RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Understanding and Analysing Internet Connection Issues

Kisteleki Róbert | **HUNOG_3** | 2025-10-02

What We'll Cover

What we'll cover:

- Problems "somewhere on the Internet" that may have consequences to "me"
- How we can learn more and what tools are available - at least some of them

What we'll **not** cover:

- Problems on your own network, i.e. internal network monitoring and tools

Preparing in Advance or Not?

Two Major Approaches

Continuous monitoring:

- When there's time and and a will to prepare **in advance**
- Set up a tool, start periodic data collection
- Establish a baseline, observe **deviations** from that

Ad-hoc testing:

- When there's a problem **right now** and we'd like to investigate **quickly**
- Also when the issue is not anticipated

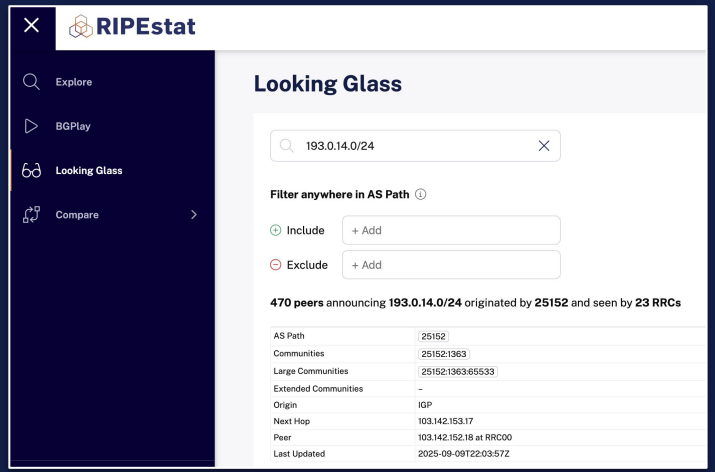
Control Plane

Control Plane - BGP Monitoring and Querying

Looking glasses

A peek into BGP “from the other side” - do my routes get there?

- RIPEstat has a RIS based looking glass
- Many, many public ones, just highlights:
  - bgp.tools
  - Hurricane Electric
  - Cogent
  - …and 1,000s more!

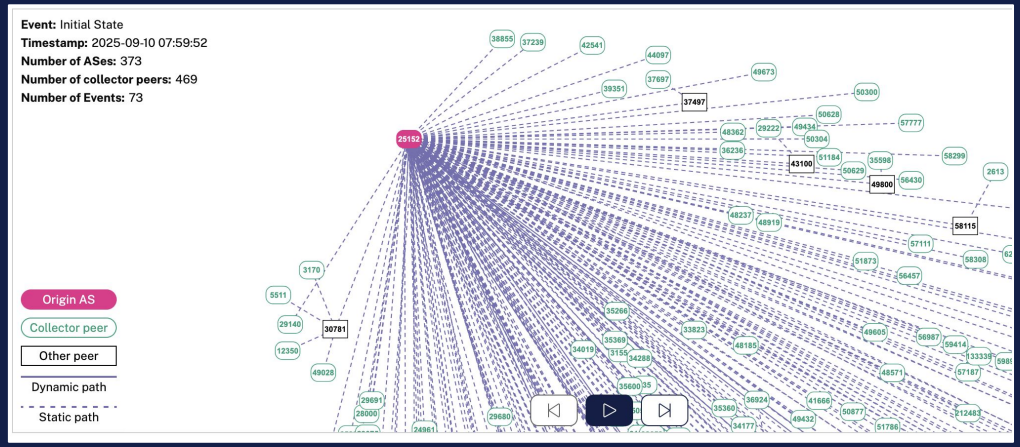


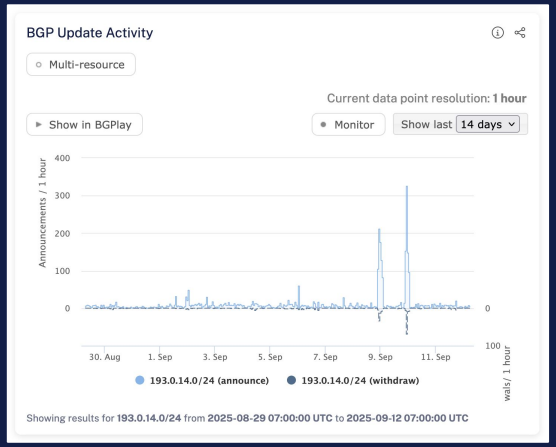
Control Plane - BGP Monitoring and Querying

BGP Activity

Sometimes it’s best to understand what precisely happened:

- BGP Update Activity in RIPEstat
- BGPlay to replay BGP events/propagation as an animation



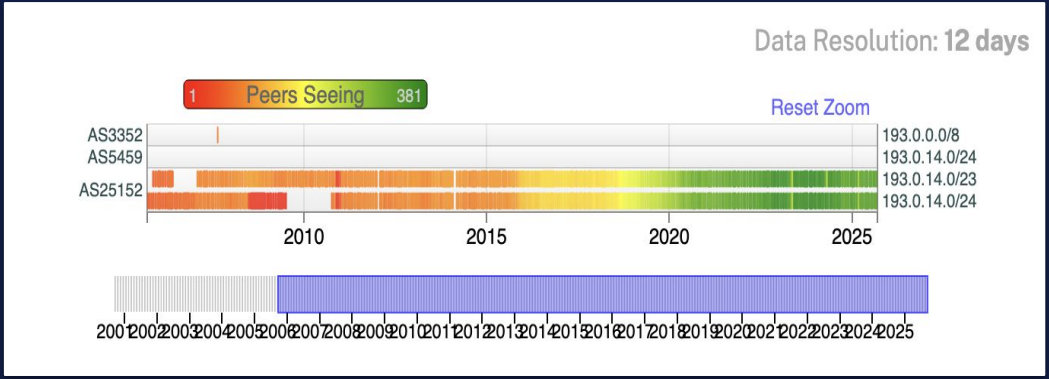


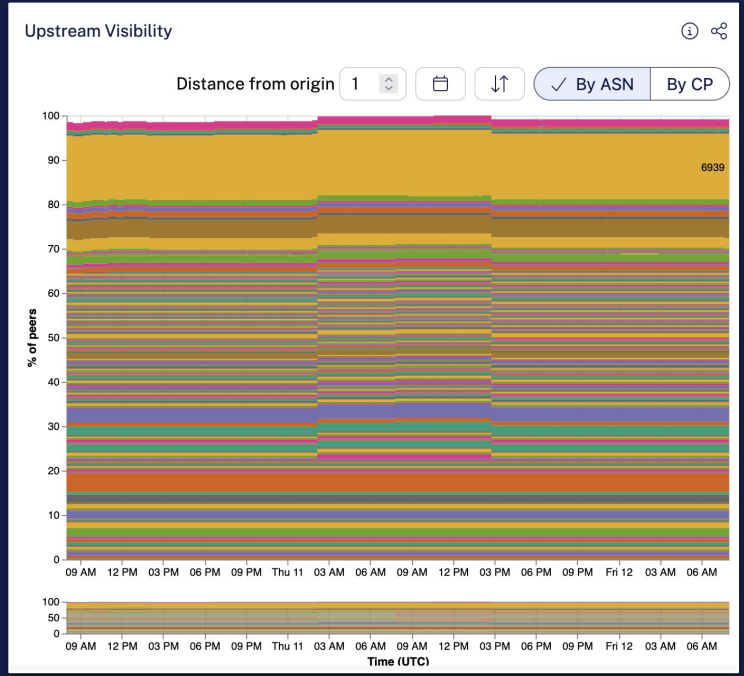
Control Plane - BGP Monitoring and Querying

