



Measuring End-User Experience in NREN Networks: Leveraging the Google ISP Tool

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Overview

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Outline

- Network Monitoring
- RENU Network Structure
- RENU Traffic Composition
- Google ISP Portal
- Analysis
- Conclusion

Network Monitoring

- With Internet already made affordable and available, more concern lies with user experience.
- Crucial in identifying network performance issues and their causes.

Traditional monitoring tools measure sections of the network.

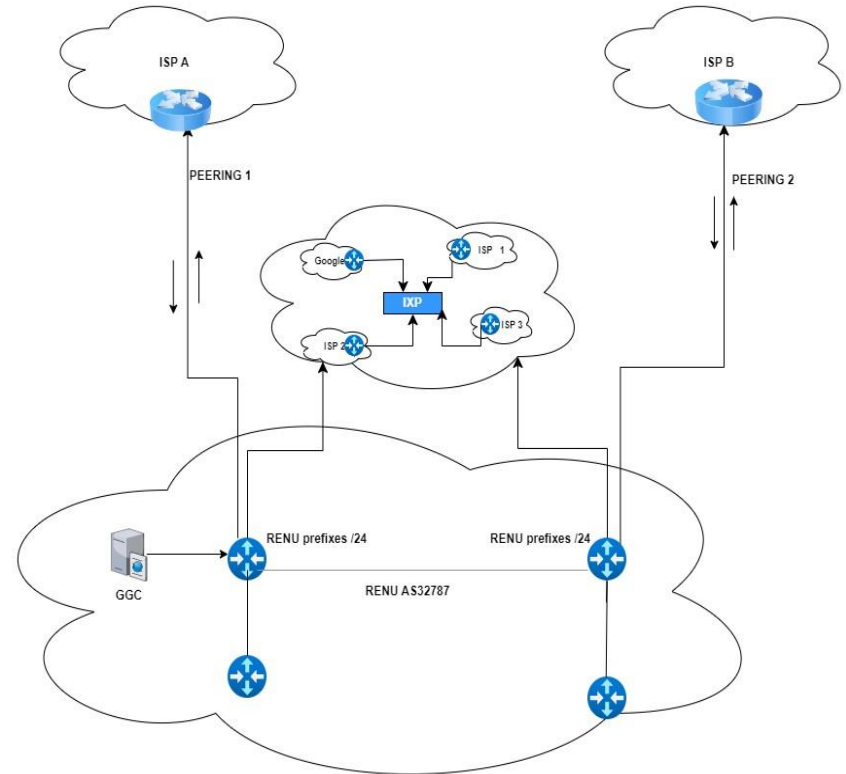
Google ISP – Measures performance from the end-user device to the server.



