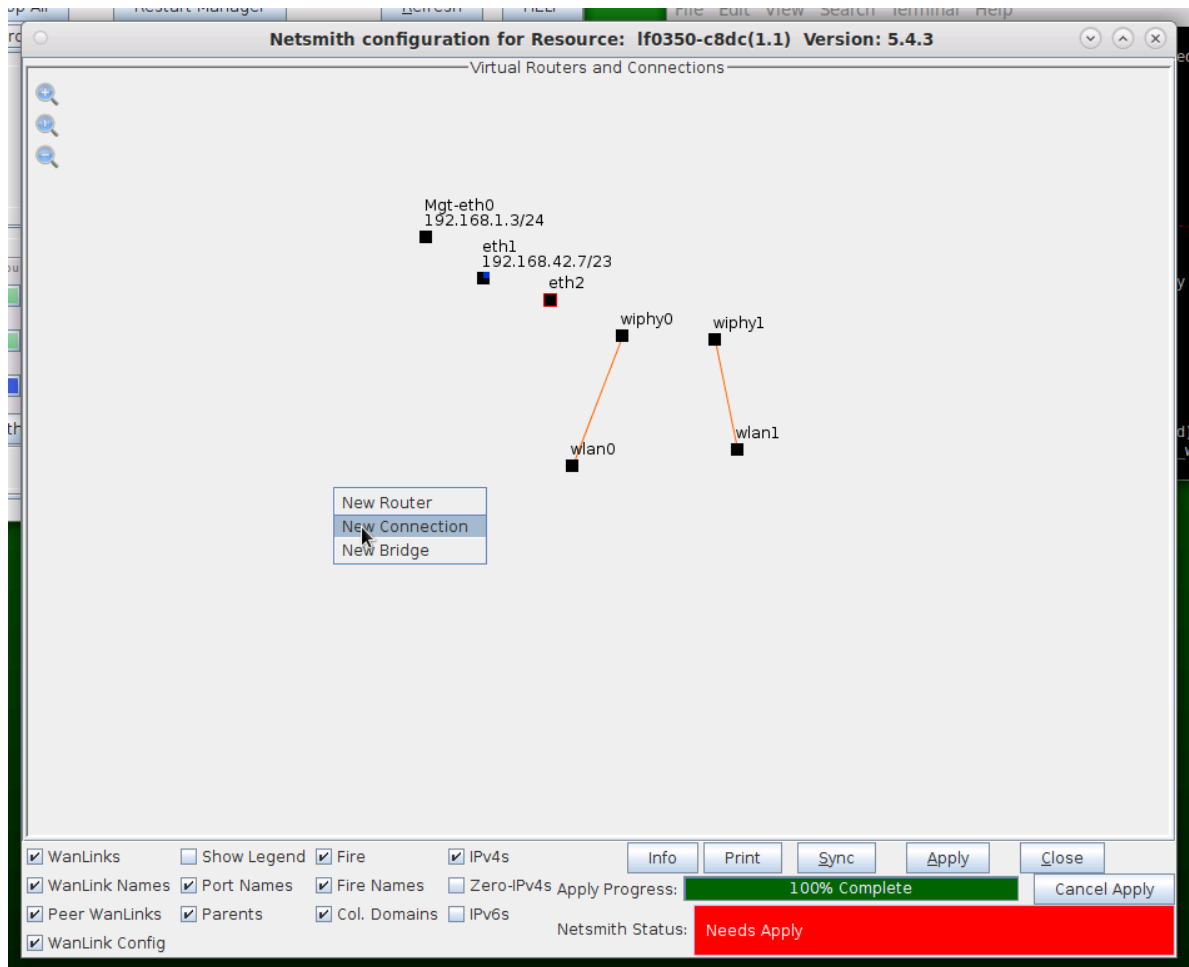


Multiple Layer-2 Switches

Goal: Emulate the behavior of five Layer-2 Switches connected together for traffic fail-over testing. In this test scenario, the function of several layer-2 switches will be emulated using multiple LANforge Bridge devices with Spanning Tree Protocol (STP) so that each bridge can be connected to at least two others and fail-over tests can be demonstrated.

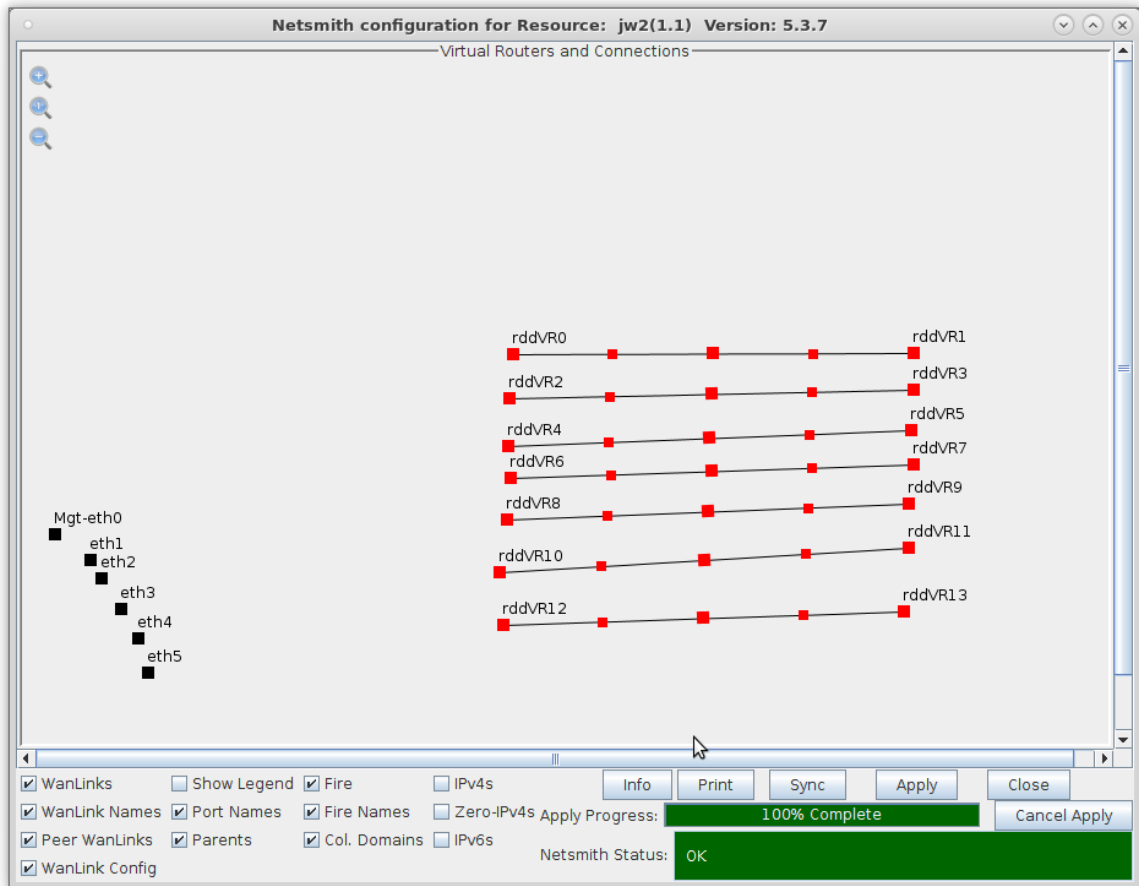
1. Setup seven Netsmith Connections.

