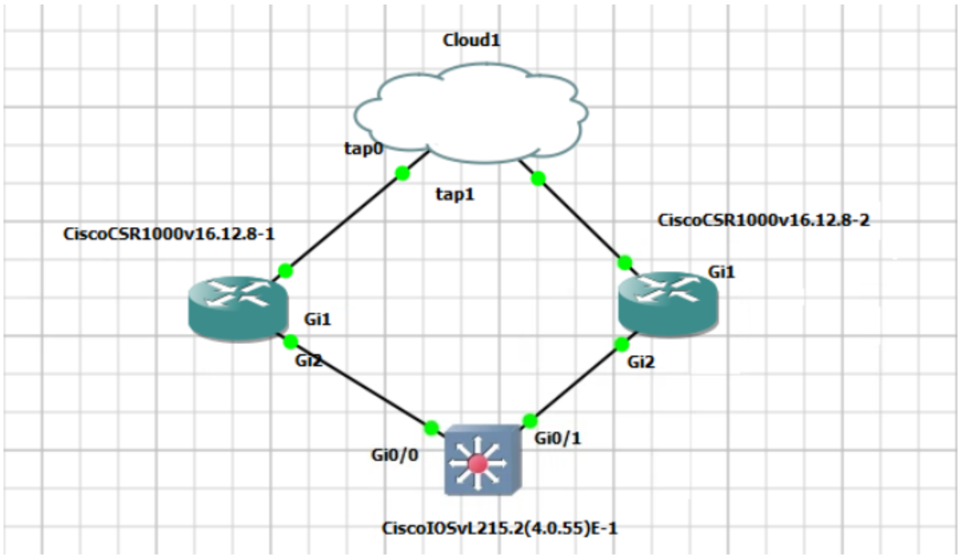
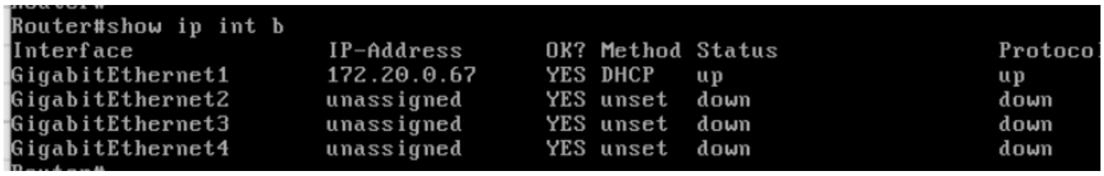
Enable the NETCONF configuration in router

Build the Network Topology in GNS3 as per below



DHCP will allocate the IP address to the Router



```
Router#show ip int b
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet1       172.20.0.67     YES DHCP   up                    up
GigabitEthernet2       unassigned      YES unset  down                  down
GigabitEthernet3       unassigned      YES unset  down                  down
GigabitEthernet4       unassigned      YES unset  down                  down
```

Go to Config Mode:

Conf t

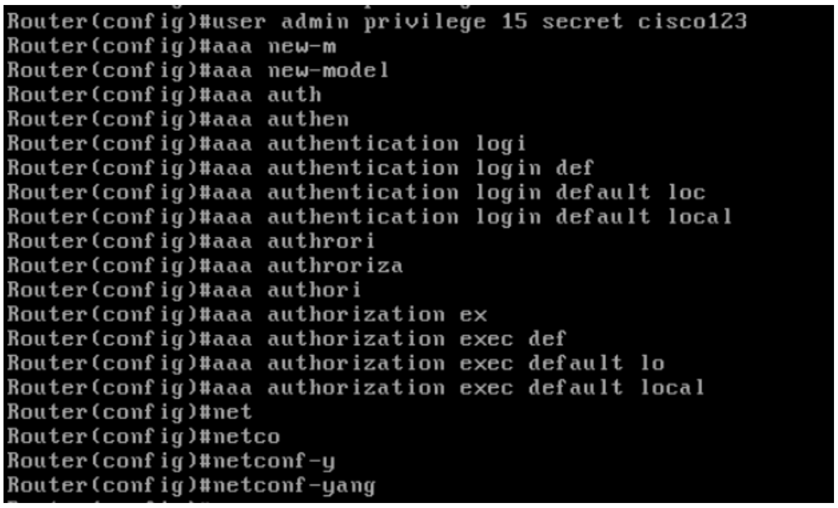
user admin privilege 15 secret cisco123

aaa new-model

aaa authentication login default local

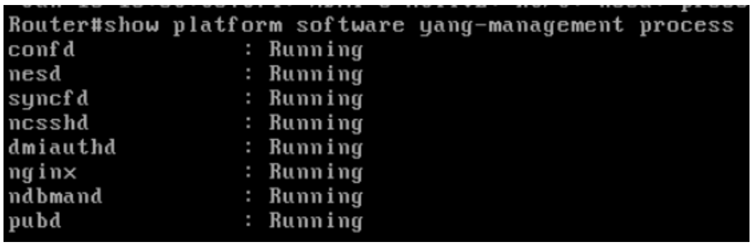
aaa authorization exec default local

Netconf-yang



```
Router(config)#user admin privilege 15 secret cisco123
Router(config)#aaa new-m
Router(config)#aaa new-model
Router(config)#aaa auth
Router(config)#aaa authen
Router(config)#aaa authentication logi
Router(config)#aaa authentication login def
Router(config)#aaa authentication login default loc
Router(config)#aaa authentication login default local
Router(config)#aaa authrori
Router(config)#aaa authroriza
Router(config)#aaa authori
Router(config)#aaa authorization ex
Router(config)#aaa authorization exec def
Router(config)#aaa authorization exec default lo
Router(config)#aaa authorization exec default local
Router(config)#net
Router(config)#netco
Router(config)#netconf-y
Router(config)#netconf-yang
```

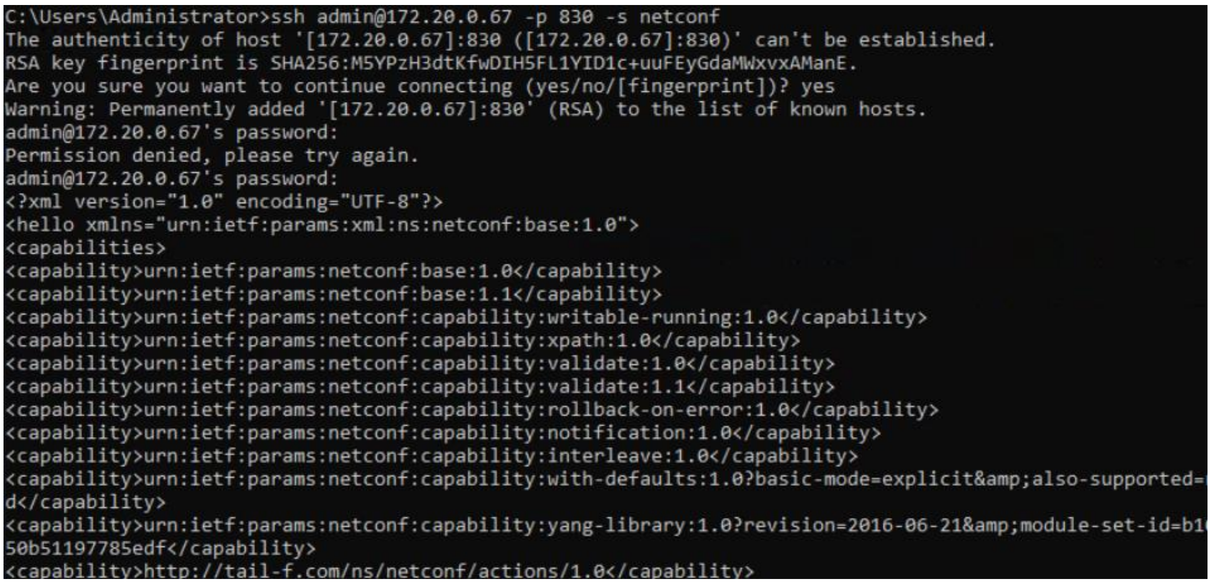
Show platform software yang-management process



```
Router#show platform software yang-management process
confd            : Running
nesd             : Running
syncfd           : Running
ncsshd           : Running
dmiauthd         : Running
nginx            : Running
ndbmand          : Running
pubd             : Running
```

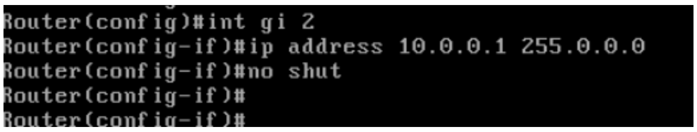
Go to Command prompt and check the yang connectivity

Ssh admin@IP -p 830 –s netconf   -- connect via cmd prompt



```
C:\Users\Administrator>ssh admin@172.20.0.67 -p 830 -s netconf
The authenticity of host '[172.20.0.67]:830 ([172.20.0.67]:830)' can't be established.
RSA key fingerprint is SHA256:M5YPzH3dtKfwDIH5FL1YID1c+uuFEyGdaMWxvxAManE.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '[172.20.0.67]:830' (RSA) to the list of known hosts.
admin@172.20.0.67's password:
Permission denied, please try again.
admin@172.20.0.67's password:
<?xml version="1.0" encoding="UTF-8"?>
<hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
<capabilities>
<capability>urn:ietf:params:netconf:base:1.0</capability>
<capability>urn:ietf:params:netconf:base:1.1</capability>
<capability>urn:ietf:params:netconf:capability:writable-running:1.0</capability>
<capability>urn:ietf:params:netconf:capability:xpath:1.0</capability>
<capability>urn:ietf:params:netconf:capability:validate:1.0</capability>
<capability>urn:ietf:params:netconf:capability:validate:1.1</capability>
<capability>urn:ietf:params:netconf:capability:rollback-on-error:1.0</capability>
<capability>urn:ietf:params:netconf:capability:notification:1.0</capability>
<capability>urn:ietf:params:netconf:capability:interleave:1.0</capability>
<capability>urn:ietf:params:netconf:capability:with-defaults:1.0?basic-mode=explicit&amp;also-supported=
d</capability>
<capability>urn:ietf:params:netconf:capability:yang-library:1.0?revision=2016-06-21&amp;module-set-id=b1
50b51197785edf</capability>
<capability>http://tail-f.com/ns/netconf/actions/1.0</capability>
```

