



Example of Using the LANforge Enforce Fairness Plug-in

Starting a series of UDP Layer 3 connections between virtual stations leads to unbalanced sending rates. The Enforce Fairness plug-in can be used to determine what reduction of bandwidth allows equal transmit rates among a group of virtual stations. There is a chapter in the [LANforge User Manual](#) describing the Enforce Fairness plug-in. Specifically, the Enforce Fairness plug-in will drop the beginning transmit rate according to this formula: $R_{final} = (0.9)^{10} R_{begin}$. The final transmit rate will be about 34% of the beginning transmit rate. There are ten drop iterations performed by the plug-in, each dropping the bandwidth by 10% of the previous rate.

To effectively use this plug-in, you first want to compute a logical maximum of bandwidth per station. In the following example, we will be pointing twenty virtual stations at one 802.11abgn Access Point. The **logical maximum per station** is $(300Mbps / 20) = 15Mbps$ per station.

Balanced Example:

Starting TxBps/Station	Ending TxBps/Station
20Mbps	$(0.34)20 = 6.8Mbps$

In this example, the traffic will balance out because the transmit rate will fall well below the logical maximum transmit rate per station.

Unbalanced Example:

Starting TxBps/Station	Ending TxBps/Station
200Mbps	$(0.34)200 = 68Mbps$

In this example, the traffic will not have a chance to balance because the final transmit rate is still above the logical maximum transmit rate.

Detailed Examples

The remainder of this document is a series of steps that can be used as a cookbook for using the Enforce Fairness plug-in. It was conducted on two LANforge CT523 servers, one hosting a 802.11abgn virtual AP and the station machine with two 802.11ac radios running ten stations per radio.

1. We start with twenty stations, ten each on two radios. Stations 100-109 are on wiphy0 and stations 200-209 are on wiphy1.

LANForge Manager Version(5.3.1)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-I/O 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

Disp: 192.168.100.27:0.0 Sniff Packets Clear Counters Reset Port Delete

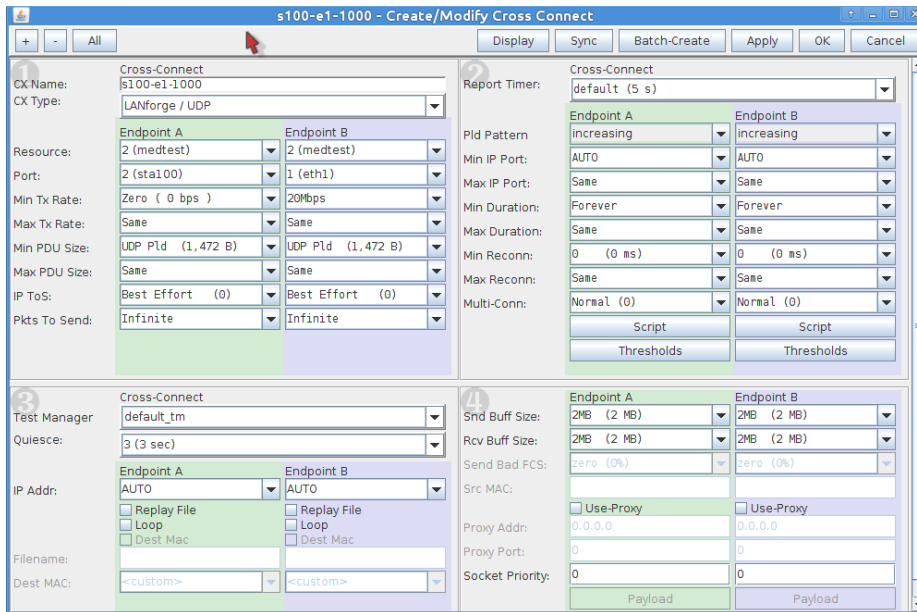
Rpt Timer: faster (1 s) Apply View Details Create Modify Batch Modify

All Ethernet Interfaces (Ports) for all Resources.

