

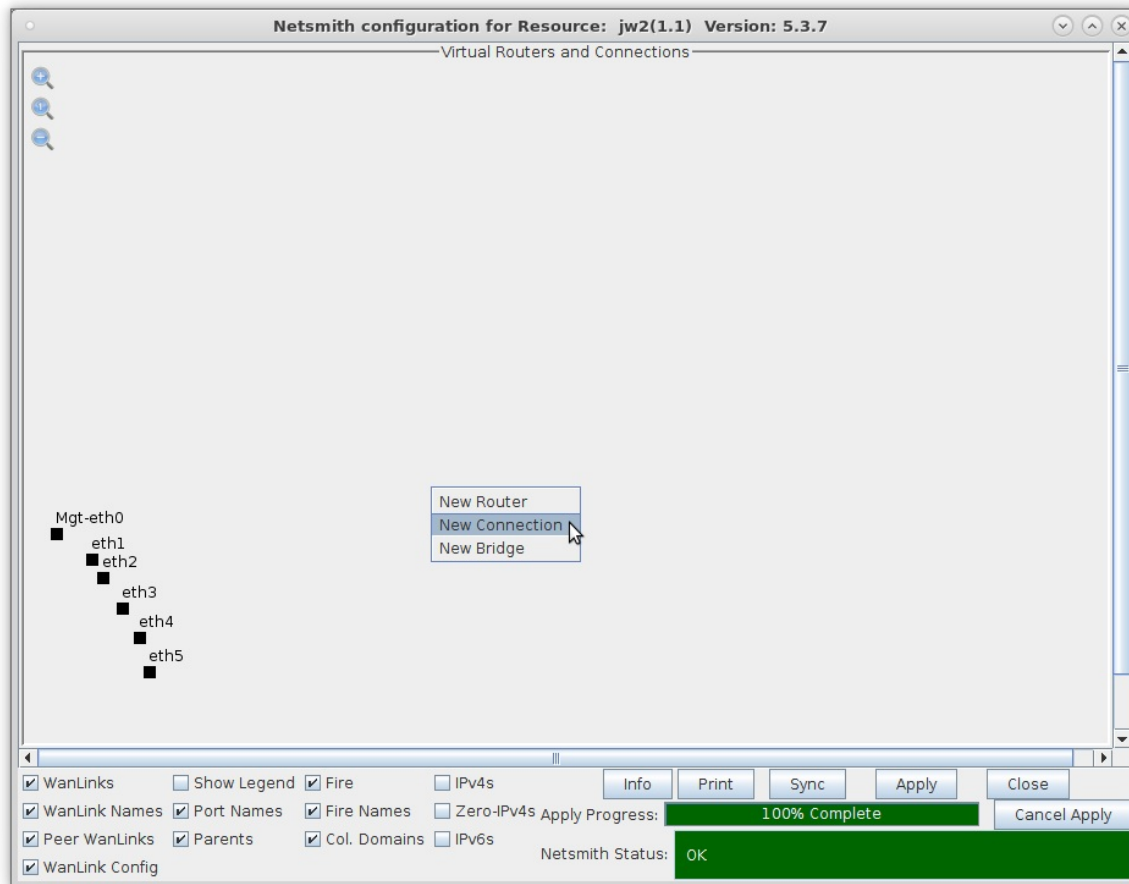
Multiple Layer-2 Switches

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.

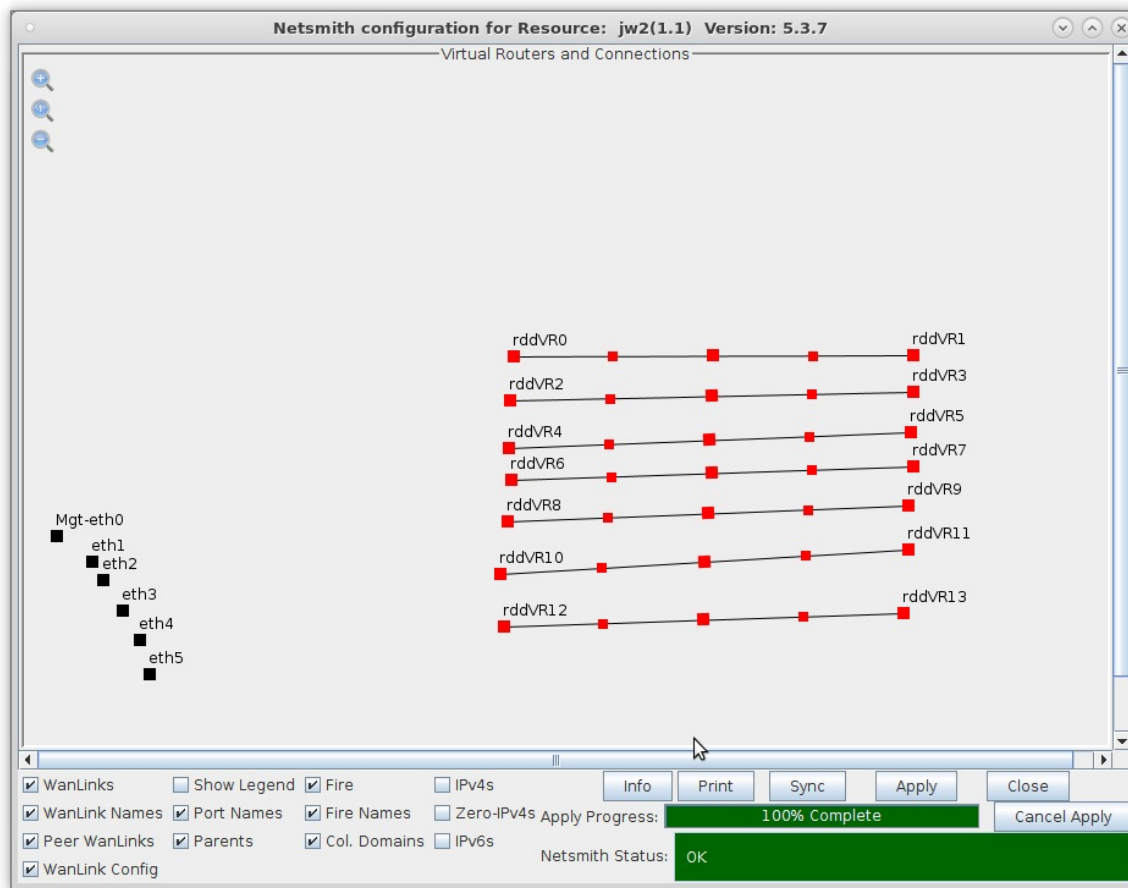
1. Setup seven Netsmith Connections.

