



## Preparation Tasks

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## Network Element Driver Package



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**Note** Download the NED package only when you onboard a new device type into Cisco MSX Managed Device service pack.

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The Cisco Network Services Orchestrator (NSO) uses Network Element Drivers (NEDs) to orchestrate a multivendor network for different devices types and services. You can add a new NED after the Cisco MSX is installed and deployed into production.

The NED management functionality in Cisco MSX allows you to add, replace, and delete NED for device management.

The Cisco MSX service packs have a predefined set of NED package that is uploaded into NSO. The Managed Device service pack consists of Cisco IOS NED. Thus allows you to onboard any IOS-XE device. Similarly, for onboarding ASR9000, you need a new Cisco IOS-XR NED added into the Managed Device NSO using the NED management functionality.

This service pack also extends its support for devices such as Cisco IOS-XR, Cisco CAT, Cisco NX-OS, Cisco ASA, Juniper SRX, and FORTINET.

### Uploading a NED Package

To upload a new NED package using the Cisco MSX portal:

#### Before you begin

- Download the NED. Use the following [URL](#).
- Use Cisco credentials to log in.

The downloaded NED package contains the following files:

```
README.signature
cisco_x509_verify_release.py
ncs-4.7.6-juniper-junos-4.5.13.signed.bin
ncs-4.7.6-juniper-junos-4.5.13.tar.gz
ncs-4.7.6-juniper-junos-4.5.13.tar.gz.signature
tailf.cer
```

**Table 1: NED Package Files**

Downloaded NED Package Files	Name of Each NED Tar Files
ncs-4.7.6-juniper-junos-4.5.13.tar.gz	Main NED file
ncs-4.7.6-juniper-junos-4.5.13.tar.gz.signature	Signature File
tailf.cer	Certificate File

## Procedure

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- Step 1** Log in to the Cisco MSX Portal.
- Step 2** In the main menu, go to **Settings > NED Management**.  
Displays the list of NEDs that are currently installed in the system.
- Step 3** Click **Add NED**.  
The **Upload NED File** dialog box appears.
- Step 4** Upload the downloaded NED package files in their respective fields:

**Figure 1: Uploading a NED File**

Upload NED File

This action requires a restart, during that time all device operations will be unavailable. This action may take up to 10 minutes to complete.

**UPLOAD NED PACKAGE**

Choose file:\* ncs-4.7.6-juniper-junos-4.5.13.tar.gz

**VERIFY NED PACKAGE**

Choose file:\* ncs-4.7.6-juniper-junos-4.5.13.tar.gz.signature

Choose file: tailf.cer

**INSTALL NED PACKAGE**

Service Pack:\* Managed Device

Cancel Upload

- In the **Upload NED Package** section, select the main NED file from the downloaded NED package and upload it.  
**Note** The same NED file cannot be uploaded more than once unless we delete the existing file.
- In the **Verify NED Package** section, select the Signature file and Certificate file from the downloaded NED package and upload it.
- In the **Install NED Package** section, choose the **Managed Device** from the Service Pack drop-down list.

- Step 5** Click **Upload**.

The **Upload NED** dialog box appears for you to confirm the upload.

**Step 6** Click **Upload** again.

**Note** Now the NSO POD restarts; during this time, the device operations are unavailable.

The **Validating and Installing NED file** dialog box appears.

The installation process takes a few minutes to complete.

Displays the validation message after installing the NED file.

**Step 7** Click **Close**.

The **NED Management** home page displays the list of NEDs that are installed in the system.

**Note** Ensure that the newly installed NED is displayed on the home page.

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## Deleting a NED Package

To delete a NED package using the Cisco MSX Portal:

### Before you begin

- Ensure that you delete all the sites that are using the NED.
- On deleting NED, the device models that use the NED namespace cannot be used in Managed Device anymore.

