JUNIPER NETWORKS | Engineering Simplicity

Juniper Apstra Installation and Upgrade Guide

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Apstra Installation

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Installation Requirements

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Installation Overview

Before installing Juniper Apstra software, refer to the following sections and ensure that the server where you'll install it meets requirements. Then you can install and configure Apstra on one of the supported hypervisors. Default passwords are not secure, so make sure to replace them with secure ones during configuration. We know how important complex passwords are, so as of Apstra version 4.1.2 we've made it a requirement to change default passwords with more complex ones than previous versions. We also recommend replacing the self-signed SSL certificate with a signed one from your own

certificate authority so your environment is more secure. Keep reading for installation and configuration steps.

Supported Hypervisors and Versions

Table 1: Supported Hypervisors

Hypervisor	Supported Versions
VMware ESXi	7.0, 6.7, 6.5, 6.0, 5.5
QEMU / KVM for Ubuntu	22.04 LTS, 18.04 LTS
Microsoft Hyper-V	Windows Server 2016 Datacenter Edition
Oracle VirtualBox / VMware Workstation	For lab / evaluation purposes only

Required Server Resources

Apstra server VM resource requirements are based on the size of the network (blueprint), the scaling of offbox agents and the use of Intent Based Analytics (IBA). If one VM is insufficient for your needs, you can increase capacity by adding worker nodes with Apstra VM Clusters.

CAUTION: Although Apstra server VMs might run with fewer resources than recommended, depending on the size of the network, the CPU and RAM allocations may be insufficient. The system could encounter errors or a critical "segmentation fault" (core dump). If this happens, delete the VM and redeploy it with additional resources.

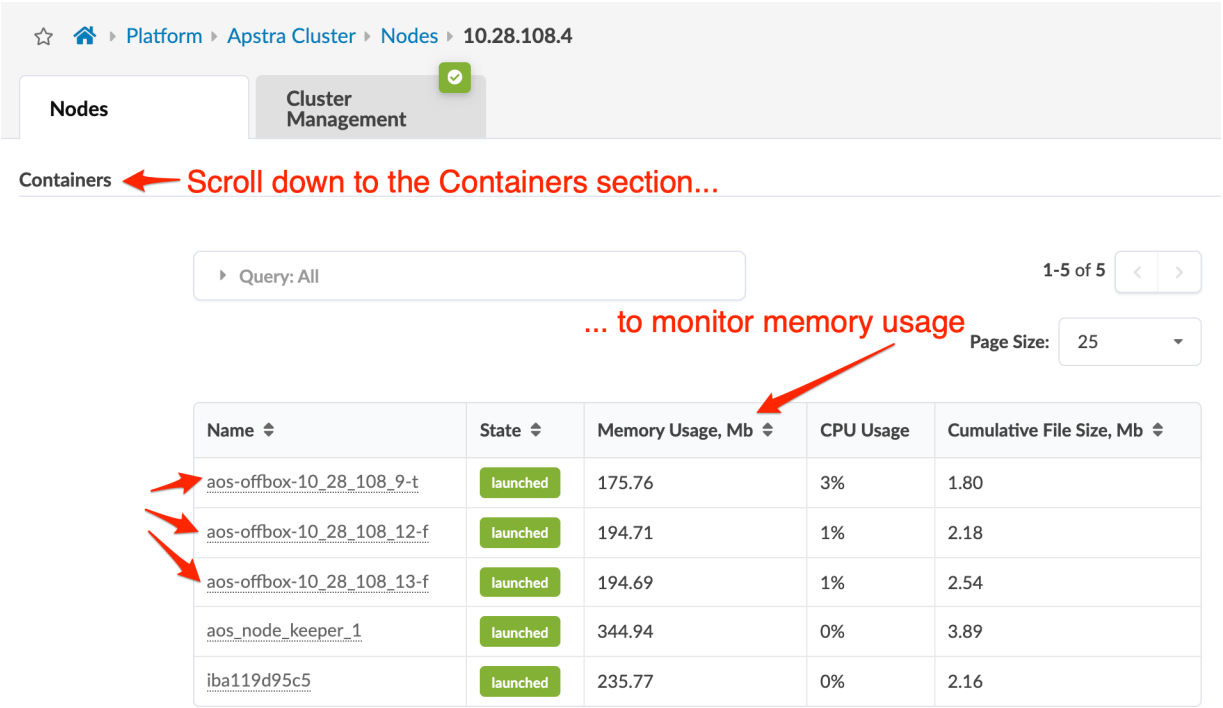
Table 2: Recommended VM Resources

Resource	Recommendation
Memory	64 GB RAM + 500 MB per installed offbox agent*
CPU	8 vCPU
Disk	160 GB**
Network	1 network adapter, initially configured with DHCP

* Container memory usage is dependent on the number of IBA collectors enabled. At a minimum, you'll need to change the application weight for Juniper offbox agents after installation is complete and you're in the Apstra environment.

** Apstra images ship with an 80 GB disk by default. As of Apstra version 4.1.2, ESXi images ship with a second "empty" disk. On first boot, Apstra automatically runs `aos_extend_disk`, and if space is available, it extends `/(root)`, `/var`, `/var/log`, and `/var/log/aos/db` to the new disk. (Shipping with an 80 GB disk instead of 160 GB keeps the image size reasonable.)

If you deploy Linux KVM QCOW2 or Microsoft Hyper-V VHDX, the second disk isn't included so the default is 80 GB. You can manually add an additional disk. Run aos_extend_disk yourself to extend `/(root)`, `/var`, `/var/log`, and `/var/log/aos/db` to the new disk. For more information, see Juniper Support Knowledge Base article KB37699.



Required Communication Ports

Open ports and services that run on the Apstra server are listed in the table below.

Apstra requires a minimum of eight (8) SSH connections, two (2) SSH max-sessions-per-connection, and twenty (20) SSH rate-limit (maximum number of connection attempts per minute).

A running iptables instance ensures that network traffic to and from the Apstra server is restricted to the services listed.

Table 3: Apstra Server Network Protocol Requirements

Source	Destination	Protocol	Description
User workstation	Apstra Server	tcp/22 (ssh)	CLI access to Apstra server
User workstation	Apstra Server	tcp/80 (http)	Redirects to tcp/443 (https)
User workstation	Apstra Server	tcp/443 (https)	GUI and REST API
Network Device for device agents	Apstra Server	tcp/80 (http)	Redirects to tcp/443 (https)
Network Device or Off-box Agent	Apstra Server	tcp/443 (https)	Device agent installation and upgrade, Rest API
Network Device or Off-box Agent	Apstra Server	tcp/29730-29739	Agent binary protocol (Sysdb)
ZTP Server	Apstra Server	tcp/443 (https)	Rest API for Device System Agent Install
Apstra Server	Network Devices	tcp/22 (ssh)	Device agent installation and upgrade
Off-box Agent	Network Devices	tcp/443 (https) tcp/9443 (nxapi) tcp/830 (for Junos)	Management from Off-box Agent

Additional Network Protocols

The network protocols in the table below are not required for Apstra server functionality, but they may be required for network device configuration and discovery, and for direct access to devices.

Table 4: Additional Network Protocols

Source	Destination	Protocol	Description
Administrator	Network Device	tcp/22 (ssh)	Device management from Administrator
Network Device	DNS Server	udp/53 (dns)	DNS Discovery for Apstra server IP (if applicable)

Table 4: Additional Network Protocols *(Continued)*

Source	Destination	Protocol	Description
Network Device	DHCP Server	udp/67-68 (dhcp)	DHCP for automatic management IP (if applicable)
		(icmp type 0, type 8 for echo and response	As necessary for network troubleshooting. Not required for the Apstra server.

Network Client Services

Use and configuration of the Apstra server determine the number of network client services that must be enabled.

Table 5: Apstra server Network Client Services

Source	Destination	Protocol	Description
Apstra Server	DNS Server	udp/53 (dns)	Server DNS Client
Apstra Server	LDAP Server	tcp/389 (ldap) tcp/636 (ldaps)	Apstra Server LDAP Client (if configured)
Apstra Server	TACACS+ Server	tcp/udp/49 (tacacs)	Apstra Server TACACS+ Client (if configured)
Apstra Server	RADIUS Server	tcp/udp/1812 (radius)	Apstra Server RADIUS Client (if configured)
Apstra Server	Syslog Server	udp/514 (syslog)	Apstra Server Syslog Client (if configured)

Install Apstra on ESXi

These instructions are for *installing Apstra software* on an ESXi hypervisor. For information about using ESXi in general, refer to VMware's ESXi documentation.

1. Confirm that you're running one of the "Supported Hypervisors and Versions" on page 2 and that the VM has the "Required Server Resources" on page 2.
2. Apstra software is delivered pre-installed on a single VM. The same Apstra VM image is used for installing both the Apstra controller and Apstra workers. As a registered support user, download the **Apstra VM Image for VMware ESXi** (OVA) from Juniper Support Downloads.

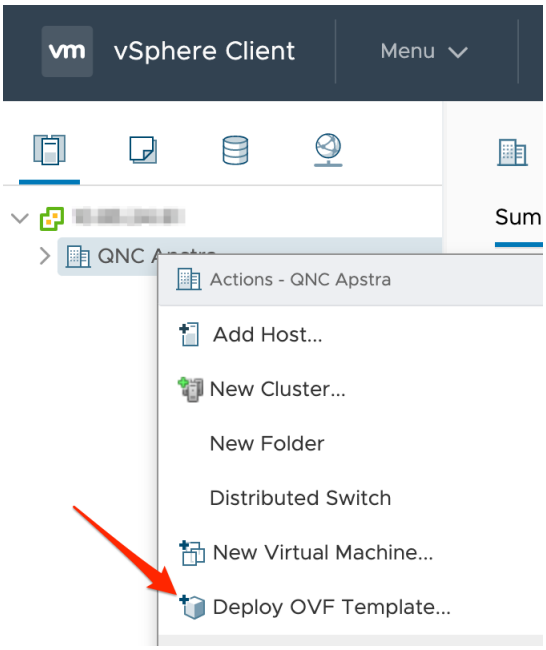
To download the image on your localhost, CLICK HERE

To download the image directly on your device, use the following URL:

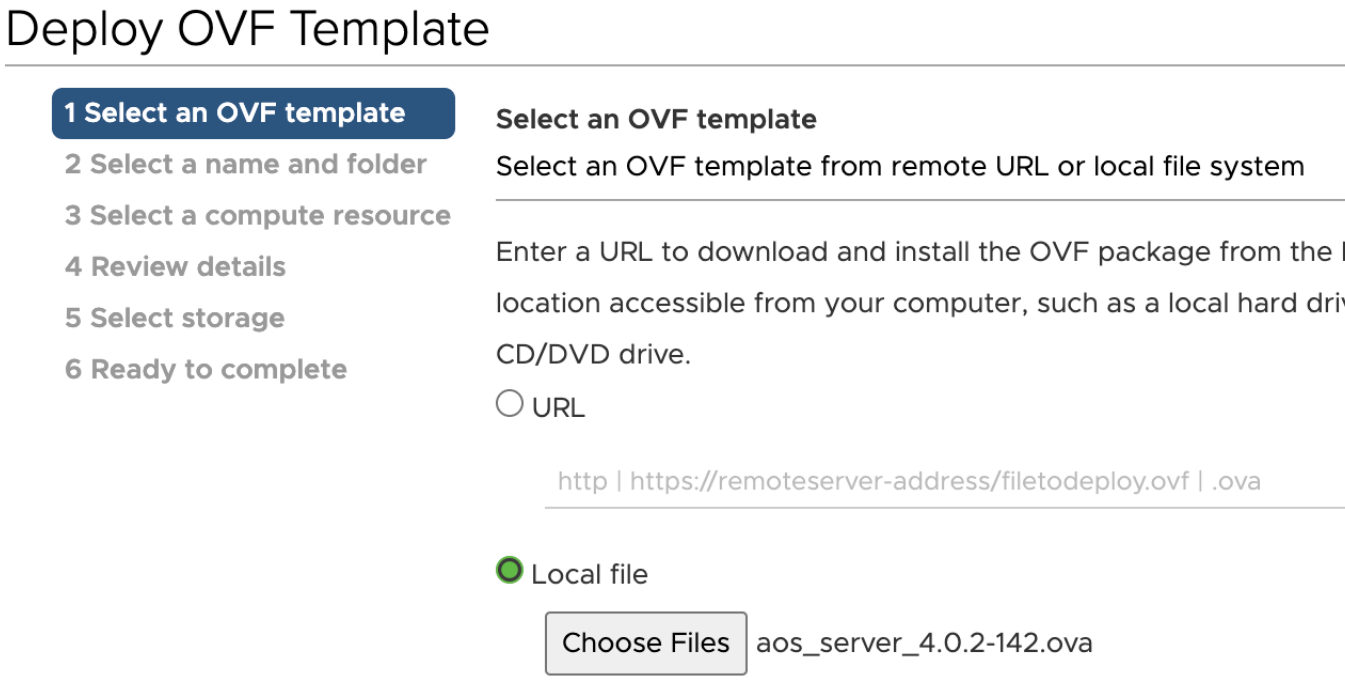
https://cdn.juniper.net/software/jafc/4.0.2/aos_server_4.0.2-142.ova?

copy

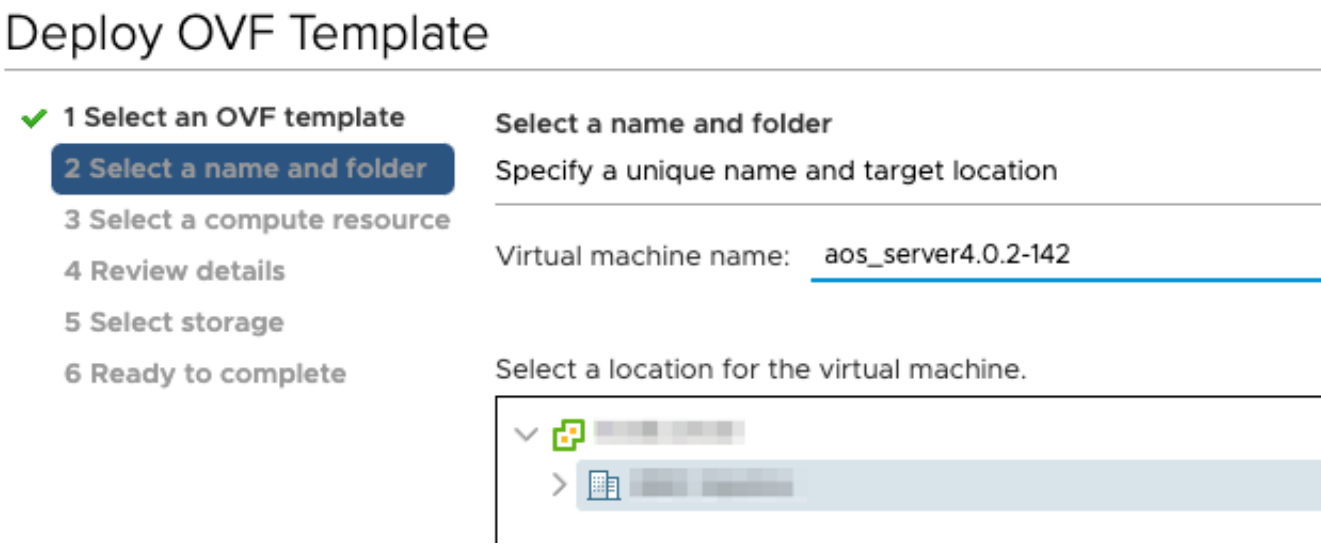
3. Log in to vCenter, right-click your target deployment environment, then click **Deploy OVF Template**.



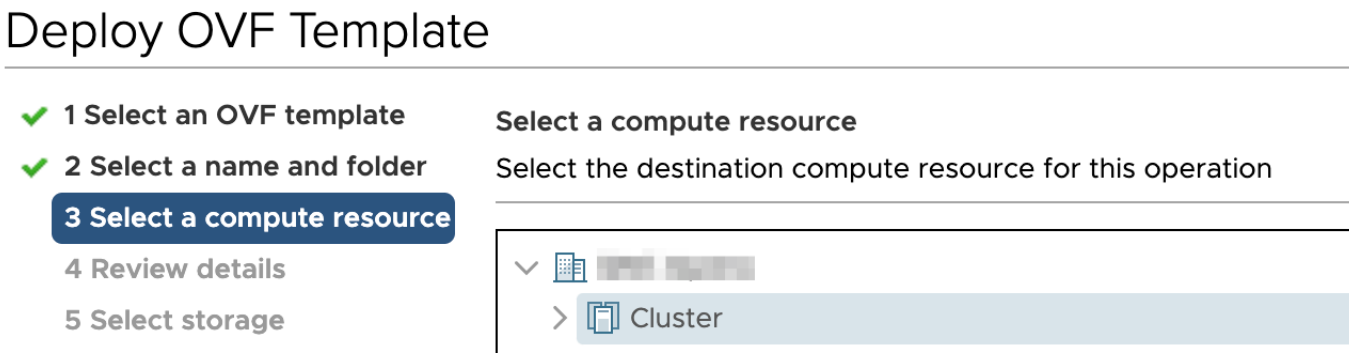
4. Specify the URL or local file location for the OVA file you downloaded, then click **Next**.



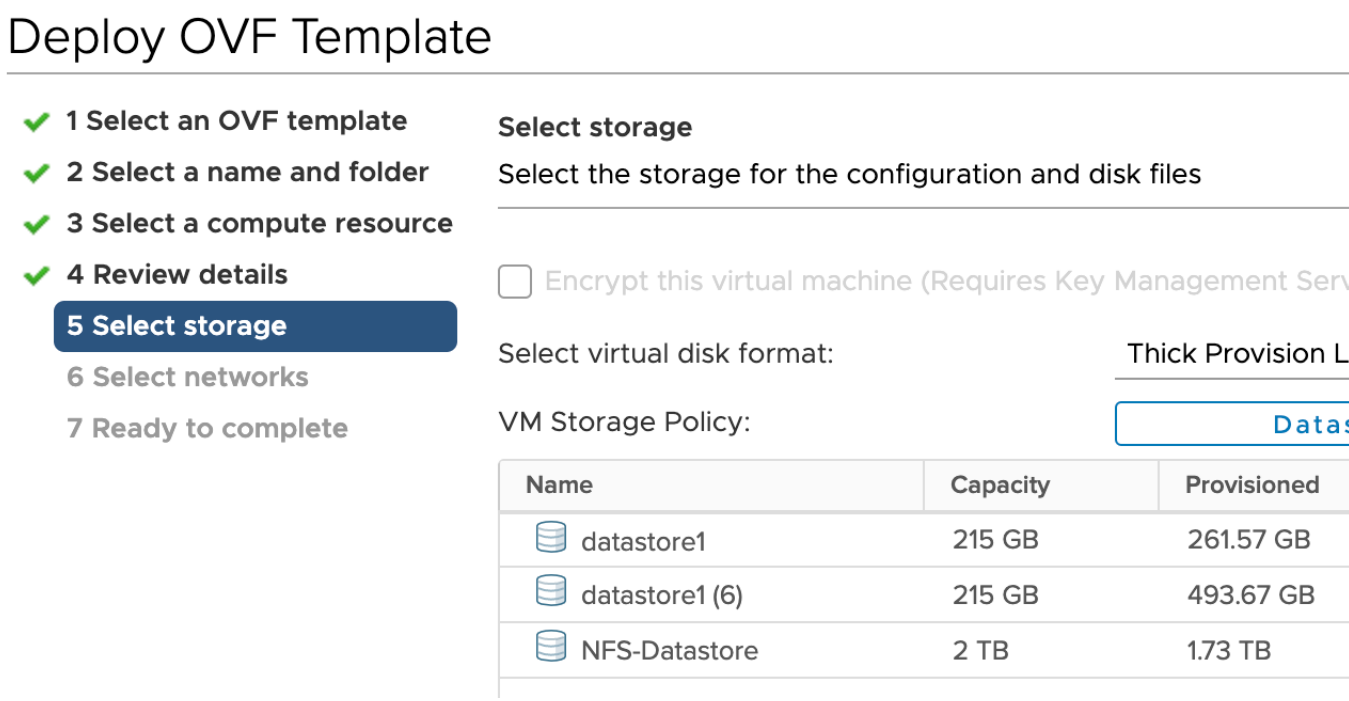
5. Specify a unique name and target location for the VM, then click **Next**.



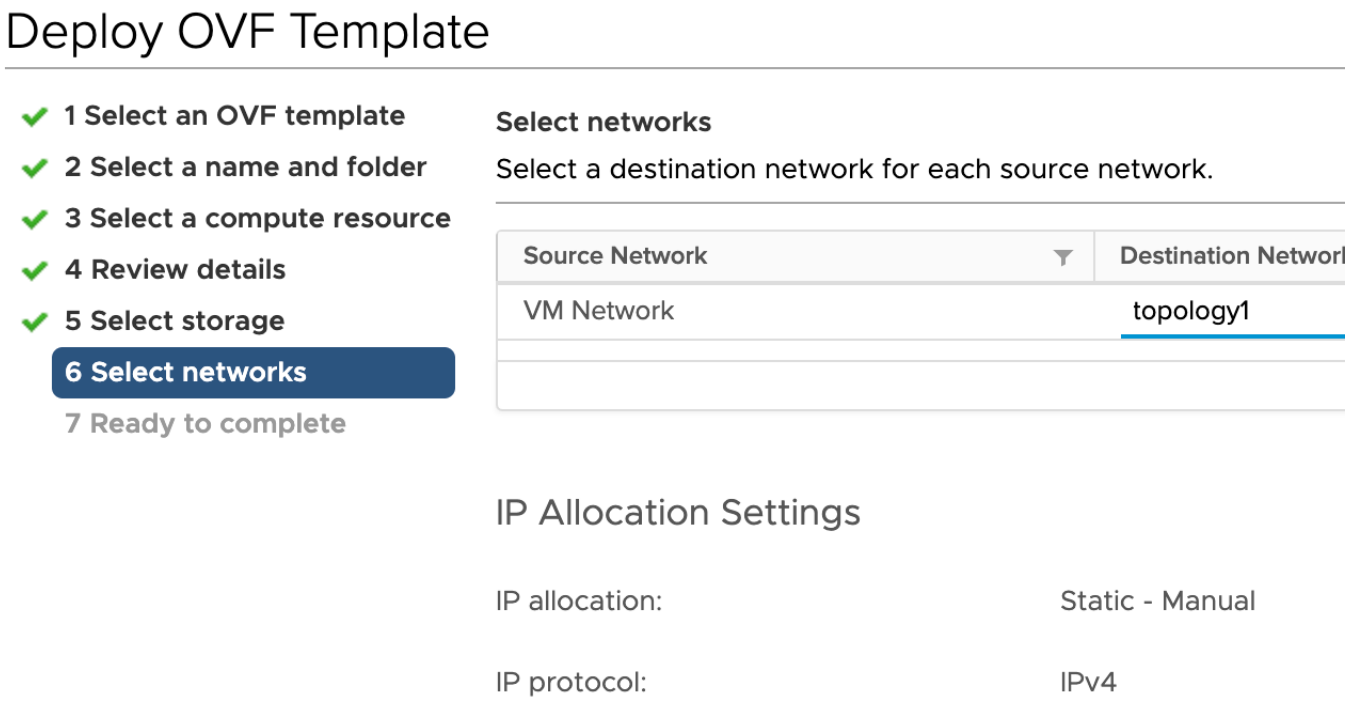
6. Select your destination compute resource, then click **Next**.



7. Review template details, then click **Next**.
8. Select storage for the files, then click **Next**. We recommend thick provisioning for the Apstra server.



9. Map the Apstra Management network to enable it to reach the virtual networks that the Apstra server will manage on ESXi, then click **Next**.



10. Review your specifications, then click **Finish**.

You're ready to "Configure" on page 20 the Apstra server.

Install Apstra on KVM

SUMMARY

You can install KVM with **Virtual Machine Manager** or with the CLI.

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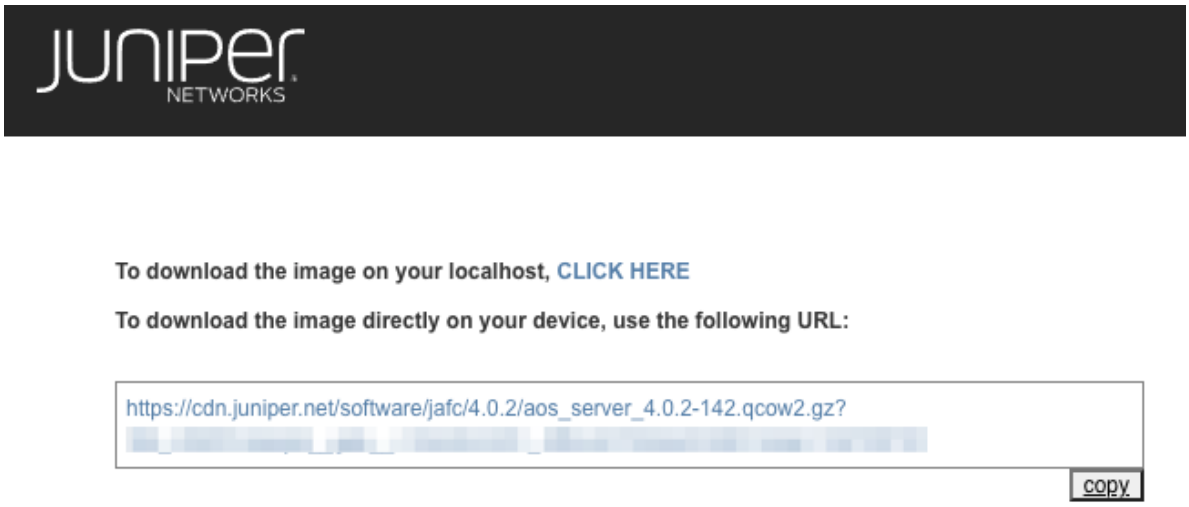
- Install on KVM with Virtual Machine Manager | 9
- Install on KVM with CLI | 13

These instructions are for *installing Apstra software* on a KVM hypervisor. For information about using KVM in general, refer to Linux KVM documentation.

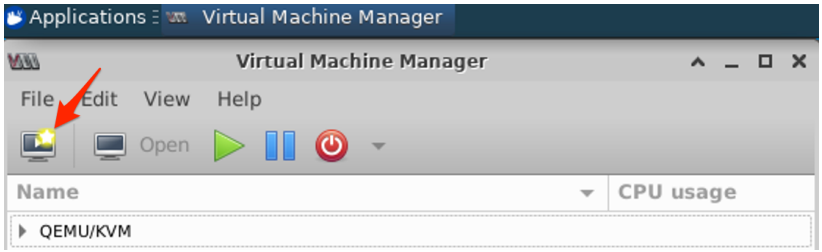
Install on KVM with Virtual Machine Manager

1. Confirm that you're running one of the "Supported Hypervisors and Versions" on page 2 and that the VM has the "Required Server Resources" on page 2.

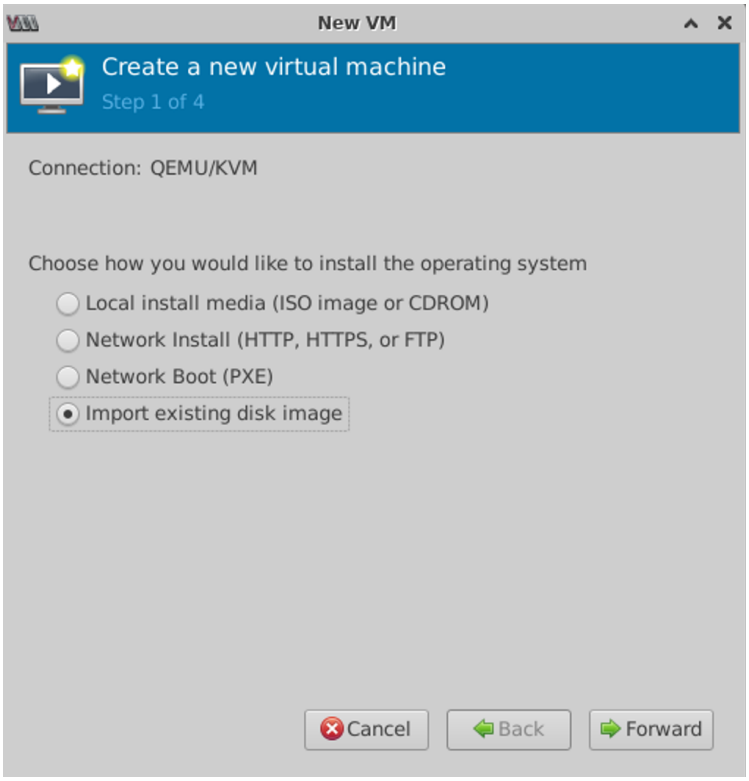
2. Apstra software is delivered pre-installed on a single VM. The same Apstra VM image is used for installing both the Apstra controller and Apstra workers. As a registered support user, download the **Apstra VM Image for Linux KVM** (QCOW2) from Juniper Support Downloads.



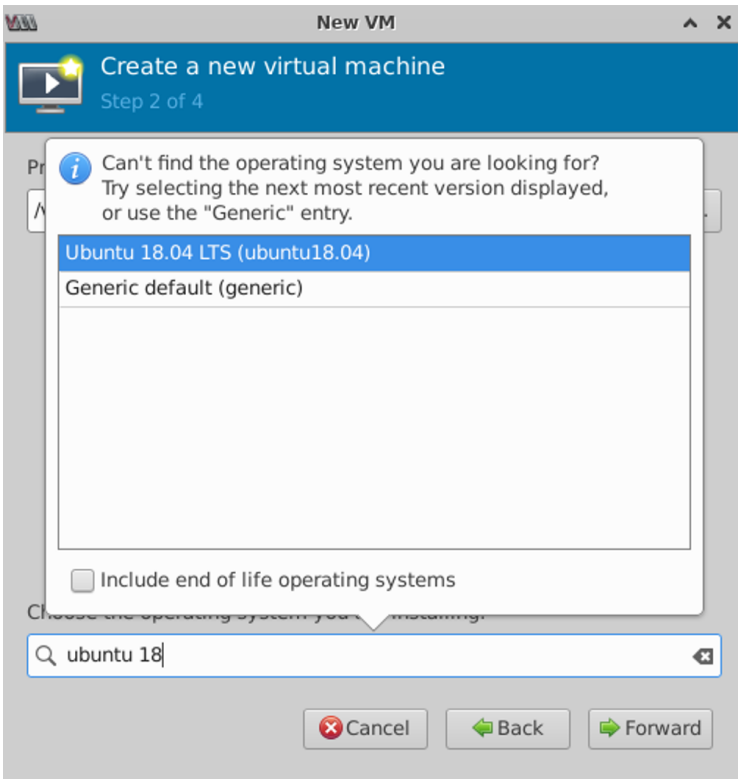
3. Uncompress the disk image, then move it to where it will run.
4. Start **Virtual Machine Manager**, then click the **Create a new virtual machine** button.



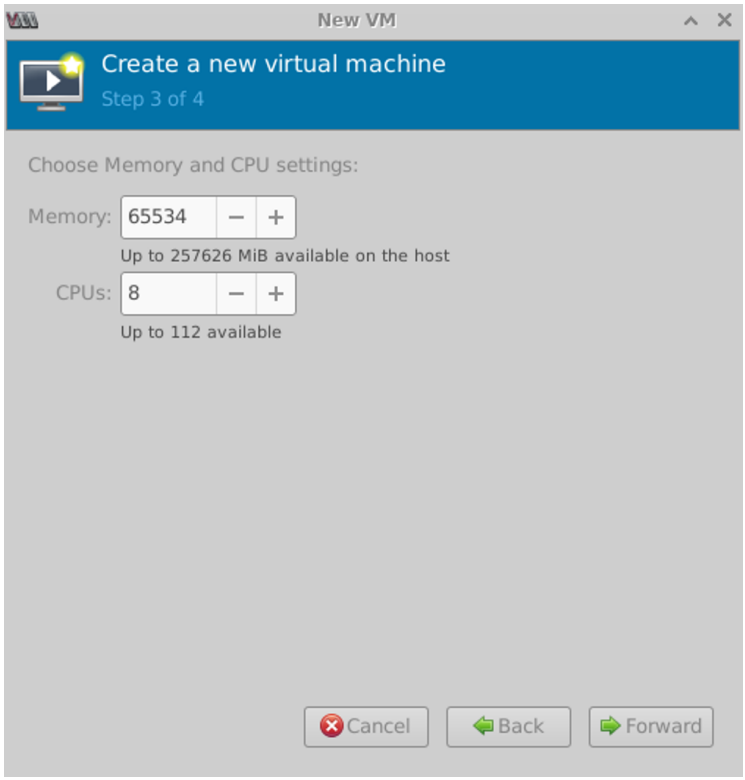
5. Select **Import existing disk image**, then click **Forward**.



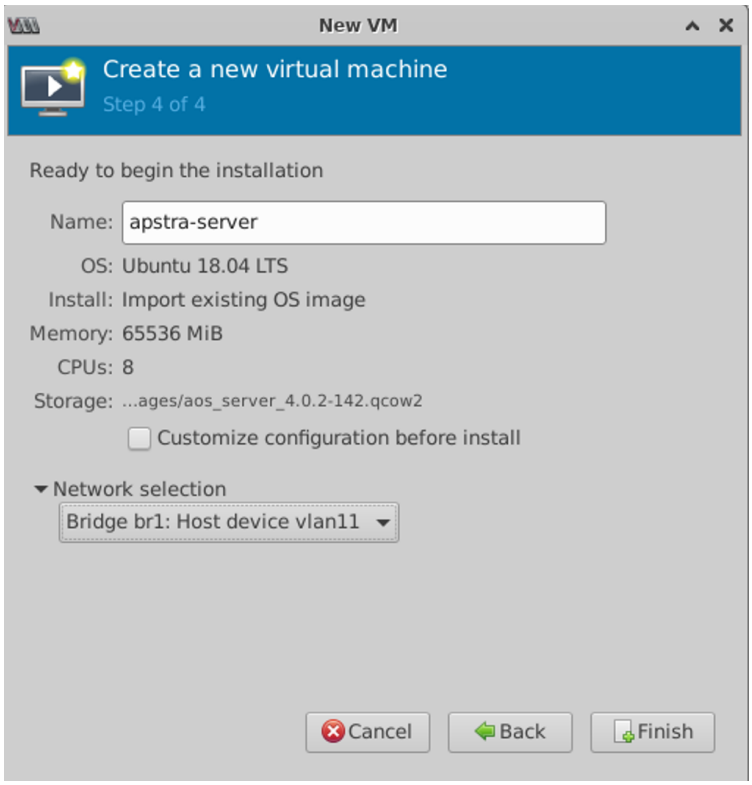
6. Browse to where you moved the QCOW2 image, then click **Choose Volume**.
7. Select **Ubuntu 18.04 LTS** operating system, then click **Forward**.



