System Requirements for SAS® 9.4 Foundation for z/OS

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Welcome

Note: *If you are familiar with previous SAS releases, please note that the SAS/C Transient Library is no longer used and is not shipped with SAS 9.4.*

This document provides requirements for installing and running SAS 9.4 Foundation under IBM z/OS. You must update your system to meet the minimum requirements before running SAS 9.4 Foundation. The major requirements listed in the document are:

- Software Requirements on page 1.
- Hardware Requirements on page 3.
- Space Requirements on page 4.
- Specific Product Requirements on page 6.
- Graphics Hardware and Software Compatibility on page 11.

For additional information and to view the latest system requirements for your system, access the following web site:

`http://support.sas.com/installcenter/`

or contact SAS Institute Technical Support at `http://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

z/OS, Version 1, Release 11, Version 2, or later.

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

Note: *Beginning with the fourth maintenance release of SAS 9.4, you must install an appropriate Service Refresh of the IBM 31-bit SDK. SAS will no longer provide a Java Software Development Kit (SDK) for use during installation, maintenance, and application of hot fixes.*

Some features of SAS 9.4 require the use of a Java Software Development Kit (SDK) to function properly. The features include the following:

- SAS Deployment Wizard
- SAS Migration Utility
- SAS Deployment Manager
- SAS/GRAPH support for the `javaimg` device
- SAS/BASE when creating graphics output with ODS Graphics and the SAS SG procedures (such as SGPLOT, SGSCATTER, SGRENDER, and SGPANEL)
- The SAS REPORT procedure

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.

If you are using any of these features, determine that you have at least the SDK 8 (31-bit version or release) of the Software Development Kit. This is the version of the 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.

Supported versions are as follows:

Java 8.0 SR5 FP17+IJ09574

You can check the SAS Third Party Support web page for information about the latest supported version of the SDK for z/OS at http://support.sas.com/resources/thirdpartysupport/.

For information about Java Runtime Environment (JRE) requirements, please refer to the SAS 9.4 Support for Java Runtime Environments web page, located at http://support.sas.com/resources/thirdpartysupport/v94/jres.html.

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: http://support.sas.com/resources/thirdpartysupport/v94/browsers.html.

For the Google Chrome and Mozilla Firefox browsers, only the minimum supported versions are listed, but SAS also supports subsequent minor versions of these browsers.

On client machines where you do not plan to deploy the Remote Browsing feature (described below), install a recent version of your preferred web browser, such as Microsoft Internet Explorer 11, Google Chrome 42, or Mozilla Firefox 31, to support the most modern SAS user interfaces.

A few SAS product user interfaces deploy HMTL5 to support newer features. For example, SAS Visual Analytics provides an optional "modern" appearance mode. The individual system requirements documents for these products include a link to additional information about supported web browsers.

SAS 9.4 Foundation offers a Remote Browsing feature to display information. Instead of using a local browser, SAS 9.4 Foundation 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 7 and later or Linux for x64.

Default DATACLAS Specification for Installation

In SAS 9.4, there are several SAS library data sets that are installed by using INSTALXX jobs. If an INSTALXX job is used, then the default DATACLAS at your site must allocate these datasets with a DNSTYPE=BASIC or DNSTYPE=LARGE. If you use other DNSTYPE values such as EXTENDED, the installation fails.

Hardware Requirements

Machines Supported

Both the zSeries and System z machines are supported.

Distribution Media

- Electronic Software Delivery
- DVD
- FTP Format (***Note:*** Supported beginning in the fifth maintenance release of SAS 9.4)

Note: *As of October 2015, SAS software is no longer shipped on cartridge media.*

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 will typically add approximately 250 MB to the region requirement.

