

SAS®9 Pre-Installation Checklist

Installation and Configuration Service

Customer Name	
Plan File Created By	
Plan File Created On (yyyy-MM-dd HH:mm:ss.SSS)	2023-08-23 13:08:25.063
Plan Name	Metadata Server, one machine
Plan Description	Metadata Server, one machine
SAS Version	9.4_M8
Machine Names	Server, Middle Tier, and Clients Metadata Server Node (Optional)
Offerings	Standalone SAS Metadata Server 9.4 Select Individual Products

Pre-Installation Checklist

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1 Software Order Information

A Software Order E-mail was sent to your site's SAS Representative. The Software Order E-mail contains important information about obtaining your software and instructions for preparing to install your software. The SAS Installation Data file (SID file), which contains the license required to run your SAS Software, is included with the software itself, not the e-mail.

The following information is also contained in the Software Order E-mail. Record the following:

Tech Support Site Number:	
SAS Installation Key:	
Order Number:	

SAS Intelligence Platform documentation is available at:

<http://support.sas.com/94administration>

Electronic Software Delivery and SAS Software Depots

The preferred method for acquiring your SAS software is by using the SAS Electronic Software Delivery (ESD) system. By downloading the software over the Internet, you are able to receive your software faster. In addition, this helps you and SAS to make changes to protect our environment by eliminating the need to expend resources on a physical shipment. Once the software is downloaded, you have the option of creating physical media on-site if needed. If ESD does not work for you, then SAS can discuss alternative methods of delivering your software.

For instructions on acquiring your software via the SAS Electronic Software Delivery (ESD) system, see the QuickStart Guide to Your SAS Electronic Software Delivery Installation for Planning Installations on Install Center:

<http://support.sas.com/qsgesdplan94.html>

To begin accessing the SAS Electronic Software Delivery (ESD) system, you will need to download the SAS Download Manager. The SAS Download Manager can be found here:

<http://support.sas.com/downloadmgr>

Once downloaded, the SAS Software Depot will need to be made available to all machines in the architecture.

2 Network Configuration

Network Configuration		
1	Is the SAS Software Depot accessible from each machine that will be used for the SAS installation? Or has media been created, and does each system have the appropriate media drive attached or accessible (DVD, CD or mainframe cartridge)?	
2	Will the SAS installer have remote access to the servers?	
3	Do all the hardware components reside within the same domain?	
4	What is the bandwidth between server and client accessing remotely?	
5	A workspace and a workstation is required for each installer. Describe the workstation, its method of access to the server(s) (terminal emulators, etc.) and the location of the workspace in which it resides.	
6	Will the SAS installer have Internet access from the workstation? Are there any restrictions for browsers or FTP usage that we should be aware of?	
7	Will the SAS installer have a telephone available at this workstation? Or, is the use of cell phones and other portable communication devices allowed in this area?	

3 Logistics and Security

Logistics and Security		
<p>NOTICE: SAS provides installation services to support customers wishing to configure SAS software, either by visiting the customer site or performing the installation remotely. These services are typically chargeable and require planning in advance to allow the customer team to prepare for their environment prior to the SAS team working within the environment. For more information about these services and others, the customer should have their representatives contact their SAS account manager or SAS Customer Support. Fill out the following table if SAS or a consulting organization will be performing this installation on site.</p>		
1	What is the address where the installation will occur? Please provide the street address, city, etc.	
2	Provide any directions needed to locate the facility and access it.	
3	Who will be the SAS installer's contact to enter the facility?	
4	Do you have an airport recommendation?	

Logistics and Security

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5	Do you have a hotel recommendation?	
6	What is the dress code for your facility?	
7	Please inform us of any special travel policies you may have that we need to comply with.	
8	Please inform us of any special security clearance requirements the SAS installer needs to comply with in order to gain access to your facility.	

4 Hardware Infrastructure

SAS is designed for analyzing small to very large volumes of data. To achieve these analyzes, SAS predominantly uses one of two methods. The first is to read and write the data using large block sequential I/Os. The second approach is to load data directly "in-memory". For more information about in-memory, please see the "SAS In-Memory Analytics Technology" topic in SAS 9.4 Language Reference: Concepts, located at http://support.sas.com/documentation/cdl_main/94/docindex.html. The remainder of this section focuses on the requirements and recommendations of the reading and writing of large block sequential I/Os.

For optimizing large block sequential I/Os, we strongly recommend reviewing the information below to ensure your hardware infrastructure (CPUs, memory, I/O subsystem) are all configured as optimally as possible.

