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Introduction

About This Guide

Use this guide to deploy SAS Visual Investigator in a private cloud.

- Make sure that you have the latest version of this guide, which is available at the following site:
  SAS Viya Deployment Guides
- To use this guide successfully, you should have a working knowledge of BOSH, Cloud Foundry, and vSphere or OpenStack, depending on your environment.
- The contents of this guide are subject to continual updates. If you are viewing a saved copy of the PDF version of this guide, the content might be outdated.

How Deployment Works

SAS Visual Investigator takes advantage of industry-standard software and tools to deploy to the cloud.

- Cloud Foundry is the supported PaaS.
- VMware vSphere and OpenStack are the supported IaaS environments.

  Note: For vSphere environments, you can deploy SAS Visual Investigator to support disaster recovery. During this type of deployment, a secondary software stack, called the standby site, is made available for use in the event of a planned or unforeseen outage.
- BOSH is used to upload the required stemcells and releases for SAS Visual Investigator. After the stemcells and releases are in place, you will create files that are used in deploying the services and applications. Deploying SAS Visual Investigator consists of deploying stateful services to BOSH, and deploying stateless services and the microservices.
- The SAS Visual Investigator services and applications are packaged as a container. You will access the container from a binary installer file that you download from SAS.
What Gets Deployed

This guide provides information for deploying the following products and supporting components:

- SAS Visual Investigator
- SAS Cloud Analytic Services (CAS), which is used as the run-time environment and the analytics server for SAS Visual Investigator
- SAS/ACCESS to ODBC
- SAS/ACCESS to PostgreSQL

Contact SAS Technical Support

Technical support is available to all customers who license SAS software. However, we encourage you 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 call, 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 for SAS Visual Investigator

Cloud Platform Software Requirements

Cloud Foundry Requirements
SAS Visual Investigator requires versions 254 through 276 of Cloud Foundry.

The supported stemcell type is CentOS 3468.17, based on CentOS 7.x.

For additional information about the supported run-time environment and stemcells, see https://support.sas.com/en/documentation/third-party-software-reference/viya/support-for-operating-systems.html#cf.

BOSH Director
BOSH Director is required in order to install SAS Viya components. BOSH Director provides cloud orchestration and management, including VM creation, deployment, and other software life cycle events. SAS Visual Investigator deployment uses BOSH manifest schema v2 only. BOSH CLI 1.3262.26.0 or later is required.

Other Required Software
The following third-party software is included with your SAS software:

- HashiCorp Consul – Enables service discovery and configuration.
PostgreSQL – Creates the SAS Infrastructure Data Server, which stores user content such as reports, custom groups, audit records, and preferences.

RabbitMQ – Provides an open-source, standards-based platform for SAS components and applications to send and receive messages.

Elasticsearch – Provides search capabilities.

SAS Cache Locator – Used for session caching.

**Supported Data Sources**

The following external data stores are supported by SAS Visual Investigator:

- Data sources accessible with an ODBC driver
- PostgreSQL 9.4

A PostgreSQL database is also used as an internal data store, named SAS Infrastructure Data Server. It is based on PostgreSQL version 9 and is configured specifically to support SAS software by storing user content and preferences.

**Virtual Machine Operating System and Software Requirements**

**Requirements for the Deployment Machine**

The VM instance or physical machine that is used to install SAS Visual Investigator has the following requirements:

- Red Hat Enterprise Linux or CentOS 7.2 or later must be installed.
- The systemd-nspawn component must be installed.
- 30 GB of free space must be available.

**BOSH Virtual Machine Requirements**

The requirements for virtual machines are typically dependent on the number of users who access the SAS Visual Investigator environment and the amount of data that is imported and indexed. However, with SAS Visual Investigator for Cloud Foundry, requirements for the VMs that are deployed by BOSH are different from the requirements for resources that are dynamically allocated for applications within the Cloud Foundry Elastic Runtime environment. Although the Elastic Runtime runs on host VMs called *cells* in Cloud Foundry, VMs that are deployed by BOSH are referred to as *component VMs*.

BOSH component VMs are not dynamically allocated. Use the guidelines in the following table to allocate initial VM resources in BOSH:

<table>
<thead>
<tr>
<th>Role</th>
<th>VCPUs</th>
<th>Disk Space</th>
<th>RAM</th>
<th>Storage Volume (Min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cache</td>
<td>4</td>
<td>40 GB</td>
<td>8 GB</td>
<td>20 GB</td>
</tr>
<tr>
<td>Role</td>
<td>VCPUs</td>
<td>Disk Space</td>
<td>RAM</td>
<td>Storage Volume (Min.)</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------</td>
<td>------------</td>
<td>------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>CAS Controller</td>
<td>2</td>
<td>20 GB</td>
<td>2 GB</td>
<td>20 GB</td>
</tr>
<tr>
<td>CAS Workers</td>
<td>8</td>
<td>40 GB</td>
<td>16 GB</td>
<td>20 GB</td>
</tr>
<tr>
<td>Consul</td>
<td>2</td>
<td>20 GB</td>
<td>2 GB</td>
<td>20 GB</td>
</tr>
<tr>
<td>Elasticsearch Master</td>
<td>2</td>
<td>20 GB</td>
<td>2 GB</td>
<td>20 GB</td>
</tr>
<tr>
<td>Elasticsearch Client</td>
<td>4</td>
<td>40 GB</td>
<td>4 GB</td>
<td>20 GB</td>
</tr>
<tr>
<td>Elasticsearch Data</td>
<td>16</td>
<td>40 GB</td>
<td>32 GB</td>
<td>20 GB</td>
</tr>
<tr>
<td>PgPool</td>
<td>8</td>
<td>40 GB</td>
<td>8 GB</td>
<td>20 GB</td>
</tr>
<tr>
<td>PostgreSQL</td>
<td>16</td>
<td>40 GB</td>
<td>32 GB</td>
<td>20 GB</td>
</tr>
<tr>
<td>RabbitMQ</td>
<td>4</td>
<td>40 GB</td>
<td>4 GB</td>
<td>20 GB</td>
</tr>
</tbody>
</table>

Note: The size of the storage volume shown is the minimum amount. For CAS workers, Elasticsearch data, and the PostgreSQL database (SAS Infrastructure Data Server), you will likely adjust the size of the volume to accommodate the amount of data that is generated by end users. You can determine this amount based on the number of users and their expected usage levels.

If you decide to use a single VM for CAS, and use only the controller node without workers, follow the guidelines for CAS workers that are provided in the table.

---

**Security Requirements**

**User Accounts**

The user account that is used to perform the deployment process must have sudoers privileges and a home directory.

SAS Viya requires a predefined user account that enables the administrator to log on after the deployment has completed. This account is called viadmin in this document. Before the deployment process is started, the viadmin user account must exist as a valid LDAP user.

The administrator creates groups for users as well as a group for administrators by adding users and groups through the Administration interface.

**Authentication**

SAS Visual Investigator supports LDAP for user authentication. Microsoft Active Directory and OpenLDAP are supported LDAP implementations. In addition, the CAS server uses OAuth tokens for all clients in your deployment. The deployment process configures LDAP settings automatically.

