Integrating Third Party Devices

with

Cisco FND5.0 & **OpenCSMP**

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Prerequisites

FND Installation

Install FND version 5.0.0-70 RPMs.

Refer: https://www.cisco.com/c/en/us/td/docs/routers/connectedgrid/iot_fnd/install/oracle/b-cisco-iot-fnd-install-guide-oracle-r43x/m-installing-iot-fnd-rpm-for-the-first-time--oracle-only-deployment.html

OpenCSMP:

Download latest v1.0.0 release: https://github.com/CiscoDevNet/csmp-agent-lib/releases/tag/v1.0.0

Cisco DevNet Github repository: https://github.com/CiscoDevNet/csmp-agent-lib

Refer: README, CSMP Developer Tutorial - 0v11.pdf

Signing CSMP POST messages:

1. If the CSMP agent is enabled with signature settings, ensure that FND has HSM or SSM modules installed with the certificates. Refer the below FND documentation links for SSM and HSM installation:
   https://www.cisco.com/c/en/us/td/docs/routers/connectedgrid/iot_fnd/install/oracle/b-cisco-iot-fnd-install-guide-oracle-r43x/m-installing-iot-fnd-rpm-for-the-first-time--oracle-only-deployment.html#Cisco_Concept.dita_09694780-0e30-418c-a852-215b7f45bc36
   https://www.cisco.com/c/en/us/td/docs/routers/connectedgrid/iot_fnd/install/oracle/b-cisco-iot-fnd-install-guide-oracle-r43x/m-generating-and-installing-certificates1.html#Cisco_Concept.dita_b0b9e74f-f70a-442b-aa5f-62e9e68ac810

Registering Third-Party Devices in IoT FND

Follow the below steps to create a new device type metadata for a TPD:

Step 1 Run the addGenericEndpoints.sh script in opt/cgms/bin directory. The system prompts for the device type name.

Step 2 Provide an alphanumeric name. The script creates the endpoint-meta directory under opt/cgms/server/cgms/conf directory, if not present already. If the name of the new device type is provided as endpointdevice1, then the sub directory is created under endpoint-meta directory as:

opt/cgms/server/cgms/conf/endpoint-meta/endpointdevice1
The addGenericEndpoints.sh script copies all the template files from endpoint-meta-templates directory, renames them as per the device type name provided and moves it under new device type directory.

Note: Addition or removal of existing set of template files is not allowed.

Step 3 Edit the opt/cgms/server/cgms/conf/endpoint-meta/endpointdevice/endpointdevice1Meta.json file to update the metadata of the device type required for registration of new device.

```
{
 "device_info": {
 "device_type": " ",
 "device_function": " ",
 "device_description": " ",
 "display_string": " ",
 "pids": [ ] ,
 "vendorId": " ",
 "vendorName": " ",
 "configure_vendortlv": "",
 "device_actions": [
 "reboot",
  "ping",
 "traceroute",
 "inventory",
     ],
 "hw_info": " "
   }
}
```

The description for each field is provided below:

- device_type : Enter alphanumeric characters for the name of the device type to be registered (Eg: endpointdevice1).
- device_function : Mention any of the existing mesh functions. The list of device functions currently supported in IoT FND are meter (1), extender (2), gateway (3), cge (4), root (5), controller (6), sensor (7), networknode (8), gasmeter (9). entPhysicalFunction field in Hardware Description TLV11 should report one of the above device functions.
- device_description : Provide a brief information about the device type.

- display_string : Enter the display name for the endpoint device as it is to be displayed in the left side tree of the Field Devices page under Endpoint category. The display string is in the format <device function>-<display string> (Eg: METER-ENDPOINTDEVICE1).
- pids : (optional) Enter the device pids as comma separated values (for example, “spid1”, “spid2”).
- vendorId: Enter the vendorId which is used in Vendor TLV 127. Vendor Id are based on IANA PEN assignments. IANA PEN assignments for VendorTLV is defined in iana_pen.h in the OpenCSMP code which is based on IANA PEN registry here https://www.iana.org/assignments/enterprise-numbers/
- vendorName: Enter the vendor name which corresponds to the vendorId.
- device_actions : (optional) This indicates the supported actions that could be performed for this device. The default set of actions are
    - Ping : The Ping button is used to send a ping to the device to determine its network connectivity.
    - Traceroute : The Traceroute button is used to trace the route to the device.
    - Refresh Metrics : The Refresh Metrics button is used to manually update the metrics of the device.
    - Reboot : The reboot button is used to reboot the device.
    - Sync Config Membership : The Sync Config Membership button is used to synchronize the config membership for this device.
    - Sync Firmware Membership: The Sync Firmware Membership button is used to synchronize the firmware membership for this device.
- configure_vendortlv : Enter true for FND to support config push of Vendor TLV 127.
- hw_info : Enter the hardware id for this device type which is present in the compatible firmware image header. Currently FND 5.0.0-70 allows users to have a unique 1:1 mapping between the device_type and hw_info. For example: All the methane sensors with the same hw_info can be onboarded using a unique device_type namely methane_sensors followed by a specific suffix which are unique to these methane sensors.

Step 4 Start IoT FND after adding or updating the metadata files. IoT FND reads the endpoint-meta directory and creates the appropriate tables in IoT FND for each device type. In case of any issues during IoT FND start up, it logs the errors in server.log and continues with the startup process.

Step 5 Once IoT FND is restarted, you can add the devices to IoT FND by importing the csv file containing the EID and devicetype newly created above.

For more info about adding endpoints, see Adding Routers, Head-End Routers, IC3000 Gateway, Endpoint and Extenders and IR500 in Bulk. On addition, the device gets listed under Endpoints Category in the Field Devices page.

The below screenshot depicts the metadata of the sample device type created.

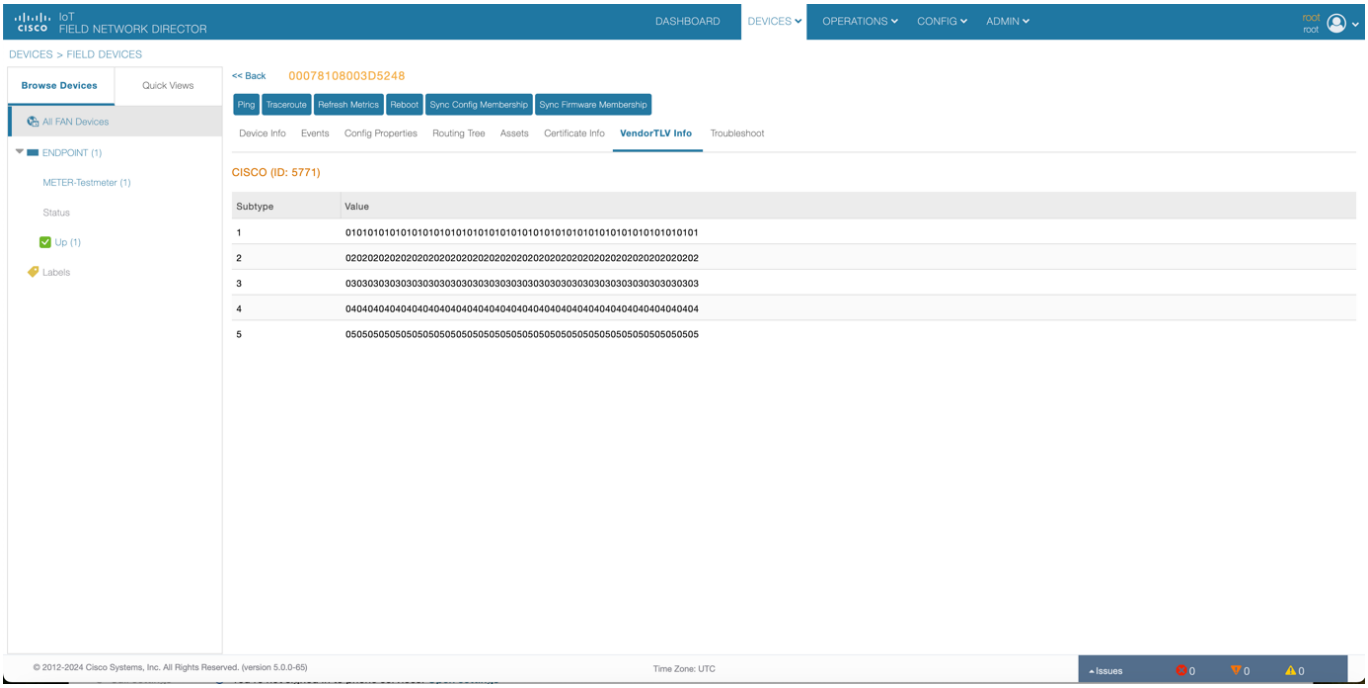
```
[root@iot-fnd-oracle testmeter]# cat testmeterMeta.json
{
    "device_info": {
        "device_type": "testmeter",
        "device_function": "meter",
        "device_description": "Its a test meter",
        "display_string": "testmeter",
        "pids": ["OPENCSMP"],
        "vendorId": "5771",
        "vendorName": "CISCO",
        "configure_vendortlv": "true",
        "hw_info": "OPENCSMP",
        "device_actions": [
            "reboot",
            "ping",
            "traceroute",
            "inventory"
        ]
    }
}
```

Caveats:

1. Creation of duplicate device types is not allowed.
2. A unique 1:1 mapping needs to exist between device_type and hw_info.
3. Removal of already created device type is currently not supported. Please create a new device type instead.

