AmLight ExP
Americas Lightpaths Express & Protect

SA3CC Meeting – May 07th, 2025

AmLight: Monitoring and Measurement Improvements

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Tools/Frameworks in use at AmLight [1]

- AmLight has a rich set of tools to monitor its infrastructure and measure its performance.
- A Zabbix server monitors the entire network and IT infrastructure.
- [New] BER tests running on demand (BERToD).
- The perfSONAR results can be accessed at https://dashboard.ampath.net/maddash-webui/index.cgi
  - We have been working on a new dashboard, using perfSONAR 5.1.4 with Grafana for visualization: https://ps-cma.amlight.net/grafana/d/feh19rrki0lq8a/amlight-perfsonar-matrix
- A Status page is available for the community to inform about any ongoing events quickly and directly: https://status.amlight.net.
- Links' utilization can be found on https://my.amlight.net.

Tools/Frameworks in use at AmLight [2]

Tool/Framework	Used for:
SNMP	➢ General monitoring.
sFlow	➢ Troubleshooting unusual events. ➢ TOP N reports.
perfSONAR	➢ Testing user perspective.
Juniper Telemetry Interface (JTI)	➢ Environments that require more granular information. Juniper devices only.
In-band Network Telemetry (INT)	➢ Troubleshooting short-time events.
Bit Error Rate Test on Demand (BERToD)	➢ Testing infrastructure. ➢ Fault isolation.

New!!

AmLight perfSONAR Infrastructure
May 2025

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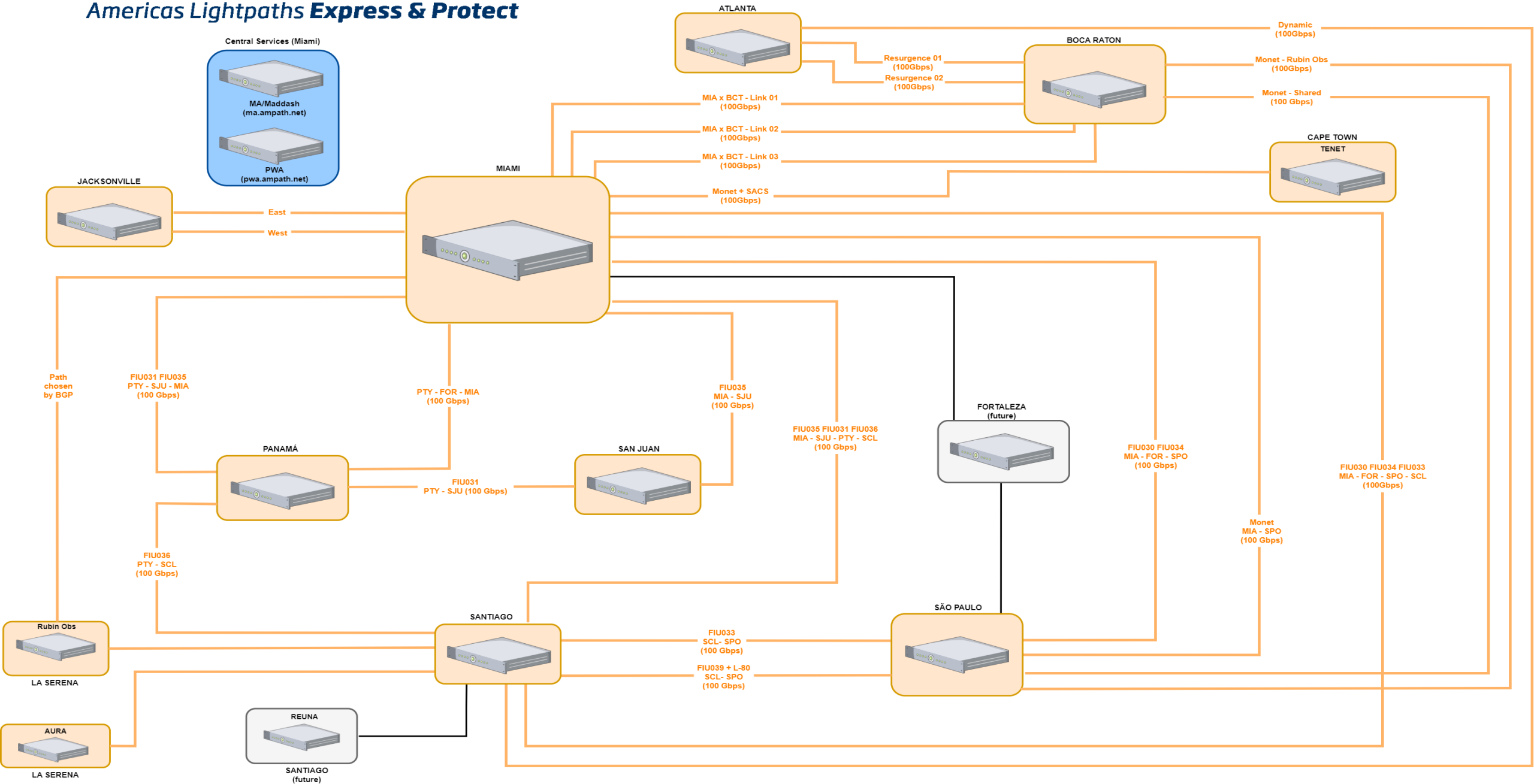
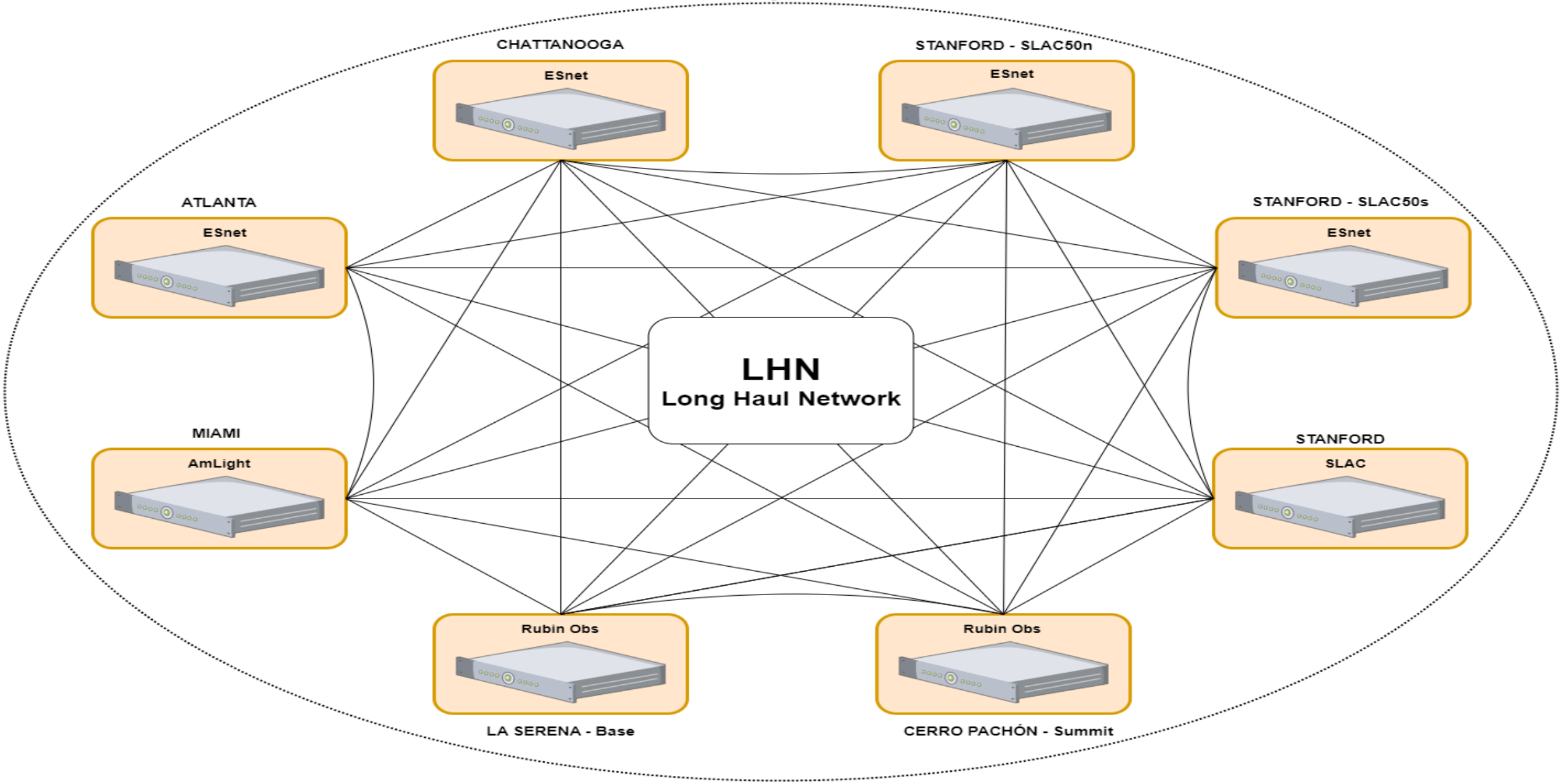


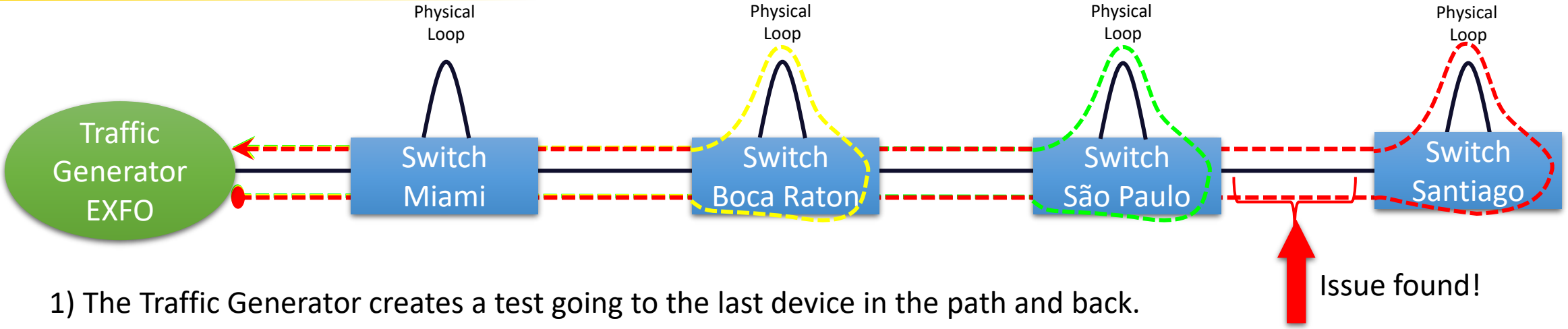
LHN perfSONAR Infrastructure
May 2025



ps-CMA (perfSONAR Central Management Archive)

- New server running perfSONAR 5.1.4 (Ongoing work)
  - Grafana for visualization
  - OpenSearch + Logstash for archiving
- Public Dashboards:
  - AmLight Matrix: https://ps-cma.amlight.net/grafana/d/feh19rrki0lq8a/amlight-perfsonar-matrix
  - Vera Rubin Observatory Matrix: https://ps-cma.amlight.net/grafana/d/aaatqaA0QfVk/vera-rubin-observatory-perfsonar-matrix
- Maddash (old server) is running in parallel: https://dashboard.ampath.net/

Traffic Generator for Network Testing – 2024's idea



1) The Traffic Generator creates a test going to the last device in the path and back.

2) A problem is detected, so the Traffic Generator will start "shrinking" the path.

3) The Traffic Generator will start a new test using just the first half of the path.

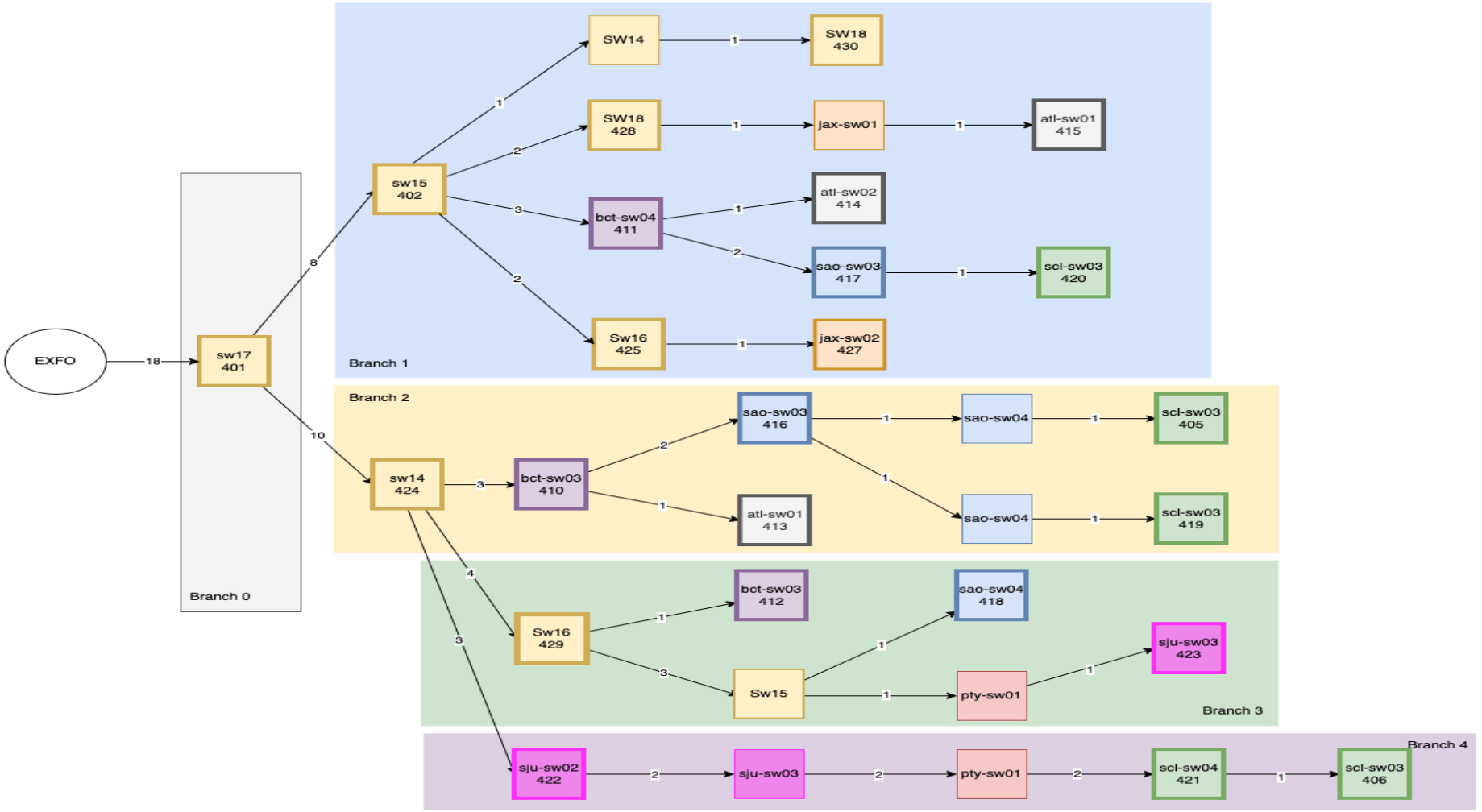
4) The new test didn't detect any issues, meaning there's no problem in the first section of the path.

5) The Traffic Generator will then shrink the second half of the path.

6) No issues are found again, meaning the problem is confined between São Paulo and Santiago, generating an alarm.

All tests will run periodically and automatically. No intervention from the Engineers!

BERToD - Bit Error Rate Test on Demand [1]

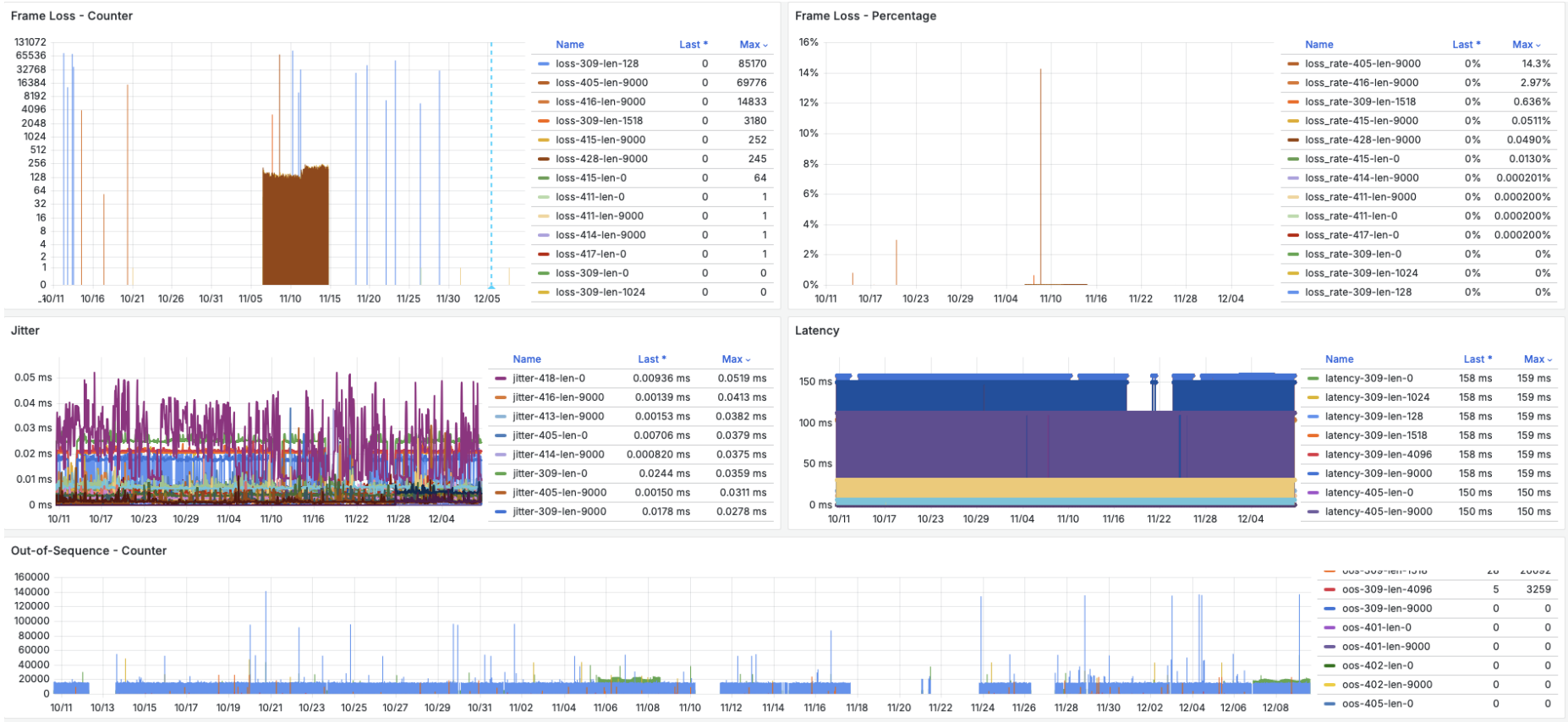


BERToD - Bit Error Rate Test on Demand [2]

- Test every possible link every 30 min:
  - Latency, jitter, frame loss, and out-of-sequence tests
  - Multiple frame sizes: 68, 256, 512, 1024, 1518, 9000 bytes
  - Each test runs for up to 10 seconds, and we send up to 500,000 frames
  - In case a test fails, run it again with a multiplier metric (for instance, 3)
  - Choice for max bandwidth comes from BAPM
    - Up to 50% of the available bandwidth based on the last 30 seconds (and up to 40 Gbps)
- Displaying results:
  - Last hour, Last 7 days, heatmap, and text outputs
- Grafana Annotations are used to document known topology events and actions to help correlate events.

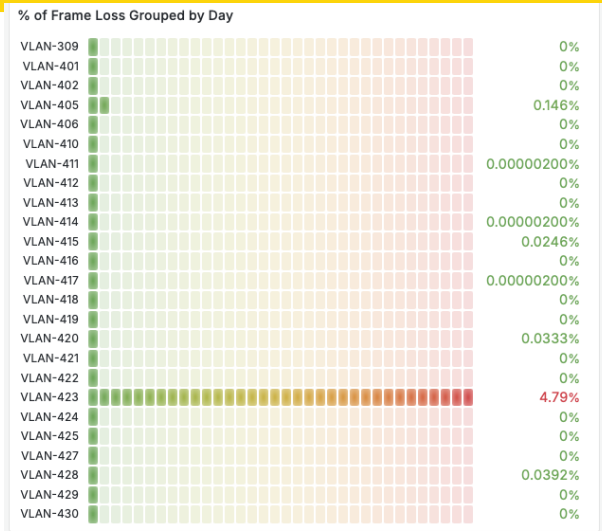
BERToD – Granular Individual Results

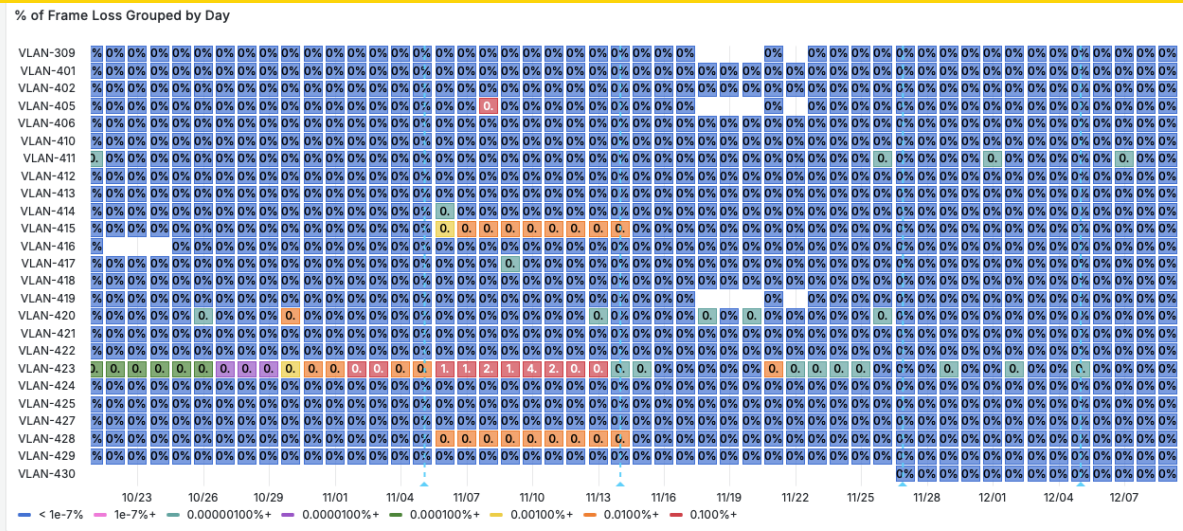
- Using Grafana to plot each test's loss, jitter, latency, and out-of-sequence
- Great way to understand the last 24 hours
- Filters available to visualize test results based on frame size and individual paths
- Not great for correlating events