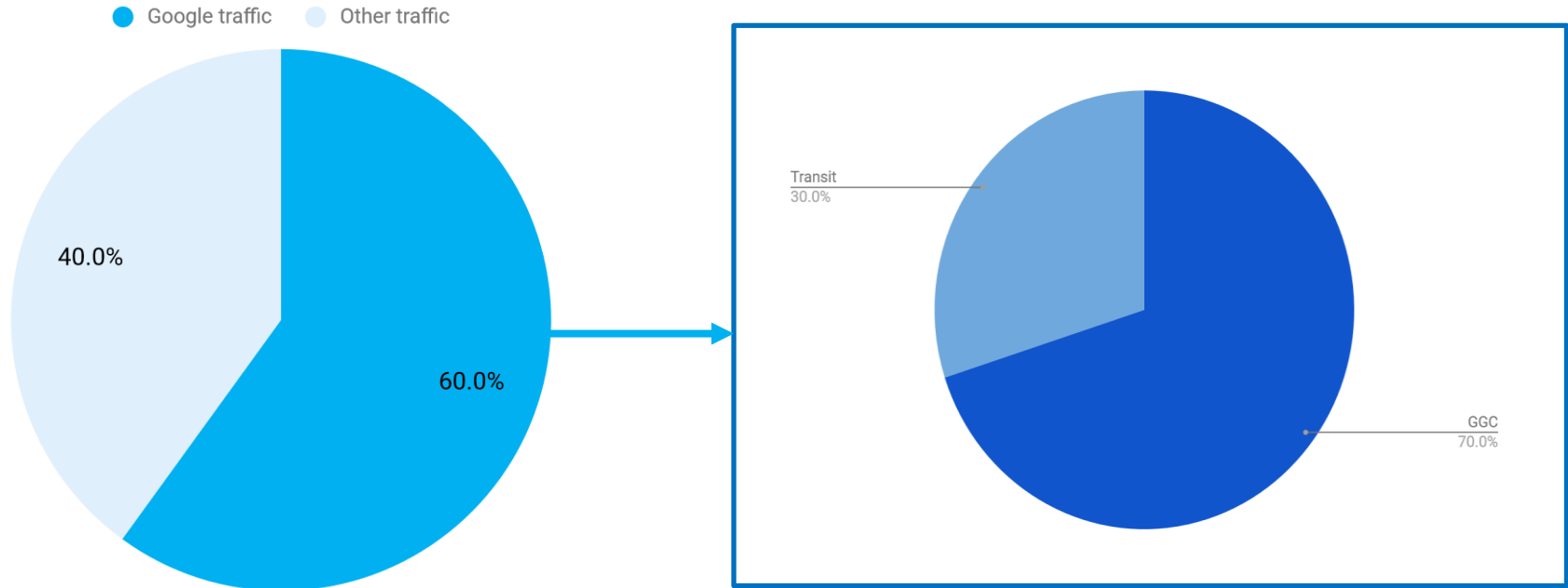
Google ISP Portal

RENU Network Structure

- REN – UbuntuNet Alliance
- /24 for each institution (Identity)
- GGC for enhanced performance



RENU Traffic Composition



Of the entire RENU traffic, 60% is Google traffic. 70% of the Google traffic is served by the GGC

Google ISP Portal

The Google ISP Portal exclusively measures Google traffic performance.

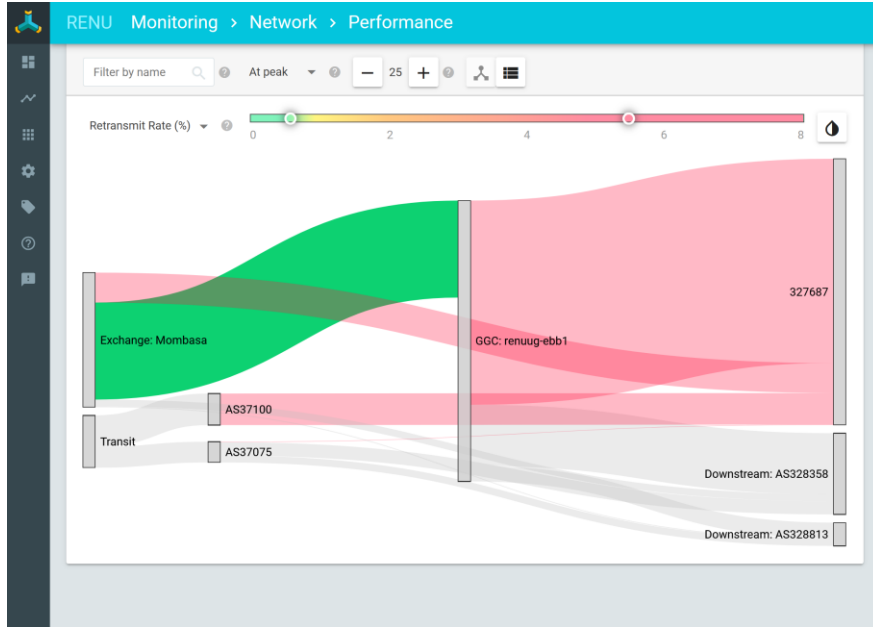
Google is interested in the entire performance between the requesting end-user device and the serving infrastructure.

Google uses Autonomous System (AS) numbers to identify and categorize the transit provider that is delivering traffic.

Cacheable traffic is served from Google Global Cache (GGC).



Google ISP Portal



Traffic by ASN Time: 2023/09/25, 12:20 - 12:30. CDN traffic only.

