadata server to store any new or updated passwords using SAS005.

SAS 9.4M4

This release provides these enhancements:

- enhanced Webseal information
- certificate management
- new default minimum encryption levels with TLS configurations

SAS 9.4M3

This release provides these enhancements:

- the ability to audit internal accounts on the middle tier
- the ability to specify an allowlist of sites that are allowed to link to SAS web applications
- improved Transport Layer Security
- Windows Challenge/Response (NTLM) support for proxy authentication

SAS 9.4M2

In SAS 9.4M2, Integrated Windows Authentication on Linux systems no longer requires the use of Quest Authentication Services. SAS can leverage the libraries that are shipped with the supported operating system or that are provided in most third-party authentication solutions.

SAS 9.4M1

SAS 9.4M1 provides the ability to put a SAS server in a locked-down state, ensuring that the process can access only designated resources in the host operating environment. For more information, see [“Locked-Down State” on page 44](#).

SAS 9.4

You can now use either SAS Management Console or the AUTHLIB procedure to bind SAS data to metadata. All access from SAS to metadata-bound data is subject to metadata-layer permissions.

For more information, see [“Audit and Report More about SAS and SAS Applications” on page 51](#).

SAS Web Server and SAS Web Application Server

Starting in SAS 9.4, the middle-tier software includes SAS Web Server for use as an HTTP server and SAS Web Application Server, so that a third-party web application server is no longer needed. SAS Web Application Server is a lightweight server that provides enterprise-class features for running SAS web applications. The SAS deployment tools can configure these servers automatically. The tools simplify the configuration of vertical and horizontal clustering as well as HTTP load balancing.

- Starting with SAS 9.4M7, the version of SAS Web Application Server used in the middle-tier environment has been upgraded. It is now based on Apache Tomcat.
- Starting with SAS 9.4M6, SAS Web Server is now based on Apache Open Source HTTP server. It is built and packaged by SAS.
- In SAS 9.4M3, SAS has made changes that are expected to result in a 40% to 50% decrease in start-up time for SAS Web Application Server.

Metadata Server Clustering

The metadata server clustering feature provides redundancy and high availability of the metadata server, which is a core component of the SAS infrastructure. Clustering ensures that the server continues to operate if a server host machine fails.

Effective with SAS 9.4M2, metadata server clustering is supported on z/OS. In previous SAS 9.4 releases, it is supported only on UNIX and Windows.

Backup Tools

The Deployment Backup and Recovery tool provides an integrated method for backing up and recovering SAS content across multiple tiers and machines.

SAS 9.4M3 includes SAS Backup Manager, which is an easy-to-use interface for scheduling, configuring, monitoring, and performing integrated backups. The interface incorporates most of the functions of the Deployment Backup and Recovery tool's batch commands. SAS Backup Manager can be accessed from the **Administration** tab of SAS Environment Manager.

Batch Tools for Relationship Reporting

- SAS 9.4M3 includes a new batch command that enables you to use SAS Metadata Bridges to load third-party lineage information to the SAS Relationship Service.
- SAS 9.4M2 includes a new batch command that you can use to run the metadata analyze and repair tools that are available in SAS Management Console.
- SAS 9.4M1 includes new batch tools for relationship reporting. You can use these tools to identify relationships among the content objects in the SAS Folder tree.

Smaller WAR Files for SAS Web Applications

Starting in SAS 9.4M3, some SAS web applications no longer include JAR files, which makes the corresponding WAR files smaller. The web applications that support this feature now load the common JAR files from a central repository in the **SASHome** directory instead of including copies of the files in the WAR file. This change results in a smaller configuration area.

DataFlux Integration

Beginning in 2012, SAS has fully integrated the DataFlux suite of data quality, data integration, data governance, and master data management solutions. SAS data management offerings now include products with the DataFlux name, such as Data Management Studio, as well as other SAS products, including Base SAS, SAS/ACCESS interfaces, and the SAS Metadata Server.

When SAS integrated the DataFlux product line into SAS offerings, some products such as SAS MDM and SAS Federation Server were enhanced and rebranded. Other products have retained the DataFlux name but continue to be enhanced and adapted to SAS. Support for SAS Metadata Server has been added to DataFlux Data Management Studio on an incremental basis. For example, DataFlux Data Management Studio 2.5 and 2.6 can use either DataFlux Authentication Server or SAS Metadata Server for user authentication.

New SAS offerings, including the comprehensive SAS Data Management Advanced and Standard offerings, replace offerings such as SAS Enterprise Data Integration Server. These offerings enable customers to choose from a broader array of data management products and enable them to add SAS products such as SAS LASR Analytic Server and SAS Visual Analytics Administration and Reporting.

Changes to Migration and Deployment

SAS 9.4M8

The SAS 9.4 M8 Migration Utility requires JRE 11. The SAS 9.4 M8 Migration Utility will not continue if Java 11 is not provided. For more information, see “[SAS Migration Utility Requirements](#)” in *SAS Intelligence Platform: Migration Guide*.

SAS 9.4M4

A new migration utility property enables you to increase the Java heap size for the SAS Content Server repository. This utility also preserves the customizations for your TLS configurations.

SAS 9.4M3

In SAS 9.4M3, several features have been added to the SAS Deployment Wizard:

- If the wizard is interrupted and then restarted during the installation phase, it will install only those SAS products that it has not already installed.
- The wizard enables you to reduce the number of password prompts for required SAS internal accounts, metadata-based server accounts, and SAS Web Infrastructure Data Server accounts.

Support has also been added for compressing and validating SAS Software Depots. In addition, the SAS Migration Utility has been enhanced to protect passwords in the migration package from being exposed.

SAS 9.4M2

The SAS Deployment Wizard enables you to specify the size of your web application based on the number of users and workload. In addition, the SAS Deployment Wizard provides an option to install only the newly released documentation.

SAS 9.4M1

A feature has been added that identifies those versions of SAS offerings that are unable to be migrated directly to SAS 9.4 with the SAS Migration Utility. The Migration Utility Analysis Report identifies which products to update in order to prepare them for migration.

Processing the Configuration Folders

Starting in SAS 9.4M4, you can use the new USERCONFIG system option to specify whether to process the .sasv9.cfg and sasv9.cfg configuration files in a user's home directory.

General Enhancements

- In SAS 9.4, users can view some SAS Web Report Studio relational reports on mobile devices with SAS Visual Analytics Apps. In addition, users can manage mobile access permissions through devices using allowlists and denylists.
- Beginning in October 2014, new roles and capabilities are available for SAS Add-In 7.1 for Microsoft Office and SAS Enterprise Guide 7.1.
- Starting in SAS 9.4M3 and the release of SAS Visual Analytics 7.2, Visual Analytics Hub is a sibling of Visual Analytics, immediately below SAS Application Infrastructure. This adjustment to the software architecture is reflected on the **Plugins** tab in SAS Management Console.

- In SAS 9.4M6, support has been added for a new scheduler named the SAS Job Flow Scheduler. SAS Job Flow Scheduler is a component of SAS Grid Manager.

Additional Information

For more information about changes from the previous release, see For more information, see “SAS Intelligence Platform” in *SAS Guide to Software Updates and Product Changes*.

For more information, see these What’s New topics:

- “What’s New in Installation and Configuration for the SAS 9.4 Intelligence Platform” in *SAS Intelligence Platform: Installation and Configuration Guide*
- “What’s New in Migration for the SAS 9.4 Intelligence Platform” in *SAS Intelligence Platform: Migration Guide*
- “What’s New in Application Server Administration for the SAS 9.4 Intelligence Platform” in *SAS Intelligence Platform: Application Server Administration Guide*
- “What’s New in System Administration for the SAS 9.4 Intelligence Platform” in *SAS Intelligence Platform: System Administration Guide*
- “What’s New in Desktop Application Administration for the SAS 9.4 Intelligence Platform” in *SAS Intelligence Platform: Desktop Application Administration Guide*
- “What’s New in Security Administration in SAS 9.4” in *SAS Intelligence Platform: Security Administration Guide*
- “What’s New in Middle-Tier Administration for the SAS 9.4 Intelligence Platform” in *SAS Intelligence Platform: Middle-Tier Administration Guide*
- “What’s New in Data Administration for the SAS 9.4 Intelligence Platform” in *SAS Intelligence Platform: Data Administration Guide*
- “What’s New in Web Application Administration for the SAS 9.4 Intelligence Platform” in *SAS Intelligence Platform: Web Application Administration Guide*

SAS Information Retrieval Studio 1.53

SAS Information Retrieval Studio 1.53 provides SSL support for search.

For more information, see “Updates to SAS Information Retrieval Studio for SSL” in *SAS Intelligence Platform: Middle-Tier Administration Guide*.

SAS Theme Designer 5.1

SAS Theme Designer 5.1 shipped in May 2019. Here are the new features:

- For application themes, the **Pin the pane** and **Unpin the pane** options enable you to pin or unpin the side pane in the **Preview** pane.
- When editing an application theme in context, you can save a theme without publishing it.
- The primary color is used for application themes only. It is not used in report themes.

- If you import a SAS theme and a theme with the same name already exists, you can choose to overwrite the current theme or create a second theme.

SAS Theme Designer for Flex

SAS Theme Designer 4.7 for Flex

You can now access SAS Theme Designer 4.7 for Flex from a new Sign-In Screen. When accessing SAS Theme Designer 4.7 for Flex from the SAS Visual Analytics 7.2 Home page, the **Home** banner enables you to select the **SAS Theme Designer (Classic)** option. When you select this option, the SAS Theme Designer for Flex opens.

SAS Theme Designer 4.2 for Flex

The **User Interface Components** pane and the **Properties** pane have been combined into a single pane for SAS Theme Designer 4.2 for Flex. The **User Interface Components** pane now contains all components to create or modify a theme. In addition, you can now customize the font style for a theme. In the **User Interface Components** pane, the **Global Settings** option now contains a setting for **Font**.

The name for a theme is now assigned when you are saving or saving and deploying a theme. And, when a theme is deployed, undeployed, or deleted in SAS Theme Designer 4.2 for Flex, the list of available themes is immediately updated in applications that use Flex themes.

For more information, see [What's New in SAS Theme Designer 4.2 for Flex](#) in *SAS Theme Designer for Flex: User's Guide*.

SAS Theme Designer 4.1 for Flex

For SAS Theme Designer 4.1 for Flex, the SAS Corporate theme is now the default theme, which has been updated with a new color palette that is based on a navy blue palette.

You can now access SAS Theme Designer for Flex from the SAS Visual Analytics Hub to create custom themes. In addition, report themes are now automatically created when a custom application theme is created in SAS Theme Designer for Flex. These custom report themes can then be used in SAS Visual Analytics reports.

Chapter 13

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SAS IT Resource Management

SAS IT Resource Management 3.12

SAS IT Resource Management 3.12 became available in June 2023 and runs on SAS 9.4M8. This release includes updates to the IBM SMF adapter in order to support MXG 40.40.

See the resources:

- For more information about this release, see the product documentation page for [SAS IT Resource Management](#).
- For more information about changes from the previous release, see [SAS IT Resource Management](#) in *SAS Guide to Software Updates and Product Changes*.

SAS IT Resource Management 3.11

SAS IT Resource Management 3.11 became available in April 2020 and runs on SAS 9.4M6. This release includes these new features and enhancements:

- graph format changes for supplied SAS Enterprise Guide projects and the Report Definition task
- updates to the VMware vCenter Adapter for VMware vCenter 6.7
- updates to the Adapter for MXG 37.08
- Microsoft System Center Operations Manager updates for System Center Management Pack Windows Server Operating Systems v2019 (1709 Plus)

- Microsoft System Center Operations Manager updates for System Center Management Pack for SQL Server Operating Systems v2017

SAS IT Resource Management 3.10

SAS IT Resource Management 3.10 became available in June 2019 and runs on SAS 9.4M6. This release includes these new features and enhancements:

- a simplified web application for the IT Resource Management Report Center
- updates to the VMware vCenter Adapter for the vCenter Server Application vPostgres database
- updates to the Adapter for MXG 36.36

SAS IT Resource Management 3.9

SAS IT Resource Management 3.9 became available in May 2018 and runs on SAS 9.4M5. New in this release are updates to adapters based on MXG software for MXG 36.01. Additional updates include Amazon CloudWatch, System Activity Report (SAR), Microsoft System Center Operations Manager for Windows Server Operating System 2003/2998/2008 R2/2012/2012 R2, Windows Server Operating System 2016, and updates to SQL Server Memory metrics.

SAS IT Resource Management 3.8

SAS IT Resource Management 3.8 became available in February 2017 and runs on SAS 9.4M4. In this release, a new feature allows MXG software tables and columns that are not natively supported by the solution to be added to IT Resource Management metadata and staging jobs. Also new in this release are updates to adapters based on MXG software for MXG 34.08 and VMware vCenter adapter updates for VMware 6.5. In addition, packages that contain the Visual Analytics reports for VMware vCenter described in Appendix 14 of *SAS IT Resource Management: Administrator's Guide* are provided.

SAS IT Resource Management 3.7

SAS IT Resource Management 3.7 became available in February 2016. In this release, two new adapters are provided: Amazon CloudWatch and Ganglia. As with earlier releases, there are also multiple adapter updates.

SAS IT Resource Management 3.6

SAS IT Resource Management 3.6 became available in May 2015. In this release, two new adapters are provided: SAS Environment Manager and ASG TMONDB2 V5. As with earlier releases, there are also multiple adapter updates. In addition, the copy function of ITRM Report Center is enhanced.

SAS IT Resource Management 3.5

SAS IT Resource Management 3.5 became available in September 2014. In this release, upon request, SAS Visual Analytics and the in-memory SAS LASR Analytic Server can be included with the solution. Reference documentation about installing and configuring

SAS IT Resource Management without the SAS middle tier is available in *Guide to Operating SAS IT Resource Management 3.5 without a Middle Tier*. Version updates as well as enhanced support capabilities are provided for multiple adapters with this release. As is true for all releases, there are also multiple adapter updates.

SAS IT Resource Management 3.4

SAS IT Resource Management 3.4 became available in December 2013. In this release, you can use exception analysis processing to define, evaluate, detect, and report on exceptional conditions in IT data marts. Also new in this release is the ITRM Report Center web application used to view, organize, filter, and share SAS IT Resource Management performance and exception reports. Integration with SAS Visual Analytics was added through macros that enable you to load and update ITRM tables into the SAS LASR Analytic Server. There is a new wizard to add domain categories to an existing staging transformation. As is true for all releases, there are also multiple adapter updates.

Chapter 14

SAS Risk Management

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SAS Credit Risk for Banking

Starting in SAS 9.4M7, SAS Credit Risk for Banking is no longer available. Consider modernizing with SAS Solution for Stress Testing 2020.06. For more information, contact your SAS account executive.

SAS Enterprise GRC 6.1

Note: Starting with SAS 9.4M8, SAS Enterprise GRC is a retired product. If you order SAS 9.4M8, SAS Enterprise GRC is not included in that order. A best practice is to unconfigure retired SAS products before you upgrade and to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

SAS shipped SAS Enterprise GRC 6.1 in October 2014.

This release has added several new features, which include, but are not limited to the following:

- The procedure to install SAS Enterprise GRC and its dependent products has been simplified.
- SAS Enterprise GRC 6.1 now integrates with SAS Visual Analytics. Users can now shift between the SAS Enterprise GRC and SAS Visual Analytics user interfaces for managing and running reports. In addition, two new SAS Visual Analytics reports are provided by default.
- New security features have been added to protect the server from malicious web traffic.
- Attachments can now be filtered by name and file type.
- Updates have been made to screen definitions and workflows to improve usability and performance.
- Several new data loaders have been added.

See these resources:

- For more information, see the software product page for [SAS Enterprise GRC](#).
- For more information about changes from the previous release, see [SAS Enterprise GRC](#)

Note: The documentation for SAS Enterprise GRC is available only to customers who license this product.

SAS Firmwide Risk for Solvency II

About SAS Firmwide Risk for Solvency II

SAS Firmwide Risk for Solvency II performs risk analysis and risk-based capital calculations for insurers. With a data management and reporting platform that includes an insurance-specific data model, you can implement the Solvency II standard model approach for calculating risk-based capital. The solution has as its foundation an extendible risk analytics framework to support other regulatory regimes. It also supports an internal model approach for risk analysis, providing insurance companies with additional business benefit. SAS Firmwide Risk for Solvency II is designed to perform risk analysis and risk-based capital calculations for all insurance companies. It supports the standard model approach for Solvency II compliance at solo entity and insurance group levels.

SAS Firmwide Risk for Solvency II also performs these tasks:

- stress testing and scenario analysis
- calculation of risk margins
- aggregation of risk capital charges
- calculation of solvency capital requirements (SCR) and minimum capital requirements (MCR)
- regulatory and internal risk reporting

The current release of SAS Firmwide Risk for Solvency II is 3.2.

SAS Firmwide for Solvency II Content Releases

The SAS Firmwide Risk for Solvency II solution is delivered as a *content release* that runs on the SAS Infrastructure for Risk Management platform. Solutions that are based on SAS Infrastructure for Risk Management share the same architecture and layout. The difference between the solutions is the calculation content that is delivered in a solution's content release. After installing SAS Infrastructure for Risk Management, you must separately download and install the SAS Firmwide Risk for Solvency II content release to complete the installation.

See these resources:

- For more information about new features and enhancements in the latest SAS Firmwide for Solvency II content release, see the [SAS Firmwide Risk for Solvency II](#) product page.
- For more information about changes from the previous release, see [SAS Firmwide Risk for Solvency II](#)

Note: The documentation for SAS Firmwide Risk for Solvency II is available only to customers who license this product.

Support for SAS Firmwide Risk for Banking

Starting in SAS 9.4M7, SAS Firmwide Risk for Banking is no longer available. Consider modernizing with SAS Solution for Stress Testing 2020.06.

SAS High-Performance Risk

About SAS High-Performance Risk

SAS High-Performance Risk is a portfolio management solution that uses scalable, in-memory technology to quickly process complex loan-level modeling systems for all portfolios across the enterprise. With SAS High-Performance Risk, you can do the following:

- Improve your financial portfolio management by pricing large portfolios over many simulated market states and analyzing risk in near-real-time.
- View the values of financial variables such as profit/loss, exposure, and cash flows.
- Analyze metrics like expected shortfall, potential future exposure, duration, and convexity.
- Aggregate values across market states and compute risk measures on demand as you explore risk through an interactive user interface.
- Perform on-demand stress testing.

SAS High-Performance Risk includes SAS Risk Dimensions, the HPEXPORT procedure, and the HPRISK procedure.

- SAS Risk Dimensions integrates the measurement of market and credit risk by using SAS data access and repository technologies to manage position and market data. SAS Risk Dimensions provides the COMPILE procedure and the RISK procedure, which you can use to manage functions, CALL routines, and method programs, to create SAS Risk Dimensions environments and to execute risk analysis projects.
- The HPEXPORT procedure enables you to export SAS Risk Dimensions environments to a format that can be used by the HPRISK procedure.
- The HPRISK procedure enables you to execute the analysis projects on a cluster or on a single computer system with multiple CPUs.

SAS High-Performance Risk 4.5

SAS shipped SAS High-Performance Risk 4.5 in June 2025. This release runs on SAS 9.4M9 and includes SAS Risk Dimensions 6.15.

See these resources:

- For more information, see the software product page for [SAS High-Performance Risk](#).
- For more information about changes from the previous release, see [SAS High-Performance Risk](#) in *SAS Guide to Software Updates and Product Changes*.

SAS High-Performance Risk 4.4

SAS shipped SAS High-Performance Risk 4.4 in January 2023. This release runs on SAS 9.4M8 and includes SAS Risk Dimensions 6.14.

SAS High-Performance Risk 4.3

SAS shipped SAS High-Performance Risk 4.3 in August 2020. This release runs on SAS 9.4M7 and includes SAS Risk Dimensions 6.13.

SAS High-Performance Risk 4.2

SAS High-Performance Risk 4.2 shipped in June 2019 and runs on SAS 9.4M6 and includes SAS Risk Dimensions 6.12.

This release provides the following enhancements:

- enables you to perform the following actions for risk explorations:
 - add class variables to an active forced hierarchy in the crosstab
 - replace a data source on an exploration in the Welcome window
 - view risk factors for every state in a simulation
 - create a comparison chart of multiple subportfolios of the same output variable and of different output variables
 - display simulated risk factors on a page
- provides the following new features:
 - ability to filter SubCubes of a comparison join independently
 - ability to store one or more schema files as cube data files
 - new QueryVal subroutines that enable you to iterate through scenarios
 - support for aggregate and side-by-side joins of basecell result set cubes
 - prompts to refresh the risk exploration if the data source has changed
 - ability to use input methods during distribute tasks to update positions for stress
 - ability to compute and display computed methods by scenario in a risk exploration
- provides the following performance enhancement:
 - when in grid mode, SIMVALUES= uses an along-side write to write directly to SAS LASR and Apache Hadoop

SAS High-Performance Risk 4.1

SAS High-Performance Risk 4.1 shipped in June 2018 and runs on SAS 9.4M5. This release provides these enhancements:

- provides a new roll-up method. When you query risk price cubes, you can run a roll-up method on each output variable for each horizon and replication at each level in the hierarchy for that query.
- provides these analytical features:

- the TOP function, which returns the value for the top-level portfolio at the current horizon and state (or base case) in a scenario
- the RESET_CASHFLOW argument in the PROC HPRISK statement, which easily initializes cash flow structures in methods to missing
- the BATCHBY argument in the QUERY statement, which performs large queries as a sequence of smaller queries in order to avoid out-of-memory conditions
- provides these performance enhancements:
 - various performance enhancements to the SAS Risk Scenario Manager
 - reduced file sizes for stored cubes that contain ValueData objects
 - reduced memory requirements when performing INSTID queries with SCENTRANS
 - support for the BASECELL argument when you create a portfolio cube
 - ability to subset scenario output by scenario name
- provides the following improvements to cube management:
 - the ability to update the path of stored libref definitions without rebuilding the cube
 - a new PORTCOLS argument in the [UIDEFAULTS statement](#) of the HPRISK procedure to limit the columns displayed in the UI
 - the ability to create comparison join cubes from different releases of SAS High-Performance Risk (The component cube cannot be older than SAS High-Performance Risk Release 3.9.)

SAS High-Performance Risk 3.9

SAS High-Performance Risk 3.9 shipped in September 2017 and aligns with SAS 9.4M5.

SAS High-Performance Risk 3.8

SAS High-Performance Risk 3.8 shipped in June 2017 and runs on SAS 9.4M4. This release provides these new features:

- new computed roll-up methods and pre-query methods
- historical simulation and sensitivity analysis
- new cross-classification filters when you create a cube
- a new administrative tool that works across SAS risk solutions to set up risk work groups

SAS High-Performance Risk 3.7

SAS High-Performance Risk 3.7 shipped in November 2016 and runs on SAS 9.4M4. This release provides these new features:

- support for Delta-Normal analysis
- scenario cash flow and ValueData data sets
- transposed scenario analysis result set

SAS High-Performance Risk 3.6

SAS High-Performance Risk 3.6 runs on SAS 9.4M3. This release includes a bridge component that enables you to run programs that are not thread-safe and a preproduction custom file reader that enables you to directly access risk data in Hadoop MAPREDUCE jobs. This release also includes new SAS language elements.

SAS High-Performance Risk 3.5

SAS High-Performance Risk 3.5 runs on SAS 9.4M3. Starting with this release, scenario results can be stored in a risk cube. This release also includes enhancements to the user interface and new SAS language elements.

SAS High-Performance Risk 3.4

SAS High-Performance Risk 3.4 runs on SAS 9.4M2 and provides these new features:

- the capability to store risk cube data files in the Hadoop Distributed File System (HDFS) in distributed mode. The primary benefit of storing risk cubes in HDFS is an improved backup and restore process.
- the ability to define statistics and include them in a risk cube. You can also include distortion risk measures in a risk cube.
- the ability to plot risk factors in the Scenario Editor.
- new language elements.