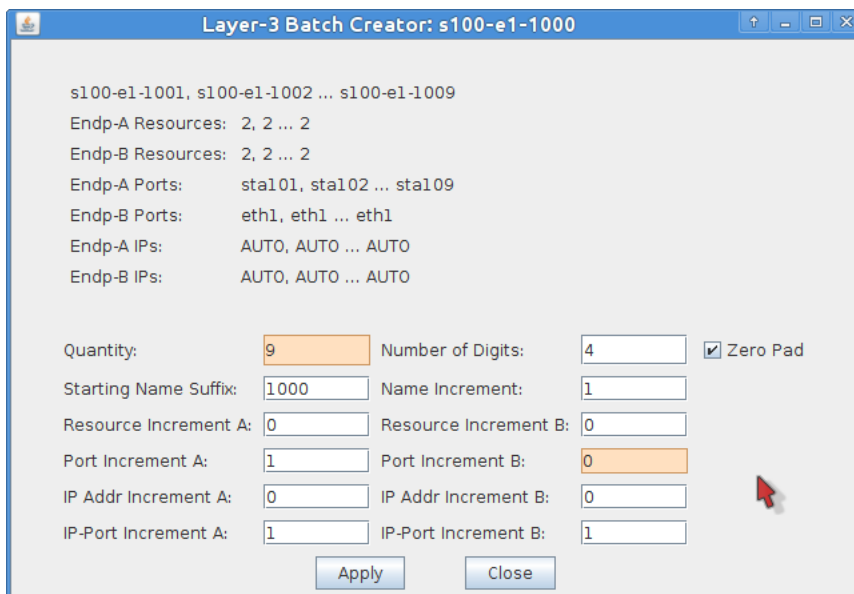
Port	Pha...	Down	IP	SEC	Alias	Parent Dev	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	T
1.1.03			0.0.0.0	0	wiphy1		154,966,074	1,237,359	0	0	14,643,097...	9,6
1.2.068			0.0.0.0	0	wiphy1		0	12,884,...	4	0	0	0 12
1.1.02			0.0.0.0	0	wiphy0		125,803,130	1,008,954	0	226	83,649,184...	54
1.2.003			0.0.0.0	0	wiphy0		0	12,884,...	4	0	0	0 12
1.1.08			0.0.0.0	0	vap0	wiphy0	12,146,415	108,399	0	23	82,667,170...	54
1.2.077			10.43.3.240	0	sta209	wiphy1	1,755,057	29,690	0	0	116,871	
1.2.076			10.43.3.230	0	sta208	wiphy1	1,755,852	29,842	0	0	110,714	
1.2.075			10.43.3.231	0	sta207	wiphy1	1,851,188	32,034	0	0	120,069	
1.2.074			10.43.3.242	0	sta206	wiphy1	1,808,240	30,774	0	0	110,967	
1.2.073			10.43.3.241	0	sta205	wiphy1	1,839,513	31,076	0	0	112,426	
1.2.072			10.43.3.244	0	sta204	wiphy1	1,810,686	31,054	0	0	116,508	
1.2.071			10.43.3.234	0	sta203	wiphy1	1,753,187	29,157	0	0	111,985	
1.2.070			10.43.3.239	0	sta202	wiphy1	1,732,831	28,996	0	0	116,943	
1.2.069			10.43.3.246	0	sta201	wiphy1	1,864,049	31,773	0	0	109,320	
1.2.067			10.43.3.243	0	sta200	wiphy1	1,822,842	30,942	0	0	125,289	
1.2.012			10.43.3.221	0	sta109	wiphy0	4,182,711,...	2,792,008	0	0	322,413	
1.2.011			10.43.3.222	0	sta108	wiphy0	4,327,042,...	2,887,536	0	0	242,362	
1.2.010			10.43.3.235	0	sta107	wiphy0	4,188,169,...	2,793,325	0	0	306,033	
1.2.009			10.43.4.0	0	sta106	wiphy0	4,418,001,...	2,947,477	0	0	336,242	
1.2.008			10.43.3.226	0	sta105	wiphy0	4,255,436,...	2,839,561	0	0	287,723	
1.2.007			10.43.3.217	0	sta104	wiphy0	4,483,805,...	2,990,274	0	0	262,324	
1.2.006			10.43.3.229	0	sta103	wiphy0	4,367,339,...	2,914,315	0	0	269,978	
1.2.005			10.43.3.212	0	sta102	wiphy0	4,480,607,...	2,988,430	0	0	305,832	
1.2.004			10.43.3.220	0	sta101	wiphy0	4,591,147,...	3,063,657	0	0	420,830	
1.2.002			10.43.3.255	0	sta100	wiphy0	7,497,743,...	4,982,258	0	0	431,068	
1.1.01			10.43.8.1	0	eth1		224,748,56...	148,056...	0	0	4,387,934	
1.2.001			10.43.8.2	0	eth1		4,386,392	7,488	0	0	224,748,60...	14
1.1.00			192.168.100.43	0	eth0		46,038,601...	38,480,...	1,222	12,063...	52,717,432...	40
1.2.000			192.168.100.38	0	eth0		1,086,369,...	4,604,945	140	279,667	43,176,896...	30

