SAS® 9.4 and SAS® Viya®
Functional Comparison

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SAS 9.4 and SAS Viya Functional Comparison
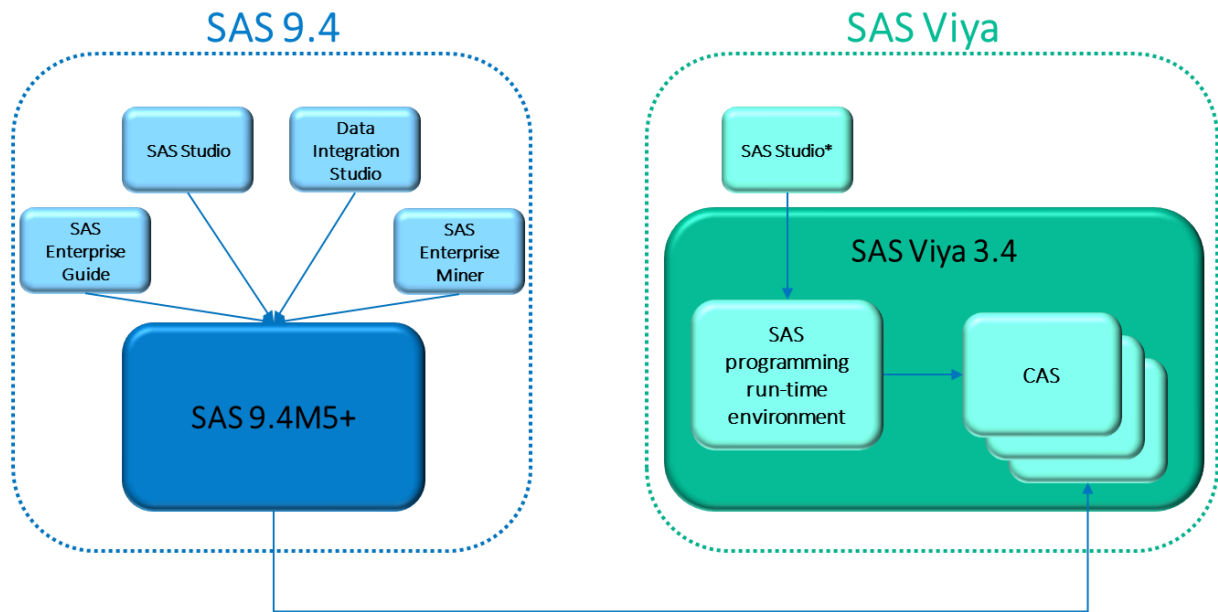
SAS Platform

The SAS Platform comprises the software components that underpin SAS product offerings in analytics, data management, and visualization. These components provide support for foundational capabilities such as distributed processing, security, administration, program development and execution, resource management, user interfaces, as well as integration with cloud environments, operating systems and third-party software. SAS 9.4 and SAS Viya contribute software components that can be integrated into a unified SAS Platform.

Although SAS 9.4 and SAS Viya represent two engines that support a common SAS Platform, it's helpful to compare the functional approaches delivered by each. Understanding these respective approaches will help you optimize the SAS Platform for your specific business needs by leveraging the engine or engines that make the most sense. SAS products have been developed to take advantage of both engines, and in many cases you will find equivalent product functionality in both engines. This document highlights the similarities and differences between the engines and the products that leverage them.

Starting with the SAS 9.4M5 release, SAS 9.4 programming clients can take advantage of a SAS® Cloud Analytics Services (CAS) server in a SAS Viya environment. This means that, in most cases, you do not have to choose between the two engines. You can use a single SAS 9.4 client such as SAS® Studio, SAS® Enterprise Guide, SAS® Data Integration Studio, Display Manager System (DMS), or even a batch program to execute SAS 9.4 code that uses a SAS 9.4 server, and SAS Viya procedures that use a CAS server, all within the same program.

Because SAS Viya deployments include a full SAS programming run-time environment, they can provide similar support to developers without the need for a separate SAS 9.4 environment. A SAS Viya client can execute both SAS 9.4 code in the SAS programming run-time environment and SAS Viya procedures using a CAS server.

The following diagram depicts the relationship between SAS programming clients and execution engines. All SAS programs are initially submitted to either the SAS 9.4 engine or SAS programming run-time environment engine. Any SAS Viya procedure that is encountered by either engine is executed in the SAS Viya CAS server.

*Many SAS Viya clients (e.g., SAS Visual Analytics) do not submit SAS code, but rather call CAS directly

SAS Foundation

At the core platform level, functionality is shared between SAS 9.4 and SAS Viya. First and foremost, both engines support the full complement of Base SAS®. This means that SAS 9.4 programs can run unmodified within a SAS Viya client session. In a SAS Viya environment, some of the Base SAS procedures can take advantage of a CAS server, and others simply run on a traditional SAS Foundation server. You can find a list of CAS-enabled procedures in the *SAS 9.4 and SAS Viya 3.4 Programming Documentation: Base SAS Procedures Guide*. In addition, the DATA step itself is CAS-enabled and can therefore take advantage of distributed processing for faster execution times. Care must be taken in converting existing DATA step code to run in CAS because splitting execution across multiple CAS server worker nodes can result in changes in behavior of automatic macro variables, which previously assumed single-threaded execution. Programmers are encouraged to read Steven Sober's 2018 SAS Global Forum paper entitled *My Experiences in Adopting SAS Cloud Analytic Services into Base SAS Processes* for more detail. You can also view a recorded presentation on this topic entitled *Leveraging SAS® Viya® to Improve Base SAS® Processes* on communities.sas.com.

Other SAS Foundation products such as SAS/STAT®, SAS/GRAPH®, SAS/ETS®, and SAS/OR® are fully supported in a SAS Viya environment when they are included in related product offerings. Other SAS Foundation products, such as SAS/IML®, SAS/QC®, and many SAS/ACCESS® interfaces are available as add-on products to a SAS Viya order. Therefore, SAS Viya users have access to both the distributed computing capabilities of the SAS Viya products and the functionality of the included SAS Foundation products. You can run your new SAS Viya code as well as your existing SAS code in your SAS Viya environment, which can access both the SAS Foundation server and the CAS server.

The way in which SAS Foundation code is executed varies according to the clients that are used in a SAS 9 and SAS Viya environment. With SAS 9, both desktop clients (such as SAS Enterprise Guide and SAS® Add-In for Microsoft Office) and web clients (such as SAS Studio) submit code to a SAS object spawner that then routes the job

to an appropriate workspace server or to a stored process server. With SAS Viya, such requests are typically submitted to a launcher server, which then routes the job to an appropriate compute server. The binary files that support the compute server execution are analogous to a SAS Foundation V9 installation and are referred to as the SAS programming run-time environment. These files are stored in the `spre` directory of your SAS Viya installation. Although SAS Studio 5.x uses the launcher server method with SAS Viya, SAS Studio 4.x, which is the default SAS programming client for SAS Viya 3.3 and earlier, uses the SAS object spawner method.

