

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 12:59:32.130
Plan Name	Data Loader with CI QKB, 1 Machine, Unix
Plan Description	Data Loader with CI QKB, one machine, unix
SAS Version	9.4_M8
Machine Names	Server, Middle Tier, and Clients Metadata Server Node (Optional) Middle Tier Node (Optional)
Offerings	SAS Data Loader for Hadoop 3.2 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 Solution-Specific System Requirements and Installation Instructions

SAS Data Loader for Hadoop

The documentation for SAS Data Loader for Hadoop, located at <http://support.sas.com/documentation/onlinedoc/dmdd/>, contains required pre-installation tasks. You should use the documentation at the website as your primary reference for completing the SAS Data Loader for Hadoop pre-installation, installation, and post-installation tasks.

3 Data Sources

Provide the information below for each database repository to which your SAS environment will be connecting to using SAS/ACCESS products. Include all source repositories of data that reside on each server separately. If the DBMS is not on a SAS server, then the DBMS client software must be installed on the SAS server.

SAS/ACCESS Interface to Hadoop Repository/Platform		
For information about the database requirements for using the SAS/ACCESS product, go to https://support.sas.com/en/documentation/install-center.html Select the Installation Guide for the operating system you are using, then go to the system requirements for the specific platform.		
1	DBMS vendor	
2	DBMS version	
3	File structure (if not DBMS)	
4	Test ID \ Password	
5	Availability of the tables - can these tables be accessed at any time that we choose?	
6	DBMS Location\Path\Home directory	
7	Who in the organization understands the technical aspects of this data?	

4 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?	

Network Configuration		
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?	

5 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?	
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.	

Logistics and Security

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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.	
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6 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.

6.1 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>

6.2 CPU Guidelines

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

6.3 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.

6.4 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>

6.5 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>

6.6 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>

6.7 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>

6.8 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>

6.9 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>

7 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
X	SAS Application Server
X	Middle Tier
X	Clients-Administration
	Clients-End User
	Clients-Analytics

SAS Application Server

The SAS Application Server is where the bulk of the SAS processing occurs. The SAS workspace, stored process, and OLAP servers typically run on this machine, although the OLAP server can be installed on a separate machine if desired. A SAS license file (SID file) is required for this server.

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.

SAS Middle Tier

The middle tier handles all the web traffic from browser-based applications such as SAS Web Report Studio and the SAS Information Delivery Portal. In addition to these SAS products, third-party software is installed on this machine to serve as the web application server for the Java-based applications. No separate license file (SID file) is required for this server. SAS recommends this machine to be separated from the metadata server and SAS application server machines for security purposes, typically so that a firewall can be placed between users accessing the web server and sensitive data and metadata residing on the other servers.

You cannot use the "_" character in the host name or DNS alias of the middle tier machine. Other unreserved characters (including !~'()*) in the host name can also cause problems.

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	# of Network Cards (per server):	
4	DNS Alias Name:	
5	Physical Location:	
6	Access Method (Console or Remote):	
7	Server Specifications	
7.1	Vendor:	
7.2	Type:	
7.3	Model:	
7.4	Operating System:	
7.5	OS Version:	
7.6	Disk:	
7.7	CPUs (Number, Type and Speed):	
7.8	RAM:	
7.9	Network:	
7.10	Other Information (I/O Paths, number of network cards, other deployed software):	