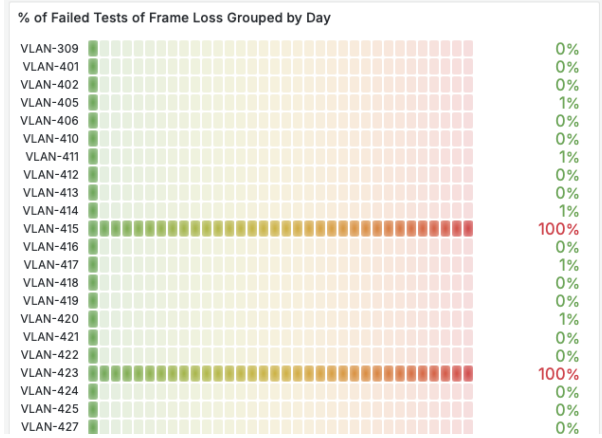


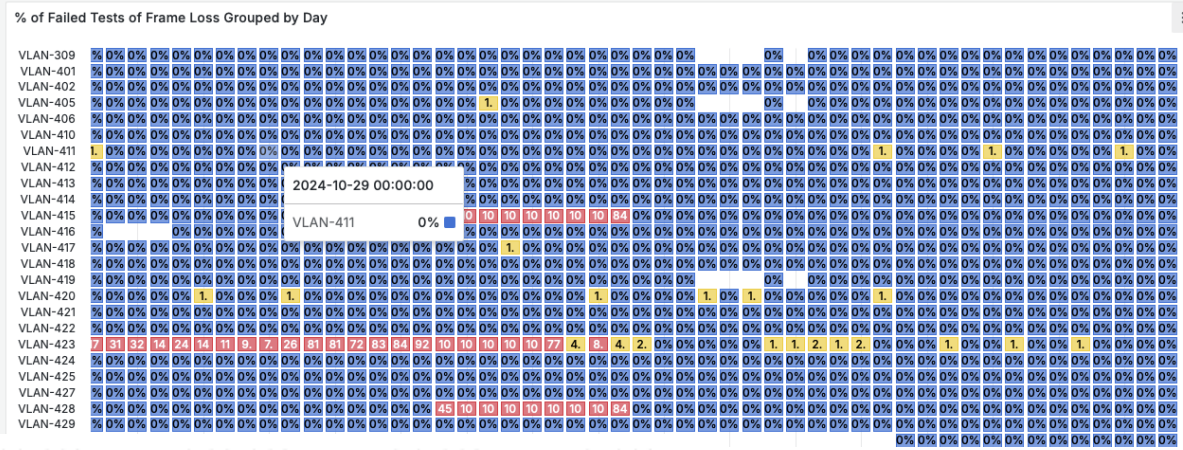
BERToD – Historical Results

- Using Grafana to plot each test's loss per day
- Great way to correlate events and identify patterns
- Filters available to visualize test results based on frame size and individual paths
- Used with annotations to add context









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BERToD – Next Steps: More Automation!

- Automate the fault isolation process using all data sources available, using AI/ML
  - SDN logs, topology changes, EVC optimizations, events/demos, optical monitoring, and visits to the data center.
- Integration with Kytos-ng SDN Controller to test links after each link flap:
  - The goal is to evaluate if the link is clean after a maintenance/repair before using it again!
  - After a link flap, the SDN controller waits up to 2 min to confirm the link is stable and then initiates the quarantine mode
  - BERToD is notified of the quarantine and starts a 5 min test
  - If results are clean, BERToD sets the link as operational/ready
  - The SDN controller then makes the link available to all applications

BERToD – Conclusion

- BERToD is a fantastic addition to the network monitoring portfolio thanks to the hardware-based traffic generator and enhanced network telemetry provided by the AmLight SDN solution.
  - Production since September 2024. Used daily by AmLight OPS.
- Having a hardware-based traffic generator enables quick testing with extreme accuracy
  - Helps us follow the demands of our SLA-driven science drivers
- BERToD is a great complement to perfSONAR @ AmLight.
  - While perfSONAR allows AmLight to test applications and protocols with excellent per-direction visibility, BERToD provides extreme performance visibility for applications over ultra-long paths where any packet loss causes damage.
- Interested in more information? Check the CI Engineering Lunch & Learn presentation: https://youtu.be/s0Ek0oBcwR4

Final Comments

- All the tools presented (and more!) are used in our daily operations, increasing the network visibility beyond our expectations.
- Each tool has its pros and cons.
  - Combining all monitoring tools enables AmLight to track performance issues and user complaints.
- Future work:
  - Improving BERToD
  - [Ongoing] ps-CMA running perfSONAR 5.1.4
  - Correlating multiple data sources to automate the fault isolation process
- We continue studying new ways of monitoring our environment.
  - If you want to request monitoring of something specific, feel free to reach us!

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