

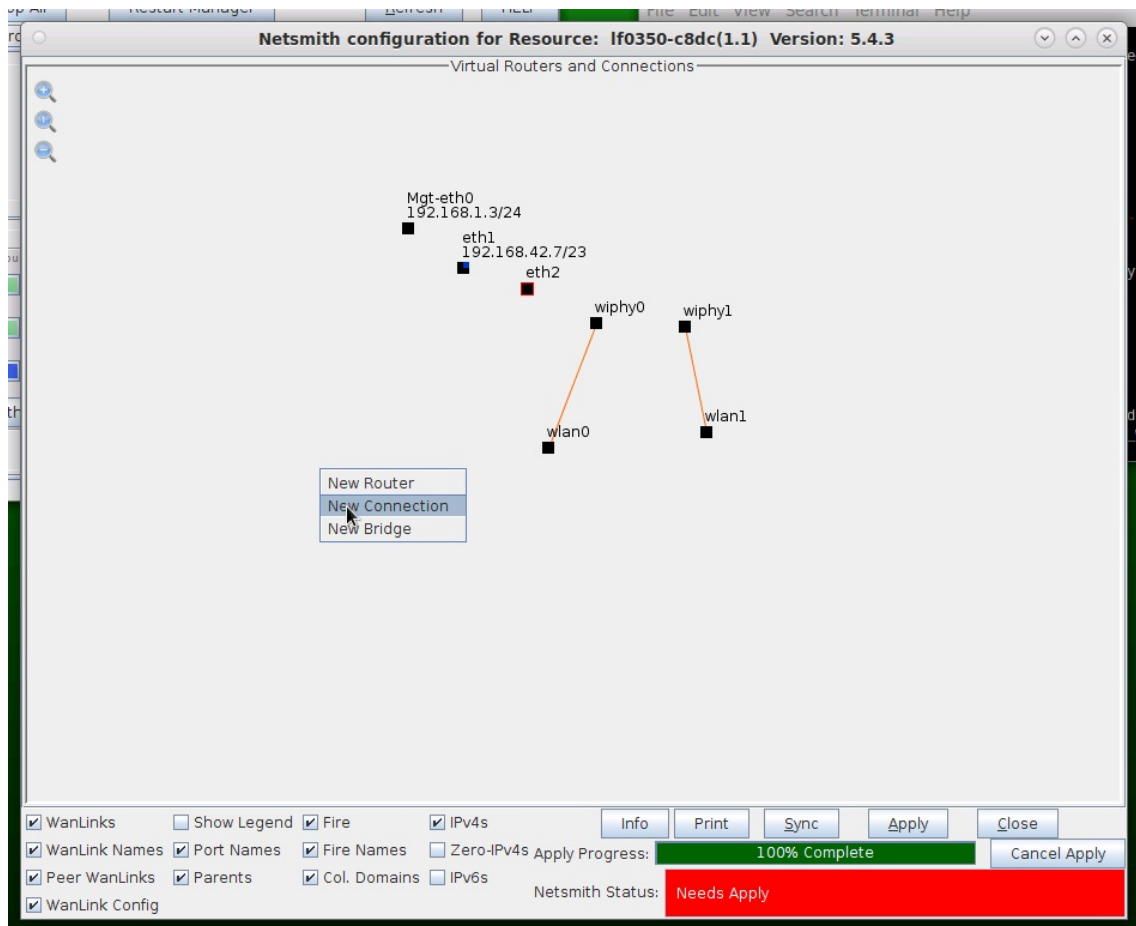
Multiple Layer-2 Switches

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.

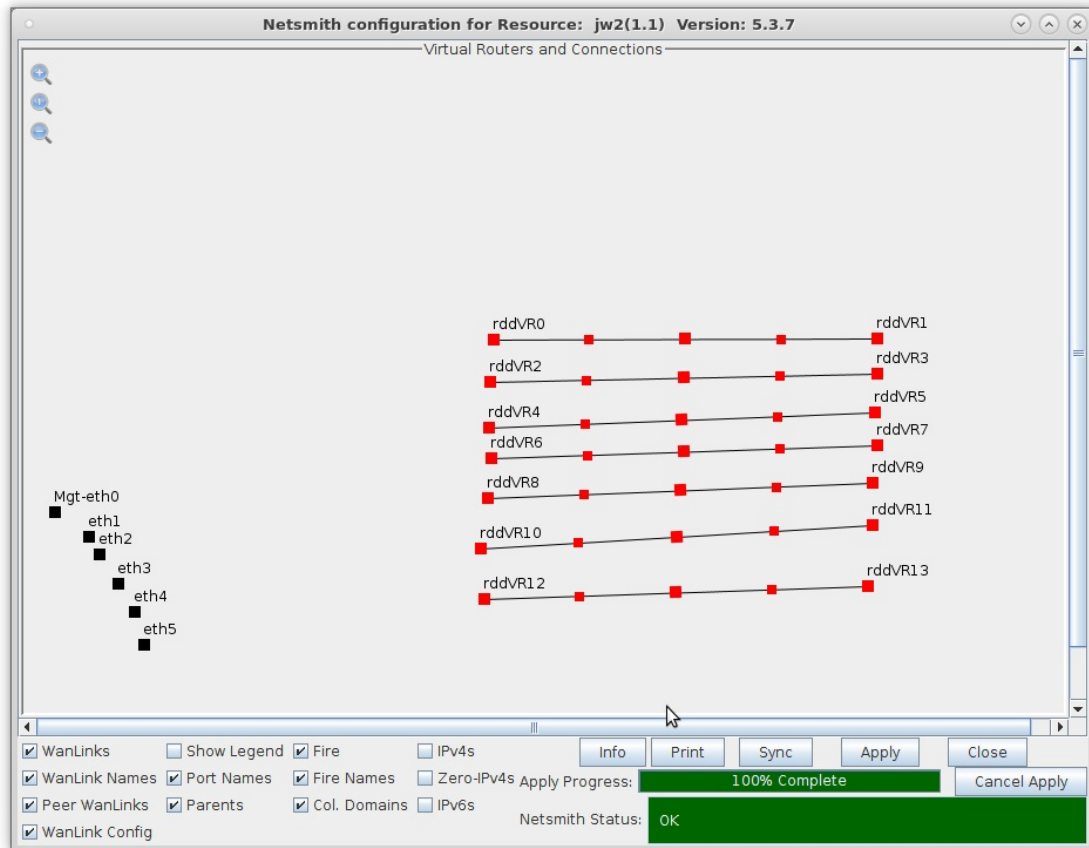
1. Setup seven Netsmith Connections.

