



Appendix

This section contains the following topics:

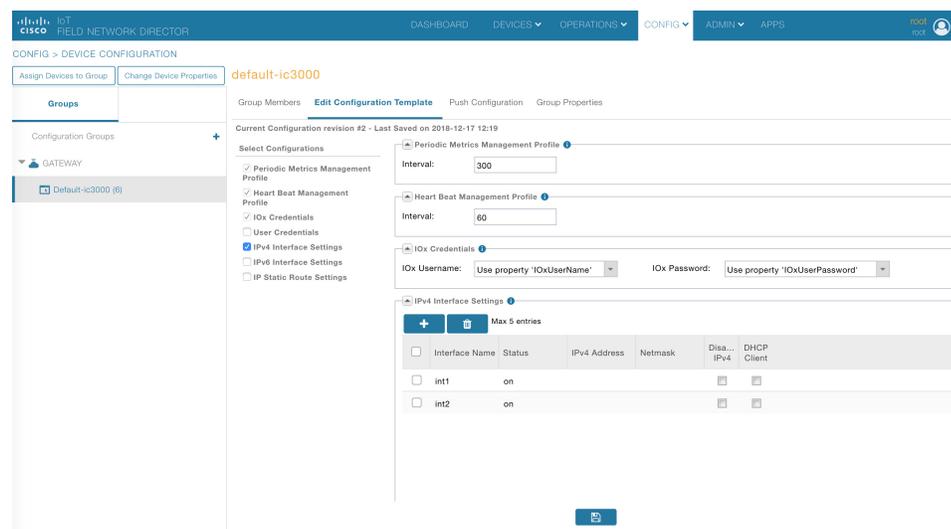
- [FND 4.3 device-configuration templates, on page 1](#)
- [Installing Cisco IoT Field Network Director \(Cisco IoT FND\), on page 4](#)

FND 4.3 device-configuration templates

Understand the default values and select the other parameters as required and save the template. Use the (i) button to understand the optional and mandatory parameters.

Once complete, push the configurations to the devices using the **Push Configuration** tab on the top of the window.

Figure 1: Edit Configuration Template



For the FND 4.3.1 release and greater, the JSON formats for editing a particular IC3000 device are as follows:

```
Bring up interface:
"{
  "name": "InterfaceSettings",
  "value": {
```

```
"ifName": "int1",
"status": 1
}
}
Bring down interface:
{
"name": "InterfaceSettings",
"value": {
"ifName": "int2",
"status": 0
}
}
Setting DHCP:
{
"name": "InterfaceSettings",
"value": {
"ifName": "int3",
"dhcpClient": 1
}
}
Setting static IP:
{
"name": "InterfaceSettings",
"value": {
"ifName": "int4",
"status": 1,
"ipv4": "12.23.34.45",
"netmask": "255.255.255.0"
}
}
Create user:
{
"name": "UserMgmt",
"value": {
"userName": "user1",
"newPassword": "passwd4user1!"
}
}
Delete user:
{
"name": "UserMgmt",
"value": {
"userName": "user1",
"delUser": "True"
}
}
Change user password:
{
"name": "UserMgmt",
"value": {
"userName": "user1",
"oldPassword": "passwd4user1!",
"newPassword": "user1passwd!"
}
}
```

To download a text file with clean JSON entries, go here:

<https://www.cisco.com/c/dam/en/us/td/docs/routers/ic3000/deployment/guide/IC3000-JSON.txt>



Note Make sure your JSON is validated properly before pushing the configuration to device. It is highly recommended to use a JSON validator such as this one: <https://jsonlint.com/>

Copy and paste your entire device configuration template and see if its set appropriately. Anything that's commented has to be removed before validation.

A typical comment section in json is between the following characters.

```
<!--
```

```
Comment text here
```

```
-->
```

As an example, a working JSON entry for bringing all the interfaces up on an IC3000 is as follows.

```
[{
  "name": "MgmtProfile",
  "value": {
    "id": 2,
    "name": "PeriodicMetrics",
    "interval": 300,
    "dataIds": ["5", "18", "23", "24", "25"]
  }
}, {
  "name": "UserMgmt",
  "value": {
    "userName": "${device.IOxUserName}",
    "newPassword": "${device.IOxUserPassword}"
  }
},
{
  "name": "MgmtProfile",
  "value": {
    "id": 1,
    "name": "Heartbeat",
    "interval": 60,
    "dataIds": ["4"]
  }
}, {
  "name": "InterfaceSettings",
  "value": {
    "ifName": "int1",
    "status": 1
  }
}, {
  "name": "InterfaceSettings",
  "value": {
    "ifName": "int2",
    "status": 1
  }
}, {
  "name": "InterfaceSettings",
  "value": {
    "ifName": "int3",
    "status": 1
  }
}, {
  "name": "InterfaceSettings",
  "value": {
```

```
    "ifName": "int4",  
    "status": 1  
  }  
}  
]
```

Installing Cisco IoT Field Network Director (Cisco IoT FND)

This section provides the steps required to install the Cisco IoT Field Network Director (Cisco IoT FND) Release 4.3.1 and greater application with Integrated Application Management (Fog Director) on an Open Virtual Appliance (OVA), VMware ESXi 5.5 or 6.0. You use the same instructions to install both VMware versions.

Note: For information about installing Cisco IoT FND 4.3 and Oracle on an OVA for Release 4.3 and greater, refer to the following guides:

[Cisco IoT FND Deployment on an Open Virtual Appliance, VMware ESXi 5.5/6.0](#)

[Cisco IoT Field Network Director Installation Guide-Oracle Deployment, Releases 4.3.x, 4.4.x and 4.5.x](#)

For an overview of the features and functionality of the IoT FND application and details on how to configure features and manage Cisco IoT FND after its installation, refer to the [Cisco IoT Field Network Director User Guide](#) for your current FND release.