System Infrastructure Specification	
7.11	<p>Authentication: If your system uses an authentication method other than /etc/passwd or /etc/shadow, you must configure authentication before you begin your SAS software deployment. Refer to the "Post-Installation Configuration for User Authentication and Identification" chapter in the Configuration Guide for SAS 9.4 Foundation for UNIX Environments (located at http://support.sas.com/installcenter) for more information. If you do not follow the instructions in that chapter, the software will be unable to authenticate users.</p>
	<p> <input type="checkbox"/> Host <input type="checkbox"/> LDAP <input type="checkbox"/> Integrated Windows Authentication <input type="checkbox"/> Pluggable Authentication Modules (PAM), such as Kerberos and LDAP <input type="checkbox"/> SAS Internal Authentication <input type="checkbox"/> SAS Token Authentication <input type="checkbox"/> Web Authentication - Metadata Server Host <input type="checkbox"/> Web Authentication - IWA <input type="checkbox"/> Web Authentication - LDAP Active Directory <input type="checkbox"/> Web Authentication - Client Certificates <input type="checkbox"/> Web Authentication - SAML <input type="checkbox"/> Web Authentication - CA SiteMinder <input type="checkbox"/> Web Authentication - IBM Tivoli WebSeal </p>
8	Existing applications and concurrent processes running:
9	E-mail (SMTP) Server Host Name:
10	<p>Multicast Address:</p> <p>1. IPv4 - *must* be in the range 224.0.0.0 - 239.255.255.255. In all likelihood *should* be in the range 239.0.0.0- 239.255.255.255. This latter range is the locally administered block scoped by RFC 3171.</p> <p>2. IPv6 - *must* have the prefix ff00::/8. In all likelihood, the prefix *should* be ff14::/16. This latter prefix is the locally administered block scoped by RFC 4291.</p> <p>3. The combination of multicast IP address and multicast UDP port should be different for each SAS deployment and also different from those used by other multicast applications at your site.</p>
11	Configuring SAS Web Server for HTTPS protocol requires a valid X509 certificate and an RSA private key. SAS strongly recommends that the certificate be signed by a Root Certificate Authority, that the RSA key not be secured by a passphrase, and that both be available prior to configuration.
11.1	Path to valid X509 certificate:
11.2	Path to RSA private key:
12	<p>SAS Shared Services database:</p> <p>Choose one:</p> <p> <input type="checkbox"/> SAS Web Infrastructure Platform Data Server (default) <input type="checkbox"/> DB2 v8 or higher <input type="checkbox"/> MS SQL 2008 or higher <input type="checkbox"/> MySQL 5.1 or higher <input type="checkbox"/> Oracle 10g or higher <input type="checkbox"/> PostgreSQL 9.1.9 or higher </p> <p>Note that the database used by SAS Environment Manager will always be PostgreSQL regardless of the database you choose for SAS Shared Services.</p>
12.1	Database name:
12.2	Database user ID:
12.3	Database password:

System Infrastructure Specification	
12.4	If the SAS Shared Services database you chose above is not SAS Web Infrastructure Platform Data Server, then provide the following information. Refer to the "Configuring an Alternate Database for SAS Web Infrastructure Platform Services" appendix of the SAS 9.4 Intelligence Platform: Installation and Configuration Guide, located at http://support.sas.com/94administration for specifications for third-party Shared Services databases.
12.5	Database host:
12.6	Database port:
12.7	Directory containing JDBC .jar files (directory should preferably contain all required .jar files for the JDBC driver and no additional .jar files):
13	SAS Web Infrastructure Platform Data Server Database information:
13.1	SAS Web Infrastructure Platform Data Server Database name:
13.2	SAS Web Infrastructure Platform Data Server Database host:
13.3	SAS Web Infrastructure Platform Data Server Database port:
13.4	SAS Web Infrastructure Platform Data Server Database user ID:
13.5	SAS Web Infrastructure Platform Data Server Database password:
14	SAS Environment Manager Database information:
14.1	SAS Environment Manager Database host:
14.2	SAS Environment Manager Database port:
14.3	SAS Environment Manager Database user ID:
14.4	SAS Environment Manager Database password:
15	SAS Environment Manager Administration Database information:
15.1	SAS Environment Manager Administration Database host:
15.2	SAS Environment Manager Administration Database port:
15.3	SAS Environment Manager Administration Database user ID:
15.4	SAS Environment Manager Administration Database password:
16	Starting with the third maintenance release of SAS 9.4, websites that link directly to your SAS web applications must be added to a whitelist of allowed sites. For detailed information about this list and the what it does, see the "Whitelist of Websites and Methods Allowed to Link to SAS Web Applications" section of the Intelligence Platform: Middle-Tier Administration Guide, located at http://support.sas.com/94administration
16.1	URLs to be included in the whitelist:
17	Hadoop Deployment Information
17.1	Hadoop Distribution:
17.2	Cluster Manager:
17.3	Cluster Manager host:
17.4	Cluster Manager port:
17.5	Cluster Manager user ID:

System Infrastructure Specification		
17.6	Cluster Manager password:	
17.7	Hive2 service host:	
17.8	Oozie service host:	
17.9	SSH account that can be used to access both Hive and Oozie node:	
17.10	Hive schema name:	
17.11	Is Kerberos enabled?	
18	Server Administrator Contact	
18.1	Name:	
18.2	Phone:	
18.3	E-mail:	

File System Specification		
1	Path to SAS Software Depot or media drive:	
2	SAS Installation Directory:	
3	<p>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 Permissions within the configuration directory are set correctly for most common use cases. These permissions take into account the need to provide security to sensitive data, and security credentials stored within the configuration directory. However, the directories that are parent directories of the configuration directory should not block read or search access to the configuration directory. Everyone should be able to read and search the contents of the top level configuration directory as the individual files and directories located therein are protected at lower directory and individual file levels.</p>	
4	SAS Data Directory:	
5	SAS Work Directory or Unit:	
6	Other:	
7	Other:	