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

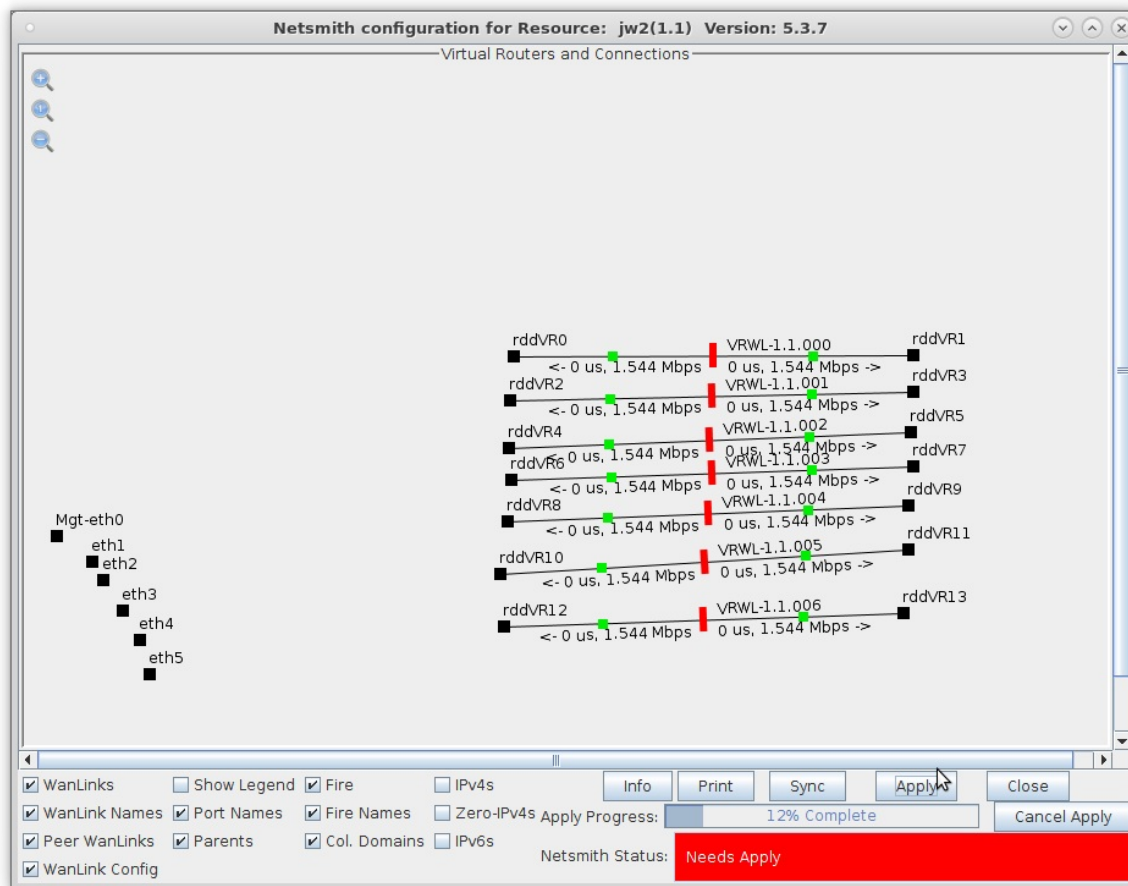


B. Accept defaults *Auto Create* everything then click **OK**.

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

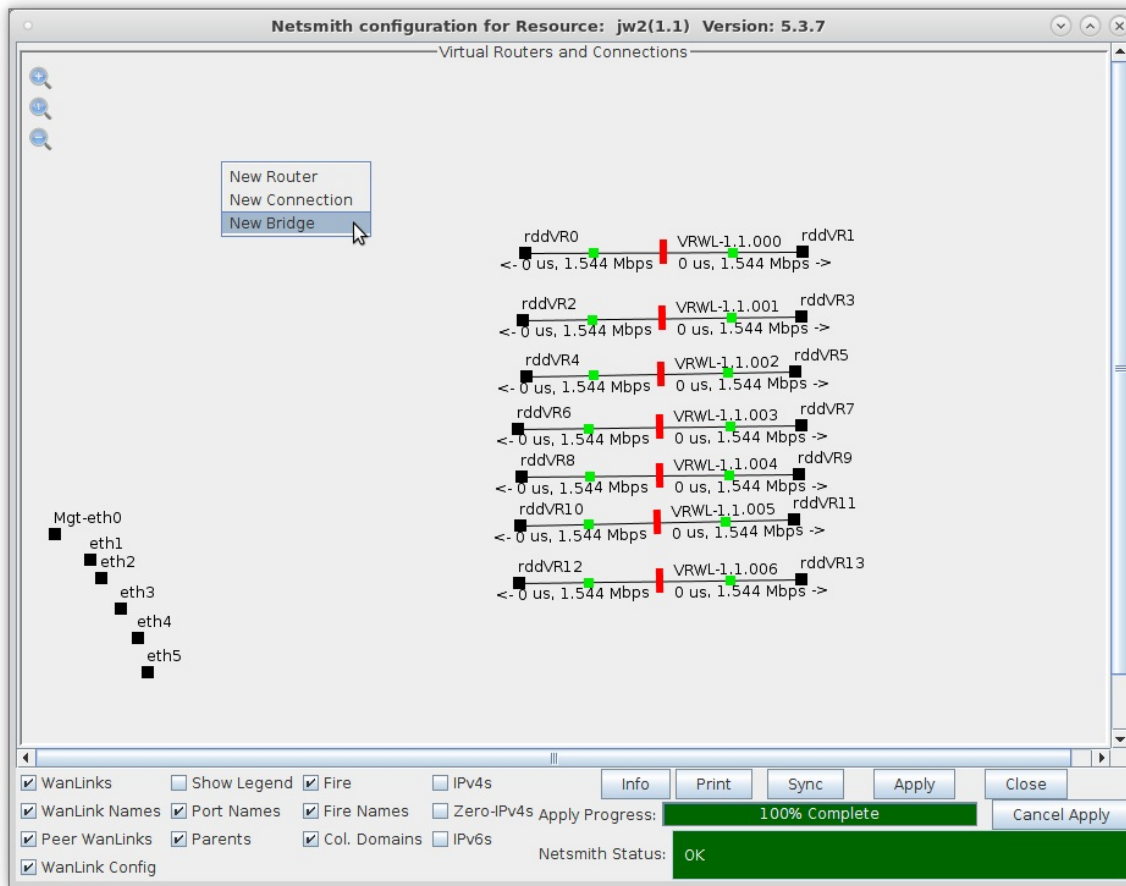


A. **NOTE:** Modifications in Netsmith are only sent to the LANforge-Server after Applying them

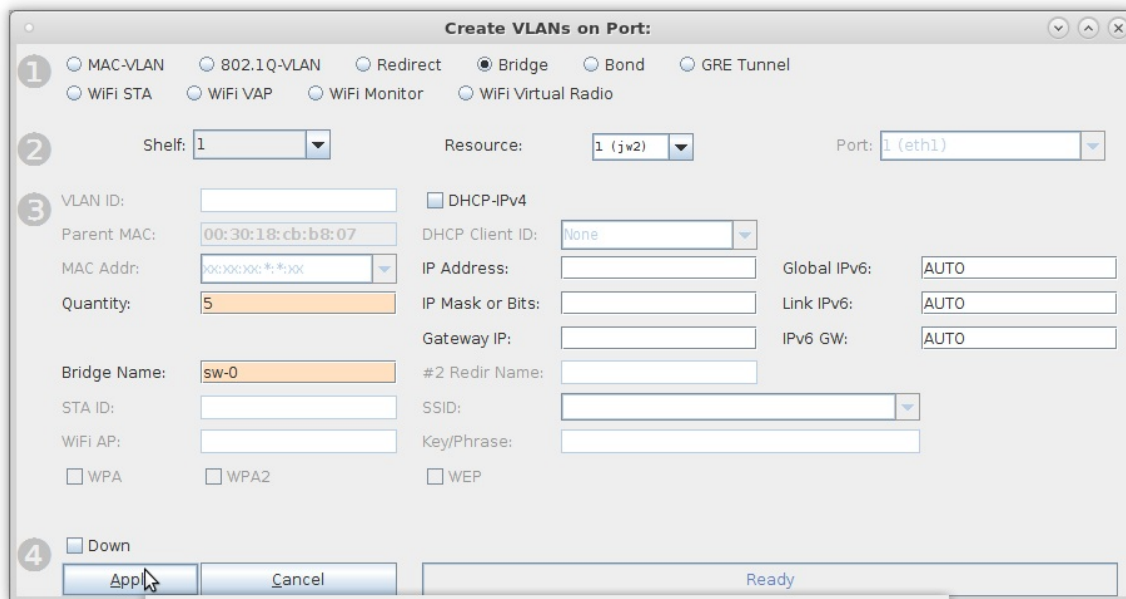
For more information see [LANforge-GUI User Guide: Virtual Interfaces](#)

2. Setup five Bridge devices.

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

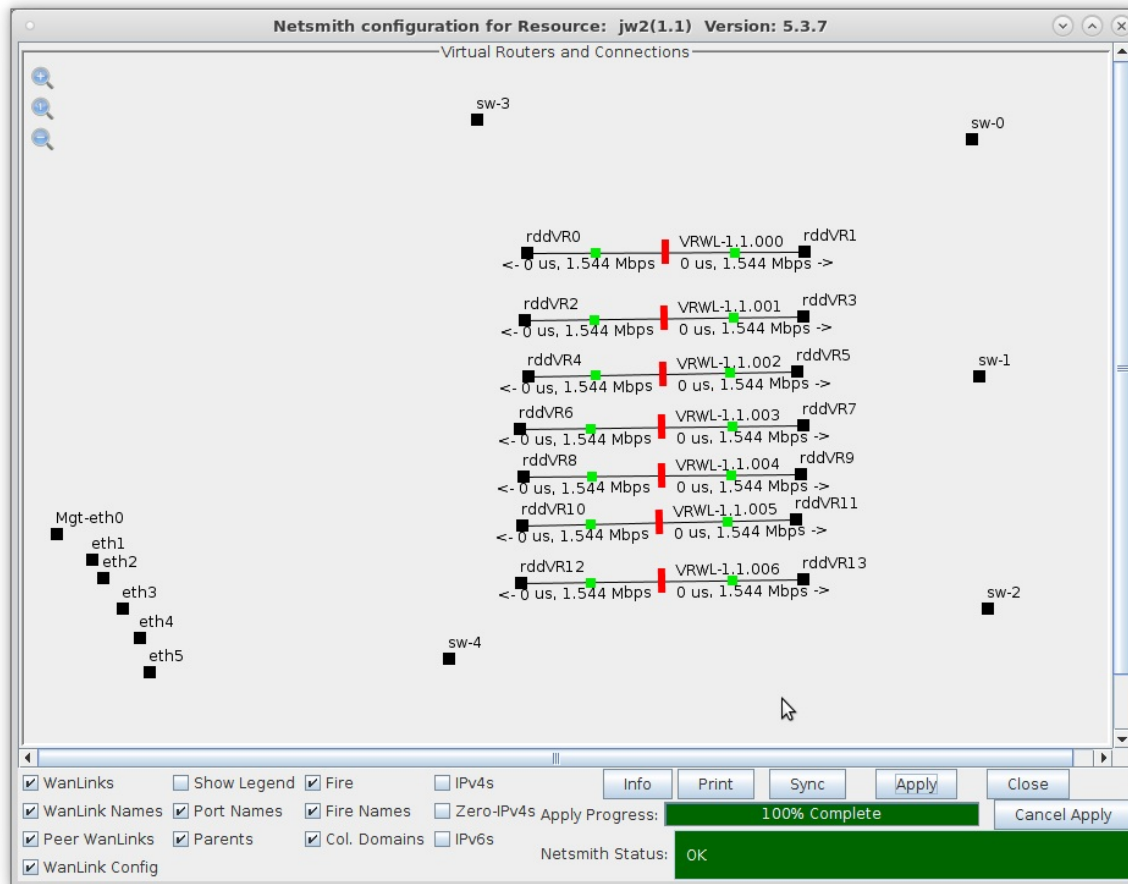


B. Select the **Bridge** button, enter a name and quantity 5



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

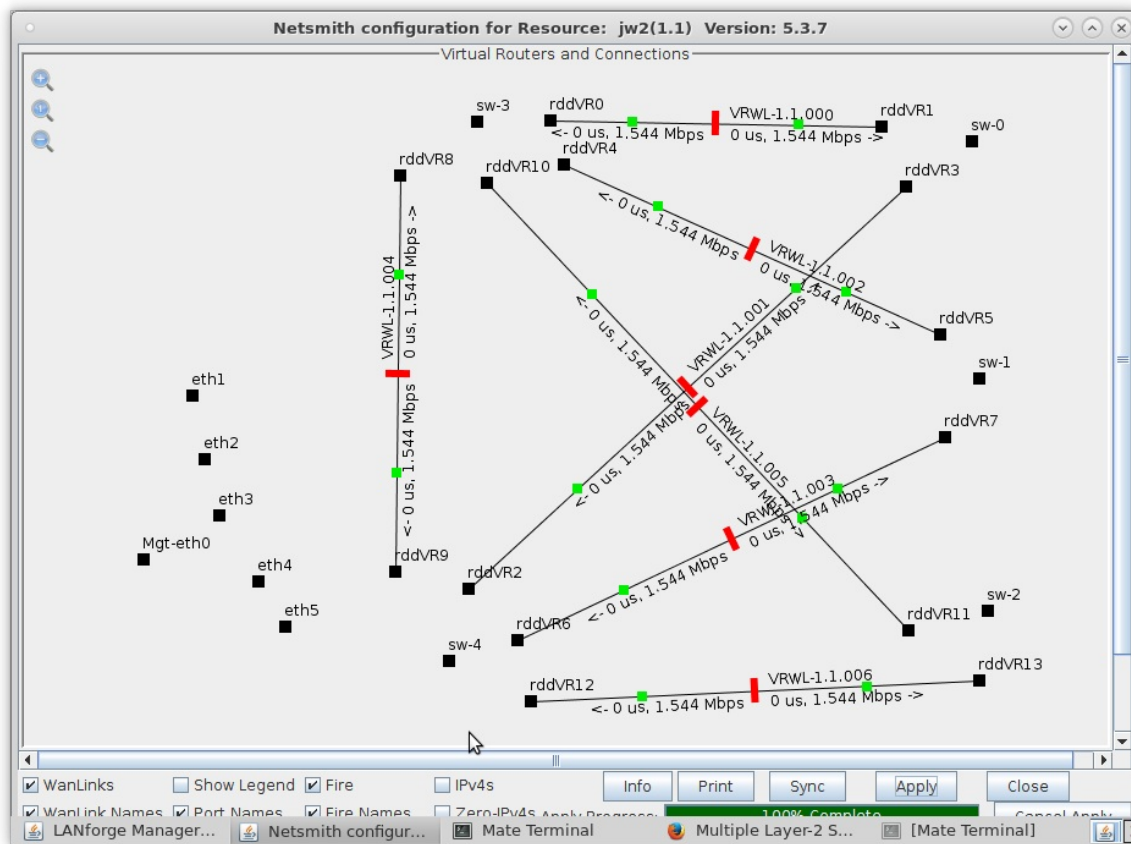
- C. In Netsmith, position the bridge devices into separate areas so they can be grouped with WanLink entry points



