Maximizing the Value of your Network Emulator

Typically, a network emulator is set in the direct path between the intended source and destination devices. Although this configuration works for those devices on that direct path it has limited impact for other users and applications.

A new method to maximize the impact of your network emulator is to have it impair packet streams so that multiple people have access to these streams independently and at the same time.

The Hurricane VI and VII emulators can impair hundreds of streams and change their Ethernet and IP header fields so that these streams are on the network for anyone to utilize. There are a few ways in which this can be accomplished either by steering streams from a switch to the emulator or by using IGMP.

This paper provides details on how to use the Hurricane VII to receive a multicast stream, perform impairments, and modify the IP destination address to create a unique multicast stream. In this configuration, two emulator ports in a link are connected to the same switch. IGMP is employed to request the multicast stream that is to be received on the input port, impaired, modified and transmitted to the output port.

WARNING! The configuration outlined in this application note avoids creating a network loop. Make sure to follow all steps prior to connecting the Hurricane 7 to the switch.

Under the Configuration/Port Configuration menu, select the ports (for ST 2022-7 Ports A and B are paired and Ports C and D are paired) that will connect to the switch and set the following:

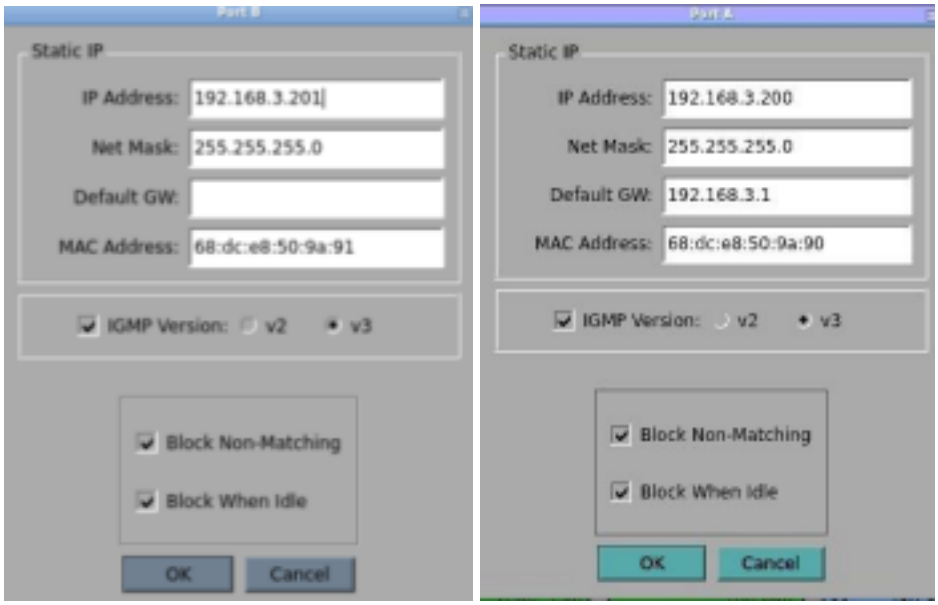


Figure 1 - Port Configuration for paired Ports A and B

IP Address – change the IP address to the same network subnet as the connecting device.

IGMP Version – ensure this checked and either v2 or v3 is selected.

Block Non-Matching – ensure this is checked. This blocks all traffic not matching a filter during emulation.

Block When Idle - ensure this is checked. This blocks all traffic when emulation is not running.

For a new configuration, select the chain icon (Create Link) at the top of the GUI to open the following Link dialog box.