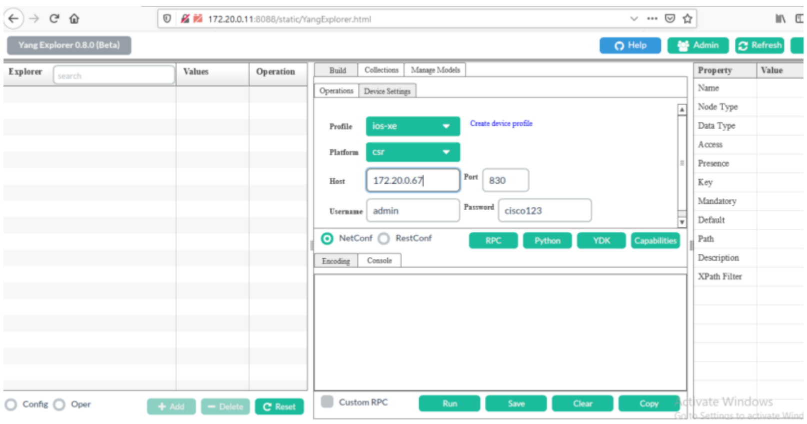
Add the additional Gi2 interface to router and assign the IP 10.0.0.1



```
Router(config)#int gi 2
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#
```

Login to YANG Explorer:

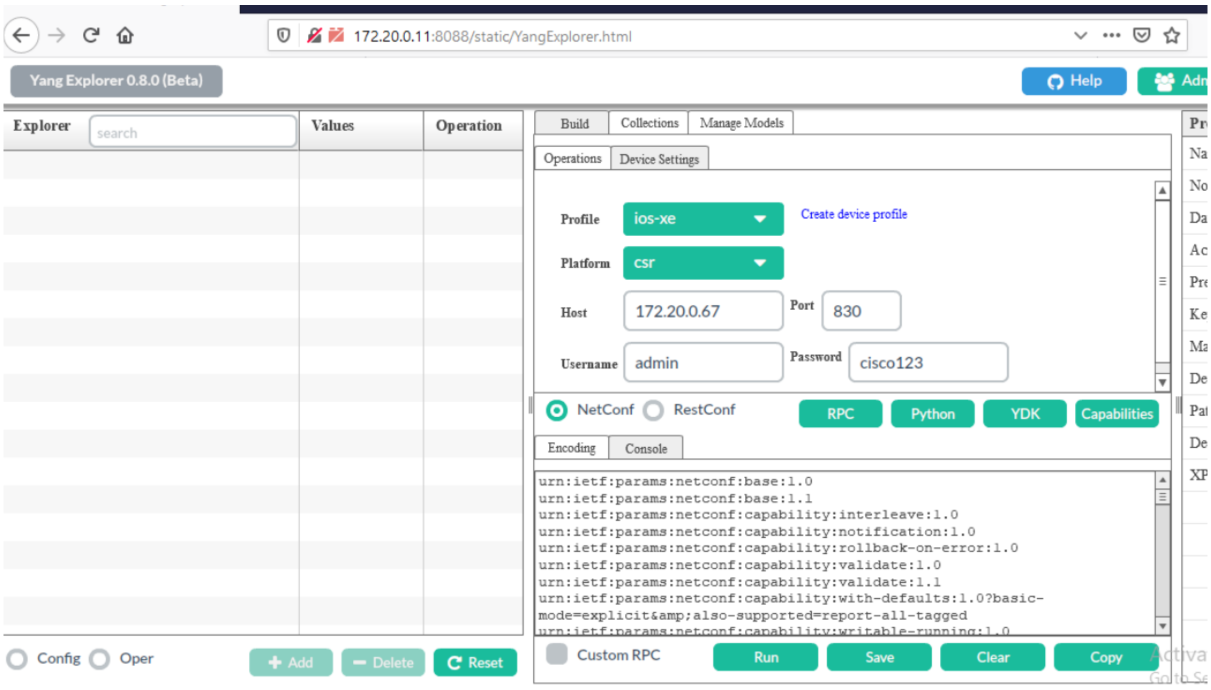
https://172.20.0.11:8088/static/YangExplorer.html (guest/guest)



172.20.0.11:8088/static/YangExplorer.html

Profile: ios-xe
Platform: csr
Host: 172.20.0.67
Port: 830
Username: admin
Password: cisco123
[✓ NetConf] RestConf

Click on capability, router will exchange the capability.

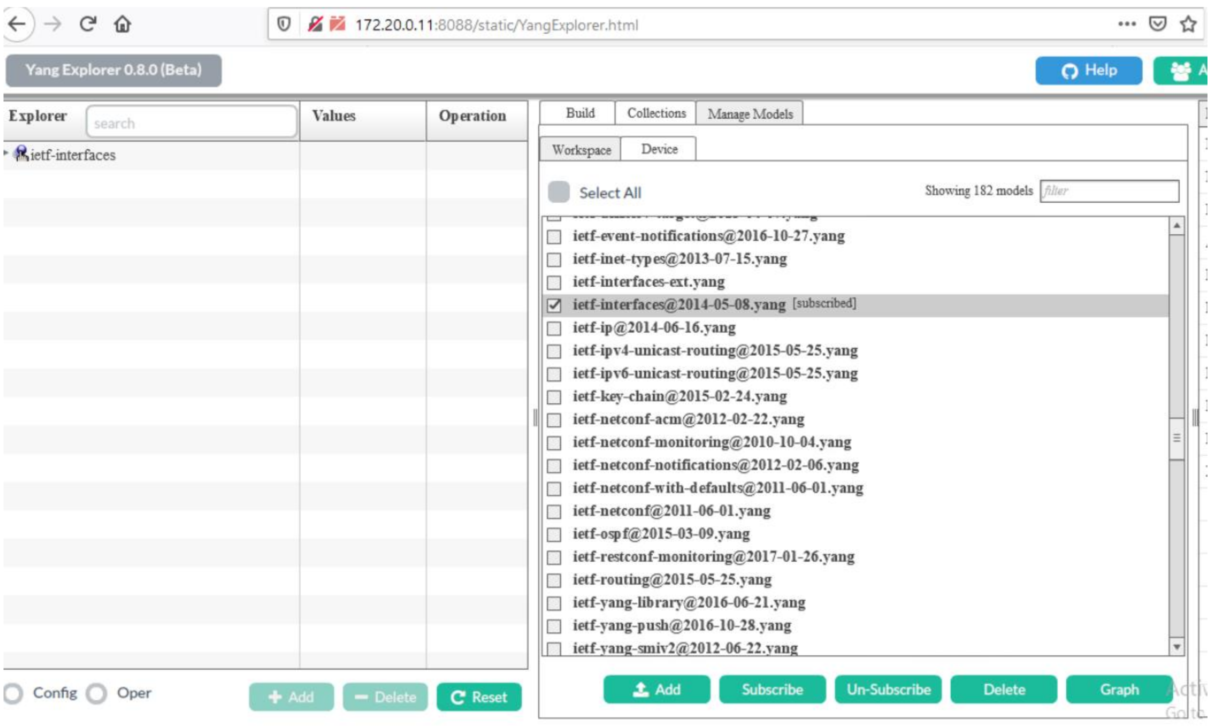


172.20.0.11:8088/static/YangExplorer.html

Profile: ios-xe
Platform: csr
Host: 172.20.0.67
Port: 830
Username: admin
Password: cisco123
[✓ NetConf] RestConf

```
urn:ietf:params:netconf:base:1.0
urn:ietf:params:netconf:base:1.1
urn:ietf:params:netconf:capability:interleave:1.0
urn:ietf:params:netconf:capability:notification:1.0
urn:ietf:params:netconf:capability:rollback-on-error:1.0
urn:ietf:params:netconf:capability:validate:1.0
urn:ietf:params:netconf:capability:validate:1.1
urn:ietf:params:netconf:capability:with-defaults:1.0?basic-
mode=explicit&amp;also-supported=report-all-tagged
urn:ietf:params:netconf:capability:writable-running:1.0
```

Click on Manage model and subscribe the ietf-interface yang model

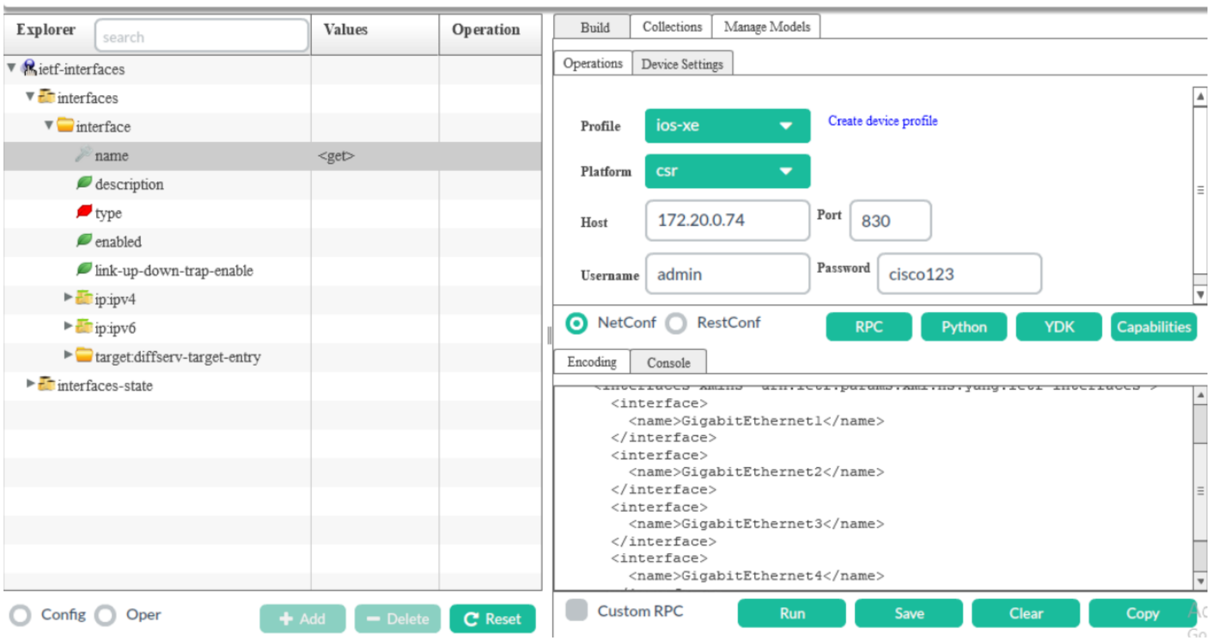


172.20.0.11:8088/static/YangExplorer.html

Showing 182 models

```
ietf-event-notifications@2016-10-27.yang
ietf-inet-types@2013-07-15.yang
ietf-interfaces-ext.yang
☑ ietf-interfaces@2014-05-08.yang [subscribed]
ietf-ip@2014-06-16.yang
ietf-ipv4-unicast-routing@2015-05-25.yang
ietf-ipv6-unicast-routing@2015-05-25.yang
ietf-key-chain@2015-02-24.yang
ietf-netconf-acm@2012-02-22.yang
ietf-netconf-monitoring@2010-10-04.yang
ietf-netconf-notifications@2012-02-06.yang
ietf-netconf-with-defaults@2011-06-01.yang
ietf-netconf@2011-06-01.yang
ietf-ospf@2015-03-09.yang
ietf-restconf-monitoring@2017-01-26.yang
ietf-routing@2015-05-25.yang
ietf-yang-library@2016-06-21.yang
ietf-yang-push@2016-10-28.yang
ietf-yang-smiv2@2012-06-22.yang
```