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

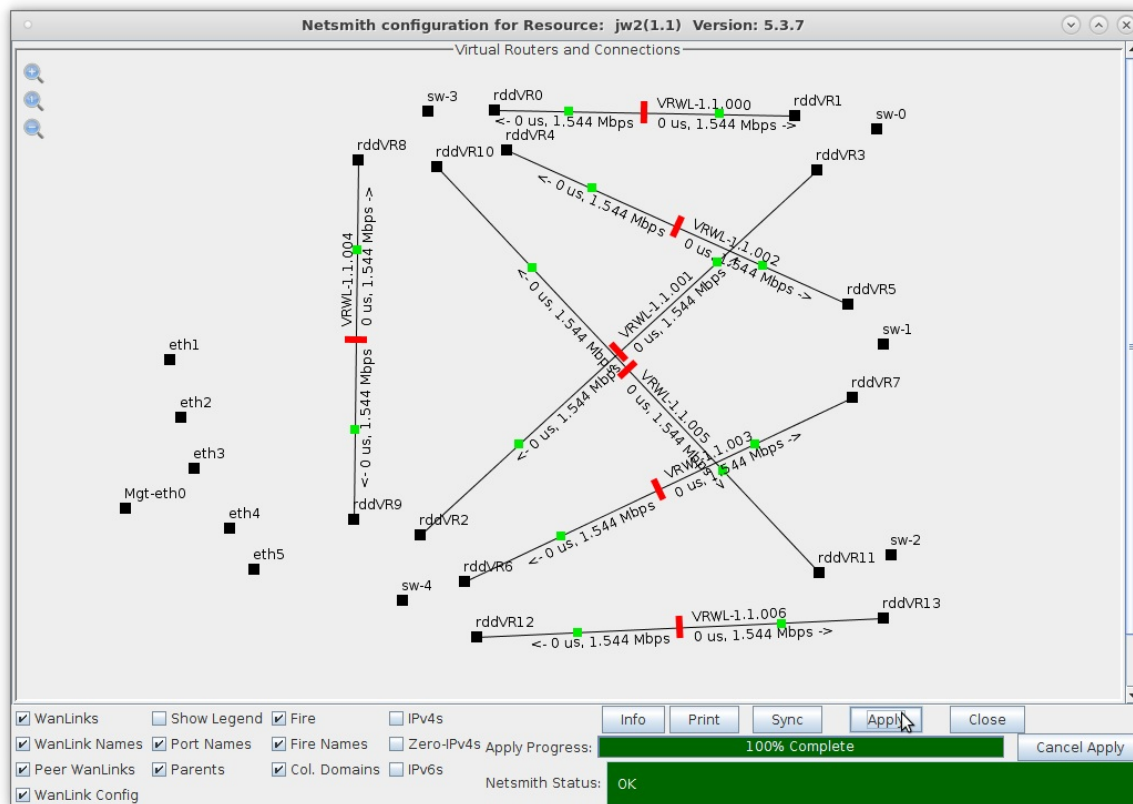
3. Move the WanLinks into their desired positions.

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

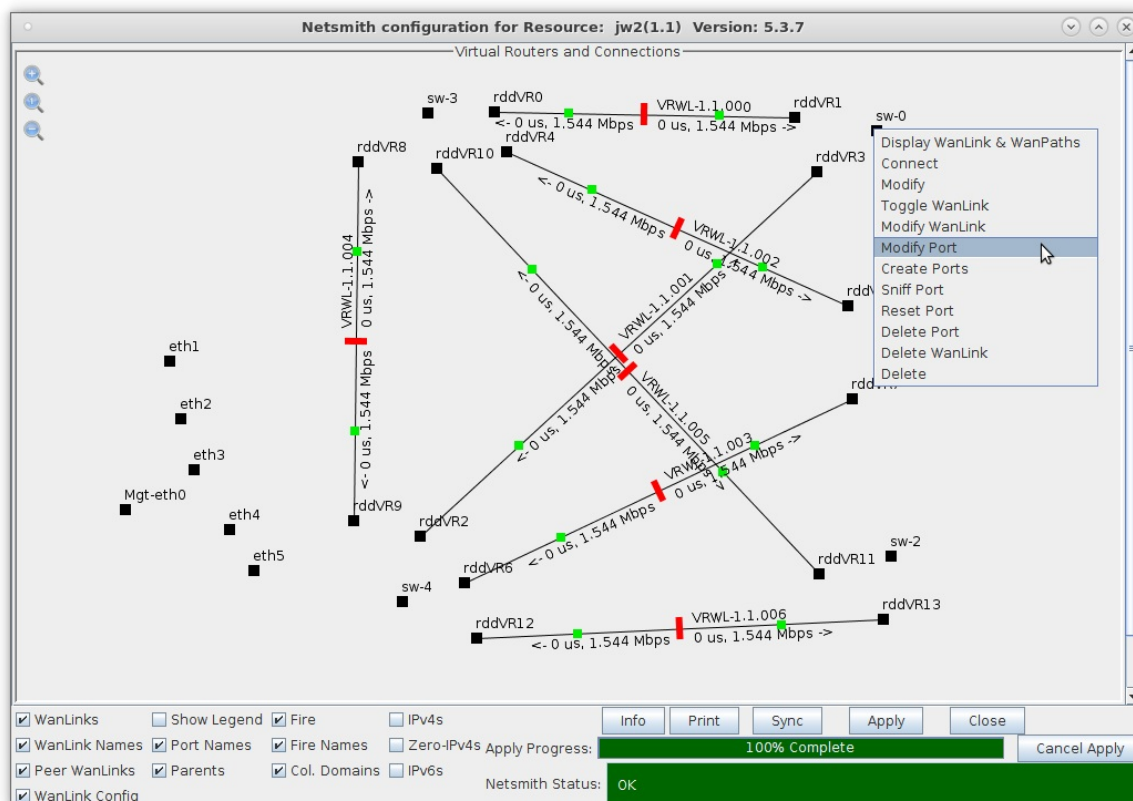


- A. 2 entry points near sw-0, sw-1, and sw-2 (one to sw-3 and one to sw-4)
- B. 3 entry points near sw-3 and sw-4 (one to sw-0, sw-1, and sw-2)
- C. Bridges sw-3 and sw-4 should also have a WanLink between them

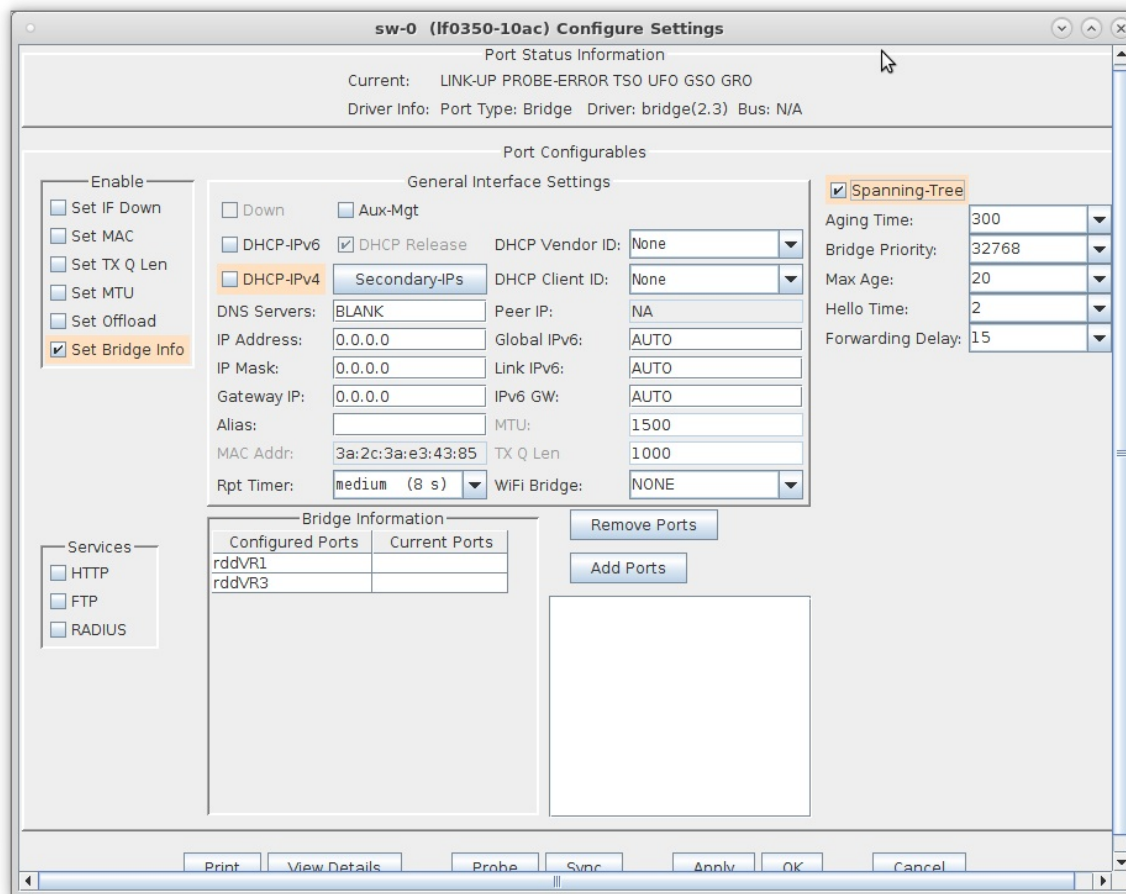
B. Click Netsmith **Apply** to commit the changes



4. Modify each Bridge to enable Spanning Tree Protocol (STP) and add Bridge Members.
 - A. Right-click bridge sw-0 and select **Modify Port**