Field Devices Page

A new tab “VendorTLV Info” in the device inventory page displays the vendor TLV details along with vendor name as: vendor-name (vendor-id) Eg: Cisco (ID: 5771) , where ID is the IANA PEN of the Vendor received by FND from CSMP agent during device registration.



Config Group

The new endpoint devices shall show up in the UI with the default group name (default-deviceType). The config is read from the template meta data file(default<deviceType>Template.json). Any changes in the template meta data file will get reflected in the default group.

Below is the default config template supported as part of the metadata file “default<deviceType>Template.json” where now VendorTlv should be added as part of periodic metrics to fetch Vendor TLV during periodic metric refresh.

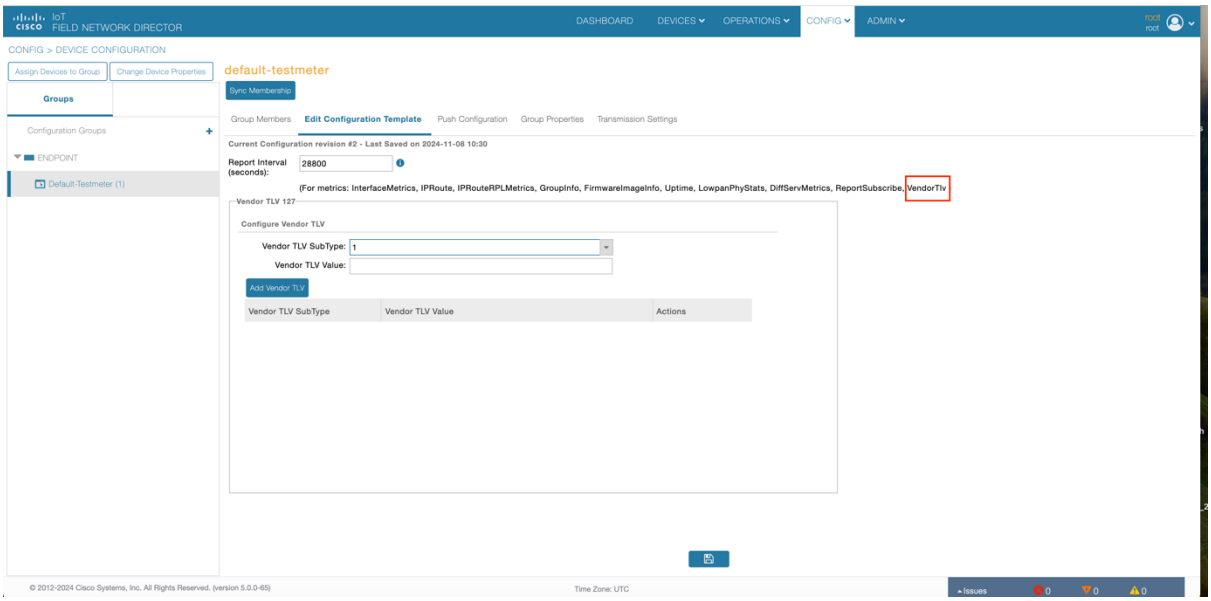
For the VendorTlv to be subscribed as part of the periodic metric refresh, VendorTlv must be added to the “default<deviceType>Template.json” file as indicated below.

```
[root@iot-fnd-oracle testmeter]# cat defaulttestmeterTemplate.json
[{
    "name": "ReportSubscribe",
    "value": {
        "interval": 28800,
        "tlvid": ["InterfaceMetrics", "IPRoute", "IPRouteRPLMetrics", "GroupInfo", "FirmwareImageInfo", "Uptime", "LowpanPhyStats", "DiffServMetrics", "ReportSubscribe", "VendorTlv"]
    }
}]
[root@iot-fnd-oracle testmeter]# cat defaulttestmeterTemplateNoIPRoute.json
[{
    "name": "ReportSubscribe",
    "value": {
        "interval": 28800,
        "tlvid": ["InterfaceMetrics", "GroupInfo", "FirmwareImageInfo", "Uptime", "LowpanPhyStats", "DiffServMetrics", "ReportSubscribe", "VendorTlv"]
    }
}]
[root@iot-fnd-oracle testmeter]#
```