Increase per process limit on open file descriptors

It is recommended that you increase the per process limit on the number of open file descriptors on UNIX platforms to at least 65536. For more information on the reasons for this recommendation, refer to the "SAS Metadata Server Recommendations" topic in the SAS 9.4 Intelligence Platform:

Installation and Configuration Guide, located at

<http://documentation.sas.com/?docsetId=biig&docsetTarget=titlepage.htm&docsetVersion=9.4>

Set limit on processes (UNIX only)

If you are using a Linux system running on kernel version 4.3 or greater, you may have to change the system limit for thread processes. For more information, refer to the "Pre-Installation Steps for SAS 9.4 Middle Tier" section of the Pre-Installation Steps for SAS 9.4 Support for Web Application Servers and HTTP Servers web page at

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

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 UNIX

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	You must have a password for this account. Sudo access is not sufficient.	sas *				
* Do not use root.						

Purpose	Required Rights	Recommended User ID	Actual User ID	Administrator/group Responsible	Will password expire?	Expiration policy
SAS Spawne d Servers Account	Must be a member of the group that is the primary group for the SAS Installer. On AIX, make sure that the "User can LOGIN?" setting is set to true for the user.	sassrv				
SAS First User (optional)	Must be a member of the group that is the primary group for the SAS Installer.	sasdemo				

Groups on UNIX

To deploy SAS on UNIX, you should create an operating system group and make this the primary group for the UNIX SAS Installer user. Members of this group will be given access to certain directories and files created by the SAS Deployment Wizard. The SAS Spawne Servers account should also be made a member of the sas group.

Purpose	Group Members	Recommended Group Name	Actual Group
Primary group for the SAS Installer user. Enables the SAS Deployment Wizard to create the necessary log and configuration directories required by SAS.	SAS Installer	sas	
Through group membership, grants Write permissions to the SAS Spawne Servers account for modifying SAS log and configuration directories.	SAS Spawne Servers Account	sas *	

* Limit membership because this privileged group has operating system access to certain configuration files.

Do not use root for the SAS Installer account. The SAS Deployment Wizard requires that you supply the root password during configuration. Certain SAS products and features employ functionality that requires SAS to check user ID authentication and file access authorizations. This in turn necessitates that certain files within your SAS installation have setuid permissions and be owned by root.

Server, Middle Tier, and Clients, Part 4: UNIX Permissions

Using the root Password

The SAS Deployment Wizard requires that you supply the root password during configuration. Some SAS products and features employ functionality that requires SAS to check user ID authentication

and file access authorizations. This in turn necessitates that certain files within your SAS installation have setuid permissions and be owned by root.

SAS Web Application Directory Permissions

The SAS Web Application Server stores its license files in the `/etc/opt/vmware/vfabric/` folder. This change is required regardless of whether or not you are running vmware. Therefore, this folder must be created with write access before beginning your deployment. In order to create the folder with the appropriate permissions, use the following procedure:

1. Log on as the root user.
2. Create the directory `/etc/opt/vmware/vfabric/`.
3. Issue the following command:
`chown -R <SAS install user name> /etc/opt/vmware/vfabric/`
4. Issue the following command:
`chgrp -R <Group name of SAS install user> /etc/opt/vmware/vfabric/`

Some sites have security settings that require these changes to be made instead at the `/etc/opt` level rather than the `/etc/opt/vmware` level. Therefore, access to root user may be required at installation time to make these changes.

JAVA_HOME Environment Variable

If the `JAVA_HOME` variable is used to define shell environment variables in `.kshrc` or `.bashrc` files, that variable should be removed for the installation and configuration of your SAS software. After your deployment is complete, the original `JAVA_HOME` variable can be replaced.

Server, Middle Tier, and Clients, Part 5: 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).

On UNIX, we recommend that you document each third-party port that you reserve in the following standard locations on each machine: `/etc/services`. This practice will help to avoid port conflicts on the affected machines.

