

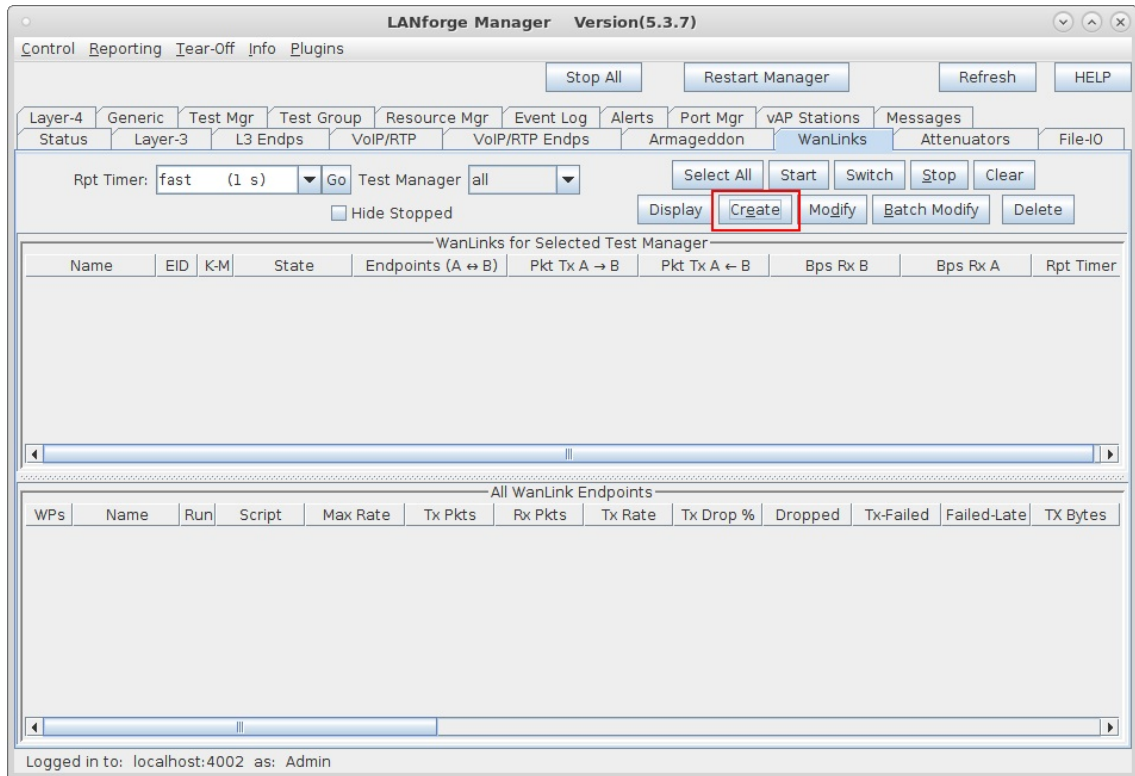
## WanPath Corruptions

**Goal:** Setup a WanLink with WanPath Corruptions.

In this test scenario, LANforge-ICE is used to filter traffic by VLAN on a WanLink with the use of WanPaths and then use WanPath Corruptions to overwrite the DSCP field in the IP packet.

**Note:** VLAN filtering was recently fixed and should be used with LANforge version 5.3.7 and up.

1. Setup a WanLink connection.
  - A. Go to the **WanLinks** tab and select **Create**.



- B. Enter the WanLink name, physical ports, base transfer rate, delay, jitter etc...  
These impairments will be applied to all traffic on the WanLink.

