

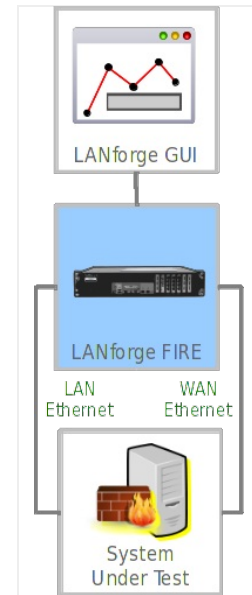
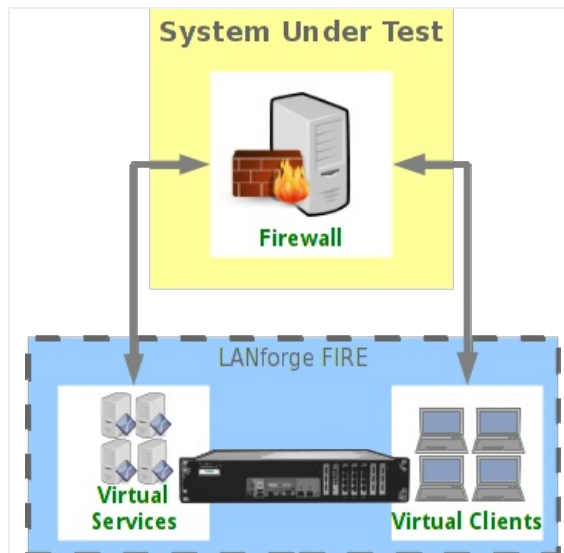
## Multiple Thousands of TCP Connections

**Goal:** Set up and run traffic on multiple thousands of stateful TCP connections.

As of LANforge release version 5.1.4, LANforge-FIRE has the capability to create multiple thousands of TCP connections using only two ports on one Layer-3 connection that can all run simultaneously and in a stateful manner. This feature can be used to test connection state aware devices such as firewalls, stateful packet inspection systems and intrusion detection/prevention systems.

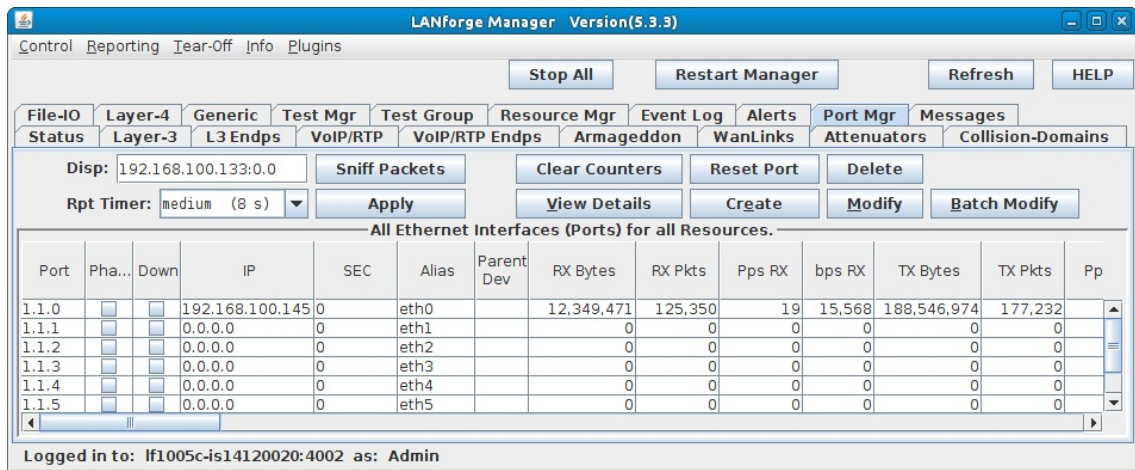
The upper limit of the total number of concurrent connections is determined by the processor speed and total memory available on the system running the LANforge software. In addition, the packet rate and payload size of each connection will also affect performance.

**NOTE:** If you are attempting to run this test scenario, you will need a LANforge license key that enables the correct number of multi-connections. Please contact us at [support@candelatech.com](mailto:support@candelatech.com) for assistance.