Filter by name At peak

Source	Client ↑	Traffic	Goodput	Retransmits	RTT
<input type="radio"/> AS37075	327687	1.32 Mbps	293.75 kbps	29.2%	309 ms
<input type="radio"/> AS37100	327687	239.80 Mbps	3.40 Mbps	22.94%	137 ms
<input type="radio"/> Exchange: Mombasa	327687	159.84 Mbps	2.49 Mbps	28.11%	221 ms
<input type="radio"/> GGC: renuug-ebb1	327687	1.52 Gbps	3.82 Mbps	24.53%	143 ms
<input type="radio"/> Transit	AS37075	233.59 Mbps	N/A	N/A	N/A
<input type="radio"/> Transit	AS37100	241.81 Mbps	N/A	N/A	N/A
<input type="radio"/> AS37075	Downstream: AS328358	192.51 Mbps	N/A	N/A	N/A
<input type="radio"/> Exchange: Mombasa	Downstream: AS328358	110.28 Mbps	N/A	N/A	N/A
<input type="radio"/> GGC: renuug-ebb1	Downstream: AS328358	379.94 Mbps	N/A	N/A	N/A
<input type="radio"/> AS37075	Downstream: AS328813	39.76 Mbps	N/A	N/A	N/A
<input type="radio"/> AS37100	Downstream: AS328813	2.01 Mbps	N/A	N/A	N/A
<input type="radio"/> Exchange: Mombasa	Downstream: AS328813	11.21 Mbps	N/A	N/A	N/A
<input type="radio"/> GGC: renuug-ebb1	Downstream: AS328813	101.88 Mbps	N/A	N/A	N/A
<input type="radio"/> Exchange: Mombasa	GGC: renuug-ebb1	728.94 Mbps	85.79 Mbps	0.45%	15 ms
<input type="radio"/> GGC: renuug-ebb1	GGC: renuug-ebb1	102.64 Mbps	100.00 Mbps	0.14%	N/A

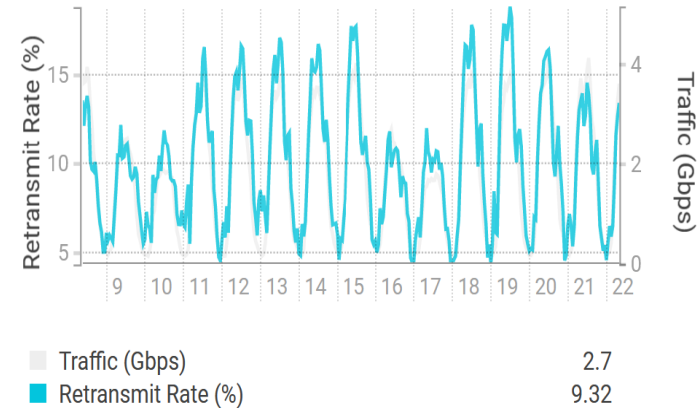
Insights into traffic flows and quality of experience.

Performance Metrics

- **Goodput:** The data that is successfully transferred per unit time (Mbps)
- **Application Round Trip Time:** The amount of time it takes for a packet to be sent from a source to a destination and back (ms)
- **Retransmit Rate:** The percentage of packets that need to be retransmitted because they were lost or corrupted in transit.