Logged in to: ledtest:4002 as: Admin

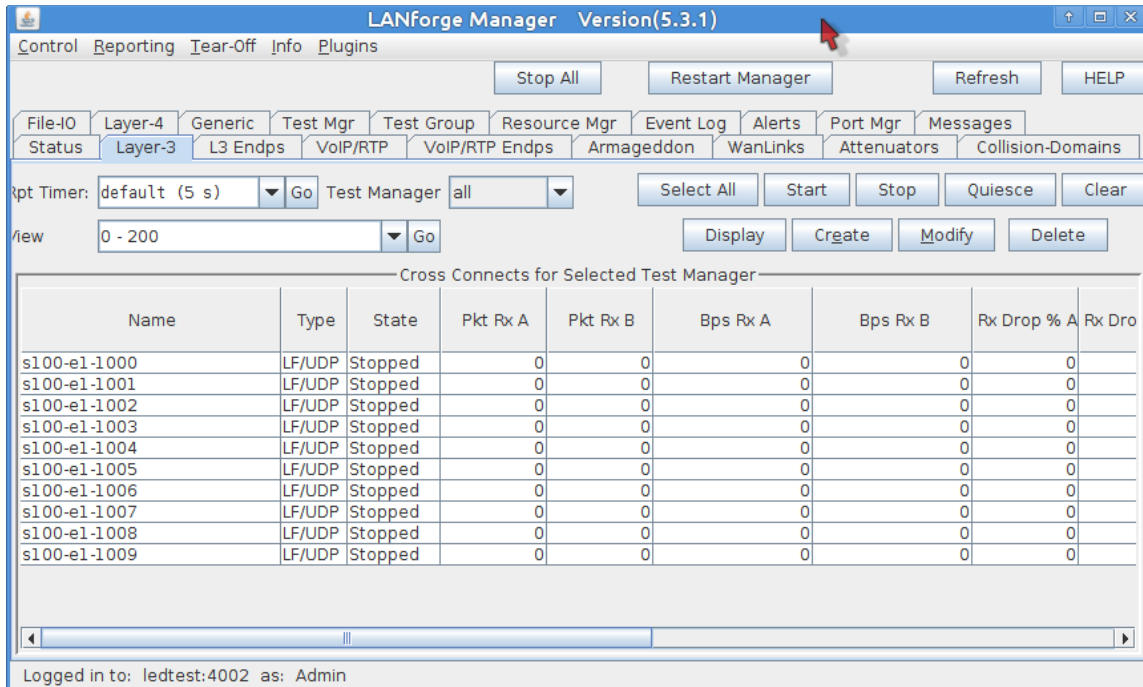
2. In the **Layer-3** tab, create a UDP connection between *sta100* and *eth1*.
 1. Select wiphy0
 2. Set the TX rate to **20Mbps** for *eth1* and **0** for *sta100*.
 3. Set the Endpoint A and Endpoint B send and receive buffers to 2MB.
 4. Click Apply.