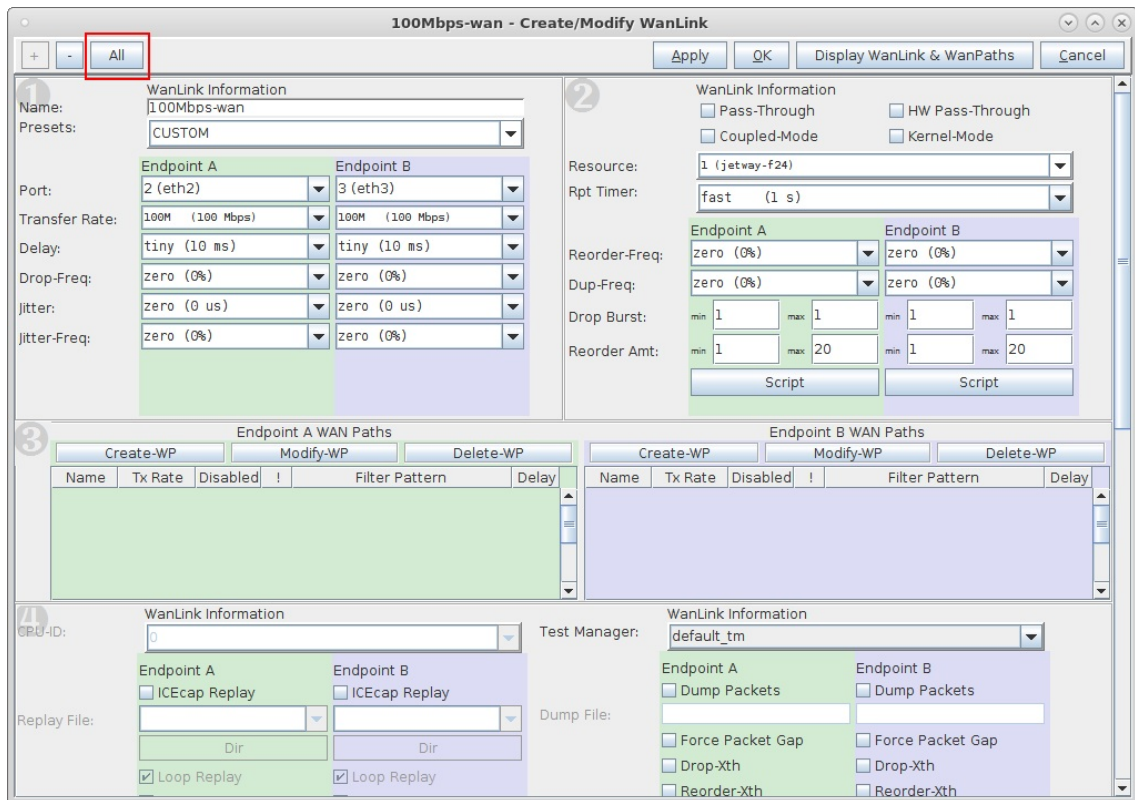
The screenshot shows a dialog box titled "100Mbps-wan - Create/Modify WanLink". At the top, there are buttons for "+", "-", "All", "Apply", "OK", "Display WanLink & WanPaths", and "Cancel". Below the buttons, the "WanLink Information" section is visible. It includes a "Name" field with the value "100Mbps-wan" and a "Presets" dropdown menu set to "CUSTOM". The configuration is split into two columns: "Endpoint A" (highlighted in green) and "Endpoint B" (highlighted in blue). The "Port" field shows "2 (eth2)" for Endpoint A and "3 (eth3)" for Endpoint B. Other fields include "Transfer Rate" (100M (100 Mbps)), "Delay" (tiny (10 ms)), "Drop-Freq" (zero (0%)), "Jitter" (zero (0 us)), and "Jitter-Freq" (zero (0%)).

- C. Select **Apply** to create the base WanLink.

