DAY-3

Session-1

NETCONF Concept Cont..

LAB-

- NETCONF configuration in router
- Manage via SSH Client
- Manage via YANG Explorer

NETCONF <hello> Operation

- Capabilities exchange
- Data model ID exchange

- Encoding
  - NETCONF 1.0
  - NETCONF 1.1

```
<?xml version="1.0" encoding="UTF-8"?>
<hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
<capabilities>
<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:candidate:1.0</capability>
<capability>urn:ietf:params:netconf:capability:confirmed-commit: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:rollback-on-error:1.0</capabilit
```

NETCONF <get-config> Operation

- Sub-tree filtering

```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.1” message-id="1">
  <get-config>
    <source>
      <running/>
    </source>
    <filter xmlns="http://tail-f.com/ns/aaa/1.1">
      <aaa/>
    </filter>
  </get-config>
</rpc>
```

NETCONF <get-config> Operation

```
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.1” message-
id="1">
  <data>
    <aaa xmlns="http://tail-f.com/ns/aaa/1.1">
      <authentication>
        <users>
          <user>
            <name>admin</name>
            <uid>9000</uid>
            <gid>0</gid>
            <password>$1$3ZHhR6Ow$acznsyClFc0keo3B3BVjx/</password>
            <ssh_keydir>/var/confd/homes/admin/.ssh</ssh_keydir>
            <homedir>/var/confd/homes/admin</homedir>
          </user>
          <user>
            <name>oper</name>
          …
        </users>
      </authentication>
    </aaa>
  </data>
</rpc-reply>
```

NETCONF <edit-config> Operation

```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.1” message-id="1">
  <edit-config>
    <target><running/></target>
    <config>
      <dhcp xmlns="http://tail-f.com/ns/example/dhcpd"
            xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1">
        <defaultLeaseTime nc:operation="merge”>PT1H
        </defaultLeaseTime>
      </dhcp>
    </config>
  </edit-config>
</rpc>
```

```
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.1" message-
id="1">
  <ok/>
</rpc-reply>
```

NETCONF <copy-config> Operation

- Copy and replace configuration data between stores or URLs

```
<rpc message-id="101”
xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
  <copy-config>
    <target><running/></target>
    <source>
      <url>https://user@example.com:passphrase/cfg/new.txt
      </url>
    </source>
  </copy-config>
</rpc>
```

```
<rpc-reply message-id="101”
xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
  <ok/>
</rpc-reply>
```

NETCONF <copy-config> Operation

- Copy ‘Running Data Store” to “Candidate Data Store”

```
>>>>> Router-West (Sun Nov 15 15:24:33 CET 2009)
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" nc:message-id="4">
  <nc:copy-config>
    <nc:target>
      <nc:candidate></nc:candidate>
    </nc:target>
    <nc:source>
      <nc:running></nc:running>
    </nc:source>
  </nc:copy-config>
</nc:rpc>
```

NETCONF <delete-config> Operation

- Delete a complete data store (not running)

```
<rpc message-id="101”
xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
  <delete-config>
    <target>
      <startup/>
    </target>
  </delete-config>
</rpc>
```

```
<rpc-reply message-id="101” xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
  <ok/>
</rpc-reply>
```

NETCONF <lock>, <unlock> Operation

- Lock/unlock a complete data store

```
<rpc message-id="101" xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
  <lock>
    <target>
      <candidate/>
    </target>
  </lock>
</rpc>
```

```
<rpc-reply message-id="101"
xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
  <ok/>
</rpc-reply>
```

NETCONF <get> Operation

- Read configuration **and** status

```
<rpc message-id="101" xmlns="urn:ietf:param
<get>
  <filter type="subtree">
    <top xmlns="http://example.com/ns/dhc
      <interfaces>
        <interface>
          <ifName>eth0</ifName>
        </interface>
      </interfaces>
    </top>
  </filter>
</get>
```

```
<rpc-reply message-id="101" xmlns="urn:ie
  <data>
    <top xmlns="http://example.com/ns/dhc
      <interfaces>
        <interface>
          <ifName>eth0</ifName>
          <ifInOctets>45621</ifInOctets>
          <ifOutOctets>774344</ifOutOctet
        </interface>
      </interfaces>
    </top>
  </data>
</rpc-reply>
```