Distributed Processing

Perhaps the most significant core platform functional difference between SAS 9.4 and SAS Viya is in the way that each one handles distributed processing. SAS Viya leverages the CAS server, and SAS 9.4 uses SAS® LASR™, SAS® High-Performance Analytics (HPA) and SAS® Grid Manager. Even though SAS LASR and HPA will remain only in SAS 9.4, SAS Grid Manager will eventually be available natively in SAS Viya environments (targeted for 2019). Because the CAS server is the third major evolution of the SAS distributed in-memory technology, it is no surprise that it offers the most value. Compared to HPA, the CAS server performs better because it can retain data from one action to the next action rather than having to reload the same data from disk for each action. In comparison to both HPA and SAS LASR, the CAS server offers dynamic scalability, a virtual memory footprint, high availability, parallel data loading, shared library access, and integration with open-source languages and REST APIs. SAS Grid Manager in a SAS 9.4 environment can work in concert with a SAS Viya environment. "The grid" distributes multiple SAS 9.4 jobs from multiple users across a cluster of machines, and each job can be further parallelized with the DATA step and SAS procedure code executing across multiple worker nodes in a CAS server that is running in a companion SAS Viya environment.

User Interfaces and Program Development

While SAS 9.4 clients use a variety of interfaces, such as Java clients like SAS Enterprise Miner, .NET clients like SAS Enterprise Guide, and web clients like SAS Visual Analytics, SAS Viya clients all use a common HTML5 web interface. This common interface allows for all functionality to be merged into a single user experience. SAS 9.4 provides a launching page for certain web clients that is known as SAS® Home. This dashboard supports launcher tiles that are specific to the associated SAS products. SAS Viya provides a dashboard for all its web clients called SAS® Drive. This dashboard is oriented toward the user more than is SAS Home, enabling users to view, edit, and share content associated with their licensed SAS Viya products.

SAS Viya has a single interactive development interface for SAS code – the SAS Studio web application. SAS 9.4 has several interfaces, including SAS Studio (a different version from the one delivered with SAS Viya), SAS Enterprise Guide, Display Manager System (DMS), and the Code Editor in SAS Data Integration Studio. SAS Studio 4.x and SAS Studio 5.1 (which are both delivered with SAS Viya) do not yet provide full replacement value for all of the capabilities that are provided by SAS Studio 3.x (which is delivered with SAS 9.4). For example, SAS Studio 3.x offers access to the local file system; SAS Studio 5.x does not provide access to the local file system, but instead uses the SAS® Infrastructure Data Server to save programs. Such an approach lends itself more readily to cloud deployments.

Both SAS 9.4 and SAS Viya support batch execution of SAS code as well as integration with open development environments such as Jupyter Notebook. This integration includes execution of SAS code as well as the generation of SAS code from Python calls. The SASPy project, which is available on GitHub, provides this native Python interoperability for both SAS 9.4 and SAS Viya. For SAS Viya, you can also use the SAS Scripting Wrapper for

Analytics Transfer (SWAT) Python package to call CAS server actions directly, skipping the translation layer. In fact, because the CAS server allows for direct calls from Python, R, Java, Lua, and REST APIs, you can use any integrated development environment that supports these languages. Furthermore, you can call analytic functions that are provided by these alternative languages within SAS® Visual Data Mining and Machine Learning jobs. Models created using these languages can be imported and managed using SAS Model Manager, which allows for ease in using ensemble modeling methods.

SAS 9.4 has rich support for stored processes, which allow for SAS programs to be defined and executed interactively, either through the SAS® Stored Process web application, directly from a URL, or via clients such as SAS Enterprise Guide. A prompting framework is provided to support arguments that are passed to these programs at run time. Such programs can also be run in batch and can always take advantage of the SAS Stored Process Server. SAS Viya uses job definitions to manage such code and provides the SAS Job Execution Web Application to define these programs. A current limitation to the SAS Viya job execution framework is the absence of an interactive prompting framework.

Administration

SAS 9.4 has several utilities to perform administrative functions: SAS® Environment Manager, SAS® Management Console, SAS® Visual Analytics Administrator, and SAS® Deployment Manager. For SAS Viya, all of this functionality was collapsed into a single web application: SAS Environment Manager. For SAS Viya, SAS Environment Manager was totally rewritten. The only thing it shares with its SAS 9.4 counterpart is its name. The SAS Environment Manager interface for SAS 9.4 provides a rich set of near real-time reports about various process and system metrics as well as an advanced event handling interface. The SAS Environment Manager interface for SAS Viya provides similar metrics and reporting capabilities as the SAS 9.4 application, but does not yet have as complete a set of real-time reports. Both environments supply a back-end data mart that contains historical metric and logging information for user-developed reports. SAS Viya adds an event-driven operations infrastructure to the mix, with command line interface (CLI) access to a real-time message bus that can be integrated with third-party monitoring applications.

Another key administrative difference between SAS 9.4 and SAS Viya is that the former uses the SAS® Metadata Server to persist and manage data about your environment, including server and library definitions, security, user content, and configuration information. SAS Viya persists much of this information in the new SAS® Infrastructure Data Server (based on PostgreSQL) and SAS® Configuration Server (based on Consul). Another important distinction is that although SAS 9.4 uses identities from the SAS Metadata Server to define users and groups, SAS Viya leverages pre-existing customer directory services that are LDAP-based, such as Microsoft Active Directory. The advantage of SAS Viya is that administrators do not have to worry about keeping their SAS identities in sync with their LDAP identities as they do with SAS 9.4.

Operating Environments

SAS 9.4 can be installed on a variety of operating systems, including z/OS and several flavors of Windows, UNIX, and Linux. SAS Viya can be installed on Linux or Windows Server. SAS Viya on Windows is limited to SAS Visual Data Mining and Machine Learning, SAS Visual Statistics, and SAS Visual Analytics. It is also limited to single-machine environments in which the CAS server and all other supporting servers and services are installed on the same physical or virtual machine. Both SAS 9.4 and SAS Viya can be deployed to a public or private cloud, which can be used as an Infrastructure- as- a- Service (IaaS). In addition, SAS Viya supports native deployment to public and private clouds that support the Cloud Foundry Platform as a Service (PaaS) infrastructure.

In addition, SAS provides deployment automation scripts that are native to certain public cloud providers. For example, a SAS 9.4 SAS Grid Manager reference deployment is available as the **SAS Grid on AWS Quick Start** deployment script. A reference deployment containing SAS Visual Data Mining and Machine Learning, SAS Visual Statistics, and SAS Visual Analytics is available as the **SAS Viya on AWS Quick Start** deployment script. A similar offering is available for Microsoft Azure's Resource Manager.

SAS is increasingly adopting strategies using Docker containers and Kubernetes orchestration to provide more composable, scalable, and maintainable deployments. The SAS® Analytics for Containers offering for SAS 9.4 provides customers with a way to build and deliver a SAS® Analytics Pro environment (for example, an environment that includes Base SAS, SAS/GRAPH, SAS/STAT, and SAS/ACCESS) as a Docker container. SAS Viya provides support for both pre-built Docker images as well as Docker recipes for building your own containers. Recipes for SAS Viya containers are maintained on GitHub. SAS® Cloud Software as a Service (SaaS) offerings of select SAS Viya products use Kubernetes to more easily orchestrate complex container-based deployments.

Multi-tenancy

Both SAS 9.4 and SAS Viya provide support for separating processing and data and allocating them to "tenants," such as different customers, departments, or levels of a deployment (for example, DEV [development], TEST, and PROD [production]). With SAS 9.4, multi-tenancy can be accomplished by allocating different SAS application servers to different tenants, which locks their use and their access to data based on membership in groups that are associated with the respective tenants. SAS Grid Manager offers increased support for multi-tenancy, enabling advanced allocation of compute resources among tenants. SAS Viya environments can be configured to handle tenants in the same fashion as SAS 9.4, using authorization settings and separate SAS and CAS run-time environments for each tenant. SAS Viya also offers a more explicit form of multi-tenancy out-of-the-box, which relieves the administrator of the burden of resource isolation and provides even more separation between tenants. In a true SAS Viya multi-tenant deployment, tenants are essentially given separate environments, with each tenant having no awareness of the others. A single provider tenant is used to manage all of the other tenants, each of which has its own separate servers, user content, and web application entry points. Each tenant can also be configured to point to a different LDAP server for associated users and groups. A common set of services is used to support the entire multi-tenant environment, allowing for economy of scale in administrative functions such as software updates and horizontal scaling.