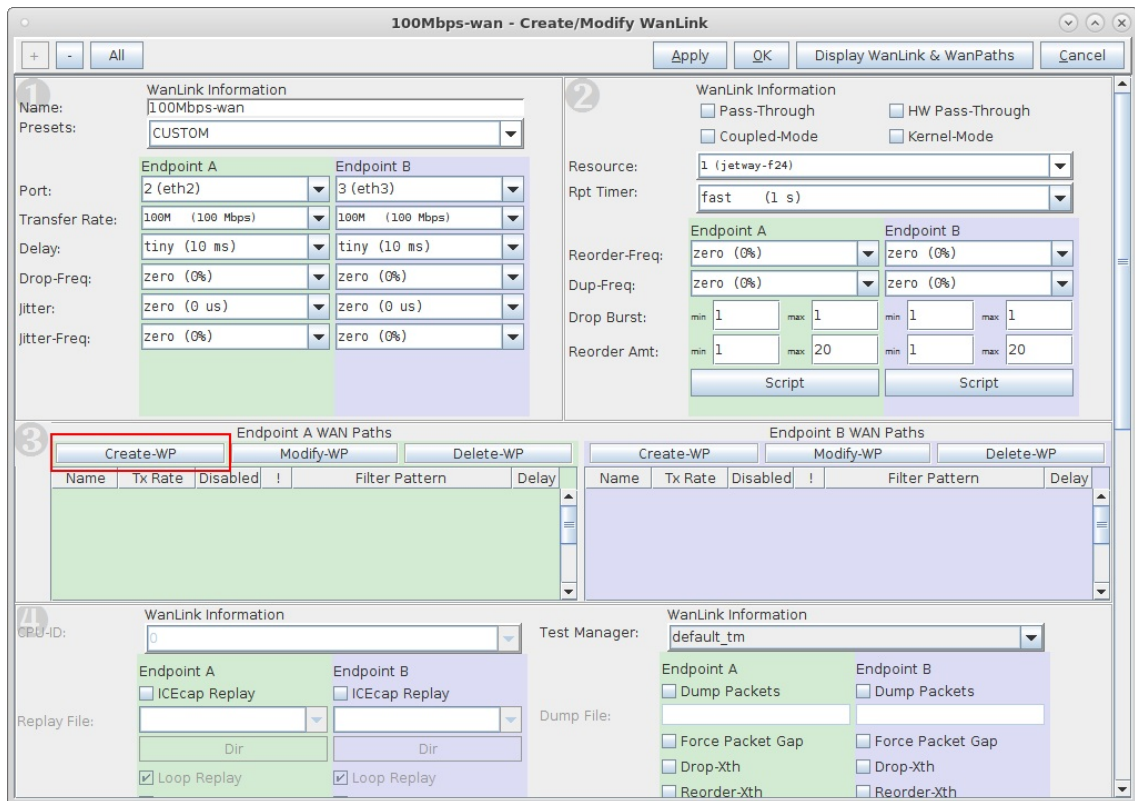
For more information see [LANforge-GUI User Guide: Creating & Modifying WanLinks](#)

2. Setup the WanPaths.

- A. Select **All** to un-hide the other WanLink config panels.



- B. In panel 3, for Endpoint-A WAN Paths, select **Create-WP**.



- C. Enter a Name and Transfer Rate for the WanPath.  
Here we are matching the WanLink's transfer rate.

**Create/Modify WanPath for Endpoint: 100Mbps-wan-A**

Buttons: Display, Clear Counters, Apply, OK, Cancel

Name: wp-a Backlog Buffer: AUTO

PCAP Filter:

Source IP/MAC: 0.0.0.0 Source Mask: 0.0.0.0

Dest IP/MAC: 0.0.0.0 Dest Mask: 0.0.0.0

Transfer Rate: 100M (100 Mbps) Delay: zero (0 us)

Jitter: zero (0 us) Drop-Freq: zero (0%)

Min Drop Burst: 1 Max Drop Burst: 1

Min Reorder Amount: 1 Max Reorder Amount: 20

Reorder-Freq: zero (0%) Dup-Freq: zero (0%)

Jitter-Freq: zero (0%) Test Manager:

ICEcap Replay Replay File: Dir

Disabled  Loop Replay  Replay Latency  Replay Loss

Same As WanLink  Replay Dup  Replay Bandwidth  Use Pcap Filter

Inverse Match  Drop-Xth  Duplicate-Xth  Reorder-Xth

**Corruption #0**

Rate: 0

Corruption: Random Write

Byte-to-Write: 0

Min Offset: 0

Max Offset: 0

Chain-to-Next  Do Checksum

**Corruption #1**

Rate: 0

Corruption: Random Write

Byte-to-Write: 0

Min Offset: 0

Max Offset: 0

Chain-to-Next  Do Checksum

**Corruption #2**

Rate: 0

Corruption: Random Write

Byte-to-Write: 0

Min Offset: 0

Max Offset: 0

Chain-to-Next  Do Checksum

**Corruption #3**

Rate: 0

Corruption: Random Write

Byte-to-Write: 0

Min Offset: 0

Max Offset: 0

Chain-to-Next  Do Checksum

**Corruption #4**

Rate: 0

Corruption: Random Write

Byte-to-Write: 0

Min Offset: 0

Max Offset: 0

Chain-to-Next  Do Checksum

**Corruption #5**

Rate: 0

Corruption: Random Write

Byte-to-Write: 0

Min Offset: 0

Max Offset: 0

Chain-to-Next  Do Checksum

D. Select checkbox for **Use Pcap Filter**

The image shows a Windows-style dialog box titled "Create/Modify WanPath for Endpoint: 100Mbps-wan-A". At the top, there are buttons for "Display", "Clear Counters", "Apply", "OK", and "Cancel". The main area contains various configuration fields:

- Name: wp-a
- Backlog Buffer: AUTO
- PCAP Filter: (empty)
- Source IP/MAC: 0.0.0.0
- Source Mask: 0.0.0.0
- Dest IP/MAC: 0.0.0.0
- Dest Mask: 0.0.0.0
- Transfer Rate: 100M (100 Mbps)
- Delay: zero (0 us)
- Jitter: zero (0 us)
- Drop-Freq: zero (0%)
- Min Drop Burst: 1
- Max Drop Burst: 1
- Min Reorder Amount: 1
- Max Reorder Amount: 20
- Reorder-Freq: zero (0%)
- Dup-Freq: zero (0%)
- Jitter-Freq: zero (0%)
- Test Manager: (empty)

Below these fields is the "ICEcap Replay" section with a "Replay File:" field and a "Dir" button. There are several radio and checkbox options:

- Radio buttons: Disabled, Same As WanLink (selected), Inverse Match
- Checkboxes: Loop Replay, Replay Dup, Drop-Xth, Duplicate-Xth, Reorder-Xth, Use Pcap Filter (highlighted with a red box), Replay Latency, Replay Loss, Replay Bandwidth

At the bottom, there are six "Corruption" sections (Corruption #0 through #5). Each section has fields for Rate (0), Corruption (Random Write), Byte-to-Write (0), Min Offset (0), and Max Offset (0). There are also checkboxes for Chain-to-Next and Do Checksum.

- E. Enter the PCAP Filter **vlan 1010** to apply any WanPath impairment or corruptions only to packets with 802.1q vlan id 1010  
Expression is based on the tcpdump expression field.

**Create/Modify WanPath for Endpoint: 100Mbps-wan-A**

Buttons: Display, Clear Counters, Apply, OK, Cancel

Name: wp-a Backlog Buffer: AUTO

PCAP Filter: vlan 1010

Source IP/MAC: 0.0.0.0 Source Mask: 0.0.0.0

Dest IP/MAC: 0.0.0.0 Dest Mask: 0.0.0.0

Transfer Rate: 100M (100 Mbps) Delay: zero (0 us)

Jitter: zero (0 us) Drop-Freq: zero (0%)

Min Drop Burst: 1 Max Drop Burst: 1

Min Reorder Amount: 1 Max Reorder Amount: 20

Reorder-Freq: zero (0%) Dup-Freq: zero (0%)

Jitter-Freq: zero (0%) Test Manager:

ICEcap Replay Replay File: Dir

Disabled  Loop Replay  Replay Latency  Replay Loss

Same As WanLink  Replay Dup  Replay Bandwidth  Use Pcap Filter

Inverse Match  Drop-Xth  Duplicate-Xth  Reorder-Xth

Corruption #0: Rate: 0, Corruption: Random Write, Byte-to-Write: 0, Min Offset: 0, Max Offset: 0,  Chain-to-Next,  Do Checksum

Corruption #1: Rate: 0, Corruption: Random Write, Byte-to-Write: 0, Min Offset: 0, Max Offset: 0,  Chain-to-Next,  Do Checksum

Corruption #2: Rate: 0, Corruption: Random Write, Byte-to-Write: 0, Min Offset: 0, Max Offset: 0,  Chain-to-Next,  Do Checksum

Corruption #3: Rate: 0, Corruption: Random Write, Byte-to-Write: 0, Min Offset: 0, Max Offset: 0,  Chain-to-Next,  Do Checksum

Corruption #4: Rate: 0, Corruption: Random Write, Byte-to-Write: 0, Min Offset: 0, Max Offset: 0,  Chain-to-Next,  Do Checksum

Corruption #5: Rate: 0, Corruption: Random Write, Byte-to-Write: 0, Min Offset: 0, Max Offset: 0,  Chain-to-Next,  Do Checksum

- F. Select **Apply** to create the WanPath.

