



What's New in SAS[®] 9.4 and SAS[®] Viya[®] 3.3

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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 3.3. The functionality available at your site depends on what you have licensed and installed. See the product-specific documentation for your SAS products.

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Chapter 1

Introduction to SAS 9.4

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Overview of SAS 9.4

Initial Release of SAS 9.4

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

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

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

Enhancing SAS 9.4 through Maintenance Releases

Over the past several years, SAS 9.4 technology has advanced, and SAS has introduced SAS Viya. Both 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 9.4M5 (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.

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.

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 Viya: Data in Motion](#), [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

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 from mobile 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.

If you license the SAS Enterprise BI Server or SAS Visual Analytics, you can use the SAS Mobile BI app.

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.

Improving Access to Your Data

In SAS 9.4, the SAS/ACCESS engines to Oracle, DB2, and Teradata are enhanced to improve READ and WRITE performance. In addition, 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 the PI System
- SAS/ACCESS Interface to PostgreSQL
- SAS/ACCESS Interface to SAP HANA
- SAS/ACCESS Interface to Vertica

Integration with SAS Viya

SAS 9.4M5 supports sessions between SAS and the SAS Viya CAS server. You can work with your SAS 9.4 and SAS Viya environments from the same familiar SAS interfaces, such as SAS Enterprise Guide, SAS Studio, and the SAS windowing environment.

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

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

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

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SAS 9.4M5 Integration with SAS Viya

SAS 9.4M5 supports sessions between SAS and the CAS server. In December 2017, SAS Viya 3.3 shipped. In this release, 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 *Encryption in SAS Viya: Data in Motion*.

- 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 [A Guide to the SAS 9.4 and SAS Viya 3.3 Programming Documentation](#).
 - SAS Studio 3.71. For more information, see [A Guide to the SAS Studio 3.71 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 available in SAS Viya. The CAS statement, CAS system options, and CAS macros enable SAS 9.4M5 programmers to directly reference CAS server resources.

CAS Statement

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

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

CAS System Options

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

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

CAS 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.

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 9.4M5

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 9.4M5

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 9.4M4

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 in SAS 9.4M5

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

- New system options have been added for LINUX, UNIX, and z/OS:
 - SSLCACERTDATA specifies the trusted Certification Authority (CA) certificate in base64 encoded string.
 - SSLCIPHERLIST specifies a list of cipher suites to use.
 - SSLSNIHOSTNAME enables the client to use Server Name Indication (SNI) in the TLS handshake to identify the server name that it is trying to connect to.
 - SSLCACERTDIR specifies the location of the trusted Certification Authority (CA) certificates found in OpenSSL format.

- SSLMINPROTOCOL specifies the minimum TLS protocol that can be negotiated when using OpenSSL.
- 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.

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 the SAS System, 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 Viya: Data in Motion, 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 in 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” on page 25](#).
- 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 in 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 in 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 in SAS 9.4M2

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

Output Enhancements in SAS 9.4M1

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

Output Enhancements in 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 9.4M5

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

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 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.

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 [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 in 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 %LOC2XMP 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 in 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 FCMP supports dictionaries and Analytic Store scoring models.
- PROC HTTP adds a DEBUG statement, the TIMEOUT= procedure option, and response status macro variables.
- PROC REPORT, TABULATE, MEANS, and SUMMARY can summarize data using CAS server actions.
- PROC SGOOP supports workflows and Kerberos on Linux, and the WFHDFSPATH= option is now optional.

Procedure Enhancements in SAS 9.4M4

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

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

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

Data Set Options

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

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

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.

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](#).

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 26](#).
- 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

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

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, 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 Base SAS 9.4 Language Concepts](#) in *SAS Language Reference: Concepts*
- [What's New in SAS 9.4 Scalable Performance Data Engine](#) in *SAS Scalable Performance Data Engine: Reference*
- [What's New in Encryption in SAS 9.4](#) in *Encryption in SAS Viya: Data in Motion*
- [What's New in the SAS 9.4 Logging Facility](#) in *SAS Logging: Configuration and Programming Reference*
- [What's New in the Output Delivery System](#) in *SAS Output Delivery System: User's Guide*
- [What's New in SAS/GRAPH and Base SAS 9.4: Mapping Reference](#)
- [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

SAS/ACCESS 9.4 Interface for Relational Databases

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: The SAS/ACCESS Interface to Impala and the SAS/ACCESS Interface to PI System were added in SAS 9.4M2 (August 2014) . 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.

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 Interface to the PI System](#) in *SAS/ACCESS Interface to the PI System: Reference*.

SAS/ACCESS 9.4 to Amazon Redshift

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 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 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 18](#).

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 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 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 9.4M5 (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

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 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 Interface to the PI System](#) in *SAS/ACCESS Interface to the PI System: Reference*.

SAS/ACCESS 9.4 Interface to PostgreSQL

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 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

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

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

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

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

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

SAS/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 TCPROXYLIST 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 TCPROXYLIST 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.

For more information, see [What's New in SAS/CONNECT 9.4](#) in *SAS/CONNECT User's Guide*.

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 9.4M5

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

- Mapping procedures GEOCODE and MAPIMPORT are moved from SAS/GRAPH to Base SAS. Mapping procedures GINSIDE, GMAP, GPROJECT, GREDUCE, and GREMOVE remain with SAS/GRAPH.
- *SAS/GRAPH: Mapping Reference* is moved to the Base SAS documentation library. It documents the existing mapping procedures plus the new ODS Graphics SGMAP procedure.
- The GCHART procedure provides new options:
 - The new GROUPREF option on the HBAR and VBAR statements provides the ability to draw a dividing line between bars or groups of bars. In addition, three new options enable you to manage the appearance of reference lines: option CGROUPREF manages line color, option LGROUPREF manages line type, and option WGROUPREF manages line width.
 - Four new options enable you to draw a reference line between the midpoints of bars or groups of bars. Option MIDPOINTREF on the HBAR and VBAR statements provides the ability to draw a dividing line between the midpoints of bars or groups of bars. Three additional options enable you to manage the appearance of the midpoint reference line: option CMIDPOINTREF manages line color, option LMIDPOINTREF manages line type, and option WMIDPOINTREF manages line width.
 - The new frequency format option STATFMT= on the BLOCK, VBAR, VBAR3D, HBAR, HBAR3D, PIE, PIE3D, DONUT, and STAR statements applies a specified format to a calculated statistical value such as that specified with the frequency (FREQ=) option of the TYPE= option. This option overrides the GCHART procedure's default format of the displayed statistical value. Use this option to change the default format that might contain decimal points, percentages, or commas. The STATFMT= option does not control the format of the response axis tick marks.
- The GBARLINE procedure provides a new frequency format option STATFMT= on its BAR and PLOT statements. This option applies a specified format to a calculated statistical value such as that specified with the frequency (FREQ=) option of the TYPE= option. The STATFMT= option overrides the GBARLINE procedure's default format of the displayed statistical value. Use this option to change the default format that might contain decimal points, percentages, or commas. The STATFMT= option does not control the format of the response axis tick marks.
- The annotate IMAGE function STYLE= option provides a new value SINGLE that centers a single instance of an image on a specific coordinate.
- New graphics devices IMGPNG and IMGJIF provide improved graph-rendering performance over the PNG and GIF Universal Printer devices. The IMGPNG and IMGJIF devices can be used to improve the performance of SAS jobs that generate a large number of graphs in the PNG or GIF format.

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

SAS/GRAPH 9.4M4

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

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

SAS/GRAPH 9.4M3

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

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

SAS/GRAPH 9.4M2

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

- The GEOCODE procedure for city geocoding offers a new variable to handle nonstandard state values, changes requirements for the customized versions of the SASHELP.GCSTATE lookup data set, changes variable values within the SASHELP.GCSTATE lookup data set, allows non-abbreviated state names, and offers an improved %TIGER2GEOCODE import program.
- The GRADAR procedure offers a new parameter on the SPKLABEL= option.
- The PowerPoint destination supports both the JAVAIMG device and the ACTXIMG device. The ZPNG device is disabled. Also, new HTML attributes are added to the SVG, SVGT, and SVGView devices.
- The GTILE procedure now supports the NOLEGEND option.

SAS/GRAPH 9.4M1

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

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

SAS/GRAPH 9.4

SAS/GRAPH 9.4 includes the following enhancements:

- The GEOCODE procedure now supports non-U.S. street geocoding. To support non-U.S. street geocoding, new lookup data sets are available, and the existing lookup data sets are reformatted. A new import macro program, %GEOBASE2GEOCODE, and an updated version of %TIGER2GEOCODE are available from the SAS Maps Online website. These macros create lookup data sets in the new format. The new DIRECTION= option enables you to specify an alternate data set of street direction names and abbreviations, such as northwest or NW. The new STATE= option enables you to specify an alternate data set that contains state or province character names rather than FIPS numeric codes. The STREET geocoding method now provides several new and changed values for the output variables _MATCHED_ and _NOTES_ to support U.S. and non-U.S. street geocoding.
- The map data sets in the MAPSGFK library have been updated.
- The GINSIDE procedure provides two new options to control whether to keep or drop map data set variables, KEEPMAPVARS and DROPMAPVARS.
- In the GMAP procedure, the new LATLON= option specifies that the unprojected LAT and LONG variables from the map data set are used for coordinate data instead of the Y and X variables. The new RESOLUTION= option specifies that the GMAP procedure use those map observations containing a resolution variable with a certain level (value). The new preproduction OSM option enables you to specify an OpenStreetMap style and project map data onto an OSM map.
- In the GPROJECT procedure, the LATLON= option specifies that the unprojected LAT and LONG variables from the map data set are used for coordinate data instead of the Y and X variables. The new FROM= and TO= options invoke the proj.4projection 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, 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*.

SAS Grid Manager

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, 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.

For more information, see [What's New in SAS/SHARE 9.4](#) in *SAS/SHARE User's Guide*.

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 3.71

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, 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.

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SAS Business Rules Manager

SAS Business Rules Manager 3.2

SAS Business Rules Manager 3.2 runs on SAS 9.4M4.

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

- 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

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

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 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, see the product documentation page for [SAS Contextual Analysis](#).

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 3.2

SAS Decision Manager 3.2 runs on SAS 9.4M4.

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

- 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, see [What's New in SAS Decision Manager 3.2](#) in *SAS Decision Manager: User's Guide*

SAS Decision Manager 3.1

SAS Decision Manager 3.1 runs on SAS 9.4M3.

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

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

SAS Decision Manager 2.2

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

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

- create libraries and register tables in the SAS Metadata Repository
- manage workflows and track workflow tasks

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

SAS Enterprise Miner

SAS Enterprise Miner 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.

For more information about SAS Enterprise Miner 14.3, see the software product page for [SAS Enterprise Miner](#).

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 procedure 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.

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.

For more information, see the software product page for [SAS Energy Forecasting](#).

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 Processing

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.

For more information, see the software product page for [SAS Event Stream Processing](#).