NETCONF <close-session> Operation

- Polite way of disconnecting

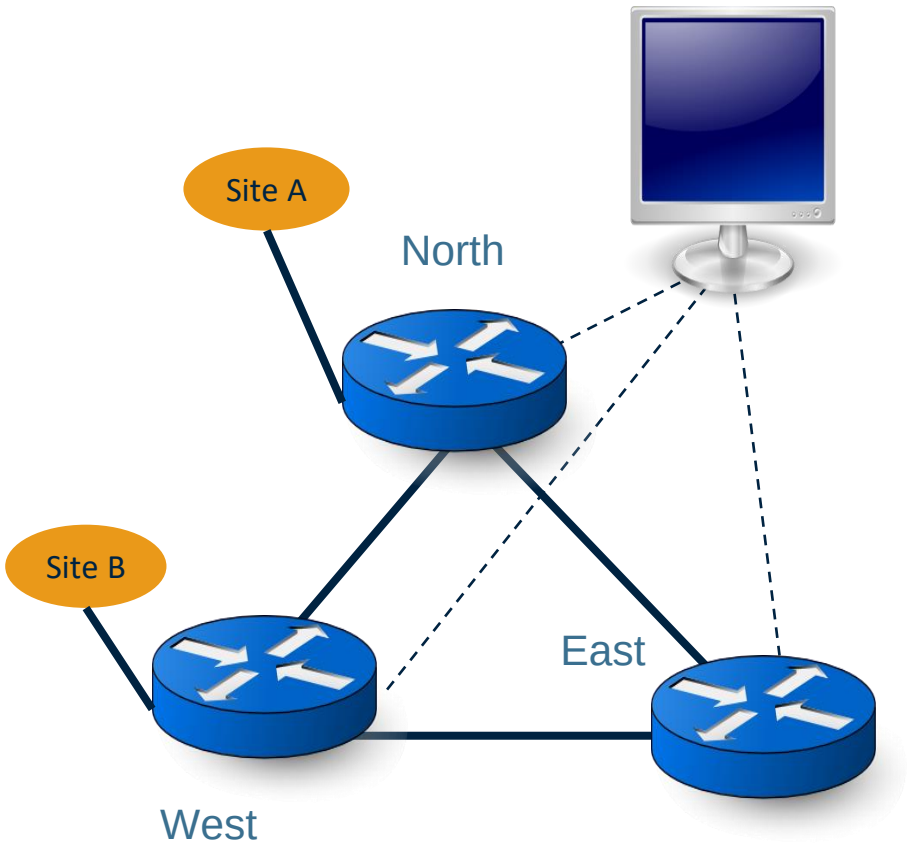
```
<rpc message-id="101” xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
  <close-session/>
</rpc>
```

```
<rpc-reply message-id="101”
xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
  <ok/>
</rpc-reply>
```

Example:

VPN provisioning using NETCONF Network-wide Transactions

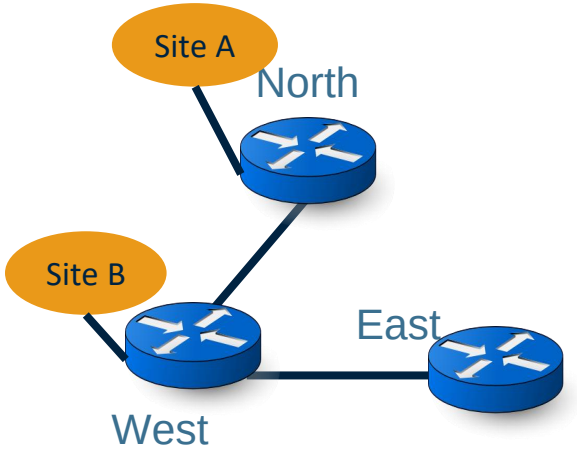
VPN Scenario



- An operator owns a network of routers and other equipment from different vendors
- They have a management station connected to all the devices in the network to provision and monitor services
- Now, we need to set up a VPN between two customer sites
- There is no point what so ever to make any changes on any device unless all changes succeed
- We need a Network-wide Transaction

Hello

- Exchange capabilities




```
>>>>> Router-West (Sun Nov 15 14:41:25 CET 2009)
<hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
  <capabilities>
    <capability>urn:ietf:params:netconf:base:1.1</capability>
  </capabilities>
</hello>
```

```
<<<< Router-West (Sun Nov 15 14:41:25 CET 2009)
<hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.1">
  <capabilities>
    <capability>urn:ietf:params:netconf:base:1.1</capability>
    <capability>http://tail-f.com/ns/netconf/actions/1.0</capability>
    <capability>http://tail-f.com/ns/aaa/1.1</capability>
    <capability>http://tail-f.com/ns/example/quagga/1.0</capability>
  </capabilities>
  <session-id>4</session-id>
</hello>
```