8. Specify memory and CPU requirements based on your environment.



9. Change the default name (optional), select the VM network that you want the VM to connect to, then click **Finish**. It may take a few minutes to create the VM.



You're ready to "Configure" on page 20 the Apstra server.

Install on KVM with CLI

1. Confirm that you're running one of the "Supported Hypervisors and Versions" on page 2 and that the VM has the "Required Server Resources" on page 2.
2. Ensure that the QEMU environment and bridge networking are installed and configured. For examples of installing and configuring QEMU, refer to the following documents:
   - Ubuntu - https://help.ubuntu.com/community/KVM/Installation
   - RHEL - https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/7/html/virtualization_deployment_and_administration_guide/index
3. You must use `e1000` or `virtio` Linux KVM network drivers. Run the command `ethtool -i eth0` from the Apstra server to confirm which network drivers you're using.

```
admin@aos-server:~$ ethtool -i eth0
driver: virtio_net
version: 1.0.0
firmware-version:
expansion-rom-version:
bus-info: 0000:00:03.0
supports-statistics: no
supports-test: no
supports-eeprom-access: no
supports-register-dump: no
supports-priv-flags: no
admin@aos-server:~$
```

CAUTION: Using other drivers such as `rtl8139` may result in high CPU utilization for the `ksoftirqd` process.

4. As a registered support user, download the **Apstra VM Image for Linux KVM** (QCOW2) from Juniper Support Downloads.
5. Uncompress the disk image (with **gunzip**) and move it to where it will run.

```
ubuntu@ubuntu:~$ ls -l
total 1873748
-rw-r--r-- 1 ubuntu ubuntu 1918712115 Feb  4 22:28 aos_server_4.0.2-142.qcow2.gz
ubuntu@ubuntu:~$ gunzip aos_server_4.0.2-142.qcow2.gz
```

```
ubuntu@ubuntu:~$ ls -l
total 1905684
-rw-r--r-- 1 ubuntu ubuntu 1951413760 Feb  4 22:28 aos_server_4.0.2-142.qcow2.gz
ubuntu@ubuntu:~$
```

6. Create a VM with the `virt-install` command line tool. For example, to install the `aos_server_4.0.2-142.qcow2.gz` image using the existing bridge network (named br0), use the following command:

```
ubuntu@ubuntu:~$ sudo virt-install --name=aos-server --disk=aos_server_4.0.2-142.qcow2 --os-
type=linux --os-variant ubuntu18.04 --import --noautoconsole --vcpu=8 --ram=65536 --network
bridge=br0,model=virtio

Starting install...
Domain creation completed.
ubuntu@ubuntu:~$ sudo virsh list
 Id    Name                           State
----------------------------------------------------
 4     aos-server                     running

ubuntu@ubuntu:~$
```

7. Connect to the VM console.

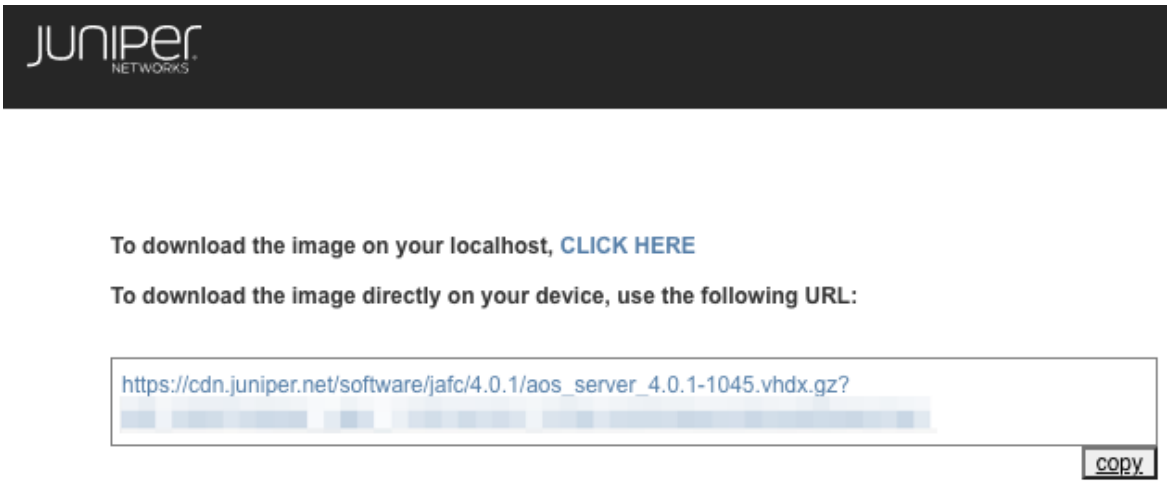
```
ubuntu@ubuntu:~$ sudo virsh console aos-server
Connected to domain aos-server
Escape character is ^]

Apstra Operating System (AOS)

aos-server login:
```

You're ready to "Configure" on page 20 the Apstra server.

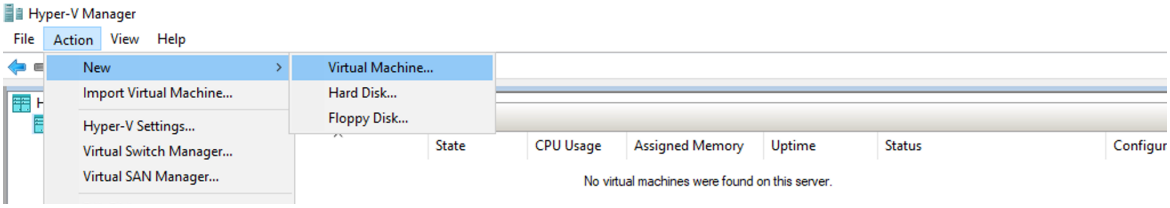
Install Apstra on Hyper-V

These instructions are for *installing Apstra software* on a Microsoft Hyper-V hypervisor using Hyper-V Manager on a Windows Server 2016 Datacenter Edition. For information about using Hyper-V in general, refer to Microsoft's Hyper-V documentation.

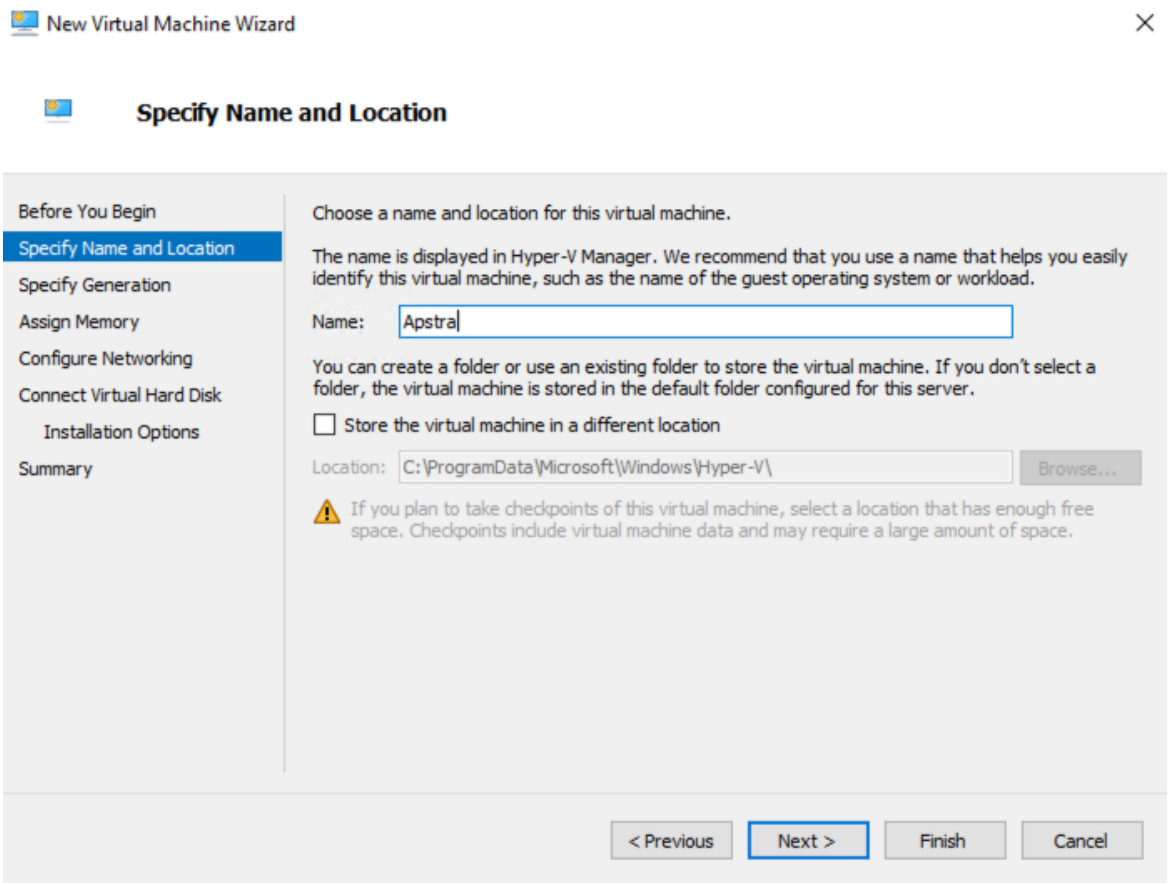
1. Confirm that you're running one of the "Supported Hypervisors and Versions" on page 2 and that the VM has the "Required Server Resources" on page 2.
2. Apstra software is delivered pre-installed on a single VM. The same Apstra VM image is used for installing both the Apstra controller and Apstra workers. As a registered support user, download the **Apstra VM VHDX Image for Microsoft Hyper-V** from Juniper Support Downloads.



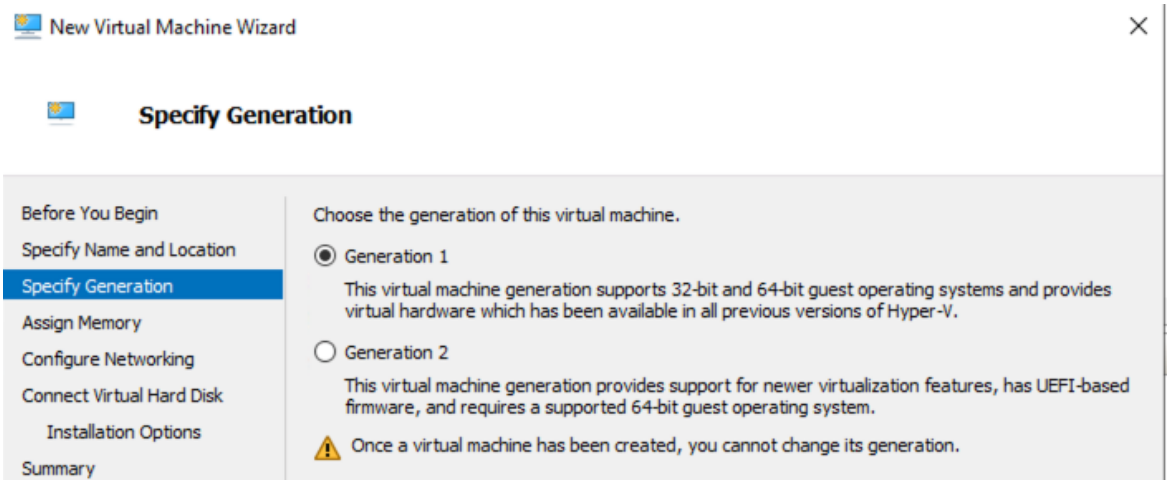
3. Uncompress the disk image and move it to where it will run.
4. Start Hyper-V Manager, select the server for the VM and navigate to **Actions > New > Virtual Machine**. The **New Virtual Machine Wizard** opens.



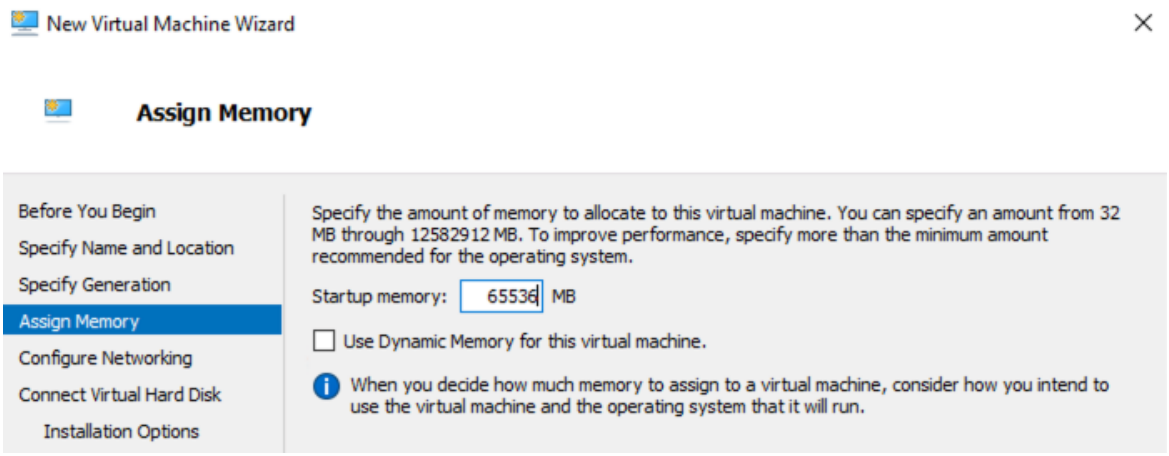
5. Specify a VM name and location, then click **Next**.



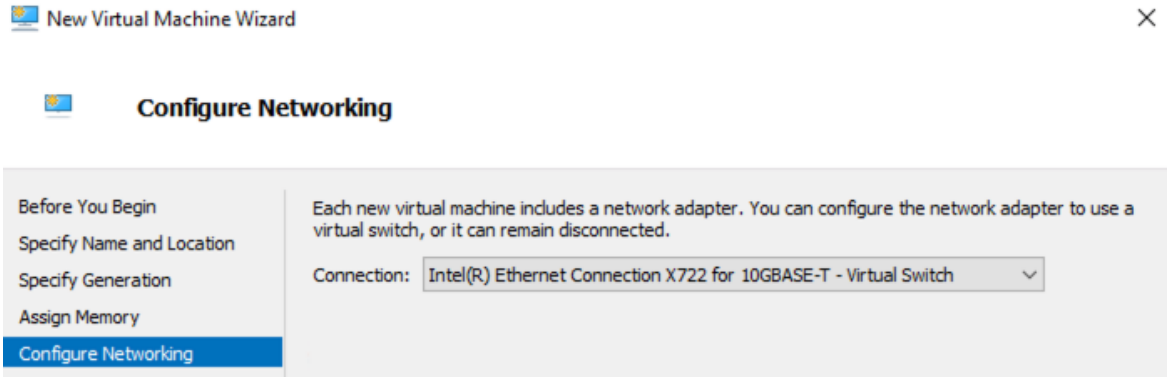
6. Specify **Generation 1**, then click **Next**.



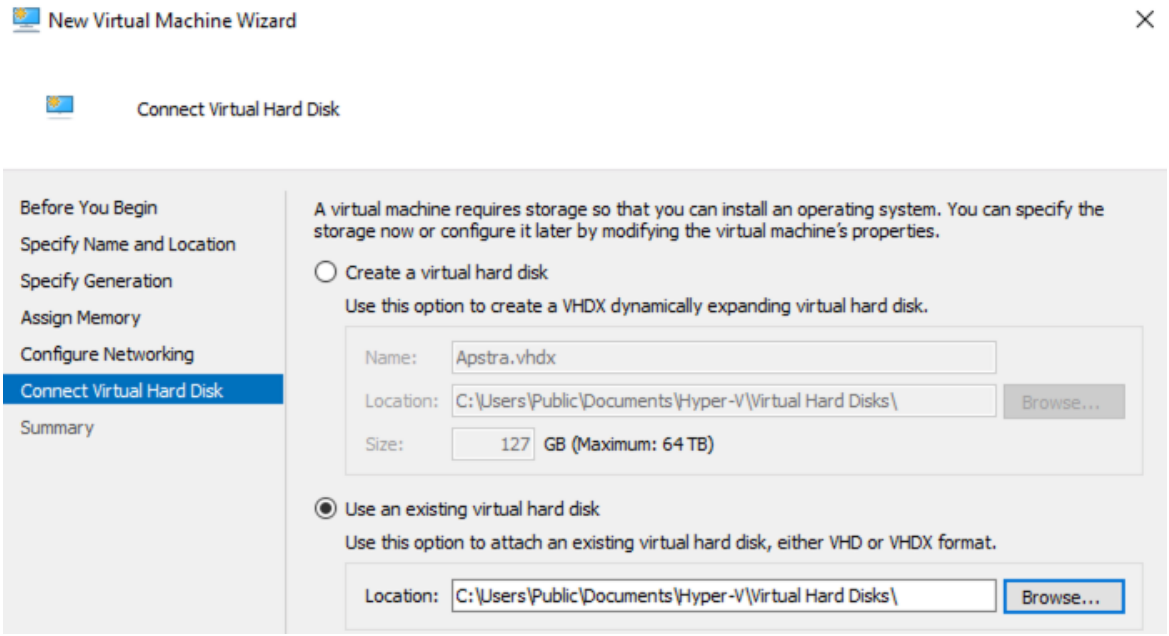
7. Specify required memory based on your environment, then click **Next**.