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

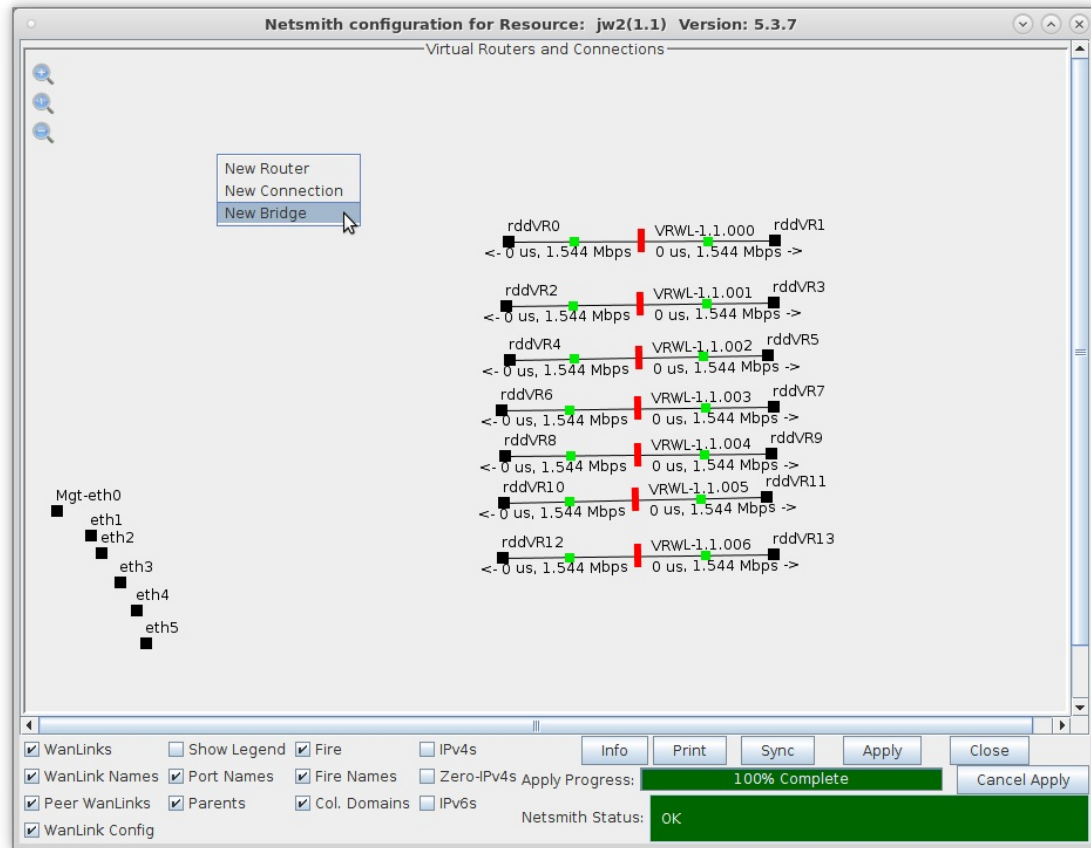


A. **NOTE:** Modifications in Netsmith are only sent to the LANforge-Server after Applying them

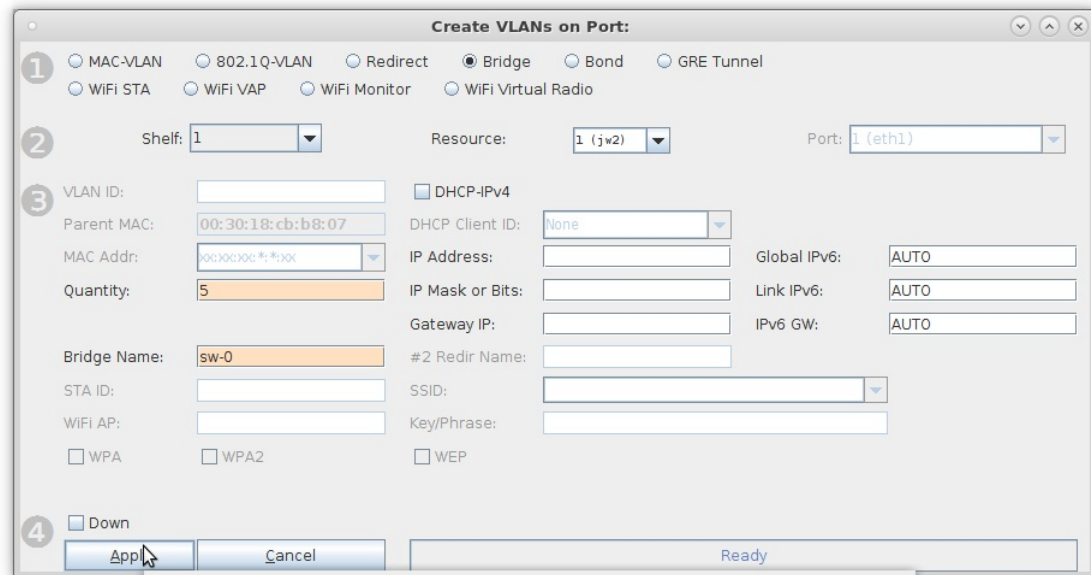
For more information see [LANforge-GUI User Guide: Virtual Interfaces](#)

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

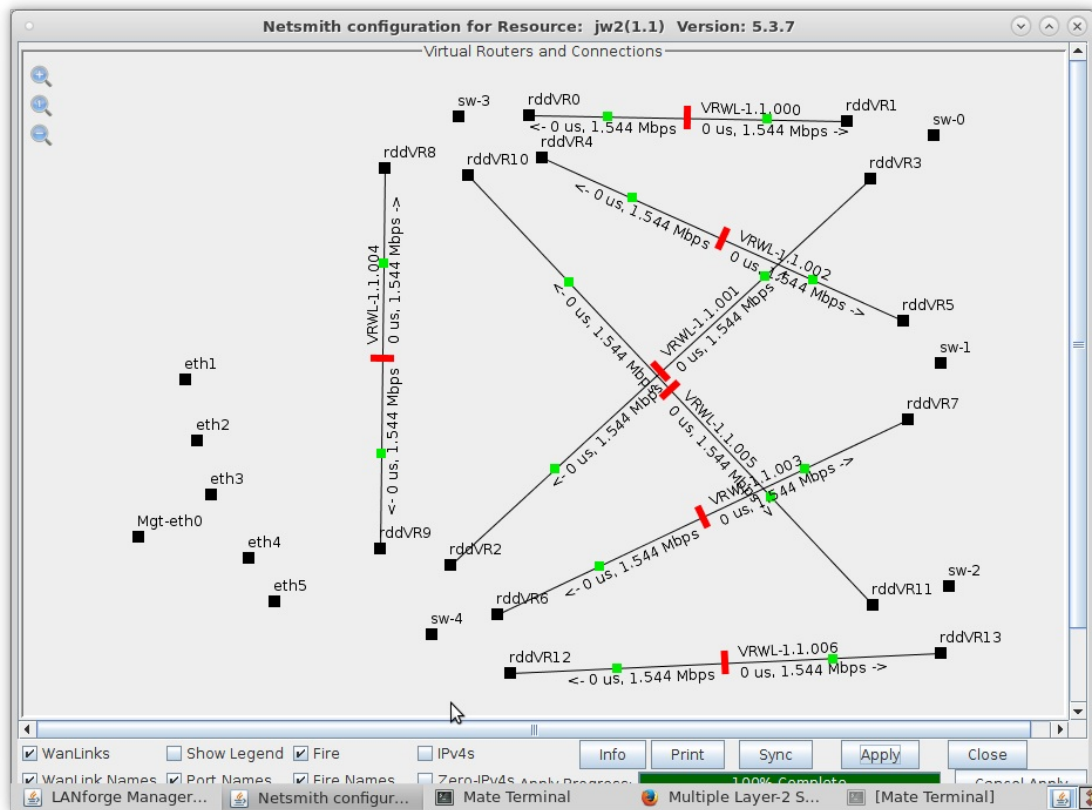
- C. In Netsmith, position the bridge devices into separate areas so they can be grouped with WanLink entry points



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

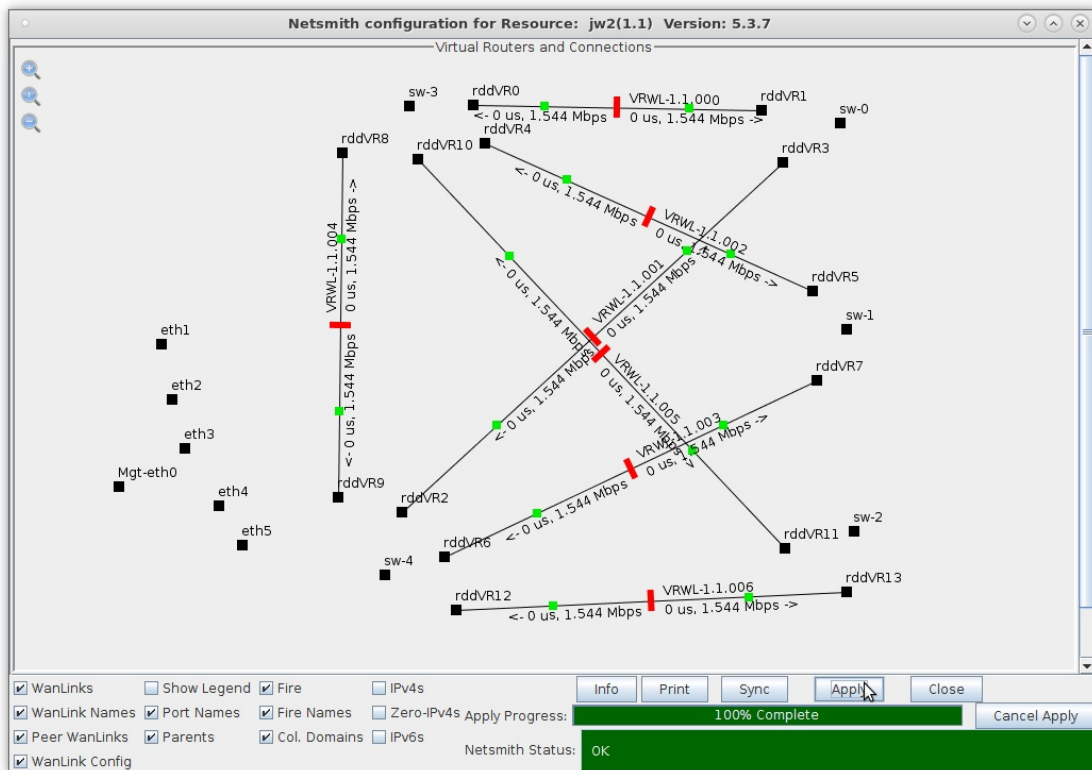
3. Move the WanLinks into their desired positions.

