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Introduction

Because the contents of this guide are subject to continual updates, make sure that you have the latest guide. You can always access the latest release of this guide from the following site:

SAS Viya Deployment Guides

If you accessed this guide directly from the Software Order Email (SOE), you are viewing the latest guide. If you are viewing a saved copy of the PDF version of this guide, the content might be outdated.

To use this guide successfully, you should have a working knowledge of Ansible and the Linux operating system.

SAS Event Stream Manager is a web-based client that enables you to manage SAS Event Stream Processing environments. SAS Event Stream Manager is optimized to support SAS Event Stream Processing on Linux. In all environments, SAS recommends installing SAS Event Stream Manager on a separate machine from the SAS Event Stream Processing server.

Step 1 — Prepare for the Deployment

1. Perform one of the following tasks:
   - To update, upgrade, or add software to an existing deployment, go directly to "Managing Your Software" on page 39.
   - To deploy a new instance of the software, continue with the following steps.

2. Go to "System Requirements" on page 3 to learn about requirements for hardware, software, security, and more.

3. Go to "Pre-installation Tasks" on page 7 to prepare the environment before you deploy the software.
Step 2 — Perform the Deployment

1. Go to “Installing SAS Event Stream Manager” on page 21 to edit the playbook and install the software.
2. Go to “Post-installation Tasks” on page 29 to perform post-installation configuration.

Step 3 — Validate and Complete the Deployment

1. Go to “Validating the Deployment” on page 33 to verify that the servers were deployed correctly and to locate the log files.
2. Go to “Completing the Deployment” on page 37 for best practices after deployment, including where to find additional documentation.

Contact SAS Technical Support

Technical support is available to all customers who license SAS software. However, you are encouraged to engage your designated on-site SAS support personnel as your first support contact. If your on-site SAS support personnel cannot resolve your issue, have them contact SAS Technical Support to report your problem.

Before you contact SAS Technical Support, explore the SAS Support website at support.sas.com/techsup/. This site offers access to the SAS Knowledge Base, as well as SAS communities, Technical Support contact options, and other support materials that might answer your questions.

When you contact SAS Technical Support, you are required to provide information, such as your SAS site number, company name, email address, and phone number, that identifies you as a licensed SAS software customer.
System Requirements

Hardware and Operating System Requirements

Hardware Requirements for SAS Event Stream Manager

SAS recommends that you install SAS Event Stream Manager on a separate machine from SAS Event Stream Processing. The SAS Event Stream Manager Agent component is installed along with SAS Event Stream Processing. This component is recommended to enable all SAS Event Stream Manager functionality.

The following table describes a standard set of specifications for a machine where SAS Event Stream Manager is deployed:

<table>
<thead>
<tr>
<th>Item</th>
<th>Recommended Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>2 cores (x86 architecture)</td>
</tr>
<tr>
<td></td>
<td>Intel Xeon chip set with a minimum speed of 2.6 GHz</td>
</tr>
<tr>
<td>Memory</td>
<td>16 GB of RAM</td>
</tr>
<tr>
<td></td>
<td>Memory clock speed of 1600 MHz</td>
</tr>
<tr>
<td>Disk Space and Speed</td>
<td>10 GB</td>
</tr>
<tr>
<td></td>
<td>10,000 RPM</td>
</tr>
</tbody>
</table>
Each machine that is used to access the user interface must have a minimum screen resolution setting of 1280 x 1024.

**Supported Operating Systems**

SAS Event Stream Manager runs on 64-bit Linux operating systems.

For the full list of supported platforms, see: https://support.sas.com/en/documentation/third-party-software-reference/viya/34/support-for-operating-systems.html.

---

**Server Software Requirements**

**Java**

A Java Runtime Environment (JRE) must be installed on every machine in your deployment. The playbook checks for a pre-installed version of Java that meets or exceeds the requirements. If one is found, it is used. Otherwise, the playbook attempts to install a recent version of OpenJDK and to set the path in a system configuration file. You can also specify the path to an existing JRE in the vars.yml file before you run your playbook.

Java 1.8 is required for both SAS Event Stream Processing and SAS Event Stream Manager.

**Apache httpd**

The deployment process automatically installs Apache httpd on the machines that you designate as targets for the HTTP proxy installation unless it has already been installed. Apache httpd with the mod_ssl module is required in order to create the Apache HTTP Server, which provides security and load balancing for multiple SAS Viya components. This server is also referred to as the reverse proxy server in this guide.

SAS recommends that you install Apache httpd and configure the Apache HTTP Server to use certificates that comply with the security policies at your enterprise before you start the deployment process. The playbook will automatically configure the certificates to secure the server. For more information, see “Specify the Path to Certificates” on page 24.

The Apache HTTP Server must be dedicated to a single SAS Viya deployment.

---

**Security Requirements**

**Security Requirements**

Verify that the following prerequisites have been met before you start the deployment:

- An LDAP server, for user authentication.
  
  The SAS Logon Manager component provides logon services for SAS Event Stream Manager. It requires LDAP.

- Administrator privileges for the Linux machine where you are launching the SAS software deployment.

- Super user (sudo) access for the user account that you are using for the deployment. To verify that the user ID is included in the sudoers file, run the following command:

  ```bash
  sudo –v
  ```
To verify your sudoers privileges, run the following command:
```
sudo -l
```

**Note:** The ability to start a shell (with the `!SHELL` entry in some sudoers files) as root is not required.

After the installation has completed, administrator privileges are not required in order to run SAS Event Stream Manager. User accounts are managed in LDAP.

**LDAP Requirements**

Read access to your LDAP provider is required for SAS Event Stream Stream Manager.

SAS Viya requires a userDN and password in order to bind to the LDAP server. Anonymous binding is supported for clients that are authenticating to the LDAP server.

If the mail attribute is specified for LDAP accounts, it must have a non-null value that is unique for each user.

LDAPS is supported, but the required certificates are not configured automatically by the deployment process.

To configure LDAP to enable access to SAS Event Stream Manager, follow the steps in “Configure LDAP Settings” on page 24 before you run the playbook.

**Transport Layer Security**

Transport Layer Security (TLS) is applied to many of the network connections in your deployment. These connections are secured by SAS Secret Manager, which is provided by HashiCorp Vault. In a full deployment that is also fully compliant with SAS security standards, the certificates are all signed by a Vault-generated root CA and an intermediate certificate.

The deployment process provides a default level of data encryption. However, you should perform several additional actions to increase the level of security on your systems.

**How Default Security Is Applied**

An Apache HTTP server acts as a reverse proxy server to secure your environment. Default security settings use the Apache mod_ssl module to secure the server with self-signed certificates.

The playbook can automatically install Apache httpd with the mod_ssl module. This option uses default Apache security settings and self-signed certificates. These settings are reasonably secure, but they are not compliant with SAS security standards.

The playbook also inspects any existing certificates and the CA chain to determine whether they comply with SAS security requirements. If compliant certificates are found, they are used without changes. If only the default mod_ssl is found, the playbook generates a self-signed certificate and configures mod_ssl to use it.

You can add your own certificates after the completion of the deployment process, which will require a brief outage. If you do not add compliant certificates and instead keep the default security settings and certificates, end users will see a standard web browser warning message. SAS recommends replacing the certificates before giving end users access to the software.

**Enhance Default Security Settings**

SAS recommends that you enhance the default security that is applied by the playbook. As a best practice, follow these steps before you start the deployment process:

1. Install the Apache httpd module and the Apache mod_ssl module on all the web servers in your environment.
2. Add certificates that conform to the policies at your enterprise.
3. Specify the location of the intermediate certificates and the root CA when you edit the playbook. For more information, see “Specify the Path to Certificates” on page 24.
The playbook can then enhance the security of your SAS software deployment automatically. It detects the CA chain that is configured for mod_ssl and incorporates it into the truststores for all other machines in your deployment. On machines that are targets for Consul deployment, the playbook performs additional security configuration.

(Optional) You can also perform these actions after the playbook has been run:

- Block external connections to port 80.
- Use HTTPS for access to SAS user interfaces from a web browser.
- Add custom certificates to the self-signed certificates that a full deployment provides on all machines.
- Upgrade the security protocol and ciphers that are enabled by default using the sas-ssl.conf file.

For more information about setting up the Apache HTTP Server and configuring additional security settings, see Encryption in SAS Viya: Data in Motion.

---

**Client Requirements**

**Web Browsers**

End users can access the product user interfaces for SAS Viya applications from a desktop computer, using a supported web browser. Because SAS software is not installed on this machine, the requirements are minimal. UNIX and 64-bit Windows operating systems are supported.

Some SAS Viya user interfaces include some advanced features that require recent versions of popular web browsers. For information about supported web browsers and the corresponding platforms to access SAS user interfaces, see: https://support.sas.com/en/documentation/third-party-software-reference/viya/34/support-for-web-browsers.html.

**Screen Resolution**

The minimum screen resolution for each client machine that will access the SAS Viya user interfaces is 1280 x 1024.

---

**Deployment Tools**

**Ansible Controller Requirements**

A typical Ansible deployment consists of at least one control machine (the Ansible controller) and multiple Ansible managed nodes (the machines where SAS software is installed). In a single-machine deployment, Ansible and all SAS software are installed on the Ansible controller. For more information, see “Install Ansible” on page 15.

In a distributed deployment, the managed nodes use a secure shell (SSH) framework for connections to the Ansible controller. Verify network connectivity between the controller and the managed nodes. Connectivity is also required among all machines in the deployment and from the controller to the SAS yum repositories.

For information about supported Ansible versions and other requirements, see: https://support.sas.com/en/documentation/third-party-software-reference/viya/34/support-for-operating-systems.html#ansible.
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Prepare for Deployment

Be sure to complete the tasks that are described in this chapter before you run the playbook.
Create a Mirror Repository

Standard Mirror Repository Creation

SAS Mirror Manager is a command-line utility for synchronizing a collection of SAS software repositories. Its primary use is to create and manage mirror repositories for software deployment.