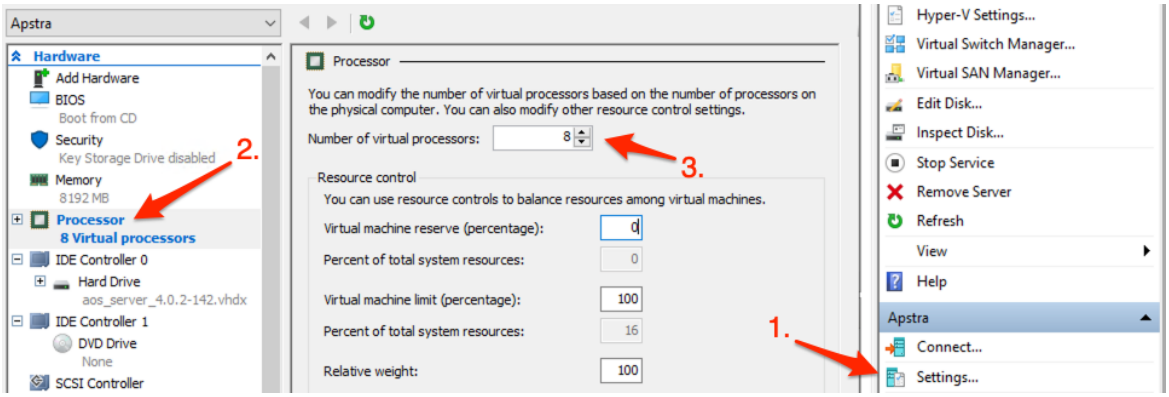
8. Configure the virtual switch as required for your deployment environment, then click **Next**.



9. Select **Use an existing virtual hard disk** and browse to the extracted file, then click **Finish**.



10. Click **Settings** (right panel), click **Processor** (left panel), specify the number of virtual processors based on required VM resources, then click **OK**.

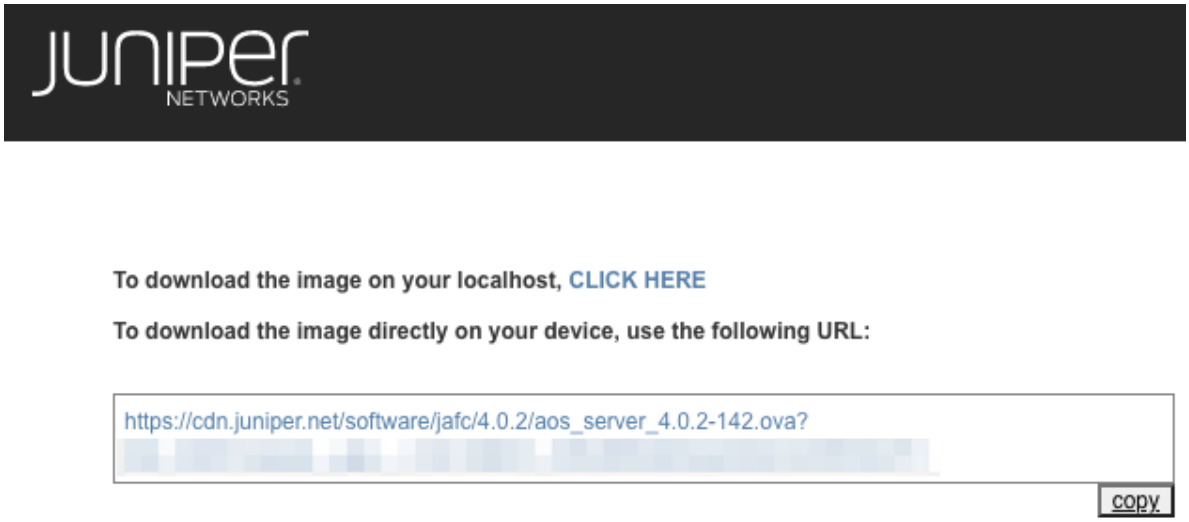


You're ready to "Configure" on page 20 the Apstra server. (When the Apstra server is configured, the Docker daemon runs properly.)

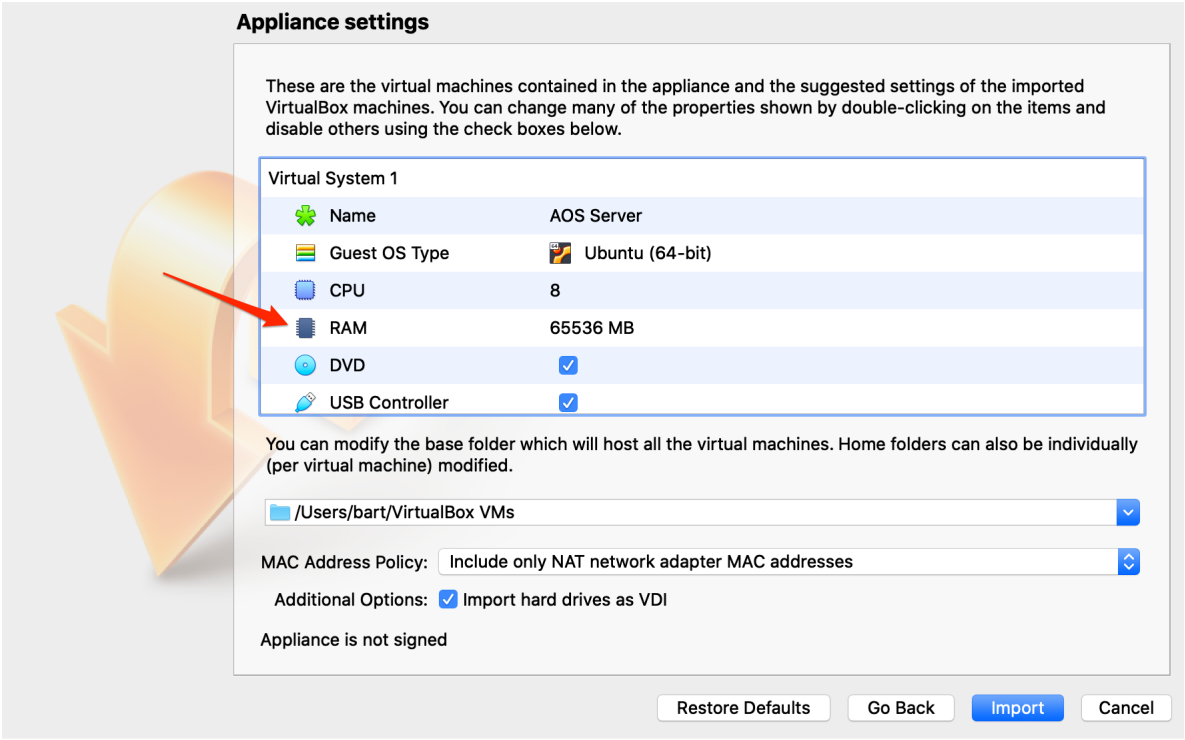
Install Apstra on VirtualBox

VirtualBox is for demonstration and lab purposes only. Production environments require a proper enterprise-scale virtualization solution (See "Supported Hypervisors and Versions" on page 2). These instructions are for *installing Apstra software* on a VirtualBox hypervisor. For information about using VirtualBox in general, refer to Oracle's VirtualBox documentation or the open-source community.

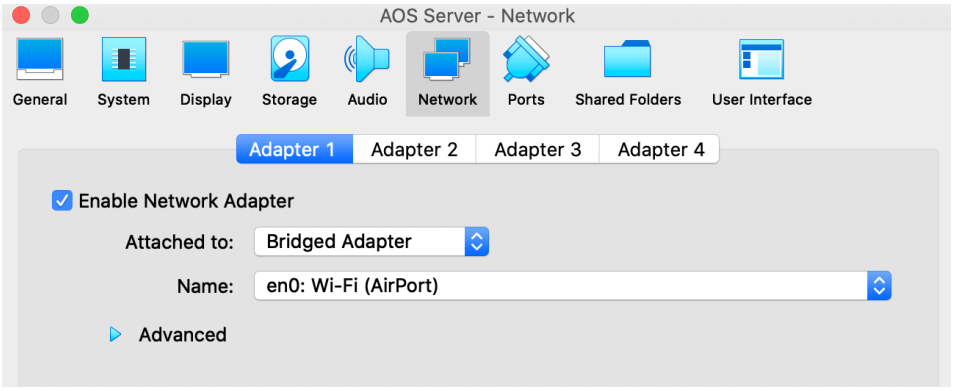
1. Apstra software is delivered pre-installed on a single virtual machine (VM). As a registered support user, download the **Apstra VM Image for VMware ESXi** (OVA) from Juniper Support Downloads to your local workstation.



2. Start VirtualBox, select **File > Import Appliance**, navigate to the OVA file, select it, then click **Continue**.
3. Change **RAM** to 8 GB. 8 GB is sufficient for lab and testing purposes.



4. Click **Import** to start the import process.
5. When the import is complete, start the server VM, click **Settings** and confirm that the VM meets requirements. In particular, check network settings for the adapter that's attached to your management network. If this value is not set correctly, the Apstra server does not receive an IP address. Since VirtualBox has one network adapter attached to the bridged adapter using active networking, full connectivity from your workstation to the VM (HTTP, SSH) is expected by default.



6. "Configure" on page 20 the Apstra server.
7. Confirm connectivity. (Run `ifconfig -a` on the VM to get the IP address.)
   - SSH from your workstation to the VM's active network adapter IP address.
   - Point a web browser to the VM's active network adapter IP address.

Configure Apstra Server

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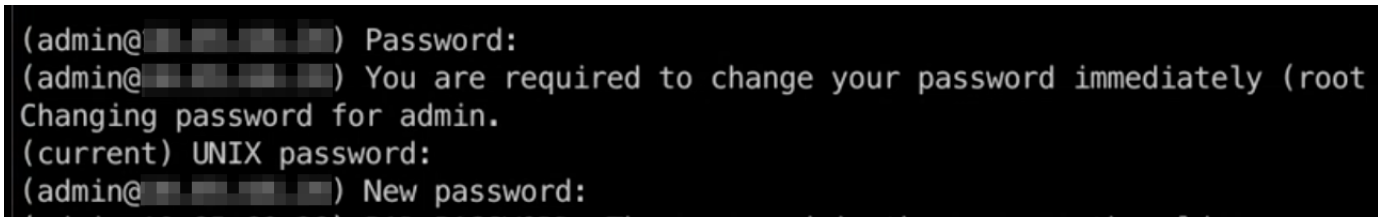
- Configure Apstra 4.1.2 | 20
- Configure 4.1.1 or 4.1.0 | 23
- Configure Apstra Server Static Management IP Address | 25
- Change Apstra Server Hostname | 25
- Configure Apstra Docker Subnets | 26
- Replace SSL Certificate | 27

Configuration requirements are different for 4.1.2 and 4.1.1 or 4.1.0. Follow the steps for your Apstra version.

Configure Apstra 4.1.2

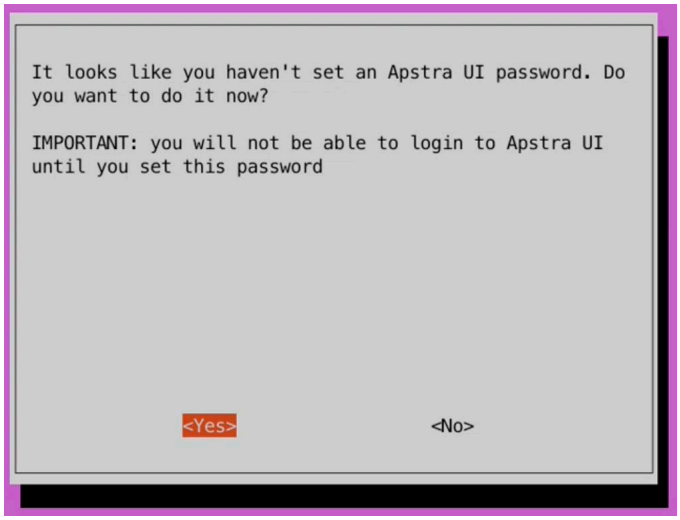
1. Log in to the Apstra server with the default credentials (user: **admin**, password: **admin**) either from the web console or via SSH (`ssh admin@<apstra-server-ip>` where `<apstra-server-ip>` is the IP address of the Apstra server.) You must change the default password before you can proceed.



2. Enter a password that meets the following complexity requirements, then enter it again:
   - Must contain at least 14 characters
   - Must contain an uppercase letter
   - Must contain a lowercase letter
   - Must contain a digit
   - Must contain a special character
   - Must NOT be the same as the username
   - Must NOT contain a repeat of the same character

- Must NOT contain consecutive sequential characters
- Must NOT use adjacent keys on the keyboard

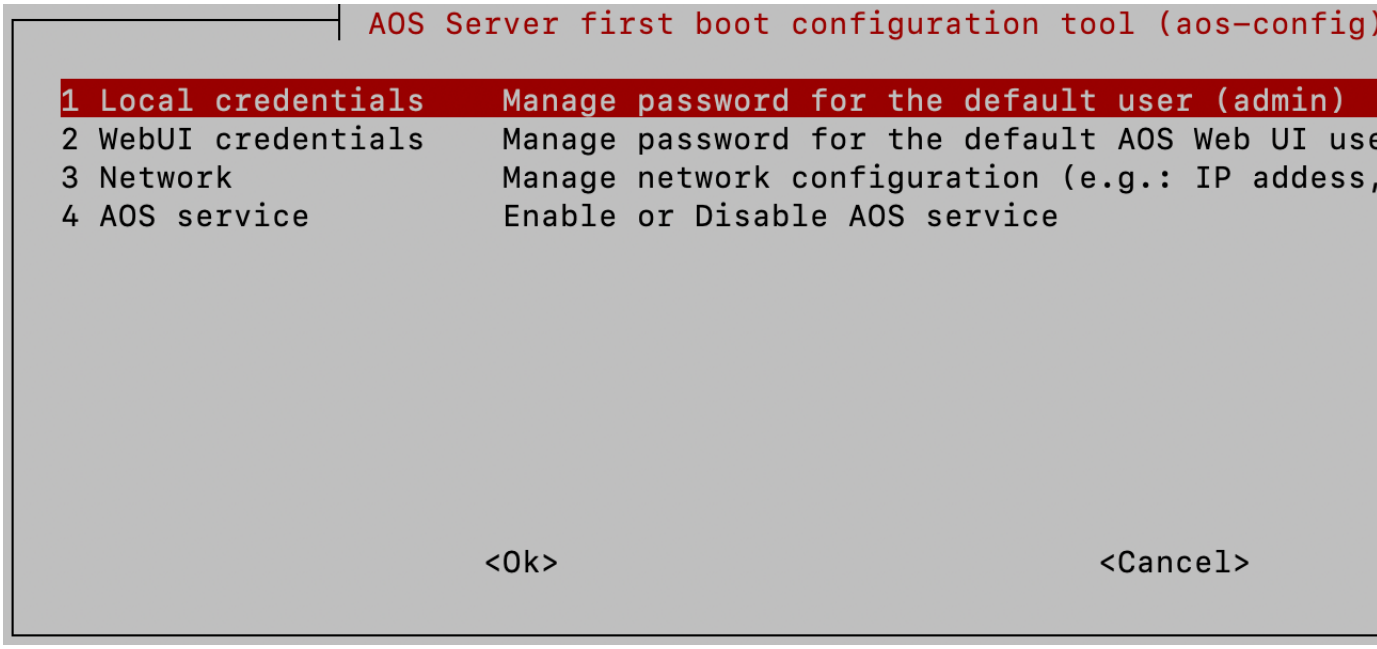
3. When you've successfully changed the Apstra server password a dialog opens prompting you to set the Apstra GUI password.



You won't be able to access the Apstra GUI until you set this password. Select **Yes** and enter a password that meets the following complexity requirements, then enter it again:

- Must contain at least 9 characters
- Must contain an uppercase letter
- Must contain a lowercase letter
- Must contain a digit
- Must contain a special character
- Must NOT be the same as the username
- Must NOT contain a repeat of the same character
- Must NOT contain consecutive sequential characters
- Must NOT use adjacent keys on the keyboard

4. A dialog appears stating "Success! Apstra UI password is changed." Select **OK**.
5. The configuration tool menu appears.



You've just changed the local credentials and the Apstra GUI credentials, so you don't need to manage them again now.

The network is configured to use DHCP by default. To assign static IP addresses instead, select **Network**, change it to **Manual**, and provide the following:

- (Static Management) IP address in CIDR format with netmask (for example, 192.168.0.10/24)
- Gateway IP address
- Primary DNS
- Secondary DNS (optional)
- Domain

6. Apstra service is stopped by default. To start and stop Apstra service, select **AOS service** and select **Start** or **Stop**, as appropriate. Starting service from this configuration tool invokes `/etc/init.d/aos`, which is the equivalent of running the command `service aos start`.
7. To exit the configuration tool and return to the CLI, select **Cancel** from the main menu. (To open this tool again in the future, run the command `aos_config`.)

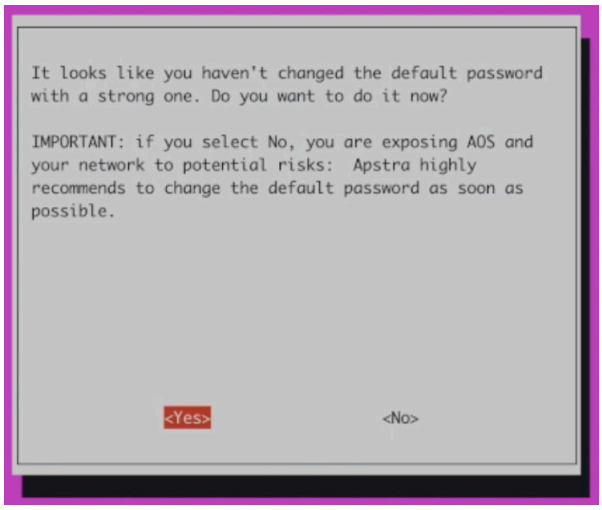
You're ready to "Replace the default SSL certificate with a signed one" on page 28.