3. Use the **Batch Create** tool to make nine more of these on this radio.

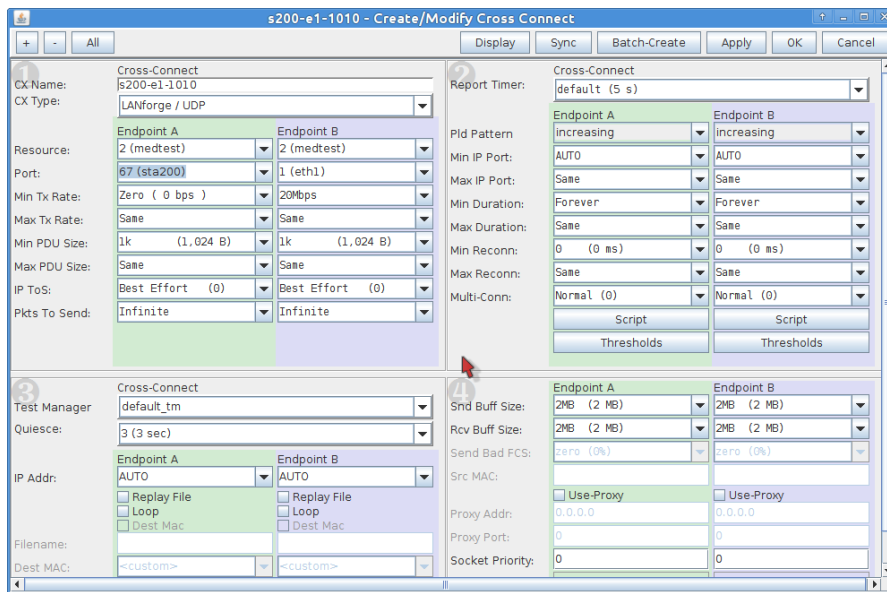


4. You now have ten connections for wiphy0.

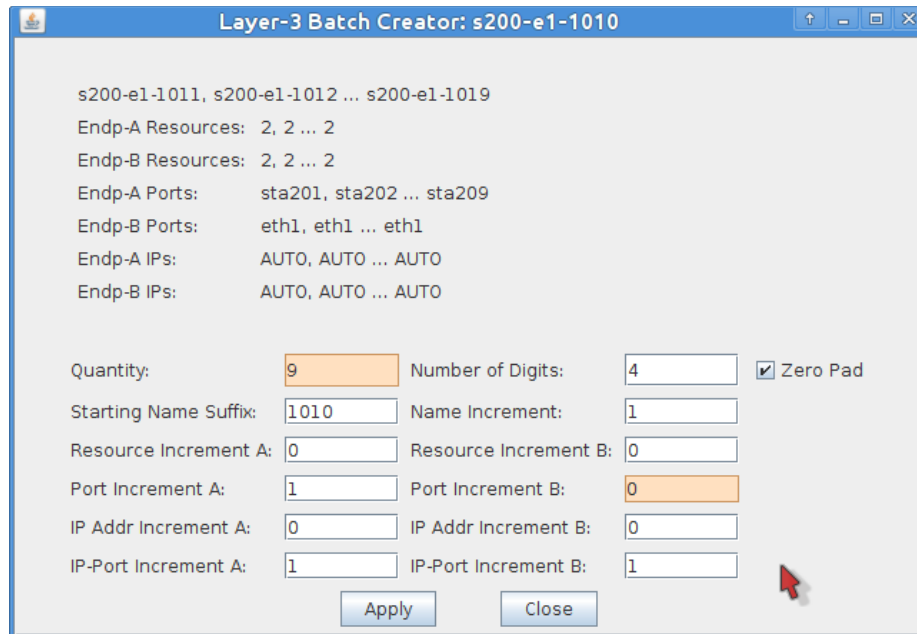


5. In the Layer-3 tab, create a UDP connection between sta200 and eth1.

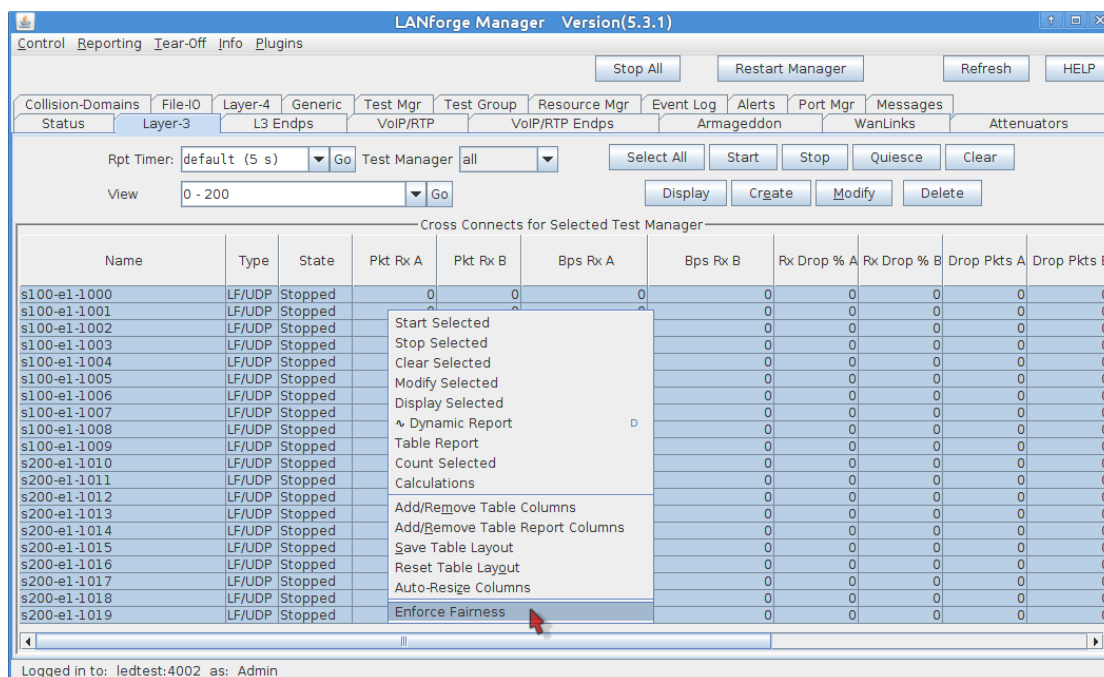
1. Select wiphy1
2. Make the connection with TX rate and buffer the same as the previous connections.
3. Click Apply.



