PLANETLAB

An open platform for developing, deploying, and accessing planetary-scale services

Experiment Reproducibility in Planetlab

RP 1.1 Project Presentation

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Experiment reproducibility

in a distributed environment

- Processing power
- Load of individual servers
- Available bandwidth
- Latency between servers

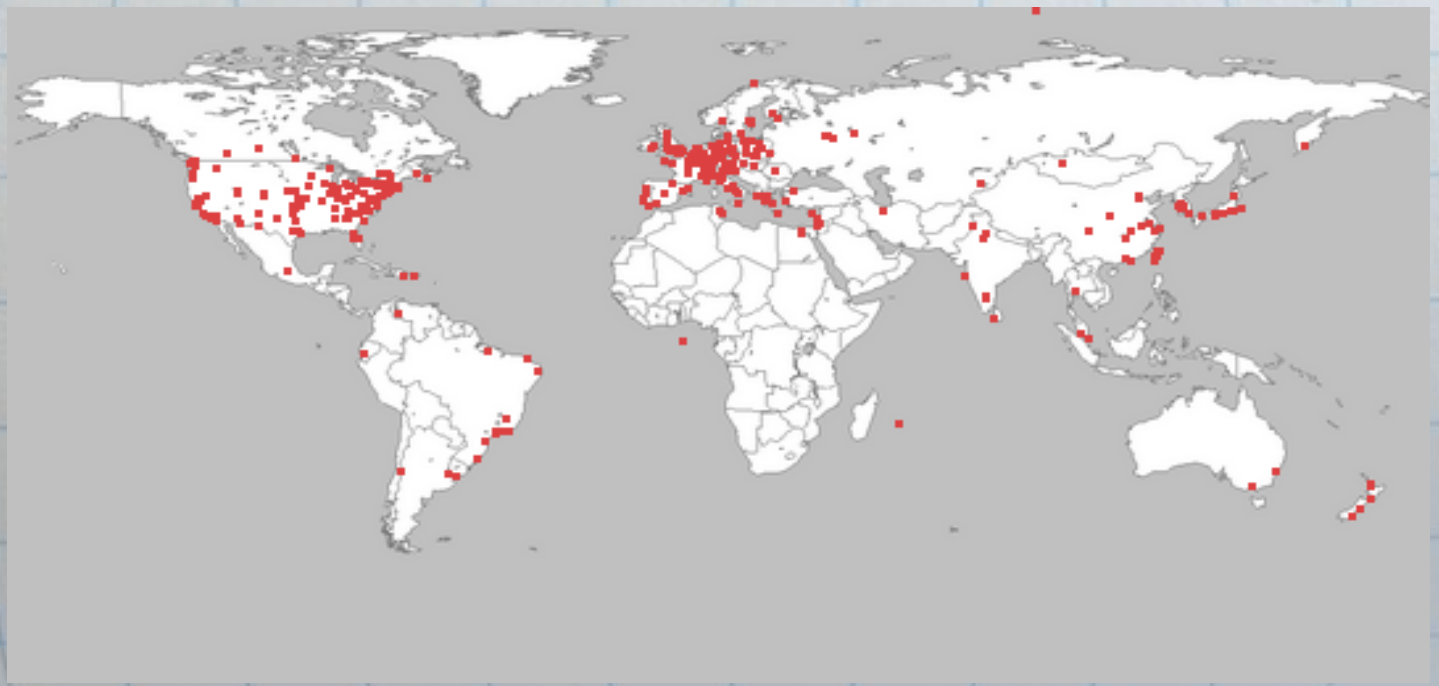
Under influence of

- Network topology changes
- Occupation of resources
- Bandwidth management

Planetlab?

Distributed Network Research Environment

- Application Development for the Internet
- CDN's (Content Distribution Networks)
- P2P (Peer to peer systems)
- Resource Distribution / Load balancing
- Currently 1076 nodes at 544 sites*



Planetlab 101

Node:

A machine in the planetlab network

Slice:

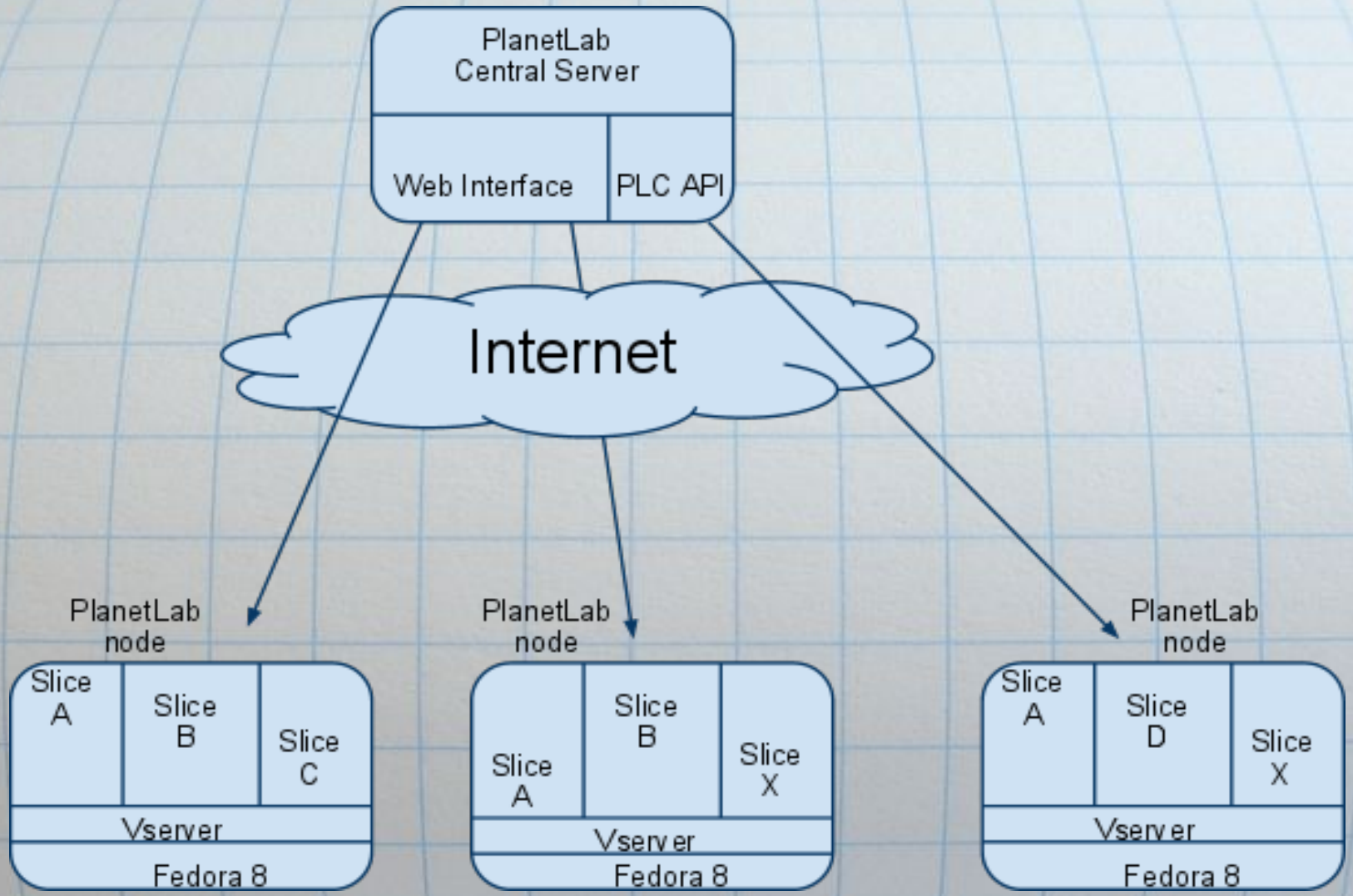
A collection of virtual machines spread over several nodes

Sliver:

A single virtual machine residing on a single node in the network

Slices can be configured to contain VM's on any node through an API or web interface.