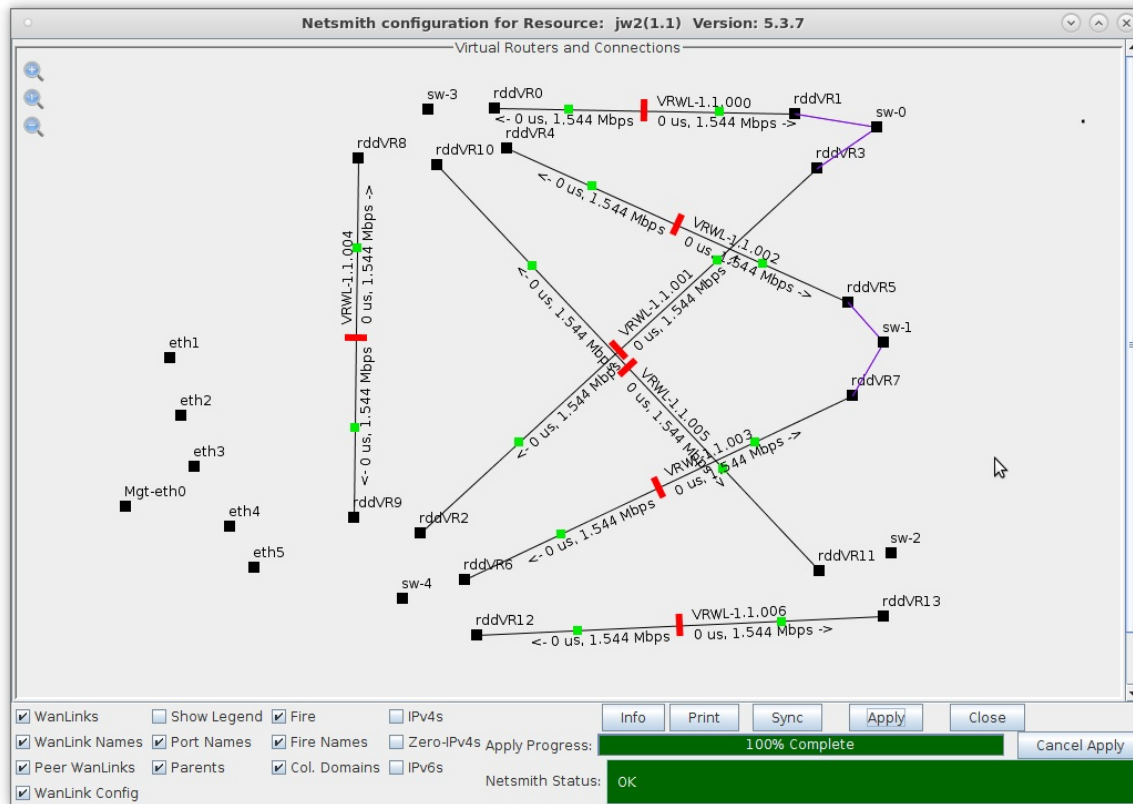


- B. Select the 'Set Bridge Info' and 'Spanning Tree' checkboxes, then add bridge members rddVR1 and rddVR3



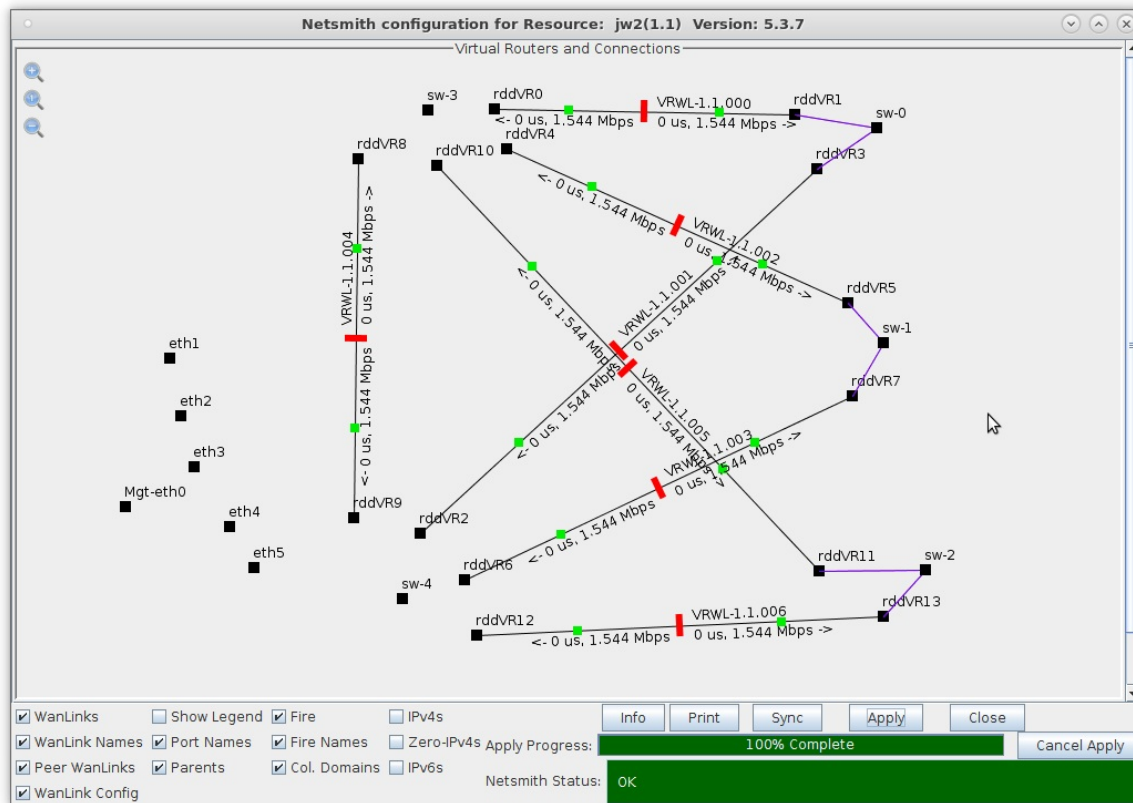
- A. **NOTE:** Selecting the 'Spanning Tree' checkbox enables Spanning Tree Protocol (STP) for that port
- B. Click the **Apply** or **OK** button to commit the changes in bridge configuration to the LANforge-Server

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



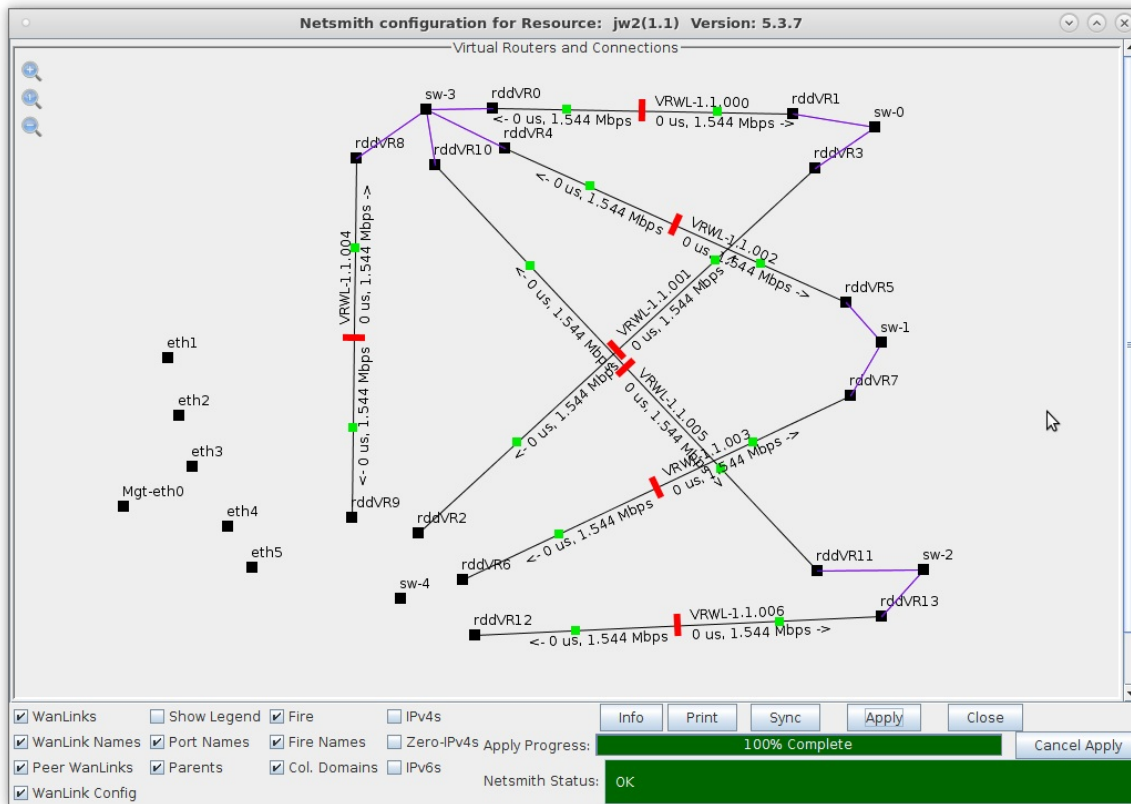
A. Enable STP and add members rddVR5 and rddVR7

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



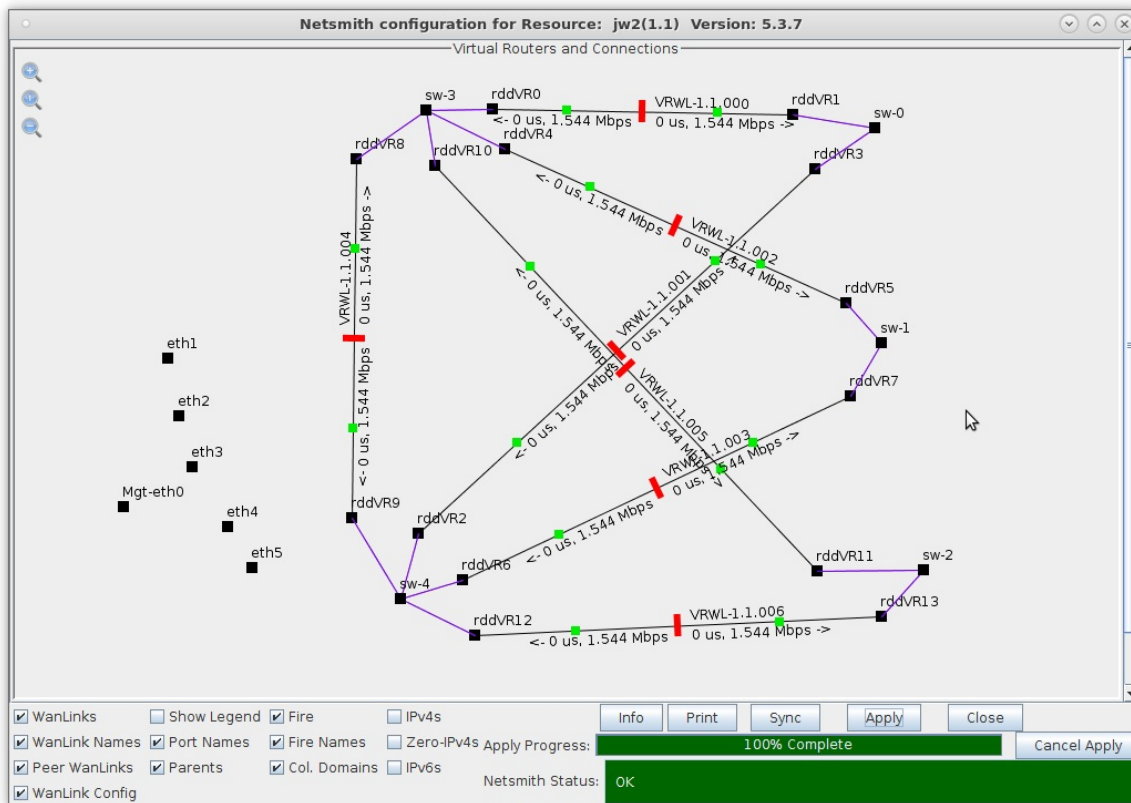
A. Enable STP and add members rddVR11 and rddVR13

