

System Requirements for SAS[®] 9.4 Foundation for z/OS



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Table of Contents

Welcome	1
Software Requirements	1
Operating System	1
UNIX System Services Requirements	1
Java Requirements	1
Security Requirements	2
Pervasive Encryption	2
Web Browsers	3
Hardware Requirements	3
Machines Supported	3
Tape Drives Supported	3
Distribution Media	3
Memory Requirements	4
Java Memory Requirements	4
Space Requirements	4
Specific Product Requirements	5
Base SAS Software	5
TCP/IP Access Method	5
Requirements for SPD Engine on z/OS	5
SAS/ACCESS Interface to Adabas	5
SAS/ACCESS Interface to CA-Datcom/DB	6
SAS/ACCESS Interface to CA-IDMS	6
SAS/ACCESS Interface to DB2	6
SAS/ACCESS Interface to IMS-DL/I	6
SAS/ACCESS Interface to Oracle	6
For SAS 9.4M0 - SAS 9.4M7	6
SAS/ACCESS Interface to SYSTEM 2000	7
SAS/ACCESS Interface to Teradata	7
For SAS 9.4M2 – 9.4M7	7
SAS/ASSIST	7
SAS/CONNECT	8
TCP/IP Access Method	8
Components Required	8
SAS/Genetics	8
SAS/GIS	8
SAS High-Performance Forecasting	8
SAS/IntrNet	8
CGI Tools and Applications	9
Installation Notes	9
Application Dispatcher	9
htmSQL	9
MDDDB Report Viewer Application	9

Xplore Sample Web Application.....	9
Java Tools and Applications	9
SAS/CONNECT Driver for Java.....	9
Tunnel Feature.....	9
SAS/OR 12.1 Software	9
SAS/SESSION Software.....	10
SAS/SHARE Software	10
TCP/IP Access Method.....	10
Security System.....	10
SAS Studio Software.....	10
User Address Space.....	10
Graphics Hardware and Software Compatibility	11
Terminals and Displays	11
Interfaces with other Graphics Software.....	11
Requirements for ActiveX and Java Graphics	11

Welcome

This document provides requirements for installing and running SAS 9.4 Foundation under IBM z/OS. It has been updated for [SAS 9.4M8](#) (TS1M8).

You must update your system to meet the minimum requirements before deploying SAS 9.4 Foundation.

For additional information and to view the latest requirements, access the following website:

<https://support.sas.com/installcenter/>

or contact SAS Technical Support at <https://support.sas.com/techsup/contact/>.

Software Requirements

The following topics summarize system requirements for running SAS 9.4 Foundation software on IBM z/OS.

Operating System

- SAS 9.4M0 through SAS 9.4M7 offer support for IBM z/OS V1R11, or V2 and later. Only the z/Architecture chip family is supported.
- [SAS 9.4M8](#) requires IBM z/OS V2R4 or later. This support includes V3R1 (z/OS 3.1), released by IBM in 2023. Only the z/Architecture chip family, using the 31-bit z/Architecture instruction set, is supported.
- For 64-bit support, [SAS 9.4M8](#) requires IBM z/OS V2R4 or later (64-bit versions). This support includes V3R1. Only the z/Architecture chip family is supported.

Note: With [SAS 9.4M8](#), SAS Foundation running in z/OS for the 31-bit z/Architecture includes support for Pervasive Encryption. Pervasive Encryption is available for SAS direct access bound libraries (using EXCP) and sequential access libraries (TAPE) using both the older CCW based channel programs and the newer zHPF channel programs. See [Pervasive Encryption](#) for more information.

UNIX System Services Requirements

In SAS 9.4, each user needs an OMVS segment, either specifically defined or as a default for all user IDs, so that the user can be “dubbed” in UNIX terms. End users do not require their own UNIX file system directory.

The user completing the installation needs the ability to install Help content and other SAS 9.4 content into a UNIX file system (preferably zFS).

Java Requirements

Some features of SAS 9.4 require a Java Software Development Kit (SDK).

[SAS 9.4M8](#) requires the IBM JRE 8 (31-bit version or release). This is the version of the Java SDK that SAS has tested and supports. Later patch levels and versions of this SDK might work; however, they have not been tested by SAS.

You can check the SAS Third-Party Support web page for information about the latest supported version of the SDK for z/OS at <https://support.sas.com/en/documentation/third-party-software-reference.html>.

For information about Java Runtime Environment (JRE) requirements, refer to the SAS 9.4 Support for Java Runtime Environments page, located at <https://support.sas.com/en/documentation/third-party-software-reference/9-4.html>.