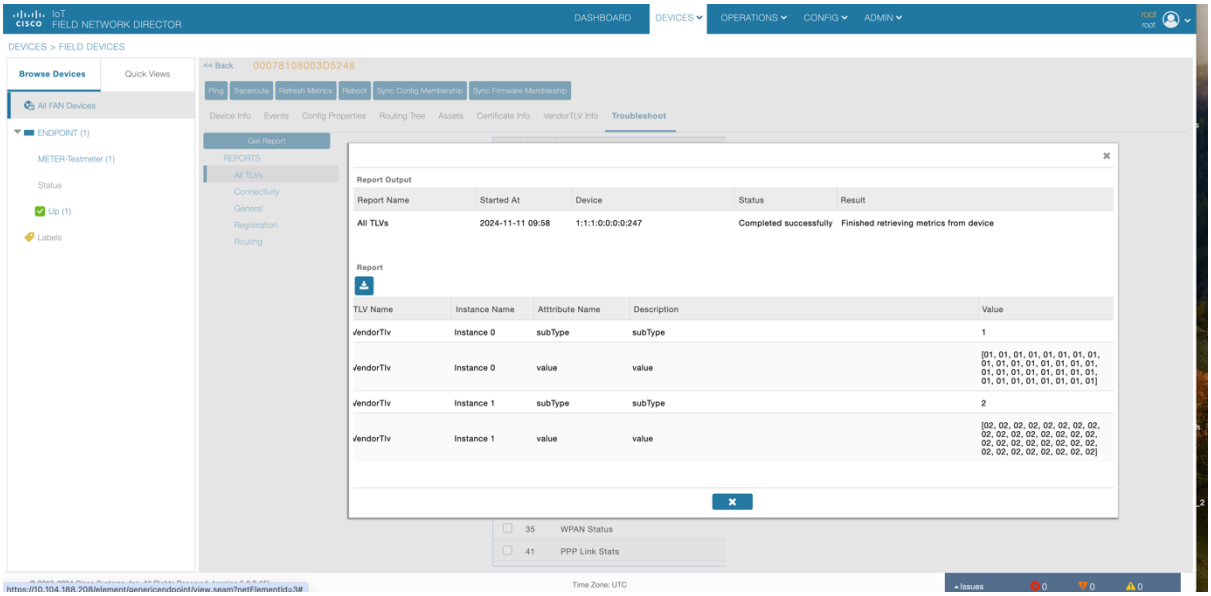
Push Config

Config changes can be pushed to devices. Changing the report interval and pushing the config to new endpoint devices .

Changing the Vendor TLV 127 details and pushing the config to the new endpoint devices and retrieving the Vendor TLV 127 details as part of refresh metrics. The vendor TLV subtype can be selected from the dropdown box(non editable) containing the supported subtypes read during the registration.



GET operation of Vendor TLV 127 can be done in FND in the troubleshooting tab.