### Procedure

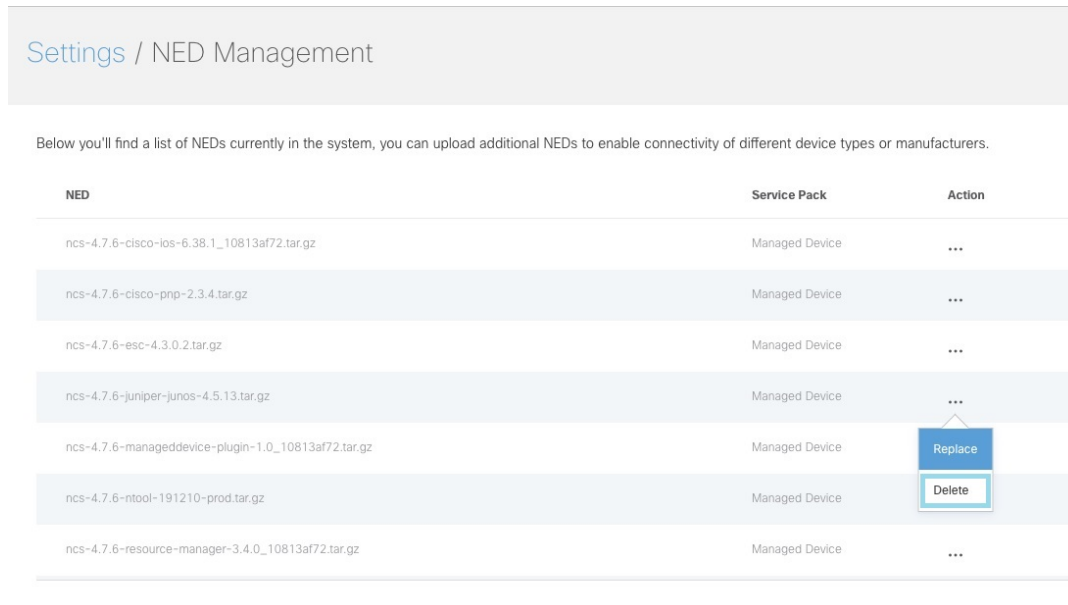
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**Step 1** Log in to the Cisco MSX Portal.

**Step 2** In the main menu, go to **Settings > NED Management**.

Displays the list of NEDs that are currently installed in the system.

**Figure 2: Deleting NED**



**Step 3** Select the NED, and click the **ellipsis (...)** and choose **Delete**.

The **Delete NED** confirmation dialog box appears for you to confirm the delete.

**Step 4** Click **Delete**.

**Note** Now the NSO POD restarts; during this time, the device operations are unavailable.

The **Deleting and Uninstalling NED file** dialog box appears.

The deletion process takes a few minutes.

Displays the validation message after deleting the NED file.

**Step 5** Click **Close**.

## Replacing a NED Package

Replace option is used to upgrade or change an existing version of the NED package.

To replace a NED package using the Cisco MSX Portal:

### Procedure

**Step 1** Log in to the Cisco MSX Portal.

**Step 2** In the main menu, go to **Settings > NED Management**.

Displays the list of NEDs that are currently installed in the different service packs.

**Step 3** Select the NED and click **Replace**.

The **Replace NED File** dialog box appears.

**Figure 3: Replacing NED**

Replace NED File

This action requires a restart, during that time all device operations will be unavailable. This action may take up to 10 minutes to complete.

Package to be replaced: "ncs-4.7.6-cisco-ios-6.38.1\_10813af72.tar.gz".

**UPLOAD NEW NED PACKAGE**

Choose file:\* *Select NED file*

**VERIFY NED PACKAGE**

Choose file:\* *Select signature file*

Choose file: *Select certificate file*

**INSTALL NED PACKAGE**

Service Pack:\* *Managed Device*

Cancel Replace

- Step 4** Upload the downloaded NED package files in their respective fields:
- In the **Upload NED Package** section, select the main NED file from the downloaded NED package and upload it.
  - In the **Verify NED Package** section, select the Signature file and Certificate file from the downloaded NED package and upload it.
  - In the **Install NED Package** section, choose the **Managed Device** from the Service Pack drop-down list.