Planetlab 101



http://www.usenix.org/event/lisa07/tech/full_papers/jaffe/jaffe_html/=16.jaffe.Planetlab.gif

Research Questions

"What changes does the PlanetLab infrastructure experience and how will these changes influence experiments conducted in the Planetlab distributed environment?"

“Which factors can be identified that influence the latency between nodes and to what extent?”

“Which factors can be identified that influence the bandwidth between nodes and to what extent?”

Planetlab monitoring system

CoMon, passive monitoring, published via webinterface

- Node centric daemon
  - current load of node
  - # active slices on node
  - TX/RX rates
  - disk I/O
- Slice centric daemon
  - Relative resource usage per slice

Initial approach

- Dynamically acquire sets of nodes in different regions.
- Retrieve passive monitoring data at fixed intervals.
- Transfer data (100 MB) to each node.
- Measure latency before, during and after the datatransfer.
- Collect, store and analyze data.

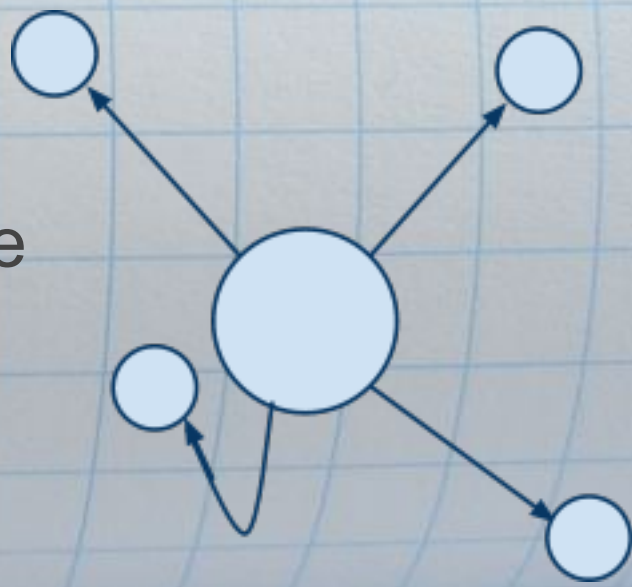
Experimental setup

Set up multiple experiments in different regions.

Have a central node run a python script which:

- Collect monitoring data from remote servers
- Run iperf client against remote servers
- Run ping against remote servers
- Send data to local machine for analysis.

4 Remote nodes, of which:
1 Remote node in the vicinity of central node
3 Nodes in the same "region" (country).



Implementation Issues

- Planetlab Central API:
  - Acquire nodes
  - Release nodes
  - Retrieve new nodes
- Returns faulty nodes
- Manual selection