Prerequisites

- Access to the VMware ESXi server.
 - Contact your IT administrator to obtain the IP address to the VMware ESXi server.
 - OR
 - If you are installing the VMware ESXi server software yourself, go to the VMware ESXi site to download the software: <https://www.vmware.com/products/esxi-and-esx.html>
- If you are installing the VMware ESXi server software yourself, go to the VMware ESXi site to download the software: <https://www.vmware.com/products/esxi-and-esx.html>
- Install the VMware vSphere Client for the ESXi 5.5 or 6.0 server.
- Locate the VMware credentials to create virtual machines in ESXi 5.5. or 6.0, respectively.
- Ensure that you meet the VMware server machine requirements. Listed below are the VM CPU and memory requirements for a small scale deployment:

NMS OVA

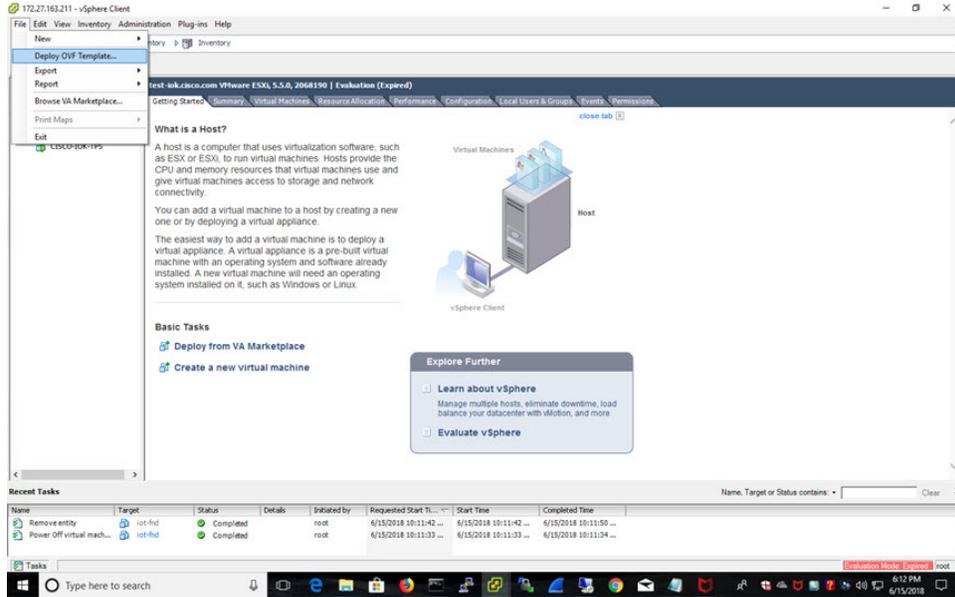
- 16 GB memory
- 1 core and 4 virtual sockets
- 150 GB of virtual storage
- Download the OVA from Cisco.com.

Installing the OVA

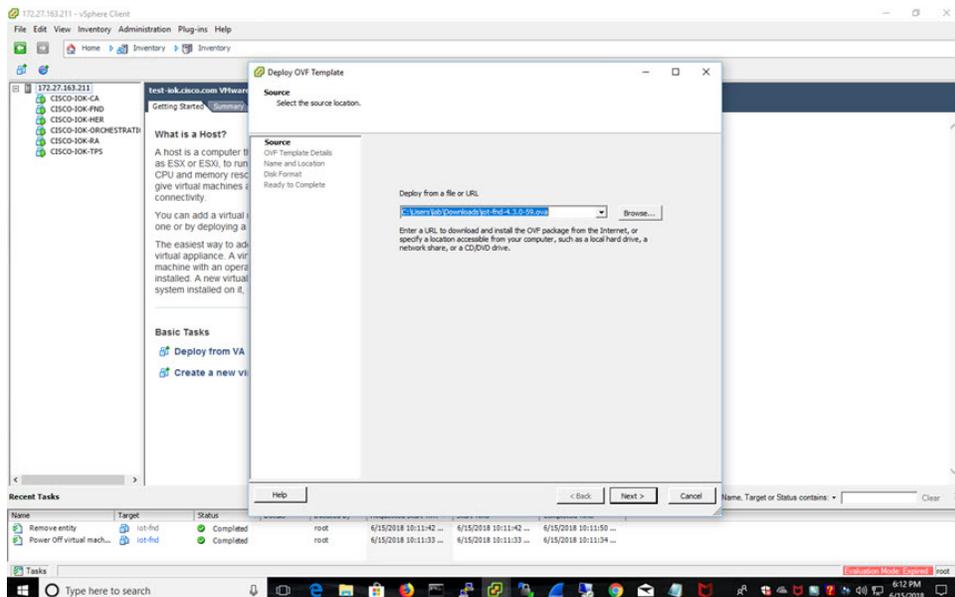
Procedure

Step 1 Use VMware Fusion or VMware vSphere client to deploy OVA on ESXi Server. Do not change the defaults for the installation.