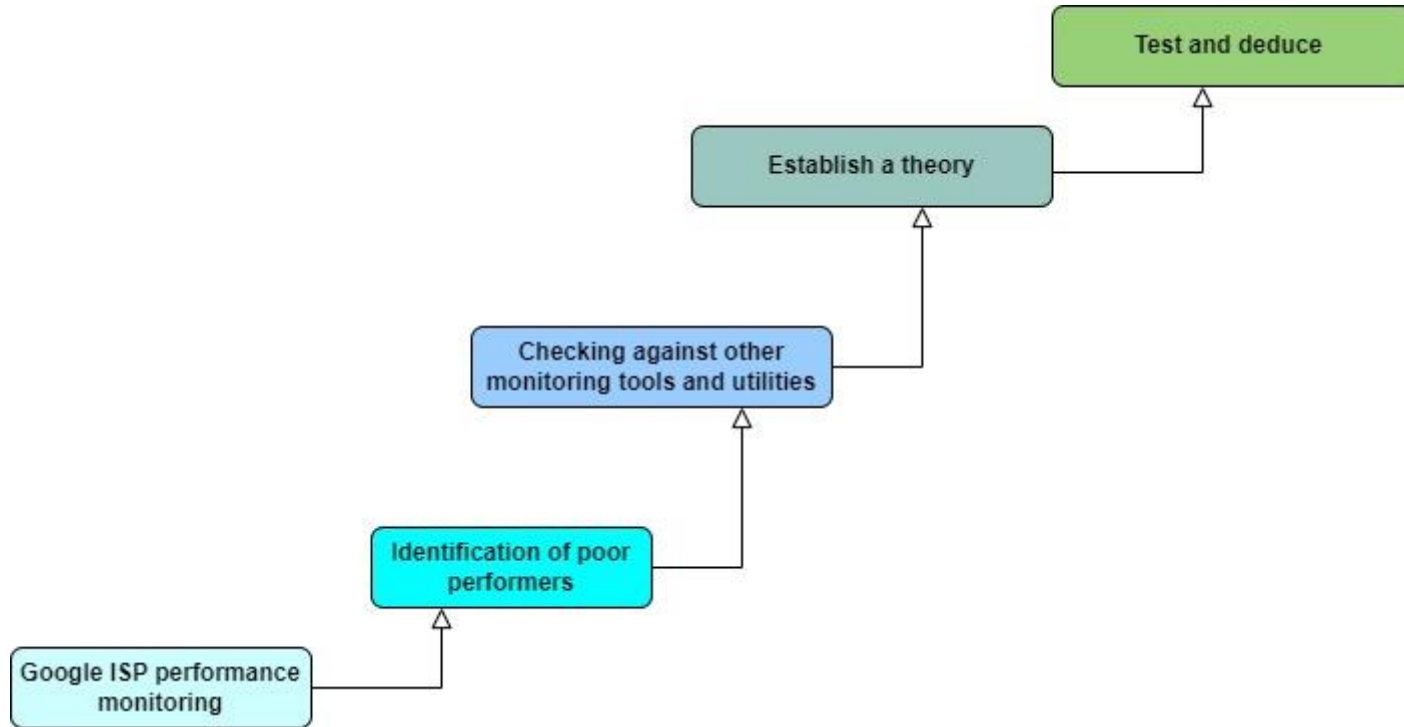
Why Retransmit Rate?

- Retransmit rate was considered the most important among the 3 parameters.
- Traditional tools can measure RTT and Goodput.
- None of the traditional tools measure retransmit rate.