Refer to the section titled “Configuring SAS Software for Use with the Java Platform” in the *Configuration Guide for SAS 9.4 Foundation for z/OS* for configuration details.

Security Requirements

Beginning with SAS 9.4M8, SAS Foundation servers use the cryptographic libraries that are available from the operating systems supported by SAS to provide encryption. Each SAS-supported cipher suite might not be available from all operating system. When this issue is encountered, use a cipher suite that is supported by both SAS and that operating system, or install a third-party SSL provider for use by SAS.

For z/OS, compare the list of SAS-supported cipher suites to those supported by IBM System SSL for TLS 1.3. These are documented in the z/OS Cryptographic Services System Secure Sockets Layer Programming documentation in the [Cipher Suite definitions](#) section.

For more information, see [Encryption in SAS 9.4](#).

Pervasive Encryption

Starting in SAS 9.4M8, support for the IBM Z Pervasive Encryption feature is available. This support is limited to SAS direct access bound libraries (via EXCP) and sequential access libraries (such as TAPE). Note that z/OS data set encryption currently only supports data-encrypting keys that are using the AES algorithm with a 256-bit key length.

Pervasive Encryption makes it easier to manage encryption keys and passwords. Pervasive encryption also enables system administrators to control and track encryption of both SAS and non-SAS stored datasets and libraries using the same approach and the same system tools.

At this time, pervasive encryption support is available for the SAS 9.4 Foundation for 31-bit z/OS offering, but not for the 64-bit offering. SAS 9.4M8 is required.

Pervasive Encryption support within SAS 9.4 Foundation also requires the following:

- SAS libraries must reside in SMS (Storage Management Subsystem) managed data sets.
- An appropriate key has been enabled with ICSF.
- An encryption key label must be set up in the CKDS and provided to the SAS deployment. The key label must point to an AES-256-bit encryption DATA key within the z/OS ICSF key repository (CKDS). Authorized users must have at least READ access to the label name in the RACF CSFKEYS class.
- Pervasive Encryption is only supported on 3390 device types.

Refer to the *Configuration Guide for SAS 9.4 Foundation for z/OS* for more information about enabling Pervasive Encryption.

Web Browsers

Both SAS 9.4 Foundation software and client applications support recent versions of popular web browsers to display SAS user interfaces. To run SAS clients, use a browser and platform combination that is listed on the following SAS Support page:

<https://support.sas.com/en/documentation/third-party-software-reference/9-4/support-for-9-4-web-browsers.html>.

On client machines, install a recent version of your preferred web browser, such as Microsoft Edge, Google Chrome, or Mozilla Firefox, to support modern SAS user interfaces. Many SAS product user interfaces deploy HTML5 to support newer features. For example, SAS Visual Analytics uses HTML5. These products require recent browser versions.

SAS 9.4 offers a Remote Browsing feature to display information. Instead of using a local browser, SAS 9.4 sends the information as a URL to your desktop computer for display in a web browser. This feature removes the browser overhead from the server and allows for the display of output that requires browser plug-ins that do not run on a 64-bit computer. A software agent, the Remote Browser Server, is installed on your desktop computer to enable SAS to communicate with your browser.

To enable remote browsing, your desktop computer must be running on Windows 8 or later or Linux for x64. For SAS 9.4M8, only Windows 10, Windows 11, and 64-bit Linux are supported.

Hardware Requirements

Machines Supported

Both the zSeries and System z machines are supported.

Tape Drives Supported

SAS uses standard operating system access methods to read/write tape files, and will operate with any tape drive that can be used by these access methods. The list includes:

- IBM 3480 compatible drives
- IBM 3490 compatible drives
- IBM 3590 compatible drives
- IBM 3592 compatible drives (includes IBM TS1120 drives)

Distribution Media

- Electronic Software Delivery
- DVD
- Cartridge (3590 only)

Memory Requirements

The total memory required for a SAS session depends on the work being performed and SAS 9.4 Foundation options that are active. Most work, up to moderately large jobs, can be run in a region that provides 64 MB of storage above the line. This is recommended for both batch jobs and TSO sessions.

SAS 9.4 use of below-the-line storage is substantially less than was required for SAS 9.0. 4 MB of below-the-line storage should be adequate for most batch jobs and TSO sessions.

Programs that utilize AF and SCL program entries may require additional region size in SAS 9.4 to exploit the various functions of the product. Examples of SAS products which may require a larger region are SAS/ASSIST and SAS IT Resource Management. Refer to the “Specific Product Requirements” section for the recommended REGION size for these products.

Note: This may also be necessary for user-written AF and SCL programs. For these, the site **must** determine what an appropriate REGION is.