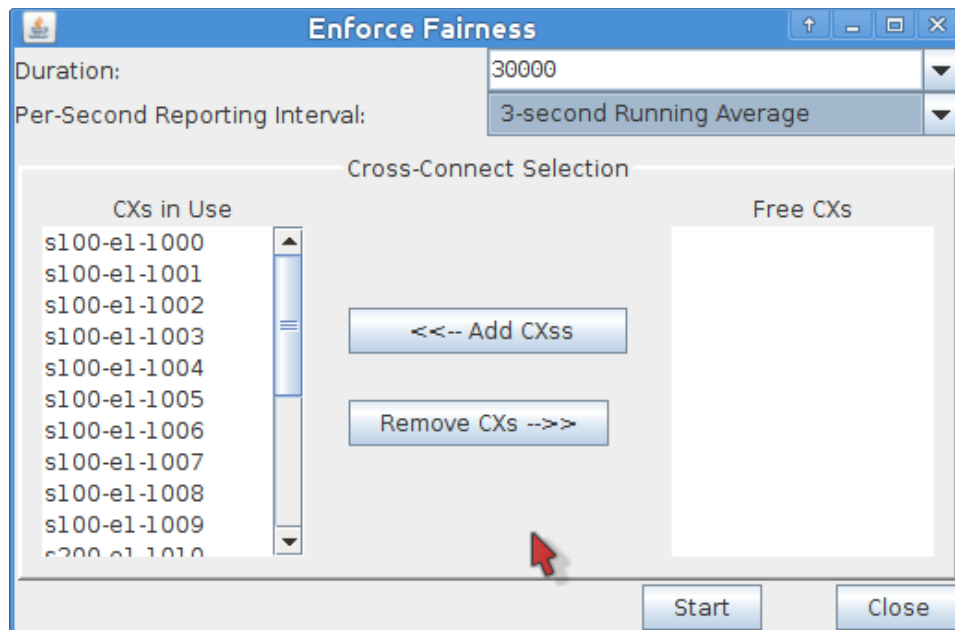
6. Use the **Batch Create** tool to make nine more on radio *wiphy1*.



7. In the **Layer-3** tab you will see twenty connections. Highlight them all, right click and select the *Enforce Fairness* option. (Or go to the Plugins Menu and select the plugin there.)