BGP Visibility, History

Longer term views:

- Routing history in RIS
- Upstream Visibility in RIS



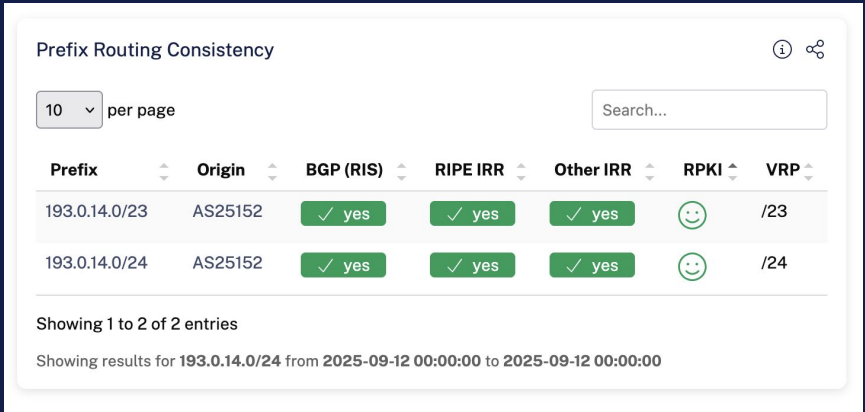


Control Plane - BGP Monitoring & Querying

Don’t forget RPKI

RPKI can affect prefix visibility in real time

- Check your Prefix Routing Consistency
- ROAs (ROV), BGPSEC, ASPA validation can affect prefix visibility
- Validation and filtering “happens elsewhere”!



Data Plane

The Basic Tools - Old and New

Of course we've had our tools for network debugging for ages now:

- ping
- traceroute
- dig
- "my traceroute" (mtr)
- …

There's also NLNOG RING and RIPE Atlas as well

Measuring Damage with RIPE Atlas

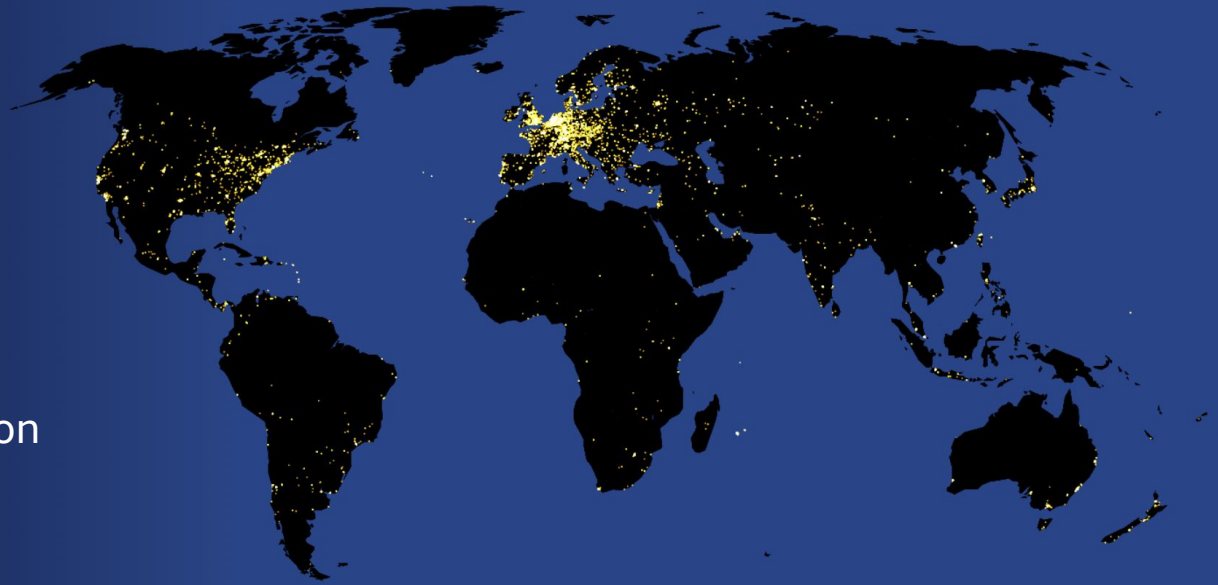
RIPE Atlas

A global network of probes measuring the Internet in real time

13,400+ probes connected

800+ anchors deployed

35,000+ daily measurements on average (both user-defined and built-in)



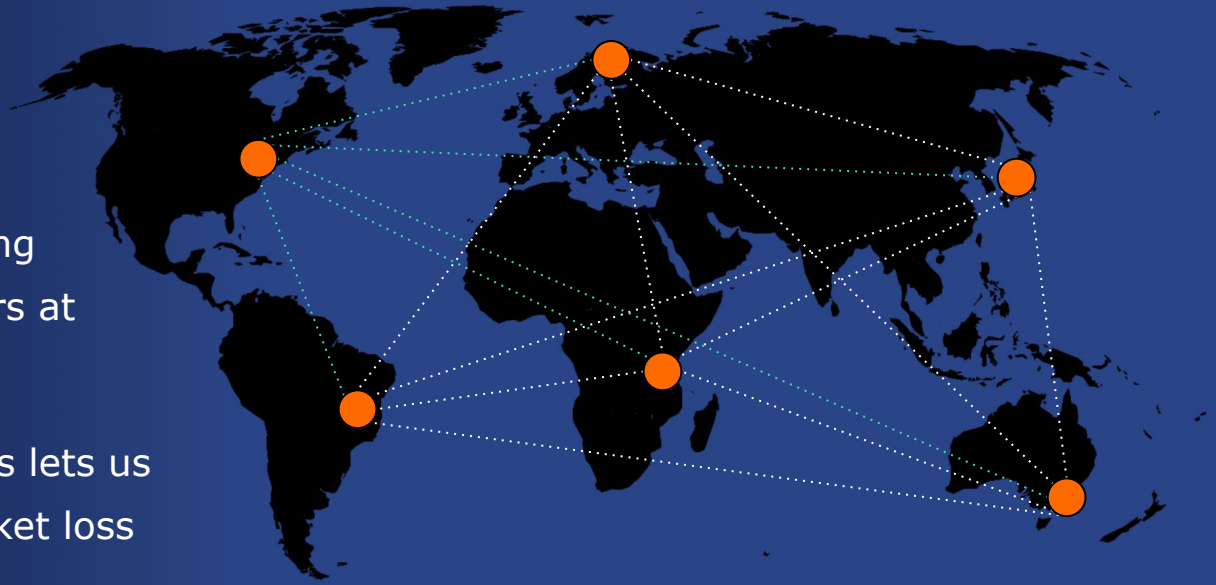
Measuring Damage with RIPE Atlas

Anchor mesh

RIPE Atlas anchors support ping, traceroute, DNS, HTTP/S measurements

Each anchor performs ongoing ping measurements to all other anchors at four-minute intervals

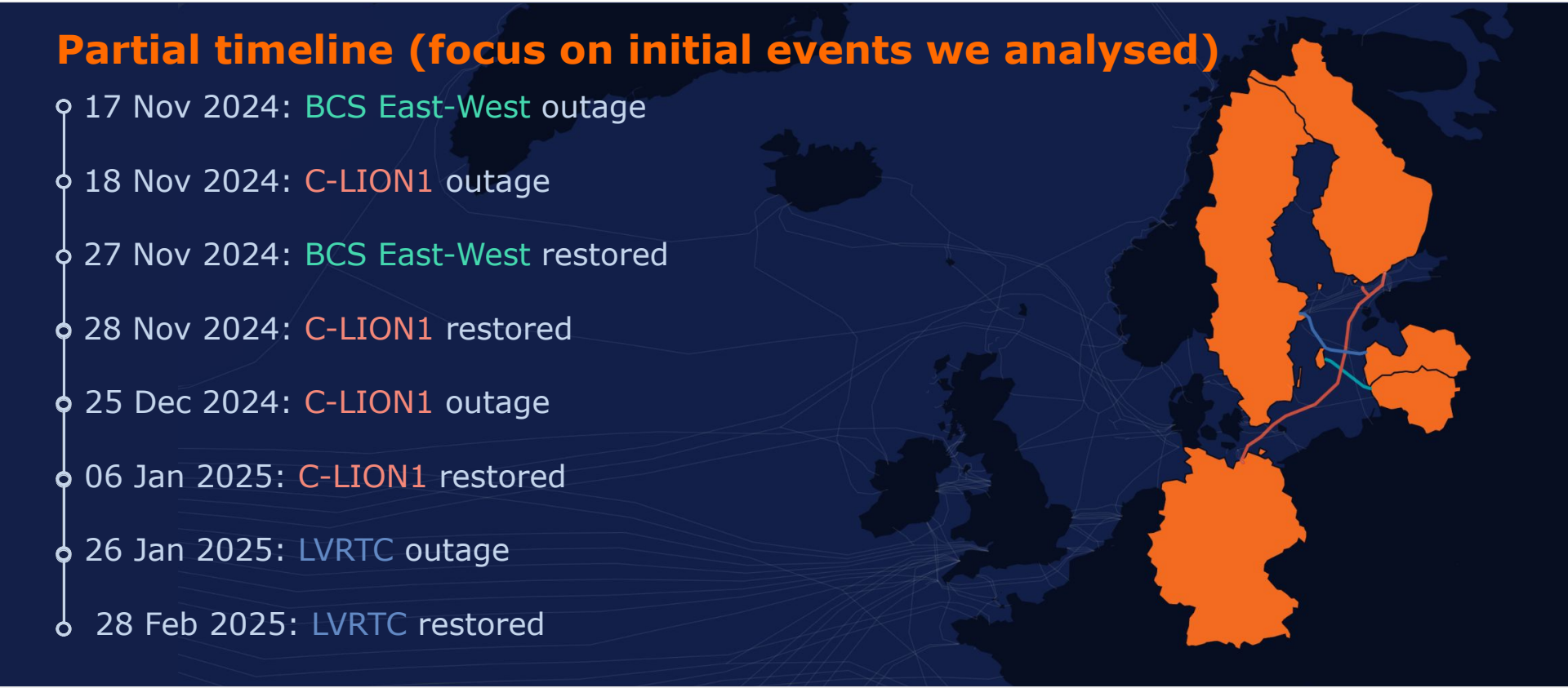
Resulting ‘mesh’ of measurements lets us observe latency changes and packet loss between anchors



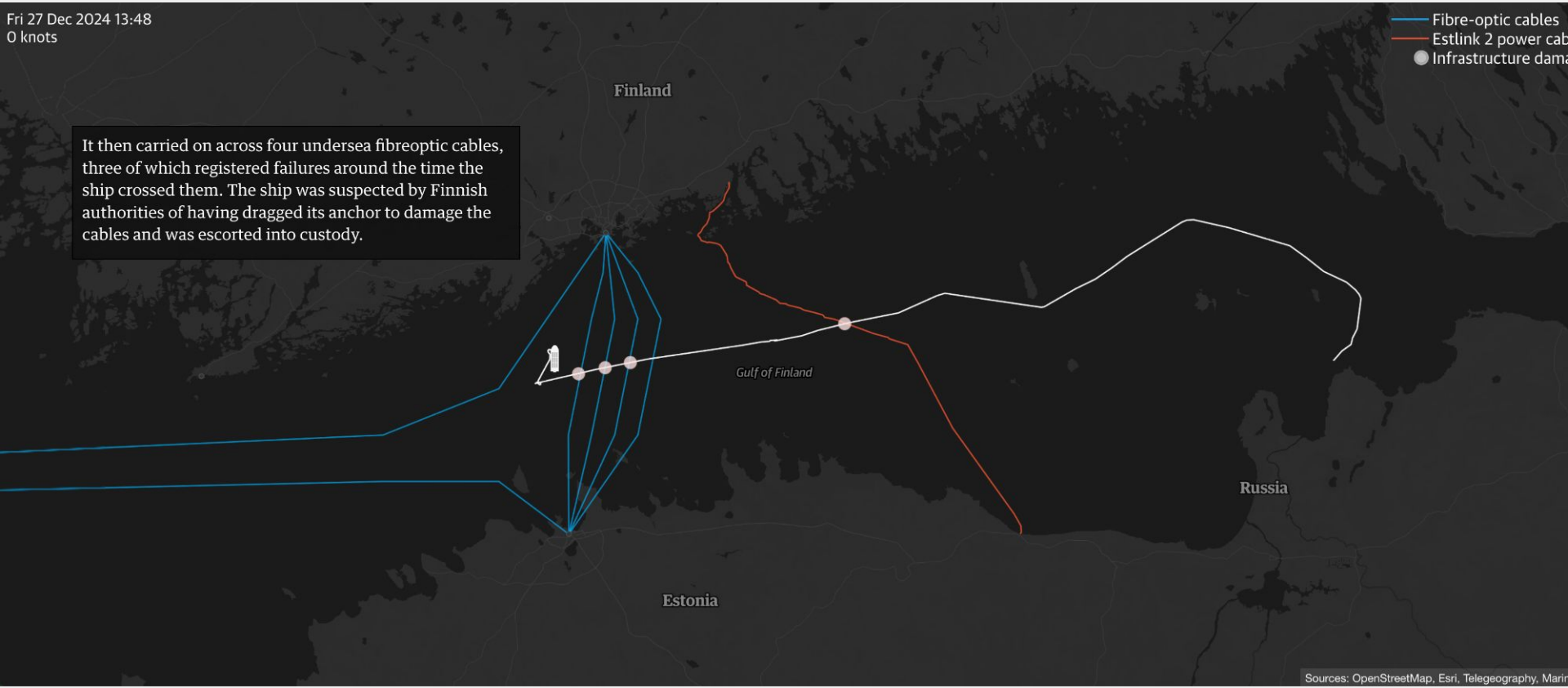
Baltic Sea Cable Damage

Partial timeline (focus on initial events we analysed)

- 17 Nov 2024: BCS East-West outage
- 18 Nov 2024: C-LION1 outage
- 27 Nov 2024: BCS East-West restored
- 28 Nov 2024: C-LION1 restored
- 25 Dec 2024: C-LION1 outage
- 06 Jan 2025: C-LION1 restored
- 26 Jan 2025: LVRTC outage
- 28 Feb 2025: LVRTC restored



Baltic Sea Cable Damage



First look

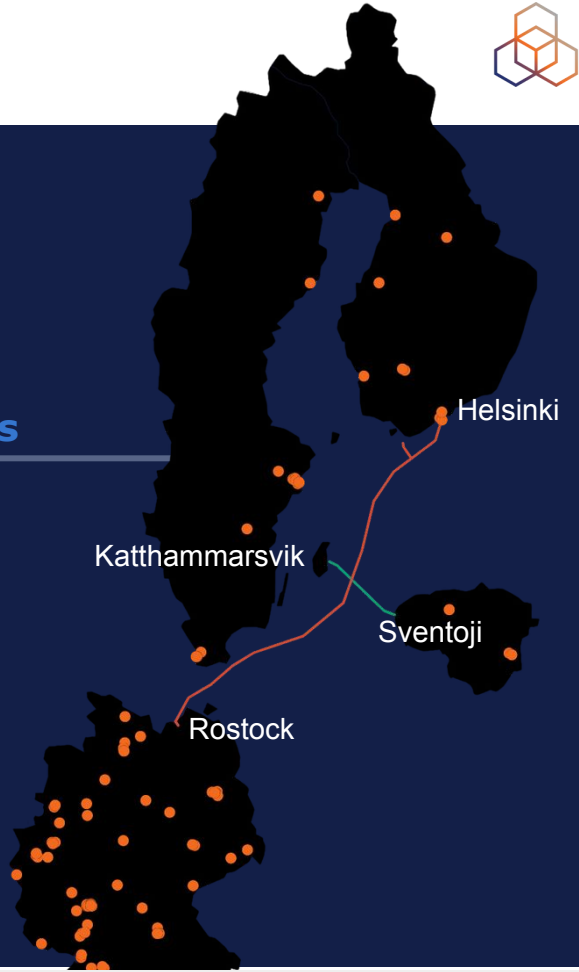
17-18 November

BCS East-West: Sweden-Lithuania

C-LION1: Germany-Finland

We looked at results in the RIPE Atlas anchor mesh between these countries around reported time of the event.

Country	# anchors
Germany:	100
Sweden:	15
Finland:	12
Lithuania:	5



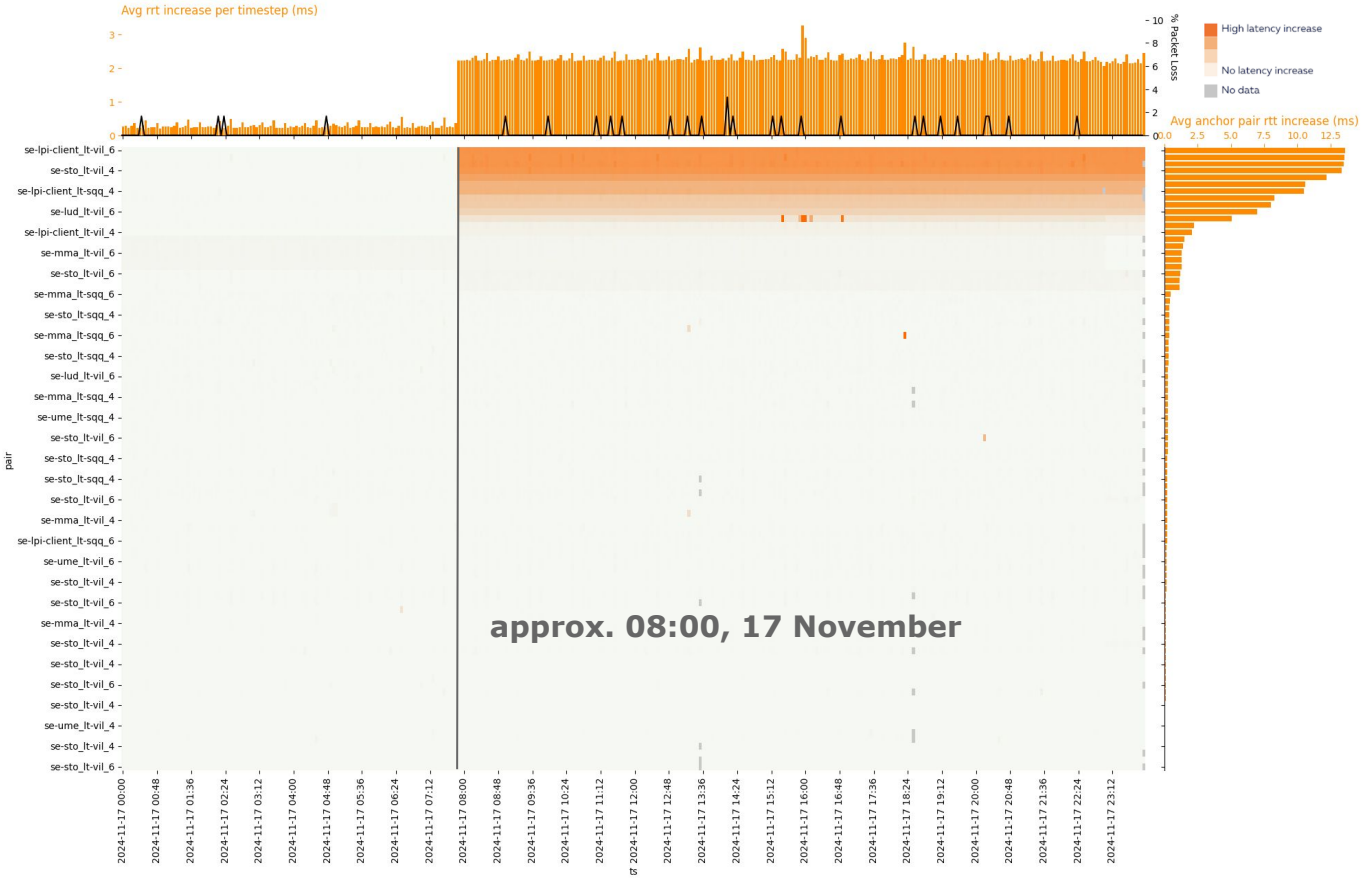
BCS East West

Latency shift

12 hour before/after time of event

Latency increase of approx 10-20 ms shortly before 08:00 UTC on 17 November

We subtract the minimum latency for a path during our observation period to make the latency jumps comparable



BCS East West

Packet loss

Baseline of 0% packet loss

(with occasional spikes)

No significant increase in packet loss at time of the cable outage (shortly before 08:00 UTC)

