



North Bound API User Guide for the Cisco IoT Field Network Director, Release 3.0

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This guide covers all 3.0 releases created between the First Published and Last Updated dates.

Please check the IoT Field Network Director Release Notes for your release for specific feature support.

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Overview of the IoT FND North Bound API

This section describes the North Bound API (NB API) supported by the Cisco IoT Field Network Director (Cisco IoT FND or IoT FND). Topics include:

- [Document Conventions, page 3](#)
- [Obtaining Documentation and Submitting a Service Request, page 3](#)
- [IoT FND NB API Modules, page 4](#)
- [Query Syntax, page 5](#)
- [Property Field Names for All Devices, page 6](#)
- [Metrics Field Names, page 8](#)

IoT FND maintains a database of inventory information about network devices, groups, properties, metrics, and events. You can use NB API to retrieve network statistics and properties for deployed networked devices. You can also access the database using the IoT FND NB API ([Figure 1](#)).

The IoT FND NB API is a Simple Object Access Protocol (SOAP) API that provides methods for:

- Read-only access to the IoT FND database
- Push-based event reporting
- Invoking management operations such as mesh firmware updates, rule creation, and mesh migration

Many APIs return lists of identifiers or objects. Because these lists could be very long in a large network, every method has three optional arguments: `queryId`, `count`, and `offset`. NB APIs use the Web Services Description Language (WSDL) to define network services.

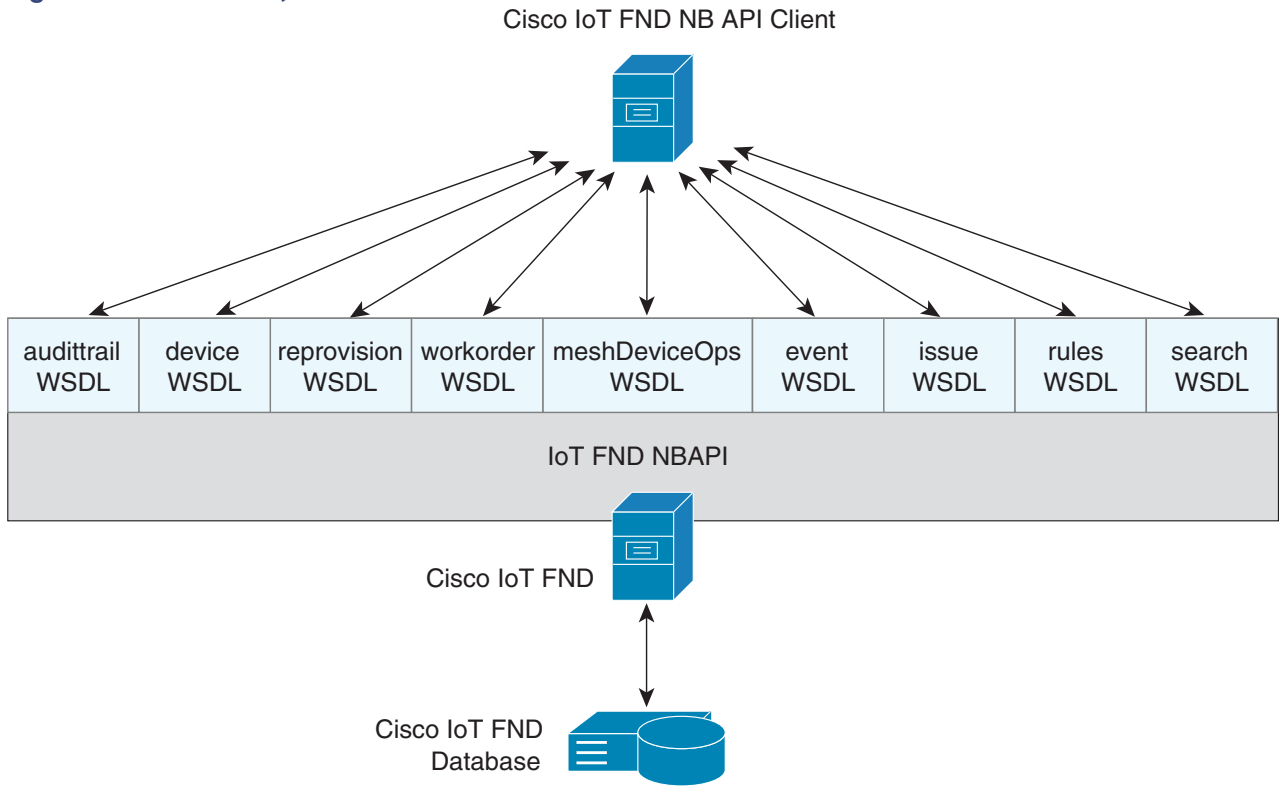
When no argument is included, the call returns the first `count` list items. The maximum count is 1000 items.

To iterate through the full contents of a list, select a `queryId`, which is a random string. Then repeat the call using the same `queryId`, and increment the `offset` by `count` for each call, starting from 0. When the call returns an empty list, the iteration is complete, and the `queryId` is invalidated on the server. Reusing `queryId` starts the request from the beginning. If a particular `queryId` is not used for 10 minutes, it is cleared to conserve resources.

The API uses HTTPS and HTTP Basic Authentication for username and password authorization, and for sending event data.

Note: IoT FND Release 2.1.1-54 and later do not support TLSv1.0 or TLSv1.1 based connections. Only TLS1.2 based connections are supported.

Figure 1 Database Queries



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Document Conventions

This document uses the following conventions:

Conventions	Indication
bold font	Commands and keywords and user-entered text appear in bold font .
<i>italic font</i>	Document titles, new or emphasized terms, and arguments for which you supply values are in <i>italic font</i> .
[]	Elements in square brackets are optional.
{x y z }	Required alternative keywords are grouped in braces and separated by vertical bars.
[x y z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
courier font	Terminal sessions and information the system displays appear in courier font.
< >	Nonprinting characters such as passwords are in angle brackets.
[]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Note: Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the manual.

Caution: Means *reader be careful*. In this situation, you might perform an action that could result in equipment damage or loss of data.

Warning: IMPORTANT SAFETY INSTRUCTIONS

Means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see [What's New in Cisco Product Documentation](#).

To receive new and revised Cisco technical content directly to your desktop, you can subscribe to the [What's New in Cisco Product Documentation RSS feed](#). The RSS feeds are a free service.

IoT FND NB API Modules

IoT FND defines the following API modules:

API Module	WSDL URL	Method Calls
audittrail Audit Trail API, page 17	https://<server_address>/nbapi/audittrail?wsdl	deleteAuditTrailsByTime getAuditTrailsByOperation getAuditTrailsByTime getAuditTrailsByUser getAuditTrailsByUserAndIp getAuditTrailsByUserAndOperation getAuditTrailsByUserIpAndOperation
device Device Management API, page 29	https://<server_address>/nbapi/device?wsdl	addDevices exportDevices getJob removeDevices setDevices updateDevices
reprovision Mesh Firmware Migration API, page 37	https://<server_address>/nbapi/reprovision?wsdl	cancelReprovision showReprovisionStatus startReprovisionByEidList startReprovisionByEidListAbridged startReprovisionByGroup startReprovisionByGroupAbridged
meshDeviceOps Firmware Upgrade API, page 45	https://<server_address>/nbapi/meshDeviceOps?wsdl	getFirmwareUploadStatus getFirmwareImageInfoList scheduleReload setBackupFirmwareImage startUpload stopUpload
Note: Firmware upgrades are only supported on Cisco IOS.		
workorder Workorders API, page 53	https://<server_address>:portnumber/nbapi/workorder	RequestUserAuthentication RequestSignedAuthorization UploadServiceReport

Query Syntax

API Module	WSDL URL	Method Calls
event Event API, page 63	<a href="https://<server_address>/nbapi/event?wsdl">https://<server_address>/nbapi/event?wsdl	searchEvents subscribeForCgmeshOutage subscribeForEvents unsubscribeForCgmeshOutage unsubscribeForEvents
issue Issues API, page 87	<a href="https://<server_address>/nbapi/issue?wsdl">https://<server_address>/nbapi/issue?wsdl	searchIssues
rules Rules API, page 93	<a href="https://<server_address>/nbapi/rules?wsdl">https://<server_address>/nbapi/rules?wsdl	activateRule createRule deactivateRule dropRule findRulesByName findRulesByUsername
search Search API, page 105	<a href="https://<server_address>/nbapi/search?wsdl">https://<server_address>/nbapi/search?wsdl	getDeviceDetails getDeletedDevices getUpdatedDeviceDetails getGroups getMetricHistory searchDevices findEidsForIpAddress findEidsForIpAddressByDeviceType

To view the WSDL of the API in a Web browser, use this URL format:

https://<server_address>/nbapi/<api>?wsdl

For example:

<https://10.27.167.19/nbapi/event?wsdl>

Query Syntax

The IoT FND NB API supports the following simple query language:

- Search := filter ?[filter ...]
- Filter := Filter := <fieldName><operator><value>
- Operator := < | <= | > | >= | <> | = | :

Property Field Names for All Devices

Search query examples:

```
"deviceType:cgr1000 uptime>=100 uplinkTxDrops<-50"
"deviceType:cgmesh uptime>=100"
"" (search everything)
"uptime>=100 status:up"
"eid:xyz"
"xyz"
```

Property Field Names for All Devices

Table 1 describes the property field names available to all devices. Field names are case sensitive.

Table 1 Property Field Names for All Devices

Field Name	Type	Description	Example
eid	string	Unique identifier for the device. For routers and communication modules, this is the string representation of the X.500 distinguished name subject ID contained in the devices X.509 certificate. This field name is obtained from the notice-of-shipment file.	CGR1240/K9 CGR1120/K9
deviceType	enum	Identifier for the device type that indicates which IoT FND module coordinates communications with the device. <ul style="list-style-type: none"> ■ Cisco Connected Grid Routers 1000 series are cgr1000 ■ Cisco Aggregation Services Routers 1000 series are asr1000 ■ Cisco Integrated Service Routers 3900 series are isr3900 ■ Cisco 800 Series Integrated Services Routers (ISR 800s) are c800 ■ Cisco 800 Series Integrated Services Routers (IR 800s) are ir800 ■ Cisco 800 Series Access Points are ap800 ■ Cisco 500 Series Wireless Personal Area Network (WPAN) Industrial Routers (IR 500) are ir500 ■ Communications modules are cgmesh ■ The IoT FND database is db This identifier is obtained from the notice-of-shipment file.	cgmesh cgr1000
ip	string	Primary IP address that IoT FND uses to contact the device. Can be IPv4 or IPv6. This address is obtained when the device registers with IoT FND.	1.1.1.1
lat	decimal	Latitude of the device obtained from manual CSV import.	10
lng	decimal	Longitude of the device obtained from manual CSV import.	-11.1
alt	decimal	Altitude of the device obtained from manual CSV import.	10
mapLevel	decimal integer	Minimum map zoom level at which the device is displayed on the map. This is useful for viewing large networks. This value is obtained from manual CSV import and is an optional field.	16
geoHash	string	String hash latitude and longitude values used for automatic hierarchical grid-based clustering of the devices.	s1qeg9spc8n95rrw1dww7

Property Field Names for All Devices

Table 1 Property Field Names for All Devices (continued)

Field Name	Type	Description	Example
lastHeard	timestamp	Time when the device was last heard from or contacted. This is used as the primary determiner of device activity level and status. This value is automatically set when the device reports to the IoT FND or the IoT FND contacts the device.	2011-05-02 00:00:00
status	enum	Current status of the device automatically set by IoT FND. Values are limited to up, down, and unheard.	up
certC	string	X.500 country name from the certificate subject, if one exists. This value is obtained from the notice-of-shipment file, as are all "cert" properties.	US
certST	string	X.500 state or province name, if one exists.	CA
certL	string	X.500 locality name, if one exists.	San Jose
certO	string	X.500 organization name, if one exists.	Cisco Systems, Inc.
certOU	string	X.500 organizational unit name, if one exists.	Operations Department
certCN	string	X.500 common name, if one exists.	App Client
certSN	string	X.500 serial number, if one exists.	12:34:A4:B9
pid	string	Product ID for the device. For routers and communication modules, this is the Cisco Secure Unique Device Identifier (SUDI) product ID from the certificate.	CGR1240/K9
vid	string	Version ID for the device. Obtained from the SUDI for routers and communication modules.	1.0
sn	string	Serial number for the device.	JAF1741ALPA

Property Field Names for Supported Routers

Table 2 describes the property field names available to supported Connected Grid routers. The field names are case sensitive.

Table 2 Property Field Names for Supported Routers

Field Name	Type	Description
activeLinkType	string	Physical link type over which device communicates with other devices, including IoT FND.
endUserIPv6Prefix	string	End user IPv6 address for basic mapping rule for the device.
endUserIPv6PrefixLen	string	Prefix length for the end user IPv6 address.
mapTipv6Address	string	Map-T settings IPv6 address.
mapTipv4Address	string	Map-T settings IPv4 address.
mapTpsid	string	Map-T status PSID.
meshAddress	string	IP address of the mesh link automatically assigned by IoT FND during registration.
meshLocalAddress	string	Local WPAN address of the mesh link automatically assigned by IoT FND during registration.
meshPrefix	string	Subnet prefix address.
meshPrefixLength	string	Subnet prefix address length.
meshPanid	string	Subnet Private Area Network (PAN) ID.

Metrics Field Names

Property Field Names for Range Extenders

[Table 3](#) describes the property field names available to range extenders. The field names are case sensitive.

Table 3 Property Field Names for Range Extenders

Field Name	Type	Description
batteryState	string	Determine the current battery state.
bbuManufacturer	string	The manufacturer of the Battery Backup Unit (BBU).
bbuPid	string	The physical model name of the BBU.
bbuPresent	string	The BBU hardware is present.
bbuReady	string	The BBU is ready.
bbuSn	string	The serial number of the BBU.
bbuVid	string	The physical hardware version of the BBU.
powerSource	string	Determine if the device is running on AC or DC power.

Property Field Names for Communications Modules

[Table 4](#) describes the property field names available to communications modules. The field names are case sensitive.

Table 4 Property Field Names for Communications Modules

Field Name	Type	Description
meshAddress	string	The IP address of the mesh link automatically assigned by IoT FND during registration.
meshLocalAddress	string	Local WPAN address of the mesh link automatically assigned by IoT FND during registration.
meshPrefix	string	Subnet prefix address.
meshPrefixLength	string	Subnet prefix address length.
meshPanid	string	Subnet PAN ID.

Metrics Field Names

Metrics collected by IoT FND are defined per device type, and maintained in a XML file specific to each device type. IoT FND locates the XML files after it loads the boot strap image.

Note: Do not use metrics defined for interfaces for searches.

Metrics for Communication Modules

[Table 5](#) describes the metrics for communication modules.

Table 5 Metrics for Communication Modules

Metric Name	Unit	Min	Max	Description
uptime	sec	0	31536000	Amount of time, in seconds, that the module has been running since last boot.
meshTxSpeed	b/s	0	76800	Current speed of data transmission over the uplink network interface, measured in bits per second, averaged over a short element-specific time period.
meshTxDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the uplink interface because the outbound queue was full.

Metrics Field Names

Table 5 Metrics for Communication Modules

Metric Name	Unit	Min	Max	Description
meshRxSpeed	b/s	0	76800	Rate of data received by the uplink network interface, measured in bits per second, averaged over a short element-specific time period.
meshRxReassemblyDrops	drops/sec	0	1	Rate of incoming packet fragments dropped because there was no space in the reassembly buffer.
meshHops	hops	1	8	Number of hops the element is from the root of its RPL routing tree.
meshLinkCost	-	1	3	RPL cost value for the link between the element and its uplink neighbor.
meshPathCost	-	1	24	RPL path-cost value between the element and the root of the routing tree.
meshRssi	dBm	-80	20	Measured RSSI value of the primary mesh RF uplink.
meshReverseRssi	dBm	-80	20	RSSI value measured by the mesh uplink neighbor.

Metrics for Communication Module Loopback Interface

Table 6 describes the metrics for communication modules loopback interface.

Table 6 Metrics for Communication Modules Loopback Interface

Metric Name	Unit	Min	Max	Description
txSpeed	b/s	0	76800	Current speed of data transmission over the interface, measured in bits per second, averaged over a short element-specific time period (for example, an hour).
txDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the interface because the outbound queue was full.
rxSpeed	b/s	0	76800	Rate of data received by the network interface, measured in bits per second, averaged over a short element-specific time period (for example, an hour).
txUnicastPackets	packets/sec	0	76800	Current packet receive rate over the interface, measured in packets per second, averaged over a short element-specific time period (for example, an hour).

Metrics for WPAN Module Interfaces

Table 7 describes the metrics for WPAN module interfaces.

Table 7 Metrics for the WPAN Module Interfaces

Metric Name	Unit	Min	Max	Description
txSpeed	b/s	0	76800	Current speed of data transmission over the interface, measured in bits per second, averaged over a short element-specific time period (for example, an hour).
txDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the interface because the outbound queue was full.

Metrics Field Names

Table 7 Metrics for the WPAN Module Interfaces

Metric Name	Unit	Min	Max	Description
txSpeed	b/s	0	76800	Rate of data received by the network interface, measured in bits per second, averaged over a short element-specific time period (for example, an hour).
txUnicastPackets	packets/sec	0	76800	Current packet send rate over the interface, measured in packets per second, averaged over a short element-specific time period (for example, an hour).
rxUnicastPackets	packets/sec	0	76800	Current packet receive rate over the interface, measured in packets per second, averaged over a short element-specific time period (for example, an hour).

Metrics for PPP Interfaces

Table 8 describes the metrics for PPP interfaces.

Table 8 Metrics for PPP Interfaces

Metric Name	Unit	Min	Max	Description
txSpeed	b/s	0	76800	Current speed of data transmission over the interface, measured in bits per second, averaged over a short element-specific time period.
txDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the interface because the outbound queue was full.
rxSpeed	b/s	0	76800	Rate of data received by the network interface, measured in bits per second, averaged over a short element-specific time period.
txUnicastPackets	packets/sec	0	76800	Current packet send rate over the interface, measured in packets per second, averaged over a short element-specific time period.
rxUnicastPackets	packets/sec	0	76800	Current packet receive rate over the interface, measured in packets per second, averaged over a short element-specific time period.

Metrics for RPL Interfaces

Table 9 describes the metrics for Routing Protocol for Low Power and Lossy Networks (RPL) interfaces..

Table 9 Metrics for RPL Interfaces

Metric Name	Unit	Min	Max	Description
hops	hops	1	8	Number of hops the element is from the root RPL tree.
linkCost	-	1	3	RPL cost value for the link between the element and its uplink neighbor.
pathCost	-	1	24	RPL path cost value between the element and the root of the routing tree.
rssi	dBm	-80	20	Measured RSSI value of the primary mesh RF uplink.
reverseRSSI	dBm	-80	20	RSSI value measured by the element's mesh uplink neighbor.

Metrics Field Names

Metrics for Supported Connected Grid Routers

Table 10 describes the metrics for supported routers.

Table 10 Metrics for Supported Routers

Metric Name	Unit	Min	Max	Description
batteryLevel	%	0	100	Percentage of charge remaining in the first battery.
batteryLevel2	%	0	100	Percentage of charge remaining in the second battery.
batteryRuntime	minutes	0	65535	Runtime remaining on the first battery.
batteryRuntime2	minutes	0	65535	Runtime remaining on the second battery.
cellRSSI	dBm	-100	0	Cell Received Signal Strength Indicator (RSSI).
chassisTemp	Celsius	0	100	Internal temperature of the device.
meshEndpointCount	devices	0	10000	Number of active mesh endpoints connected to this element.
meshRoutes	entries	0	1000	Number of entries that a given router has in its source-route table. This is a method to measure the number of elements in a given PAN.
meshRxReassemblyDrops	drops/sec	0	1	Rate of incoming packet fragments dropped because there was no space in the reassembly buffer.
meshRxSpeed	b/s	0	76800	Rate of data received by the uplink network interface, measured in bits per second, averaged over a short element-specific time period.
meshTxDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the uplink interface because the outbound queue was full.
meshTxSpeed	b/s	0	76800	Current speed of data transmission over the uplink network interface, measured in bits per second, averaged over a short element-specific time period.
serial0rxSpeed	b/s	0	100000000	Receive rate for the Serial 0 interface.
serial0txSpeed	b/s	0	100000000	Transmit rate for Serial 0 interface.
serial1rxSpeed	b/s	0	100000000	Receive rate for the Serial 1 interface.
serial1txSpeed	b/s	0	100000000	Transmit rate for Serial 1 interface.
uplinkRssi	dBm	-100	-50	Measured RSSI value of the primary RF uplink used for all RF uplinks.
uplinkRxDrops	drops/sec	0	1	Rate of packets received on the uplink interface, but then dropped because the inbound queue was full.
uplinkRxSpeed	b/s	0	3000000	Rate of data received by the uplink network interface, measured in bits per second, averaged over a short element-specific time period.
uplinkTxDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the uplink interface because the outbound queue was full.
uplinkTxSpeed	b/s	0	500000	Current speed of data transmission over the uplink network interface, measured in bits per second, averaged over a short element-specific time period.
uptime	sec	0	31536000	Amount of time, in seconds, that the element has been running since last boot.

Metrics Field Names

Metrics for Supported Connected Grid Routers

Table 11 describes the metrics for supported routers.

Table 11 Metrics for Supported Routers

Metric Name	Unit	Min	Max	Description
batteryLevel	%	0	100	Percentage of charge remaining in the first battery.
batteryLevel2	%	0	100	Percentage of charge remaining in the second battery.
batteryRuntime	minutes	0	65535	Runtime remaining on the first battery.
batteryRuntime2	minutes	0	65535	Runtime remaining on the second battery.
cellRSSI	dBm	-100	0	Cell Received Signal Strength Indicator (RSSI).
chassisTemp	Celsius	0	100	Internal temperature of the device.
fourTo6Translations	-	0	100000000	MAP-T metrics map4to6Translations.
meshEndpointCount	devices	0	10000	Number of active mesh endpoints connected to this element.
meshRoutes	entries	0	1000	Number of entries that a given router has in its source-route table. This is a method to measure the number of elements in a given PAN.
meshRxReassemblyDrops	drops/sec	0	1	Rate of incoming packet fragments dropped because there was no space in the reassembly buffer.
meshRxSpeed	b/s	0	76800	Rate of data received by the uplink network interface, measured in bits per second, averaged over a short element-specific time period.
meshTxDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the uplink interface because the outbound queue was full.
meshTxSpeed	b/s	0	76800	Current speed of data transmission over the uplink network interface, measured in bits per second, averaged over a short element-specific time period.
serial0rxSpeed	b/s	0	100000000	Receive rate for the Serial 0 interface.
serial0txSpeed	b/s	0	100000000	Transmit rate for Serial 0 interface.
serial1rxSpeed	b/s	0	100000000	Receive rate for the Serial 1 interface.
serial1txSpeed	b/s	0	100000000	Transmit rate for Serial 1 interface.
sixTo4Translations	-	0	100000000	MAP-T metrics map6to4Translations.
uplinkRssi	dBm	-100	-50	Measured RSSI value of the primary RF uplink used for all RF uplinks.
uplinkRxDrops	drops/sec	0	1	Rate of packets received on the uplink interface, but then dropped because the inbound queue was full.
uplinkRxSpeed	b/s	0	3000000	Rate of data received by the uplink network interface, measured in bits per second, averaged over a short element-specific time period.
uplinkTxDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the uplink interface because the outbound queue was full.
uplinkTxSpeed	b/s	0	500000	Current speed of data transmission over the uplink network interface, measured in bits per second, averaged over a short element-specific time period.
uptime	sec	0	31536000	Amount of time, in seconds, that the element has been running since last boot.

Metrics Field Names

Metrics for VPN Interfaces

Table 12 describes the metrics for the VPN interfaces.

Table 12 Metrics for VPN Interfaces

Metric Name	Unit	Min	Max	Description
txSpeed	b/s	0	76800	Current speed of data transmission over the interface, measured in bits per second, averaged over a short element-specific time period.
txDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the interface because the outbound queue was full.
rxSpeed	b/s	0	76800	Rate of data received by the network interface, measured in bits per second, averaged over a short element-specific time period.

Metrics for 3G Interfaces

Table 13 describes the metrics for 3G interfaces.

Table 13 Metrics for 3G Interfaces

Metric Name	Unit	Min	Max	Description
txSpeed	b/s	0	76800	Current speed of data transmission over the interface, measured in bits per second, averaged over a short element-specific time period.
txDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the interface because the outbound queue was full.
rxSpeed	b/s	0	76800	Rate of data received by the network interface, measured in bits per second, averaged over a short element-specific time period.

Metrics for WiMAX Interfaces

Table 14 describes the metrics for WiMAX interfaces.

Table 14 Metrics for WiMAX Module Interfaces

Metric Name	Unit	Min	Max	Description
txSpeed	b/s	0	76800	Current speed of data transmission over the interface, measured in bits per second, averaged over a short element-specific time period.
txDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the interface because the outbound queue was full.
rxSpeed	b/s	0	76800	Rate of data received by the network interface, measured in bits per second, averaged over a short element-specific time period.

Metrics Field Names

Metrics for WPAN Interfaces

Table 15 describes the metrics for the WPAN interfaces.

Table 15 Metrics for WPAN Interfaces

Metric Name	Unit	Min	Max	Description
txSpeed	b/s	0	76800	Current speed of data transmission over the interface, measured in bits per second, averaged over a short element-specific time period.
txDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the interface because the outbound queue was full.
txSpeed	b/s	0	76800	Rate of data received by the network interface, measured in bits per second, averaged over a short element-specific time period.

Metrics for Management Interfaces

Table 16 describes the metrics for management interfaces.