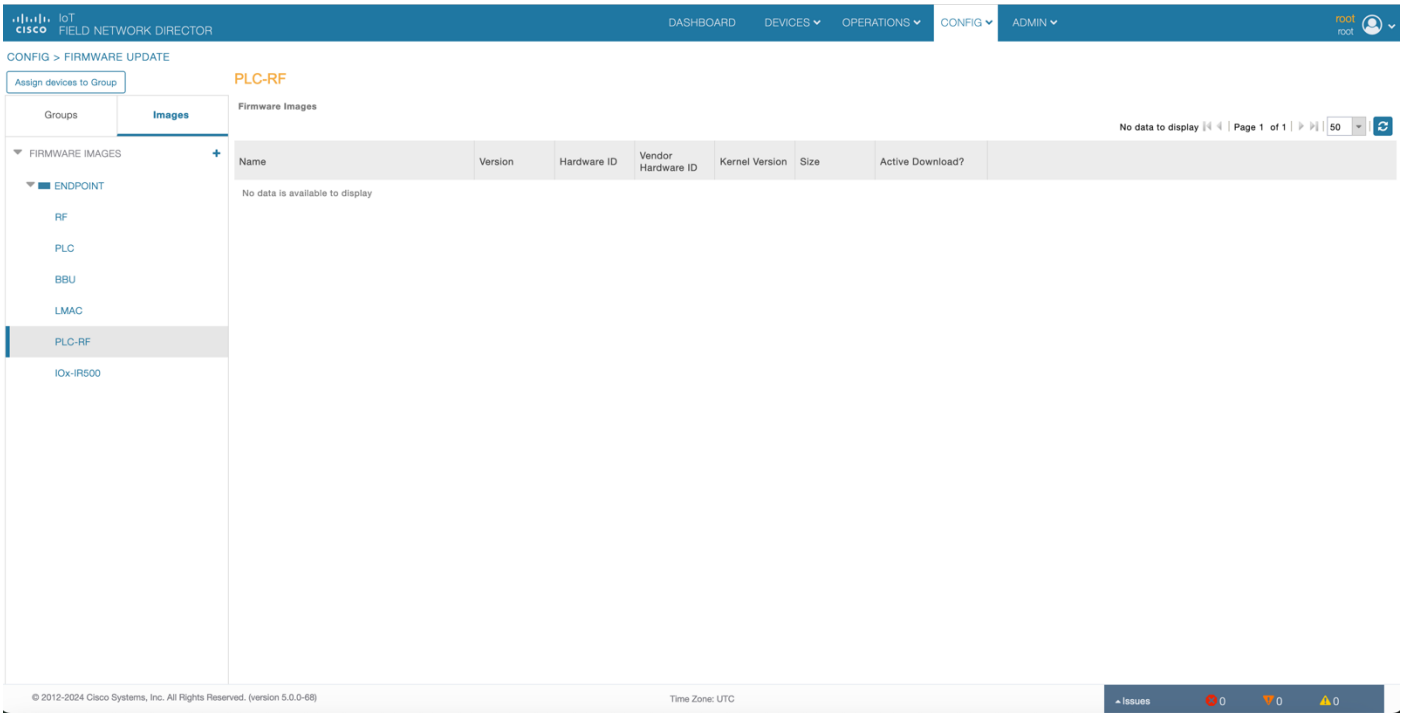
Firmware Upgrade

Firmware image for a particular device will have the header containing the metadata of the image. Below are the metadata fields in the firmware image header which are read by FND.

hdrVersion	mandatory
hdrLen	mandatory
appRevMajor	mandatory
appRevMinor	mandatory
appBuild	mandatory
appLen	mandatory
appName	mandatory
appGitBranch	not mandatory
appGitCommit	not mandatory
appGitFlag	not mandatory
appBuildDate	mandatory
hwId	mandatory
kernelVersion	not mandatory