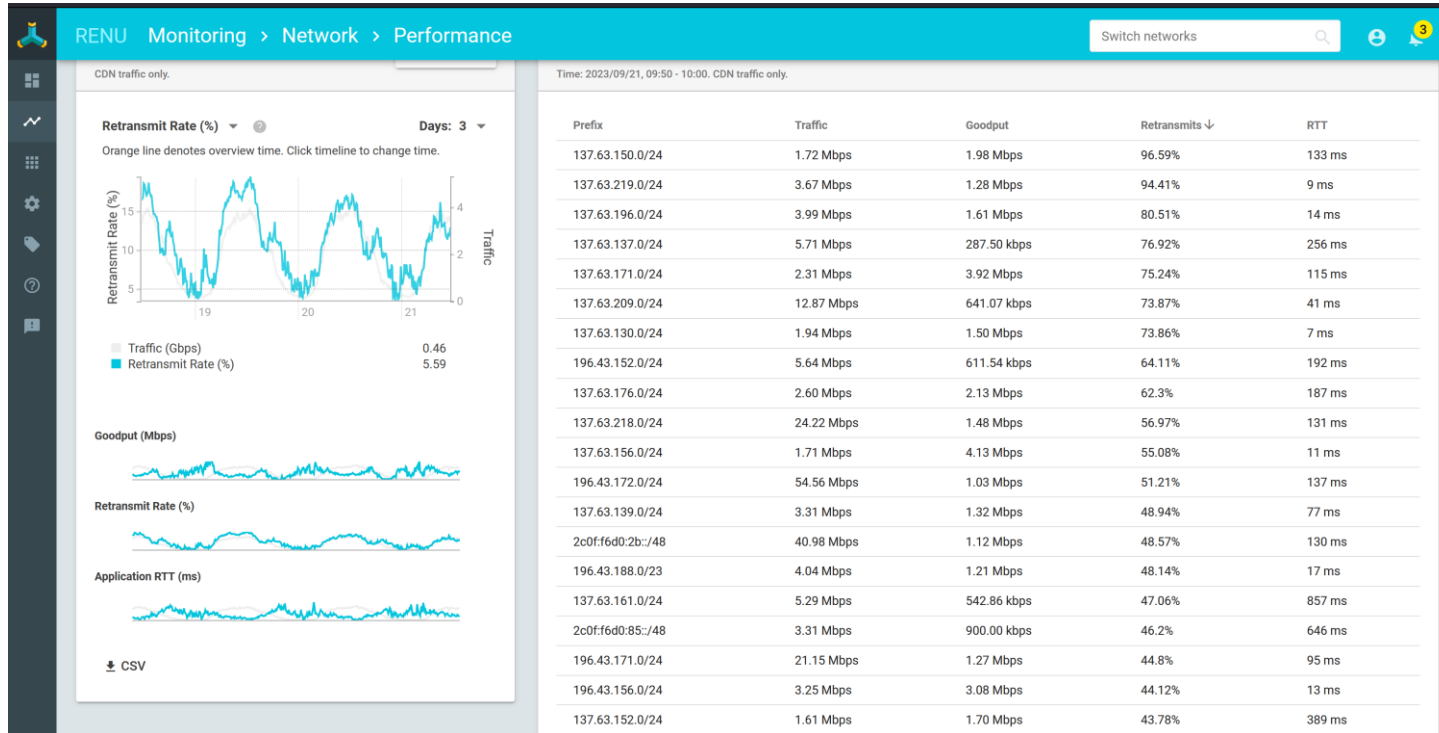


> 50% is flagged

Performance Analysis Process

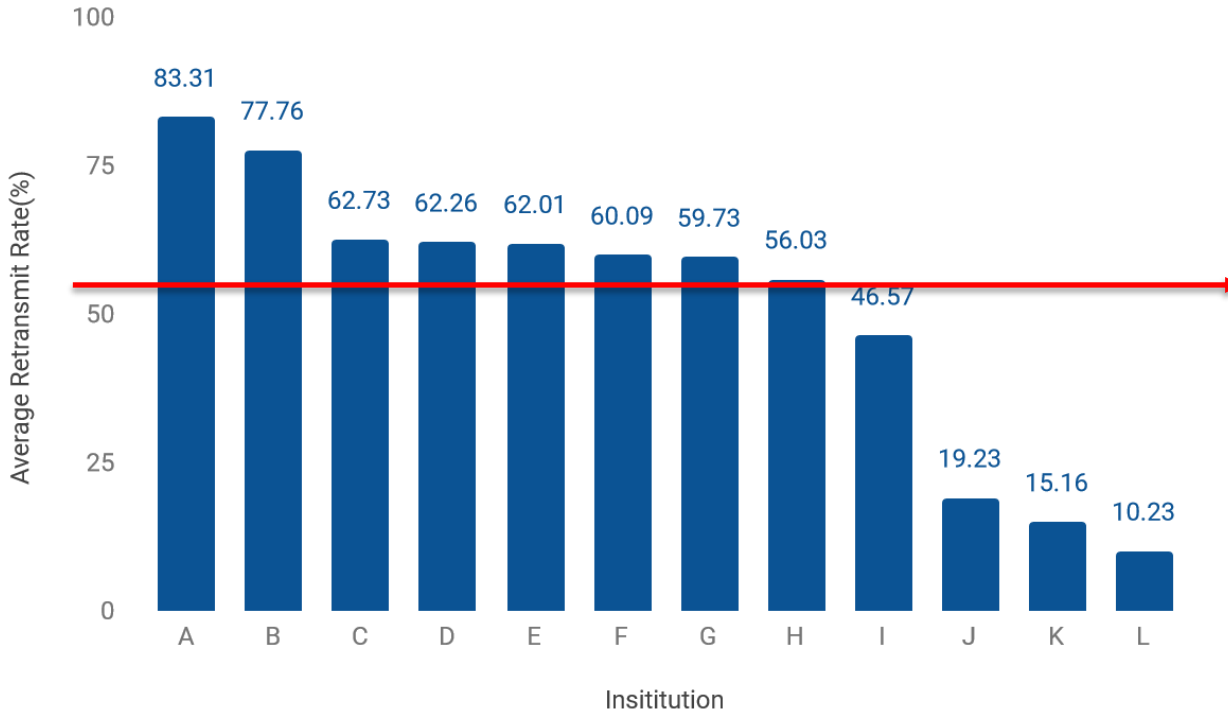


Google ISP Portal - Performance Analysis

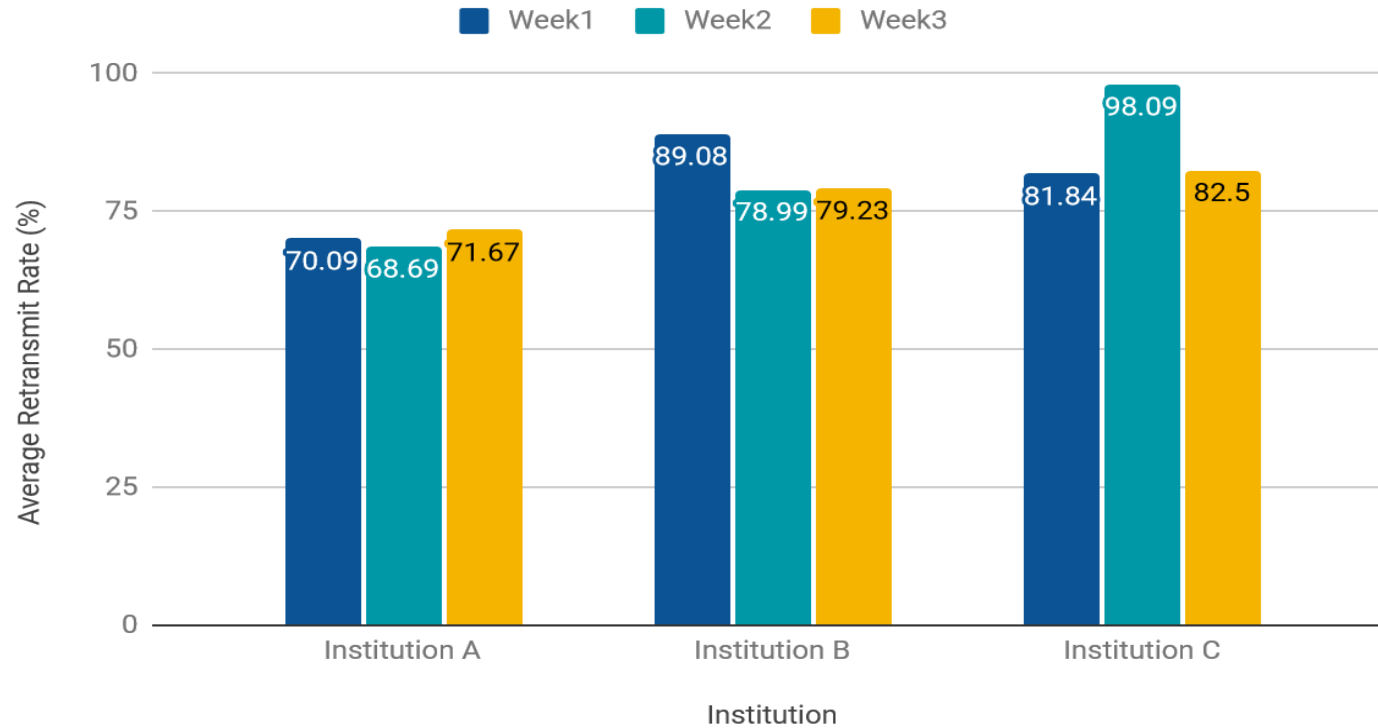


Prefix based performance analysis according to Goodput, Retransmit Rate and RTT.