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



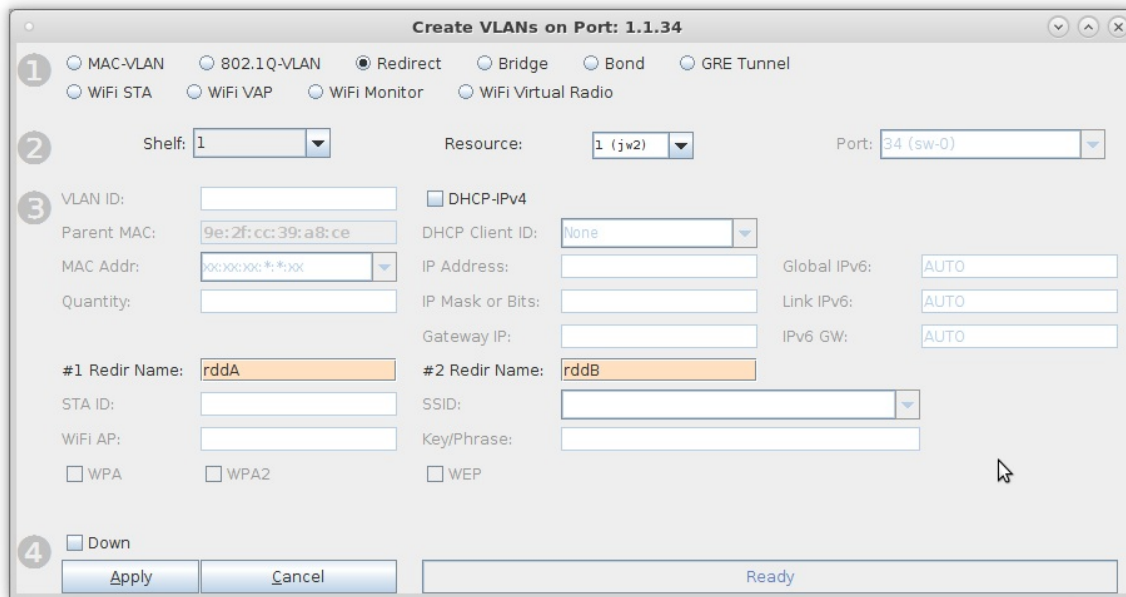
A. Enable STP and add members rddVR0, rddVR4, rddVR8 and rddVR10

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



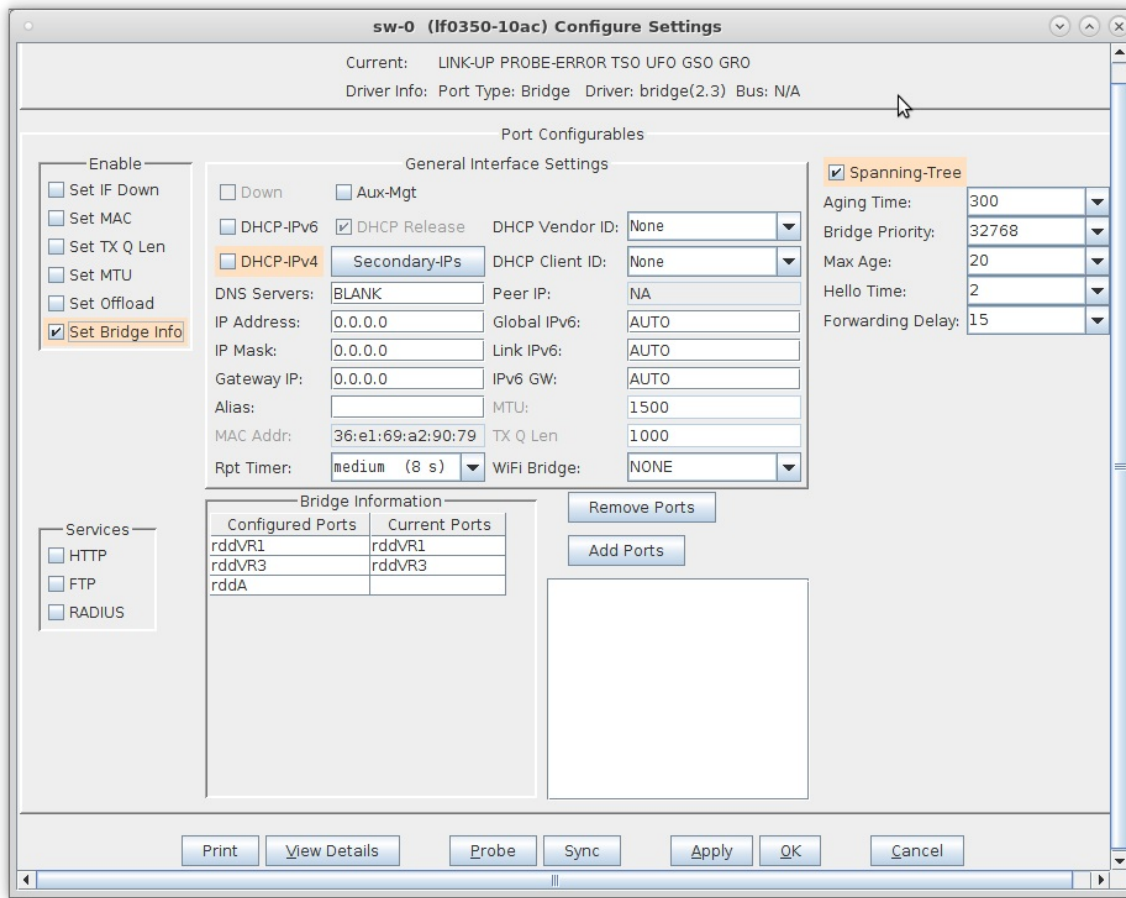
A. Enable STP and add members rddVR2, rddVR6, rddVR9 and rddVR12

5. Create virtual interfaces for traffic generation and fail-over tests.
 - A. Right-click sw-0 and select **Create Ports** and choose Redirect



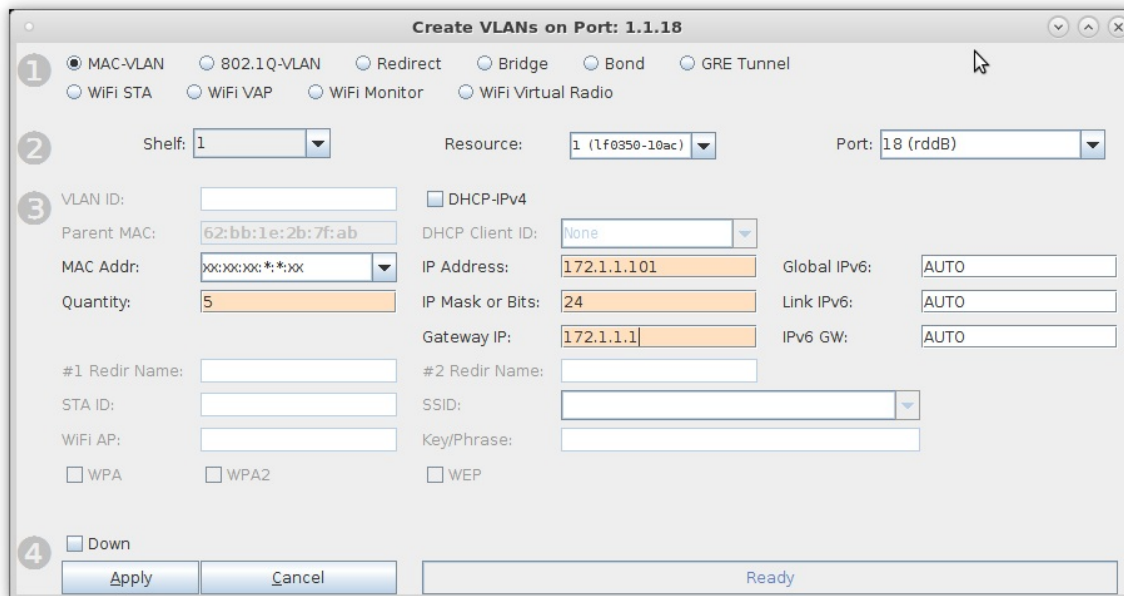
A. This step will create two Redirect Devices, rddA and rddB