For more information see [Tcpdump man page](#) , [Pcap Filter Syntax](#)



C. Select **OK** then create a second WanPath for this WanLink on Endpoint-B using the same values.

**Create/Modify WanPath for Endpoint: 100Mbps-wan-B**

Buttons: Display, Clear Counters, Apply, OK, Cancel

Name: wp-b Backlog Buffer: AUTO

PCAP Filter: vlan 1010

Source IP/MAC: 0.0.0.0 Source Mask: 0.0.0.0

Dest IP/MAC: 0.0.0.0 Dest Mask: 0.0.0.0

Transfer Rate: 100M (100 Mbps) Delay: zero (0 us)

Jitter: zero (0 us) Drop-Freq: zero (0%)

Min Drop Burst: 1 Max Drop Burst: 1

Min Reorder Amount: 1 Max Reorder Amount: 20

Reorder-Freq: zero (0%) Dup-Freq: zero (0%)

Jitter-Freq: zero (0%) Test Manager:

ICEcap Replay Replay File: Dir

Disabled  Loop Replay  Replay Latency  Replay Loss  
 Same As WanLink  Replay Dup  Replay Bandwidth  Use Pcap Filter  
 Inverse Match  Drop-Xth  Duplicate-Xth  Reorder-Xth

Corruption #0: Rate: 100000, Corruption: Write Byte, Byte-to-Write: 40, Min Offset: 19, Max Offset: 20,  Chain-to-Next,  Do Checksum

Corruption #1: Rate: 0, Corruption: Random Write, Byte-to-Write: 0, Min Offset: 0, Max Offset: 0,  Chain-to-Next,  Do Checksum

Corruption #2: Rate: 0, Corruption: Random Write, Byte-to-Write: 0, Min Offset: 0, Max Offset: 0,  Chain-to-Next,  Do Checksum

Corruption #3: Rate: 0, Corruption: Random Write, Byte-to-Write: 0, Min Offset: 0, Max Offset: 0,  Chain-to-Next,  Do Checksum

Corruption #4: Rate: 0, Corruption: Random Write, Byte-to-Write: 0, Min Offset: 0, Max Offset: 0,  Chain-to-Next,  Do Checksum

Corruption #5: Rate: 0, Corruption: Random Write, Byte-to-Write: 0, Min Offset: 0, Max Offset: 0,  Chain-to-Next,  Do Checksum

D. Verify that the WanPaths on this WanLink are setup correctly, then select **OK** on the Create/Modify WanLink window shown here

**100Mbps-wan - Create/Modify WanLink**

Buttons: Apply, OK, Display WanLink & WanPaths, Cancel

WanLink Information: Name: 100Mbps-wan, Presets: CUSTOM

Endpoint A: Port: 2 (eth2), Transfer Rate: 100M (100 Mbps), Delay: tiny (10 ms), Drop-Freq: zero (0%), Jitter: zero (0 us), Jitter-Freq: zero (0%)

Endpoint B: Port: 3 (eth3), Transfer Rate: 100M (100 Mbps), Delay: tiny (10 ms), Drop-Freq: zero (0%), Jitter: zero (0 us), Jitter-Freq: zero (0%)

Resource: 1 (jetway-f24), Rpt Timer: fast (1 s)

Reorder-Freq: zero (0%), Dup-Freq: zero (0%), Drop Burst: min 1 max 1, Reorder Amt: min 1 max 20

Endpoint A WAN Paths: Create-WP, Modify-WP, Delete-WP

| Name | Tx Rate | Disabled                 | !                        | Filter Pattern  | Delay |
|------|---------|--------------------------|--------------------------|-----------------|-------|
| wp-a | 100 M   | <input type="checkbox"/> | <input type="checkbox"/> | Pcap: vlan 1010 | 0     |
| wp-b | 100 M   | <input type="checkbox"/> | <input type="checkbox"/> | Pcap: vlan 1010 | 0     |