**Step 5** Click **Replace**.  
The **Replace NED** dialog box appears for you to confirm the replacement.

**Step 6** Click **Replace** again.

**Note** Now the NSO POD restarts; during this time, the device operations are unavailable.

The **Validating and Replacing NED File** dialog box appears.  
Displays the validation message after replacing the NED file.

**Step 7** Click **Close**.

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## Preparing Device Model

Cisco MSX Managed Device service pack supports out-of-the-box device models. To facilitate the SNMP metric collection for new device type, use the device model construct with several fields that capture all the necessary metrics data.

### Sample device model fields:

```
"deviceModelName": "", ---> Unique Name
"platformDeviceType": "", --> This is a global field and a big category where this particular device belongs.
  For example "CPE".
"platformDeviceSubType": "", --> This is sub category. For example, Sub category of a Juniper Device can be
  "SRX", "EX" etc..
"interfaces": [], ---> List of interfaces for the device model.
"lan": [], ---> Interfaces that can be categorized as LAN.
"wan": [], ---> Interfaces that can be categorized as WAN.
"nedId": "", --> NSO NED ID for this device
"deviceType": "", --> NSO Device-Type for this device
"directTemplate": "" --> This field allows you to apply configurations to a device while it is onboarded to MSX.
  In this case, use this for applying SNMP configuration. Create a new file and name it. Save the NSO XML template
  in this file. |
```

**Note:** Ensure that you keep a note of the file name used for the XML template. You can reuse this later during device model preparation.

```
"deviceMetricConfigurations": [{
  "snmpDetails": { ---> This is needed to connect to the device. This step is for preparing the CLI
  configuration for the SNMP support. Enter your choices for authentication protocol, privacy protocol, user
  used, and so on. Ensure to make a note of it.
    "snmpAuthProto": "",
    "snmpVersion": "",
    "snmpPrivProto": "",
    "snmpUserName": ""
  },
  "platformDeviceType": "", ---> This must be similar to the device model section.
  "platformDeviceSubType": "", ---> This must be similar to the device model section.
  "snmpOidList": [], -----> The set of OIDs that is required to retrieve the data
  "snmpCpuMemoryUptimeQueryTemplate": { ---> This is a query template that explores the data collected
  from SNMPBEAT and provides a representation on the UI based on device OIDs and MIBs that are specific to this
  new device type.
  }
}]
}
```

The two important fields in the data model construct are given in the table below:



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**Note**

This table contains the list of default OIDs that work only for specific Cisco devices. These OIDs may vary for the new device type. Therefore, the list of extra OIDs that helps to fetch the necessary data has to be imported into Cisco MSX.

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**Table 2: SNMP OID and Query Template**

Data Model Field	List of Default OID/Query Template	Metrics Data
snmpOidList	"oid":".1.3.6.1.2.1.1.3"	System / System Uptime
	"oid":".1.3.6.1.6.3.10.2.1.3"	snmpEngineBoots
	"oid":".1.3.6.1.4.1.9.9.109.1.1.1.6"	CPU / MEM
	"oid":".1.3.6.1.4.1.9.9.109.1.1.1.7"	CPU / MEM 1 min
	"oid":".1.3.6.1.4.1.9.9.109.1.1.1.8"	CPU / MEM 5 min
	"oid":".1.3.6.1.4.1.9.9.48.1.1.1"	CiscoMemoryPool
	"oid":".1.3.6.1.2.1.2.2.1"	InterfaceTable
snmpCpuMemoryUptimeQueryTemplate	"enterprises.2636.3.1.13.1.11.9.1.0.0"	Memory consumption value in terms of percentage (%)

**SNMP OID List:** In the Managed Device service pack, SNMP metrics are collected using the OIDs of the device type. OIDs are ISO specific, but the OIDs for CPU and memory are enterprise-specific.

