

Getting Started with Python scripting for LANforge

Goal: After reading this, a user will know what python modules which are available to use LANforge. There are many of python modules which control LANforge. These allow the user to automate tasks. This cookbook will introduce you to six scripts to automate your systems. After following this guide, you will understand how to:

1. How to run a script

- A. We start in the /home/lanforge/scripts/py-scripts directory on your lanforge system
- B. On a Linux system, open your terminal and navigate to the py-scripts folder. You can run any python script by typing python3 your_script_here.py --your_flag into your command line. After the script, put any flags you need in order to run your test.
- 2. Station Creation

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- A. The create_station.py script creates wi-fi stations from your terminal.
- B. Type

./create_station.py --radio wiphy0 --ssid lanforge --passwd password --security wpa2 into your terminal, remembering to change the ssid, passwd, and security fields to match your network credentials.

- C. This will create 2 stations on your lanforge device off of your wiphy0 radio. You might need to wait 30 seconds for them to stop being phantom ports.
- D. You can specify the following flags as well:
 - A. num_stations Specify a different number of stations to create off of your antenna. The default is 2.
 - B. debug call this flag if you want detailed diagnostic information

3. Find available networks

A. You can find available WiFi networks on any Linux device by typing sudo iw dev wlan0 scan | grep SSID into your command line

- B. You can also find available WiFi networks by clicking on the station you created in the previous step,
- 4. Associate to a specific BSSIDIf you want to connect to a specific MAC Address for your router (which is called the BSSID) you can specify that on each station, you can do that in both the GUI and in the command line.
 - A. Connect via Command line
 - A. Each of your scripts has an optional AP tag where you can define the MAC address of the router you want to connect to. To do so, simply append --ap to the end of the command line argument you are running followed by the router's MAC Address.
 - B. Connect via GUI
 - A. When you double click on a Station there is an AP field inside WiFi Settings. Type the MAC Address of your router in that box and everything will work assuming the MAC Address is correct.
- 5. Bridge Creation

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- A. To create a bridge, you can use the create_bridge.py script in the py_scripts folder.
- B. Type

```
./create_bridge.py --target_device wlan0 --radio wiphy1
```

Into your terminal, remembering to change the ssid, passwd, and security fields to match your network credentials.

- C. create_bridge requires the following arguments:
 - A. target_device which device the bridge is going to connect
 - B. radio default is wiphy0
- D. It is not valid to add stations to a bridge, they don't work like you would expect. Bridges can have: eth ports, redirects (rdd) ports, vaps, and qvlan ports. Ports in a bridge cannot have IP addresses.
- 6. VAP Creation

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A. You can create a VAP from your terminal with the create_vap.py script.

B. Type

./create_vap.py --radio wiphy0 --security wpa2 --ssid lanforge --passwd password into your terminal, remembering to change the ssid, passwd, and security fields to match your network credentials.

- C. create_vap supports the following flags:
 - A. num_vaps A user defined number of VAPs to create off of your antenna
 - B. upstream_port if your ethernet cable to your router is not eth1, define it using this flag. Eth1 is the default for this flag.
 - C. debug call this flag if you want detailed diagnostic information

7. Layer-3 Cross Connect

- A. In your py-scripts, there is a create_I3 script which allows you to create stations in your terminal.
- B. Type

```
./create_13.py --radio wiphy0 --num_stations 0
```

into your terminal, remembering to change the ssid, passwd, and security fields to match your network credentials.

- C. This will create a layer3 cross connect between each station you already built on your lanforge device and your wiphy0 radio. You might need to wait 30 seconds for them to stop being phantom ports. If you do not specify num_stations 0 it would have created two stations by default off your specified radio. You can change which port the cross connect will be connected to with the --upstream_port option.
- D. You can specify the following flags as well:
 - A. num_stations Specify a different number of stations to create off of your antenna.
 - B. upstream_port if your ethernet cable to your router is not eth1, define it using this flag. Eth1 is the default for this flag.
 - C. debug call this flag if you want to get error messages in case anything goes wrong.

E. Your port manager will look similar to this

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1.1.00			192.16		0		thu th1			15,954,312				7 60,450,57 0 10,68			(base) [tainoige@tiosse.couc py-scripts]\$
1.1.02		1	0.0.0.0		0	e	th2			0	0	(0 1	0 0		
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F. Your Layer 3 connections will look similar to this

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8. Layer-4 Cross Connect

A. In your py-scripts, there is a create_l4 script which allows you to create stations in your terminal.

B. Type

```
./create_14.py --radio wiphy0 --ssid lanforge --passwd password --security wpa2 into your terminal
```

C. This will automatically create 2 stations on your Lanforge device off of your wiphy0 radio and also create a cross connect from each station to your eht1 port. You can change which port the cross connect will be connected to with the --upstream_port option.