SAS High-Performance Risk 3.3

SAS High-Performance Risk 3.3 runs on SAS 9.4M2 and provides the following features:

- enhancements to scenario creation and stress testing
- enhanced support for counterparty risk and credit value adjustment
- ability to price a portfolio by both positions and market states
- new SAS language statements

SAS High-Performance Risk 3.2

SAS High-Performance Risk 3.2 runs on SAS 9.4M1 and provides the following new features:

- access to SAS High-Performance Risk through the SAS Visual Analytics application bar
- ability to export risk explorations to a PDF file
- user interface enhancements
- ability to send data sets from grid nodes directly to a distributed data file system or to in-memory data
- ability to perturb instrument variables in a portfolio

SAS High-Performance Risk 3.1

SAS High-Performance Risk 3.1 runs on SAS 9.4 and includes these features:

- enhancements to risk analytics include netted and collateralized exposure calculations, portfolio stressing and filtering, and an enhanced scenario builder
- integration with Hadoop and SAS LASR
- enhancements to the user interface include enhanced sorting, the ability to export graphs to Microsoft Excel, the ability to drill down in bar charts, and enhancements to stress testing
- ability for high-performance sensitivity analysis
- improvements to performance

SAS Market Risk for Banking

Starting in SAS 9.4M7, SAS Market Risk for Banking is no longer available. Consider modernizing with SAS Solution for Stress Testing 2020.06. For more information, contact your SAS account executive.

SAS Market Risk Management for Insurance

About SAS Market Risk Management for Insurance

SAS Market Risk Management for Insurance enables insurance companies to perform asset valuation, portfolio allocation, and risk management analysis in a flexible, configurable, and high-performance environment. You can integrate, manage, and analyze data, run multiple models, and quantify the risks underlying your market portfolio.

SAS Market Risk Management for Insurance is designed for IT managers to govern the enterprise risk data management process; risk analysts to quantify the risk exposure and perform simulations and what-if analysis; and senior managers to monitor risk level and make risk-based strategic business decisions.

The solution provides these features:

- flexible risk analysis framework
- risk data management and governance
- mark risk assessment and monitoring
- financial instrument modeling
- stress testing and what-if analysis
- visualization and reporting
- high-performance capabilities

The current release of SAS Market Risk Management for Insurance is 7.2.

SAS Market Risk Management for Insurance Content Releases

The SAS Market Risk Management for Insurance solution is delivered as a *content release* that runs on the SAS Infrastructure for Risk Management platform. Solutions that are based on SAS Infrastructure for Risk Management share the same architecture and layout. The difference between the solutions is the calculation content that is delivered in a solution's content release. After installing SAS Infrastructure for Risk Management, you must separately download and install the SAS Market Risk Management for Insurance content release to complete the installation.

For more information about new features and enhancements in the latest SAS Market Risk Management for Insurance content release, see the [SAS Market Risk Management for Insurance](#) product page.

Note: The documentation for SAS Market Risk Management for Insurance is available only to customers who license this product.

SAS Model Implementation Platform

About SAS Model Implementation Platform

SAS Model Implementation Platform is a robust software platform that is built to handle the diverse challenges that institutions face when implementing and executing systems of credit risk models.

SAS Model Implementation Platform is designed for model developers, model implementation teams, and analysts who are responsible for models that support activities such as forecasting, stress testing (CCAR and DFAST), reserving, calculating expected credit loss (IFRS 9 and CECL), and loan valuation.

SAS Model Implementation Platform performs the following actions:

- streamlines the pipeline between estimating models and implementing those models into an integrated system
- provides a controlled, transparent, and replicable model execution environment
- improves auditability with a searchable, centralized model repository
- provides pre-built modeling templates to simplify the setup of new modeling frameworks such as the Cox proportional hazards model, the Monte Carlo state-transitions model, and the Markov chain transitions model
- enables thread-safe parallelization without the need to write any distributed processing code
- uses scalable, in-memory technology to quickly process complex loan-level modeling systems for all portfolios across the enterprise
- provides the ability to aggregate model results for millions of loans, and enables visual exploration and drill-down through those results
- provides built-in tools for backtesting, model sensitivity analysis, and attribution analysis

For more information, see the software product page for [SAS Model Implementation Platform](#).

Note: The documentation for SAS Model Implementation Platform is available only to customers who license this product.

SAS Model Implementation Platform 3.4

SAS shipped SAS Model Implementation Platform 3.4 in June 2025. This release includes SAS 9.4M9.

SAS Model Implementation Platform 3.3

SAS shipped SAS Model Implementation Platform 3.3 in January 2023. This release includes SAS 9.4M8 and SAS High-Performance Risk 4.4.

SAS Model Implementation Platform 3.2

SAS shipped SAS Model Implementation Platform 3.2 in June 2019. This release includes SAS 9.4M6 and SAS High-Performance Risk 4.2.

Here are some of the new actions that you can perform in this release:

- execute a scenario run and a portfolio cube run in a single analysis run
- submit a new originations run, which includes both existing portfolio data and synthetic new originations in the analysis
- execute model unit tests
- create an editable copy of a modeling system so that you can perform what-if analysis
- use SAS Code Debugger to debug the code that is generated for analysis runs and model unit tests
- generate the $\chi\beta$ data for each model variable and horizon combination that is included in an analysis run or a model unit test
- customize the HPEXPORT procedure for analysis runs
- implement Python models (preproduction)
- implement analytic store models (preproduction)
- explore and decompose attribution analysis results by different cross-classification variables
- enable job queuing so that administrators can limit job throughput and assign users a priority
- use system-supplied macros to call the SAS Model Implementation Platform REST API so that you can submit an analysis run, replace a model in a model group, or publish a run to a modeling system

SAS Model Implementation Platform 3.1

SAS shipped SAS Model Implementation Platform 3.1 in June 2018. This release includes SAS 9.4M5 and SAS High-Performance Risk 4.1.

Here are some of the new actions that you can perform in this release:

- perform attribution analyses to analyze differences between two analysis runs

- use the SAS Risk Model Editor component to publish models to SAS Model Implementation Platform
- define your own backtesting metrics, or use the built-in backtesting metrics
- publish the backtesting-metrics data to SAS Model Risk Management
- define custom librefs to expand the input and output data locations
- display a graph of the economic scenarios in the user interface
- remove an object and simultaneously remove all of its dependent objects
- analyze cash flow legs, and use time bucket schemes to group the results
- define multiple shocks within a single scenario in a scenario run with model sensitivity analysis
- specify multiple derived-from variables for the variable definitions in an atomic model
- use the SAS Risk Work Groups component to register and manage work groups for SAS Model Implementation Platform

SAS Model Implementation Platform 2.4

SAS shipped SAS Model Implementation Platform 2.4 in June 2017. This release includes SAS 9.4M4 and SAS High-Performance Risk 3.8.

Here are some of the new actions that you can perform in this release:

- explore the effect of perturbing portfolio or economic inputs on the results of your model
- encrypt a model group's user-defined logic and model methods
- add computed methods, computed roll-up methods, function sets, and risk data objects to analysis runs
- provide dynamic model overrides
- use the following new model forms: transitionMatrix, custom, and code
- cancel an in-progress run (best effort), and force delete a run even though one or more of its artifacts cannot be deleted

SAS also shipped SAS Model Implementation Platform 2.4 in September 2017. This release includes SAS 9.4M5 and SAS High-Performance Risk 3.9.

Here are some of the new actions that you can perform in this release:

- debug the models, model groups, and PostProcess methods that are included in an analysis run that contains computed methods
- use the syntax *package_name.function_name* to call a function in the user-defined logic and methods that are included in an analysis run

SAS Model Implementation Platform 2.3

SAS shipped SAS Model Implementation Platform 2.3 in November 2016. This release includes SAS 9.4M4 and SAS High-Performance Risk 3.7.

Here are some of the new actions that you can perform in this release:

- publish collections of portfolio analysis objects (execution logic) together as a single, versioned system
- implement a formal approval process for your models and modeling systems
- use the following new model forms: pdCurves and emModel
- use work groups in Windows environments
- delete multiple analysis runs simultaneously
- replace models in a model group
- create and manage templates for user-defined logic
- customize the SAS Risk Dimensions environment for analysis runs
- offset exposures in a portfolio data set

SAS Model Risk Management

About SAS Model Risk Management

SAS Model Risk Management is a user-friendly, web-based application that facilitates the capture and life cycle management of statistical model-related information. That information is then used to conduct all aspects of model risk management, including governance. Specifically, SAS Model Risk Management facilitates the entry, collection, transfer, storage, tracking, and reporting of models that are drawn from multiple lines of business across an organization. It also integrates with other SAS products, including the SAS Workflow Engine and SAS Visual Analytics.

SAS Model Risk Management enables you to perform the following activities:

- create, update, and track your model inventory across the model life cycle
- conduct model reviews, including full scope validation and other types of reviews
- perform assessments of model candidates
- create and track findings (effective challenges) and develop action plans
- conduct change management related to all aspects of the model life cycle
- conduct model usage tracking
- measure, manage, and monitor model risk assessment
- retire models
- initiate and manage "in system" ad hoc communication
- manage documents and workflows
- create and manage model governance policies
- enhance and extend all functional capabilities provided with the solution
- access an aggregated view of models through interactive dashboards
- generate reports based on entered and collected data

Each of these activities can be tied to other activities in the system. Therefore, the SAS Model Risk Management application provides an integrated and centralized framework

for collecting, managing, and storing model information, while capturing all changes, communication, and interactions across the model life cycle.

The SAS Model Risk Management system also provides the ability to extensively customize the user interface and add new fields, links, and user interface elements; rename windows and labels; add new screens; and so on.

SAS Model Risk Management 7.3

SAS shipped SAS Model Risk Management 7.3 in December 2017. This release runs on SAS 9.4M5.

Here are some of the new features and enhancements in this release:

- model performance tracking with Model Monitoring
- the ability to manage a targeted review of internal models (TRIM)
- support for the bulk approval of model risk management business objects
- support for additional custom business objects
- support for Rich Text formatting in additional fields

For more information, see the software product page for [SAS Model Risk Management](#).

SAS Model Risk Management 7.2

SAS shipped SAS Model Risk Management 7.2 in November 2016. This release runs on SAS 9.4M4.

Here are some of the new features and enhancements in this release:

- the ability to integrate model metadata with SAS Model Implementation Platform for the storage and classification of model-related information
- the ability to export models for import and use in SAS Model Implementation Platform
- significant improvements to search capabilities, including the ability to conduct searches across all business objects
- support for rich text formatting of fields (for example, the Comments field)
- a built-in Groovy editor for programming new functions and components
- updates to email notification templates
- performance improvements for business objects that contain a large number of custom fields or links
- the ability to select models and download attachments for those models to a user's PC
- updates to screen definitions
- reporting improvements

SAS Model Risk Management 7.1

SAS shipped SAS Model Risk Management 7.1 in July 2016. This release runs on SAS 9.4M3. Here are some of the new features and improvements in this release:

- completely redesigned user interface with improved navigation and usability

- a significant content update that includes these features:
 - the addition of the model risk assessment feature
 - the addition of the inventory attestation feature
 - the addition of the data sources feature
 - an overhaul of the model inventory, model review, findings, and action plans features
- significant reporting improvements, including a set of new reports and integration with Microsoft Office
- intelligent provisioning of defaults for business objects
- support for up to 25 custom business objects
- improved automation and support for migration
- a rich and extensive set of options to support relationships between models (upstream/downstream, parent/child, prior versions, and so on)
- improvements to search capabilities

SAS OpRisk VaR 6.1

Note: Starting with SAS 9.4M8, SAS OpRisk VaR is a retired product. If you order SAS 9.4M8, SAS OpRisk VaR is not included in that order. A best practice is to unconfigure retired SAS products before you upgrade and to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

SAS OpRisk VaR 6.1 enables you to perform incremental data load, incremental VaR calculation, and reporting using web services rather than the user interface. New reports in this release include FFIEC – Schedule 5 and COREP – Operational Risk.

Here are the enhanced analytics in this release:

- the ability to compute the effect of one additional large loss on VaR
- the ability to model the severity of your losses by combining two lognormal distributions

SAS OpRisk VaR 6.1M2 shipped in May 2015 and runs on SAS 9.4M3. Here are some of the new features and enhancements in this release:

- Custom scaling enables you to define your own scale factors for internal data.
- Single loss approximation to VaR enables you to quickly learn how different modeling choices affect the VaR.
- Additional dependence structure options provide you with increased flexibility in specifying the dependence structure for a simulation.

See these resources:

- For more information about this release, see the software product page for [SAS OpRisk VaR](#).
- For more information about changes from the previous release, see [SAS OpRisk VaR](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Risk and Finance Workbench

SAS 9.4M8 Retired Product: SAS Risk and Finance Workbench

Starting with SAS 9.4M8, SAS Risk and Finance Workbench is a retired feature. A best practice is to unconfigure retired SAS products and features before you upgrade and to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

About SAS Risk and Finance Workbench

Note: Starting in SAS 9.4M8, SAS Risk and Finance Workbench is a retired product. A best practice is to unconfigure retired SAS products and features before you upgrade and to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Risk and Finance Workbench provides an efficient and collaborative environment for regulatory risk and finance projects that involve classification, measurement, and reporting activities. The following regulations and standards are typical subjects of such projects:

- IFRS 9 Financial Instruments (IFRS 9)
- Current Expected Credit Loss (CECL) model
- Dodd-Frank Act Stress Testing (DFAST)
- Comprehensive Capital and Analysis Review (CCAR)
- EU-wide stress testing and supervisory reporting (FINREP and COREP)

SAS Risk and Finance Workbench 3.2

SAS shipped SAS Risk and Finance Workbench 3.2 in July 2018. This release runs on SAS 9.4M6. The following list provides some of the new features and enhancements:

- support for new data load formats and file types
- additional roles and capabilities to enable more flexible user management schemes
- usability improvements to project and worksheet features
- enhanced style support for notifications
- expanded support for formulas in worksheets
- enhancements to the SAS Risk and Finance Workbench API

See these resources:

- For more information about this release, see the software product page for [SAS Risk and Finance Workbench](#).
- For more information about changes from the previous release, see [SAS Risk and Finance Workbench](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Risk and Finance Workbench 3.1

SAS shipped SAS Risk and Finance Workbench 3.1 in December 2017. This release runs on SAS 9.4M5. The following list provides some of the new features and enhancements:

- full support for dimensions
- configuration archives to manage projects and model groups
- the ability to send notifications from a project on an ad hoc basis
- expanded support in process definitions for custom notifications and task groups
- improvements to user management and access with risk work groups
- the ability to run sensitivity analyses with model groups
- enhanced parameter definition for scripts

See these resources:

- For more information about this release, see the software product page for [SAS Risk and Finance Workbench](#).
- For more information about changes from the previous release, see [SAS Risk and Finance Workbench](#) in *SAS Guide to Software Updates and Product Changes*.

Note: The documentation for SAS Risk and Finance Workbench is available only to customers who license this product.

SAS Risk and Finance Workbench 2.3

SAS shipped SAS Risk and Finance Workbench 2.3 in November 2016. This release runs on SAS 9.4M4. The following list provides some of the new features and enhancements:

- object security with work groups
- allocation of aggregated data values to details
- drill-down support for aggregated data
- ability to launch SAS scripts from task actions
- versioning support
- ability to lock projects
- enhanced log information
- selection of worksheet templates for projects
- enhancements to the SAS Risk and Finance Workbench API

SAS Risk Dimensions

SAS Risk Dimensions 6.X runs on SAS 9.4. Here are some highlights for these releases:

- SAS Risk Dimensions 6.1 shipped in July 2013 and supports SAS 9.4.

This release includes infrastructure changes to support SAS High-Performance Risk 3.1 and SAS Risk Management for Banking 3.2. These statements were also added to the RISK procedure: NLOPT, DRIVER, READSCENARIOS, and WRITESCENARIOS.

- SAS Risk Dimensions 6.2 shipped in December 2013 and supports SAS 9.4M1.

In this release, the ANALYSISGROUP argument was added to the READSCENARIOS statement for the RISK procedure.

- SAS Risk Dimensions 6.3 shipped in November 2014 and supports SAS 9.4M2.
- SAS Risk Dimensions 6.4 shipped in May 2015 and supports SAS 9.4M2.
- SAS Risk Dimensions 6.5 shipped in October 2015 and supports SAS 9.4M3.

This release includes infrastructure changes to support SAS High-Performance Risk 3.5 and SAS Model Implementation Platform 2.1.

- SAS Risk Dimensions 6.6 shipped in April 2016 and supports SAS 9.4M3.

This release includes changes to support SAS High-Performance Risk 3.6 and SAS Risk Management for Banking 3.4. Also, in this release, GBM (Geometric Brownian motion) was added as a new value to the MLEVEL argument in the DECLARE statement for the RISK procedure.

- SAS Risk Dimensions 6.7 shipped in November 2016 and supports SAS 9.4M4.
- SAS Risk Dimension 6.8 shipped in June 2017 and supports SAS 9.4M4.

SAS Risk Dimensions now provides a way to apply pre-computed values for Deltas, Gammas, and the base case value to a sensitivity analysis or a DeltaNormal analysis. You specify these values in a Sensitivities data set, and register them for use in the MARKETDATA statement of SAS Risk Dimensions.

- SAS Risk Dimensions 6.9 shipped in September 2017 and supports SAS 9.4M5.
- SAS Risk Dimensions 6.11 shipped in June 2018 and supports SAS 9.4M5.
- SAS Risk Dimensions 6.12 shipped in June 2019 and supports SAS 9.4M6.
- SAS Risk Dimensions 6.13 in August 2020 and supports SAS 9.4M7.
- SAS Risk Dimensions 6.14 shipped in January 2023 and supports SAS 9.4M8.

Note: Starting with SAS 9.4M8, SAS retired these features:

- SAS Risk Dimensions Java Client
- SAS Risk Model Execution Library Server Configuration
- SAS Risk Model Execution Library Mid-Tier
- SAS Risk Model Execution Library Server

If you order SAS 9.4M8, these features are not included in that order. A best practice is to unconfigure retired SAS products and features before you upgrade and to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products” in SAS Guide to Software Updates and Product Changes](#).

- SAS Risk Dimensions 6.15 shipped in June 2025 and supports SAS 9.4M9.

See these resources:

- For more information about this release, see the software product page for [SAS Risk Dimensions](#).

- For more information about changes from the previous release, see [SAS Risk Dimensions](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Risk Management for Banking

SAS Risk Management for Banking 3.4

SAS Risk Management for Banking 3.4 shipped in July 2016. In this release, the regulatory reporting regime for European Banking Authority (EBA) is supported for Taxonomy 2.4.1.1.

See these resources:

- For more information about this release, see the software product page for [SAS Risk Management for Banking](#).
- For more information about changes from the previous release, see [SAS Risk Management for Banking](#) in *SAS Guide to Software Updates and Product Changes*.

Note: The documentation for SAS Risk Management for Banking is available only to customers who license this product.

SAS Risk Management for Banking 3.3

SAS Risk Management for Banking 3.3 extends the bank's capability to assess, monitor, optimize, and create regulatory reports for financial risks. The various analyses within SAS Risk Management for Banking can be run on SAS High-Performance Risk in addition to SAS Risk Dimensions. Running calculations of large portfolios in a distributed environment on SAS High-Performance Risk has substantial performance benefits. The multithreading capabilities of SAS High-Performance Risk also mean that performance is enhanced even in solo mode.

New Monte Carlo simulation methods are offered for several of the analysis tasks.

The regulatory Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) calculations are extended in the areas of classification of contingent cash flows and in accounting for collateral. The collateral management tools enable you to perform these tasks:

- estimate collateral shortfalls
- predict the impact of the downgrading of collateral assets
- predict the impact of the downgrading of the bank
- predict the impact of derivative volatilities

SAS Underwriting Risk Management for P&C Insurance

About SAS Underwriting Risk Management for P&C Insurance

Note: Starting with SAS 9.4M8, SAS Underwriting Risk Management for Life Insurance and SAS Underwriting Risk Management for P&C Insurance are retired products. A best practice is to unconfigure retired SAS products and features before you upgrade and to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Underwriting Risk Management for P&C Insurance enables insurance companies to perform loss estimation, reserving and risk management analysis within a single, flexible and high-performance analytics environment. Analysts can blend actuarial and financial techniques to value P&C insurance liabilities using an internal model approach.

SAS Underwriting Risk Management for P&C Insurance is designed to be used by actuarial and investment analysts, risk analysts and managers, IT managers and senior management at P&C insurance companies.

The solution provides the following features:

- integrated data management
- blend of actuarial and financial techniques for valuing P&C insurance liabilities on both an accident- and underwriting-year basis
- flexible risk analysis and reporting framework
- high-performance capabilities

The current release of SAS Underwriting Risk Management for P&C Insurance is 3.2.

SAS Underwriting Risk Management for P&C Insurance Content Releases

The SAS Underwriting Risk Management for P&C Insurance solution is delivered as a *content release* that runs on the SAS Infrastructure for Risk Management platform. Solutions that are based on SAS Infrastructure for Risk Management share the same architecture and layout. The difference between the solutions is the calculation content that is delivered in a solution's content release. After installing SAS Infrastructure for Risk Management, you must separately download and install the SAS Underwriting Risk Management for P&C Insurance content release to complete the installation.

For more information about new features and enhancements in the latest SAS Underwriting Risk Management for P&C Insurance content release, see the [SAS Underwriting Risk Management for P&C Insurance](#) product page.

Note: The documentation for SAS Underwriting Risk Management for P&C Insurance is available only to customers who license this product.

Chapter 15

SAS Visual Analytics

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SAS Visual Analytics

About SAS Visual Analytics

SAS Visual Analytics is a web-based product that uses SAS high-performance analytic technologies to explore huge volumes of data quickly in order to see patterns and trends.

SAS Visual Analytics 7.5

SAS Visual Analytics 7.5 shipped in May 2019 and supports SAS 9.4M6 and later releases. SAS Visual Analytics 7.51 shipped in August 2020 and supports SAS 9.4M7 and later releases. SAS Visual Analytics 7.52 shipped in January 2023 and supports 9.4M8 and later releases. SAS Visual Analytics 7.53 shipped in June 2025 and supports 9.4M9 and later releases.

Here are some of the general enhancements in this release:

- The user interface has been rewritten in HTML5. Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe has announced that it intends to end support for Flash technology and will stop updating and distributing the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

- The SAS Visual Analytics Explorer (the explorer) and the SAS Visual Analytics Designer (the designer) interfaces have been combined into a single interface.
- There are new side panes. For example, the new **Outline** pane provides you with a convenient way to work with pages and objects in your report.
- The existing side panes have been updated. For example, you can right-click a data item in the **Data** pane to add the item as either a report control or a page control.
- New objects have been added. For example, the new key value object can be used to highlight numeric and categorical values in an infographic.
- Existing objects have been improved. For example, the pop-up menus now enable you to move objects; sort, replace, or remove data items; and print or share an object.
- New features are available for geo maps. For example, geo maps support animation for all map types.
- There are enhanced parameters. For example, you can have parameters based on date and datetime formats.
- Accessibility has been enhanced. SAS Visual Analytics is now accessible via the keyboard. Some graphs have integration with SAS Graphics Accelerator.
- Functionality that was previously in SAS Visual Analytics Administrator is now incorporated in SAS Environment Manager Administration. For more information, see [What's New in Administration of SAS Visual Analytics](#).

SAS Visual Data Builder 7.5 has these new features and enhancements:

- The user interface has been rewritten in HTML5. Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe has announced that it intends to end support for Flash technology and will stop updating and distributing the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).
- The interface for maintaining data queries has been modernized, but the steps for creating and maintaining queries are basically the same.
- The expression builder enables you to create calculated columns, WHERE clauses, and HAVING clauses for data queries. This window has been enhanced for 7.5. Among other improvements, the expression builder enables you to select more functions for analyzing and processing data.
- The scheduling interface for queries has been simplified for 7.5. You can select **Unschedule** to stop the execution of a scheduled query. The query is saved automatically after scheduling.
- Hadoop data sources now have a separate section in the Import window.

See these resources:

- For more information about this release, see [What's New in SAS Visual Analytics 7.5: Details](#) and [What's New in SAS Visual Data Builder 7.5](#).
- For more information about changes from the previous release, see [SAS Visual Analytics](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Visual Analytics 7.4

SAS Visual Analytics 7.4 shipped in April 2017 and supports SAS 9.4M4 and later releases.