Platform Summary

The following table summarizes the similarities and differences between certain core platform functionality in SAS 9.4 and SAS Viya deployments.

Category	Capability	SAS 9.4M6	SAS Viya 3.4
SAS Foundation	Base SAS	✔	✔
	Multi-threaded DATA step execution	✔	✔
	Extended data types	✔ (VARCHAR)	✔
	SAS/GRAPH, SAS/STAT, SAS/OR, SAS/ETS, SAS/IML, SAS/QC	✔	✔ [1]
Distributed Processing	SAS Grid Manager	✔	✔
	SAS LASR	✔	
	SAS High Performance Analytics	✔	
	CAS server		✔
Interfaces	Batch	✔	✔
	SAS Studio	✔	✔
	SAS Enterprise Guide	✔	✔
	Open programming languages (Python, Java, R, Lua)[2]		✔
	REST APIs		✔
SAS Application Development	SAS® Stored Processes[3]	✔	
	Job definitions		✔
Administration	LDAP integration for users and groups		✔
	Monitoring and reporting	✔	✔
	Auditing	✔	✔
	CLIs	✔	✔
Operating Environments for Servers	Linux	✔	✔
	Windows	✔	✔ [4]
	Solaris, HP, AIX	✔	
	z/OS	✔	
	Cloud - IaaS	✔	✔
	Cloud - PaaS (Cloud Foundry)		✔
	Docker containers	✔	✔

Note: A gray checkmark (✔) means that the capability is possible if both SAS 9.4 and SAS Viya are present.

[1] Product availability based on licensed SAS Viya offering(s), not all of which are available on Windows

[2] Some Python capability is available for SAS 9.4 through the SASPy GitHub project

[3] SAS 9.4 stored processes can be accessed from SAS Viya reports.

[4] Single machine deployments

Related Product Offerings

Many SAS Viya product offerings have counterparts in SAS 9.4. In many cases, the SAS Viya Customer Advantage Program can provide significant financial benefit to existing SAS 9.4 customers who license related SAS Viya offerings. The following table summarizes these related offerings.

SAS 9.4 Offering	Related SAS Viya Offering
SAS® High-Performance Data Mining	SAS Visual Data Mining and Machine Learning (VDMML)
SAS® Enterprise Miner	

SAS® High-Performance Econometrics	SAS® Econometrics
SAS/ETS®	
SAS High-Performance Optimization	SAS® Optimization
SAS/OR	
SAS® High-Performance Forecasting	SAS® Visual Forecasting
SAS® Forecast Server	
SAS® Text Miner	SAS® Visual Text Analytics (VTA)
SAS® High-Performance Text Mining	
SAS® Contextual Analysis	
SAS® Text Analytics languages	SAS Text Analytics languages (on SAS Viya)
SAS Visual Analytics (VA)	SAS Visual Analytics (on SAS Viya)
SAS® Visual Statistics	SAS Visual Statistics (on SAS Viya)
SAS® High-Performance Statistics	
SAS® In-Memory Statistics	
SAS/STAT	
SAS Analytics Pro	
SAS/CONNECT®	SAS/CONNECT (on SAS Viya)

Analytics Life Cycle

The SAS Platform provides software that supports all aspects of the analytics life cycle, from data to discovery to deployment. This is true for both SAS 9 and SAS Viya environments. SAS Viya environments more closely integrate this life cycle through both a common web-based interface and clients such as Model Studio and SAS Drive. The interface provides a task-oriented view of the software, abstracting away the underlying products that deliver the functionality. For example, SAS Viya users can simply select "Build Models" from a functional menu, without having to know that they are leveraging the SAS Visual Data Mining and Machine Learning product in the process.

The following diagram maps several SAS 9 and SAS Viya products to the workflow associated with this integrated approach to the analytics life cycle.
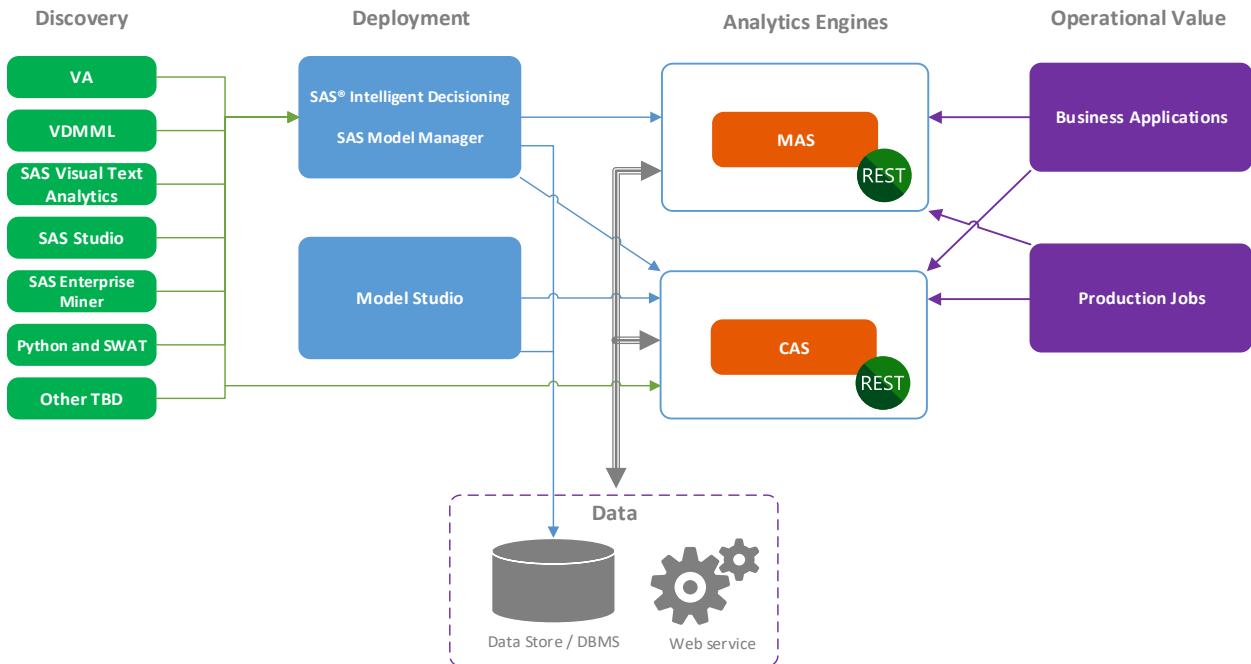
The following sections compare the capabilities of SAS 9 and SAS Viya in product areas mapping to this analytics life cycle.

Data Management

Perhaps the most significant difference between data management products in SAS 9.4 and SAS Viya is in the supported data sources. The sources that integrate directly with the CAS server in SAS Viya are known as data connectors. The number of data connectors continues to increase, but many sources are still supported only by the SAS 9.4 SAS/ACCESS products. However, SAS/ACCESS engines can be licensed with SAS Viya orders in order to provide access to data sources that are not yet CAS-enabled. Such access is enabled with the SAS programming run-time environment, which is included with SAS Viya orders. Although this access does not take advantage of the distributed processing of the CAS server, it does provide compatibility with preexisting SAS 9.4 code and data sources.