CAUTION: We recommend that you back up the Apstra server on a regular basis (since HA is not available). For backup details, see the Apstra Server Management section of

the Juniper Apstra User Guide. For information about setting up automated backup collection see the Juniper Support Knowledge Base article KB37808.

Configure 4.1.1 or 4.1.0

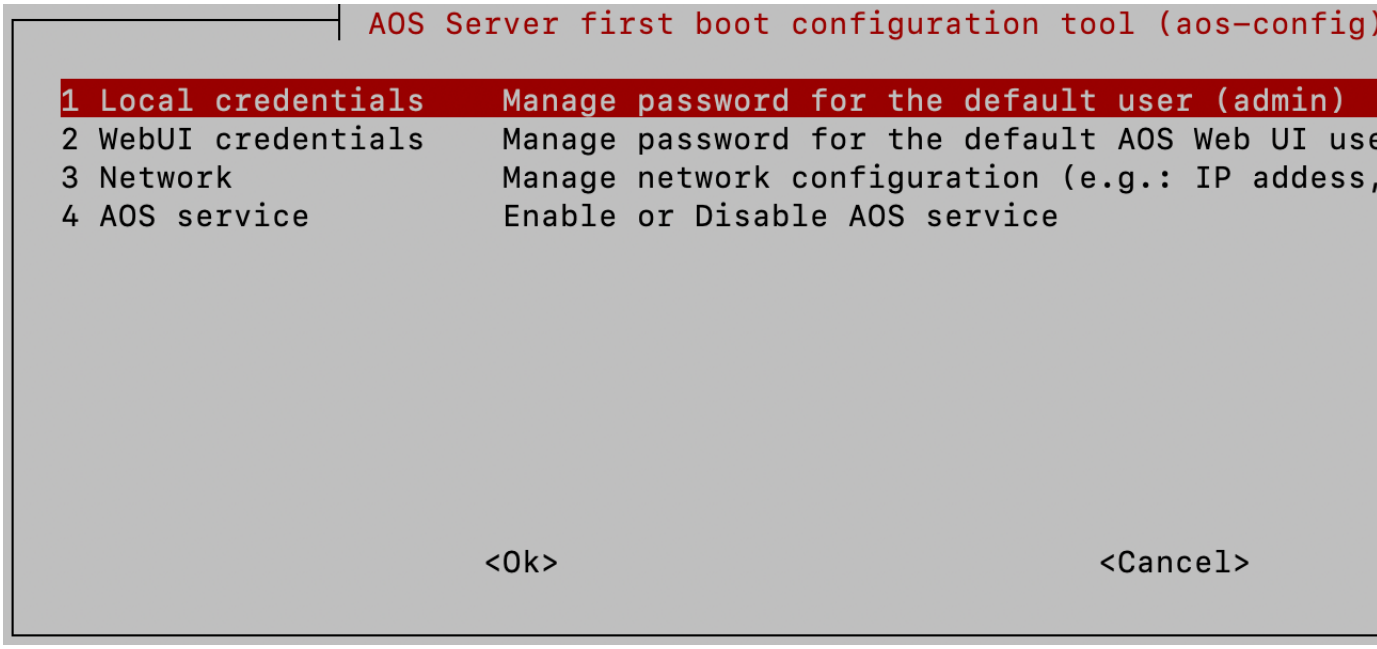
1. Log in to the Apstra server with the default credentials (user: **admin**, password: **admin**) either from the web console or via SSH (`ssh admin@<apstra-server-ip>` where `<apstra-server-ip>` is the IP address of the Apstra server.
2. A dialog opens prompting you to change the default server password.



   Select **Yes** and follow the prompts to enter a strong password that doesn't contain the current username in any form and that has a minimum of fourteen characters, one uppercase character, and one digit.

   CAUTION: We highly recommend that you change default passwords. User admin has full root access. Juniper is not responsible for security-related incidents because of not changing default passwords.

3. After you've changed the password, you're prompted to start Apstra service. Select **Yes**.
4. When service is up and running click **OK**. The configuration tool menu opens to assist you. (To open this tool at any time, run the command `aos_config`.)
5. You updated default local credentials in the previous steps. To change the password again at any time, select **Local credentials** in the configuration tool and follow the prompts.



6. Select **WebUI credentials** and change the default password for the Apstra GUI user **admin**. (Service must be up and running to change the Apstra GUI password. If service is stopped, proceed to step 8 and start service.)
7. The network is configured to use DHCP by default. To assign static IP addresses instead, select **Network**, change it to **Manual**, and provide the following:
   - (Static Management) IP address in CIDR format (for example, 192.168.0.10/24)
   - Gateway IP address
   - Primary DNS
   - Secondary DNS (optional)
   - Domain
8. Apstra service is stopped by default. To start and stop Apstra service, select **AOS service** and select **Start** or **Stop**, as appropriate. Starting service from this configuration tool invokes `/etc/init.d/aos`, which is the equivalent of running the command `service aos start`.
9. To exit the configuration tool and return to the CLI, select **Cancel** from the main menu.

You're ready to "Replace the default SSL certificate with a signed one" on page 28.

CAUTION: We recommend that you back up the Apstra server on a regular basis (since HA is not available). For backup details, see the Apstra Server Management section of the Juniper Apstra User Guide. For information about setting up automated backup collection see the Juniper Support Knowledge Base article KB37808.

Configure Apstra Server Static Management IP Address

If you're not using DHCP, you can use the "configuration tool" on page 20 to enter a static management IP address:

1. Log in to the Apstra server via console, as user **admin**.
2. Run the configuration tool `aos_config` and configure Network to set a static management IP address.
3. If you have already installed onbox agents, you must reconfigure each device agent (`/mnt/flash/aos-config`, `/etc/aos/aos.conf`) to point to the new Apstra server IP address.

Change Apstra Server Hostname

IN THIS SECTION

- Configure New SSH Keys on Apstra Server | **25**

CAUTION: To avoid issues with the Apstra container's binding, don't change the `/etc/hostname` file directly with any Linux CLI command or other command than the one below.

1. SSH into the Apstra server as user **admin**. (`ssh admin@<apstra-server-ip>` where `<apstra-server-ip>` is the IP address of the Astra server.)
2. With root privileges, run the command `/#aos_hostname <hostname>` where `<hostname>` is the new hostname of the Apstra server. This command modifies the hostname in the `/etc/hostname` file and performs necessary backend configuration.
3. For the change to take effect, reboot the Apstra server, preferably during a maintenance window. The Apstra server is temporarily unavailable during a reboot, though it most likely won't impact service.

Configure New SSH Keys on Apstra Server

You can replace SSH host keys on new or existing Apstra server VMs.

1. SSH into the Apstra server as user **admin**. (`ssh admin@<apstra-server-ip>` where `<apstra-server-ip>` is the IP address of the Astra server.)
2. Run the command `sudo rm /etc/ssh/ssh_host*` to remove SSH host keys.

3. Run the command `sudo dpkg-reconfgigure openssh-server` to configure new SSH host keys.

```
admin@aos-server:~$ sudo dpkg-reconfigure openssh-server
Creating SSH2 RSA key; this may take some time ...
2048 SHA256:EWRFcs4V6BmOILR3T2Psxng1uE0qXQ/z9IKkXrnLpJs root@aos-server (RSA)
Creating SSH2 ECDSA key; this may take some time ...
256 SHA256:THaXEia8VW6Jfw6OBXFegu1Cav0zcGSVOy9RkNOPxf4 root@aos-server (ECDSA)
Creating SSH2 ED25519 key; this may take some time ...
256 SHA256:0HOn0nnF+7oRaF5HggI4vWeyxT+UNsHcbvNpBJdaKhQ root@aos-server (ED25519)
admin@aos-server:~$ sudo dpkg-reconfigure openssh-server
```

4. To restart the SSH server process, run the command `sudo systemctl restart ssh`.

Configure Apstra Docker Subnets

IN THIS SECTION

- docker0 | 26
- Docker Network and Apstra Upgrades | 27

The Apstra server Docker containers require one network for internal connectivity, which is automatically configured with the following subnets:

- docker0: inet 172.17.0.1/16
- Apstra same VM (in-place) upgrade docker network: inet 172.18.0.1/16

If you need to use these subnets elsewhere, to avoid conflicts, change the Docker network as follows:

docker0

Update `bip` with the new subnet. If the `/etc/docker/daemon.json` file doesn't already exist, create one with the following format (Replace `172.26.0.1/16` in the example below with your own subnet.):

```
$ sudo vi /etc/docker/daemon.json

    {
      "bip": "172.26.0.1/16"
    }
```

```
$ sudo service docker restart
$ sudo service aos restart
```

Docker Network and Apstra Upgrades

If you're upgrading your Apstra server on the "same VM" on page 46 that's it currently on, the Apstra upgrade creates an additional Docker network. By default in Docker, this network is 172.18.0.1/16. If you're using this subnet elsewhere on your network, the Apstra upgrade could fail.

To use a different subnet, create or edit the `/etc/docker/daemon.json` file with the following format (Replace 172.27.0.0/16 in the example with your own subnet).

```
$ sudo vi /etc/docker/daemon.json

{
    "default-address-pools":
    [
        {
            "base": "172.27.0.0/16",
            "size": 24
        }
    ]
}

$ sudo service docker restart
$ sudo service aos restart
```

Replace SSL Certificate

IN THIS SECTION

- Replace SSL Certificate on Apstra Server with Signed One | 28
- Replace SSL Certificate on Apstra Server with Self-Signed One | 30

For security, we recommend that you replace the default self-signed SSL certificate with one from your own certificate authority. Web server certificate management is the responsibility of the end user. Juniper support is best effort only.

Replace SSL Certificate on Apstra Server with Signed One

When you boot up the Apstra server for the first time, a unique self-signed certificate is automatically generated and stored on the Apstra server at `/etc/aos/nginx.conf.d` (`nginx.crt` is the public key for the webserver and `nginx.key` is the private key.) The certificate is used for encrypting the Apstra server and REST API. It's not for any internal device-server connectivity. Since the HTTPS certificate is not retained when you back up the system, you must manually back up the `etc/aos` folder. We recommend replacing the default SSL certificate. Web server certificate management is the responsibility of the end user. Juniper support is best effort only.

1. Back up the existing OpenSSL keys.

```
admin@aos-server:/$ sudo -s
[sudo] password for admin:

root@aos-server:/# cd /etc/aos/nginx.conf.d
root@aos-server:/etc/aos/nginx.conf.d# cp nginx.crt nginx.crt.old
root@aos-server:/etc/aos/nginx.conf.d# cp nginx.key nginx.key.old
```

2. Create a new OpenSSL private key with the built-in openssl command.

```
root@aos-server:/etc/aos/nginx.conf.d# openssl genrsa -out nginx.key 2048
Generating RSA private key, 2048 bit long modulus
.............+++
......+++
e is 65537 (0x10001)
```

> **CAUTION**: Don't modify `nginx.crt` or `nginx.key` filenames. They're referred to in `nginx.conf`. As part of subsequent service upgrades, these files could be replaced, so the filenames must be predictable.
>
> Also, don't change configuration in `nginx.conf`, as this file may be replaced during Apstra server upgrade, and any changes you make would be discarded.

3. Create a certificate signing request. If you want to create a signed SSL certificate with a Subjective Alternative Name (SAN) for your Apstra server HTTPS service, you must manually create an OpenSSL template. For details, see Juniper Support Knowledge Base article KB37299.

CAUTION: If you have created custom OpenSSL configuration files for advanced certificate requests, don't leave them in the Nginx configuration folder. On startup, Nginx will attempt to load them (*.conf), causing a service failure.

```
root@aos-server:/etc/aos/nginx.conf.d# openssl req -new -sha256 -key nginx.key -out nginx.csr
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:California
Locality Name (eg, city) []:Menlo Park
Organization Name (eg, company) [Internet Widgits Pty Ltd]:Apstra, Inc
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name) []:aos-server.apstra.com
Email Address []:support@apstra.com

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
```

4. Submit your Certificate Signing Request (nginx.csr) to your Certificate Authority. The required steps are outside the scope of this document; CA instructions differ per implementation. Any valid SSL certificate will work. The example below is for self-signing the certificate.

```
root@aos-server:/etc/aos/nginx.conf.d# openssl req -x509 -sha256 -days 3650 -key nginx.key -
in nginx.csr -out nginx.crt
root@aos-server:/etc/aos/nginx.conf.d#
```

5. Verify that the SSL certificates match: private key, public key, and CSR.

```
root@aos-server:/etc/aos/nginx.conf.d# openssl rsa -noout -modulus -in nginx.key | openssl md5
(stdin)= 60ac4532a708c98d70fee0dbcaab1e75

root@aos-server:/etc/aos/nginx.conf.d# openssl req -noout -modulus -in nginx.csr | openssl md5
```

```
(stdin)= 60ac4532a708c98d70fee0dbcaab1e75

root@aos-server:/etc/aos/nginx.conf.d# openssl x509 -noout -modulus -in nginx.crt | openssl
md5
(stdin)= 60ac4532a708c98d70fee0dbcaab1e75
```

6. To load the new certificate, restart the nginx container.

```
root@aos-server:/etc/aos/nginx.conf.d# docker restart aos_nginx_1
aos_nginx_1
root@aos-server:/etc/aos/nginx.conf.d
```

7. Confirm that the new certificate is in your web browser and that the new certificate common name matches 'aos-server.apstra.com'.

Replace SSL Certificate on Apstra Server with Self-Signed One

When you boot up the Apstra server for the first time, a unique self-signed certificate is automatically generated and stored on the Apstra server at `/etc/aos/nginx.conf.d` (`nginx.crt` is the public key for the webserver and `nginx.key` is the private key.) The certificate is used for encrypting the Apstra server and REST API. It's not for any internal device-server connectivity. Since the HTTPS certificate is not retained when you back up the system, you must manually back up the `etc/aos` folder. We support and recommend replacing the default SSL certificate.

1. Back up the existing OpenSSL keys.

```
admin@aos-server:/$ sudo -s
[sudo] password for admin:

root@aos-server:/# cd /etc/aos/nginx.conf.d
root@aos-server:/etc/aos/nginx.conf.d# cp nginx.crt nginx.crt.old
root@aos-server:/etc/aos/nginx.conf.d# cp nginx.key nginx.key.old
```

2. If a Random Number Generator seed file .rnd doesn't exist in `/home/admin`, create one.

```
root@aos-server:~# touch /home/admin/.rnd
root@aos-server:~#
```

3. Generate a new OpenSSL private key and self-signed certificate.

```
root@aos-server:/etc/aos/nginx.conf.d# openssl req -newkey rsa:2048 -nodes -keyout nginx.key -
x509 -days 824 -out nginx.crt -addext extendedKeyUsage=serverAuth -addext
subjectAltName=DNS:apstra.com
Generating a RSA private key
.....................................+++++
.....................................................................................+++++
writing new private key to 'nginx.key'
-----
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:California
Locality Name (eg, city) []:Menlo Park
Organization Name (eg, company) [Internet Widgits Pty Ltd]:Apstra, Inc
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name) []:aos-server.apstra.com
Email Address []:support@apstra.com
root@aos-server:/etc/aos/nginx.conf.d#
```

4. To load the new certificate, restart the nginx container.

```
root@aos-server:/etc/aos/nginx.conf.d# docker restart aos_nginx_1
aos_nginx_1
root@aos-server:/etc/aos/nginx.conf.d
```

Apstra Upgrade

IN THIS SECTION

- Supported Apstra Server Upgrade Paths | 32
- Apstra Server Upgrade Workflow | 34
- Upgrade Apstra on New VM (VM-VM) (Recommended) | 35
- Upgrade Apstra on Same VM (In-Place) | 46
- Roll Back Apstra Server Upgrade | 55

Supported Apstra Server Upgrade Paths

IN THIS SECTION

- Apstra Server Supported Upgrade Paths to Version 4.1.2 | 33
- Apstra Server Supported Upgrade Paths to Version 4.1.1 | 33

- First major release versions are for new Juniper Apstra installations only. You can't upgrade to a first major release version (4.1.0 for example).
- You *can* upgrade to maintenance release versions and later (4.1.2 for example).
- To check your current Apstra version from the Apstra GUI, navigate to **Platform > About** from the left navigation menu.
- To check your current Apstra version from the CLI, run the command `service aos show_version`.

NOTE: Upgrading from Apstra release versions 3.X are not supported.

Apstra Server Supported Upgrade Paths to Version 4.1.2

From Version	VM-to-VM (on new VM)	In-Place (on Same VM)
4.1.1	Yes (recommended for production)	Yes
4.1.0	Yes (recommended for production)	Yes
4.0.2	Yes	No
4.0.1	Yes	No
4.0.0	Yes	No

Apstra Server Supported Upgrade Paths to Version 4.1.1

From Version	VM-to-VM (on new VM)	In-Place (on Same VM)
4.1.0	Yes (recommended for production)	Yes
4.0.2	Yes	No
4.0.1	Yes	No
4.0.0	Yes	No

Apstra Server Upgrade Workflow

Stage	Description
Pre-Upgrade Validation	• Verify upgrade path is supported • Verify sufficient VM memory for new version • Check the new Apstra version release notes for config-rendering changes that could impact the data plane. Update configlets, as needed. • Review blueprints and address issues • Verify device OS versions are supported • Remove any device AAA configuration • Remove any configlets used to configure firewalls • Back up current Apstra environment
Upgrade Apstra Server	• Download Apstra VM image • Install software on controller VM (Check configlets for conflicts.) • Install software on worker VMs (new VMs with Apstra Cluster only) • Verify connections to new server • Import SysDB database (new VMs only) • Verify that configlets don't conflict with newly rendered config • Log in to the upgraded server • Change operation mode to normal
Upgrade Agents	• From the Apstra GUI
Upgrade Worker Nodes (Apstra Cluster only)	• If re-using VMs for worker nodes - import state • If using new VMs for worker nodes - install software on worker VM(s)

(Continued)

Stage	Description
Upgrade Device NOS, as needed	If the NOS versions of your devices are not qualified on the new Apstra version, upgrade them to a qualified version. (See the Juniper Apstra User Guide for details.)
Roll back Apstra Server, as needed	If you upgraded on a new VM, you can roll back to a previous Apstra version.

