SAS® Viya® 3.3 Administration: General Servers and Services

General Servers and Services: Overview

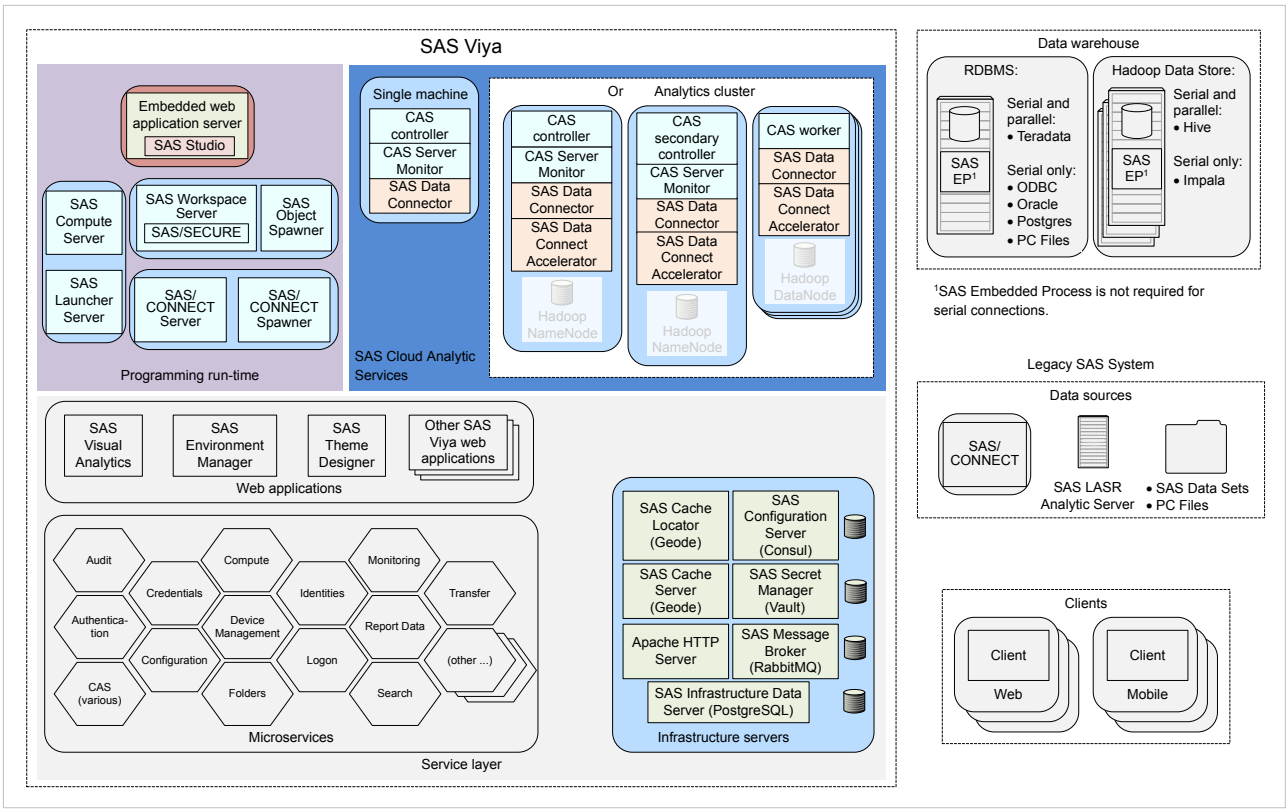
Servers

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)
  - Apache HTTP Server
  - SAS Message Broker (RabbitMQ)
  - SAS Infrastructure Data Server (PostgreSQL)

Note: A programming-only deployment includes only one of the infrastructure servers: Apache HTTP Server.

