

# Low Latency Network Emulator Web UI

## User Guide

Version 1.002

Date: April 10, 2018.

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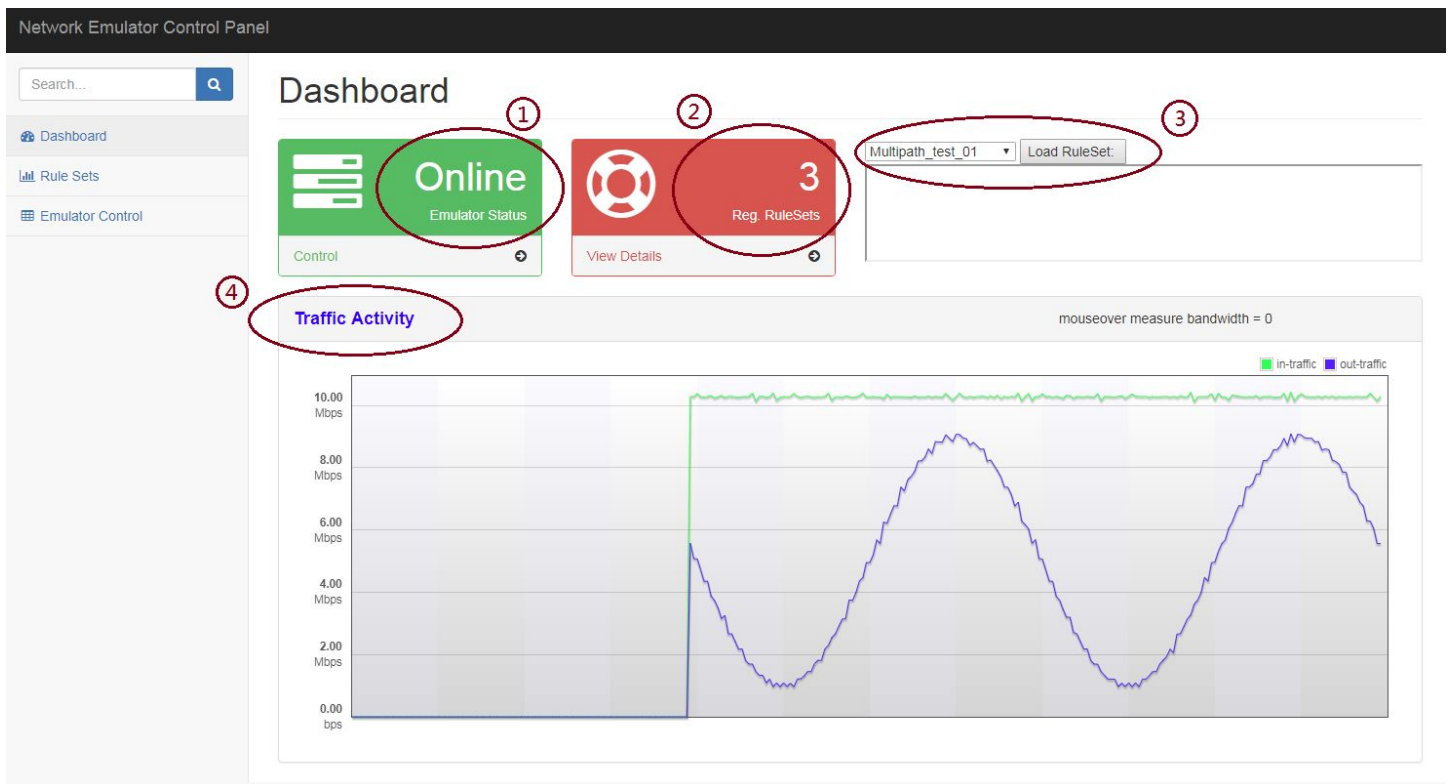
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# Emulator Dashboard



The web UI Dashboard is the main control panel page. It contains:

- (1) An Emulator live status block,
- (2) A ruleset summary block,
- (3) The ruleset enforcing control, and
- (4) The traffic activity monitor.

The Emulator live status block shows the online status of the emulator.

The ruleset summary block counts the number of registered rulesets in the system.

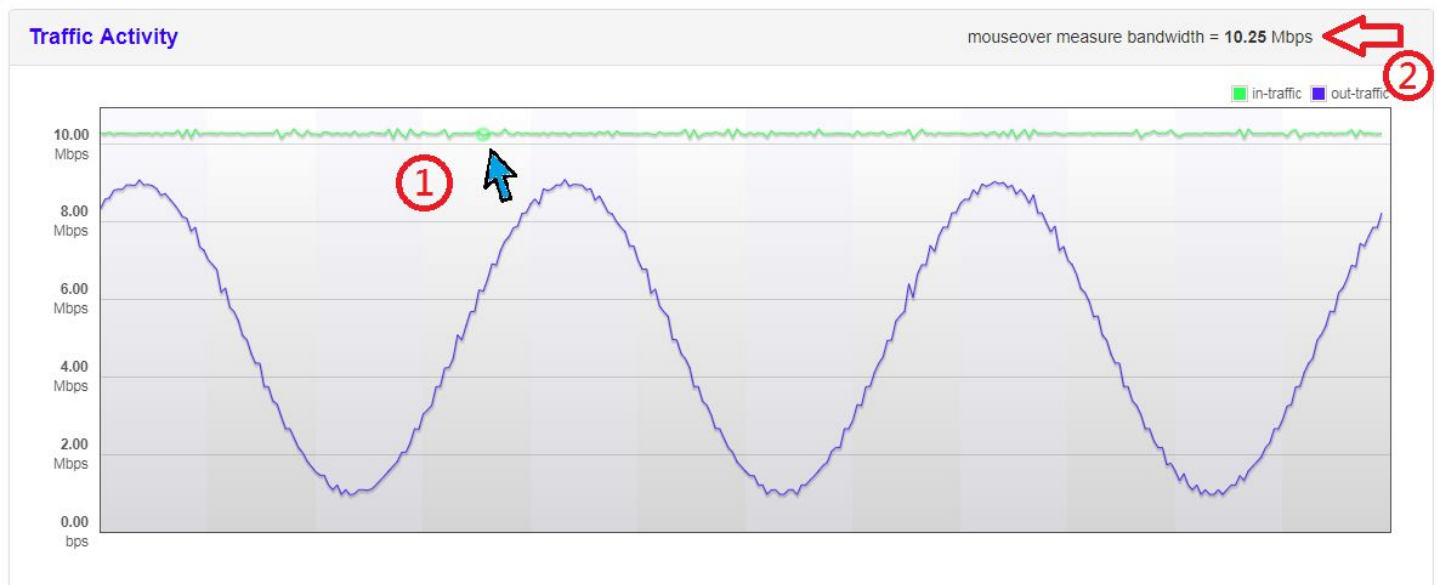
The ruleset enforcing control allows you to select and load the registered ruleset into enforcement.

## Dashboard



Just select the desired ruleset you registered previously in the system (1) and click the “Load Ruleset” button to enforce it (2).

The Traffic Activity monitor shows the real time incoming and outgoing network traffic trace across the emulator data network ports.



You can hold your mouse pointer over the chart lines to measure specific data point values (1). The measured value is presented on the top right hand position of the chart canvas (2).

# Rule Set Configuration Guide

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## RuleSets

Network Emulator Rulesets

Add New Ruleset...

RuleSet Name	# of pipes	Show Details	Delete ?
Multipath_test_01	3	Show Details...	Delete
Protocol_Classes	3	Show Details...	Delete
Sine_Wave_Shaping	1	Show Details...	Delete

On the left menu, clicking on the “Rule Sets” menu item will bring you to the List of rulesets defined in this system (1).

On each ruleset row, you can choose:

“Show Details...” to show further the pipes defined inside individual ruleset

“Delete” to delete a ruleset

You can also Add a new ruleset by typing a new ruleset name (2) and clicking on the “Add New Ruleset...” button (3).