Upgrade Apstra on New VM (VM-VM) (Recommended)

IN THIS SECTION

- Step 1: Pre-Upgrade Validation | 35
- Step 2: Deploy New Apstra Server | 37
- Step 3: Import State | 38
- Step 4: Keep Old VM's IP Address (Optional) | 42
- Step 5: Change Operation Mode to Normal | 42
- Step 6: Upgrade Onbox Agents | 44
- Step 7: Shut Down Old Apstra Server | 45

We recommend that you upgrade Apstra on a new VM (instead of in-place on the same VM) so you'll receive Ubuntu Linux OS fixes, including security vulnerability updates. To upgrade the Apstra server you need Apstra OS admin user privileges and Apstra admin user group permissions.

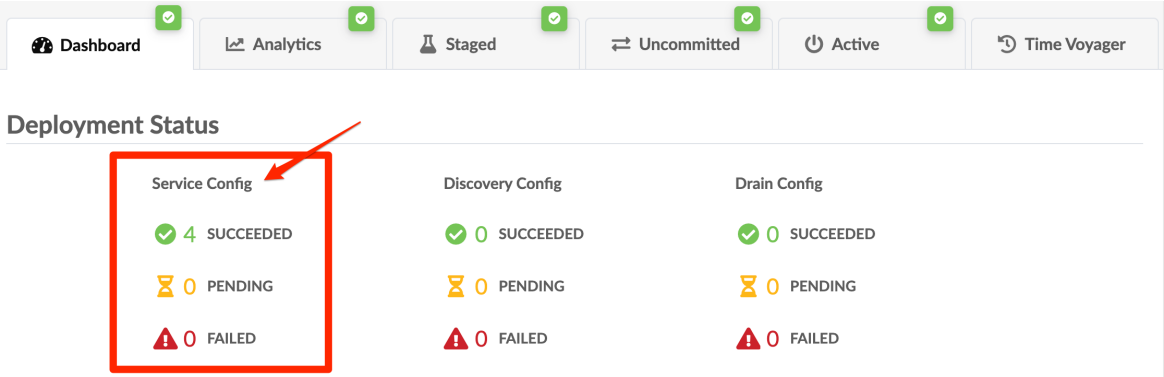
Step 1: Pre-Upgrade Validation

1. Refer to "Upgrade Paths" on page 32 to confirm that you're upgrading to a supported version.
2. Log in to the Apstra server as **admin** (For example, if your Apstra server IP address were 10.28.105.3, the command would be `ssh admin@10.28.105.3`).

3. Run the command `service aos status` to check that the server is active and has no issues.

```
admin@aos-server:~$ service aos status
* aos.service - LSB: Start AOS management system
   Loaded: loaded (/etc/init.d/aos; generated)
   Active: active (exited) since Thu 2022-10-28 17:11:27 UTC; 24h ago
     Docs: man:systemd-sysv-generator(8)
  Process: 1157 ExecStart=/etc/init.d/aos start (code=exited, status=0/SUCCESS)
```

4. Check the new Apstra version release notes for configuration-rendering changes that could impact the data plane.
5. Review each blueprint to confirm that all **Service Config** is in the SUCCEEDED state. If necessary, undeploy and remove devices from the blueprint to resolve any pending or failed service config.



6. Review each blueprint for probe anomalies, and resolve them as much as possible. Take notes of any remaining anomalies.
7. Refer to Qualified Devices and NOS in the Apstra User Guide to verify that the devices' NOS versions are qualified on the new Apstra version. Upgrade or downgrade as needed, to one of the supported versions.
8. Remove any Device AAA configuration. During device upgrade, configured device agent credentials are required for SSH access.
9. Remove any configlets used to configure firewalls. If you use FW's Routing Engine filters on devices, you'll need to update them to include the IP address of the new controller and worker VMs.
10. To upgrade device system agents, Apstra must be able to SSH to all devices using the credentials that were configured when creating the agents. To check this from the Apstra GUI, navigate to **Devices > Agents**, select the check box(es) for the device(s) to check, then click the **Check** button in the Agent menu. Verify that the states of all jobs is SUCCESS. If any check job fails, resolve the issue before proceeding with the Apstra upgrade.

11. As **root** user, run the command `sudo aos_backup` to back up the Apstra server.

```
admin@aos-server:~$ sudo aos_backup
[sudo] password for admin:
======================================================================
  Backup operation completed successfully.
======================================================================
New AOS snapshot: 2022-10-29_18-58-56
admin@aos-server:~$
```

> ⚠ **CAUTION**: The upgraded Apstra server doesn't include any time voyager revisions, so if you need to revert back to a past state, this backup is required. Previous states are not included due to the tight coupling with the reference designs which may change between Apstra versions.

12. Copy the backup files from `/var/lib/aos/snapshot/<shapshot_name>` to an external location.
13. Make sure that the new VM has the "Required Server Resources" on page 2 for the Apstra server.

Step 2: Deploy New Apstra Server

> **NOTE**: If you customized the `/etc/aos/aos.conf` file in the old Apstra server (for example, if you updated the `metadb` field to use a different network interface), you must re-apply the changes to the same file in the new Apstra server VM. It's not migrated automatically.

1. As a registered support user, download the Apstra VM image from Juniper Support Downloads (`for example, aos_server_4.1.2-269`) and transfer it to the new Apstra server.
2. Install and configure the new Apstra VM image with the new IP address (same or new FQDN may be used).
3. If you're using an Apstra cluster (offbox agents, IBA probes) and you want to put your worker nodes on new VMs, download and deploy a new VM for each worker node. The upgrade process automatically creates the cluster. (If you're going to re-use your worker VMs, skip this step.)

   > **NOTE**: Example of replacing all VMs: if you have a controller and 2 worker nodes and you want to upgrade all of them to new VMs, you would create 3 VMs with the new Apstra version and designate one of them to be the controller.

4. Verify that the new Apstra server has SSH access to the old Apstra server.

5. Verify that the new Apstra server can reach system agents. (See "Required Comminication Ports" on page 3.)
6. Verify that the new Apstra server can reach applicable external systems (such as NTP, DNS, vSphere server, LDAP/TACACs+ server and so on).

Step 3: Import State

CAUTION: If you perform any API/GUI write operations to the old Apstra server after you've started importing the new VM, those changes won't be copied to the new Apstra server.

1. Log in to the new Apstra server as user **admin**.
2. Run a command to import SysDB from the old server, apply necessary translations, and import configuration:
   - `sudo aos_import_state`
   - `--ip-address <old-apstra-server-ip>`
   - `--username <admin-username>`
   - For Apstra clusters with new worker node IP addresses, include the following: `--cluster-node-address-mapping <old-node-ip> <new-node-ip>`
   - To run the upgrade preconditions checks without running the actual upgrade use the following:`--dry-run-connectivity-validation`
   - To not check connectivity validation include the following: `--skip-connectivity-validation`

   Example command: Single VM or Apstra Cluster with Same Worker Nodes

```
admin@aos-server:~$ sudo aos_import_state --ip-address 10.28.105.3 --username admin
```

   Example Command: Apstra Cluster with New Worker Nodes

```
admin@aos-server:~$ sudo aos_import_state --ip-address 10.28.105.3 --username admin --cluster-node-address-mapping 10.28.105.4 10.28.105.6 --cluster-node-address-mapping 10.28.105.7 10.28.105.8
```

In the example above, `10.28.105.4` and `10.28.105.7` are old worker node IP addresses; `10.28.105.6` and `10.28.105.8` are new worker node IP addresses.

```
admin@aos-server:~$ sudo aos_import_state --ip-address 10.28.105.3 --username admin --cluster-node-address-mapping 10.28.105.4 10.28.105.6
[sudo] password for admin:
AOS[2022-10-27_20:17:23]: Initiating docker library import DONE
SSH password for remote AOS VM:
Root password for remote AOS VM:
AOS[2022-10-27_20:17:50]: Preparing to retrieve data from remote AOS Server. DONE
AOS[2022-10-27_20:18:29]: Retrieving data from remote AOS Server. This step can take up to 10 minutes DONE
AOS[2022-10-27_20:21:44]: Importing retrieved state to AOS. This step can take up to 30 minutes DONE
AOS[2022-10-27_20:21:48]: Waiting for blueprint <3db44826-807f-4ab9-8ca0-e25040af7ef6> processing to finish. DONE
AOS[2022-10-27_20:21:55]: Waiting for blueprint <964211f7-7f3c-4b0a-b6b7-137790c461f5> processing to finish. DONE
Summary saved to /tmp/aos-upgrade-config-summary-2022.10.27-202203
```

Root is required for importing the database, so you'll be asked for the SSH password and root password for the remote Apstra VM.

NOTE: When you upgrade an Apstra cluster, the SSH password for old controller, old worker and new worker must be identical, otherwise the upgrade fails authentication. In the above example, the password you enter for 'SSH password for remote AOS VM' is used for remote controller, old worker, and new worker VMs. (AOS-27351)

If you change the worker VMs' SSH password after the upgrade, then you also need to update the worker's password in the Apstra GUI (Platform > Apstra Cluster > Nodes).

NOTE: The size of the blueprint and the Apstra server VM resources determine how long it takes to complete the import. If the database import exceeds the default value, the operation may 'time out'. (The default value as of Apstra 4.1.2 is 40 min or 2400 seconds). If this happens, you can increase the timeout value with the `AOS_UPGRADE_DOCKER_EXEC_TIMEOUT` command.

For example, the following command increases the time before timeout to 2 hours (7200 seconds).

```
admin@aos-server:~$ sudo AOS_UPGRADE_DOCKER_EXEC_TIMEOUT=7200 aos_import_state --ip-address
10.10.10.10 --username admin
```

The upgrade script presents a summary view of the devices within the fabric that will receive configuration changes during the upgrade. As of Apstra version 4.1.2, a warning appears on the screen recommending that you read Release Notes and "Upgrade Paths" on page 32 documentation before proceeding. The release notes include a category for **Configuration Rendering Changes**, as of Apstra version 4.1.2. Configuration rendering changes are clearly documented at the top explaining the impact of each change on the network.

```
Apstra Upgrade Summary
================================================================================
This is a summary of configuration pushed to devices logically grouped
into sections.  Use 'q' to exit this view.  For more device specific
configurations, use the menu after quitting this view

WARNING: This upgrade will modify the configuration of devices running
in Apstra blueprints. Before proceeding, ensure you have read the
Release Notes as well as the Upgrade Paths and Workflow documentation at:
https://www.juniper.net/documentation/product/us/en/apstra/#cat=release_notes
https://www.juniper.net/documentation/product/us/en/apstra/#cat=install/upgrade_software/

BLUEPRINT: 3db44826-807f-4ab9-8ca0-e25040af7ef6
(BP2)

BLUEPRINT: 964211f7-7f3c-4b0a-b6b7-137790c461f5
(BP1)
Section: FULL_CONFIG
~~~~~~~~~~~~~~~~~~~~
Full configuration apply.
Configuration      Role                              Systems
================================================================================
Spine        spine2 [525400E3EF4A, 10.28.105.10]
          spine1 [52540006D434, 10.28.105.9]

--------------------------------------------------------------------------------
Leaf         l2-virtual-ext-001-leaf1 [5254006260B2, 10.28.105.11]
          l2-virtual-ext-002-leaf1 [5254009D09D6, 10.28.105.12]


Warnings: Template '_L2 Virtual EVPN' (id: '7bc432ed-c219-4e77-b08d-889ccf939add') has
```

```
external connectivity settings in RackTypes: ('L2 Virtual Ext' (id: 'L2_Virtual_External'))
which will be removed during upgrade.
```

As of Apstra version 4.0.1, the **Apstra Upgrade Summary** shows information separated by device roles (superspine, spine, leaf, leaf pair, and access switch for example). If an incremental config was applied instead of a full config, more details are displayed about the changes.

3. After you've reviewed the summary, enter `q` to exit the summary. The **AOS Upgrade: Interactive Menu** appears where you can review the exact configuration change on each device. If you're using configlets, verify that the new configuration pushed by the upgrade does not conflict with any existing configlets.

CAUTION: The Apstra Reference Design in the new Apstra release may have changed in a way that invalidates configlets. To avoid unexpected outcomes, verify that your configlets don't conflict with the newly rendered config. If you need to update your configlets, quit the upgrade, update your configlets, then run the upgrade again.

```
AOS Upgrade: Interactive Menu
================================================
<Device SN> - display config changes using a
            specific device serial number
(s)ummary   - display config change summary
(l)ist      - list all devices with config changes
(d)ump      - dump all config changes to a file
(c)ontinue  - continue with AOS upgrade
(q)uit      - quit AOS upgrade

