



What's New in SAS[®] 9.4 and SAS[®] Viya[®] 3.4

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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 3.4. 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

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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 of these engines 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 9.4M6 (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 [Security Assurances from SAS](#) and [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.

Chapter 2

SAS Foundation

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Base SAS 9.4

SAS 9.4M6 Integration with SAS Viya

SAS 9.4M6 provides further integration with SAS Viya 3.4, which shipped in July 2018.

SAS 9.4M5 Integration with SAS Viya

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 will 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

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.

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 `CASDATA LIMIT=` 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.

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 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 9.4M6

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:

- PROC DS2 supports databases that are JDBC compliant as data sources.
- The SAS In-Database Code Accelerator can be executed on MapReduce or Spark.
- Character data can be written in a universally unique identifier (UUID) format.
- Inline declarations can be specified for DO loop counters.
- 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.
- You can direct the PROC DSTODS2 output file to a directory using the OUTDIR= option.
- New functions are available: CMISS, LOGISTIC, SAVING, SHA256, and SYSGET.
- New methods for the DS2 HTTP package enhance security and a default character set.

DS2 Language: SAS 9.4M5

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

- 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 supports reading multiple tables and embedded SQL by using the SET statement, 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.
- You can change several default behaviors of a DS2 program by using the `DS2_OPTIONS` statement.
- You can use the `FMTINFO()` function to determine whether you are using a format or informat and to obtain information about that format or informat. This function also returns 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 D2TX package enables you to perform time zone processing.
- 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.

DS2 Language: SAS 9.4M1

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

- The behavior for the SAS In-Database Code Accelerator has changed where the DS2 code is not executed inside the database, by default. An option must be set to send the DS2 code to 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.
- New DS2 configuration and run-time loggers have been added to the SAS Logging Facility.

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 9.4M6

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 includes connection options that enable you to connect to MongoDB and Salesforce databases.

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

- PROC FEDSQL support for databases that are JDBC compliant as data sources.
- The FedSQL language creates VARCHAR columns that contain greater than 65,535 characters as type STRING in Hive.

FedSQL Language: SAS 9.4M5

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

- 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
- a new DESCRIBE TABLE statement
- support for three-level names when creating and reading Hive tables
- support for several new functions

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.
- DBMS-specific clauses can be added when indexes are created.
- SASHDAT files can be compressed.

FedSQL Language: SAS 9.4M1

SAS 9.4M1 (December 2013) adds support for Memory Data Store (MDS), SAP HANA, and SASHDAT data sources.

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 9.4M6**

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 9.4M4

Starting in SAS 9.4M4 (November 2016), the FILENAME statement, Hadoop access method now supports Knox security.

Hadoop Support: SAS 9.4M3

SAS 9.4M3 has these enhancements:

- Using the 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, and then setting a SAS_HADOOP_CONFIG_PATH environment variable to the location of the configuration files. You can also request recursive action to execute the operation on the specified directory as well as subdirectories for several HDFS statement options. Support was added for BINARY and DECIMAL data types, and options were added to enhance automatic creation of generated SQL code and to control transcode errors.

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

- New HDFS statement options display the contents of files, change file access permissions, and list HDFS files. In addition, you can submit a MapReduce program and Pig language code to a Hadoop cluster through the Apache Oozie RESTful API. For more information about HDFS commands, see FILENAME (Hadoop Access Method) in [SAS Global Statements: Reference](#).
- In the SPD Engine, current access to data that is 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.
- You can submit HDFS commands through WebHDFS.

Hadoop Support: SAS 9.4M1

SAS 9.4M1 (December 2013) enables you to use the SPD Engine to read, write, and update data in a Hadoop cluster through the HDFS. In addition, you can now use the HADOOP procedure to submit configuration properties to the Hadoop server.

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 9.4M2 (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

- SAS can process large amounts of data more efficiently by using new system options to align data and utility files on a page boundary and to set the page size for a SAS library to be the same size as a RAID stripe.
- Optimization processes to determine page size and the default size of a logical record length have been enhanced.
- 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*.

Increased Security

Security Updates: 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.
- PROC S3 has these enhancements:
 - supports encryption when working with the Amazon S3 or Amazon Redshift environment
 - the ENCKEY statement to register encryption keys
 - encryption is enabled with new options in the COPY, GET, GETDIR, INFO, PUT, and PUTDIR statements

Security Updates: 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.

- SSLSNIIHOSTNAME 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.
- 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.
- When encrypting data at rest, you can now specify data set option ENCRYPT=AES2. AES2 is another key generation algorithm for AES encryption.
- 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.

Security Updates in SAS 9.4M3

In SAS 9.4M3 (July 2015), 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.

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.

SAS provides OpenSSL versions of TLS on UNIX and z/OS. For the SAS 9.4 release and all maintenance releases of SAS 9.4, updated versions of OpenSSL are provided at the time of the software release and are kept up-to-date through hotfixes. For the latest information about OpenSSL security advisories under consideration for SAS components, see [SAS Statement Regarding OpenSSL Security Advisories](#).

Security Updates in SAS 9.4M1

SAS 9.4M1 (December 2013) incorporates a new default location for the TLS Certificate Authority for UNIX and z/OS foundation servers, and support for Subject Alternative Names in TLS certificates on UNIX and z/OS clients and servers. Also new in this release, authorized users of metadata-bound libraries can access data without supplying the key-in code.

Security Updates in 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.

For more information about the new features for accessibility, see [“Creating Accessible Output: SAS 9.4M6” on page 28](#).

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 29](#).
- 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 ODS TEXT procedure.
- The new DESCRIPTION= option has been added to these methods: IMAGE, LAYOUT_ABSOLUTE, LAYOUT_GRIDDED, REGION (absolute), REGION (gridded), and TABLE_START.
- The new DESCRIPTION= option specifies alternative text for layouts and layout regions. The DESCRIPTION= option is new for these 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:

- Support for Microsoft Excel that uses the ODS EXCEL statement.
- A new procedure, MSCHART, creates charts that can be opened and manipulated in Microsoft Excel.
- The default EPUB version is EPUB3.
- In ODS EPUB3, embedded video, audio, and images are supported. This functionality is provided using the Report Writing Interface (RWI) and the Inline Formatting functions that are used with the ODS ESCAPECHAR statement.
- The ODS EPUB3 statement supports new EVENT= values for figures and custom entries in a table of contents.
- The ODS POWERPOINT statement now supports style options for the slide background. This statement also supports changes to the slide transitions and their effects.
- 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.

Output Enhancements: SAS 9.4M1

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

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.
- You can now create text and list templates.
- You can arrange ODS output objects exactly where you want them on a page, or use dynamic placement of objects by using a grid structure.
- A new procedure creates table templates and binds them with input data set in one statement.
- You can animate multi-page GIF images and SVG files by setting system options.

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 9.4M6**

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 SGPANEL procedure. The statement adds a confidence or prediction ellipse to another plot.
- A new ELLIPSEPARM statement has been added to the SGPLOT and SGPANEL 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), ODS Graphics has several new plot statements and includes a wide range of enhancements to plots, legends, axes, axis tables, and attribute maps. The ODS Graphics Designer enables you to create more sophisticated graphs. The ODS Graphics Editor supports editing new plot types and annotating and editing some attributes of graphs that are generated by the SAS/QC procedures. The viewport function in the ODS Graphics Editor adjusts the view of 3-D graphs, and groups are supported in histograms and density plots. For all ODS Graphics, implementation of sub-pixel rendering results in clearer images.

ODS Graphics in SAS 9.4M2

In SAS 9.4M2 (August 2014), ODS Graphics has a new text plot and several enhancements to the graphics output.

ODS Graphics in SAS 9.4M1

In SAS 9.4M1 (December 2013), ODS Graphics has new and revised plots, charts, and panels.

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.

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.
- 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="`
- ATTRPRIORITY=NONE is now the default setting for the Daisy ODS style.

- 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.

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

In SAS 9.4M1 (December 2013), the SAS 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.

In SAS 9.4M2 (August 2014), certain access methods and their related procedures are disabled, by default, when a SAS session is locked down.

For more information, see [SAS Language Reference: Concepts](#). To determine whether your SAS product supports this functionality, see the Administrator's Guide for your SAS product.

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 “Hadoop Support” on page 12 and [SAS Scalable Performance Data Engine: Reference](#).

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.

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*.

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

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*.

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

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](#).

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 9.4M5

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.
- Several new character string functions search for strings, return string positions, and count characters and substrings in character strings.

National Language Support in SAS 9.4

SAS 9.4 adds the following support:

- After placing locale information in a data set, SAS can use the data set to configure SAS for a locale. A new SAS 9.4 procedure manages the data set and writes the locale information to the SAS registry.
- Using system options, you can change the language of SAS output and the SAS log.

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 9.4M6

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.

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 autocall macros.

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

General Enhancements to SAS Procedures

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.
- 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.

- 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

Starting in SAS 9.4M5 (December 2017), the TRANSPOSE procedure can summarize data using CAS server actions.

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 support CAS tables, and Amazon Redshift, Microsoft SQL Server, and Vertica data sources. You must use the SESSREF= or SESSUID= options to connect the procedure to a CAS session.

The procedures also support SAS Scalable Performance Data (SPD) Server connections using the NOLIBS= and CONN= options. PROC DS2 and PROC FEDSQL are available in both SAS 9.4 and SAS Viya.

- 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 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 SGOOP supports workflows and Kerberos on Linux, and the WFHDFSPATH= option is now optional.

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

Procedure Enhancements: SAS 9.4M4

In SAS 9.4M4 (November 2016), PROC RANK and PROC SORT support the Hive database management system.

Procedure Enhancements: SAS 9.4M3

SAS 9.4M3 includes these enhancements:

- 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.
- 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:

- In DS2 and FedSQL, you can control the behavior of the SAS session when an NLS transcoding failure occurs.
- You can control the sorting of imported files according to the destination collating sequence.
- Passwords are hidden in the SAS log.
- The REPORT procedure supports several statistical keywords.

Procedure Enhancements: SAS 9.4M1

In SAS 9.4M1 (December 2013), changes and enhancements to procedures enable you to determine the encoding of data sets in a transport file, transport data sets with time zone offsets, generate a one-time password from the metadata server to access the SAS Content Server, and support user identity authentication. A link and supporting text were added for Microsoft Excel functions.

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 CROSSLIST 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](#).

Functions

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

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

Starting in SAS 9.4M5 (September 2017), 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.

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

Statements

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.

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 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.

Macro Language

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

- Several new automatic macro variables report device types, directory information, fileref and the %INCLUDE filename from a %INCLUDE file.
- The SYSMAXLONG automatic variable returns the maximum long integer value allowed under Linux.

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

XMLV2 Engine

In SAS 9.4M6, two LIBNAME statement options expand column lengths to avoid truncation when importing XML data that contains double-byte character set (DBCS) or multi-byte character set (MBCS) data.

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

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.

In SAS 9.4M4 (November 2016), the cleanwork utility has two new options, `-V` and `-LOG`.

In SAS 9.4M3 (July 2015), the CONTENTS procedure generates the size of file in KB, MB, or GB.

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

- You can specify Read, Write, and Execute permissions for a fileref.
- The default for the MVARSIZE system option changed from 32000 to 65534.
- In a locked-down state, some FILENAME statement access methods are, by default, not available but can be re-enabled by the SAS server administrator. For more information, see [“Locked-down State” on page 30](#).
- New information is available about UNIX environment variables.
- You can measure system performance.

In SAS 9.4M1 (December 2013), you can enable SAS programs to send messages to and receive messages from an ActiveMQ message broker and any JMS API-compliant message service in the UNIX environment.

For more information, see [SAS Companion for UNIX Environments](#).

SAS under Windows

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

SAS 9.4M5 (September 2017) adds support for Windows 2016.

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

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

- SAS provides a utility to clear temporary files.
- You can specify Read, Write, and Execute permissions for a fileref.
- In a locked-down state, some FILENAME statement access methods are, by default, not available but can be re-enabled by the SAS server administrator.

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

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

SAS under z/OS

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 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 9.4M4 (November 2016) has these new features:

- The .spds9 file extension is supported.
- FILE/INFILE statement processing supports the BUFNO= SAS system option.
- 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.

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

- Large block size support for SAS libraries on tape devices improves performance and efficiency.
- The LOCKDOWN feature is supported for foundation servers.
- SAS can generate TCW channel programs for Read operations on some direct access bound libraries, improving I/O performance.

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 Base 9.4 System Options](#) in *SAS System Options: Reference*
- [What's New in Encryption in SAS 9.4](#) in *Encryption in SAS*
- [What's New in the SAS 9.4 Logging Facility](#)

- [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](#)
- [What's New in SAS 9.4 Graph Template Language](#) in *SAS Graph Template Language: Reference*
- [What's New in SAS ODS 9.4 Graphics Procedures](#) 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 Vertica

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.

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 [What's New in SAS/ACCESS 9.4 Interface 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 to Amazon Redshift

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

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

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

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 for UNIX and PC Hosts](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to Greenplum

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

SAS/ACCESS 9.4 Interface to Hadoop

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 20](#).

SAS/ACCESS 9.4 Interface to HAWQ

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 Impala

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

SAS/ACCESS 9.4 Interface to JDBC

In SAS 9.4M6 (November 2018), support was added for customers who run only SAS 9.4.

SAS/ACCESS 9.4 Interface to Microsoft SQL Server

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 for Nonrelational Databases: Reference](#).

SAS/ACCESS 9.4 Interface to MySQL

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

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

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

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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

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 [What's New in SAS/ACCESS for Nonrelational Databases](#) in *SAS/ACCESS for Nonrelational Databases: Reference*.

SAS/ACCESS 9.4 Interface to PostgreSQL

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), 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

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 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 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 9.4 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 9.4M6 (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 9.4 Interface to SAP IQ](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS 9.4 Interface to Teradata

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

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*.

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.

These updates were made in a maintenance release:

- 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 filename. 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 9.4M6

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 `IMGGIF` provide improved graph-rendering performance over the `PNG` and `GIF` Universal Printer devices. The `IMGPNG` and `IMGGIF` 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 `DROPVARS`.
- 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 9.4M6

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 9.4M5 (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

SPD Server 5.2 can read, write, and update tables in the Hadoop environment. SPD Server 5.2 supports WHERE-processing optimization in the Hadoop cluster using MapReduce. 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 3.8

SAS Studio 3.8 (November 2018) supports SAS 9.4M6.

- This release includes experimental support for Git integration.
- 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.
- Finally, there are many new SAS Viya tasks.

See these resources:

- [What's New in SAS Studio 3.8](#) in *SAS Studio: User's Guide*.
- For more information about changes from the previous release, see [SAS Studio](#) in *SAS Guide to Software Updates and Product Changes*.

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.

For more information, see [What's New in SAS Studio 3.71](#) in *SAS Studio: User's Guide*.

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.

For more information, see [What's New in SAS Studio 3.7](#) in *SAS Studio: User's Guide*.

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.

For more information, see [What's New in SAS Studio 3.6](#) in *SAS Studio: User's Guide*.

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.

For more information, see [What's New in SAS Studio 3.5](#) in *SAS Studio: User's Guide*.

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 CVS), 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.

For more information, see [What's New in SAS Studio 3.4](#) in *SAS Studio: User's Guide*.

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.

For more information about this release, see [What's New in SAS Studio 3.3](#) in *SAS Studio: User's Guide*.

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.

For more information, see [What's New in SAS Studio 3.2](#) in *SAS Studio: User's Guide*.

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.

Chapter 3

Analytical Products

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SAS Business Rules Manager

SAS Business Rules Manager 3.3

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.
- add a stand-alone assignment statement to a rule set.
- create, move, and rename folders in the Manage Folders 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.

For more information, see these resources:

- [SAS Business Rules Manager: What's New](#)
- “Business Rules Manager” in [SAS Guide to Software Updates and Product Changes](#)

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

See these resources:

- For more information, see [What's New in SAS Business Rules Manager 3.2](#) in [SAS Business Rules Manager: User's Guide](#).
- For more information about changes from the previous release, see [SAS Business Rules Manager](#) in [SAS Guide to Software Updates and Product Changes](#).

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

For more information, see [What's New in SAS Business Rules Manager 3.1](#) in *SAS Business Rules Manager: User's Guide*.

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

For more information, see [What's New in SAS Business Rules Manager 2.2](#) in *SAS Business Rules Manager: User's Guide*.

SAS Contextual Analysis

SAS Contextual Analysis 15.1

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

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

See these resources:

- For more information about this release, see [What's New in SAS Contextual Analysis 15.1](#) in *SAS Contextual Analysis: User's Guide*.
- 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).

For more information about this release, see [What's New in SAS Contextual Analysis 14.3](#) in *SAS Contextual Analysis: User's Guide*.

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 3.3 runs on the June 2019 release of 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](#).

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

- edit rules in an improved, simplified rule set editor.
- 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 Intelligent Decisioning: 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 15.1

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.

See these resources:

- For more information about SAS Enterprise Miner 15.1, 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 14.3

SAS Enterprise Miner 14.3 (September 2017) runs on SAS 9.4M5 and later releases. 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 and later releases. 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 and later releases.

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 and later releases.

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 Event Stream Manager

SAS Event Stream Manager 6.1

SAS Event Stream Manager 6.1 works with data from SAS Event Stream Processing 6.1. These products shipped in May 2019.

Here are some of the new features and enhancements in SAS Event Stream Processing 6.1:

- The look and feel of the user interface has been enhanced to improve the user experience. For example, the Deployments page has new status icons that make it easier to check the status of ESP servers for each deployment.
- When you publish a project in SAS Event Stream Processing Studio, the project is now visible in SAS Event Stream Manager.
- You can use controls in the SAS Event Stream Manager user interface to load, start, stop, and unload projects. This feature is an alternative to using instructions in job templates to perform these actions.
- When deploying a job template, you are now prompted to select the project version.
- You can now move a deployment between test and production.
- The Metering page provides a more detailed breakdown of metering data. You can also export this data to a comma-separated values (CSV) file.
- When you view details for a specific ESP server, you can access information about memory and CPU use for each project and window.
- SAS Event Stream Manager supports multi-tenancy when it is installed in a full SAS Viya deployment.
- SAS Event Stream Manager no longer uses agents to communicate with SAS Event Stream Processing. Instead, you can configure the esm.xml file in SAS Event Stream Processing to enable SAS Event Stream Processing to pass information about ESP servers to SAS Event Stream Manager.

See these resources:

- For more information about this release, see [SAS Event Stream Processing 6.1: What's New](#).
- For more information about changes from the previous release, see [SAS Event Stream Processing](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Event Stream Manager 5.2

SAS Event Stream Manager 5.2 shipped in June 2018.

Here are some of the new features and enhancements in SAS Event Stream Manager 5.2:

- The look and feel of the user interface has been enhanced to improve the user experience. For example, the pages in the menu bar are listed in a different order, and the **Jobs** page has been renamed as the **Log** page.
- The user interface for filtering ESP servers has been enhanced.
- You can monitor ESP metering servers from within SAS Event Stream Manager, using a new page called **Metering**.
- When you reference a project in SAS Model Manager, it is now more obvious when an update to the model is available. In addition, you can now update the model in more than one project at a time.
- Project major version numbers that are set in SAS Event Stream Processing Studio are now reflected in SAS Event Stream Manager. In addition, if you update a project that references a project in SAS Model Manager, SAS Event Stream Manager increments your project's minor version number.

