SAS® Viya® 3.4 Administration: General Servers and Services

General Servers and Services: Overview . . . 1
- Servers . . . 1
- Services . . . 3
- Usage of Systemd and SysV init Commands . . . 4

General Servers and Services: Operate (Linux) . . . 5
- Read This First: Start and Stop Servers and Services . . . 5
- Start and Stop a Specific Server or Service . . . 8
- Start and Stop All Servers and Services . . . 9

General Servers and Services: Operate (Windows) . . . 9
- Start and Stop All Servers and Services . . . 9
- Start and Stop a Specific Server or Service . . . 10

Remove Erroneous GPU Reservations . . . 11

Fault Tolerance in SAS Viya (Linux) . . . 12
- Recommended Fault-Tolerant Topology for SAS Viya on Linux . . . 12

General Servers and Services: Troubleshooting . . . 13

General Servers and Services: Overview

Servers

List of Servers

SAS Viya contains these servers:

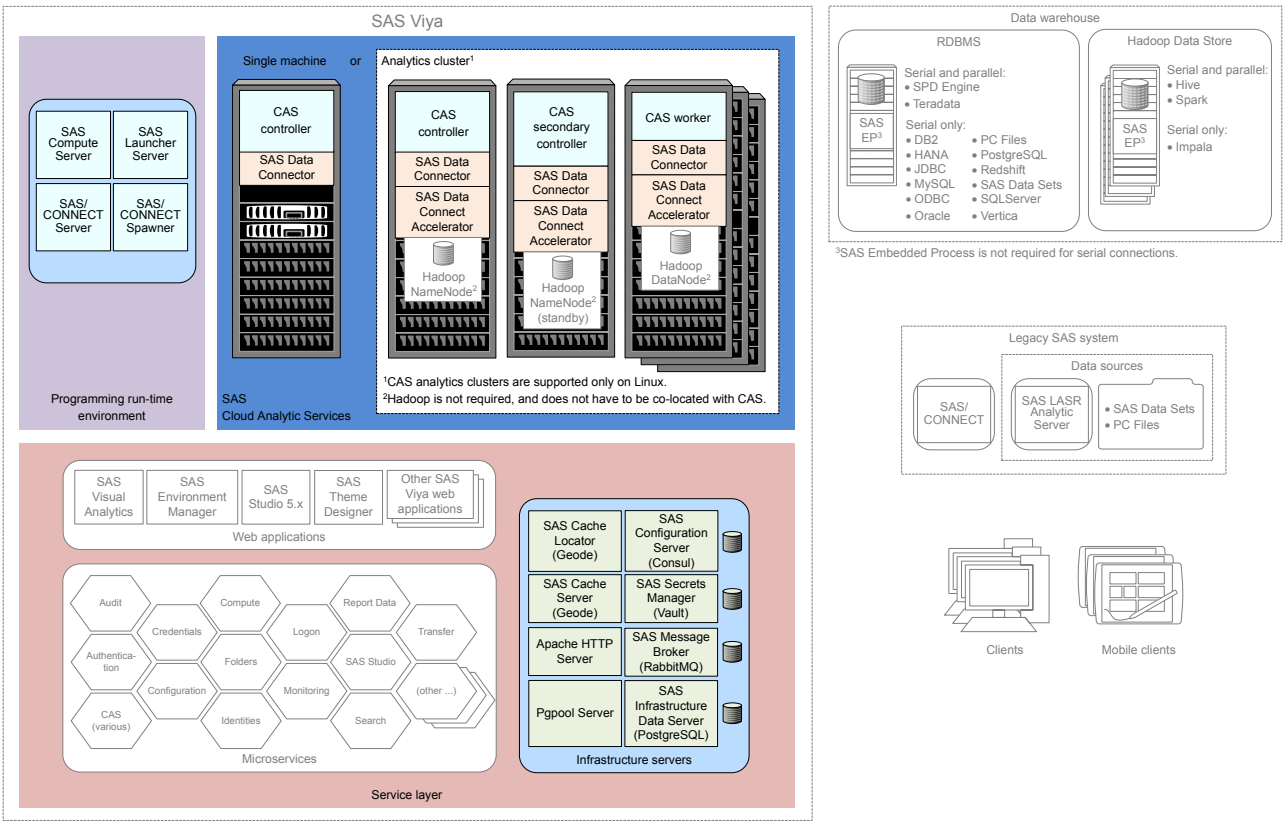
- SAS Cloud Analytic Services
- Programming run-time servers:
  - SAS Compute Server
  - SAS Launcher Server

- SAS Workspace Server and SAS Object Spawner
- SAS/CONNECT Server and SAS/CONNECT Spawner
- embedded SAS Web Application Server

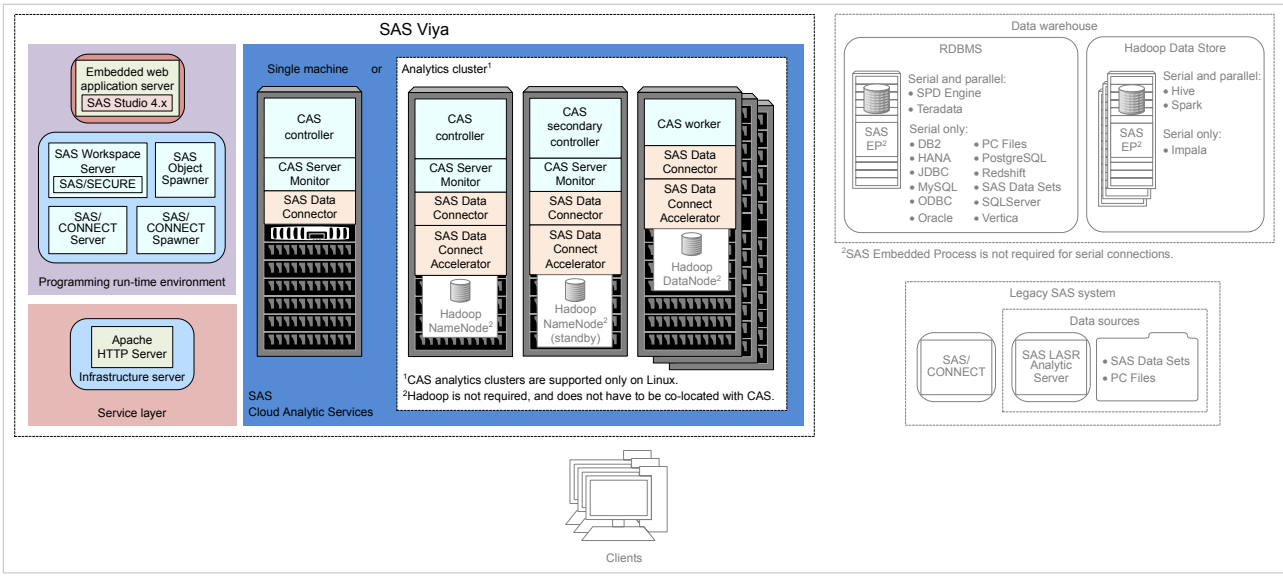
- Infrastructure servers:
  - SAS Cache Locator and SAS Cache Server (Geode)
  - SAS Configuration Server (Consul)
  - SAS Secret Manager (Vault)
  - SAS HTTP Proxy Server (Apache HTTP Server)
  - SAS Message Broker (RabbitMQ)
  - SAS Infrastructure Data Server (PostgreSQL)

The following diagram shows the relationship of the servers to other components in the SAS Viya full deployment:

Figure 1 *SAS Viya Servers (Full Deployment)*



The following diagram shows the relationship of the servers to other components in the SAS Viya programming-only deployment:



Servers Managed with SAS Environment Manager

Using SAS Environment Manager, you can manage CAS servers and Launcher Servers:

- CAS Server Tasks
- Launcher Servers Tasks

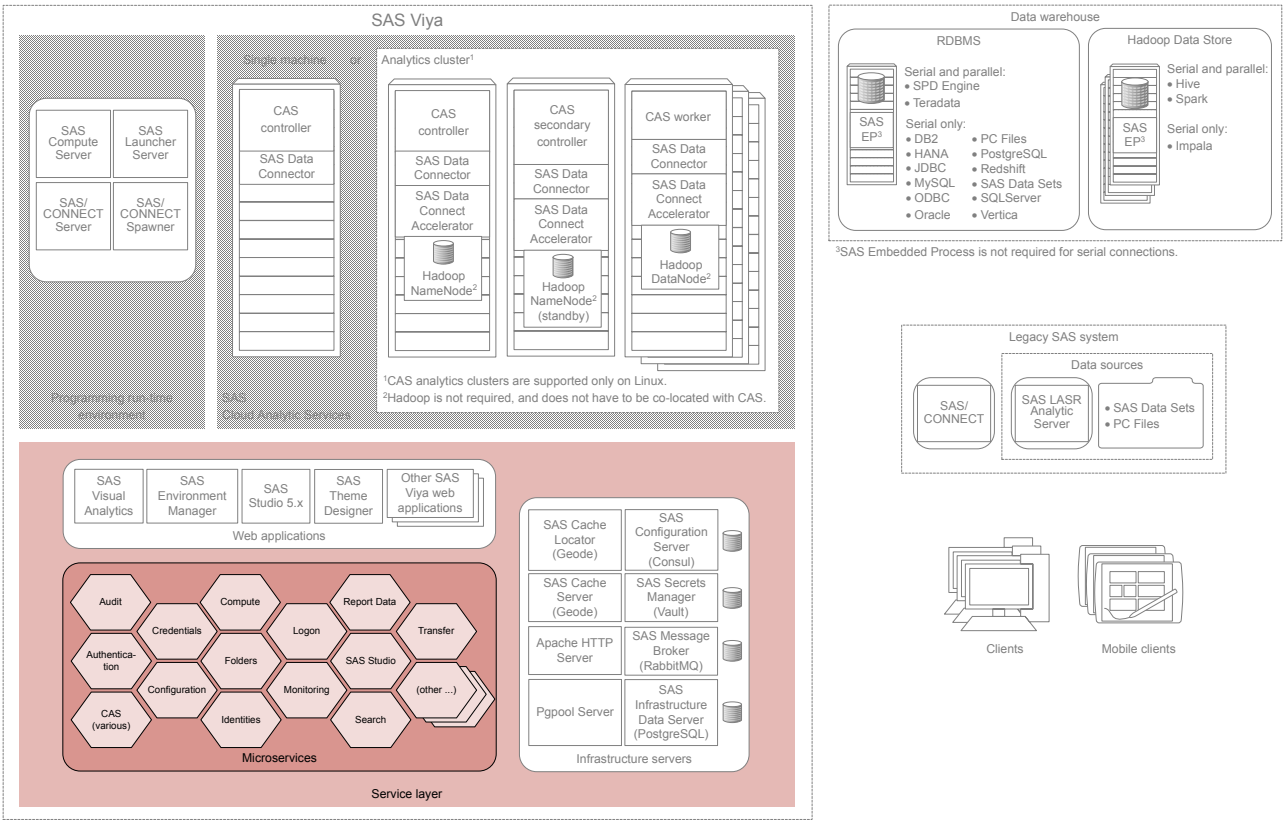
Services

SAS Viya contains several services that are often referred to as *microservices*. A microservice is a discrete service that runs in its own process and that communicates using HTTP.

SAS Viya includes services such as Audit, Identities, and Monitoring. To see the complete list of SAS Viya services follow the initial steps in "Edit Configuration Instances" in *SAS Viya Administration: Configuration Properties*.

Note: A programming-only deployment does not use most SAS Viya services.

Figure 2 *SAS Viya Services*



Usage of Systemd and SysV init Commands

Systemd is a new init system and service manager that was implemented on all the major Linux distributions in lieu of the traditional SysV init system. Systemd is a background process that was designed to start processes in parallel, thus reducing the boot time and computational overhead of the SysV init system. The SysV init process starts serially and often results in a delayed and lengthy boot time.

SysV init commands are still being used on Red Hat Enterprise Linux 6.*x* and earlier versions.

To determine the version of the operating system that you are running, use any of the following commands:

```
cat /etc/os-release

lsb_release -a

hostnamectl
```

If you run both the systemd systemctl command and the SysV init service command on the same Linux system, the services could become confused and might stop responding. The systemctl command has no awareness of services that were started or stopped with the service command. For example, if you start a SAS Viya service on Red Hat Enterprise Linux 7.*x* with the systemctl command, and you later attempt to shut down the service using the service command, the service might stop responding without shutting down the system.

Refer to your Linux documentation for more information about the Systemd and SysV commands.

General Servers and Services: Operate (Linux)

Read This First: Start and Stop Servers and Services

CAUTION! There is a sequence for starting and stopping SAS Viya servers and services. You must follow this sequence to avoid operational issues. The SAS Viya start and stop scripts, including the sas-viya-all-services script, do not span multiple machines. You must run the appropriate script, in the correct sequence, on each machine in your SAS Viya topology.

Note: For more information about how to use the individual start and stop scripts, see "Start and Stop a Specific Server or Service".

For single-machine deployments, you use the sas-viya-all-services script to automatically start the services to ensure that the services are started in the correct order. If you need to manually start the services for troubleshooting purposes, you must also start the services in the correct order. For details about how to start services manually, see Start SAS Viya servers and services in this sequence on page 5, where all the services are deployed on the same machine.

Start SAS Viya servers and services in this sequence:

1. Before you start these servers and services, check the system process list and process table, and stop or remove the process for any orphan or zombie service.

   For more information, see your Linux documentation.

   Note: If this is a multi-tenancy deployment, always start the tenant services last.

2. Start the SAS Configuration Server (Consul) by running the sas-viya-consul-default script.

   For highly available deployments that run SAS Configuration Server on multiple machines, start the configuration server on those machines in any order.

   To identify which machines contain SAS Configuration Servers, review the `[consul]` host group in your Ansible inventory.ini file.

   Refer to information about how to run the sas-viya-consul-default script in *SAS Viya Administration: Infrastructure Servers*.

3. SAS Viya machines that do not host the SAS Configuration Server will host instead the SAS Configuration Server agent. Start the SAS Configuration Server agent on all other machines using the sas-viya-consul-default script.

   Note: Most SAS Viya deployments contain either the SAS Configuration server or its agent. However, there are exceptions. To verify that a machine contains a configuration server agent, look for the sas-viya-consul-default script in **`/etc/init.d`**.

   Important: On a distributed CAS analytics cluster, it is important to start SAS Configuration Server agents on the CAS worker machines before starting CAS on the CAS controller machine.

4. Start all instances of SAS Secret Manager (Vault).

   Note: SAS Secret Manager is deployed wherever the SAS Configuration Server server is deployed. SAS Vault does not reside on machines that host configuration server agents.

   Refer to information about how to run the sas-viya-vault-default script in *SAS Viya Administration: Infrastructure Servers*.