## RuleSet Details

Rule Set <b>Multipath_test_01</b>					
<a href="#">Edit Ruleset...</a>					
Pipe ID	Probability	Protocol	Source IP	Dest. IP	Configuration
1	0.333300	tcp	10.10.0.1	10.10.11.1	bandwidth = <b>bw0007.txt</b> delay = 100ms loss prob. = 0.000000
2	0.500000	tcp	10.10.0.1	10.10.11.1	bandwidth = Fixed 2468 kbps delay = 1000ms loss prob. = 0.001000
3	1.000000	tcp	0.0.0.0	0.0.0.0	bandwidth = Unlimited delay = 0ms loss prob. = 0.000000

The “Show Details...” button on a ruleset row brings you into the detailed pipes defined within the ruleset.

Here, columns shows the pipe ID, probability, matching protocol, source IP and destination IP address ranges.

The last column shows the configuration apply to the matching traffic flows. They include the:

- Bandwidth limit
- Delay added
- Packet loss probability

The bandwidth limit is either specified as a fixed value of kilo bits per second, or Input from a bandwidth profile file.

All bandwidth profile file are located inside the “/home/bwprofs” folder of the emulator device and can be replaced with your desired data. Please check out the “How to upload Bandwidth profiles” section for procedure.

The bandwidth profile file name is pre-defined in a “bwNNNN.txt” format, where NNNN is the serial number of the file. Currently the system supports bandwidth profile name range from “bw0001.txt” to “bw0100.txt”.

On this ruleset detail page you can click the “Edit Ruleset...” button to start making changes to the pipe definitions.

## Editing Ruleset Details

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### Edit RuleSet Details

Rule Set **Multipath\_test\_01** Save Changes on Ruleset... Add New Pipe...

Pipe ID	Probability	Protocol	Source IP	Dest. IP	Configuration
1 <a href="#">Delete Pipe</a>	0.333300	all	10.10.0.1	10.10.11.1	<div>bandwidth = <input checked="" type="radio"/> Fixed 1234 kbps OR <input type="radio"/> Profile bw0001.txt</div> <div>delay = 100 ms</div> <div>loss prob. = 0.000000</div>
2 <a href="#">Delete Pipe</a>	0.500000	all	10.10.0.1	10.10.11.1	<div>bandwidth = <input type="radio"/> Fixed 0 kbps OR <input checked="" type="radio"/> Profile bw0014.txt</div> <div>delay = 250 ms</div> <div>loss prob. = 0.000000</div>
3 <a href="#">Delete Pipe</a>	0.500000	all	10.10.0.1	10.10.11.1	<div>bandwidth = <input checked="" type="radio"/> Fixed 2468 kbps OR <input type="radio"/> Profile bw0001.txt</div> <div>delay = 1000 ms</div> <div>loss prob. = 0.001000</div>

Inside the Ruleset editor, all the pipes definition of the ruleset is shown and changeable with different available options.

The other fields can be changed by replacing the current values with your desired ones or by choosing a new value on dropdown lists.

For the bandwidth limit part, you have to choose between Fixed value mode or Profile mode.

**Configuration**

bandwidth =	<input type="radio"/> Fixed 0 kbps OR	<input checked="" type="radio"/> Profile bw0007.txt
delay =	100 ms	
loss prob. =	0.000000	

Choose between fixed bandwidth limit OR profile bandwidth limit

Click on the radio button to choose between these two modes

If you choose the fixed mode, please input kbps value.

If you choose the profile mode, please select the desired profile filename from the dropdown list.

You can add new pipe to the end of the list by clicking on the “Add New Pipe...” button

A new pipe definition will be appended to the last position of the ruleset and you can edit it for the desired values.

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## Edit RuleSet Details

Rule Set **Multipath\_test\_01**

Save Changes on Ruleset...

Add New Pipe...

Pipe ID	Probability	Protocol	Source IP	Dest. IP	Configuration
1 <a href="#">Delete Pipe</a>	0.333300	all	10.10.0.1	10.10.11.1	bandwidth = <input type="radio"/> Fixed 1234 kbps OR <input type="radio"/> Profile bw0001.txt delay = 100 ms loss prob. = 0.000000
2 <a href="#">Delete Pipe</a>	0.500000	all	10.10.0.1	10.10.11.1	bandwidth = <input type="radio"/> Fixed 0 kbps OR <input checked="" type="radio"/> Profile bw0014.txt delay = 250 ms loss prob. = 0.000000
3 <a href="#">Delete Pipe</a>	0.500000	all	10.10.0.1	10.10.11.1	bandwidth = <input type="radio"/> Fixed 2468 kbps OR <input type="radio"/> Profile bw0001.txt delay = 1000 ms loss prob. = 0.001000
4 <a href="#">Delete Pipe</a>	1	all	0.0.0.0	0.0.0.0	bandwidth = <input type="radio"/> Fixed 234 kbps OR <input type="radio"/> Profile bw0001.txt delay = 234 ms loss prob. = 0

You can also mark delete a specific pipe by clicking on the “Delete Pipe” button next to the pipe ID.

