

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 12:59:01.954
Plan Name	Data Quality Standard, two machines, windows
Plan Description	Data Quality Standard, two machines, windows
SAS Version	9.4_M8
Machine Names	Server and Middle Tier Clients Metadata Server Node (Optional) Middle Tier Node (Optional)
Offerings	SAS Data Quality Standard 2.9 Select Individual Products

Pre-Installation Checklist

Copyright	Copyright © 2023, SAS Institute Inc., Cary, NC, USA. All rights reserved. Produced in the United States of America.
Disclaimer	No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, or otherwise, without the prior written permission of the publisher, SAS Institute Inc.
U.S. Government Restricted Rights Notice	Use, duplication, or disclosure of this software and related documentation by the U.S. government is subject to the Agreement with SAS Institute and the restrictions set forth in FAR 52.227-19, Commercial Computer Software-Restricted Rights (June 1987).
Trademarks and Patents	<p>SAS Institute Inc., SAS Campus Drive, Cary, North Carolina 27513.</p> <p>SAS® and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries.</p> <p>® indicates USA registration. Other brand and product names are registered trademarks or trademarks of their respective companies.</p>
Confidentiality	This document is provided for informational purposes. SAS' contractual commitments are contained solely in the agreement for professional services executed between SAS and the Client. This document is the confidential and proprietary property of SAS Institute Inc. This document may contain approaches, techniques and other information proprietary to SAS. This document shall not be disclosed in whole or in part to third parties without the prior written consent of SAS.

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

DataFlux Software

Review the documentation for your DataFlux software, available under the Documentation tab at the following location:

<http://support.sas.com/software/products/dataflux/index.html>

Some of the documents on this site are password-protected. If they are required, use the following credentials:

Username: sasdfuser (case-sensitive)

Password: DataManagement (case-sensitive)

In addition to the documents available from this web site, DataFlux readme files located in your SAS Software Depot in \install_doc\<order number>\ReadmeFiles contain information required for a successful deployment of your software.

3 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?	

Network Configuration

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?	
---	---------------------------------------------------------------------------------------------------------------------------------------------------------------------	--

4 Logistics and Security

Logistics and Security

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.

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.	
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.	

5 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.

5.1 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>

5.2 CPU Guidelines

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

5.3 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.

5.4 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>

5.5 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>

5.6 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>

5.7 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>

5.8 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>

5.9 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>

6 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 and Middle Tier: Pre-Installation Checklist

Server and Middle Tier, 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 and Middle Tier, 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	Authentication:	<input type="checkbox"/> Host <input type="checkbox"/> LDAP <input type="checkbox"/> Integrated Windows Authentication <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
8	Existing applications and concurrent processes running:	
9	E-mail (SMTP) Server Host Name:	
10	Multicast Address: 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. 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. 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.	
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	SAS Shared Services database:	Choose one: <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 Note that the database used by SAS Environment Manager will always be PostgreSQL regardless of the database you choose for SAS Shared Services.
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	Server Administrator Contact
17.1	Name:
17.2	Phone:
17.3	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 and Middle Tier, 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.

Purpose	Required Rights	Recommended User ID	Actual User ID	Administrator/group Responsible	Will password expire?	Expiration policy
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 account rather than a local account accessible to all the metadata server machines. **	my-domain\sassvlg				
** 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.						
SAS Spawned Servers Account	Log on as a batch job (can be assigned by the SAS Deployment Wizard) SAS recommends SAS Spawned Servers Account be a domain account. For more information about this account, see the "Launch Credentials" section of the "Authentication Model" chapter in SAS 9.4 Intelligence Platform: Security Administration Guide, located at http://support.sas.com/94administration	my-domain\sassrv				

