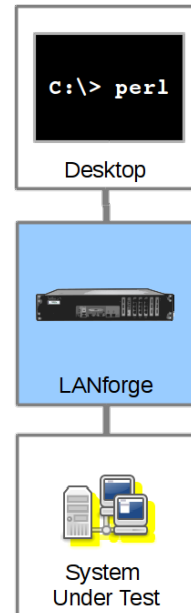


Cross Connects and Endpoints Tutorial

Goal: Gain a better understanding on how you will use Cross connects, Connections and Endpoints to use the LANforge CLI scripts knowlegably.

Creating connections in the LANforgeGUI implies creating endpoints. These endpoint entities are created with predictable names and are usually created in pairs.

Understanding these naming conventions and how they are created is fundamental to your proficiency with creating connections with LANforge CLI scripts.



Most examples in our cookbooks assume a dual-ended connection, also known as a *cross-connect* or abbreviated as *CX*.

Building Endpoints and Connections

Let's follow the creation of a Connection:

The screenshot shows a Windows-style dialog box titled 'tutorial-cx - Create/Modify Cross Connect'. It has a toolbar with buttons: '+', '-', 'All', 'Display', 'Sync', 'Batch-Create', 'Apply', 'OK', and 'Cancel'. The main area is divided into sections. The 'Cross-Connect' section has 'CX Name: tutorial-cx' and 'CX Type: LANforge / UDP'. Below this is a table with two columns: 'Endpoint A' (highlighted in green) and 'Endpoint B' (highlighted in purple). The table contains the following settings:

| | Endpoint A | Endpoint B |
|---------------|---------------------|---------------------|
| Resource: | 1 (jedtest) | 1 (jedtest) |
| Port: | 4 (sta301) | 1 (eth1) |
| Min Tx Rate: | New Modem (56 Kbps) | New Modem (56 Kbps) |
| Max Tx Rate: | Same | Same |
| Min PDU Size: | AUTO | AUTO |
| Max PDU Size: | Same | Same |
| IP ToS: | Best Effort (0) | Best Effort (0) |
| Pkts To Send: | Infinite | Infinite |

Using a terminal on the LANforge machine, we look at the `/home/lanforge/DB/DFLT/endps.db` file and inspect the commands issued that create that connection:

```
lanforge@jedtest ~/DB/DFLT
> grep 'tutorial[^\ ]*' *db
endp.db:add_endp tutorial-cx-A 1 1 sta301 lf_udp -1 NO 56000 0 NO -1 0 INCREASING NO 32 0 0
endp.db:set_endp_flag tutorial-cx-A ReplayOverwriteDstMac 0
endp.db:set_endp_details tutorial-cx-A 0 0 4294967295 0 '00 90 0b 29 06 f9 ' 0 0 0 0 10000 0 NA NA NA 0.0.0.0 0
endp.db:set_endp_quiesce tutorial-cx-A 3
endp.db:set_endp_addr tutorial-cx-A '00 0e 8e 24 1f 5b ' AUTO 0 0
endp.db:set_endp_flag tutorial-cx-A ReplayLoop 0
endp.db:set_endp_flag tutorial-cx-A EnableTcpNodelay 0
endp.db:set_endp_flag tutorial-cx-A EnableRndSrcIP 0
endp.db:set_endp_flag tutorial-cx-A EnableConcurrentSrcIP 0
endp.db:set_endp_flag tutorial-cx-A EnableLinearSrcIP 0
endp.db:set_endp_flag tutorial-cx-A EnableLinearSrcIPPort 0
endp.db:set_endp_flag tutorial-cx-A QuiesceAfterRange 0
endp.db:set_endp_flag tutorial-cx-A QuiesceAfterDuration 0
endp.db:set_endp_tos tutorial-cx-A DONT-SET 0
endp.db:set_script tutorial-cx-A NA NA NONE 'NA' 0 0
endp.db:set_endp_proxy tutorial-cx-A NO
endp.db:rm_thresholds tutorial-cx-A all
endp.db:set_endp_report_timer tutorial-cx-A 5000
endp.db:set_endp_flag tutorial-cx-A ClearPortOnStart 0
endp.db:add_endp tutorial-cx-B 1 1 eth1 lf_udp -1 NO 56000 0 NO -1 0 INCREASING NO 32 0 0
endp.db:set_endp_flag tutorial-cx-B ReplayOverwriteDstMac 0
endp.db:set_endp_details tutorial-cx-B 0 0 4294967295 0 '00 0e 8e 24 1f 5b ' 0 0 0 0 10000 0 NA NA NA 0.0.0.0 0
endp.db:set_endp_quiesce tutorial-cx-B 3
endp.db:set_endp_addr tutorial-cx-B '00 90 0b 29 06 f9 ' AUTO 0 0
endp.db:set_endp_flag tutorial-cx-B ReplayLoop 0
endp.db:set_endp_flag tutorial-cx-B EnableTcpNodelay 0
endp.db:set_endp_flag tutorial-cx-B EnableRndSrcIP 0
endp.db:set_endp_flag tutorial-cx-B EnableConcurrentSrcIP 0
endp.db:set_endp_flag tutorial-cx-B EnableLinearSrcIP 0
endp.db:set_endp_flag tutorial-cx-B EnableLinearSrcIPPort 0
endp.db:set_endp_flag tutorial-cx-B QuiesceAfterRange 0
endp.db:set_endp_flag tutorial-cx-B QuiesceAfterDuration 0
endp.db:set_endp_tos tutorial-cx-B DONT-SET 0
endp.db:set_script tutorial-cx-B NA NA NONE 'NA' 0 0
endp.db:set_endp_proxy tutorial-cx-B NO
endp.db:rm_thresholds tutorial-cx-B all
endp.db:set_endp_report_timer tutorial-cx-B 5000
endp.db:set_endp_flag tutorial-cx-B ClearPortOnStart 0
tst_mgr.db:add_cx tutorial-cx default_tm tutorial-cx-A tutorial-cx-B
tst_mgr.db:set_cx_report_timer default_tm tutorial-cx 5000 cxonly

lanforge@jedtest ~/DB/DFLT
> █
```