D. You can specify the following flags as well:

- A. num_stations Specify a different number of stations to create off of your antenna.
- B. upstream_port if your Ethernet cable to your router is not eth1, define it using this flag. Eth1 is the default for this flag.
- C. debug call this flag if you want detailed diagnostic information

E. Your port manager will look similar to this

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· · ·						A	Etherne	t Interfa	ces (P	orts) for	all Resour	ces.					Response X-Error-0: Error: [-22]: 22 Invalid argument OpId: 10795: add_sta 1 1 wiphy0 sta0000 68719608832 lanforge NA password NA NA xx:xx:xx:xx:*:xx 0 NA NA M
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1.1.02	1	0.0.0.0				eth2				0	0	0	0		0 0		(base) [lanforge@lf0350-c8dc py-scripts]\$./create_l4.pyradio wiphy0ssid l
1.1.03		0.0.0.0				wiphy0			175,8	366,868				151,703,29			anforgepasswd passwordsecurity wpa2 Cleaning up cxs and endpoints
1.1.04	_	0.0.0.0				wiphy1					213,971				0 0		Cleaning up stations
1.1.06		0.0.0.0				wlan0 wlan1		wiphy0 wiphy1		0	0				0 0		ERROR: StationProfile cleanup, list is empty
1.1.107		0.0.0.0				sta0000		wiphy0		0	0				0 0		Waiting until ports disappear
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F. Your Layer 4 connections will look similar to this

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	Endps File-IO	Resource Mgr			Stop All Profiles Aler	ts Warnings	Manager + Wifi-Mes			HELP	(b`{'shelT*: 1, 'resource`: 1, 'radlo`: vµlphy0`, 'sta_name': 'sta0000', 'ssl0'' b`: 'lanforge', 'key': 'password', 'mode': 0, 'mac': 'xx:xx:xx:xx:', 'tag' b`s': 68719608832, 'flag mask': 68719608832, 'suppress_preexec_cll': 'yes', '' b`suppress preexec method": 1}')
Status	Port Mgr	· Layer-	3 L3	Endps	Layer 4-7	Armage	ddon	WanLinks	VolP/RT	P	Response Access-Control-Allow-Methods: GET, POST
Rpt	t Timer: fast	(1 s) 🔻 G	o Test Manag	ger all	-	Select All S	Start + <u>S</u> top	- <u>Q</u> uiesce	Clear		Response Access-Control-Allow-Origin: * Response Content-Type: application/json;charset=utf-8 Response Date: Mon, 11 Jan 2021 21:26:37 GMT
Vie	w 0 - 500		-			Disp <u>l</u> ay Cr <u>e</u> at	te Mo <u>d</u> ify	<u>B</u> atch Modify	Delete		Response X-Error-0: Error: [-22]: 22 Invalid argument OpId: 10795: add_sta 1 1 wiphy0 sta0000 68719608832 lanforge NA password NA NA xx:xx:xx:xx:*:xx 0 NA NA N
	1	1	Layer	4-7 Endpoint	s for Selected T	est Manager—	IT: Date		D. Date	_	A NA NA 68719608832 NA NA NA NA Response X-Error-2: Important message from card: Shelf: 1, Card: 1 -:[ADD Virtua_
Name	EID Ty 4 1.1.10.66 L4/G	pe Status en Stopped	Total-URLs	URLs/s	Bytes-RD E	Bytes-WR Tx	Rate Tx Rate (1 min)	Rx Rate	e Rx Rate (1 min)	0	<pre>WiFi] 1.1.10-sta0000: ERROR: Cannot change MAC address with the 'add-vwifi' command. Use 'set port' instead.</pre>
	4 1.1.11.67 L4/G		0		0	0	0	0	0	0	(base) [lanforge@lf0350-c8dc py-scripts]\$./create l4.pyradio wiphy0ssid l
4	n									•	Cleaning up stations ER006: StationProfile Cleanup, list is empty Waiting until ports disappear Creating stations (base) [lanforge@tH0350-c0dc py-scripts]6]
Logged in to	o: localhost:400	2 as: Admin						4	stations: 01	41 OØ	

G. Your Netsmith display will look similar to this. The connections on this picture have been oriented for legibility.

- 9. Monitor and record an IPV4 variable time test. The purpose of this test is to detect whether your router is able to keep a steady signal when being barraged by multiple users.
 - A. In the first part of this tutorial, you are going to connect various numbers of stations, record them for 1 and 10 minutes, and then save as a CSV, excel, or pickle format. A station represents a device which is connected to a network, LANforge creates representations of stations which create real traffic on your network and then records statistics on that traffic. This module determines whether your device is able to sustain a heavy load of traffic for an user defined period of time. By recording the traffic it is then possible to go back and detect where any problems occurred which allows a network manager to fix problems which could be facing your network.

B. Navigate to the py-scripts folder and type the following command into your command line

./test_ipv4_variable_time.py --radio wiphy0 --security wpa2 --ssid lanforge --password password --output format csv

Replace the security, ssid, and password variables with the settings for the network you are testing. This will create 2 wiphy stations by default, connect them to the network you are testing, and report the results to a CSV file. You will find a file with a timestamp within the last 5 minutes in the report_data folder in your home directory. If you are running this script from another machine using the --mgr function, you will need to define the report_file variable.