The collected SNMP metric data are as follows:

- Interface traffic
- Interface BW utilization
- CPU
- Memory
- System Uptime

For examples:

**Table 3: SNMP OID**

Name of the Vendor	OID for CPU	Description
CISCO	1.3.6.1.4.1.9.9.109.1.1.1	(1.3.6.1.4.1) – This prefix is the standard OID and must not be changed. (9.9.109.1.1.1)-This is Cisco enterprise-specific code.
JUNIPER	1.3.6.1.4.1.2636.3.1.13.1.21	(1.3.6.1.4.1.) - This prefix is the standard OID and must not be changed. (2636.3.1.13.1.21) - This is Juniper enterprise-specific code.

**SNMP QUERY Template:** The Managed Device service pack can process the data that is collected as a part of SNMP polling using the Query Template. The metrics data is represented differently for each vendor. Query template is defined based on these returned metric values.



For example: The table below lists some of the sample query templates.

**Table 4: SNMP Query Template**

Name of Vendor	OID for Memory Usage Metrics	Description
JUNIPER SRX	"enterprises.2636.3.1.13.1.11.9.1.0.0"	Represents the memory usage value in terms of percentage (%).
Cisco ASA	".1.3.6.1.4.1.9.9.48.1.1.1"	<ul style="list-style-type: none"> <li>• Cisco has no OID for representing values in terms of percentage (%).</li> <li>• But, Cisco uses the query calculation on the data fields to calculate the memory metrics.</li> <li>• Execute this OID to get the metrics of both free memory and used memory. Use these two values to compute memory usage in terms of percentage (%).</li> </ul>

## Preparing Device Model Information for New Device Type

To facilitate the SNMP metric collection for the new device type, you can utilize the device model construct to collect metrics details.

For more details on how to build each SNMP field in the device model construct, see 'Sample device model field with description' in the [Preparing Device Model](#).

Sample device model construct of Juniper:

```
{
  "deviceModels": [{
    "deviceModelName": "Juniper SRX",
    "platformDeviceType": "",
    "platformDeviceSubType": "",
    "interfaces": [],
    "lan": [],
    "wan": [],
    "nedId": "",
    "deviceType": "",
    "directTemplate":""
  }],
  "deviceMetricConfigurations": [{
    "snmpDetails": {
      "snmpAuthProto": "",
      "snmpVersion": "",
      "snmpPrivProto": "",
      "snmpUserName": ""
    },
    "platformDeviceType": "",
    "platformDeviceSubType": "",
    "snmpOidList": [],
    "snmpCpuMemoryUptimeQueryTemplate": {
    }
  }
}]
```

}

### Next step:

After preparing the device model information (JSON file) for the new device type, upload this JSON file into Cisco MSX. For more information, see [Importing Device Model](#).

## Importing Device Model



**Note** For onboarding new device type, prepare the device model information and then import the JSON file into the Cisco MSX. For more information, see [Preparing Device Model Information for New Device Type](#).

Ensure that you update the device model as per the latest Cisco MSX version.

To import a device model:

### Procedure

**Step 1** Log in to the Cisco MSX portal.

**Step 2** From the left pane, choose **Settings**.

The **Settings** window appears.

**Step 3** Click **Device Model Management**.

**Step 4** Click **Managed Device**.

The **Managed Device Models** window is displayed.