B. Add rddA to bridge sw-0



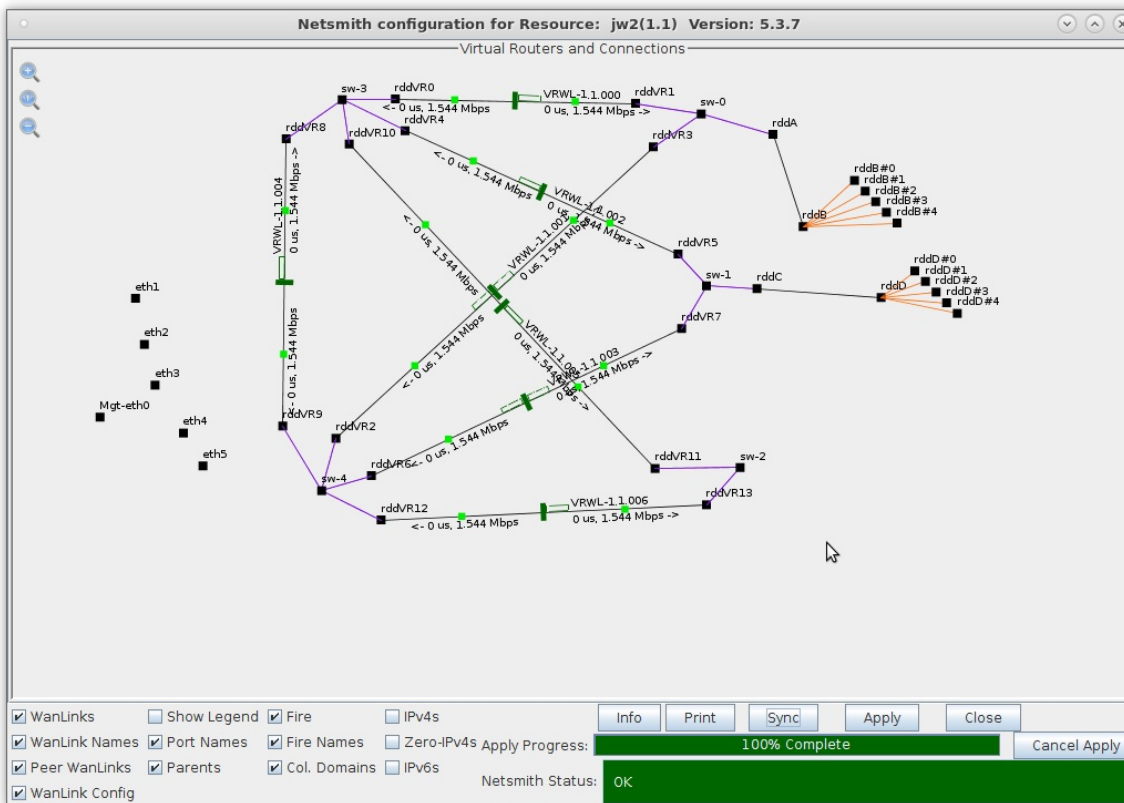
A. Click the **Apply** or **OK** button to commit the changes in bridge configuration to the LANforge-Server

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



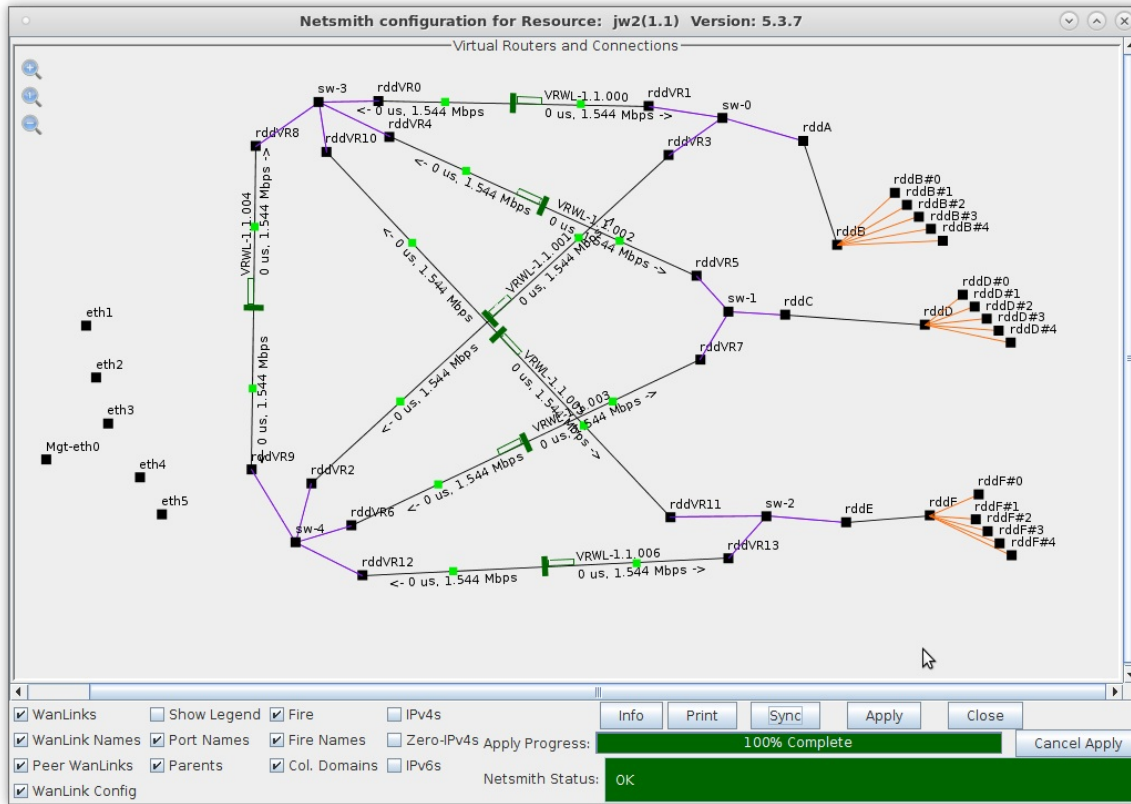
A. Enter a starting MAC address, quantity 5, and starting IP address

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

CX Name: cx-01
 CX Type: LANforge / UDP

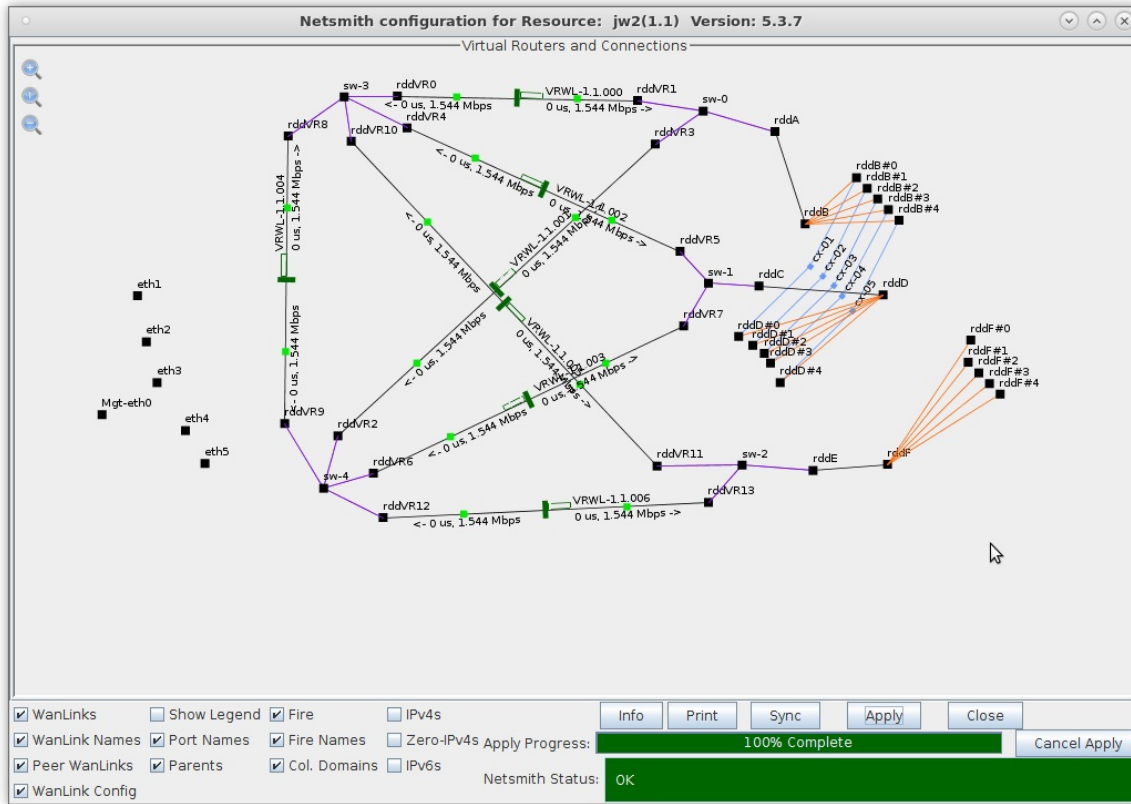
	Endpoint A	Endpoint B
Resource:	1 (1f0350-10ac)	1 (1f0350-10ac)
Port:	43 (rddB#0)	48 (rddD#0)
Min Tx Rate:	ISDN (128 Kbps)	ISDN (128 Kbps)
Max Tx Rate:	Same	Same
Min PDU Size:	UDP Pld (1,472 B)	UDP Pld (1,472 B)
Max PDU Size:	Same	Same
IP ToS:	Best Effort (0)	Best Effort (0)
Pkts To Send:	Infinite	Infinite

Report Timer: fast (1 s)

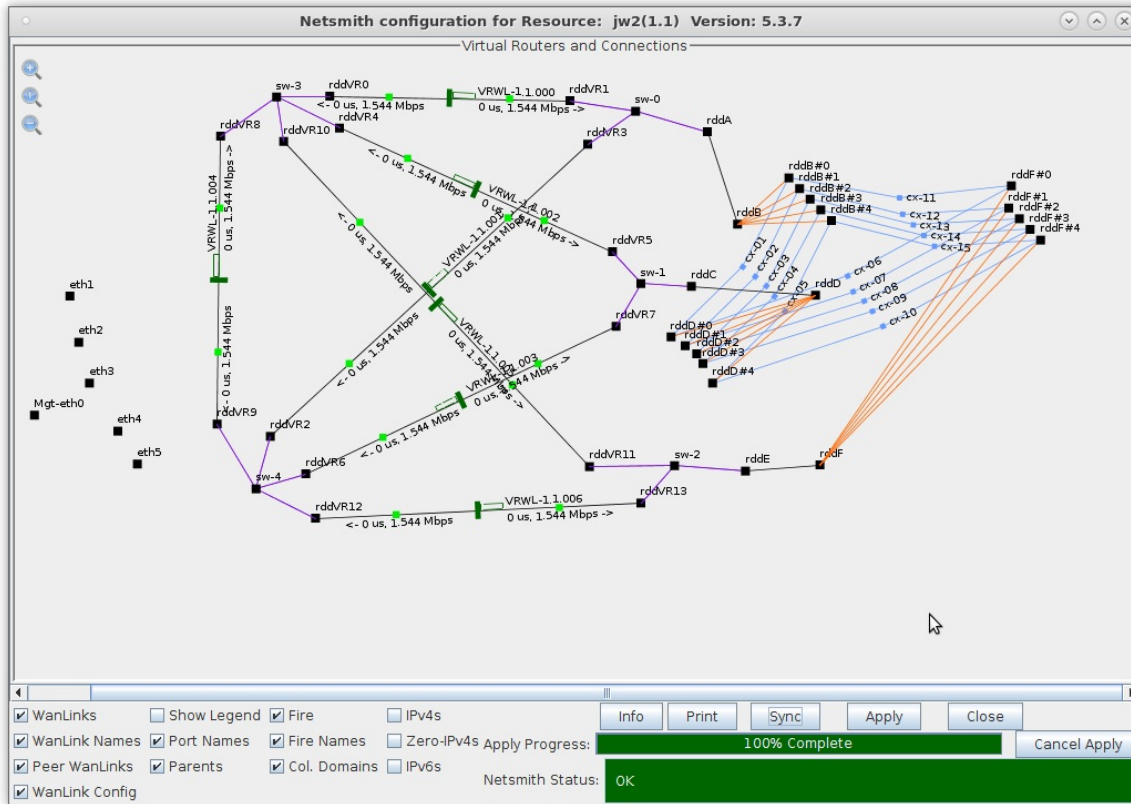
Pld Pattern: increasing increasing
 Min IP Port: AUTO AUTO
 Max IP Port: Same Same
 Min Duration: Forever Forever
 Max Duration: Same Same
 Min Recon: 0 (0 ms) 0 (0 ms)
 Max Recon: Same Same
 Multi-Conn: Normal (0) Normal (0)

Script Script
 Thresholds 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.