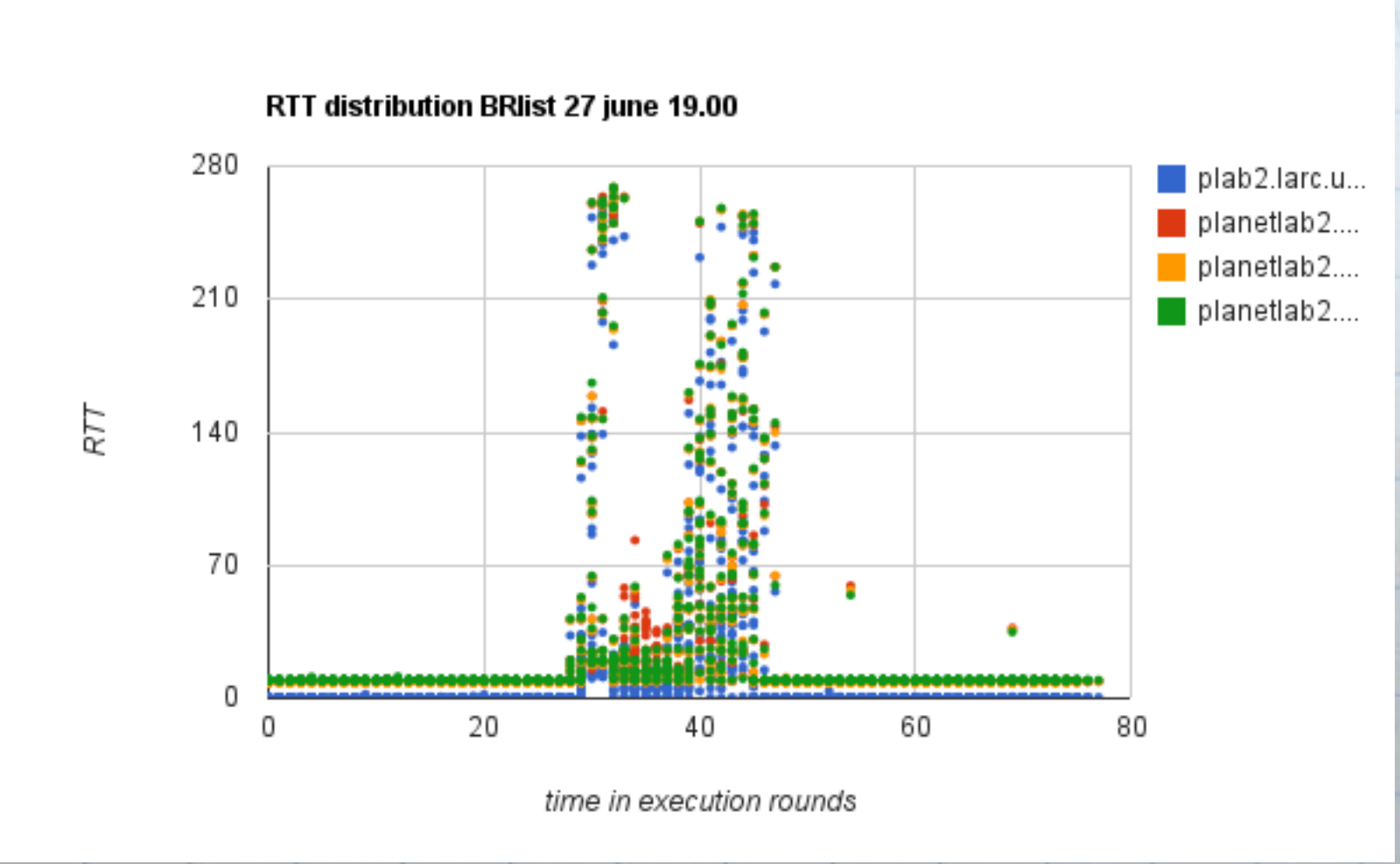
- Python script:
  - Run experiment and measurements repeatedly
  - In multiple regions
  - Analyze data
- No concurrent execution of threads due to GIL
- Meta_script which launches separate processes
- Manual analysis of data