One key advantage of SAS Viya over SAS 9.4 is in parallel data access through the CAS data connect accelerators. Also, there are several cloud-based data sources, such as Twitter and Google, that are supported by SAS Viya.

A wealth of data management capability beyond data access (such as data governance, data quality, and data integration) is available through the SAS® Data Preparation and SAS® Data Quality offerings on SAS Viya.

The following tables compare data management capabilities offered in SAS 9.4 and SAS Viya.

Capability	SAS/ACCESS® on 9.4M6	SAS/ACCESS® on Viya 3.4	
		MVA	Connector
Data Access			
SAS/ACCESS® Interface to ADABAS	✔		
SAS/ACCESS® Interface to Amazon Redshift	✔	✔	✔
SAS/ACCESS® Interface to Aster	✔		
SAS/ACCESS® Interface to CA IDMS	✔		
SAS/ACCESS® Interface to DATACOM/DB	✔		
SAS/ACCESS® Interface to DB2	✔	✔	✔
SAS/ACCESS® Interface to GreenPlum	✔	✔	
SAS/ACCESS® Interface to Hadoop	✔	✔	✔
SAS/ACCESS® Interface to HAWQ	✔	✔	
SAS/ACCESS® Interface to Impala	✔	✔	✔
SAS/ACCESS® Interface to IMS-DL/I	✔		
SAS/ACCESS® Interface to INFORMIX	✔		
SAS/ACCESS® Interface to Microsoft SQL Server	✔	✔	✔
SAS/ACCESS® Interface to MySQL	✔	✔	✔
SAS/ACCESS® Interface to Netezza	✔		
SAS/ACCESS® Interface to ODBC	✔	✔	✔
SAS/ACCESS® Interface to OLEDB	✔		
SAS/ACCESS® Interface to ORACLE	✔	✔	✔
SAS/ACCESS® Interface to ORACLE Rdb	✔		
SAS/ACCESS® Interface to PC Files	✔	✔	✔
SAS/ACCESS® Interface to PostgreSQL	✔	✔	✔
SAS/ACCESS® Interface to R/3	✔		
SAS/ACCESS® Interface to SAP HANA	✔	✔	✔
SAS/ACCESS® Interface to SAP ASE	✔		
SAS/ACCESS® Interface to SAP IQ	✔		
SAS/ACCESS® Interface to SYSTEM 2000	✔		
SAS/ACCESS® Interface to Teradata	✔	✔	✔
SAS/ACCESS® Interface to the PI System	✔		
SAS/ACCESS® Interface to Vertica	✔	✔	✔
SPD Engine	✔	✔	✔
SPD Server	✔		
SAS/ACCESS® Interface to JDBC			✔
SAS/ACCESS® Interface to Hadoop (+ Spark SQL)			✔

Capability	SAS In-Database and HPA on 9.4M6					SAS In-Database on Viya 3.4		
	Scoring	Code Accel	DQ	HPA Parallel	HPA Serial	Parallel	MVA Scoring	CAS Scoring
Data Access								
SAS/ACCESS Interface to ADABAS					✔			
SAS/ACCESS Interface to Amazon Redshift					✔			
SAS/ACCESS Interface to Aster	✔				✔			
SAS/ACCESS Interface to CA IDMS TM					✔			
SAS/ACCESS Interface to DATACOM/DB					✔			
SAS/ACCESS Interface to DB2	✔				✔			
SAS/ACCESS Interface to GreenPlum	✔	✔		✔	✔			
SAS/ACCESS Interface to Hadoop	✔	✔	✔	✔	✔	✔		✔
SAS/ACCESS Interface to HAWQ					✔			
SAS/ACCESS Interface to Impala					✔			
SAS/ACCESS Interface to IMS-DL/I					✔			
SAS/ACCESS Interface to INFORMIX					✔			
SAS/ACCESS Interface to Microsoft SQL Server					✔			
SAS/ACCESS Interface to MySQL					✔			
SAS/ACCESS Interface to Netezza	✔				✔			
SAS/ACCESS Interface to ODBC					✔			
SAS/ACCESS Interface to OLEDB					✔			
SAS/ACCESS Interface to ORACLE	✔			✔	✔			
SAS/ACCESS Interface to ORACLE Rdb					✔			
SAS/ACCESS Interface to PC Files					✔			
SAS/ACCESS Interface to PostgreSQL					✔			
SAS/ACCESS Interface to R/3					✔			
SAS/ACCESS Interface to SAP HANA	✔			✔	✔			
SAS/ACCESS Interface to SAP ASE					✔			
SAS/ACCESS Interface to SAP IQ					✔			
SAS/ACCESS Interface to SYSTEM 2000					✔			
SAS/ACCESS Interface to Teradata	✔	✔	✔	✔	✔	✔		✔
SAS/ACCESS Interface to the PI System					✔			
SAS/ACCESS Interface to Vertica					✔			
SPD Server	✔				✔			
SAS/ACCESS Interface to JDBC								
SAS/ACCESS Interface to Hadoop (+ Spark SQL)						✔		✔

Capability	Data Management on 9.4M6						Data Management on Viya 3.4		
	SAS Data Integration Server	SAS Data Quality Server	SAS Data Loader for Hadoop	SAS Data Management	SAS Data Quality	SAS Data Governance	All Viya Offerings	SAS Data Quality	SAS Data Preparation
Data Access									
SPDS									~cas?
Twitter							✔	✔	✔
Facebook							✔	✔	✔
Google Analytics							✔	✔	✔
YouTube							✔	✔	✔
Google Drive							✔	✔	✔
ESRI							✔	✔	✔
Local File							✔	✔	✔
Cloud Data Exchange									✔
Data Governance									
SAS® Lineage - network diagram view				✔	✔	✔	✔	✔	✔
SAS Lineage - impact analysis view				✔	✔	✔			
SAS Lineage - governance view				✔	✔	✔			
SAS® Metadata Bridge support	✔			✔					
Relationship loader support	✔			✔	✔	✔			
SAS® Data Remediation - all functions				✔	✔	✔			
SAS® Business Data Network - all functions				✔	✔	✔			
Workflow support				✔	✔	✔			
Data Quality									
SAS® Quality Knowledge Base for Contact Information		✔	✔	✔	✔	✔		✔	✔
SAS® Quality Knowledge Base for Product Data		✔		✔	✔	✔			
Change case	✔		✔	✔	✔	✔	✔	✔	✔
Convert column	✔		✔	✔	✔	✔	✔	✔	✔
Rename column	✔		✔	✔	✔	✔	✔	✔	✔
Remove column	✔		✔	✔	✔	✔	✔	✔	✔
Split column	✔		✔	✔	✔	✔	✔	✔	✔
Trim whitespace	✔		✔	✔	✔	✔	✔	✔	✔
Calculated column creation	✔		✔	✔	✔	✔	✔	✔	✔
Custom code transformation	✔		✔	✔	✔	✔	✔	✔	✔
Data quality - UI driven		✔	✔	✔	✔				✔
Casing (QKB)		✔	✔	✔	✔			✔	✔
Parsing (QKB)		✔	✔	✔	✔			✔	✔
Field extraction (QKB)		✔	✔	✔	✔			✔	✔
Gender analysis (QKB)		✔	✔	✔	✔			✔	✔
Identification analysis (QKB)		✔	✔	✔	✔			✔	✔
Match codes (QKB)		✔	✔	✔	✔			✔	✔
Standardize (QKB)		✔	✔	✔	✔			✔	✔
Profiling - UI driven			✔	✔	✔	✔			✔
Basic profiling	✔		✔	✔	✔	✔	✔	✔	✔
Advanced profiling (table/column)			✔	✔	✔	✔		✔	✔
Advanced profiling (custom metrics)			✔	✔	✔	✔			
Matching/clustering	✔		✔	✔	✔			✔	✔
Survivorship			✔	✔	✔				
Address verification (batch)				✔	✔				
Geocoding (batch)				✔	✔				
Data monitoring				✔	✔	✔			
Unstructured contextual extraction				✔	✔	✔			
Reference data management				✔	✔	✔			
Data type identification			✔					✔	✔
Tagging							✔	✔	✔
Data Integration									
Append	✔		✔	✔	✔	✔	✔	✔	✔
Join	✔		✔	✔	✔	✔	✔	✔	✔
Filter	✔		✔	✔	✔	✔	✔	✔	✔
Transpose	✔		✔	✔			✔	✔	✔
SPDS Integration	✔			✔					
Message queue integration	✔			✔					
Change data capture	✔			✔					
Conditional flow logic	✔			✔					
Slowly changing dimensions	✔			✔					
Advanced Hadoop integration	✔			✔					
Publish actions	✔			✔					
SAP integration	✔			✔					
Advanced SQL functions	✔			✔					
Complex ETL data flows	✔			✔					
General									
Project management							✔	✔	✔
Reusable job/program creation	✔	✔	✔	✔	✔	✔	✔	✔	✔
Job/program schedulability	✔	✔		✔	✔	✔	✔	✔	✔
Job monitoring			✔	✔	✔		✔	✔	✔
Reporting (either VAAR or VA as pre-req)				✔	✔	✔	✔	✔	✔
Business rules (SAS Business Rules)				✔					