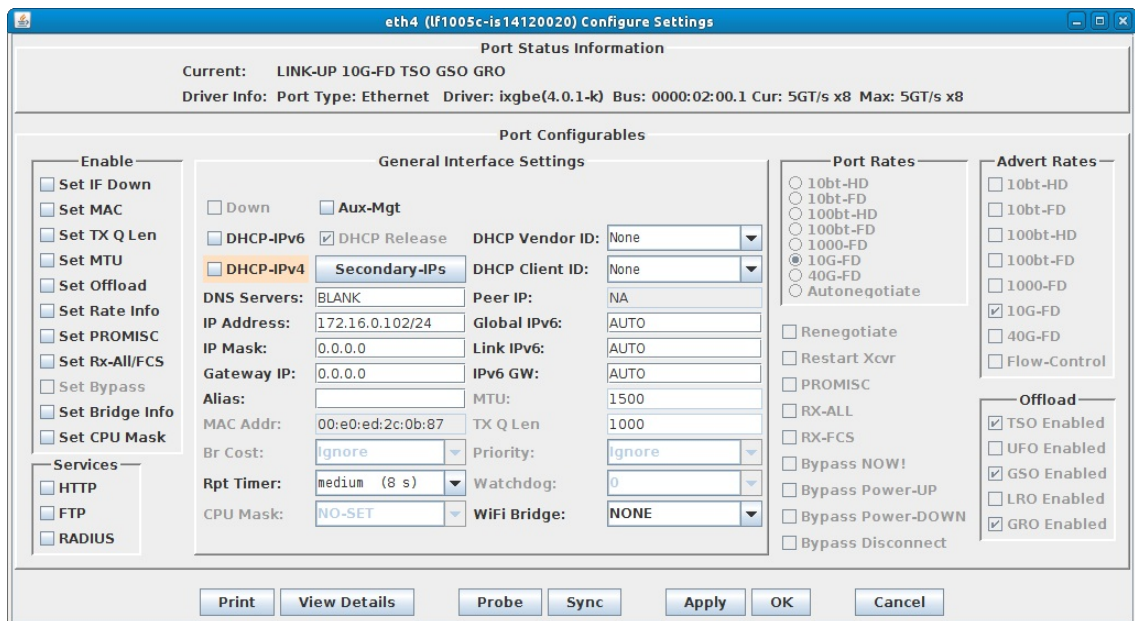


1. For this example, two physical ports on a single LANforge system are connected together.
2. Set up the LANforge ports so that they have valid IP addresses and IP masks.

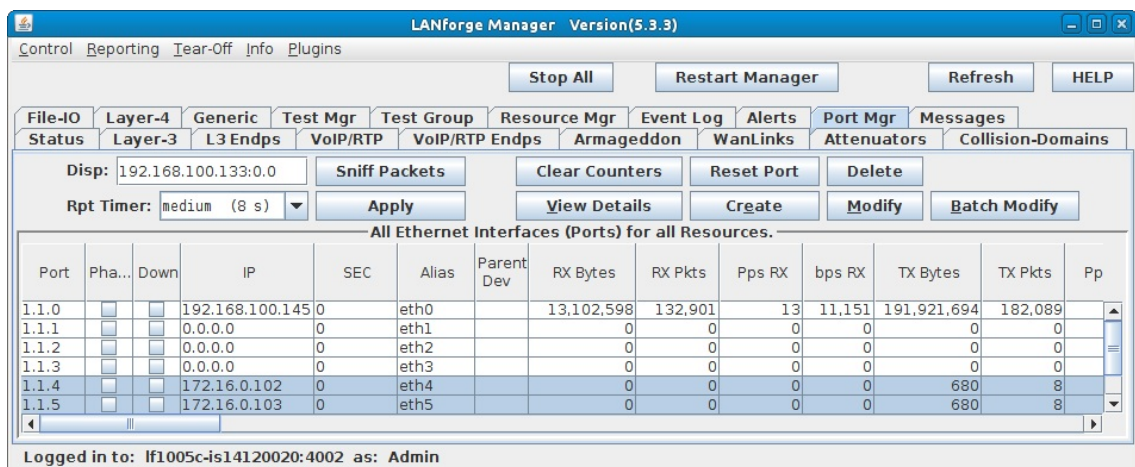
- A. Using the LANforge GUI, go to the Port Manager tab.