Institutional Retransmit Rate Performance



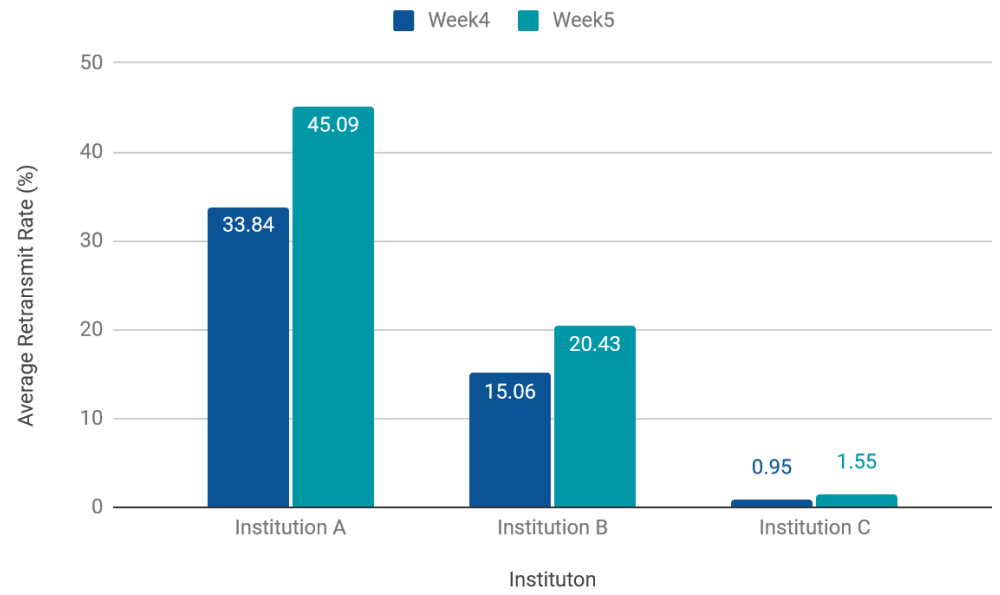
Retransmit Rate Vs Performance



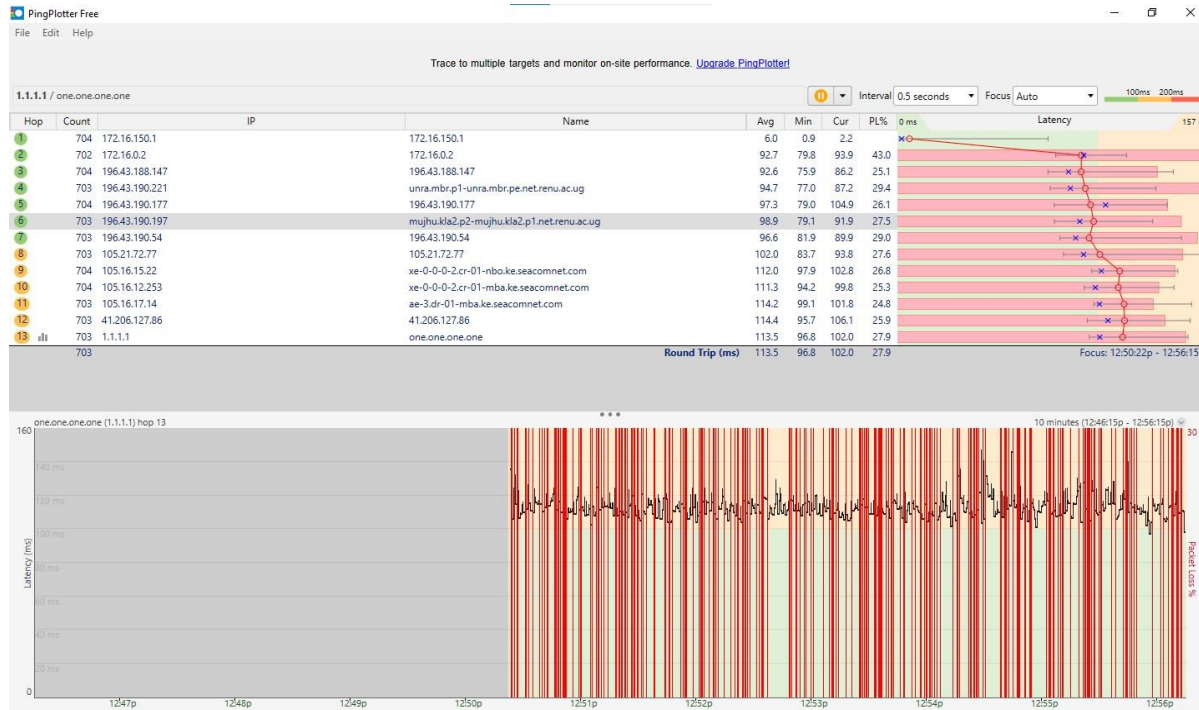


Retransmit Rate Vs Performance

- Reduction in retransmit rate
- Improvement in performance
- Increase in packet loss