Final Implementation

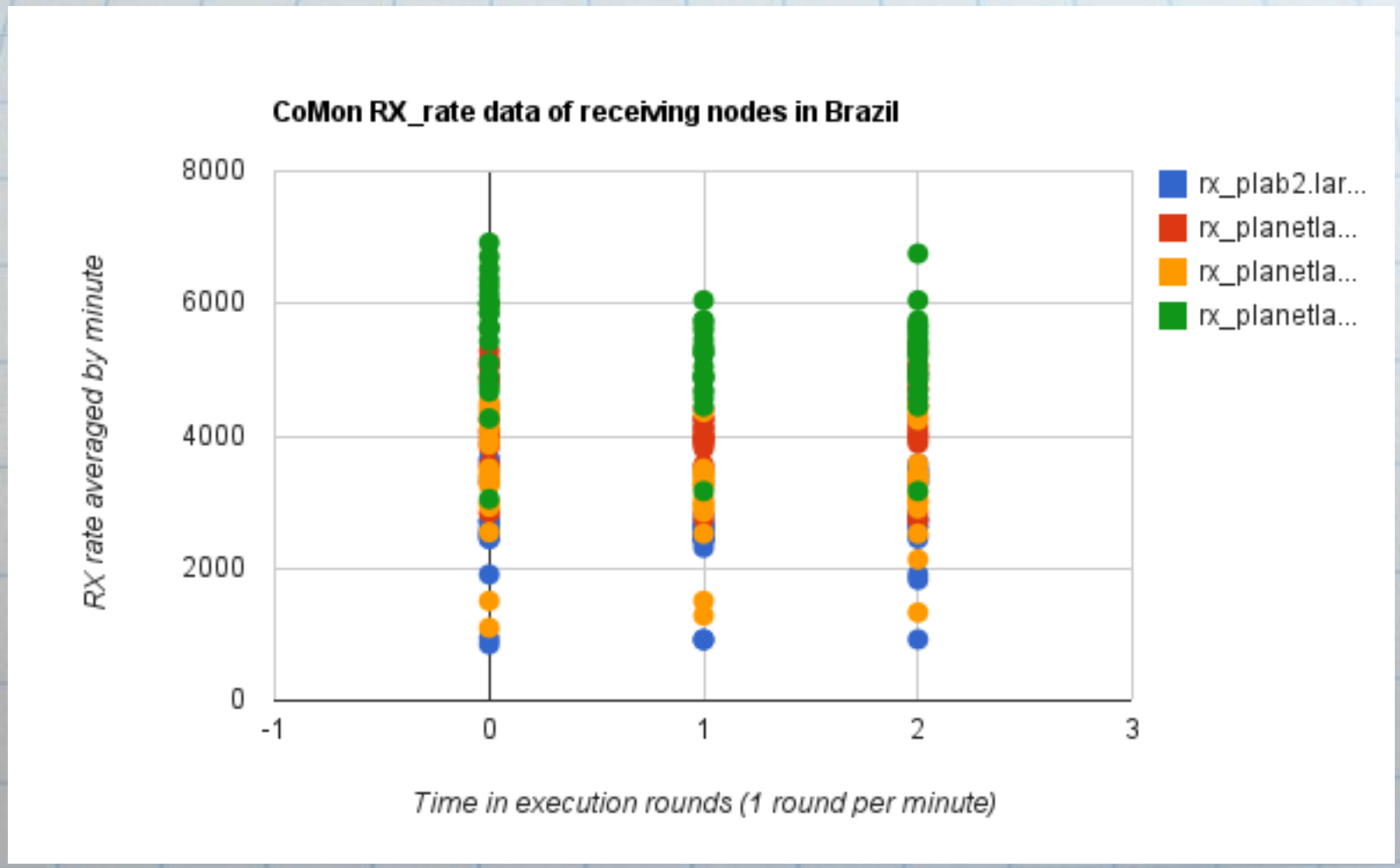
- Gather data
- Run experiment
- Stop gathering data
- Sync data
- Repeat

```
while time < ##:
    planetlab.py monitor &
    planetlab.py ping &
    sleep 60 seconds
    planetlab.py iperf (main)
    sleep 60 seconds
    touch $stop_monitoring
    rsync data my_server:~/data
done
```