Here are some of the general enhancements in this release:

- SAS Visual Analytics Designer (the designer) has dynamic text, improved calculations, as well as enhanced prompted filter controls, parameters, report links, and section links.
- The modern SAS Visual Analytics Viewer (the viewer) now contains most of the features that the classic viewer had, which enables many users to switch to the modern viewer.
- Enhanced printing features enable you to have page breaks in the PDF for list tables and to show the filter context for filter controls. Another new feature enables the same footer to be printed on every page of a report. For example, you could have the same legal statement on each page in all of your company's reports. The customized footer is also displayed in reports that are distributed using the designer. (This feature must be enabled by a SAS administrator using SAS Management Console.) For more information, see [What's New in SAS Visual Analytics Administration 7.4](#) in *SAS Visual Analytics 7.4: Administrator's Guide*.
- Importing data from Teradata no longer requires a user name and password.

SAS Visual Analytics 7.3

SAS Visual Analytics 7.3 shipped in August 2015 and supports SAS 9.4M3. SAS Visual Analytics 7.3 contains these updates:

- Samples tables, sample reports, and a sample exploration (if you have SAS Visual Analytics Explorer) are now available. When the samples are installed, you can access them from SAS Home (the home page).
- You can now import data from a Pivotal HAWQ database.
- SAS Visual Analytics Designer has a new **Expand clipped content** option, which is available for printing to PDF. This option enables you to print the entire content of tables, crosstabs, gauges, and containers with content that is only partially available in the layout of the report section.
- SAS Visual Analytics Viewer has a new appearance called modern, which is the default. You can use preferences to specify the default appearance of the viewer as modern or classic. The modern appearance includes a **Report Refresh** setting, which lets you specify how many minutes to wait between update checks.

For more information, see [What's New in SAS Visual Analytics 7.3](#) in *SAS Visual Analytics 7.3: User's Guide*.

SAS Visual Analytics 7.2

SAS Visual Analytics 7.2 shipped in May 2015 and supports SAS 9.4M2. SAS Visual Analytics 7.2 contains many updates, including the following:

- SAS Visual Statistics is visually and functionally integrated with SAS Visual Analytics Explorer. A new feature in SAS Visual Statistics is that you can derive predicted values for predictive models. (SAS Visual Statistics remains a separately licensed product.)
- Decision tree visualizations include an icicle plot of the nodes in the tree.
- You can import data from Google Analytics, Facebook, and MapR. You can import a ZIP file that contains a single spreadsheet or delimited text file.

- A new report theme, SAS Snow, provides a clean, uncluttered default appearance for your reports.
- When you print a report to PDF, new options are available (for example, you can add page numbers).
- When you send a report by email, you can attach a PDF of the report.
- Calculated data items and grouped category data items can be changed into geographic data items and used in geo maps.
- In URLs that link to reports in the designer or viewer, you can include parameter-value pairs. For example:

```
http://abc.com/SASVisualAnalyticsViewer/...&Origin=Europe&Cost=3
```

For more information, see [What's New in SAS Visual Analytics 7.2](#) in *SAS Visual Analytics 7.2: User's Guide*.

SAS Visual Analytics 7.1

SAS Visual Analytics 7.1 shipped in October 2014 and supports SAS 9.4M2. SAS Visual Analytics 7.1 contains many updates, including the following:

- Importing data from Pivotal HD and Cloudera Impala is supported.
- A new Sankey diagram visualization enables you to perform path analytics. Path analytics displays flows of data from one event (value) to another as a series of paths.
- With goal seeking, you can specify a target value for the forecast measure, and then determine the values of the underlying factors that would be required to achieve the target value.
- Text analytics in a word cloud visualization enables you to analyze the sentiment of documents in your document collection. It also enables you to explore a selection of specific documents as a new visualization.
- Parameters are supported for report controls, and can be used in calculations, filters, ranks, and display rules.
- New options for printing to PDF are available for reports. You can use category data items, calculated items that are categories, and custom categories in custom sorts. You can distribute reports to other users based on a schedule. Report designers can localize (or translate) the labels, tooltips, and other descriptive text that are part of reports.
- A predefined report provides insight into how your site uses SAS Visual Analytics. The report is populated after you enable auditing, and is visible only to administrators.

For more information, see [What's New in SAS Visual Analytics 7.1](#) in *SAS Visual Analytics 7.1: User's Guide*.

SAS Visual Analytics 6.4

SAS Visual Analytics 6.4 shipped in March 2014 and supports SAS 9.4M1. SAS Visual Analytics 6.4 contains many updates, including the following:

- You can now import data from these third-party vendor database servers:
 - Aster

- BigInsights
- Cloudera
- DB2
- Greenplum
- Hortonworks
- MySQL
- Netezza
- ODBC
- Oracle
- PostgreSQL
- Salesforce
- SAP HANA
- SQL Server
- Teradata
- Vertica
- Importing data from massively parallel processing databases has been enhanced.
- Working with visualizations usability is improved.
- Designing reports usability is improved.

For more information, see [What's New in SAS Visual Analytics 6.4](#) in the *SAS Visual Analytics 6.4: User's Guide*.

SAS Visual Analytics 6.3

SAS Visual Analytics 6.3 shipped in December 2013 and supports SAS 9.4M1. SAS Visual Analytics 6.3 contains many new features, including the following:

- Simplified self-service capabilities enable users to quickly and easily load their own data, whether the users are exploring data or designing a report.
- You can use Esri mapping technology when exploring data and designing reports.
- Network diagrams enable you to see the relationships and contributions between elements with nodes on a chart and across a geo map.
- Alerts that are based on expressions notify report subscribers when metrics reach specific values.
- You can create custom graph templates for reports.
- Guest access, which does not require a login ID or password, is available for viewing explorations, reports, and dashboards.
- New text analysis capabilities enable you to understand the most common terms and topics discussed in your Twitter streams or other text fields such as "customer comments."

Integration with SAS Office Analytics enables customers to display SAS Visual Analytics content in Microsoft Excel, PowerPoint, Word, Outlook, and SharePoint.

For more information, see [What's New in SAS Visual Analytics 6.3](#) in the *SAS Visual Analytics 6.3: User's Guide*.

SAS Visual Analytics 6.2

Here are some of the updates in SAS Visual Analytics 6.2:

- The SAS Visual Analytics home page now displays tables, and the search has been enhanced to include any registered SAS types, not only reports, explorations, and stored processes.
- SAS Visual Data Builder now supports input tables from the SAS LASR Analytic Server and has improved performance with the Greenplum Data Computing Appliance.
- In SAS Visual Analytics Explorer, forecasting has been enhanced to support underlying factors and scenario analysis. You can now create aggregated measures and perform decision tree analysis. You can also rank your data based on the greatest and least aggregated values.
- SAS Visual Analytics Designer has been enhanced to give you the ability to create new aggregated calculated items for tables and graphs, filter or rank your data based on the top or bottom values, and change the report theme. You can add links to a specific section in a target report or add links from a report object, text, or image to another report. You can group more than five gauges in a report.
- Using SAS Visual Analytics Administrator, you can define permission conditions in an interactive editor. You can use either denylists or allowlists to manage mobile devices. You can register tables.

For more information, see [What's New in SAS Visual Analytics 6.2](#) in the *SAS Visual Analytics 6.2: User's Guide*.

SAS Visual Statistics

About SAS Visual Statistics

SAS Visual Statistics uses the in-memory capabilities of SAS LASR Analytic Server to create and compare powerful statistical models in an easy-to-use, web-based interface. SAS Visual Statistics extends the capabilities of SAS Visual Analytics by creating, testing, and comparing models on the basis of the patterns discovered in SAS Visual Analytics. SAS Visual Statistics enables you to export model score code in order to apply your model to new data.

SAS Visual Statistics is integrated with SAS Visual Analytics in order to provide a seamless transition between the two solutions. Documentation for SAS Visual Statistics 7.2 and later is included in the documentation for SAS Visual Analytics.

For more information, see the product documentation page for [SAS Visual Statistics](#).

SAS Visual Statistics 7.5

SAS Visual Statistics 7.5 shipped in May 2019 and runs on SAS 9.4M6. SAS Visual Statistics 7.51 shipped in August 2020 and runs on SAS 9.4M7. SAS Visual Statistics 7.52 shipped in January 2023 and runs on SAS 9.4M8.

Here are some of the general enhancements in this release:

- The user interface has been rewritten in HTML5. Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe announced that it intends to end support for Flash technology and will cease to update and distribute the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).
- The SAS Visual Analytics Explorer (the explorer) and the SAS Visual Analytics Designer (the designer) interfaces have been combined into a single interface.
- You can select **Duplicate as** to duplicate an object and change its type at the same time.
- You can create new objects from data items that are selected in other objects.
- You can export the score code of the champion model.
- New detail tables relating to model information, lift, ROC, and assessment statistics are available.
- Model comparison objects are saved in the reports.
- New settings and style options are available.

For more information about this release, see [SAS Visual Statistics 7.5: What's New](#).

Part 2

SAS Viya 3.5

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Chapter 16

Introduction to SAS Viya

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Highlights of New Features in SAS Viya 3.5

- The new SAS Job Flow Scheduler includes the Job Flow Editor that enables the graphical editing and management of complex job flows.
- Support is added for IBM Power9 and Linux on Power with the POWER9 chip.
- Stored processes, visual data builder queries, and some OLAP cube structures can be migrated from a SAS 9 environment to corresponding objects in SAS Viya.
- SAS Studio adds the ability to create job definitions with prompting.
- SAS Infrastructure Data Server is updated to use PostgreSQL version 11.
- SAS Cloud Analytic Services adds support for Apache Parquet data files. The server must use Linux. The files can be loaded and saved with Path, DNFS, or Amazon Web Services S3 caslibs.
- SAS Cloud Analytic Services adds support for Hadoop distributions built on Apache Hadoop version 3.
- SAS Viya can be deployed on machines that have multiple network interface cards (NICs). When you install a deployment, you can specify the NIC for SAS to use on each machine.

- SAS Cloud Analytic Services has the following enhancements for caslib data sources:
 - The server supports adding a caslib to Azure Data Lake Storage Gen2 for data access. The ADLS caslib type supports loading and saving delimited files (CSV files) and Optimized Row Columnar (ORC) files.
 - The server can assign caslibs to remote HDFS clusters on a caslib-by-caslib basis. Each remote HDFS cluster must be configured for SASHDAT access with the SAS Plug-ins for Hadoop. In earlier releases, the server could access either a single co-located cluster or a single remote cluster for use with HDFS caslibs.

For information about specifying NICs, see [“Installation” in SAS Viya for Linux: Deployment Guide](#).

For information about using CAS with Hadoop version 3, see [Configuring CAS SASHDAT Access to HDFS](#).

About SAS Viya

Here are the key software components in SAS Viya.

Component	Description
The analytics engine to SAS Viya	<p>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.</p> <ul style="list-style-type: none"> • SAS Cloud Analytic Services (CAS) is a server that is suitable for both on-premises and cloud deployments. The server provides the run-time environment for data management and analytics. By run-time environment, we refer to the combination of hardware and software where data management and analytics take place. • The server can run on a single machine or as a distributed server on multiple machines. The distributed server consists of one controller, an optional backup controller, and one or more workers. This architecture is often referred to as a massively parallel processing architecture. For both architectures, the server is multi-threaded for high-performance analytics. • The distributed server has a communication layer that supports fault tolerance. A distributed server can continue processing requests even after losing connectivity to some nodes. The communication layer also enables you to remove or add worker nodes from a server while it is running.

Component	Description
A modular set of supporting services	SAS Viya contains several services often referred to as microservices. A <i>microservice</i> 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.
A web application for basic administration	CAS Server Monitor is a web application that you use to monitor your CAS server and to perform some administration tasks.
A web application for enterprise administration	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.
A web application for writing and submitting code	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.
A web application for visual reporting, exploration, and modeling	SAS Visual Analytics uses SAS high-performance analytic technologies and empowers organizations to explore huge volumes of data quickly to identify patterns, trends, and opportunities for further analysis. The highly visual, drag-and-drop data interface of SAS Visual Analytics, combined with the speed of SAS Cloud Analytic Services (CAS), accelerate analytic computations and enable organizations to derive value from massive amounts of data. This power creates an unprecedented ability to solve difficult problems, improve business performance, predict future performance, and mitigate risk rapidly and confidently. Users can quickly create reports or dashboards, which can be viewed on a mobile device or on the web.

Component	Description
Multiple application programming interfaces	<p>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.</p> <p>For more information, see SAS for Developers.</p>

For more information, see [SAS Cloud Analytic Services: Fundamentals](#).

Cumulative Functionality

Among some of the products in 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.

Comparing SAS 9 and SAS Viya

Item for Comparison	SAS 9	SAS Viya
---------------------	-------	----------

Servers	SAS 9 contains these servers:	SAS Viya contains these servers:
	<ul style="list-style-type: none">• SAS Metadata Server• SAS Workspace Server• SAS Pooled Workspace Server• SAS Stored Process Server• SAS OLAP Server• SAS Web Infrastructure Platform Data Server• SAS/CONNECT Server and Spawner• SAS Content Server• SAS LASR Analytic Server• embedded web application server• SAS Web Server• SAS Messaging Engine	<ul style="list-style-type: none">• SAS Cloud Analytic Services• SAS Workspace Server and Object Spawner• SAS Infrastructure Data Server• SAS Configuration Server• SAS Message Broker• SAS/CONNECT Server and Spawner• embedded web application server

Data Location	<p>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.</p> <p>You must aggregate the data in some way before running the analysis or DATA step.</p>	<p>SAS Viya still uses LIBNAME engines and librefs for traditional workloads. CAS adds caslibs, which is 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.</p> <p>Starting in SAS Viya 3.3, in-database support is available using SAS Scoring Accelerator.</p> <p>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.</p> <p>For distributed servers, your data can be distributed across various worker nodes, and the processing of that data occurs on that node.</p> <p>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.</p>
Management Tools	<p>SAS 9 uses a variety of management tools such as SAS Management Console and SAS Deployment Manager.</p>	<p>SAS Viya consolidates administrative tasks into a completely rewritten SAS Environment Manager.</p> <p>CAS Server Monitor is also available for a programming-only deployment.</p>
Installation, Configuration, and Maintenance	<p>SAS 9 uses SAS proprietary tools such as 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.</p>	<p>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.</p>

Backups	In SAS 9, backups are created using SAS Environment Manager or SAS Management Console.	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.
Availability	In SAS 9, a failed LASR node or job could potentially impact everyone on that server.	In SAS Viya, CAS server processes and CAS session processes are independent of each other.
Interfaces	In SAS 9, analytics procedures are accessed through SAS interfaces and REST-based services.	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.

Relationship between SAS 9.4 and SAS Viya

SAS Viya Augments SAS 9

SAS 9 and SAS Viya are two run-time environments built for different use cases. However, these environments 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 in both SAS 9 and SAS Viya, so some existing SAS code can be run in SAS Viya. 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 SAS Viya.

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 Analytic 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 metadata-based authorization, SAS Viya maintains data access authorizations within SAS 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. You can include CAS-enabled procedures in SAS 9 code and run that code in SAS Viya, if it is available.

SAS Viya is designed to coexist with SAS 9.4 solutions and the SAS 9 environment. For a list of procedures that can run CAS actions, see [SAS Procedures That Can Run CAS Actions](#) in *Base SAS Procedures Guide*.

See Also

[SAS Viya: Overview](#)

Differences in Programming

UTF-8 Session Encoding

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 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 can 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 access 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 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](#)
- [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. However, you can use these interfaces to submit code to a CAS server when the SAS 9 environment has access to a SAS Viya environment. 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.

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 to disk in a path-based caslib. 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.

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SAS Viya Administration

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New Features and Enhancements for SAS Viya 3.5

Here are some of the key administrative features in SAS Viya 3.5:

- Reduced footprint. The disk and memory footprint of SAS Viya has been reduced. Much of this has been achieved by combining microservices. In certain SAS Environment Manager views, you will see a shorter list of services.
- Promoting content from SAS Viya to SAS Viya is enhanced with a new inventory plug-in to the sas-admin command-line interface.
- A new health check service (healthcheck) is provided as a sas-admin plug-in.
- Licensed users can use the Job Flow Scheduler in the **Jobs and Flows** section of SAS Environment Manager to create complex flows. The entry **Jobs** in SAS Environment Manager becomes **Jobs and Flows** if you have a SAS Job Flow Scheduler license.
- Jobs for scheduling or including in a flow can be created from a SAS DATA step program.
- The contents of the Application Menu on the left have been significantly improved.
- SAS Studio has two flavors: SAS Studio (Basic) and SAS Studio (Enterprise). SAS Studio (Basic) is used in a programming-only environment and SAS Studio (Enterprise) is used in a full environment.

See Also

SAS Viya Administration: What's New

Working with Backups

- Use the following command to cancel a backup:

```
sas-admin backup cancel -i=<backup-job-id>
```

A cancel is an asynchronous operation. It returns the current state of the backup. The user can execute the SHOW command to determine whether the backup was canceled.

- All SAS Message Broker exchanges, queues, bindings, users, virtual hosts, permissions, and parameters are backed up. Actual messages are not backed up.
- The backups are retained for a period that is set by an administrator. The default value for the retentionPeriod property is 30 days. The retentionPeriod property can be modified by selecting **Backup service** on the Configuration page in SAS Environment Manager. Click **New Configuration**, and then select **sas.deploymentbackup**.

Auditing

All audit records now include an Administrative Action. The value is **true** when an audited action is created by a SAS administrator. Otherwise, the value is **false**.

SAS Data Preparation

SAS Data Explorer 2.5

SAS Data Explorer 2.5 shipped in November 2019 and runs on SAS Viya 3.5. Here are some of the new features and enhancements:

- You can now define connections to these data sources: S3 (Simple Storage Services of Amazon Web Services), ADLS (Azure Data Lake Storage Gen2), and Snowflake, MongoDB, Google BigQuery, and Salesforce databases.
- You can now load an imported table into memory without saving a physical copy of the table to the target destination. This feature offers a significant performance gain for small tables.
- Several new import options enable you to copy content from multiple tables or files and load it to an in-memory table for analysis.
- You can copy a source table to a target table in a different format. For example, you can copy a SAS table to a Parquet table.
- You can add a user-defined connection to a project on a SAS Event Stream Processing Server.
- If you license SAS Data Preparation, you can use the **dataexplorer** command-line interface (CLI) to automate data management. Support for generic data connectors is new for this release.

For more information, see [What's New in SAS Data Explorer 2.5](#).

SAS Data Studio 2.5

Here are some of the new features in SAS Data Studio 2.5:

- You can select a format when you save target tables. The available formats depend on the library where the table is saved.
- You can set the data type of the cluster ID generated by the Match and Cluster transform. The available options are **Double** (8 bytes) and **Char** (12 bytes).
- You can now remove all but one row from a set of rows that have identical values in a list of user-specified fields.
- You can load a table to memory without saving a physical copy of the table to the target destination. This option can provide a significant performance boost for small tables.
- The Simple Random partitioning method has been added to the Analytical Partitioning transform.
- The Suggestions feature uses machine learning to analyze your data and suggest transforms and actions that you can add to your SAS Data Studio plans.

For more information, see [What's New in SAS Data Studio 2.5](#).

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SAS Cloud Analytic Services

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Enhancements to the CAS Procedure

New CASL Functions

The following CASL functions are new:

- The ACTIONQ function displays the action queue.
- The EXECUTE function compiles and executes the code that is provided as an argument to the EXECUTE function.

New Common Functions

The following common functions are new for the CAS procedure:

- The RAND function generates random numbers from a distribution that you specify.
- The CALL STREAMINIT function specifies a random-number generator and seed value for generating random numbers.

See Also

SAS Cloud Analytic Services: CASL Reference

Enhancements to SAS Deep Learning

SAS Deep Learning Toolkit on SAS Viya 3.5

Note: You must have SAS Visual Data Mining and Machine Learning licensed and installed to use these action sets.

The SAS Deep Learning toolkit is a growing set of cloud-enabled deep neural networking CAS actions, most recently released with SAS Viya 3.5. The actions are delivered as part of SAS Visual Data Mining and Machine Learning (VDMML) 8.5. The new SAS Deep Learning toolkit includes the Python open-source utility SAS DLPy, as well as these Deep Learning key features:

- supports Windows 64-bit operating environments on a single GPU.
- supports the Linux on Power platform with SMP, MPP, and GPUs. SAS Deep Learning and SAS Viya 3.5 specifically support models using the POWER9 chip.
- the SAS Deep Learning tools provide GPU performance improvements on processing speed and memory utilization.
- supports Mask R-CNN for instance segmentation.
- supports a new RoI Alignment layer.
- supports Layer Normalization.

- supports a new embedding loss layer to train Siamese, triplet, and quartet networks.
- supports a Survival layer type for the addLayer action (in the deepLearning action set) in order to create deep survival analysis analytic models.
- supports the Cosine Margin Softmax loss function. For more information, see Embedding with Cosine Margin Softmax Loss in the SAS Deep Learning technical documentation for the Output layer.
- supports CNN layers in RNN models. For more information, see Requirements for Mixing Sequential and Fixed-Dimension Layers in the RNN model technical documentation.
- supports transfer learning with Transformer-based NLP architectures (such as BERT) on CPU. Here the base architecture is fixed (not trainable), whereas the task-specific terminating layers are fully trainable.
- supports multi-head attention with the Multi-Head Attention layer.
- supports GPU scoring for CPU-trained RNN and LSTM models, and vice versa. For more information, see the technical documentation on RNN Model Portability.
- supports the robust TRish optimization algorithm. For more information, see TRish with Momentum in the model optimization technical documentation.
- supports the Layer-wise Adaptive Rate Scaling (LARS) algorithm for distributed training with large batch-size.
- supports custom FCMP functions that you can use to define early stopping criteria during training.
- supports data augmentations (such as cropping, mutating, and flipping) for object detection and segmentation tasks.
- supports deep clustering unsupervised learning applications.
- supports computing more model metrics for model classification and segmentation tasks. For more information and usage details, see the Evaluating Segmentation Models example for the SAS deepLearn action set.
- the dlTrain, dnnTrain, and rnnTrain actions now support the options freezeLayers and freezeLayerTo as part of the optimizer. These options enable you to freeze one or more layers in a deep network.
- the addLayer action of the SAS deepLearn action set now supports a sharingWeights option. You use the sharingWeights option to share variable weights between model layers.
- supports a Split Layer to split features into multiple branches in CNN.
- includes updated tools, libraries, and examples in the SAS DLPy utility.

See Also

SAS Visual Data Mining and Machine Learning: Deep Learning Programming Guide

Enhancements to DS2 in CAS

Starting in August 2021 in SAS Viya 3.5 with the installation of a hot fix, most log messages that are generated for DS2 programs that run in CAS have log line numbers in them. Log line numbers are reported in execution-time messages and in program

compilation messages that previously did not report line numbers. The generation of the log line numbers can affect performance. A new option on the DS2_OPTIONS statement, REPORTLINE, is provided to suppress the generation of the log line numbers, if needed.

For more information, see documentation for the [REPORTLINE option](#) in the “DS2_OPTIONS Statement” in *SAS DS2 Language Reference*.

Enhancements to Real-Time Entity and Network Generation

In the November 2020 release of SAS Viya 3.5, Real-Time Entity and Network Generation enhancements include performance and scalability improvements as well as the ability to split entities on the basis of conflicting compound values.

Enhancements to SAS Visual Text Analytics Action Sets

Overview

SAS Visual Text Analytics 8.5 includes the ability to use the Sampling and Partitioning action set, a redesigned action, new action examples, new action parameters, the ability to search for special missing values, improved concept scoring in the Korean language, improvements to extraction of predefined concepts in the Danish language, improved coverage of predefined concepts in the Spanish language, and performance enhancements.

Enhanced Functionality

SAS Visual Text Analytics is a text analytics framework that combines text mining, contextual extraction, categorization, sentiment analysis, and search.

Note: You must have SAS Visual Text Analytics licensed and installed to use these action sets.