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 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 QUANDLAPI 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, see [What's New in SAS/ETS 14.3](#) in *SAS/ETS 14.3 User's Guide*.

SAS/ETS 14.2

SAS/ETS 14.2 (November 2016) runs on SAS 9.4M4 and later releases.

These components have been added to SAS/ETS software:

- The SASENOAA interface engine enables SAS users to retrieve severe weather data from the National Oceanic and Atmospheric Administration (NOAA) Severe Weather Data Inventory (SWDI) web service.
- The SASERAIN interface engine enables SAS users to retrieve weather data from the World Weather Online website.
- The SPATIALREG procedure analyzes spatial econometric models for cross-sectional data where observations in the data are spatially referenced or georeferenced.

New features have been added to these SAS/ETS components:

- HPCDM procedure
- HPSEVERITY procedure
- QLIM procedure
- SASEFAME interface engine
- SASEFRED interface engine
- SASEQUAN interface engine
- SASEXFSD interface engine
- SEVERITY procedure
- SSM procedure
- TIMESERIES procedure
- VARMAX procedure

For more information, see [What's New in SAS/ETS 14.2](#) in *SAS/ETS 14.2 User's Guide*.

SAS/ETS 14.1

SAS/ETS 14.1 (July 2015) runs on SAS 9.4M3 and later releases.

Here are some of the new features and enhancements:

- The COUNTREG procedure adds the TEST statement, three statements that enable you to include spatial effects in a model, and more Bayesian analysis features.
- The HPCOUNTREG procedure adds the TEST statement and support for the Conway-Maxwell distribution.
- The HPPANEL procedure adds support for the between-groups estimator, between-time-periods estimator, and pooled OLS regression.
- The MODEL procedure adds the %EQAR and %EQMA macros.
- The PANEL procedure adds more general Hausman specification tests, comparison tables for multiple models, and Hausman and Taylor (1981) and Amemiya and MaCurdy (1986) estimators.
- The QLIM procedure adds the RANDOM statement, which enables you to estimate the random-intercept models, and more Bayesian analysis features.

- The SASEFRED interface engine supports Linux X64 (LAX) hosts; real-time periods for Federal Reserve Economic Data (FRED) data; logging of diagnostics in the SAS log; requests for useful information about categories, tags, groups, and releases; and use of blanks in 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 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.

For more information, see the software product page for [SAS Enterprise Miner and SAS Factory Miner](#).

SAS Forecast Server

SAS Forecast Server 14.3

SAS Forecast Server 14.3 shipped in September 2017 and supports SAS 9.4M5.

For more information about SAS Forecast Server 14.3, see the software product page for [SAS Forecast Server](#).

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 3.9

SAS High-Performance Risk 3.9 shipped in September 2017 and aligns with SAS 9.4M5.

For more information, see the software product page for [SAS High-Performance Risk](#).

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 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, 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 LOGABSDET 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 14.2

SAS Model Manager 14.2 runs on SAS 9.4M4.

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

- 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 from 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, 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 14.3

SAS/OR 14.3 shipped in September 2017 and runs on SAS 9.4M5 and later releases.

Several optimization solvers have been updated in SAS/OR 14.3 and improve their performance. The LP, MILP, QP, and NLP solver algorithms all reduce the time they require to solve benchmark optimization problems. These improvements also include the decomposition (DECOMP) algorithm for LP and MILP.

SAS Simulation Studio 14.3, a component of SAS/OR 14.3 for Windows environments, adds Linux support (on an experimental basis) and also adds an alternative user interface design.

For more information, see [What's New in SAS/OR 14.3](#) in *SAS/OR 14.3 User's Guide: Mathematical Programming*.

SAS/OR 14.2

SAS/OR 14.2 shipped in November 2016 and runs on SAS 9.4M4 and later releases.

SAS/OR 14.2 includes performance improvements in the LP, MILP, and NLP solvers.

SAS Simulation Studio, a component of SAS/OR 14.2 for Windows environments, now includes these modeling blocks:

- The new Caster block makes it easier to transfer complex objects (entities, observations, and so on) within a model.
- The Queue block adds extended queueing controls that you can use to help prevent a queue from becoming blocked.

For more information, see [What's New in SAS/OR 14.2](#) in *SAS/OR 14.2 User's Guide: Mathematical Programming*.

SAS/OR 14.1

SAS/OR 14.1 shipped in July 2015 and runs on SAS 9.4M3 and later releases. It adds a number of new optimization capabilities that shorten optimization time, increase diagnostic capabilities, and make the software easier to use.

Here are some of the new features and enhancements:

- Several solvers improve their performance.
- The concurrent FOR loop (the COFOR loop) in PROC OPTMODEL can run in distributed mode.

Note: Distributed mode requires SAS High-Performance Optimization.

- PROC OPTMODEL adds a profiler that tracks the amount of time spent in problem generation, presolve, and various stages of the solution process.
- PROC OPTNET enables parallel computing, provides faster graph data input, and adds enhancements to three of its algorithms.
- The quadratic and nonlinear solvers add irreducible infeasible set (IIS) diagnostics.
- The decomposition algorithm expands the range of constraint matrix structures that it can detect automatically.
- The CLP procedure adds more variable selection strategies.

SAS Simulation Studio 14.1, a component of SAS/OR 14.1 for Windows environments, adds features that improve the accuracy of your models and give you additional controls on model execution. Highlights include the following:

- controls on the order in which dynamically created data input and output ports on blocks execute during the run of a model
- centralized controls on the ranking of blocks in a model, which determines the order of execution for events that are scheduled for the same simulation clock time
- expanded and improved controls on the allocation of resource units among resource entities when there is a scheduled adjustment
- automatic launching of the SAS server on your local PC

For more information, see [What's New in SAS/OR 14.1](#) in *SAS/OR 14.1 User's Guide: Mathematical Programming*.

SAS/OR 13.2

SAS/OR 13.2 shipped in August 2014 and runs on SAS 9.4M2 and later releases.

Here are some of the new features and enhancements:

- Several optimization solvers improve their performance.
- PROC OPTMODEL adds the experimental constraint logic programming (CLP) solver.
- The nonlinear programming (NLP) solver adds output of the covariance matrix for the decision variables (parameter estimates).
- The decomposition (DECOMP) algorithm adds new block detection features.
- For the linear programming (LP) interior point solver, the crossover algorithm is applied by default.
- The network solver is now production.
- The parallel implementation of the mixed integer linear programming (MILP) solver is now production.
- SAS Simulation Studio 13.2 provides a new optional parallel mode that executes design points and replications simultaneously on multiple computational cores, a

central facility in the new Data Trimmer block to control data collection, and added control on the precision of the numeric values that the Formula block produces.

For more information, see [What's New in SAS/OR 13.2](#) in *SAS/OR 13.2 User's Guide: Mathematical Programming*.

SAS/OR 13.1

SAS/OR 13.1 shipped in December 2013 and runs on SAS 9.4M1 and later releases. It includes new features and enhancements to current features in optimization, discrete-event simulation, and constraint programming.

Here are some of the new features and enhancements:

- The OPTMODEL procedure now supports:
 - direct access to network optimization and analysis algorithms (Experimental)
 - parallel execution of solver invocations in a COFOR loop
 - support for function definition via PROC FCMP in Base SAS software
- The OPTLSO procedure now provides:
 - multiobjective optimization
 - support for the use of array-structured data in function definition (via PROC FCMP)
- The mixed integer linear programming (MILP) solver adds the option to execute in parallel on multiple computational cores. (Experimental)
- SAS Simulation Studio adds:
 - support for custom block icons
 - improvements to the simulation clock display
 - enhancements to the Submodel block interface
 - other interface improvements

For more information, see [What's New in SAS/OR 13.1](#) in *SAS/OR 13.1 User's Guide: Mathematical Programming*.

SAS/OR 12.3

SAS/OR 12.3 is largely a maintenance release of SAS/OR software that runs on SAS 9.4. The most significant addition is PROC OPTLSO for parallel hybrid local search optimization. This procedure, formerly named PROC HPLSO, previously was included only in SAS High-Performance Optimization but is now available with SAS/OR for use in single-machine mode.

For more information, see the software product page for [SAS/OR](#).

SAS/QC

SAS/QC 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, see [What's New in SAS/QC 14.3](#) in *SAS/QC 14.3 User's Guide*.

SAS/QC 14.2

SAS/QC 14.2 shipped in November 2016 and runs on SAS 9.4M4 and later releases. SAS/QC 14.2 includes enhancements to the ANOM, CAPABILITY, CUSUM, MACONTROL, RAREEVENTS, and SHEWHART procedures.

For more information, see [What's New in SAS/QC 14.2](#) in *SAS/QC 14.2 User's Guide*.

SAS/QC 14.1

SAS/QC 14.1 shipped in July 2015 and runs on SAS 9.4M3 and later releases.

Here are some of the new features and enhancements:

- The new, experimental RAREEVENTS procedure produces control charts for rare events. A rare event is one that occurs infrequently, with a low probability. A rare events chart is better suited than traditional control charts to detecting changes in the frequency of low-probability events.
- The ANOM, CUSUM, MACONTROL, and SHEWHART procedures are now capable of producing graphs that you can edit by using the ODS Graphics Editor.

For more information, see [What's New in SAS/QC 14.1](#) in *SAS/QC 14.1 User's Guide*.

SAS/QC 13.2

SAS/QC 13.2 shipped in August 2014 and runs on SAS 9.4M2 and later releases.

Here are some of the new features and enhancements:

- The ANOM, CUSUM, MACONTROL, and SHEWHART procedures now use templates that are written in the Graph Template Language to produce ODS Graphics.
- The CAPABILITY procedure now calculates the geometric means of analysis variables and can save them in an output data set or display them in a graph (or both).
- The MVPMONITOR procedure now includes an option that enables you to specify the distribution that is used to compute control limits.
- The RELIABILITY procedure can now produce confidence bands for stress-lifetime plots that are produced by the RELPLOT statement.

For more information, see [What's New in SAS/QC 13.2](#) in *SAS/QC 13.2 User's Guide*.

SAS/QC 13.1

SAS/QC 13.1 shipped in December 2013 and runs on SAS 9.4M1 and later releases.

Here are some of the new features and enhancements:

- The CAPABILITY procedure now provides the following:
 - improved parameter estimation for the Johnson S_U distribution
 - support for the OVERLAY option, which overlays, onto a single plot, histograms that are associated with different levels of a CLASS variable
- The MVPMONITOR procedure supports the new SCORECHART statement, which produces control charts of principal component score.
- The RELIABILITY procedure now supports the following features:
 - horizontal plots of failure and censoring times for recurrent events data
 - parameter estimation and probability plotting for the Gompertz and Gompertz-Makeham distributions
- The SHEWHART procedure has several new options:
 - The ACTUALALPHA option displays the effective α value, which might not be the same as the requested α value, in the limits legend of an attribute chart. This option is available in the CCHART, NPCHART, PCHART, and UCHART statements.
 - The IDSYMBOLHEIGHT= option controls the size of the symbols that are used to plot outliers in box plots that are produced by the BOXCHART statement.
 - The PROBLIMITS=DISCRETE option requests discrete control limits for attribute charts. This option is available in the CCHART, NPCHART, PCHART, and UCHART statements.
 - The WESTGARD= option applies Westgard rules to a Shewhart chart for quality control in health care laboratories.
 - The WHISKERPERCENTILE= option requests that the whiskers of the box plots that are produced by the BOXCHART statement be drawn to percentile values.