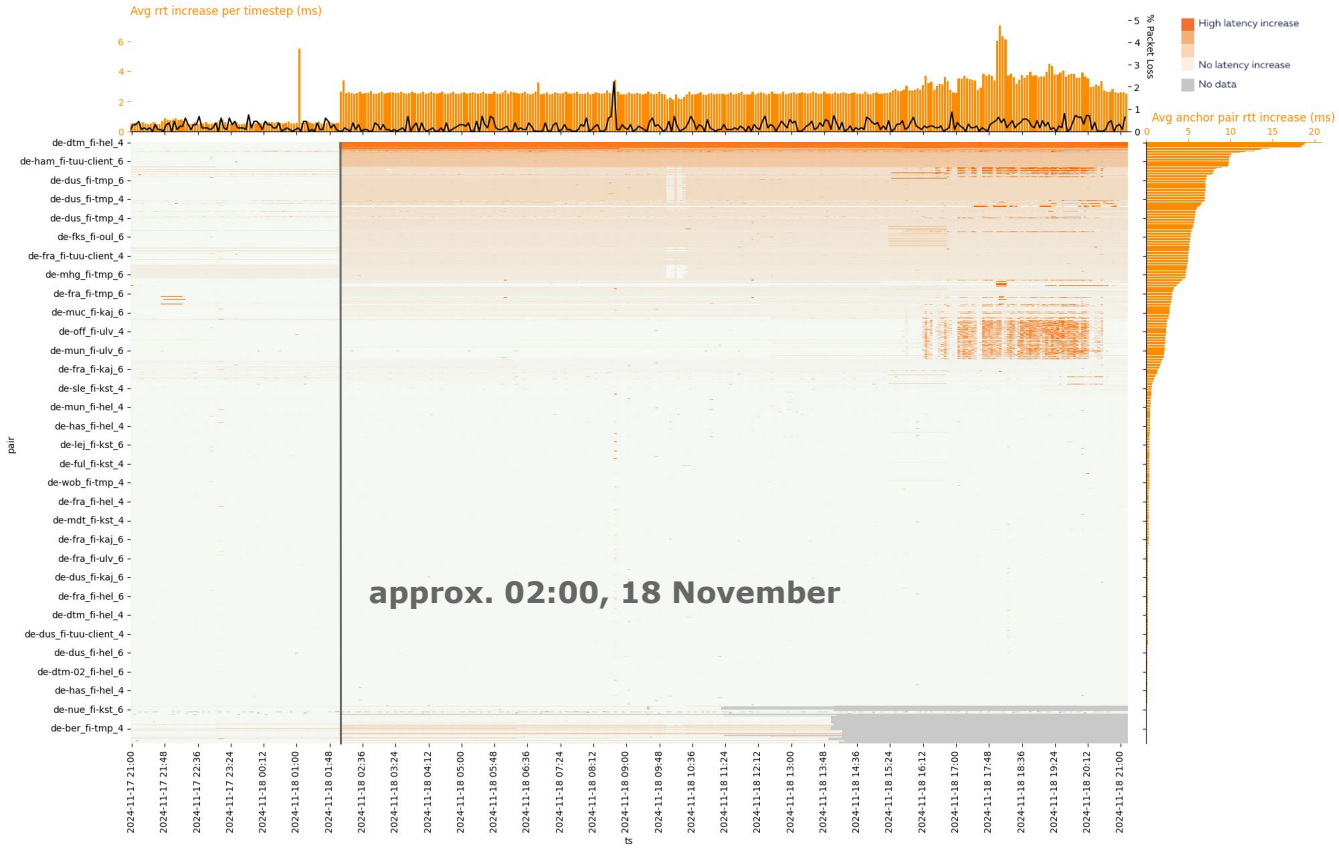
C-LION1

Latency shift

Latency increase of approx 5ms a little after
02:00 UTC on
18 November

Packet loss

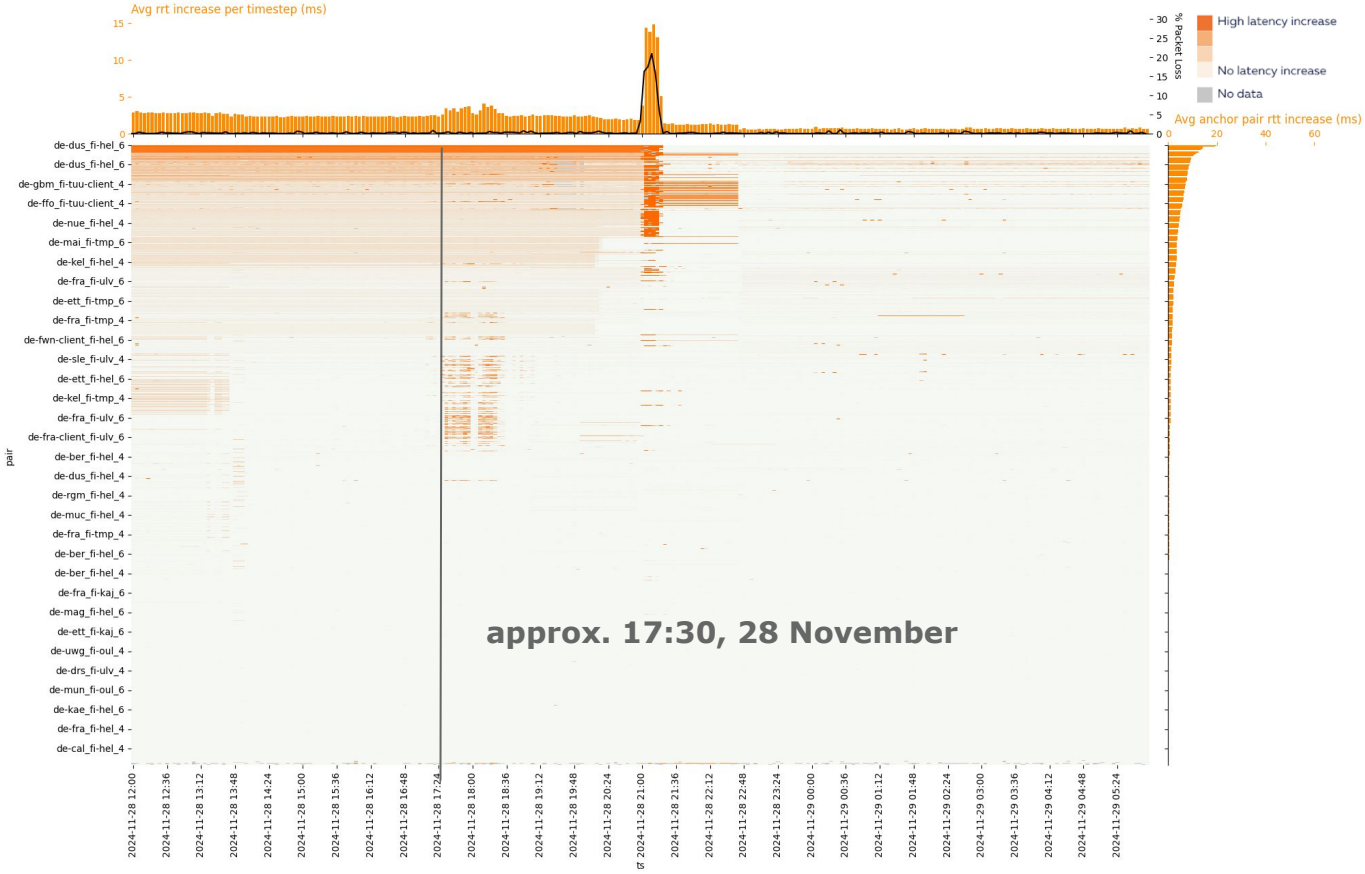
Again, no significant increase in packet loss at time of outage



C-LION1 repair

28 November (17:30 UTC): C-Lion1 cable repair ship reported leaving the area after successful repair

Unclear what exactly causes these latency effects and the temporary increase in packet loss…

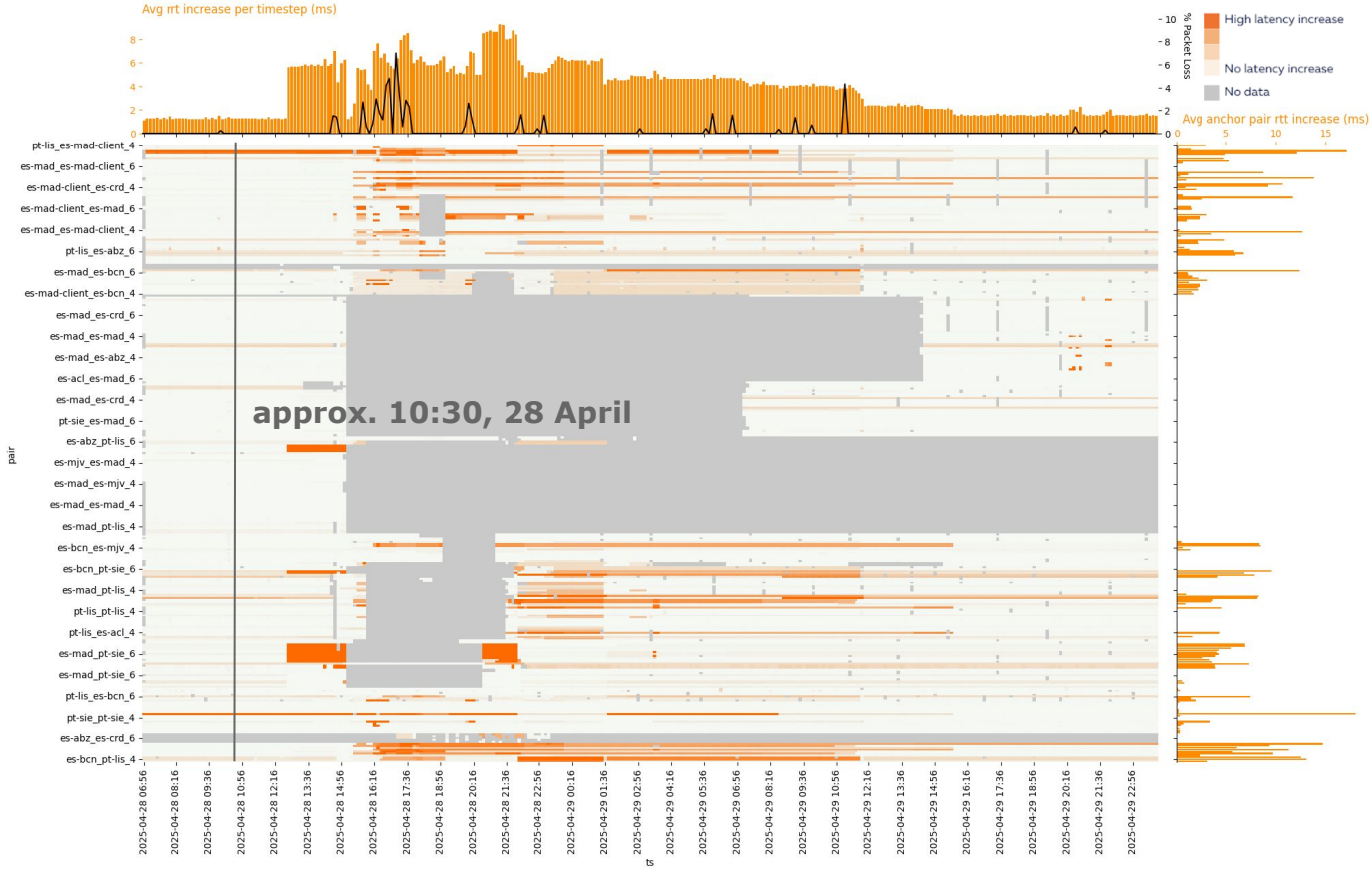


Beyond the Baltic: ES-PT Power Outage April 2025

Anchor mesh measurements - potential for getting insights into outages

Power outage events much harder to measure compared to cable outage events

Due to the infrastructure being brought offline by the event itself

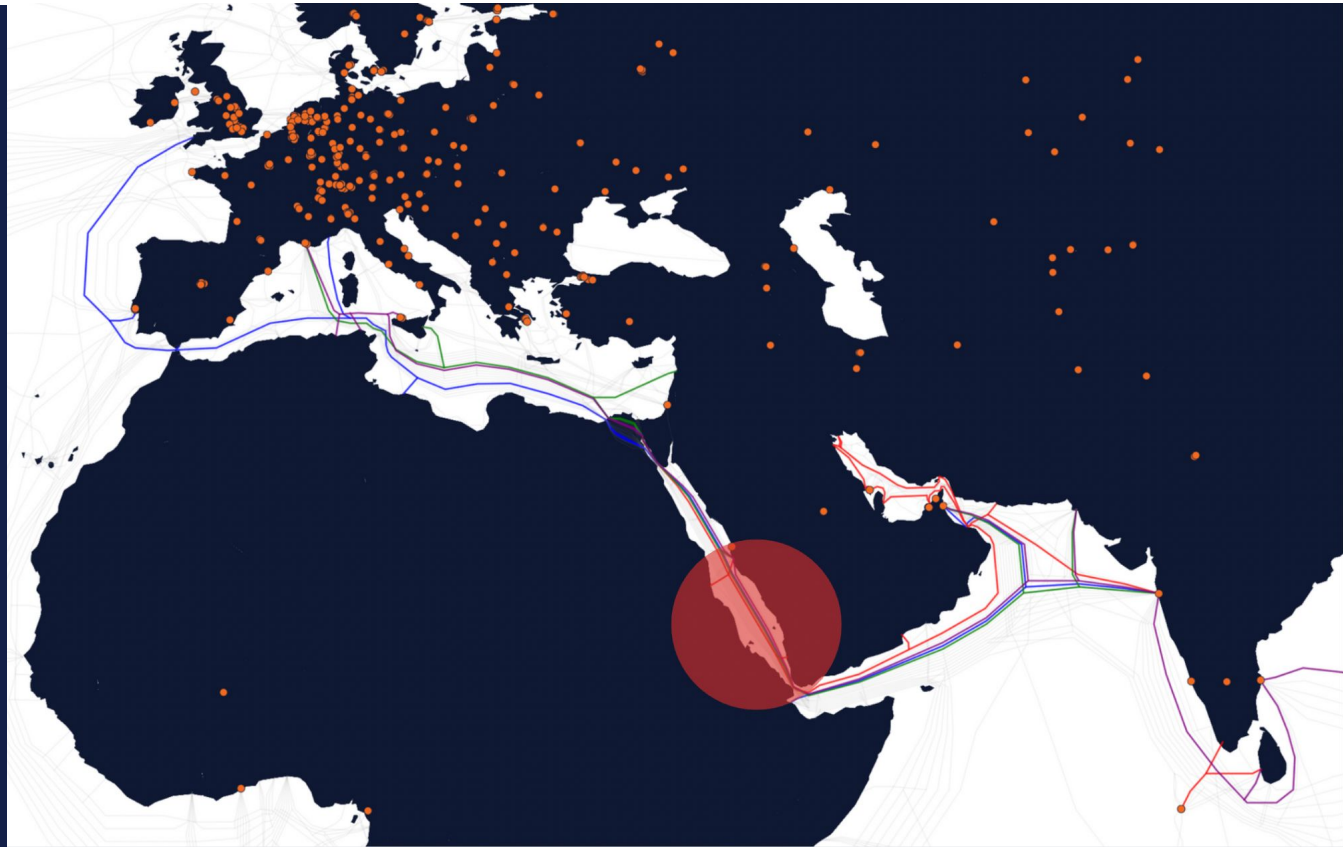


Cable Damage in the Red Sea - September 2025

Cable damage in the Red Sea

6 September 2025: Reports emerge of cable outages in the Red Sea affecting:

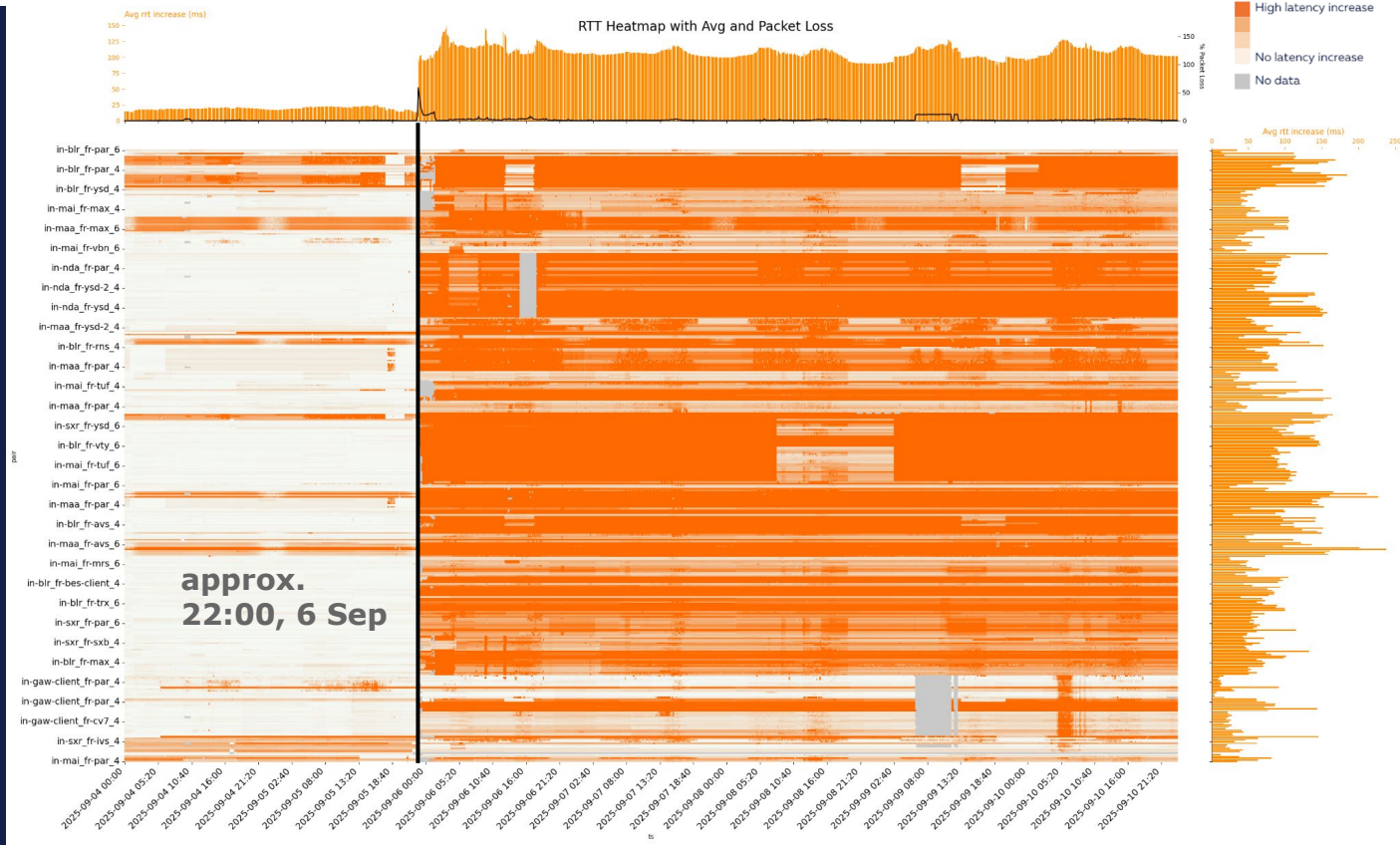
- **FALCON**
- **SeaMeWe-4**
- **WACS: West Africa Cable System**



Cable Damage in the Red Sea - September 2025

Latency shift *with* packet loss

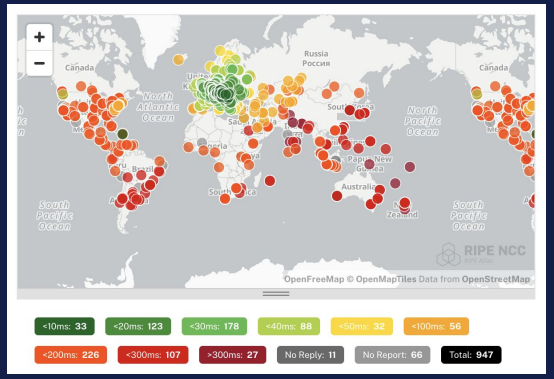
Latency increases of approx 20-30 ms accompanied by concurrent increase in packet loss.

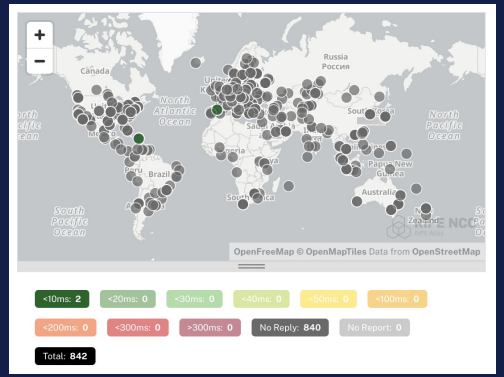


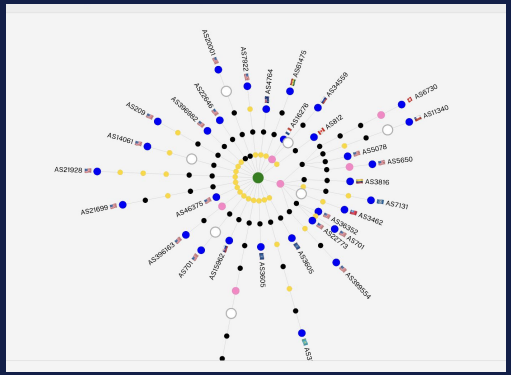
Measure as You Like

Available in RIPE Atlas:

- Reachability Testing (“QuickLook”): real-time ping and traceroute “from and to anywhere”
- Path analysis (“Khipu”): visualise how network paths converge







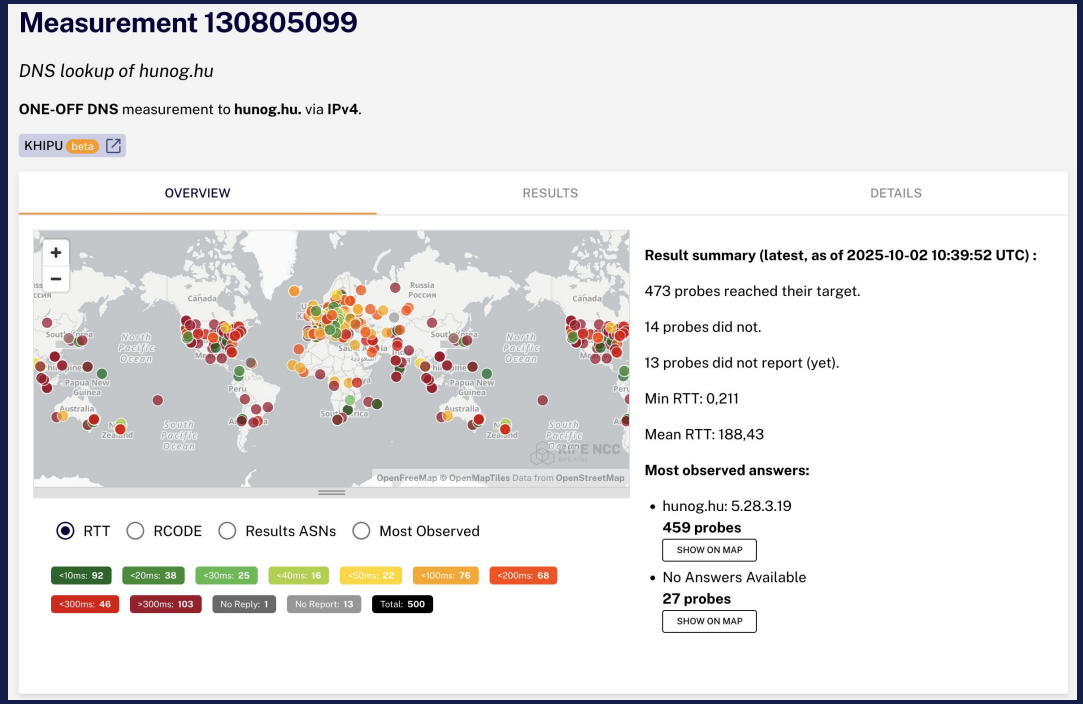
Other Sources and Tools

There’s also Downdetector, Down for Everyone or Just Me and many other services to get signals from about the extent of a website problems

For censorship or network interferences information: OONI

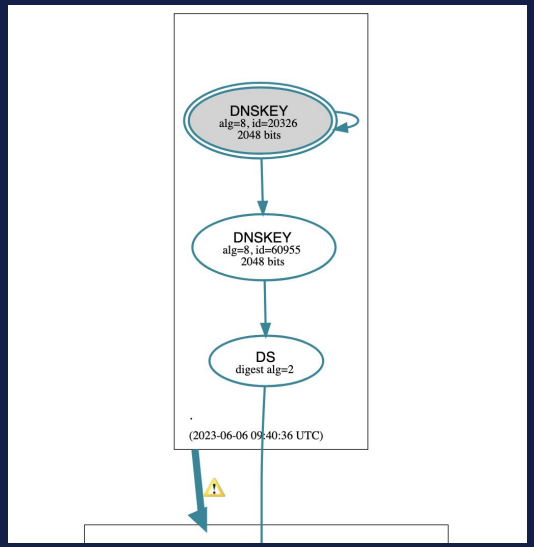
DNS

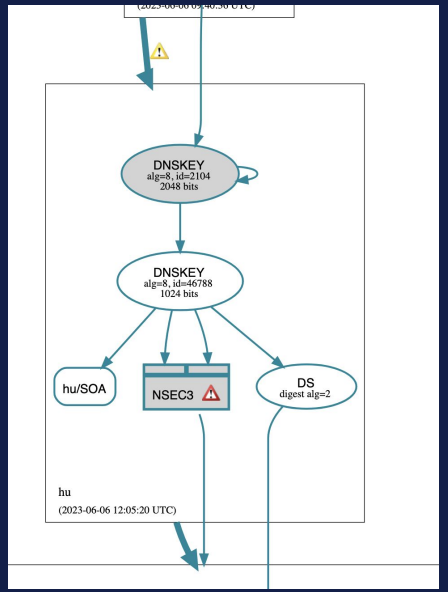
DNS Answers As Seen By RIPE Atlas

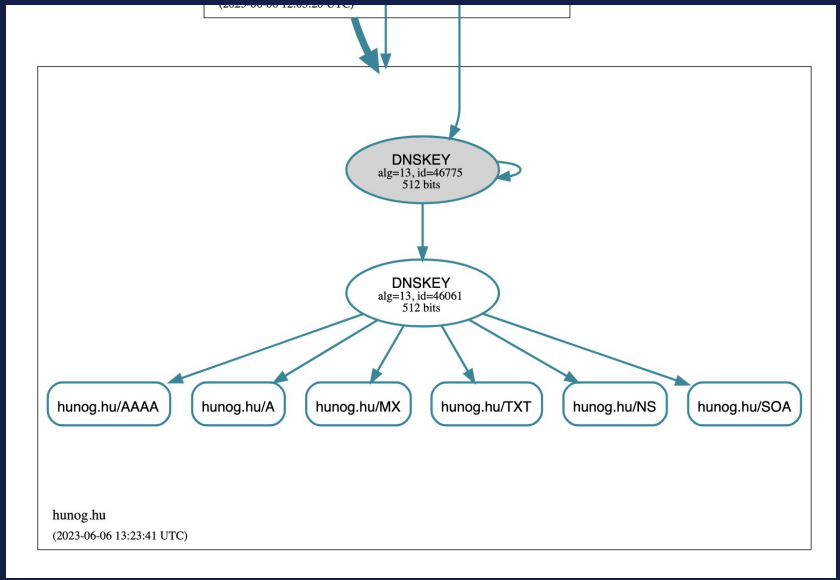


DNSSEC

DNSSEC - dnsviz.net View Of hunog.hu







In The Future:
The Role of AI/ML

The Role of AI/ML

Wouldn’t it be nice to ask your favourite AI agent:

- “Can traffic from currently get from ASx in <city> to BIX?”
- “Was there a latency change between X and Y in the last 10 minutes?”
- “Compare DNS responses about <SOMETHING>.hu across all Hungarian providers and provide me the summary.”

Also:

- Monitoring of, and automatic notifications about, latency changes or packet loss towards my network (ML/anomaly detection)

Public Event Analyses

Public Event Analyses, Reports, Other Sources

Many organisations offer event analyses or reports:

- RIPE NCC on RIPE Labs
- Cloudflare Radar (also @CloudflareRadar)
- Kentik Network Analysis Center
- … and many more

And of course big providers (AWS, Google, Meta, Azure, …) have their own - private - view of the world.

Paid Services

Paid Services and Big Providers

Plenty of providers offer paid services in this area

- At a minimum monitoring, observability and alerting

Many of them integrate several, complementary data sources

- BGP information: collectors, looking glasses, etc.
- Flow information
- Active measurements: either continuous or ad-hoc

Questions & Comments

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THANK YOU!