Figure A.1 *SAS Viya Servers*



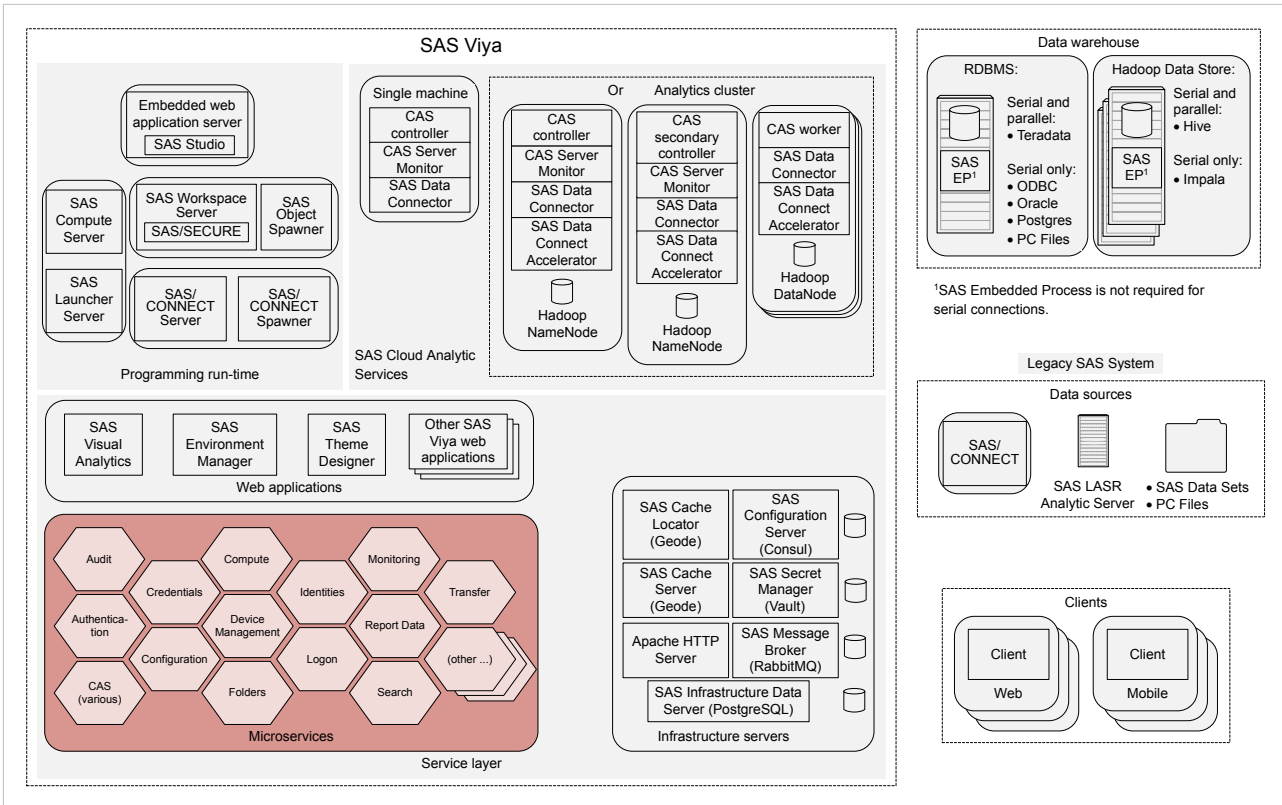
Services

SAS Viya contains several services often referred to as *microservices*. A microservice is a small service that runs in its own process and that communicates with a lightweight mechanism (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 A.2 *SAS Viya Services*



General Servers and Services: Operate

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".

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. To start the primary SAS Configuration Server (Consul) on the machine that is designated in the `[consul]` host group in the inventory.ini file, run the sas-viya-consul-default script.

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

3 Start the non-primary SAS Configuration Server and its agent on all other machines using the sas-viya-consul-default script.

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

   Note: 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).

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

   Note: SAS Secret Manager is deployed wherever Consul server is deployed.

5 Start SAS Message Broker (RabbitMQ).

   If there are multiple instances of SAS Message Broker, start them in this sequence:

   a Start the primary message broker service before its secondary service.