Important: *It is recommended 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 accommodates both the Basic and Planned order type scenarios.*

Space Requirements

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

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

- SAS Software Depot for all electronic download, DVD planned orders (only needed during installation)
  - Base-only 7.6 GB
  - All products 22 GB
- Space for permanent installation
  - Traditional z/OS data sets 7160 * cylinders
  - UNIX file system space for SASHOME directory 3 GB (allows space for hot fixes and maintenance)

  * This includes SAS/GRAPH map data sets from GfKGeoMarketing of 4031 cylinders disk space.
- Temporary space for Maintenance/Add-on (Actions B/C) during installation
  Traditional z/OS data sets require 1200 cylinders 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 will be released back to the system.

Dataset Allocation Requirements

New validation checks have been added during the prompting for z/OS-specific values in the SAS Deployment Wizard (SDW) that are needed to create the data sets. The validation enables the user to understand if the installation will be successful. The user does not have to wait for the entire install to run and fail during post-install processing.
The new checks make use of the REXX *bpxwdyn* callable service to perform dynamic allocation of temporary data sets using the values provided by the user for all disk allocation parameters.
Since z/OS system environment can be customized in many ways, the validation checks that account for all these customized environments might not work correctly. The table lists the commands that are passed to *bpxwdyn* to determine whether the validation check works correctly. Your system programmer can verify whether the command works correctly at your site. If the checks are not valid, they can be bypassed or the entire set of checks can also be bypassed by using *-nozosprecheck* option during the invocation of *setup.rexx* script.

Note that in each of these checks, data set name includes the "*<hlq>*" string which is replaced with the high-level qualifier that is entered at the SDW prompt. It also includes the "*Tnnnnnnn*" string, which is constructed using the low-order seven digits of the system time in nanoseconds. This guarantees unique names for the temporary data sets.

SDW Label	**New Validation Process**
High-Level Qualifier	Additional validation is done by creating a sequential data set called "*<hlq>.Tnnnnnnn.TEST*" with specifying only SPACE, DCB, and DISP parameters. This allocation fails if the user is not authorized to use the high-level qualifier. For example, if the user specifies the high-level qualifier as "PROD.SAS94", the alloc command passed to *bpxwdyn* is: "**alloc da('PROD.SAS94.Tnnnnnnn.TEST') new delete dsorg(ps) recfm(f,b) lrecl(80) blksize(6160) space(1,0) block(6160)**"
SMS Parameters	Additional validation is done by creating a sequential data set called "*<hlq>.Tnnnnnnn.TEST*" with specifying only SPACE, DCB, SMS, and DISP parameters. The SMS parameters used are the ones specified by the user. For example, if the user specifies the Storage class as "SAS", the Management Class as "STD", and the Data Class as "STD", the alloc command passed to *bpxwdyn* is: "**alloc da('<hlq>.Tnnnnnnn.TEST') new delete dsorg(ps) recfm(f,b) lrecl(80) blksize(6160) space(1,0) block(6160) storclas(SAS) mgmtclas(STD) dataclas(STD)**"
SMS PDS/E Parameters	Additional validation is done by creating a PDS/E called "*<hlq>.Tnnnnnnn.PDSE*" with specifying only SPACE, DCB, SMS, and DISP parameters. The SMS parameters used are the ones specified by the user. For example, if the user specifies the Storage class as "SASPDSE", the Management Class as "STD", and the Data Class as "STD", the alloc command passed to *bpxwdyn* is: **alloc da('<hlq>.Tnnnnnnn.PDSE') new delete dsorg(ps) recfm(f,b) lrecl(80) blksize(6160) dsntype(LIBRARY) space(1,0) tracks storclas(SASPDSE) mgmtclas(STD) dataclas(STD)"**
DISKUNIT	Additional validation is done by creating a sequential data set called "*<hlq>.Tnnnnnnn.TEST*" with specifying only SPACE, DCB, UNIT, and DISP parameters. The UNIT value used is the one specified by the user for DISKUNIT. For example, if the user specifies the DISKUNIT as "SYSALLDA", the alloc command passed to *bpxwdyn* is: **"alloc da('<hlq>.Tnnnnnnn.TEST') new delete dsorg(ps) recfm(f,b) lrecl(80) blksize(6160) space(1,0) block(6160) unit(SYSALLDA)"**
TMPUNI	Additional validation is done by creating a temporary sequential data set called "*&&Tnnnnnnn*" with specifying only SPACE, DCB, UNIT, and DISP parameters. The UNIT value used is the one specified by the user for TMPUNI. For example, if the user specifies the TMPUNI as "VIO", the alloc command passed to *bpxwdyn* is: "**alloc da('&&Tnnnnnnn') new delete dsorg(ps) recfm(f,b) lrecl(80)**