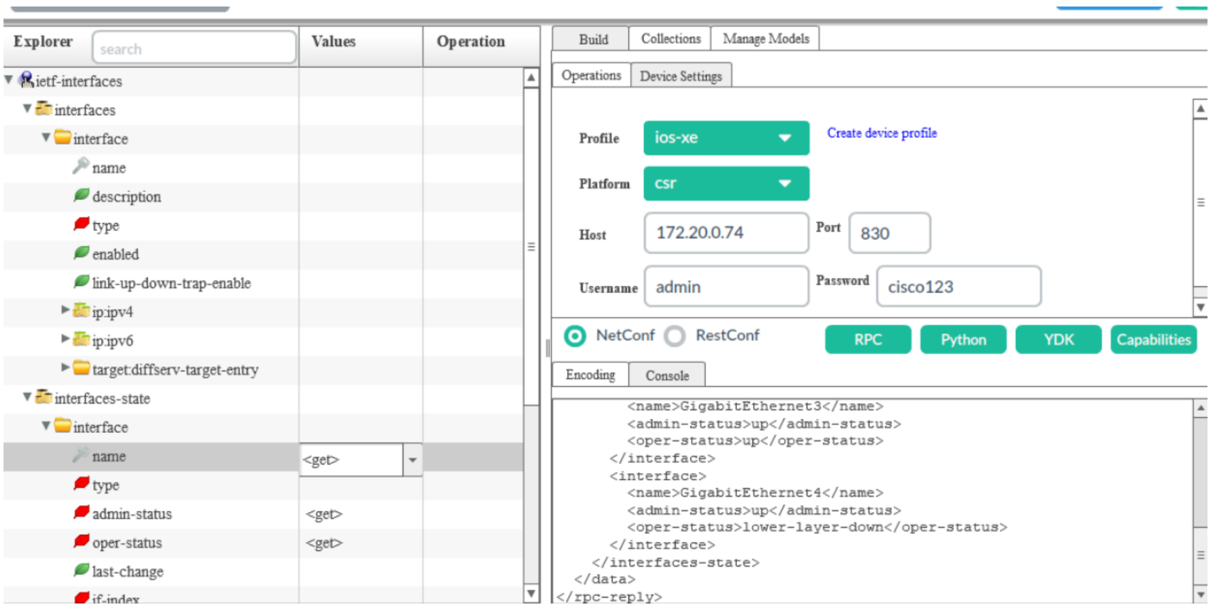
Example 1; Get the Router Interface Name



Profile: ios-xe
Platform: csr
Host: 172.20.0.74
Port: 830
Username: admin
Password: cisco123
[✓ NetConf] RestConf

```
  <interface>
    <name>GigabitEthernet1</name>
  </interface>
  <interface>
    <name>GigabitEthernet2</name>
  </interface>
  <interface>
    <name>GigabitEthernet3</name>
  </interface>
  <interface>
    <name>GigabitEthernet4</name>
```

Example 2; Get the Router Interface admin and Operation state

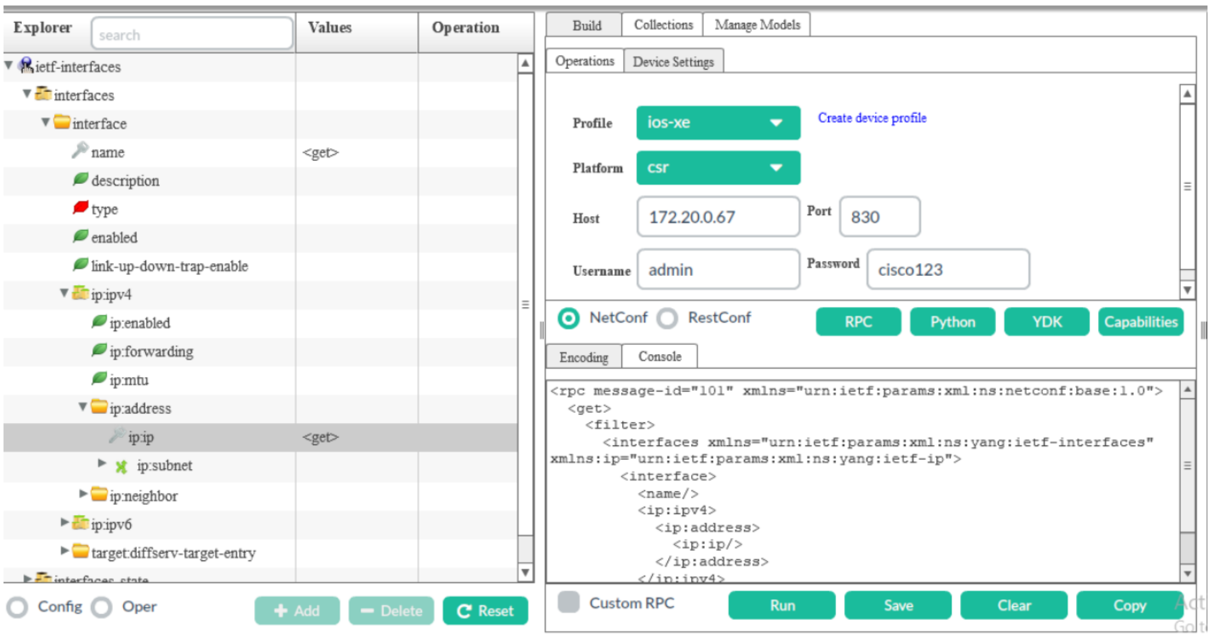


name: <get>
admin-status: <get>
oper-status: <get>

Profile: ios-xe
Platform: csr
Host: 172.20.0.74
Port: 830
Username: admin
Password: cisco123

```
            <name>GigabitEthernet3</name>
            <admin-status>up</admin-status>
            <oper-status>up</oper-status>
          </interface>
          <interface>
            <name>GigabitEthernet4</name>
            <admin-status>up</admin-status>
            <oper-status>lower-layer-down</oper-status>
          </interface>
        </interfaces-state>
      </data>
    </rpc-reply>
```

Example 3: Run the YANG query and get the Router interface and IP details

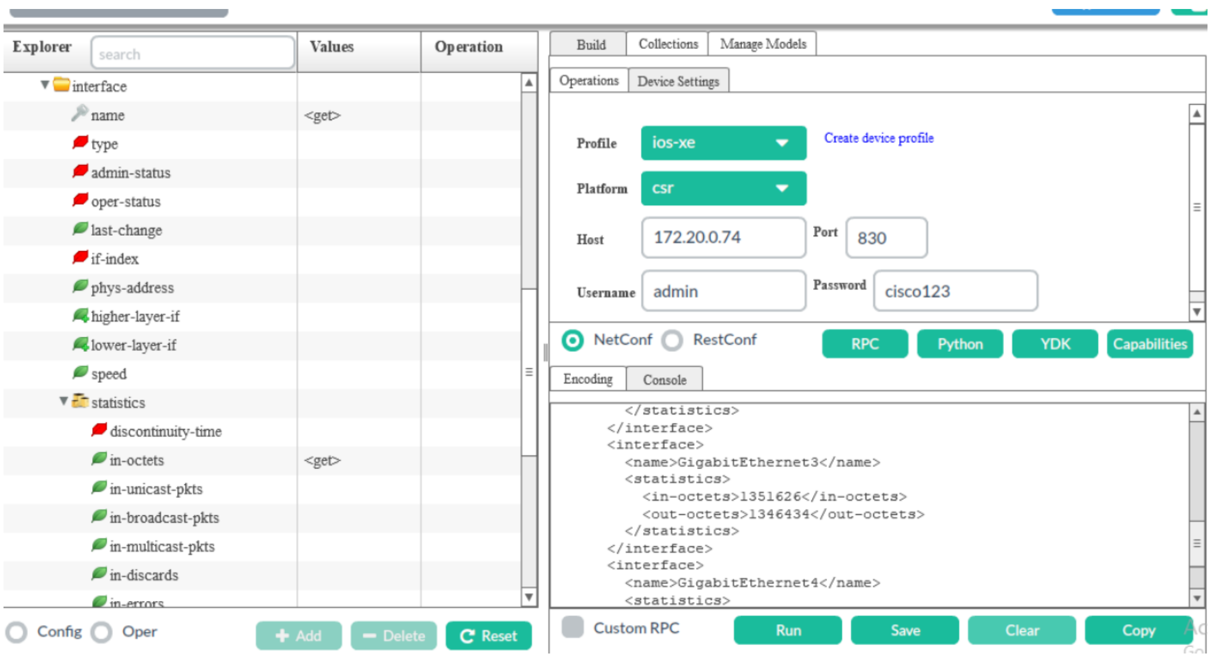


name: <get>
ip:ip: <get>

Profile: ios-xe
Platform: csr
Host: 172.20.0.67
Port: 830
Username: admin
Password: cisco123

```
<rpc message-id="101" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get>
    <filter>
      <interfaces xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces"
xmlns:ip="urn:ietf:params:xml:ns:yang:ietf-ip">
        <interface>
          <name/>
          <ip:ipv4>
            <ip:address>
              <ip:ip/>
            </ip:address>
          </ip:ipv4>
```

Example 4; Run the YANG query and get the Router interface stats



Profile: ios-xe
Platform: csr
Host: 172.20.0.74
Port: 830
Username: admin
Password: cisco123
[✓ NetConf] RestConf

```
      </statistics>
    </interface>
    <interface>
      <name>GigabitEthernet3</name>
      <statistics>
        <in-octets>1351626</in-octets>
        <out-octets>1346434</out-octets>
      </statistics>
    </interface>
    <interface>
      <name>GigabitEthernet4</name>
      <statistics>
```

Other Example

Run the custom query for below :