      The primary service is on the machine that is designated in the `[rabbitmq]` host group in the inventory.ini file.

   b Start the secondary message brokers in the reverse order in which they were previously stopped.

      For example, if broker1 was stopped first, start broker1 last.

   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*.

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

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

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

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

9 If this is a multi-tenancy deployment, start the tenant services.

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/`**.

Stop SAS Viya servers and services in this sequence:

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

2 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 3 – Step 5.

3 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*.

4 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*.

5 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 uses the operating system's default init system or systemd command to launch scripts that can stop, start, restart, and check the status of servers and services. These scripts reside in **`/etc/init.d`**.

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".

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

To operate a particular SAS Viya server or service, run the following command, as appropriate:

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

> **TIP** 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" in SAS Viya Administration: Infrastructure Servers.

> **TIP** On multi-tenant SAS Viya systems, individual server and service scripts are named sas-*tenant-ID-server-or-service*-default.

Here are a few examples of how to operate these scripts:

Note: On Red Hat Linux version 7 systems, use the systemd command when running the individual service and server scripts. The systemd command maintains a record of service status that the init system command and a direct call does not use.

- To check status of SAS Logon Manager using a direct call:

```
sudo /etc/init.d/sas-viya-saslogon-default status
```

- To stop the Comments service using the Red Hat Linux version 6 init system command:

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

- To start SAS Configuration Server using the Red Hat Linux version 7 systemd command:

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

- To restart the Cross Domain Proxy service using a direct call:

```
sudo /etc/init.d/sas-viya-crossdomainproxy-default restart
```

Start and Stop All Servers and Services

SAS Viya uses the operating system's default init system command to launch a script that can stop, start, and check the status of all SAS Viya servers and services. This script, `sas-viya-all-services`, resides in **`/etc/init.d`**.

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".

Note: You must be logged on to the machine where the SAS Viya servers and services reside, and you must have sudo privileges to run this script.

To operate all SAS Viya servers and services, run the following command, as appropriate:

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

Note: `sas-viya-all-services` does not control Apache HTTP Server.

> **TIP** On multi-tenant SAS Viya systems, the sas-viya-all-services script is named sas-*tenant-ID*-all-services.

Note: 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.

Here are a few examples of how to operate this script:

Note: When running `sas-viya-all-services` Red Hat Linux version 7, users should not use the systemd command, but instead use the init system command. (When running individual service scripts, Red Hat Linux version 7 users should use the systemd command.)

- To check status of all servers and services using a direct call:

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

- To stop all servers and services using the Red Hat Linux version 6 init system command:

```
sudo service sas-viya-all-services stop
```

- To start all servers and services using the Red Hat Linux version 6 init system command:

```
sudo service sas-viya-all-services start
```

General Servers and Services: Locale and Encoding

SAS Viya 3.3 supports all the SAS session encodings that are available in SAS 9.4. By default, SAS Viya 3.3 uses an encoding of `UTF-8` and a locale of `en_US`. You can change the SAS LOCALE option, the ENCODING option, or both options.

Change the SAS Locale

1 Sign in to the machine on which SAS Foundation resides as the SAS install user or with a user account that has sudo privileges.

   Note: SAS Workspace Server automatically uses the locale that matches the locale that is sent by the client. The LOCALE option value from sasv9.cfg and sasv9_local.cfg does not affect a SAS Studio session. If a locale is set in the sasv9_local.cfg file, that locale is set for SAS programs that are run in batch mode.

2 Modify **/opt/sas/spre/home/SASFoundation/sasv9_local.cfg** with a new line that contains the following:

   locale=*five-character-POSIX-locale-code*

   Here is an example:

   locale=fr_CA

   For valid POSIX locale codes, see five-character POSIX locale codes.

Consider these tips about using the LOCALE option:

- You can override the LOCALE option setting for your session by setting the LOCALE option on the command line.
- You can change the LOCALE option during your SAS session by setting the LOCALE option in the OPTIONS statement.

Change the SAS Encoding

1 Sign in to the machine on which SAS Foundation resides as the SAS install user or with a user account that has sudo privileges.