If you install the SAS bundles into the LPA, the region requirements for SAS jobs will be reduced, because less storage is needed in the region for SAS executable modules. Information regarding installation of LPA bundles can be found in the [Configuration Guide for SAS 9.4 Foundation for z/OS](#).

No below-the-line storage is required for any of the LPA bundles.

Java Memory Requirements

SAS sessions that invoke the Java virtual machine will require a much larger region. The JVM typically adds approximately 250 MB to the region requirement.

Important: SAS recommends that the logon user ID that will be running the SAS Deployment Wizard to install SAS 9.4 Foundation for z/OS have a region size or ASSIZEMAX of 1 GB. This size accommodates both the Basic and Planned order deployment scenarios.

Space Requirements

The media you received are customized for your site and contain all the SAS software products for which you are licensed.

Approximate space requirements for all of the products available for SAS 9.4 Foundation are as follows:

- SAS Software Depot for all electronic download, DVD and tape planned orders (only needed during installation)
 - Base-only 8.2 GB
 - All products 24.1 GB
- Space for permanent installation
 - Traditional z/OS data sets: 6529 * cylinders
 - UNIX file system space for SASHOME directory: 3 GB (provides space for hot fixes and maintenance)

* This includes SAS/GRAPH map data sets from GfKGeoMarketing of 3855 cylinders disk space.

- Temporary space for Maintenance/Add-on (Actions B/C) during installation
Traditional z/OS data sets require 1200 cylinders to be released back to the system.

Note: SAS recommends a minimum of 100 MB of available /tmp space during installation and deployment.

After the installation of the SAS software is complete, any unused space is released to the system.

Specific Product Requirements

Base SAS Software

TCP/IP Access Method

Some features of Base SAS require TCP/IP; for example, Remote Help and the FTP access method require it. SAS requires either:

- A properly configured IBM z/OS TCP/IP.
- A third-party TCP/IP package. This package must fully support the function and interfaces found in the minimum system requirements for z/OS.

Requirements for SPD Engine on z/OS

The minimum requirement for a computer system to support SPD Engine is a UNIX file system (zFS).

SAS/ACCESS Interface to Adabas

Important: Starting with [SAS 9.4M8](#), SAS/ACCESS Interface to Adabas is not available. If you upgrade or migrate SAS Foundation to SAS 9.4M8, SAS recommends that you install and use a different data source and a different SAS/ACCESS engine instead. Contact your SAS representative for assistance.

If you have an existing installation of SAS/ACCESS Interface to Adabas in your environment, SAS recommends that you first unconfigure and uninstall before upgrading or migrating to [SAS 9.4M8](#). A best practice is to unconfigure retired SAS products before you upgrade and to uninstall them after you upgrade. For more information, see “[Unconfiguring and Uninstalling Retired Products](#)” in the SAS Guide to Software Updates and Product Changes.

Base SAS is required for the installation of SAS/ACCESS Interface to Adabas software.

DBMS Products Required:

- ADABAS, Release 6.2.1 or later
- For SAS 9.4 M3: ADABAS, Release 7.4.1 or later

Optional DBMS Products

- NATURAL, Release 2.3.2 or later
- NATURAL Security, Release 2.3.2 or later
- PREDICT, Release 3.4.1 or later

SAS/ACCESS Interface to CA-Datcom/DB

Base SAS is required for the installation of SAS/ACCESS Interface to CA-Datcom/DB software.

DBMS Products Required

- CA-Datcom/DB, Release 9.0 or later. For SAS 9.4 M3, Release 11 SP2 or later.
- CA-DATADictionary, Release 9.0 or later

SAS/ACCESS Interface to CA-IDMS

Base SAS is required for the installation of SAS/ACCESS Interface to CA-IDMS software.

DBMS Products Required:

- CA-IDMS, Release 14.0 or later
- For SAS 9.4 M3, Release 16.0 or later

SAS/ACCESS Interface to DB2

Base SAS is required for the installation of SAS/ACCESS Interface to DB2.

DBMS Product Required: IBM Db2 Version 10 or later

SAS/ACCESS Interface to IMS-DL/I

Base SAS is required for the installation of SAS/ACCESS Interface to IMS-DL/I software.

DBMS Products Required:

- IMS/VS, Version 6.1 or later
- For SAS 9.4 M3, Version 7 or later

SAS/ACCESS Interface to Oracle

Important: Starting with [SAS 9.4M8](#), SAS/ACCESS Interface to Oracle is not available. If you upgrade or migrate SAS Foundation to SAS 9.4M8, SAS recommends that you install and use a different data source and a different SAS/ACCESS engine instead. Contact your SAS representative for assistance.