- There are no new XML elements and attributes available for use in job templates. However, there are new variables for the project-version attribute.

For more information, see [SAS Event Stream Manager 5.2: What's New](#).

SAS Event Stream Processing

SAS Event Stream Processing 6.1

SAS Event Stream Processing 6.1 shipped in May 2019. SAS Event Stream Processing is a stand-alone product that can coexist with SAS 9.4. You can also use SAS Event Stream Processing 5.2 with SAS Viya.

Here are some of the new features and enhancements in SAS Event Stream Processing 6.1:

- Beginning with SAS Event Stream Processing 6.1, Streamviewer is always deployed with the full product on Linux and Windows platforms.
- You can now use the validation tool, `dfesp_xml_validate`, to determine whether your XML code would encounter run-time errors.
- You can now set up an ESP server as a daemon by editing preferences in three files in the `init.d` subdirectory of the configuration directory.
- The command line for C++-based and Java adapters has been simplified. You now provide a single argument, `-C` with key-value pairs to govern the behavior of the adapter.
- SAS Event Stream Processing now supports several new connectors and adapters.

See these resources:

- For more information about this release, see [SAS Event Stream Processing 6.1: What's New](#).
- For more information about changes from the previous release, see [SAS Event Stream Processing](#) in *SAS Guide to Software Updates and Product Changes*.

SAS Event Stream Processing 5.2

SAS Event Stream Processing 5.2 shipped in June 2018. SAS Event Stream Processing is a stand-alone product that can coexist with SAS 9.4. You can also use SAS Event Stream Processing 5.2 with SAS Viya.

Here are some of the new features and enhancements in SAS Event Stream Processing 5.2:

- SAS Event Stream Processing 5.2 provides a set of JavaScript objects and methods that communicate with running ESP servers. Using the ESPJS API, you can create models and publish/subscribe operations in SAS Event Stream Processing from within web pages and across other platforms that support JavaScript.
- Beginning with release 5.2, SAS Event Stream Processing Analytics is supported on Microsoft Windows. Also new analytics algorithms are available.
- SAS Event Stream Processing 5.2 supports the use of graphical processing units (GPUs) to score streaming data with several neural networks.

- SAS Event Stream Processing now supports several new connectors and adapters.

SAS Event Stream Processing 5.1

SAS Event Stream Processing 5.1 shipped in December 2017. SAS Event Stream Processing is a stand-alone product that can coexist with SAS 9.4. You can also use SAS Event Stream Processing 5.1 with SAS Viya.

Here are some of the new features and enhancements in SAS Event Stream Processing 5.1:

- A new metering server enables you to track ESP server usage data.
- Several new analytics algorithms (such as linear regression, logistic regression, and support vector machines) are available.
- This release includes several new and enhanced connectors and adapters. New features include an adapter connector that enables you to run an adapter in the same process space as the ESP server, a BACnet publisher connector and adapter, an OPC-UA connector and adapter, a URL connector, a UVC connector and adapter, and a WebSocket connector.
- SAS Event Stream Processing 5.1 enables any language that supports WebSockets to publish and subscribe to an event stream processing engine without requiring the use of client-side C++ classes.
- You can now import SAS Micro Analytic Service stores into SAS Event Stream Processing Studio directly from SAS Model Manager.
- Three new data types are available in events: BINARY (binary large object, or blob), RUTF8STR (reference-counted string, or rstring), and ARRAY (32-bit integers, 64-bit integers, double).
- Starting in SAS Event Stream Processing 5.1, there is a single port for all HTTP requests.
- Programming enhancements include a new retention type `bytime_jumping_lookback`, a new aggregate function `ESP_aCAT`, and server publish/subscribe support for using the project port without requiring the global port.
- You can now enable cluster redundancy by setting up spare engines. When an engine fails, the router automatically and transparently replaces it with the specified spare engine.
- You can now set up a cluster of Cluster Managers to enable Cluster Manager failover. The failover mechanism is implemented using the HTTP protocol and the existing HTTP port.
- You can now define a polyline in the Geofence window.

SAS Event Stream Processing 4.3

SAS Event Stream Processing 4.3 shipped in May 2017. SAS Event Stream Processing is a stand-alone product that can coexist with SAS 9.4. You can also use SAS Event Stream Processing 4.3 with SAS Viya.

SAS Event Stream Processing Analytics enables you to execute the analytics that are produced by various SAS products, such as SAS Visual Statistics. Based on feedback from users, changes have been made to SAS Event Stream Processing Studio to improve the user experience and to expand available functionality. SAS Event Stream Processing

4.3 now enables you to set up the event stream processing server to use explicit read/write permissions on engine, project, query, and window objects based on the user.

SAS Event Stream Processing 4.2

SAS Event Stream Processing 4.2 shipped in September 2016. SAS Event Stream Processing is a stand-alone product that can coexist with SAS 9.4. You can also use SAS Event Stream Processing 4.2 with SAS Viya.

The publish and subscribe clients, Camel clients, XML clients, adapters, and the adapter manager support authentication against a SASLogon service URL. And the HDFS adapter users can now authenticate against a Kerberized Hadoop grid using native Java Kerberos. SAS ESP adapters and connectors now provide increased access to metadata and message-level logging information for increased administration. SAS Streamviewer has introduced a new geographic visualization component. The event stream processing server can now be configured to maintain a metering source window to track the number of events processed within a specified interval. A migration tool is also available to convert XML models from the 3.2 XML schema to the 4.2 XML schema. Enhancements to documentation and examples are also included in this latest release.

SAS Event Stream Processing 4.1

SAS Event Stream Processing 4.1 shipped in August 2016. SAS Event Stream Processing is a stand-alone product that can coexist with SAS 9.4.

SAS Event Stream Processing 4.1 provides the Adapter Manager for orchestration and grid publishing. This release is cloud-ready. SAS Event Stream Processing 4.1 also provides enhancements to SAS Event Stream Processing Studio, a number of new adapters and connectors, enhancements to existing adapters and connectors, changes and enhancements to the XML layer, an enhanced Streamviewer, a Python-based publish/subscribe APT, an Adobe Adapter NiFi ESP processor, and enhancements to window types.

SAS Event Stream Processing 3.2

SAS Event Stream Processing 3.2 shipped in November 2015 and runs on SAS 9.4M3. Starting with this release, input handlers can be written using DATA step statements. This release adds authentication and includes compression for pattern windows and changes to the HTTP API. SAS Event Stream Processing 3.2 also provides integration with Hadoop Yarn and new connectors and adapters.

SAS Event Stream Processing 3.1

SAS Event Stream Processing 3.1 (formerly known as SAS Event Stream Processing Engine) shipped in May 2015 and runs on SAS 9.4M2. This release provides a web-based client that enables you to create event stream processing models. The SAS Event Stream Processing Studio client generates XML code based on the models that you define in the user interface. SAS Event Stream Processing 3.1 now supports these connectors and adapters: Twitter, Sniffer, SOAP, Netezza, and REST. This release also includes a new integrated HTTP client driver.

SAS Event Stream Processing Engine 2.3

SAS Event Stream Processing Engine 2.3 includes a new Streamviewer tool that uses the HTTP protocol. The tool provides enhanced graphic and publishing capabilities. 1+N way failover has been enhanced to support the RabbitMQ messaging system. SAS Event Stream Processing Engine now enables expressions to access an event's opcode or flags. This release also includes a new Project publish connector and a new RabbitMQ connector and adapter.

SAS/ETS

SAS/ETS 15.1

SAS/ETS 15.1 (November 2018) runs on SAS 9.4M6 and later releases. The SASEOCD 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.

See these resources:

- For more information about this release, see [What's New in SAS/ETS 15.1](#) in *SAS/ETS 15.1 User's Guide*.
- For more information about changes from the previous release, see [SAS/ETS](#) in *SAS Guide to Software Updates and Product Changes*.

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
- SASEXFSM 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 pathnames 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 pathnames 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 pathnames 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
 - Gourieroux, 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 SASEXFS 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 15.1

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 15.1

SAS Forecast Server 15.1 shipped in November 2018 and supports SAS 9.4M6 and later releases.

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 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 High-Performance Risk

SAS High-Performance Risk 4.2

SAS High-Performance Risk 4.2 shipped in June 2019 and runs on SAS 9.4M6. This release provides these 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
- input methods during distribute tasks to update positions for stress
- ability to compute and display computed methods by scenario in a risk exploration

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 new features:

- a new user interface
- a new roll-up method
- new analytical features
- improvements to cube management

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 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/IML

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 KCPAScore 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 VARMASIM 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 231 – 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 14.3

SAS Model Manager 14.3 runs on the June 2019 release of 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](#).

See these resources:

- For more information about this release, see [What's New in SAS Model Manager 14.3](#) in *SAS Model Manager: User's Guide*.
- 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 14.2

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

For more information, see [What's New in SAS Model Manager 12.3](#) in *SAS Model Manager: User's Guide*.

SAS/OR

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.

See these resources:

- For more information about this release, see [What's New in SAS/OR 15.1](#) in *SAS/OR 15.1 User's Guide: Mathematical Programming*.
- For more information about changes from the previous release, see [SAS/OR](#) in *SAS Guide to Software Updates and Product Changes*.

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 queuing 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 15.1

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.

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 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, RAREVENTS, 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 15.1

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.

See these resources:

- For more information about this release, see [What's New in SAS/STAT 15.1](#).
- For more information about changes from the previous release, see [SAS/STAT in SAS Guide to Software Updates and Product Changes](#).

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 15.1

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.

See these resources:

- For more information about the new features and enhancements in SAS Text Miner 15.1, 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 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 an 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 3.7

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 2.82

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*.

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 2.81

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 8.1 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.

See these resources:

- For more information about this release, see [What's New in SAS Add-In 8.1 for Microsoft Office](#).
- For more information about changes from the previous release, see [SAS Add-In 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 Enterprise Guide

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.

See these resources:

- For more information about this release, see [What's New in SAS Enterprise Guide 8.1](#).
- 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 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. To learn how to use this new feature, see [What's New in Release 8.3](#).

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 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

To learn how to use these features, see [What's New in Release 8.3](#).

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

For more information, see [What's New in Release 8.3](#).

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

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 this release, see [What's New in SAS Web Parts 6.1 for Microsoft SharePoint](#) in the *SAS Web Parts for Microsoft SharePoint: User's Guide*.
- 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

SAS Web Report Studio 4.4 provides enhanced totals and subtotals. It also supports several additional browsers.

- For more information about this release, see [What's New in SAS Web Report Studio 4.4](#) in the *SAS Web Report Studio: User's Guide*.
- For more information about changes from the previous release, see [SAS Web Report Studio](#) in *SAS Guide to Software Updates and Product Changes*.

Chapter 6

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](#).

For a list of SAS support for DataFlux Data Management products, see [SAS Note 51665](#).

DataFlux Authentication Server

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 2.7

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.

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 2.6

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 **dmexec** 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 2.7

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.

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 [SAS Data Management Studio](#)

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 2.7

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 3.3

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](#).

See these resources:

- For more information, see [What's New in SAS Business Data Network 3.3](#).
- 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 3.2

SAS Business Data Network 3.2 shipped in April 2017 and runs on SAS 9.4M4 and higher.

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 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.

See these resources:

- For more information about this release, see [What's New in SAS Data Loader 3.1 for Hadoop](#) in *SAS Data Loader for Hadoop: User's Guide*
- 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 4.904

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

See these resources:

- For more information about this release, see [What's New in SAS Data Integration Studio 4.904](#) in *SAS Data Integration Studio: User's Guide*.
- 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 4.903

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

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](#).

SAS Data Quality Accelerator for Teradata

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.

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 2.4

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.

See these resources:

- For more information, see [What's New in SAS Data Remediation 2.4](#) in *SAS Data Remediation: User's Guide*.
- 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 2.3

SAS Data Remediation 2.3 shipped in April 2017 and runs on SAS 9.4M4 and higher.

For more information, see [What's New in SAS Data Remediation 2.3](#) in *SAS Data Remediation: User's Guide*

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 4.2

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 master 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 3.3

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

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 3.2

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 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.

For more information, see the product documentation for [SAS Quality Knowledge Base \(QKB\)](#).

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 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 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

SAS Customer Intelligence

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SAS Marketing Automation

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

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 6.3

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 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

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 6.3

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 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

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 6.3

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](#) in *SAS Cost and Profitability Management: User's Guide*.

- 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](#) in *SAS Cost and Profitability Management: User's Guide*

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.

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 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

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

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.

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*.

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

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](#).

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:

- As of February 2022, on Windows, Availability data for SAS Web Applications Servers is not reliable. You should use Availability data only as a reference.
- 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 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 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.
- 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.
- The new SAS Backup Manager is available on the **Administration** tab. For more information, see [“Backup Tools” on page 178](#).

See these resources:

- For more information about this release, see [What's New in SAS Environment Manager 2.5](#) in *SAS Environment Manager: User's Guide*.
- 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 2.4

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.

For more information, see [What's New in SAS Environment Manager 2.4](#) in *SAS Environment Manager: User's Guide*.

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.

For more information, see [What's New in SAS Environment Manager 2.3](#) in *SAS Environment Manager: User's Guide*.

SAS 9.4 Intelligence Platform

Security Enhancements

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 a whitelist 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 30](#).

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 33](#).

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.

- In SAS 9.4M5, the version of SAS Web Application Server used in the middle-tier environment has been upgraded. It is now based on Apache Tomcat version 8.5.13.
- 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 9.4M4

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 the use of whitelisting and blacklisting devices.
- 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 [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 the *SAS Intelligence Platform: Installation and Configuration Guide*

- [What's New in Migration for the SAS 9.4 Intelligence Platform](#) in the *SAS Intelligence Platform: Migration Guide*
- [What's New in Application Server Administration for the SAS 9.4 Intelligence Platform](#) in the *SAS Intelligence Platform: Application Server Administration*
- [What's New in System Administration for the SAS 9.4 Intelligence Platform](#) in the *SAS Intelligence Platform: System Administration Guide*
- [What's New in Desktop Application Administration for the SAS 9.4 Intelligence Platform](#) in the *SAS Intelligence Platform: Desktop Application Administration Guide*
- [What's New in Security Administration for the SAS 9.4 Intelligence Platform](#) in the *SAS Intelligence Platform: Security Administration Guide*
- [What's New in Middle-Tier Administration for the SAS 9.4 Intelligence Platform](#) in the *SAS Intelligence Platform: Middle-Tier Administration Guide*
- [What's New in Data Administration for the SAS 9.4 Intelligence Platform](#) in the *SAS Intelligence Platform: Data Administration Guide*
- [What's New in Web Application Administration for the SAS 9.4 Intelligence Platform](#) in the *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

SAS IT Resource Management

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SAS IT Resource Management

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

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 3.9

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 Enterprise GRC 6.1

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.

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 3.2

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 runs on SAS 9.4M2. It 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

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

About SAS Risk and Finance Workbench

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.

The latest release is SAS Risk Dimensions 6.11.

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

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.

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 blacklisting or whitelisting 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. 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 3.4

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Chapter 16

Introduction to SAS Viya

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Highlights of New Features in SAS Viya 3.4

Platform Capabilities

The changes to the platform can be grouped into four categories.

- Usability enhancements include the availability of SAS Drive, several new SAS Visual Analytics objects, and user-written CASL actions.
- This release of SAS Viya is faster and smaller. SAS Viya 3.4 has streamlined services, better performance, and a smaller footprint.
- You can deploy SAS Viya 3.4 on SUSE Linux. You can also use the new Mirror Manager and upgrade in place.
- SAS Viya 3.4 provides more management tools in CAS resource management, SAS Environment Manager, CLIs, and promotion tools.

Integration

- SAS Viya 3.4 adds support for these data connectors: JDBC, MySQL, Spark, and Vertica.
- Integration with the Cloud has been improved with S3 caslibs, the S3 procedure, an enhancement to the Redshift integration, and a Quick Start for Amazon Web Services.
- In security, SAS Viya 3.4 provides LDAP flexibility.
- SAS Viya 3.4 also supports Lineage and includes SAS Studio 5.1, which is written to use microservices.

Analytics

SAS Viya 3.4 includes new features and enhancements in several analytic areas.

- SAS Visual Data Mining and Machine Learning includes several new procedures: GMM, MTLEARN, SEMISUPLEARN, and TSNE. This release also includes Deep Learning actions.
- In SAS Viya Econometrics, these procedures are new: CARIMA, CESM, and ECM.
- SAS Visual Forecasting includes segmentation, modeling, and several enhancements to the user interface.
- SAS Visual Text Analytics includes searching and parsing actions.

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.
A modular set of supporting services	<p>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.</p>
A web application for basic administration	<p>CAS Server Monitor is a web application that you use to monitor your CAS server and to perform some administration tasks.</p>
A web application for enterprise administration	<p>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.</p>

Component	Description
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.
Multiple application programming interfaces	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. For more information, see SAS for Developers .

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	<p>SAS 9 contains these servers:</p> <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 	<p>SAS Viya contains these servers:</p> <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—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

3.4

Here are some of the key administrative features in SAS Viya 3.4:

- A new promotion wizard is available for importing content from SAS 9.x to SAS Viya 3.4 and SAS Viya 3.x to SAS Viya 3.4. For more information, see “Promotion: How to Import (Wizard)” in *SAS Viya Administration: Promotion (Import and Export)*
- SAS Viya now supports additional Cloud Analytic Services (CAS) servers. For more information, see “Add a CAS Server to a New Machine” in *SAS Viya Administration: SAS Cloud Analytic Services*.
- CAS has extended support for resource management through policies for table quotas and CPU utilization. For more information, see “CAS Resource Management (Linux Only)” in *SAS Viya Administration: SAS Cloud Analytic Services*.
- A new license file has been introduced in preparation for future billing enhancements. For more information, see “Licensing: How To” in *SAS Viya Administration: Licensing*
- In SAS Environment Manager, new and enhanced interfaces help you monitor and schedule jobs, view the properties and status of servers, manage improved dashboards, and configure user-defined formats.
- SAS Viya now supports Windows Server.

- SAS Viya now supports running SAS software in a container on Docker and Kubernetes.

See Also

SAS Viya Administration: What's New

Differences from SAS Viya 3.3

If you are upgrading from SAS Viya 3.3, be aware of these changes in SAS Viya 3.4.

- The CAS server option, `cas.ELASTICSSL`, has been deprecated.
- These services have new or deprecated configuration properties for SAS Viya 3.4:
 - Backup service
 - Report Data service
 - Report Package service
 - Report Renderer service

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 got 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**.

SAS Environment Manager

SAS Environment Manager 3.3

Here are some of the new features for SAS Environment Manager 3.3:

- The new **Jobs** page combines the functions of the Job Monitor application and the Scheduling function in SAS Viya 3.3
- The **Data** page incorporates the functions of the Data Explorer application

- The new **Servers** page enables you to view a wide variety of server information, including status, host, port, sessions, CAS configuration properties, nodes, superusers, and loggers and associated thresholds. Superusers can also edit caslib paths and loggers.
- The new **User-Defined Formats** page enables you to display and manage user-defined formats and format libraries
- The **My Credentials** page (named **My Passwords** in SAS Viya 3.3) enables you to manage personal domain credentials
- The **Import Wizard** enables you to promote internal identity groups, base libraries, LASR libraries, LASR tables, folders, reports, explorations, and supporting resources from SAS 9 into SAS Viya (export and preparation outside of SAS Environment Manager is first required). The **Export Wizard** and **Import Wizard** enable you to promote content from a previous version of SAS Viya into SAS Viya 3.4.