- SAS Visual Text Analytics 8.5 includes improved text processing.
- The SAS Visual Text Analytics 8.5 license includes the ability to use the Sampling and Partitioning action set.
- The ruleGen action has been redesigned in SAS Visual Text Analytics 8.5 to generate LITI concept and fact rules that might be useful in your analysis.
- You can now use the appendIndex and searchIndex actions in the Search action set to search for special missing values.
- Capabilities for morphological expansion in the Korean language have been enhanced. Terms used in CONCEPT, C_CONCEPT, CONCEPT_RULE, SEQUENCE, PREDICATE_RULE, REMOVE_ITEM and NO_BREAK rules are now automatically expanded to include inflectional forms. When scoring these rules with the applyConcept action, the inflectional forms will match in addition to the term in the rule. In other words, if the stem of a word (for example, "하다") is in a

CONCEPT rule, inflectional forms in the dictionary (such as "했다", "하면서", or "하시면") in a document will be matched.

- Extraction of predefined concepts in the Danish language has been enhanced. The ability to extract predefined concepts (including terms that denote a place, organization, person, or date) has been improved in the Danish language in SAS Visual Text Analytics 8.5. These improvements also include the ability to identify time expressions and percent value in documents, as well as improved accuracy in identifying part-of-speech tags.
- Coverage of predefined concepts in the Spanish language has been enhanced. The coverage of the predefined concepts `nlpTime`, `nlpDate`, `nlpMoney`, and `nlpCurrency` has been extended for the Spanish language. In addition, fully elaborated combined date-and-time spans such as "21 agosto a las 16:00" are now recognized in their entirety as `nlpTime`.

New Action Parameters

- SAS Visual Text Analytics 8.5 includes the following new action parameters in the Search action set:
 - You can now use the `casOut` parameter in the `searchAggregate` action to write results to a CAS table.
 - You can now use the `casOut` parameter in the `valueCount` action to write results to a CAS table.
 - You can now use the `trim` parameter in the `valueCount` action to specify whether to trim the padding spaces of a JavaScript Object Notation (JSON) report.
- SAS Visual Text Analytics 8.5 includes the new action parameter `exclude` in the `ruleGen` action in the Text Analytics Rule Development action set. The `exclude` parameter specifies an input table that contains the concept rules that you want to exclude from your analysis.
- SAS Visual Text Analytics 8.5 includes the new option `outputTableAnalysisLevel` for the `build` parameter for the `exportTextModel` action in the Text Analytics Rule Development action set. The `outputTableAnalysisLevel` option enables you to specify which output tables are generated when exporting a sentiment astore model. A value of `All` for this option generates all output tables, and a value of `DOCUMENT` generates only a document-level sentiment output table. If you want to score a sentiment astore model using a Micro Analytic Service (MAS) or the SAS Embedded Process (EP), you should use the `DOCUMENT` value because MAS and EP support only one output table.

See Also

- [SAS Visual Text Analytics: Programming Guide](#)
- [SAS Visual Analytics: Programming Guide](#)

Enhancements to SAS Visual Data Mining and Machine Learning 8.5 Action Sets

New Kernel Principal Component Analysis (kernelPCA) Action Set

The Kernel Principal Component Analysis (kernelPCA) action set was added in SAS Visual Data Mining and Machine Learning 8.5 (November 2019 release of SAS Viya 3.5).

KPCA is a nonlinear extension to the widely used linear dimensionality reduction technique principal component analysis (PCA). KPCA exploits the “kernel trick” to implicitly map the original data to certain high-dimensional RKHS (reproducing kernel Hilbert space) and implement PCA in that space. The resulting projections onto the kernel principal components extract the nonlinear pattern in the data.

The kernelPCA action in this action set also features fast training and fast scoring methods, which greatly alleviate the computational and memory burden that is associated with ordinary KPCA while achieving comparable accuracy. These methods are based on low-rank matrix approximation coupled with k -means clustering as a sampling scheme. Thanks to this approximation, the kernelPCA action is capable of handling large data tables efficiently. The kernelPCA action can be applied in many areas, including nonlinear dimensionality reduction, nonlinear data visualization, kernel principal component regression, image denoising, novelty detection, and so on.

For more information, see [Kernel Principal Component Analysis Action Set](#) in *SAS Visual Data Mining and Machine Learning: Programmer's Guide*.

New Reinforcement Learning Action Set

Along with supervised learning and unsupervised learning, reinforcement learning is one of the major branches of machine learning. Each branch of machine learning differs in the manner of feedback the model receives during training.

- Supervised learning methods require data to be labeled so that the model can compare its output to the target output and can determine how the model should change to improve. Supervised learning models are often used for predictive or classification tasks.
- Unsupervised learning techniques do not require data to be labeled. Instead of comparing model output to a target, unsupervised learning methods compare the data to itself to find useful patterns or groupings within it.
- Reinforcement learning methods rely on a reward signal for training feedback. The reward signal is a scalar function that indicates the goodness or badness of the agent's decisions. Reinforcement learning models attempt to learn a policy that maximizes this reward signal over some sequence of time steps.

For more information about reinforcement learning, see [SAS Visual Data Mining and Machine Learning: Reinforcement Learning Programming Guide](#)

Enhanced Action Sets

These action sets were enhanced in SAS Visual Data Mining and Machine Learning 8.5 (November 2019 release of SAS Viya 3.5):

- Analytic Store Scoring action set
 - This action set now supports varbinary data type in the Embedded Process (EP) code and for SAS Event Stream Processing.
 - The action set now supports multiple output tables and multiple output rows per input row for SAS Event Stream Processing.
 - The action set now supports the Hidden Markov Model action set, the Kernel Principal Component Analysis action set, the Mixed Modeling action set, the Reinforcement Learning action set, and the gamSelect action in the Generalized Additive Models action set.
- Autotune action set
 - These actions are new:
 - The tuneDeepForest action automatically adjusts deep forest parameters to tune a model for minimum error.
 - The tuneGlm action automatically adjusts linear regression parameters to tune a model for minimum error.
 - The tuneLabelSpread action automatically adjusts label spreading technique parameters to tune for minimum loss function value.
 - The tuneLogistic action automatically adjusts logistic regression parameters to tune a model for minimum error.
 - The relative importance of each hyperparameter based on all configurations evaluated is now reported in a new results table.
 - The action set now supports the creation of a CAS table from the evaluation history of all model configurations that have been evaluated. This history table can be created in real time while the tuning action is running, allowing dashboarding of the autotune data. It can also be fed back in to subsequent autotune executions as a lookup table to initialize to a previous best point and avoid duplicate evaluations.
 - The tuneDecisionTree, tuneForest, and tuneGradientBoostTree actions can now optionally tune the leafSize parameter.
 - The tuneForest action now supports tuning of the nBins parameters.
- BioMedImage action set
 - The processBioMedImages action enables users to filter ROIs by their display color in the DICOMRT_SPECIFIC substep of the ROI2MASK step. Accordingly, if the DICOM-RT data contain contours for multiple organs, each with a different value of the ROI Display Color DICOM attribute, the user can select a single organ for the action to generate segmentation images.
 - The processBioMedImages action incorporates a new step called BINARY_OPERATION, which supports operations on pairs of biomedical images. The step currently includes one substep called MASK_SPECIFIC, which can be used to mask one image with another.

- The processBioMedImages action includes a new step called HISTOGRAM_EQUALIZATION, which enhances the contrast of biomedical images. This step consists of the BASIC substep, which considers the histogram of the entire image, and the ADAPTIVE substep, which uses the histogram of a chosen image window.
- Data Science Pilot action set
 - The new detectInteractions action searches for interactions among pairs of predictor variables in a regression or classification data table. The action generates an output CAS table that contains the candidate interactions ranked according to their interaction strength. The action implements an efficient and scalable algorithm to handle data tables that contain a large number of predictor variables as well as a large number of observations.
 - The new generateShadowFeatures action generates new random features by a scalable, random permutation of the input features. These randomly permuted features, usually referred to as shadow features, can be used for all relevant feature selection.
 - The featureMachine action has several new parameters and updates. The rankPolicy parameter specifies the ranking policy to apply to the generated features; the interaction parameter controls the generation of interaction features; and features now come with autogenerated labels that describe the transformations.
 - The dsAutoML action has several new parameters. These include an expanded saveState parameter to support the generation of analytic score objects for both the feature generation and the top-*k* models; generalized linear model (GLM) and logistic model types; and an hpOptimizer parameter to specify the hyperparameter optimizer to use for model hyperparameter tuning.
- Explain Model action set
 - A new shapleyExplainer action quickly gives accurate Shapley value estimates by using the HyperSHAP method invented by SAS.
 - The partialDependence action now supports a second analysis variable and more analysis variable parameters, including using missing values as a valid level and reading in user-defined levels.
 - The linearExplainer action now supports more parameters for training regression models and supports including missing values in the analysis.
 - All actions in the action set now support the use of DS2 code to accompany an analytic store model, as well as multiple analytic stores as part of a full model.
- The Factorization Machine (factmac) action set now accepts data that contain missing values without issuing an error. Observations that have missing values are excluded from the analysis.
- In the Graph-Based Semisupervised Learning action set, a loss function was added to demonstrate the computation results based on graph prediction.
- Image action set
 - The condenseImages action generates encoded or decoded image tables, depending on the value of the new decode parameter. Most common photographic image formats, such as JPG and PNG, are supported for the encoding.
 - The RESIZE step in the processImages action now supports preserving the aspect ratio of images during resizing by using the new type parameter.

- The MUTATIONS step in the processImages action has a new parameter called angle. You can use the angle parameter with the ROTATE_LEFT and ROTATE_RIGHT values of the type parameter to rotate images by arbitrary angles.
- The MUTATIONS step in the processImages action now supports perspective transformations of images. You can perform a perspective transformation by specifying the WARP_PERSPECTIVE value of the type parameter and the values of the homography matrix in the new homographyValues parameter.
- Network action set
 - The internalFormat parameter has been deprecated. The best underlying internal structures are chosen for the requested algorithm.
 - For algorithms that support multilinks, the default value of the multiLinks parameter is True. Previously, this default was determined by the value of the internalFormat parameter.
 - The loadGraph action enables you to load graph input data tables and build in-memory data structures for subsequent analyses.
 - The unloadGraph action enables you to delete in-memory data structures that have been loaded with the loadGraph action.
 - You can now find network projections by using the new projection action, which creates a single-partition graph from a multiple-partition graph.
 - New features have been added to the community, cycle, nodeSimilarity, patternMatch, and summary actions.
- In the Support Vector Machine action set, the earlyStop parameter is new. If this parameter is set to True and the partition parameter is specified, the action uses the validation data to determine whether to stop the iterations early.

For more information about these action sets, see [SAS Visual Data Mining and Machine Learning: Programming Guide](#).

SAS Visual Statistics 8.5 Action Sets

New Action Sets

These action sets are new for SAS Visual Statistics 8.5 (November 2019 release of SAS Viya 3.5):

- The Distribution System Simulation (simSystem) action set simulates continuous univariate data from distributions in the Pearson and Johnson systems.
- The Nonlinear Models (nonlinear) action set performs nonlinear model fitting.
- The Nonnegative Matrix Factorization (nmf) action set performs nonnegative matrix factorization.
- The Sparse Regression (sandwich) action set analyzes linear models by using the classical robust sandwich variance estimator.

New Actions

These actions are new for SAS Visual Statistics 8.5 (November 2019 release of SAS Viya 3.5):

- The gamSelect action in the gam action set fits and performs model selection on generalized additive models.
- The logisticLackfit action in the regression action set performs the Hosmer-Lemeshow goodness-of-fit test for binary and polytomous response models by using a model that was previously fit and stored by the logistic action and a (possibly new) data table.
- The logisticOddsRatio action in the regression action set performs odds ratios for effects from a model that was previously fit and stored by the logistic action.
- The nlmod action in the nonlinear action set performs nonlinear model fitting by using the maximum likelihood or nonlinear least squares method. You can define the nonlinear models either by using standard distributions or by specifying a general likelihood function.
- The nmf action in the nmf action set performs nonnegative matrix factorization, which seeks to approximately decompose a nonnegative data matrix into two low-rank nonnegative factor matrices.
- The simsk action in the simSystem action set uses the Pearson and Johnson systems to simulate continuous univariate data for any given feasible values of mean, standard deviation, skewness, and kurtosis.
- The sparseReg action in the sandwich action set analyzes linear models by using the classical robust sandwich variance estimator.

Enhanced Actions

These actions were enhanced in SAS Visual Statistics 8.5 (November 2019 release of SAS Viya 3.5):

- In the glm action, the new ELASTICNET value of the method subparameter in the selection parameter specifies the elastic net method, an extension of LASSO that estimates parameters by using a version of ordinary least squares in which both the sum of the absolute regression coefficients and the sum of the squared regression coefficients are constrained. If the model contains classification variables, then these corresponding effects can be split.
- genmod action
 - The new inParmEst parameter enables you to input starting values for the optimizations.
 - The new maxResponseLevels parameter enables you to specify the maximum number of allowed response levels.
 - The new useLastIter parameter requests that the action continue its computations even when the optimization fails.
- logistic action
 - The new inParmEst parameter enables you to input starting values for the optimizations.

- The new `maxResponseLevels` parameter enables you to specify the maximum number of allowed response levels.
- The new `lackfit` parameter performs the Hosmer-Lemeshow goodness-of-fit test for binary and polytomous response models.
- The new `useLastIter` parameter requests that the action continue its computations even when the optimization fails.
- In the `mbcFit` action, the `covStruct` parameter now provides eight new covariance structures for fitting parsimonious Gaussian mixture models (PGMMs).
- In the `mixed` action, the new `store` parameter saves a model containing both fixed and random effects and the results of the statistical analysis to a binary compressed file. This stored model can then be used by the `ASTORE` procedure to score a new data set.
- The stratified action in the sampling action set now supports segment-stratified sampling for each target.

Differences from the Previous Release

- In the `genmod` action, the maximum number of response levels allowed is now 100 when the value of the `dist` parameter is `MULTINOMIAL`. You can change this value by specifying the `maxResponseLevels` parameter. This limit is added to prevent you from accidentally trying to use these models to fit a continuous response variable.
- In the `logistic` action, the maximum number of response levels allowed for polytomous response variables is now 100. You can change this value by specifying the `maxResponseLevels` parameter. This limit is added to prevent you from accidentally trying to use these models to fit a continuous response variable.

Enhancements to Data Quality Action Sets

Enhancements to Actions

- The Data Discovery action set has a list of values and the data type for the collected column, which is Row ID 1001.
- The Data Discovery action set does not include the output from certain metrics when the threshold for a field is reached to avoid displaying invalid data. Here are the metrics:
 - 1004 Frequency distribution (High)
 - 1005 Frequency distribution (Low)
 - 1006 Maximum value
 - 1009 Median
 - 1010 Minimum value
 - 1012 Mode
 - 1016 Outlier high values
 - 1017 Outlier low values

- 1018 Pattern frequency distribution (High)
- 1019 Pattern frequency distribution (Low)
- 1020 Unique patterns
- 1021 Primary Key candidate
- 1025 Unique count
- 1026 Unique pct
- 1027 Pattern unique pct
- 1041 Unique percentage
- 1042 Pattern unique percentage
- The entityRes.match action has a new parameter named ClusterIDType. You can choose from CHAR, DOUBLE, INT, and it defaults to DOUBLE.

See Also

SAS Data Quality: CAS Action Programming Guide

Enhancements to SAS Econometrics Action Sets

New Action Sets for SAS Econometrics

In SAS Econometrics 8.5, the new Time Series Information Analysis (tsInfo) action set evaluates a variable in an input data table for its suitability as a time ID variable in SAS procedures, CAS action sets, and solutions that are used for time series analysis. The tsInfo action set is intended for use as a tool to either identify the time interval of a variable or prepare problematic data sets for use in subsequent time series analyses.

Enhanced Action Sets

These action sets were enhanced in SAS Econometrics 8.5 (November 2019 release of SAS Viya 3.5):

- In the Aggregate Loss Modeling action set, the cdm action has been enhanced. The output style as it relates to adjusted severity symbols is now consistent whether you specify one or more adjusted severity symbol in the adjustedSeverity parameter. In previous releases, the output style with one adjusted severity symbol differed from the output style with more than one adjusted severity symbol. To revert to the older style for the case of one adjusted severity symbol, you can use the new backwardCompatibleOutput subparameter of the adjustedSeverity parameter.
- In the Copula Modeling (copula) action set, the following enhancements have been made:
 - In both the copulaFit and copulaSimulate actions, the new plot parameter has been added to request ODS tables that can be used to visualize correlation plots.
 - In the copulaFit action, the new margApproxOpts parameter has been added. This parameter supports a more accurate algorithm for computing the cumulative distribution function for variables in large data tables and for variables that have nonsmooth distributions and extreme values.

- A new Simulation Summary table has been added to describe results of the `copulaSimulate` action.
- In the Hidden Markov Model (`hmm`) action set, state-independent parameter estimation and analytic store technology are now supported.
- In the Panel Data Regression Modeling (`panel`) action set, these estimators are now supported:
 - heteroscedasticity-corrected standard error estimator (`HCCME`)
 - cross-sectional-correlation-corrected (`CLUSTER`) standard error estimator
 - heteroscedasticity- and autocorrelation-consistent (`HAC`) standard error estimator
- In the Qualitative and Limited Dependent Variable Modeling (`qlim`) action set, the Bayesian estimation of most univariate models is now supported.
- In the Severity Distribution Modeling (`severity`) action set, the parameter estimation phase now balances the available work in each BY group equitably among all available threads of computation. This new default behavior can lead to significantly faster estimation times, but it can also cause the numeric results to differ from those in previous releases. To revert to the numeric results of older releases, you can use the new `balanceThreads` parameter.

Enhancements to SAS Optimization Action Sets

OptNetwork Action Set Enhancements

The following list highlights changes that are related to graph handling for all algorithms:

- The `internalFormat` parameter has been deprecated. The best underlying internal structures are chosen for the requested algorithm.
- For algorithms that support multilinks, the default value of the `multiLinks` parameter is **True**. Previously, this default was determined by the value of the `internalFormat` parameter.
- The `loadGraph` action enables you to load graph input data tables and build in-memory data structures for subsequent analyses.
- The `unloadGraph` action enables you to delete in-memory data structures that have been loaded with the `loadGraph` action.

The following actions have been enhanced:

- In the `cycle` action, you can now specify the `outCyclesLinks` parameter to produce an output table that contains the sequence of links for each cycle that the action finds.
- In the `linearAssignment` action, the linear assignment problem solver now includes the `maxTime` parameter, which enables you to specify the maximum amount of time to spend on the algorithm.
- In the `minCut` action, the minimum cut algorithm now includes the source and sink parameters, which you can use to find a minimum source-sink cut.
- In the `summary` action, you can now add the triangle count for undirected graphs to the graph summary output by specifying the `clusteringCoefficient` parameter.

Optimization Action Set Enhancements

The following actions have been enhanced:

- The runOptmodel action supports the use of the COFOR loop with distributed execution. A COFOR loop is a FOR loop in which solver invocations are executed in parallel with other statements inside the loop.
- The runOptmodel action also adds support for BY-group processing, which provides a new and highly efficient means for solving multiple optimization problems by a single action call. This method is far more efficient than embedding a SOLVE statement within a loop in OPTMODEL code, and it enables you to solve a large number of problems more easily.
- The new solveBlackbox action calls the black-box solver, which uses innovative methods to find solutions to some of the most challenging optimization problems.
- For the solveMilp action, the new iis parameter enables (TRUE) or disables (FALSE) IIS analysis. The default value is **FALSE**.

See Also

- [SAS Optimization: Mathematical Optimization Programming Guide](#)
- [SAS Optimization: Network Optimization Programming Guide](#)

Enhancements to SAS Visual Analytics Action Sets

Enhancement to SAS Cloud Analytic Services

- The server adds support for Linux on Power for the POWER9 chip.
- The server supports reading and writing files in the Apache Parquet file format. Support is available for single-machine and distributed servers that run Linux or Linux on Power. Apache Parquet files can be used with Path, DNFS, and Amazon Web Services S3 caslib types.
- The HDFS caslib type is enhanced to support data access to a remote HDFS cluster. The Hadoop cluster must be configured to enable SASHDAT access to HDFS. For deployment information, see [SAS Viya for Linux: Deployment Guide](#).
- The server supports adding a caslib to Azure Data Lake Storage Gen 2 for data access. The ADLS caslib type supports loading and saving delimited files (CSV files) and Optimized Row Columnar (ORC) files.
- The following enhancements related to Amazon S3 are added:
 - The server has improved performance for loading and saving files with Amazon S3. The data transfer for load and save uses multiple threads to transfer data in parallel. The performance improvement is most noticeable with large files.
 - Support for server-side encryption (SSE) is added. The settings can be specified when you add a caslib.

- Support for adding caslibs that use Identity and Access Management (IAM) roles is added. The settings can be specified when adding a caslib or loading a table.
- For actions that generate in-memory tables, a new parameter is available for the output table. You can specify the lifetime parameter. The lifetime parameter sets the number of seconds for the table to remain in memory after it is last accessed. When the table has not been accessed in the specified number of seconds, the server drops the table.

New Action Sets

- The new Duplicate Management (deduplication) action set provides the deduplicate action for managing rows within groups.
- The SAS Embedded Process for Spark (sparkEmbeddedProcess) action set is new. The action set provides actions for interacting with the SAS Embedded Process for Spark continuous session.

New Actions

These actions are new for SAS Visual Analytics 8.5:

- The new session.listactionq action enables you to see what, if any, actions are currently queued for execution in a session identified by its UUID.
- The new table.addCaslibSubdir action creates a subdirectory in an existing caslib.
- The new table.deleteRows action deletes matching rows from a table.
- The new table.describeView action provides the definition of the view, such as caslib, table names, keys, and so on.
- The new builtins.getCasheInfo action retrieves information about CAS_DISK_CACHE usage on session worker nodes.
- The new simple.compare action compares the index and frequency of each group within each input CAS table, as well as the index of each record within each group of the input CAS tables.

Enhancements to Actions

The following actions are enhanced for SAS Viya 3.5:

- The table.loadTable action is enhanced to support loading a directory of CSV files into a single in-memory table. For more information, see [multifile CSV import](#).
- The table.fetch action is enhanced to support the sortBy parameter when fetching rows from a view.
- The table.tableInfo action is enhanced to support the % and _ characters as wildcard characters.
- The table.save action is enhanced to change how the number of copies (replicate HDFS blocks) is determined when a table is saved to HDFS.
- The threadBlockSize parameter is new for the datastep.runCodeTable action. The threadBlockSize parameter specifies the number of bytes to use for blocks in the output table.

- The `dynamicCardinality` parameter is new for the `fedSql/execDirect` action. When `dynamicCardinality` is set to `True`, the FedSQL query planner performs cardinality estimations of the input data.
- The `sessionProp.setSessOpt` action is enhanced to support the following new parameters:
 - `azureTenantId`
 - `dataStepMergeNoBy`
 - `debugopt`
 - `useGpu`
- The `tag` parameter is new for the `session.flushresult` action. The `tag` parameter specifies the results TAG.
- The `fcmpact.runProgram` action is enhanced to support the following new parameters:
 - `debughost`
 - `debuglabel`
 - `debugport`
- The `configuration.setServOpt` action is enhanced to support the following new parameters:
 - `addNodeCancelTimeout`
 - `addNodeKillTimeout`
 - `azureTenantId`
 - `azureAuthCacheLoc`
 - `casuserencr`
 - `dataStepMergeNoBy`
 - `debugopt`
 - `dcextport`
 - `dcport`
 - `encryptfips`
 - `exthostknownby`
 - `useGpu`
- The following parameters are new in the `transform` action in the Data Preprocess action set:
 - `topKSave`
 - `separateRank`
 - `topKInteractions`
 - `rareThreshold`
 - `slice`
 - `noTable`
 - `adjustMisraGries`
 - `label`

- lifetime
- The following parameters are new in the hypergroup action in the Hypergroup action set:
 - The directed parameter is used to specify whether a graph is directed and has a default value of **False**.
 - The shortestPathStart parameter specifies that either vertex=, vertexNumber=, or vertexNumeric= is the start of the shortest path when the value of the directed parameter is set to **True**. The default value for shortestPathStart is **False**.
 - The degree parameter specifies whether to generate vertice degrees. If a graph is directed, both in-degree and out-degree are generated. The default value for degree is **False**.
- In the percentile.assess action, the following parameters are new:
 - The new method option enables users to specify the algorithm used for percentile analysis.
 - The new userCutoff parameter is used to generate a confusion matrix and associated metrics based on the user-defined threshold. It is especially useful for rare event classification where the cutoff would be significantly less than 0.5.
- In the percentile.boxplot action, the new method option parameter enables users to specify the algorithm used for percentile analysis.
- In the search.valueCount action, the new trim parameter specifies whether to trim the padding spaces of a JavaScript Object Notation (JSON) report.
- In the simple.groupByInfo action set, the following parameters are new:
 - nSubGroupVars
 - keyModify
 - inputRegEx
 - divider
 - minGroupsLL
 - sparse

See Also

- [SAS Viya: System Programming Guide](#)
- [SAS Visual Analytics: Programming Guide](#)

New IML Action Set

The iml action set enables you to run SAS/IML programs in SAS Viya. The action supports most of the statements and functions in the SAS/IML language. In addition, the iml action supports new functionality that enables you to take advantage of the distributed computational resources in SAS Viya. In particular, you can use the iml action to implement custom parallel algorithms that use multiple nodes and threads on a cluster of machines.