4.1 Operating System Tuning Guidelines

You can find tuning guidelines for working with SAS on various operating systems in SAS Usage Note 53873, located at <http://support.sas.com/kb/53/873.html>

4.2 CPU Guidelines

SAS recommends using the latest class of processors supported for Windows/UNIX/Linux systems.

4.3 Memory Guidelines

SAS recommends the following for memory for each of the SAS tiers you are configuring:

- for the SAS compute tier, a minimum of 8 GB of RAM per core
- for the SAS middle tier, a minimum 24 GB or 8 GB of RAM per core, whichever is larger
- for the SAS metadata tier, a minimum of 8 GB of RAM per core

SAS recommends the virtual memory be between 1.5 and 2 times the size of the physical RAM. If, in monitoring your system, the computer is paging to disk on a frequent basis, then SAS recommends either the addition of more physical memory or moving the paging file to a disk drive with a more

robust I/O throughput rate compared to the default drive. In some cases, both of these steps may be necessary.

4.4 Best Practices of I/O Configuration

Configuring the I/O subsystem (disks within the storage, adaptors coming out of the storage, interconnect between the storage and processors, input into the processors) to be able to deliver the I/O throughput recommended by SAS will provide a positive end-user experience. Here are the recommended I/O throughput for the typical file systems required by the SAS Compute tier:

- Overall I/O throughput needs to be a minimum of 100-125 MB/sec/core.
- for SAS WORK, a minimum of 150 MB/sec/core.
- for permanent SAS data files, a minimum of 100 MB/sec/core.

For more information regarding how SAS does I/O, see “Best Practices for Configuring your IO Subsystem for SAS® 9 Applications”, located at

<http://support.sas.com/resources/papers/proceedings16/SAS6761-2016.pdf>

In addition, SAS has tools you can use to ensure your I/O subsystem is getting the recommended I/O throughput. Refer to the Usage Note 53876, located at <http://support.sas.com/kb/53/876.html>

4.5 File System Guidelines

The Best Practices for Configuring IO paper described above lists the preferred local file systems for SAS (such as JFS2 for AIX, XFS for RHEL, and NTFS for Windows). Specific tuning for these file systems can be found in the operating system tuning papers listed in SAS Usage Note 53873.

For SAS Grid implementations, a clustered file system is required. We have tested SAS Grid with many file systems and the results of the testing along with any tuning guidelines can be found in “Shared File Systems: Determining the Best Choice for your Distributed SAS Foundation Applications”, located at <http://support.sas.com/resources/papers/proceedings17/SAS0569-2017.pdf>.

In addition to this overall paper, there are more detailed papers on Red Hat's GFS2 and IBM's GPFS clustered file systems on the SAS Usage Note 53875, located at <http://support.sas.com/kb/53/875.html>

Due to the nature of SAS WORK (the temporary file system for SAS applications), which performs large sequential reads and writes and then destroys these files at the termination of the SAS session, we do not recommend that you employ NFS mounted file systems. We have seen lots of issues with file-locking on NFS systems, and the network can negatively influence the performance of SAS when accessing files across it, especially when doing writes. Details of these issues can be found on page 4 of “Best Practices for Configuring Your I/O Subsystems for SAS 9 Applications”, located at <http://support.sas.com/resources/papers/proceedings16/SAS6761-2016.pdf>

4.6 Storage Array Guidelines

Storage arrays play an important part in the I/O subsystem infrastructure. Papers that include tuning guidelines for various storage arrays are listed in SAS Usage Note 53874, located at <http://support.sas.com/kb/53/874.html>

4.7 Running SAS in the Public Cloud

For papers discussing the pros and cons of running SAS in the Public Cloud, refer to the papers in SAS Usage Note 62239, located at <http://support.sas.com/kb/62/239.html>

4.8 Virtualization Guidelines

For papers discussing the pros and cons of running SAS in a virtualization infrastructure, refer to the papers in SAS Usage Note 62240, located at <http://support.sas.com/kb/62/240.html>

4.9 Miscellaneous

Generic papers about how to set up your hardware for SAS are described below.

- “How to Maintain Happy SAS9 Users”, located at <http://support.sas.com/resources/papers/proceedings16/SAS6201-2016.pdf>
- “A Guide to SAS for the IT Organization”, located at <http://support.sas.com/resources/papers/proceedings14/SAS103-2014.pdf>
- “Top 10 Resources Every SAS Administrator Should Know About”, located at <http://support.sas.com/resources/papers/proceedings14/SAS106-2014.pdf>
- “Guidelines for Preparing your Computer Systems for SAS”, located at <http://support.sas.com/resources/papers/proceedings12/363-2012.pdf>
- SAS Administrators Blog, located at <http://blogs.sas.com/content/sgf/tag/sas-administrators/>

If you want to monitor your hardware to ensure that you have ample compute resources for SAS, papers that will help you understand what and how to monitor are listed in SAS Usage Note 53877, located at <http://support.sas.com/kb/53/877.html>

5 Anti-Virus and/or Firewall Software

Before installing your SAS software, it is recommended that you close your anti-virus and firewall software. Some anti-virus and/or firewall configurations can prevent an application from installing successfully.