Note that cells with a diagonal background fill pattern represent functionality that is available only in the "Advanced" flavor of a given offering (for example: SAS Data Management Advanced).

Visualization

SAS Visual Analytics is divided into the 7.x series running on SAS 9.4 and the 8.x series running on SAS Viya. VA 8.x includes many new features, such as CAS enablement, a brand new HTML5 look-and-feel, and full replacement value for the 7.x functionality. VA 7.5 was retrofitted with a similar HTML5 look-and-feel, in addition to including several features previously only available with VA 8.x on SAS Viya.

The following table compares the features in these respective releases.

Category	Capability	SAS Visual Analytics 7.4 on 9.4M5	SAS Visual Analytics 7.5 on 9.4M6	SAS Visual Analytics 8.2 on Viya	SAS Visual Analytics 8.3 on Viya
Data Access & Preparation	YouTube	✔	✔	✔	✔
	Facebook	✔	✔	✔	✔
	Twitter	✔	✔	✔	✔
	Google Analytics	✔	✔	✔	✔
	Google Drive	✔	✔	✔	✔
	Other RDBMS Data Access as supported by the platform	✔	✔	✔ [1]	✔ [1]
Reporting	Dynamic Text	✔	✔	✔	✔
	Dynamic report summaries				✔ [2]
	Multi-value parameters	✔	✔	✔	✔
	Cascading prompt controls	✔	✔	✔	✔
	Geo Custom regions for geographical maps (e.g. sales territories)	✔	✔	✔	✔
	Geo Enrichment (Data Import of Esri Demographics)			✔	✔
	Geo Selection - Travel Time, Travel Distance			✔	✔
	Geo Search			✔	✔
	Geo Web Map layers (via Data Driven Content object)			✔	✔
	Geo Clustering			✔	✔
	Geo Contour Map				✔
	Geocoding (from Manage Data-Import)				✔
	Geo Points of Interest - Pin Management, Routing, Identify Place				✔
	Geo Demographics - based on Geo Selected area				✔
	Sort based on custom order	✔	✔	✔	✔
	Include spark lines in list tables	✔	✔	✔	✔
	Cell Graph support		✔		✔
	Group guages by a category	✔	✔	✔	✔
	Horizontal & vertical containers (scrollable)	✔	✔	✔	✔
	Include links to additional content in text	✔	✔	✔	✔
	Support Right-to-Left orientation	✔	✔	✔	✔
	Add reference lines to graphs	✔	✔	✔	✔
	Sankey Diagram	✔	✔	✔	✔
	Report Linking (manual one-way filter actions)	✔	✔	✔	✔
	Auto-Interactions across objects			✔	✔
	Two-way filter interactions between objects			✔	✔
	Number Compaction		✔		✔
	Auto-Refresh per object (streaming data)				✔
	Report Data Views				✔
	Object templates				✔
	Multi-edit Formats		✔		✔
	Multi-edit aggregations		✔		✔
	Scoped aggregations			✔	✔
	Aggregate a specific range of cell values in a table (e.g. moving average)			✔	✔
	Multi-level aggregations (aggregatetable function))				✔
	Reuse Filters (Common filters)				✔
	Undo/Redo (desgin-time)		✔	✔	✔
	Save User State (Viewer)				✔
	Playable Dashboards (Viewer)		✔		✔
	Multi-Data Source Joins (Design time)				✔
	Desging grid lines		✔		✔
	Freeze Columns		✔		
	Column total disabling		✔		✔ [2]
	Key Value		✔		✔
	Parallel Coordinates Plot				✔
	Measure Correlations in Data Pane		✔		
	Suggestions Pane		✔		
	Parameterize display rules	✔	✔	✔	✔
Approachable Analytics	Forecasting	✔	✔	✔	✔
	Fit Line	✔	✔	✔	✔
	Decision Tree	✔	✔	✔	✔
	Automated Analysis				✔ [2]
	Correlation Matrix	✔	✔	✔	✔
Customize	Consume SAS Stored Processes	✔	✔		
	Consume SAS Job Execution results				
	Create custom graph objects (templates)	✔	✔		✔
	Include Web content		✔	✔	✔
	Data driven content (3rd party objects)			✔	✔
Enterprise Support	Distribute Reports (scheduled)	✔	✔	✔	✔
	Notify stakeholders to alert conditions in reports	✔	✔	✔	✔
	Localize report content	✔	✔	✔	✔
	Audit Reporting	✔	✔		✔
	Refresh reports automatically	✔	✔	✔	✔
	Autosave			✔	✔
	Lineage			✔	✔
	SAS Drive				✔
	Accessibility - Graphics Accelerator		✔		✔ [2]
	Allow guests to view reports	✔	✔	✔	✔

Category	Capability	SAS Visual Analytics 7.4 on 9.4M5	SAS Visual Analytics 7.5 on 9.4M6	SAS Visual Analytics 8.2 on Viya	SAS Visual Analytics 8.3 on Viya
Native Apps	Mobile Device Management support (3rd party providers)	✔	✔	✔	✔
	Offline report viewing	✔	✔	✔	✔
	Windows 10	✔	✔	✔	✔
	iOS	✔	✔	✔	✔
	Android	✔	✔	✔	✔
	Natural Language Understanding				✔
	SDK Support for mobile apps	✔	✔	✔	✔
Operating Environment	Linux server	✔	✔	✔	✔
	Windows server	✔	✔		✔ [2]
	Internet Explorer browser	✔			
	Edge browser		✔	✔	✔
	Safari browser (Mac)	✔	✔	✔	✔
	Chrome browser (Windows)	✔	✔	✔	✔
	Firefox browser (Windows)	✔	✔	✔	✔

[1]SAS Viya data access is limited compared to SAS 9. See the list of supported data sources in the Data Management section.
[2]The functionality is available as of September, 2018.