2 Change to the **/opt/sas/spre/home/SASFoundation** directory, and update the symbolic link for **sas** to point to the new encoding configuration file:

   cd /opt/sas/spre/home/SASFoundation

   ln -sf bin/sas_*nn* sas

   where *nn* is the two- or four-character code that supports the SAS encoding.

   Note: Encoding configuration files reside in **/opt/sas/spre/home/SASFoundation/bin**.

   Here is an example:

```
cd /opt/sas/spre/home/SASFoundation
ln -sf bin/sas_en sas
```

3 In the shell environment on the SAS Foundation machines and in the sasv9_usermods.cfg file for the server, modify the LANG environment variable to match the new LOCALE and ENCODING option values:

   LANG=*five-character-POSIX-Locale-code.Linux-encoding-string*; export LANG

   The sasv9_usermods.cfg file resides in **/opt/sas/viya/config/etc/*server*/*deployment-instance*** for each server.

   Here is an example:

   /opt/sas/viya/config/etc/workspaceserver/default

   For valid POSIX locale codes and Linux encoding strings, see five-character POSIX locale codes and Linux encoding strings.

Note: The LANG environment variable setting must match the locale and encoding that you plan to select for SAS Foundation and SAS Workspace Server.

Here is an example:

```
LANG=ja_JP.eucjp; export LANG
```

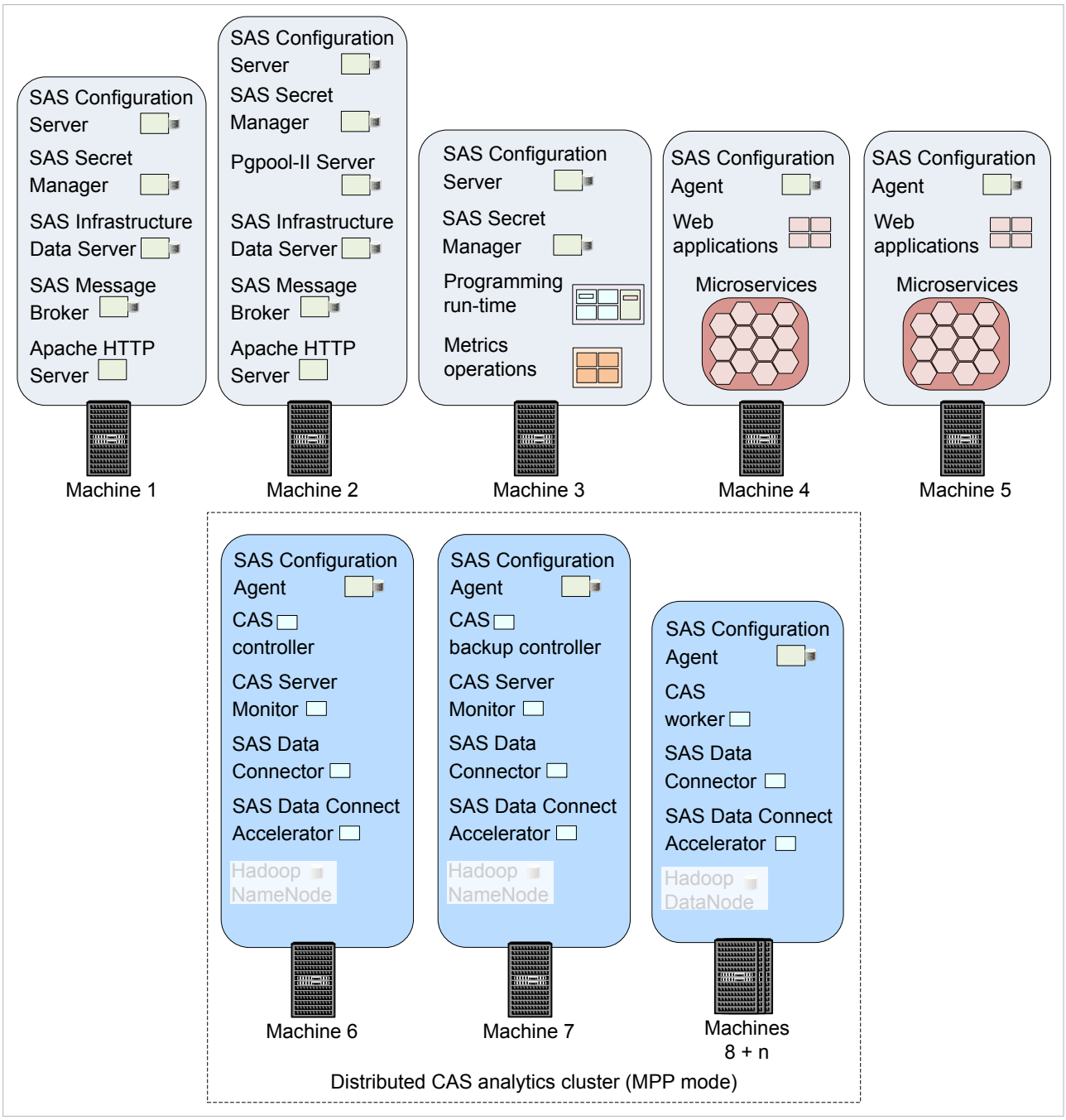
Note: The `export` command (`export LANG`) is not needed when modifying the sasv9_usermods.cfg file.