## Edit RuleSet Details

Rule Set **Multipath\_test\_01**

Save Changes on Ruleset...

Add New Pipe...

Pipe ID	Probability	Protocol	Source IP	Dest. IP	Configuration
1 <a href="#">Delete Pipe</a>	0.333300	tcp	10.10.0.1	10.10.11.1	bandwidth = <input type="radio"/> Fixed 1234 kbps OR <input type="radio"/> Profile bw0001.txt delay = 100 ms loss prob. = 0.000000
2 <a href="#">Undo Delete</a>	0.500000	tcp	10.10.0.1	10.10.11.1	bandwidth = <input checked="" type="radio"/> Fixed 2468 kbps OR <input type="radio"/> Profile bw0001.txt delay = 1000 ms loss prob. = 0.001000
3 <a href="#">Delete Pipe</a>	1.000000	tcp	0.0.0.0	0.0.0.0	bandwidth = <input type="radio"/> Fixed 0 kbps OR <input type="radio"/> Profile bw0001.txt delay = 0 ms loss prob. = 0.000000

You can save the changes to the ruleset definition by clicking the “Save Changes on Ruleset...” button on top of the table.

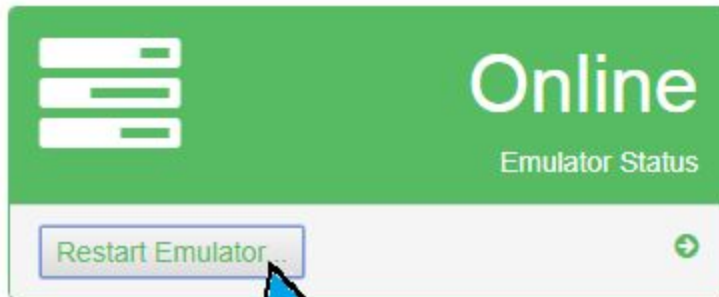
## NOTE:

Newly added pipe and mark deleted pipes are not yet effected before you confirm to save the changes. So if you switch to other functions any time before clicking SAVE button, the accumulated add or delete actions will NOT be executed.



## Emulator Start-Stop Panel

# Emulator Start-Stop Control



```
OLD ID [67489] NEW ID [67489]  
OLD ID [67489] NEW ID [80523]  
Current Emulator version : 1.0408  
Emulator Restart successful...
```

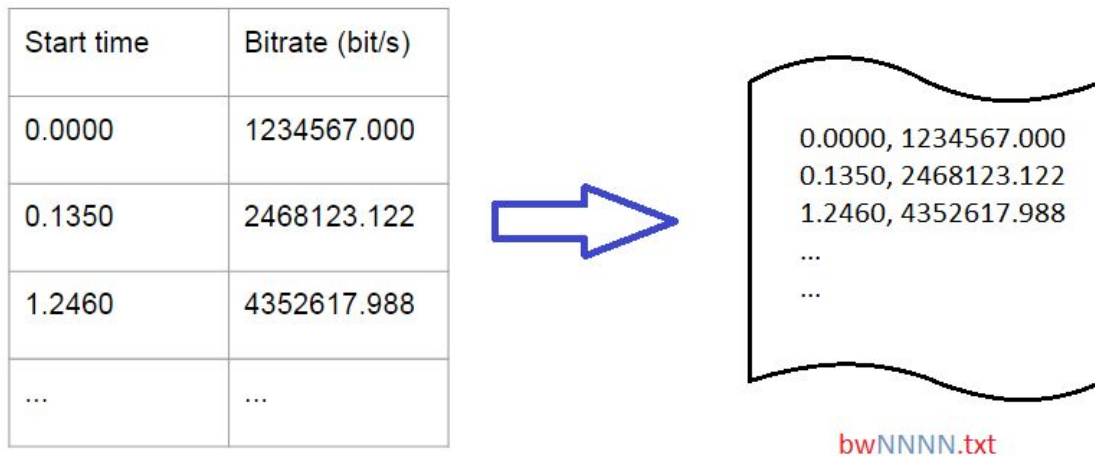
The Emulator status widget allows you to check the current status of the emulator. It shows either Online or Offline.

In any time if you want to re-start the emulator you can click on the “Restart Emulator” button on this page. You will be asked to confirm and the emulator will be restarted according to your choice.

The restarting action will emit some output on the text pane below. It normally includes the successfulness and the emulator version information. When performing an upgrade to the emulator executable the new version of the emulator will be shown if the upgrade is successful.

## How to upload Bandwidth profiles for use

The emulator has a bandwidth profile configuration for individual pipes, which allow you to control bandwidth limit of matching traffic flows according to a bandwidth limit time table. This time table is a csv text file with two columns per row, maximum 100k rows.



The emulator system can accommodate 100 bandwidth profiles concurrently. All of such profile files are named in the pattern:

bwNNNN.txt

under the “/home/bwprofs” folder. Where NNNN is the serial number in zero-padded format. For example, “bw0001.txt” is the first allowed profile and “bw0100.txt” is the last one.

In order to upload your own bandwidth profile for use by the emulator, simply use either sftp or scp tools to connect to the emulator via the administration network interface.

```
root@dummynet:~ # sftp mclab@192.168.80.121
The authenticity of host '192.168.80.121 (192.168.80.121)' can't be established.
ECDSA key fingerprint is SHA256:UWBF844jAzs1LJ8b88muZITthqFV7c1XtvtbinIWLcBY.
No matching host key fingerprint found in DNS.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.80.121' (ECDSA) to the list of known hosts.
Password for mclab@dummynet:
Connected to 192.168.80.121.
sftp>
sftp>
sftp> cd /home/bwprofs
sftp> ls
bw0001.txt  bw0002.txt  bw0003.txt  bw0004.txt  bw0005.txt  bw0006.txt  bw0007.txt  bw0008.txt  bw0009.txt  bw0010.txt
bw0011.txt  bw0012.txt  bw0013.txt  bw0014.txt  bw0015.txt  bw0016.txt  bw0017.txt  bw0018.txt  bw0019.txt  bw0020.txt
bw0021.txt  bw0022.txt  bw0023.txt  bw0024.txt  bw0025.txt  bw0026.txt  bw0027.txt  bw0028.txt  bw0029.txt  bw0030.txt
bw0031.txt  bw0032.txt  bw0033.txt  bw0034.txt  bw0035.txt  bw0036.txt  bw0037.txt  bw0038.txt  bw0039.txt  bw0040.txt
bw0041.txt  bw0042.txt  bw0043.txt  bw0044.txt  bw0045.txt  bw0046.txt  bw0047.txt  bw0048.txt  bw0049.txt  bw0050.txt
bw0051.txt  bw0052.txt  bw0053.txt  bw0054.txt  bw0055.txt  bw0056.txt  bw0057.txt  bw0058.txt  bw0059.txt  bw0060.txt
bw0061.txt  bw0062.txt  bw0063.txt  bw0064.txt  bw0065.txt  bw0066.txt  bw0067.txt  bw0068.txt  bw0069.txt  bw0070.txt
bw0071.txt  bw0072.txt  bw0073.txt  bw0074.txt  bw0075.txt  bw0076.txt  bw0077.txt  bw0078.txt  bw0079.txt  bw0080.txt
bw0081.txt  bw0082.txt  bw0083.txt  bw0084.txt  bw0085.txt  bw0086.txt  bw0087.txt  bw0088.txt  bw0089.txt  bw0090.txt
bw0091.txt  bw0092.txt  bw0093.txt  bw0094.txt  bw0095.txt  bw0096.txt  bw0097.txt  bw0098.txt  bw0099.txt  bw0100.txt
sftp>
sftp> put bw0007.txt
```

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