That's a lot of commands. We will point out what is particularly necessary when using our Perl scripts.

Endpoints and Connections Naming Convention

The connection we created above is named **tutorial-cx**. Two endpoints also have names, **tutorial-cx-A** and **tutorial-cx-B**. The A-side of a connection is always managed. A B-side endpoint may be unmanaged. When you write CLI scripts that create connections, name your endpoints using a similar convention.

Endpoints are Created First

We can use the `lf_firemod.pl` script to create endpoints and a cross connect in this order:

```
$ ./lf_firemod.pl --action create_endp --endp_name tutorial2-cx-A \
--speed 256000 --endp_type lf_tcp --port_name sta301

$ ./lf_firemod.pl --action create_endp --endp_name tutorial2-cx-B \
--speed 256000 --endp_type lf_tcp --port_name eth1

$ ./lf_firemod.pl --action create_cx --cx_name tutorial2-cx \
--cx_endps tutorial2-cx-A,tutorial2-cx-B
```

We can see the results of those script commands in our **Layer-3** and **L3 Endps** tabs:

LANforge Manager Version(5.3.3)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

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

Status Layer-3 L3 Endps Armageddon WanLinks Attenuators File-I/O

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 Pkt |
|--------------|--------|---------|------------|------------|----------|----------|-------------|-------------|----------|
| cx-sta300 | LF/UDP | Run | 33,823,148 | 33,802,288 | 767,489 | 767,016 | 0.066 | 0.113 | 22,4 |
| tutorial-cx | LF/UDP | Stopped | 0 | 0 | 0 | 0 | 0 | 0 | |
| tutorial2-cx | LF/TCP | Stopped | 0 | 0 | 0 | 0 | 0 | 0 | |

Logged in to: 192.168.100.26:4002 as: Admin

L3 Endps

Stop All Restart Manager Refresh HELP

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

MIN Tx Rate New Modem (56 Kbps) Go MAX Tx Rate Same Go Display Create Modify Batch Modify Delete

View 0 - 400

All Endpoints

| Name | EID | Run | Mng | Script | Tx Rate | Tx Rate (1 min) | Tx Rate LL | Rx Rate | Rx Rate (1 min) |
|----------------|---------|-------------------------------------|-------------------------------------|--------|---------|-----------------|------------|---------|-----------------|
| cx-sta300-A | 1.1.2.1 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | None | 767,881 | 768,102 | 793,626 | 767,489 | 767,905 |
| cx-sta300-B | 1.1.1.2 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | None | 767,999 | 768,124 | 791,578 | 767,016 | 768,124 |
| tutorial-cx-A | 1.1.4.3 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | None | 0 | 0 | 0 | 0 | 0 |
| tutorial-cx-B | 1.1.1.4 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | None | 0 | 0 | 0 | 0 | 0 |
| tutorial2-cx-A | 1.1.4.5 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | None | 0 | 0 | 0 | 0 | 0 |
| tutorial2-cx-B | 1.1.1.6 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | None | 0 | 0 | 0 | 0 | 0 |

i Multiple Windows can be displayed using the *Tear Offs* menu.

i Clicking on the Layer-3 connection automatically highlights the two endpoints.

Starting and Stopping: Connections have State

When a connection is first created, it is STOPPED. When you start it, it becomes RUNNING. When you set a connection to STOPPED, both endpoints immediately stop sending and receiving. That can have a consequence of leaving unacknowledged packets in flight. The safest way is to QUIESCE the connection, which first stops the endpoints transmitting, waits a short time, and then stops the endpoints from receiving.

When there is just one Endpoint

Normally, if you see one endpoint, it should only be a multicast endpoint. A single endpoint can be seen in these situations:

- You have paused between creating the first and second endpoint for a connection. Continue working.
- Created by a script mistakenly, through a typo or other misconfiguration
- Left over from an interrupted script that deleted the cross-connect and one of two endpoints

A single endpoint is not an illegal entity, but lonely endpoints can add confusion. If you find endpoints that do not match any existing connections, we suggest deleting them.

A Cross-Connect can be *one-sided*, that is, have one *unmanaged* endpoint. The A side endpoint is a LANforge managed port transmitting to another device that's not a LANforge machine. Some connection types create this style of endpoint pairs, like **File-endpoints** and **Layer 4-7 connections**.

Multicast

Multicast endpoints are created differently both in the GUI and in the CLI scripting environment. This tutorial does not focus on multicast, but see the section [Creating Endpoints section of Creating Connections with FIREMod Script](#) and the [chapter on WiFi Multicast Download](#).

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