Data Mining / Machine Learning

In addition to supporting an expanding suite of analytic procedures, SAS Visual Data Mining and Machine Learning surfaces a broad set of capabilities within the SAS Viya common HTML5 interface. Data preparation, modeling, and integrated reporting all have interactive approaches, which are not present in SAS 9.4 data mining offerings. As with other products in SAS Viya, SAS Visual Data Mining and Machine Learning also supports the ability to access its functionality through open-source languages and REST APIs. The SAS 9.4 offerings do provide a few capabilities that are not yet present in SAS Viya. However, the latest version of SAS Visual Data Mining and Machine Learning provides complete replacement value for all machine learning methods and includes many that are not present in SAS 9.4.

The following table compares the features in these respective releases.

Major Capability	Advanced Analytics 15.1 on 9.4M6			SAS Visual Data Mining and Machine Learning 8.2 on Viya	SAS Visual Data Mining and Machine Learning 8.3 on Viya	SAS Visual Data Mining and Machine Learning 8.4 on Viya
	SAS Enterprise Miner	SAS Factory Miner	SAS HP Data Mining (Code)			
Integrated data prep				✔	✔	✔
Interactive model editing (VA models in Model Studio)						✔
Multiple data sources (after data prep)	✔		✔			
Integrated reporting (interactive dashboards)				✔	✔	✔
Model assessment NLG						✔
Model insight reporting						✔
General Features						
Audio file analysis					✔	✔
Autotuning				✔	✔	✔
Custom extension nodes	✔					
EM batch code execution (migration)	n/a				✔	✔
Included text mining (lightweight)				✔	✔	✔
Incremental response models	✔					
Integrated coding (code node)	✔		✔	✔	✔	✔
Interactive binning	✔					
Interactive modeling	minimal			✔	✔	✔
K Fold cross validation	✔				✔	✔
Model lineage view					✔	✔
Multiple-pipeline comparison				✔	✔	✔
Pipeline annotations						✔
REST API calling product				✔	✔	✔
Reusable model templates (central storage)		✔		✔	✔	✔
Segment profile	✔					✔
Som/Kohennen	✔					
Start/End Groups (group processing)	✔	✔				
Survival data mining	✔					
Time series data mining	✔					
Two stage models	✔					

Major Capability	Advanced Analytics 15.1 on 9.4M6			SAS Visual Data Mining and Machine Learning 8.2 on Viya	SAS Visual Data Mining and Machine Learning 8.3 on Viya	SAS Visual Data Mining and Machine Learning 8.4 on Viya
	SAS Enterprise Miner	SAS Factory Miner	SAS HP Data Mining (Code)			
Machine Learning Methods						
Automated feature engineering package						✔
Automated interpretability action package						✔
Bayesian networks	✔	✔	✔	✔	✔	✔
Boolean rules				✔	✔	✔
Convolutional neural networks				✔	✔	✔
Dirichlet Gaussian Mixture Models (GMM)					✔	✔
Ensemble	✔			✔	✔	✔
Factorization machines				✔	✔	✔
Frequent item set mining	✔	✔		✔	✔	✔
Gaussian regression						✔
Gradient boosting	✔	✔		✔	✔	✔
Isolation forest					✔	✔
K nearest neighbor				✔	✔	✔
Image (incl. biomedical) processing				✔	✔	✔
Image Object Detection					✔	✔
Image keypoints detection					✔	✔
Image segmentation						✔
Market basket analysis	✔	✔		✔	✔	✔
Model interpretability (LIME, PDP, ICE)					✔	✔
Moving windows PCA				✔	✔	✔
Multi-task learning					✔	✔
Network analytics/community detection	✔			✔	✔	✔
Neural networks	✔	✔	✔	✔	✔	✔
Random forest	✔	✔	✔	✔	✔	✔
Recurrent neural network				✔	✔	✔
Reinforcement learning						✔
Robust PCA				✔	✔	✔
Semi-Supervised learning					✔	✔
Support vector data description				✔	✔	✔
Support vector machines	✔	✔	✔	✔	✔	✔
Support vector regression						✔
Text mining	✔			✔	✔	✔
T-SNE					✔	✔
Variable clustering	✔			✔	✔	✔
Open Source						
Open source calling SAS				✔	✔	✔
SAS calling open source	✔			minimal	✔	✔
Model Deployment						
Publish to MAS						✔
Model scoring (node)	✔					✔
Model retraining	✔	✔	✔	✔	✔	✔
Batch execution	✔	✔	✔	✔	✔	✔
Model Manager integration (pushbutton)	✔	✔		✔	✔	✔
Score code editor in code node	✔					✔
SAS DATA step score code	✔	✔	✔	✔	✔	✔
Astore score code	✔	✔	✔	✔	✔	✔
PMML score code	✔					
C score code	✔					
Java score code	✔					
REST scoring API				✔	✔	✔
Architecture						
Browser based (no install)	Java Web Start	✔	SAS Studio	✔	✔	✔
Windows based	✔	✔	✔			✔
Linux based	✔	✔	✔	✔	✔	✔
SMP mode (calling local non-in-memory data automatically)	✔	✔	✔			
MPP mode	✔	✔	✔	✔	✔	✔
SAS Viya integration (calling from SAS 9)	✔					

Econometrics

SAS Econometrics on SAS Viya provides full replacement value for all distributed procedures that are available with SAS High-Performance Econometrics on SAS 9.4, and it adds several more procedures such as HMM, CMDC, and CSPATIALREG. SAS Econometrics also includes a SAS/ETS license. The license allows a customer to run SAS/ETS procedures, thereby enabling them to address virtually any econometrics and time series analysis challenge. The SAS/ETS procedures execute only on the SAS Foundation server.

Optimization

SAS Optimization on SAS Viya includes all the optimization capabilities (to build and solve optimization models) that have recently been developed for SAS/OR. Several optimization solvers are implemented using distributed algorithms on CAS. Collectively, these distributed elements include and surpass the distributed optimization solver features of SAS High-Performance Optimization.   Added capabilities include distributed computation features in mixed integer linear programming, nonlinear programming, local search optimization, and constraint programming. Because SAS Optimization also includes a SAS/OR license, you can run SAS/OR procedures in order to use operations research methods in other areas such as project and resource scheduling. These SAS/OR procedures execute on the SAS Foundation server.

Forecasting

As previously mentioned, with the SAS Visual Data Mining and Machine Learning offering, SAS Visual Forecasting provides a modern HTML5 interface, which is integrated across all SAS Viya products. It also shares the advantage of being callable by open-source programming languages as well as by REST APIs.

Forecasting functionality is distributed evenly between SAS 9.4 Forecast Server and SAS Visual Forecasting on SAS Viya. Although they share many features, each supports unique capabilities as well. SAS Visual Forecasting includes a license for the SAS Forecast Server procedures and SAS/ETS procedures. All SAS Viya forecasting procedures are optimized for the highly performant, resilient CAS server. In a nutshell, both forecasting offerings provide a breadth of non-distributed capability. However, SAS Visual Forecasting offers new functionality, speed, and resilience.

The following table compares the features in these respective releases but does not reflect the additional functionality that is offered by the Forecast Server procedures and SAS/ETS procedures that are included with SAS Visual Forecasting.

