

Network Implementation Test Automation Lab

NITA QFX Series Fabric Builder on JCL4.0 Cheat Sheet

Introduction

This lab is designed to allow users to set up a test data center (see Figure 1). Once the full set up (which, for the first time, takes users just 30 minutes or so) is complete, the user can leverage NITA to change the configuration in seconds.

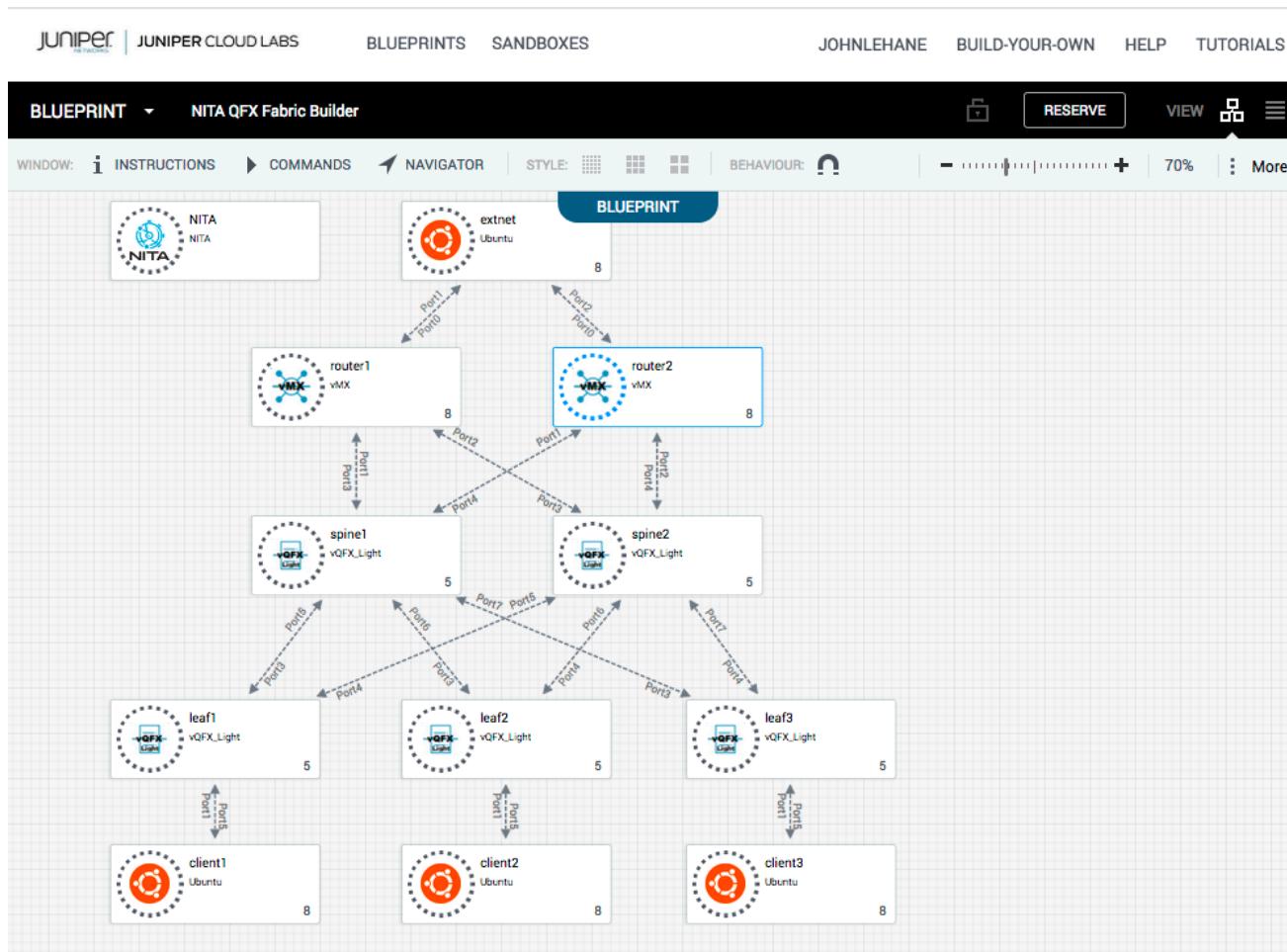
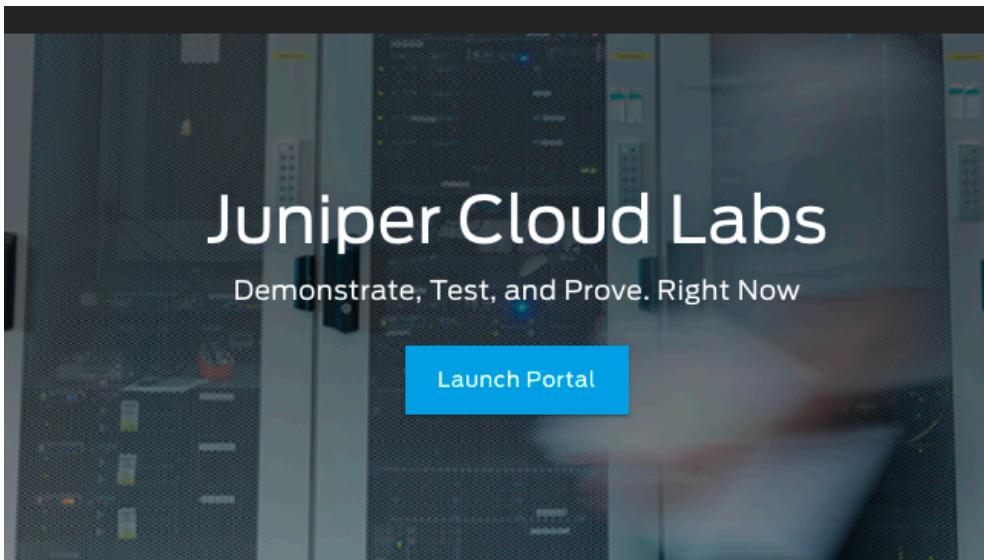


Figure 1: Test Data Center

Cheat Sheet for the NITA QFX Series Fabric Builder on JCL 4.0

Log in to <https://jlabs.juniper.net/jcl/portal/index.page> using Juniper SSO. Once logged in:

- Click on “Launch Portal” to open the JCL portal:

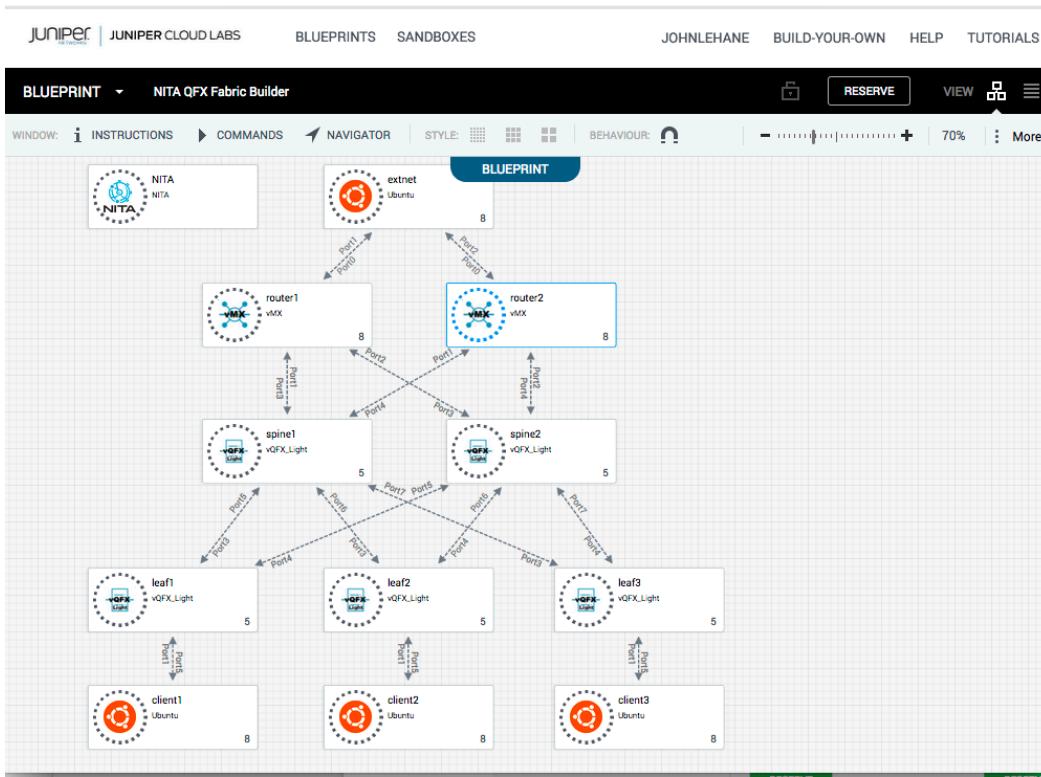


- Find Blueprints under NITA (upper left corner):