The SAS/IML language is a high-level matrix-vector language that supports a rich library of functions in statistics, data analysis, matrix computations, numerical analysis, simulation, and optimization. A primary goal of SAS/IML software is to enable programmers to extend the capabilities of SAS software.

See Also

[*SAS IML: Programming Guide*](#)

CAS Session Options

These CAS session options are new in SAS Viya 3.5:

- The USEGPU session option specifies whether work is offloaded to the Graphics Processing Unit (GPU), if it is available.
- The DEBUGOPT session option specifies the host and port for the SAS Code Debugger in a session.
- The AZURETENANTID session option specifies the tenant ID for connecting to a Microsoft Azure storage system in a session.

See Also

[*SAS Cloud Analytic Services: User's Guide*](#)

Enhancements to the CASUTIL Procedure

Here are the new parameters and options in the CASUTIL procedure.

- The ALERTTABLE statement enables you to change your table, such as renaming the table.
- The INDEX statement enables you to create indexes on one or more table variables.
- The LOAD statement now supports reading data from an external file using a fileref.
- The LOAD statement now supports the WRITETRANSFERSIZE= option, which specifies the maximum number of bytes that the CAS engine writes when transferring data to the CAS server.
- The PARTITION statement enables you to partition a table.
- The PROMOTE statement now supports the QUIET option, which does not return a message with status and severity.
- The UPDATE statement enables you to update rows in a table.

See Also

[*SAS Cloud Analytic Services: User's Guide*](#)

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SAS Viya Foundation

SAS Viya supports the Apache ORC (Optimized Row Columnar) open-source file format. You use a SAS LIBNAME engine in the SAS Viya programming environment to read and write ORC tables. For more information, see [SAS Viya Engine for ORC: Reference](#). The Apache ORC Data Connector is available for SAS Cloud Analytic Services (CAS). For more information, see [SAS Cloud Analytic Services: User's Guide](#). Apache ORC is an open-source file format that was created for use with Apache Hive.

Base SAS

For more information, see [Details about the New Features in Base SAS 9.4 and SAS Viya](#).

Create and Run Python Objects in SAS

In SAS Viya 3.5 and the November 2019 release of SAS 9.4M6, you can submit to the CAS server Python objects using PROC FCMP or the DATA step.

Platform Data Sources

In SAS Viya 3.5, support was added for the USEIAMROLE= option for the S3 platform data source. This option enables you to use the credentials that are defined for your EC2 instance on S3.

Data Connectors

These data connectors are new in SAS Viya 3.5:

- SAS Data Connector to MongoDB
- SAS Data Connector to Salesforce
- SAS Data Connector to ORC

These data connector enhancements have been made in SAS Viya 3.5:

- Amazon Redshift: bulk unloading (data retrieval). Bulk-unloading support includes the new BULKUNLOAD= data connector option.

- PostgreSQL: bulk unloading (data retrieval). Bulk-unloading support includes these new data connector options: BULKUNLOAD=, BLDELDATFILE=, BLDELIMITER=, BLESCAPE=, BLFORMAT=, BLNULL, BLPSQLPATH=, BLQUOTE=, and LDPATH=.
- Teradata: support for the NUMBER data type.

SAS LIBNAME Engine for SAS Federation Server

In SAS Viya 3.5, the behavior of two LIBNAME options and their respective data set options have changed:

- The IGNORE_READ_ONLY_COLUMNS= LIBNAME option and data set option affect columns that are Read-only and have unique values. In SAS 9.4 and earlier releases of SAS Viya, the options affect columns whose data types are Read-only.
- The READBUFF= LIBNAME option and data set option use a default block size of 64K to read data if the underlying database supports extended Fetch. The default number of rows is determined by dividing 64K with the width of a row. In SAS 9.4 and earlier releases of SAS Viya, the options perform single-row Fetch by default.

The DBMS option is removed from the SPOOL= LIBNAME option documentation. It is not supported in SAS 9.4 or SAS Viya.

Debugging SAS Code

SAS Viya 3.5 has two new debugging environments.

- In SAS Studio 5.2, use the SAS DATA Step Debugger to debug a DATA step.
- You can use the SAS Code Debugger to debug a subset of DATA step programming and Base SAS procedures, as well as some analytical procedures.

Output Delivery System (ODS)

In SAS Viya 3.5, ODS has these enhancements:

- The ODS Destination for Microsoft Word supports these new features:
 - The COLUMNS= option specifies the number of columns to place across each page of output.
 - The SUBJECT= option inserts the text string that you specify as the subject into the metadata of a file.
 - You can standardize Word-specific styles using the SAS Registry.
 - SVG is a supported file type.
- The ODS Destination for Excel supports the SUBJECT= option.
- The ODS Destination for PowerPoint supports the SUBJECT= option.

ODS Graphics Procedures

SAS Viya 3.5 has these enhancements:

- These changes apply to the SGPLOT and SGPANEL procedures:

- The NOLIMITCAPS option was added to the DOT, HLINE, and VLINE statements. This option suppresses the serif cap on limit lines.
- In the fit plots (LOESS, REG, and PBSPLINE), the FILL | NOFILL and OUTLINE | NOOUTLINE suboptions were added to the CLIATTRS= option and the CLMATTRS= option. These suboptions give you more control over the display of confidence band features. You can now easily specify fills, outlines, and their attributes.
- The STATFMT= option was added to the PIE and DONUT statements in the SGPIE procedure. This option specifies the format of the displayed statistical value in the pie or donut chart.

Creating Maps Using ODS Graphics and Mapping Procedures

SAS Viya 3.5 has these enhancements for the SGMAP procedure:

- The STYLEATTRS statement enables you to specify color, marker, and other attributes for a graph. You no longer have to change the ODS style template to accomplish this.
- These are the general enhancements for the PROC SGMAP statement:
 - The CYCLEATTRS and NOCYCLEATTRS options specify whether plots are drawn with unique attributes in the graph. Automatic cycling of attributes is allowed.
 - The DATTRMAP= option and the RATTRMAP= option specify the discrete attribute map data set or the range attribute map data set, respectively, that you want to use with the SGMAP procedure. Use these options in conjunction with overlay map or the plot statement's options ATTRID= and RATTRID=, respectively. These attribute ID options specify the value of the ID variable that is contained in the discrete or range attribute map data set.
 - You can specify coordinate system references directly in the PROC SGMAP statement with the MAPCS= and the PLOTCS= options. This enhancement negates the need to run PROC GPROJECT on a map data set to project the coordinates before using the projected data in the SGMAP procedure.
- PROC SGMAP has several new options for map, legend, and plot overly statements. Here is a summary of the new functionality:
 - Sizing of all markers in a legend in proportion to the font size that is used for the legend value labels.
 - New color options.
 - Specify a value that determines which axis offsets can be affected by the plot.
 - Options to specify a value ID in a discrete or range attribute map set.
 - Automatic binning of a numeric response variable.
 - Code, label, and format data tip information to be displayed when you hover over a graphics element.
 - Ability to code an active link when selecting parts of the plot.
 - There are 30 new TEXT options. These options give you control over the appearance of text and titles on the map.
- Automatic legends are created differently now when the CHOROMAP statement is used.

SAS Engines for Open-Source File Formats

Beginning in SAS Viya 3.5, SAS supports Apache ORC tables by using the SAS ORC engine.

The SAS ORC engine can create or access an ORC table that is stored in one of the following storage systems:

- Microsoft Azure Data Lake Storage Gen2
- Linux for x64 distributions that are supported by SAS

Scalable Performance Data Engine

In SAS Viya 3.5, you can override and change the encoding when reading or writing SAS data sets by using the INENCODING= LIBNAME statement option.

National Language Support (NLS)

SAS Viya 3.5 has these changes and enhancements.

- Aliases and POSIX numbers are updated for these locales:
 - Chinese_China
 - Chinese_HongKong
 - Chinese_Macau
 - Chinese_Singapore
 - Chinese_Taiwan
 - Serbian_Serbia
 - SerbianLatin_Serbia
- These formats are new:
 - NLTIMEL converts a SAS time value to the time value of the specified locale, and then writes the value as a time value in a long-uniform pattern.
 - NLTIMEM converts a SAS time value to the time value of the specified locale, and then writes the value as a time value in a medium-uniform pattern.
 - NLTIMES converts a SAS time value to the time value of the specified locale, and then writes the value as a time value in a short-uniform pattern.
- These formats have been restored to SAS Viya 3.5:
 - JNENGO writes SAS date values as Japanese dates as reign, year, month, and day.
 - JNENGOT writes SAS datetime values as Japanese datetimes as reign, year, month, day, hour, and minute, and with narrow character numbers.
 - JNENGOTW writes SAS datetime values as Japanese datetimes as reign, year, month, day, hour, and minute, and with wide character numbers.
 - JNENGOW writes SAS date values as Japanese dates as reign, year, month, and day, and with wide character numbers.

- The JNENGO informat has been restored to SAS Viya 3.5. The JNENGO informat reads Japanese kanji date values.
- These functions have been enhanced:
 - You can modify the functionality of the KCOMPARE function by using modifiers.
 - The KPROPDATA function PUNC option converts commonly used 8-bit punctuation.
- These LIBNAME statement options are new:
 - You can exclude variables for data processing by using the CVPEXCLUDE statement option.
 - You can include variables for data processing by using the CVPINCLUDE statement option.

Procedures

For a list of SAS Foundation procedures that are available for sites with only SAS Viya and SAS Visual Analytics installed, see [SAS Viya Foundation Procedures](#) in *An Introduction to SAS Viya Programming*.

SAS Viya 3.5 has these changes and enhancements:

- Starting with the October 2024 release of SAS Viya 3.5, the ICU library version incorporated by SAS and used by PROC SORT is ICU 74. This ICU version uses locale data from version 44 of the Unicode Common Locale Data Repository (CLDR). For in-depth information, see [ICU 74](#) and CLDR 44.
- The CIMPORT procedure has these enhancements:
 - PROC CIMPORT can be used to import a file that was created in UTF-8 encoding into non-UTF-8 SAS sessions and output corresponding data sets.
 - When a transport file is imported, the original string variable length might not be large enough for the transcoded strings. To ensure that your destination buffer size is sufficient for transcoded data, specify the EXTENDVAR= and EXTENDFORMAT = options in the PROC CIMPORT statement.
- In the COPY procedure, the APPEND procedure supports appending data that includes VARCHAR columns if the VARCHAR column attributes match.
- In the DATASETS procedure, the DATASETS APPEND statement supports appending data that includes VARCHAR columns if the VARCHAR column attributes match.
- In the DS2 procedure, the following enhancements have been made:
 - Beginning in November 2019 on SAS 9.4M6 and with SAS Viya 3.5, Write access is available for MongoDB and Salesforce data sources. The Write support is available through a SAS library and a CAS library. Appropriate SAS/ACCESS software must be installed.
 - The VARBINARY data type is supported for DS2 programming in CAS.
 - Support for Spark is clarified.
- The EXPORT procedure supports all access types that are available in the FILENAME statement.
- In the FedSQL procedure, the following enhancements have been made:

- Beginning in November 2019 on SAS 9.4M6 and with SAS Viya 3.5, Write access is available for MongoDB and Salesforce data sources. The Write support is available through a SAS library and a CAS library. Appropriate SAS/ACCESS software must be installed.
- Use of the UNION set operator is supported for FedSQL programming in CAS.
- The VARBINARY data type is supported for FedSQL programming in CAS.
- There are several new options for optimizing FedSQL performance on the CAS server. They are specified in the CNTL= procedure option.
- The output of the _METHOD procedure option has changed. This procedure option no longer returns the stage query and number of threads used by a FedSQL query plan in its textual description of the plan.
- There is a new CNTL= option, showStages, which returns the information previously printed by the _METHOD procedure option. In addition, showStages returns query execution details such as whether the tables in a query were partitioned, the number of rows and columns processed by each stage of the query, and the elapsed time for each processing stage.
- Support for Spark is clarified.
- The IMPORT procedure supports all access types that are available in the FILENAME statement.
- In PROC S3, you can save LIST output to an external file by using the OUT= option.
- The SCOREACCEL procedure adds support for publishing a model to a global model table:
 - You publish a model to a global model table by using the PUBLISHGLOBAL= option in the PUBLISHMODEL statement.
 - You delete a model from a global model table by using the DELETEDGLOBAL= option in the DELETEMODEL statement.
- PROC SQOOP support was added for the HIVE_SERVER= option to connect to the Hive server and port and for the HIVE_URI= option to specify the JDBC URI. The HIVE_URI= option is required when connecting to a Kerberized HDP 3.1 cluster when the hive-site.xml file does not contain the Zookeeper service.

Functions

In SAS Viya 3.5, here are the changes and enhancements:

- There are several new Git functions and the Git functions that began with GITFN_ have been deprecated and replaced with functions that begin with GIT_.
- The COMPSRV_OVAL function returns the original, possibly unsafe, value of an input parameter or global macro variable passed into the compute server.
- The COMPSRV_UNQUOTE2 function un.masks matched pairs of quotation mark characters in an input parameter or global macro variable.

Statements

SAS Viya 3.5 has these changes and enhancements:

- The DESCENDING option in the BY statement is now supported for a DATA step that is running in CAS. The option is supported only for the second and subsequent variables in a CAS DATA step and not for the first variable in a BY statement.
- The FILENAME statement Azure access method enables access to data in Microsoft Azure Data Lake Storage Gen2.
- The FILENAME statement S3 access method enables access to data in Amazon S3 files.

System Options

These are the new features for SAS Viya 3.5:

- The AZUREAUTHCACHELOC system option specifies the location of a file that contains login information for connecting to a Microsoft Azure storage system.
- The AZURETENANTID system option specifies the tenant ID for connecting to a Microsoft Azure storage system.
- The DEBUGOPT system option specifies the host and port where debugging SAS languages occurs.

Macros

To use your SAS user-defined formats on the CAS server, you can migrate them from a SAS catalog to the CAS server using the autocall macro %UDFSEL. This macro generates a SELECT statement that you can use with the FORMAT procedure to migrate only the user-defined formats that your data is using. User-defined formats are stored in a CAS library on the CAS server.

SAS DS2

The SAS Viya 3.5 release has the following new features and enhancements:

- The ability to read and write to MongoDB and Salesforce nonrelational databases with DS2 when appropriate SAS/ACCESS software is installed. The functionality is available when accessing the databases through a SAS library. It is also available when accessing the databases through a CAS library.
- Support for the VARBINARY data type when reading and writing to CAS tables
- There are improvements to data type support for various third-party relational databases when appropriate SAS/ACCESS software is installed. The features are available when the databases are accessed through a SAS library.
 - DS2 now creates VARCHAR columns that contain more than 65,535 characters as type STRING in Hive.
 - DS2 now reads and writes Teradata NUMBER columns.
 - DS2 now reads JSON columns in MySQL.
- The documentation about the scope of package instances has been updated. The THIS and package-instance arguments of the NEW operator have been deprecated and are removed from the _NEW_ operator for packages. The lifetime of a package instance now depends on whether a DS2 package variable references it. The lifetime of a package instance can extend beyond the scope in which the instance itself was created.

- Some DS2 error messages that are written to the SAS log now contain an internal error code. If you need to contact Technical Support, these internal error codes can help SAS more quickly determine the source of the problem. An appendix has been added to the documentation that provides more information about these error codes.
- A DS2 program that runs in CAS can create a column with a VARBINARY data type, read a VARBINARY column from a CAS table, and write a VARBINARY column to a CAS table. In addition, a DS2 program that runs in CAS can create a column with a BINARY data type. However, a DS2 program cannot read a BINARY data column from a CAS table or write a BINARY column to a CAS table.
- If you use in-database processing with the SAS Embedded Process on Teradata, the SASTransform table function has been deprecated. The SASTblOp table operator should be used with Teradata version 14.10 or later.
- Write support is added for the MongoDB nonrelational database. Access is available through a SAS library or a caslib. Appropriate SAS/ACCESS software must be installed. For data type support, see [“Data Types for MongoDB” in SAS DS2 Language Reference](#).
- The following functions have been added:
 - COMPLEV returns the Levenshtein edit distance between two strings.
 - COMPCOST sets the costs of operations for later use by the COMPGED function.
 - COMPGED returns the generalized edit distance between two strings.
- The COMPRESS function now has an optional third argument, modifier, that specifies a character constant, variable, or expression in which each non-blank character modifies the action of the COMPRESS function.
- The maximum number of threads you can specify on the SET FROM statement is 100 if you are using an FCMP package.

SAS FedSQL

The SAS FedSQL language has the following new functionality in SAS Viya 3.5:

- The ability to read and write to MongoDB and Salesforce nonrelational databases with FedSQL when appropriate SAS/ACCESS software is installed. The functionality is available when accessing the databases through a SAS library. It is also available when accessing the databases through a CAS library.
- Support for the VARBINARY data type when reading and writing to CAS tables
- There are improvements to data type support for various third-party relational databases when appropriate SAS/ACCESS software is installed. The features are available when the databases are accessed through a SAS library.
 - FedSQL now creates VARCHAR columns that contain more than 65,535 characters as type STRING in Hive.
 - FedSQL now reads and writes Teradata NUMBER columns.
 - FedSQL now reads JSON columns in MySQL.
- The COMPRESS function supports a Modifier argument.
- There are four new instructions for the Cntl option in FedSQL for CAS:

- An optional `dynamicCardinality` instruction for the `Cntl` option directs the FedSQL query planner to perform a cardinality estimation before creating a query plan.
 - An optional `optimizeVarbinaryPrecision` instruction for the `Cntl` option optimizes VARBINARY precision by using a precision that is appropriate to the actual data, instead of the declared precision for VARBINARY columns.
 - An optional `optimizeVarcharPrecision` instruction for the `Cntl` option optimizes VARCHAR precision by using a precision that is appropriate to the actual data, instead of the declared precision for VARCHAR columns.
 - An optional `showStages` instruction for the `Cntl` option returns FedSQL query execution details, including times for intermediate stages, along with the FedSQL query plan.
 - The new `CAST` function converts a column from one data type to another and also enables you to change the column's length.
 - The new `UNION` set operator combines the result sets of two `SELECT` queries and returns unique rows from both result sets. Columns are combined by position by default. An optional `CORRESPONDING` keyword enables you to combine columns based on column name instead. An optional `BY` keyword enables you to submit a column list to the `CORRESPONDING` keyword.
 - In earlier versions of SAS Viya, the `DROP TABLE` statement and `REPLACE=` table option considered global tables when enforcing name uniqueness rules and would drop and replace a table that was previously promoted. Beginning in SAS Viya 3.5, the `DROP TABLE` statement and `REPLACE=` table option operate exclusively on CAS session tables.
 - In previous versions of SAS Viya, the `fedSql.execDirect` action serialized many operations on one worker. Beginning with SAS Viya 3.5, the action partitions operations that have computed columns by creating temporary intermediate tables. The following operations, which were previously serialized on one worker, can now be performed on multiple workers:
 - `FULL` outer joins, except full outer joins where the join condition is an inequality condition ($t1.x < t2.x$) or an equality condition where one side of the equation contains column references from more than one table ($t1.x + t2.y = 7$).
 - `GROUP BY` aggregations where one or more group expressions are computed columns
 - Joins on columns that use different SAS formats.
 - `SELECT DISTINCT` with computed columns.
- `LIMIT` and `OFFSET` operations are still serialized on one worker.
- Some FedSQL error messages that are written to the SAS log now contain an internal error code. If you need to contact Technical Support, these internal error codes can help SAS more quickly determine the source of the problem.

SAS/ACCESS Interface to Snowflake

In SAS Viya 3.5, support was added for the 64-bit Microsoft Windows platform.

SAS Drive 2.2

SAS Drive 2.2 shipped in November 2019 and runs on SAS Viya 3.5. Here are the new features and enhancements in this release:

- Performance has been improved for the SAS Drive user interface. For example, tabs display their contents more quickly.
- The **Quick Access** bar has a new button to add recommended items.
- On the SAS Viya side menu, the SAS Drive application is now labeled **Share and Collaborate**.

For more information, see [What's New in SAS Drive 2.2](#).

SAS Econometrics

About SAS Econometrics

SAS Econometrics runs in SAS Viya. 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.

SAS Econometrics 8.5

SAS Econometrics 8.5 (November 2019 release of SAS Viya 3.5) includes these new features and enhancements:

- The new SASEMOOD interface engine enables SAS users to retrieve time series data from the Moody's Analytics Data Buffet (Economy.com) website.
- The new TSINFO procedure evaluates a variable in an input data table for its suitability as a time ID variable in SAS procedures and solutions that are used for time series analysis. PROC TSINFO assesses how well a time interval specification fits SAS date values, SAS datetime values, or observation numbers that are used to index a time series.

PROC TSINFO is intended for use as a tool to either identify the time interval of a variable or prepare problematic data sets for use in subsequent time series analyses. In particular, this procedure can be used to investigate inconsistencies between time ID values and the ID statement options that are used in other SAS procedures and solutions.

- The CCDM procedure has been enhanced. The output style as it relates to adjusted severity symbols is now consistent whether you specify one or more adjusted severity symbol in the ADJUSTEDSEVERITY= option. In previous releases, the output style with one adjusted severity symbol differed from the output style with more than one adjusted severity symbol. To revert to the older style for the case of

one adjusted severity symbol, you can specify the new ONEADJSEVCOMPAT option in the PROC CCDM statement.

- CCOPULA procedure
 - The new PLOTS= option has been added to request correlation plots for pairs of variables in the DATA= data table for the FIT statement. Both the original data and their transformed uniform values can be plotted. The PLOTS= option is also available to plot the correlations between variables generated by the SIMULATE statement.
 - Additional options are available in the MARGINALS=EMPIRICAL option in the FIT statement. These options support a more accurate algorithm for computing the cumulative distribution function for variables in large data tables and for variables that have nonsmooth distributions and extreme values.
 - A new SimulateModelSummary ODS table has been added to describe results of the SIMULATE statement.
- The CPANEL procedure now supports these estimators:
 - heteroscedasticity-corrected standard error estimator (HCCME)
 - cross-sectional-correlation-corrected (CLUSTER) standard error estimator
 - heteroscedasticity- and autocorrelation-consistent (HAC) standard error estimator
- In the HMM procedure, state-independent parameter estimation and analytic store technology are now supported.
- In the SEVSELECT procedure, the parameter estimation phase now balances the available work in each BY group equitably among all available threads of computation. This new default behavior can lead to significantly faster estimation times, but it can also cause the numeric results to differ from those in previous releases. To revert to the numeric results of older releases, you can specify the new NOBALANCETHREADS option in the PROC SEVSELECT statement.

For information about the new and enhanced action sets in SAS Econometrics, see [“Enhancements to SAS Econometrics Action Sets” on page 294](#).