Consider the requirements for your mirror repository:

- SAS Mirror Manager can be used to place the files in several locations, such as on a web server that serves the files up by HTTP or on a shared NFS mount.
- The default location for the download is the `sas_repos` directory of the installation user. Ensure that the default location or the location that you select has adequate space. Also ensure that the machine where the mirror repository will be located has adequate space.

To create a mirror repository with SAS Mirror Manager:

1. The Software Order Email (SOE) indicated that you should save the `SAS_Viya_deployment_data.zip` file attachment. If you have not already done so, save that file now.

2. Download SAS Mirror Manager from the [SAS Mirror Manager download site](#) to the machine where you want to create your mirror repository. If you use Internet Explorer to download the Linux or Macintosh version, save the file as a `.tgz` file instead of a `.gz` file.

3. Uncompress the downloaded file.

4. Run the following command:
   ```bash
   mirrormgr mirror --deployment-data path-to-deployment-zip-file-from-SOE --latest options
   ```
   By default, the repositories are placed in the `sas_repos` directory in the installation user’s home directory. If you want to place them in another location, use the `--path` option followed by the full directory location of the mirror destination. This guide will refer to that location as `sas_repos`. However, if you choose to use a different location, replace instances of `sas_repos` in this guide with the actual location that you select. See the next sections for information about options.

   ```bash
   mirrormgr mirror --deployment-data path-to-deployment-zip-file-from-SOE --path location-of-mirror-repository --latest
   ```

   The `sas_repos` directories are broken down as follows:
   - The `entitlements.json` is a list of the repositories to which you are entitled.
   - The `location_group_declarations.json` file and the `sasmd` directory contain data that is used by the SAS Orchestration CLI to create the order-specific tools for your deployment.
   - Any remaining directories are the software repositories, organized by native deployment tools:
     - `repos` contains yum files for Linux.
     - `win` contains MSI files for Windows.
     - `deb` contains APT files for Debian.
     - `bosh` contains BOSH releases for BOSH.

5. (Optional) After the initial download is complete, move the file structure to a web server or shared NFS mount. The destination machine does not have to be connected to the internet.

   You can use tools like rsync and scp to move the files. Here is a sample command for rsync:
rsync -av --progress sas_repos target_machine:/var/www/html/pulp/

Optionally, if you are using Red Hat Satellite, you can work with your system administrator to move the files to your Red Hat Satellite Server.

**Mirror Manager Options**

**Specify a Distribution-Specific Subset of Files**

To retrieve only the files for the Linux distribution that you are using:

```
mirrormgr mirror --deployment-data path-to-deployment-zip-file-from-SOE
--platform Linux-distribution-value --latest
```

Here are the values that can be used for the `--platform` option for Linux:

- Use **x64-redhat-linux-6** for all supported versions of Red Hat Enterprise Linux and its equivalent such as Oracle Linux.
- Use **x64-suse-linux-12** for all supported versions of SUSE Linux.

**Specify a Log Location**

The default location for the logs for SAS Mirror Manager is `user-home-directory/.local/share/mirrormgr/mirrormgr.log`. To specify an alternative log location:

```
mirrormgr mirror --deployment-data path-to-deployment-zip-file-from-SOE
--log-file location-of-mirror-repository/mirrormgr.log --latest
```

**Create a Playbook**

If you are installing on SUSE Linux, be sure to complete the steps in “Create a Mirror Repository” on page 8 before you create a playbook.

The SAS Orchestration Command Line Interface (CLI) uses the order information that was included in your Software Order Email (SOE) to create a playbook for deploying your SAS Viya software. Before you use the SAS Orchestration CLI, ensure that the SAS_Viya_deployment_data.zip file attachment from your SOE is copied to a directory on a machine that runs the Linux, Macintosh, or Windows operating system.

**Download the SAS Orchestration CLI**

The SAS Orchestration CLI can be run on Linux or Windows and it requires the Java Runtime Environment 1.8.x. It also requires access to the internet.

1. The SOE indicated that you should save the SAS_Viya_deployment_data.zip file attachment. If you have not already done so, save that file now.

2. Go to [SAS Viya Install Center](https://support.sas.com/software/sas-viya/), and download the SAS Orchestration CLI for the operating system where you stored the ZIP file.

   The SOE recommended that you save the ZIP file to a machine that runs Linux, which is where you will install the SAS software that you purchased. However, you can also store it on a machine that runs Macintosh or Windows. If you use Internet Explorer to download the Linux or Macintosh version, save the file as a .tgz file instead of a .gz file.
Note: This step requires internet connectivity.

3 Uncompress the .tgz file (Linux and Macintosh) or .zip file (Windows) in the same location where you downloaded it. The result is a file named sas-orchestration on Linux or Macintosh or a file named sas-orchestration.exe on Windows.

Create a Playbook with the SAS Orchestration CLI

Basic Command
To create a playbook, use the command that is appropriate for the operating system where the SAS Orchestration CLI is located.

Note: The following commands are organized by the operating system where the SAS Orchestration CLI will run, rather than by the operating system where your SAS Viya software will be deployed. After you create the playbook, you can move it to the machine where you will deploy your software.

Linux or Macintosh

```
./sas-orchestration build --input location-of-ZIP-file-including-file-name --platform deployment-platform-tag
```

Windows

```
\sas-orchestration.exe build --input location-of-ZIP-file-including-file-name --platform deployment-platform-tag
```

For `deployment-platform-tag`, if you deploy to Red Hat Enterprise Linux or an equivalent distribution, such as Oracle Linux, specify `redhat`. If you deploy to SUSE Linux, specify `suse`.

Using the SAS Orchestration CLI creates a new file named SAS_Viya_playbook.tgz.

Options

Use a Proxy Server
If you use an unauthenticated proxy to reach the internet, you must add the following option to the run command in order to make an outgoing connection:

```
--java-option "-Dhttps.proxyHost=proxy-server-IP-address-or-host-name"
```

In addition, if the proxy server is not using the default proxy port of 80, you must also add the following option:

```
--java-option "-Dhttps.proxyPort=proxy-server-port-number"
```

If you use both options, they should not be combined into a single option. The following is an example of using both options on a Linux machine:

```
./sas-orchestration --java-option "-Dhttps.proxyHost=my.proxy.com" --java-option "-Dhttps.proxyPort=1111" build --input /tmp/SAS_Viya_deployment_data.zip
```

The `--java-option` tags must come before the `build` command.

Use a Mirror Repository
If you created a mirror repository with SAS Mirror Manager, you must include its location with the `--repository-warehouse` option.

```
./sas-orchestration build --input /sas/install/SAS_Viya_deployment_data.zip --platform redhat --repository-warehouse "URL-to-mirror-repository-content"
```

Note: The repository warehouse URL must be available to all hosts that will participate in the deployment because the hosts are going to use that address to retrieve packages from the repositories. For example, if the
repository warehouse is file-based, that location should be shared across hosts and should be shared at the same path on each of those hosts.

For more information about SAS Mirror Manager, see “Create a Mirror Repository” on page 8.

Help with the Options

The SAS Orchestration CLI includes several options. To learn about all the options for the SAS Orchestration CLI, use the appropriate command:

**Linux or Macintosh**

```
./sas-orchestration build --help
```

**Windows**

```
\sas-orchestration.exe build --help
```

Store the Playbook

1. If necessary, move the SAS_Viya_playbook.tgz file to a directory on your Ansible controller that can be read by other users. The recommended location is `/sas/install`.

2. In the same directory where you have saved the playbook, uncompress it.

   ```
tar xf SAS_Viya_playbook.tgz
   ```

In addition, SAS recommends that you create a directory on each machine in your deployment for storing files that are used to deploy and maintain your software. The best practice is to use the same directory location on each machine. SAS recommends using `/sas/install`. This guide assumes that you will use `/sas/install`. However, if you do not use it, replace those instances in this guide with the actual location that you select.

Enable Required Ports

The following ports should be available before you begin to deploy your software. The same ports should also be available for any firewalls that are configured on the operating system or the network.

<table>
<thead>
<tr>
<th>Process</th>
<th>Required Port</th>
<th>Must Allow Inbound Traffic From</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event Stream Manager service and web interface</td>
<td>80 (external)</td>
<td>anywhere</td>
<td></td>
</tr>
<tr>
<td>HTTPD</td>
<td>80 (internal)</td>
<td>anywhere</td>
<td>See note below.</td>
</tr>
<tr>
<td></td>
<td>443 (external)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAS Infrastructure Data Server</td>
<td>5430–5439</td>
<td>SAS Viya servers only</td>
<td>For a single server deployment with no failover, ports 5430-5432 must be opened. Additional standby nodes each get the next available port number sequentially up to 5439.</td>
</tr>
<tr>
<td>default SAS Messaging Broker AMQP client access port</td>
<td>5672</td>
<td>SAS Viya servers only</td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>Required Port</td>
<td>Must Allow Inbound Traffic From</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------------</td>
<td>---------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>SAS Configuration Server</td>
<td>8300–8309, 8500</td>
<td>SAS Viya servers only</td>
<td>SAS uses HashiCorp Consul as its configuration server. Ports should be open to both UDP and TCP traffic.</td>
</tr>
<tr>
<td>default SAS Messaging Broker management</td>
<td>15672</td>
<td>SAS Viya servers only</td>
<td></td>
</tr>
<tr>
<td>web console port</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>default SAS Messaging Broker clustering port</td>
<td>25672</td>
<td>SAS Viya servers only</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** To enable the machines in your deployment to communicate, port 80 on the machine where HTTPD is installed must be reachable by any machine where SAS software is installed. However, in order to secure web access to your SAS software, only port 443 (HTTPS) should be open externally.

The Linux operating system defines a specific series of network service ports as an ephemeral port range. These ports are designed for use as short-lived IP communications and are allocated automatically from within this range. If a required port is within the range of the ephemeral ports for a host, another application can attempt to claim it and cause services to fail to start. Therefore, you must exclude the required ports from the ports that can be allocated from within the ephemeral port range.

1. To determine the active ephemeral port range, run the following command on your host:
   ```
   sudo sysctl net.ipv4.ip_local_port_range
   ```
   The results contain two numbers:
   ```
   net.ipv4.ip_local_port_range = inclusive-lower-limit inclusive-upper-limit
   ```

2. To list any existing reserved ports, run the following command:
   ```
   sudo sysctl net.ipv4.ip_local_reserved_ports
   ```
   Here is an example of the results:
   ```
   net.ipv4.ip_local_reserved_ports = 23, 25, 53
   ```
   If no ports are reserved, no ports are listed in the results:
   ```
   net.ipv4.ip_local_reserved_ports =
   ```

3. After you determine the limits of the ephemeral port range, you must add any required ports that are included in the ephemeral port range to the Linux system reserved ports list. Add ports to the reserved list as comma-separated values or as a range within quotation marks:
   ```
   sudo sysct1 -w net.ipv4.ip_local_reserved_ports="ports-or-port-range"
   ```
   Here is an example:
   ```
   sudo sysctl -w net.ipv4.ip_local_reserved_ports="5672,15672,25672,4369,16060-16069,9200"
   ```
   **Note:** The sysctl command numerically sorts the port numbers regardless of the order that you specify.

4. Add an entry to the `/etc/sysctl.conf` file to make your changes permanent. Here is an example:
   ```
   net.ipv4.ip_local_reserved_ports = 4369,5672,9200,15672,16060-16069,25672
   ```
Firewall Considerations

The following steps should be performed on each machine in the deployment.

1. If you are deploying on Red Hat or an equivalent distribution, ensure that your firewall is open in order to allow access to the IP address of the content delivery servers that provide updates from Red Hat or Oracle. The IP addresses for content delivery services vary by region. For more information about the list of IP addresses, see one of the following websites:
   - Public CIDR Lists for Red Hat
   - https://linux.oracle.com/
     This website provides instructions for registering with the Oracle ULN.

2. Ensure that the firewall allows access to the SAS repositories by running the following command from the playbook subdirectory (/sas/install/sas_viya_playbook if you used the recommended location for uncompressing your playbook).

   ```
   curl -OLv --cert ./entitlement_certificate.pem --cacert ./SAS_CA_Certificate.pem https://ses.sas.download/ses/repos/meta-repo/bigfile.bin
   ```

   If the firewall is set up correctly, the command successfully transfers the bigfile.bin file. If a connection fails, add any failing server to your firewall proxy whitelist and try the command again. Repeat this step until you successfully transfer the bigfile.bin file.

3. The firewall service should not be running while you deploy your software.
   a. Create a list of the services that are running by performing the appropriate command from the list below.
      - For Red Hat Enterprise Linux 6.x:
        ```
        sudo service --status-all
        ```
      - For Red Hat Enterprise Linux 7.x and SUSE Linux:
        ```
        sudo systemctl list-unit-files
        ```
   b. Use the following table to identify the name of the service that you should look for in the output from the command.

   Note: To identify the version of Linux that you are using, Red Hat Enterprise Linux and Oracle Linux users should see the /etc/redhat-release file. CentOS Linux users should see the /etc/centos-release file. SUSE Linux users should see the /etc/os-release file.

   Table 3.1  Firewall Services by Linux Distribution and Version

<table>
<thead>
<tr>
<th>Linux Version</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Hat Enterprise Linux earlier than 7.1</td>
<td>iptables</td>
</tr>
<tr>
<td>Red Hat Enterprise Linux 7.1 or later</td>
<td>firewalld</td>
</tr>
<tr>
<td>Oracle Linux earlier than 7.1</td>
<td>iptables</td>
</tr>
<tr>
<td>Oracle Linux 7.1 or later</td>
<td>firewalld</td>
</tr>
<tr>
<td>Linux Version</td>
<td>Service</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>CentOS Linux earlier than 7.1</td>
<td>iptables</td>
</tr>
<tr>
<td>CentOS Linux 7.1 or later</td>
<td>firewalld</td>
</tr>
<tr>
<td>SUSE Linux</td>
<td>SuSEfirewall2.service</td>
</tr>
</tbody>
</table>

If the firewall service from the table is listed in the output of the command, then the firewall is running and you should continue to the next step. Otherwise, you do not need to take any further actions.

To stop iptables, run the following commands:

- `sudo service iptables stop`
- `sudo chkconfig iptables off`
- `sudo service ip6tables stop`
- `sudo chkconfig ip6tables off`

To stop firewalld, run the following commands:

- `sudo systemctl stop firewalld.service`
- `sudo systemctl disable firewalld.service`

To stop SuSEfirewall2.service, run the following commands:

- `sudo systemctl stop SuSEfirewall2.service`
- `sudo systemctl disable SuSEfirewall2.service`
- `sudo systemctl stop SuSEfirewall2_init.service`
- `sudo systemctl disable SuSEfirewall2_init.service`

### Configure SELinux

If you have enabled Security-Enhanced Linux (SELinux) in your environment, you must enable permissive mode on all of the target machines in your deployment. You can run the following command to check whether SELinux is enabled on an individual system:

- `sudo sestatus`

For all Linux distributions, if a mode that is not permissive is returned, run the following commands:

- `sudo setenforce 0`
- `sudo sed -i.bak -e 's/SELINUX=enforcing/SELINUX=permissive/g' /etc/selinux/config`

If you get a message that the command is not enabled, you do not have SELinux, so no action is required.

### Configure a Proxy Server

#### Overview

The SAS Viya deployment process uses both curl and yum to download RPM packages from SAS repositories. If your organization uses a forward HTTP proxy server, both curl and yum on each target deployment machine must be configured for forward proxy servers.
Refer to the Linux man pages for yum.conf and curl for more information about proxy settings.

Using curl
Curl uses the https_proxy and http_proxy environment variables to send requests to proxy servers. You can export these variables in a new shell profile script such as /etc/profile.d/httpproxy.sh. Here is an example of the /etc/profile.d/httpproxy.sh script:

```bash
export https_proxy=http://user-name:password@internet-proxy-server-FQDN:8080/
export http_proxy=http://user-name:password@internet-proxy-server-FQDN:8080/
```

In addition, ensure that HTTP requests between machines in the deployment are not routed through the proxy server during deployment by adding the IP addresses, host names, or domains for the SAS Viya machines to the no_proxy variable in your profile.d script. For example, if the SAS Viya machines are using the IP addresses, 10.255.47.131 and 10.255.47.132, and the host names, machine1.example.com and machine2.example.com, you can configure no_proxy as follows:

```bash
export no_proxy="localhost,127.0.0.1,.example.com,10.255.47.131,10.255.47.132"
```

If the profile script is properly configured, these environment variables are set at login for all users. Curl requests for HTTP or HTTPS resources should use the connection information from these variables.

Using yum
Forward proxy server settings for yum can be configured in /etc/yum.conf. Here is an example of the /etc/yum.conf script:

```bash
proxy=internet-proxy-server-FQDN:8080/
proxy_username=user-name
proxy_password=password
```

Enable the Yum Cache

**Note:** SUSE Linux does not use yum as a deployment tool. If you are using SUSE Linux, you should skip this section.

By default, yum deletes downloaded files after a successful operation when they are no longer needed, minimizing the amount of storage space that yum uses. However, you can enable caching so that the files that yum downloads remain in cache directories. By using cached data, you can perform certain operations without a network connection.

In order to enable caching, add the following text to the [main] section of /etc/yum.conf.

```bash
keepcache = 1
```

This task should be performed on each machine in the deployment.

Install Ansible

Ansible is third-party software that provides automation and flexibility for deploying software to multiple machines. If you decide to use Ansible to deploy your software, you must install a supported version of Ansible.
Standard Ansible Installation
The Ansible installation process is documented at http://docs.ansible.com/ansible/latest/intro_installation.html. You should always follow the Ansible documentation and choose the installation method that works best for your IT environment.

Streamlined Ansible Installation for Red Hat Enterprise Linux and Equivalent Distributions
Note: Even though you are advised to follow the instructions in the Ansible documentation, streamlined installation instructions are provided here as a convenience. Before performing these instructions, ensure that they are appropriate for your site and that they comply with the IT policies in your organization.

These steps assume that you have sudo access to the machine where you are installing Ansible.

1 Run the following commands to attach the EPEL repository to your server. You can copy and paste this entire block of text for convenience.

```bash
## find out which release (6 or 7)
if grep -q -i "release 6" /etc/redhat-release ; then
    majversion=6
elif grep -q -i "release 7" /etc/redhat-release ; then
    majversion=7
else
    echo "Apparently, running neither release 6.x nor 7.x *
fi
## Attach EPEL
# Display the available repositories
sudo yum repolist
```

2 To Install Python PIP and related packages:

```bash
sudo yum install -y python python-setuptools python-devel openssl-devel
sudo yum install -y python-pip gcc wget automake libffi-devel python-six
```

3 Since EPEL will no longer be needed, you can remove it with the following command:

```bash
sudo yum remove -y epel-release
```

4 Upgrade PIP and setuptools with the following command based on the version of Python you are running.

For Python 2.6 (and later within 2.6.x):

```bash
sudo pip install --upgrade pip==9.0.3
sudo pip install pycparser==2.14
```

For Python 2.7 (and later within 2.7.x):

```bash
sudo pip install --upgrade pip setuptools
```

5 To install a specific version of Ansible through PIP:

```bash
sudo pip install ansible==2.4.3
```

Streamlined Ansible Installation for SUSE Linux
Note: Even though you are advised to follow the instructions in the Ansible documentation, streamlined installation instructions are provided here as a convenience. Before performing these instructions, ensure that they are appropriate for your site and that they comply with the IT policies in your organization.
These steps assume that you have sudo access to the machine where you are installing Ansible.