Before SAS Visual Investigator is deployed, ensure that these requirements have been met:

- Make sure that SAS Visual Investigator users are able to authenticate to your LDAP provider.
- Make sure that SAS Visual Investigator has Read access to your LDAP server.
Note: To bind to the LDAP server, SAS Visual Investigator requires a userDN and password. LDAP anonymous binding is not supported.

☐ (Optional) If you are deploying multi-tenancy, verify that tenants are set up in LDAP. Use the documentation that is appropriate for your LDAP implementation to set them up.

After the deployment has completed, the designated administrator logs on to the administration application as the viadmin user. Valid LDAP user accounts can then be added from the Administration interface.

---

**Client Requirements**

**Web Browser Requirements**

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

For information about supported web browsers to access SAS Visual Investigator user interfaces, see https://support.sas.com/en/documentation/third-party-software-reference/viya/support-for-web-browsers.html.
Enable Required Ports

The following ports are used by SAS Visual Investigator and 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>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTPD</td>
<td>80 (internal)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>443 (external)</td>
<td></td>
</tr>
<tr>
<td>default Erlang Port Mapper Daemon (epmd) port</td>
<td>4369</td>
<td></td>
</tr>
<tr>
<td>SAS Infrastructure Data Server</td>
<td>5430–5439</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>CAS Server Starting Port</td>
<td>5577</td>
<td>Used by clients to make binary connections to CAS.</td>
</tr>
<tr>
<td>CAS Communicator Port</td>
<td>5580</td>
<td></td>
</tr>
<tr>
<td>default SAS Messaging Broker AMQP client access port</td>
<td>5672</td>
<td></td>
</tr>
<tr>
<td>SAS Configuration Server</td>
<td>8300–8309, 8500 and 8501</td>
<td>SAS uses HashiCorp Consul as its configuration server. All Consul ports should be open to TCP and UDP traffic.</td>
</tr>
<tr>
<td>Object Spawner</td>
<td>8591</td>
<td>Used by clients to make REST HTTP calls to CAS, as with the Python REST interface.</td>
</tr>
<tr>
<td>CAS Server Monitor</td>
<td>8777</td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>Required Port</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Elasticsearch</td>
<td>9200</td>
<td>Default PgPool port</td>
</tr>
<tr>
<td>Default PgPool port</td>
<td>9432</td>
<td></td>
</tr>
<tr>
<td>SAS Cache Locator</td>
<td>10335</td>
<td></td>
</tr>
<tr>
<td>default SAS Messaging Broker management</td>
<td>15672</td>
<td>web console port</td>
</tr>
<tr>
<td>SAS Cloud Analytic Services Server</td>
<td>19990-19999</td>
<td>default SAS Messaging Broker clustering port</td>
</tr>
<tr>
<td>SAS/CONNECT Spawner</td>
<td>17551</td>
<td></td>
</tr>
<tr>
<td>SAS Cache Server</td>
<td>40404</td>
<td></td>
</tr>
</tbody>
</table>

**Required NFS Mount Points**

The following mount points are required on the NFS server before you begin deploying your software.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Directory on the NFS Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS</td>
<td>license</td>
</tr>
<tr>
<td>PostgreSQL</td>
<td>postgresql</td>
</tr>
<tr>
<td>Elasticsearch</td>
<td>elasticsearch</td>
</tr>
</tbody>
</table>

**Note:** The directory names must exist on the NFS server before deployment.
Installing SAS Visual Investigator on SAS Viya

Prepare the Installation Tools

Download the Binary Installer File
Unzip the Downloaded File
Extract the Binary File
Start the Container
Sign On to the Container
Access Product Help

Prepare the Installation Environment
Set the Site Name
Set the Configuration File
Edit the Configuration File
Save the Configuration File
Authenticate to Cloud Foundry and BOSH
Upload the BOSH Stemcells
Upload the BOSH Releases
(Optional) Set the Replication Configuration
Create the Files for Deployment
Prepare to Examine the Files
Examine the Files Related to BOSH
Examine the Files Related to Cloud Foundry
Using Logs

Install SAS Visual Investigator (Standard)
Overview
Deploy the Stateful Services to BOSH
Deploy the Stateless Applications and Microservices

Installing SAS Visual Investigator with Disaster Recovery
Prepare the Standby Site
Install the Standby Site

Prepare the Installation Tools

Download the Binary Installer File
Download the binary installer file to a physical machine or a virtual machine (VM) that has access to the IaaS environment. The VM is used as the secure administration host (jump server) for the installation.
Download the binary installer file sas.bin to the /home/installer-ID directory on the jump server. For example, if the binary installer file has been placed on a web server, you can use the wget command to download the binary installer file. Here is an example:

```bash
wget http://0.0.0.0/visualinvestigator__10_3_1__xxx__lax.zip
```

Note: `xxx` represents digits that are provided automatically. Note this value for use in subsequent commands in this section.

### Unzip the Downloaded File

Unzip the downloaded file using the unzip utility:

```bash
unzip visualinvestigator__10_3_1__xxx__lax.zip
```

### Extract the Binary File

After the downloaded file has been unzipped, extract the binary file:

```bash
bash visualinvestigator__10_3_1__xxx__lax.bin
```

Here is an excerpt of the results:

```
Validating archive...
Extracting to /home/test/sas...
```

The installer creates a top-level directory named `sas`, which contains two subdirectories: `bin` and `image`.

Here are typical results:

```
--2016-06-20 14:53:04--  http://10.120.16.120/visualinvestigator__10_3_1__xxx__lax.zip
Connecting to 0.0.0.0:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 5508425807 (5.1G) [application/octet-stream]
Saving to: 'visualinvestigator__10_3_1__xxx__lax.zip'
100%
[===================================>] 5,508,425,807 74.4MB/s in 1m 43s

2016-06-20 14:54:47 (50.8 MB/s) - 'visualinvestigator__10_3_1__xxx__lax.zip' saved [5508425807/5508425807]
```

`bin` consists of a single Bash script named start.

`image` is a systemd-nspawn namespace container that is invoked by the start Bash script and contains functionality that is used in deployment activities for SAS Visual Investigator. The container can be shut down and restarted whenever these functions are needed.

In addition, the entire container, with any changes that are made, can be repackaged, archived, or moved to another server or a VM as needed.

### Start the Container

To start the container, run the start.sh script from the user’s home directory:

```bash
./sas/bin/start
```

Here are typical results:

```
Starting SAS Visual Investigator Deployment Container...
Spawning container <instance>.<hostname>.unx.sas.com on /home/test/sas/image.
```
Press `^]` three times within 1s to kill container.

systemd 219 running in system mode. (+PAM +AUDIT +SELINUX +IMA -APPARMOR +SMACK +SYSVINIT +UTMP +LIBCRYPTSETUP +GCRYPT +GNUTLS +ACL +XZ -LZ4 -SECCOMP +BLKID +ELFUTILS +KMOD +IDN)

Detected virtualization systemd-nspawn.

Detected architecture x86-64.

Welcome to CentOS Linux 7 (Core)!

Because the container attempts to alter the state of the host operating system, the following error message might be displayed. You can safely ignore the message:

[FAILED] Failed to listen on RPCbind Server Activation Socket.
[FAILED] Failed to start LSB: Bring up/down networking.

See 'systemctl status network.service' for details.