1: Get the router hostname

2: Change the Router hostname

3: Change the interface operational status

4: Check the IP address

5: Assign the Ip address on interface

6: configure the loopback IP address

7: Attempt to create new loopback interface with same IP address

8: Delete the Loopback ip address

9: Delete the loopback interface

10: Get Complete config

11: Get the filtered configuration

12: Enable Candidate data store

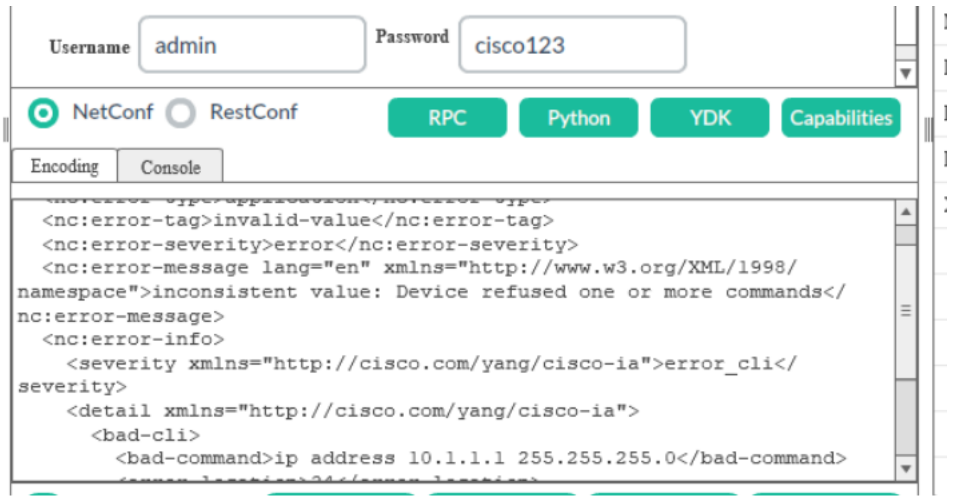
13: make the changes on candidate data store

14: Commit the changes on candidate

15: Copy configuration from running to candidate

16: Close the session

Attempt to create a new loopback interface with the same IPv4 address and get the Error from router

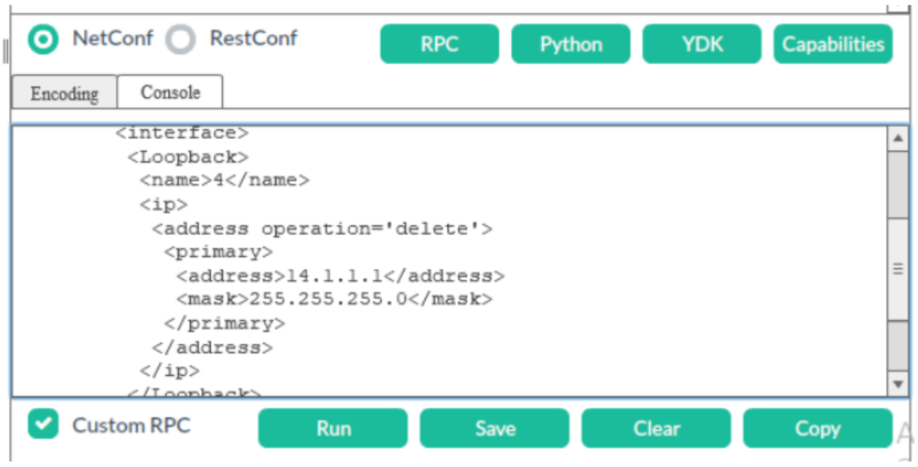


Username admin Password cisco123

[✓ NetConf] RestConf

```
  <nc:error-tag>invalid-value</nc:error-tag>
  <nc:error-severity>error</nc:error-severity>
  <nc:error-message lang="en" xmlns="http://www.w3.org/XML/1998/
namespace">inconsistent value: Device refused one or more commands</
nc:error-message>
  <nc:error-info>
    <severity xmlns="http://cisco.com/yang/cisco-ia">error_cli</
severity>
    <detail xmlns="http://cisco.com/yang/cisco-ia">
      <bad-cli>
        <bad-command>ip address 10.1.1.1 255.255.255.0</bad-command>
```

Delete the Loopback IP address

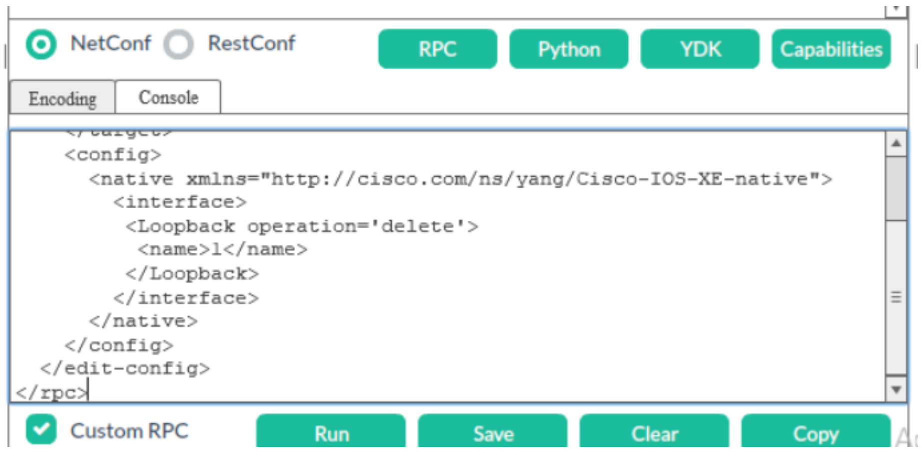


[✓ NetConf] RestConf

```
        <interface>
         <Loopback>
          <name>4</name>
          <ip>
           <address operation='delete'>
            <primary>
             <address>14.1.1.1</address>
             <mask>255.255.255.0</mask>
            </primary>
           </address>
          </ip>
         </Loopback>
```

[✓ Custom RPC]

Delete the Loopback interface

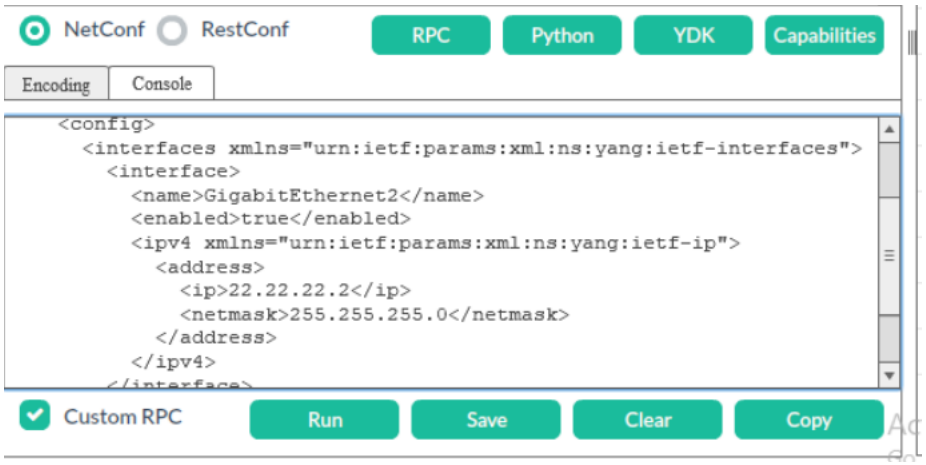


[✓ NetConf] RestConf

```
    </target>
    <config>
      <native xmlns="http://cisco.com/ns/yang/Cisco-IOS-XE-native">
        <interface>
         <Loopback operation='delete'>
          <name>1</name>
         </Loopback>
        </interface>
      </native>
    </config>
  </edit-config>
</rpc>
```

[✓ Custom RPC]

Assign the IP address on Gi2 interface



```
    <config>
      <interfaces xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces">
        <interface>
          <name>GigabitEthernet2</name>
          <enabled>true</enabled>
          <ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
            <address>
              <ip>22.22.22.2</ip>
              <netmask>255.255.255.0</netmask>
            </address>
          </ipv4>
```