1 To install Python's setup tools:
   ```
   sudo zypper install python-setuptools
   ```

2 To Install Python PIP:
   ```
   sudo easy_install pip
   ```

3 To install a specific version of Ansible through PIP:
   ```
   sudo pip install ansible==2.4.3
   ```

### Test Your Ansible Installation

1 To test the Ansible version:
   ```
   ansible --version
   ```

Here is an example of successful output:

   ```
   ansible 2.4.3.0
   config file =
   configured module search path = Default w/o overrides
   python version = 2.7.5 (default, May 3 2017, 07:55:04) [GCC 4.8.5 20150623 (Red Hat 4.8.5-14)]
   ```

2 To perform a basic ping test:
   ```
   ansible localhost -m ping
   ```

Here is an example of successful output:

   ```
   [WARNING]: Host file not found: /etc/ansible/hosts
   [WARNING]: provided hosts list is empty, only localhost is available
   localhost | SUCCESS => {
    "changed": false,
    "ping": "pong"
   }
   ```

---

### (Optional) Enable Key-Based SSH Authentication

**Note:** Even though key-based SSH authentication is optional, it is recommended.

In order to run Ansible tasks on multiple hosts without being prompted for a password, you can create an SSH key pair and distribute the public key to the machines where SAS software will be installed. Performing this task provides a secure authentication mechanism for SSH logins and avoids the need for SSH password options when running Ansible tasks.

Here is an example of one process of setting up an SSH key pair. However, there are many methods for creating and propagating SSH keys.

**Note:** These steps assume that the PasswordAuthentication keyword has been enabled in the SSH daemon configuration file. It is also assumed that the user has a password that can be used for ssh-copy-id authentication.

1 Create an SSH key pair without a passphrase. The following example specifies the RSA key type. However, you can specify any key type that is supported by your SSH installation. Refer to the ssh-keygen man page for more information.
2 Copy the public key to each target host. Here is an example:

```
ssh-copy-id target0.example.com
ssh-copy-id target1.example.com
```

If the machine where Ansible is installed is also a target host for installing SAS software, run `ssh-copy-id` against the Ansible host as well.

3 Verify that you can authenticate to all target hosts without being prompted for a password.

### Perform Linux Tuning

This section describes tuning that should be performed on your Linux machines before you deploy your software.

### Set the ulimit Values

#### Overview

The Linux operating system provides mechanisms that enable you to set the maximum limit for the amount of resources that a process can consume. Here are some of the resource types:

- open file descriptors
- stack size
- processes available to a user ID

Each resource type with limits is stored in the appropriate file on each machine in your deployment.

Here is the format of the `/etc/security/limits.conf` file for setting the maximum number of open file descriptors:

```
*     -     nofile     value
```

The asterisk (*) indicates all user accounts.

For a single user account, * can be replaced with the user ID for that account. Here is an example:

```
account-name -     nofile     value
```

This line is duplicated in the file for each user ID.

For a group, * can be replaced with the at symbol (@) followed by the group name. Here is an example:

```
@group-name     -     nofile     value
```

#### Set the Maximum Number of Open File Descriptors and Stack Size

For each machine in your deployment:

1. Open the `/etc/security/limits.conf` file.

2. Set the limit for open file descriptors as follows:

   - If PostgreSQL will be deployed on the machine, set the limit (using the nofile item) to 150000 for the sas user account.

```
sas     -     nofile     150000
```
For all other machines in the deployment, set the limit for the sas user to at least 48000.

```bash
*     -     nofile     48000
```

**Note:** If you are performing a single-machine deployment, use the highest limit (described in step 2) for all users.

```bash
*     -     nofile     150000
```

3 For machines on which PostgreSQL will be deployed, set the limit for the stack size (using the stack item) to 10240 for the sas user.

```bash
sas     -     stack     10240
```

For machines that will not have PostgreSQL deployed on them, do not set a limit for the stack size.

4 Save and close the `/etc/security/limits.conf` file.

### Set the Maximum Number of Processes Available

For each machine in your deployment:

1 Open the appropriate file. For Red Hat Enterprise Linux 6.7 or an equivalent distribution, open `/etc/security/limits.d/90-nproc.conf`. For Red Hat Enterprise Linux 7.1 and greater or an equivalent distribution, open `/etc/security/limits.d/20-nproc.conf`. For SUSE Linux, open `/etc/security/limits.conf`.

2 Set the limit for the number of processes as follows:

- If PostgreSQL will be deployed on the machine, set the limit (using the nproc item) to 100000 for the sas user account.

  ```bash
  sas     -     nproc     100000
  ```

- For all other machines in the deployment, set the sas user to at least 65536.

  ```bash
  *     -     nproc     65536
  ```

**Note:** If you are performing a single-machine deployment, use the highest limit (described in step 2) for all users.

```bash
*     -     nproc     100000
```

3 Save and close the `*-nproc.conf` file.

### Set the Semaphore Values

For each machine on which PostgreSQL will be deployed.

1 Open the `/etc/sysctl.conf` file.

2 Add the following lines or modify existing values as follows:

```bash
kernel.sem=512 32000 256 1024
net.core.somaxconn=2048
```

3 Save and close the `/etc/sysctl.conf` file.

4 Refresh the revised settings from the `/etc/sysctl.conf` file:

```bash
sudo sysctl -p
```
Change the Default Time-outs

Note: The information in this section applies only to systems running Red Hat Enterprise Linux 7.1 or later or equivalent distributions. If you are using a Linux distribution earlier than Red Hat Enterprise Linux 7.1, you should skip this section.

To change the default time-out values:

1. Open the `/etc/systemd/system.conf` file.

2. Find the two variables that control time-outs: DefaultTimeoutStartSec and DefaultTimeoutStopSec.

3. If the lines that contain these variables are not already uncommented, uncomment each line by removing the number sign (#).

4. Assign both the DefaultTimeoutStartSec and DefaultTimeoutStopSec variables a value of 1800s.

   ```
   DefaultTimeoutStartSec=1800s
   DefaultTimeoutStopSec=1800s
   ```

5. Save and close the `/etc/systemd/system.conf` file.

(SUSE Linux Only) Change the Maximum Number of Operating System Tasks

If you are deploying on SUSE Linux, run the following commands to change the maximum number of operating system (OS) tasks that each user can run concurrently.

Note: Run these commands as a root or sudoer user.

```bash
sudo sed -i 's#.*UserTasks.*#UserTasksMax=50000#g' /etc/systemd/logind.conf
sudo systemctl restart systemd-logind
```

These commands allow the user to run 50000 tasks concurrently.
Installing SAS Event Stream Manager

Overview

This chapter describes the initial deployment of your SAS Event Stream Manager software. For information about modifying an existing deployment with updated software or adding new software to an existing deployment, see “Managing Your Software” on page 39.

SAS recommends installing SAS Event Stream Manager on a separate machine from SAS Event Stream Processing.

When you order SAS software, SAS sends a Software Order Email (SOE) to your business or organization. Your SOE includes information about the software order, including several file attachments and instructions for generating a deployment playbook using the SAS Orchestration CLI.

If you have not already done so, be sure to uncompress the file that is attached to your SOE, as instructed in the email text.

Edit the Playbook

About the Inventory File

Ansible uses an inventory file to define the machines to be included in a deployment and the software to be installed on them. SAS strongly recommends installing SAS Event Stream Manager on a separate machine from SAS Event Stream Processing. An inventory file lets you define multiple machines for multi-machine deployments. In these situations, the file named hosts in the playbook archive is used as the inventory file. If you used the recommended location for uncompressing your playbook, the file is located at /sas/install/sas_viya_playbook/hosts.
For a single-machine deployment, in which all SAS software is installed on the same machine as Ansible, the `sas_viya_playbook/host_local` file is used. The hosts and host_local files are generated for a specific software order. Do not copy these files from one playbook and attempt to use them in another playbook.

**Edit the host_local File**

The first line of the host_local file is a deployment target reference. It defines the machine on which the SAS Viya software is being deployed. In a typical SAS Event Stream Processing deployment, Ansible is used locally (on the same machine where you are deploying SAS software), and the host_local file should be used without modification.

**Note:** If you are instead using Ansible remotely from a separate machine, modify the first line in the host_local file to include the location of the machine where SAS software is being deployed. Use the following format:

```
deployTarget ansible_ssh_host=host1.example.com
```

**Modify the vars.yml File**

As its name suggests, the vars.yml file contains deployment variables that enable you to customize your deployment to meet your needs. Note that all entries in the vars.yml file are case-sensitive.

**Set the Deployment Label**

The DEPLOYMENT_LABEL is a unique name used to identify the deployment across multiple machines. A default value for DEPLOYMENT_LABEL is set by the playbook.

If you want to use a customized DEPLOYMENT_LABEL, replace the default entry with another name, within double quotation marks, that is appropriate for your deployment. The name can contain only lowercase alphabetic characters, numbers, and hyphens. Nonalphanumeric characters, including a space, are not allowed. Here is an example of a valid name:

```
DEPLOYMENT_LABEL: "va-04april2017"
```

**Set the Pre-deployment Validation Parameters**

The setting of the VERIFY_DEPLOYMENT variable determines the extent of the pre-deployment validation that the playbook performs. If the variable is set to true (the default), all of the following actions take place. If the variable is set to false, only the Ansible version check is performed.

**Check the Ansible Version**

The playbook checks the installed Ansible version to determine whether it is at least the minimum supported version. If not, the playbook stops with a message.

**Note:** For information about supported Ansible versions, see “Ansible Controller Requirements” on page 6.

**Verify Machine Properties**

The playbook checks each computer in the deployment to ensure that the necessary conditions for deployment are met. If any of the following conditions is not met, a warning is given and the playbook stops the deployment.

1. Verify that the DEPLOYMENT_LABEL variable has content and contains only lowercase alphabetic characters, numbers, and hyphens.

2. Verify that each computer’s fully qualified domain name contains fewer than or equal to 64 characters.

3. Verify that each computer in the inventory file can successfully connect to every other machine in the inventory file.
4 Verify that each computer’s fully qualified domain name resolves to the same address for every other computer.