Capability	Forecast Server 15.1 on 9.4M6 Forecast Studio	Time Series Studio	SAS Visual Forecasting 8.2 on Viya 3.3	SAS Visual Forecasting 8.3 on Viya 3.4	SAS Visual Forecasting 8.4 on Viya 3.4
Forecasting procedures	✔	✔	✔	✔	✔
Time series explorer / viewer	✔ Forecasts only	✔ Time Series only	✔ Facet search based only	✔ Facet search based only	✔ Facet search based only
Predefined set of time series descriptive statistics attributes (min, max, mean, missing, etc.)	✔	✔			✔
Predefined set of forecasting derived attributes (model properties, statistics of fit)	✔				✔
Predefined set of demand classification derived attributes					✔
Predefined set of volume/volatility derived attributes					✔
Filters using descriptive statistics	✔	✔			✔
Filters using model properties and statistics of fit	✔				✔
Predefined attributes available for use in faceted filters for viewers - Time series based attributes available in all viewers - Forecasting based attributes available in forecast viewer and overrides					✔
Envelope plots		✔			✔
Display single or multiple time series / forecasts	✔ Single Forecast only	✔ Time Series only			✔
View model list in forecast viewer	✔				✔
Filter manager - project wide	✔	✔ From Tree Only			✔
Segmentation		✔		✔ Imported using _seg_ variable in the attributes table	✔ Imported using _seg_ variable in the attributes table
Segmentation template using imported _seg_ attribute				✔ Numeric Only	✔
Prebuilt segmentation template based on demand classification segmentation					✔
Nested pipeline for each individual segment					✔
Nested demand classification segmentation within an individual segment					✔
Automatic model selection	✔		✔	✔	✔
Hierarchical forecasting	✔		✔	✔	✔
Hierarchical reconciliation	✔		✔ TD only in TSReconcile; aggregation for BU using TSMODEL or	✔ TD only in TSReconcile; aggregation for BU using TSMODEL or	✔ TD only in TSReconcile; aggregation for BU using TSMODEL or
Temporal reconciliation	✔				
Automatic outlier detection (ARIMA only)	✔			✔ Code only	✔
Concept of a project	✔	✔	✔	✔	✔
Project archive/unarchive	✔	✔	✔ Applicable project settings only; project data must be manually loaded into CAS	✔ Applicable project settings only; project data must be manually loaded into CAS	✔ Applicable project settings only; project data must be manually loaded into CAS

Capability	Forecast Server 15.1 on 9.4M6 — Forecast Studio	Time Series Studio	SAS Visual Forecasting 8.2 on Viya 3.3	SAS Visual Forecasting 8.3 on Viya 3.4	SAS Visual Forecasting 8.4 on Viya 3.4
Events	✔		✔ Built-in calendar and holiday events only; Code only	✔ Default calendar events and Importing events	✔ Default calendar events and Importing events
Events management	✔			✔ Create event repository using FS procedures or in FS	✔ Create event repository using FS procedures or in FS
Import event repository	✔			✔	✔
Export event repository	✔				
Automatic event selection in modeling	✔			✔	✔
Project level default event usage	✔			✔	✔
Modify event usage in each modeling node				✔	✔
Events management - CRUD	✔				
Assign events to individual or subsets of time series (EventBY capability)				✔ Code only	✔ Code only
Overrides using modeling hierarchy	✔				
Overrides using attribute based filters			✔	✔	✔
Overrides impact analysis			✔	✔	✔
Interactive modeling	✔				
Mandatory override justifications					
Tracking for overrides					
Forecast tracking					
Forecast Value Added (FVA) analysis					
Forecast model monitoring					
Custom models	✔		✔ Code only	✔ Code only	✔ Code only
Task management (diagnose, fit, forecast, etc.)	✔		✔ Available in some modeling nodes but not all of them	✔ Available in some modeling nodes but not all of them	✔ Available in some modeling nodes but not all of them
Import custom model selection list	✔			✔ Code or Hierachical Forecasting Modeling Strategy only	✔ Code or Hierachical Forecasting Modeling Strategy only
Combination models	✔			✔ Code or Hierachical Forecasting Modeling Strategies only	✔ Code or Hierachical Forecasting Modeling Strategies only
Machine learning modeling strategies				✔ 3 types - Panel Series, Stacked, and	✔ 3 types - Panel Series, Stacked, and
View model diagnostics	✔				
Compare Models	✔				
Rolling simulations	✔				
Goal seeking					
"What if ..." or scenario analysis	✔				
Batch execution	✔		✔	✔	✔
Code in modeling nodes can be modified and customized				✔ Except for Hierarchical Forecasting, Panel Series Neural Network, and Stacked	✔ Except for Hierarchical Forecasting, Panel Series Neural Network, and Stacked
Macros for project lifecycle management (create, run, copy, delete, etc.)	✔				
Prebuilt reports	✔				
Stability monitoring			✔ Code only	✔ Code only	✔ Code only
REST API			✔	✔	✔
Data Preparation integration			✔	✔	✔
Model Manager integration					

Capability	Forecast Server 15.1 on 9.4M6		SAS Visual Forecasting 8.2 on Viya 3.3	SAS Visual Forecasting 8.3 on Viya 3.4	SAS Visual Forecasting 8.4 on Viya 3.4
	Forecast Studio	Time Series Studio			
VA integration				✔ Limited to input and a subset of output tables by default	✔ Limited to input and a subset of output tables by default
Lineage integration				✔ Basic Lineage	✔ Basic Lineage
SAS Drive integration				✔	✔
Singular Spectrum Analysis (SSA)			✔ Code only	✔ Code only	✔ Code only
Multivariate Singular Spectrum Analysis (SSA)					✔ Code only
Motif analysis			✔ Code only	✔ Code only	✔ Code only
Time series missing value imputations				✔ Code only	✔ Code only
Time series similarity analysis	✔ Using SAS/ETS		✔ Code only	✔ Code only	✔ Code only
Vector time series similarity analysis					✔ Code only
Time series distance measures					✔ Code only
Time frequency analysis			✔ Code only	✔ Code only	✔ Code only
Time series filtering				✔ Code only	✔ Code only
Subspace tracking				✔ Code only	✔ Code only
Importing FS projects into VF				✔ Settings only	✔ Settings only
Interpretability - NLG project summary					✔

Text Analytics

Text Analytics functionality appears in several offerings: SAS Text Miner and SAS Contextual Analysis on SAS 9.4 and SAS Visual Data Mining and Machine Learning and SAS Visual Text Analytics on SAS Viya. The offerings that are based on SAS Viya add social media connectors as well as some unique features such as hierarchical column sorting and categorical cutting and pasting. The SAS Visual Text Analytics offering on SAS Viya provides replacement value for the SAS 9.4 text analytic capability.

Note that some of the text analytic functionality that is based on SAS Viya is available only as CAS actions and is not surfaced in the visual interface. Also note that SAS Visual Text Analytics offers tight integration with both SAS Visual Analytics and SAS Data Preparation.

The following table compares text analytic features in SAS 9.4 offerings and SAS Viya offerings.