Enable Candidate Data Store Capability

Conf t

user admin privilege 15 secret cisco123

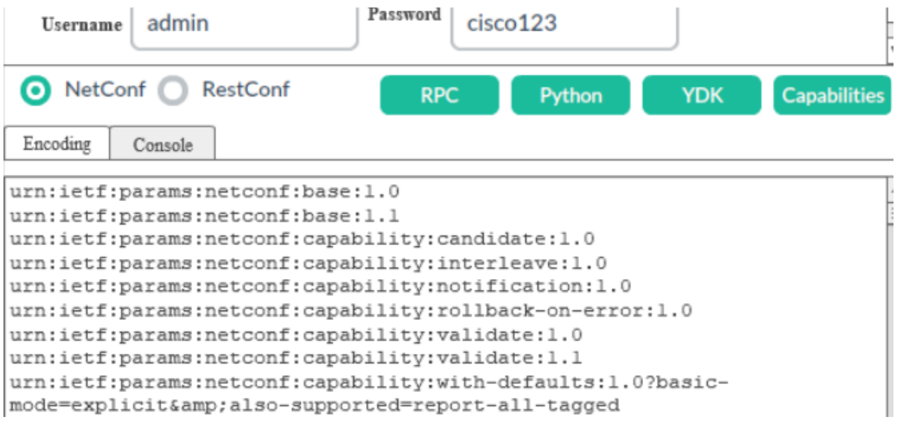
aaa new-model

aaa authentication login default local

aaa authorization exec default local

Netconf-yang feature candidate-datastore

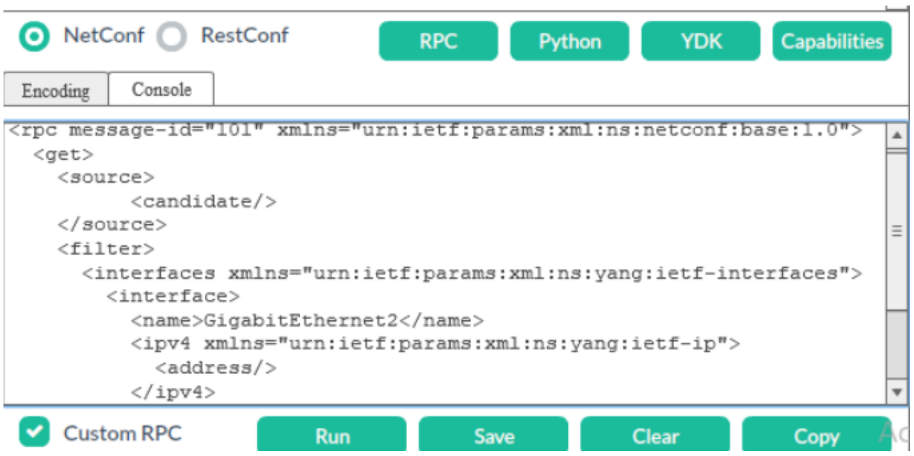
Netconf-yang



Username admin Password cisco123

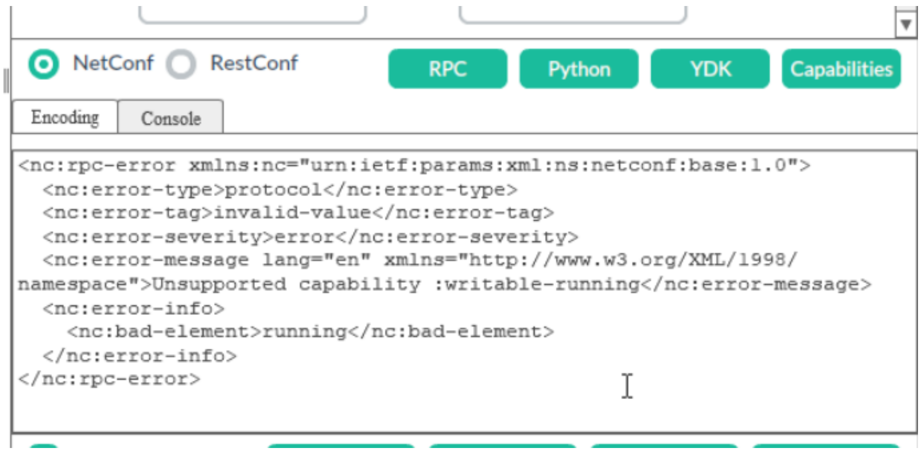
```
urn:ietf:params:netconf:base:1.0
urn:ietf:params:netconf:base:1.1
urn:ietf:params:netconf:capability:candidate:1.0
urn:ietf:params:netconf:capability:interleave:1.0
urn:ietf:params:netconf:capability:notification:1.0
urn:ietf:params:netconf:capability:rollback-on-error:1.0
urn:ietf:params:netconf:capability:validate:1.0
urn:ietf:params:netconf:capability:validate:1.1
urn:ietf:params:netconf:capability:with-defaults:1.0?basic-
mode=explicit&amp;also-supported=report-all-tagged
```

Get the Configuration from Candidate data store



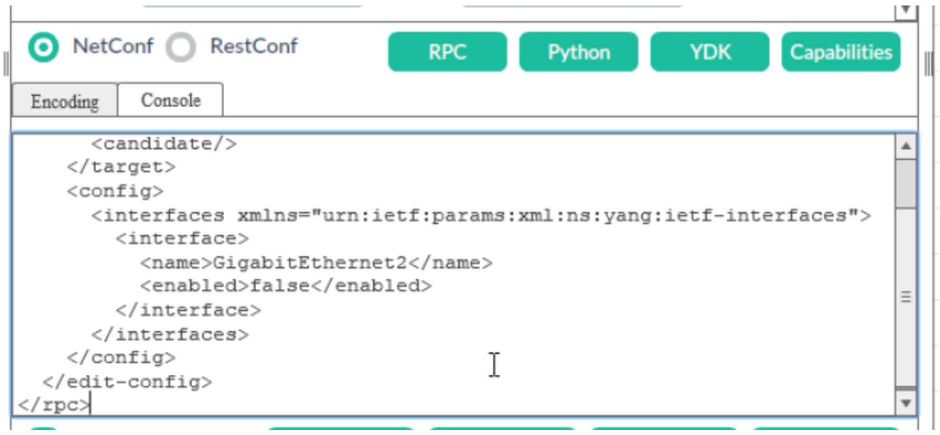
```
<rpc message-id="101" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get>
    <source>
          <candidate/>
    </source>
    <filter>
      <interfaces xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces">
        <interface>
          <name>GigabitEthernet2</name>
          <ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
            <address/>
          </ipv4>
```

Change the interface status to down (Gi2) in running data store --- **Error as no writable running capability**



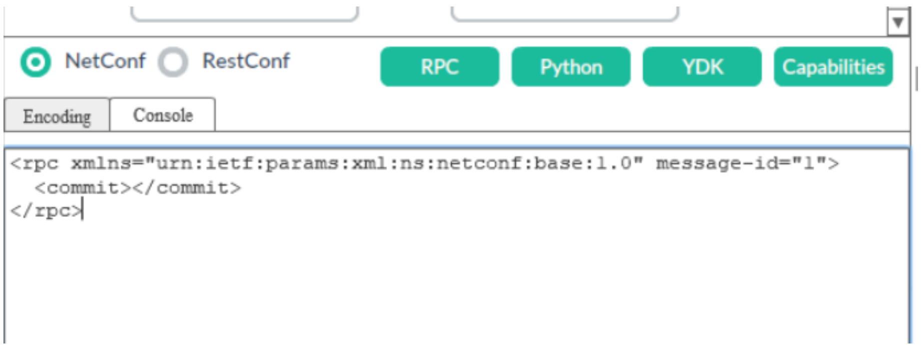
```
<nc:rpc-error xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
  <nc:error-type>protocol</nc:error-type>
  <nc:error-tag>invalid-value</nc:error-tag>
  <nc:error-severity>error</nc:error-severity>
  <nc:error-message lang="en" xmlns="http://www.w3.org/XML/1998/
namespace">Unsupported capability :writable-running</nc:error-message>
  <nc:error-info>
    <nc:bad-element>running</nc:bad-element>
  </nc:error-info>
</nc:rpc-error>
```

Change the interface status to down (Gi2) in candidate data store



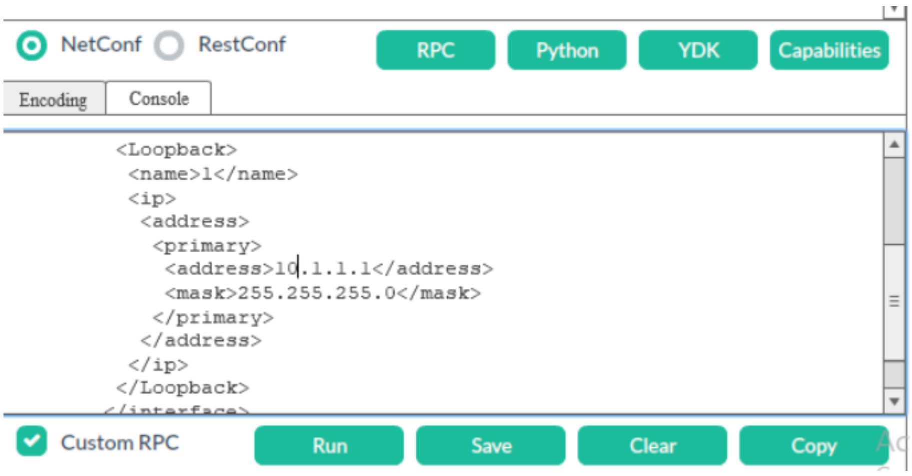
```
      <candidate/>
    </target>
    <config>
      <interfaces xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces">
        <interface>
          <name>GigabitEthernet2</name>
          <enabled>false</enabled>
        </interface>
      </interfaces>
    </config>
  </edit-config>
</rpc>
```

Commit the changes



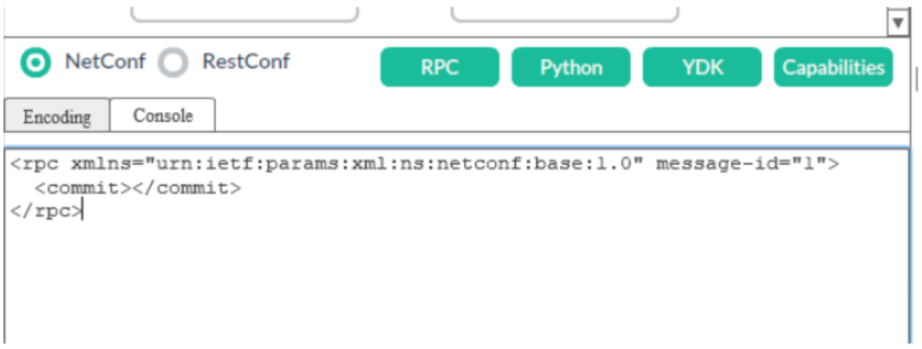
```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <commit></commit>
</rpc>
```

Create the Loopback interface on candidate data store



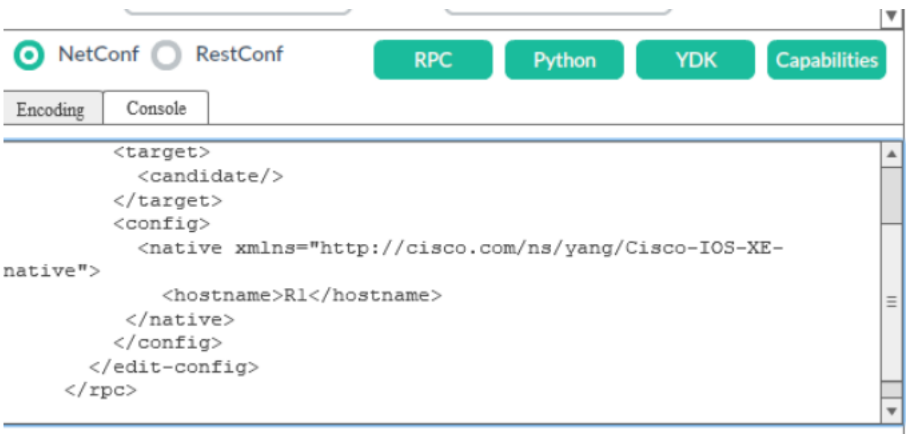
```
         <Loopback>
          <name>1</name>
          <ip>
           <address>
            <primary>
             <address>10.1.1.1</address>
             <mask>255.255.255.0</mask>
            </primary>
           </address>
          </ip>
         </Loopback>
        </interface>
```

Commit the changes

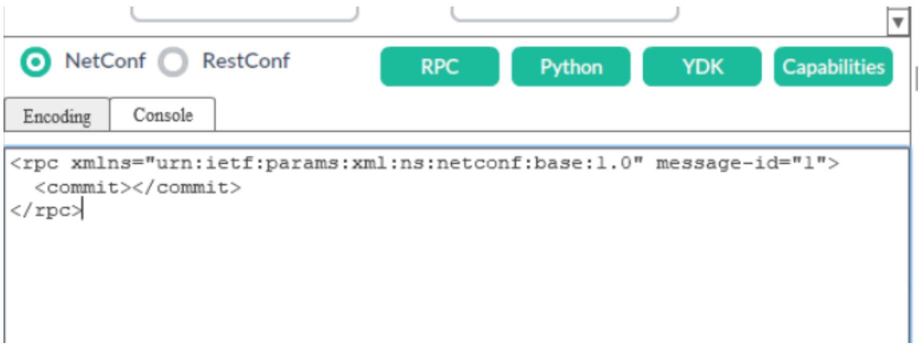


```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <commit></commit>
</rpc>
```

Change the router Hostname on candidate data store and commit the change



```
         <target>
           <candidate/>
         </target>
         <config>
           <native xmlns="http://cisco.com/ns/yang/Cisco-IOS-XE-
native">
             <hostname>R1</hostname>
           </native>
         </config>
       </edit-config>
     </rpc>
```



```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <commit></commit>
</rpc>
```