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



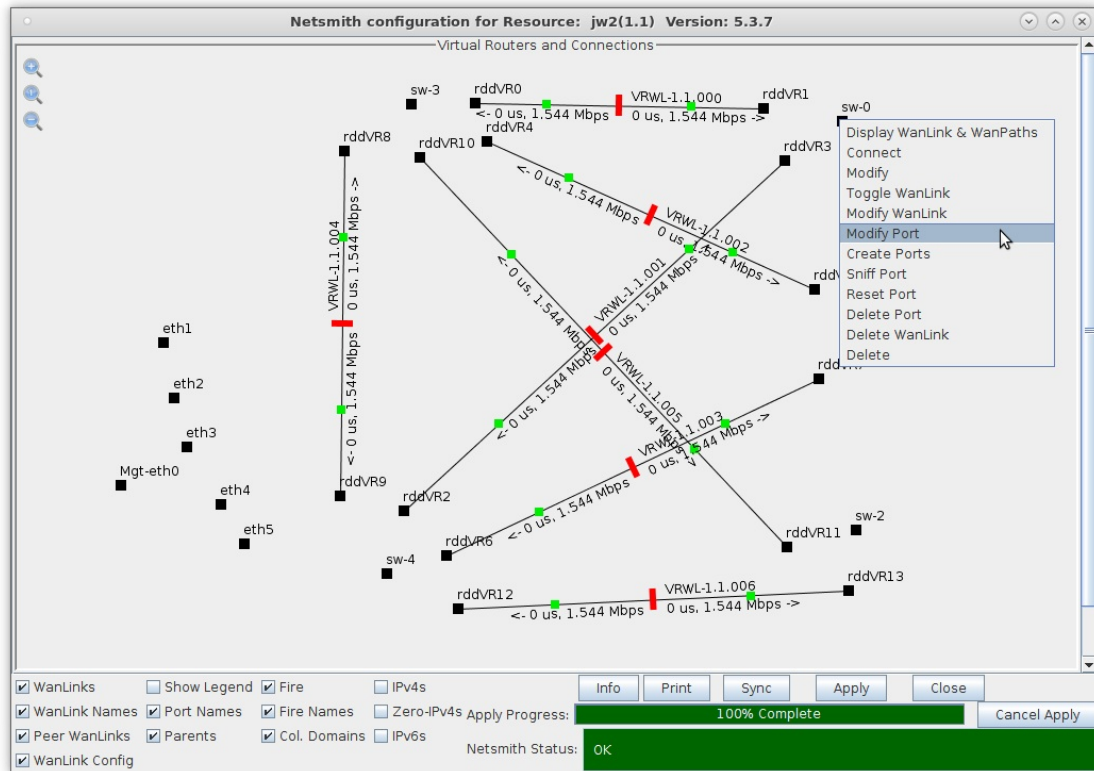
- A. 2 entry points near sw-0, sw-1, and sw-2 (one to sw-3 and one to sw-4)
- B. 3 entry points near sw-3 and sw-4 (one to sw-0, sw-1, and sw-2)
- C. Bridges sw-3 and sw-4 should also have a WanLink between them

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

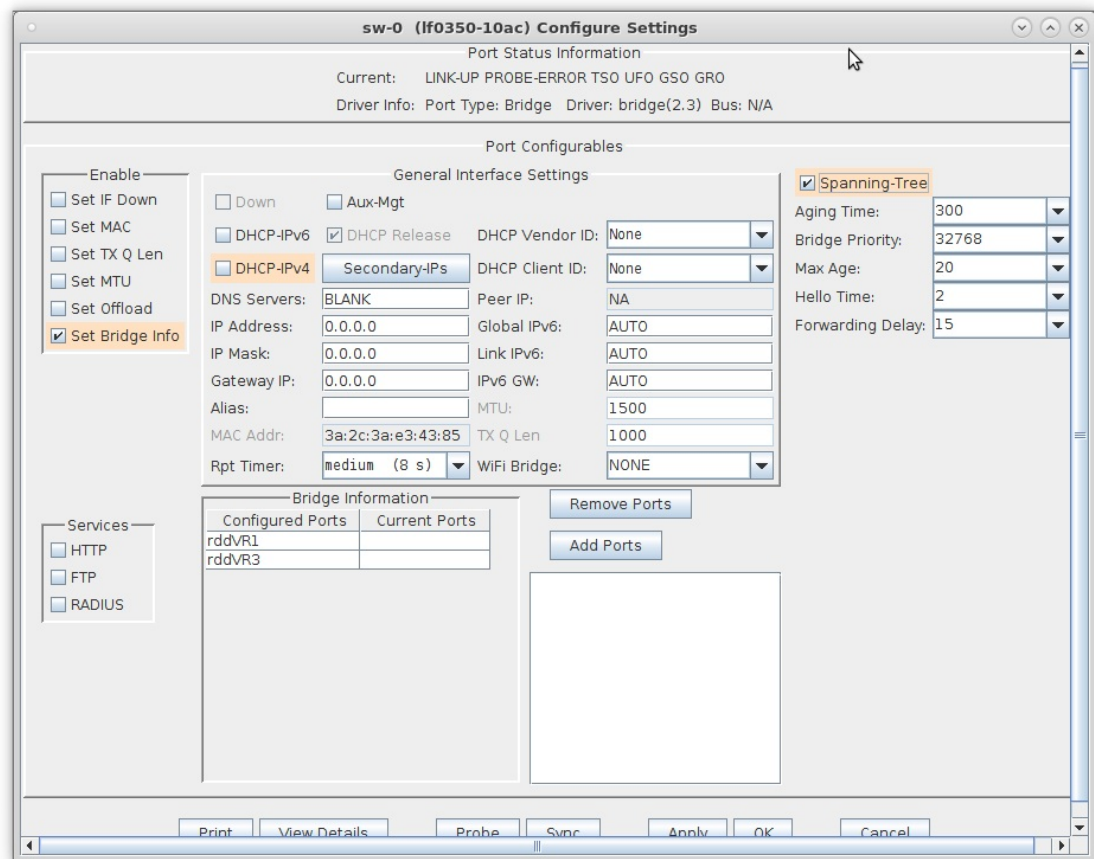


4. Modify each Bridge to enable Spanning Tree Protocol (STP) and add Bridge Members.

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



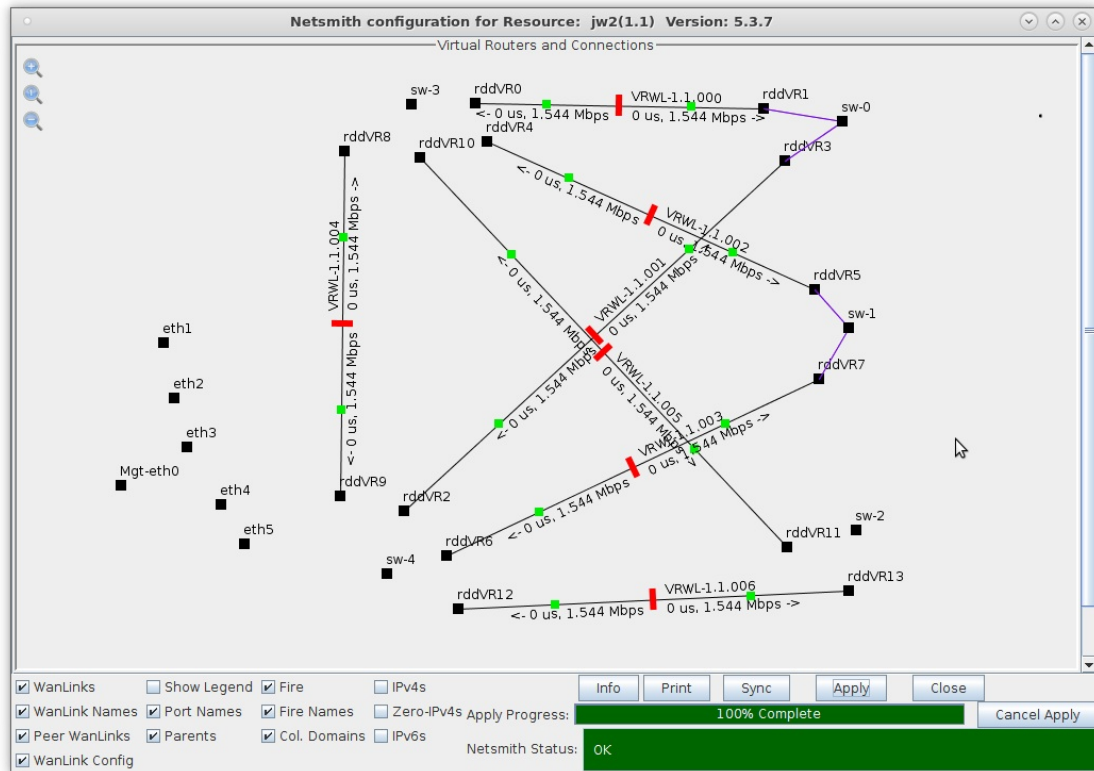
B. Select the 'Set Bridge Info' and 'Spanning Tree' checkboxes, then add bridge members rddVR1 and rddVR3