There are four new macros for measurement system analysis:

- The %basicEMP macro performs a basic evaluating-the-measurement-process (EMP) analysis.
- The %shortEMP macro performs the eight steps for characterizing relative utility.
- The %gaugeRR macro performs a traditional gauge repeatability and reproducibility analysis.
- The %honestGaugeRR macro creates an “honest” gauge repeatability and reproducibility report.

For more information, see [What’s New in SAS/QC 13.1](#) in *SAS/QC 13.1 User’s Guide*.

SAS/QC 12.3

SAS/QC 12.3 is essentially a maintenance release of SAS/QC software that runs on SAS 9.4.

For more information, see the software product page for [SAS/QC](#).

SAS/STAT

SAS/STAT 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 multi-way 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 the 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.

For more information, see [What's New in SAS/STAT 14.3](#) in *SAS/STAT 14.3: User's Guide*.

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 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.

For more information about the new features and enhancements in SAS Text Miner 14.3, see the software product page for [SAS Text Miner](#).

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.

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 2.81

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.

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 2.8

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 (%)'`, 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

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SAS Add-In 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 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.

For more information, see the software product page for [SAS Add-In for Microsoft Office](#).

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 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 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.

For more information, see the software product page for [SAS Enterprise Guide](#).

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 Mobile BI

About SAS Mobile BI

You can use the SAS Mobile BI app to view SAS Visual Analytics reports on your Apple and Android mobile devices, and Windows tablets. For more information, see the [SAS Mobile BI documentation](#).

SAS Mobile BI 8.15 for iPad and iPhone

SAS Mobile BI 8.15 for iPad and iPhone (August 2017) provides these changes and enhancements:

- enhanced support for Premium Geographic Mapping Services
- the ability to override the theme used by a report
- support for SAS Visual Analytics 8.1, 7.4, 7.3, and 7.2

You can download the free iPad and iPhone app from [Apple iTunes store](#).

SAS Mobile BI 8.15 for Android

SAS Mobile BI 8.15 for Android (August 2017) provides these changes and enhancements:

- enhanced support for report features
- support for SAS Visual Analytics 8.1, 7.4, 7.3, and 7.2

You can download the free Android app from [Google Play](#).

SAS Mobile BI 8.11 for Windows 10 Tablets

SAS Mobile BI 8.11 for Windows 10 (August 2017) provides these changes and enhancements:

- the ability to extract report data
- search results now include path information
- enhanced support for report features
- support for SAS Visual Analytics 8.1, 7.4, 7.3, and 7.2

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, see [What's New in SAS 9.4 OLAP Server](#) in *SAS 9.4 OLAP Server: User's Guide*.

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

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, see [What's New in SAS Web Report Studio 4.4](#) in the *SAS Web Report Studio: User's Guide*.

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. For more information, see the product documentation page for [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.

For more information, see the software product page for [DataFlux Data Management Studio](#), [DataFlux Data Management Server](#), and [DataFlux Expression Language](#).

DataFlux Data Management Server 2.6

DataFlux Data Management Server 2.6 runs on SAS 9.4M1 and later releases.

Here are the primary enhancements in DataFlux Data Management Server 2.6:

- When you import objects that replace existing objects, you can now apply the permissions from the existing object to the new object.
- Objects, jobs, and services receive a default access control list (ACL) when they are added to the DataFlux Data Management Server. In the 2.6 release, the default ACL contains ALLOW or DENY permissions for lists of users and groups.
- To make batch and profile job logs more accessible to administrators and to the SAS Job Monitor, you can now specify a separate storage location for those log files.
- When you run jobs with the **dmpexec** command, you can now configure the log files that are generated by those job runs.
- You can now enable the capture of log data for the SOAP packets that are received and transmitted by the DataFlux Data Management Server.
- You can now validate XML in output data from real-time services.

DataFlux Data Management Server 2.5

DataFlux Data Management Server runs jobs and real-time services in response to requests that are submitted by authorized SOAP/HTTP clients. DataFlux Data Management Server 2.5 runs on SAS 9.4.

Here are the primary enhancements in DataFlux Data Management Server 2.5:

- The DataFlux Data Management Server has a new server configuration and security.
- The SAS Metadata Server is configured by default for security.
- The SAS Metadata Server provides configuration options when the server starts.
- SAS Job Monitor collects job status and statistics.

DataFlux Data Management Studio

DataFlux Data Management Studio 2.7

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.

For more information, see the software product page for [DataFlux Data Management Studio](#), [DataFlux Data Management Server](#), and [DataFlux Expression Language](#).

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.

For more information, see *DataFlux Secure: Administrator's Guide* from the product documentation page for [DataFlux Secure](#).

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 Quality Knowledge Base for Contact Information

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 Locales for Contact Information 2013A

Quality Knowledge Base Locales 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 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 Locales for Product Data 2013A

Quality Knowledge Base Locales 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 Business Data Network

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 the product documentation page for [SAS Business Data Network](#).

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.

For more information, see the software product page for [SAS Data Loader](#).

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 4.903

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, 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*.

For more information, see the product documentation page for [SAS Data Quality Accelerator for Teradata](#).

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 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. For more information, see [“SAS Data Quality 3.3” on page 205](#).

The new function DQLOCALESCORE returns an integer confidence score for a source string and a locale.

For more information, see [What’s New in SAS Data Quality](#) in *SAS Data Quality and SAS Data Quality Server: Language Reference*.

SAS Data Remediation

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 the product documentation page for [SAS Data Remediation](#).

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 3.2

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.

For more information, see the product documentation page for [SAS Lineage](#).

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 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

For more information, see the product documentation page for [SAS MDM](#).

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 2.2

The main enhancement for SAS Task Manager 2.2 is four new user preferences.

For more information, see the product documentation page for [SAS Task Manager](#).

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, see the product documentation page for [SAS Visual Process Orchestration](#).

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

For more information, see the software product page for [SAS Marketing Automation](#).

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

For more information, see the software product page for [SAS Marketing Optimization](#).

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

For more information, see the software product page for [SAS Real-Time Decision Manager](#).

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 Financial Management

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, see the software product page for [SAS Financial Management](#).

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.

For more information, see the software product page for [SAS Anti-Money Laundering](#).

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.

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.

For more information, see the software product page for [SAS Customer Due Diligence](#).

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.

For more information, see the software product page for [SAS Social Network Analysis](#).

SAS Visual Investigator

SAS Visual Investigator 10.3.1

For more information, see the software product page for [SAS Visual Investigator](#).

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

Chapter 10

SAS In-Database Products

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SAS 9.4 In-Database Products

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, 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.

For more information, see the software product page for [SAS Integration Technologies](#).

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 2.5

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:

- 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 149](#).

For more information, see [What’s New in SAS Environment Manager 2.5](#) in *SAS Environment Manager: User’s Guide*.

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

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.

Security Enhancements

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 26](#).

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 28](#).

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 Mobile BI. 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.

Additional Information

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 Guide*
- [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 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 3.8

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.

For more information, see the product documentation page for [SAS IT Resource Management](#).

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.

For more information, see the software product page for [SAS Enterprise GRC](#).

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.

For more information about new features and enhancements in the latest SAS Firmwide Risk for Solvency II content release, see the [SAS Firmwide Risk for Solvency II](#) product page.

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 enables financial institutions to build the types of credit modeling systems that are required to satisfy regulatory standards.

With SAS Model Implementation Platform, you can do the following:

- use scenarios or stochastic economic simulations to perform model implementation activities like stress testing, expected credit loss calculations, and loan valuation
- use built-in model implementation logic to efficiently implement complex and computationally intensive systems of credit risk models
- store your models in a controlled, centralized repository to facilitate transparency, improve auditability and model governance, and eliminate the need to track models manually
- interactively explore the results of analysis runs at any aggregation level

For more information, see the software product page 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 Implementation Platform 2.2

SAS shipped SAS Model Implementation Platform 2.2 in June 2016. This release includes SAS 9.4M3 and SAS High-Performance Risk 3.6.

Here are some of the new actions that you can perform in this release:

- perform stochastic economic simulations and counterparty scoring
- add a post-execution program, PostProcess (PostVar) methods, and precalculated cash flows to analysis runs
- enable scenario registration and advanced debug logging for analysis runs
- edit and resubmit analysis runs
- create a portfolio cube without needing to execute a scenario run
- customize the Execution Summary report and the reporting numeraire currency for analysis runs
- export portfolio analysis objects from one work group, and import them into another work group
- use the work group feature to limit the data and models that users can access
- use Oracle 11g or higher as the database for SAS Model Implementation Platform

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.

For more information, see the software product page for [SAS OpRisk VaR](#).

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 3.1

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

For more information, see the software product page for [SAS Risk and Finance Workbench](#).

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 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, and 6.9 run 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.

The latest release is SAS Risk Dimensions 6.9. For more information, see the software product page for [SAS Risk Dimensions](#).

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.

For more information, see the software product page for [SAS Risk Management for Banking](#).

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 7.4

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.

For more information, see [What's New in SAS Visual Analytics 7.4](#) in *SAS Visual Analytics 7.4: User's Guide*.

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

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 based on 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 contained in the documentation for SAS Visual Analytics.

Part 2

SAS Viya 3.3

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Chapter 16

Introduction to SAS Viya

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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 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 microservice is a small service that runs in its own process and communicates with a lightweight mechanism (HTTP). Some of the services in SAS Viya are Authorization, Backup, and CAS Management. Use SAS Environment Manager to see the complete list of SAS Viya services.</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 leverages 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 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 the metadata-based authorization, SAS Viya maintains data access authorizations within Cloud Analytic Services.
- In SAS Viya, CAS uses a VARBINARY data type that enables image analysis. The CAS server supports the VARCHAR data type, which uses character semantics and varying length variables.

SAS Viya Interoperates with SAS 9.4

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

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

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

See Also

[Migrating Data to UTF-8 for SAS Viya](#)

SAS Cloud Analytic Services (CAS)

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

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

- Fault tolerance on the CAS server detects when a node no longer operates and distributes that node's work to other nodes.
- Processing occurs in CAS server sessions and not in server processes, enabling CAS session monitoring, resource tracking, and resource management.
- In-memory tables can have local (session) or global scope.
- The CAS server is able to continue to process tables when memory capacity is exceeded.