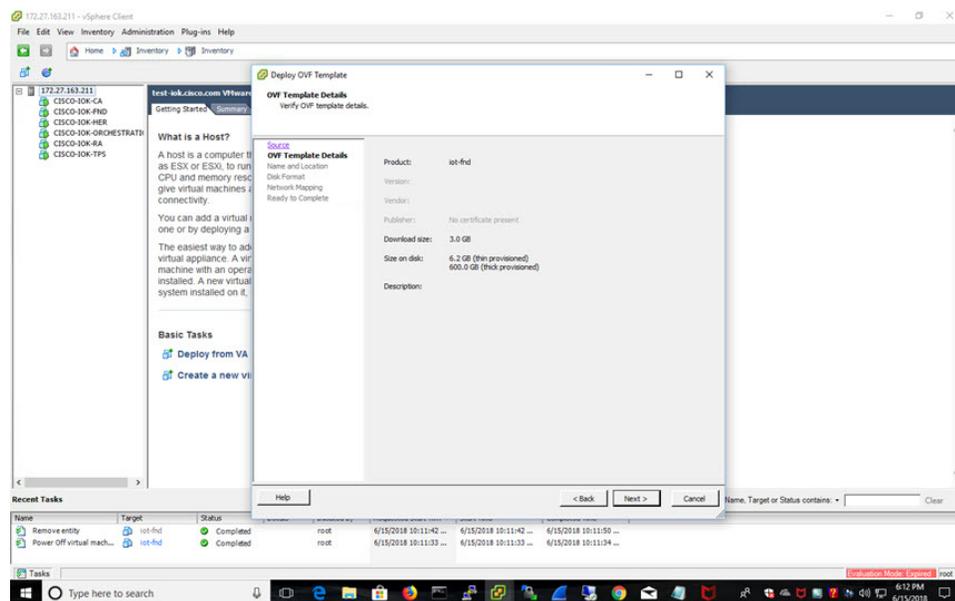
a) Under File, choose **Deploy OVF template**.



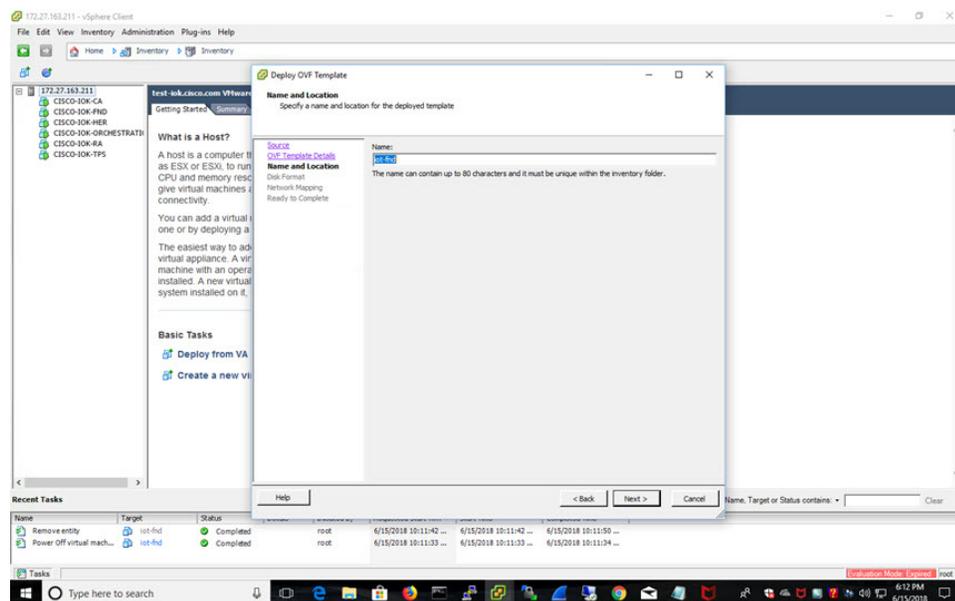
b) Keep the default location and click **Next**.



c) Click **Next**.

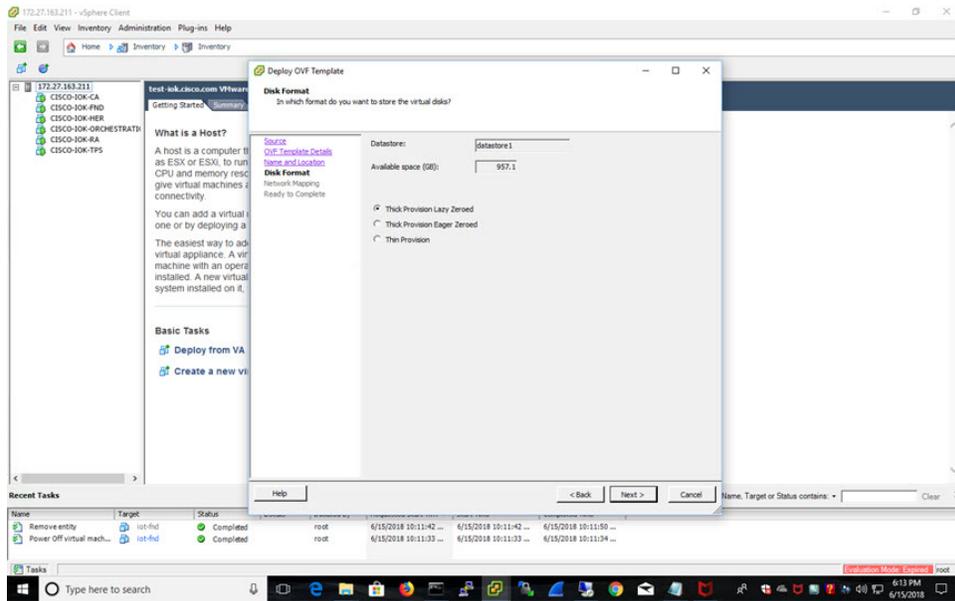


d) Enter a name of the deployed template.