Table 16 Metrics for Management Interfaces

Metric Name	Unit	Min	Max	Description
txSpeed	b/s	0	76800	Current speed of data transmission over the interface, measured in bits per second, averaged over a short element-specific time period.
txDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the interface because the outbound queue was full.
txSpeed	b/s	0	76800	Rate of data received by the network interface, measured in bits per second, averaged over a short element-specific time period.

Metrics for Ethernet Interfaces

Table 17 describes the metrics for Ethernet interfaces.

Table 17 Metrics for Ethernet Interfaces

Metric Name	Unit	Min	Max	Description
txSpeed	b/s	0	76800	Current speed of data transmission over the interface, measured in bits per second, averaged over a short element-specific time period.
txDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the interface because the outbound queue was full.
txSpeed	b/s	0	76800	Rate of data received by the network interface, measured in bits per second, averaged over a short element-specific time period.

Metrics Field Names

Metrics for Serial Interfaces

Table 18 describes the metrics for the serial interfaces.

Table 18 Metrics for Serial Interfaces

Metric Name	Unit	Min	Max	Description
txSpeed	b/s	0	76800	Current speed of data transmission over the interface, measured in bits per second, averaged over a short element-specific time period.
txDrops	drops/sec	0	1	Rate of packets dropped while trying to transmit on the interface because the outbound queue was full.
rxSpeed	b/s	0	76800	Rate of data received by the network interface, measured in bits per second, averaged over a short element-specific time period.

Metrics Field Names



Audit Trail API

This chapter describes the Audit Trail API:

- [Using the Audit API, page 17](#)
- [Audit API Method Calls, page 17](#)

Using the Audit API

In your IoT FND NB API client application, use this IoT FND server URL to access the Audit Trail API WSDL:

`http://<server_address>/nbapi/audittrail?wsdl`

The time service used is Linux Epoch, see:

`http://www.epochconverter.com`

Audit API Method Calls

- [deleteAuditTrailsByTime, page 28](#)
- [getAuditTrailsByOperation, page 24](#)
- [getAuditTrailsByTime, page 18](#)
- [getAuditTrailsByUser, page 20](#)
- [getAuditTrailsByUserAndIp, page 22](#)
- [getAuditTrailsByUserAndOperation, page 25](#)
- [getAuditTrailsByUserIpAndOperation, page 26](#)

getAuditTrailsByTime

This call lets the client retrieve the audit trail for a specified time range.

Prototype

```
<aud:getAuditTrailsByTime>
  <startTimeInMs>1329163991000</startTimeInMs>
  <endTimeInMs>1329166091000</endTimeInMs>
</aud:getAuditTrailsByTime>
```

Parameters

Table 1 describes the parameters in the interface.

Table 1 getAuditTrailsByTime Request

Parameter	Description
startTimeInMs	Audit trail entries start time for the specified time range in Epoch time format (for example, midnight on September 17, 2004 is specified as 109537920000).
endTimeInMs	Audit trail entries end time for the specified time range in Epoch time format.

getAuditTrailsByTime SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:aud="http://audittrail.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <aud:getAuditTrailsByTime>
      <startTimeInMs>1329163991000</startTimeInMs>
      <endTimeInMs>1329166091000</endTimeInMs>
    </aud:getAuditTrailsByTime>
  </soapenv:Body>
</soapenv:Envelope>
```

Response

```
<env:Envelope xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
  <env:Header>
    <seam:conversationId xmlns:seam="http://www.jboss.org/seam/webservice">54</seam:conversationId>
  </env:Header>
  <env:Body>
    <ns2:getAuditTrailsByTimeResponse xmlns:ns2="http://audittrail.nbapi.cgms.cisco.com/">
      <audit_trail>
        <details>N/A</details>
        <generatedAt>1329166073474</generatedAt>
        <id>2001000</id>
        <ipAddrNum>2130706433</ipAddrNum>
        <ipAddrStr>127.0.0.1</ipAddrStr>
        <operation>Login</operation>
        <status>Success</status>
        <userName>root</userName>
      </audit_trail>
      <audit_trail>
        <details>N/A</details>
        <generatedAt>1329164689460</generatedAt>
        <id>1001000</id>
        <ipAddrNum>2130706433</ipAddrNum>
        <ipAddrStr>127.0.0.1</ipAddrStr>
        <operation>Login</operation>
        <status>Success</status>
        <userName>root</userName>
      </audit_trail>
    </ns2:getAuditTrailsByTimeResponse>
  </env:Body>
</env:Envelope>
```

Audit API Method Calls

```
<details>N/A</details>
<generatedAt>1329164073521</generatedAt>
<id>1002</id>
<ipAddrNum>2130706433</ipAddrNum>
<ipAddrStr>127.0.0.1</ipAddrStr>
<operation>Login</operation>
<status>Success</status>
<userName>root</userName>
</audit_trail>
<audit_trail>
  <details>N/A</details>
  <generatedAt>1329164069521</generatedAt>
  <id>1001</id>
  <ipAddrNum>2130706433</ipAddrNum>
  <ipAddrStr>127.0.0.1</ipAddrStr>
  <operation>Password changed</operation>
  <status>Success</status>
  <userName>root</userName>
</audit_trail>
<audit_trail>
  <details>N/A</details>
  <generatedAt>1329164057605</generatedAt>
  <id>1000</id>
  <ipAddrNum>2130706433</ipAddrNum>
  <ipAddrStr>127.0.0.1</ipAddrStr>
  <operation>Login</operation>
  <status>Success</status>
  <userName>root</userName>
</audit_trail>
</ns2:getAuditTrailsByTimeResponse>
</env:Body>
</env:Envelope>
```

getAuditTrailsByUser

This call retrieves audit trail entries for a specified user and time range.

Prototype

```
<aud:getAuditTrailsByUser>
  <userName>endpoint_oper</userName>
  <startTimeInMs>1329163991000</startTimeInMs>
  <endTimeInMs>1329174551000</endTimeInMs>
</aud:getAuditTrailsByUser>
```

Parameters

Table 2 describes the parameters in the interface.

Table 2 getAuditTrailsbyUser Request

Parameter	Description
userName	Audit trail entries for the specified user name.
startTimeInMs	Audit trail entries start time for the specified time range.
endTimeInMs	Audit trail entries end time for the specified time range.

getAuditTrailsByUser SOAP XML Request Format Request

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:aud="http://audittrail.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <aud:getAuditTrailsByUser>
      <!--Optional:-->
      <userName>endpoint_oper</userName>
      <startTimeInMs>1329163991000</startTimeInMs>
      <endTimeInMs>1329174551000</endTimeInMs>
    </aud:getAuditTrailsByUser>
  </soapenv:Body>
</soapenv:Envelope>
```

Response

```
<env:Envelope xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
  <env:Header>
    <seam:conversationId xmlns:seam="http://www.jboss.org/seam/webservice">85</seam:conversationId>
  </env:Header>
  <env:Body>
    <ns2:getAuditTrailsByUserResponse xmlns:ns2="http://audittrail.nbapi.cgms.cisco.com/">
      <audit_trail>
        <details>N/A</details>
        <generatedAt>1329174503078</generatedAt>
        <id>2001003</id>
        <ipAddrNum>2130706433</ipAddrNum>
        <ipAddrStr>127.0.0.1</ipAddrStr>
        <operation>Logout</operation>
        <status>Success</status>
        <userName>endpoint_oper</userName>
      </audit_trail>
      <audit_trail>
        <details>N/A</details>
        <generatedAt>1329174494253</generatedAt>
        <id>2001002</id>
        <ipAddrNum>2130706433</ipAddrNum>
        <ipAddrStr>127.0.0.1</ipAddrStr>
        <operation>Login</operation>
        <status>Success</status>
      </audit_trail>
    </ns2:getAuditTrailsByUserResponse>
  </env:Body>
</env:Envelope>
```

Audit API Method Calls

```
        <userName>endpoint_oper</userName>
      </audit_trail>
    </ns2:getAuditTrailsByUserResponse>
  </env:Body>
</env:Envelope>
```

getAuditTrailsByUserAndIp

This call retrieves audit trail entries for a specified user, IP address, and time range.

Prototype

```
<aud:getAuditTrailsByUserAndIp>
  <userName>endpoint_oper</userName>
  <ipAddr>127.0.0.1</ipAddr>
  <startTimeInMs>1329163991000</startTimeInMs>
  <endTimeInMs>1329174551000</endTimeInMs>
</aud:getAuditTrailsByUserAndIp>
```

Parameters

Table 3 describes the parameters in the interface.

Table 3 getAuditTrailsByUserandIP Request

Parameter	Description
userName	Audit trail entries for the specified user name.
ipAddr	Audit trail entries for the specified IP address.
startTimeInMs	Audit trail entries start time for the specified time range.
endTimeInMs	Audit trail entries end time for the specified time range.

getAuditTrailsByUserAndIp SOAP XML Request Format Request

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:aud="http://audittrail.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <aud:getAuditTrailsByUserAndIp>
      <userName>endpoint_oper</userName>
      <ipAddr>127.0.0.1</ipAddr>
      <startTimeInMs>1329163991000</startTimeInMs>
      <endTimeInMs>1329174551000</endTimeInMs>
    </aud:getAuditTrailsByUserAndIp>
  </soapenv:Body>
</soapenv:Envelope>
```

Response

```
<env:Envelope xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
  <env:Header>
    <seam:conversationId xmlns:seam="http://www.jboss.org/seam/webservice">86</seam:conversationId>
  </env:Header>
  <env:Body>
    <ns2:getAuditTrailsByUserAndIpResponse xmlns:ns2="http://audittrail.nbapi.cgms.cisco.com/">
      <audit_trail>
        <details>N/A</details>
        <generatedAt>1329174503078</generatedAt>
        <id>2001003</id>
        <ipAddrNum>2130706433</ipAddrNum>
        <ipAddrStr>127.0.0.1</ipAddrStr>
        <operation>Logout</operation>
        <status>Success</status>
        <userName>endpoint_oper</userName>
      </audit_trail>
      <audit_trail>
        <details>N/A</details>
        <generatedAt>1329174494253</generatedAt>
        <id>2001002</id>
        <ipAddrNum>2130706433</ipAddrNum>
      </audit_trail>
    </ns2:getAuditTrailsByUserAndIpResponse>
  </env:Body>
</env:Envelope>
```


Audit API Method Calls

```
<ipAddrStr>127.0.0.1</ipAddrStr>  
<operation>Login</operation>  
<status>Success</status>  
<userName>endpoint_oper</userName>  
</audit_trail>  
</ns2:getAuditTrailsByUserAndIpResponse>  
</env:Body>  
</env:Envelope>
```

getAuditTrailsByOperation

This call retrieves audit trail entries for a specified operation type and time range.

Prototype

```
<aud:getAuditTrailsByOperation>
  <operation>password changed</operation>
  <startTimeInMs>1329163991000</startTimeInMs>
  <endTimeInMs>1329174551000</endTimeInMs>
</aud:getAuditTrailsByOperation>
```

Parameters

Table 4 describes the parameters in the interface.

Table 4 getAuditTrailsByOperation Request

Parameter	Description
operation	Audit trail entries by operation type.
startTimeInMs	Audit trail entries start time for the specified time range.
endTimeInMs	Audit trail entries end time for the specified time range.

getAuditTrailsByOperation SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:aud="http://audittrail.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <aud:getAuditTrailsByOperation>
      <operation>password changed</operation>
      <startTimeInMs>1329163991000</startTimeInMs>
      <endTimeInMs>1329174551000</endTimeInMs>
    </aud:getAuditTrailsByOperation>
  </soapenv:Body>
</soapenv:Envelope>
```

Response

```
<env:Envelope xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
  <env:Header>
    <seam:conversationId xmlns:seam="http://www.jboss.org/seam/webservice">88</seam:conversationId>
  </env:Header>
  <env:Body>
    <ns2:getAuditTrailsByOperationResponse xmlns:ns2="http://audittrail.nbapi.cgms.cisco.com/">
      <audit_trail>
        <details>N/A</details>
        <generatedAt>1329164069521</generatedAt>
        <id>1001</id>
        <ipAddrNum>2130706433</ipAddrNum>
        <ipAddrStr>127.0.0.1</ipAddrStr>
        <operation>Password changed</operation>
        <status>Success</status>
        <userName>root</userName>
      </audit_trail>
    </ns2:getAuditTrailsByOperationResponse>
  </env:Body>
</env:Envelope>
```

getAuditTrailsByUserAndOperation

This call retrieves audit trail entries for a specified user, operation type, and time range.

Prototype

```
<aud:getAuditTrailsByUserAndOperation>
  <userName>endpoint_oper</userName>
  <operation>login</operation>
  <startTimeInMs>1329163991000</startTimeInMs>
  <endTimeInMs>1329174551000</endTimeInMs>
</aud:getAuditTrailsByUserAndOperation>
```

Parameters

Table 5 describes the parameters in the interface.

Table 5 getAuditTrailsByUserAndOperation Request

Parameter	Description
userName	Audit trail entries for the specified user.
operation	Audit trail entries for the specified operation type.
startTimeInMs	Audit trail entries start time for the specified time range.
endTimeInMs	Audit trail entries end time for the specified time range.

getAuditTrailsByUserAndOperation SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:aud="http://audittrail.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <aud:getAuditTrailsByUserAndOperation>
      <userName>endpoint_oper</userName>
      <operation>login</operation>
      <startTimeInMs>1329163991000</startTimeInMs>
      <endTimeInMs>1329174551000</endTimeInMs>
    </aud:getAuditTrailsByUserAndOperation>
  </soapenv:Body>
</soapenv:Envelope>
```

Response

```
<env:Envelope xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
  <env:Header>
    <seam:conversationId xmlns:seam="http://www.jboss.org/seam/webservice">89</seam:conversationId>
  </env:Header>
  <env:Body>
    <ns2:getAuditTrailsByUserAndOperationResponse
xmlns:ns2="http://audittrail.nbapi.cgms.cisco.com/">
      <audit_trail>
        <details>N/A</details>
        <generatedAt>1329174494253</generatedAt>
        <id>2001002</id>
        <ipAddrNum>2130706433</ipAddrNum>
        <ipAddrStr>127.0.0.1</ipAddrStr>
        <operation>Login</operation>
        <status>Success</status>
        <userName>endpoint_oper</userName>
      </audit_trail>
    </ns2:getAuditTrailsByUserAndOperationResponse>
  </env:Body>
</env:Envelope>
```

getAuditTrailsByUserIpAndOperation

This call retrieves audit trail entries for a specified user, IP address, operation type, and time range.

Prototype

```
<aud:getAuditTrailsByUserIpAndOperation>
  <ipAddr>127.0.0.1</ipAddr>
  <userName>endpoint_oper</userName>
  <operation>login</operation>
  <startTimeInMs>1329163991000</startTimeInMs>
  <endTimeInMs>1329174551000</endTimeInMs>
</aud:getAuditTrailsByUserIpAndOperation>
```

Parameters

Table 6 describes the parameters in the interface.

Table 6 getAuditTrailsByUserIPAndOperation Request

Parameter	Description
ipAddr	Audit trail entries for the specified IP address.
userName	Audit trail entries for the specified user.
operation	Audit trail entries for the specified operation type.
startTimeInMs	Audit trail entries start time for the specified time range.
endTimeInMs	Audit trail entries end time for the specified time range.

getAuditTrailsByUserIpAndOperation SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:aud="http://audittrail.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <aud:getAuditTrailsByUserIpAndOperation>
      <ipAddr>127.0.0.1</ipAddr>
      <userName>endpoint_oper</userName>
      <operation>login</operation>
      <startTimeInMs>1329163991000</startTimeInMs>
      <endTimeInMs>1329174551000</endTimeInMs>
    </aud:getAuditTrailsByUserIpAndOperation>
  </soapenv:Body>
</soapenv:Envelope>
```

Response

```
<env:Envelope xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
  <env:Header>
    <seam:conversationId xmlns:seam="http://www.jboss.org/seam/webservice">90</seam:conversationId>
  </env:Header>
  <env:Body>
    <ns2:getAuditTrailsByUserIpAndOperationResponse
xmlns:ns2="http://audittrail.nbapi.cgms.cisco.com/">
      <audit_trail>
        <details>N/A</details>
        <generatedAt>1329174494253</generatedAt>
        <id>2001002</id>
        <ipAddrNum>2130706433</ipAddrNum>
        <ipAddrStr>127.0.0.1</ipAddrStr>
        <operation>Login</operation>
        <status>Success</status>
        <userName>endpoint_oper</userName>
      </audit_trail>
    </ns2:getAuditTrailsByUserIpAndOperationResponse>
```

Audit API Method Calls

```
</env:Body>  
</env:Envelope>
```

deleteAuditTrailsByTime

This call removes audit trail entries by the specified time.

Prototype

```
<aud:deleteAuditTrailsByTime>
  <startTimeInMs>1329163991000</arg0>
  <endTimeInMs>1329174551000</arg1>
</aud:deleteAuditTrailsByTime>
```

Parameters

[Table 7](#) describes the parameters in the interface.

Table 7 deleteAuditTrailsByTime Request

Parameter	Description
startTimeInMs	Delete audit trail entries start time by specified time range.
endTimeInMs	Delete audit trail entries end time by specified time range.

deleteAuditTrailsByTime SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:aud="http://audittrail.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <aud:deleteAuditTrailsByTime>
      <startTimeInMs>1329163991000</arg0>
      <endTimeInMs>1329174551000</arg1>
    </aud:deleteAuditTrailsByTime>
  </soapenv:Body>
</soapenv:Envelope>
```

Response

```
<env:Envelope xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
  <env:Header>
    <seam:conversationId xmlns:seam="http://www.jboss.org/seam/webservice">91</seam:conversationId>
  </env:Header>
  <env:Body>
    <ns2:deleteAuditTrailsByTimeResponse xmlns:ns2="http://audittrail.nbapi.cgms.cisco.com/">
      <delete_response>Successfully deleted audit trails.</delete_response>
    </ns2:deleteAuditTrailsByTimeResponse>
  </env:Body>
</env:Envelope>
```



Device Management API

This chapter describes the Device Management API:

- [Using the Device Management API, page 29](#)
- [Using the device-client Script, page 29](#)
- [Device Management API Method Calls, page 30](#)

Using the Device Management API

In your IoT FND NB API client application, use this IoT FND server URL to access the Device API WSDL:

```
http://<server_address>/nbapi/device?wsdl
```

Using the device-client Script

The IoT FND distribution provides a Device Management API client (device-client script) in the `cgms-tools-version.x86_64.rpm` package. The client is wrapped by a shell script (`/opt/cgms-tools/bin/device-client`) to directly communicate with the IoT FND API.

```
[root@localhost bin]# ./device-client
usage:
./bin/device-client add <endpoint URL> <filename>
./bin/device-client remove <endpoint URL> <filename>
./bin/device-client set <endpoint URL> <filename> <status>
./bin/device-client update <endpoint URL> <filename>
./bin/device-client export <endpoint URL> <query>
./bin/device-client job <endpoint URL> <job id>
```

[Table 1](#) lists device-client script commands:

Table 1 device-client Commands

Command	Description
add	Calls the addDevices API.
remove	Calls the removeDevices API.
set	Calls the setDevices API to change status.
update	Calls the updateDevices API to change device properties.
export	Calls the exportDevices API.
job	Calls the getJob API to get the status of the job for one of the commands above.

Except for export and job, all other commands return a job ID used to query the job execution status.

Device Management API Method Calls

- [addDevices, page 31](#)
- [exportDevices, page 35](#)
- [getJob, page 36](#)
- [removeDevices, page 32](#)
- [updateDevices, page 34](#)

addDevices

This call lets the client add the devices specified in a CSV file to a managed device list in the IoT FND database. It is an asynchronous call that returns a job ID used to query the status of the add device job using the [getJob](#) call (see [getJob](#), page 36).

Prototype

```
<dev:addDevices>
  <file>
    <data>eid:564620131674</data>
    <filename>H:\SGBU\csv_loading\test_for_device_api_2.csv</filename>
    <username>root</username>
  </file>
</dev:addDevices>
```

Parameters

[Table 2](#) describes the parameters in the interface.

Table 2 addDevices Parameters

Parameter	Options	Description
file	data	A structure describing the CSV file to import. This file contains the list and details of devices to add. The data type is base 64 binary.
	filename	This example CSV file specifies new values for the mapLevel, latitude, and longitude properties of the specified devices:
	username	
		<pre>eid,mapLevel,lat,lng CA06001400100,2,-22.229488,37.860659 CA06001400100-0,15,-22.22887230524572,37.85273990917842 CA06001400100-1,15,-22.21759741145942,37.85962556788922</pre>

Results

[Table 3](#) describes the parameters in the response.

Table 3 addDevices Response

Parameter	Type	Description
jobId	int	Use the job ID to get more information about the status of this call. For more information, see getJob , page 36.

addDevice SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:dev="http://devicemgmt.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <dev:addDevices>
      <!--Optional:-->
      <file>
        <!--Optional:-->
        <data>eid:564620131674</data>
        <!--Optional:-->
        <filename>H:\SGBU\csv_loading\test_for_device_api_2.csv</filename>
        <!--Optional:-->
        <username>root</username>
      </file>
    </dev:addDevices>
  </soapenv:Body>
</soapenv:Envelope>
```

removeDevices

This call lets the client remove the devices specified in a CSV file from a managed devices list stored in the IoT FND database. It is an asynchronous call that returns a job ID used to query the status of this job using the `getJob` call (see [getJob](#), page 36).

Prototype

```
<dev:removeDevices>
  <file>
    <data>eid:136162421901</data>
    <filename>h:\SGBU|csv_loading\remove_device_Notepad_format.csv</filename>
    <username>root</username>
  </file>
</dev:removeDevices>
```

Parameters

[Table 4](#) describes the parameters in the interface.

Table 4 removeDevices Parameters

Parameter	Options	Description
file	data	A structure describing the CSV file to import. This file contains the list of devices to remove. The data type is base 64 binary.
	filename	This example CSV file specifies new values for the mapLevel, latitude, and longitude properties of the specified devices:
	username	
		<pre>eid,mapLevel,lat,lng CA06001400100,2,-22.229488,37.860659 CA06001400100-0,15,-22.22887230524572,37.85273990917842 CA06001400100-1,15,-22.21759741145942,37.85962556788922</pre>

Results

[Table 5](#) describes the parameters in the response.

Table 5 removeDevices Response

Parameter	Type	Description
jobId	int	The job ID used to get more information about the status of this call. For more information, see getJob , page 36.

removeDevices SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:dev="http://devicemgmt.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <dev:removeDevices>
      <!--Optional:-->
      <file>
        <!--Optional:-->
        <data>eid:136162421901</data>
        <!--Optional:-->
        <filename>h:\SGBU|csv_loading\remove_device_Notepad_format.csv</filename>
        <!--Optional:-->
        <username>root</username>
      </file>
    </dev:removeDevices>
  </soapenv:Body>
</soapenv:Envelope>
```

setDevices

This call sets the properties of the specified devices as defined in a CSV file.

Parameters

[Table 6](#) describes the parameters in the interface.

Table 6 setDevices Parameters

Parameter	Options	Description
file	data filename username	<p>A structure describing the CSV file to import. This file contains the list of devices and corresponding properties to set. The data type is base 64 binary.</p> <p>This example CSV file specifies new values for the mapLevel, latitude, and longitude properties of the specified devices:</p> <pre>eid,mapLevel,lat,lng CA06001400100,2,-22.229488,37.860659 CA06001400100-0,15,-22.22887230524572,37.85273990917842 CA06001400100-1,15,-22.21759741145942,37.85962556788922</pre>

Results

[Table 7](#) describes the parameters in the response.

Table 7 setDevices Response

Parameter	Type	Description
jobId	int	The job ID used to get more information about the status of this call. For more information, see getJob , page 36.

updateDevices

This call updates the properties of the specified devices with new values provided in CSV file.

Prototype

```
<dev:updateDevices>
  <file>
    <data>eid:568127286335</data>
    <filename>?</filename>
    <username>?</username>
  </file>
</dev:updateDevices>
```

Parameters

Table 8 describes the parameters in the interface.

Table 8 updateDevice Parameters

Parameter	Type	Description
file	data	This structure describes the CSV file to import. This file contains the list of devices and corresponding properties to update. The data type is base 64 binary.
	filename	This example CSV file specifies new values for the mapLevel, latitude, and longitude properties of the specified devices:
	username	
		<pre>eid,mapLevel,lat,lng CA06001400100,2,-22.229488,37.860659 CA06001400100-0,15,-22.22887230524572,37.85273990917842 CA06001400100-1,15,-22.21759741145942,37.85962556788922 CA06001400100-10,15,-22.21672330007085,37.85933754140877 CA06001400100-100,15,-22.22737656792707,37.866319080937444 CA06001400100-1000,15,-22.23107565852129,37.86334942264521 CA06001400100-1001,15,-22.23444480993644,37.86209437189405</pre>

Results

Table 9 describes the parameters in the response.

Table 9 updateDevice Response

Parameter	Type	Description
jobId	int	The job ID used to get more information about the status of this call. For more information, see getJob , page 36.

updateDevice SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:dev="http://devicemgmt.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <dev:updateDevices>
      <!--Optional:-->
      <file>
        <!--Optional:-->
        <data>eid:568127286335</data>
        <!--Optional:-->
        <filename>?</filename>
        <!--Optional:-->
        <username>?</username>
      </file>
    </dev:updateDevices>
  </soapenv:Body>
</soapenv:Envelope>
```

exportDevices

This call returns a list of devices found by the query. This is an asynchronous call. Unlike other device management APIs, this call is blocking until all results are consumed by the caller.