See Also

SAS Viya Administration: Using SAS Environment Manager

Differences between SAS Environment Manager for SAS 9.4 and SAS Viya

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

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

SAS Data Preparation

SAS Data Explorer 2.2

SAS Data Explorer replaces SAS Visual Data Builder, a data management tool interface that was included in SAS Visual Analytics 8.1. Social media import features have been

enhanced to support larger sets of data. For more information, see [SAS Data Explorer: User's Guide](#)

SAS Data Studio 2.2

Here are some of the new features in SAS Data Studio 2.2:

- The Match and cluster transform enables you to match columns according to clustering rules and conditions. Then, you can group them in clusters.
- The Analytical Partitioning transform enables you to create a column in the target table that specifies training, validation, and test values randomly in a new field. These values are used to create partitions for validation purposes in SAS Visual Analytics.
- The Unique identifier transform enables you to create a column in the target table that contains a unique value for each row in the table. These unique row identifiers are used in text topics in SAS Visual Analytics.

SAS Lineage Viewer 2.2

SAS Lineage Viewer 2.2 includes these new features and enhancements:

- Data objects are now supported from these connection types: Data Agent, Other (such as MS SQL Server, HDMD, and Hana connections), and Redshift.
- Two new view types, primary relationships and lineage saved diagrams, are supported.

Chapter 18

SAS Cloud Analytic Services

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Enhancements to the CAS Procedure

New CASL Statements

The CASL statements shown in the following table are new.

Table 18.1 New CASL Statements

Statement	Description
CLASS	Declares variables and functions whose values define combinations for analysis.
DEFAULT	Enables the user to configure how CASL processes certain statements.
ENDCLASS	Ends class declaration.
EXIT	Exits the current code stream and returns the value of the application.
FNC	Lists all available functions by name and category with simple descriptions.
GLOBAL	Declares a variable that has global scope.
Labels	Identifies a statement that is referred to by another statement.
PRINTLST	Prints to the list file defined by the application. If the value is a list, the list will transverse and each item will be displayed. If the item is a table, it will be printed to the current output location.

New CASL Functions

The CASL functions shown in the following table are new.

Table 18.2 New CASL Functions

Function	Description
ACTIONSTATUS	Returns a Boolean value if the session is active with an action.
ADDUNIQUE	Adds a value to a list if the value does not already exist within the list.
CANCELACTION	Cancels the action running on the given session.
CANCELACTIONS	Cancels the action running on the given list of sessions.
CLEAR	Clears the given value.
CODETOSTATUS	Converts the action status to a dictionary.
DICTIONARY	Searches for a value in the dictionary.
EXISTS	Searches a dictionary to see whether a key exists.
EXIT	Exits the current code stream with the given status.
MEMORYSTATS	Lists CPU and memory statistics.
GETENV	Returns the environment variable for the given string.
INPUT FORMAT	Converts a string to a value.
is<keyword>	Operates on the CASL variable to determine whether the variable matches the type of the specified function.
MEMORYSTATS	Displays CPU and memory statistics.
LISTPARALLELSESSION	Lists a parallel session.
PUT	Formats a value with given format and returns as a string.
READFILE	Reads and returns the contents of the input file specified in the filename.
SYMDEL	Deletes a macro variable.
SYMPUT	Stores a value in a SAS macro variable.

Function	Description
SYMPUTX	Assigns a value to a macro variable, and removes both leading and trailing blanks.
TIMESTAMP	Returns the current date and time.
UNIQUE	Searches for a value in a list.
UUID	Returns the universally unique identifier (UUID) for the given session.

See Also

SAS Cloud Analytic Services: CASL Reference

Enhancements to SAS Deep Learning

New Deep Learning Action Sets

Note: You must have SAS Visual Data Mining and Machine Learning licensed and installed to use these action sets.

These SAS Deep Learning actions in the deepLearn action set are new:

- The dlJoin action joins the data table and annotation table.
- The dlPrune action prunes a layer in a deep learning model.

In the May 2019 release of SAS Viya 3.4, the rnnExportModel action in the deepRnn action set is new. The rnnExportModel action exports a recurrent neural network model.

SAS Deep Learning Toolkit on SAS Viya 3.4**May 2019 Release**

The SAS Deep Learning toolkit is a growing set of cloud-enabled deep neural networking CAS actions, most recently released with SAS Viya 3.4. The actions are delivered as part of SAS Visual Data Mining and Machine Learning (VDMML) 8.4. The new Deep Learning toolkit includes the Python open-source utility SAS DLPy and supports these key features:

- randomly sampling mini-batches with recordSeed
- transposed convolutions, ShuffleNet with groupwise convolutions, and MobileNet with depth-wise convolution operations
- a shuffle layer that uses a deterministic method to shuffle feature maps
- Faster R-CNN in a two-stage object detection network model
- semantic segmentation with the Segmentation layer
- Autoencoder using dataSpecs options (dataLayer)
- multitask learning with multiple task layers

- ASTORE with FCMP (SAS Function Compiler)
- extracting features using ASTORE models
- multiple source layers for fully connected layers
- ASTORE with text embedding
- using FCMP (SAS Function Compiler) to define a customized Learning Rate policy
- fully connected layers in RNN models
- improved options and performance in the dlTune, dlPrune, LBFGS, and Natural Gradient Descent algorithms
- Gradient Compression for Synchronous Stochastic Gradient Descent on MPP
- improvements on GPU memory and speed for CNN and RNN

December 2018 Release

The SAS Deep Learning toolkit is a new set of cloud-enabled SAS CAS actions released with SAS Viya 3.4. The actions are delivered as part of SAS Visual Data Mining and Machine Learning (VDMML) 8.3. The SAS Deep Learning toolkit supports these key features:

- Volta V100 with tensor cores on GPUs
- TensorRT for inference on the Jetson TX2 box
- CUDA9.1 and cuDNN7.0.5
- LBFGS on GPUs
- RNN on GPUs, using either text or numerical sequences as inputs for regression and classification models
- dropout in recurrent layers
- pruning of CNN models
- BN (Batch Normalization) layers on multiple GPUs (SMP only)
- synchronous optimization mode on MPP with BN on CPU
- multiple GPUs on a single SMP node on GPU
- natural gradients in DNN networks running on SMP with CPUs
- a new dataSpecs option that enables the use of multiple inputs
- improvements to the dlTune algorithm performance
- using FCMP (SAS Function Compiler) to define a new layer
- object detection with YoloV1 and YoloV2
- new layer types: Concatenation, Reshape, Scale, and Keypoints
- GPU-based ASTORE scoring in the SAS CAS environment and in the SAS ESP (Event Stream Processing) application
- GPUs on homogeneous and heterogeneous MPP with synchronized SGD (Stochastic Gradient Descent)

See Also

SAS Visual Data Mining and Machine Learning: Deep Learning Programming Guide

Enhancements to SAS Visual Text Analytics Action Sets

New Actions for SAS Visual Text Analytics Action Sets

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.

- Search Analytics action set
 - The buildTermIndex action creates a term index table for significant terms.
 - The searchJoin action joins two CAS tables.
 - The significantTerms action compares the term distribution from a result set with the term distribution from an index.
- Text Parse action set
 - The tpSpell action checks the output of the tpParse action and refines the parent spelling results for a term.
 - The tpWordVector action applies a word vector model to score documents.
- In the Text Analytics Rule Development action set, the ruleGen action generates LITI concept or fact rules using annotated documents.
- In the Text Topics action set, the tmSplitTopic action splits one topic into two topics.
- In the Text Utilities action set, the tmCooccur action computes a term-by-term co-occurrence matrix.

Document Conversion

The following document conversion functionality is new:

- You can use the loadTable action in the Table action set to load and convert a file into a CAS table. The new DOCUMENT file type enables the loadTable action to read files that use common document file formats, perform document conversion with Apache Tika, and store the documents in an in-memory table. This in-memory table can be used with text analysis actions. For more information, see [Load and Convert Document Files into a CAS Table Using the loadTable Action](#).
- You can use actions in the Table action set to extract text from binary files under a Hadoop directory and store it in a CAS table. For more information, see [Extract Text from Binary Files under a Hadoop Directory and Store It in a CAS Table](#).

Recurrent Neural Network Action Set

In SAS Viya 3.4, you can use the actions that are available in the Recurrent Neural Network action set with a SAS Visual Text Analytics license.

- The rnnScore action scores a table using a recurrent neural network model.

- The rnnTrain action trains a recurrent neural network.

See Also

- [SAS Visual Text Analytics: Programming Guide](#)
- [SAS Visual Analytics: Programming Guide](#)

Enhancements to SAS Visual Data Mining and Machine Learning Action Sets

New Action Sets

These action sets were added in SAS Visual Data Mining and Machine Learning 8.4 (May 2019 release of SAS Viya 3.4):

- The Data Science Pilot action set provides actions for automating data science workflows, including automated feature engineering and automated exploration, execution, and ranking of machine learning pipelines.
- The Explain Model Actions action set provides actions for explaining already trained models.
- The Machine Learning for Sparse Data action set provides actions for sparse data learning.

These actions sets were added in SAS Visual Data Mining and Machine Learning 8.3 (July 2018 release of SAS Viya 3.4):

- The Audio action set provides actions for processing audio data.
- The Generalized Linear Multitask Learning action set implements generalized linear multitask learning and solves multiple related sparse linear regression problems simultaneously.
- The Graph-Based Semisupervised Learning action set provides actions for graph-based semisupervised learning.
- The Language Model action set provides actions that create and apply language models to convert audio data to text transcripts in a speech-to-text system.
- The Machine Learning Tools action set provides utility actions for machine learning.
- The Nonparametric Bayes action set implements nonparametric Bayesian machine learning.
- The t -Distributed Stochastic Neighbor Embedding action set provides actions for the t -distributed stochastic neighbor embedding algorithm.

Enhanced Action Sets

These action sets were enhanced in SAS Visual Data Mining and Machine Learning 8.4 (May 2019 release of SAS Viya 3.4):

- The Autotune action set adds these new actions:

- The modelComposer action runs multiple other tuning actions from the Autotune action set to perform combined algorithm selection and hyperparameter (CASH) tuning by using optimized allocations in multiple rounds.
- The tuneAll action runs multiple other tuning actions from the Autotune action set to perform combined algorithm selection and hyperparameter (CASH) tuning.
- The tuneGraphMultiReg action tunes select parameters of the graphMultiReg action in the Generalized Linear Multitask Learning action set to identify a generalized linear multitask learning model that has reduced average validation errors across all tasks.
- The tuneTsne action tunes select parameters of the tSne action in the t-Distributed Stochastic Neighbor Embedding action set to identify the t-distributed stochastic neighbor embedding with minimum loss (Kullback-Leibler loss with pseudo-BIC penalty).
- The Graph-Based Semisupervised Learning action set adds the new KNN kernel for graph-based semisupervised learning.
- The Language Model action set adds these new actions:
 - The calculateErrorRate action calculates the error rates of characters, words, and sentences by comparing hypothesis and reference transcripts.
 - The textToNgram action converts raw text data to n -gram data.
 - The nGramCount action removes redundant n -grams and merges their counts.
 - The NGramCountToLm action creates a language model from n -gram data.
- The Robust PCA action set has these enhancements:
 - The robustpca action provides methods for anomaly detection.
 - The mwpcas action enables you to track the angle change and the absolute angle of the first principal component.
- The Support Vector Machine action set provides support vector regression (SVR) training.

Enhanced Actions

These actions were enhanced in SAS Visual Data Mining and Machine Learning 8.4 (May 2019 release of SAS Viya 3.4):

- The fastknn action in the Fast k-Nearest Neighbors action set now supports approximate nearest-neighbor search.
- The SVDDTrain action in the Support Vector Data Description action set supports a new fast incremental solver and also provides the new trace criterion method for bandwidth selection.

Enhancements to SAS Visual Forecasting Action Sets

New Actions

The filterDesign action is new in the timeFilters action set. This action designs a digital filter.

Enhancements to SAS Optimization Action Sets

New Actions

These actions were enhanced in SAS Optimization 8.4 (May 2019 release of SAS Viya 3.4):

- The runOptmodel supports the use of the COFOR statement in a single-machine mode (threaded execution). The COFOR statement creates a FOR loop in which solver invocations are executed in parallel with other statements. This action enables solver invocations in multiple loop iterations to execute in parallel, thus shortening the time needed to execute the entire loop.
- The solveMilp action expands its ability to return multiple solutions via the addition of the solType and maxPoolGap parameters to the maxPoolSols parameter. The parameters operate in the same way as their corresponding options in the MILP solver and PROC OPTMILP.

In SAS Optimization 8.3 (initial release of SAS Viya 3.4), the runOptModel action is new in the optimization action set. This action runs OPTMODEL code.

Enhancements to Data Quality Action Sets

New Action Set

The Entity Resolution action set provides actions used in Data Management Entity Resolution.

Enhancements to Actions

The Data Discovery action set has the following enhancements:

- MultiIdentity is a new parameter for the Profile action. This True or False parameter defaults to False. If set to True, then identity analysis tries to find all of the items on the identities list instead of just the first matching item. It assigns a score to any item on the list with a match. The scores for all of the matching items are tallied, and the identity analysis results (metric 1028) reflect this score. The score does not reflect the number of records that were matched.

Note: When the MultiIdentity parameter is on, the resulting score is written to the decSextValue column. When MultiIdentity is not turned on, it is written to the count column.

- QKB is a new parameter for the Profile action. This parameter is used for QKB identity analysis and enables you to override the QKB name option.
- Locale is a new parameter for the Profile action. This parameter is used for QKB identity analysis and enables you to override the default locale that is specified in the data quality options on the CAS server.
- The Identities parameter has three new possible Regex values:
 - Definition specifies that this is a QKB item and that the specified definition will be used to match the data (for example, “Field Content”).
 - Prefix helps distinguish a QKB result from a non-QKB result if there are both QKB and non-QKB identities in use. If QKB identity analysis is being used and the Type parameter is set to *, then the text of this prefix is appended to the result.
 - Score specifies the item’s score if multiIdentity is on and if this is a non-QKB item. Note that QKB items have a score that comes from the QKB itself.
- When QKB identity analysis is being used, the user should use the QKB’s output as the defined type. In this case, the Type parameter should be specified as “*”. If type is not specified as “*”, then the text specified for Type is used as the output.
- If the Pattern parameter is prefixed with “NOT=”, it is considered a match if the pattern does not match. For example, “NOT=^123” means that any string not starting with 123 is considered a match.

See Also

SAS Data Quality: CAS Action Programming Guide

Enhancements to SAS Econometrics Action Sets

New Action Sets for SAS Econometrics

The following action sets are new for SAS Econometrics 8.3 (July 2018 release of SAS Viya 3.4):

- The Economic Capital Modeling action set contains actions for estimating an economic capital model.
- The Univariate Time Series Analysis action set consists of two actions.
 - The arima action analyzes and forecasts univariate time series data or transactional data by using the autoregressive integrated moving average (ARIMA) model. It supports seasonal, subset, and factored ARIMA models and allows for missing values in time series.
 - The esm action generates forecasts by using exponential smoothing models that have optimized smoothing weights for one or more time series.

Enhanced Action Sets

These action sets were enhanced in SAS Econometrics 8.4 (May 2019 release of SAS Viya 3.4):

- These parameters have been added to the `cdm` action set:
 - The new `plotTable` parameter enables you to create a `PlotData` results table that you can use to prepare a graphical summary of the nonparametric estimates of the probability density function, empirical distribution function, and conditional density function of the simulated aggregate loss samples.
 - The new `simulationMode` parameter enables you to simulate different types of aggregate loss models, including pure premium and custom.
 - The new `countDistributions` parameter provides another method of specifying count models.
 - The new `simulatedSymbols` parameter enables you to specify stochastic symbols that follow one of the supported parametric distributions.
 - The new `perturbMode` parameter enables you to control how the perturbed samples are generated and distributed across multiple nodes of the grid.
- The `hmm` action set now supports the regime-switching model in mean-adjusted form, stochastic gradient descent (SGD) optimization algorithm, and the solution for the label switching problem.
- These features have been added to the `panel` action set:
 - `FIXONETIME` and `BTWNT` models
 - Instrumental variables (IV) models including `IVFIXONETIME`, `IVFIXTWO`, `IVG2SLS`, and `IVRANTWO`, each of which can be estimated by either the two-stage least squares method (2SLS) or the two-step GMM estimation method
 - The two-step GMM option for `IVBTWNG`, `IVFIXONE`, `IVPOOLED`, and `IVRANONE` models
 - The `ROBUST` option and the `BIASCORRECTED` option for the IV models
- The `qlim` action set now includes bivariate and multivariate limited dependent variable models, bivariate and multivariate discrete response variable models, and multivariate linear equations models.
- The new `noConstFitStats` parameter enables you to request that the severity action ignore the constant distribution parameters while it computes the likelihood-based fit statistics.
- In the `spatialreg` action sets, impact estimation was added to several model types.
- In the `timedata` action set, the new `nlFormat` parameter enables you to specify the selection of the best international SAS format for the time ID values that are stored in CAS output tables.

Here are the enhancements in SAS Econometrics 8.3 (July 2018 release of SAS Viya 3.4):

- In addition to the two new actions in the Copula Modeling action set, the `groupBy` parameter in the `copulaFit` and `copulaSimulate` actions enables you to group results according to a grouping variable, and the `restore` parameter in the `copulaSimulate` action enables you to simulate a copula defined by the model fitting results that are

preserved in an item store (which is created by using the store parameter in the copulaFit action).

- The hmm action set has the following enhancements:
 - The Gaussian Mixture Hidden Markov model (GM HMM), the regime-switching regression model (RS REG, also known as the regression hidden Markov model or REG HMM), and the regime-switching autoregression model (RS AR, also known as the autoregressive hidden Markov model or AR HMM) are supported.
 - Several models that have different numbers of states or different orders of autoregressive process (or both) can be estimated together in order to help you with the important and difficult task of model selection.
 - The parameter estimates in a data table that is output from a previous estimation can be read back in order to use those parameter estimates as the initial values for a new estimation.
- In the Severity Distribution Modeling action set, a new plotTable parameter is added to specify the information to write to the PlotData results table. You can use this table to prepare plots.
- The Spatial Data Regression Modeling action set adds support for these models: spatial moving average (SMA), spatial Durbin moving average (SDMA), spatial autoregressive moving average (SARMA), spatial Durbin autoregressive moving average (SDARMA), spatial autoregressive confused (SAC), and spatial Durbin autoregressive confused (SDAC).

New Actions

These actions are new for SAS Econometrics:

- The copulaFit action is new for the Copula Modeling action set and estimates the parameters for a particular copula type.
- The copulaViewStore action is new for the Copula Modeling action set. The copulaViewStore action enables you to view the contents of an item store that was created using the store parameter in the copulaFit action.