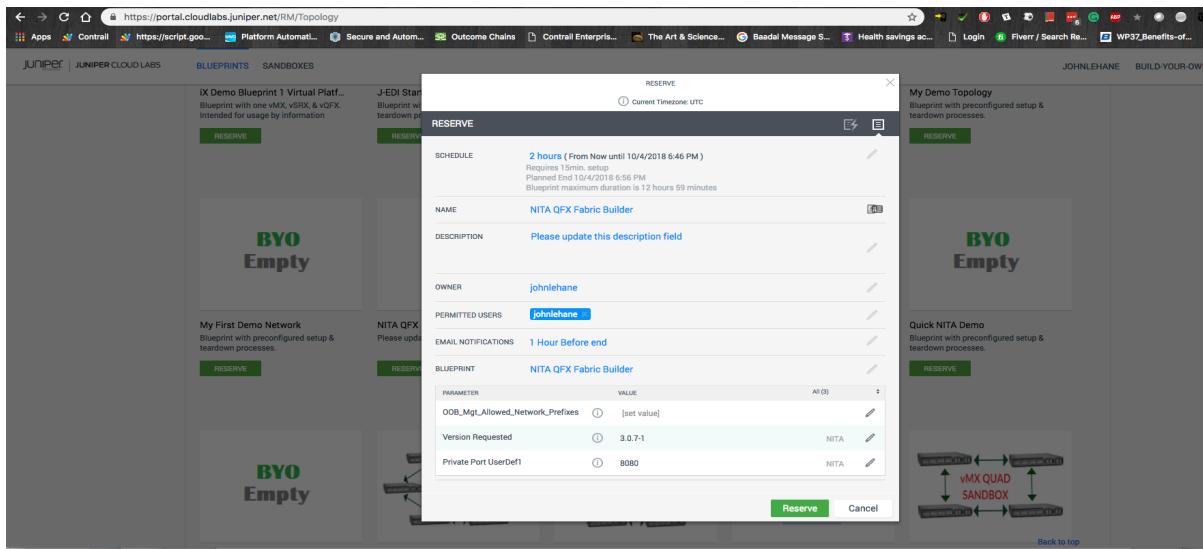
A screenshot of the Juniper Cloud Labs Blueprint Catalog page. The URL in the browser bar is https://portal.cloudlabs.juniper.net/RM/Topology. The page has a header with the Juniper Networks logo and the text "JUNIPER CLOUD LABS". Below the header, there are tabs for "BLUEPRINTS" (which is selected) and "SANBOXES". On the left, there is a sidebar with a search bar containing "NITA", a "Blueprints" section (selected), and a "Sandboxes" section showing "1 New, 1 Total". Below that is a "FILTER BY:" section with "My Blueprints" expanded, showing "Active (1)". The main content area is titled "BLUEPRINT CATALOG (2)" with a "Reset filters" link. It shows two blueprint cards: "NITA QFX Fabric Builder" and "Quick NITA Demo". Both cards have the text "BYO Empty" in large green letters. Below each card is a brief description and a "RESERVE" button. A note at the bottom says "Currently reserved by me".

Blueprint Name	Description	Status
NITA QFX Fabric Builder	Blueprint with preconfigured setup & teardown processes.	Empty
Quick NITA Demo	Blueprint with preconfigured setup & teardown processes.	Empty

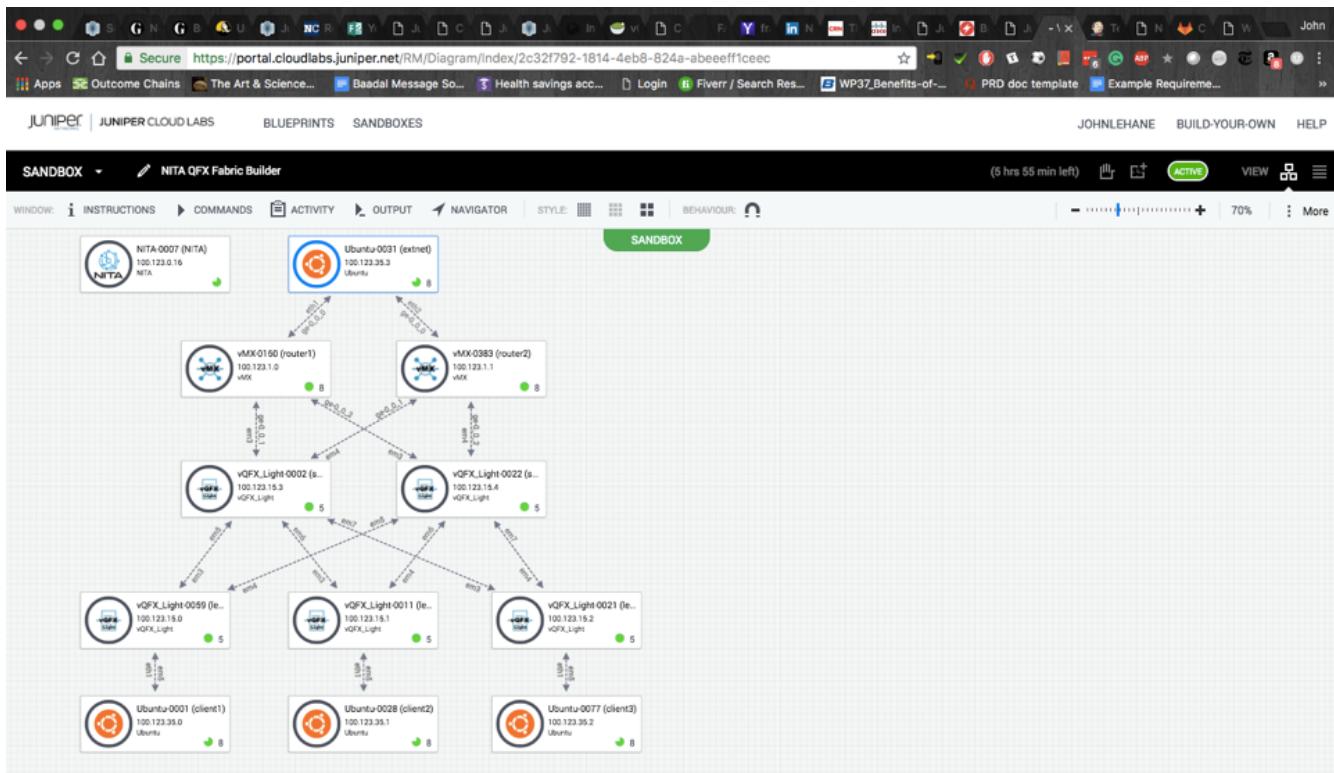
- Click on “NITA QFX Fabric Builder” in the navigation bar to open the blueprint:



- Click on Reserve in the upper right corner to create a new sandbox (note: you can edit the length of the reservation, as well as and other fields):



- Once reserved, it will take approximately 12 minutes for this portion (Layer1) of the lab to complete:



Additional information is needed to access the lab from your local device.