Port Name	Port Description	Default Port Numbers (TCP, unless noted otherwise)	Port Type	Data Direction	Alternate Port Number if Default Port Number is Unavailable
tcp	TCP port for middle-tier cache communications	0 – 65535 If set to zero, the operating system selects an available port. Each process on a machine must have its own TCP port. Note that some operating systems restrict the range of ports usable by non-privileged users, and using restricted port numbers can cause runtime errors in GemFire start-up.	TCP	Both	
mail	Mail Server	25	TCP	Outbound	
saswebhttp	SAS Web Server HTTP Port	7980	TCP	Both	
saswebhttps	SAS Web Server HTTPS Port	8343	TCP	Both	
sasenvmngag	SAS Environment Manager Agent	2143-2152	TCP	Inbound	
sasdpolyagnt	SAS Deployment Agent	5660-5669	TCP	Both	
saseventadm	Event Broker Admin Port	6050 - 6059	TCP	Inbound	
sasenvmgrhttp	SAS Environment Manager Dashboard Port (HTTP)	7079-7088	TCP	Both	
sasenvmgrhttps	SAS Environment Manager Dashboard Secure Port (HTTPS)	7442-7450	TCP	Both	
sasschedmain	IP Multicast UDP Scheduler Main Channel Port	7450 - 7459	UDP	Both	
sasschedhash	IP Multicast UDP Scheduler Main Channel Port	7460 - 7469	UDP	Both	
saseventhttp	Event Broker HTTP Port	8110 - 8119	TCP	Inbound	
sasmeta	SAS Metadata Server	8560 - 8569	TCP	Inbound	
sasobjspawno	SAS Object Spawner - Operator Port	8580 - 8589	TCP	Inbound	
saspool1	SAS Object Spawner: pooled workspace server port bank 1	8800 - 8809	TCP	Inbound	
saspool2	SAS Object Spawner: pooled workspace server port bank 2	8810 - 8819	TCP	Inbound	

Port Name	Port Description	Default Port Numbers (TCP, unless noted otherwise)	Port Type	Data Direction	Alternate Port Number if Default Port Number is Unavailable
saspool3	SAS Object Spawner: pooled workspace server port bank 3	8820 - 8829	TCP	Inbound	
saswork	SAS Workspace Server	8590 - 8599	TCP	Inbound	
sassp	SAS Stored Process Server: Bridge connection	8600 - 8609	TCP	Inbound	
sasspmb1	SAS Stored Process Server: load balancing connection 1 (MultiBridge)	8610 - 8619	TCP	Inbound	
sasspmb2	SAS Stored Process Server: load balancing connection 2 (MultiBridge)	8620 - 8629	TCP	Inbound	
sasspmb3	SAS Stored Process Server: load balancing connection 3 (MultiBridge)	8630 - 8639	TCP	Inbound	
sasevmjmx	SAS Environment Manager Embedded tcServer JMX Port	9360-9369	TCP	Inbound	
sasevmbasejmx	SAS Environment Manager Embedded tcServer Base JMX Port	9360-9369	TCP	Inbound	
sasdmgsrv	SAS Data Management Data Server	10441-10450	TCP	Both	

Port Name	Port Description	Default Port Numbers (TCP, unless noted otherwise)	Port Type	Data Direction	Alternate Port Number if Default Port Number is Unavailable
sasmulticast	<p>Multicast Port A multicast group communications protocol is used to communicate configuration among middle tier SAS applications in a single SAS deployment (the set of applications connected to the same SAS Metadata Server). Therefore, the combination of multicast IP address and multicast UDP port should be different for each SAS deployment and also different from those used by other multicast applications at your site.</p> <p>The multicast port defaults to the same value as the metadata server port, but there is no conflict since it is a UDP port vs. a TCP port. Extra care should be taken in the assignment of this port, due to the SAS Deployment Wizard's inability to detect usage conflicts with the entered value.</p>	8560 - 8569	UDP	Both	
saswebapphttp1	SAS Web Application Server HTTP Server 1 Port	8080 (or 8080-8084 for vertical clustering)	TCP	Both	
saswebapphttps1	SAS Web Application Server HTTPS Server 1 Port	8443 (or 8443-8448 for vertical clustering)	TCP	Both	
saswebappjmx1	SAS Web Application Server JMX 1 Port	6969 (or 6969-6973 for vertical clustering)	TCP	Inbound	
saswebapphttp2	SAS Web Application Server HTTP Server 2 Port	8180 (or 8180-8184 for vertical clustering)	TCP	Both	
saswebapphttps2	SAS Web Application Server HTTPS Server 2 Port	8543 (or 8543-8548 for vertical clustering)	TCP	Both	
saswebappjmx2	SAS Web Application Server JMX 2 Port	7069 (or 7069-7073 for vertical clustering)	TCP	Inbound	
saswebapphttp15	SAS Web Application Server HTTP Server 15 Port	9480 (or 9480-9484 for vertical clustering)	TCP	Both	