5. Start SAS Message Broker (RabbitMQ).

6

If there are multiple instances of SAS Message Broker, start the last instance that went down first. Then, start the other instances.

> **TIP** If you can start all instances of SAS Message Broker within 30 seconds of each other, the order in which you start each instance is unimportant.

Refer to information about how to run the sas-viya-rabbitmq-server-default script in *SAS Viya Administration: Infrastructure Servers*.

6 On the pgpool server machine, start the SAS Infrastructure Data Server cluster.

Refer to information about how to run the sas-viya-sasdatasvrc-postgres script in *SAS Viya Administration: Infrastructure Servers*.

Note: Check the status of the cluster (sas-viya-sasdatasvrc-postgres status), to make sure that all nodes are running.

7 Start the HTTP proxy server (Apache HTTP Server).

Refer to information about how to run the httpd script in *SAS Viya Administration: Infrastructure Servers*.

8 Start the sas-httpproxy service by running the sas-viya-httpproxy-default script.

Refer to information about how to run the sas-viya-httpproxy-default script in *SAS Viya Administration: Infrastructure Servers*.

9 Then, start all remaining services using sas-viya-all-services.

Note: If you have more than one CAS server instance, always start the additional CAS servers after the original CAS server. The order in which you start the additional servers is unimportant. See Step 11.

After `sas-viya-all-services` has finished, run `sas-viya-all-services status`. If any services are reported as down, start it using its script.

10 If this is a multi-tenancy deployment, start the tenant services using the tenant all-services command. Order does not matter.

11 If you have more than one CAS server instance, always start the additional CAS servers after the original CAS server. The order in which you start the additional servers is unimportant.

On the additional CAS server machines, start the SAS Configuration Server agents first, followed by CAS and other SAS Viya services:

a Run the following command, appropriate for your operating system:

- On Red Hat Enterprise Linux 7.*x* (or an equivalent distribution) and SUSE Linux Enterprise Server 12.*x*:

  ```
  sudo systemctl start sas-viya-consul-default
  ```

- On Red Hat Enterprise Linux 6.*x* (or an equivalent distribution):

  ```
  sudo service sas-viya-consul-default start
  ```

b Start all remaining servers and services:

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

Note: After following these steps, if the service still does not start as expected, check the log for the respective service in **`/opt/sas/viya/config/var/log/`**. For multi-tenant environments, check **`/opt/sas/tenant/config/var/log/`**.

TIP Because the SAS Viya service start and stop sequence is so important, a best practice is to record the start and stop order of services for your site.

Stop SAS Viya servers and services in this sequence:

1 If this is a multi-tenancy deployment, always stop the tenant services first.

2 If you have more than one CAS server instance, always stop the additional CAS servers before the original CAS server.

Note: If you have more than one additional CAS server, the order in which you stop the CAS servers is unimportant.

On the additional CAS server machines, stop CAS and other SAS Viya services first followed by the SAS Configuration Server agents:

a Run the following command, appropriate for your operating system:

- On Red Hat Enterprise Linux 7.*x* (or an equivalent distribution) and SUSE Linux Enterprise Server 12.*x*:

```
sudo systemctl stop sas-viya-cascontroller-default
```

- On Red Hat Enterprise Linux 6.*x* (or an equivalent distribution):

```
sudo service sas-viya-cascontroller-default stop
```

b Stop the other SAS Viya services using their individual service scripts.

3 Stop servers and services on machines that do not contain the following:

- SAS Infrastructure Data Servers and PGPool server
- SAS Configuration Server (Consul)
- SAS Secret Manager (Vault)

Note: If you have machines that contain SAS Configuration Server, SAS Secret Manager, SAS Infrastructure Data Server, and other SAS Viya services, stop the other services first using their individual service scripts. Then, follow the order that is prescribed in Step 4 – Step 6.

4 On the pgpool server machine, stop the SAS Infrastructure Data Server cluster.

Refer to information about how to run the sas-viya-sasdatasvrc-postgres script in *SAS Viya Administration: Infrastructure Servers*.

5 Stop all instances of SAS Message Broker (RabbitMQ).

Refer to information about how to run the sas-viya-rabbitmq-server-default script in *SAS Viya Administration: Infrastructure Servers*.

6 Stop all instances of SAS Secret Manager and SAS Configuration Server.

Refer to information about how to run the sas-viya-vault-default script and the sas-viya-consul-default script in *SAS Viya Administration: Infrastructure Servers*.

Note: After following these steps, if the service still does not stop as expected, check the log for the respective service in `/opt/sas/viya/config/var/log/`. For multi-tenant environments, check `/opt/sas/tenant/config/var/log/`.

Start and Stop a Specific Server or Service

SAS Viya provides scripts in **/etc/init.d** that you use to stop, start, restart, and check the status of an individual SAS Viya server and service.

Syntax

How you run the individual server and service scripts depends on your operating system:

- Red Hat Enterprise Linux 7.*x* (or an equivalent distribution) and SUSE Linux Enterprise Server 12.*x*:

  sudo systemctl status | stop | start | restart sas-viya-*server-or-service*-default

- Red Hat Enterprise Linux 6.*x* (or an equivalent distribution):

  sudo service sas-viya-*server-or-service*-default status | stop | start | restart

Usage Notes and Tips

- You must be logged on to the machine where the particular service resides that you want to start or stop. Also, you must have root-level privileges to run these scripts.

CAUTION! There is a sequence for starting and stopping SAS Viya servers and services. You must follow this sequence to avoid operational issues. The SAS Viya start and stop scripts, including the sas-viya-all-services script, do not span multiple machines. You must run the appropriate script, in the correct sequence, on each machine in your SAS Viya topology. For more information, see "Read This First: Start and Stop Servers and Services".

- On multi-tenant SAS Viya systems, individual server and service scripts are named `sas-tenant-ID-server-or-service-default`.
- To see the complete list of SAS Viya server and service scripts, run the following command: **ls /etc/init.d/sas-viya-***. To operate Apache HTTP Server, see "Operate (Linux)" in *SAS Viya Administration: Infrastructure Servers*.
- On Linux systems that support systemd, use the `systemctl` command when running the individual service and server scripts. The `systemctl` command maintains a record of service status that the `service` command and a direct call does not use.

CAUTION! On Red Hat Enterprise Linux 7.*x* (or an equivalent distribution) and SUSE Linux Enterprise Server 12.*x*, do not mix the System V init and systemd commands. Mixing the System V init (`service` command) with the systemd (`systemctl` command) causes several issues. The `systemctl` command knows nothing about a SAS Viya service started with the `service` command. If you start `sas-viya-all-services` on Red Hat Enterprise Linux 7.*x* with the `service` command, and later attempt to shut down all services using the `systemctl` command, the service stops responding and does not shut down.

Examples

- To check status of SAS Logon Manager on Red Hat Enterprise Linux 7.*x* (or an equivalent distribution) and SUSE Linux Enterprise Server 12.*x*:

```
sudo systemctl status sas-viya-saslogon-default
```

- To stop the Comments service on Red Hat Enterprise Linux 6.*x* (or an equivalent distribution):

```
sudo service sas-viya-comments-default stop
```

- To start SAS Configuration Server on Red Hat Enterprise Linux 7.*x* (or an equivalent distribution) and SUSE Linux Enterprise Server 12.*x*:

```
sudo systemctl start sas-viya-consul-default
```

Start and Stop All Servers and Services

SAS Viya provides a script, `sas-viya-all-services`, in **`/etc/init.d`** that you use to stop, start, and check the status of all SAS Viya servers and services.

Syntax

Unlike the individual server and services start scripts, there is only one method for running `sas-viya-all-services`:

`sas-viya-all-services status | stop | start`

Usage Notes and Tips

- You must be logged on to the machine where the SAS Viya servers and services reside, and you must have root-level privileges to run `sas-viya-all-services`.

CAUTION! There is a sequence for starting and stopping SAS Viya servers and services. You must follow this sequence to avoid operational issues. The SAS Viya start and stop scripts, including the sas-viya-all-services script, do not span multiple machines. You must run the appropriate script, in the correct sequence, on each machine in your SAS Viya topology. For more information, see "Read This First: Start and Stop Servers and Services".

- On multi-tenant SAS Viya systems, `sas-viya-all-services` is named `sas-tenant-ID-all-services`.
- `sas-viya-all-services` does not control Apache HTTP Server.
- When checking status, it is normal for certain servers and services to not display host, port, and PID information. The reason is that these servers and services are not registered with the SAS Configuration Server, including the configuration server itself.

Examples

- To check status of all servers and services:

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

- To stop all servers and services:

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

- To start all servers and services:

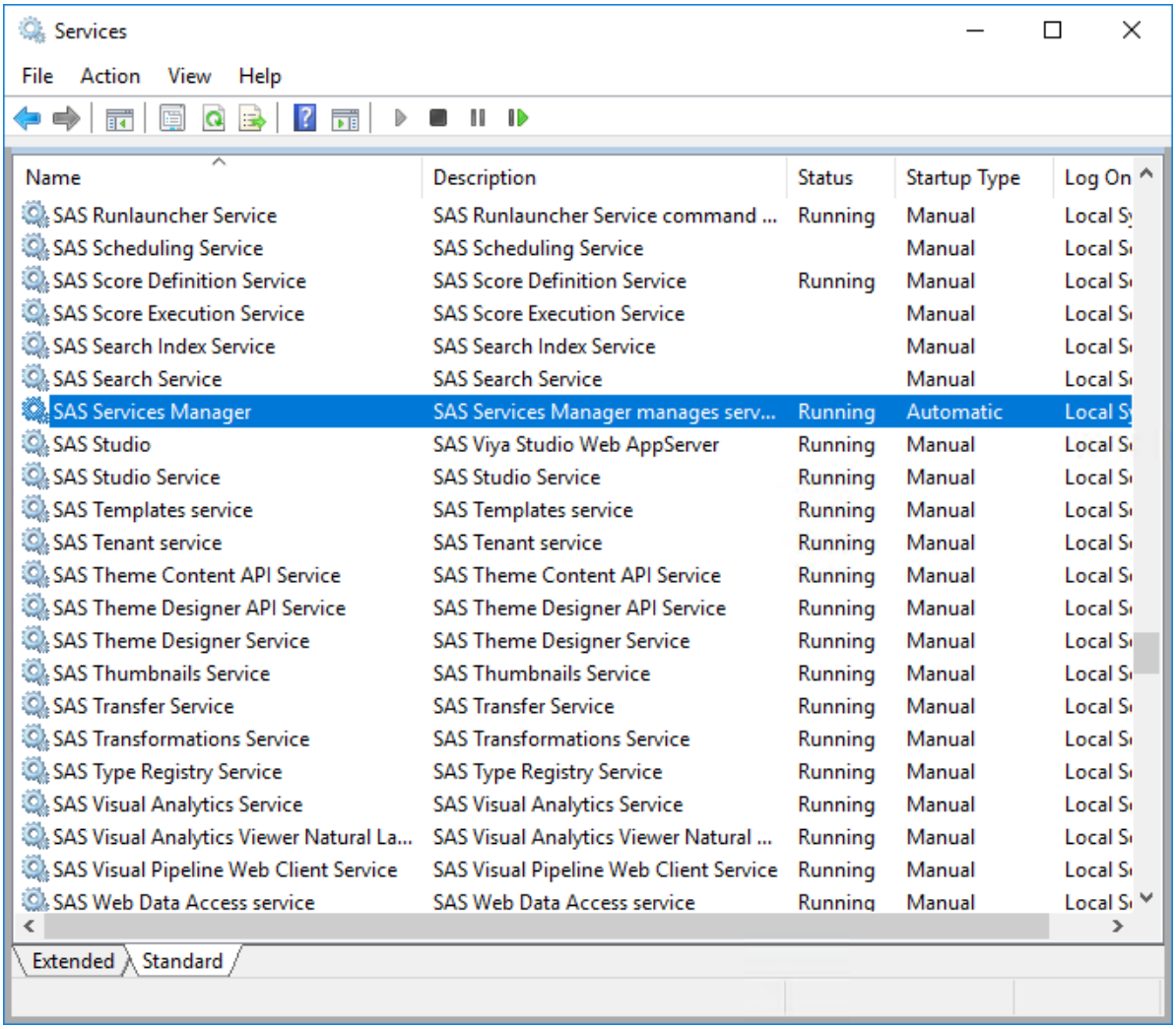
```
sudo /etc/init.d/sas-viya-all-services start
```

General Servers and Services: Operate (Windows)

Start and Stop All Servers and Services

Using the Microsoft Management Console (MMC) Services snap-in, you can use the **SAS Services Manager** service to start and stop all SAS Viya servers and services.

Figure 3 *SAS Viya Servers and Services in the Services Snap-In*



SAS Services Manager is a registered service that is configured to start automatically. **SAS Services Manager** starts and stops SAS Viya servers and services in the proper sequence.

Important:

Do not attempt to restart SAS Services Manager, using the **restart** command in the Services snap-in.

In the Services snap-in, use the **stop** command to stop SAS Services Manager, and wait until all the SAS Viya services have stopped (are down). After all the services have stopped, use the **start** command in the Services snap-in to start SAS Services Manager. Failure to wait until all SAS Viya services have stopped before you start SAS Services Manager causes errors.

Start and Stop a Specific Server or Service

Use the Microsoft Management Console (MMC) Services snap-in to start, stop, and restart individual SAS Viya servers and services.

Because there is a particular sequence in which the servers and services must be started and stopped, the individual services are not configured to run automatically when the SAS Viya machine is booted.

Important: SAS Configuration Service (Consul), SAS Infrastructure Data Server (PostgreSQL), SAS HTTP Proxy Server (Apache HTTP Server), and SAS Message Broker (RabbitMQ) are dependencies for the other

SAS Viya services. If you are operating one or more services individually, always start each of these four services first and stop them last.

Remove Erroneous GPU Reservations

The GPU Reservation service is a SAS Viya service that aids SAS processes in resource sharing and utilization of graphics processing units (GPUs) that are available on a system. A companion tool to the GPU Reservation service is gputool.

Communication with the GPU Reservation service to remove an erroneous reservation is the primary use for gputool. An erroneous reservation can occur when a SAS Viya server that has made the reservation abnormally exits without releasing the reservation.

1 Log on to the machine that hosts the GPUs.

2 Change to the **`/opt/sas/viya/home/SASFoundation/utilities/bin/`** directory.

3 If you know the PCI bus ID for the GPU, skip this step and go to Step 4.

Otherwise, run the following command to obtain the bus ID for the GPU:

```
./gputool -l
```

You receive output similar to the following:

```
----------------------------
PCIBusId 00000000:03:00.0
Device 0 is reserved
----------------------------
PCIBusId 00000000:82:00.0
Device 1 is available
```

4 To remove a GPU reservation, enter the following command:

```
./gputool -release PCI-bus-ID
```

where *PCI-bus-ID* is the bus ID for the GPU (obtained in Step 3).