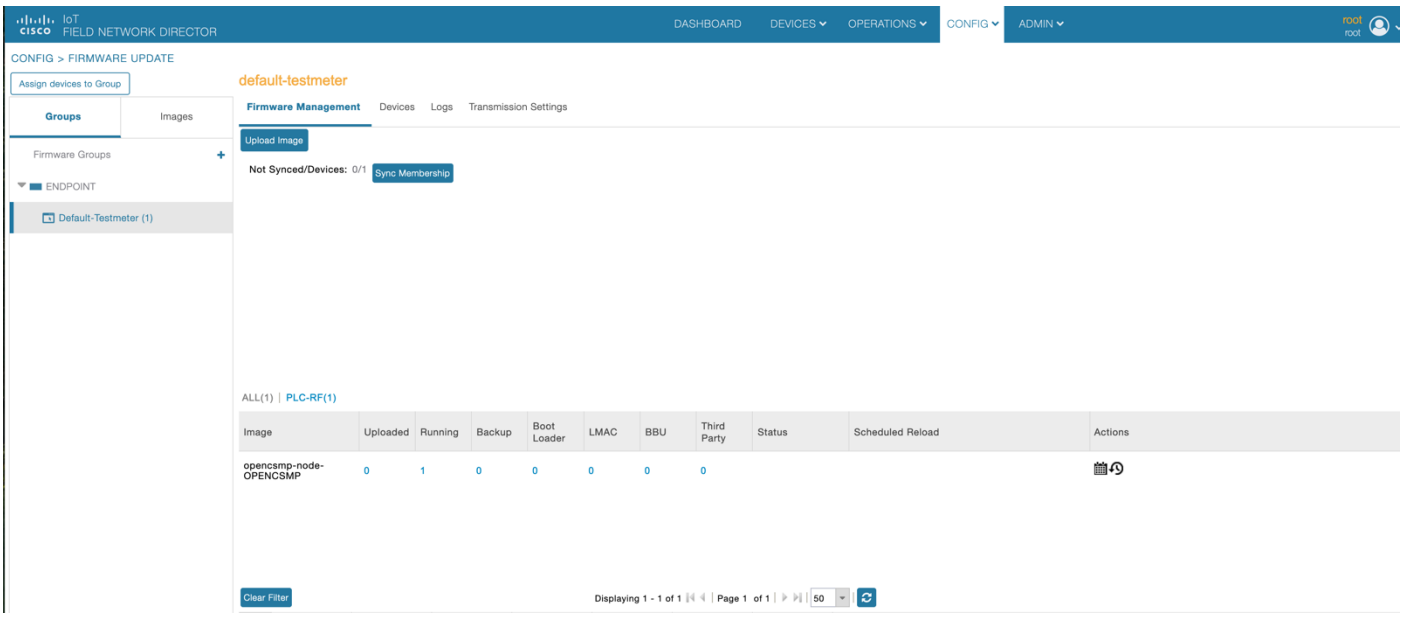
Upload firmware image to FND

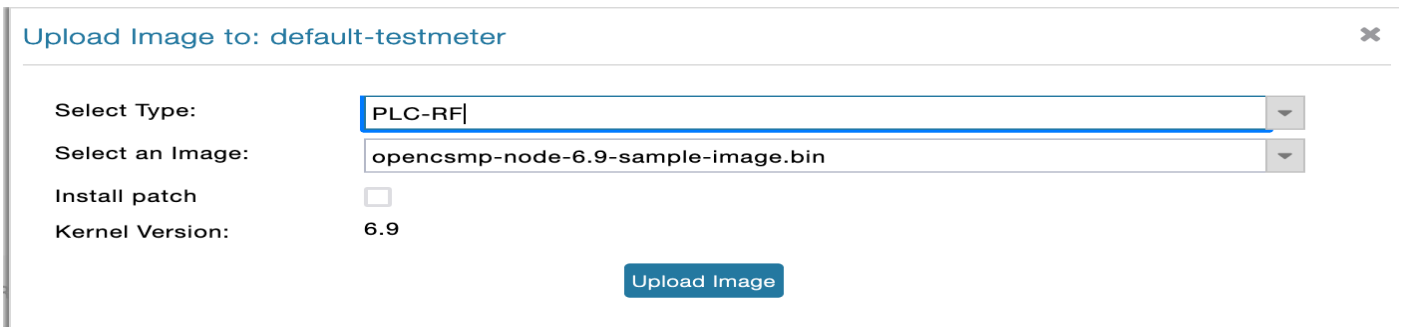
- Choose CONFIG > Firmware Update -> Images -> PLC-RF
- Click on + (plus icon) next to the FIRMWARE IMAGES heading to browse the firmware from your local system.
- Browse and click on Add file.



Upload firmware image to the devices group

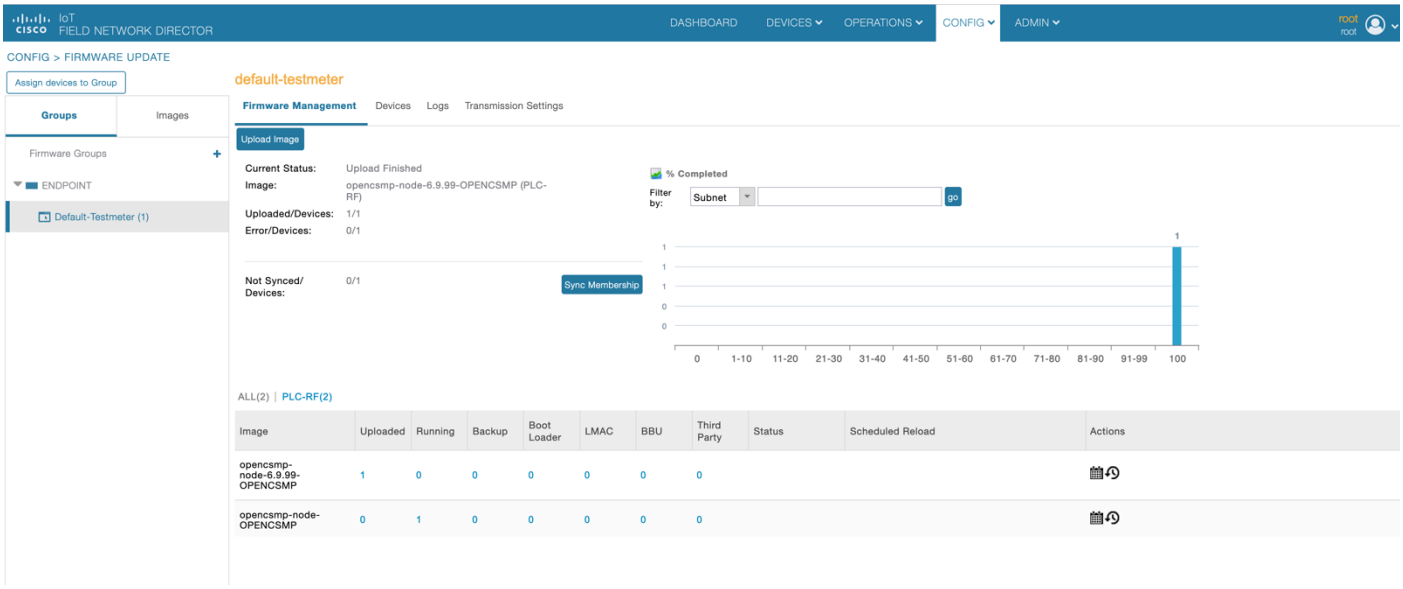
- Choose CONFIG > Firmware Update
- Click the Groups tab (left-pane).
- Select the Endpoint firmware group to update.
- In the right panel, select Firmware Management and then click the Upload Image button. In the entry panel that appears, do the following:
- From the Select Type drop-down menu, choose the firmware type for your device. - PLC-RF
- From the Select an Image drop-down menu, choose the firmware bundle to upload
- Click Upload Image.