Enhancements to SAS Visual Analytics Action Sets

New Actions

These actions are new for SAS Visual Analytics 8.3:

- The deleteModelExternal action is new for the Model Publishing and Scoring action set. The deleteModelExternal action deletes a model from an external database.
- The groupByInfo action is new for the Simple Analytics action set. The action groupByInfo enables you to remove duplicate group-by records, and to select group-by groups based on position or frequency. You can then use the results to create group-by tables.
- The actionStatus action is new for the Session action set. The action actionStatus enables you to determine whether an action is currently running in another session.

- The PersonalCaslibs action is new for the accessControl action set. In CAS authorization, the new action, accessControl.accessPersonalCaslibs, enables administrators to see all personal caslibs and to drop promoted tables in any personal caslib.
- The Builtins action set has five new actions that are related to writing user-defined actions:
 - The defineActionSet action adds the user-defined action set. This action can be run from any client, but the programming statements for the user-defined actions are in CASL.
 - The actionSetToTable action stores the user-defined action set as an in-memory table. This action enables you to save the action set as a SASHDAT file.
 - The actionSetFromTable action is used to restore a user-defined action from an in-memory table. This action enables other users to run the user-defined actions in their CAS sessions.
 - The describeActionSet action shows the parameters, including CASL statements, that were run to define the action set.
 - The dropActionSet action drops a user-defined action set or single action.

New Parameters and Functionality for Actions

These enhancements were added in the May 2019 release of SAS Viya 3.4:

- The dataPreprocess.catTrans action has an enhancement to the arguments parameter. The new preprocessRare parameter controls the grouping of rare levels into a single group at the start of the grouping process.
- The dataPreprocess.rustats action has a new quantileSketch parameter and a new seed parameter.
- The dataPreprocess.transform action has three new parameters: misraGries, quantileSketch, and saveState.
- A fieldmatch query using actions in the Search action set now supports ISO dates, integer, and float formats. A rangefilter query now supports ISO dates.
- The 100 KB limit on the size of output text per file has been removed for document conversion.
- New parameters and functionality have been added to these actions in the Model Publishing and Scoring action set:
 - runModel External action
 - The authenticationDomain parameter specifies the authentication domain that is used to retrieve the Teradata database credentials.
 - The platform parameter specifies the platform where the Embedded Process is executed.
 - publishModelExternal action
 - The authenticationDomain parameter specifies the authentication domain that is used to retrieve the Teradata database credentials.
 - The formatItemStore parameter specifies the format item store to be published.

- The storeTables parameter specifies the tables containing the analytic stores to be published.
- publishModel action
 - The formatItemStore parameter specifies the format item store to be published.
 - The storeTables parameter specifies the tables containing the analytic stores to be published.
- The simple.correlation action has a new parameter, casOut. The casOut parameter enables you to send the correlation results directly to a table on the server instead of having the results returned to your client.
- The results of the table.fileInfo action are enhanced to include the file modification time for path-based caslibs. For server-based caslibs, the modTime field is a missing value.
- The table.loadTable action is enhanced to support applying SAS informats when reading from delimited files.
- The builtins.log action has a new parameter, newSessions. The newSessions parameter specifies that the log change should also be sent to new sessions. The SuperUser administrator can indicate whether the server logging level being set is only for the current session (FALSE) or is persistent for future sessions (TRUE).
- The datastep.runCode action now supports the use of the WHERE statement in the DATA step CODE= parameter.
- The fedSql.execDirect action supports explicit SQL pass-through in the SELECT statement FROM clause in SAS Viya 3.4. A CONNECTION TO caslib (native-syntax) argument enables you to specify data from a DBMS catalog in the SELECT statement by using the FedSQL pass-through facility. You can submit SQL syntax that the DBMS understands, even if that syntax is not valid in FedSQL.
- The builtins.log action has a new parameter, newSessions. The newSessions parameter specifies that the log change should also be sent to new sessions. The SuperUser administrator can indicate whether the server logging level being set is only for the current session (FALSE) or is persistent for future sessions (TRUE).

See Also

- [SAS Visual Analytics: Programming Guide](#)
- [SAS Viya: System Programming Guide](#)

Document Conversion

The following document conversion functionality is new:

- You can use the loadTable action in the Table action set to load and convert document files into a CAS table. For more information, see [Load and Convert Document Files into a CAS Table Using the loadTable Action](#).
- You can use actions in the Table action set to extract text from binary files under a Hadoop directory and store it in a CAS table. For more information, see [Extract Text from Binary Files under a Hadoop Directory and Store It in a CAS Table](#).

See Also

- [SAS Viya: System Programming Guide](#)
- [SAS Visual Analytics: Programming Guide](#)

Enhancements to SAS Visual Statistics Action Sets

New Action Sets

- The Independent Component Analysis action set performs independent component analysis.
- The Model-Based Clustering action set performs model-based clustering.
- The Mixed Modeling action set fits linear mixed models.

Enhancements to Actions and Action Sets

In the May 2019 release of SAS Viya 3.4, the mixed action in the mixedmodeling action set was enhanced. You can now specify model repeated measures data by using the repeated parameter to specify the R matrix in the mixed model.

These enhancements were introduced in the July 2018 release of SAS Viya 3.4:

- The logistic action in the Regression action set now produces association statistics by using the association parameter and classification (ROC) tables by using the ctable parameter. Prior predicted probabilities can be specified using the prior parameter, and the posterior probabilities are available in the output data table.
- The genmod and logistic actions in the Regression action set add the centerlasso parameter to center and scale all effects for the LASSO method.
- The Regression action set now includes more actions that you can apply to models stored by the logistic action: the logisticType3 action produces Type 3 tests; the logisticAssociation action displays association statistics and creates classification (ROC) tables; and the logisticCode action produces SAS DATA step code for scoring new data tables.
- The Regression action set also now includes the modelMatrix action, which generates the design matrix corresponding to the model that you specify.
- If you have licensed SAS Visual Data Mining and Machine Learning, then the score action in the Analytic Store Scoring action set can now be used with models that you store in these actions:
 - the gampl action in the Generalized Additive Models action set
 - the glm, genmod, and logistic actions in the Regression action set
- You can also use the ASTORE procedure to describe these stored models and score new CAS tables. PROC ASTORE can also download and upload these stored models, score new SAS data sets, and produce DS2 scoring code.

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*](#).

The July 2018 release of SAS Viya 3.4 has these enhancements:

- In the DS2 procedure, SAS Viya 3.4 adds support for databases that are JDBC compliant and for Spark with PROC DS2. You can access both data sources by assigning either a libref or a caslib. When using a libref, PROC DS2 can read and write to the data sources directly by using a SAS/ACCESS engine. When using a caslib, PROC DS2 loads the data into CAS for processing by the CAS server. The full functionality of the SAS DS2 language is available in both environments, with a few exceptions. For information about processing differences, see *SAS DS2 Programmer's Guide*.

A new option, URI=, can be used to connect to Hive when you are using the NOLIBS and CONN= options. This option specifies connection parameters as a URL, providing an alternative to using the SERVER=, SCHEMA=, PORT=, and PROPERTIES= options. The PROPERTIES= option replaces CONOPTS= for Hive. It is no longer necessary to specify the SUBPROTOCOL= connection option for Hive.

- In the DSTODS2 procedure, the new OUTDIR= argument specifies the output directory name for the file.
- The FEDSQL procedure now includes this functionality:
 - support for Jdatabases that are JDBC compliant and for Spark with PROC FedSQL. You can access both data sources by assigning a libref or a caslib. When using a libref, PROC FEDSQL can create and query data directly by using a SAS/ACCESS engine. When using a caslib, the data is processed in CAS. The SAS FedSQL language supports a subset of the functionality in a CAS library that it does in a SAS library. For information about the FedSQL statements, data types, and table options supported in a SAS library, see *SAS FedSQL Language Reference*. For information about the FedSQL statements, data types, and table options supported in a CAS library, see *SAS Viya: FedSQL Programming for SAS Cloud Analytic Services*.
 - explicit pass-through for SQL-based CAS libraries. For more information about FedSQL explicit pass-through in CAS, see *SAS Viya: FedSQL Programming for SAS Cloud Analytic Services*.
 - A new option, URI=, can be used to connect to Hive when you are using the NOLIBS and CONN= options. This option specifies connection parameters as a URL, providing an alternative to using the SERVER=, SCHEMA=, PORT=, and PROPERTIES= options. The PROPERTIES= option replaces CONOPTS= for Hive. It is no longer necessary to specify the SUBPROTOCOL= connection option for Hive.
- The LUA procedure includes this functionality:
 - The Lua constant Math.Huge is now represented in SAS as the value 1.7976931348623E308. In previous releases, SAS represented this value as nil.

- Support has been added for the following string-manipulation functions. These functions are SAS extensions to the Lua language and can be used only within PROC LUA:
 - STRING.ENDS_WITH
 - STRING.STARTS_WITH
 - STRING.RESOLVE
 - STRING.TRIM
 - STRING.SPLIT
- The S3 procedure includes these enhancements:
 - Additional regions are supported in the configuration file and the REGION= argument. These additional regions are apindia, apseoul, cacentral, cnbeijing, cningxa, eulondon, euparis, and useastoh.
 - The AWSCREDENTIALS= option was added. This option enables you to specify alternative locations for the credentials file.
 - The CREDENTIALSPROFILE= option was added. This option enables you to specify the profile to use in the credentials file.
- The SCOREACCEL procedure includes these new features and enhancements:
 - The DELETEMODEL statement enables you to delete models previously published to CAS, Teradata, and Hadoop.
 - The AUTHDOMAIN option is added to the PUBLISHMODEL, RUNMODEL, and DELETEMODEL statements. This option enables you to specify the name of the authentication domain that contains the credentials that are used to access Teradata.
 - The PUBLISHMODEL statement now supports the FORMATITEMSTOREFILE and STORETABLES options. The FORMATITEMSTOREFILE option enables you to specify the file containing the format item store to be published. The STORETABLES option enables you to specify one or more CAS blob table names that contain the analytic stores to be published.
 - The KEEPLIST option in the PUBLISHMODEL statement enables you to specify whether to include a KEEP statement in the DS2 model program that was automatically generated from an analytic store model.
 - The PLATFORM option in the RUNMODEL statement enables you to specify MAPRED or SPARK as the platform where the Hadoop Embedded Process is to be executed.
 - The CONFIGPATH option in the RUNMODEL statement enables you to specify a folder where the Hadoop and Spark configuration files reside.
- The CONTENTS procedure shows the database and client versions in the output.
- In the DATASETS procedure, the CONTENTS statement shows the database and client versions in the output.

See Also

Base SAS Procedures Guide

Platform Data Sources

Support for Amazon Web Services S3 as a caslib data source for SAS Cloud Analytic Services was added in SAS Viya 3.4. This data source enables you to access SASHDAT files and CSV files in S3. You can use the CASLIB statement or the `table.addCaslib` action to add a caslib for S3.

See Also

SAS Cloud Analytic Services: User's Guide

Session Options

This CAS session option is new in SAS Viya 3.4:

- The `CMPLIB=` session option specifies one or more CMP libraries that contain compiler subroutines to include during program compilation.

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 DELETESOURCE statement now supports two new parameters:

- `DATASOURCEOPTIONS=` parameter specifies the data source options.
- `DELETEOPTIONS=` parameter specifies the settings for deleting a file from a data source.

The LOAD statement now supports two new options:

- `TIMEOUTSECONDS=` option specifies the client inactivity time-out interval in seconds.
- `TRANSCODE_FAIL=` option specifies how the engine handles transcoding errors.

The SAVE statement now supports two new parameters and one new option:

- `EXPOROPTIONS=` parameter specifies the settings for saving a table to a data source.
- `IMPORTDATASOURCEOPTIONS=` parameter enables you to save an in-memory table to the specified data source.
- `EXPORTDATASOURCEOPTIONS=` option specifies an override for the `DATASOURCE=` option for the caslib.

See Also

SAS Cloud Analytic Services: User's Guide

Data Connectors

These data connectors are new in SAS Viya 3.4:

- SAS Data Connector to JDBC
- SAS Data Connector to MySQL
- SAS Data Connector to Spark
- SAS Data Connector to Vertica

These enhancements have been made in SAS Viya 3.4:

- For DBMS-based data connectors, support for the NCHARMULTIPLIER= option was added for use with multi-byte character sets.
- SAS Data Connect Accelerators
 - The BUFFERSIZE= option now supports suffixes that indicate the size of a buffer. The supported suffixes are "B" (bytes), "K" (kilobytes), "M" (megabytes), "G" (gigabytes), and "T" (terabytes). For example, you can set BUFFERSIZE="4G" to indicate that the buffer size is four gigabytes.
 - Support was added for the MAXLOADTHREADS= and MAXSAVETHREADS= options. These options specify the maximum number of threads per worker node when you transfer data.
- SAS Data Connector to Amazon Redshift. These options have been added to support bulk loading: AWSCONFIG=, BLOPTIONS=, BUCKET=, BULKLOAD=, COMPRESS=, DEFAULTDIR=, DELETEDATAFILES=, DELIMITER=, ESCAPE=, KEY=, PROFILE=, REGION=, S3CONFIG=, SECRET=, TOKEN=, and USESSL=.

See Also

SAS Cloud Analytic Services: User's Guide

DS2

The July 2018 release of SAS Viya 3.4 includes these changes and enhancements:

- 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 one in the SAS environment.
- A RETAIN option has been added to the MERGE statement that produces a Cartesian product on a many-to-many match merge that is the same as a DATA step merge.
- DS2 actions and PROC SCOREACCEL arguments delete models from an external data source.

- Use the new option in the RunModel statement of PROC SCOREACCEL and the runModelExternal action to run your scoring model with either MapReduce or the Spark engine.
- DS2 action options and PROC SCOREACCEL arguments provide an analytic store without a DS2 model program as input to the publish model action. The DS2 model program is generated in CAS by the publishModel action.
- The DS2 language supports two new data sources: Spark and databases that are JDBC compliant (such as PostgreSQL).

SAS FedSQL

In SAS Viya 3.4, FedSQL adds two new features:

- The CONNECTION TO **caslib** (**native-syntax**) argument enables you to specify data from a DBMS catalog in the SELECT statement by using the SQL pass-through facility. The CONNECTION TO statement supports an explicit SQL pass-through connection. You can use SQL syntax that the DBMS understands, even if that syntax is not valid in FedSQL.
- SAS Viya 3.4 adds support for FedSQL implicit pass-through for Apache Spark and databases that are JDBC compliant. The FedSQL implicit pass-through facility translates FedSQL query code into equivalent data-source-specific SQL code so that it can be passed directly to the data source for processing.

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SAS Foundation

These language enhancements work only in the SAS Viya 3.4 environment.

Updates from SAS 9.4M6

Starting with the SAS Viya 3.4 (May 2019 release), updates to Base SAS, SAS/ACCESS, SAS/CONNECT, and SAS/GRAPH are now included in the SAS Programming Run-Time Environment. 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.

For more information, see these resources:

- [Chapter 2, “SAS Foundation,” on page 11](#)
- “Programming Run-Time Servers: Overview” in *SAS Viya Administration: Programming Run-Time Servers*

In addition, these updates are available:

- SAS Econometrics includes updates for SAS/ETS 15.1. For more information, see [“SAS/ETS 15.1” on page 80](#).
- SAS IML (on SAS Viya) includes updates for SAS/IML 15.1. For more information, see [“SAS/IML 15.1” on page 92](#).
- SAS Optimization includes updates to SAS/OR 15.1. For more information, see [“SAS/OR 15.1” on page 98](#).
- SAS Visual Statistics includes updates to SAS/STAT 15.1. For more information, see [“SAS/STAT 15.1” on page 103](#).
- SAS/QC (on SAS Viya) includes updates to SAS/QC 15.1. For more information, see [“SAS/QC 15.1” on page 101](#).
- SAS/ACCESS (on SAS Viya) includes any updates to the corresponding SAS/ACCESS software products. For more information, see [“SAS/ACCESS” on page 40](#).

Procedures

- Database and client versions are now shown in the output for PROC CONTENTS and the PROC DATASETS CONTENTS statement.
- PROC LUA has new string-manipulation functions.
- PROC S3 supports additional regions, and alternate locations and profile specifications for the credentials file.
- PROC SCOREACCEL has these enhancements:
 - Models published to CAS, Teradata, and Hadoop can be deleted.
 - You can specify the name of the authentication domain that contains the credentials that are used to access Teradata.
 - You can publish a format item store and one or more CAS blob table names that contain analytic stores.
 - You can specify whether to include a KEEP statement in the DS2 model program that was automatically generated from an analytic store model.
 - MAPRED or SPARK can be specified as the platform where the Hadoop Embedded Process is to be executed.
 - You can specify a folder where the Hadoop and Spark configuration files reside.

SAS Viya Foundation Procedures

When your SAS Viya installation is SAS Visual Analytics and no other SAS Viya products, a limited number of SAS foundation procedures are available. In SAS Viya

3.4, the FTM2ITM, HDMD, and MAPIMPORT procedures have been added as available procedures.

For a complete list of foundation procedures for a SAS Visual Analytics installation only, see [SAS Viya Foundation Procedures](#).

Data Set Options

You can use the WHERE= data set option for input on the CAS server. It is not supported for creating output data sets on the CAS server.

Formats and Informats

UUID (universally unique identifier) can be read in and written using the \$UUIDw. informat and format.

Functions

New functions support hashing message strings and message authentication codes.

You can sort a list of variables using the SORT function or the CALL SORT routine.

Statements

- The FILE and INFILE statements have new options to open specific files or files in a directory-based file such as a ZIP file.
- The LIBNAME statement, JSON Engine now supports a NOALLDATA option. The NOALLDATA LIBNAME option suppresses creation of the ALLDATA data set.

DS2

- PROC DS2 supports Spark and databases that are JDBC compliant.
- You can direct the PROC DSTODS2 output file to a specific directory.
- New methods for the HTTP package 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 one in the SAS environment.
- In-line declarations are new for DO loop counters.
- The RETAIN option for the MERGE statement produces a many-to-many match merge that is the same as a DATA step merge.
- The \$UUIDw. format converts character data to the universally unique identifier (UUID) format.
- The SYSGET function returns the value of a specified operating environment variable.
- It is no longer necessary to specify the SUBPROTOCOL= connection option when you use PROC DS2 to connect to Hive with the NOLIBS and CONN= options.

FedSQL

- PROC FEDSQL supports Spark and databases that are JDBC compliant.

- It is no longer necessary to specify the SUBPROTOCOL= connection option when you use PROC FEDSQL to connect to Hive with the NOLIBS and CONN= options.
- Explicit pass-through for SQL-based CAS libraries is now available.
- The SYSGET function returns the value of the specified operating environment variable.

Logging Facility

Retrieve a message key for an appender or layout combination that is generated in a log event using the K conversion character.

Utility Macros

Use the %TSLIT macro to eliminate double quotation marks around literal text. The macro adds single quotation marks around the input value.

Create and Run Python Objects in SAS

In the May 2019 release of SAS Viya 3.4, you can create and submit Python objects if your site installs one of these products or a later version of these products:

- SAS Event Stream Processing 6.1
- SAS Intelligent Decisioning 5.3
- SAS Model Manager 15.2

SAS/ACCESS Software

New Interfaces

In SAS Viya 3.4 (July 2018), these SAS/ACCESS interfaces are new:

- The SAS/ACCESS Interface to JDBC includes SAS Data Connector to JDBC, which enables you to transfer data between a JDBC data source and the CAS server.
- SAS Data Connector to MySQL enables you to transfer data directly between your MySQL database and the CAS server.
- SAS/ACCESS Interface to Spark is a new interface released in limited availability as part of the SAS/ACCESS Interface to Hadoop. Contact a SAS representative for access to the Spark interface. The Spark interface includes SAS Data Connector to Spark, which enables you to transfer data between a Spark database and the CAS server.
- SAS Data Connector to Vertica enables you to transfer data directly between your Vertica database and the CAS server.