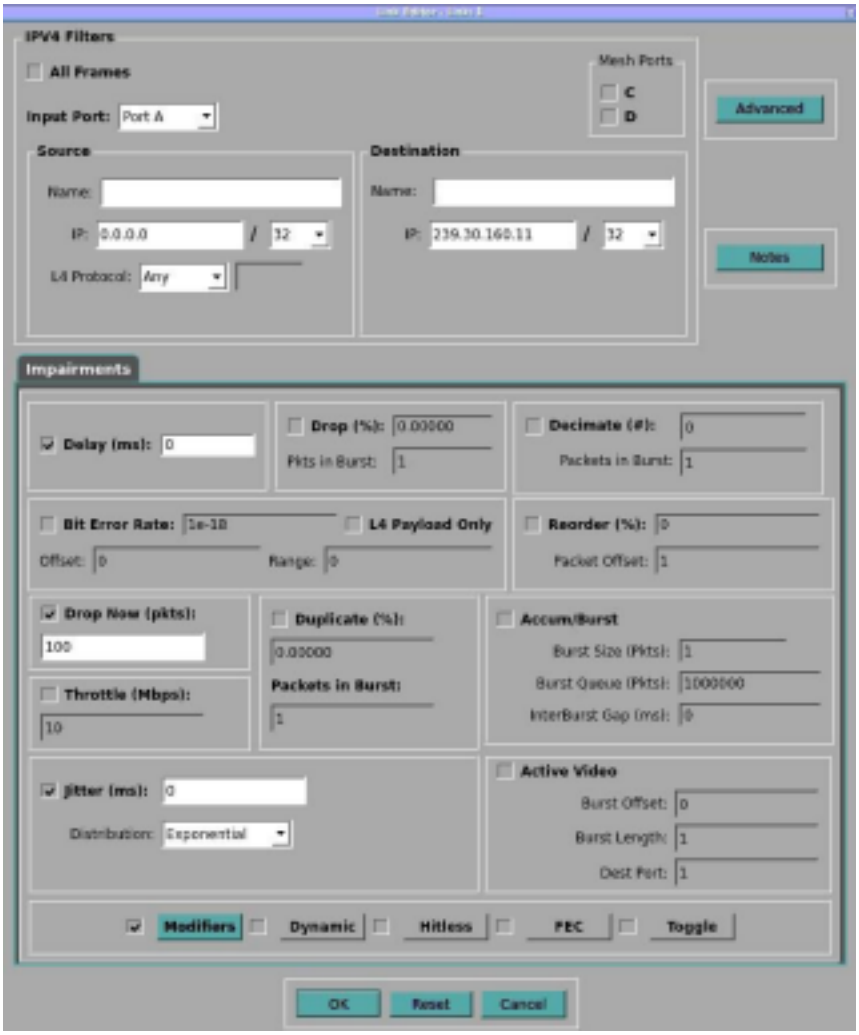


Figure 2 – Link Dialog Box

Set the following parameters:

Input Port - where the flow is coming into the emulator.
Source Address – enter an IP address for a specific sender address or 0.0.0.0/32 for any sender. Destination Address – the flow destination address (also referred to as the group address). Modifiers – change the Ethernet and IP Destination Address (click on the check box).

Enabling the check box next to Modifiers opens the Modifiers dialog box.

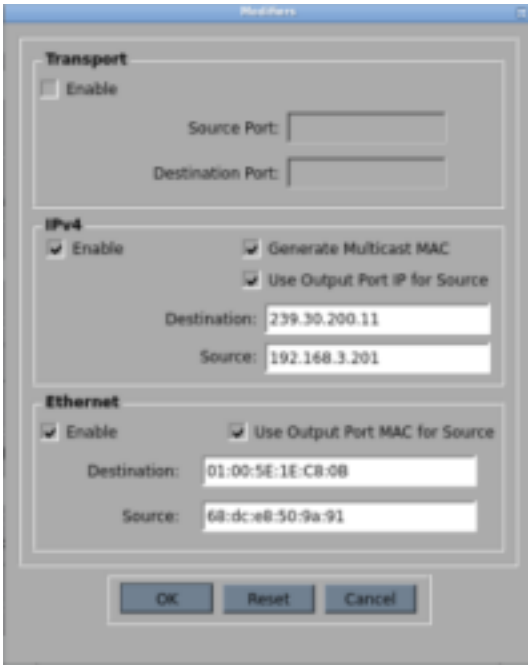


Figure 3 – Modifiers Dialog Box for Port B of paired Ports A and B

By changing the Ethernet and IP Destination Address of the flow creates a new flow onto the network.