If you have an existing installation of SAS/ACCESS Interface to Oracle in your environment, SAS recommends that you first unconfigure and uninstall before upgrading or migrating to [SAS 9.4M8](#). A best practice is to unconfigure retired SAS products before you upgrade and to uninstall them after you upgrade. For more information, see “[Unconfiguring and Uninstalling Retired Products](#)” in the SAS Guide to Software Updates and Product Changes.

Base SAS is required for the installation of SAS/ACCESS Interface to Oracle.

SAS/ACCESS Interface to Oracle software can be installed on either a full Oracle RDBMS server node or on an Oracle client node.

For SAS 9.4M0 - SAS 9.4M7

DBMS Products Required:

- Oracle Database 12.1 or later
- Oracle Client 12.1 or later

SAS/ACCESS Interface to SYSTEM 2000

Base SAS is required for the installation of SAS/ACCESS Interface to SYSTEM 2000.

DBMS Products Required: SYSTEM 2000, Version 2.0 (current release), or Release 11.6 with Field Fix 1 or later.

SAS/ACCESS Interface to Teradata

Important: Starting with SAS 9.4M8, SAS/ACCESS Interface to Teradata is not available. If you upgrade or migrate SAS Foundation to SAS 9.4M8, SAS recommends that you install and use a different data source and a different SAS/ACCESS engine instead. Contact your SAS representative for assistance.

If you have an existing installation of SAS/ACCESS Interface to Teradata in your environment, SAS recommends that you first unconfigure and uninstall before upgrading or migrating to SAS 9.4M8. A best practice is to unconfigure retired SAS products before you upgrade and to uninstall them after you upgrade. For more information, see [“Unconfiguring and Uninstalling Retired Products”](#) in the SAS Guide to Software Updates and Product Changes.

Base SAS is required for the installation of SAS/ACCESS Interface to Teradata.

DBMS Products Required

- Teradata Database 12 or later (or 13.10 or later if Temporal features are required)
- Teradata CLIV2 client libraries TTU 12 - 16.20 on the machine where you run SAS and SAS/ACCESS Interface to Teradata. CLIV2 is part of Teradata Tools and Utilities (TTU). TTU 13.10 or later is required for Temporal features.
- If you are running any Teradata Utility (BTEQ, FastLoad, MultiLoad, FastExport, TPump), CLIV2 is already on your machine.

Note: Connectivity from the z/OS client to the Teradata DBS server should be established and validated as described in the Teradata Tools and Utilities Installation Guide for MVS. If you are successfully accessing tables with BTEQ, FastLoad, or other Teradata utilities, you already have the needed connectivity.

For SAS 9.4M2 – 9.4M7

- Teradata Database 14.10 or later.
- Teradata CLIV2 client libraries TTU 12 - 16.20 on the machine where you run SAS and SAS/ACCESS Interface to Teradata. TTU 13.10 or later is required for Temporal features.

SAS/ASSIST

Products Required: Base SAS software

Memory Requirements

Due to the increased storage requirements for SAS 9 and above, it may be necessary to increase the default REGION to 64 MB.

SAS/CONNECT

TCP/IP Access Method

See “TCP/IP Access Method” in “Base SAS Requirements” [on page 5](#) for details.

Note: If you are familiar with earlier SAS releases, note that the SAS/C Transient Library is no longer used and is not shipped with SAS 9.4. The associated configuration options (such as CTRANSLOC) are accepted but ignored.

Components Required

Version 9 SAS SVC Routine is required, except for Basic Telnet SAS/CONNECT Session.

Refer to “Chapter 1 — Setting Up SAS 9.4 Foundation” in the [Configuration Guide for SAS 9.4 Foundation for z/OS](#) for information about the Version 9 SAS SVC Routine.

SAS/Genetics

Important: Starting with SAS 9.4M8, SAS/Genetics is not available. In order to continue using SAS/Genetics, do not upgrade Base SAS or SAS Foundation to SAS 9.4M8.

A best practice is to unconfigure retired SAS products before you upgrade and to uninstall them after you upgrade. For more information, see “[Unconfiguring and Uninstalling Retired Products](#)” in the SAS Guide to Software Updates and Product Changes.

Base SAS and SAS/GRAPH are required for the installation of SAS/Genetics software.

SAS/GIS

Products Required

- Base SAS software
- SAS/GIS software
- SAS/GRAPH software

Other products may be required depending on the application.

SAS High-Performance Forecasting

Base SAS is required for the installation of SAS High-Performance Forecasting software.