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

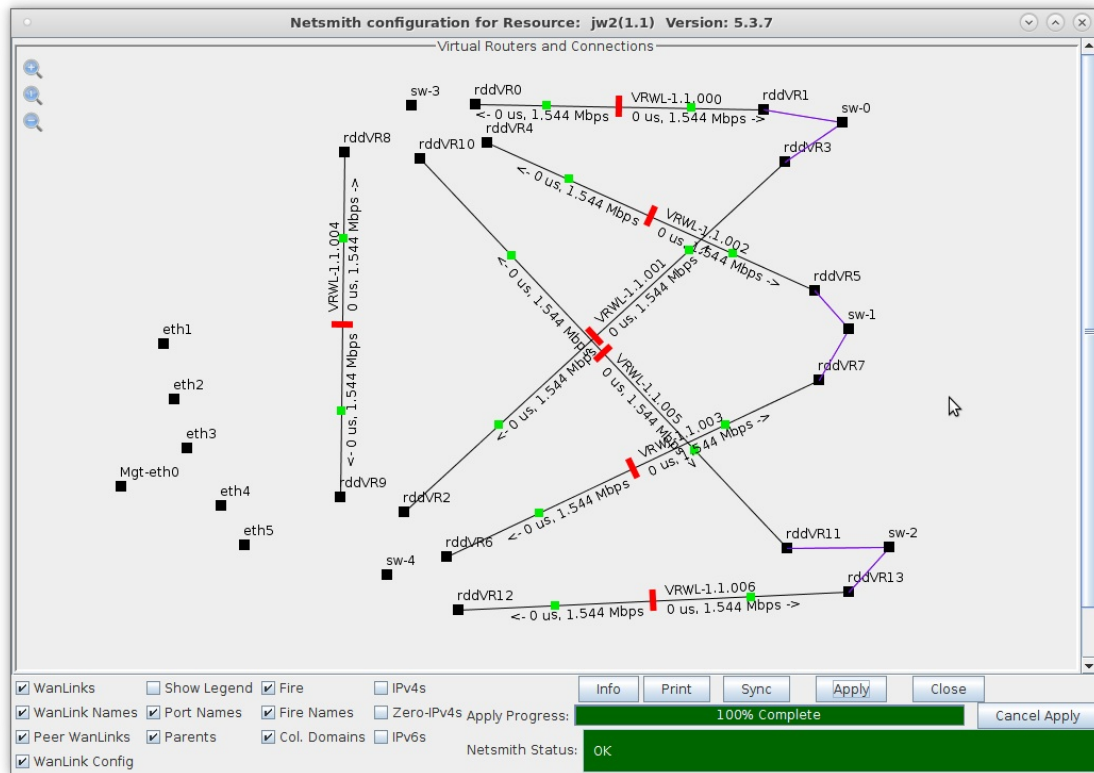
B. Click the **Apply** or **OK** button to commit the changes in bridge configuration to the LANforge-Server

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



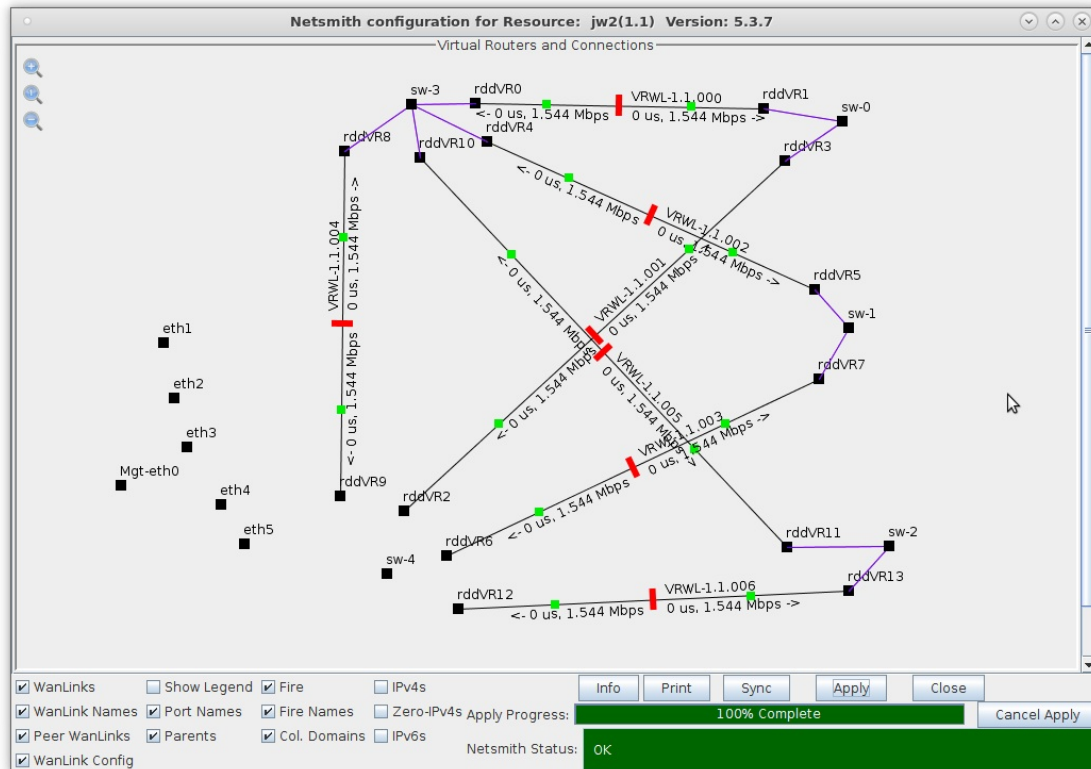
A. Enable STP and add members rddVR5 and rddVR7

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



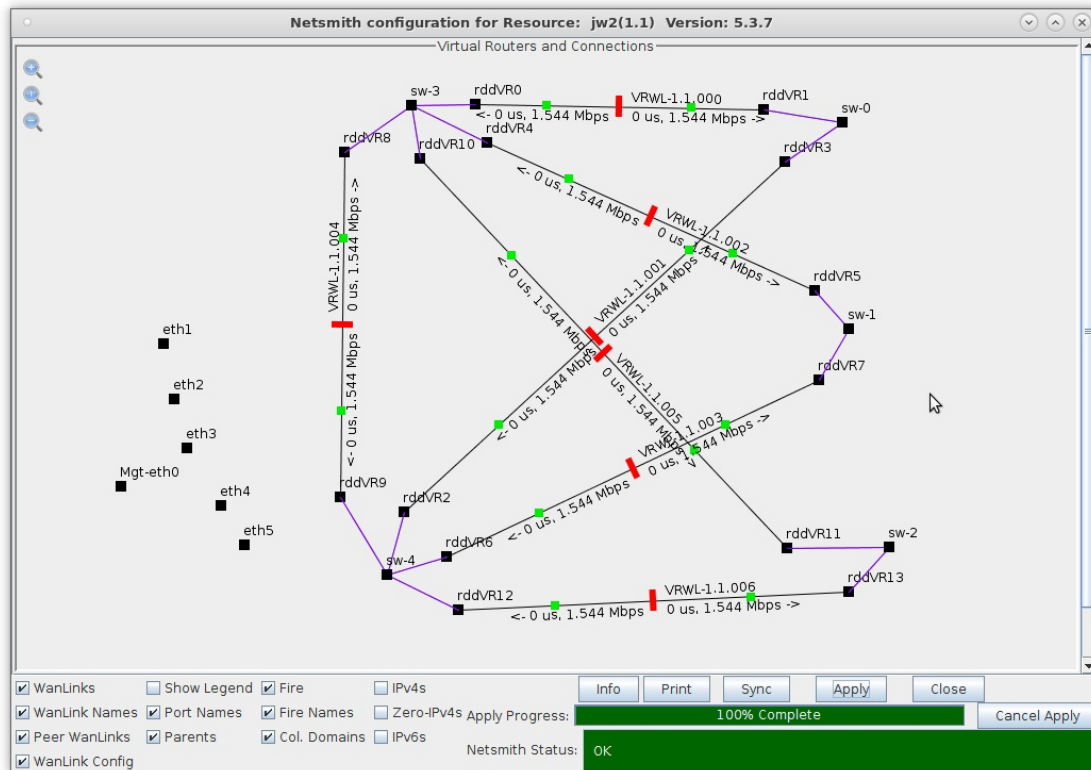
A. Enable STP and add members rddVR11 and rddVR13