For more information, see these resources on the product documentation page for [SAS Econometrics](#):

- [SAS Econometrics 8.5: Programming Guide](#)
- [SAS Econometrics 8.5: Econometrics Procedures](#)

SAS Event Stream Manager 6.2

SAS Event Stream Manager 6.2 (November 2019 release of SAS Viya 3.5) includes these new features and enhancements:

- SAS Event Stream Manager can be deployed on a Kubernetes cluster.
- SAS Event Stream Manager can deploy projects to a Kubernetes cluster.
- The ESP server log is visible in SAS Event Stream Manager.
- The user interface has been enhanced. For example, the color scheme has been updated and windows have a new style.

- SAS Event Stream Manager documentation has been merged with the SAS Event Stream Processing documentation in the SAS Event Stream Processing Help Center.

For more information, see [SAS Event Stream Manager 6.2: What's New](#).

SAS Event Stream Processing 6.2

SAS Event Stream Processing 6.2 (November 2019 release of SAS Viya 3.5) includes these new features and enhancements:

- new cloud-native capabilities with pre-built Docker images
- enhancements to SAS Event Stream Processing Studio, including an improved test mode and expression validation
- enhancements to SAS Event Stream Processing Streamviewer, including new and easier-to-understand icons
- new and improved adapters, including the new OPC-DA adapter
- enhancements to ESPPy, including support for a group of windows that connect in a specific way as templates, which can then be reused within a Python program
- new ESP Server Connection API that uses the WebSocket protocol that enables ESP functions to operate with minimal system resources
- improvements to the Image Processing Algorithm to support more flexible image processing
- expanded support for Deep Learning functionality that is available from SAS Visual Data Mining and Machine Learning
- enhanced Analytical support, including the new online models Kalman Filter, Slice Operations, and Smoothing, and expanded ASTORE support
- new capability to start and stop event stream processing projects on Kubernetes clusters using SAS Event Stream Manager

For more information, see [SAS Event Stream Processing 6.2: What's New](#).

SAS Intelligent Decisioning 5.4

SAS Intelligent Decisioning 5.4 (November 2019 release of SAS Viya 3.5) includes new features and enhancements that enable you to perform these tasks:

- add Equals, Range, and LIKE multi-branch nodes to a decision. With Equals and LIKE branches, you can also combine branch paths using the OR operator.
- enable performance logging for decisions that are run on the Micro Analytic Score service by setting the `includeLoggingInGeneratedCode` configuration property.
- trace how variable values change as a decision executes. The **Enable value tracing** option for decision tests enables you to capture the values of decision variables as they change while the decision executes.
- use a subdecision to score the rows in a data grid. The **Score rows in this data grid** option is available when you are mapping variables for a subdecision.

- copy and paste the content of specific versions of decisions, rule sets, lookup tables, treatments, and treatment groups.
- delete specific versions of decisions, rule sets, and lookup tables.
- control whether published rule sets and decisions use updated versions of lookup tables without republishing rule sets or decisions. The `lookupStaticBinding` configuration option enables you to specify whether published content uses new versions of lookup tables.
- update the version of a rule set or subdecision that is used in a decision.
- generate PDF documentation for decisions, rule sets, lookup tables, and treatment groups. For decisions, you can choose to include the decision diagram and the code for custom code nodes. You can also choose to download additional documents for any rule sets, treatment groups, and subdecisions used in the decision.
- view, edit, and manage custom code files from the Code Files category view.
- use custom code files to submit SQL queries to a Google BigQuery database.
- build custom SQL query files in SAS Studio.
- validate SQL and DS2 code files.
- use macro variables in data query files in SAS Studio to pass input data to a decision node.
- edit the description of code file nodes in a decision.
- publish a decision with the new `%DCM_PUBLISH_DECISION` macro.
- add data quality functions to rule expressions.
- copy rules between rule sets.
- duplicate variables in a rule set or decision.
- duplicate treatment attributes.
- add treatment attributes from another treatment.

For more information, see [SAS Intelligent Decisioning 5.4: What's New](#).

SAS Model Manager 15.3

SAS Model Manager 15.3 (November 2019 release on SAS Viya 3.5) has new features and enhancements that enable you to perform these tasks:

- compute partial model performance monitoring based on the input data
- generate DS2 score code from Python code
- import and export analytic score models
- perform an advanced search for models and projects
- publish open-source models such as Python and R to container publishing destinations
- compute the feature combination index (FCI) to measure the relationships between input and output variables
- view published history for models within a project

For more information, see [SAS Model Manager 15.3: What's New](#).

SAS Studio 5.2

New Features and Enhancements

For SAS Viya 3.5, SAS Studio has two flavors: SAS Studio (Basic) and SAS Studio (Enterprise). SAS Studio (Basic) is used in a programming-only environment and SAS Studio (Enterprise) is used in a full environment.

Here are some of the new features and enhancements in this release:

- Using the Query tool, you can create a query to extract data from one or more tables according to criteria that you specify. You can generate your query using either SQL or FedSQL query code.
- With Git integration, you can clone repositories, stage changes and create commits, create, merge, and rebase branches, and resolve merge conflicts from within SAS Studio.
- Using the import tool, you can import several basic file types into data sets.
- You can now access files and folders on both the SAS Content server and your server file system from the **Explorer** section in the navigation pane.
- You can use the new DATA Step Debugger to find logic errors in a DATA step program.
- You can run and create SAS Viya jobs.
- You can run a saved program as a background job.
- You can use the new command line interface to access SAS Studio by using the keyboard.
- You can create a filter based on a single column by right-clicking the column heading in the table viewer and selecting **Quick Filter**.
- You can send a copy of your results and the associated code and log files by email. Files that you can send include results in HTML5, RTF, and PDF formats as well as the code and log files that are associated with the results.
- You can now specify custom SAS code to run before or after the code for programs, tasks, queries, and imports. This code persists between SAS Studio sessions.
- You can now customize some keyboard shortcuts.
- SAS Studio includes many new tasks for Cloud Analytic Services, Machine Learning, and Time Series Modeling.
- The common task model (CTM) was enhanced to support dynamic and cascading prompts.

For more information, see [What's New in SAS Studio 5.2](#).

Differences between SAS Studio in SAS 9.4 and SAS Viya

If you are a current SAS Studio user, here are some differences between SAS Studio 3.81 (which runs on SAS 9.4) and SAS Studio 5.2 (which runs in SAS Viya):

- The Standard and Interactive perspectives are available in SAS Studio 5.2.

- The lists of tasks and snippets differ.

In addition, SAS Studio 5.2 does not support this functionality:

- process flows
- SAS Studio repositories
- the ability to export tables to XML, JMP, DBF, DTA, and XLSX
- 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 8.5

SAS Visual Analytics 8.5 (November 2019 release of SAS Viya 3.5) includes these new features and enhancements:

- The user interface has been enhanced. For example, there are new page templates.
- A new automated prediction object has been added.
- New geo maps objects have been added and existing geo map features have been enhanced. For example, geo maps now support multiple data layers.
- Existing objects have been improved. For example, crosstabs now display sparse values with a horizontal line (–).
- Accessibility has been enhanced. SAS Visual Analytics now produces accessible PDF files.

For more information, see [What's New in SAS Visual Analytics 8.5](#).

SAS Visual Statistics 8.5

SAS Visual Statistics 8.5 (November 2019 release of SAS Viya 3.5) includes these new features and enhancements to the user interface:

- A confusion matrix that displays the classification results for categorical response models is available.
- Several new assessment statistics are available for all models.
- You can now derive predicted items from generalized additive models and nonparametric logistic regression models.
- You can now export and save generalized additive models and nonparametric logistic regression models.
- In the Cluster object, a details table has been added for the Parallel Coordinates plot.
- The **Bin method** property that specifies the way that measure predictors are binned has been added to the Decision tree object.
- There is a new option for autotuning decision tree models: **Leaf size**.
- In the settings, you can now specify to automatically convert measure variables with two levels to a category when a data set is first opened in SAS Visual Analytics.

- In the settings, you can now set a default assessment statistic to use in all models.

For more information, see [What's New in SAS Visual Statistics 8.5](#).

SAS Visual Statistics 8.5 (November 2019 release of SAS Viya 3.5) includes these new programming features and enhancements:

- The new GAMSELECT procedure fits and performs model selection on generalized additive models. PROC GAMSELECT supports model selection by componentwise functional gradient descent (Friedman 2001; Bühlmann and Hothorn 2007) and the shrinkage method by using the penalized likelihood with sparsity-inducing penalties (Meier, Van de Geer, and Bühlmann 2009).
- The new NMF procedure performs nonnegative matrix factorization, which seeks to approximately decompose a nonnegative data matrix into two low-rank nonnegative factor matrices. The procedure produces output data tables that contain the two low-rank factor matrices. You can use nonnegative matrix factorization for dimension reduction, feature identification, and feature extraction in applications in many different fields, such as image processing, text mining, bioinformatics, and spectral data analysis.
- The new SANDWICH procedure analyzes linear models by using a robust sandwich estimate of the parameter covariance. It uses distributed computing and efficient sparse algorithms to handle models with a large number of clusters and models with large and sparse design matrices.
- The new SIMSYSTEM procedure simulates continuous univariate data from distributions in the Pearson and Johnson systems. You request these distributions by directly specifying their measures of skewness and kurtosis rather than their mathematical parameters. This makes it convenient to simulate data from a series of distributions whose degrees of asymmetry and tail weight vary over a grid of skewness-kurtosis combinations.
- In the ASSESS procedure, the new METHOD= option enables you to apply a new efficient algorithm for computing exact quantiles for quantile binning in the lift analysis. This method uses smart technology to perform an exact count to compute the percentile without global sorting in the distributed environment.
- BINNING procedure
 - The new RAW= option in the PROC statement specifies whether to process variables by using their raw values or formatted values.
 - The new Variable Mapping Information ODS table displays how each binning variable name is mapped to each result variable name.
- In the FREQTAB procedure, the new ONEWAY option in the TABLES statement provides additional statistics and display options for one-way frequency tables. The new PLOTVAR= and SCALE= plot options for PLOTS=DEVIATIONPLOT specify the residual statistic to display in one-way deviation plots. The FORMAT= option for frequencies is now available for one-way, LIST, and CROSSTAB crosstabulation tables (in addition to default crosstabulation tables).
- GENSELECT procedure
 - The new INPARMEST= option enables you to input starting values for the optimizations.
 - The new MAXRESPONSELEVELS= option enables you to specify the maximum number of allowed response levels.
 - The new STORE statement saves a model and the results of the statistical analysis to a binary compressed file. This stored model can then be used by the

ASTORE procedure and the logisticScore action from the regression action set to score a new data set. This stored model can also be read by many other actions in the regression action set.

- The new USELASTITER option requests that the procedure continue its computations even when the optimization fails.
- The new STORE statement saves a model containing both fixed and random effects and the results of the statistical analysis to a binary compressed file. This stored model can then be used by the ASTORE procedure to score a new data set.
- LOGSELECT procedure
 - The new INPARMEST= option enables you to input starting values for the optimizations.
 - The new LACKFIT option performs the Hosmer-Lemeshow goodness-of-fit test for binary and polytomous response models.
 - The new MAXRESPONSELEVELS= option enables you to specify the maximum number of allowed response levels.
 - The new STORE statement saves a model and the results of the statistical analysis to a binary compressed file. This stored model can then be used by the ASTORE procedure and the logisticScore action from the regression action set to score a new data set. This stored model can also be read by many other actions in the regression action set.
 - The new USELASTITER option requests that the procedure continue its computations even when the optimization fails.
- In the MBC procedure, the COVSTRUCT= option now provides eight new covariance structures for fitting parsimonious Gaussian mixture models (PGMMs).
- In the PARTITION procedure, the TARGET statement now supports segment-stratified sampling for each target.
- In the REGSELECT procedure, the new METHOD=ELASTICNET option in the SELECTION statement specifies the elastic net method, an extension of LASSO that estimates parameters by using a version of ordinary least squares in which both the sum of the absolute regression coefficients and the sum of the squared regression coefficients are constrained. If the model contains classification variables, then these corresponding effects can be split.

Here are two changes from the previous release:

- In the GENSELECT procedure, the maximum number of response levels allowed when DIST=MULTINOMIAL is now 100. You can change this value with the MAXRESPONSELEVELS= option. This limit is added to prevent you from accidentally trying to use these models to fit continuous response variable.
- In the LOGSELECT procedure, the maximum number of response levels allowed for polytomous response variables is now 100. You can change this value by specifying the MAXRESPONSELEVELS= option. This limit is added to prevent you from accidentally trying to use these models to fit a continuous response variable.

SAS Visual Data Mining and Machine Learning 8.5

SAS Visual Data Mining and Machine Learning requires both SAS Visual Statistics and SAS Visual Analytics.

SAS Visual Data Mining and Machine Learning 8.5 (November 2019 release of SAS Viya 3.5) includes these new features and enhancements:

- The new KPCA procedure performs kernel principal component analysis (KPCA).
KPCA is a nonlinear extension to the widely used principal component analysis (PCA). It uses the “kernel trick” to implicitly map the original data to some high-dimensional RKHS (reproducing kernel Hilbert space) and implement PCA in that space. The resulting projections onto the kernel principal components can capture nonlinear patterns in the data. The KPCA procedure features fast training and fast scoring methods, which greatly alleviate the computation and memory burden associated with ordinary KPCA. These methods are based on low-rank matrix approximation coupled with *k*-means clustering as a sampling scheme. Thanks to this approximation algorithm, the KPCA procedure is capable of handling large data sets efficiently.
- The new SPARSEML procedure was designed for machine learning with sparse input data set. It currently implements the support vector machines (SVM) algorithm in SAS Viya for binary classification. By using the parallel coordinate descent optimization method, the SPARSEML procedure can train large data sets that can be both wide and deep. Like many other predictive modeling tools, the SPARSEML procedure uses input data to train a model and generates an analytic store that can be deployed through the ASTORE procedure. It can load data from multiple nodes and perform computations in parallel.
- The AUTOTUNE procedure now supports a hyperparameter importance ODS table, more options, saving the configuration history, and including warm start.
- The FACTMAC procedure now accepts data with missing values without issuing an error. Observations with missing values are excluded from the analysis.
- FOREST procedure
 - The NUMBIN= and MINLEAFSIZE= options can now be set by autotuning.
 - The default value of the NUMBIN= option is now 50 instead of 20, and the default value of the BINMETHOD= option is QUANTILE instead of BUCKET.
 - For isolation forests, the TARGET statement is no longer required, and fit statistics including variable importance are no longer computed.
- GRADBOOST procedure
 - The MINLEAFSIZE= option can now be set by autotuning.
 - The default value of some options have changed: the NUMBIN= option default is now 50 instead of 20; the MAXDEPT= option default is now 4 instead of 5; the RIDGE= option default is now 1 instead of 0; and the BINMETHOD= option default is now QUANTILE instead of BUCKET.
- The SEMISUPLEARN procedure now supports the AUTOTUNE statement.
- In the SVMACHINE procedure, the EARLYSTOP option is new. If the option is specified and the PARTITION statement is also specified, then the generated model is based on the validation accuracy.

For more information about the action sets and actions for SAS Visual Data Mining and Machine Learning, see [“Enhancements to SAS Visual Data Mining and Machine Learning 8.5 Action Sets” on page 288](#).

For more information, see these resources on the product documentation page for [SAS Visual Data Mining and Machine Learning](#):

- [SAS Data Mining and Machine Learning 8.5: Programming Guide](#)

- [SAS Visual Data Mining and Machine Learning 8.5: The NETWORK Procedure](#)
- [SAS Visual Data Mining and Machine Learning 8.5: Procedures Guide](#)

SAS Visual Forecasting

About SAS Visual Forecasting

SAS Visual Forecasting runs in SAS Viya. 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.

SAS Visual Forecasting requires SAS Visual Analytics.

SAS Visual Forecasting 8.5

SAS Visual Forecasting 8.5 includes these new programming features and enhancements:

- The new DFIL procedure enables you to design a digital infinite impulse response (IIR) filter of any type, to visualize the frequency response of the designed filter, to visualize the zero-pole plot of the designed filter for stability analysis, and to filter any input data by using the designed digital filter.
- In the ARIMA statement of the SMSPEC procedure, the new P= and Q= options enable you to specify a custom range for the moving average (MA) and autoregressive (AR) orders of the ARIMA model specification.
- The new External Languages (EXTLANG) package enables you to integrate external-language code written in Python and R into your SAS program. The package supports various versions of the Python 2, Python 3, and R languages.
- The new Time Series Dimension Reduction (TDR) package enables you to reduce the dimensionality of time series. The dimension reduction technique includes piecewise aggregate approximation, symbolic aggregate approximation, discrete Fourier transformation, discrete wavelet transformation, random projection, and singular value decomposition.
- The Automatic Time Series Modeling (ATSM) package has been enhanced.
 - The new EventGroup method of the EVENT object enables you to specify a group event definition that is stored in the EVENT object.
 - The new 'CHOOSE' argument of the FORENG object enables you to specify the name of the winning forecast model.
 - The new 'ENDZEROS.MAXNUM', 'ENDZEROS.MAXPCT', and 'ENDZEROS.MINOBS' arguments of the FORENG object enable you to configure the _ZERO_ model test, which determines whether the FORENG object produces an all-zero forecast when trailing zeros are present in the dependent series.

- The new 'ZEROMISS' options of the TSDF.AddSeries, TSDF.AddX, and TSDF.AddY methods enable you to specify how to interpret beginning and ending zero values in the ancillary, independent, and dependent series that you provide for the generation of forecast models

For more information, see these resources on the product documentation page for [SAS Visual Forecasting](#):

- [SAS Visual Forecasting 8.5: Programming Guide](#)
- [SAS Visual Forecasting 8.5: Forecasting Procedures](#)
- [SAS Visual Forecasting 8.5: Time Series Packages](#)

SAS Visual Investigator 10.7

SAS Visual Investigator 10.7 shipped in November 2020 and runs on SAS Viya 3.5. Here are the new key features:

- alert management enhancements, including support for re-investigating alert history, UI suppression of scenarios, partial disposition of scenario-fired events, operation reports for alert assignment, and an improved user experience for alert domain, strategy, and queue administration
- the ability to include entity-related enrichment data, with an alerting event that is generated through a SAS Visual Investigator scenario
- flow and scenario enhancements, including retention of flow edit history, entity scorecard generation through flows, the ability to filter out repeatedly triggered events to save space and improve system performance, improved transaction replication performance, redesign of flow test results, and the scheduling of flows
- access to reference data that can be used to tag a user task, or user task actions, in a workflow
- workflow enhancements, including hardcoded values, an escalation process for workflow tasks, the ability to capture who is currently assigned a user task and who manually starts a workflow, a group detail view in reports, the ability to update a workflow variable as a null value, the ability to select the user type when updating an entity
- the ability for administrators to edit entity definitions through an API, after an entity type has been saved
- the ability for a user to identify where in the object the query term can be found when opening an object from the results list
- the ability to control access to data objects based on whether the current user is a member of a specific user group, when creating page context rules
- the ability for a user to undo, redo, and reset nodes on a network chart
- the ability to view previous object versions and action history
- accessibility features providing the ability to navigate and interact with SAS Visual Investigator without using a mouse
- the ability to create reports using SAS Visual Analytics and embed them on SAS Visual Investigator pages, as well as export data to SAS Visual Analytics from a SAS Visual Investigator workspace

- SAS Mobile Investigator enhancements, including no longer needing an internet connection to create records and capture and report information
- enhancements that make SAS Mobile Investigator a native mobile application
- the ability to build solution extensions as web components
- SAS Adaptive Learning and Intelligent Agent System enhancements, including allowing users to generate a model report

For more information, see [SAS Visual Investigator 10.7: What's New](#).

SAS Visual Investigator 10.8

In the February 2022 release of SAS Viya 3.5, Real-Time Entity and Network Generation enhancements include the following changes:

- Performance and scalability improvements have been made.
- When you use the `upsertDocuments` action, you can specify documents to delete by using the `deleteDocuments` parameter.
- You can use the `pageCacheLimit` parameter to specify the threshold at which in-memory data are transferred to the compound store tables during execution of the `batchBuild`, `addDocuments`, and `upsertDocuments` actions.

For more information, see [Real-Time Entity and Network Generation Action Set](#) in *Real-Time Entity and Network Generation in SAS Viya: Programming Guide*.

SAS Visual Text Analytics 8.5

SAS Visual Text Analytics 8.5 (November 2019 release of SAS Viya 3.5) includes these new features and enhancements:

- Use stratified sampling when automatically generating categories for large data sets to reduce pipeline run time.
- Filter matches in the rule editor of the Edit Concept and Sandbox tabs by using the `_SELF_` keyword in conjunction with `REMOVE_ITEM` and `NO_BREAK` rules.
- Generate output data from a Concepts node and export it to SAS Visual Analytics for further analysis and visualization.
- Use a report template in SAS Visual Analytics to quickly create reports from Concepts and Categories output data.
- The autocomplete feature of the code editor in the interactive windows for the Concepts and Categories nodes is case sensitive, preventing accidental automatic completion of a key word as an operator.
- Add a pipeline template to a new or existing project in The Exchange.

For more information, see [What's New in SAS Visual Analytics 8.5](#).

SAS Visual Text Analytics 8.5 includes these new programming features and enhancements:

- the ability to use the Sampling and Partitioning action set
- a redesigned rule generation action

- new action parameters in the Search action set, the ruleGen action, and the exportTextModel action
- the ability to search for special missing values
- improved capabilities for morphological expansion in the Korean language
- improvements to extraction of predefined concepts in the Danish language
- improved coverage of predefined concepts in the Spanish language

For more information, see [What's New in SAS Visual Text Analytics 8.5](#).

SAS Workflow Manager 2.3

Key features in SAS Workflow Manager 2.3 enable you to perform these tasks:

- workflow administrators can create and manage business calendars to exclude specific days of the week, dates, or both for timer events.
- users can add business calendars to boundary timer events.
- configure a default workflow administrator account for users who can administer SAS Workflow definitions.
- manage administrative failure notifications for additional service task and timer failures.
- add users or groups to an **Excluded Owner** role. Using excluded owners ensures that the same person does not review the task twice and can increase the transparency of an organization's processes.
- workflow administrators can customize performance parameters.
- use transient variables with service tasks to store values that are required for the next step in the workflow.
- save REST Service Tasks as custom task templates. Task templates can be selected for use in other workflow definitions.

For more information, see [What's New in SAS Workflow Manager 2.3](#).

Part 3

Appendix

Appendix 1

Documentation Enhancements [327](#)

Appendix 1

Documentation Enhancements

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Overview

The What's New documentation is cumulative and is updated whenever there is an update to a SAS product. The following topics will help you determine what changes were made after the initial release of SAS 9.4, which shipped in July 2013.

June 2025 (SAS 9.4, Rev. 940_25w25)

New Releases and Product Updates

SAS 9.4M9 is available.

- These products shipped a new release or updates:
 - Base SAS 9.4M9. See [“Base SAS 9.4” on page 15](#).
 - SAS/ACCESS Software
 - SAS/ACCESS Interface to Amazon Redshift
 - SAS/ACCESS Interface to DB2 under UNIX and PC hosts
 - SAS/ACCESS Interface to Google BigQuery
 - SAS/ACCESS Interface to Greenplum
 - SAS/ACCESS Interface to Hadoop
 - SAS/ACCESS Interface to Impala
 - SAS/ACCESS Interface to Informix
 - SAS/ACCESS Interface to JDBC
 - SAS/ACCESS Interface to Microsoft
- See [“SAS/ACCESS” on page 73](#).
- SAS Add-In 8.6 for Microsoft Office. See [“SAS Add-In for Microsoft Office” on page 164](#).
- SAS Business Rules Manager 3.3M3. See [“SAS Business Rules Manager” on page 109](#).
- SAS/CONNECT 9.4M9. See [“SAS/CONNECT 9.4” on page 90](#).
- SAS Data Integration Studio 4.910. See [“SAS Data Integration Studio” on page 185](#).
- SAS Data Loader. See [“SAS Data Loader” on page 183](#).
- SAS Data Remediation 2.6. See [“SAS Data Remediation” on page 191](#).
- DataFlux Data Management Studio 2.10. For more information, see [“DataFlux Data Management Studio” on page 180](#).