If you are unable to close the anti-virus or firewall software, make sure that your configuration allows you to install software and to update the registry. If your SAS installation fails and you have mandatory anti-virus or firewall software running, check with your system administrator.

Following the deployment on the servers, the antivirus configuration should be modified to exclude the SAS WORK location, as well as all files with the following extensions:

- .lck
- .sd2
- .sc2
- .SPDS
- .sas*
- .utl

This would be performed by an administrator and can prevent performance issues and file locking

errors.

Server, Middle Tier, and Clients: Pre-Installation Checklist

Server, Middle Tier, and Clients, Part 1: Architecture Details

X	Metadata Server
	SAS Application Server
	Middle Tier
X	Clients-Administration
	Clients-End User
	Clients-Analytics

SAS Metadata Server

The SAS Metadata Server is one of the key technology applications delivered with the SAS9 platform. Its ability to surface metadata from one or more repositories and serve it to applications via the SAS Open Metadata Architecture provides the ability to gather and store data in multiple formats and locations without losing the ability to derive consistent business intelligence. The metadata server provides a centralized and easily managed system for consistent enterprise data repositories so you will always know where your data is located, what it consists of, and how it has been modified. This provides an auditable, repeatable, and secure environment from which to derive business intelligence. The metadata server provides a foundation for greater metadata sharing to support a more advanced and collaborative environment. Metadata usage is consistent and accurate for analysis, resulting in reduced errors in decision making for your report consumers.

It should be noted that the metadata server is an "in-memory" process. That is, all queried and updated metadata will be held in memory by the server. Many factors determine the volume of resources that the metadata server will require to operate efficiently and effectively. Although the metadata server can reside on a separate machine or it may operate on a machine with other servers, determining optimal configuration requires careful planning and is typically done during the architecture phase of a project. There is no additional SAS software licensing for the placement of the metadata server on a separate machine of equal or smaller size than the SAS Server, as your existing license includes this, however platform specific software may need to be shipped. To put the metadata server on a separate machine, it needs to be specified as a separate machine in the order.

Clients-Administration

Clients-Administration machines host SAS Management Console and its various plug-ins.

Server, Middle Tier, and Clients, Part 2: Machine Specifications and Details

System Infrastructure Specification		
1	Fully Qualified Domain Name (DNS):	
2	IP Address:	
3	DNS Alias Name:	
4	Physical Location:	
5	Access Method (Console or Remote):	
6	Server Specifications	
6.1	Vendor:	
6.2	Type:	
6.3	Model:	
6.4	Operating System:	
6.5	OS Version:	
6.6	Disk:	
6.7	CPUs (Number, Type and Speed):	
6.8	RAM:	
6.9	Network:	
6.10	Other Information (I/O Paths, number of network cards, other deployed software):	
6.11	Authentication:	<input type="checkbox"/> Host <input type="checkbox"/> LDAP <input type="checkbox"/> Integrated Windows Authentication <input type="checkbox"/> SAS Internal Authentication
7	Existing applications and concurrent processes running:	
8	E-mail (SMTP) Server Host Name:	
9	Server Administrator Contact	
9.1	Name:	
9.2	Phone:	
9.3	E-mail:	

File System Specification		
1	Path to SAS Software Depot or media drive:	
2	SAS Installation Directory:	
3	SAS Configuration Directory: You must also install the SAS 9.4 SVC routine as described in the "Install the SAS 9.4 SVC Routine" topic in the "Additional z/OS Pre-Installation Tasks" section of the "Setting Up Users, Groups, and Ports" chapter of the SAS 9.4 Intelligence Platform: Installation and Configuration Guide, located at http://support.sas.com/94administration	
4	SAS Data Directory:	
5	SAS Work Directory or Unit:	
6	Other:	
7	Other:	

Server, Middle Tier, and Clients, Part 3: Pre-Installation Accounts and Groups

Internal User Accounts

Certain user accounts (internal to the SAS platform) will be created during the deployment process. Please note any password requirements or policies that you may have. The default accounts are sasadm@saspw, sastrust@saspw, and webanon@saspw.