A. Right-click inside the Netsmith window and select **New Connection**

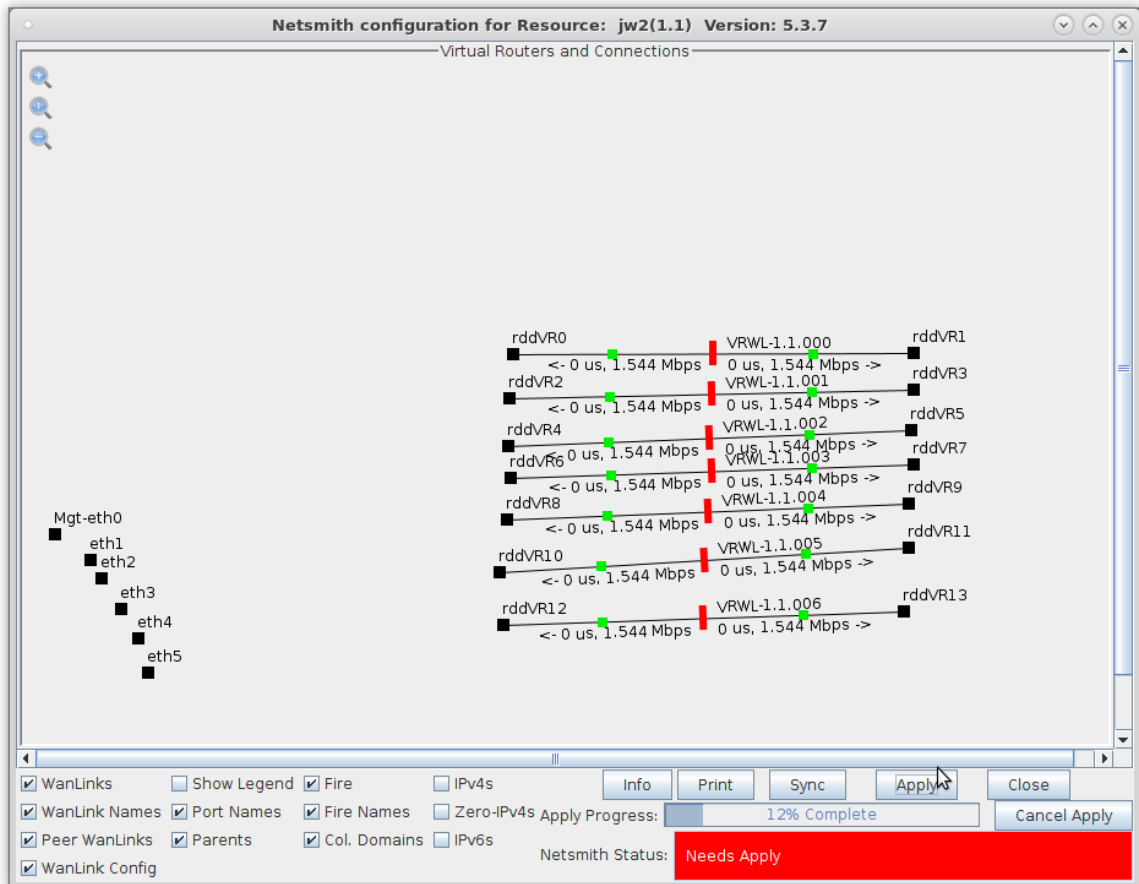


B. Accept defaults *Auto Create* everything then click **OK**.

C. Repeat and create a total of seven (7) connections



D. Click the **Apply** button to commit the changes in Netsmith to the LANforge-Server

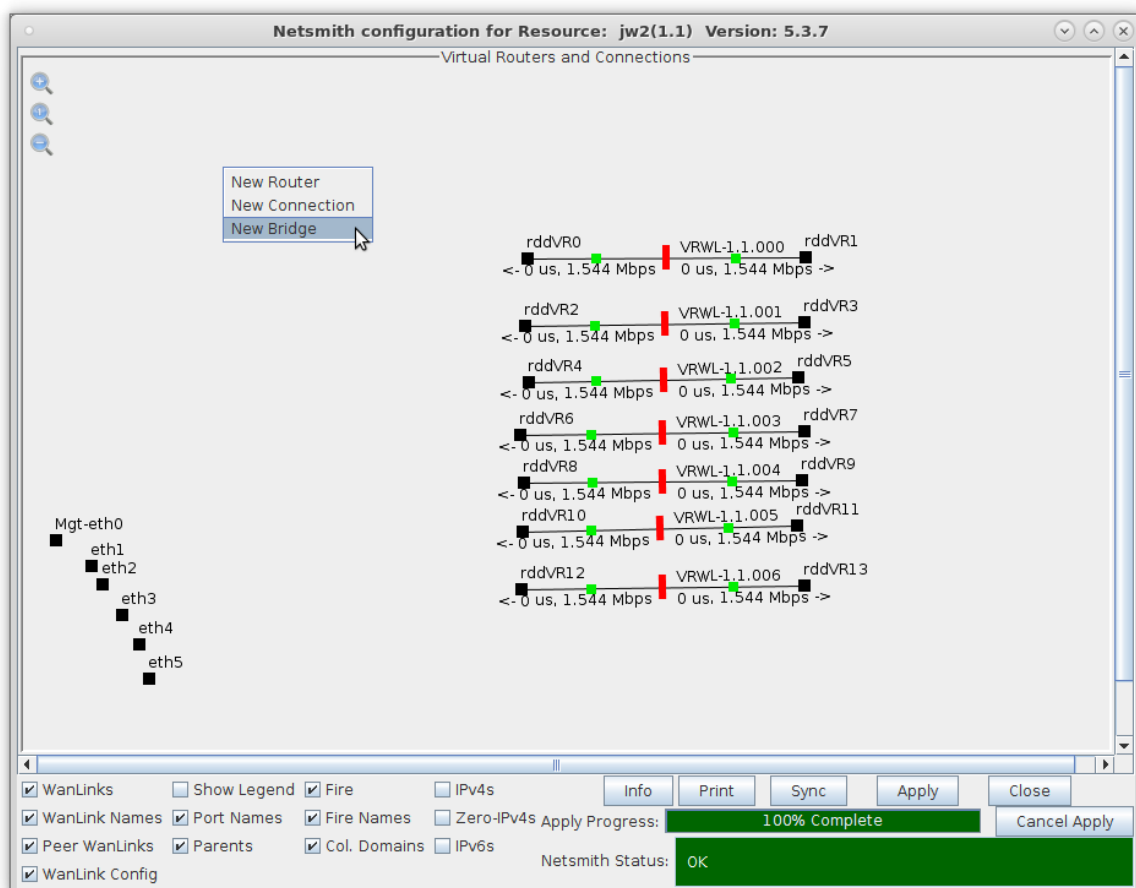


A. **NOTE:** Modifications in Netsmith are only sent to the LANforge-Server after Applying them

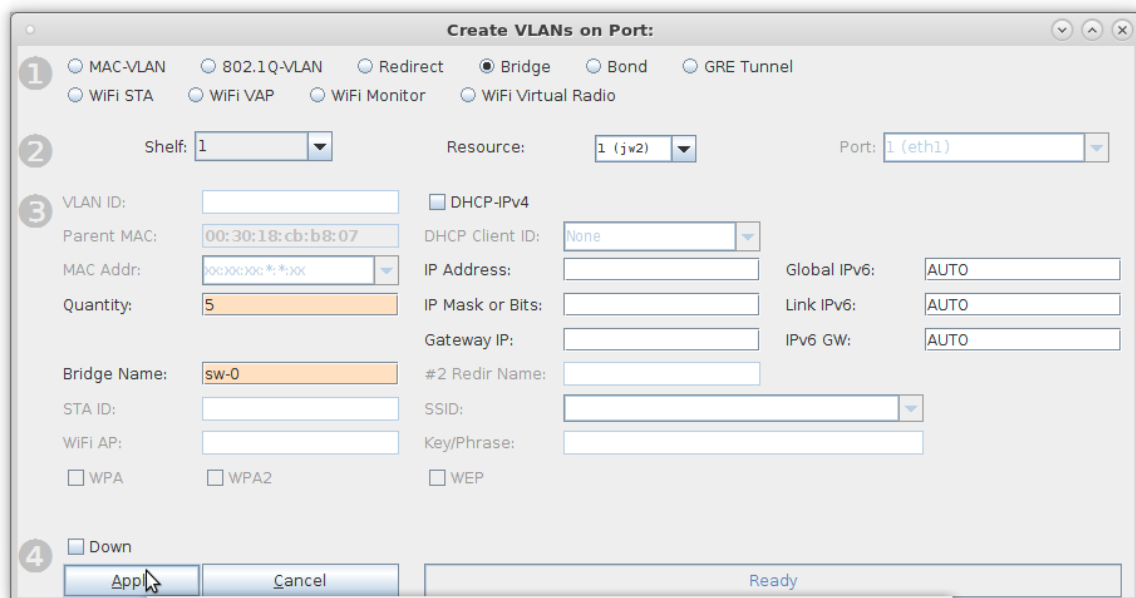
For more information see [LANforge-GUI User Guide: Virtual Interfaces](#)

2. Setup five Bridge devices.

- A. Right-click inside the Netsmith window and select **New Bridge**

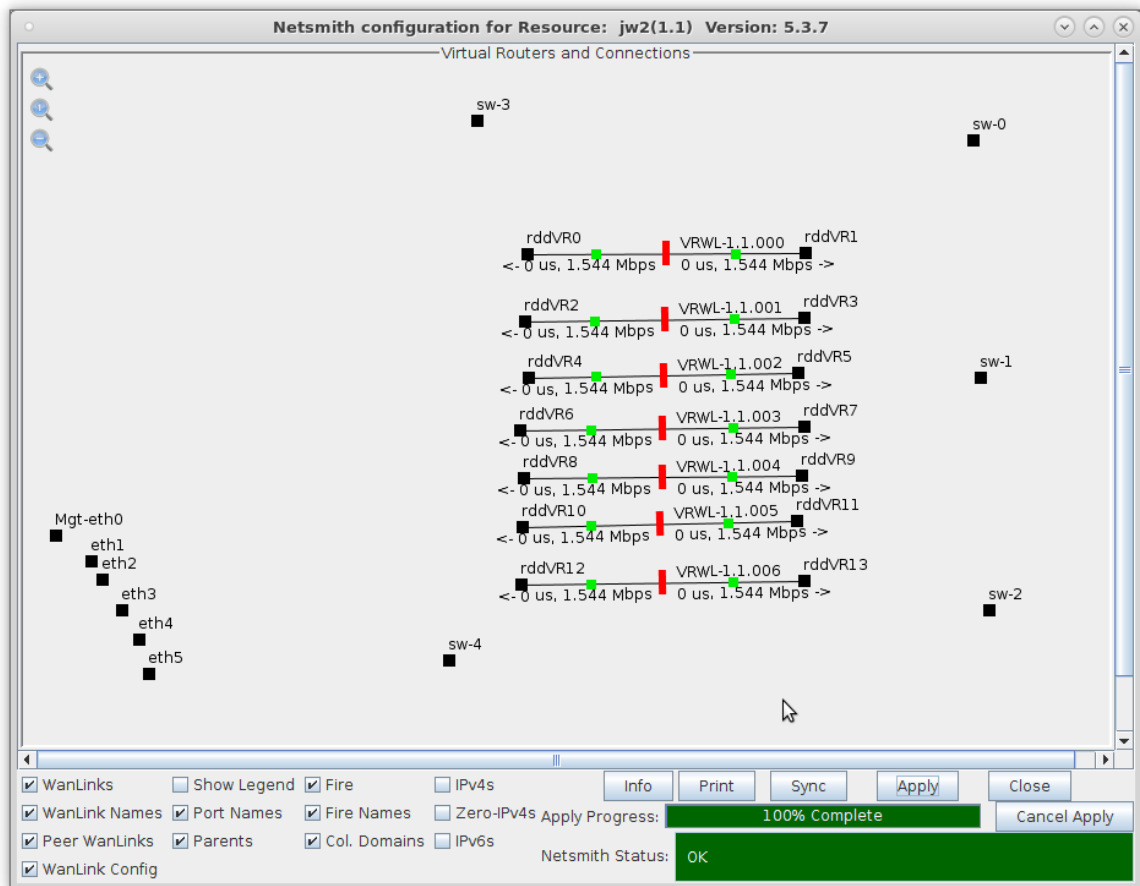


- B. Select the **Bridge** button, enter a name and quantity 5



- A. **NOTE:** The 5 bridges here are sw-0, sw-1, sw-2, sw-3, and sw-4

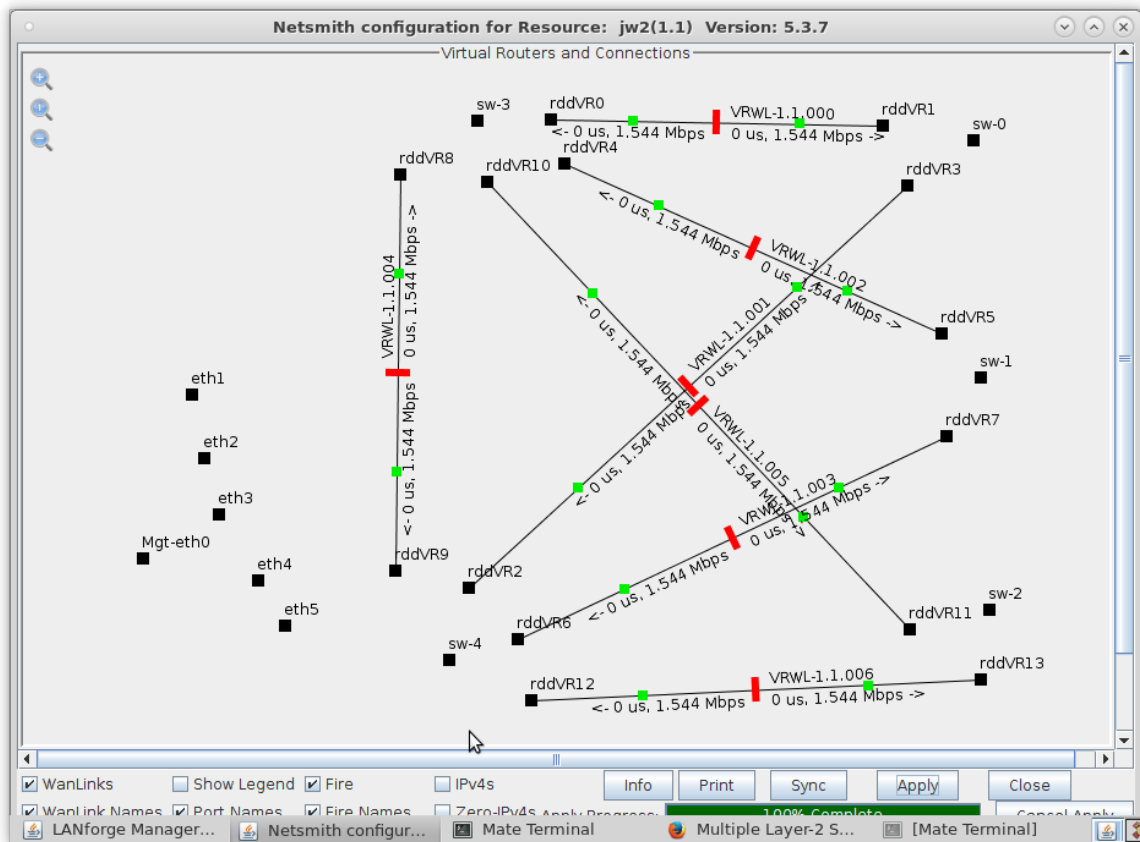
- C. In Netsmith, position the bridge devices into separate areas so they can be grouped with WanLink entry points



For more information see [LANforge-GUI User Guide: Ports \(Interfaces\)](#)

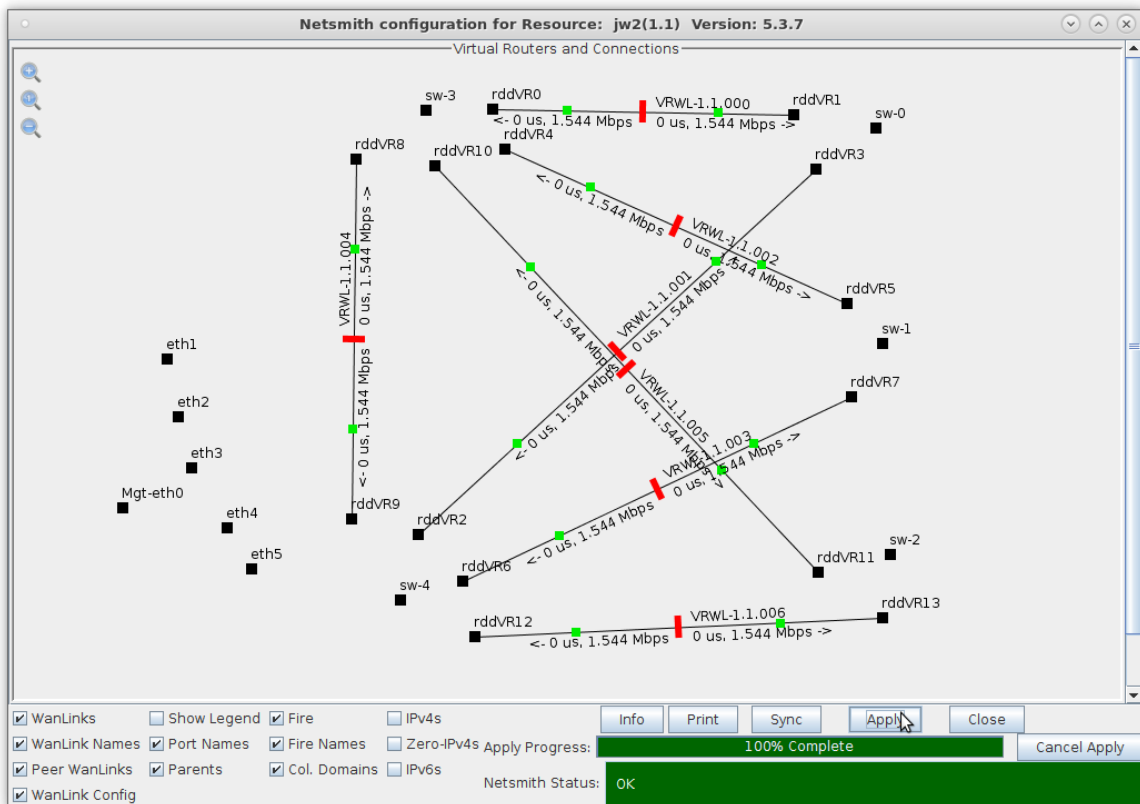
3. Move the WanLinks into their desired positions.

A. Position the WanLink entry points in groups near the bridges as follows:



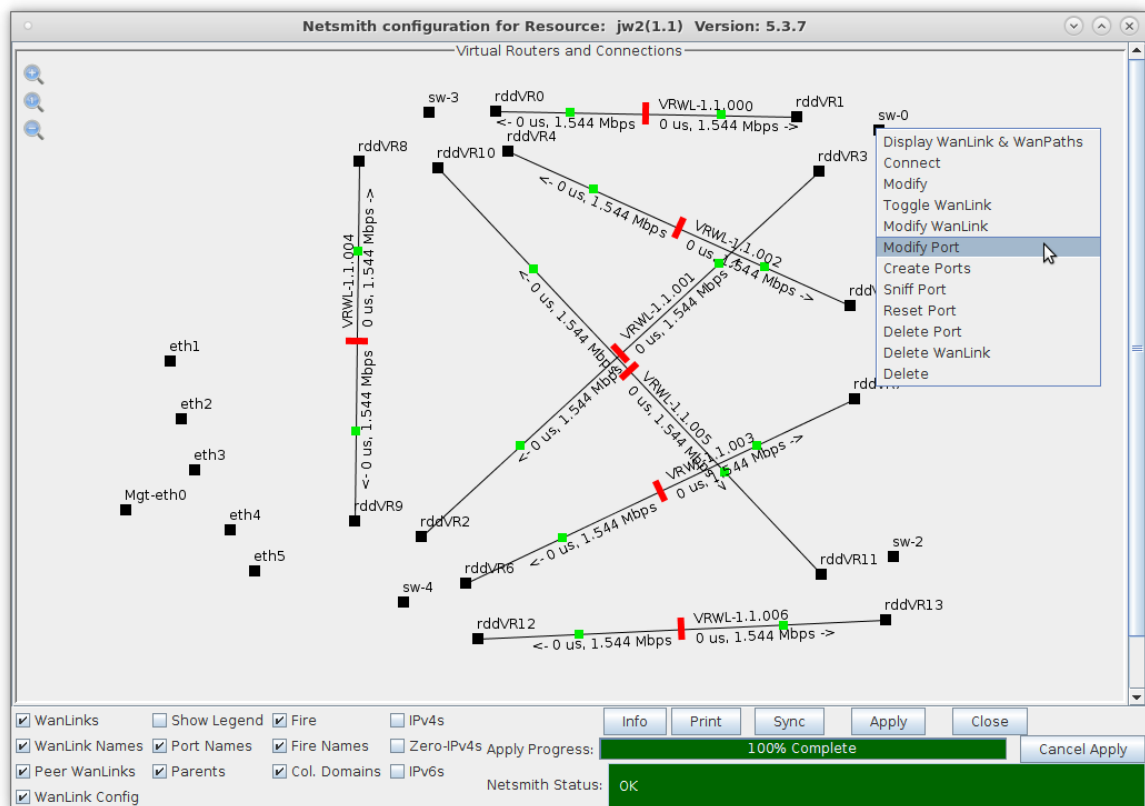
- A. 2 entry points near sw-0, sw-1, and sw-2 (one to sw-3 and one to sw-4)
- B. 3 entry points near sw-3 and sw-4 (one to sw-0, sw-1, and sw-2)
- C. Bridges sw-3 and sw-4 should also have a WanLink between them

B. Click Netsmith **Apply** to commit the changes

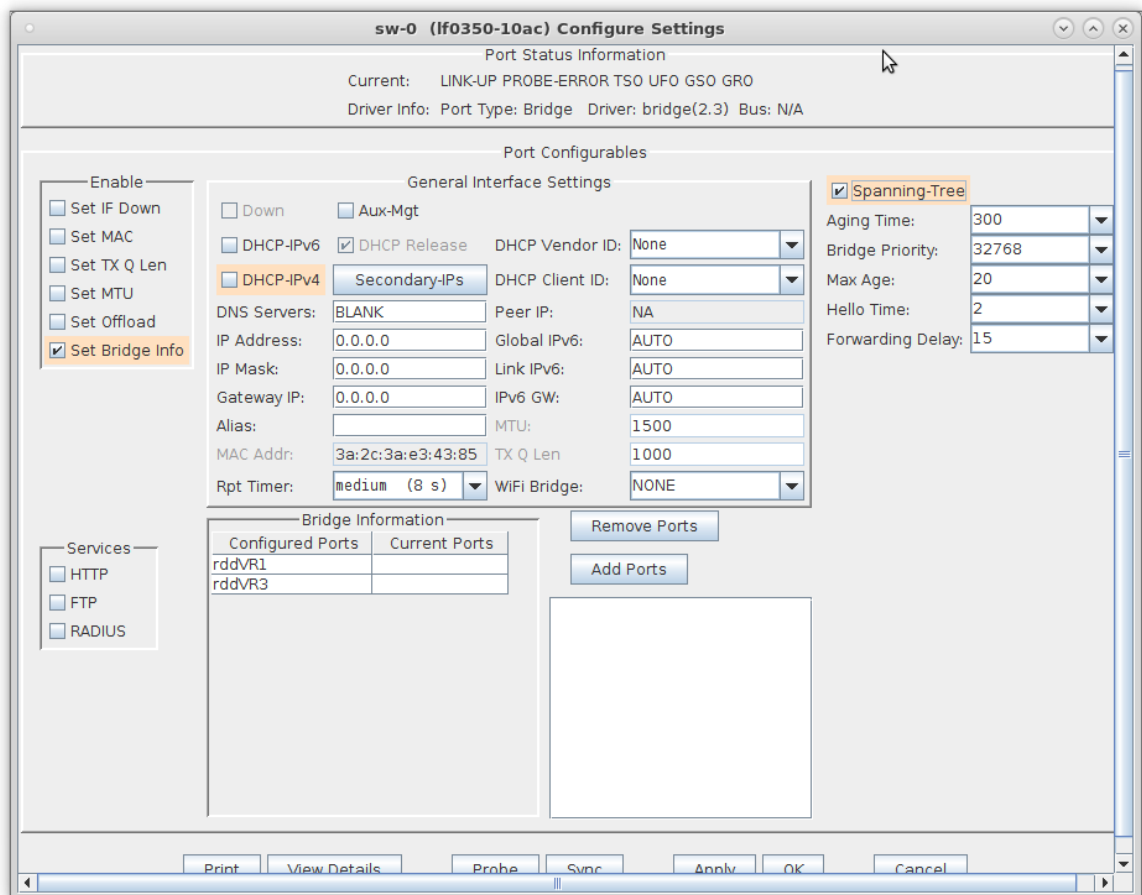


4. Modify each Bridge to enable Spanning Tree Protocol (STP) and add Bridge Members.

A. Right-click bridge sw-0 and select **Modify Port**



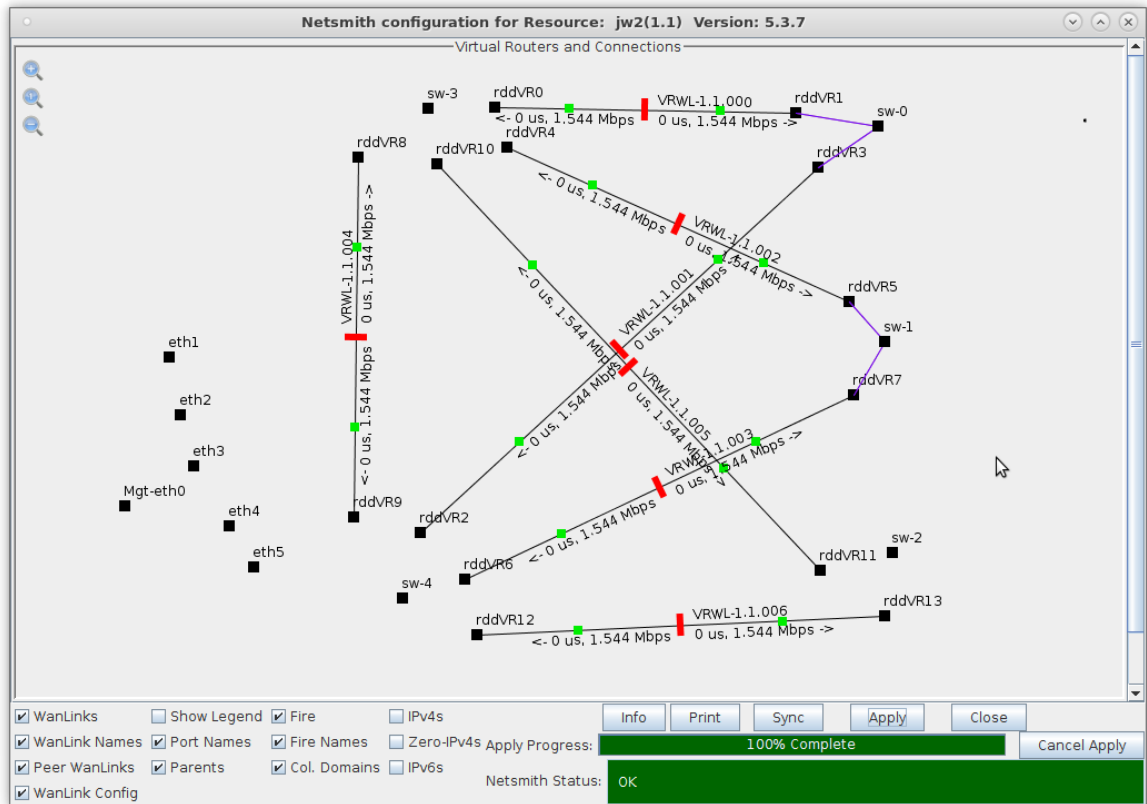
B. Select the 'Set Bridge Info' and 'Spanning Tree' checkboxes; then add bridge members rddVR1 and rddVR3