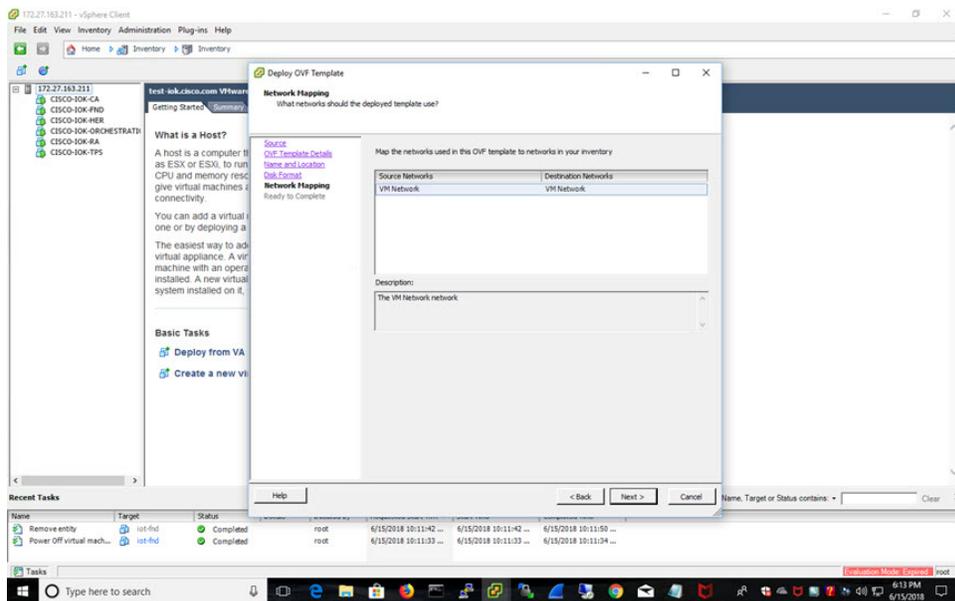


e) Choose the format that you want virtual disks to be stored.

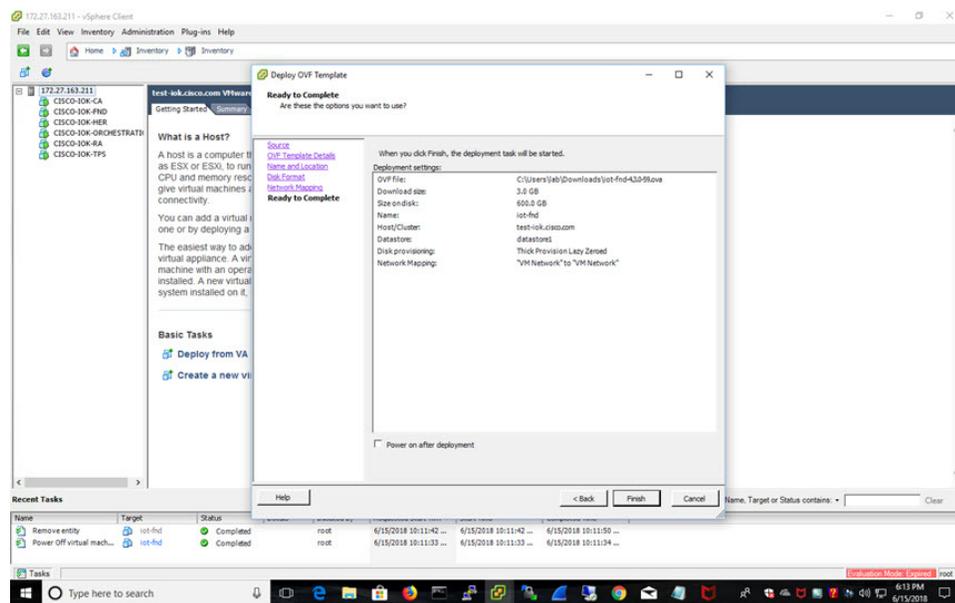
Note Thick provisions require 600 GB of disk space on the ESXi server.



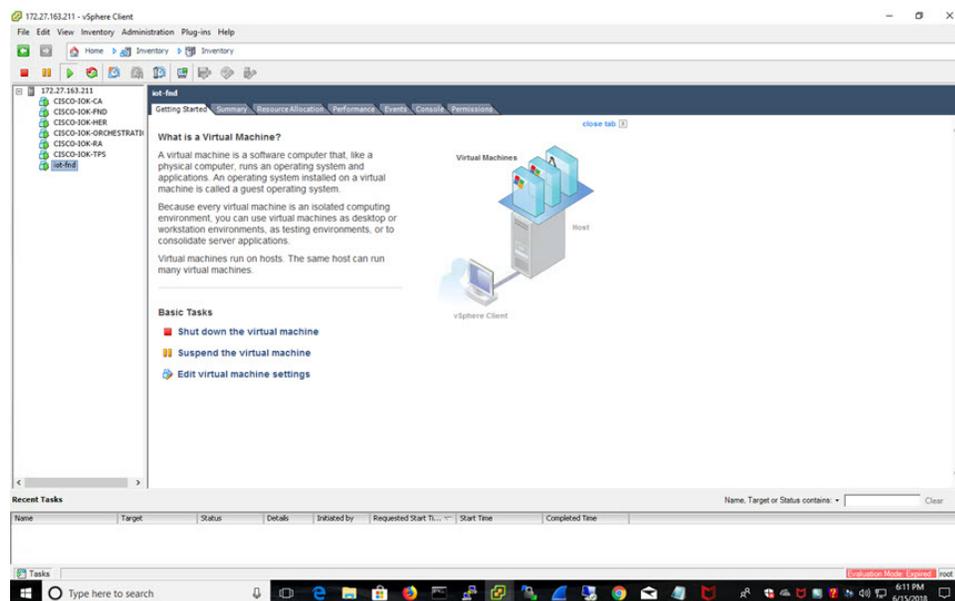
f) Click **Next**.