Endpoint B WAN Paths: Create-WP, Modify-WP, Delete-WP

WanLink Information: CPU-ID: 0, Test Manager: default\_tm

Endpoint A:  ICEcap Replay,  Loop Replay, Dir

Endpoint B:  ICEcap Replay,  Loop Replay, Dir

Endpoint A:  Dump Packets,  Force Packet Gap,  Drop-Xth,  Reorder-Xth

Endpoint B:  Dump Packets,  Force Packet Gap,  Drop-Xth,  Reorder-Xth



For more information see [LANforge-GUI User Guide: Creating & Modifying WanPaths](#)

4. Run traffic through LANforge-ICE ports **eth2** and **eth3**, and capture traffic on eth2.

- A. Here we are using LANforge-FIRE on a secondary resource to send a 10Mbps bi-directional UDP flow between 802.1q VLAN endpoints eth2.1010 and eth3.1010 with an IP ToS value of decimal 184 which corresponds to DSCP value decimal 46 or Expedited Forwarding

- B. Go to the **Port Mgr** tab and highlight WanLink port eth2, then select the **Sniff Packets** button to bring up Wireshark.

| Port   | Pha... | Down                                | IP              | SEC | Alias     | Parent Dev | RX Bytes      | RX Pkts   | Pps RX | bps RX  | TX Bytes      | TX Pkts    | Pps |
|--------|--------|-------------------------------------|-----------------|-----|-----------|------------|---------------|-----------|--------|---------|---------------|------------|-----|
| 1.1.00 |        | <input type="checkbox"/>            | 192.168.100.198 | 0   | eth0      |            | 5,529,927,... | 8,709,413 | 55     | 143,334 | 5,281,552,... | 9,617,541  |     |
| 1.1.01 |        | <input checked="" type="checkbox"/> | 0.0.0.0         | 0   | eth1      |            | 0             | 0         | 0      | 0       | 0             | 0          | 0   |
| 1.1.02 |        | <input type="checkbox"/>            | 0.0.0.0         | 0   | eth2      |            | 3,482,049,... | 2,399,718 | 0      | 4       | 7,757,660,... | 4,297,3... |     |
| 1.1.03 |        | <input type="checkbox"/>            | 0.0.0.0         | 0   | eth3      |            | 3,482,026,... | 2,399,705 | 0      | 0       | 7,757,666,... | 4,297,3... |     |
| 1.1.04 |        | <input type="checkbox"/>            | 0.0.0.0         | 0   | eth4      |            | 0             | 0         | 0      | 0       | 12,506        | 147        |     |
| 1.1.05 |        | <input type="checkbox"/>            | 0.0.0.0         | 0   | eth5      |            | 0             | 0         | 0      | 0       | 12,234        | 147        |     |
| 1.1.06 |        | <input type="checkbox"/>            | 0.0.0.0         | 0   | wiphy0    |            | 0             | 0         | 0      | 0       | 0             | 0          | 0   |
| 1.1.07 |        | <input type="checkbox"/>            | 0.0.0.0         | 0   | wiphy1    |            | 0             | 0         | 0      | 0       | 0             | 0          | 0   |
| 1.1.08 |        | <input checked="" type="checkbox"/> | 0.0.0.0         | 0   | wlan0     | wiphy0     | 0             | 0         | 0      | 0       | 0             | 0          | 0   |
| 1.1.09 |        | <input checked="" type="checkbox"/> | 0.0.0.0         | 0   | wlan1     | wiphy1     | 0             | 0         | 0      | 0       | 0             | 0          | 0   |
| 1.2.00 |        | <input type="checkbox"/>            | 192.168.100.103 | 0   | eth0      |            | 653,572,601   | 5,346,946 | 13     | 15,109  | 5,202,101,... | 4,863,373  |     |
| 1.2.01 |        | <input checked="" type="checkbox"/> | 0.0.0.0         | 0   | eth1      |            | 0             | 0         | 0      | 0       | 0             | 0          | 0   |
| 1.2.02 |        | <input type="checkbox"/>            | 172.16.0.102    | 0   | eth2      |            | 3,460,380,... | 2,384,176 | 0      | 0       | 3,482,059,... | 2,399,880  |     |
| 1.2.03 |        | <input type="checkbox"/>            | 172.16.0.103    | 0   | eth3      |            | 3,460,386,... | 2,384,178 | 0      | 0       | 3,482,036,... | 2,399,868  |     |
| 1.2.04 |        | <input type="checkbox"/>            | 0.0.0.0         | 0   | eth4      |            | 2,394         | 7         | 0      | 0       | 9,852         | 138        |     |
| 1.2.05 |        | <input type="checkbox"/>            | 0.0.0.0         | 0   | eth5      |            | 2,052         | 6         | 0      | 0       | 9,852         | 138        |     |
| 1.2.06 |        | <input type="checkbox"/>            | 192.168.9.29    | 0   | eth3.1009 | eth3       | 0             | 0         | 0      | 0       | 9,306         | 131        |     |
| 1.2.07 |        | <input type="checkbox"/>            | 192.168.8.28    | 0   | eth3.1008 | eth3       | 0             | 0         | 0      | 0       | 9,306         | 131        |     |
| 1.2.08 |        | <input type="checkbox"/>            | 192.168.1.11    | 0   | eth2.1001 | eth2       | 84,760,294    | 68,374    | 0      | 0       | 85,730,804    | 68,508     |     |
| 1.2.09 |        | <input type="checkbox"/>            | 192.168.9.19    | 0   | eth2.1009 | eth2       | 0             | 0         | 0      | 0       | 9,236         | 130        |     |
| 1.2.10 |        | <input type="checkbox"/>            | 192.168.5.15    | 0   | eth2.1005 | eth2       | 0             | 0         | 0      | 0       | 9,236         | 130        |     |
| 1.2.11 |        | <input type="checkbox"/>            | 192.168.7.17    | 0   | eth2.1007 | eth2       | 0             | 0         | 0      | 0       | 9,306         | 131        |     |