Here is an example of the command and output:

```
./gputool -release 00000000:03:00.0
```

```
NOTE: GPU released
```

5 Gputool also provides the following command-line options:

- **-d**

  Causes the GPU Reservation service to dump its reservation statistics to **`/var/tmp/sasgpud_resdump`**.

- **-g**

  Prints the utilization for each GPU to the screen.

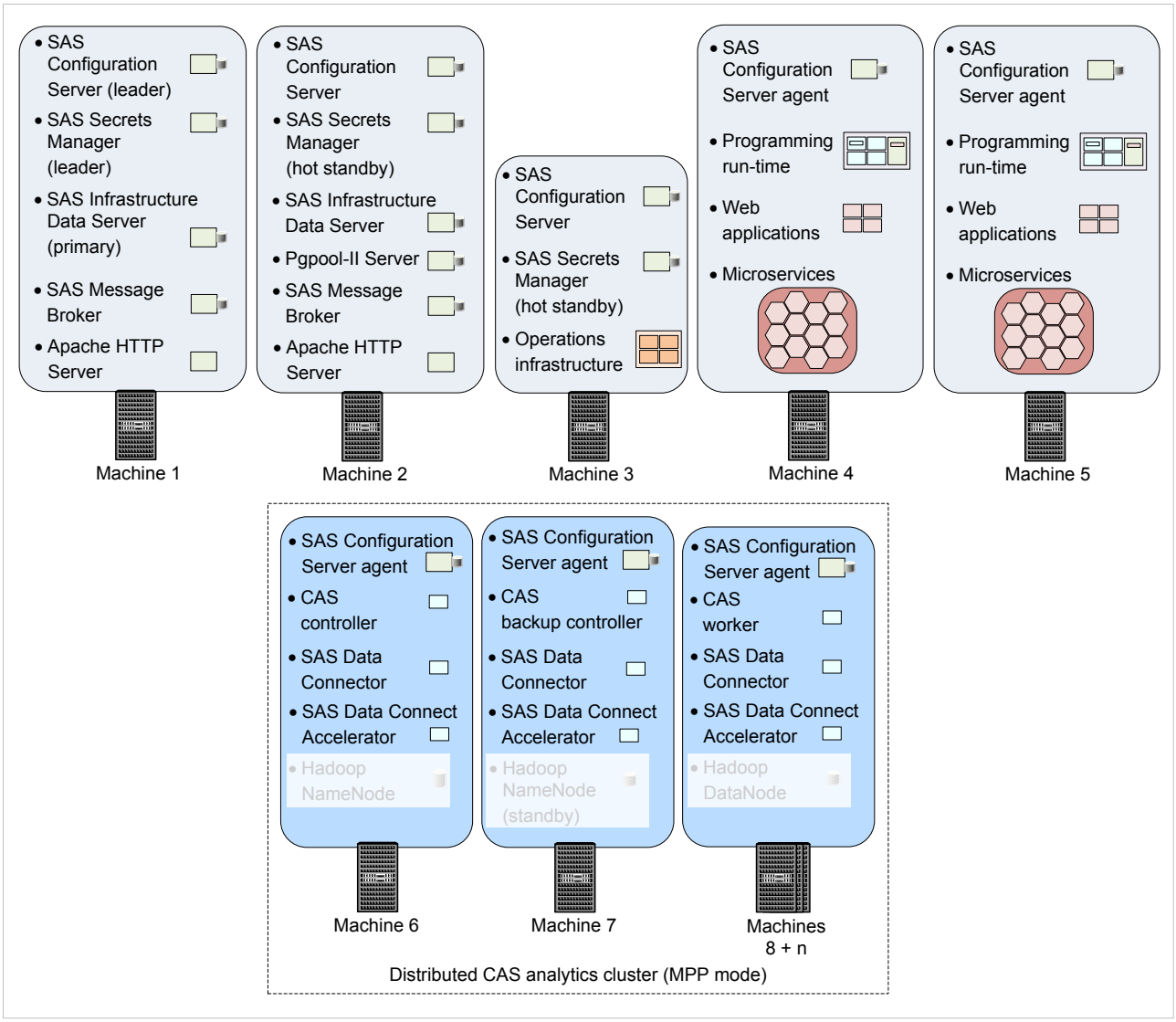
- **-h**

  Prints help (the gputool usage commands) to the screen.

Fault Tolerance in SAS Viya (Linux)

The following figure shows the recommended fault-tolerant topology for SAS Viya on Linux.

Figure 4 *Recommended Fault-Tolerant Topology for SAS Viya on Linux*



Most of the SAS Viya infrastructure servers reside on machines 1 and 2. SAS Configuration Server (Consul) is unique because it uses a consensus algorithm that requires a leader and a quorum to maintain and replicate logs. For more information, see www.consul.io/docs/internals/consensus.html.