- C. test_ipv4_variable_time accepts the following flags:
 - A. output_format The format you want to save your results to
 - B. col_names Which columns should be saved in the output file
 - C. test_duration how long you want the test to last.
 - D. report_file where you want the results to be stored
- D. Your port manager will look similar to this

Ø Applications Places System 📃 🌌 🐸 🗊	✓ ₩ Fri Jan 8, 12:00:54
📷 💷 Mate Terminal 💿 🛽 LANforge Manager	
$^{\circ}$ LANforge Manager Versio $^{\circ}$ $^{\circ}$ $^{\circ}$	Mate Terminal
Control Beporting Windows Info Tests Chamber View Stop All Restart Manager Befresh HEL File40 Resource May TOUT Profiles Traffic-Profiles Alerts Warnings + With Messages	File Edit View Search Terminal Help
Status Port Mgr Layer-3 Cls Endps Layer 4.7 Armageddon WanLinks VolP/RTP VolP/RTP Fold Disp. 152.163.1.4.1 Sniff Packets IZ Down 1 Clear Counters Reset Port Delete PRT Times Residence IZ Down 1 Clear Counters Create Modify Batch	security wpa2ssid lanforgepassword passwordoutput_format csv Creating stations Waiting for ips, timeout: 60 WStarting CXs
All Ethernet Interfaces (Ports) for all Resources.	× Ü
1.1.00 192.1681.4 0 eth0 13.650.235 175.885 22 13.635 1.1.01 192.1684.2.7 0 eth1 16.012.805 0.0 0 0 1.1.02 >0.0.00 0 eth2 0<	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	
1.1.11 172.16.42.52 0 sta0001 wphy0 2,266 10 0 1,228	
	N
	4
Logged in to: localhost:4002 as: Admin 4 stations: 21 21	

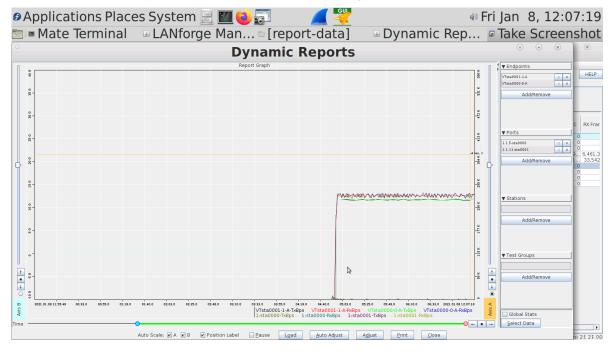
E. Your Layer 3 connections will look similar to this

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🛅 🖬 M	ate	Terr	ninal		🛽 LA	Nforge	Man	ager.	🖻 [repoi	rt-da	ta]		Take Screen	eensh	ot	
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Status Por	Mgr L	ayer-3 L3	Endps La	yer 4-7 Arn	nageddon WanLi	nks VolP/RTP	VolP/RTP End	lps File-IO	Resource		amber ⊻iew Profiles	Traffic-Pro		Stop All Restart Manager Alerts Warnings + Wifi-Messages	Befre	sh	HELP
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Name	Туре	State	Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B		Rx Drop % B		Drop Pkts B		Rpt Timer	EID	Endpoints (A ++ B)			
VTsta0000-0 VTsta0001-1	LF/UDP LF/UDP		0	3,834 3,831	0	255,985 255,857		0	0	0		5000 5000		VTsta0000-0-A <=> VTsta0000-0-8 VTsta0001-1-A <=> VTsta0001-1-8			
											D						
Logged in to: lo	colleget	1002 1	el en i en									_	_			tations: 2	

F. Your Layer 3 endpoints will look similar to this

Applications Places Syst	tem 📃 🌌 😜 🔂 🛛 🛛 📃 🔫	4	Fri Jan 8, 12:08:12
📷 🛯 Mate Terminal	LANforge Manager	Versi [report-o	data]
0	LANforge Manager Ver	sion(5.4.3)	© (\$) (\$)
Control Beporting Windgws Info Tests Status Port Mgr Layer-3 L3 Endps Layer 4-7 Armagedd	on WanLinks VolP/RTP VolP/RTP Endps File40 Resource Mgr Di		estart Manager Refresh HELP
Min PDU S MIN Tx Rat View	e Mew Modes (55 Mps) V Go MAX Tx Rate Seme V Go Dis	Start + Stop · Quiesce Clear Jay Crgate Modify Batch Modify Delete	
Name EID Run Mng Script Tx Rat	All Endpoints Tx Rate Tx Rate (last) Tx Rate LL Rx Rate (last) Rx Rate (last)	Rx Rate (last) Rx Rate LL % Tx F	PDUs Tx Pkts LL PDU/s TX Pps TX LL Rx
VTsta0000-0-B 1.1.1.63 🖌 🖌 None	989 256.051 256.460 262.952 0 0 0 0 255.930 255.930 872 255.922 254.752 263.128 0 0 0 0 255.872 255.872	0 0 0 0 0 922 254,603 263,224 0 922 254,752 263,224 0	4,091 4,091 21 21 0 0 0 0 0 4,060 4,060 21 21 0 0 0 0 0
		Ą	
			A stations 24 27 02

G. You can view a dynamic report of the connectiosn creating traffic. It will look similar to this



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