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

Create VLANs on Port: 1.1.34

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 (jw2) Port: 34 (sw-0)

3 VLAN ID: DHCP-IPv4
Parent MAC: 9e:2f:cc:39:a8:ce DHCP Client ID: None
MAC Addr: IP Address: Global IPv6: AUTO
Quantity: IP Mask or Bits: Link IPv6: AUTO
Gateway IP: IPv6 GW: AUTO
#1 Redir Name: rddA #2 Redir Name: rddB
STA ID: SSID:
WIFI AP: Key/Phrase:
 WPA WPA2 WEP

4 Down
Apply Cancel Ready

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

B. Add rddA to bridge sw-0

sw-0 (If0350-10ac) Configure Settings

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

Services

- HTTP
- FTP
- RADIUS

General Interface Settings

Down Aux-Mgt

DHCP-IPv6 DHCP Release DHCP Vendor ID: None
 DHCP-IPv4 Secondary-IPs 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: 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	

Remove Ports
Add Ports

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)

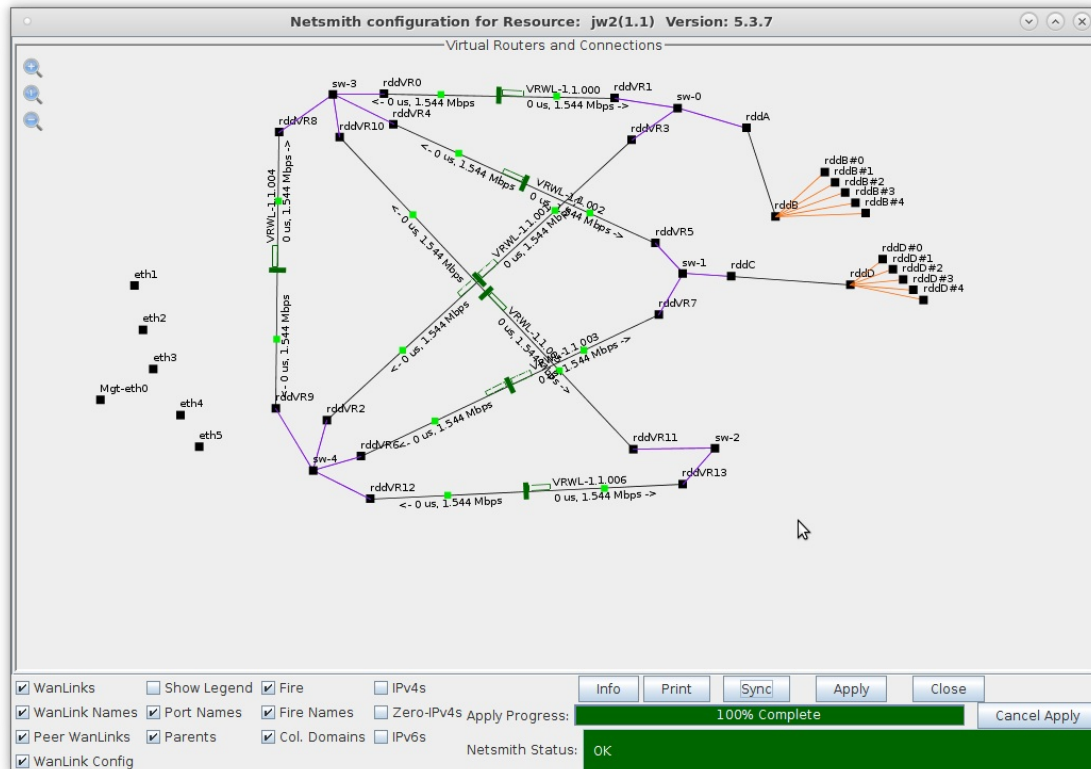
3 VLAN ID: DHCP-IPv4
Parent MAC: 62:bb:1e:2b:7f:ab DHCP Client ID: None
MAC Addr: IP Address: 172.1.1.101 Global IPv6: AUTO
Quantity: 5 IP Mask or Bits: 24 Link IPv6: AUTO
Gateway IP: 172.1.1.1 IPv6 GW: AUTO
#1 Redir Name: #2 Redir Name:
STA ID: SSID:
WiFi AP: Key/Phrase:
 WPA WPA2 WEP

4 Down

Apply Cancel Ready

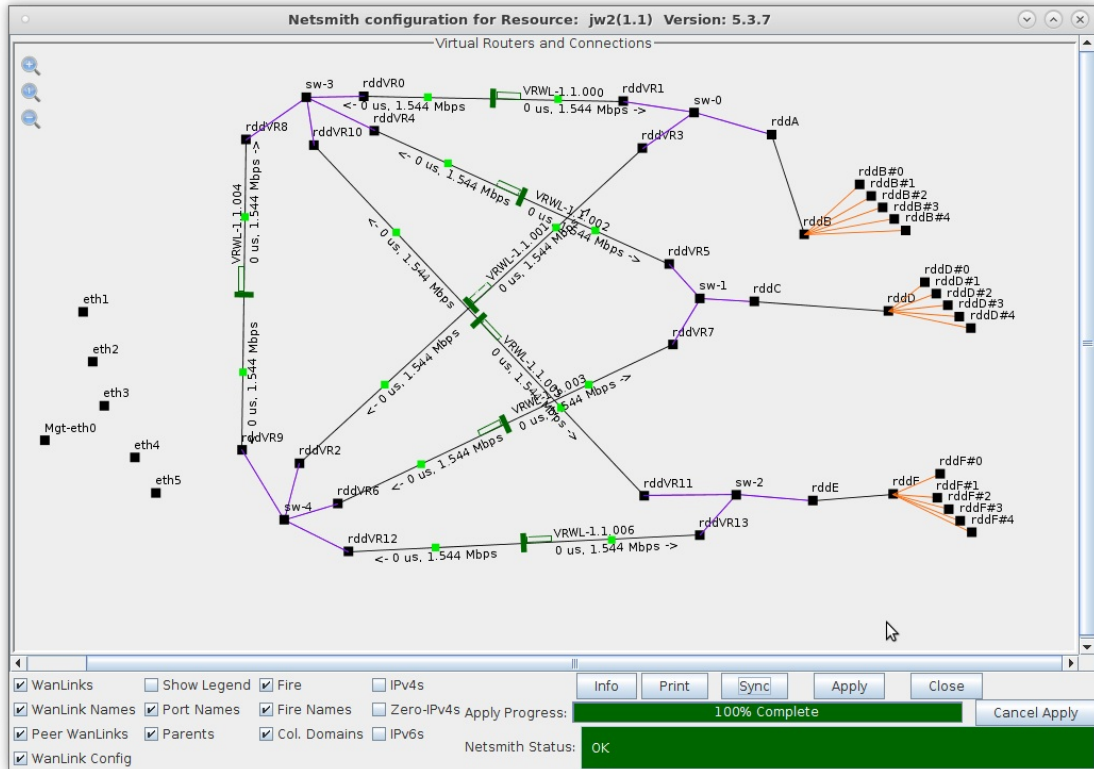
A. Enter a starting MAC address, quantity 5, and starting IP address