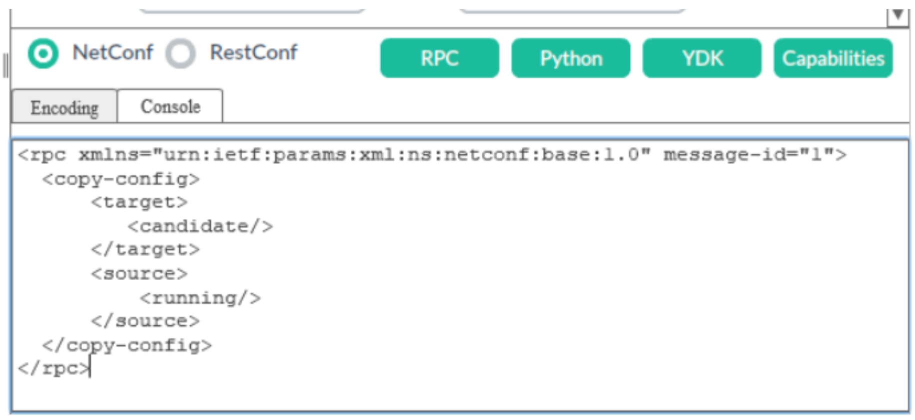
Copy the configuration from running data store to candidate data store

Step 1 : Create the new Loopback interface on candidate data store

Step 2 : Copy the running data store to candidate data store

Step 3: Commit the changes on candidate data store

Step 4: We observe new Loopback interface are not created on running data st



```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="1">
  <copy-config>
      <target>
         <candidate/>
      </target>
      <source>
          <running/>
      </source>
  </copy-config>
</rpc>
```

RestConf:

Enable the router with Restconf capability

Conf t (Config mode)

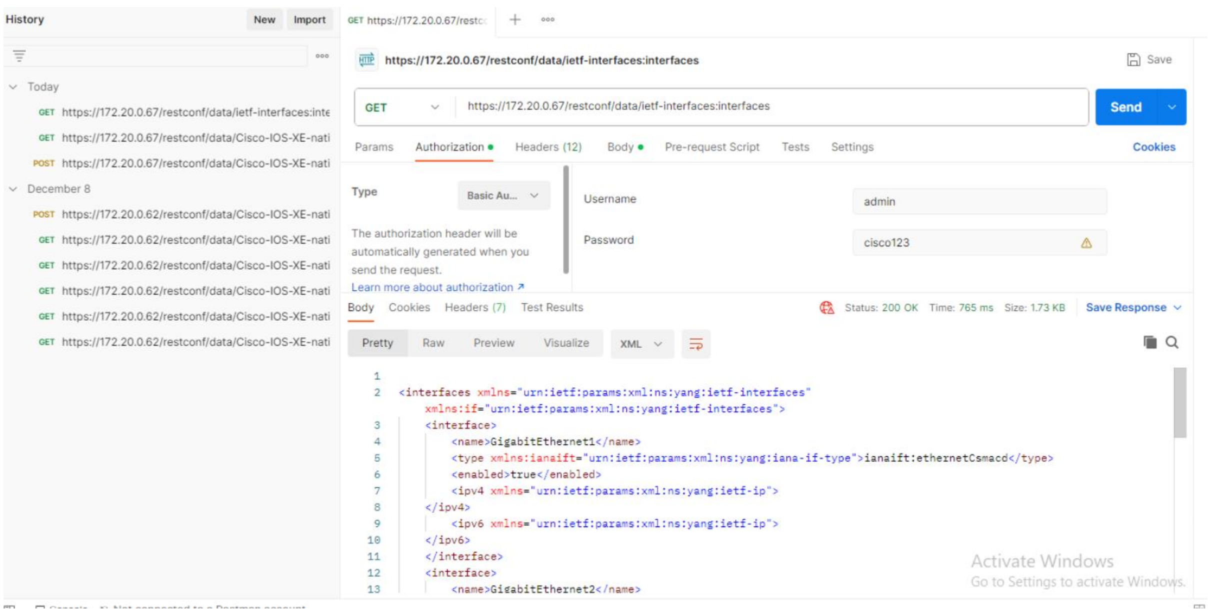
Restconf

Ip http secure-server

Login to Postman:

Example : Get the Router interface details

GET : https://IP address of server/restconf/data/ietf-interfaces:interfaces



History — New — Import

Today

GET https://172.20.0.67/restconf/data/ietf-interfaces:inte
GET https://172.20.0.67/restconf/data/Cisco-IOS-XE-nati
POST https://172.20.0.67/restconf/data/Cisco-IOS-XE-nati

December 8

POST https://172.20.0.62/restconf/data/Cisco-IOS-XE-nati
GET https://172.20.0.62/restconf/data/Cisco-IOS-XE-nati
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https://172.20.0.67/restconf/data/ietf-interfaces:interfaces

GET https://172.20.0.67/restconf/data/ietf-interfaces:interfaces — Send

Params | Authorization ● | Headers (12) | Body ● | Pre-request Script | Tests | Settings | Cookies

Type: Basic Au...

The authorization header will be automatically generated when you send the request.
Learn more about authorization ↗

Username: admin
Password: cisco123

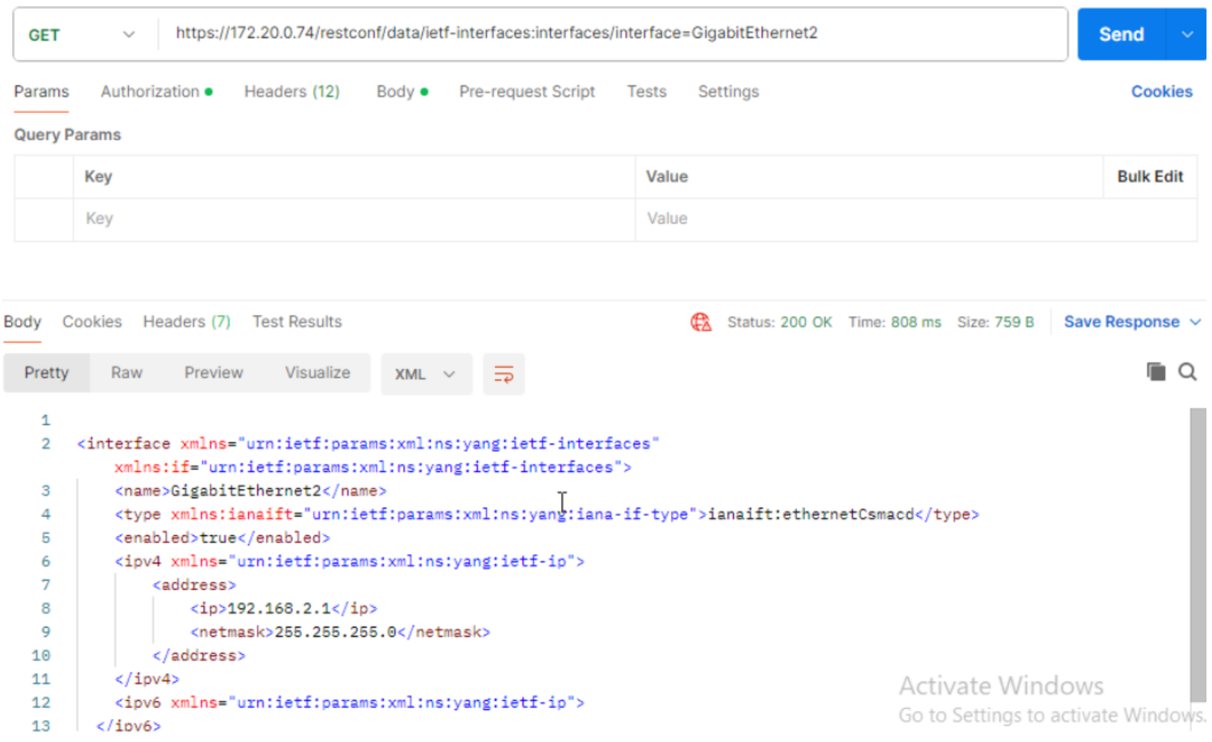
Body | Cookies | Headers (7) | Test Results — Status: 200 OK Time: 765 ms Size: 1.73 KB — Save Response

Pretty | Raw | Preview | Visualize | XML

```

<interfaces xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces"
    xmlns:if="urn:ietf:params:xml:ns:yang:ietf-interfaces">
    <interface>
        <name>GigabitEthernet1</name>
        <type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:ethernetCsmacd</type>
        <enabled>true</enabled>
        <ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
    </ipv4>
        <ipv6 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
    </ipv6>
    </interface>
    <interface>
        <name>GigabitEthernet2</name>
```

Activate Windows
Go to Settings to activate Windows.

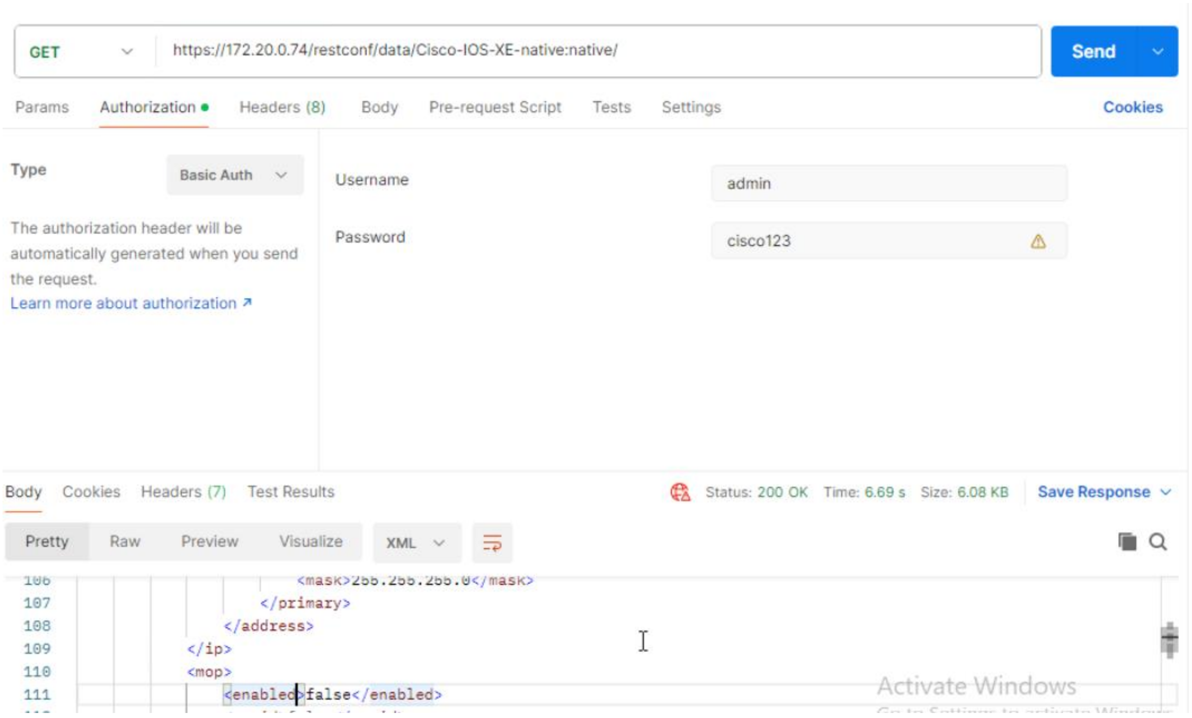


	Key	Value	Bulk Edit
	Key	Value	

```

<interface xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces"
    xmlns:if="urn:ietf:params:xml:ns:yang:ietf-interfaces">
    <name>GigabitEthernet2</name>
    <type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:ethernetCsmacd</type>
    <enabled>true</enabled>
    <ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
        <address>
            <ip>192.168.2.1</ip>
            <netmask>255.255.255.0</netmask>
        </address>
    </ipv4>
    <ipv6 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
  </ipv6>
```