Lock the candidate data stores

```
>>>>> Router-West (Sun Nov 15 15:24:33 CET 2009)
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" nc:message-id="2">
  <nc:lock>
    <nc:target>
       <nc:candidate></nc:candidate>
    </nc:target>
  </nc:lock>
</nc:rpc>
```

```
<<<< Router-West (Sun Nov 15 15:24:33 CET 2009)
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.1"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" message-id="2">
   <ok></ok>
</rpc-reply>
```

Lock the running data stores

```
>>>>> Router-West (Sun Nov 15 15:24:33 CET 2009)
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" nc:message-id="3">
  <nc:lock>
    <nc:target>
      <nc:running></nc:running>
    </nc:target>
  </nc:lock>
</nc:rpc>
```

```
<<<< Router-West (Sun Nov 15 15:24:33 CET 2009)
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.1"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" message-id="3">
   <ok></ok>
</rpc-reply>
```

Edit the candidates

```
>>>>> Router-West (Sun Nov 15 15:24:33 CET 2009)
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" nc:message-id="5">
  <nc:edit-config>
    <nc:target><nc:candidate></nc:candidate></nc:target>
    <nc:config>
      <quagga:system xmlns:quagga="http://tail-f.com/ns/example/quagga
      <quagga:vpn>
        <quagga:ipsec>
          <quagga:tunnel>
            <quagga:name>volvo-0</quagga:name>
            <quagga:local-endpoint>10.7.7.4</quagga:local-endpoint>
            <quagga:local-net>33.44.55.0</quagga:local-net>
            <quagga:local-net-mask>255.255.255.0</quagga:local-net-mas
            <quagga:remote-endpoint>10.3.4.1</quagga:remote-endpoint>
            <quagga:remote-net>62.34.65.0</quagga:remote-net>
            <quagga:pre-shared-key>ford</quagga:pre-
            <quagga:encryption-algo>default
            <quagga:hash-algo>defau
```

Validate candidates

```
>>>>> Router-West (Sun Nov 15 15:24:33 CET 2009)
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" nc:message-id="6">
   <nc:validate>
          <nc:source>
                 <nc:candidate></nc:candidate>
          </nc:source>
   </nc:validate>
</nc:rpc>
```

```
<<<< Router-West (Sun Nov 15 15:24:33 CET 2009)
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.1"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" message-id="6">
   <ok></ok>
</rpc-reply>
```

Commit candidates to running

```
>>>>> Router-West (Sun Nov 15 15:24:33 CET 2009)
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" nc:message-id="7">
   <nc:commit></nc:commit>
</nc:rpc>
```

```
<<<< Router-West (Sun Nov 15 15:24:33 CET 2009)
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.1"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" message-id="7">
   <ok></ok>
</rpc-reply>
```

Unlock candidates

```
>>>>> Router-West (Sun Nov 15 15:24:33 CET 2009)
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" nc:message-id="8">
   <nc:unlock>
          <nc:target>
                 <nc:candidate></nc:candidate>
          </nc:target>
   </nc:unlock>
</nc:rpc>
```

```
<<<< Router-West (Sun Nov 15 15:24:33 CET 2009)
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.1"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" message-id="8">
   <ok></ok>
</rpc-reply>
```

Using confirmed-commit

- Now do the same thing again, but instead of commit…

```
>>>>> Router-West (Sun Nov 15 15:29:19 CET 2009)
<nc:rpc xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" nc:message-id="16">
   <nc:commit>
          <nc:confirmed></nc:confirmed>
          <nc:confirm-timeout>120</nc:confirm-timeout>
   </nc:commit>
</nc:rpc>
```

```
<<<< Router-West (Sun Nov 15 15:29:19 CET 2009)
<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.1"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.1" message-id="16">
   <ok></ok>
</rpc-reply>
```

Disaster happens

- One of the devices disconnected
- The management station disconnects all the rest
- They all roll back to the previous configuration

LAB – 4 Netconf Operation

In this LAB exercise, we will enable the Netconf Capability on router and then will manage the same from Netconf Client

Adobe Acrobat Document

- Thanks