A. **NOTE:** Selecting the 'Spanning Tree' checkbox enables Spanning Tree Protocol (STP) for that port

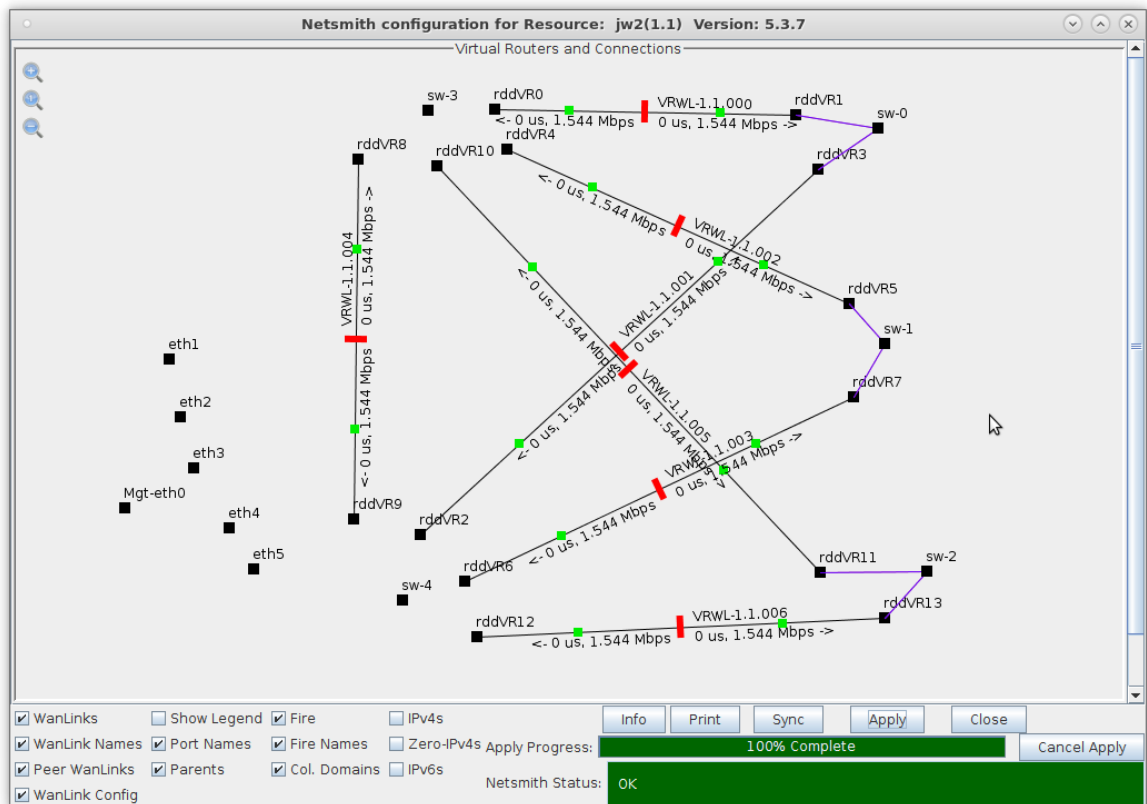
B. Click the **Apply** or **OK** button to commit the changes in bridge configuration to the LANforge-Server

C. Right-click bridge sw-1 and select **Modify Port**



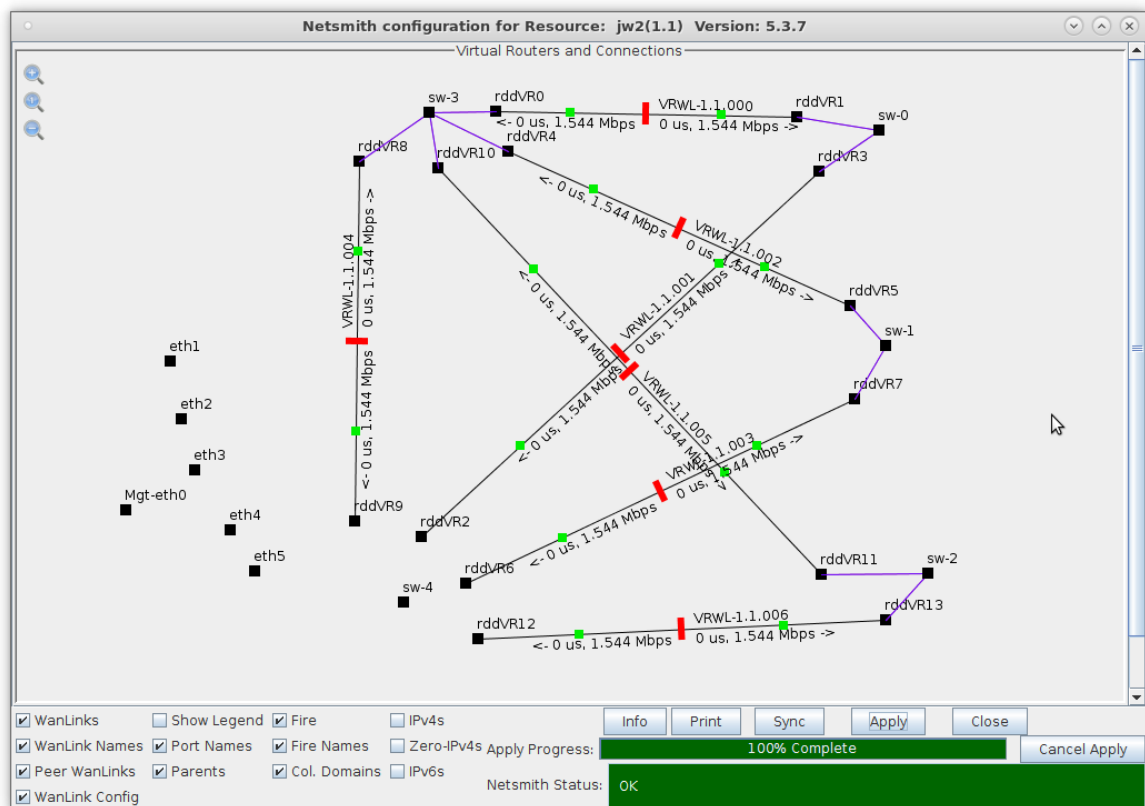
A. Enable STP and add members rddVR5 and rddVR7

D. Right-click bridge sw-2 and select **Modify Port**



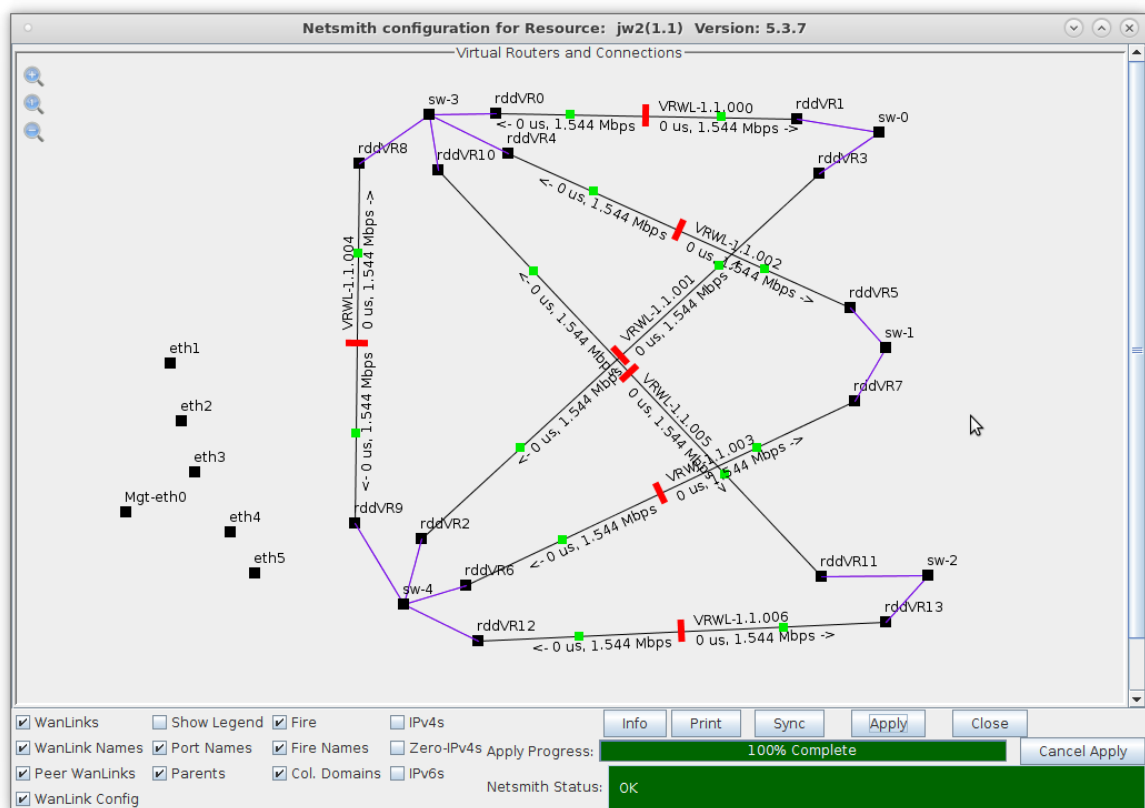
A. Enable STP and add members rddVR11 and rddVR13