**Sign On to the Container**

1. After the container is started, a login prompt is displayed:

   CentOS Linux 7 (Core)
   Kernel 3.10.0-693.2.2.el7.x86_64 on an x86_64
   np140801 login: sas

2. At the prompt, enter the user ID `sas` and then enter this password in the specified casing `XyZZy`.

   After you sign on successfully, the screen appears as follows:

   Last login: Wed Jun 15 12:41:34 on console
   Site Unset  12:23:56 !4 [~]

   The prompt now includes the string, Site Unset, followed by a timestamp. The Z shell (zsh) is set automatically. It is the standard shell for a SAS Visual Investigator deployment.

   **Note:** You should change the password immediately.

   **Note:** Do not change shells. Any other shell might produce unexpected results.

   The window of your X terminal emulator displays the title `Container`. The title is a reminder that your work environment is within the container and that you are no longer working within the host file system.

**Access Product Help**

To access Visual Investigator help, run the following command:

`sas help -g`

To show product information, run the following command:

`sas show info`

SAS Visual Investigator : Info

   Product
   Name : SAS Visual Investigator
   Version:  : 10.3.1.xxxx
   Build Date:  : 2018-2-7.xxxxxxx

   Note: The information displayed by the sas show info command will change after loading the data from the JSON configuration file.

For more details about your configuration, run the following command:

`sas conf use configuration-filename`
Prepare the Installation Environment

Set the Site Name

The site name uniquely identifies your deployment. The container can manage multiple deployments at different sites. This enables you to manage development, test, and production environments from a single deployment container. You can also manage a paired set of sites that will act as a warm backup for disaster recovery.

To set the site name, run the command:

```
sas site set site-name
```

The name can contain only lowercase alphabetic characters, numbers, and hyphens. Nonalphanumeric characters, including a space, are not allowed. SAS recommends a site name that is three to ten characters long.

The site name will also be used as the datacenter name in Consul.

Note: Once the site name has been set, it will appear at the far left side of the prompt, replacing the initial value, Site Unset.

Set the Configuration File

1. You must choose a template file as a basis for the configuration file that you will set, edit, and save. To list the available template files, run the command:

```
sas conf list
```

Here are the results:

```
SITE CONFIGURATIONS:
SYSTEM CONFIGURATIONS:
openstack_single
tospere_single
tospere_multi
SEE ALSO:
sas conf set <configurationName>  Change the active configuration
```

To use a configuration, use the command:

```
sas conf set <configurationName>
```

Now using configuration:

2. Select the template file (vSphere or OpenStack) that corresponds with the underlying IaaS for your Cloud Foundry installation and run the following command:

```
sas conf set configuration-name
```

where `configuration-name` is any of the system configurations listed by the `sas conf list` command. If you intend to use disaster recovery, specify the `vsphere_multi` configuration value.

3. Save the configuration file with a new configuration filename that is meaningful in your environment.

```
sas conf save file-name
```

Here is the output:
4 Set the new configuration file as the active configuration file for the framework to use.

```
sas conf set filename
```

Here is the output:

```
Now using configuration: filename
```

**Edit the Configuration File**

Once the template file is ready to use, edit the configuration file using the vim editor, using the following command:

```
sas conf edit
```

**Note:** SAS has configured the vim utility to check JSON syntax. If the file contains invalid JSON syntax, you will be notified when you exit the utility.

**Save the Configuration File**

To save the changes that you have made to a permanent location, run the following command:

```
sas conf save file-name
```

Here is the output:

```
Saved configuration file: test
```

This command does not change the active configuration file. Instead, it saves a copy of it to a saved configuration directory. You can see your configuration name now by running the command:

```
sas conf list
```

Here is the output:

```
SITE CONFIGURATIONS:
test (active configuration)
SYSTEM CONFIGURATIONS:
openstack
vsphere
SEE ALSO:
sas conf set configuration-name Change the active configuration
```

**Authenticate to Cloud Foundry and BOSH**

Now that you have entered the information about your Cloud Foundry installation and the servers to be created, you need to connect to Cloud Foundry. This step is required even if the jump server is signed on to Cloud Foundry and BOSH. This step is also required whenever you change your configuration to a new configuration that has different authentication details.

To authenticate, run the command:

```
sas cf auth
```

Here is typical output:

```
Authentication for user: sas
Current target is https://0.0.0.0:25555 (your-bosh)
api endpoint: https://api.sas.sas.sas.com
api version: 2.68.0
```
If authentication is successful, then you know that the data that you entered for the Cloud Foundry and BOSH environments is correct. If authentication is not successful, refer to the data that you entered for the director and run-time sections of the configuration file. Correct them for your installation and try again.

**CAUTION!** If you do not have a working connection to both BOSH and Cloud Foundry, do not continue to the next section.

### Upload the BOSH Stemcells

Once connectivity is established to the BOSH environment, you must upload the required stemcells for the creation of virtual machines (VMs). This is done in the IaaS using the BOSH Cloud Provider Interface (CPI).

1. Check to see whether the required stemcells are already installed. Run the following command:
   ```
   bosh stemcells
   ```
   If the output contains the following information, the correct stemcell is already installed. You can skip the remainder of this section.
   ```
   Name="bosh-openstack-kvm-centos-7-go_agent"
   Version="3468.17"
   ```

2. If the `bosh-openstack-kvm-centos-7-go_agent` stemcell is not installed, run the following command:
   ```
   sas bosh upload stemcells
   ```
   Two stemcells are delivered: one each for OpenStack and vSphere.

3. To ensure that the correct stemcells are loaded, even if there are existing stemcells, run the following command:
   ```
   sas bosh upload stemcells
   ```
   If the correct stemcells are already installed, you receive a warning message stating that the correct version already exists. You can safely ignore this message and continue with the upload.

### Upload the BOSH Releases

Now you need to upload the included BOSH releases to the BOSH blob storage so that they are available to BOSH when it is time to deploy the services.

To upload the BOSH releases, run the following command:
```
    sas deploy releases
```

The following release packages are delivered, one for each of the stateful services.

- Cloud Analytic Server (CAS)
- Elasticsearch
- PostgreSQL
- Consul
- RabbitMQ
- PGPool
- SAS Cache Locator
(Optional) Set the Replication Configuration

This setting permits your deployment to use disaster recovery, and it enables you to add the standby site when you are ready. If your system is enabled for disaster recovery, you do not have to create the standby site immediately. The standby instance can be created at any convenient time in the future.

Note: You must enable your deployment for disaster recovery before deploying the software. Disaster recovery works by copying important data from the active site to a standby site, where it can be used if the active site goes down. Configuring replication permits your deployment to use disaster recovery. For more information about disaster recovery and the standby site, see “Installing SAS Visual Investigator with Disaster Recovery” on page 18.

To set the replication configuration:

1. Establish the replication pattern from the active site to the standby site.
   
   `sas replicate set active-site-name to standby-site-name`

2. Save the configuration.
   
   `sas conf save`

3. Synchronize the active site’s configuration data with the remote location.
   
   `sas site sync -v`

   The data is synchronized to the `/sites` directory. The `-v` flag is optional and is used to show all the files that are synchronized.

Create the Files for Deployment

Once the stemcells and releases are in place, you must create files that are used in deploying SAS Visual Investigator services and apps.

This step should be performed each time there is a change in the active configuration file. If these files have already been generated, then remove them from the container first by running the following commands from the home directory of the installer ID.

```
cd ~/
site-name
rm -rf *
```

The configuration file provides the values to be substituted into the template files that are part of the framework.

To create the file system and files, run the following command:

`sas deploy files`

As the command runs, it copies the JAR files that will be deployed in Cloud Foundry. Then it performs the token substitution on the various files that are required for deploying the solution.

When file creation is complete, token substitution is checked to determine whether there are any unresolved tokens. If tokenization is successful, the message `All tokens successfully resolved` is displayed. If tokenization is incomplete and an error message is shown, the configuration file is incomplete and needs to be edited again.

Note: Be sure to remove the files that were generated before running the command `sas deploy files` again.
**Prepare to Examine the Files**

Examination of the BOSH and Cloud Foundry manifest files is required in order to verify that the information in the files is correct. You must have knowledge about the Cloud Foundry environment and the vim utility.

**Note:** Do not change the information in the manifest files manually because the data comes from the configuration file. Any changes should be made to the configuration file. The contents of the `site-name` directory should then be deleted, and the command to deploy files should be rerun to create a new set of manifest files.

**Examine the Files Related to BOSH**

The manifest files that deploy stateful services into the BOSH managed environment are located in the `/home/sas/site-name/services` directory in the container.

To examine the manifest files:

1. Change to the `/home/sas/site-name/services` directory.
2. Run the following command to display the `vim` editor:
   ```
   vi */man*.yml
   ```
   This displays the `vim` editor in the window, with the first file in the `vim` buffer. Use the `vim:n` command to edit the next file match. Use the `:rew` command to rewind to the beginning if you want to review all files again.

**Note:** It is acceptable to change the configurable entries in the jobs section of the `manifest.yml` file, which is in the Postgres directory under the `services` directory. They are intended to be managed outside the framework.

When examining the manifest files, check the following items:

- `director_uuid` – make sure this matches what was entered in the configuration file.
- Verify that the IP address is the correct one entered for each server. Look under `jobs` and then `static_ips`.

Once you have examined the BOSH manifest files, examine the script files in the `services` directory. To examine the script files:

1. Change to the `/home/sas/site-name/services` directory.
2. Run the following command to display the `vim` editor:
   ```
   vi */*.sh
   ```

The most important script in this group is the `post_deploy_consul.sh` script. In this file, check for empty values ("""") and determine whether an empty value is reasonable. Some expected empty values include the `archive.storage.local.destination` property and in the `Folder` loop at the bottom of the file. A property with an empty value might indicate that a JSON property in the configuration file was not specified. If you discover any entries like this, return to the configuration file and make sure that all required entries are completed. Then delete the contents of the home directory and re-create the files.

**Note:** The following `service_tag` parameters are blank for all environments: `elasticsearch/deploy.sh service_tags`, `postgres/deploy.sh service_tags`, and `rabbitmq/deploy.sh service_tags`. This is standard and can be ignored.

**Note:** If you are using OpenStack, the `static_ips` addresses in the `cas-worker.yml` and `manifest-data.yml` files are blank. This is standard for OpenStack and can be ignored.

**Examine the Files Related to Cloud Foundry**

Manifest files that deploy stateless applications and microservices into the Cloud Foundry run-time environment are located in the `/home/sas/apps` directory in the container.
To examine the manifest files:

1. Change to the `/home/sas/site-name/apps` directory.

2. Run the following command to display the vim editor:
   
   ```
   vi */man*.yml
   ```

   In these files, check for empty values ("") and determine whether an empty value is reasonable. This might indicate that a JSON property in the configuration file was not specified. If you discover any entries like this, return to the configuration file and make sure that all required entries are completed. Then delete the directories under the `/home/sas` directory and re-create the files.

---

**Using Logs**

Log data for applications and microservices is provided through the Cloud Foundry Loggregator system. Using a Cloud Foundry firehose and nozzle to collect log data and to redirect it to a logging server is the standard method of providing access to application logs. The rsyslog logging service has been added to the services deployed in Cloud Foundry BOSH. This information can be routed to any rsyslog server over TCP. This method is compatible with any of the various log store and display applications.

---

**Install SAS Visual Investigator (Standard)**

**Overview**

Installing SAS Visual Investigator consists of the following tasks:

- Install the stateful services to BOSH.
- Install the stateless applications and microservices.

**Deploy the Stateful Services to BOSH**

To deploy the stateful services to BOSH, run the following command:

```
$ sas deploy services
```

When deployments are complete, test the applications to ensure that the installation is working as expected. For more information, see "Validating the Deployment" on page 25.

**CAUTION!** Do not proceed to the next task if you see any errors during the installation of the stateful services. For error recovery, see "Appendix A: Troubleshooting" on page 39.

**Deploy the Stateless Applications and Microservices**

1. To install the stateless applications and microservices, run the following command:

   ```
   $ sas deploy apps
   ```

   This command is similar to the command that installs the stateful services. The `sas deploy apps` command runs the deploy.sh script in the `/home/sas/apps` directory. This script executes each of the deploy.sh scripts in the subdirectories under the apps directory. These scripts deploy application JAR files in the Cloud Foundry run-time environment.

2. To display the status of the full installation, run the following command:
sas show status

Note: The sas show status command implicitly performs a status check of the VMs and it also runs the cf apps and cf routes commands. To ensure that all applications are fully started, run the command:
sas show instances.

This will return the actual state of the applications within the Cloud Foundry runtime.

3 Run the following command to display information about the installed applications:
sas show info

The results include information about the product, the configuration, the URLs that enable you to connect to the application interfaces, and the environment. All the information is surfaced from the configuration file.

4 To ensure that the stateful services and applications are up and in a satisfactory condition, run the command,
sas show details

This will check the applications’ health endpoint for each application and also show the health status of the stateful services as reported to Consul.

Here is an excerpt of typical output:

Service Status

pass cas-acme-default (Success)
pass cas-shared-default (Success)
pass consul -111-222-7-86 (Agent alive and reachable)
pass consul -111-222-7-87 (Agent alive and reachable)
...  
App Status

pass audit (UP)
pass authorization (UP)
pass datahub (UP)
pass entityResolution (UP)
... 

---

**Installing SAS Visual Investigator with Disaster Recovery**

Deployments with disaster recovery enabled are designed to use two sites: active and standby. After SAS Visual Investigator is deployed, the active site contains the full software stack (SAS Viya and SAS Visual Investigator). The standby site contains a similar set of machines and services. The stateful services (PostgreSQL, Consul, RabbitMQ, CAS, and ElasticSearch) are deployed and running. Data replication occurs for the PostgreSQL database and Consul KV stores. Stateless services (also referred to as microservices) are deployed to the Cloud Foundry Runtime Environment in a stopped state which are also configured to leverage the currently selected standby microservices. Because the microservices are stopped, the SAS Visual Investigator web interface is not accessible to the standby site.

Performing the steps in this chapter up to this point installs the active site. This section describes the steps that are required to install the standby site. It assumes that the active site has been installed.