**Figure 4: Device Model Table**

Manage Device Models

Device Models

	Device Model	NED ID	Date Added	Last Modified	Sites
<input type="radio"/>	3rd Party Test CISCO CSR 1000v	cisco-ios	2020-02-12	2020-02-12	0
<input type="radio"/>	3rd Party Test CISCO ISR 4451	cisco-ios	2020-02-12	2020-02-12	0
<input type="radio"/>	Catalyst 3000	cisco-ios	2020-02-12	2020-02-12	3
<input type="radio"/>	CISCO CSR 1000v	cisco-ios	2020-02-12	2020-02-12	32
<input type="radio"/>	CISCO IR 829	cisco-ios	2020-02-12	2020-02-12	0
<input type="radio"/>	CISCO ISR 1100	cisco-ios	2020-02-12	2020-02-12	0
<input checked="" type="radio"/>	CISCO ISR 3900	cisco-ios	2020-02-12	2020-02-12	0
<input type="radio"/>	CISCO ISR 4221	cisco-ios	2020-02-12	2020-02-12	0
<input type="radio"/>	CISCO ISR 4321	cisco-ios	2020-02-12	2020-02-12	0
<input type="radio"/>	CISCO ISR 4331	cisco-ios	2020-02-12	2020-02-12	0
<input type="radio"/>	CISCO ISR 4351	cisco-ios	2020-02-12	2020-02-12	0

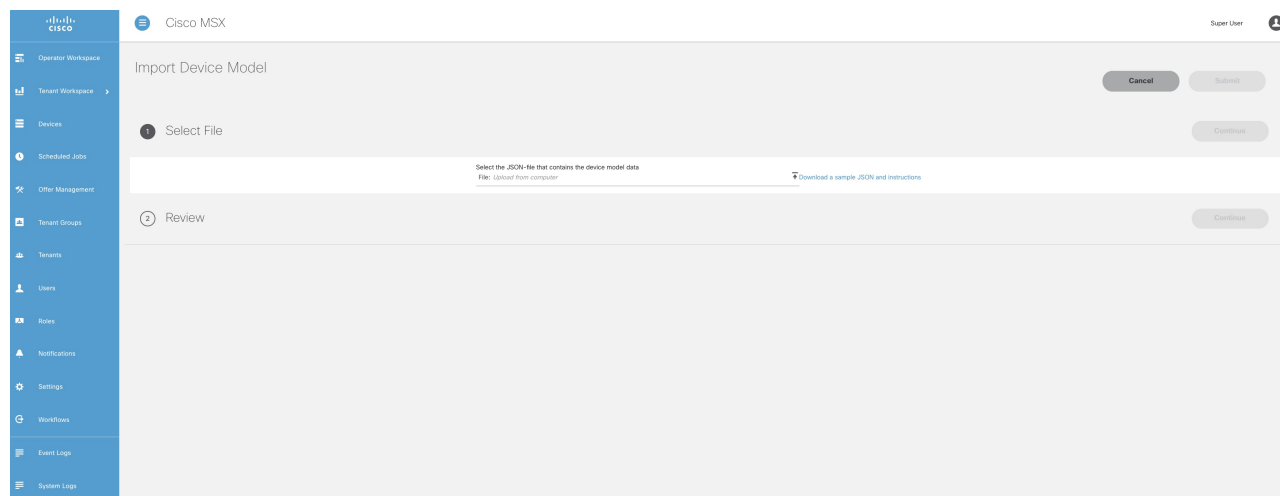
[Import Device Model](#)

The list of device model appears. These device models can be deleted or added again according to your requirement. Existing device models can be overwritten depending on the requirements of the interfaces used.

**Step 5** Click **Import Device Model**.

The **Import Device Model** is displayed.

**Figure 5: Import Device Model**



**Step 6** Upload the JSON file from your local file storage. This JSON file contains device model data.

The Managed Device service pack supports out-of-the box device models.

**Note** Download the sample JSON file and follow the instructions. You can modify the JSON file and upload with the same device model name. For more information, see '[Sample JSON File for Importing New Device Model](#)'.

To import device model for new device type, see [Sample JSON File for Importing a Device Model on the New Device Type](#).

For more information on the sample JSON file of the third-party device, see '[Sample JSON File for Importing a Device Model on the New Device Type](#)'.

**Step 7** Click **Review** to view the Device Model status. You can see the details about the interfaces and the capabilities of the WAN and LAN.

**Step 8** Click **Submit** .

Now the newly imported device model appears on the list of Device Model table.

**Next Steps**

- Add a device into the Cisco MSX. For more information, see '[Adding a Device](#)'.





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