Prototype

```
<dev:exportDevices>
  <username>root</username>
  <query>cgr1000</query>
</dev:exportDevices>
```

Parameters

Table 10 describes the parameters in the interface.

Table 10 exportDevices Parameters

Parameter	Type	Description
username	string	IoT FND username used as part of the job creation.
query	string	The query that determines the criteria of the devices to export.

Results

Table 11 describes the parameters in the response.

Table 11 exportDevices Response

Parameter	Type	Description
data	base64Binary	The job ID used to get more information about the status of this call. For more information, see getJob, page 36 .
date	dateTime	The date of the query (UTC time).
query	string	The query used to find the devices to export.
status	string	Status of the job.

exportDevices SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:dev="http://devicemgmt.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <dev:exportDevices>
      <!--Optional:-->
      <username>root</username>
      <!--Optional:-->
      <query>cgr1000</query>
    </dev:exportDevices>
  </soapenv:Body>
</soapenv:Envelope>
```

getJob

This call returns a job report describing the detailed execution status of the specified job.

Prototype

```
<dev:getJob>
  <jobId>110</jobId>
</dev:getJob>
```

Parameters

Table 12 describes the parameters in the interface.

Table 12 getJob Parameters

Parameter	Type	Description
jobId	int	The job ID to return information about.

Results

Table 13 describes the parameters in the response.

Table 13 getJob Results

Parameter	Type	Description
id	integer	Job ID.
username	string	The username of the job submitter.
filename	string	The filename of the job.
type	string	The job type.
totalCount	integer	Total count includes successes and failures.
successCount	integer	Success count represents the number of devices successfully updated.
failureCount	integer	Failure count summarizes the number of devices not successfully updated.
status	string	The job execution status.
submittedAt	date	The job submission date (UTC time).
updatedAt	date	The job updating date (UTC time).
logs	string	The logged messages of the job execution.

exportJob SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:dev="http://devicemgmt.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <dev:getJob>
      <jobId>110</jobId>
    </dev:getJob>
  </soapenv:Body>
</soapenv:Envelope>
```



Mesh Firmware Migration API

This API only applies to CGRs running CG-OS software.

This chapter describes the Firmware Migration API:

- [Using the Mesh Firmware Migration API, page 37](#)
- [Mesh Firmware Migration API Method Calls, page 37](#)

Using the Mesh Firmware Migration API

In your IoT FND NB API client application, use the following IoT FND server URL to access the Mesh Firmware Migration API WSDL:

`http://<server_address>/nbapi/reprovision?wsdl`

Mesh Firmware Migration API Method Calls

IoT FND allows you to update earlier versions of CGR firmware to allow Cisco mesh networking using the following APIs:

- [cancelReprovision, page 38](#)
- [showReprovisionStatus, page 39](#)
- [startReprovisionByEidList, page 41](#)
- [startReprovisionByEidListAbridged, page 42](#)
- [startReprovisionByGroup, page 43](#)
- [startReprovisionByGroupAbridged, page 44](#)

The mesh firmware migration process also requires editing of the Router Configuration and FAR Addition templates in IoT FND. See the IoT FND User Guide.

cancelReprovision

This call cancels a scheduled reprovisioning operation. Devices are queued in batches of 12 in FIFO order. As soon as the top reprovisioning operation completes, reprovisioning begins on the next device in the queue. When a reprovisioning operation is canceled, reprovisioning operations in progress complete. If the operation is scheduled for the future, then this call cancels the entire operation.

Prototype

```
cancelReprovision(String uid)
```

Parameters

[Table 1](#) describes the parameters in the interface.

Table 1 cancelReprovision Parameters

Parameter	Type	Description
uid	string	The UID of the scheduled reprovision operation.

Results

If the uid parameter references an unknown UID, the UID of an operation in progress, or a UID of a device that completed the reprovisioning process, the resultStatus is FAILED, and an appropriate errorDetails message is set. If the resultStatus is SUCCESS, the operation was canceled and will not execute.

[Table 2](#) describes the parameters in the response.

Table 2 cancelReprovision Results

Parameter	Type	Description
resultStatus	string	SUCCESS or FAILED. FAILED returns only on a bad UID. For all other results such as the UID of an operation in progress or UID of a device that completed the reprovisioning process, resultStatus is SUCCESS and the cancel operation did not run.
errorDetails	string	Error description if resultStatus is FAILED.

showReprovisionStatus

This call retrieves the status of the reprovision operation correlating to the specified UID.

Prototype

```
showReprovisionStatus(String uid)
```

Parameters

Table 3 describes the parameters in the interface.

Table 3 showReprovisionStatus Parameters

Parameter	Type	Description
uid	string	The UID of the scheduled reprovision operation.

Results

```
ShowReprovisionStatusReport showReprovisionStatus(String uid)
```

A ShowReprovisionStatusReport always returns. resultStatus is ERROR if the UID does not reference a known operation, which happens if the UID was incorrect or if the UID referenced an operation that completed and was cleaned up by the automatic pruning logic. Data retention time defaults to 7 days after an operation completes, which is configurable in IoT FND.

Table 4 describes the parameters in the response.

Table 4 showReprovisionStatus Results

Parameter	Type	Description
resultStatus	string	SUCCESS or FAILED.
errorDetails	string	Error description if resultStatus is FAILED.
uid	string	The UID of the reprovision operation correlating to this status.
operationStatus	string	The ReprovisionOperationStatus value correlating to this operation.
scheduledFor	int	Date specified in startReprovisionByEidList , startReprovisionByEidListAbridged , startReprovisionByGroup , or startReprovisionByGroupAbridged for operation execution.
submittedAt	int	Date when this operation was submitted to startReprovisionByEidList .
totalCount	int	Total number of devices specified in the list of EIDs in startReprovisionByEidList , startReprovisionByEidListAbridged , startReprovisionByGroup , or startReprovisionByGroupAbridged .
processedAt	int	Date when the operation began.
completedAt	int	Date when the operation finished processing all devices listed in startReprovisionByEidList , startReprovisionByEidListAbridged , startReprovisionByGroup , or startReprovisionByGroupAbridged if COMPLETED or FAILED; otherwise this parameter is null.
successCount	int	Number of devices successfully processed.
failedCount	int	Number of items that failed the processing operation.
itemReports	int	List of ReprovisionItemReport objects. Each object defines the status for a single EID specified in startReprovisionByEidList , startReprovisionByEidListAbridged , startReprovisionByGroup , or startReprovisionByGroupAbridged .

For a ShowReprovisionStatusReport object with an operationStatus of SCHEDULED or CANCELED, ReprovisionItemReport is null because no information is available for those objects until processing begins. For all other operationStatus values, a ReprovisionItemReport object will be returned for each EID that is to be processed.

Table 5 describes the parameters in the ReprovisionItemReport for the specified device.

Table 5 showReprovisionStatus ReprovisionItemReport Results

Parameter	Type	Description
eid	int	The EID of the device.
itemStatus	string	The ReprovisionItemStatus value related to this device.
errorDetails	string	Detailed error message if operationStatus is ERROR.
processedAt	int	Date when the operation began.
completedAt	int	Date when the operation finished processing the device.

startReprovisionByEidList

This call is general for all reprovisioning actions, not just for mesh migration. Some input parameters are not applicable to mesh migration operations. This call schedules an operation to execute at a future date.

For `startReprovisionByEidList` and `startReprovisionByGroup`, specify the interface name and interface type if all FARs have the same interface name and type. This is normally used for internal testing.

Prototype

```
startReprovisionByEidList(String action, List<String> eidList, String interfaceName,
    String interfaceType, Date executionDate)
```

Parameters

Table 6 describes the parameters in the interface.

Table 6 startReprovisionByEidList Parameters

Parameter	Type	Description
action	string	The name of the reprovisioning action to run. For mesh migration, this is MESH_FIRMWARE_ACTIVATION.
eidList	string	List of EIDs to perform the action on. Note: The list is limited to a maximum of 1000 IP addresses. An error returns and the operation is not scheduled if more than 1000 are specified.
interfaceName	string	(For test purposes only.) The name of the interface involved in the action. Note: Use the abridged calls for groups of mesh devices.
interfaceType	string	(For test purposes only.) The type of the interface involved in the action Note: Use the abridged calls for groups of mesh devices.
executionDate	date	Date to execute the action. This is a required parameter. Specify the current time or a time in the past to execute immediately.

Results

This method always returns a `StartReprovisionReport` object. If the operation failed to execute due to invalid parameters or if the EID list was determined invalid, `FAILED` returns. An operation is only scheduled and the UID returns if `resultStatus` is `SUCCESS`.

Table 7 describes the parameters in the response.

Table 7 startReprovisionByEidList Results

Parameter	Type	Description
resultStatus	int	SUCCESS or FAILED.
errorDetails	string	Error description if resultStatus is FAILED.
uid	string	The UID of the reprovision operation correlating to this status.

startReprovisionByEidListAbridged

This call schedules an operation to execute at a future date.

Prototype

```
startReprovisionByEidListAbridged(String action, List<String> eidList,
                                     String interfaceName, String interfaceType,
                                     Date executionDate)
```

Parameters

[Table 8](#) describes the parameters in the interface.

Table 8 startReprovisionByEidListAbridged Parameters

Parameter	Type	Description
action	string	The name of the reprovisioning action to run. For mesh migration, this is “Mesh Activation.”
eidList	string	List of EIDs to perform the action on. Note: The list is limited to a maximum of 1000 IP addresses. An error returns and the operation is not scheduled if more than 1000 are specified.
executionDate	date	Date to execute the action. This is a required parameter. Specify the current time or a time in the past to execute immediately.

Results

This method always returns a StartReprovisionReport object. If the operation failed to execute due to invalid parameters or if the EID list was determined invalid, FAILED returns. An operation is only scheduled and the UID returns if resultStatus is SUCCESS.

[Table 9](#) describes the parameters in the response.

Table 9 startReprovisionByEidListAbridged Results

Parameter	Type	Description
resultStatus	int	SUCCESS or FAILED.
errorDetails	string	Error description if resultStatus is FAILED.
uid	string	The UID of the reprovision operation correlating to this status.

startReprovisionByGroup

This call executes the reprovisioning operation on the specified group.

Prototype

```
startReprovisionByGroup(String action, String groupName, String interfaceName,
                          String interfaceType, Date executionDate)
```

Parameters

[Table 10](#) describes the parameters in the interface.

Table 10 startReprovisionByGroup Parameters

Parameter	Type	Description
action	string	The name of the reprovisioning action to run. For mesh migration, this is "Mesh Activation."
groupName	string	The name of the tunnel provisioning group.
executionDate	date	Date to execute the action. This is a required parameter. Specify the current time or a time in the past to execute immediately.

Results

This method always returns a StartReprovisionReport object. If the operation failed to execute due to invalid parameters or if the EID list was determined invalid, FAILED returns. An operation is only scheduled and the UID returns if resultStatus is SUCCESS.

[Table 11](#) describes the parameters in the response.

Table 11 startReprovisionByGroup Results

Parameter	Type	Description
resultStatus	int	SUCCESS or FAILED.
errorDetails	string	Error description if resultStatus is FAILED.
uid	string	The UID of the reprovision operation correlating to this status.

startReprovisionByGroupAbridged

This call executes the reprovisioning operation on the specified group.

Prototype

```
startReprovisionByGroupAbridged(String action, String groupName, Date executionDate)
```

Parameters

Table 12 describes the parameters in the interface.

Table 12 startReprovisionByGroupAbridged Parameters

Parameter	Type	Description
action	string	Note: For mesh migration, this parameter is “Mesh Activation.” The name of the reprovisioning action to run.
groupName	string	The name of the tunnel provisioning group.
executionDate	int	Date to execute the action. This is a required parameter. Specify the current time or a time in the past to execute immediately.

Results

This method always returns a StartReprovisionReport object. If the operation failed to execute due to invalid parameters or if the EID list was determined invalid, FAILED returns. An operation is only scheduled and the UID returns if resultStatus is SUCCESS.

Table 13 describes the parameters in the response.

Table 13 startReprovisionByGroupAbridged Results

Parameter	Type	Description
resultStatus	int	SUCCESS or FAILED.
errorDetails	string	Error description if resultStatus is FAILED.
uid	string	The UID of the reprovision operation correlating to this status.



Firmware Upgrade API

This API only applies to mesh devices.

Note: Firmware upgrades are only supported on Cisco IOS.

This chapter describes the Firmware Upgrade API:

- [Using the Firmware Upgrade API, page 45](#)
- [Firmware Upgrade API Method Calls, page 45](#)

Using the Firmware Upgrade API

In your IoT FND NB API client application, use this IoT FND server URL to access the Firmware Upgrade API WSDL:

`http://<server_address>/nbapi/meshDeviceOps?wsdl`

Firmware Upgrade API Method Calls

The following are the Firmware Upgrade API method calls:

- [startUpload, page 47](#)
- [stopUpload, page 48](#)
- [getFirmwareUploadStatus, page 49](#)
- [getFirmwareImageInfoList, page 50](#)
- [setBackupFirmwareImage, page 51](#)
- [scheduleReload, page 52](#)

The Firmware Upgrade API module allows client applications to start and stop firmware uploads to a group of mesh devices, check their firmware upload status, obtain firmware information by firmware group, setup a backup firmware image, and schedule a firmware reload.

Specified input parameters are not case sensitive, and are validated before further processing by IoT FND. All input parameters are character string. The utcDateAndTime format is “YYYY-MM-DD*HH:MM:SS.” [Table 1](#) lists return codes sent by the Firmware Upgrade module.

Table 1 Firmware Upgrade API Return Codes

Code	Definition
0	Success.
-1	Unsupported device type.
-2	Firmware group not found.
-3	Firmware image not found.
-4	Invalid date and time format (scheduleReload).

Table 1 Firmware Upgrade API Return Codes (continued)

Code	Definition
-5	Invalid firmware image.
-6	Cannot perform operation; firmware group is active.
-7	Cannot find a device in the up state in the firmware group.
-8	Cannot perform operation; empty firmware group.
-9	Cannot stop firmware update on inactive firmware group.
-10	Invalid load date specified.
-11	Simultaneous firmware group operations over maximum threshold.
-12	Cannot perform operation; firmware group file image only present on the nodes.
-99	Indicates a lower-layers system error, including: <ul style="list-style-type: none">■ System busy■ Invalid user permissions (Role Based Access Control)■ Another operation is pending for the group A text message returns with the return code.

startUpload

This call initiates the firmware upgrade on the specified firmware group with the specified firmware image.

Prototype

```
startUpload (devType, firmwareGroup, firmwareImageName)
```

Parameters

Table 2 describes the parameters in the interface.

Table 2 startUpload Parameters

Parameter	Options	Description
devType	cgmesh	The device to receive the firmware upgrade.
firmwareGroup	string	The firmware group of devices to receive the firmware upgrade.
firmwareImageName	string	The firmware image name.

Results

Table 3 describes the parameters in the response.

Table 3 startUpload Results

Value	Description
0	Success.
-1	devType not found or is not supported.
-2	firmwareGroup not found or is invalid.
-3	firmwareImageName not found or is invalid.
-99	System error.

SOAP XML Request Format

```
startUpload
```

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:startUpload>
      <firmwareGroup?</firmwareGroup>
      <firmwareImageName?</firmwareImageName>
    </mes:startUpload>
  </soapenv:Body>
</soapenv:Envelope>
```

stopUpload

This call stops the firmware upgrade in progress on the specified firmware group.

Prototype

```
stopUpload (devType, firmwareGroup)
```

Parameters

[Table 4](#) describes the parameters in the interface.

Table 4 stopUpload Parameters

Parameter	Options	Description
devType	cgmesh	The device to receive the firmware upgrade.
firmwareGroup	string	The firmware group of devices to receive the firmware upgrade.

Results

[Table 5](#) describes the parameters in the response.

Table 5 stopUpload Results

Value	Description
0	Success.
-1	devType not found or is not supported.
-2	firmwareGroup not found or is invalid.
-99	System error.

SOAP XML Request Format

```
stopUpload
```

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:startUpload>
      <firmwareGroup?></firmwareGroup>
      <firmwareImageName?></firmwareImageName>
    </mes:startUpload>
  </soapenv:Body>
</soapenv:Envelope>
```

getFirmwareUploadStatus

This call returns a list of value pairs indicating the number of devices in the specified firmware group with a partial firmware upload.

Prototype

```
getFirmwareUploadStatus (devType, firmwareGroup)
```

Parameters

Table 6 describes the parameters in the interface.

Table 6 getFirmwareUploadStatus Parameters

Parameter	Options	Description
devType	cgmesh	The device to receive the firmware upgrade.
firmwareGroup	string	The firmware group of devices to receive the firmware upgrade.

Results

Table 7 describes the parameters in the response.

Table 7 getFirmwareUploadStatus Results

Value	Description
0	Success.
-1	devType not found or is not supported.
-2	firmwareGroup not found or is invalid.
-99	System error.

SOAP XML Request Format

```
getFirmwareUploadStatus
```

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:getFirmwareUploadStatus>
      <firmwareGroup?</firmwareGroup>
    </mes:getFirmwareUploadStatus>
  </soapenv:Body>
</soapenv:Envelope>
```

getFirmwareImageInfoList

This call returns a list with the name, version and number of devices that are running, uploaded and have a backup with this firmware version. The action status and scheduled reload date and time also return.

Prototype

```
getFirmwareImageInfoList (devType, firmwareGroup)
```

Parameters

Table 8 describes the parameters in the interface.

Table 8 getFirmwareImageListInfo Parameters

Parameter	Options	Description
devType	cgmesh	The device to receive the firmware upgrade.
firmwareGroup	string	The firmware group of devices to receive the firmware upgrade.

Results

Table 9 describes the parameters in the response.

Table 9 getFirmwareImageListInfo Results

Value	Description
-1	devType not found or is not supported.
-2	firmwareGroup not found or is invalid.
-99	System error.

SOAP XML Request Format

```
setBackupFirmwareImage
```

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:setBackupFirmwareImage>
      <firmwareGroup?></firmwareGroup>
      <firmwareImageName?></firmwareImageName>
    </mes:setBackupFirmwareImage>
  </soapenv:Body>
</soapenv:Envelope>
```

setBackupFirmwareImage

This call sets the specified firmware image as the backup for the specified firmware group.

Prototype

```
setBackupFirmwareImage (devType, firmwareGroup, firmwareImageName)
```

Parameters

Table 10 describes the parameters in the interface.

Table 10 setBackupFirmwareImage Parameters

Parameter	Options	Description
devType	cgmesh	The device to receive the firmware upgrade.
firmwareGroup	string	The firmware group of devices to receive the firmware upgrade.
firmwareImageName	string	The firmware image name.

Results

Table 11 describes the parameters in the response.

Table 11 setBackupFirmwareImage Results

Value	Description
0	Success.
-1	devType not found or is not supported.
-2	firmwareGroup not found or is invalid.
-3	firmwareImageName not found or is invalid.
-99	System error.

SOAP XML Request Format

```
setBackupFirmwareImage
```

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:setBackupFirmwareImage>
      <firmwareGroup?</firmwareGroup>
      <firmwareImageName?</firmwareImageName>
    </mes:setBackupFirmwareImage>
  </soapenv:Body>
</soapenv:Envelope>
```

scheduleReload

This call sets the date and time for a firmware upgrade of the specified firmware image and group.

Prototype

```
scheduleReload (devType, firmwareGroup, firmwareImageName, utcDateAndTime)
```

Parameters

Table 12 describes the parameters in the interface.

Table 12 scheduleReload Parameters

Parameter	Options	Description
devType	cgmesh	The device to receive the firmware upgrade.
firmwareGroup	string	The firmware group of devices to receive the firmware upgrade.
firmwareImageName	string	The firmware image name.
reloadGmtTime	string	The format is "yyyy-MM-ddTHH:mm:ss."
utcDateAndTime	string	The format is "YYYY-MM-DD*HH:MM:SS."

Results

Table 13 describes the parameters in the response.

Table 13 scheduleReload Results

Value	Description
0	Success.
-1	devType not found or is not supported.
-2	firmwareGroup not found or is invalid.
-3	firmwareImageName not found or is invalid.
-4	utcDateAndTime format is invalid.
-5	Bad firmware image.
-99	System error.

SOAP XML Request Format

```
scheduleReload
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:scheduleReload>
      <firmwareGroup?></firmwareGroup>
      <firmwareImageName?></firmwareImageName>
      <reloadGmtTime?></reloadGmtTime>
    </mes:scheduleReload>
  </soapenv:Body>
</soapenv:Envelope>
```



Workorders API

This chapter describes the Workorders API:

- [Using the Workorders API, page 53](#)
- [Audit API Method Calls, page 53](#)

Using the Workorders API

These APIs talk with any cloud-based management services. It contains seven primary action calls sent using the SOAP envelope over HTTP(s):

`https://<server_address>:portnumber/nbapi/workorder`

Audit API Method Calls

- [RequestUserAuthentication, page 54](#)
- [RequestSignedAuthorization, page 56](#)
- [UploadServiceReport, page 60](#)

RequestUserAuthentication

This call requests user authentication with the cloud service. The utility field technician must sign in to IoT FND before they can use the field tool. The username and password is encrypted and cached in the device for remote connections. Below is the definition for this action based on the Cisco HSL language:

Struct UserAuthInfo

```
String appVersion      ## CG-NMS application version for version control
String scriptVersion   ## CG-NMS button script version for version control
```

Enum UserAuthResult

```
"AUTH_OK"              ## Authentication OK
"AUTH_OK_NO_PERMISSION" ## Authentication OK but no permission to access resources
"AUTH_OK_VER_MISMATCH" ## Authentication Fail - User/Pwd may be ok but the version is
                        ## not expected
"AUTH_FAIL"            ## NOTE: This may never appear in the SOAP response as some
                        ## web servers will return http status code 40x if auth fails.
                        ## Both the 40x status code and AUTH_FAIL in the SOAP response
                        ## are handled.
```

Struct UserAuthResponseInfo

```
UserAuthResult userAuthResult      ## Authentication result
String          expectAppVer        ## [Optional] If the current app version
String          expectScriptVer     ## If the current script version needs to be
                                    ## upgraded
```

Struct UserAuthResponse

Input:

```
UserAuthInfo      userAuthInfo
```

Output:

```
UserAuthResponse RequestUserAuthenticationResponse
```

Action RequestUserAuthentication

```
UserAuthResponseInfo userAuthResponse      ## Authentication result
```

SOAP XML Request Format

```
POST /nms/fieldtool HTTP/1.1
Host: sample.cisco.com:8080
Content-Length: nnn
Authorization: Basic bW2eFaHU5K+
SOAPAction: http://workorder.nbapi.cgms.cisco.com/RequestUserAuthentication
Connection: close
Content-type: text/xml; charset="UTF-8"
User-Agent: Cisco Device Management Application
```

```
<?xml version="1.0" encoding="utf-8"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:m="http://workorder.nbapi.cgms.cisco.com/">
  <SOAP-ENV:Body>
    <m:RequestUserAuthentication>
      <userAuthInfo>
        <appVersion>1.2.23.128</appVersion>
        <scriptVersion>2.3.4</scriptVersion>
```


Audit API Method Calls

```
        </userAuthInfo>
    </m:RequestUserAuthentication>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

Response

```
HTTP/1.1 200 OK
Content-type: text/xml; charset="UTF-8"
Content-Length: nnn
```

```
<?xml version="1.0" encoding="utf-8"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Body>
    <m:RequestUserAuthenticationResponse xmlns:m="http://workorder.nbapi.cgms.cisco.com/">
      <userAuthResponse>
        <userAuthResult>AUTH_OK</userAuthResult>
        <expectAppVer>1.2.25.02</expectAppVer>
        <expectScriptVer>2.3.5</expectScriptVer>
      </userAuthResponse>
    </m:RequestUserAuthenticationResponse>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

RequestSignedAuthorization

This call retrieves work authorizations from the cloud service. For security, the utility technician requests work authorizations from the management cloud service before they can complete the work order.

Enum UserRole

```
"ADMIN"    ## Unlimited commands
"TECH"     ## Most commands and interface configure
"VIEWER"   ## Read only commands
```

Struct DeviceInfo

```
String     deviceId          ## Device unique ID such as serial number
String     ssid              ## WiFi SSID for a specific FAR device
String     passphrase        ## WiFi Passphrase for a specific FAR device
String     firmwareVersion   ## [Optional] Firmware version for this device. If present,
                             ## CG-NMS needs to request it from NMS/Cloud
String     configurationId    ## [Optional] Unique configuration profile id for this
                             ## device. If present, Bahamas needs to request it from
                             ## NMS/Cloud
```

Attribute CanonicalizationTheMethod

```
String     Algorithm
```

Attribute SignatureTheMethod

```
String     Algorithm
```

Attribute TransformTheMethod

```
String     Algorithm
```

Attribute DigestTheMethod

```
String     Algorithm
```

Struct TransformsInfo

```
TransformTheMethod  TransformMethod
```

Struct SignatureReference

```
TransformsInfo      Transforms
DigestTheMethod     DigestMethod
String              DigestValue
```

Struct SignatureSignedInfo

```
CanonicalizationTheMethod CanonicalizationMethod
SignatureTheMethod         SignatureMethod
SignatureReference         Reference           ## Signed info reference
```

Struct SignatureX509Data

```
String     X509SubjectName
String     X509Certificate
```

Struct SignatureKeyInfo

```
SignatureX509Data  X509Data
```

Audit API Method Calls

Struct XMLSignature

```
SignatureSignedInfo SignedInfo
String SignatureValue
SignatureKeyInfo KeyInfo
```

Struct SignedAuth

```
String version ## Version of the schema for signed authorization
String authId ## UID in the string format
String authCreated ## Date String in UTC format
String deviceId ## Device unique ID such as serial number
String technician ## Name of the technician requesting the authorization
UserRole userRole ## What role to manage the FAR
String startDateTime ## Date in UTC string to indicate valid-from
String endDateTime ## Date in UTC string to indicate valid-to
XmlSignature Signature ## The signature info to be passed to FAR
```

Struct SignedAuthorization