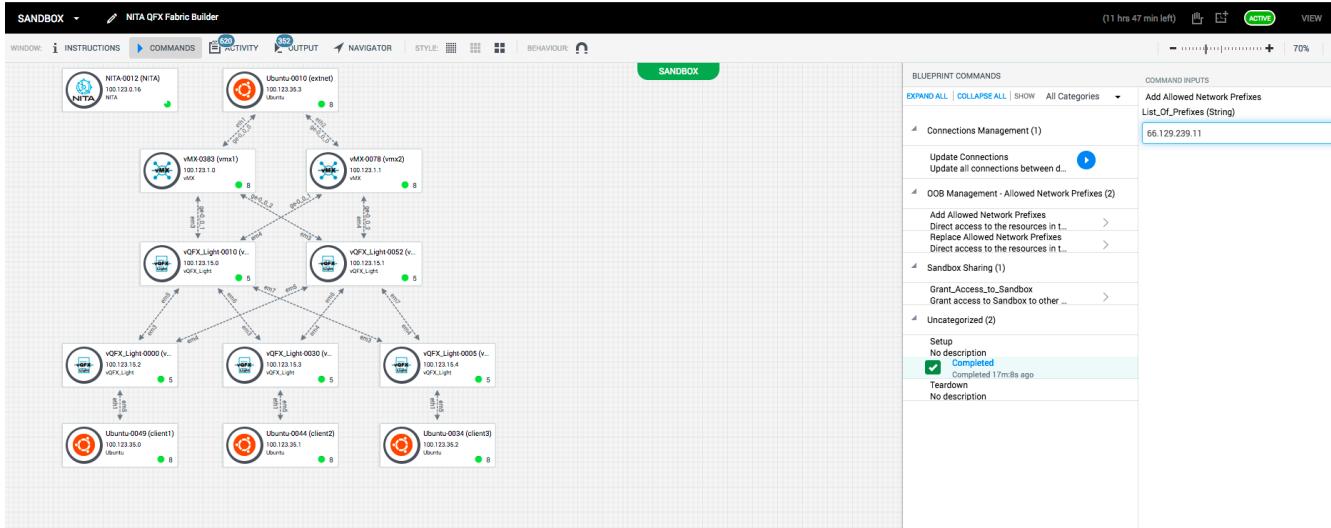
- Obtain your IP address from your browser by typing “my ip” in the search bar:

The screenshot shows a Google search results page. The search query 'my ip' is entered in the search bar. Below the search bar, there are tabs for 'All', 'News', 'Maps', 'Shopping', 'Videos', and 'More'. The main search results area displays the following information:

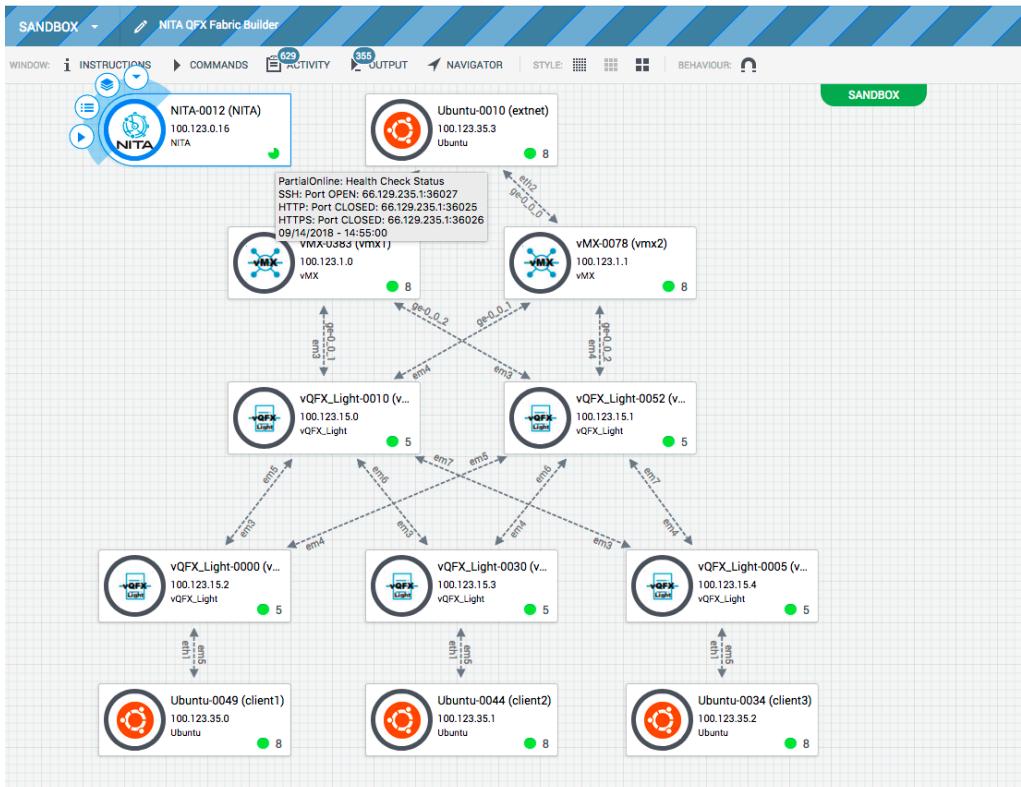
About 631,000,000 results (0.38 seconds)

66.129.239.15
Your public IP address

- Return to the sandbox. Modify the IP settings by going to the “Commands” pulldown menu, entering your IP address, and selecting “Run” (which takes approximately two minutes):



- Once set up is complete, return to the NITA box on the network diagram, mouse over the green icon in the bottom right-hand corner for a popup “Health check” monitor. Make a note of the SSH IP address and port number



- Open your terminal of choice on your laptop (Putty etc.). In the command line, enter your specific IP address and port number. This permits your local device to access the lab.

```
johnlehane-mba:/ johnlehane$ ssh -L 8080:localhost:8080 -L  
8090:localhost:8090 -p 41029 jccluser@66.129.235.1
```

The authenticity of host '[66.129.235.1]:33040 ([66.129.235.1]:33040)' can't be established.

ECDSA key fingerprint is SHA256:0HQ2cDKqulvoezOmBorPGp4kTUKOvYfE+EhVUFcvVAM.

Are you sure you want to continue connecting (yes/no)? yes

Warning: Permanently added '[66.129.235.1]:33040' (ECDSA) to the list of known hosts.

jccluser@66.129.235.1's password:

Warning: remote port forwarding failed for listen port 443

Welcome to Ubuntu 16.04.4 LTS (GNU/Linux 4.4.0-116-generic x86_64)

- * Documentation: <https://help.ubuntu.com>
- * Management: <https://landscape.canonical.com>
- * Support: <https://ubuntu.com/advantage>

34 packages can be updated.

22 updates are security updates

- Return to the web browser.
- Copy the build file for the lab from Github.com lab by going to
https://git.juniper.net/NITA-projects/nita_qfx_ipclos_example
and downloading the repository's .zip file

NITA - QFX based IPClos fabric example build

55 commits · 1 branch · 0 releases · 1 contributor

Branch: master · New pull request · Create new file · Upload files · Find file · Clone or download

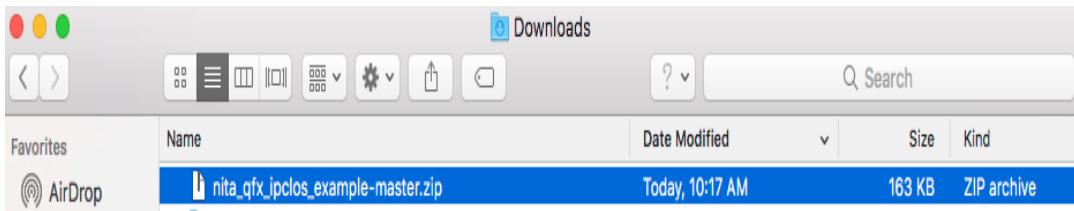
aburston changed name back

- build first attempt at incorporating MX
- group_vars simplified host file population, removed device_jps field an...
- host_vars simplified host file population, removed device_jps field an...
- jenkins initial add
- noob one noob process for all junos devices
- roles simplified host file population, removed device_jps field and made ro...
- test simplified host file population, removed device_jps field and made ro...
- QFX_Fabric_demo1.xlsx added demo data files
- QFX_Fabric_demo2.xlsx added demo data files
- README.txt initial add
- ansible.cfg initial add

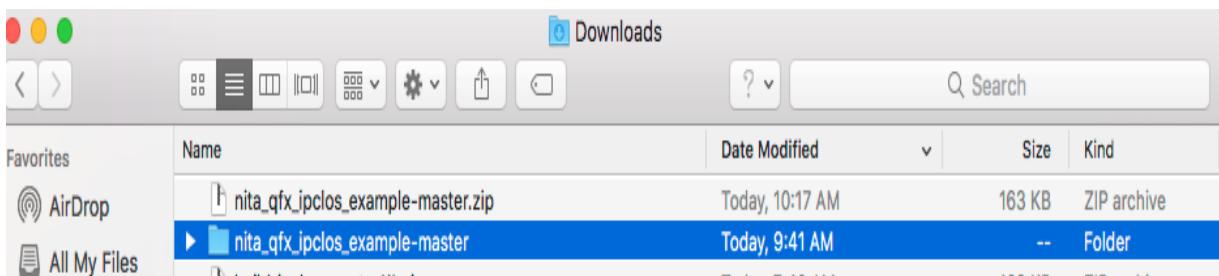
Clone with HTTPS · Use SSH
Use Git or checkout with SVN using the web URL.
https://github.com/Juniper/nita_qfx_ipclos_example

Open in Desktop · Download ZIP

- Unzip the repository file, but leave the .zip file in place since you will need it in the following steps.