- The CAS server interfaces with third-party software such as Python, Lua, Java, and REST APIs.
- All table operations are performed in a caslib. A caslib is an in-memory space to hold tables, access control lists, and data source information.
- PROC CASUTIL is a new procedure to manage CAS server tables, including loading and saving tables. Data in tables can be loaded serially or in parallel.
- The CHARACTER data type in SAS 9 uses byte semantics and supports fixed widths. The CAS server supports the VARCHAR data type, which uses character semantics and varying length variables.
- Similar to the SAS LASR Analytic Server, the basic unit of work is an action, which performs a single task. You submit actions to the CAS server either by using PROC CAS and the CAS language (CASL), or by using third-party software.
- The SAS Analytic procedures and the DATA step have been rewritten for parallel processing in multiple cores or server nodes. The DATA step has some language element restrictions.
- DS2 and FedSQL run on the CAS server. FedSQL has some restrictions.
- Catalogs are not supported on the CAS server. To support user-defined formats, format libraries are associated with caslibs.
- Some utility procedures, such as the PRINT procedure pull data from the CAS server to process, but run on the SAS Workspace server.

See Also

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

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SAS Viya Administration

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New Features and Enhancements for SAS Viya 3.3

Here are some of the key administrative features in SAS Viya 3.3:

- By default, data in motion is protected. For more information, see [Encryption in SAS Viya: Data in Motion](#).
- You can enable guest users to view reports. For more information, see [SAS Viya Administration: Authentication](#).
- You can easily script common administrative tasks. For more information, see [SAS Viya Administration: Command-Line Interfaces](#).
- You can easily import and manage batch loading of data with provided job definitions. For more information, see [SAS Viya Administration: Data](#).
- You can use a new common interface to import data. For more information, see [SAS Data Explorer: User's Guide](#).
- You can load Geographic Polygon data as a CAS table. For more information, see [SAS Viya Administration: Data](#).
- You can manage your stored credentials (personal passwords). For more information, see [SAS Viya Administration: External Credentials](#).
- At installation time, you can enable support for multiple tenants in a single deployment. For more information, see [SAS Viya Administration: Multi-tenancy](#).

See Also

[SAS Viya Administration: What's New](#)

Differences from SAS Viya 3.2

If you are upgrading from SAS Viya 3.2, be aware of these changes in SAS Viya 3.3.

- These changes were made to authorization:
 - In CAS authorization, the Anonymous identity type is replaced with the Guest identity type.
 - CAS roles no longer provide unrestricted access to data.
 - In CAS authorization, the way that access controls for database caslibs are stored has changed. After you upgrade from SAS Viya 3.2, see [Preserve Access Controls for Database Caslibs](#) in *SAS Viya for Linux: Deployment Guide*.
 - In general authorization, the Update permission on a parent is no longer required in order to move a member to a different location.
- These CAS server configuration file options have been discontinued:
 - cas.ADDFMLIB
 - cas.FMTCASLIB
 - cas.TIMEZONE

SAS Environment Manager

SAS Environment Manager 3.2

In SAS Environment Manager 3.2 (December 2017), you can customize the administrative dashboard, manage passwords, use new widgets on the dashboard to monitor availability and view a count of error messages in the logs, and view new administrative reports. New and enhanced interfaces help you manage licenses, view logs, monitor machines, schedule jobs, perform backups, and manage user-defined formats.

You can use the **Contexts** page to create contexts for the SAS Compute server and the SAS Launcher server.

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.

Here are some of the features in SAS Environment Manager in SAS 9.4 that are not yet available in SAS Environment Manager in SAS Viya:

- In SAS Viya, server control is limited to stopping a CAS server and starting additional worker nodes.
- Alerts are not supported.
- Promotion (import and export) is performed using a command-line interface.

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SAS Cloud Analytic Services

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Enhancements to the CAS Procedure

New CASL Statements

The CASL statement shown in the following table is new.

Statement	Description
UPLOAD	Used to transfer a file from the SAS client to the server.

New CASL Functions

The CASL functions shown in the following table are new.

Function	Description
ADDBYGROUP	Creates a new table from a BY-group table.
COMBINE_TABLES	Create a new table that has the name of the first table and contains all of the rows from all the tables.
CREATE_PARALLEL_SESSION	Starts multiple sessions with the same identity as the calling action.
LOC	Returns the row in which the given value is found in the given column.
READPATH	Reads the contents of the file given into the variable as a string.
RESULT_BY_COL	Creates a new table with the given columns.
RESULT_BY_TYPE	Creates a new table with columns that match the type specifications.
SEND_RESPONSE	Sends the specified result back to the client.
SESSION	Creates a session variable.
SORT	Returns a list sorted in ascending order.
SORT_REV	Returns a list sorted in descending order.
SYMPUTX	Assigns a value to a macro variable, and removes both leading and trailing blanks.
TERM_PARALLEL_SESSION	Terminates a parallel session.
WAIT_FOR_NEXT_ACTION	Wait for a completed action.

Server-Side Scripting with CASL

Server-side scripting with CASL is enabled through the action set `sccasl`. The `sccasl` interface loads the CASL interface and initializes it to run on the server. Log messages and output from CASL are sent back to the client as log messages. Use the `runCasl` action to run CASL code on the server.

Language Element	Description
CASL Server Action Set	Provides actions for running server-side CASL code
CREATE_PARALLEL_SESSION function	Starts multiple sessions with the same identity as the calling action.
SEND_RESPONSE function	Sends the specified result back to the client.
TERM_PARALLEL_SESSION function	Terminates a parallel session.
WAIT_FOR_NEXT_ACTION	Wait for a completed action.

See Also

[SAS Cloud Analytic Services: CASL Reference](#)

Enhancements to SAS Visual Data Mining and Machine Learning Action Sets

New Deep Learning Action Sets

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

The following SAS Deep Learning Action sets are new:

- The `deepNeural` action set enables you to model and score tasks that require deep fully connected neural networks.
- The `deepRnn` action set enables you to model and score tasks that require deep recurrent neural networks, using text as the input.
- The `deepLearn` action set enables you to model and score tasks that require deep learning networks. The `deepLearn` action supports DNN, CNN, and RNN.

SAS Deep Learning Toolkit on SAS Viya 3.3

The SAS Deep Learning toolkit is a new set of cloud-enabled SAS CAS actions released with SAS Viya 3.3. The actions are delivered as part of SAS Visual Data Mining and Machine Learning (VDMML) 8.2. The SAS Deep Learning toolkit provides GPU support under certain conditions.

Enhancements to SAS Visual Text Analytics Action Sets

New 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.

The following action sets are new:

- The LDA Topic Model Analysis action set implements the latent Dirichlet allocation (LDA) method for topic model analysis. You can use this action set to train a topic model for documents using the LDA method and to score documents using the trained LDA topic model.
- The Search Analytics action set provides actions for the SAS Text Analytics linguistic rule development package for categorization, concept extraction, and sentiment analysis.
- The Smart Data action set is designed to perform data analysis using machine learning.
- The Text Analytics Rule Development action set provides a linguistic rule development package for categorization, concept extraction, and sentiment analysis.
- The Text Analytics Rule Score action set provides a linguistic rule scoring package for categorization, concept extraction, and sentiment analysis.
- The Text Summarization action set provides an action that uses natural language processing (NLP) techniques to summarize documents by identifying representative sentences.
- The Text Topics action set provides actions that use the output of the textMining action sets to accomplish tasks such as creating a topic of interest from a list of terms and merging multiple topics into one topic.
- The Text Utilities action set includes a set of actions that help you extend the functionality that is currently available from the textMining and textParse action sets.
- The Text Rule Discovery action set enables you to extract a term map, and it provides an action that extracts Boolean rules from text parsing results or transactional data and organizes the extracted rules into a tree structure, with the root of the tree being the target variable or the target term.
- The applySent action in the Sentiment Analysis action set has these enhancements:
 - The new featureOut parameter specifies the output CAS table that contains the product and feature match result information.
 - The new matchOut parameter specifies the output CAS table that contains the rule-matched string result information.
 - The new model parameter specifies the path to the user-defined Sentiment Analysis Model. If not specified, the base model is used.

See Also

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

New Parameters

The Sentiment Analysis and Text Mining action sets have core functionality that is available from SAS Visual Analytics, and advanced features that are available with a SAS Visual Text Analytics license.

These new parameters for the sentimentAnalysis.applySent, textMining.tmMine, and textMining.tmSvd actions require a SAS Visual Text Analytics license:

- The sentimentAnalysis.applySent action has these new parameters:
 - The featureOut parameter specifies the output CAS table that contains the product- and feature-match result information.
 - The matchOut parameter specifies the output CAS table that contains the rule-matched string result information.
 - The model parameter specifies the path to the user-defined Sentiment Analysis Model. If not specified, the base model is used.
- The textMining.tmMine action has these new parameters:
 - The rowPivot parameter is a new document normalization approach that enables you to dampen the tendency of long documents to belong to too many topics.
 - The termStdMultiple and docStdMultiple parameters enable you to adjust the term and doc cutoffs when calculating topics.
 - The exactDocPro parameter enables you to control whether the output document projections are rounded or given with full precision.
 - The liti parameter allows users to input a CAS table containing a LITI file that is passed on to the tpParse action internally.
 - The includeEmptyDocument parameter adds a placeholder row in the parent table for each empty document.
- The textMining.tmSvd action has these new parameters:
 - The rowPivot parameter is a new document normalization approach that enables you to dampen the tendency of long documents to belong to too many topics.
 - The termStdMultiple and docStdMultiple parameters enable you to adjust the term and doc cutoffs when calculating topics.
 - The topicDecision parameter places the document cutoffs on the topics table and makes the decision of topic membership on the docPro table.
 - The exactDocPro parameter enables you to control whether the output document projections are rounded or given with full precision.
 - The scoreConfig parameter is the new output config parameter to place SVD and topic information about the input config table. The scoreConfig table is an input to the new tmAstore action.

See Also

[SAS Visual Analytics Programming Guide](#)

Enhancements to SAS Visual Analytics Action Sets

New Action Sets

These action sets are new:

- The Model Publishing and Scoring action set provides actions to support DATA step and DS2 model publishing and scoring in CAS and in external databases.
- The Recommender System action set provides actions that are used for building the entire pipeline for a recommender system. The actions can use input data that includes explicit ratings or implicit ratings. Average ratings can be calculated to assist with the cold-start problem. More sophisticated algorithms are also available such as calculating the similarity between users or ratings and using the similarity with a KNN model. Customers can build matrix factorization models for collaborative filtering. For data that includes text descriptions, actions are available to build a search index, create a filter table based on query results, and make recommendations based on the filter.
- The Sequence action set provides actions for clickstream analysis.
- The FCMP action set provides actions that add and run FCMP code.
- The CASL Server action set provides actions for running server-side CASL code.