```
SignedAuth signedAuth
DeviceInfo deviceInfo ##[Optional]
```

Struct SignedAuthorizationResponse

```
SignedAuthorization[] signedAuthorization
```

Action RequestSignedAuthorization**Input:**

```
String technicianUserName ## The technician username registered with NMS
String workOrderNumber ## If the technician knows a specific name, he can
## put it here; otherwise put null string will
## retrieve all the orders assigned to him
```

Output:

```
SignedAuthorizationResponse RequestSignedAuthorizationResponse
```

SOAP XML Request Format Request

```
POST /nbapi/workorder HTTP/1.1
Host: 128.154.157.111:8443
Content-Length: nnn
SOAPAction: http://workorder.nbapi.cgms.cisco.com/RequestSignedAuthorization
Authorization: Basic eWfqD54DefCDef4B3aA=
Connection: close
Content-type: text/xml; charset="UTF-8"
User-Agent: Cisco Device Management Application

<?xml version="1.0" encoding="utf-8"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:m="http://workorder.nbapi.cgms.cisco.com/">
  <SOAP-ENV:Body>
    <m:RequestSignedAuthorization>
      <technicianUserName>bob</technicianUserName>
      <workOrderNumber>abcd-efgh-hijk</workOrderNumber>
    </m:RequestSignedAuthorization>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

Audit API Method Calls

Response

HTTP/1.1 200 OK

Content-type: text/xml; charset="UTF-8"

Content-Length: nnn

```

<?xml version="1.0" encoding="utf-8"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Body>
    <m:RequestSignedAuthorizationResponse xmlns:m="http://workorder.nbapi.cgms.cisco.com/">
      <signedAuthorization>
        <signedAuth>
          <version>1</version>
          <orderNumber>9429C098-495A-402C-9456-57F3CC7475BF</orderNumber>
          <authCreated>2011-09-20T03:48:28Z</authCreated>
          <userRole>tech</userRole>
          <technicianUserName>bob</technicianUserName>
          <deviceId>AB193AQ</deviceId>
          <startDate>2011-09-20T03:48:28Z</startDate>
          <endDate>2011-09-20T09:48:28Z</endDate>
          <Signature xmlns="http://www.w3.org/2000/09/xmldsig#">
            <SignedInfo>
              <CanonicalizationMethod
Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315#WithComments"/>
              <SignatureMethod
Algorithm="http://www.w3.org/2000/09/xmldsig#rsa-sha1"/>
              <Reference URI="">
                <Transforms>
                  <TransformMethod
Algorithm="http://www.w3.org/2000/09/xmldsig#enveloped-signature"/>
                </Transforms>
                <DigestMethod
Algorithm="http://www.w3.org/2000/09/xmldsig#sha1"/>
                <DigestValue>CpJhSOAalu8QJeUX2wiaGG0ZGEk=</DigestValue>
              </Reference>
            </SignedInfo>
            <SignatureValue>
              lgkxD0wRdaAU0vKTVyzbdsLL0c4ONB51LTmmOdWXCYMERwMSy53nWUencU
              h14cmR4rPsumdYWJzCqJik2oci6p8uMnLDCv8=
            </SignatureValue>
            <KeyInfo>
              <X509Data>
                <X509SubjectName>
                  CN=My Name,O=Test Certificates Inc.,C=US
                </X509SubjectName>
                <X509Certificate>
                  MIIB9zCCAACgAwIBAgIERZwdkzANBgkqhkiG9w0BAQUFADBAMQswCQYD
                  VQQGEwJVUzEfMB0GA1UEChMWVGZzdCBDZXJ0aWZpY2F0ZXZXMgSW5jLjJE
                  MA4GA1UEAxMHTXkgTmFtZTAeFw0wNzAxMDMyMTE4MTFaFw0zMTA4M
                  ...
                </X509Certificate>
              </X509Data>
            </KeyInfo>
          </Signature>
        </signedAuth>
        <deviceInfo>
          <deviceId>AB193AQ</deviceId>
          <ssid>testfar</ssid>
          <passphrase>cisco123</passphrase>
          <firmwareVersion>1.2.3</firmwareVersion>
          <configurationId>123.234</configurationId>
        </deviceInfo>
      </signedAuthorization>
    </signedAuthorization>
    ... ..
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

Audit API Method Calls

```
        <signedAuthorization>  
    </m:RequestSignedAuthorizationResponse>  
    </SOAP-ENV:Body>  
</SOAP-ENV:Envelope>
```

UploadServiceReport

This call uploads the service report to the cloud service. IoT FND tracks the service status for a work order, and prompts the utility technician to mark status field as job complete, job expired, job incomplete, and so on. Once work order status is reported, the work order can be safely removed from IoT FND. Work orders are archived on the NMS server.

Enum ServiceReportResult

```
"REPORT_OK"
"REPORT_FAIL"
```

Enum ServiceStatus

```
"Completed"      # The work is done
"Incomplete"     # The work can not be completed due to some reasons
"Expired"        # The work authorization is expired
```

Struct ServiceStatusReport

```
String      orderNumber
String      deviceId
String      technicianUserName
ServiceStaus status
```

Struct ServiceStatusResponse

```
ServiceReportResult result
String              comment      ## [Optional]
```

Struct ServiceReportResponse

```
ServiceStatusResponse serviceReportResponse
```

Action UploadServiceReport

Input:

```
ServiceStatusReport [] serviceStatusReport
```

Output:

```
ServiceReportResponse UploadServiceReportResponse
```

SOAP XML Request Format

```
POST /nms/fieldtool HTTP/1.1
Host: sample.cisco.com:8080
Content-Length: nnn
Authorization: Basic bW2eFaHdD3K
SOAPAction: [http://workorder.nbapi.cgms.cisco.com/UploadServiceReport
] Connection: close
Content-type: text/xml; charset="UTF-8"
User-Agent: Cisco Device Management Application

<?xml version="1.0" encoding="utf-8"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:m="http://workorder.nbapi.cgms.cisco.com/">
  <SOAP-ENV:Body>
    <m:UploadServiceReport>
      <m:serviceStatusReport>
        <orderNumber>9429C098-495A-402C-9456-57F3CC7475BF </orderNumber>
        <deviceId>AB193BQ</deviceId>
        <technicianUserName>Bob</technicianUserName>
```

Audit API Method Calls

```
        <status>Completed</status>
    </serviceStatusReport>
    <serviceStatusReport>
        <orderNumber>8688C098-495A-402C-2356-57F3CC7475BF </orderNumber>
        <deviceId>CC210EQ</deviceId>
        <technicianUserName>Alex</technicianUserName>
        <status>Expired</status>
    </serviceStatusReport>
</m:UploadServiceReport>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

Response

HTTP/1.1 200 OK

Content-type: text/xml; charset="UTF-8"

Content-Length: nnn

```
<?xml version="1.0" encoding="utf-8"?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Body>
    <m:UploadServiceReportResponse xmlns:m="http://workorder.nbapi.cgms.cisco.com/">
      <serviceReportResponse>
        <result>REPORT_FAIL</result>
        <comment>Syntax Error</comment>
      </serviceReportResponse>
    </m:UploadServiceReportResponse>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```




Event API

This chapter describes the Event API:

- [Using the Event API, page 63](#)
- [Event API Method Calls, page 63](#)
- [Handling Event Notifications On the Client Side, page 82](#)
- [Push Mechanisms, page 83](#)

Using the Event API

In your IoT FND NB API client application, use this IoT FND server URL to access the Event API WSDL:

`http://<server_address>/nbapi/event?wsdl`

For example:

`http://10.27.167.19/nbapi/event?wsdl`

Event API Method Calls

- [searchEvents, page 64](#)
- [subscribeForEvents, page 75](#)
- [unSubscribeForEvents, page 78](#)
- [subscribeForCgmeshOutage, page 79](#)
- [unSubscribeForCgmeshOutage, page 81](#)

searchEvents

This call searches for events based on device type, event name, event time, and event severity.

Prototype

```
<even:searchEvents>
  <query>deviceType:cgmesh eventName:up</query>
  <count>4</count>
  <offset>0</offset>
</even:searchEvents>
```

Parameters

Table 1 searchEvents Parameters

Parameter	Type	Description
query	string	Search query string.
count	integer	Number of results to retrieve.
offset	integer	Position of the first result.

Use the parameters in [Table 2](#) and the options listed in [Table 3](#) in the query.

Table 2 Query Parameters

Parameter	Delimiters	Options	Description
deviceType	=	asr1000 cgmesh cgnms cgr1000 db c800 ir800 ir500 ap800	Device type.
eventName	=	Options are listed in Table 3 .	User-defined name.
eventSeverity	=	CRITICAL MAJOR MINOR INFO	Severity level.
eventTime	> < >= <=	User defined.	UTC date and time in the format: yyyy-MM-dd HH:mm:ss:SSS.

Table 3 eventName Query Options

Option	Device	Description
aaaFailure	cgr1000 c800 ir800	The AAA server returned an error or was unreachable while attempting to authenticate a meter.
act2Ifailure	cgr1000 c800 ir800	The system rebooted after a hardware ACT2 failure, and the ACT2 process is being invoked.
archiveLogModeDisabled	db	Database archive log mode is disabled. Hot backups are not permitted.
archiveLogModeEnabled	db	Database archive log mode is enabled.
batteryFailure	cgr1000 c800 ir800	The battery failed.
batteryLow	cgr1000 c800 ir800	The battery charge is below the normal range.
batteryNormal	cgr1000 c800 ir800	The battery charge is in the normal range.
bbuConfigFailure	cgr1000 c800 ir800	The battery back up (BBU) configuration failed.
bbuFirmwareDownloadFailed	cgr1000 c800 ir800	The BBU firmware download failed.
bbuFirmwareDownloadPassed	cgr1000 c800 ir800	The BBU firmware download passed.
bbuFirmwareMismatchFound	cgr1000 c800 ir800	A BBU firmware mismatch was found.

Table 3 eventName Query Options (continued)

Option	Device	Description
bbuFirmwareUpgradeFailure	cgr1000 c800 ir800 ir500	The BBU firmware upgrade failed.
bbuLockOut	ir500	The BBU is locked out.
bbuPowerOff	cgr1000 c800 ir800 ir500	The battery backup unit is not powered.
cd11IfRogueApDetectedNotif	ap800	
cd11IfStationSwitchOverNotif	ap800	
ciscoletfDot11QosExtChangeNotif	ap800	
ciscoWlanVlanWepChangeNotif	ap800	
coldBoot	cgmesh cgr1000 c800 ir800 ap800	A cold boot occurred or a mesh node registered due to cold boot.
configPushed	cgr1000 c800 ir800	(Industrial Operations Kit only) The group configuration pushed to CGRs.
configRollback	cgr1000 c800 ir800 ap800	Configuration rollback required.
criticallyLowFRASpace	db	The Flash Recovery Area (FRA) free space is critically low. Run database backup immediately or risk IoT FND and database failure.
criticallyLowTableSpace	db	Database "USERS" table space is critically low. Contact your DBA immediately to add more space or risk IoT FND and database failure.
defaultRouteLost	cgmesh	The mesh node lost the default route.
deviceAdded	cgr1000 c800 ir800	(Industrial Operations Kit only) The EID of the new device.

Table 3 eventName Query Options (continued)

Option	Device	Description
deviceLocChanged	cgr1000 c800 ir800	This event occurs when the GPS location changed in relation to the configured Interval and Distance thresholds.
deviceRemoved	cgr1000 c800 ir800	(Industrial Operations Kit only) The EID of the removed device.
deviceUnknown	cgnms	Unknown device detected by NMS.
doorClose	cgr1000 c800 ir800	The device door was closed.
doorOpen	cgr1000 c800 ir800	The device door is open.
dot11AuthenticateFail	ap800	Dot11 authentication failed for the access point
dot11Deauthenticate	ap800	Dot11 deauthentication frame was detected.
dot11Disassociate	ap800	Dot11 disassociation frame was detected.
dot1xAuthFailed	cgmesh	Dot1x authentication failed for the meter.
dot1xAuthFailure	cgmesh	A Dot1x authentication failure was detected.
dot1xAuthFlood	cgmesh	A Dot1x authentication flood was detected.
dot1xReauth	cgmesh	Multiple attempts to send the mesh key to the meter failed. Re-authentication is in progress.
down	asr1000 cgmesh cgnms cgr1000 c800 ir800 db ir500 ap800	The specified device is down.
hardwareInsertion	cgr1000 c800 ir800	A new piece of hardware was inserted into the chassis.

Table 3 eventName Query Options (continued)

Option	Device	Description
hardwareRemoval	cgr1000 c800 ir800	Hardware was removed from the chassis.
HSMdown	cgnms	The Hardware Security Module (HSM) is down.
HSMup	cgnms	The HSM is down.
interfaceDown	asr1000 c800 ir800	The device interface is down.
interfaceUp	asr1000 c800 ir800	The device interface is up.
linecardFailure	cgr1000 c800 ir800	Linecard failure detected.
linePowerFailure	cgr1000 c800 ir800	The line power supply for the device failed. This is different from the device being turned off, as happens in a power outage.
linePowerRestored	cgr1000 c800 ir800	The line power supply for the device is restored.
lowBattery	cgr1000 c800 ir800 ir500	The device battery backup unit charge is low or below the specified threshold.
lowFlashSpace	cgr1000 c800 ir800	The device is nearly out of memory on the flash partition.
lowFlashSpaceOk	cgr1000 c800 ir800	The CGR available flash memory is within the specified threshold.
lowFRASpace	db	Low database CGR space detected.

Table 3 eventName Query Options (continued)

Option	Device	Description
lowMemory	cgr1000 c800 ir800	Available memory is below the specified threshold.
lowMemoryOk	cgr1000 c800 ir800	Available memory is above the specified threshold.
manualCloseEvent	asr1000 cgmesh cgr1000 c800 ir800	The issue state changed by admin to closed.
manualNMSAddrChange	cgmesh	The mesh node registered due to a manual NMS address change.
manualReRegistration	cgmesh	The mesh node registered due to manual registration
meshConnectivityLost	cgmesh	The mesh node lost all connectivity.
meshLinkKeyTimeout	cgmesh	The mesh node link key timed out.
meshUpgradeSuccess	cgmesh	The mesh module firmware upgrade was successful.
meterCertChange	cgmesh	The mesh node registered due to a certificate change.
metricRetrievalFailure	asr1000 cgr1000 c800 ir800	Metric retrieval failed.
migratedToBetterPAN	cgmesh	The mesh node migrated to a better PAN.
modemTemperatureColdAlarm	cgr1000 c800 ir800	The temperature of the modem module fell below specified levels.
modemTemperatureColdAlarmRecovery	cgr1000 c800 ir800	The modem alarm reset.
modemTemperatureWarmAlarm	cgr1000 c800 ir800	The temperature of the modem module fell above specified levels.

Table 3 eventName Query Options (continued)

Option	Device	Description
modemTemperatureWarmAlarmRecovery	cgr1000 c800 ir800	The modem alarm reset.
nmsAddrChange	cgmesh	The mesh node registered due to an NMS address change.
nmsError	cgmesh	The mesh node registered due to an NMS error.
normalFRASpace	db	Database FRA space is normal.
normalTableSpace	db	Database table space is normal.
outage	cgmesh cgr1000 c800 ir800 ir500	An outage was detected for this device.
portDown	cgr1000 c800 ir800 ap800	Ethernet interface {0}/{1} is down.
portFailure	cgr1000 c800 ir800 ap800	Syslog message corresponding to the port facility was generated.
portUp	cgr1000 c800 ir800 ap800	Ethernet interface {0}/{1} is up.
powerSourceNormal	cgr1000 c800 ir800	The input power source is equal to or better than when system started.
powerSourceWarning	cgr1000 c800 ir800	One or more input power source is not connected.
refreshMeshKeyFailed	asr1000 cgmesh	A refresh of the mesh key failed.

Table 3 eventName Query Options (continued)

Option	Device	Description
registered	asr1000 cgmesh	The event received is registered with NMS.
registrationFailure	cgr1000 c800 ir800 ap800	Device registration failed.
registrationRequest	cgr1000 c800 ir800 ap800	A registration request from a device was received.
registrationSuccess	cgr1000 c800 ir800 ap800	Device registration was successful.
rejoinedWithNewIP	cgmesh	The mesh node registered with a new IP address.
restoration	cgmesh	The device was restored from outage.
restorationRegistration	cgmesh	The mesh node registered after an outage.
rplTreeReset	cgr1000 c800 ir800	The RPL tree version was reset to 2. Because the RPL tree is updated with data, versions increment. A value of 2 signifies a reset to its original initial state.
rplTreeSizeCritical	cgr1000 c800 ir800	More than the maximum number of mesh nodes joined the RPL tree.
rplTreeSizeCriticalClear	cgr1000 c800 ir800	Less than the maximum number of mesh nodes detected in the RPL tree.
rplTreeSizeMajor	cgr1000 c800 ir800	More than the expected mesh nodes joined the RPL tree were detected.
rplTreeSizeMajorClear	cgr1000 c800 ir800	The expected number of mesh nodes in the RPL tree were detected.

Table 3 eventName Query Options (continued)

Option	Device	Description
rplTreeVersionReset	cgr1000 c800 ir800	The RPL tree version was reset to 2. Because the RPL tree is updated with data, versions increment. A value of 2 signifies a reset to its original initial state.
ruleEvent	asr1000 cgmesh cgnms cgr1000 c800 ir800 db	This is a rule-generated event.
sdcardsRemovalAlarm	cgr1000	SD card removal detected, and an alarm sent.
signatureFailure	asr1000 cgmesh cgr1000 cgnms c800 ir800 db ir500	Invalid signature reported by mesh nodes. If this event occurs, you must verify the certificate setup and that the mesh node and IoT FND are time synchronized.
softwareCrash	cgr1000 c800 ir800	Software process failed with a stateless restart, indicating an interruption of a service. Messages are processed for crashes on supervisor modules and line cards.
systemSwInconsistent	cgr1000 c800 ir800	Inconsistency detected in software or file system.
temperatureMajorAlarm	cgr1000 c800 ir800	A thermal sensor indicates that the temperature has reached the operating major threshold.
temperatureMajorRecovery	cgr1000 c800 ir800	A major temperature alarm has recovered.

Table 3 eventName Query Options (continued)

Option	Device	Description
temperatureMinor	cgr1000 c800 ir800	The device temperature reached the minor threshold.
temperatureMinorRecovery	cgr1000 c800 ir800	The minor temperature alarm has recovered.
timeMismatch	cgmesh	The NMS server time does not match the device local time.
timeMismatchResolved	cgmesh	The NMS server time matches the device local time.
tunnelDown	cgr1000 c800 ir800	The tunnel is down.
tunnelProvFailure	cgr1000 c800 ir800	Tunnel provisioning failed.
tunnelProvRequest	cgr1000 c800 ir800	A tunnel provisioning request was received from a device.
tunnelProvSuccess	cgr1000 c800 ir800	Tunnel provisioning was successful.
tunnelUp	cgr1000 c800 ir800	The tunnel is up.
unknown	asr1000 cgmesh cgnms cgr1000 c800 ir800 ir500 ap800 db	The event received is not registered with NMS.

Table 3 eventName Query Options (continued)

Option	Device	Description
unknownRegReason	cgmesh	The mesh node registered for an unknown reason.
unknownWPANChange	cgmesh	The mesh node changed its WPAN for an unknown reason.
unsupported	cgr1000 c800 ir800 ap800	Unsupported device detected.
up	asr1000 cgmesh cgnms cgr1000 c800 ir800 ap800 db	The specified device is up.
veryLowFRASpace	db	Very low database FRA space detected.
wpanWatchdogReload	cgr1000 c800 ir800	The WatchDog reloaded the WPAN module. The bridge was unresponsive for more than 5 minutes and the WatchDog is enabled.

Results**Table 4** searchEvents Results

Field	Type	Description
subscriptionid	long	Subscription ID used by the listener to identify the subscription response origin.
events	List<EventDetail>	Details about the event.

searchEvents SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:even="http://event.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <even:searchEvents>
      <!--Optional:-->
      <query>deviceType:cgmesh eventName:up</query>
      <!--Optional:-->
      <count>4</count>
      <!--Optional:-->
      <offset>0</offset>
    </even:searchEvents>
  </soapenv:Body>
</soapenv:Envelope>
```

subscribeForEvents

This call streams a set of events to the API listener, based on the query. Event subscriptions are based on device type, event name, or severity. Listener registers the URL and specifies the push window. After every configured eventPushWindowSec event push window, all new events received in this window are delivered to the registered URL. Subscription-based events notification uses the same query language as [searchEvents, page 64](#), except that the eventTime attribute-based queries cannot be subscribed to and return unsuccessful subscription errors.

Prototype

```
<even:subscribeForEvents>  
  <soapEndPointUrl>http://customer.network.com:11001/Process/Service/  
    ProcessCellRouterStates/ReceiveEvents/EventPushService?wsdl</soapEndPointUrl>  
  <query>deviceType:cgmesh eventName:registered</query>  
  <eventPushWindowSec>21</eventPushWindowSec>  
</even:subscribeForEvents>
```

Parameters

Table 5 subscribeForEvents Parameters

Parameter	Type	Description
soapEndPointUrl	string	<p>The address of the WSDL file—as implemented by your client—that receives event notifications from the IoT FND NB API. For more information, see Handling Event Notifications On the Client Side, page 82.</p> <p><code>http://<server_address>:<port number>/<path><api>?wsdl</code></p> <p>For example:</p> <p><code>http://localhost:8445/event?wsdl</code></p> <p>soapEndPointUrl must point to the WSDL document that describes the listener application receiving the events. Ensure that the <i>target namespace</i> and <i>service name</i> parameters in the Web Services Description Language (WSDL) document conform to these default values:</p> <pre>target namespace "http://pushevent.nbapi.cgms.cisco.com/" service name "EventPushService"</pre> <p>Note: Release 2.1 and later installations support https for soapEndPointUrl.</p> <p>Functionality in IoT FND 1.1.3 and later installations</p> <p>Some applications cannot set the default values for these parameters when generating the WSDL file. If this is the case, in IoT FND 1.1.3 and later installations you can set the following properties in the <code>server/cgms/conf/cgms.properties</code> file to match the values in the generated WSDL document:</p> <pre>eventSubscriberNamespace="http://event.nbapi.cgms.mydomain.com/" eventSubscriberServiceName="MyEventService"</pre> <p>The <i>target namespace</i> and <i>service name</i> parameters must match those specified in the <code>cgms.properties</code> file. If they are not specified in the <code>cgms.properties</code> file, they must match the default values.</p> <p>Note: Only one set of these values is allowed in the <code>cgms.properties</code> file. If there are multiple subscribers, they must use the <i>target namespace</i> and <i>service name</i> parameter values specified in all WSDL documents pointed to in the soapEndPointUrl of the subscriptions.</p>
query	string	<p>The query string.</p> <p>Note: The query language <code>eventTime</code> field cannot be inside the subscription.</p>
eventPushWindowSec	integer	<p>The event push window time, in seconds. The query executes after <i>x</i> seconds, and the results are pushed to the listener endpoint specified in the soapEndPointUrl WSDL file.</p>

Results

Table 6 subscribeforEvents Response

Field	Type	Description
subscriptionId	long	Subscription ID

The QueryResult Status field indicates if the subscription succeeded or failed.

subscribeForEvents SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:even="http://event.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <even:subscribeForEvents>
      <!--Optional:-->
<soapEndPointUrl>http://128.107.155.95:8455/nbapi/pushevent?wsdl</soapEndPointUrl>
      <!--Optional:-->
      <query>deviceType:cgmesh eventName:registered</query>
      <!--Optional:-->
      <eventPushWindowSec>21</eventPushWindowSec>
    </even:subscribeForEvents>
  </soapenv:Body>
</soapenv:Envelope>
```

unSubscribeForEvents

This call unsubscribes the defined listener event query.

Prototype

```
<even:unSubscribeForEvents>
  <query>deviceType:cgmesh eventName:registered</query>
</even:unSubscribeForEvents>
```

Parameters

Table 7 unSubscribeForEvents Parameters

Parameter	Type	Description
soapEndPointUrl	string	Address where the EventNbapiService WSDL is located. http://<server_address>:<port number>/<path><api>?wsdl
query	string	Query string. Note: Query language eventTime field cannot be inside the subscription.

Results

Table 8 unSubscribeForEvents Results

Field	Type	Description
subscriptionId	long	Subscription ID

The QueryResult Status field indicates if the subscription succeeded or failed.

unSubscribeForEvents SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:even="http://event.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <even:unSubscribeForEvents>
      <!--Optional:-->
<soapEndPointUrl>http://128.107.155.95:8455/nbapi/pushevent?wsdl</soapEndPointUrl>
      <!--Optional:-->
      <query>deviceType:cgmesh eventName:registered</query>
    </even:unSubscribeForEvents>
  </soapenv:Body>
</soapenv:Envelope>
```


subscribeForCgmeshOutage

This call is similar to `subscribeForEvents`, except that it is for outage and restoration events. Up to 10 subscribers (listeners) at a time can register for these events.

Prototype

```
<even:subscribeForCgmeshOutage>
  <soapEndPointUrl>http://128.107.109.98:8456/nbapi/pushevent?wsdl</soapEndPointUrl>
</even:subscribeForCgmeshOutage>
```

Parameters

Table 9 subscribeForCgmeshOutage Parameters

Parameter	Type	Description
soapEndPointUrl	string	Address of the WSDL, implemented by your client, that receives outage notifications from the IoT FND NB API. For more information, see Handling Event Notifications On the Client Side , page 82. http://<server_address>:<port number>/<path><api>?wsdl For example: http://localhost:8445/outage?wsdl Note: Release 2.1 and later installations support https for soapEndPointUrl.