Logged in to: localhost:4002 as: Admin

- C. The capture will show that periodically the DSCP field gets overwritten per the WanPath corruption logic of writing a decimal value 40 in the IP ToS field which corresponds to a DSCP value of decimal 10 or Assured Forwarding 11.

The image shows a Wireshark capture window titled "ice\_ex12\_wanpath\_corruption.pcap [Wireshark 2.1.1 (Git Rev Unknown from unknown)] (as superuser)". The capture filter is empty. The packet list pane shows a series of packets from LANforge Traffic Generator, all with a length of 1518 bytes and a differentiated services codepoint of either "Expedited Forwarding" or "Assured Forwarding 11". Packet 158 is highlighted in black, indicating it is selected. The packet details pane for packet 158 shows the following structure:

- Frame 147: 1518 bytes on wire (12144 bits), 1518 bytes captured (12144 bits)
- Ethernet II, Src: JetwayIn\_cc:5b:d3 (00:30:18:cc:5b:d3), Dst: JetwayIn\_cc:5b:d2 (00:30:18:cc:5b:d2)
- 802.1Q Virtual LAN, PRI: 0, CFI: 0, ID: 1010
- Internet Protocol Version 4, Src: 192.168.0.30, Dst: 192.168.0.20
- User Datagram Protocol, Src Port: 33018, Dst Port: 33017
- LANforge Traffic Generator

The packet bytes pane shows the raw data in hexadecimal and ASCII. The DSCP field (bits 0-5 of the ToS field) is highlighted in red, showing the value 0000, which corresponds to a decimal value of 0. This indicates that the DSCP field has been overwritten from its original value of 11 (Assured Forwarding) to 0 (Default). The status bar at the bottom shows "File: 'ice\_ex12\_wanpath\_corruption.pcap' 3.038 kB 00:00:01 Packets: 1981 · Displayed: 1981 (100.0%) · Marked: 2 (0.1%) · Profile: Default".

For more information see [LANforge-GUI User Guide: Layer-3 Cross-Connects](#)

Candela Technologies, Inc., 2417 Main Street, Suite 201, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) | [sales@candelatech.com](mailto:sales@candelatech.com) | +1.360.380.1618