New Actions

These actions are new:

- The action `thePlotThickens` is new for the Hypergroup action set. The `thePlotThickens` action enables you to determine which points on a plot are displayed when the data has many points, while retaining the characteristics of the original plot.
- The `runCodeTable` action is new for the DATA Step action set. The action enables you to run DATA step code that is stored in a CAS code table.
- The `combineFmtLib` action is new for the Session Properties action set. The action enables you to combine all or selected formats in two or more format libraries into one format library.
- The `runModel` action is new for the DS2 action set. The `runModel` action prepares and executes a DS2 program passed as an entry in a model table.
- The Tables action set has these new actions:

`alterTable`

Modifies a table (for example, renames an in-memory table and changes the label for a table). Columns can be renamed or dropped, and the format or label can be changed.

index	Creates a new in-memory table that includes indexes for numeric and character columns. The tableDetails action is enhanced to report the size of the index. Indexing a table on a column that is frequently used for filtering data typically improves performance by reducing run times, but the size of the index can be a factor in determining overall performance. In addition to the index action, most actions that support creating new in-memory tables for output are enhanced to support an indexVars parameter for the output table.
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- The getLicensedProductInfo action is new for the Builtins action set. The action shows the information for all licensed SAS products, including expired licenses.
- In CAS authorization, the Access Control action set has these new actions:

startTransaction	Initiates an access control transaction in the current client session. Within a transaction, changes are private. Within a transaction, only exclusively reserved (checked-out) objects and their children can be updated. A transaction terminates when it is committed or rolled back.
checkOutObject	Reserves an object (and all of its children) for update by the current client session only. Prevents an object (and all of its parents) from being checked out exclusively by another session if checkOutType=Shared.
commitTransaction	Persists all changes in an access control transaction to the server, releases all checked-out objects, and terminates the transaction.
rollbackTransaction	Discards all changes in an access control transaction, releases all checked-out objects, and terminates the transaction.
statusTransaction	Shows whether a client session has an active transaction.
whatCheckoutsExist	Lists check-outs held on an object, its parents, and optionally its children.
checkInAllObjects	Releases all objects that are checked out. Use this action if the current client session does not have a transaction.

- The action thePlotThickens is new for the Hypergroup action set. ThePlotThickens enables you to determine which points on a plot are displayed when the data has many points, while retaining the characteristics of the original plot.

New Parameters and Functionality for Actions

New parameters and functionality have been added to these actions:

- The `simple.correlation` action has been updated with new features that match the features of the `HPCORR` procedure. Several parameters are added to support the new features.
- The `accessControl.whatIsEffective` and `accessControl.listAllPrincipals` actions have a new parameter, `includeMyInfo`. The `includeMyInfo` parameter ensures that the currently connected user identity's effective permissions are returned and appear first in the table.
- The `sessionProp.listFmtRanges` and `sessionProp.listFmtValues` actions have a new parameter, `fmtLibName`. The `fmtLibName` parameter enables you to list the ranges or values from a format in a specific format library.
- The `locale` parameter in the `sessionProp.listFmtRanges` and `sessionProp.listFmtValues` now supports locale-prefixed format names. Instead of using the `locale` parameter to override the default locale, you can include the locale prefix in the format name.
- The `fedSql.execDirect` action is enhanced to support implicit SQL pass-through for these data sources through `caslibs`: Amazon Redshift, DB2, Hadoop (Hive and Impala), ODBC, Oracle, PostgreSQL, SAP Hana, and Teradata. The new `cntl` parameter enables you to specify control parameters for the FedSQL query planner.

See Also

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

Enhanced CAS Statement

These options are new:

- The `AUTHDOMAIN=_SASMETA_` option requests that the SAS Metadata Server generate a one-time password that can be used to access CAS. This option enables stored processes, token-based workspace servers, and pooled workspace servers to connect to CAS without the need for stored user credentials.
- The `HOST=` option specifies the machine name for the primary control node of the server and the backup control node, if configured. If the primary control node fails and a backup controller is available, all of the sessions connect to the backup controller automatically.
- The `LOADFORMATS=` option loads formats that are stored in an item-store file into a format library in the active session. The format item-store file is created using the `FMTC2ITM` procedure. The `LOADFORMATS=` option and the `FMTC2ITM` procedure are useful for migrating user-defined formats from SAS to CAS.

See Also

- [SAS Cloud Analytic Services: User's Guide](#)

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

- The FMTC2ITM procedure converts one or more format catalogs into a single CAS item store. Use the item store as input to the CAS server addFmtLib action to add a format library to a session.
- PROC LUA supports the VARCHAR data type.
- You can manage objects in Amazon S3 using the S3 procedure.
- Publish and execute DATA step and DS2 models in CAS or an external database using the SCOREACCEL procedure.
- In PROC HTTP, the DEBUG statement, the OAUTH_BEARER= authentication option, the TIMEOUT= procedure option, and macro variables for status reporting are now supported in SAS Viya as well as SAS 9.4.

See Also

[Base SAS Procedures Guide](#)

System Options

SAS Viya deployments support only one CAS controller. Use the CASHOST= system option to specify a backup host controller. If the primary controller fails, sessions are automatically connected to the backup host controller.

See Also

[SAS Cloud Analytic Services: User's Guide](#)

Data Connectors

These data connectors are new in SAS Viya 3.3:

- SAS Data Connector to Amazon Redshift
- SAS Data Connector to DB2 for UNIX
- SAS Data Connector to Microsoft SQL Server
- SAS Data Connector to SAP HANA
- SAS Data Connector to Scalable Performance Data Engine Files

These enhancements have been made in SAS Viya 3.3 for all data connectors:

- ability to save CAS tables to your data source
- ability to delete a table in your data source from CAS
- support for multi-node data transfer when DATATRANSFERMODE="SERIAL"
- support for INTEGER data types

See Also

SAS Cloud Analytic Services: User's Guide

Data Set Options

In the December 2017 release of SAS 9.4M5 and SAS Viya 3.3, you can use the MAXTABLEMEM= data set option to specify the maximum amount of memory in bytes that each thread should allocate for in-memory blocks before converting to a memory-mapped file.

See Also

SAS Cloud Analytic Services: User's Guide

Statements

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

See Also

SAS Cloud Analytic Services: User's Guide

DS2

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

- The SCOREACCEL procedure provides an interface to the CAS server for DATA step and DS2 model publishing and scoring. Models can be published and run in CAS or in Hadoop or Teradata.
- You can use new DS2 actions to publish and run DATA step and DS2 models in CAS or in Hadoop or Teradata. Alternatively, you can use the new SCOREACCEL procedure from the SAS client.
- The SAS In-Database Code Accelerator for Hadoop honors the SCRATCH_DB option for a Hive database that is used when a temporary table is created.
- DS2 supports BIGINT (INT64) and INTEGER (INT32) as well as CHAR, DOUBLE, and VARCHAR data types in the CAS server. Columns defined as

SMALLINT and TINYINT data types in CAS are now created as INTEGER instead of DOUBLE.

- You can now pass SQL text in the SET statement if you run the DS2 program with the runDS2 action.
- The SCAN function supports a modifier. The modifier is supported only on the CAS server.
- If the content type is not set, the SETREQUESTBODYASSTRING method sets the default charset value to ISO-8859-1 (latin1) as specified by the HTTP 1.1 protocol.
- These functions are new:
 - The CMISS function counts the number of missing arguments.
 - The LOGISTIC function returns the logistic transformation of the argument.
 - The SAVING function returns the future value of a periodic saving.

SAS FedSQL

FedSQL extends its CAS data type support to include INT64 and INT32, as well as CHAR, VARCHAR, and DOUBLE. FedSQL supports SAS missing value processing for CHAR(n), DOUBLE, and VARCHAR(n). ANSI NULL processing is supported for DS2 DATE, TIME, and TIMESTAMP columns that were converted to DOUBLE and for the new integer data types.

Before the release of SAS Viya 3.3 in December 2017, all FedSQL processing in CAS was performed on tables that were loaded into CAS, whether the load was performed explicitly or automatically. Starting in SAS Viya 3.3 (December 2017), FedSQL for CAS supports implicit pass-through for SQL data sources. In the initial pass-through release, it provides single-source, full-query pushdown. That is, FedSQL for CAS attempts to push down only queries that reference tables in the same caslib; the tables must not previously have been loaded into the CAS session; and the data source must be able to handle the full query. Pushdown is supported for ANSI-compliant queries insofar as the target data source is ANSI-compliant. If these conditions are not met, data source tables are automatically loaded for FedSQL processing in CAS.

Options have been added to enable customers to require pass-through (canceling the automatic load if pass-through fails) or to disable implicit pass-through (causing data to be loaded from the onset). In addition, a new preserveJoinOrder option is available to enable customers to instruct FedSQL to join tables in the specified order instead of in the order chosen by the FedSQL query optimizer. All three options are supported in CAS only; they cannot be used to control FedSQL processing in SAS libraries.

FedSQL statements can be submitted to the CAS server by using PROC FEDSQL or by using the fedSql.execDirect option. In PROC FEDSQL, the options are specified as procedure options. In the fedSql.execDirect action, they are specified as action parameters.

FedSQL in CAS also has two new table options: COMPRESS= and REPLICATIONS=. FedSQL creates in-memory tables that exist for the duration of the CAS session. The new table options populate table attributes that are enforced if and when the CAS tables are persisted using another CAS action.

Hadoop

In the December 2017 release of SAS 9.4M5 and SAS Viya 3.3, the SCOREACCEL procedure provides an interface to the CAS server for DATA step and DS2 model publishing and scoring. Models can be published and run in the DATA step, Hadoop, or Teradata. For more information, see SCOREACCEL Procedure in [Base SAS Procedures Guide](#).

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SAS/ACCESS for Relational Databases

In SAS Viya 3.3 (December 2017), the following SAS/ACCESS interfaces have added integration with their associated data connectors:

- Amazon Redshift
- DB2 under UNIX

- Hadoop
- Impala
- Microsoft SQL Server
- ODBC
- Oracle
- PostgreSQL
- SAP HANA
- Teradata

For more information, see [What's New in SAS/ACCESS 9.4 for Relational Databases](#).

SAS/CONNECT

In SAS/CONNECT for SAS Viya 3.3 (December 2017), there is new support for VARCHAR variables in PROC UPLOAD and PROC DOWNLOAD. You can transfer data sets that contain VARCHAR variables between SAS engine libraries that support the VARCHAR variable (for example, the CAS engine). If you transfer a data set that contains VARCHAR variables to an engine library that does not support VARCHAR variables (for example, the V9 engine), the data is converted to the CHAR data type.

Note: Starting in SAS 9.4M5 (September 2017), SAS/CONNECT is no longer required to enable a SAS 9 programming environment to work with a SAS Viya environment. However, the SAS/CONNECT integration continues to be supported and enhanced.

[What's New in SAS/CONNECT for SAS Viya 3.3](#).

SAS Data Quality Accelerator for Teradata

SAS Data Quality Accelerator for Teradata is supported in SAS Viya 3.3 (December 2017) in addition to SAS 9.4. Although the configuration is different between SAS Viya 3.3 and SAS 9.4, the data quality stored procedures operate the same way in both environments. The data quality stored procedures run inside the Teradata database. They do not run on the CAS server.

For more information, see [What's New in SAS Data Quality Accelerator for Teradata](#).