	blksize(6160) space(1,0) block(6160) unit(VIO)"
VOLDISK	When SMS is not used, the disk volume must be provided. When that is the case, two additional validations are done. First the MVS UCBSCAN service is invoked to determine whether the volume exists on the system or not. Next, a sequential data set called "*<hlq>.Tnnnnnnn.TEST*" is created with specifying only SPACE, DCB, UNIT, VOL, and DISP parameters. The UNIT and VOLSER values are the ones specified by the user for DISKUNIT and VOLDISK, respectively. For example, if the user specifies the DISKUNIT as "SYSDA" and the VOLDISK as "SAS001", the alloc command passed to *bpxwdyn* is: "**alloc da('<hlq>.Tnnnnnnn.TEST') new delete dsorg(ps) recfm(f,b) lrecl(80) blksize(6160) space(1,0) block(6160) vol(SAS001) nit(SYSDA)**"

Specific Product Requirements

Base SAS Software

For Maintenance Release Upgrades, Registry Changes are Not Preserved

If you made changes to the SAS registry, these changes will not be preserved. After you upgrade, you should re-create these changes.

TCP/IP Access Method

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

General guidelines for a minimum computer system to support SPD Engine include UNIX file system (zFS).

SAS/ACCESS Interface to Adabas Software

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 and later: and later 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-Datacom/DB Software

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

DBMS Products Required

- CA-Datacom/DB, Release 9.0 or later. For SAS 9.4 M3 and later, Release 11 SP2 or later.
- CA-DATADICTIONARY, Release 9.0 or later

SAS/ACCESS Interface to CA-IDMS Software

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 and later, Release 16.0 or later

SAS/ACCESS Interface to DB2 Software

Products Required

- Base SAS software
- SAS/ACCESS Interface to DB2 software

DBMS Products Required: DB2 Version 10 or later

SAS/ACCESS Interface to IMS-DL/I Software

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 and later, Version 7 or later

SAS/ACCESS Interface to Oracle Software

Products Required

- Base SAS software
- SAS/ACCESS Interface to Oracle software

DBMS Products Required

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

The minimum required Oracle client release is: Oracle 10g.

SAS/ACCESS Interface to SYSTEM 2000 Software

Products Required

- Base SAS software
- SAS/ACCESS Interface to SYSTEM 2000 software

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 Software

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

DBMS Products Required

- Teradata Database 15.10 or later
- Teradata client TTU 15.10 or later on the machine where you run SAS and SAS/ACCESS Interface to Teradata

Note: *Connectivity from the z/OS client machine to the Teradata DBS server machine 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.*

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 Software

TCP/IP Access Method

See "TCP/IP Access Method" in "Base SAS Requirements" on page 6 for details.

Note*: If you are familiar with earlier SAS releases, please 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 12.1 Software

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

SAS/GIS Software

Products Required

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

Other products may be required depending on the application.

SAS High-Performance Forecasting 12.1 Software

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

SAS/IntrNet Software

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 6 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.

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 on the Version 9 SAS SVC Routine

TCP/IP Access Method

See "TCP/IP Access Method" in "Base SAS Requirements" on page 6 for details.

***Note**: If you are familiar with previous SAS releases, please 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.

Please 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, refer to the *System Requirements* documentation for your client system.

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