5 If the sas user already exists, verify that it is part of the sas user group.

Create and Verify sas User and sas Group

If the sas user and sas group do not already exist, the playbook creates the sas user and places it in the sas group. If this validation fails, a warning is given and the playbook stops.

Specify Security Settings

The SECURE_CONSUL and DISABLE_CONSUL_HTTP_PORT variables in vars.yml work together to determine the status of the HTTP and HTTPS ports. You can set both variables to true or false with the following results.

- If you set SECURE_CONSUL to false, only the HTTP port (8500) will be available after the software is deployed.
- If you set SECURE_CONSUL to true, the results depend on how DISABLE_CONSUL_HTTP_PORT is set:
  - If you set DISABLE_CONSUL_HTTP_PORT to true, only the HTTPS port (8501) will be available.
  - If you set DISABLE_CONSUL_HTTP_PORT to false, both the HTTP port (8500) and the HTTPS port (8501) will be available.

By default, SECURE_CONSUL is set to true and DISABLE_CONSUL_HTTP_PORT is set to true. Only the HTTPS port will be available after the software is deployed.

Change the Repository Warehouse

When you generate the playbook with the SAS Orchestration CLI, the REPOSITORY_WAREHOUSE variable in the vars.yml file is set to the default repository warehouse or to the repository warehouse that was specified in the command-line option. If you are using a mirror repository, the value for REPOSITORY_WAREHOUSE should be the location of that mirror. If the target deployment systems use a different address to the mirror repository, or if the mirror repository is moved after the initial deployment, you should change the mirror location by revising the REPOSITORY_WAREHOUSE value.

REPOSITORY_WAREHOUSE: "location-of-new-mirror-repository"

(Optional) Specify JRE

The Java Runtime Environment (JRE) must be installed on each target machine to enable SAS Event Stream Processing. By default, the playbook attempts to install a recent version of OpenJDK and to set the path in a system configuration file. You can instead supply the path to an existing JRE before you run the playbook. To use a pre-installed version of the JRE:

1 With a text editor, open the vars.yml file.

2 Set the value of sas_install_java to false. For example:

   sas_install_java: false

3 Add the file path to the JRE as the value of sasenv_java_home. Be sure to include jre in the file path. For example:

   sasenv_java_home: /usr/lib/jvm/java-1.8.0-openjdk-1.8.0.101-3.b13.el6_8.x86_64/jre

4 Save and close the vars.yml file.
Specify the Path to Certificates

By default, when SAS Event Stream Processing is deployed, it will install Apache httpd with a self-signed certificate for use across the deployment. If you want to accept the default, you should skip this section. If, however, you already have httpd set up and configured, you must provide a value for the HTTPD_CERT_PATH variable as described here.

The SSLCertificateChainFile is a variable set in the security configuration file for Apache httpd at /etc/httpd/conf.d/ssl.conf. It is a location on your system containing certificate information. SAS recommends that the file at the location that SSLCertificateChainFile represents contain the root certificate authority (CA) and all intermediate certificates in the chain.

To set HTTPD_CERT_PATH:

1. Open the vars.yml file. If you used the recommended location for uncompressing your playbook, the file is located at /sas/install/sas_viya_playbook/vars.yml. For more information about the options that you can set in this file, see “Modify the vars.yml File” on page 22.

2. Set the value of HTTPD_CERT_PATH based on the following conditions. Ensure that any value you use is enclosed in single quotation marks (').
   - If your SSLCertificateChainFile contains the root certificate authority (CA) and all intermediate certificates, remove the existing value for HTTPD_CERT_PATH. Ensure that all browsers and clients have the root CA in their truststore.
     
     Here is an example of the modified variable:

     ```yaml
     HTTPD_CERT_PATH:
     ```

   - If your SSLCertificateChainFile contains the intermediate links but not the root CA, HTTPD_CERT_PATH should be the path to the file on the machine in the [httpproxy] host group in the inventory file that contains the root CA.

     Here is an example of the HTTPD_CERT_PATH variable with a value:

     ```yaml
     HTTPD_CERT_PATH: '/etc/pki/tls/certs/my-ca-chain.crt'
     ```

     Note: The default value for HTTPD_CERT_PATH in the vars.yml file is the most likely location for the necessary file. If that file is in the default location, no changes are required.

3. Save and close the vars.yml file.

Configure LDAP Settings

The sitedefault.yml file (in the /roles/consul/files directory in the playbook) is used to configure authentication for SAS Event Stream Manager. After you set a value with sitedefault.yml, you cannot re-run sitedefault.yml to change that value. You can re-run sitedefault.yml only to set properties that have not been set.

For more information about using the sitedefault.yml file, see Configuration Properties: Concepts in SAS Viya Administration.

Take these steps to enable the playbook to configure the LDAP server so that SAS Logon Manager can provide access to SAS Event Stream Manager:
1 If you have not already copied and renamed the sitedefault.yml file, locate the sitedefault_sample.yml file on the Ansible controller machine. If you used the recommended location for uncompressing your playbook, the file is located at `/sas/install/sas_viya_playbook/roles/consul/files/sitedefault_sample.yml`. Make a copy of sitedefault_sample.yml in the same folder, and name the copy sitedefault.yml.

2 Use your preferred text editor to open sitedefault.yml.

3 Add values that are valid for your site, and save the file.

When you run your Ansible playbook using the site.yml option, the updated sitedefault.yml file is used automatically.

---

**Install the Software**

### Deploy the Software

#### Assessment Test

Before you deploy the software, SAS recommends that you run the following command to assess the readiness of your system for deployment.

```
ansible-playbook system-assessment.yml
```

If you receive an unexpected error, run the following command to ensure that you are using a supported version of Ansible.

```
ansible-playbook --version
```

**Note:** For information about supported Ansible versions, see “Ansible Controller Requirements” on page 6.

If you are using a supported version of Ansible and still receive errors from the system assessment, fix those errors before you run the deployment command.

#### Command Line

You deploy the software by running the playbook. Here is the basic syntax for the command to run the playbook:

```
command [ option ]
```

The command that you select is determined by your deployment and password requirements. See “Commands” on page 25.

You can select an option to specify the interface to the software to be installed in your environment. You can also specify the level of installation or configuration to perform. See “Options” on page 26.

#### Commands

Ensure that you are at the top level of the playbook in the `sas_viya_playbook` directory.

Use the appropriate command to run the playbook, according to the password requirements for the user ID that performs the deployment:

**Note:** The commands should be run as a root or sudoer user. Do not run these commands as a `sas` user.
## Password Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not require passwords</td>
<td><code>ansible-playbook site.yml</code></td>
</tr>
<tr>
<td>Requires a sudo password only</td>
<td><code>ansible-playbook site.yml --ask-become-pass</code></td>
</tr>
<tr>
<td>Requires an SSH password only</td>
<td><code>ansible-playbook site.yml --ask-pass</code></td>
</tr>
<tr>
<td>Requires both a sudo and an SSH password</td>
<td><code>ansible-playbook site.yml --ask-pass --ask-become-pass</code></td>
</tr>
</tbody>
</table>

In addition, SAS recommends adding a `-vvv` option to enable verbose logging. This option will assist SAS Technical Support in diagnosing any issues you might need to contact them about.

### Options

To install, but not configure the software, use the same command that is described in "Commands" on page 25, but replace `site.yml` with `install-only.yml`. Here is an example:

```
ansible-playbook install-only.yml --ask-pass --ask-become-pass
```

To configure software that has been installed only, use the full command that is described in "Commands" on page 25.

If you wanted to install the software on only a single machine that does not include Ansible but also requires SSH passwords, the entire command would be

```
ansible-playbook install-only.yml --ask-pass -vvv
```

### Run from a Directory Other Than the Default

The playbook runs the commands from the top-level sas_viya_playbook directory, by default. If you want to run the playbook from another directory, modify the ansible.cfg configuration file with the appropriate SAS Viya configuration options. Refer to the Ansible documentation to find the appropriate ansible.cfg file and add those options.

### Successful Playbook Execution

Here is an example of the output from a successful playbook execution:

```
PLAY RECAP ********************************************************************
deployTarget               : ok=81   changed=65   unreachable=0    failed=0
```

The most important indicator of success from this message is `failed=0`. If the deployment is successful, the software is deployed to the `/opt/sas` directory.

### Retry a Failed Deployment

If your deployment fails, and you are able to respond to the error message and can recover from the error, you must restart the deployment using the appropriate deployment commands described in "Commands" on page 25 and any appropriate options.

### Install with SAS 9.4 Software

SAS Viya software can be installed on the same machines as an existing SAS 9.4 deployment. No special steps need to be taken at deployment time.
During the deployment, the playbook might halt with an error indicating the ports that SAS Viya needs are in use by the SAS 9.4 deployment. If you receive that error, you should open the vars.yml file in a text editor and search for the variables for the ports that SAS Viya uses. The ports can be found in the following sections of the vars.yml file:

- For SAS/CONNECT, the `sasenv_connect_port` variable
- For SAS Studio, the `sastudio.appserver.port` in the `STUDIO_CONFIGURATION` block
- For the object spawner, the `sasPort` in the `SPAWNER_CONFIGURATION` block

### Deployment Logs

Logs for Ansible deployments are stored in `sas_viya_playbook/deployment.log`. If you used the recommended location for uncompressing your playbook, the file is located at `/sas/install/sas_viya_playbook/deployment.log`.

To view the logs from the yum installation commands that are used in your deployment, run the following commands:

```bash
sudo yum history
sudo less /var/log/yum.log
```
Post-installation Tasks

**Complete SAS Event Stream Manager Setup**

Take a few steps after the installation has completed to prepare the environment.

**Configure and Restart SAS Event Stream Manager Agent**

SAS Event Stream Manager Agent is a small executable program that is installed along with SAS Event Stream Manager.

Agents relay operational metrics from ESP servers to SAS Event Stream Manager, and they perform actions on the ESP servers in response to commands that they receive from SAS Event Stream Manager.