Port Name	Port Description	Default Port Numbers (TCP, unless noted otherwise)	Port Type	Data Direction	Alternate Port Number if Default Port Number is Unavailable
saswebapphttps15	SAS Web Application Server HTTPS Server 15 Port	9843 (or 9843-9848 for vertical clustering)	TCP	Both	
saswebappjmx15	SAS Web Application Server JMX 15 Port	8369 (or 8369-8373 for vertical clustering)	TCP	Inbound	
saswipdb	Web Infrastructure Platform Database Server	9431-9440	TCP	Both	
sasjmsjmx	JMS JMX Port	11098-11107	TCP	Inbound	
sascachelocsvr	Cache Locator Port (server tier)	41414-41423	TCP	Both	
	Cache Locator membership port range	1024-65535 The range of ephemeral ports available for unicast UDP messaging and for TCP failure detection in the peer-to-peer distributed system. These ephemeral ports are created from available ports in a system.*	TCP/UDP	Both	
<p>* For more information about the ephemeral ports see the “Modifying the Configuration to Accommodate a Firewall” section in the “Administering Cache Locator” chapter of the SAS 9.4 Intelligence Platform: Middle-Tier Administration Guide, located at http://support.sas.com/94administration</p>					
sascachelocmid	Cache Locator Port (middle tier)	41414-41423	TCP	Both	
	Cache Locator membership port range	1024-65535 The range of ephemeral ports available for unicast UDP messaging and for TCP failure detection in the peer-to-peer distributed system. These ephemeral ports are created from available ports in a system.*	TCP/UDP	Both	
<p>* For more information about the ephemeral ports, see the “Modifying the Configuration to Accommodate a Firewall” section in the “Administering Cache Locator” chapter of the SAS 9.4 Intelligence Platform: Middle-Tier Administration Guide, located at http://support.sas.com/94administration</p>					
sasjmssvr	JMS Server Port	61615-61624	TCP	Both	

Server, Middle Tier, and Clients, Part 6: Third Party Software

RDBMS client for SAS/ACCESS

Ensure that the required DBMS client software is installed on the SAS application server if SAS/ACCESS features are to be used.

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 7: UNIX Windowing Environments

If you are installing your software on a UNIX system, make sure that a windowing environment -- such as X11 -- is installed. You can also use the SAS Deployment Wizard with a text-based interface referred to as console mode, which does not require a windowing environment.

Any PCs accessing UNIX via X-Windows with a terminal emulator require X-Windows server emulator software to be installed on the PC.

For more information about console mode, see the "Using a Text-Based Interface" section of the SAS Deployment Wizard and SAS Deployment Manager User's Guide, available from Install Center at <http://support.sas.com/installcenter/>

Server, Middle Tier, and Clients, Part 8: 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 9: Minimum System Requirements

Server, Middle Tier, and Clients, Part 9.1: 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/unx/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
X	Clients-Administration
	Clients-End User
	Clients-Analytics

Clients-Administration

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

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:	
6.10	Other Information (I/O Paths, number of network cards, other deployed software):	
6.11	Authentication:	
7	Existing applications and concurrent processes running:	

System Infrastructure Specification		
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	Other:	
6	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.

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>

Middle Tier 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.

Middle Tier Node (Optional), Part 1: Architecture Details

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

Middle Tier Node (Optional), Part 2: Machine Specifications and Details

System Infrastructure Specification		
1	Fully Qualified Domain Name (DNS):	
2	IP Address:	
3	# of Network Cards (per server):	
4	DNS Alias Name:	
5	Physical Location:	
6	Access Method (Console or Remote):	
7	Server Specifications	
7.1	Vendor:	
7.2	Type:	
7.3	Model:	
7.4	Operating System:	
7.5	OS Version:	
7.6	Disk:	
7.7	CPUs (Number, Type and Speed):	
7.8	RAM:	
7.9	Network:	
7.10	Other Information (I/O Paths, number of network cards, other deployed software):	
7.11	Authentication:	
8	Existing applications and concurrent processes running:	
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:	
4	SAS Data Directory:	
5	Other:	
6	Other:	

Middle Tier 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.

Middle Tier Node (Optional), 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
sasenvmngag	SAS Environment Manager Agent	2143-2152	TCP	Inbound	
sasdp1yagnt	SAS Deployment Agent	5660-5669	TCP	Both	

For Middle Tier Node machines, refer to the SAS Web Application Server ports on the Middle Tier machine with which this middle tier node will be clustered.

Middle Tier Node (Optional), 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/>

Middle Tier Node (Optional), Part 6: Minimum System Requirements

Middle Tier Node (Optional), Part 6.1: 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>