To configure the amount of time, in seconds, after which IoT FND pushes batches of outage events and Restoration Events to all subscribers, set the value of the `event-Outage-push-sec` parameter in the `/opt/cgms/conf/cgms.properties` file. For example, to set `event-Outage-push-sec` to 30, add this line to the file:

```
event-Outage-push-sec=30
```

When IoT FND pushes outage events to subscribers, only subscribers that are up receive the events. The subscribers that are down (they do not respond) do not receive these events even after they come back online, but they receive the next outage event push.

For a very fast outage event push, set `event-Outage-push-sec` to a value as low as 1 second. If you set the push value to 1 second, IoT FND executes a job to find and push new events in the queue.

Results

Table 10 Subscribe for CG-Mesh Outage Response

Parameter	Type	Description
subscriptionId	long	Subscription ID which can be used by the listener to identify for which subscription they are getting the response from.

The `QueryResult Status` field indicates if the subscription succeeded or failed.

subscribeForCgmeshOutage SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:even="http://event.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <even:subscribeForCgmeshOutage>
      <!--Optional:-->
```

Event API Method Calls

```
<soapEndPointUrl>http://128.107.109.98:8456/nbapi/pushevent?wsdl</soapEndPointUrl>  
</even:subscribeForCgmeshOutage>  
</soapenv:Body>  
</soapenv:Envelope>
```

unsubscribeForCgmeshOutage

This call unsubscribes the defined listener.

Prototype

```
<even:unsubscribeForCgmeshOutage>
  <soapEndPointUrl>http://128.107.109.98:8456/nbapi/pushevent?wsdl</soapEndPointUrl>
</even:unsubscribeForCgmeshOutage>
```

Parameters

Table 11 describes the parameters in the request.

Table 11 unsubscribeForCgmeshOutage Parameters

Parameter	Type	Description
soapEndPointUrl	string	Address of the Event WSDL service. The soapEndPointUrl identifies the subscription. http://<server_address>:<port number>/<path><api>?wsdl Note: Release 2.1 and later installations support https for soapEndPointUrl.

Results

Table 12 unsubscribeForCgmeshOutage Results

Parameter	Type	Description
subscriptionId	long	Subscription ID

The QueryResult Status field indicates if the subscription succeeded or failed.

unsubscribeForCgmeshOutage SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:even="http://event.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <even:unsubscribeForCgmeshOutage>
      <!--Optional:-->
      <soapEndPointUrl>http://128.107.109.98:8456/nbapi/pushevent?wsdl</soapEndPointUrl>
    </even:unsubscribeForCgmeshOutage>
  </soapenv:Body>
</soapenv:Envelope>
```

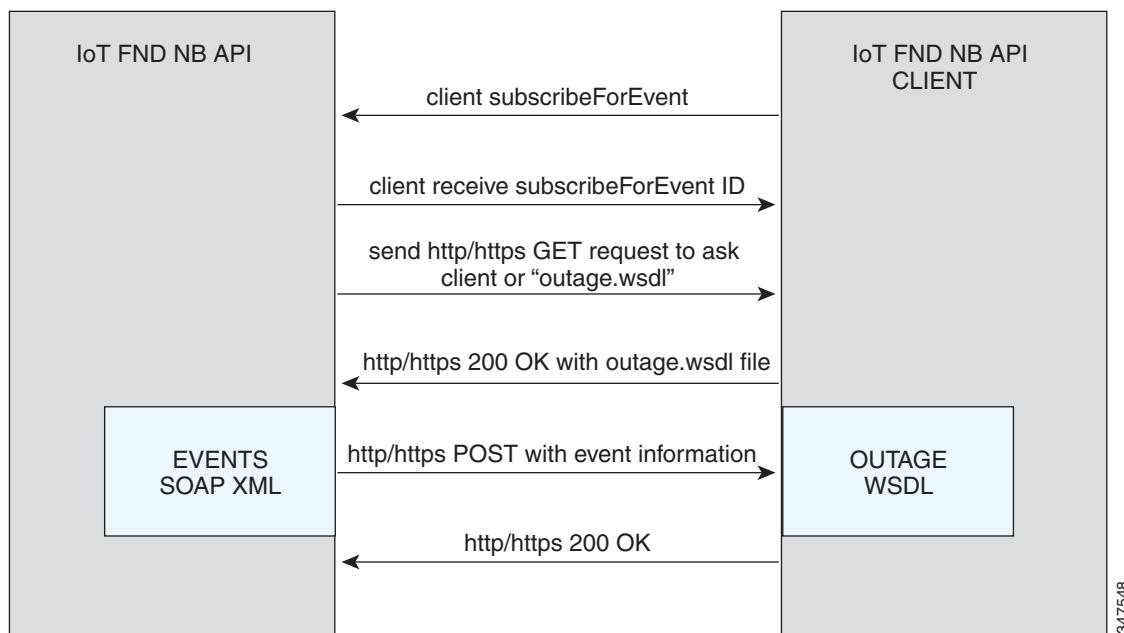
Handling Event Notifications On the Client Side

When subscribing for an event type, your IoT FND NB API client must implement a Web Service that implements the WSDL for handling event notifications sent by the IoT FND NB API. The WSDL you must provide the receiveEvents() method, which the IoT FND NB API uses to send event notifications to your client.

Example

In [Figure 1](#), the IoT FND NB API client implements the Outage WSDL. When the client subscribes for outage events, IoT FND uses the IoT FND NB API to call the method receiveEvents() on the IoT FND NB API client.

Figure 1 Event Notification Handling



This is the Event XML that your client must implement to receive outage notifications from IoT FND.

Event Notification Handling WSDL (Client Side)

Your client must implement this WSDL:

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<wSDL:definitions xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
  xmlns:tns="http://pushevent.nbapi.cgms.cisco.com/" xmlns:wSDL="http://schemas.xmlsoap.org/wsdl/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema" name="eventPush"
  targetNamespace="http://pushevent.nbapi.cgms.cisco.com/">
  <wSDL:types>
    <xsd:schema targetNamespace="http://pushevent.nbapi.cgms.cisco.com/">
      <xsd:element name="receiveEvents" type="tns:receiveEvents" />
      <xsd:complexType name="receiveEvents">
        <xsd:sequence>
          <xsd:element minOccurs="0" name="eventQueryResult"
            type="tns:eventQueryResult" />
        </xsd:sequence>
      </xsd:complexType>
      <xsd:complexType name="eventQueryResult">
        <xsd:complexContent>
          <xsd:extension base="tns:queryResult">

```

Push Mechanisms

```

        <xsd:sequence>
            <xsd:element maxOccurs="unbounded" minOccurs="0"
                name="events" nillable="true" type="tns:eventDetail" />
            <xsd:element name="subscriptionId" type="xsd:long" />
        </xsd:sequence>
    </xsd:extension>
</xsd:complexContent>
</xsd:complexType>
<xsd:complexType abstract="true" name="queryResult">
    <xsd:sequence>
        <xsd:element minOccurs="0" name="queryId" type="xsd:string" />
        <xsd:element minOccurs="0" name="queryStatus" type="xsd:string" />
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="eventDetail">
    <xsd:sequence>
        <xsd:element minOccurs="0" name="eid" type="xsd:string" />
        <xsd:element minOccurs="0" name="eventMessage" type="xsd:string" />
        <xsd:element minOccurs="0" name="eventSeverity" type="xsd:string" />
        <xsd:element minOccurs="0" name="eventTime" type="xsd:long" />
        <xsd:element minOccurs="0" name="eventTypeName" type="xsd:string" />
        <xsd:element minOccurs="0" name="meterId" type="xsd:string" />
    </xsd:sequence>
</xsd:complexType>
</xsd:schema>
</wsdl:types>
<wsdl:message name="receiveEvents">
    <wsdl:part element="tns:receiveEvents" name="receiveEvents" />
</wsdl:message>
<wsdl:portType name="EventPushService">
    <wsdl:operation name="receiveEvents">
        <wsdl:input message="tns:receiveEvents" />
    </wsdl:operation>
</wsdl:portType>
<wsdl:binding name="EventPushServiceBinding" type="tns:EventPushService">
    <soap:binding style="document"
        transport="http://schemas.xmlsoap.org/soap/http" />
    <wsdl:operation name="receiveEvents">
        <soap:operation soapAction="http://pushevent.nbapi.cgms.cisco.com/receiveEvents" />
        <wsdl:input>
            <soap:body use="literal" />
        </wsdl:input>
    </wsdl:operation>
</wsdl:binding>
<wsdl:service name="EventPushService">
    <wsdl:port binding="tns:EventPushServiceBinding" name="EventPushService">
        <soap:address location="http://127.0.0.1:8008" />
    </wsdl:port>
</wsdl:service>
</wsdl:definitions>

```

Push Mechanisms

Push mechanisms work only when the NMS server has successfully completed the subscription, as defined in the [subscribeForEvents](#) and [subscribeForCgmeshOutage](#) API methods.

A successful subscription leads to generation of the Subscription ID that is sent to the subscriber. The subscriber uses the Subscription ID to track the event push.

IoT FND runs a Scheduled Job every x seconds. Seconds are configurable during the subscription by using the event-Outage-push-sec global parameter defined in the /opt/cgms/conf/cgms.properties file. After every x seconds, IoT FND generates an EventList and pushes it to the subscribers defined in the soapEndPointUrl.

The web service to implement on the NMS side is:

```
public void receiveEvents(EventQueryResult eventQueryResult) throws java.rmi.RemoteException;
```

QueryResult

The QueryResult Status field indicates if the subscription succeeded or failed. [Table 13](#) describes the parameters in the response.

Table 13 EventQueryResult Response

Field	Type	Description
subscriptionId	long	Subscription ID used by the listener to identify which subscription the response is from.
events	List<EventDetail>	Details about the event.

[Table 14](#) describes the parameters in the EventDetail results.

Table 14 EventDetail Response

Field	Type	Description
eid	string	Serial number for the CGR and MAC address for the mesh endpoint.
eventMessage	string	Message related to the event.
eventTime	long	Time in milliseconds.
eventTypeName	string	Type of event
meterId	string	Meter ID corresponding to the EID. For this value to return, it must be included in the import file when importing meters in IoT FND.

Example

This is an example of the XML content that the subscriber receives:

```
<env:Envelope xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
  <env:Header>
    <seam:conversationId xmlns:seam="http://www.jboss.org/seam/webservice">110</seam:conversationId>
  </env:Header>
  <env:Body>
    <ns2:searchEventsResponse xmlns:ns2="http://event.nbapi.cgms.cisco.com/">
      <eventQueryResult>
        <queryId></queryId>
        <queryStatus>SUCCEEDED</queryStatus>
        <events>
          <eid>NE01</eid>
          <eventMessage>Device is Up</eventMessage>
          <eventSeverity>INFO</eventSeverity>
          <eventTime>1314656731899</eventTime>
          <eventTypeName>up</eventTypeName>
          <meterId>Sjc123</meterId>
        </events>
        <events>
          <eid>NE01</eid>
          <eventMessage>Outage detected on this device</eventMessage>
        </events>
      </eventQueryResult>
    </ns2:searchEventsResponse>
  </env:Body>
</env:Envelope>
```

Push Mechanisms

```
    <eventSeverity>CRITICAL</eventSeverity>
    <eventTime>1314656731908</eventTime>
    <eventTypeName>outage</eventTypeName>
    <meterId>Sjc123</meterId>
  </events>
  <events>
    <eid>NE01</eid>
    <eventMessage>Device has been Restored from Outage</eventMessage>
    <eventSeverity>INFO</eventSeverity>
    <eventTime>1314656771923</eventTime>
    <eventTypeName>restoration</eventTypeName>
    <meterId>Sjc123</meterId>
  </events>
  <events>
    <eid>NE01</eid>
    <eventMessage>Device is Up</eventMessage>
    <eventSeverity>INFO</eventSeverity>
    <eventTime>1314656771933</eventTime>
    <eventTypeName>up</eventTypeName>
    <meterId>Sjc123</meterId>
  </events>
  <subscriptionId>2</subscriptionId>
</eventQueryResult>
</ns2:searchEventsResponse>
</env:Body>
</env:Envelope>
```

The subscriptionId XML element (<subscriptionId>2</subscriptionId>) tells the receiver that this push is for the subscription ID equal to 2.



Issues API

This chapter describes the Issues API:

- [Using the Issues API, page 87](#)
- [Issues API Method Calls, page 87](#)

Using the Issues API

In your IoT FND NB API client application, use this IoT FND server URL to access the Issues API WSDL:

`http://<server_address>/nbapi/issue?wsdl`

Issues API Method Calls

- [searchIssues, page 88](#)

searchIssues

This call searches for issues in the IoT FND database based on the provided criteria and returns a list of those issues.

Prototype

```
<even:searchIssues>
  <query>deviceType:cgmesh issue:lowBattery</query>
  <count>4</count>
  <offset>0</offset>
</even:searchIssues>
```

Parameters

Table 1 searchIssues Parameters

Parameter	Type	Option	Description
query	string	deviceType name issue issueStatus lastUpdateTime occurTime issueSeverity	Search query string. Table 2 lists valid parameters for these options.
count	integer	-	Number of results to retrieve.
offset	integer	-	Position of the first result.

Table 2 Query Option Parameters

Option Name	Device	Parameter	Description
deviceType	db	db	The type of device.
	asr1000	asr1000	
	cgmesh	cgmesh	
	cgnms	cgnms	
	cgr1000	cgr1000	
	ir500	ir500	
	c800	c800	
	ir800	ir800	
name		User-defined entry.	
issue	db	criticallyLowFRASpace	The database Flash Recovery Area (FRA) free space is critically low. Run database backup immediately or risk IoT FND and database failure.
	db	criticallyLowTableSpace	Database "USERS" tablespace is critically low. Contact your DBA immediately to add more space or risk IoT FND and database failure.

Table 2 Query Option Parameters (continued)

Option Name	Device	Parameter	Description
	asr1000 cgmesh cgr1000 c800 ir800 ir500	deviceDown	The device is down.
	cgmesh c800 ir800 ir500	deviceTimeMismatch	The device time and NMS time are not in sync.
	cgr1000 c800 ir800	doorOpen	The device door was tampered with. Check corresponding event for details.
	asr1000 cgmesh cgr1000 c800 ir800 ir500	down	The device is down.
	cgr1000 c800 ir800	linePowerFailure	The line power supply of the CGR failed.
	cgr1000 c800 ir800	linecardFailure	Linecard failure detected.
	cgr1000 c800 ir800	lowBattery	The device is running on a low battery.
	cgr1000 c800 ir800	lowFlashSpace	The device is low on flash space.

Table 2 Query Option Parameters (continued)

Option Name	Device	Parameter	Description
	cgr1000 c800 ir800	lowMemory	The device is low on memory space.
	cgr1000 c800 ir800	majorTemperature	Major temperature alarm triggered.
	cgr1000 c800 ir800	minorTemperature	Minor temperature alarm triggered.
	cgr1000 c800 ir800	portDown	The Ethernet interface {0}/{1} is down.
	cgr1000 c800 ir800	portFailure	Device port failure detected.
	cgr1000 c800 ir800	powerSourceAlarm	One or more input power sources are not connected. Check the related event for details.
	cgr1000 c800 ir800	rplTreeSizeMajor	More than the expected nodes joined the RPL tree.
	cgr1000 c800 ir800	rplTreeSizeCritical	More than the maximum number of nodes joined the RPL tree.
	asr1000 cgmesh cgr1000 c800 ir800 ir500	signatureFailure	Invalid signature reported by mesh nodes. If this issue occurs, you must verify the certificate setup and that the mesh node and IoT FND are time synchronized.

Table 2 Query Option Parameters (continued)

Option Name	Device	Parameter	Description
	asr1000 cgmesh cgnms cgr1000 c800 ir800 ir500	unknown	The issue does not have a defined issue type.
	cgr1000 c800 ir800	wpanWatchdogReload	The WatchDog is reloading the WPAN module. The bridge was unresponsive for more than 5 minutes and the WatchDog is enabled.
issueStatus	N/A	OPEN CLOSED	
lastUpdateTime	N/A	UTC date and time in the format: yyyy-MM-dd HH:mm:ss:SSS. Delimiters are: > < >= <=	
occurTime	N/A	UTC date and time in the format: yyyy-MM-dd HH:mm:ss:SSS. Delimiters are: > < >= <=	
issueSeverity	db asr1000 cgmesh cgnms cgr1000 c800 ir800 ir500	CRITICAL MAJOR MINOR INFO	

Results

This call returns a list of issueDetail structures.

Table 3 searchIssues Results

Name	Type	Description
eid	string	Device ID.
issueLastUpdateTime	dateTime	Last time the issue was updated.
issueMessage	string	Issue description.
issueOccurTime	dateTime	Issue occurrence time.

Table 3 searchIssues Results (continued)

Name	Type	Description
issueStatus	string	Issue status.
issueTypeName	string	Issue type.
meterId	string	Meter ID.



Rules API

This chapter describes the Rules API:

- [Using the Rules API, page 93](#)
- [Rules API Method Calls, page 95](#)

Using the Rules API

The Rules API provides basic functionality to add, remove, activate, deactivate, and find rules. Each rule is identified by a name and a user. A user cannot have two rules with the same name, but different users can have rules with the same name.

When creating new rules, specify the rule name. To create a new rule, use the same syntax used in the Search API.

After creating a rule, the IoT FND Rules API returns a rule ID, which you can use to refer to the rule for removing, activating, and deactivating, operations. By default, IoT FND activates rules when created with actions.

In your IoT FND NB API client application, use this IoT FND server URL to access the Rules API WSDL:

`http://<server_address>/nbapi/rules?wsdl`

Example (Python-SUDS Client)

```
import sys
from suds.client import Client
import logging
logging.basicConfig(level=logging.INFO)
logging.getLogger('suds.client').setLevel(logging.DEBUG)
url = "http://localhost/nbapi/rules?wsdl"
cl = Client(url, username='root', password='Tree123!')
#print cl

#parse the properties of a rule and return a dictionary struct
def parseRule(r):
    rule = {}
    rule['id'] = r.id
    if (r.properties != None and r.properties != ""):
        #print r.properties
        for p in r.properties.entry:
            if (p.key == "literal"):
                rule['rule']=p.value
    else:
        rule[p.key]=p.value
    for a in r.actions:
        rule['action'] = a.type
        rule['label'] = a.parameter
    #print rule
    return rule

# output a CSV list of rules
users = ['root']
properties = ['username','status', 'lastUpdate', 'name', 'literal']
```

Using the Rules API

```

print "username,rulename,id,status,lastUpdate,rule,action,label"
for u in users:
    #print u
    result = cl.service.findRulesByUsername(u)
    #print result
    for r in result:
        rule = parseRule(r)
        print rule['username']+",",
        print rule['name']+",",
        print str(rule['id']+",",
        print rule['status']+",",
        print rule['lastUpdate']+",",
        print rule['rule']+",",
        print rule['action']+",",
        print rule['label']

# create two new rules
names = ['My New Rule 1', 'My New Rule 2']
myAction1 = cl.factory.create('ruleAction')
myAction1.parameter = 'My Label'
myAction1.type = 'ADD_LABEL'
myAction2 = cl.factory.create('ruleAction')
myAction2.parameter = 'My Label'
myAction2.type = 'REMOVE_LABEL'
myActions = [myAction1,myAction2]
myRule1 = cl.factory.create("createRule")
myRule1.name = names[0]
myRule1.username = users[0]
myRule1.literal = 'deviceType:cgmesh status:down meshRssi<-90 meshHops>5'
myRule1.actions = myAction1
print myRule1
myRule2 = cl.factory.create("createRule")
myRule2.name = names[1]
myRule2.username = users[0]
myRule2.literal = 'label:"My Label" deviceType:cgmesh status:up'
myRule2.actions = myAction2
print myRule2

r = cl.service.createRule(myRule1)
myr1 = parseRule(r)
print myr1

r = cl.service.createRule(myRule2)
myr2 = parseRule(r)
print myr2

# toggle rules by name
for n in names:
    #print n
    result = cl.service.findRulesByName(n)
    if result != None:
        #print result
        for r in result:
            rule = parseRule(r)
            if (rule['status'] == "ACTIVATED"):
                r = cl.service.deactivateRule(rule['id'])
            else:
                r = cl.service.activateRule(rule['id'])
            rule = parseRule(r)
            print rule

sys.exit()

# delete the rules we created
r = dropRule(myr1["id"])

```


Rules API Method Calls

```
r = dropRule(myr2["id"])
```

Rules API Method Calls

- [activateRule, page 96](#)
- [createRule, page 97](#)
- [deactivateRule, page 100](#)
- [dropRule, page 101](#)
- [findRulesByName, page 103](#)
- [findRulesByUsername, page 104](#)

activateRule

This call activates a deactivated rule. By default, when you create a rule with actions, IoT FND activates it. Only activated rules receive trigger events on rule matching.

Prototype

```
<rul:activateRule>
  <id?></id>
</rul:activateRule>
```

Parameters

Table 1 activateRule Parameters

Parameter	Type	Description
id	long	Rule ID.

Results

This call returns the rule object if activation is successful.

Table 2 activateRule Results

Field	Type	Description
id	long	Rule ID.
properties	Map<String,String>	Rule properties such as name, username, status, and lastUpdate.
actions	List<RuleAction>	List of actions the rule performs.

activateRule SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:rul="http://rules.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <rul:activateRule>
      <!--Optional:-->
      <id?></id>
    </rul:activateRule>
  </soapenv:Body>
</soapenv:Envelope>
```

createRule

This call creates a new rule with the specified action and name. The rule language is the same as the search language. The action can be one of the following: create label, remove label, or add event.

Prototype

```
<rul:createRule>
  <name>?</name>
  <username>?</username>
  <literal>?</literal>
  <actions>
    <parameter>?</parameter>
    <type>create_label</type>
  </actions>
</rul:createRule>
```

Parameters

Table 3 createRule Parameters

Parameter	Type	Description
name	string	The name of the rule.
username	string	The IoT FND username of the rule creator.
literal	string	The rule syntax.
actions	ruleAction	A list of rule actions. For every action, you must provide two strings: <ul style="list-style-type: none"> ■ parameter—Action label. ■ type—Action type. Valid options are: <ul style="list-style-type: none"> – create_label – remove_label – add_event

Results

Table 4 createRule Results

Field	Type	Description
id	long	Rule ID.
properties	Map<String,String>	Rule properties such as name, username, status, and lastUpdate.
actions	List<RuleAction>	List of actions the rule performs.

createRule SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:rul="http://rules.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <rul:createRule>
      <!--Optional:-->
```

```

<name>?</name>
<!--Optional:-->
<username>?</username>
<!--Optional:-->
<literal>?</literal>
<!--Zero or more repetitions:-->
<actions>
  <!--Optional:-->
  <parameter>?</parameter>
  <!--Optional:-->
  <type>?</type>
</actions>
</rul:createRule>
</soapenv:Body>
</soapenv:Envelope>

```

Sample createRule Request

```

<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:rul="http://rules.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <rul:createRule>
      <!--Optional:-->
      <name>2016-03-09-addEvent-3</name>
      <!--Optional:-->
      <username>root</username>
      <!--Optional:-->
      <literal>deviceCategory:router issue:lowMemory</literal>
      <!--Zero or more repetitions:-->
      <actions xmlns=''>
        <parameter>{"eventName":"testINFO","eventSeverity":"INFO","eventMsg":"test_INFO"}
</parameter>
        <type>add_event</type>
      </actions>
      <actions xmlns=''>
        <parameter>AndersonLabel</parameter>
        <type>add_label</type>
      </actions>
      <actions xmlns=''>
        <parameter>AndersonLabel</parameter>
        <type>remove_label</type>
      </actions>
    </rul:createRule>
  </soapenv:Body>
</soapenv:Envelope>

```

Sample createRule Response

```

<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" />
  <soap:Body>
    <ns2:createRuleResponse xmlns:ns2="http://rules.nbapi.cgms.cisco.com/">
      <rule>
        <actions>
          <parameter>{"eventName":"testINFO","eventSeverity":"INFO","eventMsg":"test_INFO"}
</parameter>
          <type>ADD_EVENT</type>
        </actions>
        <actions>
          <parameter>AndersonLabel</parameter>
          <type>ADD_LABEL</type>
        </actions>
        <actions>
          <parameter>AndersonLabel</parameter>
          <type>REMOVE_LABEL</type>

```

```
</actions>
<id>20001141</id>
<properties>
  <entry>
    <key>username</key>
    <value>root</value>
  </entry>
  <entry>
    <key>status</key>
    <value>DEACTIVATED</value>
  </entry>
  <entry>
    <key>lastUpdate</key>
    <value>2016-03-09 17:28:25.771</value>
  </entry>
  <entry>
    <key>name</key>
    <value>2016-03-09-addEvent-3</value>
  </entry>
  <entry>
    <key>literal</key>
    <value>deviceCategory:router issue:lowMemory</value>
  </entry>
</properties>
</rule>
</ns2:createRuleResponse>
</soap:Body>
</soap:Envelope>
```

deactivateRule

This call deactivates the specified rule and returns the rule object if deactivation is successful.

Prototype

```
<rul:deactivateRule>
  <id>?</id>
</rul:deactivateRule>
```

Parameters

Table 5 deactivateRule Parameters

Parameter	Type	Description
id	long	Rule ID.

Results

This call returns the rule object if deactivation is successful.

Table 6 deactivateRule Results

Field	Type	Description
id	long	Rule ID.
properties	Map<String,String>	Rule properties such as name, username, status, and lastUpdate.
actions	List<RuleAction>	List of actions the rule performs.

deactivateRule SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:rul="http://rules.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <rul:createRule>
      <!--Optional:-->
      <name?</name>
      <!--Optional:-->
      <username?</username>
      <!--Optional:-->
      <literal?</literal>
      <!--Zero or more repetitions:-->
      <actions>
        <!--Optional:-->
        <parameter?</parameter>
        <!--Optional:-->
        <type?</type>
      </actions>
    </rul:createRule>
  </soapenv:Body>
</soapenv:Envelope>
```

dropRule

This call removes the rule specified in the *id* parameter.

Prototype

```
<rul:dropRule>
  <id>?</id>
</rul:dropRule>
```

Parameters

Table 7 dropRule Parameters

Parameter	Type	Description
id	long	ID of rule to remove.

Results

Table 8 dropRule Results

Field	Type	Description
id	long	ID of removed rule.
properties	Map<String,String>	Rule properties such as name, username, status, and lastUpdate.
actions	List<RuleAction>	List of actions the rule performs.

dropRule SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:rul="http://rules.nbapi.cgms.cisco.com/">
```

```
<soapenv:Header/>
```

```
<soapenv:Body>
```

```
<rul:createRule>
```

```
<!--Optional:-->
```

```
<name?</name>
```

```
<!--Optional:-->
```

```
<username?</username>
```

```
<!--Optional:-->
```

```
<literal?</literal>
```

```
<!--Zero or more repetitions:-->
```

```
<actions>
```

```
<!--Optional:-->
```

```
<parameter?</parameter>
```

```
<!--Optional:-->
```

```
<type?</type>
```

```
</actions>
```

```
</rul:createRule>
```

```
</soapenv:Body>
```

```
</soapenv:Envelope>
```

```
?
```

dropRule SOAP XML request format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
```

```
xmlns:rul="http://rules.nbapi.cgms.cisco.com/">
```

```
<soapenv:Header/>
```

```
<soapenv:Body>
```

```
<rul:dropRule>
```

```
<!--Optional:-->
```

```
<id?</id>
```

Rules API Method Calls

```
</rul:dropRule>  
</soapenv:Body>  
</soapenv:Envelope>
```


findRulesByName

This call returns all rules specified in the *name* parameter.

Prototype

```
<rul:findRulesByName>
  <name>?</name>
</rul:findRulesByName>
```

Parameters

Table 9 findRulesByName Parameters

Parameter	Type	Description
name	string	Rule name.

Results

This call returns a list of rules matching the name string.

Table 10 findRulesByName Results

Field	Type	Description
id	long	Rule ID.
properties	Map<String,String>	Rule properties such as name, username, status, and lastUpdate.
actions	List<RuleAction>	List of actions the rule performs.

findRulesByName SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:rul="http://rules.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <rul:findRulesByName>
      <!--Optional:-->
      <name>?</name>
    </rul:findRulesByName>
  </soapenv:Body>
</soapenv:Envelope>
```

findRulesByUsername

This call returns a list of rules created by the user defined in *username*.

Prototype

```
<rul:findRulesByUsername>
  <username?></username>
</rul:findRulesByUsername>
```

Parameters

Table 11 findRulesByUsername Parameters

Parameter	Type	Description
username	string	The IoT FND username of the creator of the rules.

Results

Table 12 findRulesByUsername Results

Field	Type	Description
id	long	Rule ID.
properties	Map<String,String>	Rule properties such as name, username, status, and lastUpdate.
actions	List<RuleAction>	List of actions the rule performs.

findRulesByUsername SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:rul="http://rules.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <rul:findRulesByUsername>
      <!--Optional:-->
      <username?></username>
    </rul:findRulesByUsername>
  </soapenv:Body>
</soapenv:Envelope>
```



Search API

This chapter describes the Search API:

- [Overview, page 105](#)
- [Using the Search API, page 105](#)
- [Using the search-client Script, page 110](#)
- [Search API Method Calls, page 111](#)

Overview

All search interfaces return a `queryStatus`, in addition to the actual search results. Search interfaces with `count` and `offset` arguments also return a `queryId`. The `queryId` is useful for retrieving more results from the same search. The `queryStatus` contains an integer status code and a string message about the code.

The search API provides the following interfaces:

- `DeviceDetailQueryResult` `getDeviceDetails(string query, list<string> deviceId, string queryId, long count, long offset)`
- `DeletedDeviceQueryResult` `getDeletedDevices(string deviceType, date startTime, date endTime)`
- `DeviceQueryResult` `searchDevices(string query, list<string> fieldNames, string queryId, long count, long offset)`
- `EidsForIpAddressesResult` `findEidsForIpAddressesByDeviceType(string deviceType, list<string> ipAddresses)`
- `EidsForIpAddressesResult` `findEidsForIpAddresses(list<string> ipAddresses)`
- `GroupQueryResult` `getGroups(string groupType)`
- `MetricHistoryQueryResult` `getMetricHistory(string query, list<string> deviceId, date startTime, date endTime, List<string> metricId, string rollupInterval, string rollupFunction, string queryId, long count, long offset)`
- `UpdatedDeviceDetailQueryResult` `getUpdatedDeviceDetails(string query, date startTime, date endTime, string queryId, long count, long offset)`

Using the Search API

Use this IoT FND server URL to access the Search API WSDL:

`http://<server_address>/nbapi/search?wsdl`

Provided are these examples of client applications using the Search API:

- [Example 1 \(Python-SUDS Client\), page 106](#)
- [Example 2 \(Python-SUDS Client\), page 106](#)
- [Example 3 \(Python-SUDS Client\), page 107](#)

Using the Search API

Example 1 (Python-SUDS Client)

```

from suds.client import Client
import logging
logging.basicConfig(level=logging.INFO)
logging.getLogger('suds.client').setLevel(logging.INFO)
url = "http://localhost/nbapi/search?wsdl"
cl = Client(url, username='root', password='Tree123!')

globalMetrics = ['uptime']
cgmeshMetrics =
['meshHops', 'meshLinkCost', 'meshPathCost', 'meshRssi', 'meshReverseRssi', 'meshRxSpeed', 'meshTxSpeed']
cgr1kStatus =
['doorStatus', 'numBBU', 'battery0Level', 'battery0Runtime', 'battery1Level', 'battery1Runtime', 'battery2Level', 'battery2Runtime']
cgr1kMetrics = ['chassisTemp', 'ethernetTxDrops', 'ethernetRxSpeed', 'ethernetTxSpeed']
cgr1kCellIfMetrics = ['cellularRSSI', 'cellularRxSpeed', 'cellularTxSpeed']
cgr1kWiMAXIfMetrics = ['wimaxRSSI', 'wimaxRxSpeed', 'wimaxTxSpeed']
cgr1kMeshIfMetrics = ['meshEndpointCount', 'meshRxSpeed', 'meshTxSpeed']

# search FAN router devices
devices = []
result = cl.service.searchDevices('deviceType:cgr1000 status:down', ['lng', 'lat', 'ip'], '', 1000, 0)
#print result
if result.queryStatus == "SUCCEEDED":
    print "eid,lng,lat,ip,"
    for d in result.devices:
        devices.append(d.eid)
        print str(d.eid)+",",
        for f in d.fields.entry:
            print str(f.value)+",",
        print ""

```

Example 2 (Python-SUDS Client)

```

from suds.client import Client
import logging
logging.basicConfig(level=logging.INFO)
logging.getLogger('suds.client').setLevel(logging.INFO)
url = "http://localhost/nbapi/search?wsdl"
cl = Client(url, username='root', password='Tree123!')
#print cl

# search mesh end devices
devices = []
result = cl.service.searchDevices('deviceType:cgmesh', ['lng', 'lat', 'ip'], '', 10, 0)
#print result
if result.queryStatus == "SUCCEEDED":
    print "eid,lng,lat,ip,"
    for d in result.devices:
        devices.append(d.eid)
        print str(d.eid)+",",
        for f in d.fields.entry:
            print str(f.value)+",",
        print ""

globalMetrics = ['uptime']
cgmeshMetrics =
['meshHops', 'meshLinkCost', 'meshPathCost', 'meshRssi', 'meshReverseRssi', 'meshRxSpeed', 'meshTxSpeed']
cgr1kStatus =
['doorStatus', 'numBBU', 'battery0Level', 'battery0Runtime', 'battery1Level', 'battery1Runtime', 'battery2Level', 'battery2Runtime']
cgr1kMetrics = ['chassisTemp', 'ethernetTxDrops', 'ethernetRxSpeed', 'ethernetTxSpeed']
cgr1kCellIfMetrics = ['cellularRSSI', 'cellularRxSpeed', 'cellularTxSpeed']

```

Using the Search API

```

cgr1kWiMAXIfMetrics = ['wimaxRSSI', 'wimaxRxSpeed', 'wimaxTxSpeed']
cgr1kMeshIfMetrics = ['meshEndpointCount', 'meshRxSpeed', 'meshTxSpeed']

# get device metric history
result =
cl.service.getMetricHistory('status:up', [str(devices[0]), str(devices[1]), str(devices[2])], '2012-04-01
00:00:00', '2012-04-01 23:59:59', cgmeshMetrics, 'day', 'avg', '', 2, 0)
#print result
if (result.queryStatus == "SUCCEEDED"):
    try:
        result.metricValues
    except:
        print "no metrics returned"
    else:
        print "eid,metric,value,timestamp,"
        for m in result.metricValues:
            print str(m.eid), ",", str(m.metricId), ",", str(m.value), ",", str(m.timestamp)

# search FAN router devices
devices = []
result = cl.service.searchDevices('deviceType:cgr1000', ['lng', 'lat', 'ip'], '', 10, 0)
#print result
if result.queryStatus == "SUCCEEDED":
    print "eid,lng,lat,ip,"
    for d in result.devices:
        devices.append(d.eid)
        print str(d.eid)+",",
        for f in d.fields.entry:
            print str(f.value)+",",
        print ""

# get device metric history
for f in devices:
    result = cl.service.getMetricHistory('status:up', f, '2012-04-01 00:00:00', '2012-04-01
23:59:59', cgr1kMetrics+cgr1kCellIfMetrics+cgr1kWiMAXIfMetrics+cgr1kMeshIfMetrics, 'day', 'avg', '', 0, 0)
#print result
if (result.queryStatus == "SUCCEEDED"):
    try:
        result.metricValues
    except:
        print "no metrics returned"
    else:
        print "eid,metric,value,timestamp,"
        for m in result.metricValues:
            print str(m.eid), ",", str(m.metricId), ",", str(m.value), ",", str(m.timestamp)

```

Example 3 (Python-SUDS Client)

```

import sys
from suds.client import Client
import logging
logging.basicConfig(level=logging.INFO)
logging.getLogger('suds.client').setLevel(logging.DEBUG)
url = "http://localhost/nbapi/search?wsdl"
cl = Client(url, username='root', password='Tree123!')

# get config groups
groups = ['DeviceType', 'Status', 'ConfigGroup', 'FirmwareGroup', 'TunnelProvisioningGroup', 'Label']
for g in groups:
    result = cl.service.getGroups(g)
    #print result

```

Using the Search API

```

if result.queryStatus == "SUCCEEDED":
    print g
    for r in result.groups:
        print r.name,
        if (r.properties != None and r.properties != ""):
            for p in r.properties.entry:
                if (p.key == "description" or p.key == "deviceType"):
                    print p.value,
        if r.memberCount != None:
            print "x " + str(r.memberCount) + ", ",
        print ""
    print ""

# search devices
devices = []
result = cl.service.searchDevices('status:up', ['lng', 'lat', 'ip'], '', 10, 0)
#print result
if result.queryStatus == "SUCCEEDED":
    print "eid,lng,lat,ip,"
    for d in result.devices:
        devices.append(d.eid)
        print str(d.eid)+",",
        for f in d.fields.entry:
            print str(f.value)+",",
        print ""

# fetch mesh endpoint node device details
metrics =
("uptime", "nodeLocalTime", "meshHops", "meshRssi", "meshReverseRssi", "meshLinkCost", "meshPathCost", "meshRx
Speed", "meshTxSpeed", "meshTxDrops")
properties =
("sn", "deviceType", "pid", "lng", "lat", "alt", "geoHash", "mapLevel", "lastHeard", "status", "configInSync", "ru
nningFirmwareVersion", "hardwareId", "vid", "certSN", "certL", "certO", "certCN", "certST", "certOU", "certC")
devices = []
result = cl.service.searchDevices('deviceType:cgmesh', '', '', 10, 0)
if result.queryStatus == "SUCCEEDED":
    for d in result.devices:
        devices.append(d.eid)
    print devices
if len(devices) != 0:
    fn = "./cgmeshDevDetails.csv"
    f = open(fn, 'w')
    #fetch device details
    print >>f, "eid,configGroup,firmwareGroup,",
    for p in properties:
        print >>f, p+",",
    for m in metrics:
        print >>f, m+",",
    print >>f, "interfaces"
    for d in devices:
        result = cl.service.getDeviceDetails('', d, '', 0, 0)
        #print result
        if result.queryStatus == "SUCCEEDED":
            print >>f,
d+", "+result.deviceDetails[0].configGroup+", "+result.deviceDetails[0].firmwareGroup+", ",
            for p in properties:
                for j in result.deviceDetails[0].properties.entry:
                    if j.key == p:
                        try:
                            j.value
                        except:
                            pass
                        else:
                            if j.value != "null":
                                print >>f, j.value,

```

Using the Search API

```

        print >>f, ",",
    for m in metrics:
        for j in result.deviceDetails[0].metrics.entry:
    if j.key == m:
        print >>f, j.value,
        print >>f, ",",
    for i in result.deviceDetails[0].interfaces:
        print >>f, i.name,
    print >>f, ""

# fetch FAN router details
metrics =
["uptime", "chassisTemp", "ethernetTxSpeed", "ethernetRxSpeed", "ethernetTxDrops", "meshEndpointCount", "mesh
RxSpeed", "meshTxSpeed"]
properties =
["sn", "deviceType", "pid", "lng", "lat", "alt", "geoHash", "mapLevel", "lastHeard", "status", "doorStatus", "bbuP
resent", "numBBU", "configInSync", "runningFirmwareVersion", "hardwareId", "vid", "certSN", "certL", "certO", "c
ertCN", "certST", "certOU", "certC", "meshPanidConfig", "meshLinkKeyRefresh", "meshLinkKeyExpiration", "meshPr
efixConfig", "powerSource", "ip", "hostname", "domainName", "meshPrefixLengthConfig", "meshPrefix", "meshPrefi
xLength", "meshAddressConfig", "meshAddress"]
devices = []
result = cl.service.searchDevices('deviceType:cgr1000','',',',10,0)
#print result
if result.queryStatus == "SUCCEEDED":
    for d in result.devices:
        devices.append(d.eid)
    print devices
if len(devices) != 0:
    fn = "./cgr1kDevDetails.csv"
    f = open(fn, 'w')
    #fetch device details
    print >>f, "eid,configGroup,firmwareGroup,",
    for p in properties:
        print >>f, p+",",
    for m in metrics:
        print >>f, m+",",
    print >>f, "interfaces"
    for d in devices:
        result = cl.service.getDeviceDetails('',d','',0,0)
        #print result
        if result.queryStatus == "SUCCEEDED":
            print >>f,
d+", "+result.deviceDetails[0].configGroup+", "+result.deviceDetails[0].firmwareGroup+", ",
            for p in properties:
                for j in result.deviceDetails[0].properties.entry:
    if j.key == p:
        try:
            j.value
        except:
            pass
        else:
            if j.value != "null":
                print >>f, j.value,
                print >>f, ",",
    for m in metrics:
        for j in result.deviceDetails[0].metrics.entry:
    if j.key == m:
        print >>f, j.value,
        print >>f, ",",
    for i in result.deviceDetails[0].interfaces:
        print >>f, i.name,
    print >>f, ""

```

Using the search-client Script

The IoT FND distribution provides a Search API client (search-client script) in the `cgms-tools-version.x86_64.rpm` package. The client is wrapped by a shell script (`/opt/cgms-tools/bin/search-client`) for communicating with the IoT FND API.

```
[root@localhost bin]# ./search-client
usage:
./search-client device <endpoint URL> <query> <field names> <count> <offset>
./search-client device <endpoint URL> <query Id> <field names>
./search-client deviceDetail <endpoint URL> <query> <count> <offset>
./search-client deviceDetail <endpoint URL> <query Id>
./search-client deviceDetail <endpoint URL> <device eid list>
./search-client updatedDeviceDetail <endpoint URL> <query> <startTime> <endTime> <count> <offset>
./search-client updatedDeviceDetail <endpoint URL> <queryId>
./search-client deletedDevice <endpoint URL> <deviceType> <startTime> <endTime>
./search-client group <endpoint URL> <group type>
    <group type> can be deviceType, label, status, configGroup, firmwareGroup, tunnelGroup or
    subnetGroup
./search-client metricHistory <endpoint URL> <query> <startTime> <endTime> <field names>
    <rollupInterval> <rollupFunction> <count> <offset>
./search-client metricHistory <endpoint URL> <queryId>
./search-client metricHistory <endpoint URL> <device eid list> <startTime> <endTime> <field names>
    <rollupInterval> <rollupFunction>
./search-client eidByAddresses <endPoint URL> <deviceIps>
./search-client ReprovisionByEids <endPoint URL> <groupName> <deviceEids> <interfaceName>
    <interfaceType>
```

Table 1 lists search-client script commands.

Table 1 search-client Commands

Command	Description
device	Calls the searchDevices API.
deviceDetail	Calls the getDeviceDetails API.
deletedDevice	Calls the getDeletedDevices API.
eidByAddresses	Calls the findEidsForIpAddresses API.
event	Calls the getUpdatedDeviceDetails API.
group	Calls the getGroups API.
issues	Calls the getUpdatedDeviceDetails API.
meshFirmwareUpgrade	Calls the getUpdatedDeviceDetails API.
metricHistory	Calls the getMetricHistory API.
updatedDeviceDetail	Calls the getUpdatedDeviceDetails API.
work order	Calls the getUpdatedDeviceDetails API.

Search API Method Calls

- [searchDevices](#), page 112
- [getGroups](#), page 113
- [getDeviceDetails](#), page 114
- [getDeletedDevices](#), page 118
- [getUpdatedDeviceDetails](#), page 121
- [getMetricHistory](#), page 148
- [findEidsForIpAddresses](#), page 150
- [findEidsForIpAddressesByDeviceType](#), page 151

searchDevices

This call lets the client provide a search query string (using the query language) and returns a list of device details (properties or metrics).

Prototype

```
DeviceQueryResult searchDevices(string query, list<string> fieldNames, string queryId, long count,
                                long offset)
```

Parameters

Table 2 searchDevices Parameters

Parameter	Type	Description
query	string	Search query string.
fieldNames	string	List of property or metric names to retrieve for each device. For information about properties and metrics, see Property Field Names for All Devices, page 6 and Metrics Field Names, page 8 .
queryId	string	Query ID returned by the call. If available results for the query is more than count, the caller can use the returned queryId to call the same API repeatedly. When queryId is provided, all other parameters are ignored.
count	long	Number of results to retrieve. Valid range is 1–40000.
offset	long	Position of the first result. Valid values are >= 0.

Results

[Table 3](#) lists device details returned by this call.

Table 3 searchDevices Results

Name	Type	Description
eid	string	Device ID.
fields	map<string.string>	A list of fieldname–value pairs.
key	long	A long value associated with the device.

searchDevices SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:sear="http://search.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <sear:searchDevices>
      <!--Optional:-->
      <query>deviceType:cgr1000</query>
      <!--Zero or more repetitions:-->
      <fieldNames></fieldNames>
      <!--Optional:-->
      <queryId></queryId>
      <!--Optional:-->
      <count>10</count>
      <!--Optional:-->
      <offset>0</offset>
    </sear:searchDevices> </soapenv:Body>
</soapenv:Envelope>
```

getGroups

This call lets the client retrieve the following:

- List of groups for a specific group type within the system
- Current number of members in each group
- Properties assigned to the group

Group types are any one of the following strings:

- deviceType
- status
- label
- configGroup
- firmwareGroup
- subnetGroup
- tunnelProvisioningGroup

Prototype

```
GroupQueryResult getGroups(string groupType)
```

Parameters

Table 4 getGroups Parameters

Parameter	Type	Description
groupType	string	Group type strings from the above list.

Results

[Table 5](#) lists groups returned by this call.

Table 5 getGroups Results

Name	Type	Description
name	string	Name of the group.
memberCount	long	Number of devices in the group.
properties	map<string, string>	Property name-value pairs.

getGroups SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:sear="http://search.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <sear:getGroups>
      <!--Optional:-->
      <groupType>devicetype</groupType>
    </sear:getGroups>
  </soapenv:Body>
</soapenv:Envelope>
```

getDeviceDetails

This call lets the client retrieve the following information:

- Address list information:
 - Address
 - addressType
 - Key
 - prefixLength
- Assets list information:
 - Key
 - Name
 - Asset metrics
 - Asset properties
- ConfigGroup as a string
- EID as a string
- FirmwareGroup as a string
- Interface list information:
 - Interface key
 - Interface name
 - Interface index
 - Interface addresses list
 - Interface metrics
 - Interface properties
- Key as a long integer
- Labels list
- Metrics list
- Properties list
- SubnetGroup as a string
- Route list information:
 - Index
 - Key
 - Route metrics
 - Route properties

Devices are retrieved by specifying a query or a list. For example, the Route properties key-value pair information retrieved is:

```
destAddressType:2
nextHopAddressType:4
nextHopAddress : fe80:0:0:0:207:8108:3c:270b
destAddress:0:0:0:0:0:0:0:0
prefixLength:0
```

Prototype

```
DeviceDetailQueryResult getDeviceDetails(string query, list<string> deviceIds, string queryId,
                                           long count, long offset)
```

Parameters

Table 6 getDeviceDetails Parameters

Parameter	Type	Description
query	string	Search query.
deviceIds	list<string>	List of device EIDs to retrieve. When deviceIds is provided, the query parameter is ignored.
queryId	string	Query ID returned by the call. If available results for the query is more than count, the caller can use the returned queryId to call the same API repeatedly. When queryId is provided, all other parameters are ignored.
count	long	Number of results to retrieve. Valid range is 1-40000
offset	long	Position of the first result. Valid values are >= 0.

Results

Parameters returned by this call are listed in [Table 7](#).

Table 7 getDeviceDetails Results

Parameter	Type	Description
addresses	list<address>	A list of addresses known to the device. See Table 8 .
assets	list<asset>	A list of assets installed on the device. See Table 11 .
configGroup	string	The name of the configuration group assigned to the device.
eid	string	The string ID of the device.
firmwareGroup	string	The name of the firmware group assigned to the device.
interfaces	list<interface>	A list of interfaces of the device. See Table 9 .
labels	list<string>	The list of labels assigned to the device.
key	long	A long value associated with the device.
metrics	map<string, double>	Metric type-value pairs. See Metrics Field Names .
properties	map<string, string>	Property name-value pairs. See Property Field Names for All Devices .
routes	list<route>	A list of routes known to the device. See Table 10 .
subnetGroup	string	The name of the subnet group assigned to the device.

[Table 8](#) describes the Address attributes.

Table 8 Address Attributes

Attribute	Type	Description
key	long	A long value associated with the address.
addressType	string	Value is one of these address types: IPV4, IPV6, IPV4Z, IPV6Z or UNKNOWN.
address	string	The IP address.
prefixLength	integer	Subnet prefix length of the address.

[Table 9](#) describes the Interface attributes.

Table 9 Interface Attributes

Attribute	Type	Description
key	long	A long value associated with the interface.
index	integer	Index value of the interface.
name	string	The name of the interface.
addresses	list<address>	List of Address (see Table 8) associated with the interface.
properties	map<string, string>	Properties of the interface in name-value pairs.
metrics	map<string, double>	Metrics of the interface.

[Table 10](#) describes the Route attributes.

Table 10 Route Attributes

Attribute	Type	Description
key	long	A long value associated with the route.
index	integer	Index value of the route.
properties	map<string, string>	Properties of the route in name-value pairs.
metrics	map<string, double>	Metrics of the route.

[Table 11](#) describes the Asset attribute parameters.

Table 11 Asset Attributes

Attribute	Type	Description
key	long	A long value associated with the asset.
name	string	The name of the asset.
properties	map<string, string>	Properties of the asset in name-value pairs.
metrics	map<string, double>	Metrics of the asset.

getDeviceDetails SOAP XML Request Format for a FAR

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:sear="http://search.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <sear:getDeviceDetails>
      <!--Optional:-->
      <query>far_test2</query>
      <!--Zero or more repetitions:-->
      <deviceIds>+JSJ1522003G</deviceIds>
      <!--Optional:-->
      <queryId></queryId>
      <!--Optional:-->
      <count>5</count>
      <!--Optional:-->
      <offset>0</offset>
    </sear:getDeviceDetails>
  </soapenv:Body>
</soapenv:Envelope>
```

getDeviceDetails SOAP XML Request Format for a Mesh Device

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:sear="http://search.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <sear:getDeviceDetails>
      <!--Optional:-->
      <query>deviceType:cgmesh status:up</query>
      <!--Zero or more repetitions:-->
      <deviceIds></deviceIds>
      <!--Optional:-->
      <queryId></queryId>
      <!--Optional:-->
      <count>10</count>
      <!--Optional:-->
      <offset>0</offset>
    </sear:getDeviceDetails>
  </soapenv:Body>
</soapenv:Envelope>
```

Response

```
<env:Envelope xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
  <env:Header>
    <seam:conversationId xmlns:seam="http://www.jboss.org/seam/webservice">1125</seam:conversationId>
  </env:Header>
  <env:Body>
    <ns2:getDeviceDetailsResponse xmlns:ns2="http://search.nbapi.cgms.cisco.com/">
      <deviceDetailQueryResult>
        <queryId>E6FDA0F0D3E0ADFFF69E334462D1EF6A</queryId>
        <queryStatus>SUCCEDED</queryStatus>
      </deviceDetailQueryResult>
    </ns2:getDeviceDetailsResponse>
  </env:Body>
</env:Envelope>
```

getDeletedDevices

This call retrieves information of devices deleted within a time period.