Get Config



Type: Basic Auth

The authorization header will be automatically generated when you send the request.
Learn more about authorization ↗

Username	admin
Password	cisco123

```
                    <mask>255.255.255.0</mask>
                </primary>
            </address>
        </ip>
        <mop>
            <enabled>false</enabled>
```

Example :

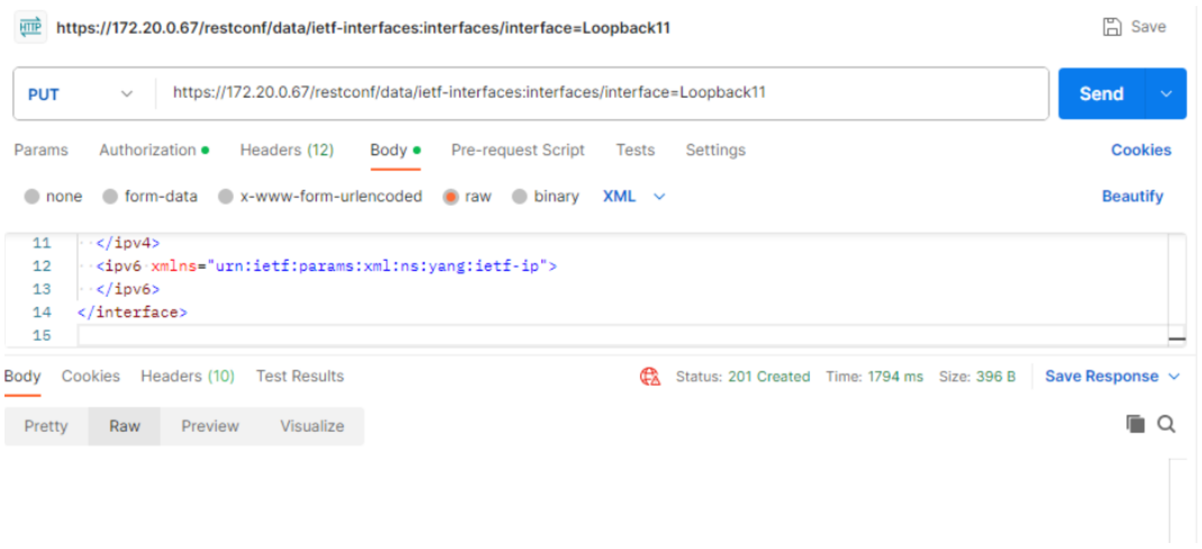
Create the new Loopback interface on router via CLI

Conf t

Int loopback1

Ip address 11.0.0.1 255.0.0.0

GET : https://IP address of server/restconf/data/ietf-interfaces:interfaces/interface=Loopback1


https://172.20.0.67/restconf/data/ietf-interfaces:interfaces/interface=Loopback11

PUT https://172.20.0.67/restconf/data/ietf-interfaces:interfaces/interface=Loopback11

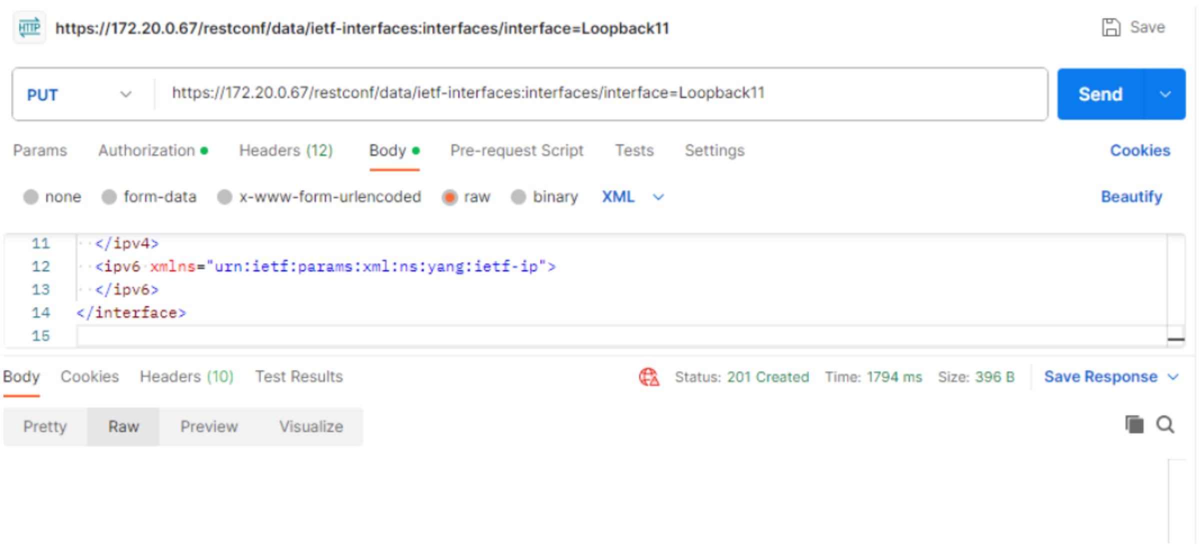
Body: raw, XML

```
  </ipv4>
  <ipv6 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
  </ipv6>
</interface>
```

Status: 201 Created Time: 1794 ms Size: 396 B

Example : Create the Loopback interface via Postman

PUT : https://IP address of server/restconf/data/ietf-interfaces:interfaces/interface=Loopback11


https://172.20.0.67/restconf/data/ietf-interfaces:interfaces/interface=Loopback11

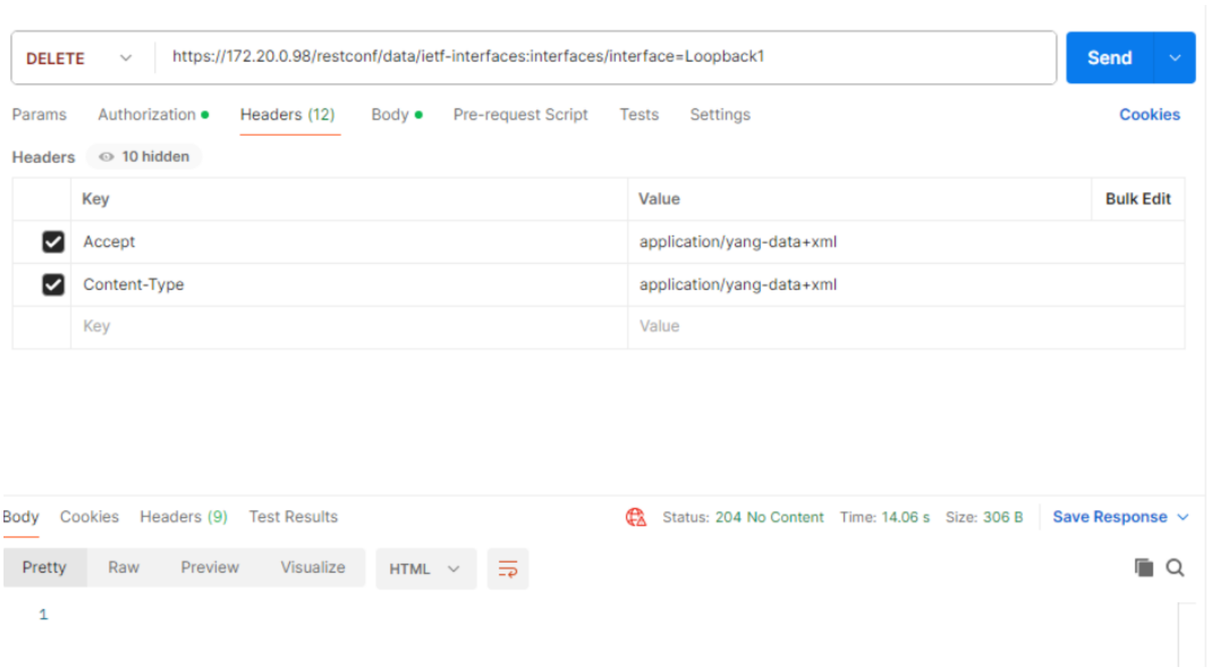
PUT https://172.20.0.67/restconf/data/ietf-interfaces:interfaces/interface=Loopback11

Body: raw, XML

```
  </ipv4>
  <ipv6 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
  </ipv6>
</interface>
```

Status: 201 Created Time: 1794 ms Size: 396 B

Delete the Loopback interface.