External User Accounts on Windows

The external user account/user ID must be unique for each purpose listed in the table below. However, the SAS Installer account should be the same user account on each machine in your deployment. For more information, see the "Uniqueness Requirements" section of the SAS 9.4 Intelligence Platform: Security Administration Guide, located at <http://support.sas.com/94administration>

Purpose	Required Rights	Recommended User ID	Actual User ID	Administrator/group Responsible	Will password expire?	Expiration policy
SAS Installer	Administrator rights (user must be a local administrator on the machine and/or a member of the administrators group)	my-domain\installer-ID*				

* The user ID should be available in the long term for future SAS maintenance.

SAS Metadata Server Service Login Account	Required for metadata server clustering. Must have Read and Write access to the metadata backup location that is accessible to all the metadata server machines. Must be a Windows domain rather than a local account accessible to all the metadata server machines. **	my-domain\sassvlg				
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** If you are using IWA for this user ID, refer to the "IWA to a Clustered Metadata Server" section of the SAS 9.4 Intelligence Platform: Security Administration Guide, located at <http://support.sas.com/94administration> for additional requirements.

Groups on Windows

To deploy SAS on Windows, the user must have certain local user rights on the machine hosting the server. These rights are required before the user can start a process for a stored process server, a

pooled workspace server, or a standard workspace server. One suggestion for giving a user these rights is to create a group, add users to the group, and then assign the rights to the group.

To set up a group, complete these steps:

1. Create a SAS server users group. This can be a local group or a group with domain scope.
2. Add the following users to the group:
 - any external users that need to access a standard workspace server
3. Finally, grant the user right 'Log on as a batch job' to the group. Unless Integrated Windows Authentication (IWA) is implemented, this user right is required for any other external user who wants to access to a standard workspace server). For information about setting local user rights, see your Microsoft Windows documentation. If the users in the group need that right on more than one Windows machine, the right needs to be assigned specifically on each machine.

Purpose	Group Members	Recommended Group Name	Actual Group
Suggested method for assigning the 'Log on as a batch job' user right to any standard workspace server users.	Any standard workspace server users*	SAS Server Users	
* Unless Integrated Windows Authentication (IWA) is implemented, add any other external users accessing standard workspace servers.			

Server, Middle Tier, and Clients, Part 4: Port Availability

The SAS servers and spawners in your system will use certain ports by default. The table below lists the default ports and provides space to record alternate port numbers if necessary. If any of these ports are unavailable, alternate ports should be reserved. A range of port numbers may be displayed if multiple levels are available (for example, a port number ending in "1" represents Lev1 or PROD).

Port Name	Port Description	Default Port Numbers (TCP, unless noted otherwise)	Port Type	Data Direction	Alternate Port Number if Default Port Number is Unavailable
mail	Mail Server	25	TCP	Outbound	
sasdp1yagnt	SAS Deployment Agent	5660-5669	TCP	Both	
sasmeta	SAS Metadata Server	8560 - 8569	TCP	Inbound	

Server, Middle Tier, and Clients, Part 5: Third Party Software

Web Browser	
Platform	Supported Browser
Windows 7 (32-bit or 64-bit) and Windows Server 2008 R2	Firefox 6.0 or higher (32-bit only) Internet Explorer 9 or 10 (32-bit only) Chrome 15 or higher (32-bit only)
Windows 8 (32-bit or 64-bit) and Windows Server 2012	Firefox 6.0 or higher (32-bit only) Internet Explorer 10 (32-bit only) Chrome 15 or higher (32-bit only)
Linux 64-bit	Firefox 6.0 or higher (32-bit only) Chrome 15 or higher (32-bit only)
Note: A web browser is required on each machine that will access SAS web content. Note also that SAS Remote Browser Server does not support the Chrome browser. For more information, see the third party software support page: http://support.sas.com/resources/thirdpartysupport/	

Server, Middle Tier, and Clients, Part 6: Encoding

By default, your SAS software will dynamically use the locale initiated by the language you use with your SAS client application and determine the encoding used for reading and writing SAS data or transcoding during data transfer. In cases where you can't ensure that all SAS users will use their client application in the same language, we recommend setting the appropriate encoding for your site during deployment. For more information about multilingual computing with SAS, see http://support.sas.com/resources/papers/Multilingual_Computing_with_SAS_94.pdf

Server, Middle Tier, and Clients, Part 7: Minimum System Requirements

Server, Middle Tier, and Clients, Part 7.1: Operating System Minimum Requirements

Go to Install Center to find the system requirements documentation for your operating system:
<http://support.sas.com/documentation/installcenter/94/win/index.html>

Metadata Server Node (Optional): Pre-Installation Checklist

This machine has been listed as optional in your plan. Therefore this machine can be deployed with your initial deployment, at some later time, or not at all. The pre-installation information described in this section remains valid no matter when this machine is deployed.