Prototype

```
DeletedDeviceQueryResult getDeletedDevices(string deviceType, date startTime, date endTime)
```

Parameters

Table 12 getDeletedDevices Parameters

Parameter	Type	Description
deviceType	string	The name of the device type to filter the results by. For example, cgr1000 only matches deleted devices against CGR devices.
startTime	date	Starting UTC date and time for the deletion interval. This is a mandatory parameter. It cannot be null. Format is YYYY-MM-DDThh:mm:ss (for example, 2015-03-25T00:00:00).
endTime	date	Ending UTC date and time for the deletion interval. This is a mandatory parameter. It cannot be null. Use it as the startTime for the next call without retrieving repeated records. Format is YYYY-MM-DDThh:mm:ss.

Results

Table 3 lists device details returned by this call.

Table 13 getDeletedDevices Results

Name	Type	Description
deleteDate	date	The date and time of device deletion.
deviceType	string	The device type of the deleted device.
eid	string	Device ID.

search-client Script Example

```
search-client deletedDevice https://kml-lnx2/nbapi/search?wsdl "cgr1000" "2015-03-25 12:00:00"
"2015-03-26 12:00:00"
```

search-client Script Results

```
URL: https://kml-lnx2/nbapi/search?wsdl
Mar 25, 2015 5:16:43 PM org.apache.cxf.service.factory.ReflectionServiceFactoryBean
buildServiceFromWSDL
INFO: Creating Service {http://search.nbapi.cgms.cisco.com/}SearchWebService from WSDL:
https://kml-lnx2/nbapi/search?wsdl
Mar 25, 2015 5:16:44 PM org.apache.cxf.service.factory.ReflectionServiceFactoryBean
buildServiceFromWSDL
INFO: Creating Service {http://search.nbapi.cgms.cisco.com/}SearchWebService from WSDL:
https://kml-lnx2/nbapi/search?wsdl
{"deleteDate":"Wed Mar 25 16:00:44 PDT 2015", "deviceType":"cgr1000", "eid":"CGR1240/K9+JSJ200201"}
{"deleteDate":"Wed Mar 25 16:00:44 PDT 2015", "deviceType":"cgr1000", "eid":"CGR1240/K9+JSJ200202"}
```

```
Elapsed Time: [169] ms
Status: Query succeeded
Rows: 2
```

SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:sear="http://search.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
```


Search API Method Calls

```

<soapenv:Body>
  <sear:getDeletedDevices>
    <deviceType>cgr1000</deviceType>
    <startTime>2015-03-25T00:00:00</startTime>
    <endTime>2015-03-26T00:00:00</endTime>
  </sear:getDeletedDevices>
</soapenv:Body>
</soapenv:Envelope>

```

Response

```

<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" />
  <soap:Body>
    <ns2:getDeletedDevicesResponse xmlns:ns2="http://search.nbapi.cgms.cisco.com/">
      <deletedDeviceQueryResult>
        <queryStatus>SUCCEDED</queryStatus>
        <deletedDevices>
          <deleteDate>2015-03-25T23:00:44Z</deleteDate>
          <deviceType>cgr1000</deviceType>
          <eid>CGR1240/K9+JSJ200201</eid>
        </deletedDevices>
        <deletedDevices>
          <deleteDate>2015-03-25T23:00:44Z</deleteDate>
          <deviceType>cgr1000</deviceType>
          <eid>CGR1240/K9+JSJ200202</eid>
        </deletedDevices>
      </deletedDeviceQueryResult>
    </ns2:getDeletedDevicesResponse>
  </soap:Body>
</soap:Envelope>

```

Example Python Request

```

#!/usr/local/bin/python
from suds.transport.https import HttpAuthenticated
from suds.client import Client
import logging
from datetime import timedelta,date,datetime,tzinfo
import requests
from requests.auth import HTTPBasicAuth
import datetime

#transport = HttpAuthenticated(username='root',password='PeterChen123!')
transport = HttpAuthenticated(username='root',password='Private123!')
#WSDL_URL= "https://172.27.126.110/nbapi/search/?wsdl"
WSDL_URL= "https://kml-lnx2/nbapi/search/?wsdl"
client = Client(WSDL_URL, faults=False,cachingpolicy=1,location=WSDL_URL,transport=transport)

print(client)
deviceType="cgr1000"
string_start_date = "2015-03-25 12:00:00.78200"
string_end_date = "2016-03-26 12:00:00.78200"
startTime = datetime.datetime.strptime(string_start_date, "%Y-%m-%d %H:%M:%S.%f")
endTime= datetime.datetime.strptime(string_end_date, "%Y-%m-%d %H:%M:%S.%f")
count=5
offset =0
searchthis = client.service.getDeletedDevices(deviceType,startTime,endTime)
print(searchthis)

```

Results

```
Suds ( https://fedorahosted.org/suds/ ) version: 0.6
```

Search API Method Calls

```

Service ( SearchWebService ) tns="http://search.nbapi.cgms.cisco.com/"
  Prefixes (1)
    ns0 = "http://search.nbapi.cgms.cisco.com/"
  Ports (1):
    (SearchWebServicePort)
      Methods (8):
        findEidsForIpAddresses(xs:string[] ipAddresses)
        findEidsForIpAddressesByDeviceType(xs:string deviceType, xs:string[] ipAddresses)
        getDeletedDevices(xs:string deviceType, xs:dateTime startTime, xs:dateTime endTime)
        getDeviceDetails(xs:string query, xs:string[] deviceIds, xs:string queryId, xs:long count,
xs:long offset)
        getGroups(xs:string groupType)
        getMetricHistory(xs:string query, xs:string[] deviceIds, xs:dateTime startTime, xs:dateTime
endTime, xs:string[] metricIds, xs:string rollupInterval, xs:string rollupFunction, xs:string queryId,
xs:long count, xs:long offset)
        getUpdatedDeviceDetails(xs:string query, xs:dateTime startTime, xs:dateTime endTime,
xs:string queryId, xs:long count, xs:long offset)
        searchDevices(xs:string query, xs:string[] fieldNames, xs:string queryId, xs:long count,
xs:long offset)
      Types (36):
        Exception
        address
        asset
        deletedDevice
        deletedDeviceQueryResult
        device
        deviceDetail
        deviceDetailQueryResult
        deviceQueryResult
        eidsForIpAddressesResult
        findEidsForIpAddresses
        findEidsForIpAddressesByDeviceType
        findEidsForIpAddressesByDeviceTypeResponse
        findEidsForIpAddressesResponse
        getDeletedDevices
        getDeletedDevicesResponse
        getDeviceDetails
        getDeviceDetailsResponse
        getGroups
        getGroupsResponse
        getMetricHistory
        getMetricHistoryResponse
        getUpdatedDeviceDetails
        getUpdatedDeviceDetailsResponse
        group
        groupQueryResult
        interface
        metricHistoryQueryResult
        metricValue
        queryResult
        queryStatus
        route
        searchDevices
        searchDevicesResponse
        updatedDeviceDetail
        updatedDeviceDetailQueryResult

(200, (deletedDeviceQueryResult){
  queryStatus = "SUCCEDED"
  deletedDevices[] =
    (deletedDevice){
      deleteDate = 2015-03-25 23:00:44+00:00
      deviceType = "cgr1000"
      eid = "CGR1240/K9+JSJ200201"
    }
  }

```

```
    },
    (deletedDevice){
        deleteDate = 2015-03-25 23:00:44+00:00
        deviceType = "cgr1000"
        eid = "CGR1240/K9+JSJ200202"
    },
})
```

getUpdatedDeviceDetails

This call lets the client retrieve the following information of devices updated within a specified time period:

- key
- eid
- configGroup
- event
- firmwareGroup
- issues
- Labels list
- meshDeviceOps
- workorder
- Updated Properties list
- Updated Metrics list
- Updated Interfaces list
- Updated Routes list
- Updated Addresses list
- Deleted Interfaces list
- Deleted Routes list
- Deleted Addresses list

Prototype

```
UpdatedDeviceDetailQueryResult getUpdatedDeviceDetails(string query, date startTime, date endTime,
                                                         string queryId, long count, long offset)
```

Parameters**Table 14** `getUpdatedDeviceDetails` Parameters

Parameter	Type	Description
<code>query</code>	string	Search query.
<code>startTime</code>	date	Starting UTC date and time for the updated interval. This is a mandatory parameter. It cannot be null. Format is YYYY-MM-DDThh:mm:ss (for example, 2015-03-25T00:00:00).
<code>endTime</code>	date	Ending UTC date and time for the updated interval. This is a mandatory parameter. It cannot be null. Format is YYYY-MM-DDThh:mm:ss. <code>endTime</code> is exclusive. It can be used as the <code>startTime</code> for the next call without retrieving repeated records.
<code>queryId</code>	string	The ID of the initial query used in subsequent calls to retrieve remaining records.
<code>count</code>	long	Number of results to retrieve. Valid range is 1-40000.
<code>offset</code>	long	Position of the first result. Valid values are ≥ 0 .

This call returns the records of devices that match the specified `deviceType` and have delete time \geq `startTime` and $<$ `endTime`.

Results

[Table 15](#) lists the device details returned by this call. The return message, `UpdatedDeviceDetailQueryResult`, is a list of `UpdatedDeviceDetail` records.

Table 15 getUpdatedDeviceDetails Results

Parameter	Type	Description
configGroup	string	The name of the configuration group assigned to the device.
deletedAddresses	list<string>	Deleted IP addresses.
deletedInterfaces	list<string>	Deleted interface names.
deletedRoutes	list<string>	Deleted route names.
eid	string	Device string ID.
event	string	Search for events based on device type, event name, event time, and event severity.
firmwareGroup	string	The name of the firmware group assigned to the device.
issues	string	Call searches for issues in the IoT FND database based on the provided criteria that return a list of those issues.
key	long	A long value associated with the device.
meshDeviceOps	string	Allows client applications to start and stop firmware uploads to a group of mesh devices, check their firmware upload status, obtain firmware information by firmware group, set up a backup firmware image, and schedule a firmware reload.
workorder	string	Provides seven primary action calls to cloud-based management services.
updatedAddresses	list<address>	The list of addresses of the device updated during the specified time interval.
updatedInterfaces	list<interface>	The interface of the device updated during the specified time interval.
updatedMetrics	map<string, double>	The metrics of the device updated during the specified time interval.
updatedProperties	map<string, string>	The properties of the device updated during the specified time interval.
updatedRoutes	list<route>	The routes of the device updated during the specified time interval.

See [Table 8](#), [Table 9](#), and [Table 10](#) for information on the Address, Interface, and Route attributes.

Example

```
search-client updatedDeviceDetails https://kml-lnx2/nbapi/search?wsdl "deviceCategory=router"
"2015-03-25 12:00:00" "2015-03-26 12:00:00" 5 0
search-client updatedDeviceDetails https://kml-lnx2/nbapi/search?wsdl "deviceCategory=router"
"2015-03-26 00:00:00" "2015-03-26 00:20:00" 2 0
```

Example SOAP Request

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:sear="http://search.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <sear:getUpdatedDeviceDetails>
      <query>deviceCategory=router</query>
      <startTime>2015-03-25T23:00:00</startTime>
      <endTime>2015-03-26T00:00:00</endTime>
      <count>1</count>
      <offset>0</offset>
    </sear:getUpdatedDeviceDetails>
  </soapenv:Body>
</soapenv:Envelope>
```

Response

```

<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/" />
  <soap:Body>
    <ns2:getUpdatedDeviceDetailsResponse xmlns:ns2="http://search.nbapi.cgms.cisco.com/">
      <updatedDeviceDetailQueryResult>
        <queryId>E1EA07CE9BE5536A883469707FCA602E</queryId>
        <queryStatus>SUCCEDEDED</queryStatus>
        <updatedDeviceDetails>
          <configGroup>default-c800</configGroup>
          <eid>C819HGW-S-A-K9+FTX174685VB</eid>
          <firmwareGroup>default-c800</firmwareGroup>
          <key>270000</key>
          <updatedInterfaces>
            <index>1</index>
            <key>290009</key>
            <metrics>
              <entry>
                <key>rxSpeed</key>
                <value>3790.8790113658024</value>
              </entry>
              <entry>
                <key>utilBytes</key>
                <value>8.40631367E8</value>
              </entry>
              <entry>
                <key>inBytes</key>
                <value>7.97480016E8</value>
              </entry>
              <entry>
                <key>txSpeed</key>
                <value>210.51087003645023</value>
              </entry>
              <entry>
                <key>outBytes</key>
                <value>4.3151351E7</value>
              </entry>
              <entry>
                <key>txDrops</key>
                <value>0.0</value>
              </entry>
            </metrics>
            <name>GigabitEthernet0</name>
            <properties>
              <entry>
                <key>physAddress</key>
                <value>c025.5c08.e3f5</value>
              </entry>
            </properties>
          </updatedInterfaces>
          .
          .
          .
        </updatedDeviceDetails>
      </updatedDeviceDetailQueryResult>
      <updatedMetrics>
        <entry>
          <key>cellularBandwidth</key>
          <value>0.0</value>
        </entry>
        <entry>
          <key>cellularTxSpeed</key>
          <value>0.0</value>
        </entry>
      </updatedMetrics>
    </ns2:getUpdatedDeviceDetailsResponse>
  </soap:Body>
</soap:Envelope>

```

```
    <key>ethernetTxSpeed</key>
    <value>516.6779073252414</value>
  </entry>
  <entry>
    <key>cellularBwPerCycle</key>
    <value>0.0</value>
  </entry>
  <entry>
    <key>ethernetTxDrops</key>
    <value>0.0</value>
  </entry>
  <entry>
    <key>uptime</key>
    <value>1650960.0</value>
  </entry>
  <entry>
    <key>cellularRxSpeed</key>
    <value>0.0</value>
  </entry>
  <entry>
    <key>cellularEcio</key>
    <value>-11.0</value>
  </entry>
  <entry>
    <key>ethernetRxSpeed</key>
    <value>3790.8790113658024</value>
  </entry>
  <entry>
    <key>cellConnectTime</key>
    <value>93.0</value>
  </entry>
  <entry>
    <key>cellularRssi</key>
    <value>-117.0</value>
  </entry>
</updatedMetrics>
<updatedProperties>
  <entry>
    <key>runningFirmwareImageId</key>
    <value>null</value>
  </entry>
  <entry>
    <key>lastUpdate</key>
    <value>2015-03-25 23:29:19.0</value>
  </entry>
  <entry>
    <key>lng</key>
    <value>-26.9007</value>
  </entry>
  <entry>
    <key>reloadFirmwareVersion</key>
    <value>null</value>
  </entry>
  <entry>
    <key>reloadDate</key>
    <value>null</value>
  </entry>
  <entry>
    <key>backupFirmwareVersion</key>
    <value>null</value>
  </entry>
  <entry>
    <key>slot4FirmwareImageId</key>
```

```
    <value>null</value>
  </entry>
  <entry>
    <key>deviceType</key>
    <value>c800</value>
  </entry>
  <entry>
    <key>alt</key>
    <value>21</value>
  </entry>
  <entry>
    <key>name</key>
    <value>C819HGW-S-A-K9+FTX174685VB</value>
  </entry>
  <entry>
    <key>configInSync</key>
    <value>>false</value>
  </entry>
  <entry>
    <key>runningFirmwareVersion</key>
    <value>15.5(0.23)T</value>
  </entry>
  <entry>
    <key>hardwareId</key>
    <value>null</value>
  </entry>
  <entry>
    <key>vid</key>
    <value>null</value>
  </entry>
  <entry>
    <key>lat</key>
    <value>26.0197</value>
  </entry>
  <entry>
    <key>slot5FirmwareImageId</key>
    <value>null</value>
  </entry>
  <entry>
    <key>sn</key>
    <value>FTX174685VB</value>
  </entry>
  <entry>
    <key>backupFirmwareImageId</key>
    <value>null</value>
  </entry>
  <entry>
    <key>status</key>
    <value>up</value>
  </entry>
  <entry>
    <key>hostname</key>
    <value>kit-819</value>
  </entry>
  <entry>
    <key>pid</key>
    <value>C819HGW-S-A-K9</value>
  </entry>
  <entry>
    <key>lastHeard</key>
    <value>2015-03-25 23:34:18.0</value>
  </entry>
  <entry>
    <key>mapLevel</key>
    <value>1</value>
```


Search API Method Calls

```

        </entry>
        <entry>
            <key>ip</key>
            <value>172.27.161.82</value>
        </entry>
        <entry>
            <key>downloadFirmwareVersion</key>
            <value>null</value>
        </entry>
        <entry>
            <key>slot6FirmwareImageId</key>
            <value>null</value>
        </entry>
        <entry>
            <key>geoHash</key>
            <value>eksu5bex8r8hrfk9942g4</value>
        </entry>
        <entry>
            <key>downloadFirmwareImageId</key>
            <value>null</value>
        </entry>
    </updatedProperties>
</updatedDeviceDetails>
</updatedDeviceDetailQueryResult>
</ns2:getUpdatedDeviceDetailsResponse>
</soap:Body>
</soap:Envelope>

```

Example SOAP Request using event

```

<soapenv:Envelope
xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/" xmlns:even="http://event.nbapi.cgms.cisco.com/"
">
    <soapenv:Header/>
    <soapenv:Body>
        <even:searchEvents>
            <!--Optional:-->
            <query?</query>
            <!--Optional:-->
            <count?</count>
            <!--Optional:-->
            <offset?</offset>
        </even:searchEvents>
    </soapenv:Body>
</soapenv:Envelope>

```

Example SOAP Request using issues

```

<soapenv:Envelope
xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/" xmlns:iss="http://issues.nbapi.cgms.cisco.com/"
">
    <soapenv:Header/>
    <soapenv:Body>
        <iss:searchIssues>
            <!--Optional:-->?
            <query>deviceType:cgr1000 issueStatus:open</query>
            <!--Optional:-->
            <count>2</count>
            <!--Optional:-->
            <offset>0</offset>
        </iss:searchIssues>
    </soapenv:Body>
</soapenv:Envelope>

```

Example SOAP Request using meshDeviceOps

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:getFirmwareImageInfoList>
      <!--Optional:-->
      <firmwareGroup?></firmwareGroup>
    </mes:getFirmwareImageInfoList>
  </soapenv:Body>
</soapenv:Envelope>
```

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:getFirmwareUploadStatus>
      <!--Optional:-->
      <firmwareGroup?></firmwareGroup>
    </mes:getFirmwareUploadStatus>
  </soapenv:Body>
</soapenv:Envelope>
```

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:scheduleReload>
      <!--Optional:-->
      <firmwareGroup?></firmwareGroup>
      <!--Optional:-->
      <firmwareImageName?></firmwareImageName>
      <!--Optional:-->
      <reloadGmtTime?></reloadGmtTime>
    </mes:scheduleReload?>
  </soapenv:Body>
</soapenv:Envelope>
```

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:setBackupFirmwareImage>
      <!--Optional:-->
      <firmwareGroup?></firmwareGroup>
      <!--Optional:-->
      <firmwareImageName?></firmwareImageName>
    </mes:setBackupFirmwareImage>
  </soapenv:Body>
</soapenv:Envelope>
```

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:startUpload>
      <!--Optional:-->
      <firmwareGroup?></firmwareGroup>
      <!--Optional:-->
      <firmwareImageName?></firmwareImageName>
    </mes:startUpload>
  </soapenv:Body>
</soapenv:Envelope>
```

Search API Method Calls

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:mes="http://meshDeviceOps.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <mes:stopUpload>
      <!--Optional:-->
      <firmwareGroup?</firmwareGroup>
    </mes:stopUpload>
  </soapenv:Body>
</soapenv:Envelope>
```

Example SOAP Request using queryId

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:sear="http://search.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <sear:getUpdatedDeviceDetails>
      <queryId>E1EA07CE9BE5536A883469707FCA602E</queryId>
    </sear:getUpdatedDeviceDetails>
  </soapenv:Body>
</soapenv:Envelope>
```

Example SOAP Request using workorder

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:wor="http://workorder.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <wor:RequestSignedAuthorization>
      <!--Optional:-->
      <technicianUserName?</technicianUserName>
      <!--Optional:-->
      <workOrderNumber?</workOrderNumber>
      <!--Optional:-->
      <appVersion?</appVersion>
    </wor:RequestSignedAuthorization>
  </soapenv:Body>
</soapenv:Envelope>
```

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:wor="http://workorder.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <wor:RequestSignedAuthorizationWithClientKey>
      <!--Optional:-->
      <technicianUserName?</technicianUserName>
      <!--Optional:-->
      <workOrderNumber?</workOrderNumber>
      <!--Optional:-->?
      <appVersion?</appVersion>
      <!--Optional:-->
      <appKey?</appKey>
    </wor:RequestSignedAuthorizationWithClientKey>
  </soapenv:Body>
</soapenv:Envelope>
```

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:wor="http://workorder.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <wor:RequestUserAuthentication>
```

Search API Method Calls

```

    <!--Optional:-->
    <userAuthInfo>
      <!--Optional:-->
      <appVersion?></appVersion>
      <!--Optional:-->
      <scriptVersion?></scriptVersion>
    </userAuthInfo>
  </wor:RequestUserAuthentication>
</soapenv:Body>
</soapenv:Envelope>

<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:wor="http://workorder.nbapi.cqms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <wor:UploadServiceReport>
      <!--Zero or more repetitions:-->
      <serviceStatusReport>
        <!--Optional:-->
        <orderNumber?></orderNumber>
        <!--Optional:-->
        <deviceId?></deviceId>
        <!--Optional:-->
        <technicianUserName?></technicianUserName>
        <!--Optional:-->
        <status?></status>
      </serviceStatusReport>
    </wor:UploadServiceReport>
  </soapenv:Body>
</soapenv:Envelope>

```

Example Python Request

IoT FND 3.0 and NB API 3.0 work with both TLS1.0 and TLS1.2.

Note: If you use TLS1.2 with SUDS package, you must use the ActivePython package available at:

<http://www.activestate.com/blog/2015/11/activepython-vs-open-source-python-whats-difference>

Note: If you use TLS1.0 with SUDS package, you must use the regular Python package available at:

<https://www.python.org/downloads/>

```

#!/usr/local/bin/python
from suds.transport.https import HttpAuthenticated
from suds.client import Client
import logging
from datetime import timedelta, date, datetime, tzinfo
import requests
from requests.auth import HTTPBasicAuth
import datetime

transport = HttpAuthenticated(username='root', password='PeterChen123!')
WSDL_URL= "https://172.27.126.110/nbapi/search/?wsdl"
client = Client(WSDL_URL, faults=False, cachingpolicy=1, location=WSDL_URL, transport=transport)

print(client)
#query="deviceType:cgr1000"
query="deviceType:cgmesh"
#fieldNames = ["uptime", "uplinkTxSpeed", "uplinkTxDrops"]
string_start_date = "2014-09-28 20:30:55.78200"
string_end_date = "2015-03-25 20:30:55.78200"
startTime = datetime.datetime.strptime(string_start_date, "%Y-%m-%d %H:%M:%S.%f")
endTime= datetime.datetime.strptime(string_end_date, "%Y-%m-%d %H:%M:%S.%f")

```

Search API Method Calls

```
#deviceId=["00173bab003c3500", "00173bab003c3501"]
count=5
offset =0
searchthis = client.service.getUpdatedDeviceDetails(query,startTime,endTime, "",count, offset)
print(searchthis)
```

Results

Suds (<https://fedorahosted.org/suds/>) version: 0.6

```
Service ( SearchWebService ) tns="http://search.nbapi.cgms.cisco.com/"
  Prefixes (1)
    ns0 = "http://search.nbapi.cgms.cisco.com/"
  Ports (1):
    (SearchWebServicePort)
      Methods (8):
        findEidsForIpAddresses(xs:string[] ipAddresses)
        findEidsForIpAddressesByDeviceType(xs:string deviceType, xs:string[] ipAddresses)
        getDeletedDevices(xs:string deviceType, xs:dateTime startTime, xs:dateTime endTime)
        getDeviceDetails(xs:string query, xs:string[] deviceIds, xs:string queryId, xs:long count,
xs:long offset)
        getGroups(xs:string groupType)
        getMetricHistory(xs:string query, xs:string[] deviceIds, xs:dateTime startTime, xs:dateTime
endTime, xs:string[] metricIds, xs:string rollupInterval, xs:string rollupFunction, xs:string queryId,
xs:long count, xs:long offset)
        getUpdatedDeviceDetails(xs:string query, xs:dateTime startTime, xs:dateTime endTime,
xs:string queryId, xs:long count, xs:long offset)
        searchDevices(xs:string query, xs:string[] fieldNames, xs:string queryId, xs:long count,
xs:long offset)
      Types (36):
        Exception
        address
        asset
        deletedDevice
        deletedDeviceQueryResult
        device
        deviceDetail
        deviceDetailQueryResult
        deviceQueryResult
        eidsForIpAddressesResult
        findEidsForIpAddresses
        findEidsForIpAddressesByDeviceType
        findEidsForIpAddressesByDeviceTypeResponse
        findEidsForIpAddressesResponse
        getDeletedDevices
        getDeletedDevicesResponse
        getDeviceDetails
        getDeviceDetailsResponse
        getGroups
        getGroupsResponse
        getMetricHistory
        getMetricHistoryResponse
        getUpdatedDeviceDetails
        getUpdatedDeviceDetailsResponse
        group
        groupQueryResult
        interface
        metricHistoryQueryResult
        metricValue
        queryResult
        queryStatus
        route
        searchDevices
```

```
searchDevicesResponse
updatedDeviceDetail
updatedDeviceDetailQueryResult
```

```
(200, (updatedDeviceDetailQueryResult){
  queryId = "60EF7F6ACFD8EE823AC2B8F83E545BC9"
  queryStatus = "SUCCEEDED"
  updatedDeviceDetails[] =
    (updatedDeviceDetail){
      configGroup = "default-cgmesh"
      eid = "00000000001"
      firmwareGroup = "default-cgmesh"
      key = 261628
      updatedMetrics = ""
      updatedProperties =
        (updatedProperties){
          entry[] =
            (entry){
              key = "runningFirmwareImageId"
              value = "null"
            },
            (entry){
              key = "lastUpdate"
              value = "2015-03-12 21:28:48.0"
            },
            (entry){
              key = "lng"
              value = "1000.0"
            },
            (entry){
              key = "reloadFirmwareVersion"
              value = "null"
            },
            (entry){
              key = "reloadDate"
              value = "null"
            },
            (entry){
              key = "function"
              value = "meter"
            },
            (entry){
              key = "backupFirmwareVersion"
              value = "null"
            },
            (entry){
              key = "slot4FirmwareImageId"
              value = "null"
            },
            (entry){
              key = "deviceType"
              value = "cgmesh"
            },
            (entry){
              key = "alt"
              value = "null"
            },
            (entry){
              key = "name"
              value = "00000000001"
            },
            (entry){
              key = "configInSync"
              value = "false"
            }
          }
        }
    }
  }
}
```

```
    },
    (entry){
        key = "runningFirmwareVersion"
        value = "null"
    },
    (entry){
        key = "hardwareId"
        value = "null"
    },
    (entry){
        key = "vid"
        value = "null"
    },
    (entry){
        key = "lat"
        value = "1000.0"
    },
    (entry){
        key = "slot5FirmwareImageId"
        value = "null"
    },
    (entry){
        key = "sn"
        value = "null"
    },
    (entry){
        key = "backupFirmwareImageId"
        value = "null"
    },
    (entry){
        key = "status"
        value = "unheard"
    },
    (entry){
        key = "hostname"
        value = "null"
    },
    (entry){
        key = "pid"
        value = "null"
    },
    (entry){
        key = "lastHeard"
        value = "null"
    },
    (entry){
        key = "mapLevel"
        value = "16"
    },
    (entry){
        key = "ip"
        value = "2.2.2.11"
    },
    (entry){
        key = "downloadFirmwareVersion"
        value = "null"
    },
    (entry){
        key = "slot6FirmwareImageId"
        value = "null"
    },
    (entry){
        key = "geoHash"
```

```
        value = "null"
    },
    (entry){
        key = "downloadFirmwareImageId"
        value = "null"
    },
}
},
(updatedDeviceDetail){
    configGroup = "default-cgmesh"
    eid = "000000000002"
    firmwareGroup = "default-cgmesh"
    key = 261627
    updatedMetrics = ""
    updatedProperties =
    (updatedProperties){
        entry[] =
        (entry){
            key = "runningFirmwareImageId"
            value = "null"
        },
        (entry){
            key = "lastUpdate"
            value = "2015-03-12 21:28:48.0"
        },
        (entry){
            key = "lng"
            value = "1000.0"
        },
        (entry){
            key = "reloadFirmwareVersion"
            value = "null"
        },
        (entry){
            key = "reloadDate"
            value = "null"
        },
        (entry){
            key = "function"
            value = "meter"
        },
        (entry){
            key = "backupFirmwareVersion"
            value = "null"
        },
        (entry){
            key = "slot4FirmwareImageId"
            value = "null"
        },
        (entry){
            key = "deviceType"
            value = "cgmesh"
        },
        (entry){
            key = "alt"
            value = "null"
        },
        (entry){
            key = "name"
            value = "000000000002"
        },
        (entry){
            key = "configInSync"
            value = "false"
        },
    },
},
```



```
(entry){
  key = "runningFirmwareVersion"
  value = "null"
},
(entry){
  key = "hardwareId"
  value = "null"
},
(entry){
  key = "vid"
  value = "null"
},
(entry){
  key = "lat"
  value = "1000.0"
},
(entry){
  key = "slot5FirmwareImageId"
  value = "null"
},
(entry){
  key = "sn"
  value = "null"
},
(entry){
  key = "backupFirmwareImageId"
  value = "null"
},
(entry){
  key = "status"
  value = "unheard"
},
(entry){
  key = "hostname"
  value = "null"
},
(entry){
  key = "pid"
  value = "null"
},
(entry){
  key = "lastHeard"
  value = "null"
},
(entry){
  key = "mapLevel"
  value = "16"
},
(entry){
  key = "ip"
  value = "2.2.2.12"
},
(entry){
  key = "downloadFirmwareVersion"
  value = "null"
},
(entry){
  key = "slot6FirmwareImageId"
  value = "null"
},
(entry){
  key = "geoHash"
  value = "null"
}
```

```
    },
    (entry){
        key = "downloadFirmwareImageId"
        value = "null"
    },
}
},
(updatedDeviceDetail){
    configGroup = "default-cgmesh"
    eid = "0007810800a80bfe"
    firmwareGroup = "default-cgmesh"
    key = 20127
    updatedAddresses[] =
        (address){
            address = "fe80:0:0:0:0:0:0:1"
            addressType = "IPV6"
            key = 20001004
            prefixLength = 64
        },
        (address){
            address = "2010:dead:beef:cafe:0:8108:a8:bfe"
            addressType = "IPV6"
            key = 20001005
            prefixLength = 64
        },
        (address){
            address = "fe80:0:0:0:207:8108:a8:bfe"
            addressType = "IPV6"
            key = 20001006
            prefixLength = 64
        },
        (address){
            address = "0:0:0:0:0:0:0:1"
            addressType = "IPV6"
            key = 20001007
            prefixLength = 128
        },
    updatedInterfaces[] =
        (interface){
            addresses[] =
                (address){
                    address = "0:0:0:0:0:0:0:1"
                    addressType = "IPV6"
                    key = 20001007
                    prefixLength = 128
                },
            index = 1
            key = 50004
            metrics = ""
            name = "lo"
            properties = ""
        },
        (interface){
            addresses[] =
                (address){
                    address = "2010:dead:beef:cafe:0:8108:a8:bfe"
                    addressType = "IPV6"
                    key = 20001005
                    prefixLength = 64
                },
                (address){
                    address = "fe80:0:0:0:207:8108:a8:bfe"
                    addressType = "IPV6"
                    key = 20001006
                    prefixLength = 64
                }
        }
    }
}
```

```
    },
    index = 2
    key = 50005
    metrics = ""
    name = "lowpan"
    properties =
      (properties){
        entry[] =
          (entry){
            key = "physAddress"
            value = "0007810800a80bfe"
          },
        }
    },
    (interface){
      addresses[] =
        (address){
          address = "fe80:0:0:0:0:0:1"
          addressType = "IPV6"
          key = 20001004
          prefixLength = 64
        },
      index = 3
      key = 50006
      metrics = ""
      name = "ppp"
      properties =
        (properties){
          entry[] =
            (entry){
              key = "physAddress"
              value = "0007810800a80bfe"
            },
          }
    },
    updatedMetrics = ""
    updatedProperties =
      (updatedProperties){
        entry[] =
          (entry){
            key = "runningFirmwareImageId"
            value = "null"
          },
          (entry){
            key = "lastUpdate"
            value = "2015-03-12 21:28:48.0"
          },
          (entry){
            key = "meshPanid"
            value = "26930"
          },
          (entry){
            key = "lng"
            value = "-88.66548868"
          },
          (entry){
            key = "reloadFirmwareVersion"
            value = "null"
          },
          (entry){
            key = "activeLinkType"
            value = "RF"
          },
        },
      }
```

```
(entry){
  key = "reloadDate"
  value = "1970-01-01 00:00:00.0"
},
(entry){
  key = "backupFirmwareVersion"
  value = "null"
},
(entry){
  key = "slot4FirmwareImageId"
  value = "null"
},
(entry){
  key = "deviceType"
  value = "cgmesh"
},
(entry){
  key = "alt"
  value = "null"
},
(entry){
  key = "name"
  value = "0007810800a80bfe"
},
(entry){
  key = "configInSync"
  value = "true"
},
(entry){
  key = "runningFirmwareVersion"
  value = "5.5.62"
},
(entry){
  key = "hardwareId"
  value = "null"
},
(entry){
  key = "vid"
  value = "3.1"
},
(entry){
  key = "lat"
  value = "43.56901132"
},
(entry){
  key = "slot5FirmwareImageId"
  value = "null"
},
(entry){
  key = "sn"
  value = "0007810800A80BFE"
},
(entry){
  key = "backupFirmwareImageId"
  value = "null"
},
(entry){
  key = "status"
  value = "outage"
},
(entry){
  key = "hostname"
  value = "null"
},
(entry){
```

Search API Method Calls

```

        key = "pid"
        value = "OWCM"
    },
    (entry){
        key = "lastHeard"
        value = "2015-02-24 18:59:52.0"
    },
    (entry){
        key = "mapLevel"
        value = "16"
    },
    (entry){
        key = "ip"
        value = "2010:dead:beef:cafe:0:8108:a8:bfe"
    },
    (entry){
        key = "downloadFirmwareVersion"
        value = "null"
    },
    (entry){
        key = "slot6FirmwareImageId"
        value = "null"
    },
    (entry){
        key = "geoHash"
        value = "dp8zy77zbn7u02v6jxzgn"
    },
    (entry){
        key = "downloadFirmwareImageId"
        value = "null"
    },
    (entry){
        key = "previousMeshPanid"
        value = "2015"
    },
}
updatedRoutes[] =
(route){
    index = 1
    key = 100005
    metrics = ""
    properties =
        (properties){
            entry[] =
                (entry){
                    key = "destAddressType"
                    value = "2"
                },
                (entry){
                    key = "nextHopAddressType"
                    value = "4"
                },
                (entry){
                    key = "nextHopAddress"
                    value = "fe80:0:0:0:207:8108:bf:a053"
                },
                (entry){
                    key = "destAddress"
                    value = "0:0:0:0:0:0:0:0"
                },
                (entry){
                    key = "prefixLength"
                    value = "0"
                }
        }
}

```

```

        },
    },
},
(updatedDeviceDetail){
    configGroup = "default-cgmesh"
    eid = "0007810800a80d40"
    firmwareGroup = "default-cgmesh"
    key = 20126
    updatedAddresses[] =
        (address){
            address = "2010:dead:beef:cafe:0:8108:a8:d40"
            addressType = "IPV6"
            key = 20001009
            prefixLength = 64
        },
        (address){
            address = "fe80:0:0:0:0:0:0:1"
            addressType = "IPV6"
            key = 20001010
            prefixLength = 64
        },
        (address){
            address = "0:0:0:0:0:0:0:1"
            addressType = "IPV6"
            key = 20001011
            prefixLength = 128
        },
        (address){
            address = "fe80:0:0:0:207:8108:a8:d40"
            addressType = "IPV6"
            key = 20001008
            prefixLength = 64
        },
    updatedInterfaces[] =
        (interface){
            addresses[] =
                (address){
                    address = "0:0:0:0:0:0:0:1"
                    addressType = "IPV6"
                    key = 20001011
                    prefixLength = 128
                },
            index = 1
            key = 50007
            metrics = ""
            name = "lo"
            properties = ""
        },
        (interface){
            addresses[] =
                (address){
                    address = "2010:dead:beef:cafe:0:8108:a8:d40"
                    addressType = "IPV6"
                    key = 20001009
                    prefixLength = 64
                },
                (address){
                    address = "fe80:0:0:0:207:8108:a8:d40"
                    addressType = "IPV6"
                    key = 20001008
                    prefixLength = 64
                },
            index = 2
            key = 50008

```

```
metrics = ""
name = "lowpan"
properties =
  (properties){
    entry[] =
      (entry){
        key = "physAddress"
        value = "0007810800a80d40"
      },
    }
},
(interface){
  addresses[] =
    (address){
      address = "fe80:0:0:0:0:0:0:1"
      addressType = "IPV6"
      key = 20001010
      prefixLength = 64
    },
  index = 3
  key = 50009
  metrics = ""
  name = "ppp"
  properties =
    (properties){
      entry[] =
        (entry){
          key = "physAddress"
          value = "0007810800a80d40"
        },
      }
    },
  },
updatedMetrics = ""
updatedProperties =
  (updatedProperties){
    entry[] =
      (entry){
        key = "runningFirmwareImageId"
        value = "null"
      },
      (entry){
        key = "lastUpdate"
        value = "2015-03-12 21:28:48.0"
      },
      (entry){
        key = "meshPanid"
        value = "26930"
      },
      (entry){
        key = "lng"
        value = "-88.96548868"
      },
      (entry){
        key = "reloadFirmwareVersion"
        value = "null"
      },
      (entry){
        key = "activeLinkType"
        value = "RF"
      },
      (entry){
        key = "reloadDate"
        value = "1970-01-01 00:00:00.0"
      }
  },
}
```

```
    },
    (entry){
        key = "backupFirmwareVersion"
        value = "null"
    },
    (entry){
        key = "slot4FirmwareImageId"
        value = "null"
    },
    (entry){
        key = "deviceType"
        value = "cgmesh"
    },
    (entry){
        key = "alt"
        value = "null"
    },
    (entry){
        key = "name"
        value = "0007810800a80d40"
    },
    (entry){
        key = "configInSync"
        value = "true"
    },
    (entry){
        key = "runningFirmwareVersion"
        value = "5.5.42"
    },
    (entry){
        key = "hardwareId"
        value = "null"
    },
    (entry){
        key = "vid"
        value = "3.1"
    },
    (entry){
        key = "lat"
        value = "43.46901132"
    },
    (entry){
        key = "slot5FirmwareImageId"
        value = "null"
    },
    (entry){
        key = "sn"
        value = "0007810800A80D40"
    },
    (entry){
        key = "backupFirmwareImageId"
        value = "null"
    },
    (entry){
        key = "status"
        value = "outage"
    },
    (entry){
        key = "hostname"
        value = "null"
    },
    (entry){
        key = "pid"
        value = "OWCM"
    },
    },
```



```
(entry){
  key = "lastHeard"
  value = "2015-02-23 23:27:00.0"
},
(entry){
  key = "mapLevel"
  value = "16"
},
(entry){
  key = "ip"
  value = "2010:dead:beef:cafe:0:8108:a8:d40"
},
(entry){
  key = "downloadFirmwareVersion"
  value = "5.5.59"
},
(entry){
  key = "slot6FirmwareImageId"
  value = "null"
},
(entry){
  key = "geoHash"
  value = "dp8xr9333g58c96cplptr"
},
(entry){
  key = "downloadFirmwareImageId"
  value = "null"
},
(entry){
  key = "previousMeshPanid"
  value = "2015"
},
}
updatedRoutes[] =
(route){
  index = 1
  key = 100006
  metrics = ""
  properties =
  (properties){
    entry[] =
    (entry){
      key = "destAddressType"
      value = "2"
    },
    (entry){
      key = "nextHopAddressType"
      value = "4"
    },
    (entry){
      key = "nextHopAddress"
      value = "fe80:0:0:0:207:8108:cc:e50b"
    },
    (entry){
      key = "destAddress"
      value = "0:0:0:0:0:0:0:0"
    },
    (entry){
      key = "prefixLength"
      value = "0"
    },
  },
}
},
```

```
},
(updatedDeviceDetail){
  configGroup = "default-cgmesh"
  eid = "0007810800bf38e7"
  firmwareGroup = "default-cgmesh"
  key = 20130
  updatedAddresses[] =
    (address){
      address = "fe80:0:0:0:207:8108:bf:38e7"
      addressType = "IPV6"
      key = 104001023
      prefixLength = 64
    },
    (address){
      address = "fe80:0:0:0:0:0:0:1"
      addressType = "IPV6"
      key = 104001024
      prefixLength = 64
    },
    (address){
      address = "2011:dead:beef:cafe:0:8108:bf:38e7"
      addressType = "IPV6"
      key = 104001025
      prefixLength = 64
    },
    (address){
      address = "0:0:0:0:0:0:0:1"
      addressType = "IPV6"
      key = 104001026
      prefixLength = 128
    },
  updatedInterfaces[] =
    (interface){
      addresses[] =
        (address){
          address = "0:0:0:0:0:0:0:1"
          addressType = "IPV6"
          key = 104001026
          prefixLength = 128
        },
      index = 1
      key = 250016
      metrics = ""
      name = "lo"
      properties = ""
    },
    (interface){
      addresses[] =
        (address){
          address = "fe80:0:0:0:207:8108:bf:38e7"
          addressType = "IPV6"
          key = 104001023
          prefixLength = 64
        },
        (address){
          address = "2011:dead:beef:cafe:0:8108:bf:38e7"
          addressType = "IPV6"
          key = 104001025
          prefixLength = 64
        },
      index = 2
      key = 250017
      metrics = ""
      name = "lowpan"
      properties =
```

```
        (properties){
            entry[] =
                (entry){
                    key = "physAddress"
                    value = "0007810800bf38e7"
                },
        }
    },
    (interface){
        addresses[] =
            (address){
                address = "fe80:0:0:0:0:0:1"
                addressType = "IPV6"
                key = 104001024
                prefixLength = 64
            },
        index = 3
        key = 250018
        metrics = ""
        name = "ppp"
        properties =
            (properties){
                entry[] =
                    (entry){
                        key = "physAddress"
                        value = "0007810800bf38e7"
                    },
            }
    },
    updatedMetrics =
        (updatedMetrics){
            entry[] =
                (entry){
                    key = "nodeLocalTime"
                    value = 1427113644.0
                },
        }
    updatedProperties =
        (updatedProperties){
            entry[] =
                (entry){
                    key = "runningFirmwareImageId"
                    value = "null"
                },
                (entry){
                    key = "lastUpdate"
                    value = "2015-03-23 12:27:24.0"
                },
                (entry){
                    key = "meshPanid"
                    value = "118"
                },
                (entry){
                    key = "lng"
                    value = "-87.71548868"
                },
                (entry){
                    key = "reloadFirmwareVersion"
                    value = "null"
                },
                (entry){
                    key = "reloadDate"
                    value = "null"
                }
        }
    }
```

```
    },
    (entry){
        key = "backupFirmwareVersion"
        value = "null"
    },
    (entry){
        key = "slot4FirmwareImageId"
        value = "null"
    },
    (entry){
        key = "deviceType"
        value = "cgmesh"
    },
    (entry){
        key = "alt"
        value = "null"
    },
    (entry){
        key = "name"
        value = "0007810800bf38e7"
    },
    (entry){
        key = "configInSync"
        value = "false"
    },
    (entry){
        key = "runningFirmwareVersion"
        value = "5.5.42"
    },
    (entry){
        key = "hardwareId"
        value = "null"
    },
    (entry){
        key = "vid"
        value = "3.1"
    },
    (entry){
        key = "lat"
        value = "42.16901532"
    },
    (entry){
        key = "slot5FirmwareImageId"
        value = "null"
    },
    (entry){
        key = "sn"
        value = "0007810800BF38E7"
    },
    (entry){
        key = "backupFirmwareImageId"
        value = "null"
    },
    (entry){
        key = "status"
        value = "down"
    },
    (entry){
        key = "hostname"
        value = "null"
    },
    (entry){
        key = "pid"
        value = "OWCM"
    },
    },
```

```
(entry){
  key = "lastHeard"
  value = "2015-03-23 12:26:00.0"
},
(entry){
  key = "mapLevel"
  value = "16"
},
(entry){
  key = "ip"
  value = "2011:dead:beef:cafe:0:8108:bf:38e7"
},
(entry){
  key = "downloadFirmwareVersion"
  value = "null"
},
(entry){
  key = "meshSsid"
  value = "sjklin-internal"
},
(entry){
  key = "slot6FirmwareImageId"
  value = "null"
},
(entry){
  key = "meterCert"
  value = "host/smartmeter"
},
(entry){
  key = "geoHash"
  value = "dp3xguxs2fpne6gfgtjyw"
},
(entry){
  key = "downloadFirmwareImageId"
  value = "null"
},
(entry){
  key = "meshTxPower"
  value = "-34"
},
(entry){
  key = "previousMeshPanid"
  value = "null"
},
(entry){
  key = "meshSecMode"
  value = "1"
},
}
},
})
```

getMetricHistory

This call lets the client retrieve the historical metric values saved in the IoT FND database by specifying the following:

- Single device
- List of devices
- Query that returns devices

You can also specify a rollup interval from the following:

- none
- hour
- day

And a rollup function from the following:

- avg
- max
- min

Prototype

```
MetricHistoryQueryResult getMetricHistory(string query, list<string> deviceIds, date startTime,
                                             date endTime, list<string> metricIds, string rollupInterval,
                                             string rollupFunction, string queryId, long count,
                                             long offset)
```

Parameters

Table 16 getMetricHistory Parameters

Parameter	Type	Description
query	string	Search query string
deviceIds	list<string>	List of device EIDs to retrieve.
startTime	date	Starting UTC date and time for the metric history interval; use null if not defined.
endTime	date	Ending UTC date and time for the metric history interval; use null if not defined.
metricIds	list<string>	List of metric type names to retrieve for each device.
rollupInterval	string	Valid values are <i>none</i> , <i>hour</i> , or <i>day</i> .
rollupFunction	string	Valid values are <i>avg</i> , <i>max</i> , or <i>min</i> .
queryId	string	If available results for the <i>query</i> is more than <i>count</i> , the caller can use the returned <i>queryId</i> to call the same API repeatedly. When <i>queryId</i> is provided, all other parameters are ignored.
count	long	Number of results to retrieve. Valid range is 1-40000
offset	long	Position of the first result. Valid values are ≥ 0 .

Results

This interface returns a list of metric values, as defined in [Table 17](#).

Table 17 getMetricHistory Results

Parameter	Type	Description
eid	string	String ID of the device.
metricId	string	Metric type name.
timestamp	date	UTC timestamp of the metric value.
value	double	Value of the metric.

getMetricHistory SOAP XML Request Format

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:sear="http://search.nbapi.cgms.cisco.com/">
  <soapenv:Header/>
  <soapenv:Body>
    <sear:getMetricHistory>
      <!--Optional:-->
      <query>deviceType:cgr1000</query>
      <!--Zero or more repetitions:-->
      <deviceIds>far_test3</deviceIds>
      <!--Optional:-->
      <startTime>null</startTime>
      <!--Optional:-->
      <endTime>null</endTime>
      <!--Zero or more repetitions:-->
      <metricIds>1</metricIds>
      <!--Optional:-->
      <rollupInterval>none</rollupInterval>
      <!--Optional:-->
      <rollupFunction>min</rollupFunction>
      <!--Optional:-->
      <queryId></queryId>
      <!--Optional:-->
      <count>5</count>
      <!--Optional:-->
      <offset>1</offset>
    </sear:getMetricHistory>
  </soapenv:Body>
</soapenv:Envelope>
```

findEidsForIpAddresses

This call retrieves the EID of devices based on the IP address, and allows the Collection Engine to communicate to IoT FND which devices to migrate.

Prototype

```
EidsForIpAddressesResult findEidsForIpAddresses(list<string> ipAddresses)
```

Parameters

Table 18 findEidsForIpAddresses Parameters

Parameter	Type	Description
ipAddresses	list<string>	<p>The list of IP addresses with EIDs corresponding to devices to search for.</p> <p>Note: The list is limited to a maximum of 1000 IP addresses. An error returns if more than 1000 are specified.</p> <p>IoT FND does not support inputs as GRE Tunnel IPv6 addresses.</p>

Results

This call always returns a response of type EidsForIpAddressesResult. The queryStatus value defines any errors.

On success, the eidMap contains correlations between the IP address and the EID of the device with that IP address. If an IP address is not mapped to a device, those IP addresses are included in the invalidMappings value.

[Table 19](#) describes the parameters in the response.

Table 19 findEidsForIpAddresses Results

Parameter	Type	Description
eidMap	map<string,string>	Map of IP addresses-to-EIDs, where the address maps to a single CGR.
invalidMappings	list<string>	List of IP addresses that did not correspond to any CGR.

findEidsForIpAddressesByDeviceType

This call retrieves the EID of devices based on the device type, and allows the Collection Engine to communicate to IoT FND which devices to migrate.

Prototype

```
EidsForIpAddressesResult findEidsForIpAddressesByDeviceType(string deviceType,
                                                           list<string> ipAddresses)
```

Parameters

Table 20 findEidsForIpAddressesByDeviceType Parameters

Parameter	Type	Description
deviceType	string	The name of the device type with EIDs corresponding to devices to search for. For example, cgr1000 only matches IP addresses against CGR devices.
ipAddresses	list<string>	Returns a list of uplink IP addresses the collection engine uses to track CGR devices. WAN or IPSEC Tunnel. Note: The list is limited to a maximum of 1000 IP addresses. An error returns if more than 1000 are specified. IoT FND does not support inputs as GRE Tunnel IPv6 addresses.

Results

This call always returns a response of type EidsForIpAddressesResult. The queryStatus value defines any errors.

On success, the eidMap contains correlations between the IP address and the EID of the device with that IP address. If an IP address is not mapped to a device of the specified deviceType, those IP addresses are included in the invalidMappings value.

Table 21 describes the parameters in the response.

Table 21 findEidsForIpAddressesByDeviceType Results

Parameter	Type	Description
eidMap	map<string,string>	Map of IP addresses-to-EIDs, where the address maps to a single CGR.
invalidMappings	list<string>	List of IP addresses that did not correspond to any CGR.