**Prepare the Standby Site**

1 Switch to the standby site.
Installing SAS Visual Investigator with Disaster Recovery

2 Select the JSON template for the standby site.
   sas conf set vsphere-multi

3 Save the configuration file with a new configuration filename that is meaningful in your environment.
   sas conf save standby-site-configuration-file-name

   Here is the command output:
   Saved configuration file: filename

4 Set the new configuration file as the configuration file for the environment to use.
   sas conf set standby-site-configuration-file-name

   Here is the command output:
   Now using configuration: filename

5 Establish the replication pattern from the active site to the standby site.
   sas replicate set active-site-name to standby-site-name
   sas site import keys active-site-name

6 Save the configuration.
   sas conf save

7 Synchronize the active site's configuration data with the remote location.
   sas site sync -v

   The data is synchronized to the/sites directory. The -v flag is optional and is used to show all the files that are synchronized.

Install the Standby Site

1 If you are not already on the standby site, switch to it.
   sas site set standby-site-name

2 Change the configuration to the file created for the standby site.
   sas conf set standby-site-configuration-file-name

3 Authenticate Cloud Foundry.
   sas cf auth

4 Verify that the IP addresses are correct.
   sas show info

5 Since the standby site must use the same keys as the active site, import those keys to the standby site.
   sas site import keys active-site-name
   sas conf save
   sas site sync

6 Deploy the files.
   sas deploy files

7 Deploy the stateful services.
   sas deploy services

8 Deploy the stateless applications and microservices.
sas deploy apps

9 Display information about the installed applications.

  sas show info
Configure and Onboard Initial Tenant

1. Locate the `tenant.properties` template in the `/home/sas/site-name` directory of the container.

2. Make a copy of the template, naming the new file with the actual name of the initial tenant that will be created.
   
   For example, if you are creating a tenant named acme, you could copy the template file as the new tenant file.
   
   ```bash
   cp tenant.properties acme.properties
   ```

3. Use the text editor to modify the newly named template file. For example, if the name of the tenant file is `acme.properties` then you could open the file to edit it using the following command.
   
   ```bash
   vi acme.properties
   ```

4. Enter the tenant properties. Here is an example showing the edited template.

   ```bash
   #!/bin/bash
   
   # This is a template file for tenant on-boarding.
   # Copy this file to a new filename and change the properties below.
   
   # ===== TENANT NAME
   #
   # Description:
   #  This is your tenant name.
   #  Tenant names must begin with a lowercase letter and
   #  may be followed by additional lowercase letters or digits
   #  for a maximum of 16 characters.
   #
   # Enter your Tenant name here:
   #svi_TENANT_ID="acme"
   
   # ===== CAS CONTROLLER IP ADDRESS
   #
   # Description:
   #  This is the CAS Controller IP address for your tenant.
   #  This is NOT the same IP address as that of the base CAS Controller
   #  that is used for licensing.
   #
   # Enter the IP address of your CAS Controller here:
   ```
svi\_SERVICE\_CAS\_CONTROLLER\_IP="10.10.10.36"

# ===== CAS WORKER IP ADDRESSES
#
# Description:
# These are the CAS Worker IP addresses for your tenant.
# These are NOT the same IP addresses as that of the base CAS workers.
# An empty array is valid.
#
# Enter the IP addresses of your CAS Workers here:
svi\_SERVICE\_CAS\_WORKER\_IP=( "10.10.0.37" )

# ===== TENANT USERNAME
#
# Description:
# This is the first user added for the new tenant.
# The tenant first user is a username that can be authenticated
# using the configured LDAP type.
# This username may be different for each deployed tenant.
#
# Enter the tenant username:
svi\_TENANT\_USERNAME="demo"

# ===== TENANT POSTGRES USERNAME
#
# Description:
# This is an optional username that will own the database created
# for the tenant data. If not specified, the default admin credentials
# are used for database access.
# If specified, the username must be different for each deployed tenant and
# a password must be included below.
#
# Enter the tenant postgres username:
svi\_MULTITENANCY\_TENANT\_POSTGRES\_USERNAME=""

# ===== TENANT POSTGRES PASSWORD
#
# Description:
# This is the password for the tenant postgres user that will own
# the database for the tenant.
#
# Enter the tenant postgres password:
svi\_MULTITENANCY\_TENANT\_POSTGRES\_PASSWORD=""

5 Save the changes.

6 If you have a PostgreSQL user ID and password, then establish the tenant PostgreSQL user ID in PgPool. To configure each user within each PgPool instance:

a To configure the instance, run the following commands:

```bash
 cd /home/sas/site-name/services/postgres_ha
 bosh deployment manifest_two_pgpools.yml
 bosh -d manifest_two_pgpools.yml ssh
```

b Choose an instance by running the following commands:

```bash
 sudo pg_md5 --username 'new-tenant-user-ID' --md5auth --prompt
 Password: new-tenant-password
```
To verify that all Consul services and applications have a passing status, run the following command:

```
sas show details
```

Make the initial tenant by running the following command:

```
sas make tenant tenant-name.properties
```

For example, if your tenant name is acme, then the command would be as follows:

```
sas make tenant acme.properties
```

Initialize the first tenant by running the following command:

```
sas deploy tenant -i
```

Deploy the initial tenant by running the following command:

```
sas deploy tenant tenant-name
```

Check the status of the initial tenant by running the following commands:

```
sas show tenant status tenant-name
```

(Optional) Scale the deployment by running the following command:

```
cf scale app-name -i n
```

where you specify $n$ as the number of instances that should be running when the command completes.
Validating the Deployment

Verify RabbitMQ

To verify that RabbitMQ has been deployed correctly, open a browser and go to the following address:

http://RabbitMQ-IP-address:15672/#/

If the RabbitMQ logon window appears, then RabbitMQ is functioning as expected.

Verify PostgreSQL

Note: This section is applicable only if your order contains PostgreSQL. If it does not, skip this section.

1 Run the following command:

/opt/sas/viya/home/bin/sas-bootstrap-config kv read "config/application/postgres/password"

2 Note the output of the command. It is the password for the dbmsowner.

3 Connect to the database:

/opt/sas/viya/home/bin/psql -h IP-address-for-PostgreSQL-database -U dbmsowner postgres

4 When prompted, enter the password that you noted in step 2:

Password for user dbmsowner:

5 If PostgreSQL is deployed appropriately, you should receive a response like this:

psql (9.4.9)
Type "help" for help
postgres=#

6 To exit the prompt, type \q and press Enter.
Validate Elasticsearch

To determine the health of the deployed Elasticsearch, use the following command:

```
curl -XGET 'https://IP-address-for-Elasticsearch-master-node:9200/_cluster/health?pretty=true'
```

Typical output follows:

```
{
  "cluster_name" : "testcluster",
  "status" : "green",
  "timed_out" : false,
  "number_of_nodes" : 2,
  "number_of_data_nodes" : 3,
  ...
}
```

If the value of status is **green**, the cluster is fully functional. For additional information about Elasticsearch cluster health, refer to [https://www.elastic.co/guide/en/elasticsearch/reference/current/cluster-health.html](https://www.elastic.co/guide/en/elasticsearch/reference/current/cluster-health.html).