- B. Assign IP addresses and masks to the two ports.



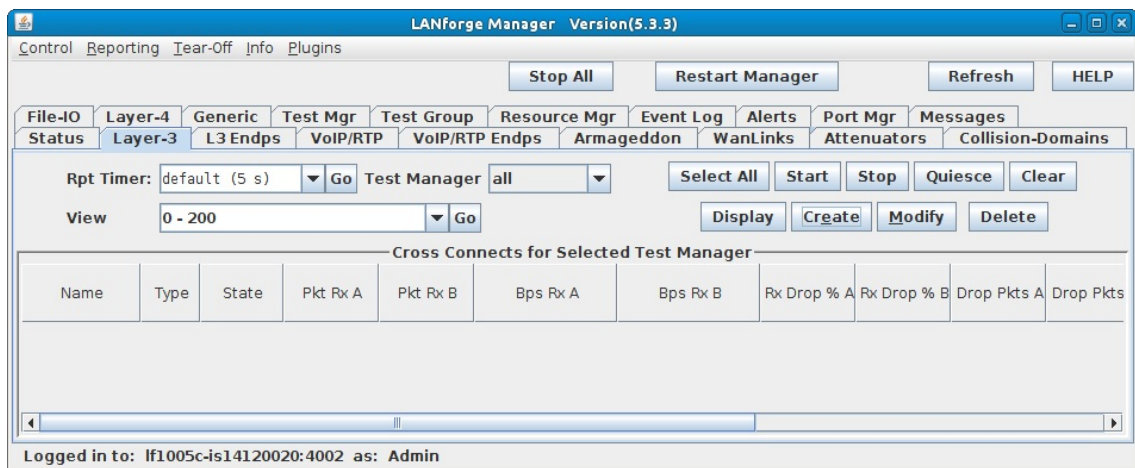
- C. Verify the port configuration.



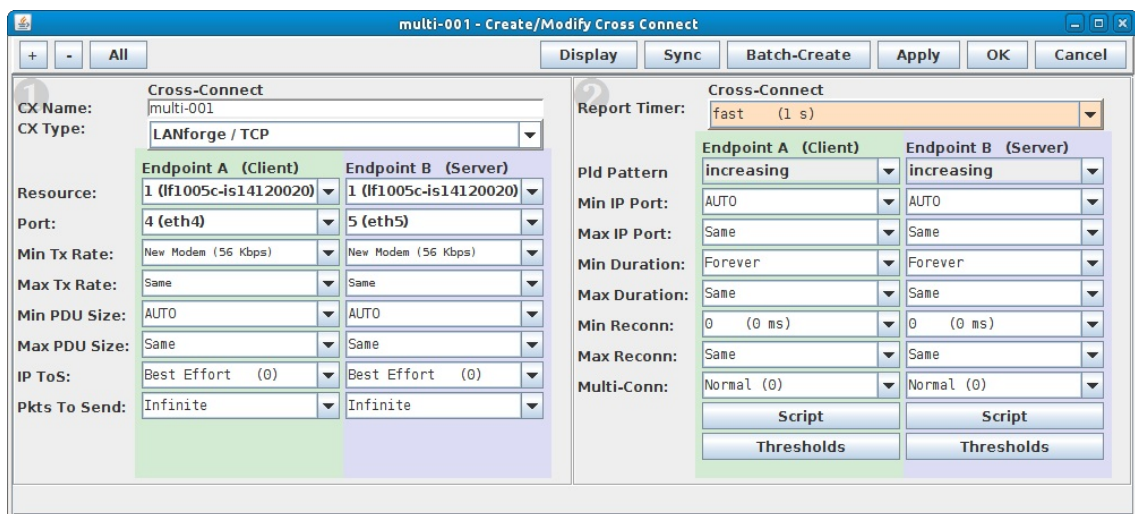
For more information see [LANforge User's Guide: Ports \(Interfaces\)](#)