aos-upgrade (h for help)#
```

4. If you want to continue with the upgrade after reviewing pending changes, enter `c`.
5. If you want to stop the upgrade, enter `q` to abort the process. If you quit at this point and later decide to upgrade, you must start the process from the beginning.

NOTE: If the Apstra upgrade fails (or in the case of some other malfunction) you can gracefully shut down the new Apstra server and re-start the old Apstra server to continue operations.

Step 4: Keep Old VM's IP Address (Optional)

If you want to keep the old VM's IP address you must perform the following extra steps before changing the Operation Mode and upgrading the devices' agent.

1. Shutdown the old VM or change its IP address to a different address to release the IP address. This is required to avoid any duplicated IP address issue.
2. Go to the new VM's Apstra interactive menu from the CLI.

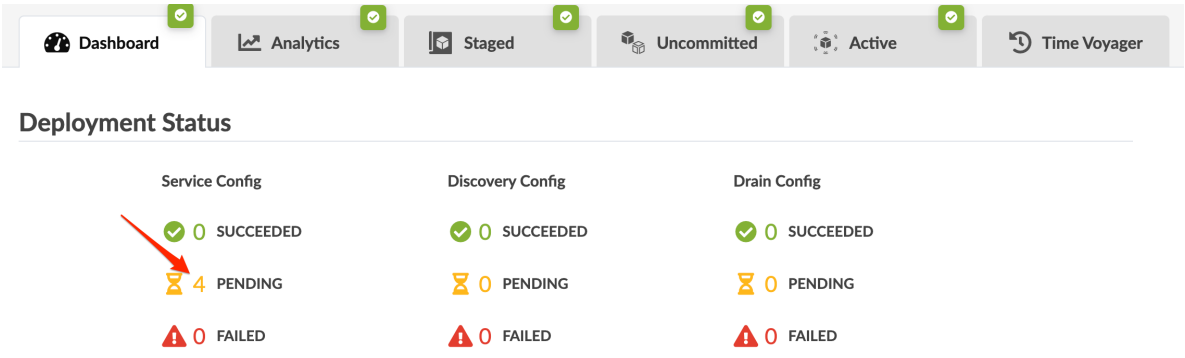
```
admin@aos-server:~$ sudo aos_config
```

3. Click **Network** to update the IP address and confirm the other parameters.
4. For the new IP address to take effect, restart the network service, either from the same menu before exiting or from the CLI after leaving the menu.

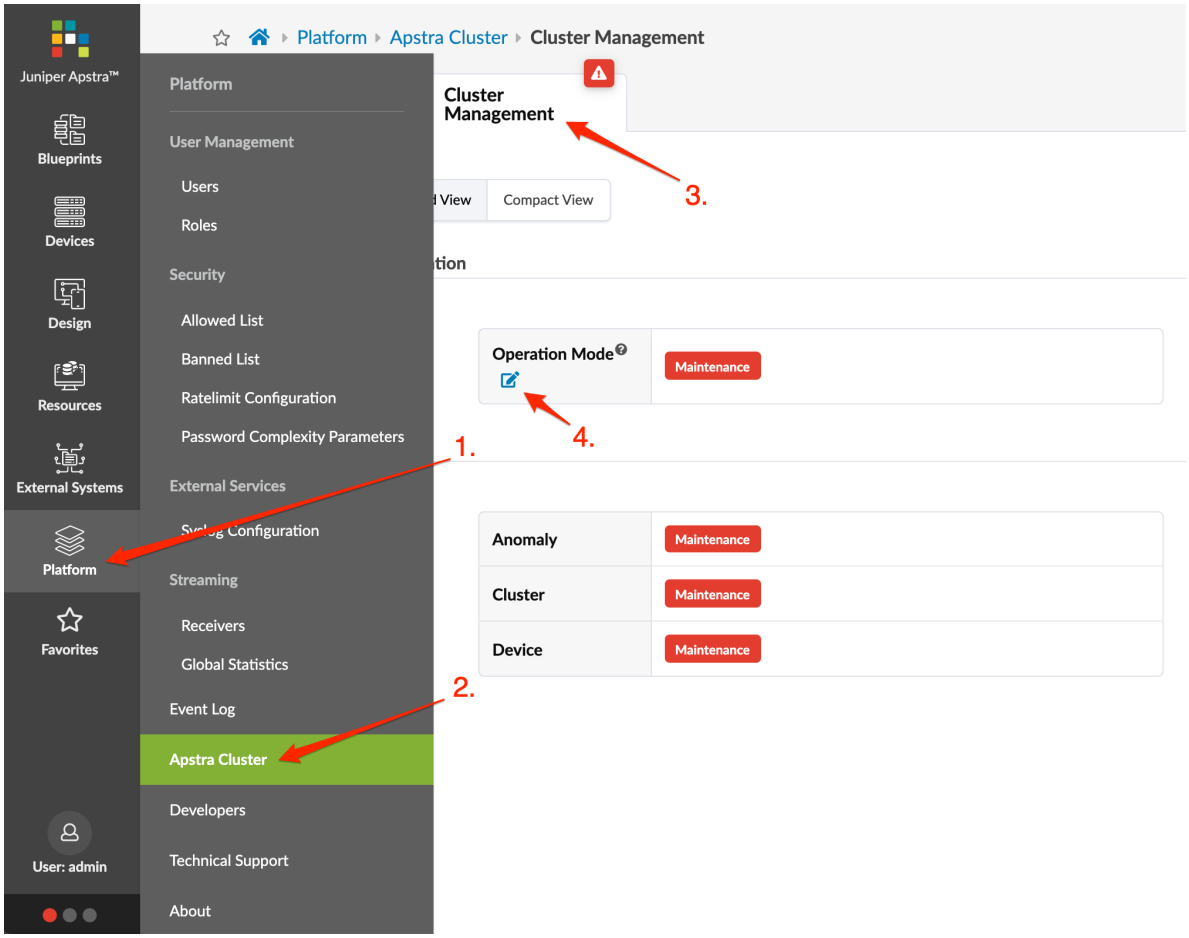
Step 5: Change Operation Mode to Normal

When you initiate an Apstra server upgrade, the operation mode changes from **Normal** to **Maintenance** automatically. Maintenance mode prevents any offbox agents from going online prematurely. No configuration is pushed and no telemetry is pulled. At this point, if you decide to continue using the previous Apstra version instead of upgrading, you could just shut down the new Apstra server. If you decide to complete the upgrade, change the mode back to **Normal**.

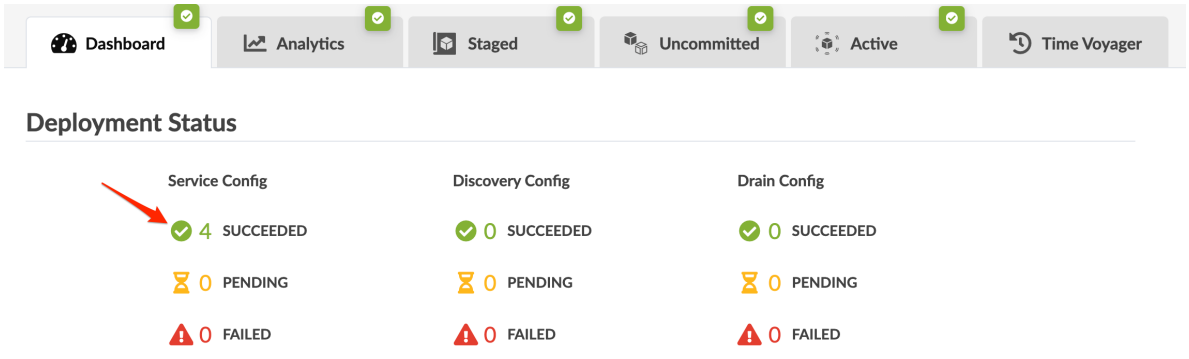
1. Log in to the Apstra GUI.
2. If you'd like to view pending service configuration changes, navigate to the dashboard of the blueprint and click **PENDING** to see the affected devices.



3. From the left navigation menu, navigate to **Platform > Apstra Cluster > Cluster Management**.

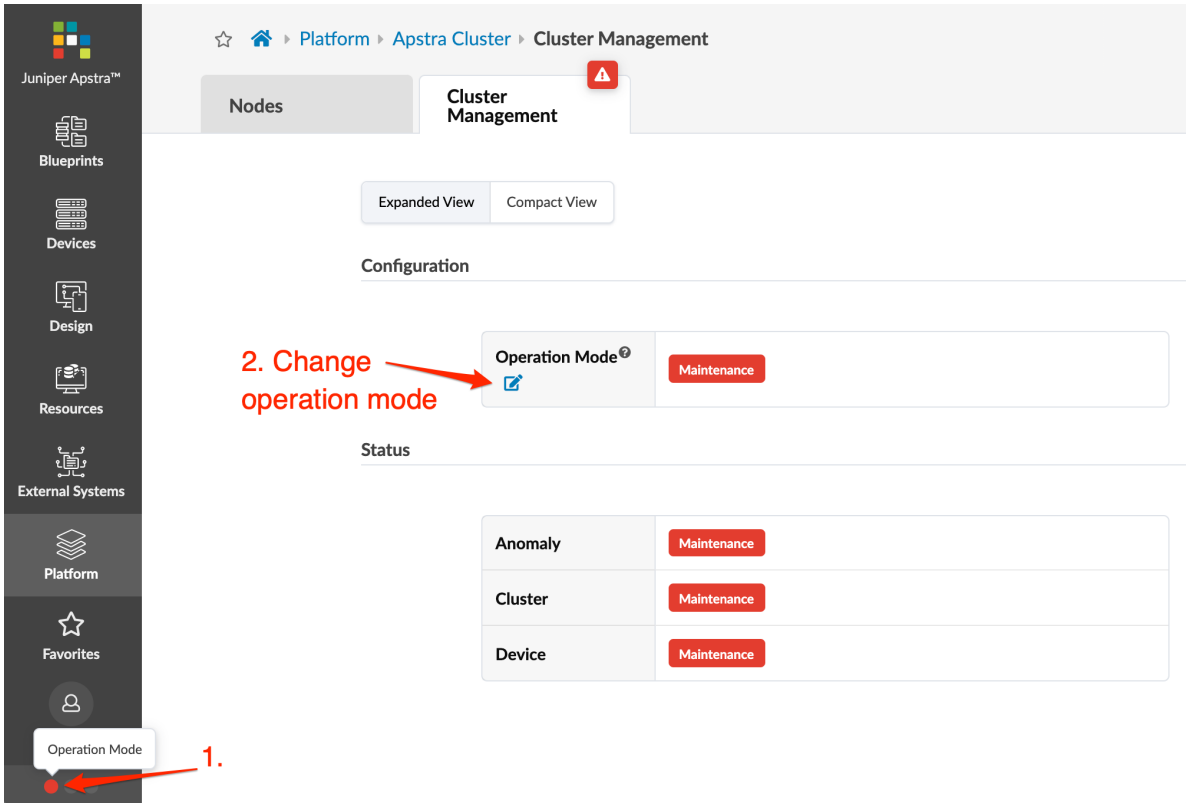


4. Click the **Change Operation Mode** button, select **Normal**, then click **Update**. Any offbox agents, whether they're on the controller or worker VMs automatically go online and reconnect devices and push any pending configuration changes. After a few moments the temporary anomalies on the dashboard resolve and the service configuration section shows that the operation has **SUCCEEDED**.



You can also access the **Cluster Management** page from the lower left section of any page. You have continuous platform health visibility from here as well, based on colors.

From the bottom of the left navigation menu, click one of the dots, then click **Operation Mode** to go to **Cluster Management**. Click the **Change Operation Mode** button, select **Normal**, then click **Update**.



Step 6: Upgrade Onbox Agents

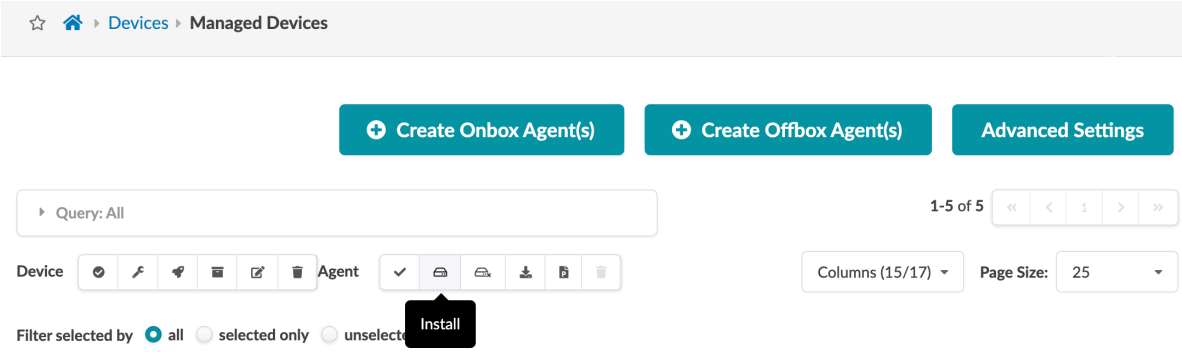
The Apstra server and onbox agents must be running the same Apstra version. If versions are different the agents won't connect to the Apstra server.

If you're running a multi-state blueprint, especially 5-stage, we recommend that you upgrade agents in stages: first upgrade superspines, then spines, then leafs. We recommend this order because of path hunting. Instead of routing everything up to a spine, or from a spine to a superspine, it's possible for routing to temporarily go from leaf to spine back down to another leaf and back up to another spine. To minimize the chances of this happening, we recommend upgrading devices in stages.

1. Log in to the Apstra GUI as user **admin**.
2. From the left navigation menu, navigate to **Devices > Managed Devices** and select the check boxes for the device(s) to upgrade (up to 100 devices at a time). You can upgrade multiple onbox agents at the same time, but the order of device upgrade is important.
   - Upgrade agents for superspines first.
   - Upgrade agents for spines second.
   - Upgrade agents for leafs third.

When you select one or more devices the **Device** and **Agent** menus appear above the table.

3. Click the **Install** button to initiate the install process.



The job state changes to **IN PROGRESS**. If agents are using a previous version of the Apstra software, they are automatically upgraded to the new version. Then they connect to the server and push any pending configuration changes to the devices. Telemetry also resumes, and the job states change to **SUCCESS**.

4. In the **Liveness** section of the blueprint dashboard confirm there are no device anomalies.

> **NOTE**: If you need to roll back to the previous Apstra version after initiating agent upgrade, you must build a new VM with the previous Apstra version and restore the configuration to that VM. For assistance, contact Juniper Technical Support.

Step 7: Shut Down Old Apstra Server

1. Update any DNS entries to use the new Apstra server IP/FQDN based on your configuration.
2. If you're using a proxy for the Apstra server, make sure it points to the new Apstra server.
3. Gracefully shut down the old Apstra server.
4. If you're upgrading an Apstra cluster and you replaced your worker nodes with new VMs, shut down the old worker VMs as well.

Next Steps:
If the NOS versions of your devices are not qualified on the new Apstra version, upgrade them to a qualified version. (See the Juniper Apstra User Guide for details.)

Upgrade Apstra on Same VM (In-Place)

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- Step 2: Deploy New Apstra Server | 48
- Step 3: Change Operation Mode to Normal | 51
- Step 4: Upgrade Onbox Agents | 53
- Step 5: Upgrade Worker Nodes (Apstra Cluster Only) | 54

NOTE: If you upgrade in-place you won't receive Ubuntu Linux OS fixes, including security vulnerability updates. To receive these updates you must "upgrade on a new VM" on page 35. To upgrade in-place instead, keep reading.

To upgrade the Apstra server you need Apstra OS admin user privileges and Apstra admin user group permissions.

Step 1: Pre-Upgrade Validation

1. Refer to "Upgrade Paths" on page 32 to confirm that you're upgrading to a supported version.
2. By default, the Apstra upgrade creates the additional Docker subnet 172.18.0.1/16. If you're using this subnet elsewhere in your network, the Apstra upgrade could fail. If this applies to you, see "Docker Network and Apstra Upgrades" on page 27 for how to use a different subnet.
3. Log in to the Apstra server as **admin** (For example, if your Apstra server IP address were 10.28.105.3, the command would be `ssh admin@10.28.105.3`).
4. Confirm that the VM has enough memory to hold two versions of the Apstra software at the same time. Run the command `free -h` to check if memory utilization is less than 50%.

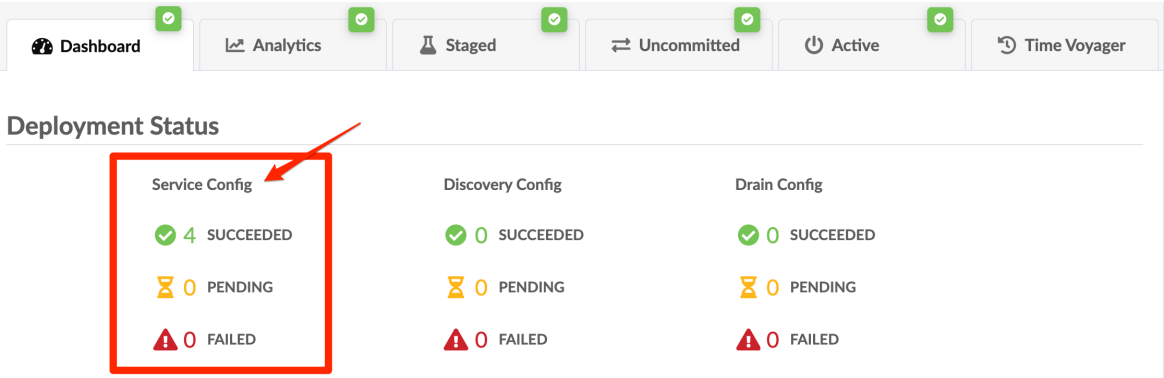
```
admin@aos-server:~$ free -h
              total        used        free      shared  buff/cache   available
Mem:            15G        5.1G        8.8G        7.8M        1.8G         10G
Swap:          3.8G          0B        3.8G
```

5. If utilization is greater than 50%, gracefully shut down the Apstra server, add resources, then restart the Apstra server.

6. Run the command `service aos status` to check that server is active and has no issues.

```
admin@aos-server:~$ service aos status
* aos.service - LSB: Start AOS management system
   Loaded: loaded (/etc/init.d/aos; generated)
    Active: active (exited) since Thu 2022-10-28 17:11:27 UTC; 24h ago
     Docs: man:systemd-sysv-generator(8)
  Process: 1157 ExecStart=/etc/init.d/aos start (code=exited, status=0/SUCCESS)
```

7. Review each blueprint to confirm that all **Service Config** has succeeded. If necessary, undeploy and remove devices from the blueprint to resolve any pending or failed service config.



8. Check the new Apstra version release notes for configuration-rendering changes that could impact the data plane. Update configlets, as needed.
9. Review each blueprint for probe anomalies, and resolve them as much as possible. Take notes of any remaining anomalies.
10. Refer to Qualified Devices and NOS to verify that your NOS versions are qualified on the new Apstra version. Upgrade or downgrade, as needed, to one of the supported versions.
11. Remove any Device AAA configuration. During device upgrade, configured device agent credentials are required for SSH access.
12. Remove any configlets used to configure firewalls. If you use FW's Routing Engine filters on devices, you'll need to update them to include the IP address of the new controller and worker VMs.
13. To upgrade device system agents, Apstra must be able to SSH to all devices using the credentials that were configured when creating the agents. To check this from the Apstra GUI, navigate to **Devices > Agents**, select the check box(es) for the device(s) to check, then click the **Check** button in the Agent menu. Verify that all job states are in the SUCCESS state. If any check job fails, resolve the issue before proceeding with the Apstra upgrade.
14. As **root** user, run the command `sudo aos_backup` to back up the Apstra server.

NOTE:

```
admin@aos-server:~$ sudo aos_backup
[sudo] password for admin:
========================================================================
  Backup operation completed successfully.
========================================================================
New AOS snapshot: 2022-10-29_18-58-56
```

> **CAUTION**: The upgraded Apstra server doesn't include any time voyager revisions, so if you need to revert back to a past state, this backup is required. Previous states are not included due to the tight coupling with the reference designs which may change between Apstra versions.

15. Copy the backup files from `/var/lib/aos/snapshot/<shapshot_name>` to an external location.

Step 2: Deploy New Apstra Server

1. Download the Apstra installer package for your platform from Juniper Support Downloads (for example, `aos_server_4.1.2-269`) and transfer it to the Apstra server.

```
admin@aos-server:~$ ls -l
total 823228
-rw------- 1 admin admin 842984302 Oct 26 00:44 aos_4.1.1-287.run.gz
```

2. Unzip the Apstra installer package.

```
admin@aos-server:~$ gunzip aos_4.1.1-287.run.gz
admin@aos-server:~$ ls -l
total 823108
-rw------- 1 admin admin 842860338 Oct 26 00:44 aos_4.1.1-287.run
```

3. If you're using an Apstra cluster (offbox agents, IBA probes), download the installer package to the worker nodes as well. You'll upgrade the worker nodes in a later step.
4. Log in to the Apstra server as **admin**.

5. Run the `sudo bash aos_<aos_version>.run` command, where `<aos_version>` is the version of the run file. For example, if the version is `4.0.1-1045` the command would be `sudo bash aos_4.1.1-287.run` as shown below.

```
admin@aos-server:~$ sudo bash aos_4.1.1-287.run
[sudo] password for admin:
Verifying archive integrity... All good.
Uncompressing AOS installer  100%
========================================================================
  Backup operation completed successfully.
========================================================================
AOS[2022-10-28_01:28:52]: Loading AOS 4.1.1-287 image
AOS[2022-10-28_01:29:44]: Initiating upgrade pre-checker
AOS[2022-10-28_01:29:45]: Initiating docker library import DONE
AOS[2022-10-28_01:30:59]: Preparing to retrieve data from running AOS Server. DONE
AOS[2022-10-28_01:31:11]: Retrieving data from running AOS Server. This step can take up to
10 minutes DONE
AOS[2022-10-28_01:34:30]: Importing retrieved state to AOS pre-checker. This step can take up
to 20 minutes DONE
AOS[2022-10-28_01:34:35]: Waiting for blueprint <3db44826-807f-4ab9-8ca0-e25040af7ef6>
processing to finish. DONE
AOS[2022-10-28_01:34:42]: Waiting for blueprint <964211f7-7f3c-4b0a-b6b7-137790c461f5>
processing to finish. DONE
Summary saved to /tmp/aos-upgrade-config-summary-2022.10.28-013449
```

When you run this command, if any previous Apstra versions are detected, the script enters upgrade mode instead of new installation mode. The new Docker container installs next to the Docker containers from the previous version. The script imports the data from the previous version and migrates it to Apstra SysDB on the new version.

The upgrade script presents a summary view of the devices within the fabric that will receive configuration changes during the upgrade. As of Apstra version 4.1.2, a warning appears on the screen recommending that you read Release Notes and "Upgrade Paths" on page 32 documentation before proceeding. The release notes include a category for **Configuration Rendering Changes**, as of Apstra version 4.1.2. Configuration rendering changes are clearly documented at the top explaining the impact of each change on the network.

```
                      Apstra Upgrade Summary
========================================================================
This is a summary of configuration pushed to devices logically grouped
into sections.  Use 'q' to exit this view.  For more device specific
configurations, use the menu after quitting this view
```

```
WARNING: This upgrade will modify the configuration of devices running
in Apstra blueprints. Before proceeding, ensure you have read the
Release Notes as well as the Upgrade Paths and Workflow documentation at:
https://www.juniper.net/documentation/product/us/en/apstra/#cat=release_notes
https://www.juniper.net/documentation/product/us/en/apstra/#cat=install/upgrade_software/

  BLUEPRINT: 3db44826-807f-4ab9-8ca0-e25040af7ef6
  (BP2)

  BLUEPRINT: 964211f7-7f3c-4b0a-b6b7-137790c461f5
  (BP1)
  Section: FULL_CONFIG
  ~~~~~~~~~~~~~~~~~~~~
  Full configuration apply.
  Configuration      Role                              Systems
  ============================================================================
                 Spine        spine2 [525400E3EF4A, 10.28.105.10]
                              spine1 [52540006D434, 10.28.105.9]

  ----------------------------------------------------------------------------
                 Leaf         l2-virtual-ext-001-leaf1 [5254006260B2, 10.28.105.11]
                              l2-virtual-ext-002-leaf1 [5254009D09D6, 10.28.105.12]
```

As of Apstra version 4.0.1, the **Apstra Upgrade Summary** shows information separated by device roles (superspine, spine, leaf, leaf pair, and access switch for example). If an incremental config was applied instead of a full config, more details are displayed about the changes.

6. After you've reviewed the summary, enter `q` to exit the summary. The **AOS Upgrade: Interactive Menu** appears where you can review the exact configuration change on each device. If you're using configlets, verify that the new configuration pushed by the upgrade does not conflict with any existing configlets.

> ⚠ **CAUTION**: The Apstra Reference Design in the new Apstra release may have changed in a way that invalidates configlets. To avoid unexpected outcomes, verify that your configlets don't conflict with the newly rendered config. If you need to update your configlets, quit the upgrade, update your configlets, then run the upgrade again.

```
AOS Upgrade: Interactive Menu
================================================
<Device SN> - display config changes using a
              specific device serial number
```

```
(s)ummary   - display config change summary
(l)ist      - list all devices with config changes
(d)ump      - dump all config changes to a file
(c)ontinue  - continue with AOS upgrade
(q)uit      - quit AOS upgrade

aos-upgrade (h for help)#
```

7. If you want to continue with the upgrade after reviewing pending changes, enter `c`. The older Apstra version is deleted and the new Apstra version is activated on the server. When the upgrade is complete, navigate to **Platform > About** in the Apstra GUI to check the version.

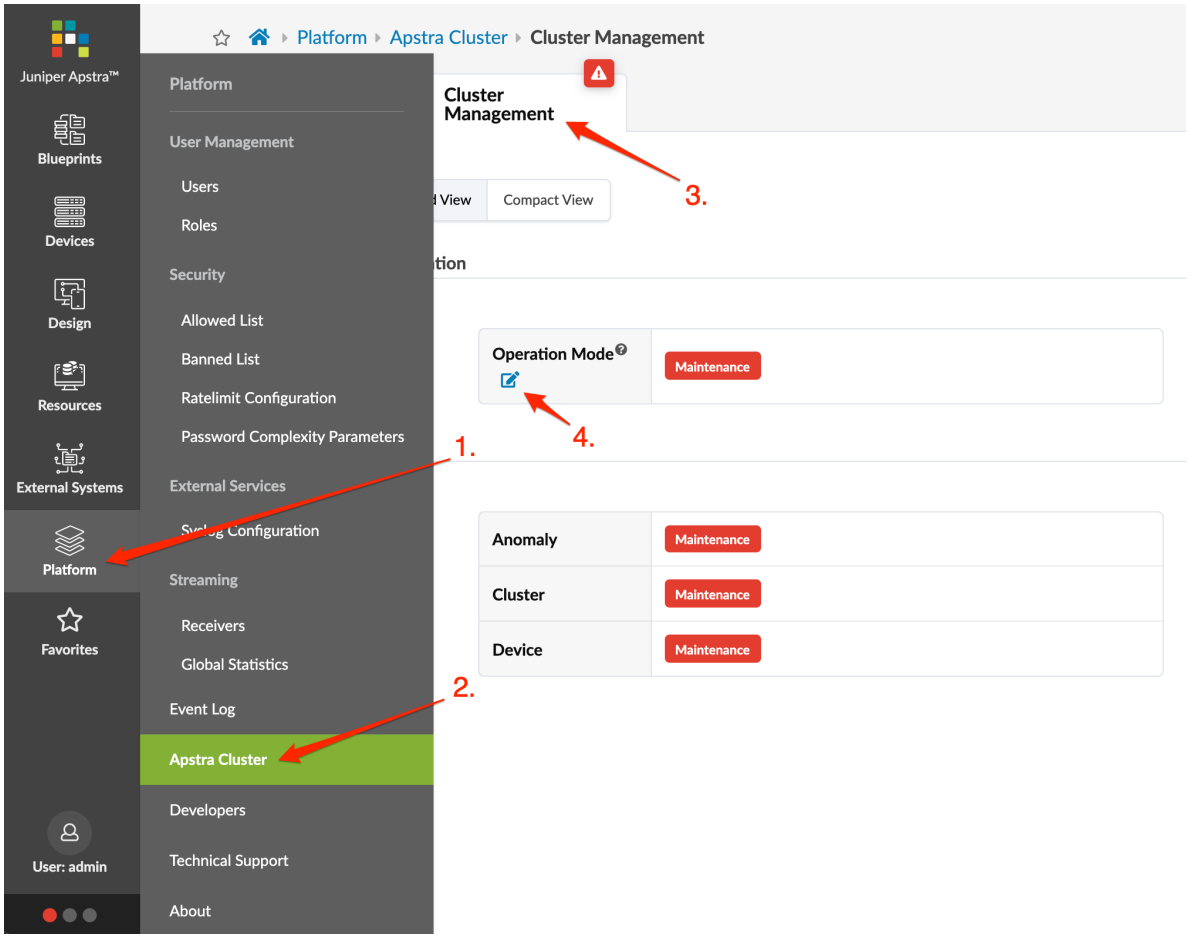
   ⚠ **CAUTION**: Upgrading the Apstra server is a disruptive process. When you upgrade in-place (same VM) and continue with the upgrade from this point, you cannot roll back the upgrade. The only way to return to the previous version is to reinstall a new VM with the previous version and restore the database from the backup that you previously made. You made a backup, right?

8. If you want to stop the upgrade, enter `q` to abort the process. If you quit at this point and later decide to upgrade, you must start the process from the beginning.
9. If you're using an Apstra cluster, the worker nodes disconnect from the Apstra controller and change to the **FAILED** state. This state means that offbox agents and the IBA probe containers that are on the worker nodes are not available; devices that are managed by the offbox agents do remain in service though. After you upgrade the agents in a later step, you'll upgrade the worker nodes in your Apstra cluster and the agents and/or probes will become available.

Step 3: Change Operation Mode to Normal

When you initiate an Apstra server upgrade, the operation mode changes from **Normal** to **Maintenance** automatically. After you've completed the upgrade you must manually change the mode back to **Normal**.

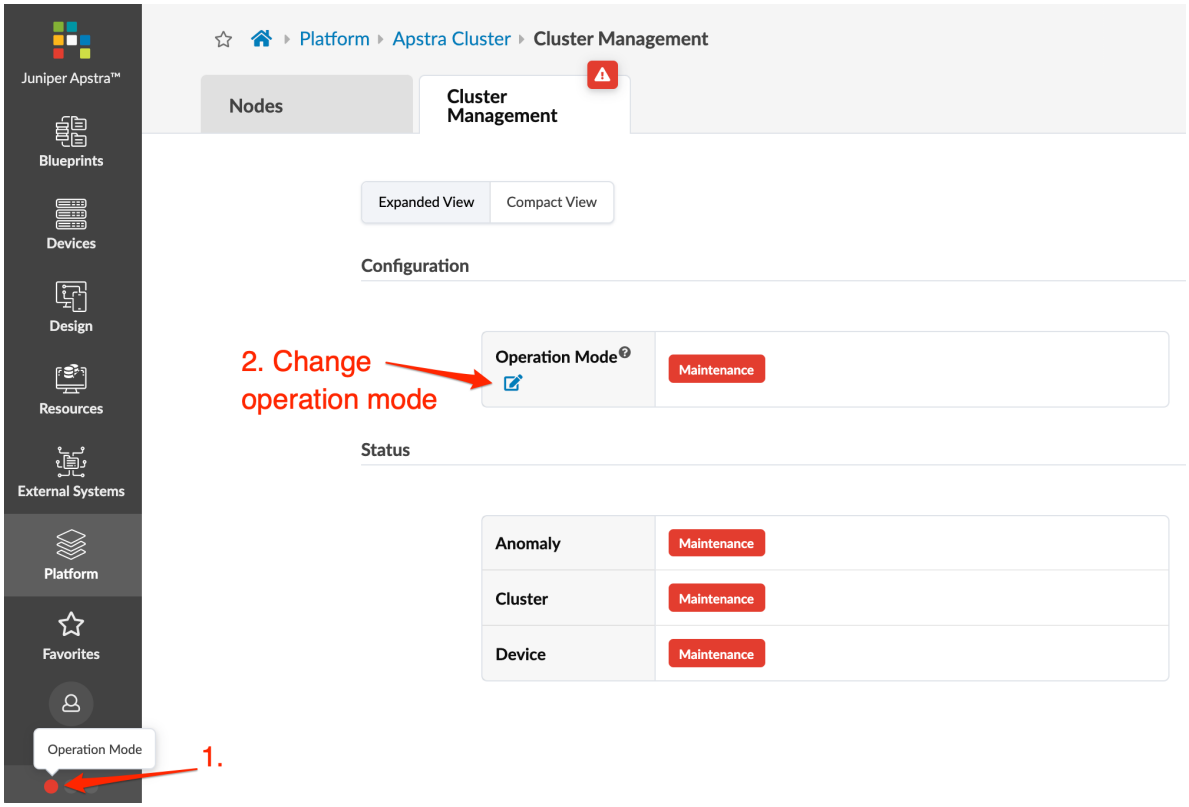
1. From the left navigation menu in the Apstra GUI, navigate to **Platform > Apstra Cluster > Cluster Management**.



2. Click the **Change Operation Mode** button, select **Normal**, then click **Update**. When you change the mode to **Normal**, any configured offbox agents are activated, but you must initiate the upgrade of any onbox agents (in the next section).

   You can also access the **Cluster Management** page from the lower left section of any page. You have continuous platform health visibility from here as well, based on colors.

From the bottom of the left navigation menu, click one of the dots, then click **Operation Mode** to go to **Cluster Management**. Click the **Change Operation Mode** button, select **Normal**, then click **Update**.



Because they're still in the process of upgrading, the agents won't be connected. When the upgrade finishes, the agents reconnect to the server and come back online. On the blueprint dashboard the **Liveness** anomalies for spine and leaf will also resolve.

Step 4: Upgrade Onbox Agents

> ⚠ **CAUTION**: When you initiate agent upgrade you cannot roll back to the previous version. The only way to return to the previous version is to reinstall a new VM with the previous version and restore the database from the backup that you previously made.

1. Log in to the Apstra GUI as user **admin**.
2. From the left navigation menu, navigate to **Devices > System Agents > Agents** and select the device(s) to upgrade (up to 100 devices at a time as of Apstra version 4.0.1). You can upgrade multiple onbox agents at the same time, but the order of device upgrade is important.
   - Upgrade agents for superspines first.
   - Upgrade agents for spines second.
   - Upgrade agents for leafs third.

3. Click the **Install** button to initiate the install process. The job state changes to **IN PROGRESS**. If agents are using a previous version of the Apstra software, they are automatically upgraded to the new version. Then they connect to the server and push any pending configuration changes to the devices. Telemetry also resumes, and the job states change to **SUCCESS**.
4. In the **Liveness** section on the blueprint dashboard, confirm that you don't have any device anomalies .

> **NOTE**: If you need to roll back to the previous Apstra version after initiating agent upgrade, you must build a new VM with the previous Apstra version and restore the configuration to that VM. For assistance, contact Juniper Technical Support.

Step 5: Upgrade Worker Nodes (Apstra Cluster Only)

If you're using an Apstra cluster (for offbox agents and/or IBA probes), you need to upgrade the worker nodes as well as the controller node that you have already upgraded.

1. If you didn't download the Apstra installer package to the worker nodes when you downloaded it to the Apstra server, do that now.
2. From each Apstra worker node, run the `sudo bash aos_<aos_version>.run` command, where `<aos_version>` is the version of the run file. For example, if the version is `4.1.1-287` the command would be `sudo bash aos_4.1.1-287.run` (no options). This is the same file you used to upgrade the controller. There are no prompts during the worker node upgrade.

```
admin@aos-server:~$ sudo bash aos_4.1.1-287.run
Verifying archive integrity... All good.
Uncompressing AOS installer  100%
======================================================================
  Backup operation completed successfully.
======================================================================
AOS[2022-10-28_23:15:29]: Removing installed (4.0.1-1045) AOS package
6babb56be259: Loading layer [==================================================>]  65.51MB/
65.51MB
4b61bdd19e28: Loading layer [==================================================>]  5.632kB/
5.632kB
bd9a55afbdce: Loading layer [==================================================>]  44.03kB/
44.03kB
f495d3ee1163: Loading layer [==================================================>]  13.31kB/
13.31kB
0222f30a89f7: Loading layer [==================================================>]  1.114GB/
1.114GB
15f1b266e91a: Loading layer [==================================================>]  3.072kB/
```

```
3.072kB
3cebea5ed20e: Loading layer [==================================================>]  5.632kB/
5.632kB
07d63988038c: Loading layer [==================================================>]   25.6kB/
25.6kB
82bbad94c148: Loading layer [==================================================>]  88.41MB/
88.41MB
30c5cc7507d8: Loading layer [==================================================>]   58.8MB/
58.8MB
c3a6272b640d: Loading layer [==================================================>]  242.4MB/
242.4MB
236ebbddf13a: Loading layer [==================================================>]  118.3MB/
118.3MB
fcd29376258b: Loading layer [==================================================>]  25.77MB/
25.77MB
214893e2d628: Loading layer [==================================================>]  4.608kB/
4.608kB
Loaded image: aos:4.0.1-1045
AOS[2022-10-28_23:16:15]: Installing AOS 4.1.1-287 package
```

Next Steps:

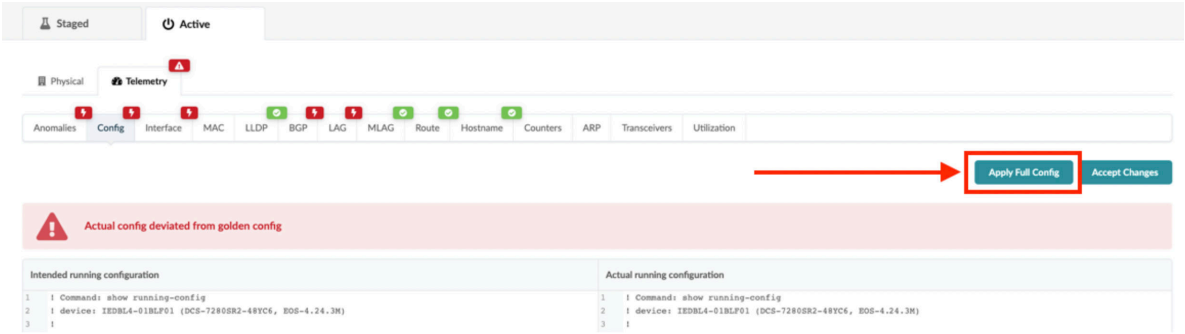
If the NOS versions of your devices are not qualified on the new Apstra version, upgrade them to a qualified version. (See the Juniper Apstra User Guide for details.)

Roll Back Apstra Server Upgrade

If you've upgraded the Apstra server onto a different VM from the previous version, you can roll back to the previous version. (If you've upgraded on the same virtual machine, this option is not available.) You'll lose any changes that you've made on the new Apstra server since upgrading. This action is disruptive.

CAUTION: Apstra does NOT support 'hitless' rollbacks.

1. Shut down the VM containing the 'new' Apstra version.
2. Install / downgrade device onbox agents to match the 'old' Apstra version. (Offbox agents will take care of themselves.)
3. Apply full configuration to the network devices to restore configuration from the 'old' Apstra server.



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