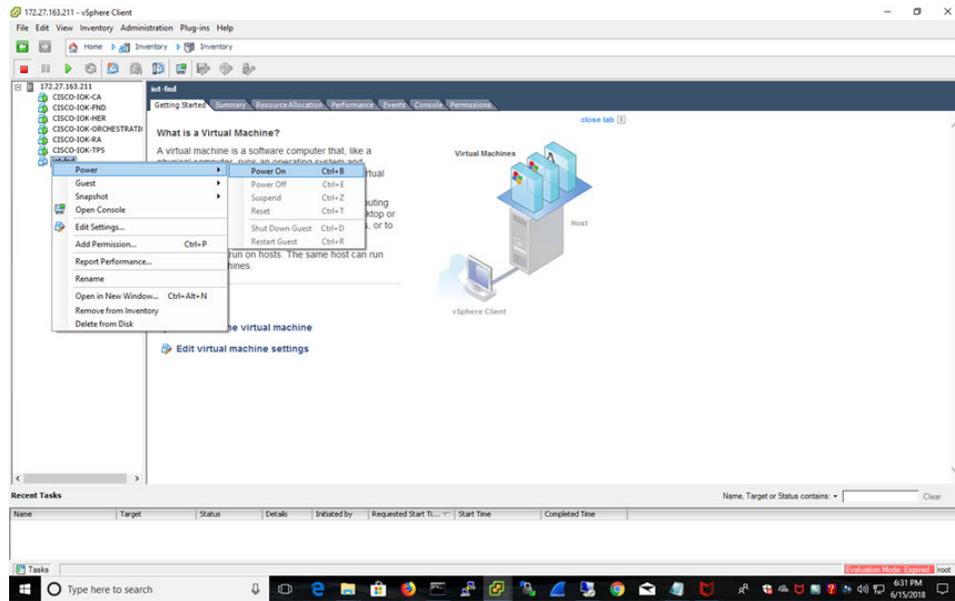
g) Review and click **Finish**.



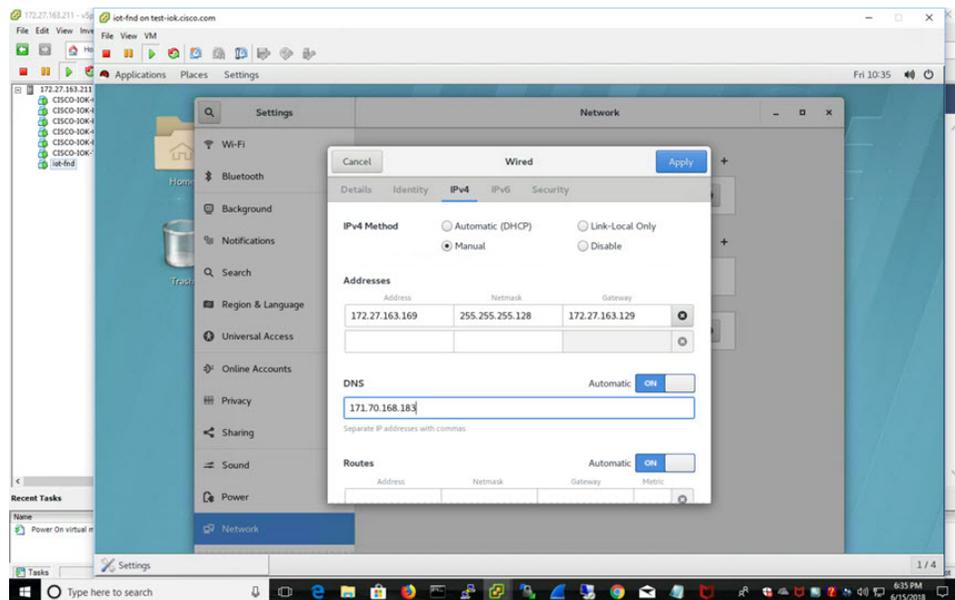
The template starts downloading. When it is completed, the template is listed on the left pane.



Step 2 Power on the VM. Right click on the iot-fnd template name. Select **Power** and **Power On**.



- Step 3** Assign a static IP address. Or, setup a DHCP server in the network, so an IP address gets assigned. Setup a valid, reachable working DNS server on the Host VM. (mandatory)



Use this IP address to access the FND GUI.

- Step 4** Click on Console and login with root/cisco123 once the OS is up.
- Once logged in, go to **Applications -> System Tools -> Settings -> Network**.
 - Click the plus sign (+).
- Step 5** From a web browser, access FND URL and change the password for the root user. Default username/password is root/root123.
- Step 6** Open a terminal window, and setup Health Monitoring for the Fog Director Container from FND.

```
[root@iot-fnd ~]# cd /opt/monitor/
```

```
[root@iot-fnd monitor]# ./setup.sh
Setup health metrics monitor for App Management Servers
Enter FND Username: root
Enter FND Password:
Successfully configured health metrics monitor for App Management Servers
```

After completing these steps, FND starts monitoring Fog Director container on the ADMIN → SERVERS page.

Using a Custom cgms_keystore in the FND Container

Enter the following information to provide a secure connection to devices within this OVA deployment.

Use these steps to have FND use your custom keystore.