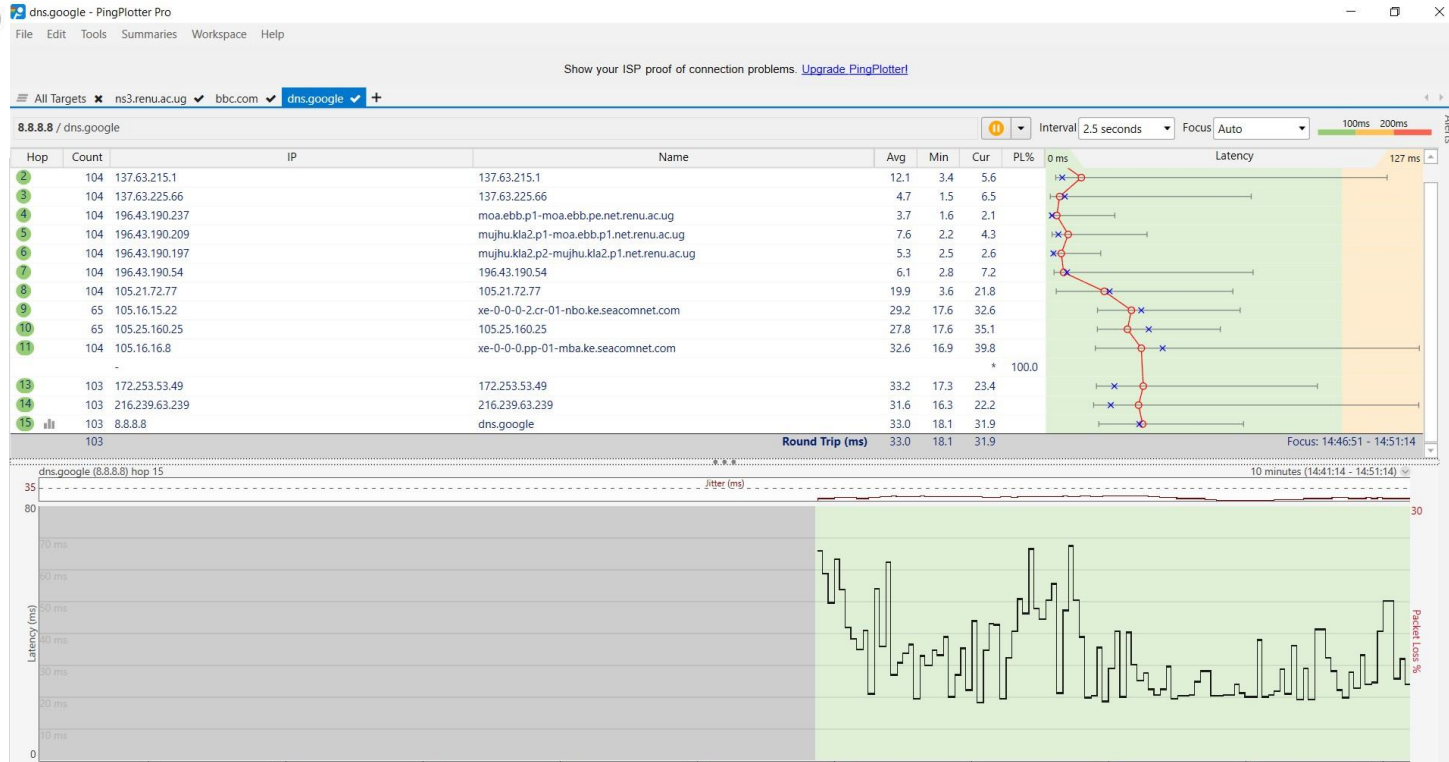
Hardware Limitations



```
Jul 19 17:34:07.068: %BW_LICENSE-4-THROUGHPUT_MAX_LEVEL:  
SIP0: cpp_ha_top_level_server:  
Average throughput rate approached the licensed bandwidth of  
50 Mbps during 130 sampling periods in the last 24 hours,  
sampling period is 300 seconds
```



Capacity Constraints

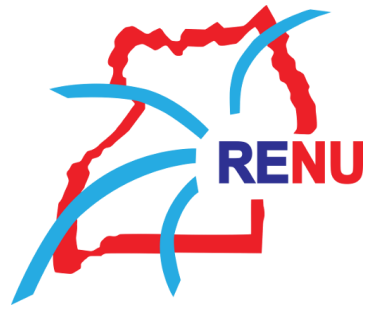




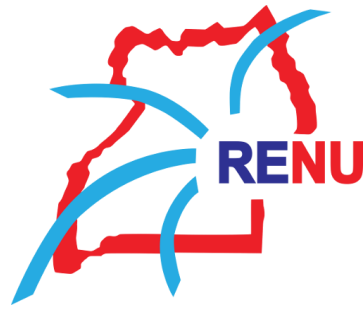
Conclusion

NRENs serve a critical sector of the country that is R&E and it is important that these networks where these rely on have good quality networks, which require extensive monitoring and performance measurement to the detail.

Extensive monitoring goes beyond what the traditional tools can currently achieve.



Q&A



THE END

Thank you for your time