E. Right-click bridge sw-3 and select **Modify Port**



A. Enable STP and add members rddVR0, rddVR4, rddVR8 and rddVR10

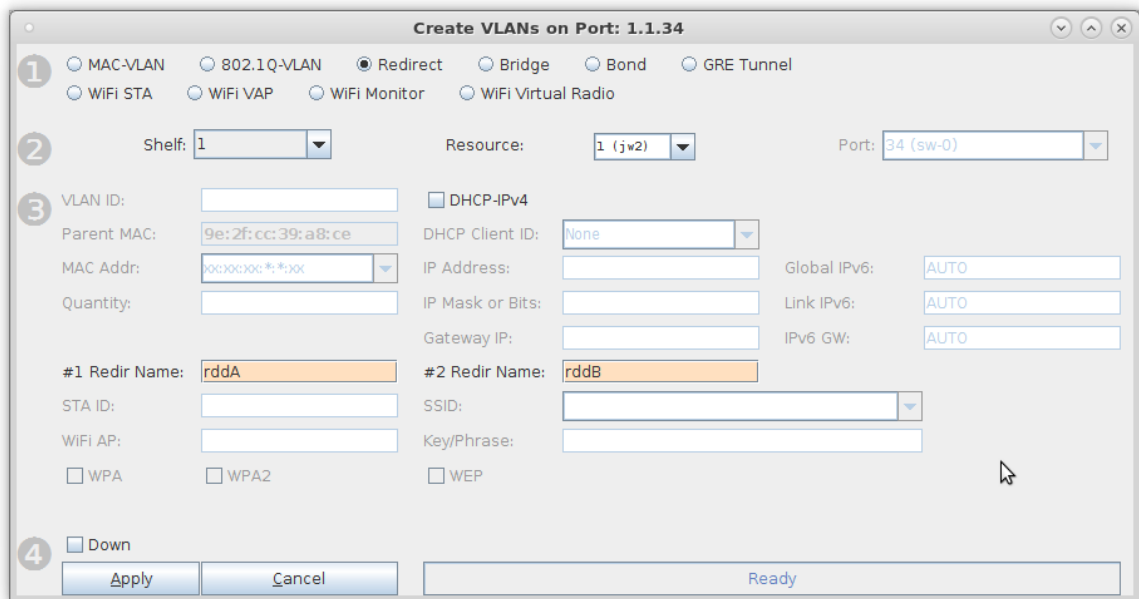
F. Right-click bridge sw-4 and select **Modify Port**



A. Enable STP and add members rddVR2, rddVR6, rddVR9 and rddVR12

5. Create virtual interfaces for traffic generation and fail-over tests.

A. Right-click sw-0 and select **Create Ports** and choose Redirect

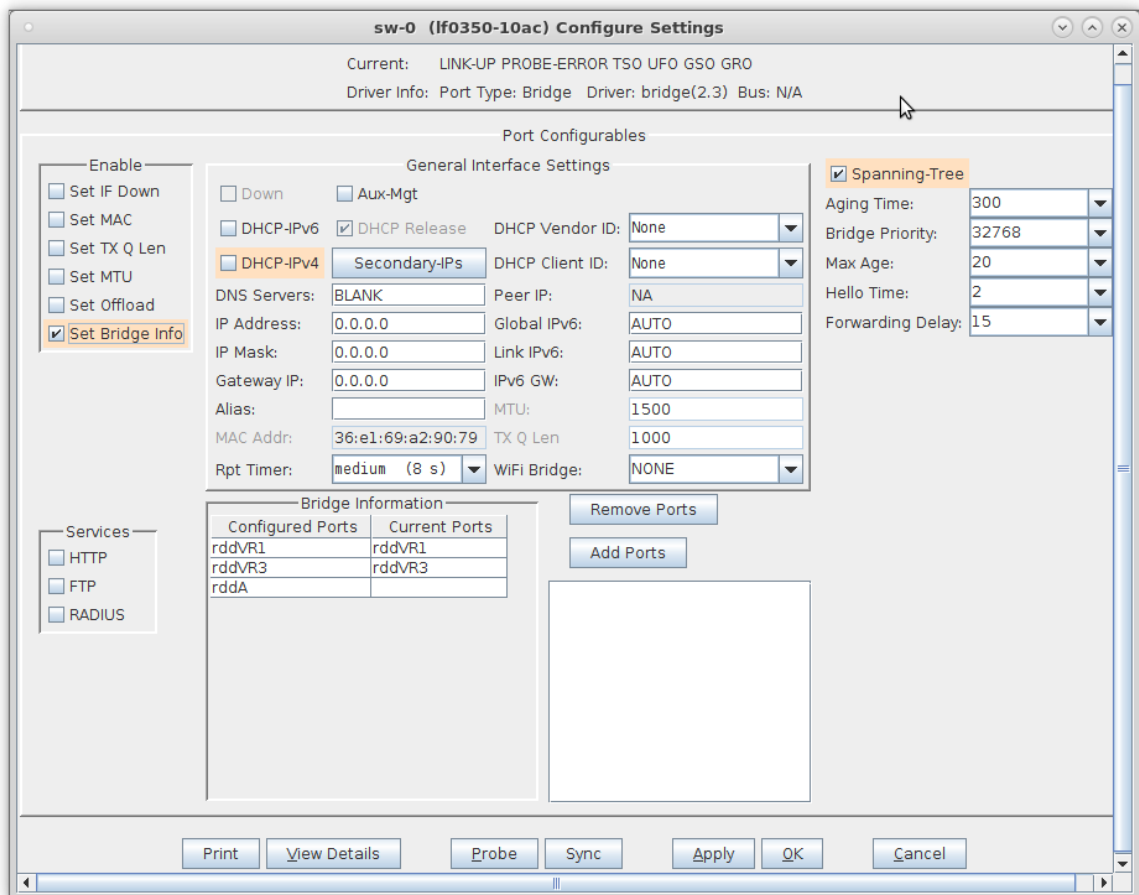


The dialog box is titled "Create VLANs on Port: 1.1.34". It has four numbered steps:

- Step 1: Select the interface type. **Redirect** is selected. Other options include MAC-VLAN, 802.1Q-VLAN, Bridge, Bond, GRE Tunnel, WiFi STA, WiFi VAP, WiFi Monitor, and WiFi Virtual Radio.
- Step 2: Select the shelf, resource, and port. Shelf: 1, Resource: 1 (jw2), Port: 34 (sw-0).
- Step 3: Configure VLAN details. VLAN ID: (empty), Parent MAC: 9e:2f:cc:39:a8:ce, MAC Addr: (empty), Quantity: (empty). DHCP-IPv4 is checked. DHCP Client ID: None. IP Address: (empty), IP Mask or Bits: (empty), Gateway IP: (empty). Global IPv6: AUTO, Link IPv6: AUTO, IPv6 GW: AUTO. #1 Redir Name: rddA, #2 Redir Name: rddB. STA ID: (empty), SSID: (empty), WiFi AP: (empty), Key/Phrase: (empty). WPA, WPA2, and WEP are unchecked.
- Step 4: Buttons for Down, Apply, Cancel, and Ready.

A. This step will create two Redirect Devices, rddA and rddB

B. Add rddA to bridge sw-0



The dialog box is titled "sw-0 (If0350-10ac) Configure Settings". It shows the configuration for the sw-0 interface.

Current: LINK-UP PROBE-ERROR TSO UFO GSO GRO
Driver Info: Port Type: Bridge Driver: bridge(2.3) Bus: N/A

Port Configurables

Enable:

- ☐ Set IF Down
- ☐ Set MAC
- ☐ Set TX Q Len
- ☐ Set MTU
- ☐ Set Offload
- ☒ Set Bridge Info

General Interface Settings

Down: ☐ Aux-Mgt: ☐ DHCP-IPv6: ☐ DHCP-IPv4: ☐ DHCP Release: ☒ DHCP Vendor ID: None DHCP Client ID: None DNS Servers: BLANK Peer IP: NA IP Address: 0.0.0.0 Global IPv6: AUTO IP Mask: 0.0.0.0 Link IPv6: AUTO Gateway IP: 0.0.0.0 IPv6 GW: AUTO Alias: (empty) MTU: 1500 MAC Addr: 36:e1:69:a2:90:79 TX Q Len: 1000 Rpt Timer: medium (8 s) WiFi Bridge: NONE

Spanning-Tree: ☒ Aging Time: 300 Bridge Priority: 32768 Max Age: 20 Hello Time: 2 Forwarding Delay: 15

Bridge Information

Configured Ports	Current Ports
rddVR1	rddVR1
rddVR3	rddVR3
rddA	

Buttons: Print, View Details, Probe, Sync, Apply, OK, Cancel

A. Click the **Apply** or **OK** button to commit the changes in bridge configuration to the LANforge-Server

C. Right-click rddB and select **Create Ports**, then select the **MAC-VLAN** button

Create VLANs on Port: 1.1.18

1 ☒ MAC-VLAN ☐ 802.1Q-VLAN ☐ Redirect ☐ Bridge ☐ Bond ☐ GRE Tunnel
☐ WiFi STA ☐ WiFi VAP ☐ WiFi Monitor ☐ WiFi Virtual Radio

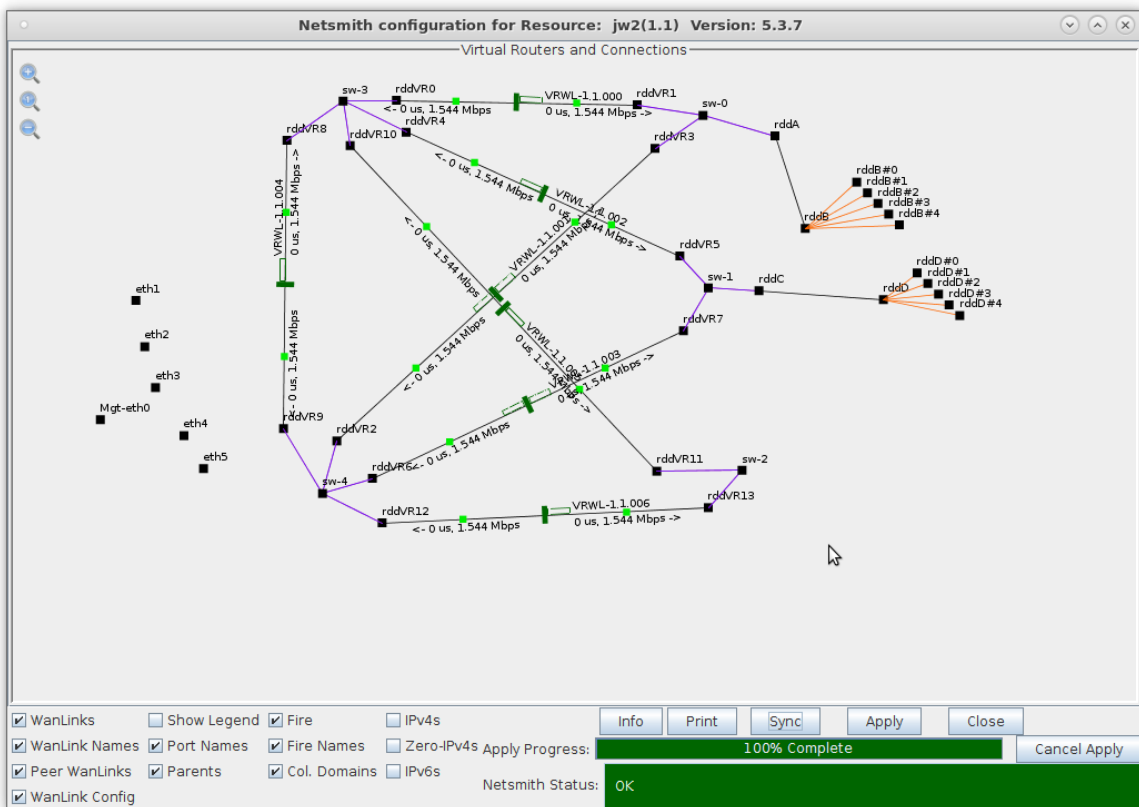
2 Shelf: 1 Resource: 1 (1f0350-10ac) Port: 18 (rddB)