3. Set up a Layer-3 Multi-Conn TCP connection.

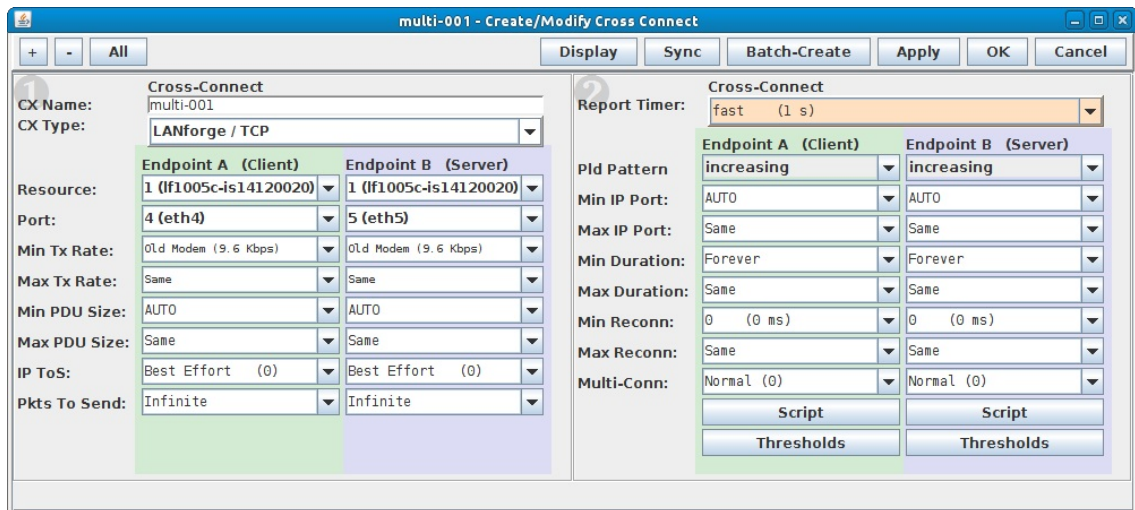
A. Go to the **Layer-3** tab, and select the **Create** button.



B. For Endpoint A, type in a name in the **CX Name** field, choose a **CX Type** of 'LANforge/TCP', choose the correct ports and set the **Report Timer** to 'fast (1 s)'.



C. Set the **Min Tx Rate** on both Endpoints A and B to '9.6Kbps'. Leave the Max Tx Rate on both set to 'Same'.



A. **NOTE:** Higher speeds and/or bursty transmit rates will require more memory to process per connection.



- D. Set the **Min PDU Size** on both Endpoints A and B to '1024B'. Leave the Max PDU Size on both set to 'Same'.

**multi-001 - Create/Modify Cross Connect**

**1 Cross-Connect**

CX Name: multi-001  
CX Type: LANforge / TCP

**Endpoint A (Client)**

Resource: 1 (lf1005c-is14120020)  
Port: 4 (eth4)  
Min Tx Rate: Old Modem (9.6 Kbps)  
Max Tx Rate: Same  
Min PDU Size: 1k (1,024 B)  
Max PDU Size: Same  
IP ToS: Best Effort (0)  
Pkts To Send: Infinite

**Endpoint B (Server)**

Resource: 1 (lf1005c-is14120020)  
Port: 5 (eth5)  
Min Tx Rate: Old Modem (9.6 Kbps)  
Max Tx Rate: Same  
Min PDU Size: 1k (1,024 B)  
Max PDU Size: Same  
IP ToS: Best Effort (0)  
Pkts To Send: Infinite

**2 Cross-Connect**

Report Timer: fast (1 s)

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

**Endpoint A (Client)**

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

**Endpoint B (Server)**

Pld Pattern: increasing  
Min IP Port: 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

A. **NOTE:** Larger packet sizes will use more memory, smaller packet sizes will require more CPU processing time.

- E. Set **Min IP Port** to **0 (zero)** on Endpoint A. Leave the Min IP Port on Endpoint B set to AUTO.