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

+ - All Display Sync Batch-Create Apply OK Cancel

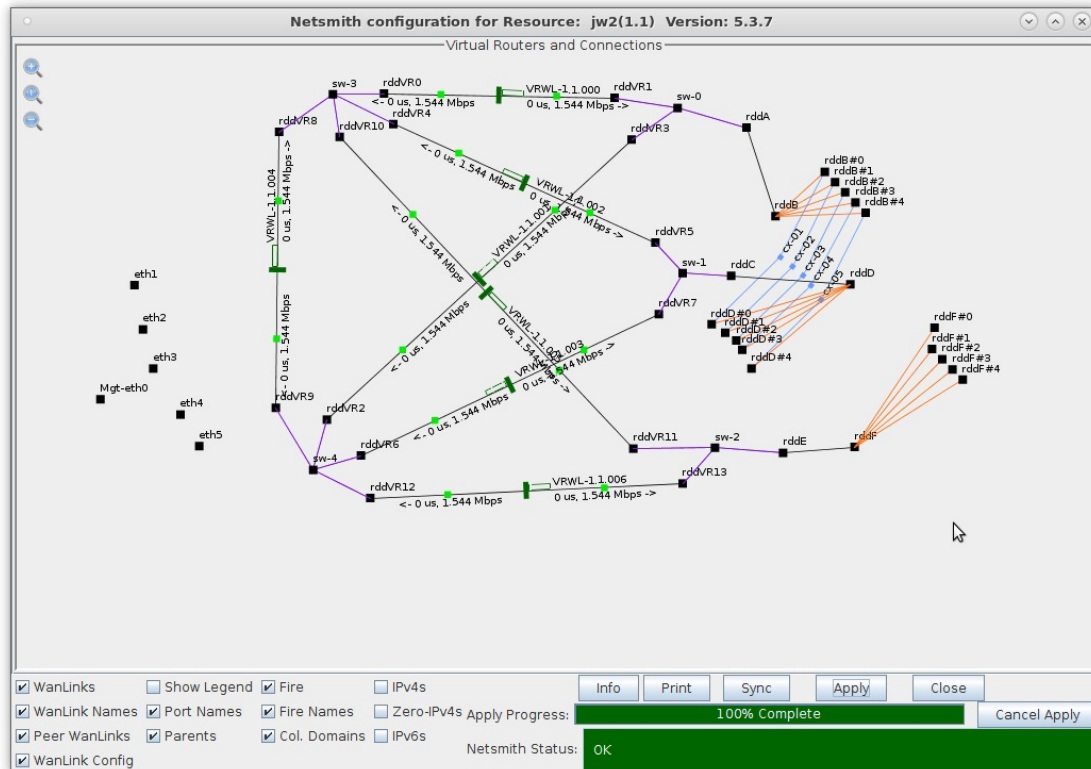
1 Cross-Connect
CX Name: cx-01
CX Type: LANforge / UDP

Resource: 1 (1f09350-10ac) Endpoint A: 1 (1f09350-10ac) Endpoint B: 1 (1f09350-10ac)
Port: 43 (rddB#0) Endpoint A: 43 (rddB#0) Endpoint B: 48 (rddD#0)
Min Tx Rate: ISDN (128 Kbps) Endpoint A: ISDN (128 Kbps) Endpoint B: ISDN (128 Kbps)
Max Tx Rate: Same
Min PDU Size: UDP Pld (1,472 B) Endpoint A: UDP Pld (1,472 B) Endpoint B: UDP Pld (1,472 B)
Max PDU Size: Same
IP ToS: Best Effort (0) Endpoint A: Best Effort (0) Endpoint B: Best Effort (0)
Pkts To Send: Infinite Endpoint A: Infinite Endpoint B: Infinite

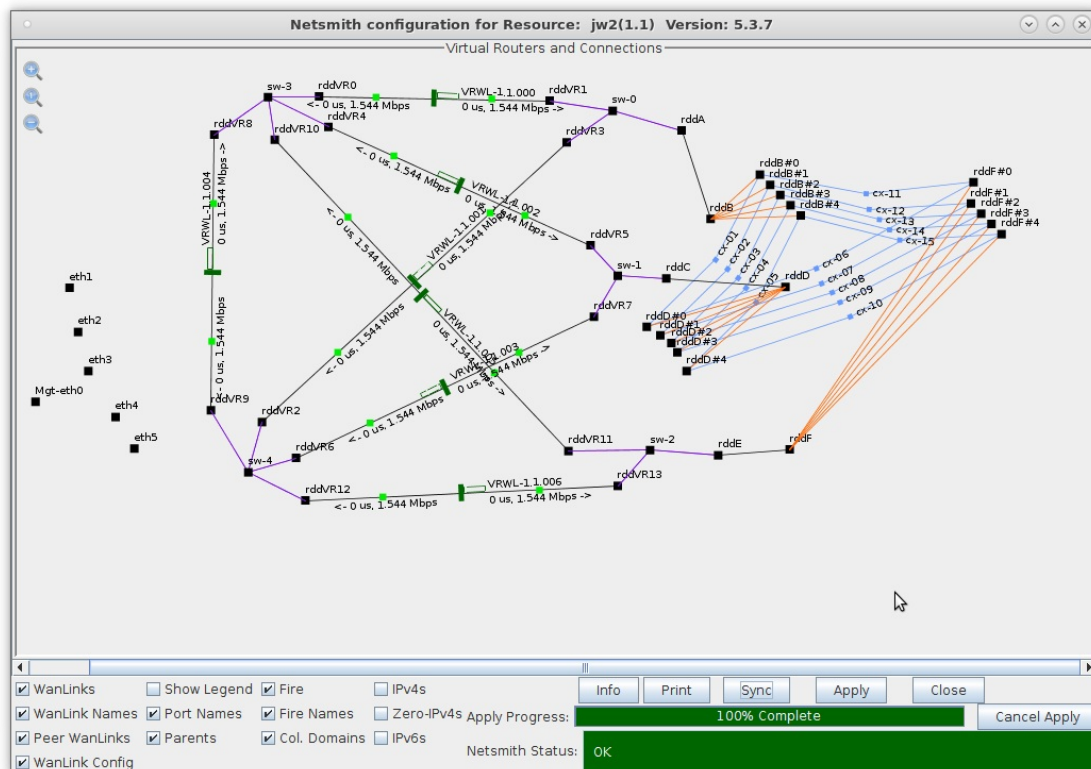
2 Report Timer: Cross-Connect: fast (1 s)
Pld Pattern: Endpoint A: increasing Endpoint B: increasing
Min IP Port: AUTO Endpoint A: AUTO Endpoint B: AUTO
Max IP Port: Same
Min Duration: Forever
Max Duration: Same
Min Reconn: 0 (0 ms)
Max Reconn: Same
Multi-Conn: Normal (0)

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

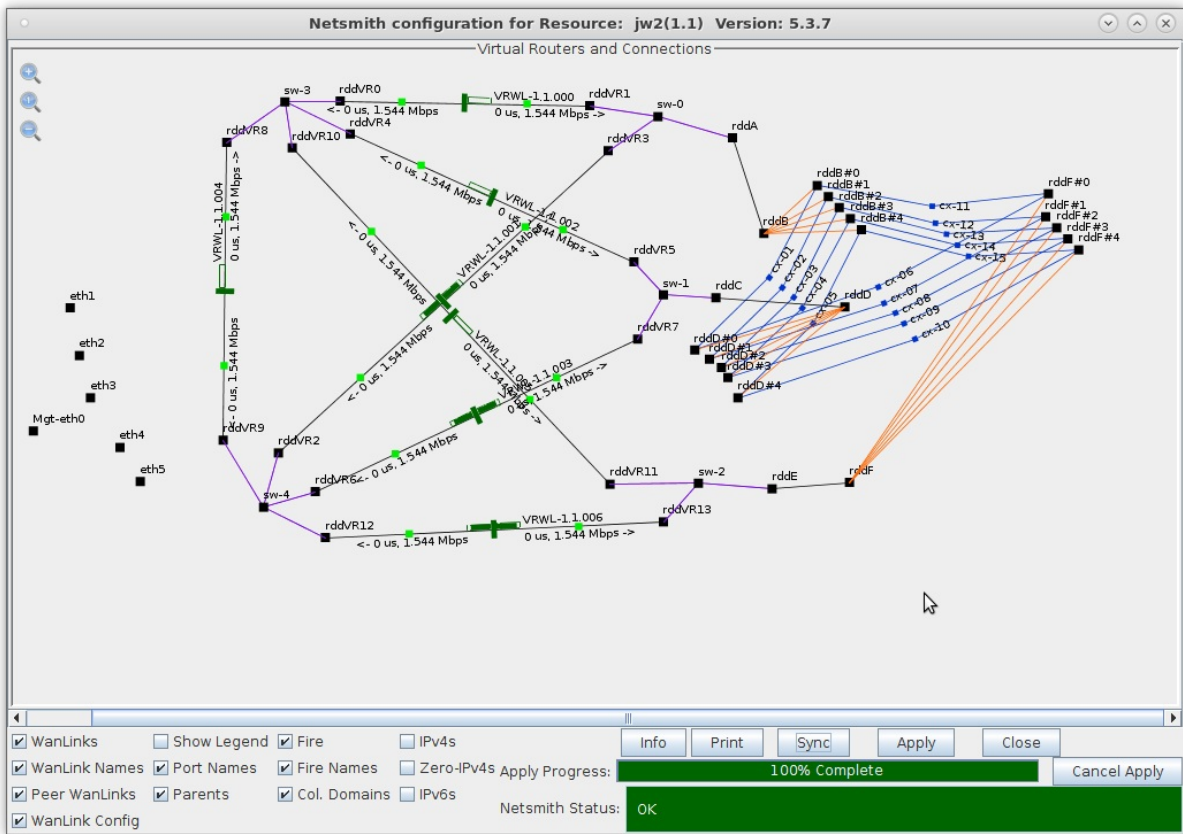
7. Test Fail-Over condition.