SAS Data Preparation 2.1

The applications menu at the top left of your SAS Viya application banner now includes one or more of the following options:

- **Prepare Data**
- **Organize Data Projects**
- **Explore Lineage**
- **Monitor Jobs**

These options enable you to perform specific data preparation tasks for applications such as SAS Environment Manager, SAS Visual Analytics, Model Studio, and SAS Decision Manager.

In addition to these standard options, your site can license SAS Data Preparation, a software offering that adds the following features:

- a **Manage Data** option on the applications menu
- advanced data profiling features
- data quality transformations
- programming interfaces for data quality operations

For more information, see [Getting Started with SAS Data Preparation for SAS Viya](#).

SAS Data Quality 3.3

SAS Data Quality 3.3 provides full language element support in SAS and adds data quality support for SAS Cloud Analytic Services (CAS). CAS runs in SAS Viya 3.3.

Most of the data quality functions can be used in DATA step programs that run in CAS. The reference information for the data quality functions clearly identifies the functions that are valid in CAS.

With an appropriate caslib, data quality programs running on a SAS Workspace Server can read and write tables in SAS Cloud Analytic Services.

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

SAS Decision Manager 5.1

SAS Decision Manager 5.1 has been redesigned in HTML5 and runs on SAS Viya. The functionality of SAS Business Rules Manager has been incorporated into SAS Decision Manager. With SAS Decision Manager 5.1, you can manage both business rule sets and decisions.

SAS Decision Manager 5.1 is integrated with SAS Model Manager, SAS Environment Manager, SAS Data Explorer, and SAS Visual Analytics.

Key features and enhancements enable you to perform these tasks:

- publish content to SAS Cloud Analytic Services (CAS), Hadoop, SAS Micro Analytic Service, and Teradata
- edit decisions by using a graphical decision editor
- include rule sets directly in decisions, which eliminates the need to build rule flows
- open models and rule sets from the decision editor
- create major and minor versions of decisions and lookup tables
- activate a specific version of a lookup table
- manage the variables (vocabulary) used by rule sets and decisions by importing the variables
- create custom variables dynamically as you author rules

- run rule-fired analyses and decision path tracking analyses for decisions
- specify literal values for variables in rule set tests and decision tests instead of mapping variables to table columns
- edit expressions as free-form text
- use RETURN action in a rule set, which causes execution to exit the current rule set

Note: SAS Decision Manager 5.1 does not support complex rule sets (using BY groups), DATAGRID variables, or filtering output records based on whether a rule fired. SAS Decision Manager 5.1 is not integrated with SAS Lineage or SAS Workflow Manager.

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

SAS Econometrics 8.2

SAS Econometrics runs on 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 8.2 (December 2017) runs on SAS Viya 3.3. These procedures have been added to SAS Econometrics software:

- CCDM
- CSPATIALREG
- HMM
- TSMODEL

In addition, the time series analysis package and the time series model package have been added for the TSMODEL procedure.

New features have been added to these SAS Econometrics procedures:

- CNTSELECT
- CPANEL
- CQLIM
- SEVSELECT

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

- [SAS Econometrics 8.2: Programming Guide](#)
- [SAS Econometrics 8.2: Econometrics Procedures](#)

SAS In-Database Products

- SAS Viya 3.3 includes support for BIGINT (INT64) and INTEGER (INT32) as well as CHAR, DOUBLE, and VARCHAR data types on the CAS server. Columns that are defined as SMALLINT and TINYINT data types in CAS are now created as INTEGER instead of DOUBLE.
- You can use new DS2 actions to publish and run DATA step and DS2 models in Hadoop or Teradata from the CAS server. Alternatively, you can use the new SCOREACCEL procedure from the SAS client.
- In SAS Viya 3.3, the information from *SAS Viya 3.2 and SAS/ACCESS: Hadoop Configuration Guide* has been merged into *SAS 9.4 Hadoop Configuration Guide for Base SAS and SAS/ACCESS. SAS Viya 3.2 and SAS/ACCESS: Hadoop Configuration Guide* is no longer available.

For more information, see [What's New in SAS In-Database Products](#).

SAS Model Manager 15.1

SAS Model Manager has been rewritten in HTML5 and runs on the SAS Viya platform. It enables you to store models in a common model repository, and organize them within projects or folders. You can also evaluate models for champion model selection, monitor performance of models, and publish models.

Key features and enhancements enable you to perform these tasks:

- create and import models within a common model repository
- compare and assess models
- export model contents in a ZIP file
- run tests to score models
- publish models to CAS, Hadoop, SAS Micro Analytic Service, and Teradata
- manage data sources, identities, and authorization for folders and objects using SAS Environment Manager
- define, run, and view performance job results
- search for content across web applications

Enhancements provide support for the following:

- integration with the Model Studio suite of analytic data mining tools
- integration with SAS Workflow Manager
- integration with SAS Event Stream Processing

For more information, see [What's New in SAS Model Manager 15.1](#).

SAS Optimization 8.2

SAS Optimization runs on 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 8.2 (December 2017) runs on SAS Viya 3.3. This release includes improvements to its procedures, optimization solvers, and CAS actions, including these enhancements:

- The MILP, network, and NLP solvers and the decomposition algorithm (for LP and MILP) improve their performance.
- The LP and MILP solvers improve their numerical stability.
- The MILP solver adds a distributed branch-and-cut algorithm and the ability to report multiple integer-feasible solutions.
- PROC OPTNETWORK and the network solver in PROC OPTMODEL each add a path enumeration algorithm to find all paths between specified nodes. The network optimization action set adds the corresponding path action.
- The connected components algorithm in the network solver adds support for the thin internal graph format.
- The LSO (local search optimization) solver is added and is called by PROC OPTMODEL.
- PROC CLP (constraint logic programming) is added and runs in CAS. You can choose to run PROC CLP on a single machine or to distribute its execution across multiple nodes.
- The `optimization` action set adds two actions, `loadMps` and `convertMps`, that help convert an .mps file on the client to a CAS table that can be accepted as input by PROC OPTLP and PROC OPTMILP in SAS Optimization.

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

- [SAS Optimization 8.2: Mathematical Optimization Programming Guide](#)
- [SAS Optimization 8.2: Network Optimization Programming Guide](#)
- [SAS Optimization 8.2: Mathematical Optimization Procedures](#)
- [SAS Optimization 8.2: Network Optimization Procedures](#)

SAS Quality Knowledge Base for Contact Information 28

For Linux environments, SAS Quality Knowledge Base for Contact Information 28 is now available in SAS Viya.

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

SAS Studio 4.3

New Features and Enhancements

SAS Studio 4.3 runs on SAS Viya 3.3. This release of SAS Studio includes new analytical tasks for text analysis and forecasting. This release also includes many SAS 9 tasks, such as Data tasks, Combinatorics and Probability tasks, and several Statistics tasks.

For more information, see [What's New in SAS Studio 4.3](#).

Differences between SAS Studio in SAS 9.4 and SAS Viya

If you are a current SAS Studio user, here are some differences between SAS Studio 3.71 (which runs on SAS 9.4) and SAS Studio 4.3 (which runs in SAS Viya):

- Only the SAS Programming perspective is available in SAS Studio 4.3. The Visual Programmer perspective is not available.
- The lists of tasks and snippets differ.
- When saving output data in SAS Studio 4.3, you must specify a CAS engine libref.

In addition, SAS Studio 4.3 does not support this functionality:

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

SAS Visual Analytics 8.2

New Features and Enhancements

This list highlights some of the new features in SAS Visual Analytics 8.2:

- The user interface has many new enhancements, including new objects for reports.
- There are new and enhanced objects.
- There are new data items and new calculations.
- There are enhanced actions, links, and parameters.

- There is a new **Locale for regional formats and sorting** setting available in SAS global settings. The default setting is the browser locale. This setting should be used when you are formatting numbers, formatting dates, or sorting in SAS Visual Analytics.

For more information, [What's New in SAS Visual Analytics 8.2](#).

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 8.2 (which runs on SAS Viya 3.3):

- SAS Visual Analytics 7.4 and earlier releases use the SAS LASR Analytic Server. SAS Visual Analytics 8.2 uses SAS Cloud Analytic Services (CAS), which is a server that provides the cloud-based run-time environment for data management and analytics with SAS.
- The SAS Visual Analytics Explorer (the explorer) and SAS Visual Analytics Designer interfaces have been combined into a single user interface, which contains many of the features that were available in SAS Visual Analytics 7.4 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 (the viewer) is now SAS Report Viewer.

There are features that were in the 7.4 release that are not available in the 8.2 release. Many of the following missing features will be added in a future release of SAS Visual Analytics:

- custom graphs created with SAS Visual Analytics Graph Builder
- report localization
- right-to-left support
- stored processes

SAS Visual Statistics 8.2

SAS Visual Statistics requires SAS Visual Analytics.

Here are some of the new features and enhancements in SAS Visual Statistics 8.2:

- There are two new model objects, generalized additive model and nonparametric logistic regression. These are extensions of the generalized linear model and logistic regression, respectively. They require spline effects as inputs.
- In the **Data** pane, you can now create one-dimensional and two-dimensional splines from any measure.
- In the **Data** pane, you can now create a partition column.

- Event level selection for Category target variables is now performed automatically, but selections can be manually adjusted.
- Assessment plots in models now simultaneously display training and validation results when data partitioning is used.
- Clustering Category variables in the cluster object is now supported. This includes clustering a mix of measures and categories.
- The decision tree object now supports autotuning. Autotuning a decision tree automatically adjusts certain properties, rebuilds the decision tree, and compares the new results to previous results. This is repeated until an optimal decision tree is found or a specified time limit is reached.
- The decision tree object now supports derived predictions in addition to the leaf ID variable.
- The decision tree object has enhanced capabilities for handling missing values.
- There are several new variable selection methods available for the linear regression, logistic regression, and generalized linear model objects. These include forward selection, backward selection, stepwise selection, lasso, and adaptive lasso.
- The Tweedie distribution is now supported for generalized linear models and generalized additive models.
- You can now copy models from SAS Visual Statistics and SAS Visual Data Mining and Machine Learning into Model Studio and continue the data mining process there.

For more information, see [What's New in SAS Visual Statistics 8.2](#).

SAS Visual Data Mining and Machine Learning 8.2

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

SAS Visual Data Mining and Machine Learning 8.2 (December 2017) runs on SAS Viya 3.3. These procedures are new:

- BNET
- FASTKNN
- FISM
- GVARCLUS
- MBANALYSIS

These procedures are enhanced:

- ASTORE
- FACTMAC
- FOREST
- GRADBOOST
- MWPCA
- NNET
- RPCA

- SVDD
- SVMACHINE

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 8.2: Programming Guide](#)
- [SAS Visual Data Mining and Machine Learning 8.2: The NETWORK Procedure](#)
- [SAS Visual Data Mining and Machine Learning 8.2: Procedures Guide](#)

SAS Visual Forecasting 8.2

SAS Visual Forecasting runs on 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 8.2 (December 2017) runs on SAS Viya 3.3. The new TSINFO procedure evaluates a variable in an input data table for its suitability as a time ID variable in SAS procedures and solutions that are used for time series analysis.