- DataFlux Data Management Server 2.10. See [“DataFlux Data Management Server” on page 178](#).
- DataFlux Secure 2.10. See [“DataFlux Secure ” on page 181](#).
- SAS Decision Manager 3.3M3. See [“SAS Decision Manager” on page 114](#).
- SAS Enterprise Guide 8.6. See [“SAS Enterprise Guide” on page 168](#).
- SAS Enterprise Miner 15.4. See [“SAS Enterprise Miner” on page 117](#).
- SAS Environment Manager 2.6. See [“SAS Environment Manager” on page 225](#).
- SAS/ETS 15.4. See [“SAS/ETS” on page 123](#).
- SAS Factory Miner 15.4. See [“SAS Factory Miner” on page 130](#).
- SAS Forecast Server 15.4. See [“SAS Forecast Server” on page 131](#).
- SAS Grid Manager 9.4M9. For more information, see [“SAS Grid Manager” on page 97](#).
- SAS/GRAPH 9.4M9. See [“SAS/GRAPH 9.4” on page 92](#).
- SAS High-Performance Analytics Infrastructure 3.9. See [“SAS High-Performance Analytics Infrastructure” on page 156](#).
- SAS High-Performance Risk 4.5. See [“SAS High-Performance Risk” on page 242](#).
- SAS/IML 15.4. See [“SAS/IML” on page 133](#).
- SAS In-Database Technologies SAS 9.4M9. See [“SAS 9.4 In-Database Products” on page 217](#).
- SAS Integration Technologies 9.4M9. See [“SAS 9.4 Integration Technologies” on page 223](#).
- SAS Intelligence Platform 9.4M9. See [“SAS 9.4 Intelligence Platform” on page 227](#).
- SAS Model Implementation Platform 3.4. See [“SAS Model Implementation Platform” on page 247](#).
- SAS Model Manager 14.3M3. See [“SAS Model Manager” on page 137](#).
- SAS/OR 15.4. See [“SAS/OR” on page 140](#).
- SAS/QC 15.4. See [“SAS/QC” on page 143](#).
- SAS Risk Dimensions 6.15. See [“SAS Risk Dimensions” on page 254](#).
- SAS Scalable Performance Data Server 5.6. See [“Scalable Performance Data Engine” on page 44](#).
- SAS/SHARE 9.4M9. See [“SAS/SHARE 9.4” on page 100](#).
- SAS/STAT 15.4. See [“SAS/STAT” on page 146](#).
- SAS Studio 3.83. See [“SAS Studio” on page 101](#).
- SAS Text Miner 15.4. See [“SAS Text Miner” on page 151](#).
- SAS Visual Analytics 7.53. See [“SAS Visual Analytics” on page 259](#).

Starting with SAS 9.4M9, Solaris on SPARC and Solaris on Intel operating environments is no longer supported.

Starting with SAS 9.4M9, SAS supports PostgreSQL 16.

December 2024

These products shipped a new release in December 2024:

- [SAS Add-In 8.5 for Microsoft Office on page 164](#)
- [SAS Enterprise Guide 8.5 on page 168](#)

September 2024

A hotfix for SAS 9.4M7 was released in September 2024 and included updates for these products:

- [DS2 Language on page 19](#)
- [FedSQL Language on page 24](#)
- [SAS/ACCESS Interface to Google BigQuery on page 76](#)

March 2024

SAS Enterprise Guide 8.4 and SAS Add-In 8.4 for Microsoft Office are now available.

In the March 2024 update to SAS 9.4M8, the FILENAME Azure access method is enhanced to support all host environments supported by SAS, except z/OS.

September 2023

As of September 2023, Microsoft Azure Active Directory (Azure AD) has been renamed to Microsoft Entra ID. SAS documentation published in September 2023 and later use the new product name.

June 2023 (SAS Viya 3.5)

With the June 2023 hot fix, Telnet is deprecated and it is recommended to use SAS/CONNECT Spawner for client sign-ons. The -CLEARTEXT option has been deprecated and is no longer available. For more information, see [SAS Note 70114](#).

January 2023 (SAS 9.4, Rev. 940_23w05)

New Releases and Product Updates

SAS 9.4M8 is available.

- These products shipped a new release or updates:
 - Base SAS 9.4M8. See “Encryption: SAS 9.4M8” on page 31.
 - “SAS Business Data Network 3.4” on page 182
 - Business Rules Manager 3.3M2. See “SAS Business Rules Manager 3.3” on page 109.
 - SAS/CONNECT 9.4M8. See “SAS/CONNECT 9.4” on page 90.
 - “SAS Data Integration Studio 4.906” on page 185
 - SAS Data Quality Server 9.4M8. See “SAS 9.4 Data Quality Server” on page 190.
 - “SAS Data Remediation 2.5” on page 191
 - SAS Decision Manager 3.3M2. See “SAS Decision Manager 3.3” on page 114.
 - SAS Enterprise Guide 8.32. See “SAS Enterprise Guide 8.3” on page 168.
 - “SAS Enterprise Miner 15.3” on page 117
 - “SAS Environment Manager 2.5 with SAS 9.4M8” on page 226
 - “SAS/ETS 15.3” on page 123
 - “SAS Factory Miner 15.3” on page 131
 - “SAS Federation Server 4.5” on page 192
 - “SAS Forecast Server 15.3” on page 131
 - “SAS Grid Manager 9.4M8” on page 97
 - “SAS High-Performance Risk 4.4” on page 243
 - “SAS/IML 15.3” on page 133
 - SAS 9.4M8 In-Database Technologies. See “January 2023 Release: SAS 9.4M8” on page 218.
 - “SAS Lineage 3.4” on page 195
 - “SAS Model Implementation Platform 3.3” on page 248
 - SAS Model Manager 14.3M2. See “SAS Model Manager 14.3” on page 137.
 - SAS OLAP Server 9.4M8. See “SAS 9.4 OLAP Server” on page 173.
 - “SAS/OR 15.3” on page 140
 - “SAS/QC 15.3” on page 143
 - “SAS Quality Knowledge Base for Contact Information 33” on page 195
 - “SAS/STAT 15.3” on page 146
 - “SAS Studio 3.82” on page 101

- [“SAS Text Miner 15.3” on page 151](#)
- SAS Visual Analytics 7.52. See [“SAS Visual Analytics 7.5” on page 259](#).
- SAS Visual Statistics 7.52. See [“SAS Visual Statistics 7.5” on page 264](#).

Retired Products and Features

Starting with SAS 9.4M8, these products and features are retired:

- DataFlux Authentication Server
- SAS AppDev Studio
- SAS BI Portal
- SAS BI Portlets
- SAS Customer Due Diligence
- SAS Customer Intelligence
- SAS Data Loader for Hadoop Spark Engine
- SAS Decision Services
- SAS Enterprise GRC
- SAS Episode Analytics
- SAS/GRAPH ActiveX Control
- SAS/GRAPH Java Applets for Web Servers
- SAS Information Delivery Portal
- SAS Marketing Automation
- SAS MDM, which includes SAS Task Manager
- SAS Model Risk Management
- SAS ODS Graphics Designer
- SAS ODS Graphics Editor
- SAS OpRisk VaR
- SAS Promotion Optimization
- SAS Real-Time Decision Manager
- SAS Risk and Finance Workbench
- SAS Risk Dimensions Java Client
- SAS/SECURE
- SAS/Session
- SAS Underwriting Risk Management for Life Insurance
- SAS Underwriting Risk Management for P&C Insurance
- SAS Web Parts for Microsoft SharePoint
- SAS Web Report Viewer

If you order SAS 9.4M8, these products and features are not included in that order. A best practice is to unconfigure retired SAS products and features before you upgrade and

to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Customer Intelligence 6.6 Products Not Available on SAS 9.4M8

These SAS Customer Intelligence 6.6 products on SAS 9.4M7 are the last releases:

- SAS Campaign Management
- SAS Marketing Automation
- SAS Marketing Optimization
- SAS Real-Time Decision Manager

If you order SAS 9.4M8 or later and your site has licensed these SAS Customer Intelligence 6.6 products or earlier, these products will not be included in that order and will no longer function after upgrading to SAS 9.4M8. If you plan to upgrade or migrate to SAS 9.M8 or later, we recommend that you instead consider SAS Customer Intelligence 360 and SAS Intelligent Decisioning for your business needs. Contact your SAS representative for more information.

Support for Operating Environments

- For UNIX environments, the HP-UX platform is no longer supported.
- In UNIX and Windows environments, the Syncsort utility is no longer supported by the SORT procedure.

No Longer Supported SAS/ACCESS Interfaces

These SAS/ACCESS interfaces are no longer supported:

- - SAS/ACCESS Interface to ADABAS
 - SAS/ACCESS Interface to Aster
 - SAS/ACCESS Interface to HAWQ
 - SAS/ACCESS Interface to MySQL on the AIX platform
 - SAS/ACCESS Interface to Oracle on the z/OS platform
 - SAS/ACCESS Interface to Teradata on the z/OS platform

For more information and to learn about enhancements to other SAS/ACCESS interfaces, see [“SAS/ACCESS”](#) on page 73.

SAS Migration Utility Requirements

The SAS 9.4 M8 Migration Utility requires JRE 11. The SAS 9.4 M8 Migration Utility will not continue if Java 11 is not provided. For more information, see [“SAS Migration Utility Requirements”](#) in *SAS Intelligence Platform: Migration Guide*.

Updates to Autocall Macro

An autocall macro, mdumap.sas, was changed to no longer extract the password from the metadata server. This autocall macro is used by mduextr.sas, also an autocall macro.

Auditing in SAS Viya 3.5

All audit records now include an Administrative Action. The value is **true** when an audited action is created by a SAS administrator. Otherwise, the value is **false**.

February 2022 (SAS 9.4, Rev. 940_22w08 and SAS Viya 3.5)

Starting in February 2022, the SAS Web Application Server is based on Apache Tomcat 9.0.55.

January 2022

The CONN= and NOLIBS options are no longer supported in the DS2 and FEDSQL procedures.

August 2021 (SAS 9.4, Rev. 940 and SAS Viya 3.5)

After a hot fix installation, most log messages that are generated for DS2 programs that run in CAS have log line numbers in them. For more information, see [“Enhancements to DS2 in CAS” on page 285](#).

November 2020 (SAS 9.4, Rev. 940_20w47 and SAS Viya 3.5)

SAS Visual Investigator 10.7 is now available. For more information, see [“SAS Visual Investigator 10.7” on page 321](#).

August 2020 (SAS 9.4, Rev. 940_20w34 and SAS Viya 3.5)

These products shipped a new release:

- [“DataFlux Data Management Server 2.9” on page 178](#)

- “SAS Data Integration Studio 4.905” on page 185
- “SAS Forecast Server 15.2” on page 132
- “SAS Enterprise Miner 15.2” on page 117
- “SAS LASR Analytic Server 2.83” on page 158
- “SAS Quality Knowledge Base for Contact Information 32” on page 196
- “SAS Text Miner 15.2” on page 151

These new product releases include bug fixes and hot fixes since the previous release:

- “SAS Add-In 8.3 for Microsoft Office” on page 164
- “SAS Enterprise Guide 8.3” on page 168
- “SAS Studio 3.81” on page 101

These products shipped a maintenance release:

- Base SAS 9.4M7
 - When using ODS Graphics, you can specify whether to always rotate the text value, even when there is enough room to draw the text normally.
 - Spark is supported as a data source with the SAS DS2 and SAS FedSQL languages when appropriate SAS/ACCESS software is installed. In SAS 9.4M7 only, Yellowbrick is supported as a data source with the SAS DS2 and SAS FedSQL languages when appropriate SAS/ACCESS software is installed.
 - In Scalable Performance Data Engine (SPD Engine), the **-yarnrm** and **-host** options provide customizations to the **sashiveserdespde-install.jar.sh** script.
 - Starting in SAS 9.4M7 or if you apply a hot fix to SAS 9.4 or to SAS Viya, in the XMLV2 engine, the behavior of the AUTOMAP= LIBNAME statement option is changed. Some XML entities are not supported.
 - SAS encoded passwords (SAS001–SAS005) are supported for SAS system options SSLPVTKEYPASS= and SSLPKCS12PASS=.
 - When lockdown is in effect, paths to SAS system options (or equivalent environment variables) SSLCALISTLOC=, SSLCACERTDIR=, SSLCERTLOC=, SSLPVTKEYLOC=, SSLPKCS12LOC=, and SSLCRLLOC= are added by default to the LOCKDOWN allowlist. These SAS system options can be specified in a SAS configuration file or as a SAS start-up command line option.
 - Two new system options enable connections to a Microsoft Azure storage system.
 - The FILENAME Statement Azure Access Method enables access to data in Microsoft Azure Data Lake Storage Gen2.
 - The FILENAME Statement S3 Access Method enables access to data in Amazon S3 files.
 - Environment variable SSLREQCERT= (added in SAS 9.4) enables you to specify checks to perform on server certificates in a TLS session. For the TLS session to continue, you can demand that certificates be provided. You can also allow the session to continue when invalid certificates are provided or when no certificates are provided. This environment variable is used only for Linux and UNIX operating systems.

- The LIBNAME engine for SAS Federation Support supports a new system option and five new LIBNAME statement options.
 - The DBIDIRECTEXEC system option improves PROC SQL performance by passing certain statements to the database for processing.
 - The DBCLIENT_MAX_BYTES= LIBNAME statement option enables you to specify the maximum number of bytes per single character in SAS session encoding when reading character data from a DBMS.
 - The PREFETCH=, PREFETCHBYTES=, PREFETCHROWS=, and SERVERPREFETCH= LIBNAME statement options modify default settings for a new performance feature.

For more information, see [“Base SAS 9.4” on page 15](#).

- SAS/ACCESS 9.4M7
 - Support was added for the Spark and Yellowbrick interfaces.
 - The default value for the SQLGENERATION system option was updated to include values for Google BigQuery, Snowflake, and Yellowbrick.
 - For SAS/ACCESS Interface to Amazon Redshift, the default value for the INSERTBUFF= LIBNAME option is now 250.
 - SAS/ACCESS Interface to Google BigQuery has added support for bulk unloading (data retrieval) into SAS. Support has also been added for running these summary procedures in database: FREQ, MEANS, RANK, REPORT, SORT, SUMMARY, and TABULATE.
 - For SAS/ACCESS Interface to Hadoop, support was added for the DRIVERCLASS= connection option.
 - SAS/ACCESS Interface to Microsoft SQL Server has added support for bulk loading to Azure Synapse Analytics (SQL DW).
 - For SAS/ACCESS Interface to MySQL, the default value for the INSERTBUFF= LIBNAME option has changed from 0 to 1. A value greater than 0 causes the engine to calculate the number of rows that can be inserted at one time, based on row size.
 - For SAS/ACCESS Interface to the PI system, support for attributes values is now up to 32767 bytes. Support was added for the BASIC value for the SAS_PI_WEB_AUTH= environment variable, which enables authentication by using a user name and password. Support was added for modified syntax for accessing PI System tags in the Asset Framework.
 - For SAS/ACCESS Interface to R/3, support was added for the INT8 data type, the WARN_BIGINT LIBNAME option, and the DBSASTYPE data set option.

For more information, see [“SAS/ACCESS” on page 73](#).

- SAS Business Rules Manager 3.3M1. For more information, see [“SAS Business Rules Manager 3.3” on page 109](#).
- SAS Decision Manager 3.3M1. For more information, see [“SAS Decision Manager 3.3” on page 114](#).
- SAS/GRAPH. The SAS/GRAPH Java applets are deprecated. Existing programs that use these items still work. However, these items are no longer supported, and they might be removed in a future release. For more information about generating ActiveX output in SAS/GRAPH, see [“Generating Interactive ActiveX Graphics” in SAS/GRAPH: Reference](#).

- SAS Grid Manager. Options were added to the SAS Grid Manager Client Utility to support digital certificates if you are using either a SAS Workload Orchestrator grid with TLS/SSL enabled or a Hadoop cluster with TLS/SSL enabled. For more information, see [“SAS Grid Manager” on page 97](#).
- SAS Model Manager 14.3M1. For more information, see [“SAS Model Manager 14.3” on page 137](#).

SAS BI Dashboard 4.41 has been rewritten in HTML5. For more information, see [“SAS BI Dashboard 4.41” on page 167](#).

Enhancements were also made to the upgrade-in-place process:

- The SAS 9 System Evaluation Tool analyzes your SAS 9 system configuration for possible issues that could adversely affect upgrading from one release of SAS 9 to another release of SAS 9. You should run this tool when preparing for a software update. For more information, see [“SAS Content Assessment” in SAS Guide to Software Updates and Product Changes](#).
- Many hot fixes are included with your order. For more information, see [“Applying Hot Fixes” in SAS Guide to Software Updates and Product Changes](#).
- Starting in SAS 9.4M7 (August 2020), if you encounter an error in the configuration process, you can suspend the update until you resolve the error. When you resume the configuration process in SAS Deployment Manager, you have the option to resume at your current step. This feature applies to all update configuration steps except the Apply Update step.

May 2020 (SAS 9.4, Rev. 940_20w21 and SAS Viya 3.5)

These products, which are part of SAS Customer Intelligence 6.6, shipped a new release:

- [“SAS Marketing Automation” on page 204](#)
- [“SAS Marketing Optimization” on page 205](#)
- [“SAS Real-Time Decision Manager” on page 206](#)

April 2020 (SAS 9.4, Rev. 940_20w18 and SAS Viya 3.5)

SAS IT Resource Management 3.11 shipped. For more information, see [“SAS IT Resource Management 3.11” on page 235](#).

November 2019 (SAS 9.4, Rev. 940_19w47 and SAS Viya 3.5)

SAS Viya 3.5 shipped in November 2019. For more information about this release, see these topics:

- [Chapter 16, “Introduction to SAS Viya,” on page 269](#)
- [Chapter 17, “SAS Viya Administration,” on page 279](#)
- [Chapter 18, “SAS Cloud Analytic Services,” on page 283](#)
- [Chapter 19, “SAS Viya Products,” on page 301](#)

In addition, these products are new:

- [“SAS Add-In 8.2 for Microsoft Office” on page 164](#)
- [“SAS Enterprise Guide 8.2” on page 168](#)

SAS Data Quality Accelerator for Teradata was enhanced. For more information, see [“SAS 9.4 Data Quality Accelerator for Teradata: November 2019 Release” on page 188](#).

August 2019 (SAS 9.4, Rev. 940_19w34 and SAS Viya 3.4)

Beginning in August 2019, PROC DS2 and PROC FedSQL support the Google BigQuery and Snowflake databases for SAS 9.4M6 and SAS Viya 3.4.

For the August 2019 release of SAS/ACCESS, support was added for the Google BigQuery LIBNAME engine and for the Snowflake LIBNAME engine. Both engines include a corresponding SAS Data Connector that enables data transfer between the DBMS and CAS.

SAS Visual Analytics 8.4 shipped.

June 2019 (SAS 9.4, Rev. 940_19w25 and SAS Viya 3.4)

These products shipped a new release:

- [“SAS Add-In 8.1 for Microsoft Office” on page 164](#)
- [“SAS Business Data Network 3.3” on page 182](#)
- [“SAS Cost and Profitability Management 8.4” on page 209](#)
- [“SAS Decision Manager 3.3” on page 114](#)
- [“SAS Data Remediation 2.4” on page 191](#)
- [“SAS IT Resource Management 3.10” on page 236](#)
- [“SAS Enterprise Guide 8.1” on page 169](#)
- [“SAS Financial Management 5.6” on page 211](#)
- [“SAS High-Performance Risk 4.2” on page 243](#)
- [“SAS Lineage 3.3” on page 195](#)
- [“SAS Model Implementation Platform 3.2” on page 248](#)
- [“SAS Model Manager 14.3” on page 137](#)
- [“SAS Quality Knowledge Base for Contact Information 32” on page 196](#)

May 2019 (SAS 9.4, Rev. 940_19w21 and SAS Viya 3.4)

The SAS 9.4M6 updates in this release are available only in orders placed after the May 2019 update. To receive these product updates, contact your SAS representative about placing an order. After you receive the new order, you can perform an upgrade in place for an existing environment.

Previously, many SAS applications and SAS solutions used the Adobe Flash Player to provide interactive user interfaces. Adobe announced that it intends to end support for Flash technology and will cease to update and distribute the Flash Player at the end of 2020. Browser vendors will disable Flash by default in 2019. For more information about Adobe Flash end-of-life, see [SAS Software and Its Use of the Adobe Flash Player](#).

April 2019 (SAS 9.4, Rev. 940_19w17 and SAS Viya 3.4)

This release includes two new SAS/ACCESS engines: SAS/ACCESS Interface to MongoDB and SAS/ACCESS Interface to Salesforce.

For more information, see these resources:

- [“SAS/ACCESS 9.4 Interface to MongoDB” on page 81](#)
- [“SAS/ACCESS 9.4 Interface to Salesforce” on page 86](#)
- [“DS2 Language: SAS 9.4M6” on page 20](#)
- [“FedSQL Language: SAS 9.4M6” on page 25](#)

April 2019 (SAS 9.4, Rev. 940_19w14 and SAS Viya 3.4)

The April 2019 update of SAS Viya 3.4 includes these changes and enhancements:

- security updates to administrative and core microservices
- support for LDAP referrals
- bug fixes and improvements to performance in multi-tenant configurations, promotion of SAS 9 content, and authorization management

November 2018 (SAS 9.4, Rev. 940_18w47)

These products shipped a new release:

- [“SAS Contextual Analysis 15.1” on page 112](#)

- [“SAS Enterprise Miner 15.1” on page 117](#)
- [“SAS/ETS 15.1” on page 123](#)
- [“SAS Factory Miner 15.1” on page 131](#)
- [“SAS Forecast Server 15.1” on page 132](#)
- [“SAS/IML 15.1” on page 133](#)
- [“SAS LASR Analytic Server 2.82” on page 159](#)
- [“SAS/OR 15.1” on page 140](#)
- [“SAS/QC 15.1” on page 143](#)
- [“SAS Quality Knowledge Base for Contact Information 30” on page 197](#)
- [“SAS/STAT 15.1” on page 146](#)
- [“SAS Studio 3.8” on page 102](#)
- [“SAS Text Miner 15.1” on page 151](#)

These products shipped as part of the SAS 9.4M6 release:

- Base SAS 9.4M6. For more information, see [“Base SAS 9.4” on page 15](#).
- SAS/ACCESS 9.4M6. For more information, see [“SAS/ACCESS” on page 73](#).
- [“SAS/GRAPH 9.4M6” on page 93](#)
- [“SAS Grid Manager 9.4M6” on page 98](#)
- [“November 2018 Release: SAS 9.4M6” on page 218](#)
- SAS Intelligence Platform 9.4M6. For more information, see [“SAS 9.4 Intelligence Platform” on page 227](#).

These products shipped a maintenance release:

- SAS Business Rules Manager 3.2M1. For more information, see [“SAS Business Rules Manager 3.2” on page 110](#).
- SAS Decision Manager 3.2M1. For more information, see [“SAS Decision Manager 3.2” on page 115](#).
- SAS Model Manager 14.2M1. For more information, see [“SAS Model Manager 14.2” on page 138](#).

October 2018 (SAS 940_18w39 and SAS Viya 3.4)

Accessibility was enhanced in SAS Visual Analytics 8.3, which is available in the SAS Viya 3.4 environment.

July 2018 (SAS 9.4, Rev. 940_18w30 and SAS Viya 3.4)

In the SAS 9.4 environment, these products shipped a new release:

- [“SAS Add-In 8 for Microsoft Office” on page 165](#)

- [“SAS IT Resource Management 3.9” on page 236](#)
- [“SAS Visual Analytics App” on page 172](#)

SAS Viya 3.4 shipped. For more information, see [What’s New in SAS 9.4 and SAS Viya 3.4](#)

June 2018 (SAS 9.4, Rev. 940_18w25)

These products shipped a new release:

- [“SAS High-Performance Risk 4.1” on page 243](#)
- [“SAS Model Implementation Platform 3.1” on page 248](#)
- [“SAS Risk Dimensions” on page 254](#)

May 2018 (SAS 9.4, Rev. 940_18w21)

SAS IT Resource Management 3.9 is new. For more information, see [“SAS IT Resource Management 3.9” on page 236](#).