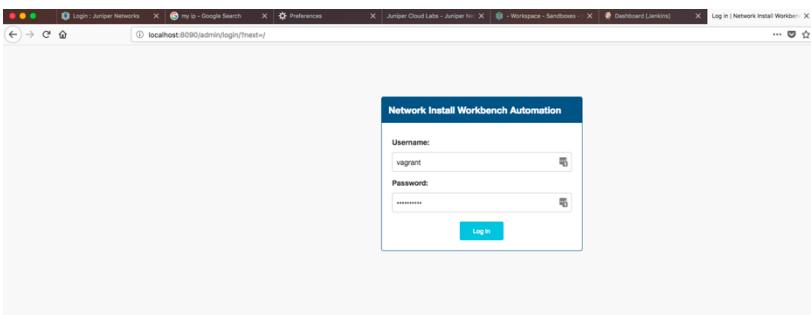


- After opening and unzipping the file, you should see the following files and directories:



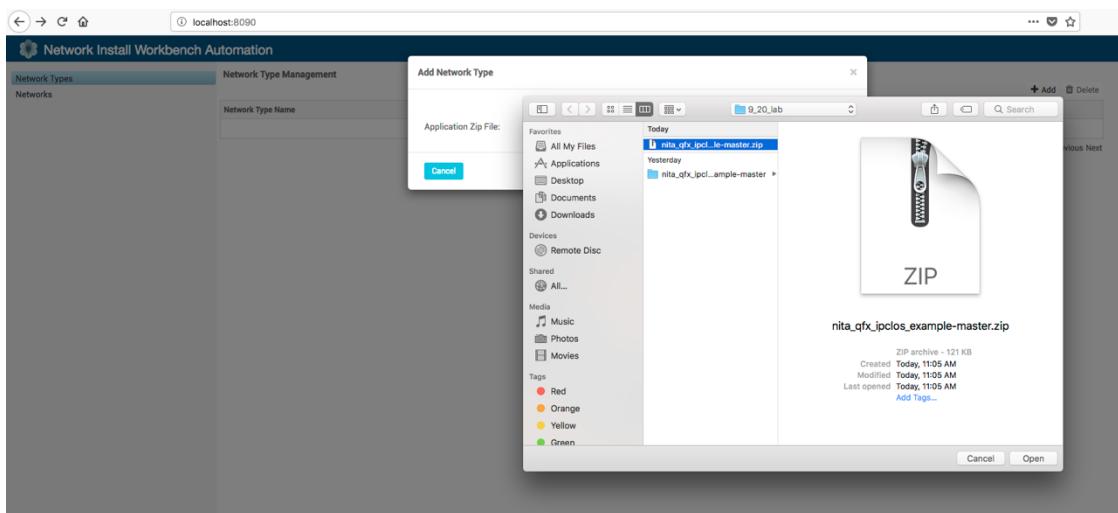
- Robot can now be used to configure the devices in the lab. From your browser, go to *localhost:8090* (a.k.a. Network, install Workbench Automation) and use the following userID password combination:

- **Username = vagrant**
- **Password = vagrant123**



The screenshot shows the "Network Type Management" section of the interface. It includes a table with columns for "Network Type Name" and "Description", and buttons for "+ Add" and "Delete". A message at the bottom says "No data available in table".

- Configure network devices using files from the build file downloaded from git.Juniper.net.
- When you select the file type, upload the .zip file (build_ipclos-master.zip) which maps to the QFX Series fabric in the virtual lab.



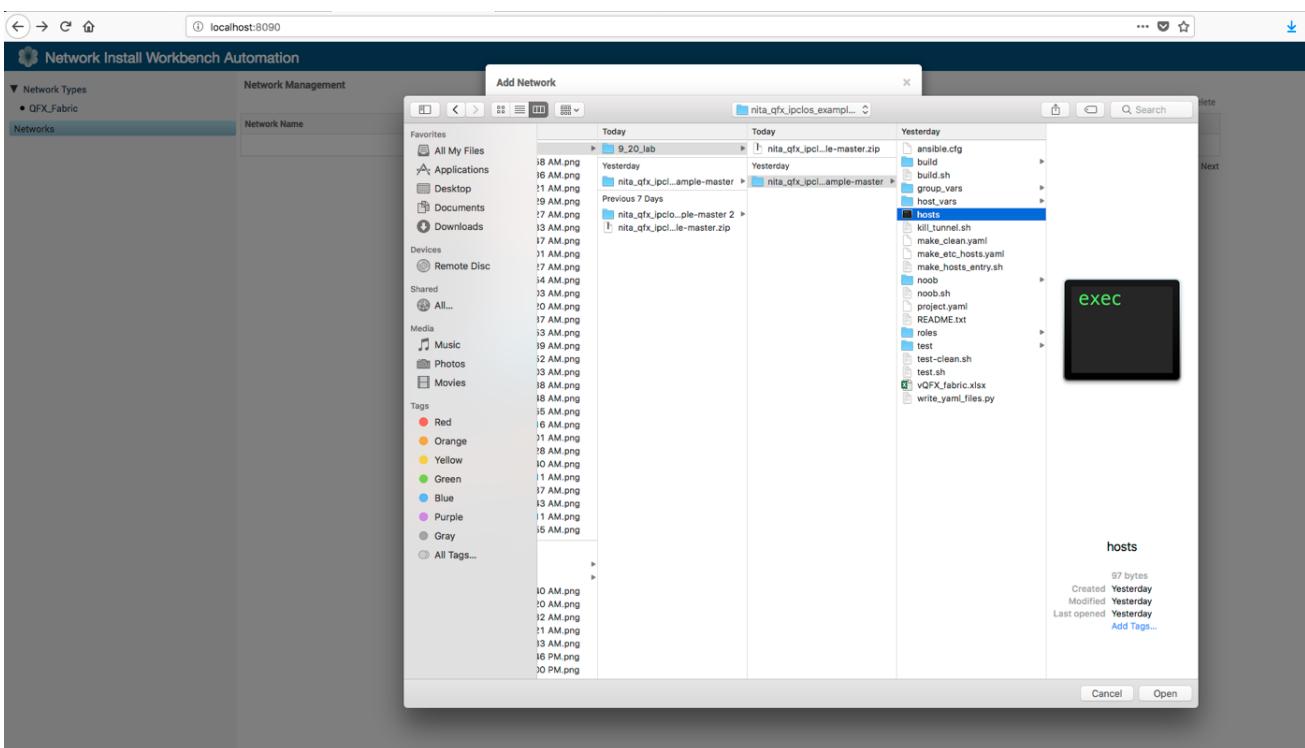
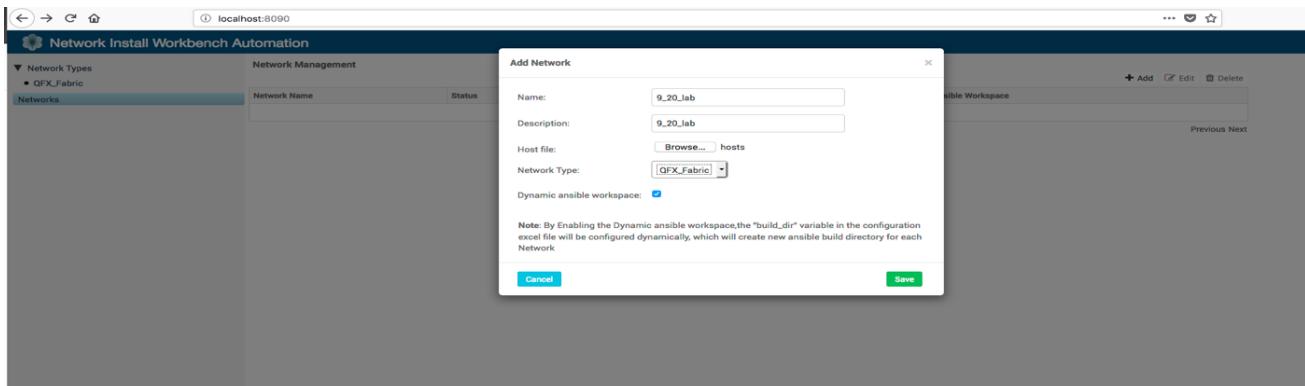
The screenshot shows the "Network Type Management" page again. A new entry, "QFX_Fabric", has been added to the table. The table has columns for "Network Type Name" (QFX_Fabric) and "Description" (QFX_Fabric). Buttons for "+ Add" and "Delete" are visible at the top right.