1. Put your cgms_keystore file in /opt/fnd/data/ on the Host.
2. Run the following command to encrypt the password for the new cgms_keystore:

```
docker exec -it fnd-container /opt/cgms/bin/encryption_util.sh encrypt <keystore password >
```

```
[root@iot-fnd ~]# docker exec -it fnd-container /opt/cgms/bin/encryption_util.sh encrypt
cisco123
2bVvZsq+vsq94YxuAKdaag==
```

1. Modify the cgms.properties file in the /opt/fnd/data folder, and edit the following line to set the new encrypted cgms_keystore password:

```
cgms-keystore-password-hidden=encrypted new cgms_keystore password
```



Note With OVA 4.3.1 and above you can leave the cgms_keystore.selfsigned default bundled keystore untouched.

If both the files (cgms_keystore and cgms_keystore.selfsigned) are present, the cgms_keystore will be used by the container.

Configuring FND for IPv6 Tunnel Provisioning and Registration

FND OVA supports only IPv4 tunnels and Registration out of the box.

To setup an IPv6 network for tunnel provisioning and registration, follow these steps:

Procedure

- Step 1** Ensure you have one interface with a valid IPv6 network which has a IPv6 prefix length less than 125. See the following example of the ens32 interface:

Example:

```
[root@iot-fnd ~]# ifconfig ens224
ens224: flags=4163[UP,BROADCAST,RUNNING,MULTICAST] mtu 1500
inet 2.2.56.117 netmask 255.255.0.0 broadcast 2.2.255.255
inet6 fe80::54f0:5d24:d320:8e38 prefixlen 64 scopeid 0x20[link]
inet6 2001:420:7bf:5f::1522 prefixlen 64 scopeid 0x0[global]
ether 00:0c:29:18:1b:3a txqueuelen 1000 (Ethernet)
RX packets 97618 bytes 12391774 (11.8 MiB)
RX errors 1001 dropped 1011 overruns 0 frame 0
TX packets 3004 bytes 568097 (554.7 KiB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
[root@iot-fnd ~]
#
```

Step 2 Run the `./setup-IPv6-network.sh` script in the `/opt/fnd/scripts` directory to obtain the FND IPv6 address on the router for tunnel provisioning and registration.

```
[root@iot-fnd scripts]# ./setup-IPv6-network.sh
Setup IPv6 Network For Containers
IPv6 Network setup process will require an active interface with a Global IPv6 Address.
IPv6 prefix length must be less than 125.

Enter Interface Name: ens32
Enter IPv6 Address: 2001:1111:2222:0:20c:29ff:fe44:ea4d
Enter IPv6 Prefix Length: 64

One of the IPv6 networks in /125 subnet from 2001:1111:2222:0:20c:29ff:fe44:ea4d/64 will be required to setup container network.
Enter IPv6 Address for network-mgmt-bridge from /125 subnet: 2001:1111:2222:0:20c:29ff:fe44:1515

Preparing Network Configuration...
Stopping Watchdog...
Stopping FND container...
Stopping FogD container...
Removing FND container...
Removing FogD container...
Prune Docker container...
Removing Docker network...
Configure Docker network for v6...
e64e98f5f67eea1c77491500e19c897eeac35b96cf718f0ac3f9bf2fb59b3836
Starting FND container...
6664d4178b244043a18aa2bf1014a8cc2ce9faa7aa86ac1d9aa9f01e7df7d3
Starting Fog Director container...
fe93771cd31c731276376a47a5ed34d86a6a8b70c4064d9923d7076170193d9b
Configure containers for v6...
Starting Watchdog...
Configured IPv6 network on the containers
Please use following FND IPv6 address with prefix length 2001:1111:2222:0:20c:29ff:fe44:1511/125 on the router for IPv6 Tunnel Provisioning and Registration
```

Note While specifying the IPv6 address for the `network-mgmt-bridge`, provide an Interface Name and a valid IPv6 address (and IP address prefix length) that is in the subnet of the provided host interface. If IPv6 address is in a different subnet, the IPv6 tunnel provisioning and registration will not be successful.

Installing Custom CA Certificates on FND

By default the FND container comes bundled with `cgms_keystore`.

- Keystore Location in the FND Container: `/opt/cgms/server/cgms/conf/`
- Keystore Name: `cgms_keystore`
- Default Password: `Public123!`
- Default Trusted Certification Entry in Keystore: `cisco_sudi, jmarconi`

To use a custom CA certificate on the router, add a CA certificate to the trusted certificate entries in the `cgms_keystore`.

Procedure

Step 1 Place the certificate file in the following location on the host machine.

```
/opt/fnd/data/
```

Step 2 Enter into FND container

```
docker exec -i -t fnd-container /bin/bash
```

Step 3 Change into the conf directory.

```
cd /opt/cgms/server/cgms/conf/
```

Step 4 Import a root or intermediate CA certificate to cgms_keystore.

```
/opt/cgms/jre/bin/keytool -import -trustcacerts -alias alias-name -file /tmp/fnd-data/ca.crt -keystore
cgms_keystore
```

Use a preferred alias name

Step 5 Restart FND.

```
/etc/init.d/cgms restart
```

Step 6 Verify that the certificate was added to the trusted entry.

```
/opt/cgms/jre/bin/keytool -list -v -keystore cgms_keystore
```

Enter keystore password.

Upgrading FND

To update FND, you must have access to dockerhub.cisco.com.