February 2018 (SAS 9.4, Rev. 940_18w08)

SAS Energy Forecasting 4.1 shipped a new release. For more information, see [“SAS Energy Forecasting 4.1” on page 121](#).

December 2017 (SAS 9.4, Rev. 940_17w47 and SAS Viya 3.3)

The SAS platform consists of two environments: SAS 9.4 and SAS Viya. In December 2017, SAS shipped SAS 9.4M5 (Rev. 940_17w47) and SAS Viya 3.3. This document includes the new features for both of these environments.

These products were updated in SAS 9.4M5.

Note: If you installed the September 2017 release of SAS 9.4M5, you must request a new order of SAS 9.4M5 to get this functionality.

These products shipped a new release:

- [“SAS Model Risk Management 7.3” on page 251](#)
- [“SAS Risk and Finance Workbench 3.1” on page 254](#)

These products shipped as part of the SAS 9.4M5 release:

- [“Base SAS 9.4” on page 15](#)
- [“SAS 9.4 In-Database Products” on page 217](#)

- “SAS Studio 3.71” on page 102

To learn about the new features in SAS Viya 3.3, see [What’s New in SAS 9.4 and SAS Viya 3.3](#).

September 2017 (SAS 9.4, Rev. 940_17w38)

These products shipped a new release:

- “SAS Add-In 7.15 for Microsoft Office” on page 165
- “SAS Contextual Analysis 14.3” on page 112
- “SAS Data Integration Studio 4.903” on page 186
- “SAS Enterprise Guide 7.15” on page 169
- “SAS Enterprise Miner 14.3” on page 118
- “SAS/ETS 14.3” on page 124
- “SAS Forecast Server 14.3” on page 132
- “SAS High-Performance Analytics Infrastructure 3.7” on page 157
- “SAS High-Performance Risk 3.9” on page 244
- “SAS/IML 14.3” on page 134
- “SAS/OR 14.3” on page 140
- “SAS/QC 14.3” on page 144
- “SAS Quality Knowledge Base for Contact Information 28” on page 197
- SAS Risk Dimensions 6.9. For more information, see “SAS Risk Dimensions” on page 254.
- “SAS/STAT 14.3” on page 147
- “SAS Studio 3.7” on page 102
- “SAS Text Miner 14.3” on page 151

These products shipped as part of SAS 9.4M5:

- “Base SAS 9.4” on page 15
- “SAS/ACCESS” on page 73
- “SAS/CONNECT 9.4” on page 90
- “SAS 9.4 Data Quality Server” on page 190
- “SAS/GRAPH 9.4” on page 92
- “SAS 9.4 Integration Technologies” on page 223
- “SAS 9.4 Intelligence Platform” on page 227
- “SAS 9.4 In-Database Products” on page 217
- “SAS/SHARE 9.4” on page 100

SAS Data Loader 3.1M1 also shipped. For more information, see “SAS Data Loader 3.1” on page 183.

June 2017 (SAS 9.4, Rev. 940_17w25)

These products shipped a new release:

- SAS High-Performance Risk 3.8. For more information, see [“SAS High-Performance Risk” on page 242](#).
- SAS Model Implementation Platform 2.4. For more information, see [“SAS Model Implementation Platform” on page 247](#).
- SAS Risk Dimensions 6.8. For more information, see [“SAS Risk Dimensions” on page 254](#).

DataFlux Data Management Studio 2.7 supports additional databases for data storage and DataFlux repositories. For more information, see [“DataFlux Data Management Studio 2.7” on page 180](#).

April 2017 (SAS 9.4, Rev. 940_17w16)

These products shipped a new release:

- [“SAS Add-In 7.14 for Microsoft Office” on page 165](#)
- [“SAS Business Data Network 3.2” on page 182](#)
- [“SAS Data Remediation 2.3” on page 191](#)
- [“SAS Lineage 3.2” on page 195](#)
- [“SAS MDM 4.3” on page 200](#)
- [“SAS Visual Analytics 7.4” on page 260](#)

These products shipped a maintenance release:

- [“SAS Energy Forecasting 3.2M1” on page 121](#)
- SAS Job Monitor 2.2M1. For more information, see [“SAS Job Monitor 2.2” on page 194](#).

February 2017 (SAS 9.4, Rev. 940_17w08)

SAS shipped SAS IT Resource Management 3.8. For more information, see [“SAS IT Resource Management 3.8” on page 236](#).

November 2016 (SAS 9.4, Rev. 940_16w48)

These products shipped a new release:

- [“SAS Add-In 7.13 for Microsoft Office” on page 165](#)

- “SAS Business Rules Manager 3.2” on page 110
- “SAS Contextual Analysis 14.2” on page 112
- “SAS Data Loader 3.1” on page 183
- “SAS Data Integration Studio 4.902” on page 186
- “SAS Decision Manager 3.2” on page 115
- “SAS Enterprise Guide 7.13” on page 169
- “SAS Enterprise Miner 14.2” on page 118
- “SAS/ETS 14.2” on page 125
- “SAS Factory Miner 14.2” on page 131
- “SAS High-Performance Risk 3.7” on page 244
- “SAS/IML 14.2” on page 135
- “SAS Model Manager 14.2” on page 138
- “SAS Model Risk Management 7.2” on page 251
- “SAS/OR 14.2” on page 140
- “SAS/QC 14.2” on page 144
- “SAS Risk and Finance Workbench” on page 253
- SAS Risk Dimensions 6.7. For more information, see “SAS Risk Dimensions” on page 254.
- “SAS/STAT 14.2 ” on page 147
- “SAS Studio 3.6” on page 102
- “SAS Text Miner 14.2” on page 151

These products shipped as part of SAS 9.4M4:

- “Base SAS 9.4” on page 15
- “SAS/ACCESS” on page 73
- “SAS 9.4 Data Quality Accelerator for Teradata” on page 188
- “SAS 9.4 Data Quality Server” on page 190
- “SAS/GRAPH 9.4” on page 92
- “SAS 9.4 Intelligence Platform” on page 227
- “SAS 9.4 OLAP Server” on page 173

July 2016 (SAS 9.4, Rev. 940_16w30)

These products shipped a new release:

- “SAS Anti-Money Laundering 7.1” on page 213
- “SAS Model Risk Management 7.1” on page 251
- “SAS Risk Management for Banking 3.4” on page 256

June 2016 (SAS 9.4, Rev. 940_16w26)

These products, which are part of SAS Customer Intelligence 6.5, shipped a new release:

- [“SAS Marketing Automation 6.5” on page 204](#)
- [“SAS Marketing Optimization 6.5” on page 205](#)
- [“SAS Real-Time Decision Manager 6.5” on page 207](#)

April 2016 (SAS 9.4, Rev. 940_16w17)

SAS/ACCESS 9.4 for Amazon Redshift is new for this release. For more information, see [“SAS/ACCESS 9.4 Interface to Amazon Redshift” on page 74](#).

These products shipped a new release:

- [“SAS High-Performance Risk 3.6” on page 245](#)
- [“SAS Quality Knowledge Base for Contact Information 27” on page 198](#)
- SAS Risk Dimensions 6.6. For more information, see [“SAS Risk Dimensions” on page 254](#).

February 2016 (SAS 9.4, Rev. 940_16w08)

These products shipped a new release:

- [“SAS/ACCESS 9.4 Interface to the PI System” on page 84](#)
- [“SAS Add-In 7.12 for Microsoft Office” on page 166](#)
- [“SAS Enterprise Guide 7.12” on page 170](#)
- [“SAS IT Resource Management 3.7” on page 236](#)
- [“SAS Studio 3.5” on page 103](#)

January 2016 (SAS 9.4, Rev. 940_16w04)

These products shipped a new release:

- [“DataFlux Data Management Server 2.7” on page 179](#)
- [“DataFlux Secure 2.7” on page 181](#)
- [“SAS Data Loader 2.4 for Hadoop” on page 184](#)
- [“SAS Federation Server 4.2” on page 193](#)

These products shipped a maintenance release:

- DataFlux Authentication Server 4.1M1. For more information, see [“DataFlux Authentication Server 4.1” on page 177](#).
- SAS Anti-Money Laundering 6.3M1. For more information, see [“SAS Anti-Money Laundering 6.3” on page 213](#).
- SAS Customer Due Diligence 6.3M1. For more information, see [“SAS Customer Due Diligence 6.3” on page 215](#).

November 2015 (SAS 9.4, Rev. 940_15w47)

SAS Contextual Analysis 14.1M1 is now available. For more information, see [“SAS Contextual Analysis 14.1” on page 113](#).

October 2015 (SAS 9.4, Rev. 940_15w42)

These products shipped a new release:

- [“SAS High-Performance Risk 3.5” on page 245](#)
- [“SAS Risk Dimensions” on page 254](#)

Social Network Analysis Server 6.2M2 is now available. For more information, see [“SAS Social Network Analysis Server 6.2” on page 216](#).

August 2015 (SAS 9.4, Rev. 940_15w33)

These products shipped a new release:

- [“SAS Quality Knowledge Base for Contact Information 26” on page 198](#)
- [“SAS Visual Analytics 7.3” on page 261](#)

July 2015 (SAS 9.4, Rev. 940_15w31)

SAS Data Loader 2.3 for Hadoop is now available. For more information, see [“SAS Data Loader 2.3 for Hadoop” on page 184](#).

July 2015 (SAS 9.4, Rev. 940_15w29)

SAS Factory Miner 14.1 is a new product. For more information, see [“SAS Factory Miner” on page 130](#).

These products shipped a new release:

- [“SAS Business Rules Manager 3.1” on page 110](#)
- [“SAS Contextual Analysis 14.1” on page 113](#)
- [“SAS Data Integration Studio 4.901” on page 187](#)
- [“SAS Decision Manager 3.1” on page 116](#)
- [“SAS Enterprise Miner 14.1” on page 118](#)
- [“SAS Environment Manager 2.5” on page 226](#)
- [“SAS/ETS 14.1” on page 126](#)
- [“SAS Forecast Server 14.1” on page 132](#)
- [“SAS High-Performance Analytics Infrastructure 3.1” on page 157](#)
- [“SAS/IML 14.1” on page 135](#)
- [“SAS 9.4 In-Database Products” on page 217](#)
- [“SAS Model Manager 14.1” on page 138](#)
- [“SAS/OR 14.1” on page 141](#)
- [“SAS/QC 14.1” on page 144](#)
- [“SAS/STAT 14.1” on page 148](#)
- [“SAS Studio 3.4” on page 103](#)
- [“SAS Text Miner 14.1” on page 152](#)
- [“SAS Theme Designer 4.7 for Flex” on page 234](#)

These products were updated as part of SAS 9.4M3:

- [“Base SAS 9.4” on page 15](#)
- [“SAS/ACCESS” on page 73](#)
- [“SAS 9.4 Data Quality Server” on page 190](#)
- [“SAS/GRAPH 9.4” on page 92](#)
- [“SAS Grid Manager” on page 97](#)
- [“SAS 9.4 Intelligence Platform” on page 227](#)
- [“SAS 9.4 OLAP Server” on page 173](#)

May 2015 (SAS 9.4, Rev. 940_15w20)

SAS Model Risk Management is a new product. For more information, see [“SAS Model Risk Management” on page 250](#).

These products shipped a new release:

- [“SAS Add-In 7.11 for Microsoft Office” on page 166](#)
- [“SAS Enterprise Guide 7.11” on page 170](#)
- [“SAS High-Performance Analytics Infrastructure 2.94” on page 157](#)
- [“SAS High-Performance Risk 3.4” on page 245](#)

- [“SAS IT Resource Management 3.6” on page 236](#)
- [“SAS Risk Management for Banking 3.3” on page 256](#)
- [“SAS Visual Analytics 7.2” on page 261](#)

April 2015 (SAS 9.4, Rev. 940_15w16)

SAS Scalable Performance Data Server 5.2 is now available. For more information, see [“SAS Scalable Performance Data Server 5.2” on page 101](#).

March 2015 (SAS 9.4, Rev. 940_15w12)

These products are new:

- SAS Data Loader for Hadoop. For more information, see [“SAS Data Loader” on page 183](#).
- SAS Energy Forecasting. For more information, see [“SAS Energy Forecasting 3.1” on page 122](#).

These products shipped a new release:

- [“SAS Data Remediation 2.2” on page 191](#)
- [“SAS Job Monitor 2.2” on page 194](#)
- [“SAS Marketing Automation 6.4” on page 204](#)
- [“SAS Marketing Optimization 6.4” on page 206](#)
- [“SAS MDM 4.2” on page 200](#)
- [“SAS Real-Time Decision Manager 6.4” on page 207](#)
- [“SAS Task Manager 2.2” on page 201](#)
- [“SAS Visual Process Orchestration 2.2” on page 202](#)

February 2015 (SAS 9.4, Rev. 940_15w08)

These products shipped a new release:

- [“SAS Data Quality Accelerator 2.6 for Teradata” on page 189](#)
- [“SAS Quality Knowledge Base for Contact Information 25” on page 198](#)
- [“SAS Studio 3.3” on page 104](#)

These products were enhanced:

- the DS2 language. The SAS In-Database Code Accelerator for Hadoop now uses HCatalog to process complex, non-delimited files. For more information, see [“DS2 Language” on page 19](#).
- SAS 9.4 In-Database Code Accelerator for Hadoop. For more information, see [“SAS 9.4 In-Database Products” on page 217](#).

January 2015 (SAS 9.4, Rev. 940_15w04)

These products shipped a new release:

- [“SAS Anti-Money Laundering 6.3” on page 213](#)
- [“SAS Customer Due Diligence 6.3” on page 215](#)
- [“SAS Financial Management 5.5” on page 211](#)

SAS Social Network Analysis Server 6.2M1 shipped. For more information, see [“SAS Social Network Analysis Server 6.2” on page 216](#).

November 2014 (SAS 9.4, Rev. 940_14w47)

These products are new:

- [“SAS Business Data Network 3.1” on page 183](#)
- [“SAS Lineage 3.1” on page 195](#)

These products shipped a new release:

- [“DataFlux Data Management Server 2.6” on page 179](#)
- [“SAS High-Performance Analytics Infrastructure 2.91” on page 157](#)
- [“SAS High-Performance Risk 3.3” on page 245](#)
- [“SAS LASR Analytic Server 2.5” on page 160](#)
- [“SAS Quality Knowledge Base for Contact Information 24” on page 198](#)
- [“SAS Quality Knowledge Base for Product Data 5” on page 199](#)

October 2014 (SAS 9.4, Rev. 940_14w41)

These products shipped a new release:

- [“DataFlux Data Management Studio 2.6” on page 181](#)
- [“SAS Add-In 7.1 for Microsoft Office” on page 166](#)
- [“SAS Enterprise GRC 6.1” on page 240](#)
- [“SAS Enterprise Guide 7.1” on page 171](#)
- [“SAS Environment Manager 2.4” on page 227](#)
- [“SAS Information Retrieval Studio 1.53” on page 233](#)
- [“SAS Visual Analytics 7.1” on page 262](#)

September 2014 (SAS 9.4, Rev. 940_14w36)

SAS IT Resource Management 3.5 is a new release. For more information, see [“SAS IT Resource Management 3.5” on page 236](#).

August 2014 (SAS 9.4, Rev. 940_14w32)

These products shipped a new release:

- [“SAS Contextual Analysis 12.3” on page 113](#)
- [“SAS Business Rules Manager 2.2” on page 111](#)
- [“SAS Data Integration Studio 4.9” on page 187](#)
- [“SAS Decision Manager 2.2” on page 116](#)
- [“SAS Environment Manager” on page 225](#)
- [“SAS Enterprise Miner 13.2” on page 119](#)
- [“SAS/ETS 13.2” on page 126](#)
- [“SAS/IML 13.2” on page 135](#)
- [“SAS Model Manager 13.1” on page 139](#)
- [“SAS/OR 13.2” on page 141](#)
- [“SAS/QC 13.2” on page 144](#)
- [“SAS/STAT 13.2” on page 149](#)
- [“SAS Studio 3.2” on page 104](#)
- [“SAS Text Miner 13.2” on page 153](#)

These products are new:

- SAS/ACCESS Interface to Impala
- SAS/ACCESS Interface to the PI System

These products shipped as part of SAS 9.4M2:

- [“Base SAS 9.4” on page 15](#)
- [“SAS/ACCESS 9.4 Interface to Hadoop” on page 77](#)
- [“SAS/ACCESS 9.4 Interface to Oracle” on page 82](#)
- [“SAS/ACCESS 9.4 Interface to PC Files” on page 83](#)
- [“SAS/CONNECT 9.4” on page 90](#)
- [“SAS/GRAPH 9.4” on page 92](#)
- [“SAS Grid Manager” on page 97](#)
- [“SAS 9.4 Integration Technologies” on page 223](#)
- [“SAS 9.4 Intelligence Platform” on page 227](#)
- [“SAS 9.4 OLAP Server” on page 173](#)

June 2014 (SAS 9.4, Rev. 940_14w23)

These products shipped a new release:

- [“SAS OpRisk VaR 6.1” on page 252](#)
- [“SAS Quality Knowledge Base for Contact Information 23” on page 198](#)

May 2014 (SAS 9.4, Rev. 940_14w19)

These products shipped a new release:

- [“DataFlux Authentication Server 4.1” on page 177](#)
- [“SAS Federation Server 4.1” on page 193](#)

SAS DataFlux Secure 2.5 was updated. For more information, see [“DataFlux Secure 2.7” on page 181](#).

April 2014 (SAS 9.4, Rev. 940_14w14)

These products shipped a new release:

- [“SAS Anti-Money Laundering 6.2” on page 214](#)
- [“SAS Data Quality Accelerator 2.5 for Teradata” on page 189](#)

These products shipped a maintenance release:

- [“SAS Data Remediation 2.1” on page 191](#)
- [“SAS MDM 4.1” on page 200](#)
- [“SAS Task Manager 2.1” on page 201](#)

March 2014 (SAS 9.4, Rev. 940_14w11)

These products are new:

- [“SAS In-Memory Statistics” on page 155](#)
- [“SAS Studio 3.1” on page 104](#)

These products shipped a new release:

- [“SAS LASR Analytic Server 2.3” on page 161](#)
- [“SAS Visual Analytics 6.4” on page 262](#)

The documentation was updated for SAS Data Surveyor 5.1 for SAP. For more information, see [“SAS Data Surveyor for SAP” on page 192](#).

December 2013 (SAS 9.4, Rev. 940_13w51)

SAS 9.4M1 shipped in December 2013. Several products were updated in this maintenance release.

- [“SAS/ACCESS 9.4 Interface to PC Files” on page 83](#)
- [“Base SAS 9.4” on page 15](#)
- [“SAS/CONNECT 9.4” on page 90](#)
- [“SAS 9.4 In-Database Products” on page 217](#)
- [“SAS 9.4 Integration Technologies” on page 223](#)
- [“SAS 9.4 Intelligence Platform” on page 227](#)
- [“SAS 9.4 OLAP Server” on page 173](#)

These products shipped a new release:

- [“SAS Data Integration Studio 4.8” on page 187](#)
- [“SAS Enterprise Miner 13.1” on page 119](#)
- [“SAS/ETS 13.1” on page 128](#)
- [“SAS Financial Management 5.4” on page 211](#)
- [“SAS Forecast Server 13.1” on page 132](#)
- [“SAS High-Performance Computing Management Console 2.4” on page 158](#)
- [“SAS High-Performance Risk 3.2” on page 245](#)
- [“SAS/IML 13.1” on page 136](#)
- [“SAS LASR Analytic Server 2.1 and 2.2” on page 161](#)
- [“SAS/OR” on page 140](#)
- [“SAS/QC” on page 143](#)
- [“SAS/STAT 13.1” on page 149](#)
- [“SAS Theme Designer 4.2 for Flex” on page 234](#)
- [“SAS Text Miner 13.1” on page 153](#)
- [“SAS Visual Analytics 6.3” on page 263](#)

These products shipped a maintenance release:

- SAS Add-In 6.1M1 for Microsoft Office is available. For more information, see [“SAS Add-In 6.1 for Microsoft Office” on page 167](#).
- SAS Enterprise Guide 6.1M1 is available. For more information, see [“SAS Enterprise Guide 6.1” on page 171](#).

November 2013 (SAS 9.4, Rev. 940_13w45)

These products shipped a new release:

- [“SAS Anti-Money Laundering 6.1” on page 214](#)
- [“SAS Quality Knowledge Base for Contact Information 22” on page 199](#)

These products are new:

- [“SAS Customer Due Diligence 6.1” on page 215](#)
- [“SAS Peer Group Analysis 6.1” on page 215](#)

October 2013 (SAS 9.4, Rev. 940_13w40)

These products are new:

- [“DataFlux Data Management Server 2.5” on page 179](#)
- [“DataFlux Data Management Studio 2.5” on page 181](#)
- [“SAS Contextual Analysis 12.3” on page 113](#)
- [“SAS Data Management Console” on page 188](#)
- [“SAS Data Remediation 2.1” on page 191](#)
- [“SAS Job Monitor 2.1” on page 194](#)
- [“SAS MDM 4.1” on page 200](#)
- [“SAS Visual Process Orchestration 2.1” on page 202](#)

These products shipped a new release.

- [“DataFlux Authentication Server 3.2” on page 178](#)
- [“DataFlux Secure 2.5” on page 182](#)
- [“SAS Data Quality Accelerator 2.4 for Teradata” on page 189](#)

September 2013 (SAS 9.4, Rev. 940_13w36)

SAS Data Quality Accelerator for Teradata 2.4 is a new product. For more information, see [“SAS Data Quality Accelerator 2.4 for Teradata” on page 189](#).

July 2013 (SAS 9.4, Rev. 940_13w30)

The SAS In-Database products were updated. For more information, see [“SAS 9.4 In-Database Products” on page 217](#).

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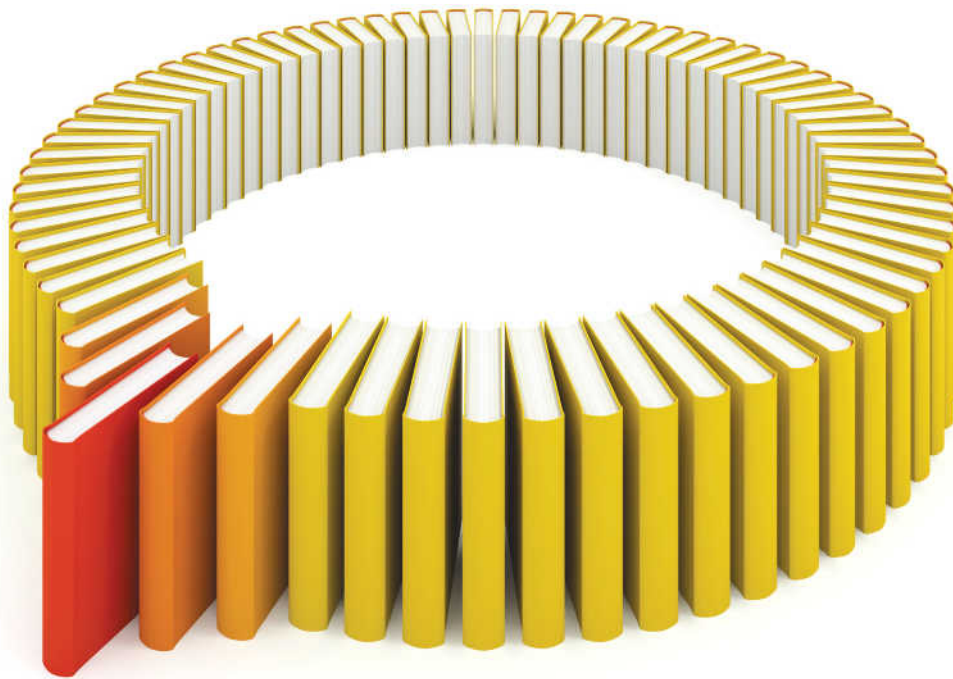
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