SAS/ACCESS Interface to Amazon Redshift

In SAS Viya 3.4 (July 2018), support was added for these options:

- BL_AWS_CONFIG_FILE= and BL_AWS_PROFILE_NAME= data set options
- COMPLETE= connection option
- CURSOR_TYPE= LIBNAME option and data set option
- DBNULLKEYS= LIBNAME option and data set option
- INSERT_SQL= LIBNAME option
- KEYSIZE= LIBNAME option and data set option
- PROMPT= and NOPROMPT= connection options
- QUALIFER= LIBNAME option

Also in SAS Viya 3.4, these options changed:

- The default value for the AUTOCOMMIT= LIBNAME option is YES.
- The default value for the DBCLIENT_MAX_BYTES= LIBNAME option is defined as the longest-byte character for the SAS session encoding.
- There is no default value for the DBSERVER_MAX_BYTES= LIBNAME option.
- The default value for the INSERTBUFF= LIBNAME option is 1.
- The default value for the PRESERVE_COL_NAMES= and PRESERVE_TAB_NAMES= LIBNAME options is NO.
- There is no default value for the SCHEMA= LIBNAME option.
- The UPDATE_MULT_ROWS= LIBNAME option is not supported.

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

SAS/ACCESS Interface to DB2 under UNIX and PC Hosts

In SAS Viya 3.4, these changes were made:

- The default value for the AUTOCOMMIT= LIBNAME option is NO.
- There is no default value for the CURSOR_TYPE= LIBNAME option.
- The default value for the DBINDEX= LIBNAME option is NO.
- There is no default value for the DBSERVER_MAX_BYTES= LIBNAME option.
- The default value for the DBSLICEPARAM= LIBNAME option is NONE.
- The default value for the PRESERVE_COL_NAMES= and PRESERVE_TAB_NAMES= LIBNAME options is YES.

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

SAS/ACCESS Interface to Greenplum

In SAS Viya 3.4, these changes and enhancements were made:

- Support was added for the BULKLOAD= LIBNAME option.

- The default value for the DBINDEX= LIBNAME option is NO.
- The default value for the DBSLICEPARAM= LIBNAME option is NONE.
- Support was added for the KEYSET_SIZE= data set option.
- The default value for the PRESERVE_COL_NAMES= LIBNAME option is YES.
- Support was added for the READ_ISOLATION_LEVEL= and UPDATE_ISOLATION_LEVEL= data set options.

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

SAS/ACCESS Interface to Hadoop

In SAS Viya 3.4, support was added for these LIBNAME options:

- DBCONTERM= option
- DBLIBINIT= option
- DBLIBTERM= option
- QUERY_TIMEOUT= option
- SQL_FUNCTIONS_COPY= option

Support was also added for the QUERY_TIMEOUT= data set option.

The default value for the DBMAX_TEXT= LIBNAME option is **1024**.

SAS/ACCESS Interface to HAWQ

SAS Viya 3.4 added support for these options:

- BULKLOAD= and LOGIN_TIMEOUT= LIBNAME options
- KEYSET_SIZE=, READ_ISOLATION_LEVEL=, and UPDATE_ISOLATION_LEVEL= data set options

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

SAS/ACCESS Interface to Impala

In SAS Viya 3.4, support was added for these options:

- DBCLIENT_MAX_BYTES= LIBNAME option
- DBCOMMIT= LIBNAME option and data set option
- DBSERVER_MAX_BYTES= LIBNAME option
- DELETE_MULT_ROWS= LIBNAME option
- PRESERVE_COL_NAMES= LIBNAME option and data set option
- UPDATE_MULT_ROWS= LIBNAME option

[SAS/ACCESS Interface to Impala](#) in *SAS/ACCESS for Relational Databases: Reference*.

SAS/ACCESS Interface to Microsoft SQL Server

In SAS Viya 3.4, support was added for these options:

- DATETIME2= LIBNAME option and data set option
- LOGIN_TIMEOUT= LIBNAME option
- SQL_FUNCTIONS= and SQL_FUNCTIONS_COPY= LIBNAME options
- WARN_BIGINT= LIBNAME option

In SAS Viya 3.4, these changes were made:

- The default value for the AUTOCOMMIT= LIBNAME option is NO.
- The default value for the DBINDEX= LIBNAME option is NO.
- The default value for the DBSLICEPARAM= LIBNAME option and data set option is NONE.

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

SAS/ACCESS Interface to MySQL

In SAS Viya 3.4, support was added for the SAS Data Connector to MySQL. The data connector enables you to transfer large amounts of data between your MySQL database and the CAS server.

In addition, support was added for these LIBNAME options:

- BULKLOAD= option
- DBCLIENT_MAX_BYTES= option
- SCHEMA= option

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

SAS/ACCESS Interface to Netezza

Here are the changes in SAS Viya 3.4:

- The default value for the DBINDEX= LIBNAME option is NO.
- The DELETE_MULT_ROWS= and UPDATE_MULT_ROWS= LIBNAME options are not supported.
- The default value for the PRESERVE_TAB_NAMES= LIBNAME option is NO.
- The USE_ODBC_CL=LIBNAME option is not supported.

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

SAS/ACCESS Interface to ODBC

In SAS Viya 3.4, support was added for these LIBNAME options:

- DBSASLABEL= option
- PRESERVE_USER= option
- WARN_BIGINT= option

In addition, the DBIDIRECTEXEC= system option is not supported.

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

SAS/ACCESS Interface to PostgreSQL

In SAS Viya 3.4, support was added for these options:

- COMPLETE= connection option
- CURSOR_TYPE= LIBNAME option and data set option
- KEYSIZE= LIBNAME option and data set option
- PROMPT= and NOPROMPT= connection options
- QUALIFIER= LIBNAME option
- SSLMODE= LIBNAME option

In SAS Viya 3.4, these options are not supported:

- BL_DEFAULT_DIR= LIBNAME option (The BL_DEFAULT_DIR= data set option is supported.)
- UPDATE_MULT_ROWS= LIBNAME option

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

SAS/ACCESS Interface to Vertica

In SAS Viya 3.4, support was added for the SAS Data Connector to Vertica. The data connector enables you to transfer large amounts of data between your Vertica database and the CAS server.

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

SAS Decision Manager 5.2

SAS Decision Manager 5.2 runs in SAS Viya 3.4. Here are the new features and enhancements:

- use data grid variables in rules
- add and edit custom DS2 code files in decisions
- add analytic store models to decisions and publish the decisions to SAS Cloud Analytic Services (CAS), Apache Hadoop, SAS Micro Analytic Service, and Teradata
- specify that published rule sets and decisions generate rule-fired tracking data or decision-path tracking data
- validate published content inside the publishing destination
- view the publishing history of rule sets and decisions
- manage SAS Decision Manager content by using SAS Drive
- explore relationships between rule sets, decisions, code files, and other objects by using SAS Lineage

- develop SAS code with SAS Studio
- configure publishing destinations by using SAS Environment Manager

SAS Drive

About SAS Drive

SAS Drive is a hub for the SAS Viya applications, and enables you to easily view, organize, and share your content from one place. The availability of the features in SAS Drive depends on the applications that have been installed, and the features and permissions that have been specified by your administrator.

Note: SAS Drive replaces SAS Home.

SAS Drive 2.1

SAS Drive 2.1 (August 2019) runs on SAS Viya 3.4. Here are some of the high-level changes in this release:

- The information pane has been redesigned to improve usability.
- You can create custom tabs.
- You can preview PDF documents.
- You can add recommended items to the **Quick Access** bar.

For more information, see [What's New in SAS Drive 2.1](#).

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 8.4

SAS Econometrics 8.4 (May 2019) runs in SAS Viya 3.4. This release includes the following changes and enhancements:

- The CARIMA procedure now produces three additional ODS tables: parameter estimates of fitted models are displayed in the "Parameter Estimate" table, the multistep-ahead variable forecasts are shown in the "Forecasts" table, and the name of the modeled variable is printed in the "Variable Info" table.

- The CCDM procedure
 - The new PLOTS= option enables you to request graphical output of the nonparametric estimates of the probability density function, empirical distribution function, and conditional density function of the simulated aggregate loss samples. Several suboptions of the PLOTS= option provide control over how PROC CCDM prepares and displays the plots.

Because the graphical output can require a significant amount of data to be transferred back from the grid to the client machine, when you request simulation of very large aggregate loss samples, PROC CCDM prepares the graphical output by using a small, representative subsample of the full sample. Therefore, it provides only an approximate graphical summary at best. For a more accurate graphical display, it is recommended that you specify the PLOTS= option only for small to moderate sample sizes.
 - The new SIMULATIONMODE= option enables you to simulate different types of aggregate loss models, including pure premium and custom. The default type is the collective risk model, which earlier versions of PROC CCDM supported.
 - The new COUNTMODEL statement provides another method of specifying count models. The earlier methods of specifying a count model by using the COUNTSTORE= option and EXTERNALCOUNTS statement are still available and take precedence over the new COUNTMODEL statement. However, the new COUNTMODEL statement is useful if you estimate one of the supported parametric count models externally and you want to specify those parameter estimates and their associated standard errors. You can especially use this new method in conjunction with the new SIMULATIONMODE=PUREPREMIUM option to specify continuous count distributions that represent an average frequency per exposure.
 - The new SIMULATEDSYMBOL statement enables you to specify stochastic symbols that follow one of the supported parametric distributions. This statement is for use with the ADJUSTEDSEVERITY= option to compute an adjusted aggregate loss that depends on the stochastic symbols that you want PROC CCDM to simulate.
 - The new PERTURBMODE= option enables you to control how the perturbed samples are generated and distributed across multiple nodes of the grid.
- The CPANEL procedure has these new features:
 - FIXONETIME and BTWNT models
 - Instrumental variables (IV) models, including IVFIXONETIME, IVFIXTWO, IVG2SLS, and IVRANTWO, each of which can be estimated by either the two-stage least squares method (2SLS) or the two-step GMM estimation method. The two-step GMM, also called the optimal GMM, uses the optimal weighting matrix to obtain the estimator so that it has the smallest asymptotic variance.
 - The two-step GMM option for IVBTWNG, IVFIXONE, IVPOOLED, and IVRANONE models.
 - The ROBUST option and the BIASCORRECTED option for the IV models. The ROBUST option provides an estimated covariance matrix that is robust to the presence of heteroscedasticity. The BIASCORRECTED option corrects the bias for the robust two-step GMM variance estimators in small sample sizes.
- The CQLIM procedure now includes bivariate and multivariate limited dependent variable models, bivariate and multivariate discrete response variable models, and multivariate linear equations models. You can estimate multivariate models by specifying a MODEL statement for each response variable. The CQLIM procedure

estimates all the models jointly as one model by using the maximum likelihood estimation method. For models that do not have a closed-form likelihood function, a Monte Carlo integration method is used to approximate the multivariate normal integral in the likelihood function.

You can use multiple MODEL statements to estimate these models:

- bivariate probit models
- multivariate probit models
- bivariate ordered choice models
- multivariate ordered choice models
- bivariate Tobit models
- multivariate censored regression models
- bivariate and multivariate truncated regression models
- multivariate linear regression models
- The CSPATIALREG procedure now supports impact estimation, which enables you to summarize the average direct impacts, the average indirect impacts, and the average total impacts from changes in an explanatory variable of your model. This feature is supported for these models:
 - linear model
 - linear model with spatial lag of X (SLX) effects
 - spatial autoregressive (SAR) model
 - spatial Durbin model (SDM)
 - spatial error model (SEM)
 - spatial Durbin error model (SDEM)
 - spatial moving average (SMA) model
 - spatial Durbin moving average (SDMA) model
 - spatial autoregressive moving average (SARMA) model
 - spatial Durbin autoregressive moving average (SDARMA) model
 - spatial autoregressive confused (SAC) model
 - spatial Durbin autoregressive confused (SDAC) model
- The HMM procedure
 - The regime-switching autoregression model in mean-adjusted form is supported.
 - The stochastic gradient descent (SGD) optimization algorithm is supported.
 - A solution for the label switching problem is supported.
 - The covariance matrix of parameter estimates can be output to a specified data table.
 - The standard errors and covariance matrix of forecasts of dependent variables can be output to a specified data table.
- The SEVSELECT procedure
 - The new PLOTS=CONDITIONALPDF and PLOTS=CONDITIONALPDFPERDIST options enable you to request

comparative and per-distribution conditional probability density function plots, respectively.

- The PRINT= option now enables you to display the parameter covariance table (PRINT=COVB) and the parameter correlation table (PRINT=CORRB). The new SYMMETRIC= global print option enables you to control the shape and contents of the covariance and correlation tables.
- A new NOCONSTFITSTATS option enables you to request that PROC SEVSELECT ignore the constant distribution parameters while it computes the likelihood-based fit statistics.
- The TSMODEL procedure
 - The new DISTRIBUTE= option in the ID statement enables you to specify the method that is used to distribute the input time series observations in the input tables across the nodes in the CAS session.
 - The new NLFORMAT= option in the ID statement enables the selection of the best international SAS format for the time ID values that are stored in CAS output tables.
- The time series model (TSM) package for the TSMODEL procedure adds the new CFC object. This new object enables you to create optimized combinations of time series model forecasts. The performance of combined model forecasts tends to improve over that of individual models.

For information about the new and enhanced action sets in SAS Econometrics, see [“Enhancements to SAS Econometrics Action Sets” on page 232](#).

For more information, see these resources on the product documentation page for [SAS Econometrics](#):

- [SAS Econometrics 8.4: Programming Guide](#)
- [SAS Econometrics 8.4: Econometrics Procedures](#)

SAS Econometrics 8.3

SAS Econometrics 8.3 (July 2018) runs in SAS Viya 3.4. These procedures have been added to SAS Econometrics software:

- The CARIMA procedure analyzes and forecasts equally spaced univariate time series data, by using the autoregressive integrated moving average (ARIMA) or autoregressive moving average (ARMA) model.
- The CESM procedure generates forecasts by using exponential smoothing models with optimized smoothing weights for one or more time series.
- The ECM procedure develops an economic capital model.

In addition, the time series utility package has been added for the TSMODEL procedure. The UTL package provides a means for performing basic statistical computations on pairs of actual and predicted time series.

New features have been added to these SAS Econometrics procedures:

- The CCOPULA procedure has these enhancements:
 - The BY statement specifies groups for which separate copula fitting analyses or simulations are performed.
 - The FIT statement estimates the parameters for a particular copula type.

- The RESTORE= option in the SIMULATE statement enables you to simulate a copula defined by the model fitting results that are preserved in an item store. You create the item store by using the STORE= option in the FIT statement.
- The VIEWSTORE statement enables you to view the contents of an item store that was created using the STORE= option in the FIT statement.
- The CSPATIALREG procedure supports the following additional models: spatial moving average (SMA), spatial Durbin moving average (SDMA), spatial autoregressive moving average (SARMA), spatial Durbin autoregressive moving average (SDARMA), spatial autoregressive confused (SAC), and spatial Durbin autoregressive confused (SDAC).
- The HMM procedure has these enhancements:
 - The Gaussian mixture hidden Markov model (GM HMM), the regime-switching regression model (RSREG, also known as the regression hidden Markov model or REG HMM), and the regime-switching autoregression model (RS AR, also known as the autoregressive hidden Markov model or AR HMM) are supported.
 - Several models that have different numbers of states or different orders of autoregressive process (or both) can be estimated together in order to help you with the important and difficult task of model selection.
 - The parameter estimates in a data table that is generated from previous estimation can be read back in order to use those parameter estimates as the initial values for a new estimation.
- The SEVSELECT procedure has these enhancements:
 - The new PLOTS= option in the PROC SEVSELECT statement helps you generate different types of plots to visually diagnose and compare how models that are based on different distributions fit the data.
 - The new PLOTS= option in the SELECTION statement helps you graphically view the progress of the regression effect selection process.

SAS Intelligent Decisioning 5.3

In May 2019, SAS Decision Manager on SAS Viya was renamed SAS Intelligent Decisioning. (On SAS 9.4, the name remains SAS Decision Manager.)

SAS Intelligent Decisioning 5.3 runs on SAS Viya 3.4 and includes several features designed to support inbound marketing campaigns.

New features and enhancements enable you to perform these tasks:

- use treatments and treatment groups to define offers that can be presented to customers
- use Record Contact nodes to record audit information and information about the treatments that are returned by a decision
- create filtering rule sets to control which records are processed by a decision and to specify who is eligible for specific treatments
- save rule set test results and model test results in folders
- add custom Python code and SQL queries to decisions
- score a rule set or a model against a data grid

- add a decision flow as a node in another decision flow
- define column metadata for a data grid
- view the values of data grid variables in test results as a table and as a formatted JSON string in addition to the raw data view
- use the %DCM_DATAGRID_INTERFACE and %DCM_DATAGRID_IMPL macros to enable the use of data grids in SAS Studio
- use macros to execute rule sets and decisions, to run rule-fired and path-tracking analyses, to retrieve subject contact history records, to retrieve specific versions of rule sets and decisions, and to update variable data types in rule sets
- export and import rule sets through the user interface
- specify a debugging variable in rule set tests and decision tests
- retrieve values in a lookup table by using literal key values
- specify an initial value for variables
- author expressions that use LOOKUP and LOOKUPVALUE functions without invoking a separate editor

For more information about this release, see [What's New in SAS Intelligent Decisioning 5.3](#).

SAS Model Manager 15.2

SAS Model Manager 15.2 has new features and enhancements that enable you to perform these tasks:

- configure publishing destinations in SAS Environment Manager
- monitor performance of models within the user interface
- publish analytic store models to SAS Micro Analytic Service
- score Python models
- validate models within a publishing destination

Note: The name of the **Tests** tab of a project has changed to **Scoring**, and the **Workflow** tab of a project now appears only for users who are members of the Application Administrators group when workflow definitions are available.

Enhancements support integration with other SAS products and solutions, enabling you to perform these tasks:

- access model and project objects from SAS Drive
- explore relationships for model and project objects using SAS Lineage
- publish and execute models using the SAS Micro Analytic Service
- register and manage SAS Visual Text Analytics models
- register and manage SAS Visual Statistics models

The May 2019 release of SAS Viya 3.4 contains the following updates to the Model Repository service:

- The name of the default repository for new installations has changed from **Repository 1** to **Public**.

- Authorization rule permissions for Model Repository endpoints and initial authorization for repository folders have changed.

For more information, see [What's New in SAS Model Manager 15.2](#).

SAS Optimization

About SAS Optimization

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

SAS Optimization requires SAS Visual Analytics.