Purpose	Required Rights	Recommended User ID	Actual User ID	Administrator/group Responsible	Will password expire?	Expiration policy
SAS Deployment Backup and Recovery Tool User	For information about this user and its required rights, see the "Specifying a Backup User to Access a Central Vault Location or a Clustered Metadata Server (Windows Only)" section of the of the Intelligence Platform: System Administrative Guide, located at http://support.sas.com/94administration	my-domain\sasbackup				
SAS First User (optional)	Log on as a batch job (can be assigned by the SAS Deployment Wizard)	my-domain\sasdemo				

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:
 - SAS Spawned Servers account (automatically assigned 'Log on as a batch job' by the SAS Deployment Wizard)
 - SAS First User (optional account, automatically assigned 'Log on as a batch job' by the SAS Deployment Wizard)
 - 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 the SAS Spawned Servers account for the stored process server and pooled workspace server.	SAS Spawned Servers Account	SAS Server Users	
Suggested method for assigning the 'Log on as a batch job' user right to the SAS First User and any other standard workspace server users.	SAS First User Any other users*	SAS Server Users	
* Unless Integrated Windows Authentication (IWA) is implemented, add any other external users accessing standard workspace servers.			

Server and Middle Tier, 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
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	80	TCP	Both	
saswebhttps	SAS Web Server HTTPS Port	443	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
sasenvmngag	SAS Environment Manager Agent	2143-2152	TCP	Inbound	
sasdpdyagnt	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	
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	

Port Name	Port Description	Default Port Numbers (TCP, unless noted otherwise)	Port Type	Data Direction	Alternate Port Number if Default Port Number is Unavailable
dmserver	DataFlux Data Management Server	21036	TCP	Both	
dmlisten	DMSERVER/WLP/SVR/LISTEN_PORT - Specifies the port on which the Wire Level Protocol server will listen for connections. This is used when DMSEVER/WLP/SVR/LISTEN is not set.	21037	TCP	Both	
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	

Port Name	Port Description	Default Port Numbers (TCP, unless noted otherwise)	Port Type	Data Direction	Alternate Port Number if Default Port Number is Unavailable
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	
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	

* 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>

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	

* 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>

sasjmssvr	JMS Server Port	61615-61624	TCP	Both	
-----------	-----------------	-------------	-----	------	--

Server and Middle Tier, Part 5: Third Party Software

Microsoft .NET

The SAS Quality Knowledge Base in the software order requires Microsoft .NET Framework 3.5. For systems using Windows 2012 and later, .NET Framework 3.5 is an optional feature that is enabled with the Add Roles and Features wizard. For releases of Windows older than Windows 2012, no extra steps are necessary.

Powershell

SAS Web Server requires Powershell 2.0 (or later). Microsoft installs Powershell 2.0 (and later) in the same Powershell storage location as Powershell Version 1.0, under Powershell 1.0's install subdirectory of %windir%\system32\WindowsPowerShell\v1.0\ . SAS will look for and detect Powershell's location automatically, but it will likely only find Powershell's 1.0 subdirectory.

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

Server and Middle Tier, 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>

Clients: Pre-Installation Checklist

Clients, 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.

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:	
7	Existing applications and concurrent processes running:	
8	Server Administrator Contact	
8.1	Name:	
8.2	Phone:	

System Infrastructure Specification		
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:	

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.

Clients, Part 4: Third Party Software

OpenSSL for Windows

DataFlux Data Management Studio requires version 1.0 or later and 32-bit.

DataFlux Data Management Studio

32-bit; if you install Java 1.7 and later after you deploy your SAS software, you must update the JAVA information in your app.cfg file of DataFlux Data Management Studio.

DataFlux Data Management Server

64-bit; if you install Java 1.7 and later after you deploy your SAS software, you must update the JAVA information in your app.cfg file of DataFlux Data Management Server.

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/>

Clients, Part 5: Minimum System Requirements

Clients, 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>

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

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>

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:	

System Infrastructure Specification		
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:	
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\sassvlgm				
-----------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------	--	--	--	--

** 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>

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>