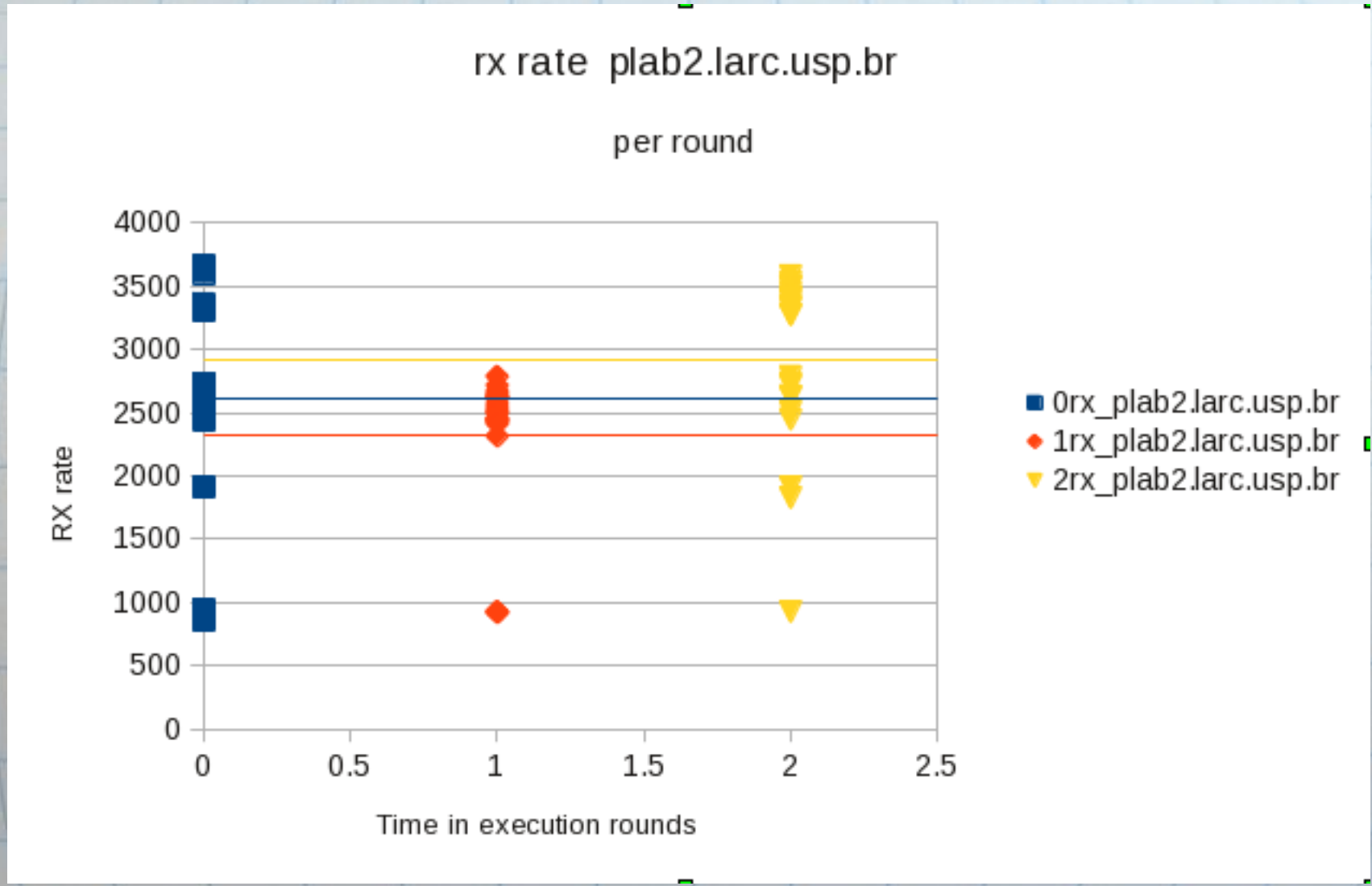
Results


RTT distribution BRlist 27 june 19.00
280
210
140
70
0
RTT
0
20
40
60
80
time in execution rounds
plab2.larc.u...
planetlab2....
planetlab2....
planetlab2....

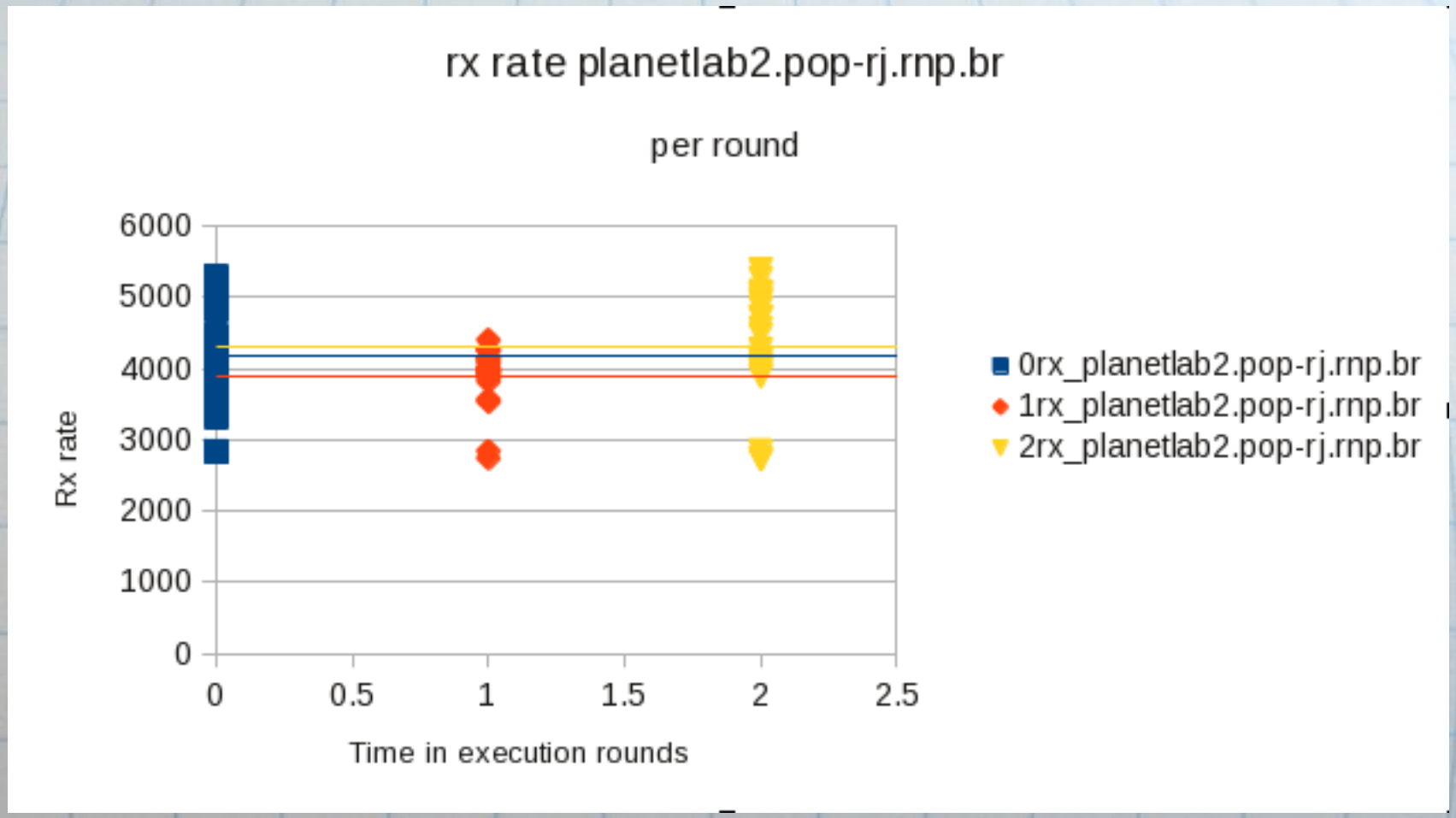
Results


CoMon RX_rate data of receiving nodes in Brazil
8000
6000
4000
2000
0
RX rate averaged by minute
-1
0
1
2
3
Time in execution rounds (1 round per minute)
rx_plab2.lar...
rx_planetla...
rx_planetla...
rx_planetla...