SAS Optimization 8.4

SAS Optimization 8.4 (May 2019 release of SAS Viya 3.4) provides improvements to its mathematical optimization procedures, solvers, and CAS actions, including the following enhancements:

- The LP and MILP solvers and the DECOMP algorithm add performance improvements.
- The MILP solver, the OPTMILP procedure, and the `solveMILP` action add the ability to report up to the k best integer feasible solutions or up to k optimal solutions.
- The MILP solver adds root node solution options and improvements in cut management.
- The NLP solver adds a primal-dual interior point algorithm on an experimental basis.
- The `runOptmodel` action supports the COFOR statement (in the PROC OPTMODEL code that it executes) in single-machine mode.
- The OPTNETWORK procedure and associated optNetwork action set include several new features and enhancements.
 - The MULTILINKS= option enables you to handle multigraphs directly.
 - The STANDARDIZEDLABELSOUT option enables you to produce a data table in standardized label format.
 - The DETERMINISTIC= option enables you to enable the nondeterministic operating mode.
 - The biconnected components algorithm and the connected components algorithm can now produce a component size summary table when you specify the OUT= option.
 - Clique enumeration now takes advantage of multicore technology.
 - The shortest path algorithm can now produce a summary table for each source node when you specify the OUTSUMMARY= option.
 - Summary calculations can now be restricted to use only finite paths when you specify the FINITEPATH= option.

For more information, see [“Enhancements to SAS Optimization Action Sets”](#) on page 231.

For more information, see these resources on the product documentation page for [SAS Optimization](#):

- [SAS Optimization 8.4: Mathematical Optimization Programming Guide](#)
- [SAS Optimization 8.4: Network Optimization Programming Guide](#)
- [SAS Optimization 8.4: Mathematical Optimization Procedures](#)
- [SAS Optimization 8.4: Network Optimization Procedures](#)

SAS Optimization 8.3

SAS Optimization 8.3 (July 2018) runs in SAS Viya 3.4. This release includes improvements to its procedures, optimization solvers, and CAS actions, including these enhancements:

- The LP, MILP, QP, NLP, and CLP solvers and the DECOMP algorithm add performance and stability improvements.
- The LP and MILP solvers significantly reduce their memory consumption.
- The DECOMP algorithm adds the COMMUNITY value to the METHOD= option.
- The CLP solver adds the CUMULATIVE predicate, and PROC CLP adds the CUMULATIVE statement.
- PROC OPTMILP adds the ability to return multiple solutions via the MAXPOOLSOLS= option.
- The new `runOptmodel` action permits PROC OPTMODEL code to run on the CAS server.
- The `solveMilp` action adds the ability to return multiple solutions.

SAS Quality Knowledge Base for Contact Information

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.

For more information, see the product documentation for [SAS Quality Knowledge Base \(QKB\)](#).

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 Report Viewer 8.3

SAS Report Viewer 8.3 includes these new features and enhancements:

- Your viewer state is maintained across sessions. When you reopen a report, SAS Report Viewer restores the report to the state that you left it in during your previous session. This includes your page selection, prompt values, hierarchy drill states, and other elements of your viewer state.
- New pop-up menus enable you to access all of the actions in the viewer with a right-click.
- Sorting the data in tables, crosstabs, and graphs is now easier by using pop-up menus.
- Automatic report playback displays the pages of your report as a slideshow. This is especially useful for kiosk displays and other settings where the audience cannot navigate the report interactively.
- You can hide object overlays such as toolbars.
- Reports and objects periodically refresh their data (every five minutes, for example) if they have been configured to do so by the report author.
- You can display summary text for reports. (September 2018 update)

For more information, see [What's New in SAS Report Viewer 8.3](#).

SAS Scalable Performance Data Server

Beginning with SAS Viya 3.4, the SPD Server SAS client is included in SAS Viya. Availability of the client in SAS Viya enables server users to access their existing servers from SAS Viya applications. SAS Viya applications can access version 5.4, 5.3, 5.2, and 5.1 servers. You can perform the same tasks in SAS Viya as you can in the SAS 9.4 environment. The functionality available depends on the release of SAS Scalable Performance Data Server. For example, use of PROC DS2 and PROC FEDSQL as well as secure client/server communication is supported only in 5.3 and 5.4. Server data cannot be accessed with the CAS server.

Server clients that run on a UNIX computer have slightly different configuration requirements to connect to a secure server from SAS Viya.

SAS Studio 5.1 and 4.4

New Features and Enhancements

For SAS Viya 3.4, there are two releases of SAS Studio.

SAS Studio 5.1 is available in the full visual deployment. The new HTML5 interface integrates with other SAS applications and is available as part of SAS Drive. SAS Studio 5.1 also uses microservices and has common authentication with other SAS applications. With SAS Studio 5.1, you access files from SAS content rather than the file system. Improvements to the user interface include support for the Microsoft Edge browser.

For more information, see [What's New in SAS Studio 5.1](#).

SAS Studio 4.4 is available in the full visual deployment and the programming-only deployment. The Dojo interface is IOM based. With SAS Studio 4.4, you access files using the file system and there is no access to SAS content. The functionality in SAS Studio 4.4 is equivalent to SAS Studio 4.3.

Differences between SAS Studio in SAS 9.4 and SAS Viya

SAS Studio 3.71 runs in the SAS 9.4 environment and is the most full featured release of SAS Studio.

If you are a current SAS Studio user, here are some differences between SAS Studio 3.71 (which runs on SAS 9.4) and SAS Studio 5.1 and 4.4 (which run in SAS Viya):

- Only the SAS Programming perspective is available in SAS Studio 5.1 and 4.4. The Visual Programmer perspective is not available.
- The lists of tasks and snippets differ.

In addition, SAS Studio 5.1 and 4.4 do not support this functionality:

- process flows
- the query tool
- the import tool
- SAS Studio repositories
- the ability to export tables
- the ODS Graphics Designer and the ODS Graphics Editor
- FTP shortcuts
- extended attributes in the SAS Table Properties and Column Properties windows

SAS Visual Analytics

SAS Visual Analytics 8.4

- The user interface has been enhanced. For example, the features in SAS Report Viewer are now fully integrated into the SAS Visual Analytics user interface. This enhancement enables users to move between editing and viewing reports without switching applications.
- There is a new side pane called **Suggestions**, which provides you with suggested objects for your report after you have selected a data source.
- Existing objects have been improved. For example, the **Automated analysis** object has been redesigned and renamed **Automated explanation**, crosstabs have new options for disabling horizontal and vertical lines, and list tables have a new option that lets you freeze a column.
- You can now enable users who are viewing your reports to customize their view of the report. The **Viewer Customization** report option controls the level of customization that is permitted.
- Usability and performance have been improved. For example, reports and report prompt values are loaded more quickly.
- There are new settings. For example, you can specify that you want to override the report theme and use the SAS High Contrast report theme for all of your reports.
- Accessibility has been enhanced. For example, there is keyboard support for moving objects and there is a new Keyboard Shortcuts window.

For more information, see [What's New in SAS Visual Analytics 8.4](#).

SAS Visual Analytics 8.3

This list highlights some of the new features in SAS Visual Analytics 8.3:

- The user interface has many new enhancements, including many updated panes. For example, the **Actions** pane has been redesigned to make it easier to add or modify actions.
- 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 geographic maps and for network analysis objects that display a map background. For example, you can identify points on the map and draw routes between two points.
- The **Data** pane has new features. For example, you can join data sources, create aggregated data sources, and create data views.
- There are new and enhanced calculations with new periodic intervals and a new AggregateTable operator.
- Accessibility has been enhanced. SAS Visual Analytics is now accessible via the keyboard and some graphs have integration with SAS Graphics Accelerator. (September 2018 update)

For more information, see [What's New in SAS Visual Analytics 8.3](#).

Differences between SAS Visual Analytics in SAS 9.4 and SAS Viya

SAS Visual Analytics enables users to design reports for SAS Viya. It also provides the primary user interface for SAS Visual Statistics and SAS Visual Data Mining and Machine Learning for sites that have licensed these products.

Here are some differences between SAS Visual Analytics 7.4 (which runs on SAS 9.4) and SAS Visual Analytics 8.3 (which runs in SAS Viya 3.4):

- SAS Visual Analytics 7.4 and earlier releases use the SAS LASR Analytic Server. SAS Visual Analytics 8.3 uses SAS Cloud Analytic Services (CAS), which is a server that provides the cloud-based run-time environment for data management and analytics with SAS.
- The SAS Visual Analytics Explorer and SAS Visual Analytics Designer interfaces have been combined into a single user interface, which contains many of the features that were available in SAS Visual Analytics 7.4 and earlier releases.
- Tasks that were accomplished in the explorer are available in a new maximize mode, which enables you to explore your data and create analytical models.
- The undo and redo feature that was available only in the explorer is now available for all reports and report objects.
- SAS Visual Analytics Viewer is now SAS Report Viewer.
- SAS Visual Data Builder has been replaced by two products. The import features are part of SAS Data Explorer and the transform features are part of SAS Data Studio.
- SAS Mobile BI is now 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.

Stored processes are not available in the SAS Visual Analytics 8.3 release.

SAS Visual Statistics

SAS Visual Statistics requires SAS Visual Analytics.

SAS Visual Statistics 8.4

SAS Visual Statistics 8.4 (May 2019 release of SAS Viya 3.4) includes these new features and enhancements:

- In the BINNING procedure, the new OUTLEVELBINMAP= option in the OUTPUT statement creates an output bin mapping data set for tree-based binning of class inputs.
- The FREQTAB procedure
 - The SENSPEC option in the TABLES statement provides estimates and confidence limits for sensitivity, specificity, positive predictive value, and negative predictive value.
 - The COMMONRISKDIFF(CL=KLINGENBERG) option provides Klingenberg confidence limits for the common risk difference. The COMMON= option for the risk difference plot specifies the confidence limit type for the common value.

Available confidence limit types include Mantel-Haenszel, minimum risk, summary score, Newcombe, Newcombe with minimum risk weights, and Klingenberg. The COMMONRISKDIFF(PRINTWTS=SCORE) option includes the summary score weights in the “Stratum Risk Differences and Weights” table.

- The CMH(I2) option provides Higgins’s I-square measure of heterogeneity for odds ratios in multiway 2x2 tables.
- In the LMIXED procedure, the new REPEATED statement enables you to model repeated measures data by specifying the R matrix in the mixed model.
- In the PCA procedure, the new PLOTS=PATTERN option in the PROC PCA statement produces pairwise component pattern plots to visualize the correlations between variables and components.

For more information about the action and actions sets in SAS Visual Statistics, see [“Enhancements to SAS Visual Statistics Action Sets” on page 237](#).

SAS Visual Statistics 8.3

Here are some of the new features and enhancements in the user interface for SAS Visual Statistics 8.3:

- If you select a subset of variables in an object’s visualization, you can create a new object using only those variables.
- Support for multiple partition data items has been added.
- Variable selection results can be displayed on modeling objects.
- The decision tree pruning algorithm has been enhanced.
- The Bayesian Network object has been added.
- SAS Visual Statistics and SAS Visual Data Mining and Machine Learning models can be inserted directly into an existing Model Studio project.
- Additional enhancements have been made to the connections between SAS Visual Statistics and SAS Visual Data Mining and Machine Learning and Model Studio.

For more information, see [What’s New in SAS Visual Statistics 8.3](#).

Here are the programming enhancements for this release:

- Four new procedures
 - The ICA procedure performs independent component analysis, extracting from the data factors that are as statistically independent from each other as possible.
 - The LMIXED procedure fits linear mixed models and enables you to use these fitted models to make statistical inferences.
 - The MBC procedure performs model-based clustering by fitting mixtures of multivariate Gaussian distributions to achieve unsupervised clustering of data.
 - The MODELMATRIX procedure creates a design matrix (a matrix of covariates) that is associated with a MODEL statement and data table that you specify.
- The BINNING procedure
 - The syntax of cutpoint binning has been enhanced and is now more flexible.
 - The BINMISSING=, MISSINGBINSTATS=, and MISSINGEVALNONEVENT= options have been added to provide the ability to handle missing values.

- The GENSELECT procedure adds the CENTERLASSO option to center and scale all effects for the LASSO method.
- The LOGSELECT procedure
 - The LOGSELECT procedure now produces association statistics by using the ASSOCIATION option and classification (ROC) tables by using the CTABLE option.
 - Prior predicted probabilities can be specified using the PRIOR= option, and the posterior probabilities are available in the output data table.
 - The CENTERLASSO option is added to center and scale all effects for the LASSO method.
- In the PARTITION procedure, the new KFOLD= option creates a fold indicator that represents k equal-size folds that can be used for k -fold cross validation.
- The SPC procedure
 - The new LIMITS= option enables you to read and apply control limits from an input data table.
 - The new SPECS= option enables you to read specification limits from an input data table and compute process capability indices.
 - The new CIINDICES option enables you to compute confidence limits for process capability indices.
- The TREESPLIT procedure
 - The new CLUSTERSPLIT option in the PROC TREESPLIT statement enables you to specify an alternative method of finding the split locations for the splits that are made by the decision tree.
 - The new VIICODE statement enables you to specify that SAS DATA step code be created for generating new interaction variables.

SAS Visual Data Mining and Machine Learning

About SAS Visual Data Mining and Machine Learning

SAS Visual Data Mining and Machine Learning requires both SAS Visual Statistics and SAS Visual Analytics.

SAS Visual Data Mining and Machine Learning 8.4

SAS Visual Data Mining and Machine Learning 8.4 shipped in May 2019. Here are the new features and enhancements:

- Models imported from SAS Visual Analytics can now be edited.
- Internet Explorer 11 is no longer supported.

SAS Visual Data Mining and Machine Learning 8.4 (May 2019) runs in SAS Viya 3.4. Here are the enhancements to the procedures for this release:

- The ASTORE procedure

- PROC ASTORE now supports text analytics models that have multiple output tables and multiple output rows per input row.
- PROC ASTORE now supports the following new SAS Cloud Analytic Services (CAS) actions that can run models: the `sparseSvmTrain` action in the `sparseML` (machine learning for sparse data) action set, the `gpReg` (Gaussian process regression) action in the `nonParametricBayes` action set, and the `transform` action in the `dataPreprocess` action set.
- The `COPYVARS=` option in the SCORE statement enables embedded process (EP) code to copy variables from the input table to one or more output tables.
- The BNET procedure
 - The PROC BNET statement now supports the `INNETWORK=` option, which names the input CAS table that contains the arcs defined as parent-child variable pairs to include in or exclude from the network.
 - The `STRUCTURE=` option in the PROC BNET statement supports learning and inference in a general Bayesian network and removes the requirement that each node in the network be directly connected to the target node.
- The FASTKNN procedure now supports approximate k -nearest-neighbor search.
- The GRADBOOST procedure
 - The new `NOMSEARCH=` option in the PROC GRADBOOST statement enables you to specify alternative methods of finding a splitting rule on nominal inputs.
 - The new `DISTRIBUTION=` option in the PROC GRADBOOST statement enables you to specify Poisson and Tweedie objective functions.
 - The new `METRIC=`, `MINIMUM=`, `THRESHOLD=`, and `THRESHOLDITER=` suboptions of the `EARLYSTOP` option in the PROC GRADBOOST statement enable you to specify new criteria for stopping the training.
 - The new `MAXDEPTH=` and `NUMBIN=` options in the AUTOTUNE statement enable you to tune these hyperparameters along with others.
- The MTLEARN procedure now supports the AUTOTUNE statement.
- In the MWPCA procedure, the new `PCANGLES` option in the OUTPUT statement enables you to track the angle change and the absolute angle of the first principal component.
- In the RPCA procedure, the new `ANOMALYDETECTION` statement enables you to detect anomalies in a subsequent run of the ASTORE procedure for scoring observations.
- The SEMISUPLEARN procedure now supports the k -nearest-neighbor (KNN) kernel, which is a memory-friendly version for semisupervised learning.
- The SVDD procedure
 - The `BW=TRACE` option in the KERNEL statement enables you to request automatic selection of the Gaussian bandwidth parameter by using the trace criterion.
 - The new `FASTINC` solver type in the SOLVER statement enables you to train your SVDD model by using the fast incremental solver.
- The SVMACHINE procedure now supports the support vector regression (SVR) model.
- The TSNE procedure now supports the AUTOTUNE statement.

- The NETWORK procedure and the associated network action set contain these new features and enhancements:
 - The MULTILINKS= option enables you to handle multigraphs directly.
 - The STANDARDIZEDLABELSOUT option enables you to produce a data table in standardized label format.
 - The DETERMINISTIC= option enables you to enable the nondeterministic operating mode.
 - The biconnected components algorithm and the connected components algorithm can now produce a component size summary table when you specify the OUT= option.
 - The PageRank centrality metric calculation and clique enumeration now take advantage of multicore technology.
 - The community algorithm now includes several metrics for community goodness when you specify the OUTCOMMUNITY= option.
 - The node similarity algorithm now includes algorithms to compute the common neighbors and Adamic-Adar node similarity measures. The EMBEDDINGS= option requests that variables of the NODES= data table be used as initial node embeddings for vector node similarity.
 - The pattern matching algorithms include these new features:
 - The MAXMATCHES= option enables you to restrict the number of matches returned.
 - The MAXTIME= option enables you to restrict the time spent searching for matches.
 - You can use the SAS Function Compiler (FCMP) to customize matches at an individual node or link level by specifying the NODEFILTER= and LINKFILTER= options, or at a more global level by specifying the NODEPAIRFILTER= and LINKPAIRFILTER= options.
 - The shortest path algorithm can now produce a summary table for each source node when you specify the OUTSUMMARY= option.
 - Summary calculations can now be restricted to use only finite paths when you specify the FINITEPATH= option.

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 Action Sets”](#) on page 229.

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 8.4: Programming Guide](#)
- [SAS Visual Data Mining and Machine Learning 8.4: The NETWORK Procedure](#)
- [SAS Visual Data Mining and Machine Learning 8.4: Procedures Guide](#)

SAS Visual Data Mining and Machine Learning 8.3

SAS Visual Analytics 8.3 includes these enhancements to the user interface:

- The Bayesian Network object has been added.

- SAS Visual Data Mining and Machine Learning models can be inserted directly into an existing Model Studio project.
- Additional enhancements have been made to the connections between SAS Visual Data Mining and Machine Learning and Model Studio.

SAS Visual Data Mining and Machine Learning 8.3 (July 2018) runs in SAS Viya 3.4. Here are the enhancements to the procedures for this release:

- Four new procedures
 - The GMM procedure performs clustering—a common step in data exploration—on quantitative data. You can use it to read and write data in distributed form, as well as to perform clustering and scoring in parallel by making full use of multicore computers or a distributed computing environment.
 - The MTLEARN procedure implements the multitask learning technique for least squares loss with LASSO and graph structure penalizations. It solves multiple related sparse linear regression problems simultaneously.
 - The SEMISUPLEARN procedure implements the graph-based semisupervised learning algorithm that relies on label spreading in a distributed framework in SAS Viya.
 - The TSNE procedure implements the t -distributed stochastic neighbor embedding (t -SNE) algorithm for dimension reduction and visualization of high-dimensional data.
- The ASTORE procedure
 - DS2CODE is added as an alias for the EPCODE option in the SCORE statement.
 - PROC ASTORE now supports models that are stored by the following procedures: GAM, GENSELECT, GMM, LOGSELECT, MTLEARN, and REGSELECT.
 - PROC ASTORE now supports BY-group processing if the underlying model supports it. Specifically, models that are stored by the GAM, GENSELECT, LOGSELECT, and REGSELECT procedures all support BY-group processing.
- The AUTOTUNING procedure

Autotuning enhancements have been made in all procedures that support autotuning: BNET, FACTMAC, FOREST, GRADBOOST, NNET, and SVM.