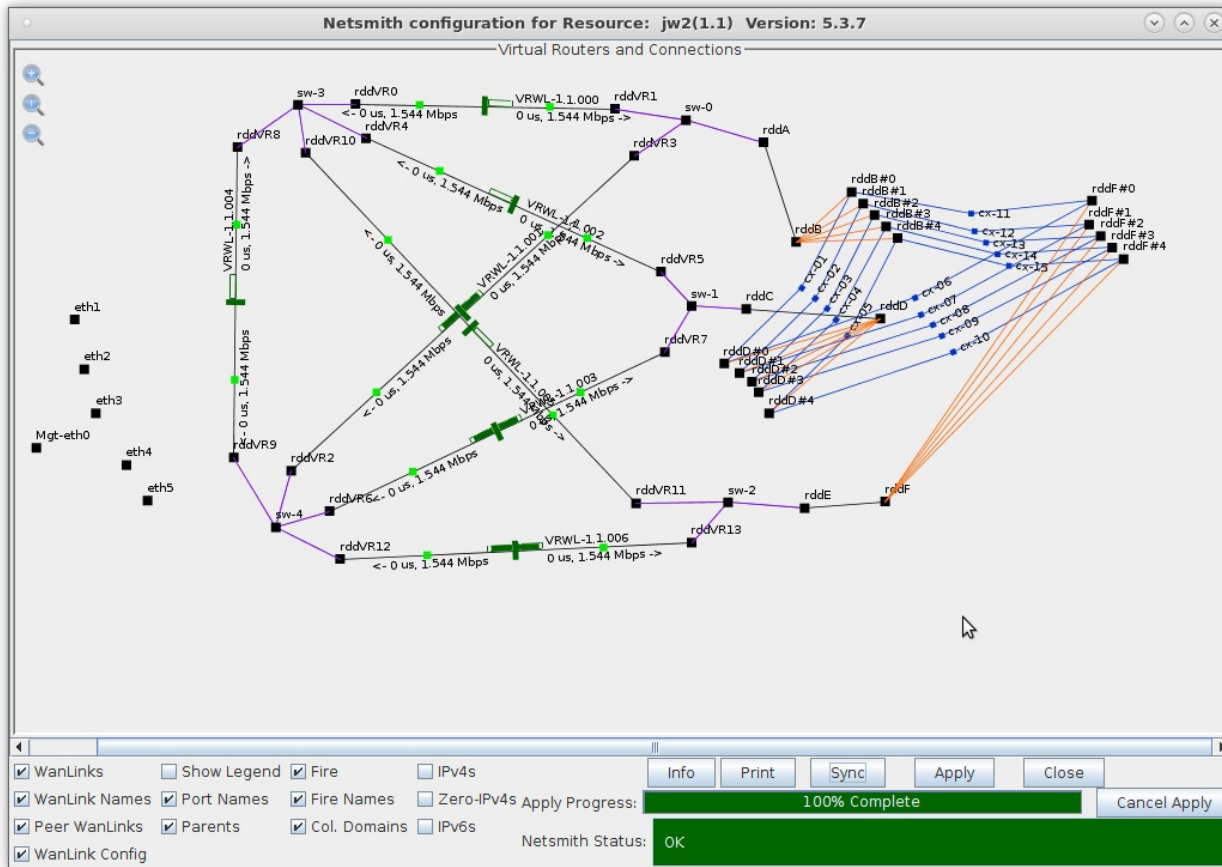
The screenshot shows the LANforge Manager Version 5.3.7 interface. The 'Layer-3' tab is selected, and the 'Test Manager' section is active. The 'Rpt Timer' is set to 'fast (1 s)' and 'Test Manager' is set to 'all'. The 'View' is set to '0 - 500'. The table below shows 15 cross connects, all in a 'Run' state, with various packet and bit rates and 0% drop rates.

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**

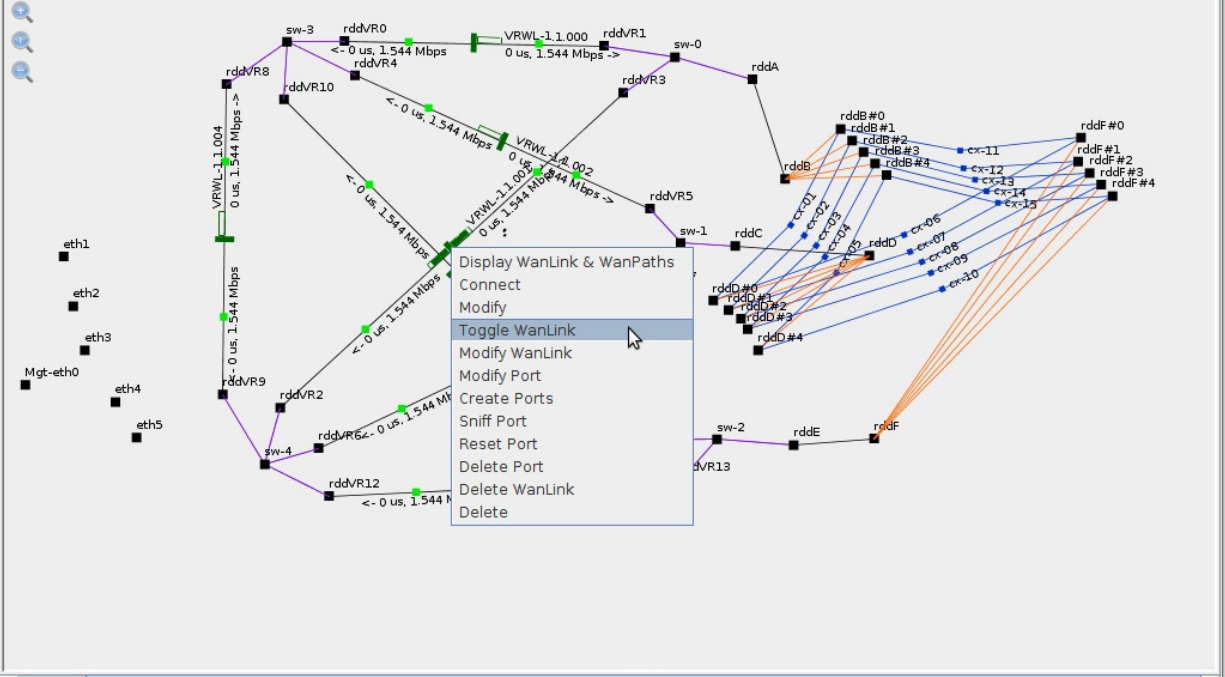
8. In Netsmith, verify traffic is flowing through sw-3 or sw-4 via 3 separate WanLinks



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

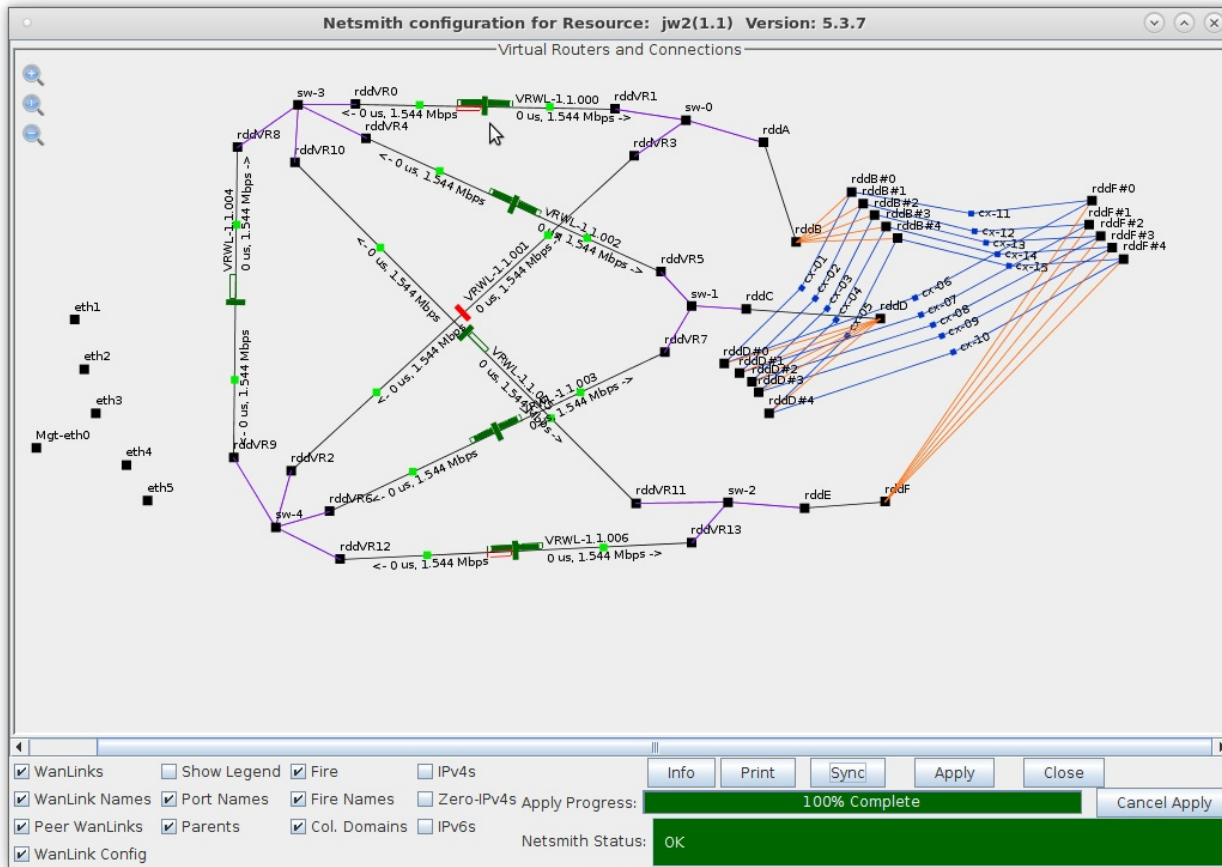
9. Right-click WanLink VRWL-1.1.001 and select **Toggle WanLink**

Virtual Routers and Connections

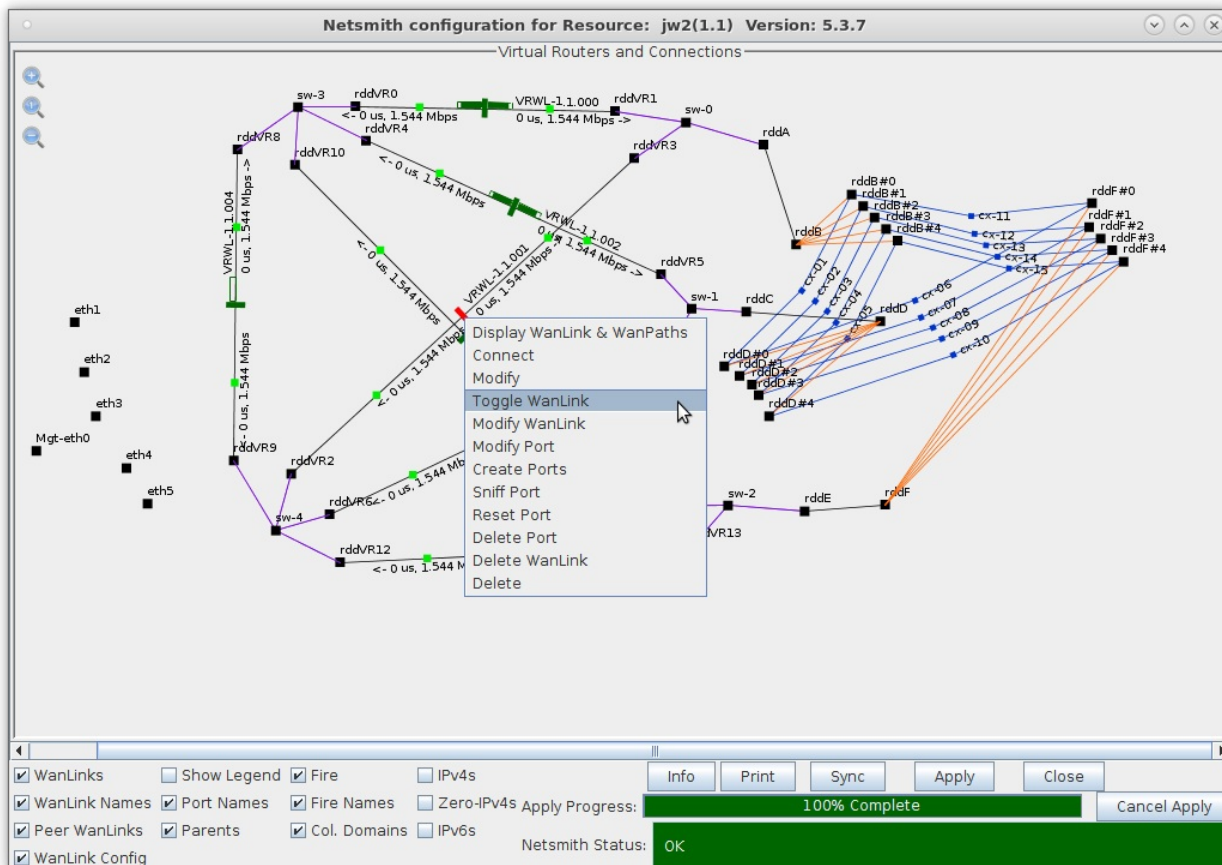


WanLinks Show Legend Fire IPv4s
 WanLink Names Port Names Fire Names Zero-IPv4s Apply Progress: 100% Complete Cancel Apply
 Peer WanLinks Parents Col. Domains IPv6s
 WanLink Config Netsmith Status: OK

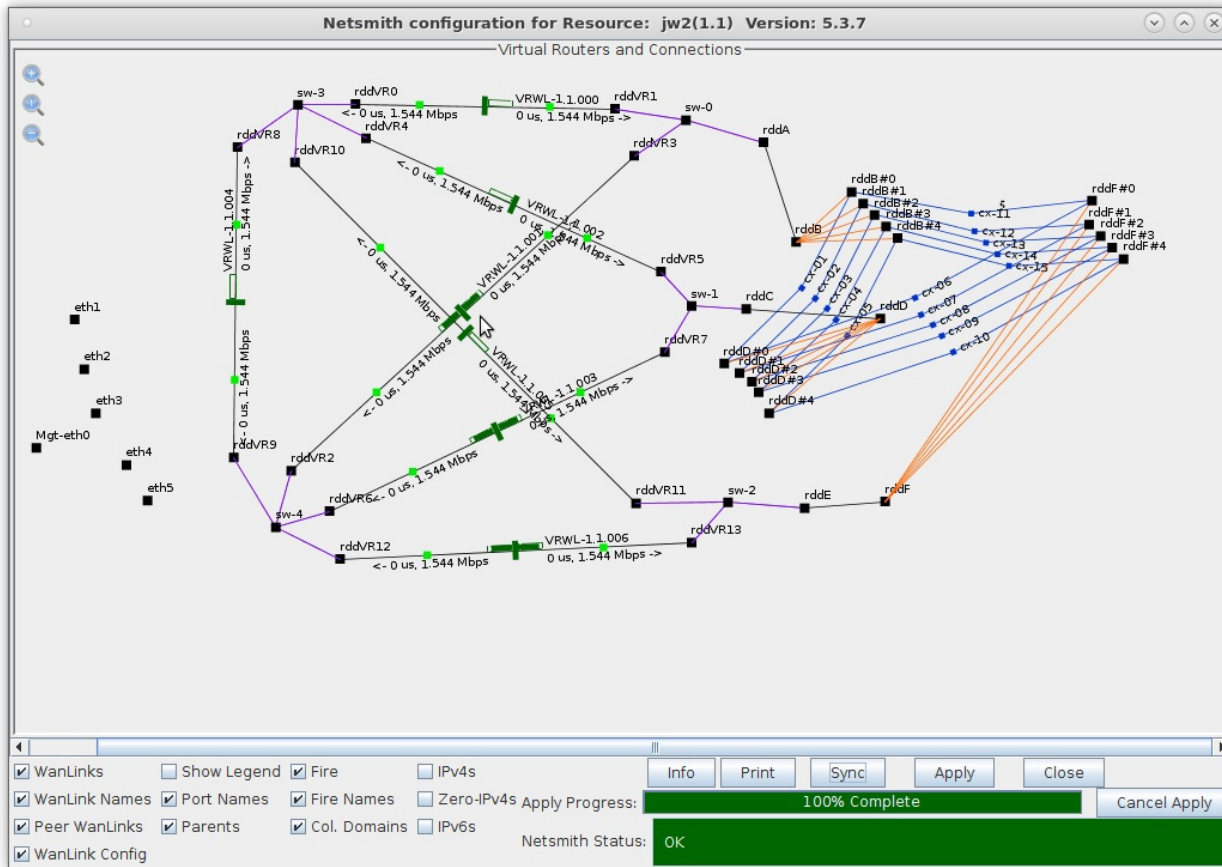
10. After approximately 1 minute, the traffic will find an alternate path



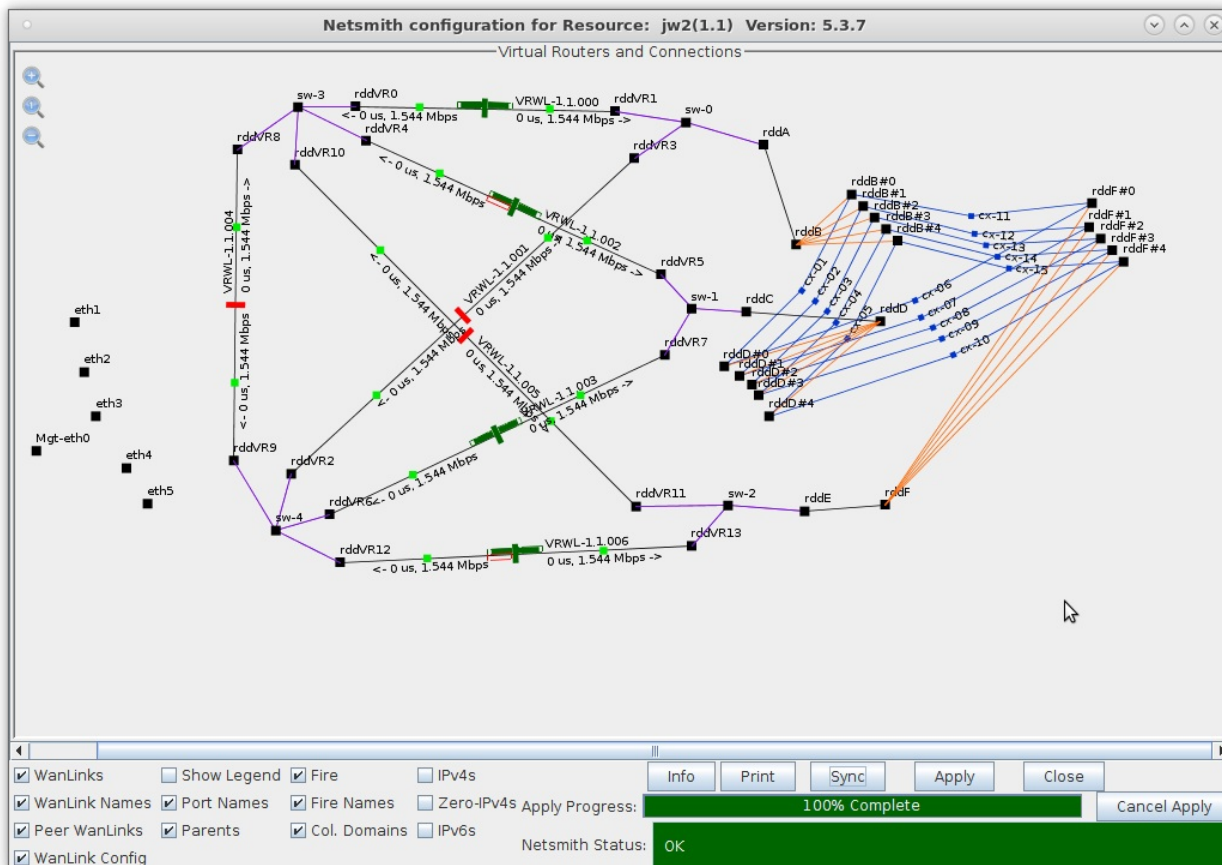
11. Right-click WanLink VRWL-1.1.001 and select **Toggle WanLink**



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](#)

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