- Click “Networks” (on LHS) and select “Add”:

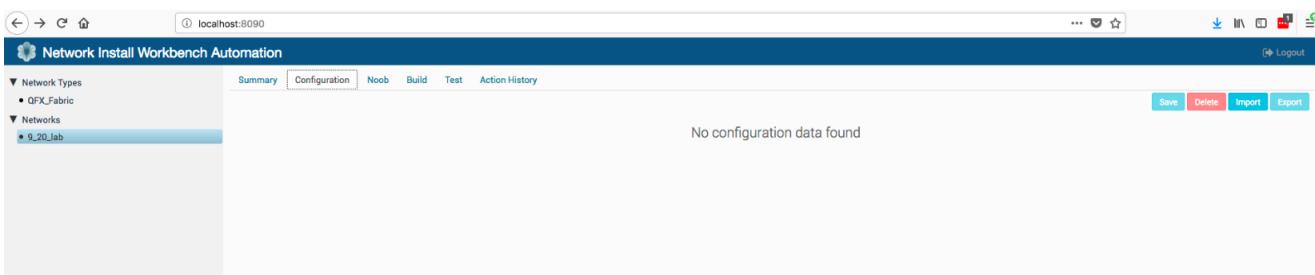
- A dialog box will ask for name, description, host file, and network type:

- Complete the dialog box:

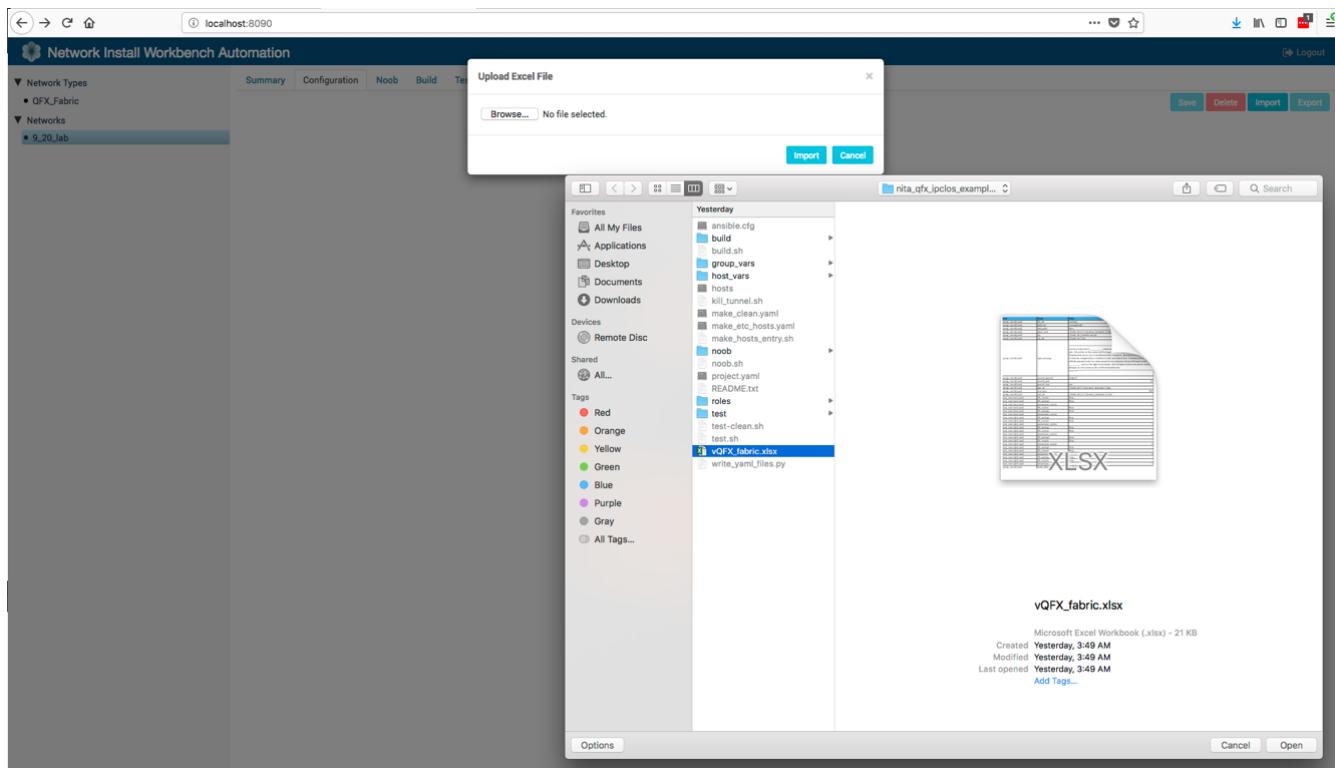
- Browse for the Hosts file in the unzipped folder extracted from the .zip file earlier:



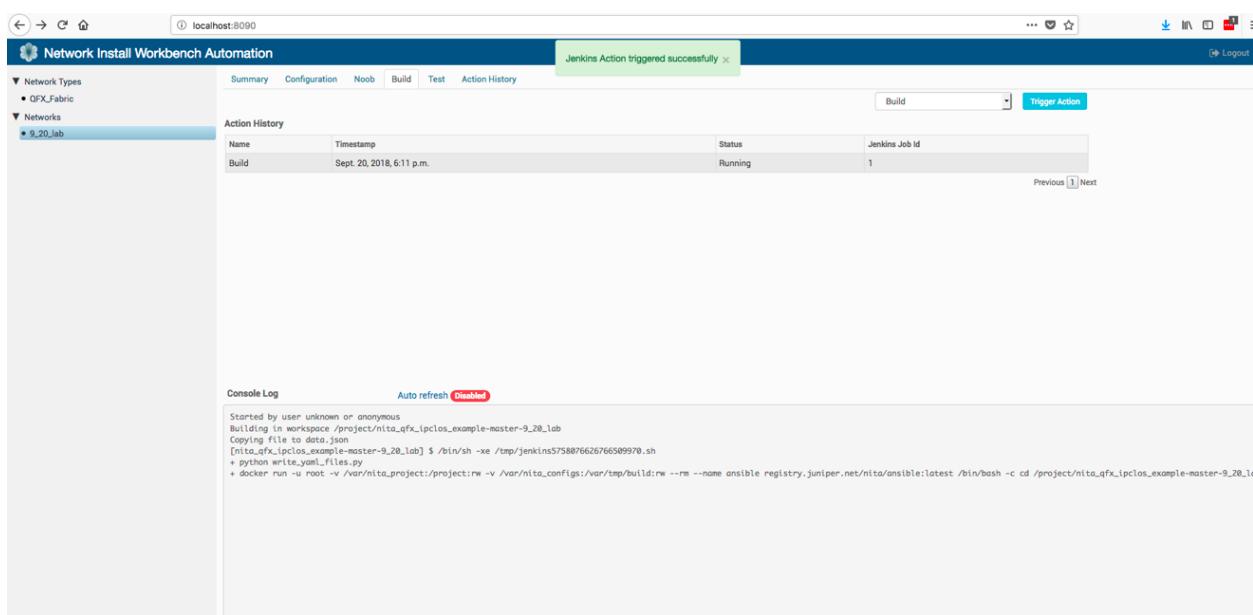
- After saving, configure the network by clicking on the “Network” button (LHS) and choose “Configuration” from the pulldown menus.



- Import the vQFX_fabric.xlsx file, which contains all of the configuration files from the unzipped directory:



- Choose the "Build" pulldown menu, click on the "Trigger Action" button, and allow the process to run (double-clicking on "Running" shows how the build is progressing). The full cycle takes about three minutes.