**multi-001 - Create/Modify Cross Connect**

**1 Cross-Connect**

CX Name: multi-001  
CX Type: LANforge / TCP

**Endpoint A (Client)**

Resource: 1 (lf1005c-is14120020)  
Port: 4 (eth4)  
Min Tx Rate: Old Modem (9.6 Kbps)  
Max Tx Rate: Same  
Min PDU Size: 1k (1,024 B)  
Max PDU Size: Same  
IP ToS: Best Effort (0)  
Pkts To Send: Infinite

**Endpoint B (Server)**

Resource: 1 (lf1005c-is14120020)  
Port: 5 (eth5)  
Min Tx Rate: Old Modem (9.6 Kbps)  
Max Tx Rate: Same  
Min PDU Size: 1k (1,024 B)  
Max PDU Size: Same  
IP ToS: Best Effort (0)  
Pkts To Send: Infinite

**2 Cross-Connect**

Report Timer: fast (1 s)

Pld Pattern: increasing  
Min IP Port: Any (0)  
Max IP Port: Same  
Min Duration: Forever  
Max Duration: Same  
Min Reconn: 0 (0 ms)  
Max Reconn: Same  
Multi-Conn: 5000

**Endpoint A (Client)**

Pld Pattern: increasing  
Min IP Port: Any (0)  
Max IP Port: Same  
Min Duration: Forever  
Max Duration: Same  
Min Reconn: 0 (0 ms)  
Max Reconn: Same  
Multi-Conn: 5000

**Endpoint B (Server)**

Pld Pattern: increasing  
Min IP Port: AUTO  
Max IP Port: Same  
Min Duration: Forever  
Max Duration: Same  
Min Reconn: 0 (0 ms)  
Max Reconn: Same  
Multi-Conn: One (1)

Script  
Thresholds

A. Leaving Min IP Port on AUTO would make connections very slow to reconnect due to IP port re-use issues. Multi-conn may not work at all with a fixed IP port.

- F. Leave the **Min Duration** set to Forever and **Max Duration** set to Same for both endpoints, unless you want each of the multiple TCP connections to teardown and restart after a specified duration.

**multi-001 - Create/Modify Cross Connect**

**1 Cross-Connect**

CX Name: multi-001  
CX Type: LANforge / TCP

**Endpoint A (Client)**

Resource: 1 (lf1005c-is14120020)  
Port: 4 (eth4)  
Min Tx Rate: Old Modem (9.6 Kbps)  
Max Tx Rate: Same  
Min PDU Size: 1k (1,024 B)  
Max PDU Size: Same  
IP ToS: Best Effort (0)  
Pkts To Send: Infinite

**Endpoint B (Server)**

Resource: 1 (lf1005c-is14120020)  
Port: 5 (eth5)  
Min Tx Rate: Old Modem (9.6 Kbps)  
Max Tx Rate: Same  
Min PDU Size: 1k (1,024 B)  
Max PDU Size: Same  
IP ToS: Best Effort (0)  
Pkts To Send: Infinite

**2 Cross-Connect**

Report Timer: fast (1 s)

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

**Endpoint A (Client)**

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

**Endpoint B (Server)**

Pld Pattern: increasing  
Min IP Port: 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

G. For Endpoint A, set the **Multi-Conn** to the desired number of multiple TCP connections.

**multi-001 - Create/Modify Cross Connect**

**Cross-Connect**

CX Name: multi-001  
CX Type: LANforge / TCP

**Endpoint A (Client)**

Resource: 1 (If1005c-is14120020)  
Port: 4 (eth4)  
Min Tx Rate: Old Modem (9.6 Kbps)  
Max Tx Rate: Same  
Min PDU Size: 1k (1,024 B)  
Max PDU Size: Same  
IP ToS: Best Effort (0)  
Pkts To Send: Infinite

**Endpoint B (Server)**

Resource: 1 (If1005c-is14120020)  
Port: 5 (eth5)  
Min Tx Rate: Old Modem (9.6 Kbps)  
Max Tx Rate: Same  
Min PDU Size: 1k (1,024 B)  
Max PDU Size: Same  
IP ToS: Best Effort (0)  
Pkts To Send: Infinite

**Report Timer:** fast (1 s)

**Multi-Conn:** 5000

A. You can type in any value that your license allows here or choose one from the drop down box. The recommended approach is to create a new Multi-Conn connection for every 5000 connections.