*Note:* SAS Event Stream Manager Agent does not operate in an environment in which SSL has been enabled for connections to the ESP server. If encryption is being applied to these connections from other SAS Event Stream Processing components, you can add an SSL connection to the ESP server from SAS Event Stream Manager. You can then use SAS Event Stream Manager without the agent. For more information about adding an SSL connection to an ESP server, see "(Optional) Enable Encryption for SAS Event Stream Manager" on page 31.

To modify agent parameters:

1. **Stop the agent.** Run the following command on Red Hat Enterprise Linux 6.x:
   ```
   sudo service sas-viya-esmagent-default stop
   ```
   Run the following command on Red Hat Enterprise Linux 7.x or SUSE Linux:
   ```
   sudo systemctl stop sas-viya-esmagent-default
   ```
   *Note:* If encryption is enabled for connections to the ESP server, do not restart the agent. You can still use SAS Event Stream Manager without the agent. For more information, see SAS Event Stream Manager: Connecting Directly to an ESP Server.

2. **Edit the start-up script to set the correct values for some environment variables.** Use your preferred text editor to open the following file for editing: `/opt/sas/viya/home/bin/sas-esmagent`.

3. **Locate the following environment variables within the start-up script.** Set their values to environment-specific values, as specified in the following table:
Table 5.1 SAS Even Stream Manager Agent Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Environment-Specific Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESM_DISCOVERY_HOST</td>
<td>Host name of the Apache HTTP Server, the machine that you assigned to the [httpproxy] host group in the inventory file.</td>
</tr>
<tr>
<td>ESM_DISCOVERY_PORT</td>
<td>The port where SAS Event Stream Manager is listening for communications from the agent. This should correspond to the port that is open on the Apache HTTP Server. The default is Port 80.</td>
</tr>
<tr>
<td>ESM_AGENT_HOSTNAME</td>
<td>The host name of the machine where you have installed SAS Event Stream Manager Agent and ESP server. (These components must be installed on the same machine.)</td>
</tr>
<tr>
<td>ESM_PORT</td>
<td>The port where the agent listens. The default setting is Port 2552.</td>
</tr>
<tr>
<td>ESM_FRIENDLY_NAME</td>
<td>The name of the agent that appears in the user interface of SAS Event Stream Manager. The default setting is “ESM Agent.”</td>
</tr>
</tbody>
</table>

For more information about ESP server parameters, see SAS Event Stream Processing: Using the ESP Server.

4 Save your changes to the start-up script.

5 Start the agent. Run the following command on Red Hat Enterprise Linux 6.x:
   ```
sudo service sas-viya-esmagent-default start
   ```
   Run the following command on Red Hat Enterprise Linux 7.x or SUSE Linux:
   ```
sudo systemctl start sas-viya-esmagent-default
   ```
   The following message indicates success: `sas-viya-esmagent-default is running`.

Log On to SAS Event Stream Manager

SAS Event Stream Manager uses SAS Logon Manager for logon functionality. SAS Logon Manager uses LDAP for user authentication. A few steps are required to configure an LDAP server during the installation. For more information, see “Configure LDAP Settings” on page 24.

1 Open the following URL:
   ```
   http://host:port/SASEventStreamManager
   ```
   The host is the system on which SAS Event Stream Manager is installed. The port is the port number used by the system that hosts SAS Event Stream Manager. The default port is 80.
   The Sign In to SAS window is displayed.

2 Enter your user ID and password, and click **Sign In**.
   If you are a member of the SASAdministrators group, the Assumable Groups window is displayed. Group membership is not required.
Successful logon to the SAS Event Stream Manager user interface indicates that the software has been installed correctly. To validate that services have been installed and started successfully, see “Verify SAS Event Stream Manager Status” on page 33.

(Optional) Enable Encryption for SAS Event Stream Manager

Enabling the Transport Layer Security (TLS) protocol for connections between SAS Event Stream Manager and the ESP server is optional. The enablement of TLS involves these processes:

- TLS on the ESP server is enabled.
- The certificate authority (CA) file is obtained and imported to the web browser and to the Java keystore.

By default, the CA file is named ca.pem.

For complete details about configuring these security options, see SAS Event Stream Processing: Security.

To enable TLS:

1. Obtain the CA file for the system where SAS Event Stream Manager is installed and for the clients that access the user interface.

2. On the machines where users access SAS Event Stream Manager, import the client certificate to the certificates store of your preferred web browser.

3. On the machine where SAS Event Stream Manager is running, import the client certificate to the Java keystore:

   **Note:** Specify the command on a single line. Multiple lines are used here to improve readability.

   ```bash
   $JAVA_HOME/jre/bin/keytool -importcert -keystore keystore-location -file path-to-file -storepass password -noprompt -alias alias
   ```

   Here is an example that assumes that you use ca.pem as the CA file:

   ```bash
   $JAVA_HOME/jre/bin/keytool -importcert -keystore /opt/sas/viya/config/etc/SASSecurityCertificateFramework/cacerts/trustedcerts.jks -file ca.pem -storepass changeit -noprompt -alias myalias
   ```

4. Restart the SAS Event Stream Manager service. Run the appropriate command:

   For Red Hat Enterprise Linux 6.7:
   ```bash
   sudo service sas-viya-esm-service-default stop
   sudo service sas-viya-esm-service-default start
   ```

   For Red Hat Enterprise Linux 7.x or SUSE Linux:
   ```bash
   sudo systemctl stop sas-viya-esm-service-default
   sudo systemctl start sas-viya-esm-service-default
   ```
Validating the Deployment

Verify SAS Event Stream Manager Status

To verify that a deployment of SAS Event Stream Manager has completed successfully, check that the required SAS services are available. You can check the status of all the SAS Event Stream Manager services by running the following commands on Red Hat Enterprise Linux 6.x:

```
sudo service sas-viya-esm-service-default status
sudo service sas-viya-esm-webui-default status
```

Run the following commands on Red Hat Enterprise Linux 7.x or SUSE Linux:

```
sudo systemctl status sas-viya-esm-service-default
sudo systemctl status sas-viya-esm-webui-default
```

Here is typical command output from Red Hat Enterprise Linux 6.7 to indicate that the software is running normally:

```
sas-viya-esm-service-default is running
sas-viya-esm-webui-default is running
```

The output is different on Linux 7.x or SUSE Linux, but it reports that each service is running.

Troubleshoot Service Status

If the output from the `service sas-viya-all-services status` command indicates that one or more services is not up, you can restart an individual service using its script. All of the SAS Event Stream Manager service scripts are installed in the `/etc/init.d` directory. Service names match the corresponding script names.

Here is an example of the commands to check the status of the web client service and restart it on Red Hat Enterprise Linux 6.x:
### Table 6.1  Check service status on Red Hat Enterprise Linux 6.7 and later

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>sudo service sas-viya-esm-webui-default status</code></td>
<td>Check the service status.</td>
</tr>
<tr>
<td><code>sudo service sas-viya-esm-webui-default start</code></td>
<td>Start the service if it is not running.</td>
</tr>
</tbody>
</table>

The commands are different on Red Hat Enterprise Linux 7.x:

### Table 6.2  Check service status on Red Hat Enterprise Linux 7.1 and later

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>sudo systemctl status sas-viya-esm-webui-default</code></td>
<td>Check the service status.</td>
</tr>
<tr>
<td><code>sudo systemctl start sas-viya-esm-webui-default</code></td>
<td>Start the service if it is not running.</td>
</tr>
</tbody>
</table>

### Access Log Files

If you encounter difficulties during the deployment, log files that include information about installation and service status are written to the following directory:

```
/opt/sas/viya/config/var/log/
```

If the deployment fails, check the logs in this location first.

### Verify SAS Message Broker

1. To verify that SAS Message Broker has been deployed correctly, go to the machine that you assigned to the [rabbitmq] host group.

2. Open a browser and go to the following address:
   - **HTTPS** is enabled:
     ```
     https://RabbitMQ-IP-address:15672/#/
     ```
     Note: If you did not add compliant certificates and instead kept the default security settings and certificates, you will see the message Your connection is not private. SAS recommends that you replace the certificates before you give end users access to SAS Viya. For details, see HTTPS Access to SAS Message Broker.
   - **HTTP** is enabled:
     ```
     http://RabbitMQ-IP-address:15672/#/
     ```

   If the RabbitMQ logon window appears, then SAS Message Broker is functioning as expected.
Verify SAS Infrastructure Data Server

Use these steps to verify that SAS Infrastructure Data Server has been deployed correctly.

1. On the machine that you assigned to the [pgpoolc] host group, to check status:
   - On Red Hat Enterprise Linux 6.x and Linux 7.x:
     `sudo service sas-viya-sasdatasvrc-postgres status`
   - For SUSE Linux:
     `sudo /etc/init.d/sas-viya-sasdatasvrc-postgres status`

2. If SAS Infrastructure Data Server is running appropriately, you should receive a response like this:

   PGPool is running with PID=11445
   Checking Postgresql nodes status...

<table>
<thead>
<tr>
<th>node_id</th>
<th>hostname</th>
<th>port</th>
<th>status</th>
<th>lb_weight</th>
<th>role</th>
<th>select_cnt</th>
<th>load_balance_node</th>
<th>replication_delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>machine1</td>
<td>5452</td>
<td>up</td>
<td>0.250000</td>
<td>primary</td>
<td>1</td>
<td>true</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>machine2</td>
<td>5452</td>
<td>up</td>
<td>0.250000</td>
<td>standby</td>
<td>0</td>
<td>false</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>machine3</td>
<td>5452</td>
<td>up</td>
<td>0.250000</td>
<td>standby</td>
<td>0</td>
<td>false</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>machine4</td>
<td>5452</td>
<td>up</td>
<td>0.250000</td>
<td>standby</td>
<td>0</td>
<td>false</td>
<td>0</td>
</tr>
</tbody>
</table>
   (4 rows)

   A status of up for a node indicates the node is running.
Chapter 6 / Validating the Deployment
Completing the Deployment

Review Example Templates for SAS Event Stream Manager

Example files are provided to help you learn to use SAS Event Stream Manager. You can find the example job templates in the SAS Event Stream Manager examples package, which you can download from the SAS Support Knowledge Base.

The package includes the resources that are required to create a deployment and deploy a job. A full set of instructions for using example job templates is included in the SAS Event Stream Manager: User’s Guide, which is available on the SAS Event Stream Manager product page.

Product Documentation

After you install, configure, and verify the deployment, you are ready to begin using SAS Event Stream Manager to manage SAS Event Stream Processing applications and analyze streaming event data in real time.

The next step is to consult the product documentation. The SAS Event Stream Manager: User’s Guide explains how to work with the projects that you create in SAS Event Stream Processing Studio and how to manage SAS Event Stream Processing deployments. You can find this guide on the SAS Event Stream Manager product page.

The SAS Event Stream Processing documentation is available on the separate SAS Event Stream Processing product page. If you are a new user, SAS recommends starting with SAS Event Stream Processing 5.2: Overview, which provides an introduction to product features and explains how to proceed with creating event stream processing models and incorporating them into applications.
Support for Upgrades

Upgrades of the SAS Event Stream Manager software from version 5.1 to 5.2 are supported.

SAS Event Stream Manager 5.2 has not been tested with back-level versions of SAS Event Stream Processing. SAS recommends that you upgrade both products at the same time.

Overview

What Is an Update?

An update replaces some or all of your deployed software with the latest versions of that software. Updated software is intended to be compatible with existing configuration, content, and data. To perform an update, you will run the same tools that were run during the initial deployment. You do not need a new order to perform an update. You might determine that your software needs updating or you might be notified by SAS that updates are available.

Note: Converting a single-tenant deployment to a multi-tenant deployment, either through an update or an upgrade, is not supported.
What Is an Add-On Product?

An add-on product is new software that you can order and then install with your currently deployed software. You will need a new order for an add-on product. Adding new software to your deployment will also update your currently deployed software.

Because an add-on product is added to the currently deployed software in an environment, you might need to expand your environment’s capacity before installing an add-on product.

What Is an Upgrade?

An upgrade adds significant feature changes or improvements to your deployed software. To perform an upgrade, you will run the same tools that were run during the initial deployment. You will need a new order to upgrade your deployed software. Add-on products present in the order will be installed as part of the upgrade process. An upgrade might require changes to the deployed software’s configuration.

You might determine that your software needs upgrading or you might be notified by SAS that upgrades are available. SAS recommends creating a backup of the deployed software environment before performing an upgrade.

Note: Converting a single-tenant deployment to a multi-tenant deployment, either through an update or an upgrade, is not supported.

Updating Your SAS Event Stream Manager Software

Overview

An update replaces some or all of your deployed software with the latest versions of that software. You perform the update with the same command that was used to install SAS Event Stream Manager, and use the same software order and the same playbook. If you mirrored your software, you must also update the mirror.

Updating your software requires an outage period because some services are stopped and restarted automatically during the update process. The update process is the same regardless of whether the deployment is single-tenant or multi-tenant.

Note: The update process preserves any user-modified configuration values in the vars.yml file, but changes made to other files in the deployment might be lost. Therefore, SAS recommends that you make changes to vars.yml when possible in order to avoid any loss of customizations that you made to other files.

You will need to know the location of the directory on each machine where you stored deployment and maintenance files.

If you are using a PDF version of this guide, go to the Deployment Guides web page at https://support.sas.com/en/documentation/install-center/viya/deployment-guides.html and verify that you have the latest version of the deployment documentation before you start the update process. The release date of each document is located in the bottom right corner of the front page.

User Requirements for Performing the Update

To perform the update process, you must have administrator privileges for the machine. In addition, your account must have superuser (sudo) access. To verify sudo user privileges, run the following command: sudo -v or sudo -l.
List the Packages That Are Available for Update

Deployments without a Mirror Repository

To list the packages that are available for the update process, run the following command:

on Red Hat Enterprise Linux:

```
sudo yum check-update "sas-*"
```

on SUSE Linux:

```
sudo zyppr list-updates | grep "sas-"
```

Deployments with a Mirror Repository

Important: How you list packages for deployments with a mirror repository depends on whether you have internet access.

With Internet Access

To list packages in a mirror repository in a deployment with internet access:

1. List the packages that are available for the update process by running the following command on the machine where the mirror repository is located:

   `mirrormgr mirror diff --deployment-data path-to-deployment-zip-file-from-SOE --path path-to-mirror-destination --latest`

2. Before performing the update, you must synchronize the mirror repository with SAS. To synchronize, run the following command on the machine where the mirror repository is located:

   `mirrormgr mirror --deployment-data path-to-deployment-zip-file-from-SOE --path path-to-mirror-destination --latest`

Without Internet Access

To list packages in a mirror repository in a deployment without internet access:

1. To list the packages that are available for the update process, run the following command on the machine where the connected mirror repository is located:

   `mirrormgr mirror diff --deployment-data path-to-deployment-zip-file-from-SOE --path path-to-mirror-destination --latest`

2. Before performing an update, you must synchronize the mirror repository with SAS. To synchronize, run the following command on the machine where the connected mirror repository is located:

   `mirrormgr mirror --deployment-data path-to-deployment-zip-file-from-SOE --path path-to-mirror-destination --latest`

3. Move the files from the machine where the connected mirror repository is located to the machine where the unconnected mirror repository is located.
Update with Yum

You can only use yum to update your software if your deployment is on Red Hat Enterprise Linux or an equivalent distribution. To update a SAS deployment using yum, repeat these steps for each machine in the deployment:

1. (Optional) Record the existing list of installed software before you begin.
   For example, you can use the following command to create a text file that lists all the SAS RPM packages:

   ```bash
   sudo rpm -qg SAS > /sas/install/sas_rpms.txt
   ```

   Create a file that lists the SAS yum groups that are installed on a machine. For example, you can use the following command to create a text file that lists all the SAS yum groups:

   ```bash
   sudo yum grouplist "SAS*" > /sas/install/sas_yumgroups.txt
   ```

   **Note:** If you receive a message such as the following, it can be ignored.
   Repository repositoryname is listed more than once in the configuration.

2. Stop all the SAS services on the machine:
   ```bash
   sudo service sas-viya-all-services stop
   ```

3. To update all SAS software on the machine:
   ```bash
   sudo yum update $(rpm -qg SAS)
   ```

   You must run this command to update any external software applications on which the SAS yum groups depend.

4. At the prompt Is this ok, review the available updates and then enter y.

5. Restart the services that are installed on the machine.
   To restart all the SAS services on the machine:
   ```bash
   sudo service sas-viya-all-services start
   ```

6. (Optional) After the update process has completed, record the new list of installed software.
   On each machine in your deployment, create a file that lists the names and versions of all the RPM packages that are installed. For example, you can use the following command to create a text file that lists all the SAS RPM packages:

   ```bash
   sudo rpm -qg SAS > /sas/install/new_sas_rpms.txt
   ```

   On each machine in your deployment, create a file that lists the SAS yum groups that are installed on a machine. For example, you can run the following command to create a text file that lists all the SAS yum groups:

   ```bash
   sudo yum grouplist "SAS*" > /sas/install/new_sas_yumgroups.txt
   ```

   You can see the differences between the previous and current deployments by comparing the lists of installed software before the update and after the update.

   **Note:** If you receive a message such as the following, it can be ignored.
   Repository repositoryname is listed more than once in the configuration.

Update with Zypper

You can only use zypper to update your software if your deployment is on SUSE Linux or an equivalent distribution. To update your deployment using zypper, repeat these steps for each machine in the deployment:
1 (Optional) Record the existing list of installed software before you begin.

On each machine in your deployment, create a file that lists the names and versions of all the RPM packages of the SAS software that are installed. For example, you can use the following command to create a text file that lists all the SAS RPM packages:

```bash
sudo rpm -qg SAS > /sas/install/sas_rpms.txt
```

Note: If you receive a message such as the following, it can be ignored.

Repository `repositoryname` is listed more than once in the configuration

2 Stop the SAS Event Stream Processing Studio (espvm) service.

```bash
sudo /etc/init.d/sas-viya-espvm-default stop
```

3 (Optional) If you installed Streamviewer, stop the Streamviewer process:

```bash
$DFESP_HOME/bin/dfesp_xml_client -url "http://host-name:http-port/exit"
```

Replace `host-name` with the host name of the machine where Streamviewer is installed and running.
Replace `http-port` with the port number that you provided when you started Streamviewer with the start-up script.

4 Stop the Metering Server:

```bash
dfesp_xml_client -url "http://host-name:http-port/SASESP/exit"
```

Replace `host-name` with the host name of the machine where the Metering Server is running.
Replace `http-port` with the port number for the Metering Server. By default, it uses port 31001.

5 To update all SAS software on the machine:

```bash
sudo zypper update "sas-*"
```

6 At the prompt `Continue? [y/n]`, review the available updates and then enter `y`.

7 To restart all the SAS services on the machine:

```bash
sudo /etc/init.d/sas-viya-all-services start
```

8 (Optional) After the update process has completed, record the new list of installed software.

On each machine in your deployment, create a file that lists the names and versions of all the RPM packages of the SAS software that are installed. For example, you can use the following command to create a text file that lists all the SAS RPM packages:

```bash
sudo rpm -qg SAS > /sas/install/new_sas_rpms.txt
```

You can see the differences between the previous and current deployments by comparing the lists of installed software before the update and after the update.

If you receive a message such as the following, it can be ignored.

Repository `repositoryname` is listed more than once in the configuration

---

**Update with Ansible**

To update your deployment using Ansible:

1 (Optional) Record the existing list of installed software before you begin.

On each machine in your deployment, create a file that lists the names and versions of all the RPM packages that are installed. Create this file in the directory on each machine where you stored deployment and maintenance files. For example, you can run the following command to create a text file that lists all the SAS RPM packages:
On each machine in your deployment, create a file that lists the SAS host groups that are installed on a machine. Create this file in the directory on each machine where you stored deployment and maintenance files. For example, you can run the following command to create a text file that lists all the SAS host groups:

```
sudo yum grouplist "SAS*" > /sas/install/sas_hostgroups.txt
```

To list the SAS packages on SUSE Linux, run the following command:

```
sudo rpm -qa | grep "sas-"
```

Note: If you receive a message such as the following, it can be ignored.