SAS/IntrNet

SAS/IntrNet software consists of several components that may be installed independently. SAS/IntrNet Server software is installed on an existing SAS system and is included on SAS 9.4 installation media.

All SAS/IntrNet components require the use of TCP/IP. See “TCP/IP Access Method” in “Base SAS Requirements” [on page 5](#) for details.

CGI Tools and Applications

Installation Notes

For a new installation of CGI Tools for the Web Server (CGI Tools), including an add-on installation, the SAS Foundation product is required to be selected. If CGI Tools is being installed as the only add-on product, we recommend using an Action C staged install. This is because the SAS Foundation product in the order will be installed again. The CGI Tools data content is only installed to the UNIX file system area, so in the case where CGI Tools is the only product being installed, the PROMOTE job does not have to run.

Application Dispatcher

Requires Base SAS software and SAS/IntrNet Server software. The Application Broker component of the Application Dispatcher must be installed on the same machine as the web server. Use of the Pool Services feature requires the installation of the z/OS Spawner.

htmSQL

Requires Base SAS software, SAS/SHARE software, and a SAS/IntrNet software license (SETINIT). The htmSQL component must be installed on a web server.

MDDB Report Viewer Application

Requires Base SAS software, SAS/GRAPH software, SAS/IntrNet software, and SAS OLAP Server software. The Application Dispatcher component must be installed and configured.

Xplore Sample Web Application

Requires Base SAS software and SAS/IntrNet Server software. The Application Dispatcher component must be installed and configured.

Java Tools and Applications

SAS/CONNECT Driver for Java

Requires Base SAS software, SAS/CONNECT software, SAS/IntrNet Server software, and a configured SAS/Connect spawner. SAS/SHARE software must also be installed if data services are used. The Java Tools package must be installed on a web server or client system.

Tunnel Feature

Must be installed on a web server running on a UNIX or Windows system.

SAS/OR 12.1 Software

The use of graphics in SAS/OR software requires a SAS/GRAPH license. Invoking the OPTLP, OPTMILP, OPTQP, and OPTMODEL procedures in distributed computing mode requires a SAS High-Performance Analytics license.

SAS/SESSION Software

Products Required: CICS Transaction Server for z/OS version 3.1 or later.

SAS/SHARE Software

Products Required: Base SAS software

Components Required

- Version 9 SAS SVC Routine
- Refer to “Chapter 1 – Setting Up SAS 9.4 Foundation” in the [Configuration Guide for SAS 9.4 Foundation for z/OS](#) for information about the Version 9 SAS SVC Routine

TCP/IP Access Method

See “TCP/IP Access Method” in “Base SAS Requirements” [on page 5](#) for details.

Note: If you are familiar with previous SAS releases, note that the SAS/C Transient Library is no longer used and is not shipped with SAS 9.4. The associated configuration options (such as CTRANSLOC) are accepted but ignored.

Security System

A security system is required for z/OS SAS/SHARE sites making use of the cross-host or cross-architecture capabilities available in Release 8.2 and beyond. This requirement may be met by any of the following:

- IBM Security Server for z/OS
- Any Security system that provides support equivalent to these servers via the SAF system interface

SAS Studio Software

User Address Space

SAS recommends that you set the user address space maximum (ASSIZEMAX) to an address storage size large enough to allow the Java JVM to load and the SAS programs to properly execute.

Set the ASSIZEMAX variable for the user address space in the OMVS shell.

Graphics Hardware and Software Compatibility

Terminals and Displays

SAS/GRAPH software supports standard IBM graphics terminals (such as the IBM 3179G, IBM 3192G, and IBM 3472G terminals).

SAS/GRAPH software should also be able to support most 3270 emulation packages as long as the 3270 emulation software is configured to provide host graphics support.

Interfaces with other Graphics Software

SAS/GRAPH software provides device drivers to create output in various graphics file formats, such as PNG, GIF, JPEG, TIFF, RTF, PDF, CGM, and PostScript.

Refer to the following web site for several z/OS-specific SAS/GRAPH examples:

<http://support.sas.com/documentation/hosts/mainframe/zos/tips/index.html>.

Requirements for ActiveX and Java Graphics

The ActiveX and Java device drivers enable you to create HTML pages from within SAS 9.4 Foundation. Before you can do this, verify the following:

- Your system meets the JDK requirements (see “Java Requirements” [on page 1](#)).
- Your job or TSO session has sufficient memory to invoke Java.

For a list of supported browsers, see <https://support.sas.com/en/documentation/third-party-software-reference/9-4/support-for-9-4-web-browsers.html>.



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