Metadata Server Node (Optional), Part 1: Architecture Details

	Metadata Server
	SAS Application Server
	Middle Tier
	Clients-Administration
	Clients-End User
	Clients-Analytics

Metadata Server Node

The Metadata Server Node adds a cluster node to the metadata server in order to support high availability and load balancing. Each cluster node will maintain a complete, up-to-date copy of the metadata for this deployment. A metadata server cluster requires at least three nodes, including the original metadata server deployment. For more information about metadata server clusters, see the "Using Metadata Server Clustering" section of the Intelligence Platform: System Administrative Guide, located at <http://support.sas.com/94administration>

Metadata Server Node (Optional), Part 2: Machine Specifications and Details

System Infrastructure Specification		
1	Fully Qualified Domain Name (DNS):	
2	IP Address:	
3	DNS Alias Name:	
4	Physical Location:	
5	Access Method (Console or Remote):	
6	Server Specifications	
6.1	Vendor:	
6.2	Type:	
6.3	Model:	
6.4	Operating System:	
6.5	OS Version:	
6.6	Disk:	
6.7	CPUs (Number, Type and Speed):	
6.8	RAM:	
6.9	Network:	

System Infrastructure Specification		
6.10	Other Information (I/O Paths, number of network cards, other deployed software):	
6.11	Authentication:	
7	Existing applications and concurrent processes running:	
8	Server Administrator Contact	
8.1	Name:	
8.2	Phone:	
8.3	E-mail:	

File System Specification		
1	Path to SAS Software Depot or media drive:	
2	SAS Installation Directory:	
3	SAS Configuration Directory:	
4	SAS Data Directory:	
5	SAS Work Directory or Unit:	
6	Other:	
7	Other:	

Metadata Server Node (Optional), Part 3: Pre-Installation Accounts and Groups

Internal User Accounts

Certain user accounts (internal to the SAS platform) will be created during the deployment process. Please note any password requirements or policies that you may have. The default accounts are sasadm@saspw, sastrust@saspw, and webanon@saspw.

External User Accounts on Windows

The external user account/user ID must be unique for each purpose listed in the table below. However, the SAS Installer account should be the same user account on each machine in your deployment. For more information, see the "Uniqueness Requirements" section of the SAS 9.4 Intelligence Platform: Security Administration Guide, located at <http://support.sas.com/94administration>

Purpose	Required Rights	Recommended User ID	Actual User ID	Administrator/group Responsible	Will password expire?	Expiration policy
SAS Installer	Administrator rights (user must be a local administrator on the machine and/or a member of the administrators group)	my-domain\installer-ID*				

* The user ID should be available in the long term for future SAS maintenance.

SAS Metadata Server Login Account	Required for metadata server clustering. Must have Read and Write access to the metadata backup location that is accessible to all the metadata server machines. Must be a Windows domain rather than a local account accessible to all the metadata server machines. **	my-domain\sassvlg				
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** If you are using IWA for this user ID, refer to the "IWA to a Clustered Metadata Server" section of the SAS 9.4 Intelligence Platform: Security Administration Guide, located at <http://support.sas.com/94administration> for additional requirements.

Metadata Server Node (Optional), Part 4: Third Party Software

Web Browser	
Platform	Supported Browser
Windows 7 (32-bit or 64-bit) and Windows Server 2008 R2	Firefox 6.0 or higher (32-bit only) Internet Explorer 9 or 10 (32-bit only) Chrome 15 or higher (32-bit only)
Windows 8 (32-bit or 64-bit) and Windows Server 2012	Firefox 6.0 or higher (32-bit only) Internet Explorer 10 (32-bit only) Chrome 15 or higher (32-bit only)
Linux 64-bit	Firefox 6.0 or higher (32-bit only) Chrome 15 or higher (32-bit only)

Note: A web browser is required on each machine that will access SAS web content. Note also that SAS Remote Browser Server does not support the Chrome browser. For more information, see the third party software support page: <http://support.sas.com/resources/thirdpartysupport/>

Metadata Server Node (Optional), Part 5: Minimum System Requirements

Metadata Server Node (Optional), Part 5.1: Operating System Minimum Requirements

Go to Install Center to find the system requirements documentation for your operating system:

<http://support.sas.com/documentation/installcenter/94/win/index.html>