- Once the Trigger Action process has concluded, it's time to run a full test on the network by selecting "Test" from the pulldown menu:

- Once the test is complete, open a Localhost:8080 browser window (for Jenkins Scheduler):

- Click on "Test(9_20lab)" to get network results:

	Total	Failed	Passed	Pass %
Critical tests	94	14	80	85.1
All tests	94	14	80	85.1

- While 14 of 94 tests have failed (see snapshot), this is because we are using virtual devices in this lab. Since the test is looking for hardware modules, virtual devices are reported as errors. These errors can be ignored.

Failed Test Cases

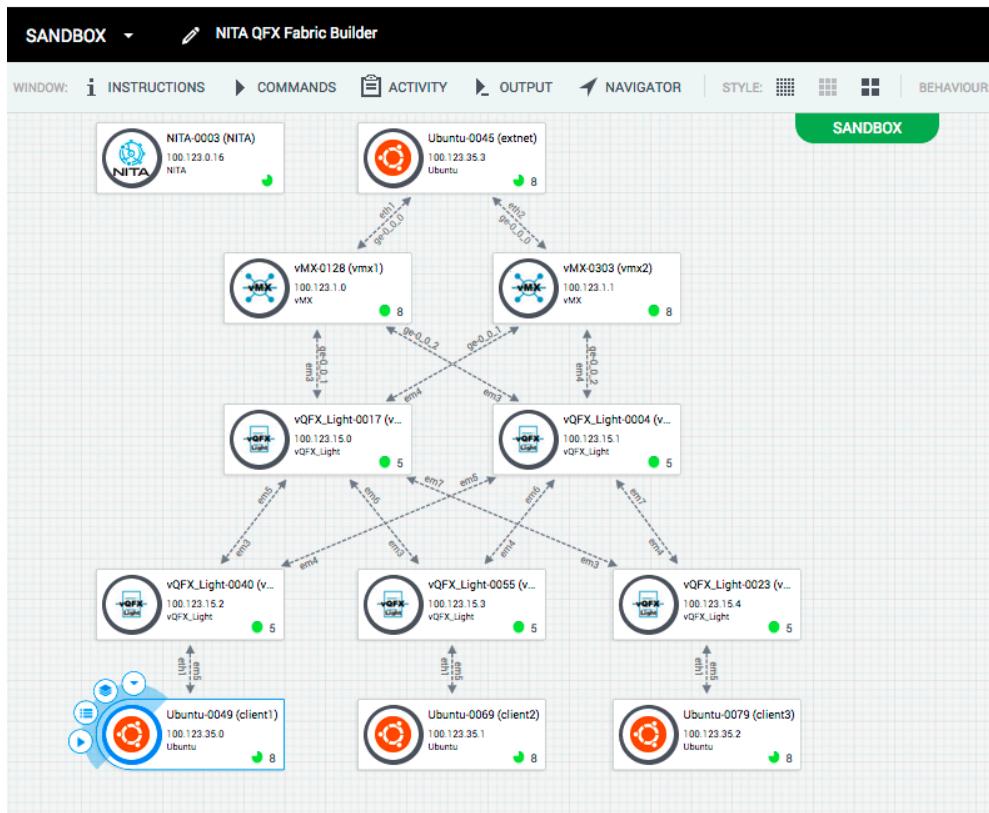
Name	Crit.	Duration	Age
⊕ Tests.02 Vmx1.T1.10: CHECK '/dev/ad0s1a' PARTITION HAVE ENOUGH FREE SPACE FOR UPGRADE	yes	0:00:00.221	1
⊕ Tests.02 Vmx1.T1.8: CHECK NO SYSTEM ALARMS	yes	0:00:00.079	1
⊕ Tests.02 Vmx2.T1.10: CHECK '/dev/ad0s1a' PARTITION HAVE ENOUGH FREE SPACE FOR UPGRADE	yes	0:00:00.222	1
⊕ Tests.02 Vmx2.T1.8: CHECK NO SYSTEM ALARMS	yes	0:00:00.129	1
⊕ Tests.02 Vqfx1.T1.5: SHOW PFE STATISTICS LOCAL TRAFFIC	yes	0:00:00.070	1
⊕ Tests.02 Vqfx1.T1.9: CHECK NO CORE DUMPS PRESENT	yes	0:00:00.200	1
⊕ Tests.02 Vqfx2.T1.5: SHOW PFE STATISTICS LOCAL TRAFFIC	yes	0:00:00.070	1
⊕ Tests.02 Vqfx2.T1.9: CHECK NO CORE DUMPS PRESENT	yes	0:00:00.200	1
⊕ Tests.02 Vqfx3.T1.5: SHOW PFE STATISTICS LOCAL TRAFFIC	yes	0:00:00.121	1
⊕ Tests.02 Vqfx3.T1.9: CHECK NO CORE DUMPS PRESENT	yes	0:00:00.251	1
⊕ Tests.02 Vqfx4.T1.5: SHOW PFE STATISTICS LOCAL TRAFFIC	yes	0:00:00.121	1
⊕ Tests.02 Vqfx4.T1.9: CHECK NO CORE DUMPS PRESENT	yes	0:00:00.196	1
⊕ Tests.02 Vqfx5.T1.5: SHOW PFE STATISTICS LOCAL TRAFFIC	yes	0:00:00.121	1
⊕ Tests.02 Vqfx5.T1.9: CHECK NO CORE DUMPS PRESENT	yes	0:00:00.249	1

Test Suites

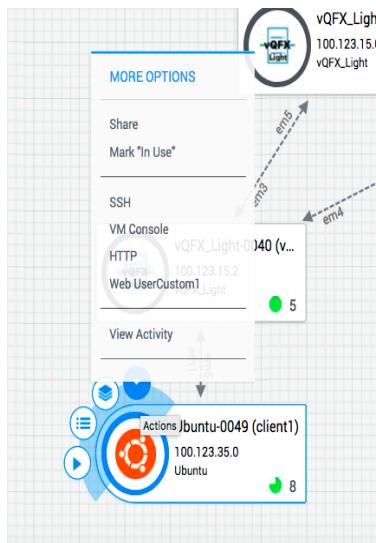
You have successfully set up all networking devices. Congratulations!

Chapter 2: Applying IP Addresses to the Ubuntu Servers

From the Workspace sandbox, it is possible to directly SSH into each of the Ubuntu servers (Clients 1, 2, and 3). Mousing over the device reveals a blue half-circle of menu items (see bottom left of the screen grab below). Choose “SSH” from the downward arrow to access the Ubuntu server.



Confirm the interface number connected to the QFX Series switch (in this case, Eth1). Log in and switch to super user to configure the server.

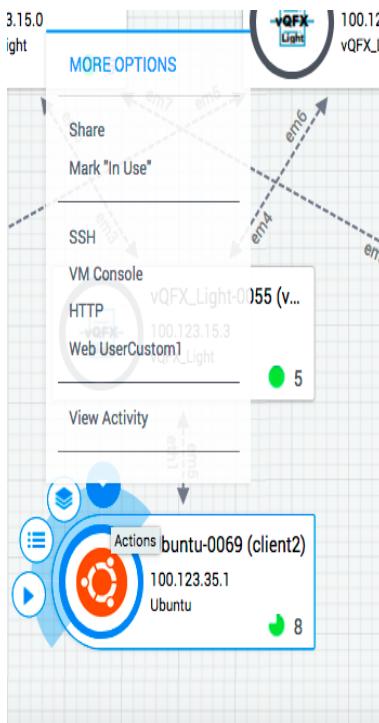


```
cluser@ubuntu:~$ sudo su -  
[sudo] password for jcluser: (PW for lab is Juniper!1)  
root@ubuntu:~# ifconfig eth1 10.30.81.2/24 (QFX is 10.30.81.1/24)  
root@ubuntu:~# ping 10.30.81.1  
PING 10.30.81.1 (10.30.81.1) 56(84) bytes of data.  
64 bytes from 10.30.81.1: icmp_seq=1 ttl=64 time=0.253 ms  
64 bytes from 10.30.81.1: icmp_seq=2 ttl=64 time=0.237 ms  
64 bytes from 10.30.81.1: icmp_seq=3 ttl=64 time=0.326 ms  
64 bytes from 10.30.81.1: icmp_seq=4 ttl=64 time=0.233 ms  
^C  
--- 10.30.81.1 ping statistics --route--  
4 packets transmitted, 4 received, 0% packet loss, time 2997ms  
rtt min/avg/max/mdev = 0.233/0.262/0.326/0.039 ms
```