H. For Endpoint B, set the **Multi-Conn** to one, then select **OK** to create the connection.

**multi-001 - Create/Modify Cross Connect**

**Cross-Connect**

CX Name: multi-001  
CX Type: LANforge / TCP

**Endpoint A (Client)**

Resource: 1 (If1005c-is14120020)  
Port: 4 (eth4)  
Min Tx Rate: Old Modem (9.6 Kbps)  
Max Tx Rate: Same  
Min PDU Size: 1k (1,024 B)  
Max PDU Size: Same  
IP ToS: Best Effort (0)  
Pkts To Send: Infinite

**Endpoint B (Server)**

Resource: 1 (If1005c-is14120020)  
Port: 5 (eth5)  
Min Tx Rate: Old Modem (9.6 Kbps)  
Max Tx Rate: Same  
Min PDU Size: 1k (1,024 B)  
Max PDU Size: Same  
IP ToS: Best Effort (0)  
Pkts To Send: Infinite

**Report Timer:** fast (1 s)

**Multi-Conn:** One (1)

A. Endpoint B is the 'server' side of the TCP connection, therefore it is only necessary to have one Multi-Conn set up on Endpoint B to reply to all of the Endpoint A TCP SYN packets when the 5000 connections are being established.

For more information see [LANforge User's Guide: Creating & Modifying Cross Connects](#)

4. Create 5 more Layer-3 Multi-Conn TCP connections.

A. On the **Layer-3** tab, highlight the first connection created in the previous step and select **Modify**.

**LANforge Manager Version(5.3.3)**

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages  
Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains

Rpt Timer: default (5 s) Go Test Manager all Select All Start Stop Quiesce Clear  
View 0 - 200 Go Display Create Modify Delete

**Cross Connects for Selected Test Manager**

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
multi-001	LF/TCP	Stopped	0	0	0	0	0	0	0	0

Logged in to: If1005c-is14120020:4002 as: Admin

B. Select the **Batch-Create** button.

multi-001 - Create/Modify Cross Connect

Buttons: +, -, All, Display, Sync, Batch-Create, Apply, OK, Cancel

1 Cross-Connect

CX Name: multi-001

CX Type: LANforge / TCP

Resource: 1 (If1005c-is14120020)

Port: 4 (eth4)

Min Tx Rate: Old Modem (9.6 Kbps)

Max Tx Rate: Same

Min PDU Size: 1k (1,024 B)

Max PDU Size: Same

IP ToS: Best Effort (0)

Pkts To Send: Infinite

Endpoint A (Client)

Endpoint B (Server)

2 Cross-Connect

Report Timer: fast (1 s)

Endpoint A (Client)

Endpoint B (Server)

Pld Pattern: increasing

Min IP Port: AUTO

Max IP Port: Same

Min Duration: Forever

Max Duration: Same

Min Reconn: 0 (0 ms)

Max Reconn: Same

Multi-Conn: 5000 (5,000)

Script

Thresholds

C. Set the **Quantity** to 5, and set **Port Increment A** and **Port Increment B** to 0 (zero)

Layer-3 Batch Creator: multi-001

multi-002, multi-003 ... multi-006

Endp-A Resources: 1, 1 ... 1

Endp-B Resources: 1, 1 ... 1

Endp-A Ports: eth4, eth4 ... eth4

Endp-B Ports: eth5, eth5 ... eth5

Endp-A IPs: AUTO, AUTO ... AUTO

Endp-B IPs: AUTO, AUTO ... AUTO

Quantity: 5

Number of Digits: 3

☒ Zero Pad

Starting Name Suffix: 001

Name Increment: 1

Resource Increment A: 0

Resource Increment B: 0

Port Increment A: 0

Port Increment B: 0

IP Addr Increment A: 0

IP Addr Increment B: 0

IP-Port Increment A: 1

IP-Port Increment B: 1

Apply

Close

D. Select the **Apply** button.



E. Verify that six Multi-Conn TCP connections were created.

LANforge Manager Version(5.3.3)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages

Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains

Rpt Timer: default (5 s) Go Test Manager all Select All Start Stop Quiesce Clear

View 0 - 200 Display Create Modify Delete

Cross Connects for Selected Test Manager

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
multi-001	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-002	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-003	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-004	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-005	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-006	LF/TCP	Stopped	0	0	0	0	0	0	0	0

Logged in to: lf1005c-is14120020:4002 as: Admin

For more information see [LANforge User's Guide: Layer-3 Endpoints \(FIRE\)](#)

5. Run traffic and verify results.
- A. Highlight all six connections.

LANforge Manager Version(5.3.3)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages

Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains

Rpt Timer: default (5 s) Go Test Manager all Select All Start Stop Quiesce Clear

View 0 - 200 Go Display Create Modify Delete

Cross Connects for Selected Test Manager

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
multi-001	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-002	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-003	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-004	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-005	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-006	LF/TCP	Stopped	0	0	0	0	0	0	0	0

Logged in to: lf1005c-is14120020:4002 as: Admin

- B. Select the **Start** button

LANforge Manager Version(5.3.3)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages

Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains

Rpt Timer: default (5 s) Go Test Manager all Select All Start Stop Quiesce Clear

View 0 - 200 Go Display Create Modify Delete

Cross Connects for Selected Test Manager

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
multi-001	LF/TCP	Run	966,616	972,843	46,927,611	47,012,605	0	0	0	0
multi-002	LF/TCP	Run	975,233	976,506	47,150,075	47,350,229	0	0	0	0
multi-003	LF/TCP	Run	971,641	976,080	47,087,849	47,256,566	0	0	0	0
multi-004	LF/TCP	Run	972,768	973,387	47,058,671	47,088,616	0	0	0	0
multi-005	LF/TCP	Run	967,832	975,218	47,047,707	47,177,471	0	0	0	0
multi-006	LF/TCP	Run	963,246	967,196	46,653,686	46,872,712	0	0	0	0

Logged in to: lf1005c-is14120020:4002 as: Admin

- C. Go to the **L3 Endps** tab to verify that all 30,000 connections are running.

LANforge Manager Version(5.3.3)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages

Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains

Min PDU Size AUTO Go Max PDU Size Same Go Start Stop Quiesce Clear

MIN Tx Rate New Modem (5G Kbps) Go MAX Tx Rate Same Go Display Create Modify Batch Modify Delete