Note: On Linux, there are differences in the spelling and the casing of language-encoding pairs. For this reason, you should run the `locale` command to check the current locale and to verify the spelling of locale values. A misspelling causes the LANG environment variable to be improperly set, and it interferes with propagation to other locale-related environment variables.

Fault Tolerance in SAS Viya

The following figure shows the minimum recommended fault tolerant SAS Viya configuration on eight machines.

Figure A.3 *Minimum Requirements for a Fault Tolerant SAS Viya Deployment*



SAS Configuration Server (Consul) is unique because it maintains a quorum voting structure among members. Three SAS Configuration Server instances (Machines 1–3) are the minimum number that is required to provide fault tolerance. SAS Secret Manager (Vault) is always deployed on the same machine as the Configuration server. (Machines that contain Configuration agents do not have SAS Secret Manager.) For more information, see https://www.consul.io/docs/internals/consensus.html.

The programming run-time servers reside on Machine 3 along with metrics operations. Metrics operations use an infrastructure that supports monitoring and logging. This infrastructure can be deployed on one machine because the programming run-time and metrics operations are not fault tolerant.

In this sample deployment, the infrastructure servers are deployed on separate machines from the web applications and the microservices (Machine 4 and Machine 5) 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: CAS worker and CAS controller.

Because there are more CAS worker machines than 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 this sample deployment, the CAS controller is deployed on Machine 6, its backup controller is deployed on Machine 7, and CAS workers are on Machines 8 + n.

Each machine runs a SAS Configuration Server agent process that performs health checks on the SAS Viya services that are running and on the machine itself. Each configuration agent provides health information to one or more configuration servers. In fault tolerant deployments, configuration servers choose a leader and store and replicate service information.

SAS Viya microservices send queries to configuration servers or configuration agents in order to discover other services. Every configuration agent has its own copy of service discovery information.

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) is not starting. One cause might be that certain configuration files are corrupted.

Resolution:

1. Check `/opt/sas/viya/config/data/consul/checks/`. Delete all zero-length files.
2. Check `/opt/sas/viya/config/data/consul/services/`. Delete all zero-length files.
3. Restart all services.
4. If the configuration server still fails to start, delete all files in `/opt/sas/viya/config/data/consul/checks/` and `/opt/sas/viya/config/data/consul/services/` and restart all services again.

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 hostnames 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 are defined in **`/etc/hostname`** with a short host name.

Resolution:

Using the Linux `hostname` command, redefine the machines in your SAS Viya deployment using their fully qualified domain names (for example, my-machine.example.com).

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.