 - The new value GRID for the SEARCHMETHOD= option enables you to request that autotuning use a grid search method to find the best hyperparameters.
 - The new MAXBAYES= option enables you to specify the maximum Bayesian model size for autotuning to use when you specify SEARCHMETHOD=BAYESIAN.
 - The new MAXTRAINTIME= option enables you to specify the maximum time allowed for training each individual model.
 - The new TRAINFRACTION= option enables you to specify the fraction of the data to use for training during autotuning.
- The BNET procedure
 - The new AUTOTUNE statement in PROC BNET enables you to optimize a set of parameters that is larger than the set of parameters that are searched when you specify the BESTMODEL option.

- Two columns are added to the ODS table ValidInfo that show the misclassification rate and the number of observations for different parameter settings that are searched when you specify the BESTMODEL option.
- The ODS table FitStatistics has two additional rows, which show the validation misclassification rate and the test misclassification rate for partitioned data.
- The FISM procedure
 - The new NFIS_RANGE option in the PROC FISM statement enables you to specify the range of the number of items in frequent item sets.
 - The maximum limit of the ITEMS= option is set to 1,000.
 - The maximum number of frequent item sets that are generated per thread on each node is 10 million.
- The FOREST procedure
 - The new ISOLATION option in the PROC FOREST statement enables you to generate an isolation forest for anomaly detection.
 - The new VIICODE statement enables you to request that SAS DATA step code be created to generate new interaction variables.
 - The CROSSVALIDATION statement has new options, and the associated ODS table has more details.
- The GRADBOOST procedure
 - The new TRANSFERLEARN statement enables you to request that the procedure use transfer learning to supplement training data with auxiliary data.
 - The new VIICODE statement enables you to request that SAS DATA step code be created to generate new interaction variables.
 - The CROSSVALIDATION statement has new options, and the associated ODS table has more details.
- In the GVARCLUS procedure, the new SELECT=PENALIZED option enables selection of the optimal clustering step to be based on minimization of the penalized log likelihood.
- The MBANALYSIS procedure
 - The new NLHS_RANGE option in the PROC MBANALYSIS statement enables you to specify the range of number of items in the left-hand side (LHS) of a rule.
 - The new NRHS_RANGE option in the PROC MBANALYSIS statement enables you to specify the range of number of items in the right-hand side (RHS) of a rule.
 - The new ANTECEDENTLIST= option in the PROC MBANALYSIS statement enables you to specify the regular expression strings to match in the antecedent (left-hand side) of a rule.
 - The new CONSEQUENTLIST= option in the PROC MBANALYSIS statement enables you to specify the regular expression strings to match in the consequent (right-hand side) of a rule.
 - The new SEPARATOR= option in the PROC MBANALYSIS statement enables you to specify the separator character in the antecedent (left-hand side) or consequent (right-hand side) of a rule.
 - The maximum limit of the ITEMS= option is set to 1,000.

- The maximum number of rules that are generated per thread on each node is one million.
- The MWPCA procedure
 - The new CUMEIGPCTTOL= option in the PROC MWPCA statement specifies the significance level of eigenvalues that determine the rank of the low-rank matrix.
 - The new EIGEN_VALUE column is added to the PROC MWPCA output table.
- The RPCA procedure
 - The new CUMEIGPCTTOL= option in the PROC RPCA statement specifies the significance level of eigenvalues that determine the rank of the low-rank matrix.
 - The new PROJECTIONTYPE= option, which specifies how scoring observations are projected, is added to the CODE statement.
 - The RSTORE= option in the SAVESTATE statement can now be used to project new observations on both the principal component space and the low-rank space.
- The SVDD procedure
 - The BW=MEAN2 option in the KERNEL statement enables you to request automatic selection of the Gaussian bandwidth parameter by using the modified mean criterion (Liao et al. 2018).
 - You can specify multiple Gaussian bandwidth parameter values for the BW= option in the KERNEL statement.
 - The MAXTIME= option in the SOLVER statement enables you to specify an upper time limit for solving the SVDD optimization problem.

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 8.3: Programming Guide](#)
- [SAS Visual Data Mining and Machine Learning 8.3: The NETWORK Procedure](#)
- [SAS Visual Data Mining and Machine Learning 8.3: 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 8.4

SAS Visual Forecasting 8.4 (May 2019 release of SAS Viya 3.4) includes these new features in the user interface:

- Segmentation has been enhanced to provide a new pipeline template for projects with segmented data. You can view time series data for each segment in the project. Each segment has its own nested pipeline that you can edit and run separately.
- In addition to attributes from project data, you can query and work with project data based on attributes derived from the characteristics of each time series.
- In the pipelines for each project, you can view series and envelope plots for one or more time series. Pipelines can be segmented based on the internal characteristics of the time series in the project, such as seasonality, intermittency, and length of time span. These are demand classification patterns that are identified for the user.

SAS Visual Forecasting 8.4 includes these new programming features and enhancements:

- The new SMSELECT procedure is added to four existing procedures that enable you to perform stability monitoring (SM).
- The SMCALIB procedure now produces an ODS plot of the holdout forecast for each successfully calibrated model for each project (forecast and actual values of target variables and upper and lower prediction limits).
- The SMPROJECT procedure
 - The new BEST= option in the PROC SMPROJECT statement enables you to specify how many best models from the successfully calibrated models for the project are to be selected for scoring.
 - The new SELECT= option in the PROC SMPROJECT statement enables you to specify the model selection criterion to select the best models for scoring according to the holdout analysis of the successfully calibrated models for the project: mean absolute percentage error (MAPE) or root mean square error (RMSE).
- The SMSCORE procedure produces an ODS plot for each successfully scored model for each project (forecast and actual values of target variables and upper and lower prediction limits).
- The TSMODEL procedure
 - The new DISTRIBUTE= option in the ID statement enables you to specify the method that is used to distribute the input time series observations in the input tables across the nodes in the CAS session.
 - The new NLFORMAT= option in the ID statement enables the selection of the best international SAS format for the time ID values that are stored in CAS output tables.
- The TSMODEL procedure adds support for these new packages:
 - The time series distant measure (TSD) package enables you to perform vector similarity analysis.
 - The multivariate singular spectrum analysis (MSSA) package enables you to perform MSSA forecasting.

For more information, see these resources on the product documentation page for [SAS Visual Forecasting](#):

- [SAS Visual Forecasting 8.4: Programming Guide](#)
- [SAS Visual Forecasting 8.4: Forecasting Procedures](#)
- [SAS Visual Forecasting 8.4: Time Series Packages](#)

SAS Visual Forecasting 8.3

SAS Visual Forecasting 8.3 (July 2018) runs in SAS Viya 3.4.

The user interface includes these new features:

- You can add events to your modeling strategies.
- You can segment your data and apply segments to different modeling strategies in a pipeline.
- Three new modeling strategies have been added to the pipelines.

The subspace tracking (SST) package was added to the TSMODEL procedure. This package enables you to perform advanced monitoring techniques.

The TSMODEL procedure also has a new `FORMAT= DATA` option in the ID statement. This option enables you to automatically propagate the SAS format of the input time ID variable to the time ID values that are stored in CAS output tables.

This release also includes four new procedures that enable you to perform stability monitoring: `SMCALIB`, `SMPROJECT`, `SMSCORE`, and `SMSPEC`.

For more information, see these resources on the product documentation page for [SAS Visual Forecasting](#):

- [SAS Visual Forecasting 8.3: Programming Guide](#)
- [SAS Visual Forecasting 8.3: Forecasting Procedures](#)
- [SAS Visual Forecasting 8.3: Time Series Packages](#)

SAS Visual Investigator

SAS Visual Investigator 10.5.1

SAS Visual Investigator 10.5.1 shipped in May 2019 and runs on SAS Viya 3.4. Here are the new key features:

- alert enhancements, including capturing and displaying a value associated with a scenario-fired event, visualizing variable scorecard contributions for an alert, and reactivating a closed alert
- workflow enhancements, including administrators releasing a claim on a task without being a participant, the ability to create multiple start workflows in the administration UI, the ability to manage workflow variables within a service task, the ability to save a workflow template with a different name, and workflow element updates
- the ability to use a new type of service task to update an entity
- the ability to view workflow history for an object after all tasks are completed

- the ability, using SAS Adaptive Learning and Intelligent Agent System, to use supervised machine learning techniques to automatically build models to detect rare events such as fraud or other suspicious activity
- the ability, using SAS Mobile Investigator, to create relationships between objects, start workflows manually, prompt when completing a workflow task, specify which page controls are mandatory on a mobile template, and include a date or datetime control on a mobile page template with the option to easily set a value to the current date or date and time
- network view enhancements, including the ability to expand nodes by related entity types, relationship types, or both, as well as expand nodes with a query and by transaction links
- options for the behavior of searches for child objects, enabling you to look for matches within one specific child object or across all child objects
- new controls within Page Builder to support the upload and display of a single image or a carousel of multiple images
- the ability for administrators to configure the default margin's paper size and orientation for print templates
- support for CLOB data types for external entities connecting to Oracle, PostgreSQL, and IBM DB2 data stores
- the ability to configure entity resolution functionality in SAS Visual Investigator to ensure that an entity is resolved only if there are two or more contributing objects
- using SAS Cloud Analytic Services (CAS), the ability to perform a distributed data load to allow grid workers to directly load data from the database to CAS
- enablement of streaming data loads into CAS
- clarification of which tables are available to load into CAS before authoring a scenario

SAS Visual Investigator 10.5

SAS Visual Investigator 10.5 includes these key features:

- the ability, using SAS Mobile Investigator, to edit objects, add and remove attachments, view related objects, and search for objects in a radius from the current location.
- using the data import functionality, the ability to select a time zone for datetime columns so that the data is stored correctly in the database.
- the ability to search the content of attachments.
- a choice of user interface themes, including a high-contrast theme to support accessibility requirements.
- the ability to manage Scenario Administrator flows from SAS Drive and view flow dependencies in SAS Data Lineage.
- workflow enhancements, including the ability to prompt users to enter information when completing their tasks, support for multiple workflows per entity, and the ability for users to manually start workflows.
- an option for administrators to configure and capture comments for automatically dispositioned alerts.
- the ability for users to open a snapshot view of contributing objects from an alert.

- the ability to pre-configure disposition reasons for users to choose during alert triage.
- print templates enhancements, including support for headers and footers that can include details about the user who printed the object, the time it was printed, and its data classification. Print templates can also include comments associated with the object.

SAS Visual Investigator 10.4

SAS Visual Investigator 10.4 includes these key features:

- The ability, using SAS Mobile Investigator, to create content, search data, and progress workflow tasks from mobile devices
- The ability to track alert disposition productivity for an alert or its scenario-fired events
- Support for alert assignment enabling alerts to be claimed, released, or assigned to specific users
- The option to display an alert's contributing objects on a map or timeline visualization
- Query builder enhancements, including the ability to define queries relative to the current date
- The option to ensure that a user must perform a search before creating and linking new objects to the current object
- Support for a text analytics visualization that provides users with a new way to analyze unstructured text within a workspace
- Workflow enhancements, including the ability to specify timer events and parallel gateways
- The ability to test scorecard behavior within Scenario Administration Page Builder and Administration enhancements, including the ability to configure read-only fields and controls and new toolbar and page context conditions
- The option to define additional attributes for internal and external relationships and drive the network time-slider based on link valid from/to dates

See these resources:

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

Note: The documentation for SAS Visual Investigator is available only to customers who license this product.

SAS Visual Investigator 10.3.1

SAS Visual Investigator 10.3.1 shipped in February 2018 and includes the following key features:

- Support for SQL Server and MySQL as external data sources
- Constraint of the user chooser list to specific groups

- Query builder enhancements, including the ability to search child object and Boolean fields
- Additional audit records for user actions such as printing and exporting data from grids to Microsoft Excel
- The option to perform a Contains query to help find pertinent audit information
- The option to use the workflow start node to set entity field values
- The option to configure workflow tasks to read or write to user group fields
- The option to use workflow variables to populate the task participant list and configure tasks to be auto-claimed
- The ability of workflow tasks to check the field value when writing to workflow variables
- The capability in Scenario Administrator for a user to specify the end of the input data set for flow execution

SAS Visual Investigator 10.3

SAS Visual Investigator 10.3 includes these key features:

- Operational management reporting
- Advanced query building interface
- Preconfigured searches
- Detailed audit log with search interface
- The ability to define a print template and print directly to a printer or to a PDF file
- The ability to graphically view the current task in a workflow
- Support for IBM DB2 and Teradata as external data sources
- Configurable entity-level security management
- Management of users and groups using the SAS Visual Investigator administration interface
- Configurable system reference numbers on internal entities
- The ability to view, suspend, resume, and cancel active workflows
- Configurable Tasks tab and My Tasks control Automated alert dispositions
- Drag-and-drop data fields when building pages
- New controls to add charts to pages so that users can see data in a visual format
- Rolling aggregation capability for surveillance

SAS Visual Text Analytics 8.4

The user interface for SAS Visual Text Analytics 8.4 includes these new features and enhancements:

- SAS Visual Text Analytics automatically generates relevant concept rules and fact rules based on existing rules for a concept.

Note: Automatic concept rule generation is an experimental feature in SAS Visual Text Analytics 8.4.

- To instantaneously add new CLASSIFIER rules to existing concepts, simply highlight and select text on the **Documents** tab.
- To quickly test new rules and subsets of your model against a document collection, use the sandbox that is associated with each predefined and custom concept.
- You can select a pipeline template from the new drop-down list in the New Project window when creating a project.
- You can view the breakdown of each topic by sentiment in the Results window for the **Topics** node when a preceding **Sentiment** node is used in the pipeline. In addition, the **Topics** node results include feedback about documents that do not match a topic.
- Kazakh is now supported in addition to 32 other languages.
- Stop lists are now provided for these languages: Arabic, Chinese, Farsi, Japanese, Korean, Tagalog, Thai, and Vietnamese. With these additions, stop lists are now provided for all supported languages.
- Text parsing now supports distributed accumulation.
- Analytic store support is now supported for the **Concepts**, **Sentiment**, and **Categories** nodes.
- Performance enhancements include improved pipeline efficiency and improved performance when compiling and validating categories and concepts.

SAS Visual Text Analytics 8.4 on SAS Viya 3.4 includes these new programming features and enhancements:

- You can now use the actions in the Deep Learning action set to build, modify, and use recurrent neural network (RNN) models with a SAS Visual Text Analytics license.
- The `rnnExportModel` action in the Recurrent Neural Network action set is new. You can use this action to export a recurrent neural network model.
- The `exportTextModel` action in the Text Analytics Rule Development action set is new in SAS Visual Text Analytics 8.4. The `exportTextModel` action builds a category astore model, a concept astore model, or a sentiment astore model.
- SAS Visual Text Analytics 8.4 adds support for the Kazakh language.
- SAS Visual Text Analytics 8.4 includes many performance enhancements.

SAS Workflow Manager 2.2

Key features in SAS Workflow Manager 2.2 enable you to perform these tasks:

- view all properties of a workflow element in the Instances view. The same properties that are available in the Definitions view are now available in the Instances view.
- use the Application Administrators authorization group to enable administrator access to workflow definitions and workflow instances.
- add new elements to a workflow definition by using new pop-up menus that are available on existing elements in a diagram. SAS Workflow Manager automatically adds sequence flows that connect new elements to existing elements.

- navigate easily between property panes for different workflow elements. When you select an element in a workflow diagram, SAS Workflow Manager displays the last property pane that you selected for that element.
- map values from response headers to data objects when you are defining a service that invokes a REST web service.
- select additional actions when you define a service task.

For more information, see [What's New in SAS Workflow Manager 2.2](#).

Part 3

Appendix

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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.

February 2022 (SAS 9.4, Rev. 940_22w08 and SAS Viya 3.4)

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

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. For more information, see [“SAS Visual Analytics 8.4”](#) on page 263.

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 121
- [“SAS Business Data Network 3.3”](#) on page 136
- [“SAS Cost and Profitability Management 8.4”](#) on page 159
- [“SAS Decision Manager 3.3”](#) on page 67
- [“SAS Data Remediation 2.4”](#) on page 144
- [“SAS IT Resource Management 3.10”](#) on page 183
- [“SAS Enterprise Guide 8.1”](#) on page 124
- [“SAS Financial Management 5.6”](#) on page 161
- [“SAS High-Performance Risk 4.2”](#) on page 89
- [“SAS Lineage 3.3”](#) on page 147
- [“SAS Model Implementation Platform 3.2”](#) on page 189
- [“SAS Model Manager 14.3”](#) on page 95
- [“SAS Quality Knowledge Base for Contact Information 31”](#) on page 148

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.

These products shipped a new release:

- “SAS Econometrics 8.4” on page 252
- “SAS Environment Manager 2.6” on page 176
- “SAS Event Stream Manager 6.1” on page 75
- “SAS Event Stream Processing 6.1” on page 77
- “SAS Intelligent Decisioning 5.3” on page 256
- “SAS Model Manager 15.2” on page 257
- “SAS Optimization 8.4” on page 258
- “SAS Visual Analytics 7.5” on page 199
- “SAS Visual Data Mining and Machine Learning 8.4” on page 266
- “SAS Visual Forecasting 8.4” on page 272
- “SAS Visual Investigator 10.5.1” on page 273
- “SAS Visual Statistics 7.5” on page 204
- “SAS Visual Text Analytics 8.4” on page 276

In addition, new actions were added to the SAS Visual Analytics action sets. For more information, see “[Enhancements to SAS Visual Analytics Action Sets](#)” on page 234.

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 43
- “SAS/ACCESS 9.4 Interface to Salesforce” on page 46
- “DS2 Language: SAS 9.4M6” on page 16
- “FedSQL Language: SAS 9.4M6” on page 18

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 65](#)
- [“SAS Enterprise Miner 15.1” on page 70](#)
- [“SAS/ETS 15.1” on page 80](#)
- [“SAS Factory Miner 15.1” on page 87](#)
- [“SAS Forecast Server 15.1” on page 88](#)
- [“SAS/IML 15.1” on page 92](#)
- [“SAS LASR Analytic Server 2.82” on page 116](#)
- [“SAS/OR 15.1” on page 98](#)
- [“SAS/QC 15.1” on page 101](#)
- [“SAS Quality Knowledge Base for Contact Information 30” on page 148](#)
- [“SAS/STAT 15.1” on page 103](#)
- [“SAS Studio 3.8” on page 56](#)
- [“SAS Text Miner 15.1” on page 108](#)
- [“SAS Visual Investigator 10.5” on page 274](#)

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 13](#).
- SAS/ACCESS 9.4M6. For more information, see [“SAS/ACCESS” on page 40](#).
- [“SAS/GRAPH 9.4M6” on page 49](#)
- [“SAS Grid Manager 9.4M6” on page 53](#)
- [“November 2018 Release: SAS 9.4M6” on page 167](#)
- SAS Intelligence Platform 9.4M6. For more information, see [“SAS 9.4 Intelligence Platform” on page 177](#).

These products shipped a maintenance release:

- SAS Business Rules Manager 3.2M1. For more information, see [“SAS Business Rules Manager 3.2” on page 64](#).
- SAS Decision Manager 3.2M1. For more information, see [“SAS Decision Manager 3.2” on page 68](#).
- SAS Model Manager 14.2M1. For more information, see [“SAS Model Manager 14.2” on page 96](#).