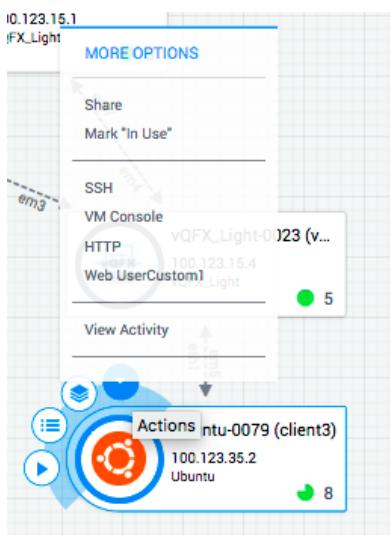
- Add routes for the other two Ubuntu server networks:

```
root@ubuntu:~# route add -net 10.30.82.0/24 gw 10.30.81.1  
root@ubuntu:~# route add -net 10.30.83.0/24 gw 10.30.81.1
```

- Complete IP addressing for the other two clients; the process is the same for all three clients. Simple ping tests between the clients confirm everything is in working order:



```
jcluser@ubuntu:~$ sudo su -
[sudo] password for jcluser:
root@ubuntu:~# ifconfig eth1 10.30.82.2/24
root@ubuntu:~# route add -net 10.30.81.0/24 gw 10.30.82.1
root@ubuntu:~# route add -net 10.30.83.0/24 gw 10.30.82.1
root@ubuntu:~#
```



```
root@ubuntu:~# history
1 ifconfig eth1 10.30.83.2/24
2 route add -net 10.30.82.0/24 gw 10.30.83.1
3 route add -net 10.30.81.0/24 gw 10.30.83.1
4 ping 10.30.83.2
```

Chapter 3: Changing the IP Addresses for the Entire Topology

The power of automation really comes into its own when you need to apply changes to the topology. In this simple example, we'll show how easy it is to change all IP addresses on the network.

This can be accomplished by simply taking the vQFX_fabric.xls file from our master clos directory (this is the file used in step 1 above when building out the network) and performing a mass change to all 10.30. addresses. In this case, we are changing 10.30 to 55.55. When done, save as a new file and apply to the network.

	A	B	C	D	E	F
1	host	static	destination			
2	host_vars/vmx1.yaml	10.30.0.0/16	discard			
3	host_vars/vmx1.yaml	0.0.0.0/0	100.123.0.1			
4	host_vars/vmx1.yaml	10.30.0.0/16	discard			
5	host_vars/vmx2.yaml	0.0.0.0/0	100.123.0.1			
6	host_vars/vqfx1.yaml	0.0.0.0/0	100.123.0.1			
7	host_vars/vqfx2.yaml	0.0.0.0/0	100.123.0.1			
8	host_vars/vqfx3.yaml	0.0.0.0/0	100.123.0.1			
9	host_vars/vqfx4.yaml	0.0.0.0/0	100.123.0.1			
10	host_vars/vqfx5.yaml	0.0.0.0/0	100.123.0.1			
11						
12						
13						
14						
15						
16						
17						

	A	B	C	D	E	F
1	host	static	destination			
2	host_vars/vmx1.yaml	55.55.0.0/16	discard			
3	host_vars/vmx1.yaml	0.0.0.0/0	100.123.0.1			
4	host_vars/vmx2.yaml	55.55.0.0/16	discard			
5	host_vars/vmx2.yaml	0.0.0.0/0	100.123.0.1			
6	host_vars/vqfx1.yaml	0.0.0.0/0	100.123.0.1			
7	host_vars/vqfx2.yaml	0.0.0.0/0	100.123.0.1			
8	host_vars/vqfx3.yaml	0.0.0.0/0	100.123.0.1			
9	host_vars/vqfx4.yaml	0.0.0.0/0	100.123.0.1			
10	host_vars/vqfx5.yaml	0.0.0.0/0	100.123.0.1			
11						
12						
13						
14						
15						
16						
17						

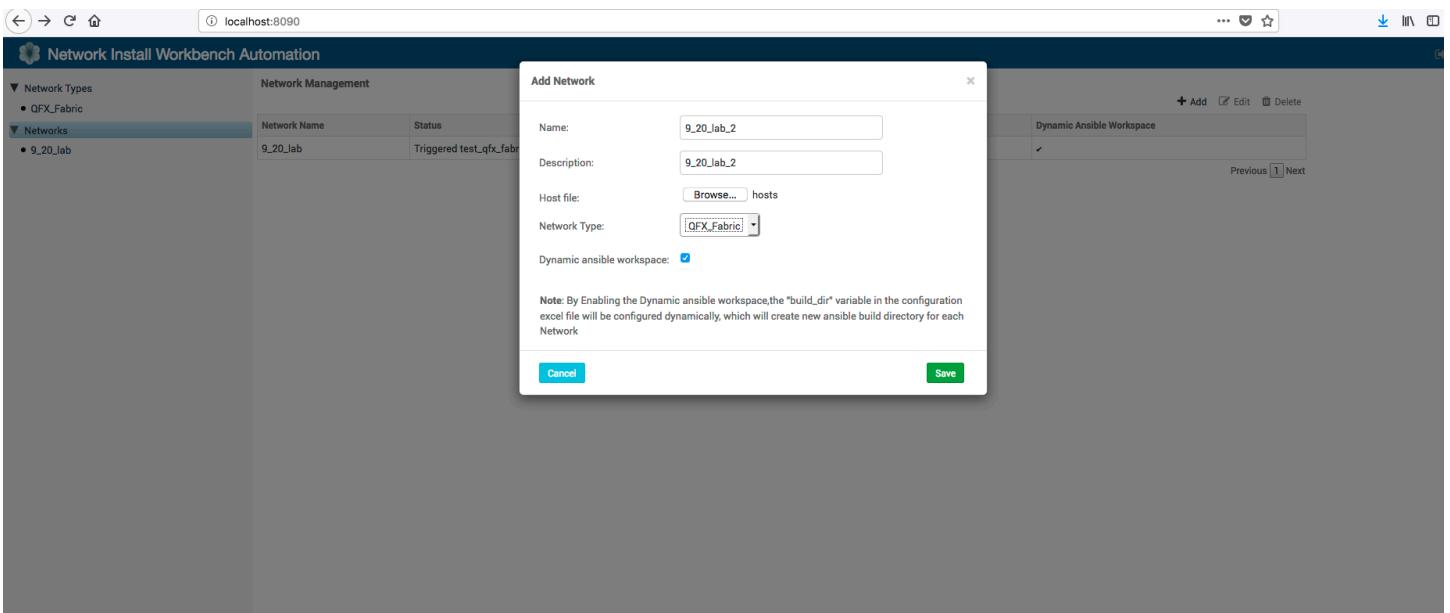
Before making any address changes to the interfaces, SSH onto on spine #1 and view the IP BGP Summary. View “Show bgp Summary” and “show configuration protocols” as follows:

```
{master:0}
jcluser@vqfx1> show bgp summary
Groups: 1 Peers: 5 Down peers: 0
Table          Tot Paths  Act Paths Suppressed      History Damp State      Pending
inet.0
Peer          AS        InPkt    OutPkt   OutQ   Flaps Last Up/Dwn State|#Active/Received/Accepted/Damped...
10.30.113.1   1         37       43       0       0     0   15:46 3/11/11/0   0/0/0/0
10.30.123.1   2         37       42       0       0     0   15:45 2/11/11/0   0/0/0/0
10.30.135.2   5         43       44       0       0     0   15:55 3/14/14/0   0/0/0/0
10.30.136.2   6         41       45       0       0     0   16:17 4/14/14/0   0/0/0/0
10.30.137.2   7         42       48       0       0     0   16:13 3/14/14/0   0/0/0/0

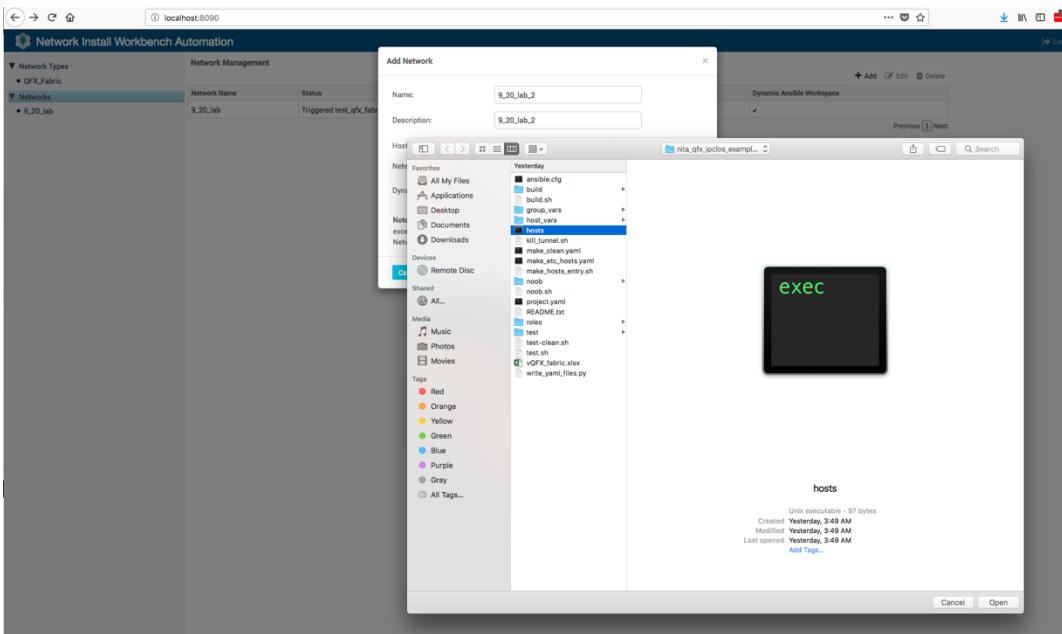
{master:0}
jcluser@vqfx1> show configuration protocols
bgp {
    export EXPORT-ALL;
    group CLOS {
        type external;
        family inet {
            unicast;
        }
        neighbor 10.30.113.1 {
            peer-as 1;
        }
        neighbor 10.30.123.1 {
            peer-as 2;
        }
        neighbor 10.30.135.2 {
            peer-as 5;
        }
        neighbor 10.30.136.2 {
            peer-as 6;
        }
        neighbor 10.30.137.2 {
            peer-as 7;
        }
    }
}
igmp-snooping {
    vlan default;
}

{master:0}
jcluser@vqfx1> █
```