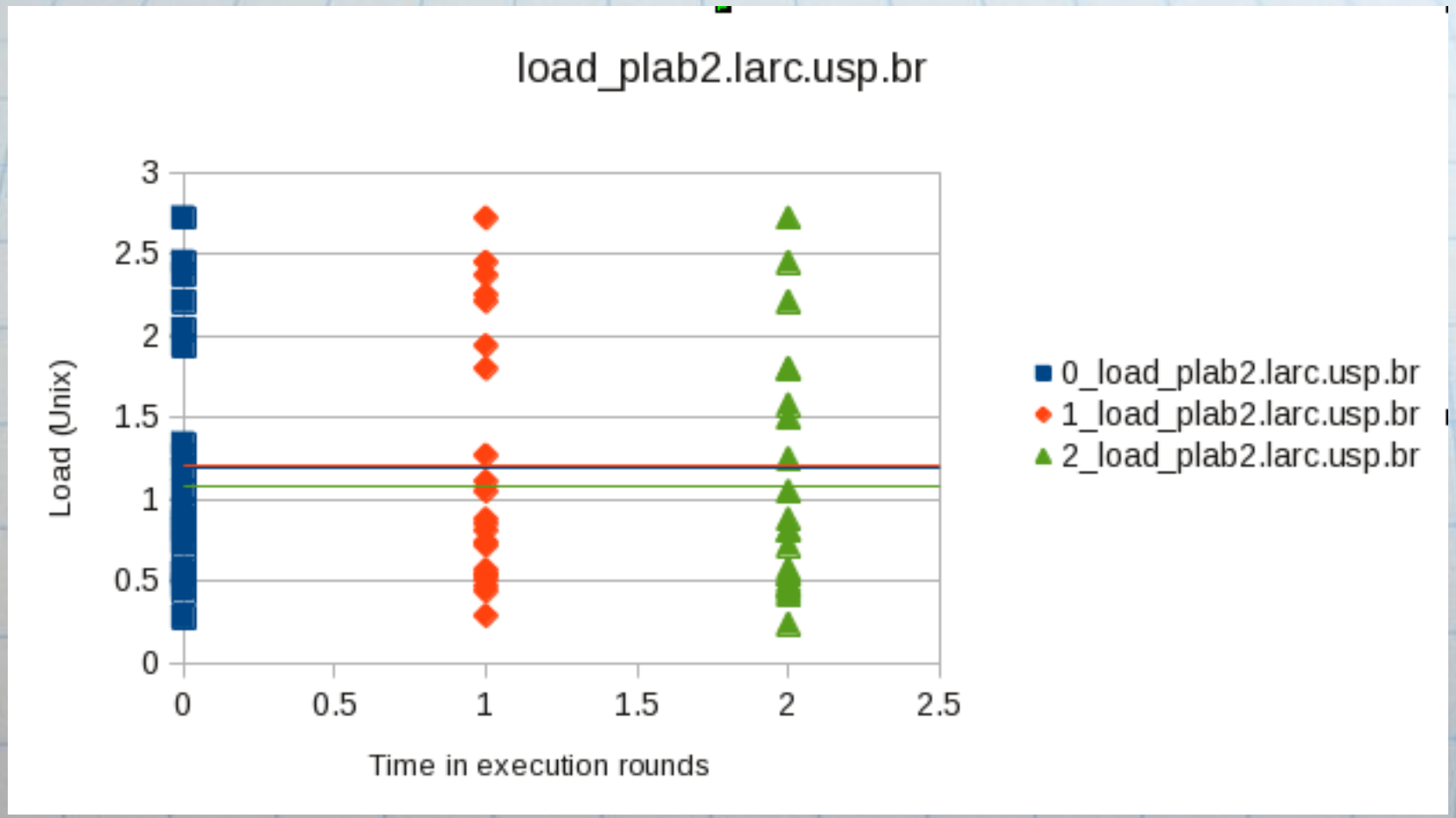
Results


rx rate plab2.larc.usp.br
per round
RX rate
4000
3500
3000
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2
2.5
Time in execution rounds
0rx_plab2.larc.usp.br
1rx_plab2.larc.usp.br
2rx_plab2.larc.usp.br

Results


rx rate planetlab2.pop-rj.rnp.br
per round
Rx rate
6000
5000
4000
3000
2000
1000
0
0
0.5
1
1.5
2
2.5
Time in execution rounds
0rx_planetlab2.pop-rj.rnp.br
1rx_planetlab2.pop-rj.rnp.br
2rx_planetlab2.pop-rj.rnp.br

Results


load_plab2.larc.usp.br
Load (Unix)
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
Time in execution rounds
0_load_plab2.larc.usp.br
1_load_plab2.larc.usp.br
2_load_plab2.larc.usp.br

Analysis

Iperf tests don't show up due to limited resolution of CoMon

Bandwidth limits on nodes limit longer tests for now

Longer measurements are needed to gather enough CoMon data.

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Questions

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