Repository repositoryname is listed more than once in the configuration

2 Review the *_deployment.* files in the existing deployment for any user-modified changes. If there are any user-modified changes to the *_deployment.* files, back up the file and update the vars.yml file with the changes before you perform the update. If you have questions, contact SAS Technical Support.

Note: SAS recommends that you add your customizations to the vars.yml file rather than to a *_deployment.* file in order to preserve your customizations. Otherwise, your customizations would be lost during the update process.

3 Stop the Metering Server:

```
dfesp_xml_client -url "http://host-name:http-port/SASESP/exit"
```

Replace host-name with the host name of the machine where the Metering Server is running.

Replace http-port with the port number for the Metering Server. By default, it uses port 31001.

4 To initiate the update, run the same command and options that you ran when you performed the initial deployment. For more information, see “Deploy the Software” on page 25.

5 (Optional) After the update process has completed, record the new list of installed software.

Create a file that lists the names and versions of all the RPM packages that are installed. Create this file in the directory on each machine where you stored deployment and maintenance files. For example, you can use the following command to create a text file that lists all the SAS RPM packages:

```
sudo rpm -qg SAS > /sas/install/new_sas_rpms.txt
```

You can see the differences between the previous and current deployments by comparing the lists of installed software before the update and after the update.

---

**Upgrading Your Software**

**Overview**

An upgrade adds significant feature changes or improvements to your deployed software. To perform an upgrade, you will run the same tools that were run during the initial deployment. You will need a new software order to upgrade your deployed software. An upgrade might require changes to the deployed software’s configuration. SAS recommends that you create a backup of the deployed software environment before performing an upgrade.

Upgrading SAS Event Stream Manager requires an outage period because some services are stopped and restarted automatically during the upgrade process.
You will need to know the location of the directory where you stored deployment and maintenance files.

Note: Upgrading a deployment on SUSE Linux is not supported in this release because support for SUSE Linux is new in SAS Event Stream Manager 5.2.

Prepare to Upgrade SAS Event Stream Manager

To prepare to upgrade your deployment:

1. (Optional) Record a list of the existing installed software before you begin.
   
   Create a file that lists the names and versions of all the RPM packages that are installed. Create this file in the directory on each machine where you stored deployment and maintenance files. For example, you can run the following command to create a text file that lists all the SAS RPM packages:
   
   ```
   sudo rpm -qg SAS > /sas/install/sas_rpms.txt
   ```

   Create a file that lists the SAS yum groups that are installed on a machine. Create this file in the directory on each machine where you stored deployment and maintenance files. For example, you can run the following command to create a text file that lists all the SAS yum groups:
   
   ```
   sudo yum grouplist "SAS*" > /sas/install/sas_yumgroups.txt
   ```

   Note: If you receive a message such as the following, it can be ignored.
   
   Repository repositoryname is listed more than once in the configuration

2. When performing an upgrade, you receive a new Software Order Email (SOE) from SAS. Use your SOE to download the SAS Orchestration CLI.

3. Using the SAS Orchestration CLI that you downloaded, create a new playbook using the instructions on the SAS Orchestration Command Line Interface (CLI) download site.

4. You must extract the new playbook to a location that is different from that of your original playbook. For example, if you extracted your original playbook to `/sas/install/`, you might extract the new playbook to `/sas/upgrade/` instead. You must extract the new playbook to a location that is different from the one that you used for your deployment for these reasons:

   - To preserve the original vars.yml file and the inventory file.
   - To ensure that the playbook directory correctly reflects what is delivered. If a new playbook is mistakenly extracted over an existing playbook, files that were removed in the newer playbook would still be available and could negatively affect the process for researching and resolving deployment issues.

   To extract the new playbook, use a command that is similar to the following:
   
   ```
   tar xf SAS_Viya_playbook.tgz -C /sas/upgrade/
   ```

5. Merge the vars.yml file and the inventory file from the previous deployment into the new playbook. If the previous inventory file contains any spaces that are used to indent machine names, do not include the extra spaces.

   a. Compare the two vars.yml files, and compare the two inventory files to check for additions or changes in the newer set of files.

   ```
   diff /sas/install/sas_viya_playbook/vars.yml /sas/upgrade/sas_viya_playbook/vars.yml
   diff /sas/install/sas_viya_playbook/inventory-file /sas/upgrade/sas_viya_playbook/inventory.ini
   ```

   b. If the new files contain new content, merge your customized edits from the two original files into the two new files. If a key/value pair in the original file is not included in the new file, you do not need to add the key/value pair to the new file. If you have any questions, contact SAS Technical Support.
Stop a Clustered RabbitMQ Configuration

If RabbitMQ is deployed in a clustered configuration, additional steps are required in the upgrade process.

1. On your Ansible controller host, locate the [rabbitmq] host group in your playbook inventory file.
2. If only one RabbitMQ target is defined, skip the rest of this section and upgrade your SAS Viya deployment.
3. If more than one RabbitMQ target is defined, log on to the last rabbitMQ target.
4. Stop the RabbitMQ server using the appropriate command:
   - If the RabbitMQ target is a 6.x Linux system, run the following command:
     ```bash
     sudo service sas-viya-rabbitmq-server-default stop
     ```
   - If the RabbitMQ target is a 7.x Linux system, run the following command:
     ```bash
     sudo systemctl stop sas-viya-rabbitmq-server-default
     ```
5. For the other RabbitMQ targets, log on to each RabbitMQ target and run a command to stop RabbitMQ, in the reverse order in which they are listed in the inventory.ini file.
6. Edit the file `/sas/upgrade/sas_viya_playbook/internal/config-start.yml` to set the line `include: rabbitmq.yml` immediately after the line `include: pgpoolc.yml`. Here is an example:
   ```yaml
   include: pgpoolc.yml
   include: rabbitmq.yml
   ```
7. Save your changes to `/sas/upgrade/sas_viya_playbook/internal/config-start.yml` and close the text editor.

Upgrade SAS Event Stream Manager

To upgrade your deployment:

1. Log on to the PostgreSQL machine in your deployment.
2. Run the following command:
   ```bash
   sudo cat -n /opt/sas/viya/config/etc/sasdatasvrc/postgres/pgpool0/pool.cdf
   ```
   All entries in the command’s output should display healthy.
3. Run the following command:
   ```bash
   sudo /etc/init.d/sas-viya-sasdatasvrc-postgres status
   ```
4. Open vars.yml and locate the INVOCATION_VARIABLES section.
5. Compare the NODE_TYPE: of each node in the PostgreSQL cluster to the output of the `sudo /etc/init.d/sas-viya-sasdatasvrc-postgres status` command.
   - P - Primary
   - S - Secondary
   If NODE_TYPE: for each node in vars.yml does not match the output of the `sudo /etc/init.d/sas-viya-sasdatasvrc-postgres status` command, you must edit vars.yml.
Compare the hostnames in the output of the `sudo /etc/init.d/sas-viya-sasdatasvrc-postgres status` command with the hostname assignments in `inventory.ini`. If the hostnames do not match, you must edit `inventory.ini`.

Compare the deploy target assignments for each node in `inventory.ini` to the deploy target assignments for each node in the `INVOCATION VARIABLES` section of `vars.yml`. If the deploy target assignments do not match, edit `vars.yml` to match `inventory.ini`.

Install your software using the steps in the installation chapter.

After the software has been installed, complete the following tasks:


b. Validate the Deployment on page 33.

The script will interactively prompt you to log on. You must log on using a profile that is a member of the SASAdministrators group. After you log on, the script will run against all CAS servers in the environment and set the new ACLs, and then exit.

(Optional) After the upgrade process has completed, record the new list of installed software. For example, you can run the following command to create a text file that lists all the SAS RPM packages:

```
  sudo rpm -qg SAS > /sas/install/new_sas_rpms.txt
```

You can see the differences between the previous and current deployments by comparing the lists of installed software before the upgrade and after the upgrade.

Note: If you receive a message such as the following, it can be ignored.

Repository `repositoryname` is listed more than once in the configuration.
Uninstalling SAS Event Stream Manager

**What deploy-cleanup Does**

When you use the deploy-cleanup command described in the following sections, it performs these actions:

1. Stop all SAS services.
2. Remove all SAS RPMs.
3. Delete any remaining SAS .pid files.
4. Delete the entitlement_certificate.pem and SAS_CA_Certificate.pem files.

The deploy-cleanup command renames the `/opt/sas/viya` directory to `/opt/sas/viya_epoch`. Also, the `/opt/sas/spre` directory is renamed as `/opt/sas/spre_epoch`.

The uninstallation does not remove the customized script that you received with your SOE, and it does not remove any users that have been set up.

**Uninstall from a Single Machine**

To uninstall your software from a single-machine deployment, run the following command:

`ansible-playbook -i host_local deploy-cleanup.yml`

If the environment requires one or more passwords, the command must include additional parameters as specified here:

<table>
<thead>
<tr>
<th>Password Requirements</th>
<th>Additional Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password for sudo only</td>
<td><code>--ask-become-pass</code></td>
</tr>
<tr>
<td>Password for SSH only</td>
<td><code>--ask-pass</code></td>
</tr>
<tr>
<td>Password for both sudo and SSH</td>
<td><code>--ask-become-pass --ask-pass</code></td>
</tr>
</tbody>
</table>
When the appropriate command is executed, Ansible performs a group uninstallation, which removes your SAS software, including both certificates. It also renames the /opt/sas/viya directory to /opt/sas/viya_\(<\text{epoch}\)>, where \(<\text{epoch}\) specifies the UNIX epoch (the number of seconds that have elapsed since 00:00:00 Coordinated Universal Time (UTC), Thursday, 1 January 1970).