3 VLAN ID: DHCP-IPv4 ☐
Parent MAC: 62:bb:1e:2b:7f:ab DHCP Client ID: None
MAC Addr: xx:xx:xx:*,*:xx IP Address: 172.1.1.101 Global IPv6: AUTO
Quantity: 5 IP Mask or Bits: 24 Link IPv6: AUTO
Gateway IP: 172.1.1.1 IPv6 GW: AUTO
#1 Redir Name: #2 Redir Name:
STA ID: SSID:
WiFi AP: Key/Phrase:
☐ WPA ☐ WPA2 ☐ WEP

4 ☐ Down
Apply Cancel Ready

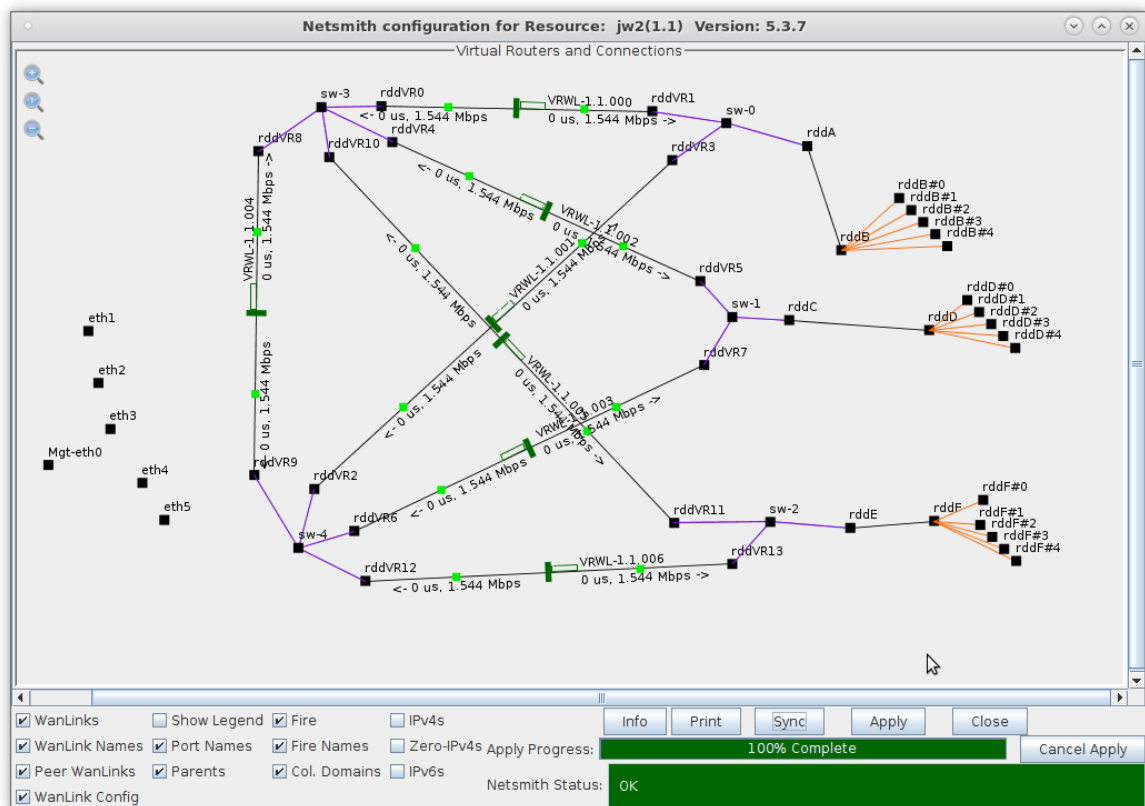
A. Enter a starting MAC address, quantity 5, and starting IP address

D. Repeat for bridge sw-1



A. **NOTE:** The Netsmith display has been 'zoomed-out' by clicking the '-' magnifying glass icon located at the top left of the Netsmith display

E. Repeat for bridge sw-2



6. Create Layer-3 connections.

A. On the **Layer-3** tab, create a Layer-3 UDP connection between rddB#0 and rddD#0

cx-01 - Create/Modify Cross Connect

Display Sync Batch-Create Apply OK Cancel

1 Cross-Connect

CX Name: cx-01

CX Type: LANforge / UDP

Resource: 1 (1f0350-10ac)

Port: 43 (rddB#0)

Min Tx Rate: ISDN (128 Kbps)

Max Tx Rate: Same

Min PDU Size: UDP Pld (1,472 B)

Max PDU Size: Same

IP ToS: Best Effort (0)

Pkts To Send: Infinite

2 Cross-Connect

Report Timer: fast (1 s)

Endpoint A

Endpoint B

Pld Pattern: increasing

Min IP Port: AUTO

Max IP Port: Same

Min Duration: Forever

Max Duration: Same

Min Reconn: 0 (0 ms)

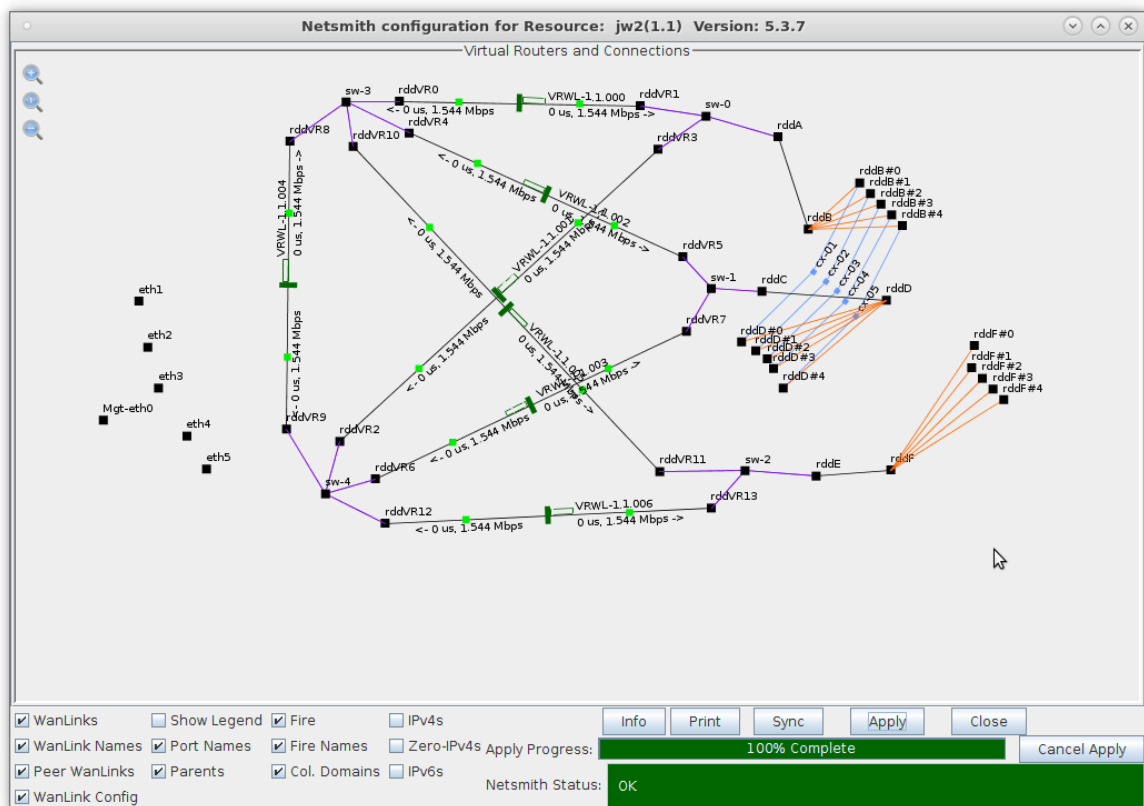
Max Reconn: Same

Multi-Conn: Normal (0)

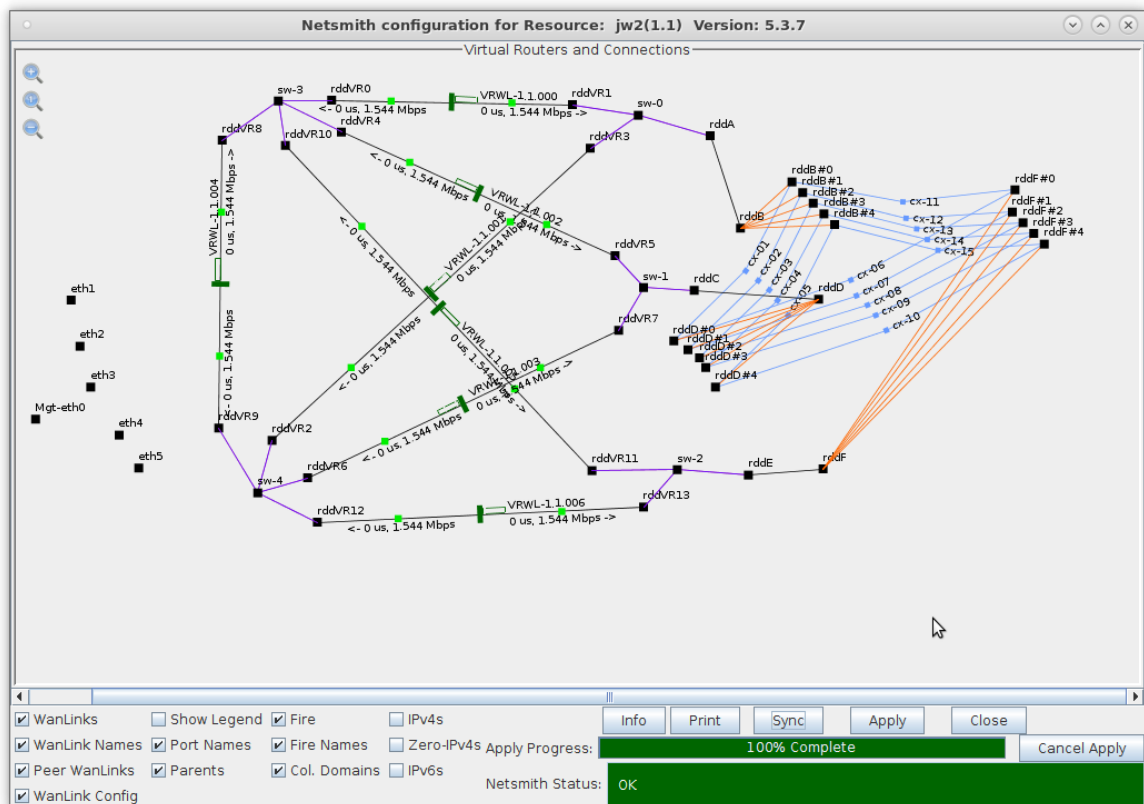
Script

Thresholds

B. Create 4 more connections between the remaining rddB and rddD ports



C. Create 5 connections between the rddD and rddF ports



A. Repeat this step for the rddF and rddB ports for a total of 15 connections

7. Test Fail-Over condition.

LANforge Manager Version(5.3.7)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr vAP Stations Messages
Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators File-IO