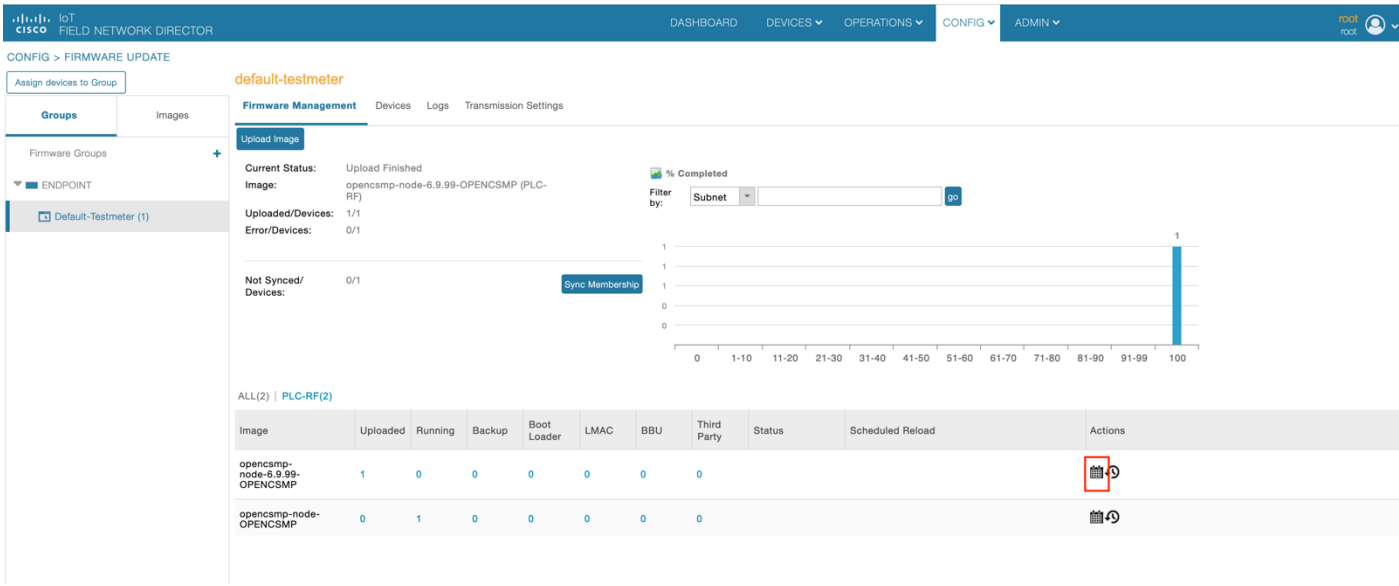
Successful upload of the firmware image to the devices group.

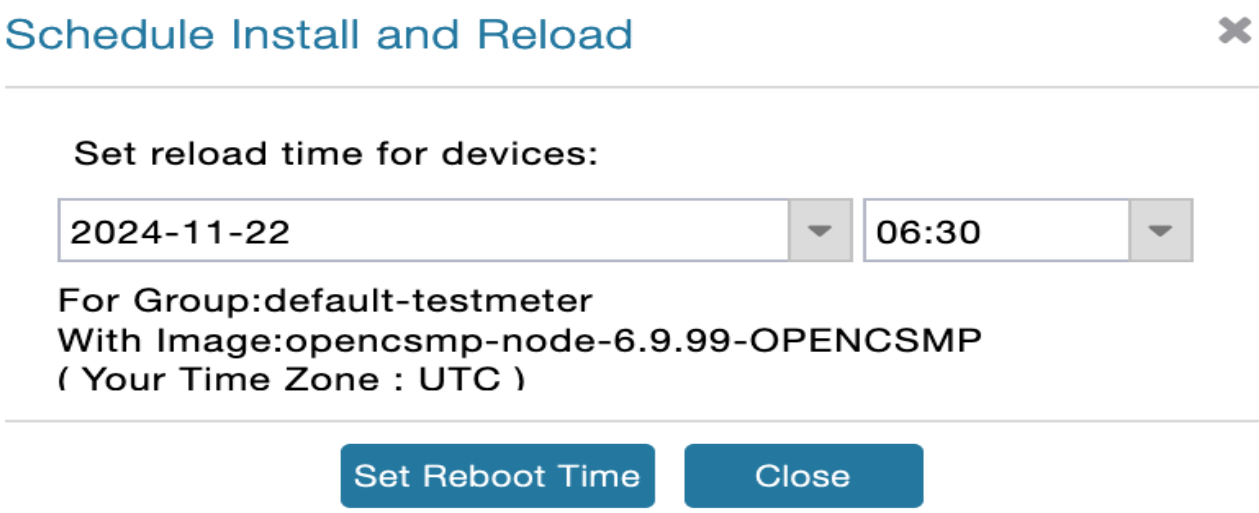
- The below screenshot shows the successful upload of the image to the devices group