The ”Use Output Port IP for Source” of IPv4 selects the output port associated with the link’s input port assignment. For example, if Port A is the link’s input port, then the Port B IP address is used for “Use Output Port IP for Source. A similar port assignment is used for Ethernet’s “Use Output Port MAC for Source. The “Use Output Port IP for Source” is a short cut to add the Modifier IP Source address. If the Modifier field is blank then that field is not modified.

If the output port IP address changes, then the “Use Output Port IP for Source” must be disabled and re-enabled to have the new output port IP Source Address appear in the Modifier field. Of course, the user can always manually enter the address into the modifier field.
For our example the modified stream is going from Port A to Port B. Here are the modifier settings:

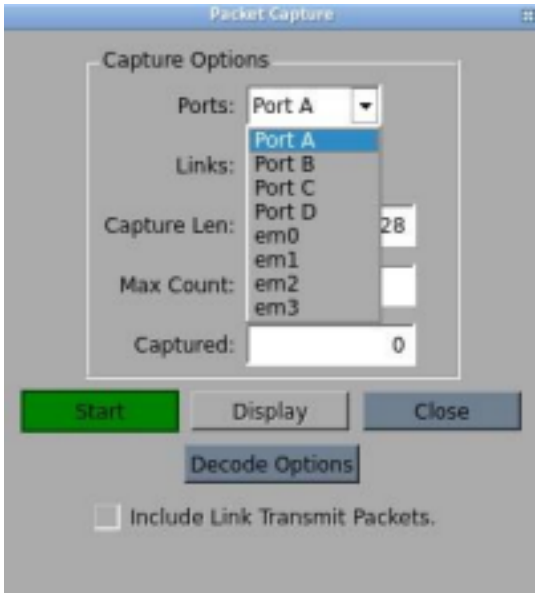
IP Source Address: 192.168.3.201 (Port B IP Address)
IP Destination Address: 239.30.200.11 (new multicast address)
MAC Source Address: 68:dc:e8:50:9a:91 (Port B MAC Address)
MAC Destination Address: 01:00:5e:1e:c8:08 (new MAC address is derived from IP multicast address when Modifier dialog box is closed)

Below is a configuration with five links. The light blue icons are modifiers and the green icons are impairments.

Figure 4 – GUI with Five Links

If there are any issues, debug the issue by ensuring the links are up by looking at the Port Status under the Configuration menu. In addition, the emulator has a packet capture capability under the Capture menu.

Figure 5 – Port Status



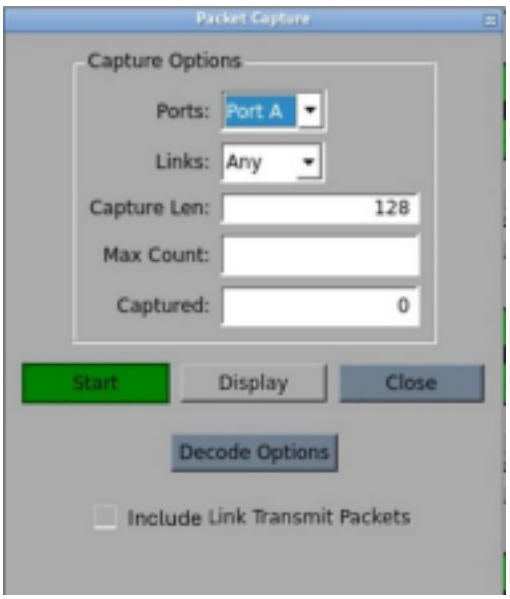


Figure 6 – Packet Capture

There are four packet capture types:

Emulator Port Received Link Packets – all packets received on the emulator port destined for a link destination address (Port A, B, C, or D and Link = Any)

Link Received Packets - all packets received by the specified link (Port A, B, C, or D and Link = specified link)

Link Received and Transmit Packets – all packets received by the specified link and all packets that leave the link (Port A, B, C, or D, Link = specified link and Include Link Transmit Packets = Enabled)

Emulator EM Interface – control packets (including IGMP) received and sent on the emulator port. “Include ARP Packets” is available, but the number of ARP packets makes it more difficult to debug when looking at IGMP packets. Em0 is on Port A, em1 on Port B, em2 on Port C and em3 on Port D.

Figure 7 – em0 Packet Capture

Even though this paper focused on a multicast stream application using IGMP