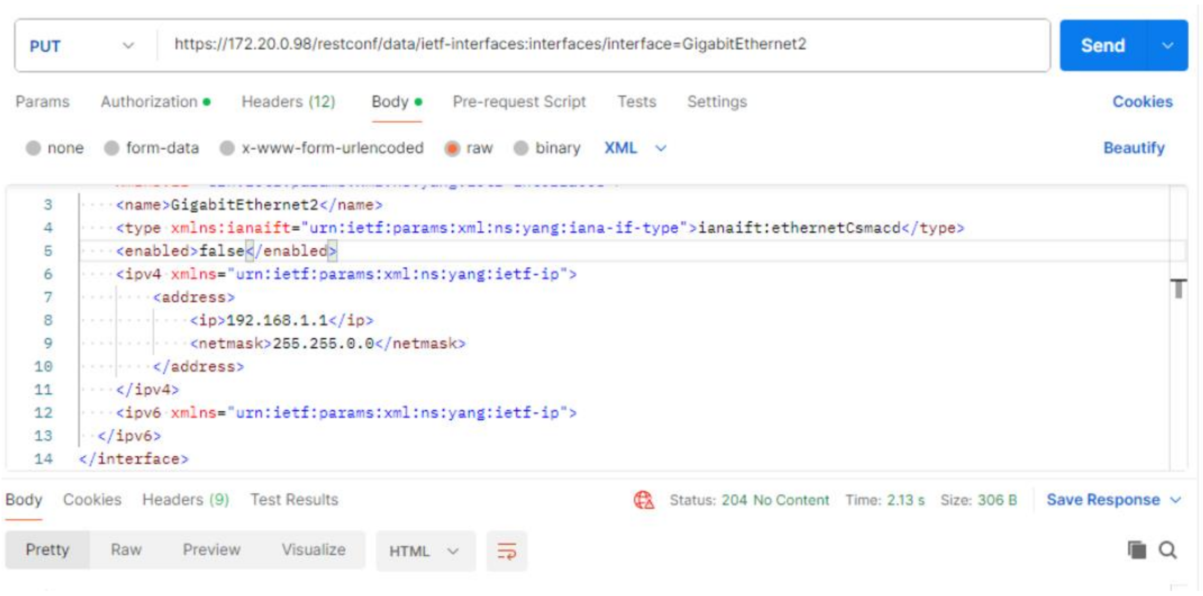

DELETE https://172.20.0.98/restconf/data/ietf-interfaces:interfaces/interface=Loopback1

Headers (12) — 10 hidden

	Key	Value
✓	Accept	application/yang-data+xml
✓	Content-Type	application/yang-data+xml
	Key	Value

Status: 204 No Content Time: 14.06 s Size: 306 B

Change the Interface status to down for GigabitEthernet2 interface

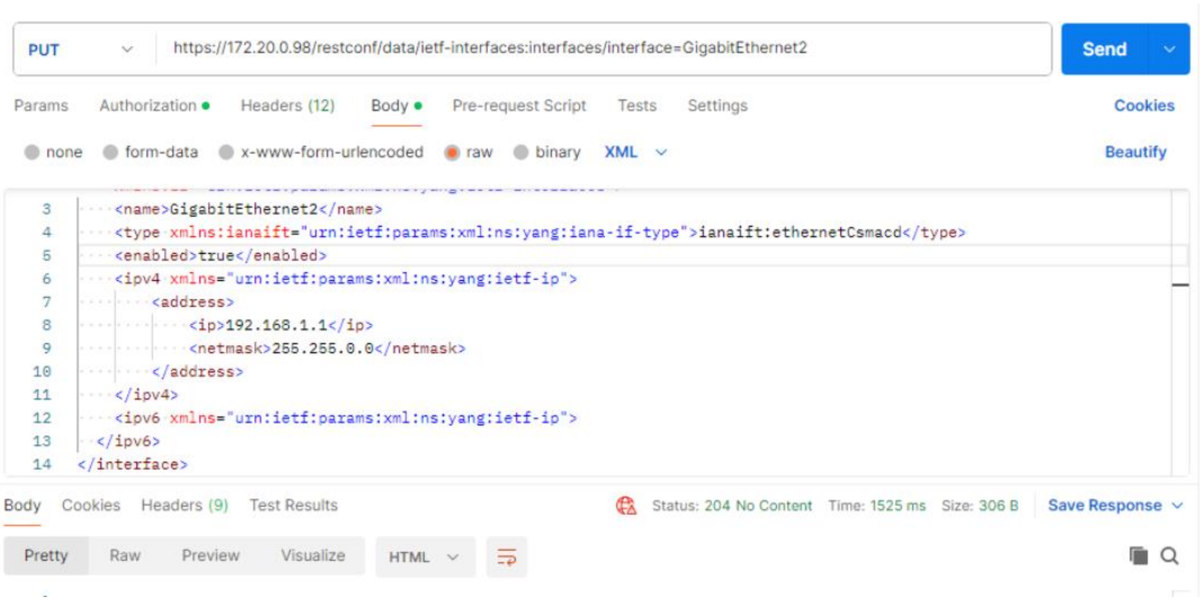


PUT https://172.20.0.98/restconf/data/ietf-interfaces:interfaces/interface=GigabitEthernet2

```
    <name>GigabitEthernet2</name>
    <type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:ethernetCsmacd</type>
    <enabled>false</enabled>
    <ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
        <address>
            <ip>192.168.1.1</ip>
            <netmask>255.255.0.0</netmask>
        </address>
    </ipv4>
    <ipv6 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
  </ipv6>
</interface>
```

Status: 204 No Content Time: 2.13 s Size: 306 B

Change the Interface status to UP for GigabitEthernet2 interface

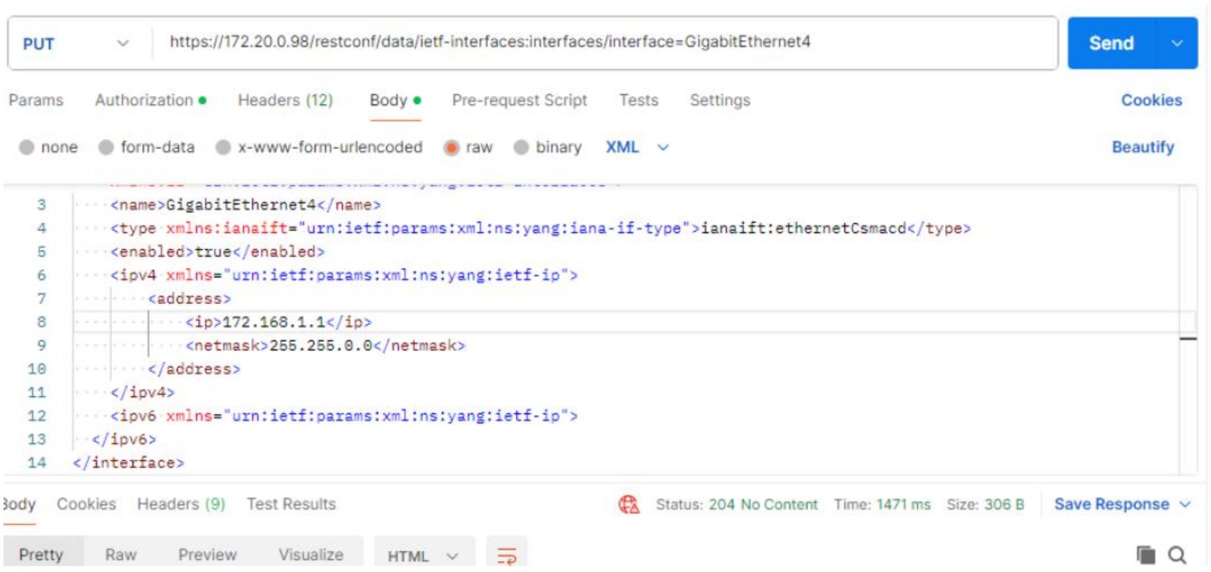


PUT https://172.20.0.98/restconf/data/ietf-interfaces:interfaces/interface=GigabitEthernet2

```
    <name>GigabitEthernet2</name>
    <type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:ethernetCsmacd</type>
    <enabled>true</enabled>
    <ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
        <address>
            <ip>192.168.1.1</ip>
            <netmask>255.255.0.0</netmask>
        </address>
    </ipv4>
    <ipv6 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
  </ipv6>
</interface>
```

Status: 204 No Content Time: 1525 ms Size: 306 B

Assign the interface IP address



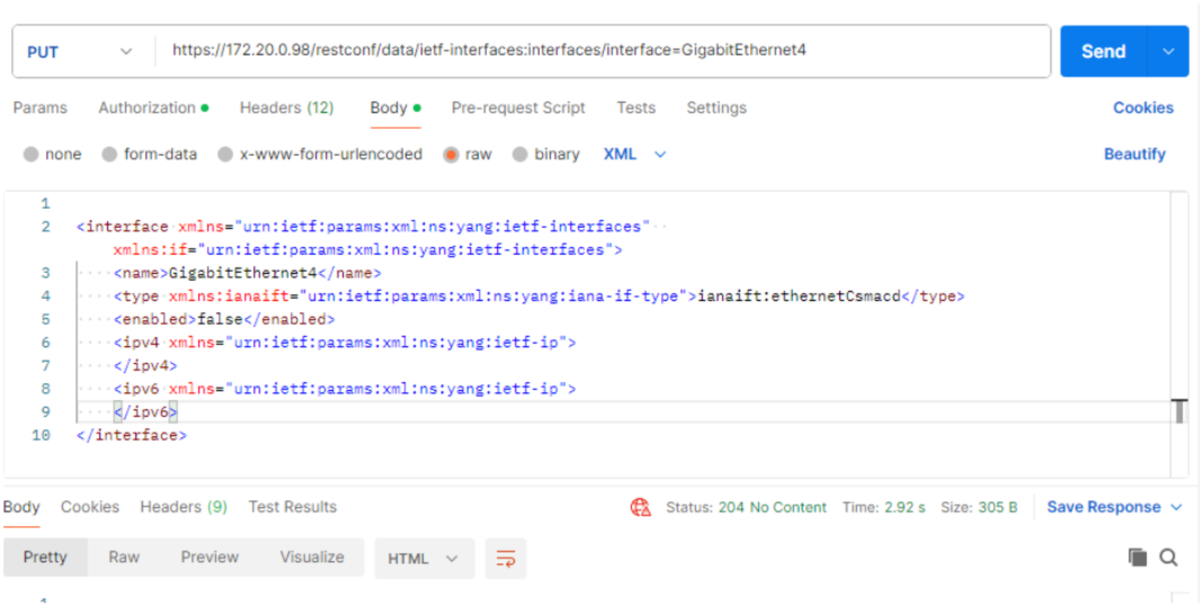
PUT https://172.20.0.98/restconf/data/ietf-interfaces:interfaces/interface=GigabitEthernet4

Body: raw XML

```
    <name>GigabitEthernet4</name>
    <type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:ethernetCsmacd</type>
    <enabled>true</enabled>
    <ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
        <address>
            <ip>172.168.1.1</ip>
            <netmask>255.255.0.0</netmask>
        </address>
    </ipv4>
    <ipv6 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
  </ipv6>
</interface>
```

Status: 204 No Content Time: 1471 ms Size: 306 B

Remove the Interface IP address



PUT https://172.20.0.98/restconf/data/ietf-interfaces:interfaces/interface=GigabitEthernet4

Body: raw XML

```

<interface xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces"
    xmlns:if="urn:ietf:params:xml:ns:yang:ietf-interfaces">
    <name>GigabitEthernet4</name>
    <type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:ethernetCsmacd</type>
    <enabled>false</enabled>
    <ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
    </ipv4>
    <ipv6 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
    </ipv6>
</interface>
```

Status: 204 No Content Time: 2.92 s Size: 305 B