Rpt Timer: fast (1 s) Go Test Manager all Select All Start Stop Quiesce Clear

View 0 - 500 Go Display Create Modify Delete

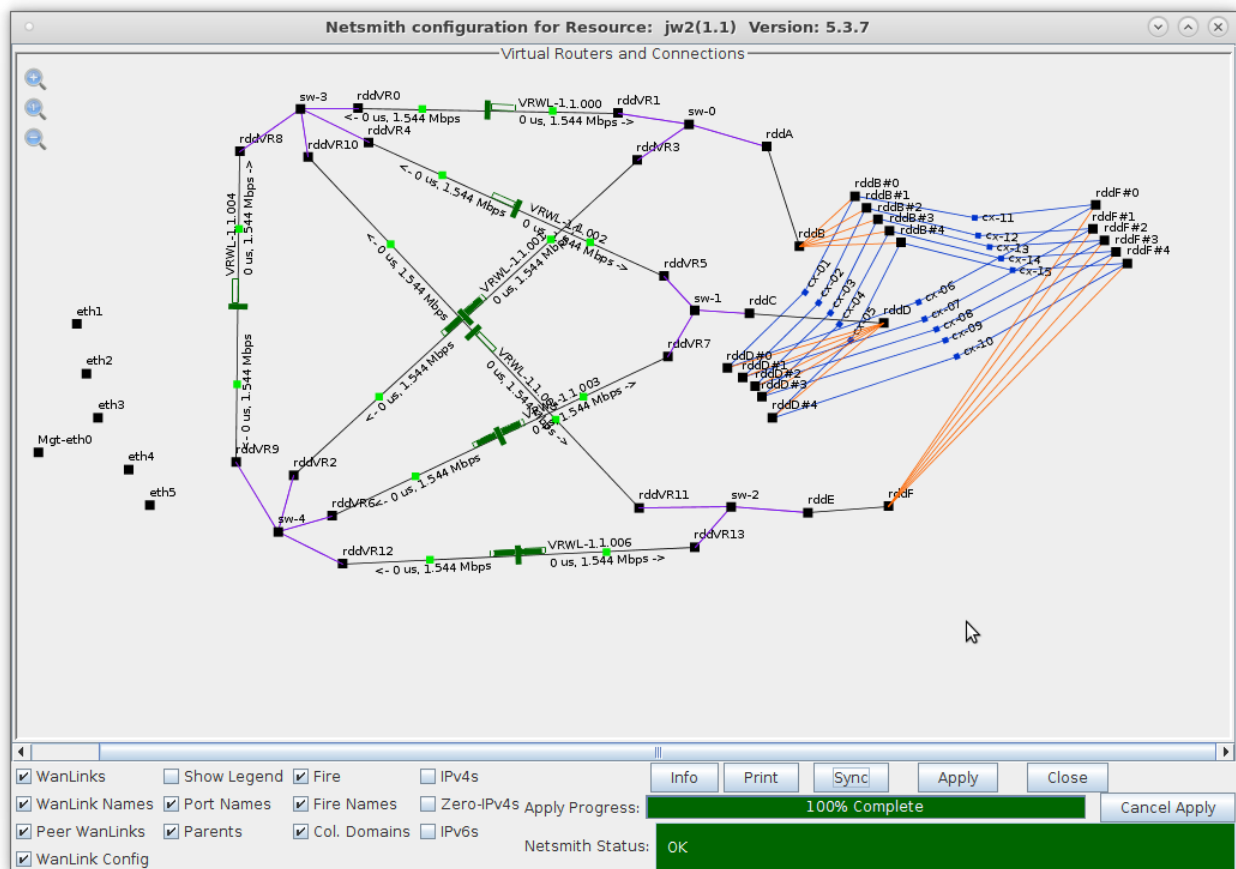
Cross Connects for Selected Test Manager

Name	Type	State	Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B	Rx Drop % A	Rx Drop % B	Drop Pkts A	Drop Pkts B
cx-01	LF/UDP	Run	330	330	127,755	127,755	0	0	0	0
cx-02	LF/UDP	Run	331	323	127,731	127,600	0	0	0	0
cx-03	LF/UDP	Run	323	325	127,592	127,522	0	0	0	0
cx-04	LF/UDP	Run	327	328	127,885	127,847	0	0	0	0
cx-05	LF/UDP	Run	328	328	127,851	127,851	0	0	0	0
cx-06	LF/UDP	Run	328	328	127,855	127,851	0	0	0	0
cx-07	LF/UDP	Run	329	329	127,645	127,645	0	0	0	0
cx-08	LF/UDP	Run	329	329	127,645	127,641	0	0	0	0
cx-09	LF/UDP	Run	329	330	127,645	127,785	0	0	0	0
cx-10	LF/UDP	Run	330	330	127,789	127,789	0	0	0	0
cx-11	LF/UDP	Run	330	330	127,789	127,789	0	0	0	0
cx-12	LF/UDP	Run	330	330	127,793	127,793	0	0	0	0
cx-13	LF/UDP	Run	330	330	127,797	127,793	0	0	0	0
cx-14	LF/UDP	Run	330	330	127,793	127,793	0	0	0	0
cx-15	LF/UDP	Run	330	330	127,797	127,797	0	0	0	0

Logged in to: 192.168.100.103:4002 as: Admin

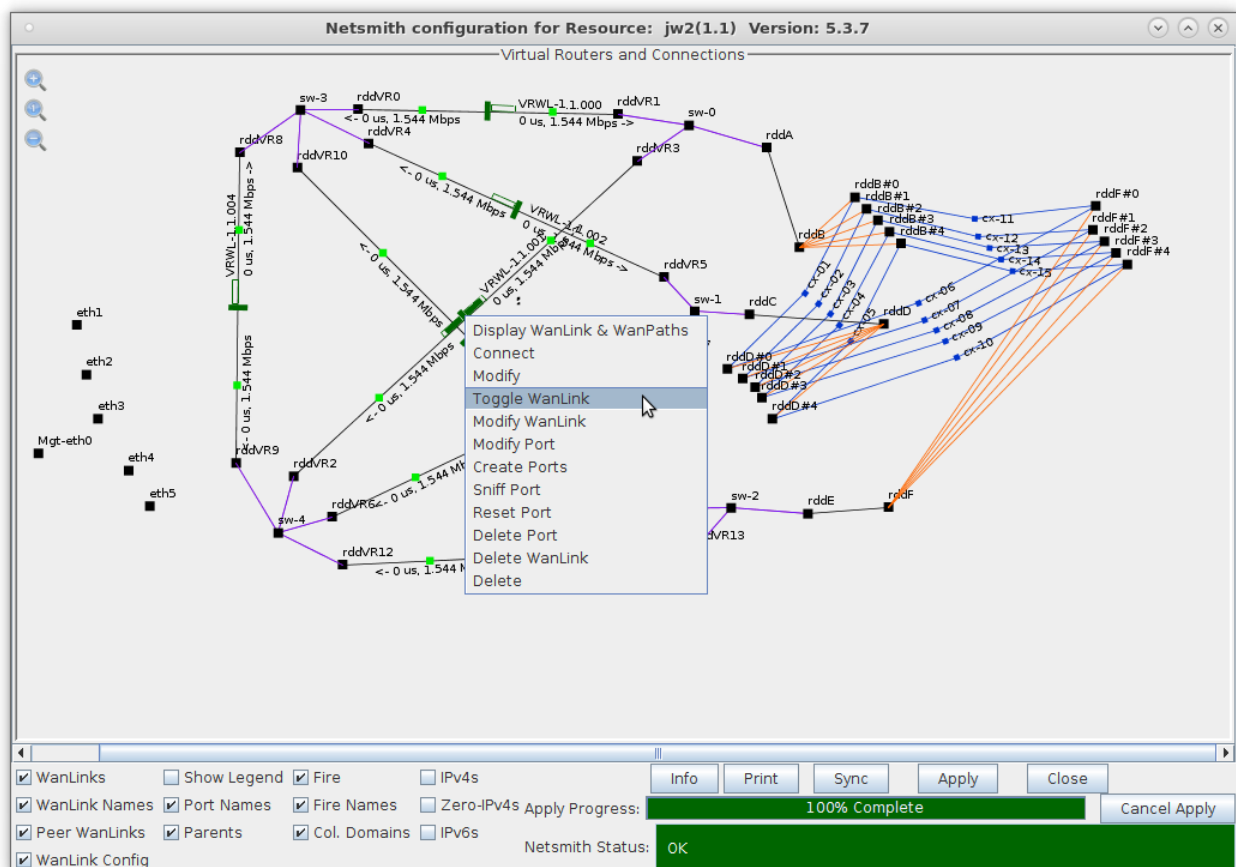
A. On the **Layer-3** tab, select all 15 connections and click **Start**