Schedule install and reload the device with the uploaded firmware image

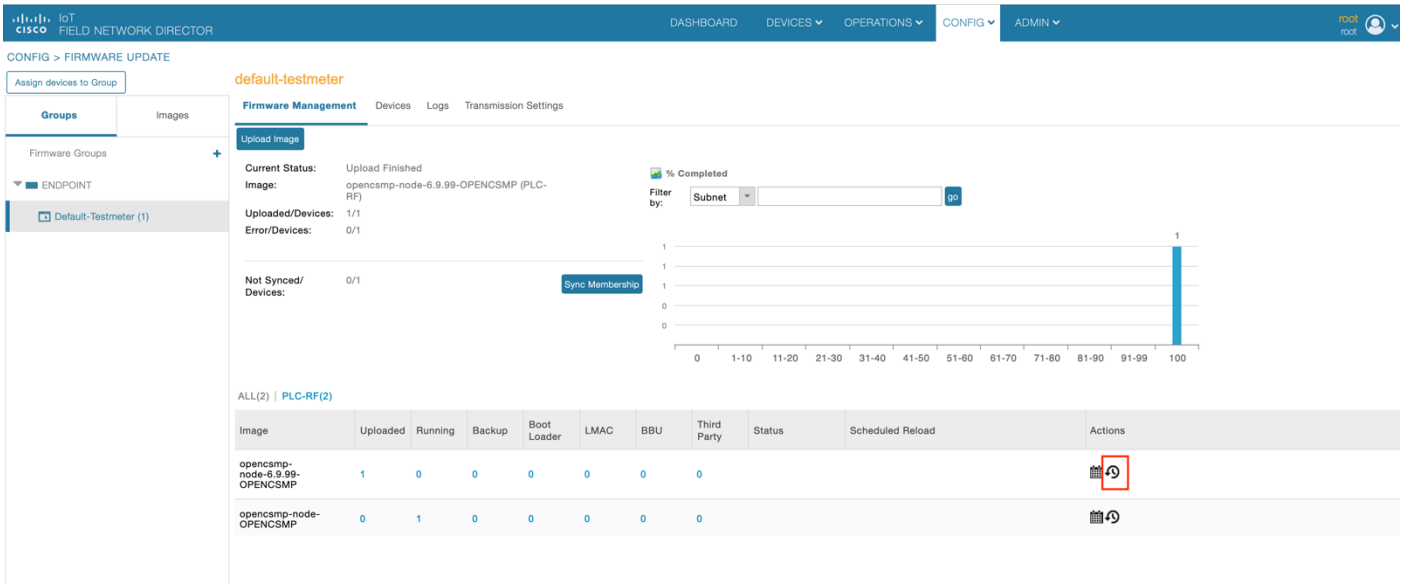
- Click the Schedule Install and Reload button (Calendar icon)
- In the page that appears, specify the date and time for the installation of the image and rebooting of device.
- Click the Set Reboot Time button.
- The device will reboot at the time that the user has entered and will come up with the uploaded firmware image.

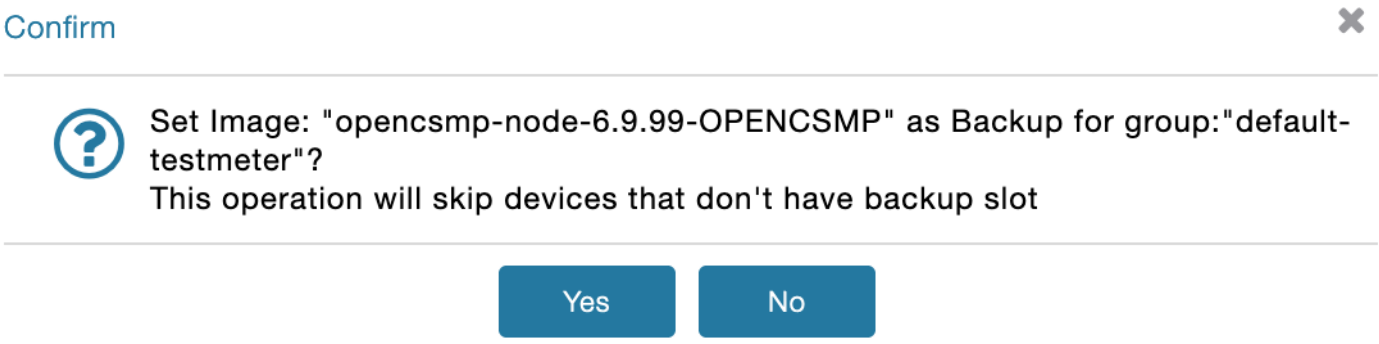




Set firmware image as backup.

- Click the Set as Backup button.
- Click Yes to confirm backup.





Cancel reload of the scheduled firmware image

- Click the Cancel Reload button.
- Click Yes to confirm Cancel Reload.