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. For more information, see [“SAS Visual Analytics” on page 263](#).

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 122](#)
- [“SAS IT Resource Management 3.9” on page 183](#)
- [“SAS Visual Analytics App” on page 128](#)
- [“SAS Visual Investigator 10.4” on page 275](#)

SAS Viya 3.4 shipped. For more information, see [“Highlights of New Features in SAS Viya 3.4” on page 209](#).

This release included many changes to SAS Foundation to support the SAS Viya 3.4 environment. For more information, see [“SAS Foundation” on page 244](#).

These products shipped a new release for the SAS Viya 3.4 environment:

- [“SAS/ACCESS Software” on page 247](#)
- [“SAS Decision Manager 5.2” on page 251](#)
- [“SAS Drive” on page 252](#)
- [“SAS Econometrics” on page 252](#)
- [“SAS Model Manager 15.2” on page 257](#)
- [“SAS Optimization” on page 258](#)
- [“SAS Quality Knowledge Base for Contact Information 29” on page 260](#)
- [“SAS Report Viewer 8.3” on page 261](#)
- [“SAS Scalable Performance Data Server” on page 261](#)
- [“SAS Studio 5.1 and 4.4” on page 262](#)
- [“SAS Visual Analytics” on page 263](#)
- [“SAS Visual Statistics” on page 264](#)
- [“SAS Visual Data Mining and Machine Learning” on page 266](#)
- [“SAS Visual Forecasting” on page 271](#)
- [“SAS Workflow Manager 2.2” on page 277](#)

June 2018 (SAS 9.4, Rev. 940_18w25)

These products shipped a new release:

- “SAS High-Performance Risk 4.1” on page 89
- “SAS Model Implementation Platform 3.1” on page 189
- “SAS Risk Dimensions” on page 195

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 183.

February 2018 (SAS 9.4, Rev. 940_18w08)

These products shipped a new release:

- “SAS Energy Forecasting 4.1” on page 74
- “SAS Visual Investigator 10.3.1” on page 275

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 Event Stream Processing 5.1” on page 78
- “SAS Model Risk Management 7.3” on page 191
- “SAS Risk and Finance Workbench 3.1” on page 194

These products shipped as part of the SAS 9.4M5 release:

- “Base SAS 9.4” on page 13
- “SAS 9.4 In-Database Products” on page 167
- “SAS Studio 3.71” on page 57

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 122
- “SAS Contextual Analysis 14.3” on page 66
- “SAS Data Integration Studio 4.903” on page 139
- “SAS Enterprise Guide 7.15” on page 125
- “SAS Enterprise Miner 14.3” on page 71
- “SAS/ETS 14.3” on page 81
- “SAS Forecast Server 14.3” on page 88
- “SAS High-Performance Analytics Infrastructure 3.7” on page 114
- “SAS High-Performance Risk 3.9” on page 90
- “SAS/IML 14.3” on page 93
- “SAS/OR 14.3” on page 98
- “SAS/QC 14.3” on page 101
- “SAS Quality Knowledge Base for Contact Information 28” on page 149
- SAS Risk Dimensions 6.9. For more information, see “SAS Risk Dimensions” on page 195.
- “SAS/STAT 14.3” on page 104
- “SAS Studio 3.7” on page 57
- “SAS Text Miner 14.3” on page 108

These products shipped as part of SAS 9.4M5:

- “Base SAS 9.4” on page 13
- “SAS/ACCESS” on page 40
- “SAS/CONNECT 9.4” on page 48
- “SAS 9.4 Data Quality Server” on page 143
- “SAS/GRAPH 9.4” on page 49
- “SAS 9.4 Integration Technologies” on page 173
- “SAS 9.4 Intelligence Platform” on page 177
- “SAS 9.4 In-Database Products” on page 167
- “SAS/SHARE 9.4” on page 55

SAS Data Loader 3.1M1 also shipped. For more information, see “SAS Data Loader 3.1” on page 137.

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 89.
- SAS Model Implementation Platform 2.4. For more information, see [“SAS Model Implementation Platform”](#) on page 188.
- SAS Risk Dimensions 6.8. For more information, see [“SAS Risk Dimensions”](#) on page 195.

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 134.

May 2017 (SAS 9.4, Rev. 940_17w21)

SAS Event Stream Processing 4.3 shipped. For more information, see [“SAS Event Stream Processing 4.3”](#) on page 78.

April 2017 (SAS 9.4, Rev. 940_17w16)

These products shipped a new release:

- [“SAS Add-In 7.14 for Microsoft Office”](#) on page 122
- [“SAS Business Data Network 3.2”](#) on page 136
- [“SAS Data Remediation 2.3”](#) on page 144
- [“SAS Lineage 3.2”](#) on page 147
- [“SAS MDM 4.3”](#) on page 151
- [“SAS Visual Analytics 7.4”](#) on page 200

These products shipped a maintenance release:

- [“SAS Energy Forecasting 3.2M1”](#) on page 74
- SAS Job Monitor 2.2M1. For more information, see [“SAS Job Monitor 2.2”](#) on page 146.

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 184.

November 2016 (SAS 9.4, Rev. 940_16w48)

These products shipped a new release:

- “SAS Add-In 7.13 for Microsoft Office” on page 122
- “SAS Business Rules Manager 3.2” on page 64
- “SAS Contextual Analysis 14.2” on page 66
- “SAS Data Loader 3.1” on page 137
- “SAS Data Integration Studio 4.902” on page 140
- “SAS Decision Manager 3.2” on page 68
- “SAS Enterprise Guide 7.13” on page 125
- “SAS Enterprise Miner 14.2” on page 71
- “SAS/ETS 14.2” on page 82
- “SAS Factory Miner 14.2” on page 88
- “SAS High-Performance Risk 3.7” on page 90
- “SAS/IML 14.2” on page 93
- “SAS Model Manager 14.2” on page 96
- “SAS Model Risk Management 7.2” on page 192
- “SAS/OR 14.2” on page 98
- “SAS/QC 14.2” on page 102
- “SAS Risk and Finance Workbench” on page 193
- SAS Risk Dimensions 6.7. For more information, see “SAS Risk Dimensions” on page 195.
- “SAS/STAT 14.2 ” on page 105
- “SAS Studio 3.6” on page 57
- “SAS Text Miner 14.2” on page 109

These products shipped as part of SAS 9.4M4:

- “Base SAS 9.4” on page 13
- “SAS/ACCESS” on page 40
- “SAS 9.4 Data Quality Accelerator for Teradata” on page 141
- “SAS 9.4 Data Quality Server” on page 143
- “SAS/GRAPH 9.4” on page 49
- “SAS 9.4 Intelligence Platform” on page 177
- “SAS 9.4 OLAP Server” on page 129

August 2016 (SAS 9.4, Rev. 940_16w33)

SAS shipped SAS Event Stream Processing 4.1. For more information, see [“SAS Event Stream Processing 4.1”](#) on page 79.

July 2016 (SAS 9.4, Rev. 940_16w30)

These products shipped a new release:

- [“SAS Anti-Money Laundering 7.1”](#) on page 163
- [“SAS Model Risk Management 7.1”](#) on page 192
- [“SAS Risk Management for Banking 3.4”](#) on page 196

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 to Amazon Redshift”](#) on page 41.

These products shipped a new release:

- [“SAS High-Performance Risk 3.6”](#) on page 90
- [“SAS Quality Knowledge Base for Contact Information 27”](#) on page 149
- SAS Risk Dimensions 6.6. For more information, see [“SAS Risk Dimensions”](#) on page 195.

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 45
- [“SAS Add-In 7.12 for Microsoft Office”](#) on page 123
- [“SAS Enterprise Guide 7.12”](#) on page 126
- [“SAS IT Resource Management 3.7”](#) on page 184
- [“SAS Studio 3.5”](#) on page 58

January 2016 (SAS 9.4, Rev. 940_16w04)

These products shipped a new release:

- [“DataFlux Data Management Server 2.7” on page 133](#)
- [“DataFlux Secure 2.7” on page 135](#)
- [“SAS Data Loader 2.4 for Hadoop” on page 138](#)
- [“SAS Federation Server 4.2” on page 145](#)

These products shipped a maintenance release:

- DataFlux Authentication Server 4.1M1. For more information, see [“DataFlux Authentication Server 4.1” on page 133](#).
- SAS Anti-Money Laundering 6.3M1. For more information, see [“SAS Anti-Money Laundering 6.3” on page 163](#).
- SAS Customer Due Diligence 6.3M1. For more information, see [“SAS Customer Due Diligence 6.3” on page 165](#).

November 2015 (SAS 9.4, Rev. 940_15w47)

SAS Event Stream Processing 3.2 is now available. For more information, see [“SAS Event Stream Processing 3.2” on page 79](#).

SAS Contextual Analysis 14.1M1 is now available. For more information, see [“SAS Contextual Analysis 14.1” on page 67](#).

October 2015 (SAS 9.4, Rev. 940_15w42)

These products shipped a new release:

- [“SAS High-Performance Risk 3.5” on page 90](#)
- [“SAS Risk Dimensions” on page 195](#)

Social Network Analysis Server 6.2M2 is now available. For more information, see [“SAS Social Network Analysis Server 6.2” on page 166](#).

August 2015 (SAS 9.4, Rev. 940_15w33)

These products shipped a new release:

- [“SAS Quality Knowledge Base for Contact Information 26” on page 150](#)
- [“SAS Visual Analytics 7.3” on page 201](#)

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 138](#).

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 87.

These products shipped a new release:

- [“SAS Business Rules Manager 3.1”](#) on page 64
- [“SAS Contextual Analysis 14.1”](#) on page 67
- [“SAS Data Integration Studio 4.901”](#) on page 140
- [“SAS Decision Manager 3.1”](#) on page 69
- [“SAS Enterprise Miner 14.1”](#) on page 71
- [“SAS Environment Manager 2.5”](#) on page 176
- [“SAS/ETS 14.1”](#) on page 82
- [“SAS Forecast Server 14.1”](#) on page 88
- [“SAS High-Performance Analytics Infrastructure 3.1”](#) on page 114
- [“SAS/IML 14.1”](#) on page 94
- [“SAS 9.4 In-Database Products”](#) on page 167
- [“SAS Model Manager 14.1”](#) on page 96
- [“SAS/OR 14.1”](#) on page 99
- [“SAS/QC 14.1”](#) on page 102
- [“SAS/STAT 14.1”](#) on page 105
- [“SAS Studio 3.4”](#) on page 58
- [“SAS Text Miner 14.1”](#) on page 109
- [“SAS Theme Designer 4.7 for Flex”](#) on page 181

These products were updated as part of SAS 9.4M3:

- [“Base SAS 9.4”](#) on page 13
- [“SAS/ACCESS”](#) on page 40
- [“SAS 9.4 Data Quality Server”](#) on page 143
- [“SAS/GRAPH 9.4”](#) on page 49
- [“SAS Grid Manager”](#) on page 53
- [“SAS 9.4 Intelligence Platform”](#) on page 177
- [“SAS 9.4 OLAP Server”](#) on page 129

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 191.

These products shipped a new release:

- “SAS Add-In 7.11 for Microsoft Office” on page 123
- “SAS Enterprise Guide 7.11” on page 126
- “SAS Event Stream Processing 3.1” on page 79
- “SAS High-Performance Analytics Infrastructure 2.94” on page 114
- “SAS High-Performance Risk 3.4” on page 91
- “SAS IT Resource Management 3.6” on page 184
- “SAS Risk Management for Banking 3.3” on page 196
- “SAS Visual Analytics 7.2” on page 201

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 56.

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 137.
- SAS Energy Forecasting. For more information, see “SAS Energy Forecasting 3.1” on page 75.

These products shipped a new release:

- “SAS Data Remediation 2.2” on page 144
- “SAS Job Monitor 2.2” on page 146
- “SAS Marketing Automation 6.4” on page 155
- “SAS Marketing Optimization 6.4” on page 156
- “SAS MDM 4.2” on page 152
- “SAS Real-Time Decision Manager 6.4” on page 157
- “SAS Task Manager 2.2” on page 152
- “SAS Visual Process Orchestration 2.2” on page 153

February 2015 (SAS 9.4, Rev. 940_15w08)

These products shipped a new release:

- “SAS Data Quality Accelerator 2.6 for Teradata” on page 142
- “SAS Quality Knowledge Base for Contact Information 25” on page 150

- “SAS Studio 3.3” on page 58

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 15.
- SAS 9.4 In-Database Code Accelerator for Hadoop. For more information, see “[SAS 9.4 In-Database Products](#)” on page 167.

January 2015 (SAS 9.4, Rev. 940_15w04)

These products shipped a new release:

- “SAS Anti-Money Laundering 6.3” on page 163
- “SAS Customer Due Diligence 6.3” on page 165
- “SAS Financial Management 5.5” on page 161

SAS Social Network Analysis Server 6.2M1 shipped. For more information, see “[SAS Social Network Analysis Server 6.2](#)” on page 166.

November 2014 (SAS 9.4, Rev. 940_14w47)

These products are new:

- “SAS Business Data Network 3.1” on page 137
- “SAS Lineage 3.1” on page 147

These products shipped a new release:

- “DataFlux Data Management Server 2.6” on page 134
- “SAS Event Stream Processing Engine 2.3” on page 80
- “SAS High-Performance Analytics Infrastructure 2.91” on page 114
- “SAS High-Performance Risk 3.3” on page 91
- “SAS LASR Analytic Server 2.5” on page 117
- “SAS Quality Knowledge Base for Contact Information 24” on page 150
- “SAS Quality Knowledge Base for Product Data 5” on page 151

October 2014 (SAS 9.4, Rev. 940_14w41)

These products shipped a new release:

- “DataFlux Data Management Studio 2.6” on page 135
- “SAS Add-In 7.1 for Microsoft Office” on page 123
- “SAS Enterprise GRC 6.1” on page 186

- “SAS Enterprise Guide 7.1” on page 127
- “SAS Environment Manager 2.4” on page 176
- “SAS Information Retrieval Studio 1.53” on page 181
- “SAS Visual Analytics 7.1” on page 202

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 184.

August 2014 (SAS 9.4, Rev. 940_14w32)

These products shipped a new release:

- “SAS Contextual Analysis 12.3” on page 67
- “SAS Business Rules Manager 2.2” on page 65
- “SAS Data Integration Studio 4.9” on page 140
- “SAS Decision Manager 2.2” on page 70
- “SAS Environment Manager” on page 175
- “SAS Enterprise Miner 13.2” on page 72
- “SAS/ETS 13.2” on page 83
- “SAS/IML 13.2” on page 94
- “SAS Model Manager 13.1” on page 97
- “SAS/OR 13.2” on page 99
- “SAS/QC 13.2” on page 102
- “SAS/STAT 13.2” on page 106
- “SAS Studio 3.2” on page 59
- “SAS Text Miner 13.2” on page 110

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 13
- “SAS/ACCESS 9.4 Interface to Hadoop” on page 42
- “SAS/ACCESS 9.4 Interface to Oracle” on page 43
- “SAS/ACCESS 9.4 Interface to PC Files” on page 44
- “SAS/CONNECT 9.4” on page 48
- “SAS/GRAPH 9.4” on page 49

- “SAS Grid Manager” on page 53
- “SAS 9.4 Integration Technologies” on page 173
- “SAS 9.4 Intelligence Platform” on page 177
- “SAS 9.4 OLAP Server” on page 129

June 2014 (SAS 9.4, Rev. 940_14w23)

These products shipped a new release:

- “SAS OpRisk VaR 6.1” on page 193
- “SAS Quality Knowledge Base for Contact Information 23” on page 150

May 2014 (SAS 9.4, Rev. 940_14w19)

These products shipped a new release:

- “DataFlux Authentication Server 4.1” on page 133
- “SAS Federation Server 4.1” on page 145

SAS DataFlux Secure 2.5 was updated. For more information, see “DataFlux Secure 2.7” on page 135.

April 2014 (SAS 9.4, Rev. 940_14w14)

These products shipped a new release:

- “SAS Anti-Money Laundering 6.2” on page 164
- “SAS Data Quality Accelerator 2.5 for Teradata” on page 142

These products shipped a maintenance release:

- “SAS Data Remediation 2.1” on page 144
- “SAS MDM 4.1” on page 152
- “SAS Task Manager 2.1” on page 153

March 2014 (SAS 9.4, Rev. 940_14w11)

These products are new:

- “SAS In-Memory Statistics” on page 113
- “SAS Studio 3.1” on page 59

These products shipped a new release:

- “SAS LASR Analytic Server 2.3” on page 118
- “SAS Visual Analytics 6.4” on page 202

The documentation was updated for SAS Data Surveyor 5.1 for SAP. For more information, see “SAS Data Surveyor for SAP” on page 145.

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 44
- “Base SAS 9.4” on page 13
- “SAS/CONNECT 9.4” on page 48
- “SAS 9.4 In-Database Products” on page 167
- “SAS 9.4 Integration Technologies” on page 173
- “SAS 9.4 Intelligence Platform” on page 177
- “SAS 9.4 OLAP Server” on page 129

These products shipped a new release:

- “SAS Data Integration Studio 4.8” on page 140
- “SAS Enterprise Miner 13.1” on page 72
- “SAS/ETS 13.1” on page 85
- “SAS Financial Management 5.4” on page 161
- “SAS Forecast Server 13.1” on page 89
- “SAS High-Performance Computing Management Console 2.4” on page 115
- “SAS High-Performance Risk 3.2” on page 91
- “SAS/IML 13.1” on page 94
- “SAS LASR Analytic Server 2.1 and 2.2” on page 119
- “SAS/OR” on page 98
- “SAS/QC” on page 101
- “SAS/STAT 13.1” on page 107
- “SAS Theme Designer 4.2 for Flex” on page 182
- “SAS Text Miner 13.1” on page 110
- “SAS Visual Analytics 6.3” on page 203

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 124.
- SAS Enterprise Guide 6.1M1 is available. For more information, see “SAS Enterprise Guide 6.1” on page 127.

November 2013 (SAS 9.4, Rev. 940_13w45)

These products shipped a new release:

- [“SAS Anti-Money Laundering 6.1”](#) on page 164
- [“SAS Quality Knowledge Base for Contact Information 22”](#) on page 151

These products are new:

- [“SAS Customer Due Diligence 6.1”](#) on page 165
- [“SAS Peer Group Analysis 6.1”](#) on page 165

October 2013 (SAS 9.4, Rev. 940_13w40)

These products are new:

- [“DataFlux Data Management Server 2.5”](#) on page 134
- [“DataFlux Data Management Studio 2.5”](#) on page 135
- [“SAS Contextual Analysis 12.3”](#) on page 67
- [“SAS Data Management Console”](#) on page 141
- [“SAS Data Remediation 2.1”](#) on page 144
- [“SAS Job Monitor 2.1”](#) on page 146
- [“SAS MDM 4.1”](#) on page 152
- [“SAS Visual Process Orchestration 2.1”](#) on page 153

These products shipped a new release.

- [“DataFlux Authentication Server 3.2”](#) on page 133
- [“DataFlux Secure 2.5”](#) on page 136
- [“SAS Data Quality Accelerator 2.4 for Teradata”](#) on page 142

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 142.

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 167.

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