8. In Netsmith, verify traffic is flowing through sw-3 or sw-4 via 3 separate WanLinks

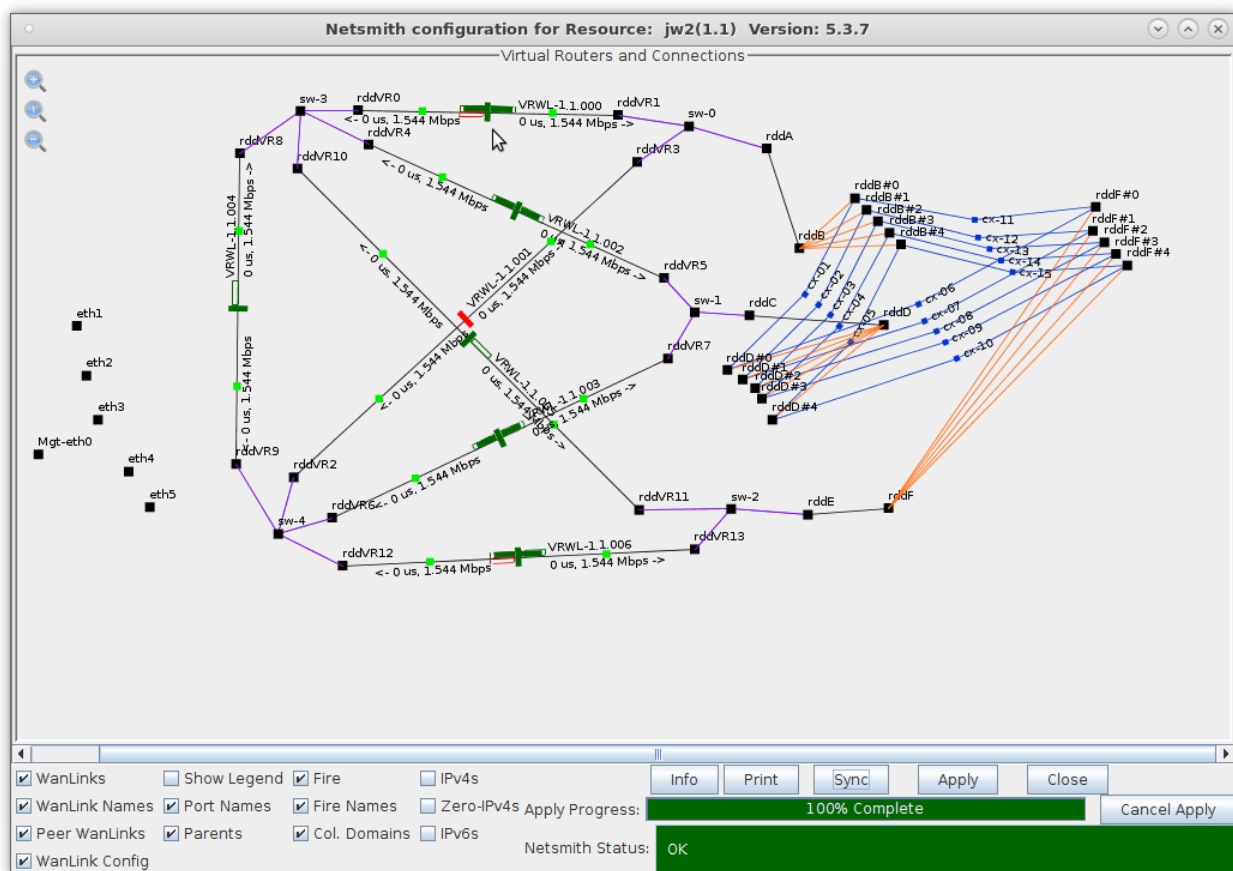


A. In this case, VRWL1.1.001, VRWL-1.1.003 and VRWL-1.1.006 all show traffic flowing

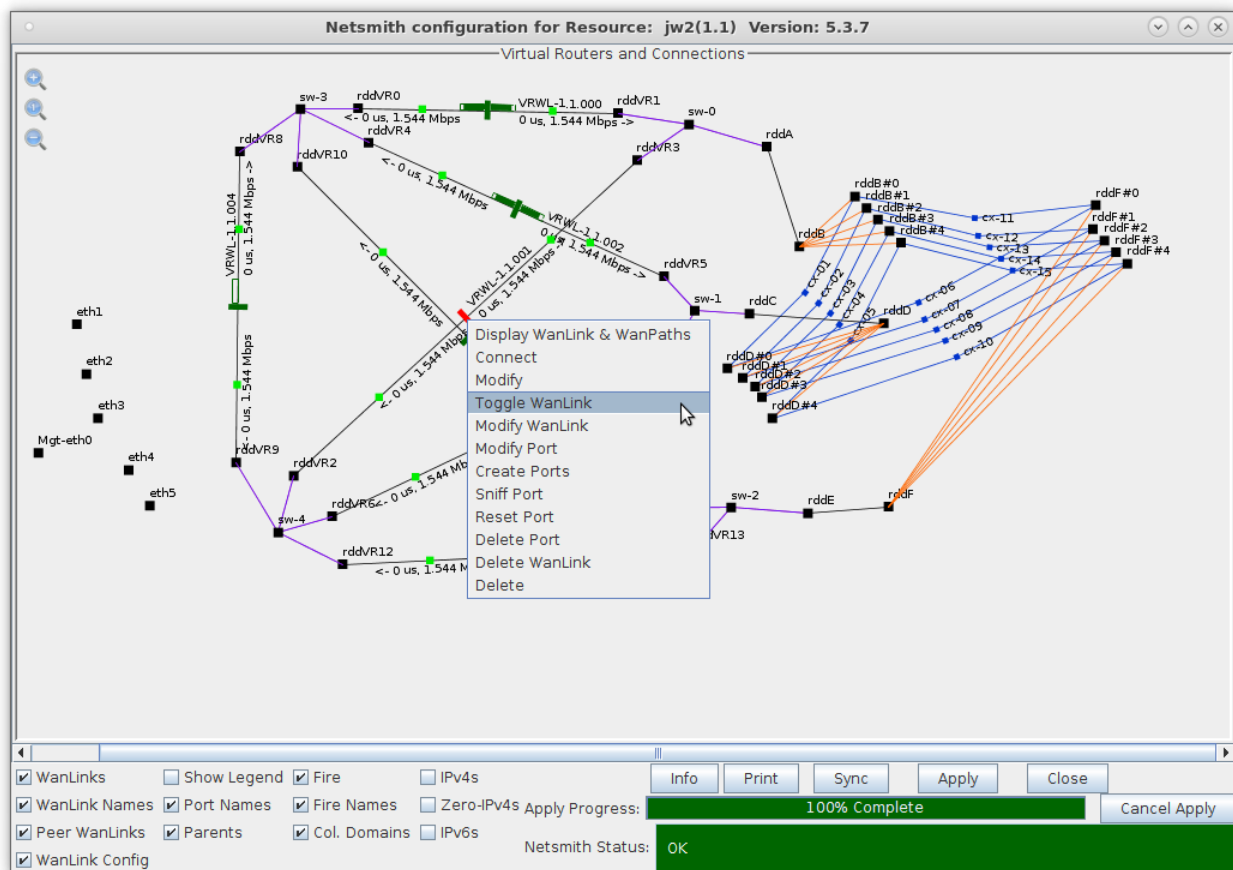
9. Right-click WanLink VRWL-1.1.001 and select **Toggle WanLink**



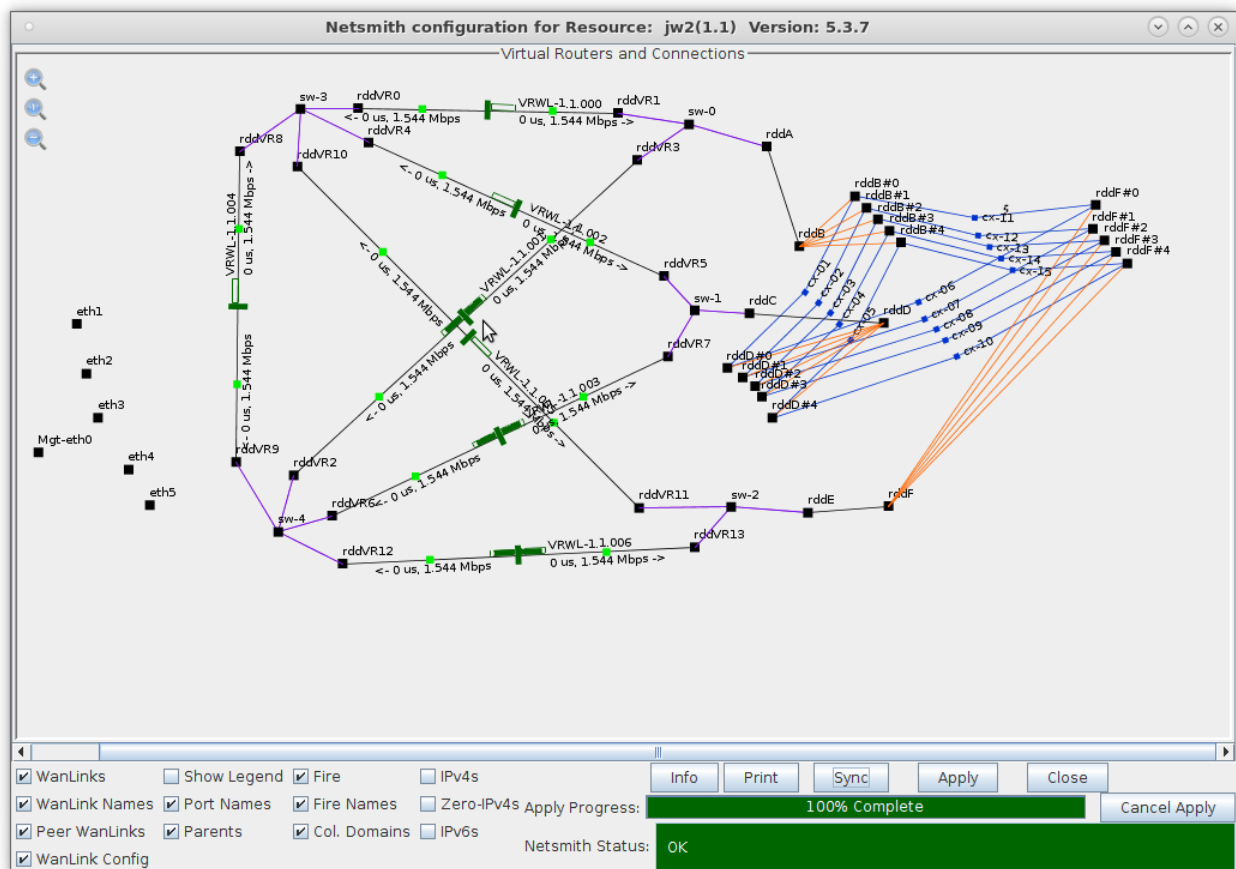
10. After approximately 1 minute, the traffic will find an alternate path



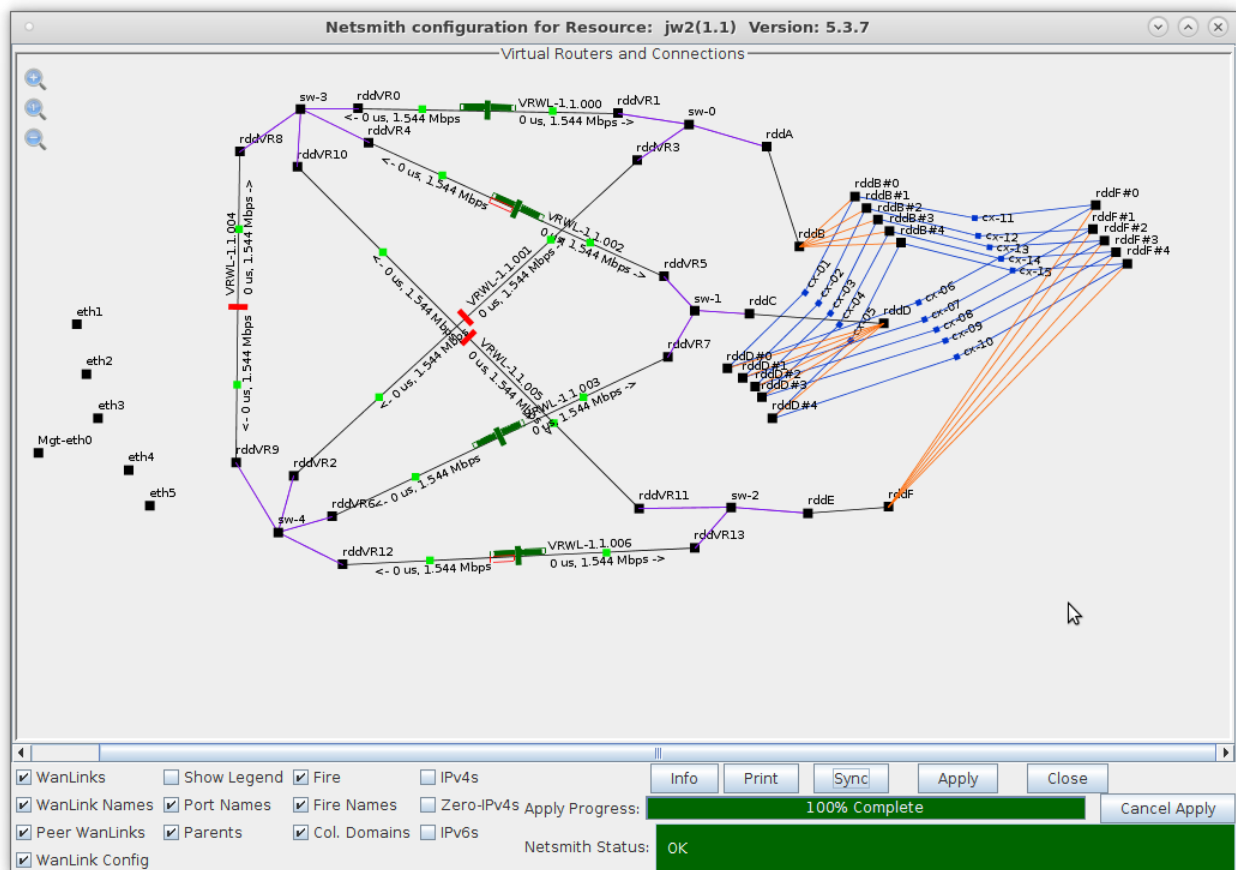
11. Right-click WanLink VRWL-1.1.001 and select **Toggle WanLink**



12. After approximately 1 minute, traffic resumes on its original path



13. Traffic flow after simulating multiple path failures



A. A sample LANforge HTML report of this fail-over test can be found here:

B. [Fail-Over Test Sample HTML Report](#)