---

Validate Consul

To validate the installation of Consul:

1. Open a web browser and enter the URL for Consul.
2. To determine the correct URL for Consul, run the following command:

```
sas show info
```

The following output is displayed:

```
SAS Visual Investigator: Info

Product:
  Name : SAS Visual Investigator
  Version : 10.2.2.517.0
  Build Date : 2017-08-01.0851

Configuration:
  JSON Configuration : test
  Org : test
  Space : test
  Host : test

URLs:
                          : https://<tenant>.test.test.pass.sas.com/SASVisualInvestigator
  Consul : http://10.10.10.01:8500
  RabbitMQ : http://10.10.10.02:15672

IP Addresses:
  CAS Controller : 10.10.10.04
```
From the preceding output, select the URL for Consul. In this example, the URL is http://10.10.10.01:8500.
Completing the Deployment

Further Documentation

You can access SAS Visual Investigator 10.3.1: Administrator’s Guide from within the SAS Visual Investigator application or from the SAS Visual Investigator documentation page. To access the secure SAS Visual Investigator 10.3.1 documentation, you must have an access key. The documentation page explains how to contact SAS Technical Support to request the access key.
Managing SAS Viya Software

Upgrade SAS Visual Investigator

Important: This section contains several references to SAS Visual Investigator: Administrator’s Guide. To access the secure SAS Visual Investigator documentation, you must have an access key. A message on the SAS Visual Investigator documentation page explains that licensed customers can contact SAS Technical Support to request the access key. SAS recommends that you obtain the access key before completing the tasks in this section.

Back Up the Deployment and Remove Applications

Before performing an upgrade on a SAS Visual Investigator 10.3 deployment, you should make backups of persisted data to facilitate performing a rollback if it becomes necessary. Persisted data includes BOSH services data as well as deployment configuration data.

1. Confirm that you are working with a SAS Visual Investigator 10.3 system.
   ```
   sas show info
   ```
   The results should include 10.3.0.xxxx in the Version field.

   ```
   SAS Visual Investigator : Info
   
   Product                          : SAS Visual Investigator
   Version:                      : 10.3.0.xxxx
   Build Date:                   : 2018-2-7.xxxxx
   ```

2. Confirm that the services and applications pass their health checks.
   ```
   sas show details
   ```
   The results should show all the services as Success or Agent alive and reachable. The applications should be listed as UP.

3. Confirm that the instances are healthy, which is indicated by the status RUNNING.
sas show instances

4 Save the configuration.
   sas conf save
   sas site sync

5 Back up PostgreSQL. See Back Up the SAS Infrastructure Data Server in SAS Visual Investigator 10.3: Administrator’s Guide.

6 Back up Consul.
   cd site-directory
   sas consul backup
   For more information see Back Up the SAS Configuration Server in SAS Visual Investigator 10.3: Administrator’s Guide.

7 Remove the applications.
   cd site-directory/apps
   sas cf auth
   ./remove.sh

8 Exit the container.
   sas util exit

Upgrade the Container

1 Run the bin installer in upgrade mode.
   bash visualinvestigator_10_3_1_xxx_lax.bin --update
   This command makes a backup of the current installation and places it at install-directory/.backup/timestamp. It also overlays persistent data from the following SAS Visual Investigator 10.3 deployment directories into the new deployment.
   ■ /home/sas/*
   ■ /home/sas/.sas

2 Start the SAS Visual Investigator container.
   ./sas/bin/start

3 Add files outside the original container to the same location in the new container. For example, in the JSON configuration, the entry .directors.director-name.certificate_path might be stored locally within the container. If so, then re-add the certificate to this path.

4 Mount points that are manually created outside the deployment process must be created again. For example, if the entry .deployments.sas.log_dir is specified in the JSON configuration file, and it is an NFS mount point, you would need to upgrade the file/etc/fstab in order to persist this mount point.

Perform Data Transformations
Because the deployment container contains code from the new release, but still contains old configuration data, the configuration data must be upgraded.

1 Set the site name.
   sas site set site-name
2 Set the configuration.

   sas conf set configuration-name

3 Upgrade the configuration.

   sas conf edit --update

   The vi editor starts and its pointer automatically moves to lines containing # Upgrade:. Use the vi commands n (next) and p (previous) to move between # Upgrade: locations in the file. Make your changes at each location and exit the vi editor with :wq.

4 Review the changes.

   sas conf diff

   The process reviews multiple files:
   - _active/configuration.json — the union of all configuration data, including system properties such as releases and stemcells as well as user-modifiable properties. Commented-out properties are not shown.
   - _active/dynamic/file.json — only the properties that the user can modify. Commented-out properties are shown.
   - _active/fixed/*.json — only the system properties. No comments are present.

   Within a file, use the Up Arrow Key and the Down Arrow key to move between differences. To change files, press Ctrl+T.

5 Save your changes.

   sas conf save

---

**Back Up the Elasticsearch Indices**

1 Authenticate the Elasticsearch indices.

   sas cf auth

2 Back up the Elasticsearch indices.

   sas site backup indices --insecure

   The indices are stored at the mount point that is specified by the deployment configuration.

---

**Upgrade Stemcells and Releases**

1 Authenticate to Cloud Foundry and BOSH.

   sas cf auth

2 Since the site directory will be regenerated from the new configuration data, you should consider saving the existing site directory for comparison purposes.

   mv ~/site-directory ~/site-directory.orig

3 Generate the deployment files.

   sas deploy files

4 Generate the tenant files.

   sas make tenant tenant-name.properties

5 Confirm that you are working with a SAS Visual Investigator 10.3.1 system.
sas show info
The results should include 10.3.1.xxxx in the Version field.

6 Confirm that the services are running.
   sas show details -S
The results should show all the services as Success or Agent alive and reachable.

7 Deploy the new stemcells.
   sas bosh upload stemcells

8 Deploy the release.
   sas deploy releases

Upgrade Services and Applications

1 Deploy Consul:
   sas consul delete network port
   cd site-directory/services/consul_ha
   bosh -n -d manifest.yml deploy
   sas consul update

2 Deploy CAS:
   cd site-directory/services/cas
   ./deploy

3 Deploy PostgreSQL.
   a Change to the PostgreSQL directory.
   cd site-directory/services/postgres_ha
   b Unmount the persistent storage by running the following code to make a secure connection to each PostgreSQL instance, and then run the unmount command.

   bosh deployment manifest_two_postgresql_databases.yml
   Label="$(sas conf select .deployments.sas.label)"
   for Instance in $(bosh instances 2>/dev/null | grep $Label | awk '{print $2}'); do
     bosh ssh "$Instance" "sudo su - root bash -c 'if mountpoint -q /var/vcap/store; then umount -l /var/vcap/store; fi''"
   done

   Note: For improved readability, the bosh ssh command in the preceding code occupies three lines. However, make sure that you enter the command on a single line.

   c Deploy the upgrade.
   bosh -n -d ./manifest_two_postgresql_databases.yml ./deploy
   bosh -n -d ./manifest_two_pgpools.yml ./deploy

   d Verify the mount points that have been remounted.
   for Instance in $(bosh instances 2>/dev/null | grep $Label | awk '{print $2}'); do
     bosh ssh "$Instance" "sudo su - root bash -c 'mountpoint /var/vcap/store'"
   done

4 Deploy the cache service.
cd site-directory/services/cache
./deploy

5 Deploy Elasticsearch.

    cd site-directory/services/elasticsearch
    ./deploy

6 Deploy RabbitMQ.

    cd site-directory/services/rabbitmq_ha
    ./deploy

7 Deploy a CAS tenant.

    cd site-directory/tenants
    for TenantDeploy in */cas/deploy.sh; do
        $TenantDeploy
    done

8 If you are updating a system that contains Visual Analytics, an additional property needs to be added to Consul. Run the following command:

    sas consul add
    /config/reportrenderer/sas.reportrenderer.properties.custom.baseUrl value

    The value should be the non-TLS base route, which is specified in the following form: http://deployment-label.Host.Domain. An example is http://dc62.v62r1.sas.com.

9 Deploy the applications.

    sas deploy apps

---

**Roll Back a Failed Upgrade**

1 Restore the Elasticsearch indices.

    sas site restore indices

2 Remove all applications and exit the deployment container.

    cd site-directory/apps
    ./remove.sh
    sas util exit

3 Archive the current deployment container.

    cd installation-directory
    Timestamp="$(date "+%Y-%m-%d.%H%M%S")"
    mkdir -p .backups/$Timestamp
    mv * .backups/$Timestamp

4 Restore the previous deployment container.

    cd installation-directory
    Previous=".backups/timestamp-of-version-10.3-backup"
    mv "$Previous"/* .

5 Start the SAS Visual Investigator container.

    ./sas/bin/start

6 Set the site and configuration.
Authenticate Bosh and Cloud Foundry.

```
sas cf auth
```

Deploy the previous stemcells.

```
sas bosh upload stemcells
```

Deploy previous releases.

```
sas deploy releases
```

Restore the Consul key/value pairs.

```
cd site-directory/services/consul_ha
bosh -n -d manifest.yml deploy
sas consul restore -f backup-file-name
```

Restore the CAS service.

```
cd site-directory/services/cas
./deploy.sh
```

Connect to the restored PostgreSQL database.

```
bosh -n -d manifest_two_postgresql_databases.yml deploy
bosh -n -d manifest_two_pgpools.yml deploy
```

Restore the cache service.

```
cd site-directory/services/cache
./deploy.sh
```

The Elasticsearch indices should be restored while you are still in the 10.3.1 deployment container. In that deployment container, run the following commands:

```
cd site-directory/services/cache
./deploy.sh
```

Restore the RabbitMQ service.

```
cd site-directory/services/rabbitmq_ha
./deploy.sh
```

Restart the applications.

```
sas deploy apps
```
Follow these steps to uninstall your software. The steps also apply to deployments that include disaster recovery software.

1. Check the current status.
   
   ```
   cd -
   sas show status
   ```

2. Remove the services and applications. If you deployed using disaster recovery, repeat these commands for the active and standby sites.
   
   ```
   sas site set site-name
   sas conf set site-configuration-file
   sas cf auth
   ./site-name/remove.sh
   ```

   **Note:** These commands will not remove any tenant-specific CAS servers. To remove tenant-specific CAS servers, also run the remove.sh script in each tenant CAS directory using the following command.
   
   ```
   ./site-name/tenants/tenant-name/cas/remove.sh
   ```

3. Verify that the environment is clean.
   
   ```
   sas show status
   ```

   If the results of this command show no BOSH deployments and no Cloud Foundry apps, then the environment is clean.

4. Remove all orphaned BOSH artifacts.
   
   ```
   bosh cleanup --all
   ```

5. Remove the log files. If you deployed using disaster recovery, repeat this command for the active and standby sites.
   
   ```
   sudo rm -f /log/cf-org/cf-space/label/*.txt
   ```

6. Exit the container.
   
   ```
   sas util exit
   ```

7. Ensure that the container has been removed.
   
   ```
   cd -
   sudo rm -rf sas
   ```
Delete any persistent data by removing any files under the `/postgres` and `/elasticsearch` directories.

```bash
sudo rm -rf /persistent-file-mount/postgres/names/*
sudo rm -rf /persistent-file-mount/elasticsearch/names/*
```

Note: Do not remove the directory `/names`, but instead remove the files in the directory. Removing the directory itself will cause future PostgreSQL and Elasticsearch deployments to fail.
Appendix A: Troubleshooting

**BOSH**

Virtual Machine Is Not Created

The most common problem with a BOSH deployment of a stateful service is the failure to create the Virtual Machine (VM). Generally, the solution is to remove the failed service and then to redeploy again. Follow the procedure:

- Change to the directory of the failed service.
- Run the remove.sh script in the directory to remove any traces of the deployment from the BOSH director.
- Run the deploy.sh script in the directory to redeploy the service.

During the attempted deployment, the RabbitMQ deployment fails and a message is displayed. Here is an example:

```plaintext
Error 400007: `rabbitmq/0 (8e792c02-47c5-495c-9c06-c7b7542bd775)' is not running after update.
Review logs for failed jobs: runrabbit
```

To determine the state of the deployment, run the following command:

```
bosh vms host-rabbitmq-deployment=ha
```

where `host` is the value of the label key in the configuration file. For this example, the test host is used.

After running the command, the output might look like this:

```
bosh vms test-rabbitmq-ha
RSA 1024 bit CA certificates are loaded due to old openssl compatibility
Acting as user 'admin' on deployment 'test-rabbitmq-ha' on 'test'
```

```
Director task 10206
Task 10206 done
```
No VMs

To clean up residual information in the Bosh director's database, change to the following directory:

```
cd services rabbitmq_ha
```

To ensure that you are in the correct directory, run the command:

```
pwd
```

**WARNINGS:**

- The `remove.sh` script uses options that prevent interaction. Therefore, the command continues processing.
- There is a `remove.sh` script in each of the directories. Make sure that you are in the correct directory or you might remove everything instead of just the deployment that failed. Each of the `remove.sh` scripts removes the service or the call for each of the `remove.sh` scripts in any subdirectories that are in the directory in which it resides. For example, if you are in the `services` directory, the `remove.sh` script removes all of the services. If you are in the `/home/sas` directory, the `remove.sh` script removes everything. If you are in the `/home/services/rabbitmq` directory, the `remove.sh` script removes only the RabbitMQ deployment.

In the `/home/services/rabbitmq` directory, run the command:

```
./remove.sh
```

Here is typical output:

```
RSA 1024 bit CA certificates are loaded due to old openssl compatibility
Acting as user 'admin' on deployment 'test-rabbitmq-deployment' on 'test'
You are going to delete deployment 'test-rabbitmq-deployment'.

THIS IS A VERY DESTRUCTIVE OPERATION AND IT CANNOT BE UNDONE!

Director task 40322
 Started deleting instances > rabbitmq/0 {43aab57f-b71c-419b-95c3-9b151cfc99a5}. Done (00:00:51)

 Started deleting properties
 Started deleting properties > Destroying deployment. Done (00:00:00)

Task 40322 done
```

```
Started 2016-01-01 00:49:34 UTC
Finished 2016-01-01 00:50:25 UTC
Duration 00:00:51

Deleted deployment `test-rabbitmq-deployment`
```

The warning message **THIS IS A VERY DESTRUCTIVE OPERATION AND IT CANNOT BE UNDONE!** is present for all BOSH delete deployment commands. There are flags in the `remove.sh` script that prevent interaction but the message is always displayed.

You must check these additional items in the manifest.yml file and the configuration JSON file:

- The watch time must be 30000-1800000 or higher.
- Canary watch time must be 30000-1800000 or higher.
- Increase the number of workers.