Capability	Text Analytics on 9.4M6		Text Analytics on Viya 3.3		Text Analytics on Viya 3.4		
	Text Miner	SAS Contextual Analysis	VDMML 8.2	VTA 8.2	VDMML 8.3	VTA 8.3	VTA 8.4
Document conversion (from file server directory)	✔	✔			✔	✔	✔
Document conversion (In-Hadoop)						Programming thru SAS Studio	Programming thru SAS Studio
Web crawl	✔	✔					
Social media connectors			✔ Data Prep	✔ Data Prep	✔ Data Prep	✔ Data Prep	✔ Data Prep
Text summarization		✔ ECC add-on		✔ Action & SAS Studio Task		✔ Action & SAS Studio Task	✔ Action & SAS Studio Task
Document de-duplication		✔ ECC add-on					
Smart data segment				✔ Action only		✔ Action & SAS Studio Task	✔ Action & SAS Studio Task
Parsing	✔	✔	✔	✔	✔	✔	✔
Misspellings detection	✔	✔				✔	✔
Interactive synonym management	✔						
Term similarity scores in UI				✔		✔	✔
Dynamic rule building (using terms/textual elements)				✔		✔	✔
Topics SVD	✔	✔	✔	✔	✔	✔	✔
Topics LDA				✔ Action only		✔ Action & SAS Studio Task	✔ Action & SAS Studio Task
Create user-defined topics	✔			✔		✔	✔
Merge topics		✔		✔		✔	✔
Split topics		✔				✔	✔
Topics curation (rename, term/doc cut-off)	✔						
Save user-defined topics and terms (for collaboration & promotion)						✔	✔
Text clustering	✔						
Text profiling	✔						
Recurrent neural networks					✔ Action only		✔ Action only
Rule generation using probablistic semantics						✔ Action only	✔ Action UI (experimental)
Predefined concepts/standard entities	✔	✔	✔	✔	✔	✔	✔
Enabling / disabling select predefined concepts	✔	✔		✔ All or none		✔ All or none	✔ All or none
Custom concepts	✔ add-on product	✔		✔		✔	✔
Concept case sensitivity		✔				✔	✔
Set primary vs. supporting (helper) concept				✔		✔	✔
Content categorization (rules based)		✔		✔		✔	✔
Boolean rules (automatic rule generation)	✔	✔	✔	✔	✔	✔	✔
Category relevancy (not in UI in SCA, but there in scoring)		✔		✔		✔	✔
Managing more structured columns	✔		✔	✔	✔	✔	✔
Columns sort by hierarchies				✔		✔	✔
Cut/paste concepts, categories				✔		✔	✔
Save topics output data	✔			✔		✔	✔
Save categories output data (transactional)				✔		✔	✔
Save categories output data (modeling)						✔	✔
Report / results for text analytics nodes	✔				✔	✔	✔
Text specific best practice pipeline templates				✔		✔	✔
Change project data source	✔	✔	✔		✔	✔	✔
Sentiment scoring in UI (document level)		✔		✔		✔	✔
Sentiment (feature level) score code		✔		✔		✔	✔
Topics scoring	✔		✔	✔	✔	✔	✔
Concepts score code		✔		✔		✔	✔
Category score code		✔		✔		✔	✔

Capability	Text Analytics on 9.4M6		Text Analytics on Viya 3.3		Text Analytics on Viya 3.4		
	Text Miner	SAS Contextual Analysis	VDMML 8.2	VTA 8.2	VDMML 8.3	VTA 8.3	VTA 8.4
ASTORE support			✔ Topics SVD only	✔ Topics SVD only	✔ Topics SVD only	✔ Topics SVD only	✔ Topics, Categories, Concepts, Sentiment, RNN
Languages	27	31	30	30	32	32	33
Document search enabled in UI	✔						
Search (actions/API)			✔	✔	✔	✔	✔
Concepts model scoring in ESP		✔		✔		✔	✔
Category model scoring in ESP		✔		✔		✔	✔
Sentiment model scoring in ESP		✔		✔		✔	✔
Topics SVD model scoring in ESP			✔	✔	✔	✔	✔
Concepts model scoring in Hadoop		✔		✔		✔	✔
Category model scoring in Hadoop		✔		✔		✔	✔
Sentiment model scoring in Hadoop		✔		✔		✔	✔
Topics model scoring in Hadoop							
RNN model scoring						✔ Action only	✔ Action only
Topics LDA model scoring						✔ Action & SAS Studio Task	✔ Action & SAS Studio Task
Boolean rules scoring						✔ Action & SAS Studio Task	✔ Action & SAS Studio Task
REST API			✔ limited text mining features	✔	✔ limited text mining features	✔	✔
Collaboration: pipeline and node sharing			✔	✔	✔	✔	✔
Project import / export		✔		✔		✔	✔
Visualization and reporting (VA integration)			✔	✔	✔	✔	✔
Data preparation (DS integration)			✔	✔	✔	✔	✔
Model Manager integration						✔	✔
SAS Drive integration					✔	✔	✔
Data Lineage integration					✔	✔	✔
Migrating SAS Contextual Analysis projects (json import/export)		✔				✔	✔

Visual Statistics

SAS Visual Statistics on SAS Viya provides many of the same features that are provided in the SAS Visual Statistics 7.x series running on SAS 9.4. In addition, it includes equivalents to most of the distributed SAS procedures that are available with SAS High-Performance Statistics, as well as new procedures such as PHSELECT, PCA, and SPC. Consult *SAS Visual Statistics 8.4 Procedures* for a complete list. SAS Visual Statistics includes a SAS/STAT license. This license allows you to run SAS/STAT procedures, which enables you to address virtually any statistical challenge. This offering also includes SAS/GRAPH, which means that all components of SAS Analytics Pro are included with the SAS Visual Statistics offering. The SAS/STAT and SAS/GRAPH procedures run only within the SAS Foundation server. Like other products included in SAS Viya, SAS Visual Statistics also supports the ability to access its functionality through open-source languages and REST APIs. Note that SAS® In-Memory Statistics on Hadoop is not available with SAS Viya.

Model Management

Both SAS 9.4 and SAS Viya have a product named SAS® Model Manager to store, validate, assess, compare, and publish analytical models. Many of the features available in SAS Model Manager on SAS 9.4 are present in the SAS Viya version. The SAS Viya version extends the product to include an HTML5-based interface and an open, modern, microservices architecture. SAS Viya's centralized model repository not only supports the ability to import

models from a SAS 9.4 environment, but also offers model registration from a broader set of modeling environments including SAS Model Studio (available with SAS Visual Data Mining and Machine Learning (VDMML) and SAS Visual Text Analytics), SAS Studio, SAS Visual Analytics, and SAS Visual Statistics. SAS Viya's version also supports Python and R models for more open modeling support. Once registered in the common model repository, you can proactively monitor both SAS and open-source classification and prediction model performance in order to identify deviations in model output or model input data.

In both SAS 9.4 and SAS Viya, the analytics life cycle extends beyond registering and monitoring analytical models. The life cycle includes operationalizing models for scoring in batch, in database, in Hadoop, and within the SAS® Micro Analytical Service. SAS Model Manager on SAS Viya adds support for retraining VDMML models using the Model Studio interface, which ensures that the most effective model is driving business operations and decisions. And like the other microservice-based products in SAS Viya, SAS Model Manager supports open REST APIs for ease of access by clients such as SAS Intelligent Decisioning and SAS Event Stream Processing.

Decision Management

The SAS 9.4 decision management offerings are SAS® Decision Manager and SAS® Real-Time Decision Manager (RTDM). SAS Decision Manager is the predecessor to the current SAS Viya offering, which is SAS® Intelligent Decisioning. Features that are currently unique to RTDM, which is part of the Customer Intelligence portfolio, include several features for the management of treatments (for example, group definition, arbitration, and eligibility rules) as well as contact history recording and response. SAS Decision Manager on SAS 9.4 includes unique features such as advanced flow management (treatment groups in a decision flow, nested flows, and integrated rule and flow management) as well as extended support for Python and SQL.

SAS Intelligent Decisioning delivers the advantages of SAS Viya products, including an integrated HTML5 interface, fault-tolerant scalable architecture, open REST APIs, and SAS Drive's centralized content management. It also supports deploying models in the SAS Viya portable ASTORE format, which is also produced by other clients such as SAS Visual Data Mining and Machine Learning.

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