The screenshot shows the LANforge Manager Version 5.3.7 interface. The 'Layer-3' tab is selected, and the 'Cross Connects for Selected Test Manager' table is displayed. The table contains 15 rows of data, each representing a connection (cx-01 to cx-15). The columns include Name, Type, State, Pkt Rx A, Pkt Rx B, Bps Rx A, Bps Rx B, Rx Drop % A, Rx Drop % B, Drop Pkts A, and Drop Pkts B. All connections are in a 'Run' state with 0% drop rate and 0 dropped packets.

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

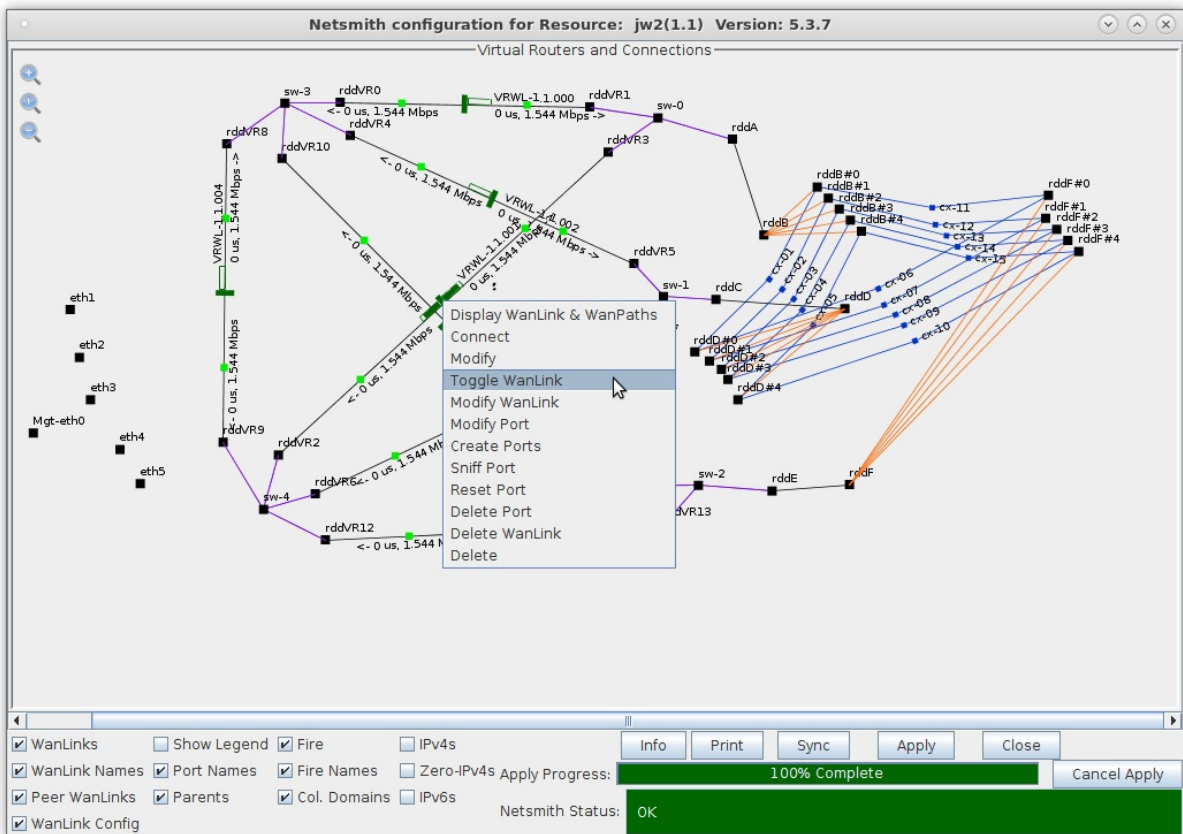
A. On the **Layer-3** tab, select all 15 connections and click **Start**