If only one VM failed in a set of deployments like ElasticSearch, it might not be desirable to remove the VMs and then redeploy them. In this situation, use the following command:
bosh delete deployment test-elasticsearch-deployment-client

In this case, you are prompted to continue with the deployment.

bosh delete deployment test-elasticsearch-deployment-client
RSA 1024 bit CA certificates are loaded due to old openssl compatibility
Acting as user 'admin' on deployment 'test-elasticsearch-deployment-client' on 'test'

You are going to delete deployment 'test-elasticsearch-deployment-client'.

THIS IS A VERY DESTRUCTIVE OPERATION AND IT CANNOT BE UNDONE!

Are you sure? (type 'yes' to continue):

Be sure to enter **yes**. BOSH continues with the deletion of the deployment.

If you enter **y** or any other character, the following message is displayed:

Canceled deleting deployment

**BOSH Deployment Fails to Remove a Canceled Deployment**

A deployment was started and then canceled using Ctrl+C in the terminal session in which the deployment was running. When canceled using the Ctrl+C, you can issue the command `bosh tasks` and then use the `bosh cancel task` command to cancel unwanted tasks. Further cleanup can be done by running a remove.sh script. An attempt to remove the canceled deployment using the remove.sh script might result in the following message:

```
./remove.sh
RSA 1024 bit CA certificates are loaded due to old openssl compatibility
Deployment set to '/home/sas/services/consul/manifest.yml'
RSA 1024 bit CA certificates are loaded due to old openssl compatibility
Acting as user 'admin' on deployment 'test-consul' on 'test'

You are going to delete deployment 'test-consul-deployment'.

THIS IS A VERY DESTRUCTIVE OPERATION AND IT CANNOT BE UNDONE!
```

Director task 49064

Error 100: Redis lock lock:deployment:test-consul-deployment is acquired by another thread

Task 49064 error

For a more detailed error report, run: bosh task 49064 --debug

Error 100 is caused by a lock in the director's Redis data store that prevents the removal of the deployment. To remove the deployment, wait approximately 10 minutes for the lock to clear and then run the remove.sh script again.
Cloud Foundry Run Time

UI Displays with No Tabs and No Access to the Administration UI

In this case, the initial problem is that the UI comes up but there are no tabs and no access to the Administrative UI.

To check the status of all of the components in Consul, run the following command;

```bash
sas show details
```

```text
pass cas-controller (Success)
pass cas-worker@192.168.5.141 (Success)
pass cas-worker@192.168.5.142 (Success)
pass consul_container (Agent alive and reachable)
pass elasticsearch (TCP connect 10.10.10.05:9200: Success. ElasticSearch cluster green.)
pass postgres (Success)
pass rabbitmq (Success)
```

App Status

```text
pass audit (UP)
pass authorization (UP)
pass casManagement (UP)
pass datahub (UP)
pass entityResolution (UP)
pass feature (UP)
pass files (UP)
pass identities (UP)
pass networkAnalytics (UP)
pass SASLogon (UP)
pass SASVisualInvestigator (UP)
pass svi-ai (UP)
warn svi-alert (DOWN)
pass svi-core (UP)
pass svi-sand (UP)
pass svi-transport (UP)
```

This displays svi-alert as a warn and the status would be (DOWN).

Most problems in the run-time deployments are linked to failures in the BOSH services. If only one service is failing (such as the svi-alert service), check the log for that service by running the command:

```bash
cf logs <host>-svi-alert --recent
```

Where host is the value of the label key in the configuration file. For our example, the test host is used.

```bash
cf logs test-svi-alert --recent
```

This displays the log data that is in the Loggregator buffer. If a store and display log service is set up, then you can use that to see the log data. When reviewing the log, you might see error messages that look like this:

```text
c.s.f.t.c.h.DatahubHealthIndicator : anonymousUser [27fa5841-1091-4d28-9faa-916782e21e22]
Datahub error: stored object not created
```

This points to a problem in the svi-datahub application. Examining the svi-datahub log, the following is displayed:
The key is the Access is denied message and the pointer to the feature service svi-feature. Examining the svi-feature log, you see the following error:

This main problem is that the CAS server cannot find the license file, which is preventing both CAS and SAS Visual Investigator from being operational.

To fix this problem, correct the nfs_mounts section of the JSON configuration file. The incorrect mount point for the license file had been entered so that you need to reenter the mount point.

Here was the original entry:

```
"cas_controller": [
  {
    # Description:
    #   The mount that specifies the location of the SAS license file.
    #   Notes: One mandatory mount point for the SAS license file is required.
    #         The entry in the fs_file value MUST be "/opt/cas/license".
    #         This is required in order for CAS to locate the SAS license file.
    #         The file must be renamed to setin90.sas.
    "fs_spec": "test.some.server.com:/files/license",
    "fs_file": "/opt/cas/cloud"
  },
],
```

The new entry would look like this:

```
"cas_controller": [
  {
    # Description:
    #   The mount that specifies the location of the SAS license file.
    #   Notes: One mandatory mount point for the SAS license file is required.
    #         The entry in the fs_file value MUST be "/opt/cas/license".
    #         This is required in order for CAS to locate the SAS license file.
    #         The file must be renamed to setin90.sas.
    "fs_spec": "test.some.server.com:/files/license",
    "fs_file": "/opt/cas/license"
  },
],
```

Once the network file system mount is corrected, check the application status and verify that all of the applications are up and running before continuing the deployment process.

**Tenant State Has Not Changed to Onboarded**

The following message might be displayed during onboarding.

```
Tenant your-tenant-name's state is ...onboarding.............
```
To onboard the client:

1. Run the following command to restart datahub:
   ```
cf restart xx-svi-datahub
   ```

2. (Optional) Ensure that the tenant has been initialized:
   ```
cd ~/tenants/
your-tenant-name
scripts/bin/tenant ./add-tenant-admin.sh -p cf -t your-tenant-name
   ```

3. Load the users:
   ```
   -Note: The users are not LDAP users.
   
   cd ~/tenants/
your-tenant-name
scripts/bin/tenant ./add-users-cf.sh -p cf -t your-tenant-name
   ```

   If all processes are complete without errors, you can load the user management spreadsheet.

**svi-feature and svi-network-analytics Fail to Start**

Check to ensure that the license is read.

1. Change to the directory for the CAS license controller:
   ```
cd ~/services/cas
   ```

2. Run the following commands:
   ```
bosh deployment manifest-controller.yml
bosh ssh
   ```

3. Change to the `/tmp` directory.
   ```
cd /tmp
   ```

4. Run the `cat` command on the `init.info` file:
   ```
cat init.info
   ```

   To locate an error with the NFS mount for the CAS license, search for the phrase "Mounting NFS...".

5. On the BOSH virtual machine, change to the `/opt/cas/license` directory.
   ```
cd /opt/cas/license
   ```

   If the license file is present, check the expiration date to determine whether it has expired.

**Destroy Tenant Command Fails on Drop of the Database**

Run the following SQL code using the pgadmin tool, or submit the following SQL using the psql script.

```sql
REVOKE CONNECT ON DATABASE tenant_name FROM PUBLIC, dbmsowner;
SELECT
    pg_terminate_backend(pid)
FROM
    pg_stat_activity
WHERE
    -- don't kill my own connection!
    pid <> pg_backend_pid()
    -- don't kill the connections to other databases
    AND datname = 'tenant_name';
```