View 0 - 400 Go

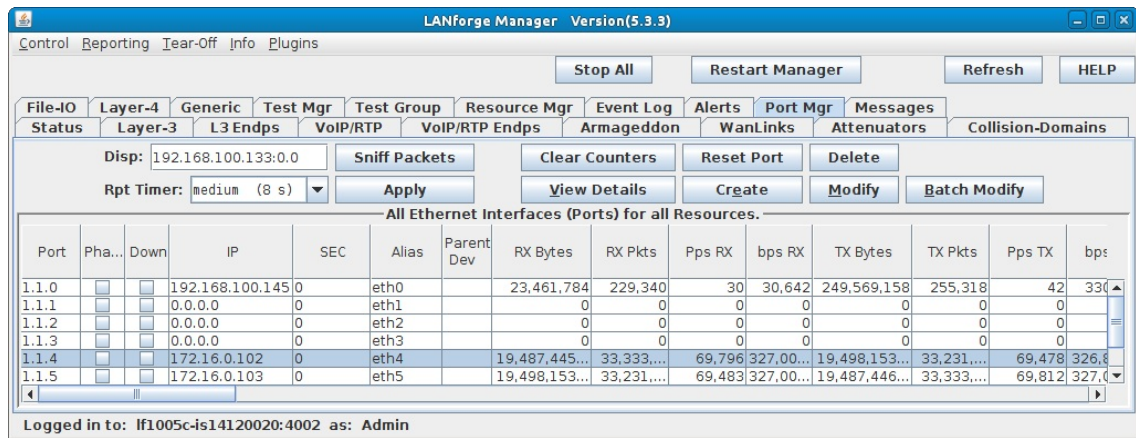
All Endpoints

Tx Bytes	Rx Bytes	Replays	TCP Rx	Dup Pkts	Rx Dup %	OOO Pkts	Rx OOO %	RX Wrong Dev	CRC Fail	RX BER	CX Active	CX Estab	CX Estab/s
2,168,671,232	2,165,875,712	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,168,355,840	2,169,897,984	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,173,019,136	2,170,444,800	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,173,028,352	2,173,854,720	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,172,618,752	2,169,956,352	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,173,020,160	2,177,105,920	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,170,354,688	2,168,975,360	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,170,106,880	2,170,354,688	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,172,047,360	2,167,830,528	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,168,659,968	2,171,337,728	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,167,525,376	2,160,612,352	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,164,663,296	2,168,122,368	0	0	0	0	0	0	0	0	0	5,000	5,000	0

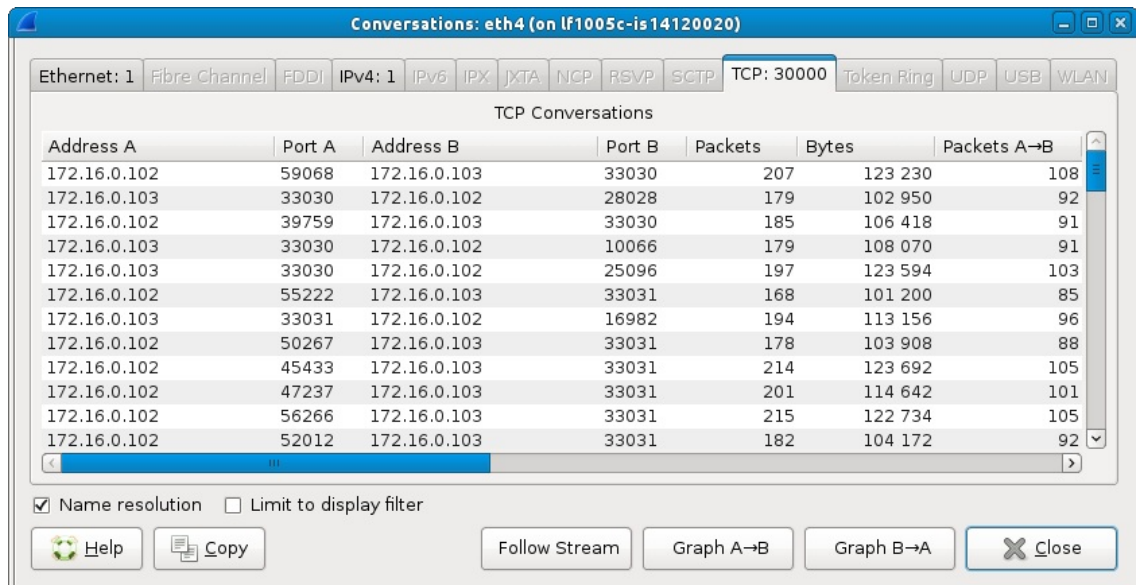
Logged in to: lf1005c-is14120020:4002 as: Admin



- D. Or, go to the **Port Mgr** tab, and sniff one of the ports while the **Multi-Conn TCP** connections are running.



- A. **NOTE:** You will need a lot of memory to run a Wireshark capture on 30,000 connections. It is probably best to stop all connections, set up the Wireshark capture, start all connections and let them run for 30 seconds to 1 minute before stopping them all, then stop the Wireshark capture and wait for it to process all those packets!
- E. After the Wireshark capture is complete, go to **Statistics - Conversations** to allow Wireshark to analyze the conversations and show that all 30,000 connections were captured. This will take some time to complete depending on the size of the capture.



For more information see [LANforge User's Guide: Layer-3 Endpoints \(FIRE\)](#)

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