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

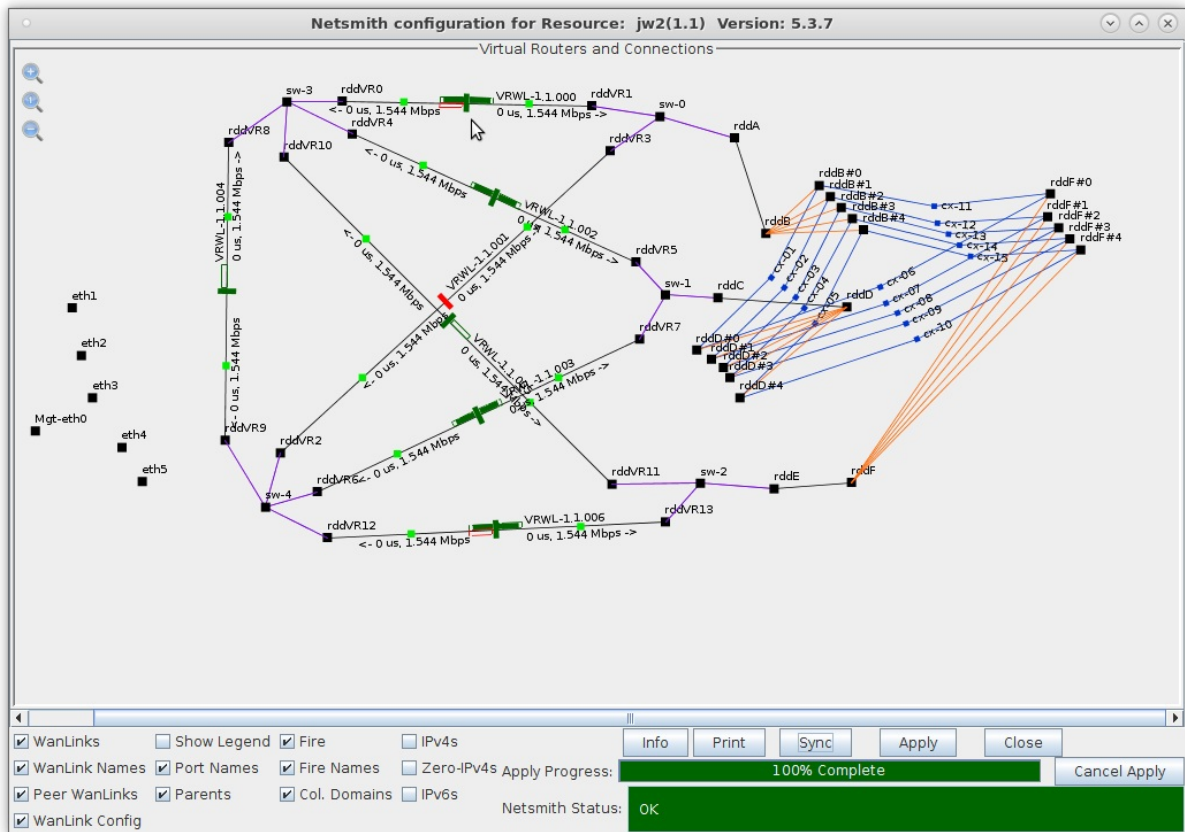


A. In this case, VRWL1.1.001, VRWL-1.1.003 and VRWL-1.1.006 all show traffic flowing

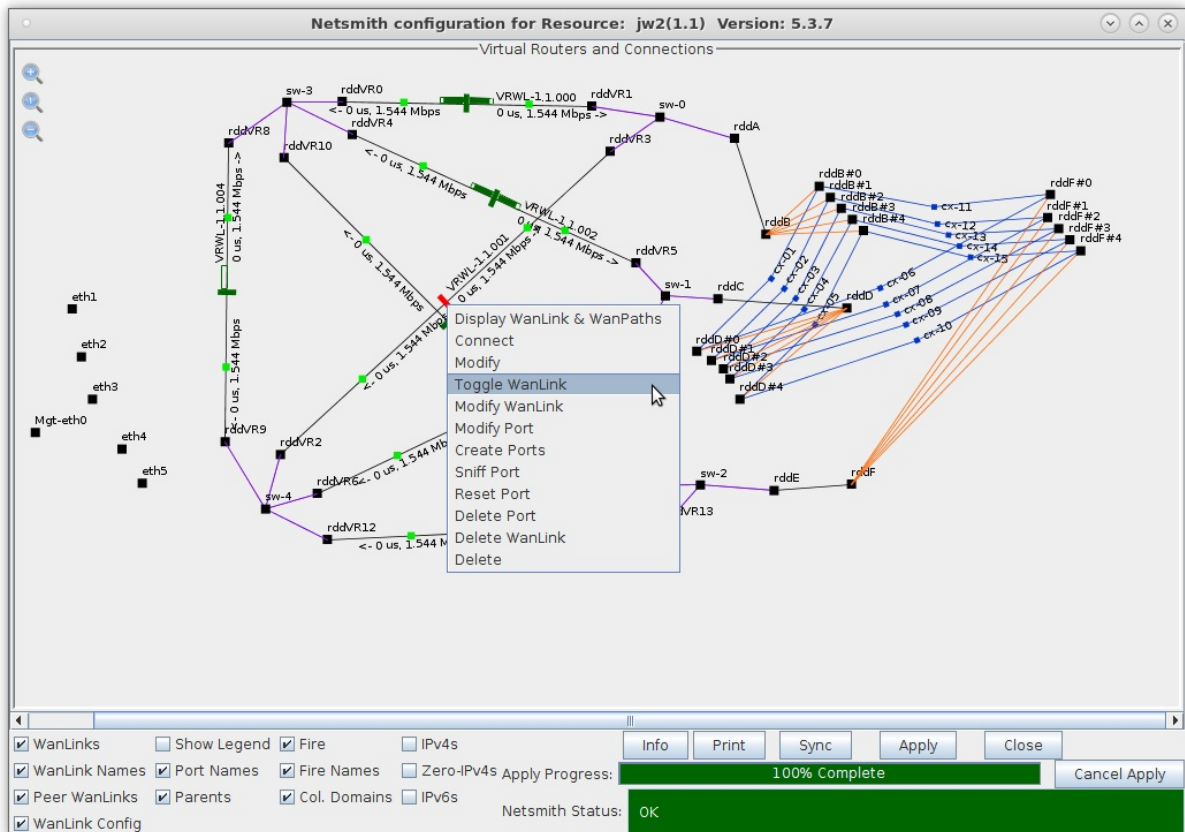
9. Right-click WanLink VRWL-1.1.001 and select **Toggle WanLink**



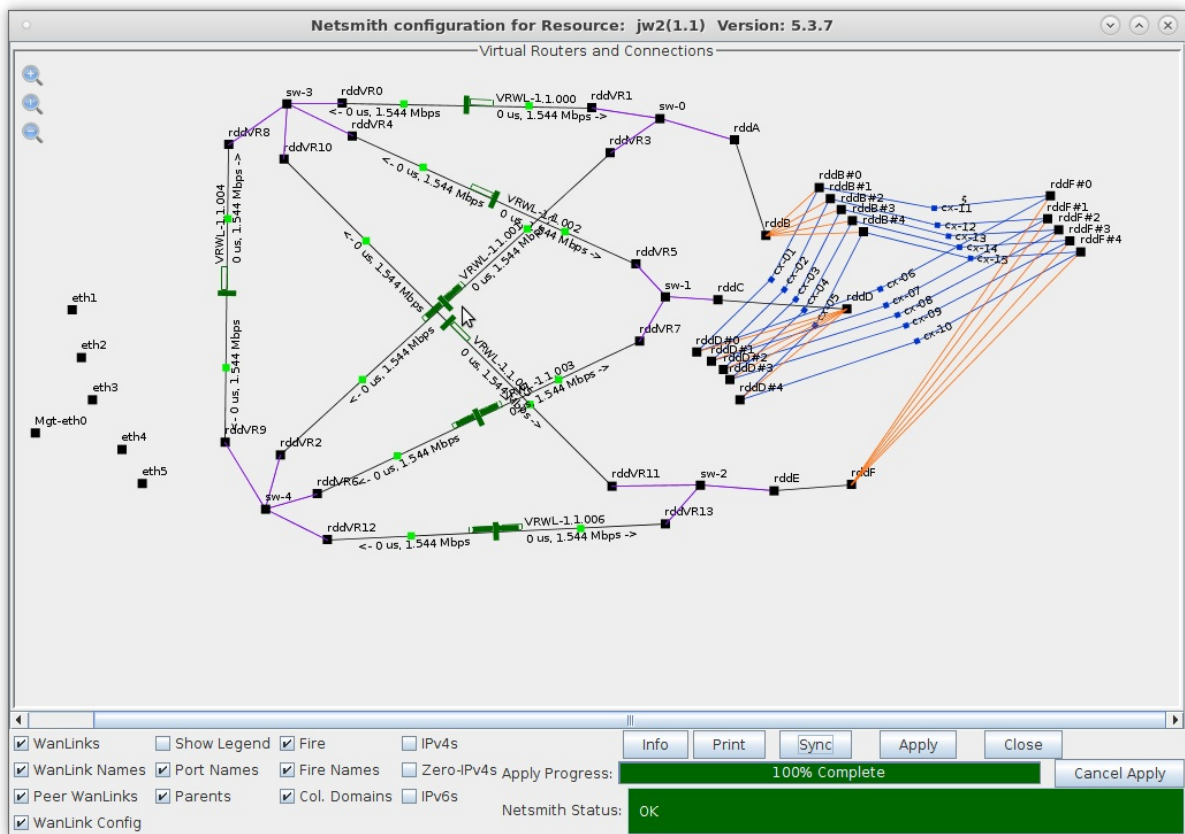
10. After approximately 1 minute, the traffic will find an alternate path



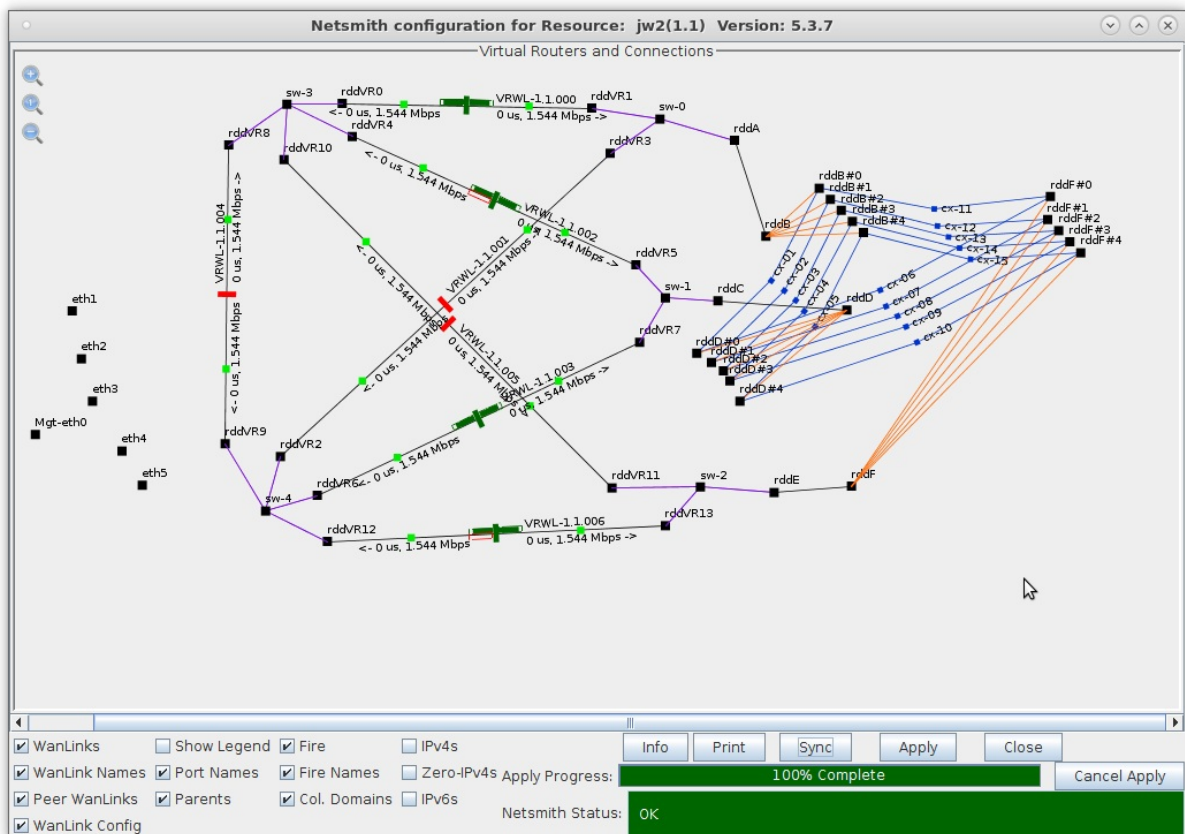
11. Right-click WanLink VRWL-1.1.001 and select **Toggle WanLink**



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](#)