Three configuration server instances (machines 1–3) is the minimum number of instances that is required to provide fault tolerance. SAS Secrets Manager (Vault) is always deployed on the same machine as the configuration server. (Machines that contain configuration agents do not also contain SAS Secrets Manager.)

Each machine in a SAS Viya deployment runs a SAS Configuration Server or an agent process that performs health checks on the SAS Viya services that are running and on the machine itself. Each configuration server agent provides health information to one or more configuration servers. The configuration servers store and replicate service information.

SAS Viya services send queries to configuration servers or configuration server agents in order to discover other services.

The SAS Infrastructure Data Server on machine 1 is the primary data server. If machine 1 goes down, the data server should fail over to machine 2. However, the data server is not truly fault tolerant because SAS Viya does not support multiple pgpool servers. For example, if the pgpool server goes down (machine 2), the data server will go offline.

The SAS Viya operations infrastructure gathers metrics and log data from SAS Viya processes and stores the data in CAS tables. In turn, SAS Viya applications use this data to produce reports and views, such as the Logs window in SAS Environment Manager. Because this infrastructure is not fault tolerant, it resides only on one machine (machine 3).

The SAS Viya programming run-time environment, the web applications, and the microservices (machine 4 and 5) are separated from the SAS Viya infrastructure servers (machines 1 and 2) to enhance performance. (Machine 5 provides fault tolerance for machine 4.)

For Cloud Analytic Services (CAS) that are running in MPP mode and are distributed across an analytics cluster, unique forms of fault tolerance are available for each machine type: the CAS worker and the CAS controller.

Because CAS worker machines outnumber CAS controller machines, worker machines are more likely to experience failure. Fault tolerance is provided automatically for worker machines that contain CAS tables, which are created with redundant copies of blocks.

The less common CAS controller failure problem is addressed with an optional CAS backup controller (also referred to as the *secondary controller*). For more information, see "Fault Tolerance" in *SAS Viya Administration: SAS Cloud Analytic Services*.

In the recommended fault-tolerant topology, the CAS controller is deployed on Machine 6, its backup controller is deployed on Machine 7, and CAS workers are on Machines 8 + n.

General Servers and Services: Troubleshooting

Starting sas-viya-consul-default
Timed out waiting for the consul service to start Exiting

Explanation:

The SAS Configuration Server (Consul) does not start. One cause might be that certain configuration files are corrupted. For example, a nonzero length configuration file might contain a definition that is not supported by the current version of Consul. This can cause a failure for Consul to start if the definition is no longer valid, and the affected SAS Viya product did not fix its definition during a software upgrade.

Resolution:

Determine what is causing the start-up failure. Then use the command-line interface, sas-bootstrap-config, to remove invalid checks and services using its `agent check deregister` and `agent service deregister` commands.

One or more SAS Viya microservices fail to start up
UnknownHostException: rabbitmq.service.consul

Explanation:

All microservices use the same API to publish and receive events from SAS Message Broker (RabbitMQ). The microservices are attempting to fetch one or more message broker server host names from SAS Configuration Server (Consul) but that information is not registered correctly because of missing information in `/etc/hosts`.

Resolution:

Make sure that **/etc/hosts** contains every machine name in your SAS Viya deployment, and that **/etc/hosts** has been copied to every machine in your SAS Viya system.

sas-viya-all-services status command returns 'not ready'

Explanation:

Machines in your SAS Viya deployment might be defined in **/etc/hostname** with a short host name.

Resolution:

Using the operating system commands that are appropriate for your Linux distribution (for example, `hostname` and `hostnamectl`), determine how the operating system identifies each machine in your SAS Viya deployment. Then, redefine the machines in your SAS Viya deployment using their fully qualified domain names (for example, my-machine.example.com). For more information, see your Linux documentation.

How do I verify that SAS Viya servers and services are healthy after an outage?

Explanation:

After an outage, you want to know that the SAS Viya servers and services are running normally.

Resolution:

1. Run the following command:

   sudo /etc/init.d/sas-viya-all-services status

2. For any server or service that is listed as `down`, check its log.

   The logs reside in **/opt/sas/viya/config/var/log/*server-service-name*/*deployment-instance***.

3. For any server or service that is listed as `down`, run the following command:

   /opt/sas/viya/home/bin/sas-csq service-health --service *server-service-name*

4. Open a SAS Technical Support track and attach the output from steps 2 and 3.

Job cannot run because no GPU can be reserved.

Explanation:

A SAS Viya server runs a job using a thread that makes a GPU reservation. The thread that made the reservation exits (normally or abnormally) without removing the reservation. Because the GPU Reservation service tracks GPUs using only process IDs, the service does not know to release the GPU reservation. In this situation, the GPU is reserved indefinitely and prevents future SAS jobs from being able to make a reservation.

Resolution:

If no one is using the GPU reservation, remove the reservation using gputool.

SAS® and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies. Copyright © 2018, SAS Institute Inc., Cary, NC, USA. All Rights Reserved. June 2019 3.4-P1:calchkadm

THE POWER TO KNOW®