These packages were added to the TSMODEL procedure:

- The new singular spectrum analysis (SSA) package enables you to perform SSA forecasting.
- The time filter (FILT) package enables you to filter time series vectors.
- The time series motif (MTF) package enables you to search for patterns in time series.

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

- [SAS Visual Forecasting 8.2: Programming Guide](#)
- [SAS Visual Forecasting 8.2: Forecasting Procedures](#)
- [SAS Visual Forecasting 8.2: Time Series Packages](#)

SAS Workflow Manager 2.1

SAS Workflow Manager 2.1 has been redesigned in HTML5 and runs on SAS Viya. SAS Workflow Manager 2.1 is a web application that stores the workflow definitions in the cloud.

SAS Workflow Manager 2.1 is integrated with SAS Model Manager and SAS Environment Manager.

Key enhancements enable you to do the following:

- produce workflow templates that conform to the Business Process Model and Notation (BPMN) standard version 2.0. See <http://www.bpmn.org> for information about the current standard.
- define user tasks that create new instances for each participant. You can specify whether each instance runs sequentially or in parallel.
- define prompts for start tasks and user tasks.
- specify due dates for user tasks.
- administer workflow processes. Workflow administrators can view the status of workflow processes, transfer tasks to different users, and terminate processes.

For more information, see *SAS Workflow Manager: What's New*.

Part 3

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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 2018 (SAS 9.4, Rev. 940_18w08)

These products shipped a new release:

- [“SAS Energy Forecasting 4.1” on page 63](#)
- [“SAS Visual Investigator 10.3.1” on page 138](#)

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 65](#)
- [“SAS Model Risk Management 7.3” on page 162](#)
- [“SAS Risk and Finance Workbench 3.1” on page 164](#)

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 141
- “SAS Studio 3.71” on page 48

To learn about the new features in SAS Viya 3.3, see Chapter 16, “Introduction to SAS Viya,” on page 177.

These products shipped as part of SAS Viya 3.3:

- “SAS/ACCESS for Relational Databases” on page 203
- “SAS/CONNECT” on page 204
- “SAS Data Quality Accelerator for Teradata” on page 204
- “SAS Data Preparation 2.1” on page 204
- “SAS Data Quality 3.3” on page 205
- “SAS Decision Manager 5.1” on page 205
- “SAS Econometrics 8.2” on page 206
- “SAS In-Database Products” on page 207
- “SAS Model Manager 15.1” on page 207
- “SAS Optimization 8.2” on page 208
- “SAS Quality Knowledge Base for Contact Information 28” on page 208
- “SAS Studio 4.3” on page 209
- “SAS Visual Analytics 8.2” on page 209
- “SAS Visual Data Mining and Machine Learning 8.2” on page 211
- “SAS Visual Forecasting 8.2” on page 212

September 2017 (SAS 9.4, Rev. 940_17w38)

These products shipped a new release:

- “SAS Add-In 7.15 for Microsoft Office” on page 99
- “SAS Contextual Analysis 14.3” on page 56
- “SAS Data Integration Studio 4.903” on page 118
- “SAS Enterprise Guide 7.15” on page 102
- “SAS Enterprise Miner 14.3” on page 60
- “SAS/ETS 14.3” on page 67
- “SAS Forecast Server 14.3” on page 74
- “SAS High-Performance Analytics Infrastructure 3.7” on page 94
- “SAS High-Performance Risk 3.9” on page 75
- “SAS/IML 14.3” on page 77
- “SAS/OR 14.3” on page 81
- “SAS/QC 14.3” on page 84
- “SAS Quality Knowledge Base for Contact Information 28” on page 114

- SAS Risk Dimensions 6.9. For more information, see [“SAS Risk Dimensions” on page 165](#).
- [“SAS/STAT 14.3” on page 86](#)
- [“SAS Studio 3.7” on page 48](#)
- [“SAS Text Miner 14.3” on page 89](#)

These products shipped as part of SAS 9.4M5:

- [“Base SAS 9.4” on page 13](#)
- [“SAS/ACCESS” on page 34](#)
- [“SAS/CONNECT 9.4” on page 40](#)
- [“SAS 9.4 Data Quality Server” on page 122](#)
- [“SAS/GRAPH 9.4” on page 42](#)
- [“SAS 9.4 Integration Technologies” on page 145](#)
- [“SAS 9.4 Intelligence Platform” on page 149](#)
- [“SAS 9.4 In-Database Products” on page 141](#)
- [“SAS/SHARE 9.4” on page 47](#)

SAS Data Loader 3.1M1 also shipped. For more information, see [“SAS Data Loader 3.1” on page 117](#).

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 75](#).
- SAS Model Implementation Platform 2.4. For more information, see [“SAS Model Implementation Platform” on page 160](#).
- SAS Risk Dimensions 6.8. For more information, see [“SAS Risk Dimensions” on page 165](#).

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 112](#).

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 65](#).

April 2017 (SAS 9.4, Rev. 940_17w16)

These products shipped a new release:

- “SAS Add-In 7.14 for Microsoft Office” on page 100
- “SAS Business Data Network 3.2” on page 116
- “SAS Data Remediation 2.3” on page 122
- “SAS Lineage 3.2” on page 125
- “SAS MDM 4.3” on page 126
- “SAS Visual Analytics 7.4” on page 169

These products shipped a maintenance release:

- “SAS Energy Forecasting 3.2M1” on page 64
- SAS Job Monitor 2.2M1. For more information, see “SAS Job Monitor 2.2” on page 125.

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 155.

November 2016 (SAS 9.4, Rev. 940_16w48)

These products shipped a new release:

- “SAS Add-In 7.13 for Microsoft Office” on page 100
- “SAS Business Rules Manager 3.2” on page 55
- “SAS Contextual Analysis 14.2” on page 57
- “SAS Data Loader 3.1” on page 117
- “SAS Data Integration Studio 4.902” on page 119
- “SAS Decision Manager 3.2” on page 58
- “SAS Enterprise Guide 7.13” on page 102
- “SAS Enterprise Miner 14.2” on page 60
- “SAS/ETS 14.2” on page 68
- “SAS Factory Miner 14.2” on page 73
- “SAS High-Performance Risk 3.7” on page 75
- “SAS/IML 14.2” on page 77
- “SAS Model Manager 14.2” on page 79
- “SAS Model Risk Management 7.2” on page 163
- “SAS/OR 14.2” on page 81
- “SAS/QC 14.2” on page 84
- “SAS Risk and Finance Workbench” on page 164

- SAS Risk Dimensions 6.7. For more information, see [“SAS Risk Dimensions”](#) on page 165.
- [“SAS/STAT 14.2 ”](#) on page 86
- [“SAS Studio 3.6”](#) on page 49
- [“SAS Text Miner 14.2”](#) on page 90

These products shipped as part of SAS 9.4M4:

- [“Base SAS 9.4”](#) on page 13
- [“SAS/ACCESS”](#) on page 34
- [“SAS 9.4 Data Quality Accelerator for Teradata”](#) on page 120
- [“SAS 9.4 Data Quality Server”](#) on page 122
- [“SAS/GRAPH 9.4”](#) on page 42
- [“SAS 9.4 Intelligence Platform”](#) on page 149
- [“SAS 9.4 OLAP Server”](#) on page 106

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 66.

July 2016 (SAS 9.4, Rev. 940_16w30)

These products shipped a new release:

- [“SAS Anti-Money Laundering 7.1”](#) on page 135
- [“SAS Model Risk Management 7.1”](#) on page 163
- [“SAS Risk Management for Banking 3.4”](#) on page 166

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 35.

These products shipped a new release:

- [“SAS High-Performance Risk 3.6”](#) on page 75
- [“SAS Quality Knowledge Base for Contact Information 27”](#) on page 114
- SAS Risk Dimensions 6.6. For more information, see [“SAS Risk Dimensions”](#) on page 165.

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 38
- [“SAS Add-In 7.12 for Microsoft Office”](#) on page 100
- [“SAS Enterprise Guide 7.12”](#) on page 103
- [“SAS IT Resource Management 3.7”](#) on page 155
- [“SAS Studio 3.5”](#) on page 49

January 2016 (SAS 9.4, Rev. 940_16w04)

These products shipped a new release:

- [“DataFlux Data Management Server 2.7”](#) on page 111
- [“DataFlux Secure 2.7”](#) on page 113
- [“SAS Data Loader 2.4 for Hadoop”](#) on page 117
- [“SAS Federation Server 4.2”](#) on page 123

These products shipped a maintenance release:

- DataFlux Authentication Server 4.1M1. For more information, see [“DataFlux Authentication Server 4.1”](#) on page 111.
- SAS Anti-Money Laundering 6.3M1. For more information, see [“SAS Anti-Money Laundering 6.3”](#) on page 135.
- SAS Customer Due Diligence 6.3M1. For more information, see [“SAS Customer Due Diligence 6.3”](#) on page 137.

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 66.

SAS Contextual Analysis 14.1M1 is now available. For more information, see [“SAS Contextual Analysis 14.1”](#) on page 57.

October 2015 (SAS 9.4, Rev. 940_15w42)

These products shipped a new release:

- [“SAS High-Performance Risk 3.5”](#) on page 75

- [“SAS Risk Dimensions” on page 165](#)

Social Network Analysis Server 6.2M2 is now available. For more information, see [“SAS Social Network Analysis Server 6.2” on page 137](#).

August 2015 (SAS 9.4, Rev. 940_15w33)

These products shipped a new release:

- SAS Quality Knowledge Base for Contact Information 26. For more information, see [“SAS Quality Knowledge Base for Contact Information 26” on page 114](#).
- SAS Visual Analytics 7.3. For more information, see [“SAS Visual Analytics 7.3” on page 170](#).

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 118](#).

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 73](#).

These products shipped a new release:

- [“SAS Business Rules Manager 3.1” on page 55](#)
- [“SAS Contextual Analysis 14.1” on page 57](#)
- [“SAS Data Integration Studio 4.901” on page 119](#)
- [“SAS Decision Manager 3.1” on page 59](#)
- [“SAS Enterprise Miner 14.1” on page 60](#)
- [“SAS Environment Manager 2.5” on page 148](#)
- [“SAS/ETS 14.1” on page 68](#)
- [“SAS Forecast Server 14.1” on page 74](#)
- [“SAS High-Performance Analytics Infrastructure 3.1” on page 94](#)
- [“SAS/IML 14.1” on page 77](#)
- [“SAS 9.4 In-Database Products” on page 141](#)
- [“SAS Model Manager 14.1” on page 79](#)
- [“SAS/OR 14.1” on page 81](#)
- [“SAS/QC 14.1” on page 84](#)
- [“SAS/STAT 14.1” on page 87](#)
- [“SAS Studio 3.4” on page 49](#)

- “SAS Text Miner 14.1” on page 90
- “SAS Theme Designer 4.7 for Flex” on page 153

These products were updated as part of SAS 9.4M3:

- “Base SAS 9.4” on page 13
- “SAS/ACCESS” on page 34
- “SAS 9.4 Data Quality Server” on page 122
- “SAS/GRAPH 9.4” on page 42
- “SAS Grid Manager” on page 45
- “SAS 9.4 Intelligence Platform” on page 149
- “SAS 9.4 OLAP Server” on page 106

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 161.