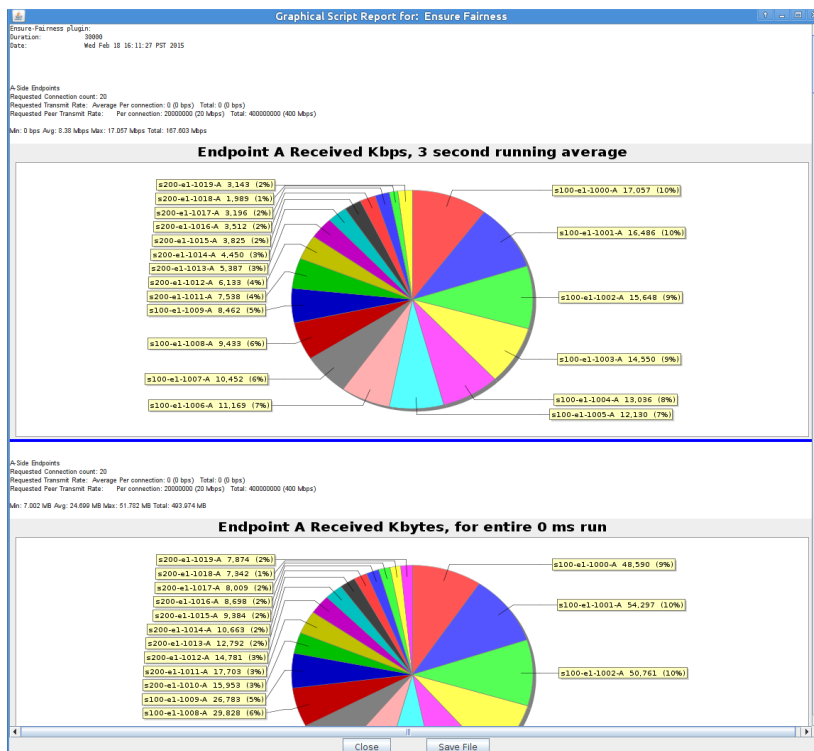


- In the Enforce Fairness plugin, set the Reporting Interval to 3s. Click *Start*. (Notice the button will change to *Stop*).

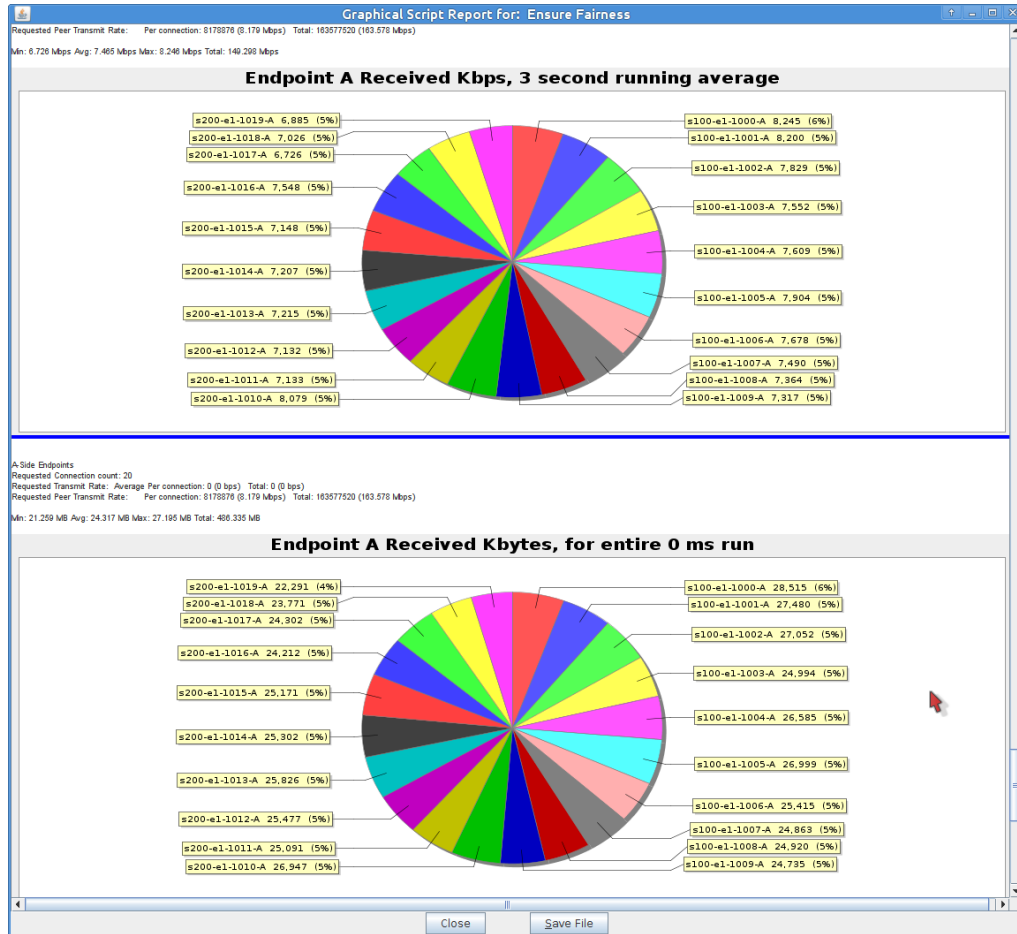


- Let the plugin run for 5 minutes. The *Stop* button will change back to *Start* when done. The *Enforce Fairness Reporting* window will have pie charts giving you time slice views of transmission percentage per station.

- See clear transmission inequity at the start:



2. See resulting equity in the final iteration:



3. The bottom of the report charts the overall transmission rates for each iteration:

