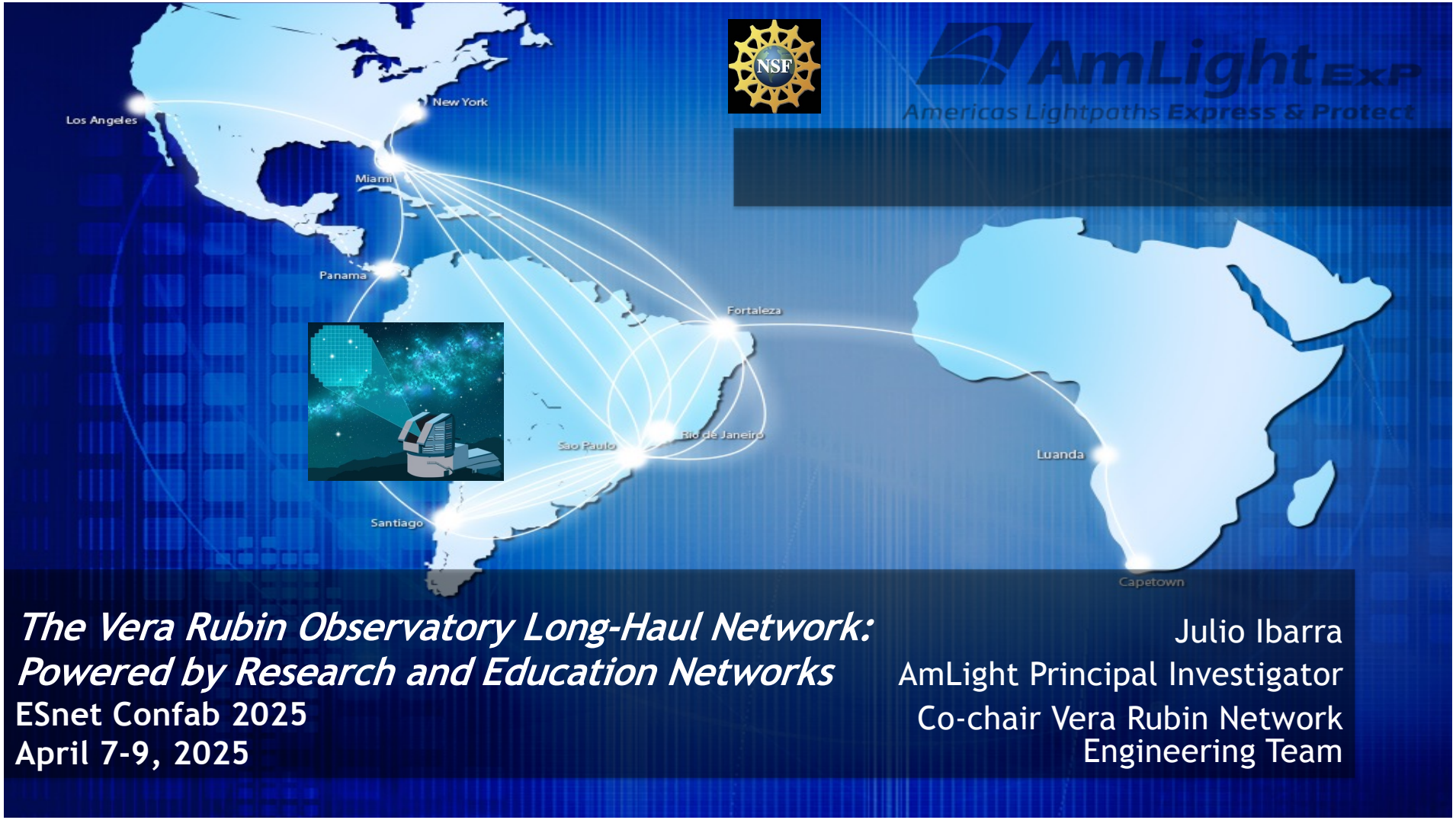


The Vera Rubin Observatory Long-Haul Network: Powered by Research and Education Networks

ESnet Confab 2025
April 7-9, 2025

Julio Ibarra
AmLight Principal Investigator
Co-chair Vera Rubin Network Engineering Team

Outline

- Vera Rubin Observatory Service Level Agreement (SLA) and Operations Use Case
- Vera Rubin Observatory Long-Haul Network (LHN) Implementation
- Results from Image transfers
- Conclusion

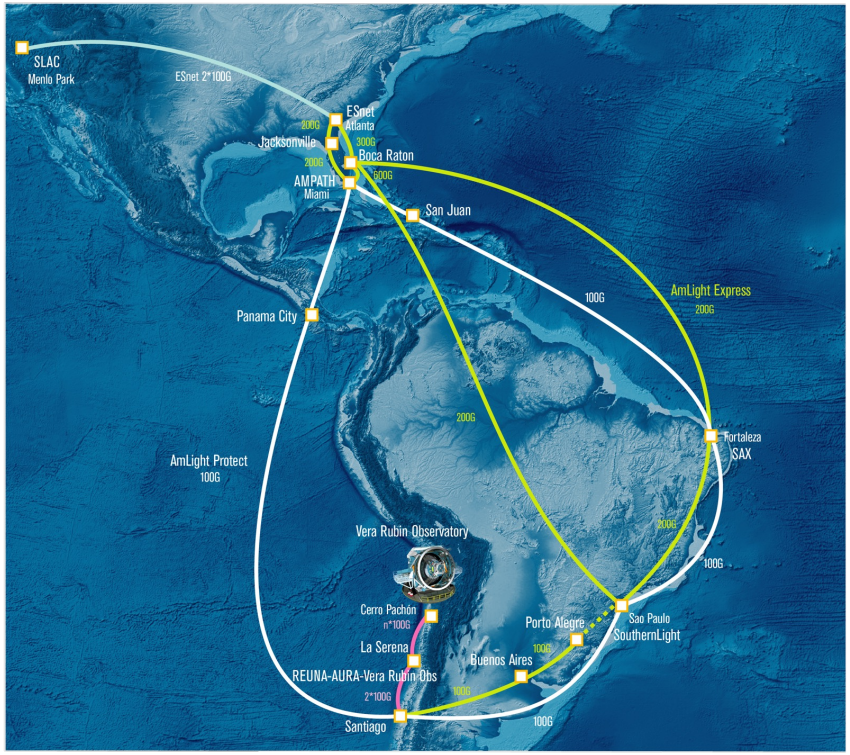
Vera Rubin Observatory Long-Haul Network SLA

- The **Vera Rubin Observatory Long-Haul Network (LHN)** is an SLA-driven network, purpose-built to support the Vera Rubin network use case
- The LHN is built upon Research & Education (R&E) networks, collaborating to support the Vera Rubin SLA, and collectively referred to as the *LHN Network Operators*

- The LHN is to provide a guaranteed 40Gbps end-to-end network transport service from the Summit to the US Data Facility at SLAC
- End-to-end service availability of 99%
- Mean Time to Restore Service (MTTR) is not to exceed 4 hours
- Network measurement instrumentation
  - Troubleshooting, Active measurements, network telemetry
  - Export data to the Rubin Virtual NOC (VNOC)
- Participation in the Rubin NET team

Use Case: Vera Rubin Observatory Operation

- The camera will take a picture of the southern sky every 27 seconds, and produce a 13GB image
- Each image must be transferred to the USDF at SLAC, within 7 seconds, inside the 27 second transfer window
- Constraints
  - Distance from the Base station to the USDF is approximately 12,000 miles
  - RTT from the Base Station to the USDF is approximately 180+ ms
  - 0.001% of packet loss will compromise the Rubin Observatory image transfer workflow
- Challenges
  - How to build the LHN to deliver a 13GB image within the 7s window?
  - How to recover from an event that impacts network service on the LHN, and continue to deliver 13GB images on time?



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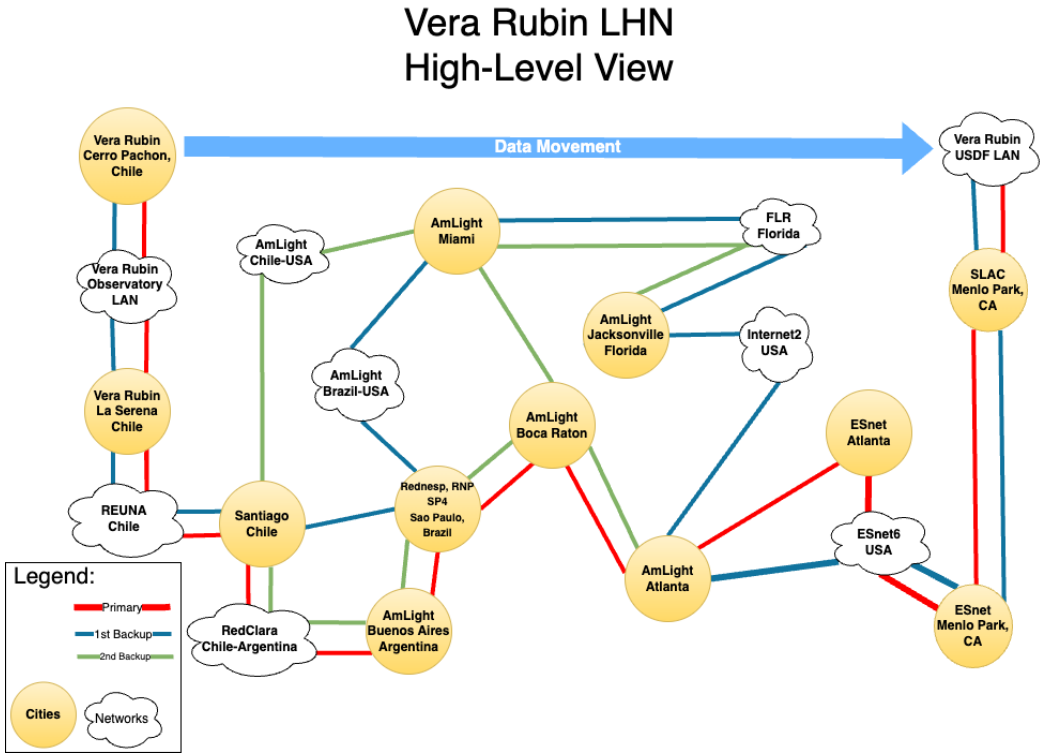
Vera Rubin LHN: High-level Topology

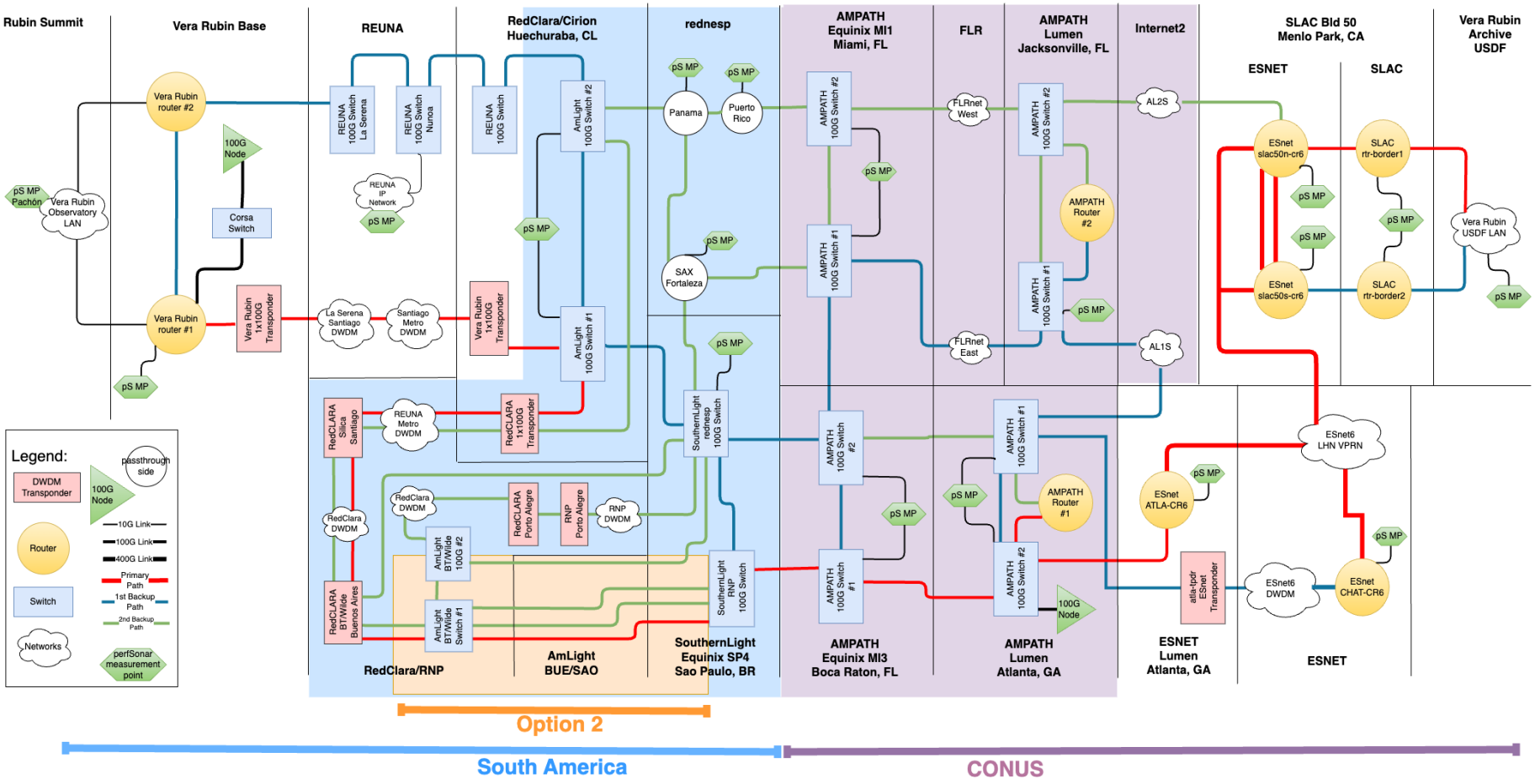


LHN Network Operators:

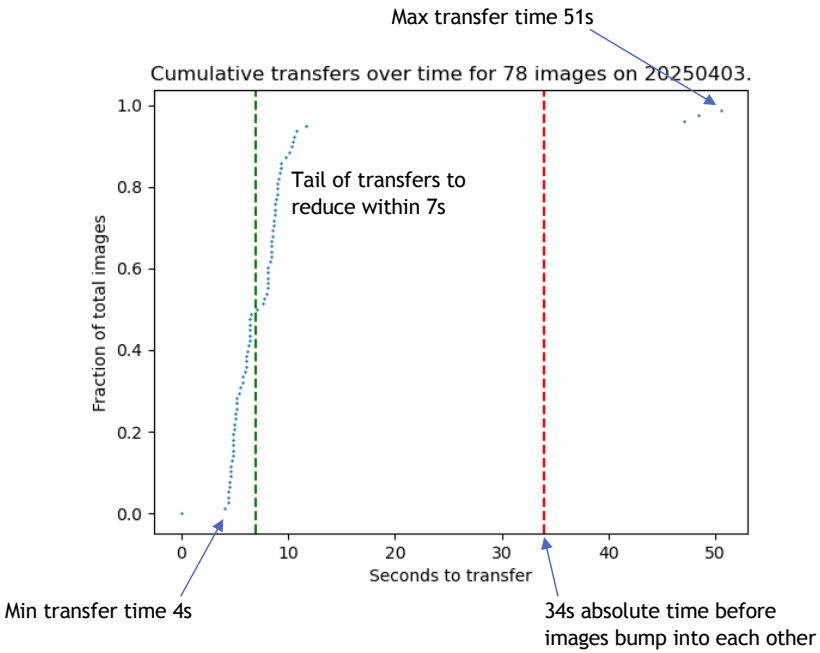
Versioning

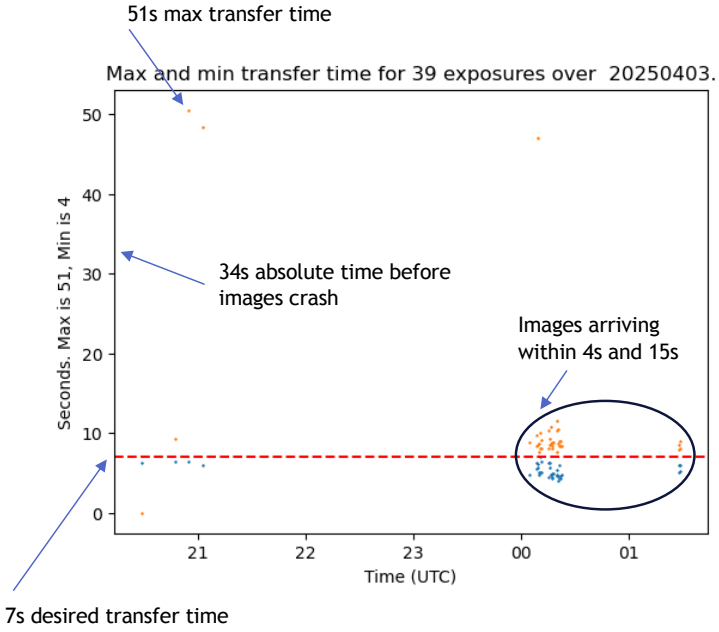
Author: NET team
Last update: April 26th, 2024

Vera Rubin Observatory LHN - Detailed



Results: Transfers over time





Results by Wil O'Mullane
Vera Rubin Observatory

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Americas Lightpaths Express & Protect

Conclusion

- The Vera Rubin LHN is operating and complying with the SLA requirements
  - *Testing, Testing! NSF-DOE Vera C. Rubin Observatory Completes Comprehensive System Tests With Flying Colors*
- The LHN is highly instrumented with PerfSonar nodes, packet and optical telemetry, and protocols for monitoring network continuity and end-to-end control to
  - Detect potential network service interruption, and to
  - Respond before the image transfer window is compromised
- The Vera Rubin Virtual NOC (VNOC) is providing NOC services to the LHN Network Operators
  - The VNOC is working towards providing NOC services to the Vera Rubin Observatory


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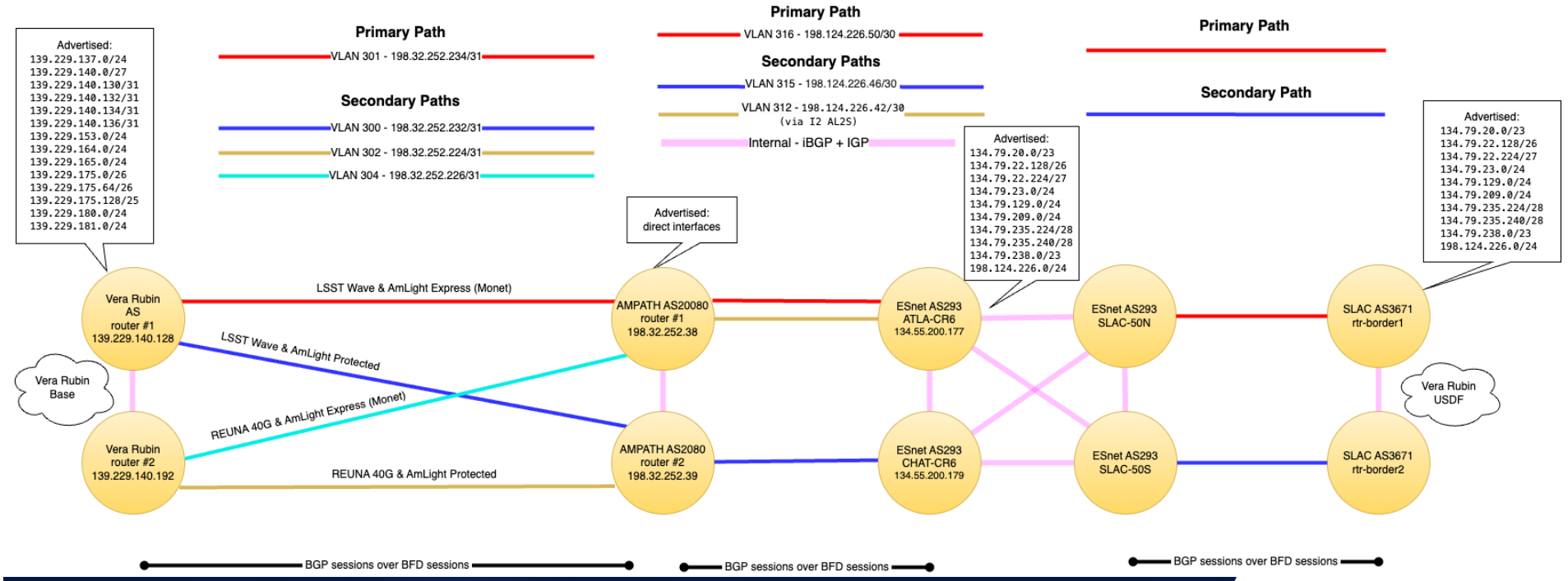
Santiago

THANK YOU

More Slides Follow

Vera Rubin LHN: Logical Network Topology

Last Update: March 28th, 2025



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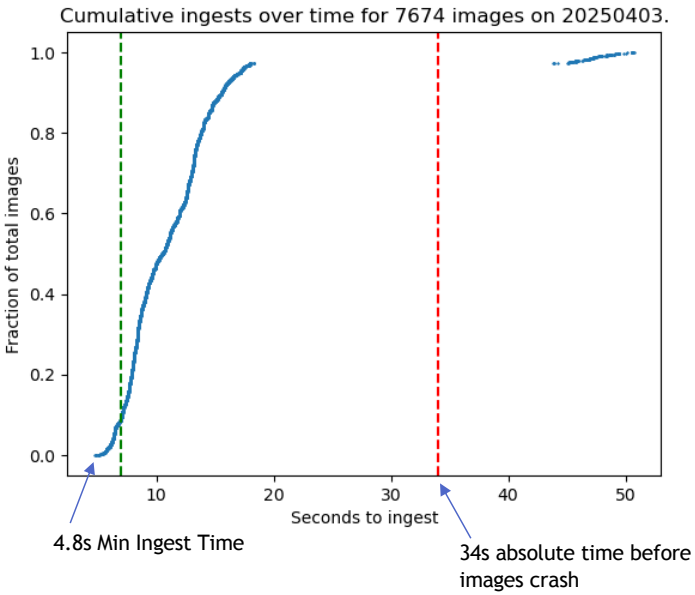
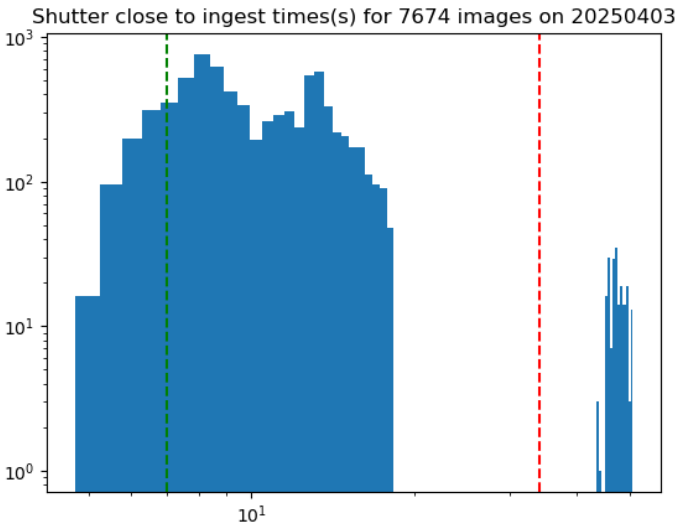
Results: Ingest over time





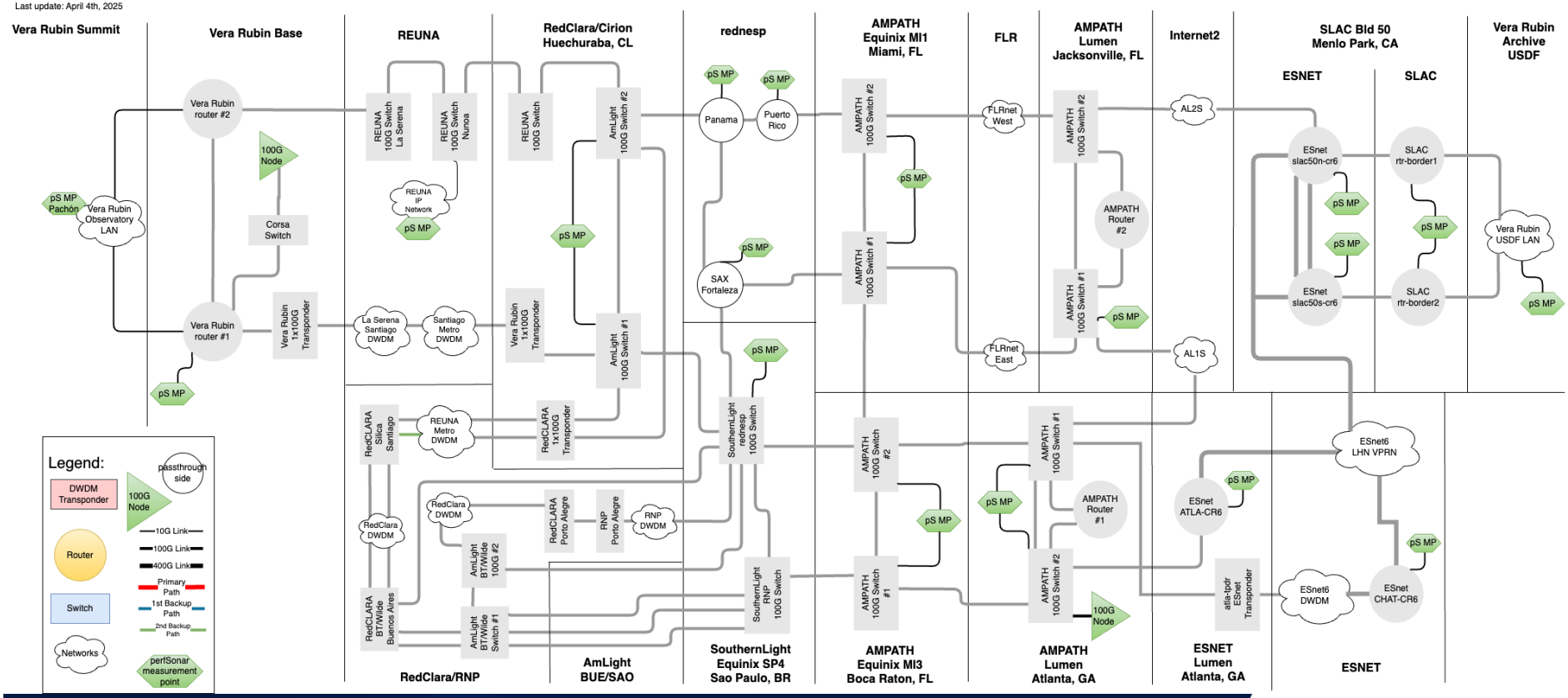
Median time between shutter close and ingest: 11s
Mean time between shutter close and ingest: 12s

Results by Wil O'Mullane

Versioning

Author: NET team
Last update: April 4th, 2025

Vera Rubin Observatory LHN - Measurement Instrumentation



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