Run the `upgrade-fnd.sh` script from the following directory:

```
cd /opt/fnd/scripts/
```

```
[root@iot-fnd scripts]# ./upgrade-fnd.sh
This script must be run with root privileges.
Usage: All upgrade: Requires <path to cgms-postgres.rpm> and <path to cgms-influx.rpm>
       For FND container upgrade: No resource required
       For FND Postgres RPM upgrade: Requires <path to cgms-postgres.rpm>
       FND Influx RPM upgrade: Requires <path to cgms-influx.rpm>

1) Full upgrade           4) FND Influx RPM upgrade
2) FND container upgrade  5) Quit
3) FND Postgres RPM upgrade
[Enter your choice: 3
Enter cgms-postgres rpm file path:
[/root/cgms-postgres-4.3.0-48.x86_64.rpm
Stopping FND container...
fnd-container
Preparing... ##### [100%]
Updating / installing...
  1:cgms-postgres-4.3.0-48 ##### [ 50%]
Cleaning up / removing...
  2:cgms-postgres-4.3.0-47 ##### [100%]
Starting FND container...
```

```
[root@iot-fnd scripts]# ./upgrade-fnd.sh
This script must be run with root privileges.
Usage: All upgrade: Requires <path to cgms-postgres.rpm> and <path to cgms-influx.rpm>
For FND container upgrade: No resource required
For FND Postgres RPM upgrade: Requires <path to cgms-postgres.rpm>
FND Influx RPM upgrade: Requires <path to cgms-influx.rpm>

1) Full upgrade          4) FND Influx RPM upgrade
2) FND container upgrade 5) Quit
3) FND Postgres RPM upgrade
Enter your choice: 2
Stopping FND container...
fnd-container
Remove FND container...
fnd-container
Prune Docker container...
WARNING! This will remove all stopped containers.
Are you sure you want to continue? [y/N] Total reclaimed space: 0B
Downloading latest FND docker image...
latest: Pulling from field-network-director-dev-docker/fnd-image
469cfcc7a4b3: Already exists
78e1c8192d09: Already exists
24106544ca78: Already exists
7ad1c8dc78ad: Already exists
3ed6a9248eed: Already exists
ae1446b14021: Already exists
ba0a265aacaf: Already exists
Digest: sha256:4451daf1d8b0f0d7f370dda8c553a68807d545a881e059029f6f0b0a31cfd6b1
Status: Image is up to date for dockerhub.cisco.com/field-network-director-dev-docker/fnd-image:latest
Starting FND container...
4bc00c18b2c83f7f10215878c9552a17fecc9e852949ab80348e448ea25d6fb2
```

Starting and Stopping FND

Use the `fnd-container.sh {start|stop|status|restart}` script in the following directory to start, stop, obtain status, and restart FND:

```
cd /opt/fnd/scripts/
```

```
[root@iot-fnd scripts]# ./fnd-container.sh status
fnd-container is running, pid=22745
CONTAINER ID        NAME               CPU %               MEM USAGE / LIMIT   MEM %               NET I/O            BLOCK I/O           PIDS
4bc00c18b2c8        fnd-container      1.99%              1.064GiB / 23.38GiB  4.55%              8.63MB / 8.07MB    0B / 1.70MB         272
[root@iot-fnd scripts]# ./fnd-container.sh stop
Stopping FND container...
fnd-container
[root@iot-fnd scripts]# ./fnd-container.sh start
[root@iot-fnd scripts]# Starting FND container...
fnd-container

[root@iot-fnd scripts]# ./fnd-container.sh restart
Stopping FND container...
fnd-container
[root@iot-fnd scripts]# Starting FND container...
fnd-container
```

Upgrading Fog Director

To update Fog Director, you must have access to `dockerhub.cisco.com`.

Run the `upgrade-fogd.sh` script from the following directory:

```
cd /opt/fogd/scripts
```

```
[root@iot-fnd scripts]# ./upgrade-fogd.sh
Stopping Fog Director container...
fogd-container
Remove Fog Director container...
fogd-container
Prune Docker container...
WARNING! This will remove all stopped containers.
Are you sure you want to continue? [y/N] Total reclaimed space: 0B
Downloading latest Fog Director docker image...
latest: Pulling from fog-director-dev-docker/fogd-image
324d088ce065: Already exists
2ab951b6c615: Already exists
9b01635313e2: Already exists
04510b914a6c: Already exists
83ab617df7b4: Already exists
39460e334589: Already exists
c6dff050367e: Already exists
2b0b56e80504: Already exists
54614f34f9fa: Already exists
24f76a367fd4: Already exists
Digest: sha256:0a4dlae165aa6be0de20c1196055ab5153b34f808bc08aaaf9087eb23bd805cf
Status: Image is up to date for dockerhub.cisco.com/fog-director-dev-docker/fogd-image:latest
Starting Fog Director container...
f2bc75fa77c29127f7cc7de7e9cba9011e7d09e8dbcf692729141b94e0815cf6
[root@iot-fnd scripts]#
```

Starting and Stopping Fog Director

Use the `fogd-container.sh {start|stop|status|restart}` script in the following directory to start, stop, obtain status, and restart Fog Director:

```
cd /opt/fogd/scripts
```

```
[root@iot-fnd scripts]# ./fogd-container.sh stop
Stopping Fog Director container...
fogd-container
[root@iot-fnd scripts]# ./fogd-container.sh start
[root@iot-fnd scripts]# Starting Fog Director container...
fogd-container

[root@iot-fnd scripts]# ./fogd-container.sh status
fogd-container is running, pid=10759
CONTAINER ID        NAME           CPU %          MEM USAGE / LIMIT   MEM %           NET I/O         BLOCK I/O        PIDS
f2bc75fa77c2       fogd-container  2.00%         764.6MiB / 23.38GiB  3.19%           849kB / 1.5MB   0B / 41kB        119
[root@iot-fnd scripts]# ./fogd-container.sh restart
Stopping Fog Director container...
fogd-container
[root@iot-fnd scripts]# Starting Fog Director container...
fogd-container
[root@iot-fnd scripts]#
```