These products shipped a new release:

- “SAS Add-In 7.11 for Microsoft Office” on page 101
- “SAS Enterprise Guide 7.11” on page 103
- “SAS Event Stream Processing 3.1” on page 66
- “SAS High-Performance Analytics Infrastructure 2.94” on page 94
- “SAS High-Performance Risk 3.4” on page 76
- “SAS IT Resource Management 3.6” on page 155
- “SAS Risk Management for Banking 3.3” on page 166
- “SAS Visual Analytics 7.2” on page 170

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 48.

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 117.
- SAS Energy Forecasting. For more information, see “[SAS Energy Forecasting 3.1](#)” on page 64.

These products shipped a new release:

- [“SAS Data Remediation 2.2” on page 123](#)
- [“SAS Job Monitor 2.2” on page 125](#)
- [“SAS Marketing Automation 6.4” on page 129](#)
- [“SAS Marketing Optimization 6.4” on page 130](#)
- [“SAS MDM 4.2” on page 126](#)
- [“SAS Real-Time Decision Manager 6.4” on page 130](#)
- [“SAS Task Manager 2.2” on page 127](#)
- [“SAS Visual Process Orchestration 2.2” on page 127](#)

February 2015 (SAS 9.4, Rev. 940_15w08)

These products shipped a new release:

- [“SAS Data Quality Accelerator 2.6 for Teradata” on page 121](#)
- [“SAS Quality Knowledge Base for Contact Information 25” on page 114](#)
- [“SAS Studio 3.3” on page 50](#)

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 141](#).

January 2015 (SAS 9.4, Rev. 940_15w04)

These products shipped a new release:

- [“SAS Anti-Money Laundering 6.3” on page 135](#)
- [“SAS Customer Due Diligence 6.3” on page 137](#)
- [“SAS Financial Management 5.5” on page 133](#)

SAS Social Network Analysis Server 6.2M1 shipped. For more information, see [“SAS Social Network Analysis Server 6.2” on page 137](#).

November 2014 (SAS 9.4, Rev. 940_14w47)

These products are new:

- [“SAS Business Data Network 3.1” on page 117](#)
- [“SAS Lineage 3.1” on page 125](#)

These products shipped a new release:

- “DataFlux Data Management Server 2.6” on page 112
- “SAS Event Stream Processing Engine 2.3” on page 67
- “SAS High-Performance Analytics Infrastructure 2.91” on page 94
- “SAS High-Performance Risk 3.3” on page 76
- “SAS LASR Analytic Server 2.5” on page 97
- “SAS Quality Knowledge Base for Contact Information 24” on page 115
- “SAS Quality Knowledge Base for Product Data 5” on page 116

October 2014 (SAS 9.4, Rev. 940_14w41)

These products shipped a new release:

- “DataFlux Data Management Studio 2.6” on page 113
- “SAS Add-In 7.1 for Microsoft Office” on page 101
- “SAS Enterprise GRC 6.1” on page 157
- “SAS Enterprise Guide 7.1” on page 104
- “SAS Environment Manager 2.4” on page 148
- “SAS Information Retrieval Studio 1.53” on page 153
- “SAS Visual Analytics 7.1” on page 171

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 156.

August 2014 (SAS 9.4, Rev. 940_14w32)

These products shipped a new release:

- “SAS Contextual Analysis 12.3” on page 58
- “SAS Business Rules Manager 2.2” on page 56
- “SAS Data Integration Studio 4.9” on page 119
- “SAS Decision Manager 2.2” on page 59
- “SAS Environment Manager” on page 147
- “SAS Enterprise Miner 13.2” on page 61
- “SAS/ETS 13.2” on page 69
- “SAS/IML 13.2” on page 78

- “SAS Model Manager 13.1” on page 80
- “SAS/OR 13.2” on page 82
- “SAS/QC 13.2” on page 84
- “SAS/STAT 13.2” on page 88
- “SAS Studio 3.2” on page 50
- “SAS Text Miner 13.2” on page 91

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 35
- “SAS/ACCESS 9.4 Interface to Oracle” on page 37
- “SAS/ACCESS 9.4 Interface to PC Files” on page 37
- “SAS/CONNECT 9.4” on page 40
- “SAS/GRAPH 9.4” on page 42
- “SAS Grid Manager” on page 45
- “SAS 9.4 Integration Technologies” on page 145
- “SAS 9.4 Intelligence Platform” on page 149
- “SAS 9.4 OLAP Server” on page 106

June 2014 (SAS 9.4, Rev. 940_14w23)

These products shipped a new release:

- “SAS OpRisk VaR 6.1” on page 164
- “SAS Quality Knowledge Base for Contact Information 23” on page 115

May 2014 (SAS 9.4, Rev. 940_14w19)

These products shipped a new release:

- “DataFlux Authentication Server 4.1” on page 111
- “SAS Federation Server 4.1” on page 124

SAS DataFlux Secure 2.5 was updated. For more information, see “DataFlux Secure 2.7” on page 113.

April 2014 (SAS 9.4, Rev. 940_14w14)

These products shipped a new release:

- [“SAS Anti-Money Laundering 6.2” on page 136](#)
- [“SAS Data Quality Accelerator 2.5 for Teradata” on page 121](#)

These products shipped a maintenance release:

- [“SAS Data Remediation 2.1” on page 123](#)
- [“SAS MDM 4.1” on page 126](#)
- [“SAS Task Manager 2.1” on page 127](#)

March 2014 (SAS 9.4, Rev. 940_14w11)

These products are new:

- [“SAS In-Memory Statistics” on page 93](#)
- [“SAS Studio 3.1” on page 51](#)

These products shipped a new release:

- [“SAS LASR Analytic Server 2.3” on page 98](#)
- [“SAS Visual Analytics 6.4” on page 171](#)

The documentation was updated for SAS Data Surveyor 5.1 for SAP. For more information, see [“SAS Data Surveyor for SAP” on page 123](#).

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 37](#)
- [“Base SAS 9.4” on page 13](#)
- [“SAS/CONNECT 9.4” on page 40](#)
- [“SAS 9.4 In-Database Products” on page 141](#)
- [“SAS 9.4 Integration Technologies” on page 145](#)
- [“SAS 9.4 Intelligence Platform” on page 149](#)
- [“SAS 9.4 OLAP Server” on page 106](#)

These products shipped a new release:

- [“SAS Data Integration Studio 4.8” on page 120](#)
- [“SAS Enterprise Miner 13.1” on page 62](#)

- “SAS/ETS 13.1” on page 71
- “SAS Financial Management 5.4” on page 133
- “SAS Forecast Server 13.1” on page 74
- “SAS High-Performance Computing Management Console 2.4” on page 95
- “SAS High-Performance Risk 3.2” on page 76
- “SAS/IML 13.1” on page 78
- “SAS LASR Analytic Server 2.1 and 2.2” on page 98
- “SAS/OR” on page 81
- “SAS/QC” on page 84
- “SAS/STAT 13.1” on page 88
- “SAS Theme Designer 4.2 for Flex” on page 153
- “SAS Text Miner 13.1” on page 92
- “SAS Visual Analytics 6.3” on page 172

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 102.
- SAS Enterprise Guide 6.1M1 is available. For more information, see “SAS Enterprise Guide 6.1” on page 104.

November 2013 (SAS 9.4, Rev. 940_13w45)

These products shipped a new release:

- “SAS Anti-Money Laundering 6.1” on page 136
- “SAS Quality Knowledge Base for Contact Information 22” on page 115

These products are new:

- “SAS Customer Due Diligence 6.1” on page 137
- “SAS Peer Group Analysis 6.1” on page 137

October 2013 (SAS 9.4, Rev. 940_13w40)

These products are new:

- “DataFlux Data Management Server 2.5” on page 112
- “DataFlux Data Management Studio 2.5” on page 113
- “SAS Contextual Analysis 12.3” on page 58
- “SAS Data Management Console” on page 120
- “SAS Data Remediation 2.1” on page 123
- “SAS Job Monitor 2.1” on page 125

- “SAS MDM 4.1” on page 126
- “SAS Visual Process Orchestration 2.1” on page 127

These products shipped a new release.

- “DataFlux Authentication Server 3.2” on page 111
- “DataFlux Secure 2.5” on page 113
- “SAS Data Quality Accelerator 2.4 for Teradata” on page 121

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 121.

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 141.

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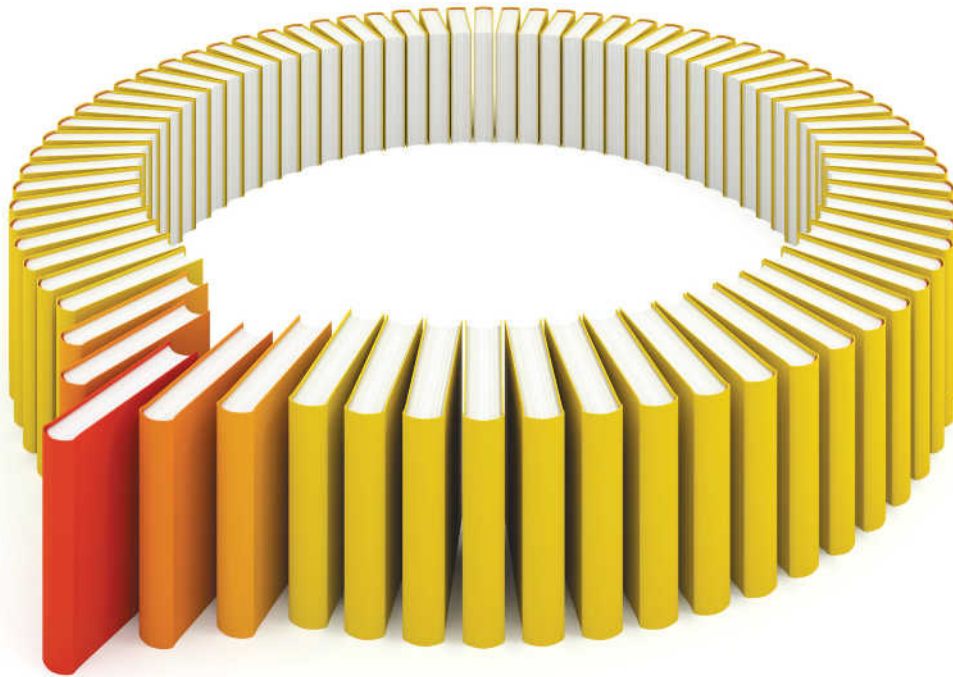
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