Note all BGP neighbors are up and communicating correctly using the original 10.30.x.x addresses. Returning to the Network Install Workbench Automation screen, add a new network to the lab. We will use the same lab name but append a “2” at the end to distinguish the files, making it “9_20_lab_2”.



We will use the same “hosts” file as in Chapter 1, since we have not made any changes to the topology.



From the configuration screen, import the vQFX_lab2.xls file:

The screenshot shows the 'Configuration' tab of the Network Install Workbench Automation interface. On the left, a sidebar lists 'Network Types' (QFX_Fabric) and 'Networks' (9_20_lab, 9_20_lab_2). The main area displays a message 'No configuration data found'. At the top right, there are 'Save', 'Delete', 'Import', and 'Export' buttons. The 'Import' button is highlighted with a blue border.

A modal dialog titled 'Upload Excel File' is open. It shows a file selection tree on the left with 'vQFX_fabric2.xlsx' selected. On the right, a preview of the Excel sheet is shown, and at the bottom, file details are listed: 'vQFX_fabric2.xlsx' (22 KB), 'Created Today, 11:20 AM', 'Modified Today, 11:20 AM', and 'Last opened Today, 11:20 AM'. Buttons for 'Cancel' and 'Open' are at the bottom right.

Next, repeat the build and test steps from this screen:

The screenshot shows the 'Build' tab of the Network Install Workbench Automation interface. A green success message 'Jenkins Action triggered successfully' is displayed. Below it, an 'Action History' table shows one entry: 'Build' on 'Sept. 20, 2018, 6:21 p.m.' with status 'Running' and Jenkins Job ID '1'. A 'Trigger Action' button is also present. At the bottom, a 'Console Log' section shows command-line output for the Jenkins build process.

```

Started by user unknown or anonymous
Building in workspace /project/nitro_qfx_ipclos_example-master-9_20_lab_2
Copying files to workspace
[workspace] $ cd /tmp/jenkins1910361408338664088
[workspace] $ python write_yaml_files.py
+ docker run -u root -v /var/nitro_project:/project:nw -v /var/nitro_configs:/var/tmp/build:rw --rm --name ansible registry.juniper.net/nitro/ansible:latest /bin/bash -c cd /project/nitro_qfx_ipclos_example-master-9_20_lab_2

```

The screenshot shows a web-based interface for Network Install Workbench Automation. On the left, there's a sidebar with 'Network Types' (QFX_Fabric) and 'Networks' (9_20_lab, 9_20_lab_2). The main area has tabs for 'Summary', 'Configuration', 'Noob', 'Build', 'Test', and 'Action History'. A green banner at the top says 'Jenkins Action triggered successfully'. Below it is a table for 'Action History' with one entry: 'Test' at 'Sept. 20, 2018, 6:22 p.m.' in 'Running' status, Jenkins Job ID 1. A 'Trigger Action' button is present. At the bottom is a 'Console Log' section with auto-refresh disabled, showing command-line output related to Jenkins and Docker.

We can see from the Jenkins Dashboard that Test9_20_lab_2 has completed:

The Jenkins dashboard shows several build jobs: 'Build(9_20_lab)', 'Build(9_20_lab_2)', 'network_template_mgr', 'network_type_validator', 'Noob(9_20_lab)', 'Noob(9_20_lab_2)', 'Test(9_20_lab_1)', and 'Test(9_20_lab_2)'. The 'Test(9_20_lab_2)' job is highlighted in yellow and has a status of '8 min 49 sec - #1'. The 'Robot Results' column indicates 80/94 passed. A legend at the bottom right shows RSS feeds for all, failures, and latest builds.

The project page for 'Test(9_20_lab_2)' shows a 'Robot Framework Tests Trend (all tests)' bar chart with 'Passed' (green) and 'Failed' (red) cases. The chart shows approximately 80 passed and 14 failed cases across build numbers 1 and 2. Below the chart, a table provides detailed test statistics: Critical tests (94 Failed, 14 Passed, 80 Passed, 85.1% Pass %), All tests (94 Failed, 14 Passed, 80 Passed, 85.1% Pass %), and links to 'Browse results', 'report.html', and 'log.html'.

This operation completes in minutes. Returning to the network, SSH into Spine#1 and repeat our “Show BGP summary” and “Show configuration protocols” network commands.

```
{master:0}
jcluser@vqfx1> show configuration protocols
bgp {
    export EXPORT-ALL;
    group CLOS {
        type external;
        family inet {
            unicast;
        }
        neighbor 55.55.113.1 {
            peer-as 1;
        }
        neighbor 55.55.123.1 {
            peer-as 2;
        }
        neighbor 55.55.135.2 {
            peer-as 5;
        }
        neighbor 55.55.136.2 {
            peer-as 6;
        }
        neighbor 55.55.137.2 {
            peer-as 7;
        }
    }
}
igmp-snooping {
    vlan default;
}

{master:0}
jcluser@vqfx1> show bgp summary
Groups: 1 Peers: 5 Down peers: 0
Table          Tot Paths  Act Paths Suppressed      History Damp State      Pending
inet.0
Peer          AS      InPkt   OutPkt   OutQ   Flaps Last Up/Dwn State #Active/Received/Accepted/Damped...
55.55.113.1   1       51      54       0      0     21:46 4/12/12/0   0/0/0/0
55.55.123.1   2       54      54       0      0     21:42 2/18/18/0   0/0/0/0
55.55.135.2   5       53      56       0      0     21:47 3/11/11/0   0/0/0/0
55.55.136.2   6       54      57       0      0     21:47 3/11/11/0   0/0/0/0
55.55.137.2   7       54      56       0      0     21:47 3/11/11/0   0/0/0/0

{master:0}
jcluser@vqfx1> █
```

The network addressing has been successfully changed to 55.55.x.x network wide. By using this method, typos and other typical user errors were avoided. This operation took approximately 10 minutes to complete.

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