Obtaining Status of All Services Running on the Host

Use the `status.sh` script in the following directory to show the status of all services running on the host.

```
cd /opt/scripts
```

```
[root@iot-fnd ~]# cd /opt/scripts/
[root@iot-fnd scripts]# ./status.sh
-----
* postgresql-9.6.service - PostgreSQL 9.6 database server
   Loaded: loaded (/usr/lib/systemd/system/postgresql-9.6.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2018-06-15 17:02:07 EDT; 13min ago
     Docs: https://www.postgresql.org/docs/9.6/static/
   Process: 1016 ExecStartPre=/usr/pgsql-9.6/bin/postgresql96-check-db-dir $(PGDATA) (code=exited, status=0/SUCCESS)
  Main PID: 1070 (postmaster)
    Tasks: 24
   Memory: 166.2M
-----
* influxdb.service - InfluxDB is an open-source, distributed, time series database
   Loaded: loaded (/usr/lib/systemd/system/influxdb.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2018-06-15 17:02:03 EDT; 13min ago
     Docs: https://docs.influxdata.com/influxdb/
  Main PID: 1024 (influxd)
    Tasks: 11
   Memory: 47.4M
-----
fnd-container is running, pid=2064
CONTAINER ID   NAME          CPU %           MEM USAGE / LIMIT   MEM %           NET I/O        BLOCK I/O      PIDS
a67827470562   fnd-container  1.04%          1.064GiB / 23.38GiB  4.55%          6.69MB / 8.19MB  581MB / 2.22MB  275
-----
fogd-container is running, pid=5192
CONTAINER ID   NAME          CPU %           MEM USAGE / LIMIT   MEM %           NET I/O        BLOCK I/O      PIDS
f6c0c5c313cb   fogd-container  1.64%          762.3MiB / 23.38GiB  3.18%          1.84MB / 3.45MB  106kB / 184kB  117
-----
[root@iot-fnd scripts]#
```

Upgrading Both Fog Director and FND

Use the upgrade.sh script in the following directory to fully upgrade both Fog Director and FND.

opt/fnd/scripts/



Note

Since this performs a full FND upgrade, you must provide the paths to cgms-postgres.rpm and cgms-influx.rpm

```
[root@iot-fnd scripts]# ./upgrade-fnd.sh
This script must be run with root privileges.
Usage: All upgrade: Requires <path to cgms-postgres.rpm> and <path to cgms-influx.rpm>
       For FND container upgrade: No resource required
       For FND Postgres RPM upgrade: Requires <path to cgms-postgres.rpm>
       FND Influx RPM upgrade: Requires <path to cgms-influx.rpm>

1) Full upgrade           4) FND Influx RPM upgrade
2) FND container upgrade  5) Quit
3) FND Postgres RPM upgrade

Enter your choice: 2
Stopping FND container...
fnd-container
Remove FND container...
fnd-container
Prune Docker container...
WARNING! This will remove all stopped containers.
Are you sure you want to continue? [y/N] Total reclaimed space: 0B
Downloading latest FND docker image...
latest: Pulling from field-network-director-dev-docker/fnd-image
469cfcc7a4b3: Already exists
78e1c8192d09: Already exists
24106544ca78: Already exists
7ad1c8dc78ad: Already exists
3ed6a9248eed: Already exists
ae1446b14021: Already exists
ba0a265aacaf: Already exists
Digest: sha256:4451daf1d8b0f0d7f370dda8c553a68807d545a881e059029f6f0b0a31cfd6b1
Status: Image is up to date for dockerhub.cisco.com/field-network-director-dev-docker/fnd-image:latest
Starting FND container...
4bc00c18b2c83f7f10215878c9552a17fecc9e852949ab80348e448ea25d6fb2
```

Backup and Restore

You can export the entire OVA image file as backup, port it to different deployment or restore from an older image file.

1. Power down the OVA in vSphere Client.

2. Select the OVA, and then select **File -> Export -> Export OVF Template**.

Setting the Time and Timezone Using NTP Service

Use the **timedatectl** command on the Host VM to perform following operations to sync the time between the host and the docker:

- Displaying the Current Date and Time: **timedatectl**
- Changing the Current Time: **timedatectl set-time HH:MM:SS**
- Changing the Current Date: **timedatectl set-time YYYY-MM-DD**
- Listing the Time Zone: **timedatectl list-timezones**
- Changing the Time Zone: **timedatectl set-timezone time_zone**
- Enabling NTP Service: **timedatectl set-ntp yes**

```
[root@iot-fnd ~]# timedatectl
Local time: Tue 2018-08-28 07:18:37 PDT
Universal time: Tue 2018-08-28 14:18:37 UTC
RTC time: Tue 2018-08-28 14:18:37
Time zone: America/Los_Angeles (PDT, -0700)
NTP enabled: yes
NTP synchronized: yes
RTC in local TZ: no
DST active: yes
Last DST change: DST began at
                  Sun 2018-03-11 01:59:59 PST
                  Sun 2018-03-11 03:00:00 PDT
Next DST change: DST ends (the clock jumps one hour backwards) at
                  Sun 2018-11-04 01:59:59 PDT
                  Sun 2018-11-04 01:00:00 PST
[root@iot-fnd ~]#
```

Please refer to the following link for more info on usage of **timedatectl** command

https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/7/html/system_administrators_guide/chap-configuring_the_date_and_time