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

   ![Netsmith Configuration](image)

   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**

   ![Netsmith configuration for Resource: Jw2(1.1) Version: 5.3.7](image)

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

   ![Create VLANs on Port](image)

   **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:

- 2 entry points near sw-0, sw-1, and sw-2 (one to sw-3 and one to sw-4)
- 3 entry points near sw-3 and sw-4 (one to sw-0, sw-1, and sw-2)
- 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

   ![Netsmith configuration for Resource: jw2(1.1) Version: 5.3.7](Diagram1)

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

   ![sw-0 (IF0350-10ac) Configure Settings](Diagram2)

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

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

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

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 rd08 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
6. Create Layer-3 connections.
   A. On the Layer-3 tab, create a Layer-3 UDP connection between rddB#0 and rddD#0
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.

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, VRWL-1.1.001, 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: