

TimeMap status & updates

Filippo Landini, Giovanni Cesaroni,
Fabio Farina

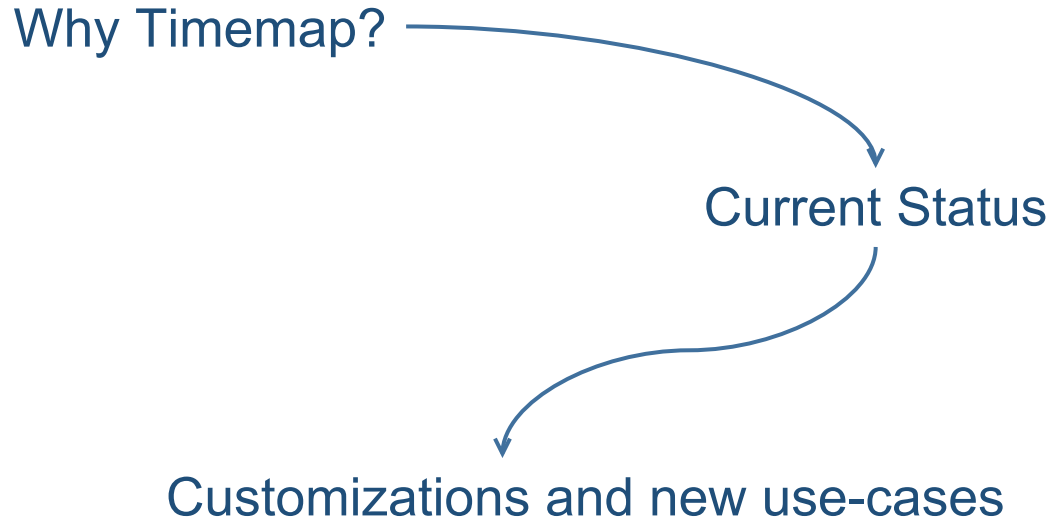
GARR & GN5-2 WP6 T3 team
timemap-dev@lists.geant.org

www.geant.org



TimeMap

Overview



Why TimeMap?



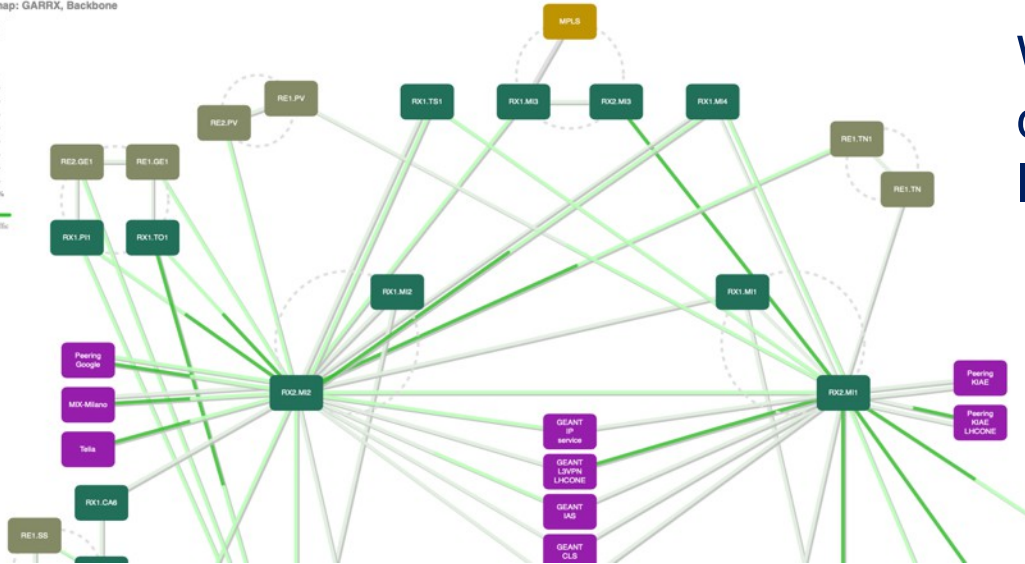
“

if do not monitor you do not control what
you're doing

”

Network Traffic: what do we usually monitor?

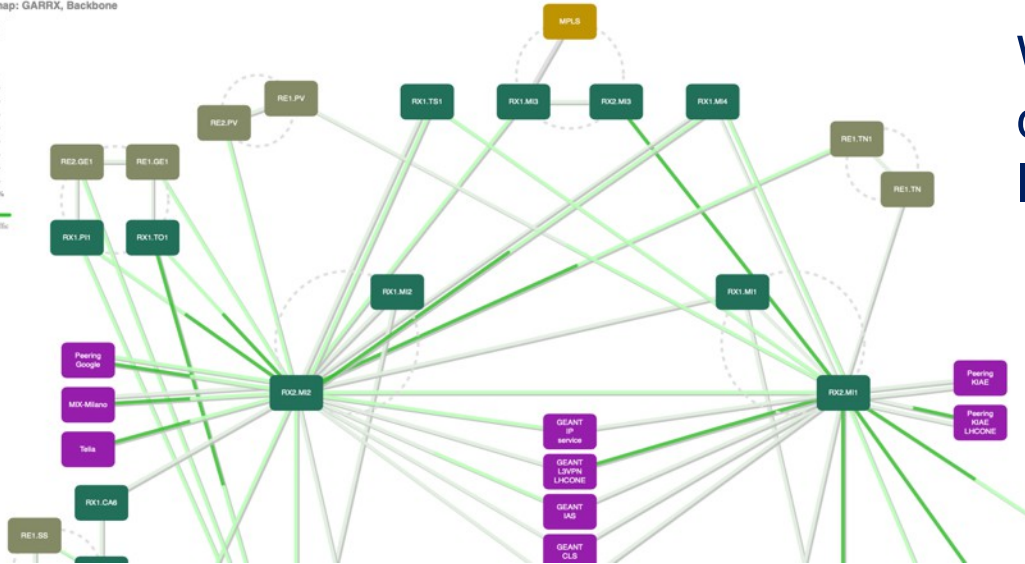
GARR Weathermap: GARRX, Backbone



Weather map are built to display capacity, load in bit/sec

Network Traffic: what do we usually monitor?

GARR Weathermap: GARRX, Backbone



Weather map are built to display capacity, load in bit/sec

...how about latency & jitter?

Real-time application sensitive to Latency & Jitter: LoLa

Audio-video service form performing arts, where musicians are physically in remote sites, connected by advanced network services (GEANT, NRENs).



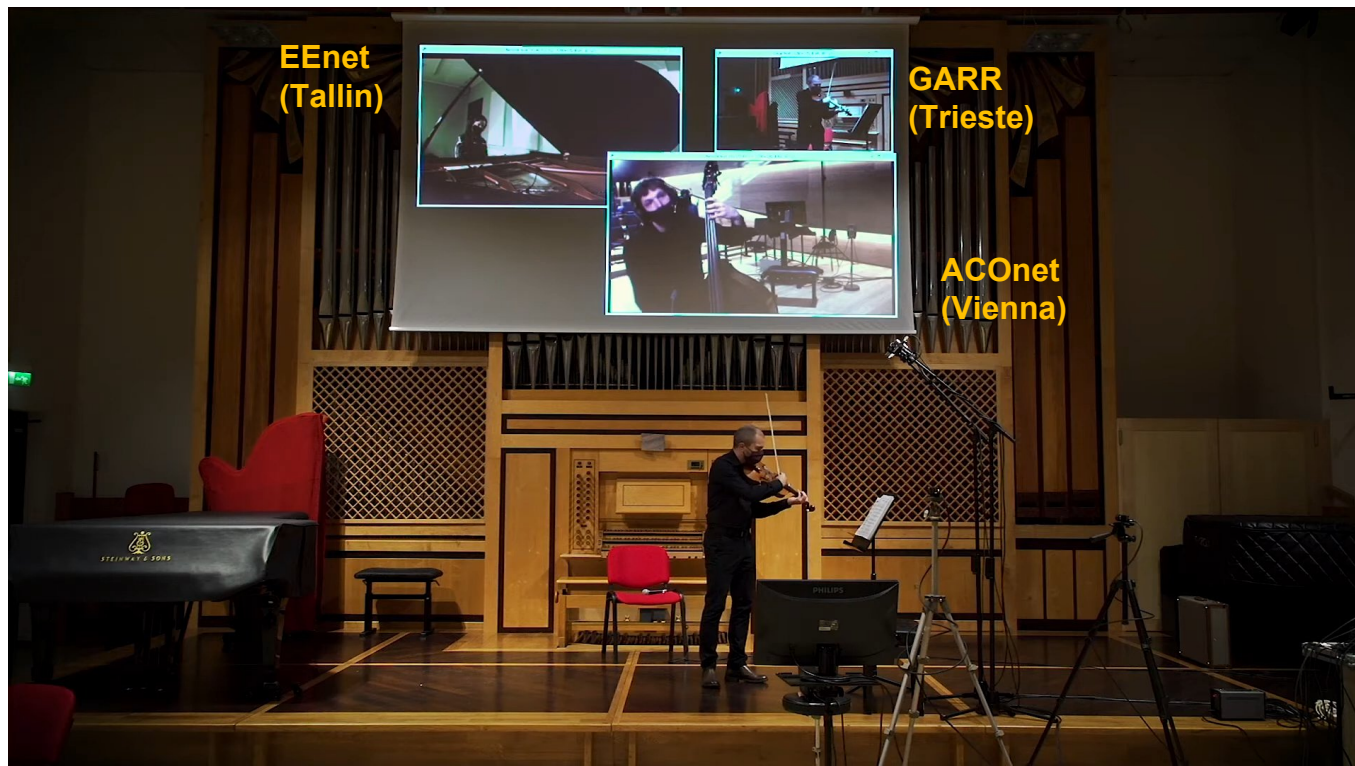
Real-time based on a **constant flow** of data:
any change in jitter
can lead to errors in
audio/video

LoLa: Low Latency AV Streaming System

www.geant.org



Real-time application sensitive to Latency & Jitter: LoLa



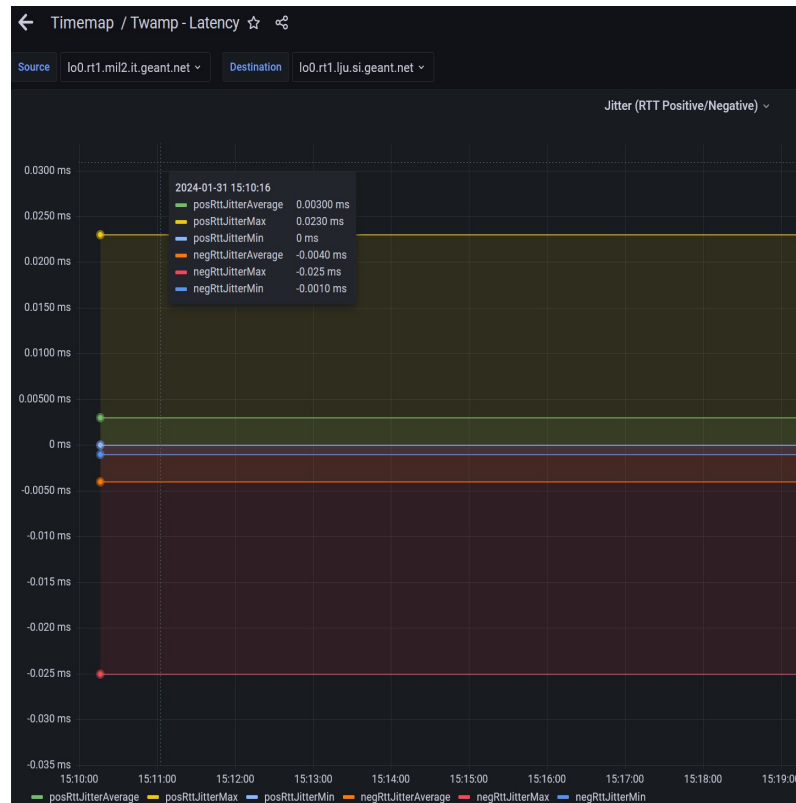
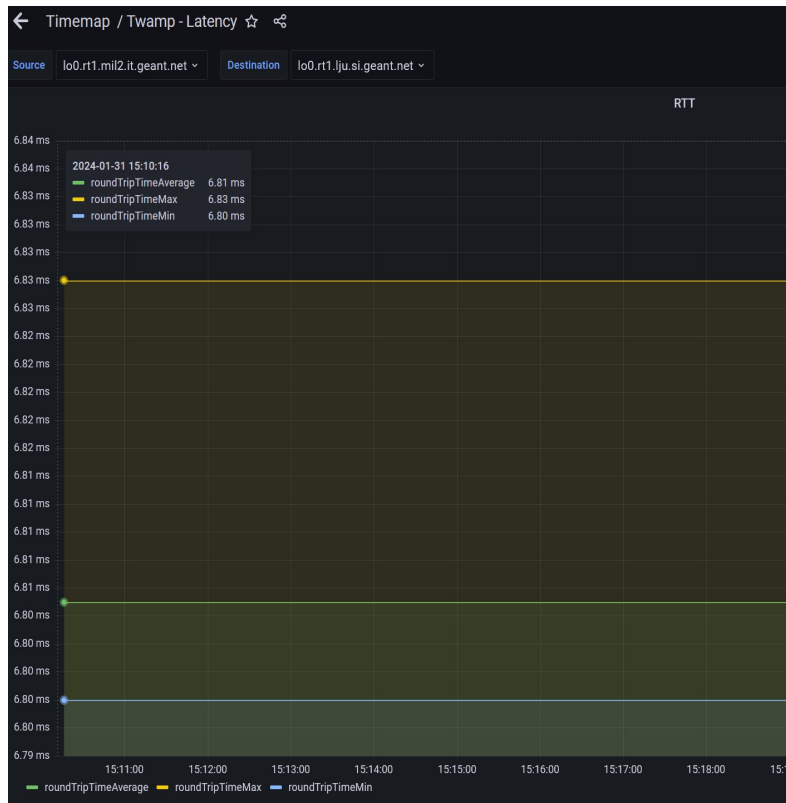
LoLa: Low Latency AV Streaming System

[47th AEC Annual Congress \(2020\)](#)

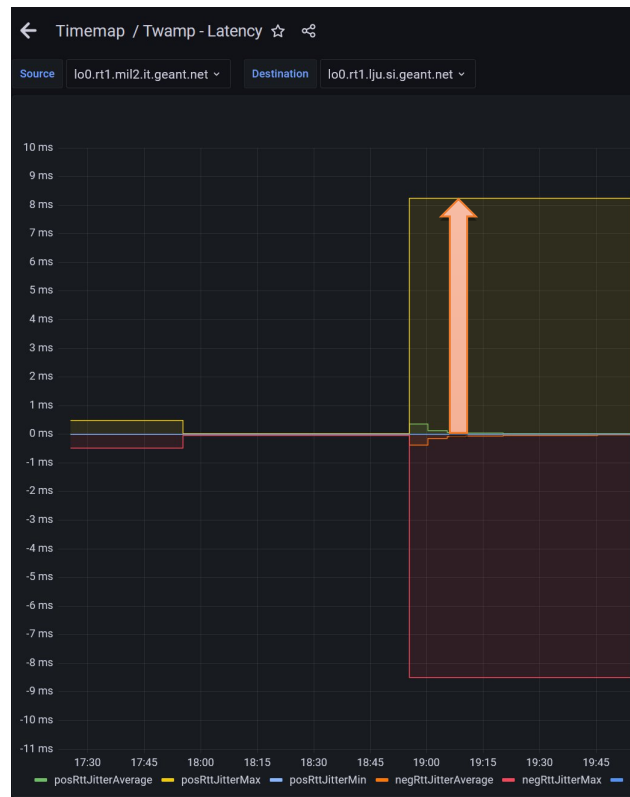
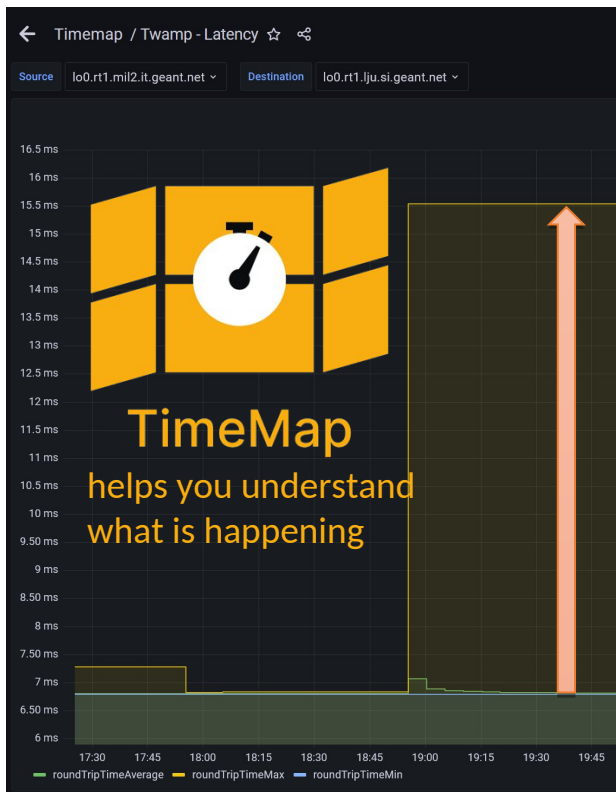
www.geant.org



Active measurements – all network segments good 👍



During the rehearsal...



Why TimeMap

We need to monitor "the hidden"

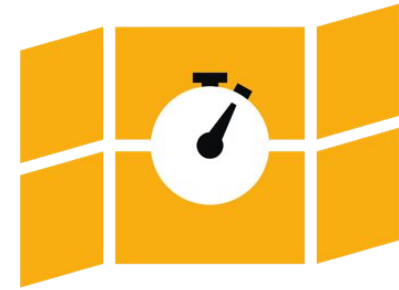
- latency
- jitter

We need to keep track of "the hidden"

- historic series

We need to find anomalies in "the hidden"

- machine learning
- alarms
- call the right NOC for the right network segment

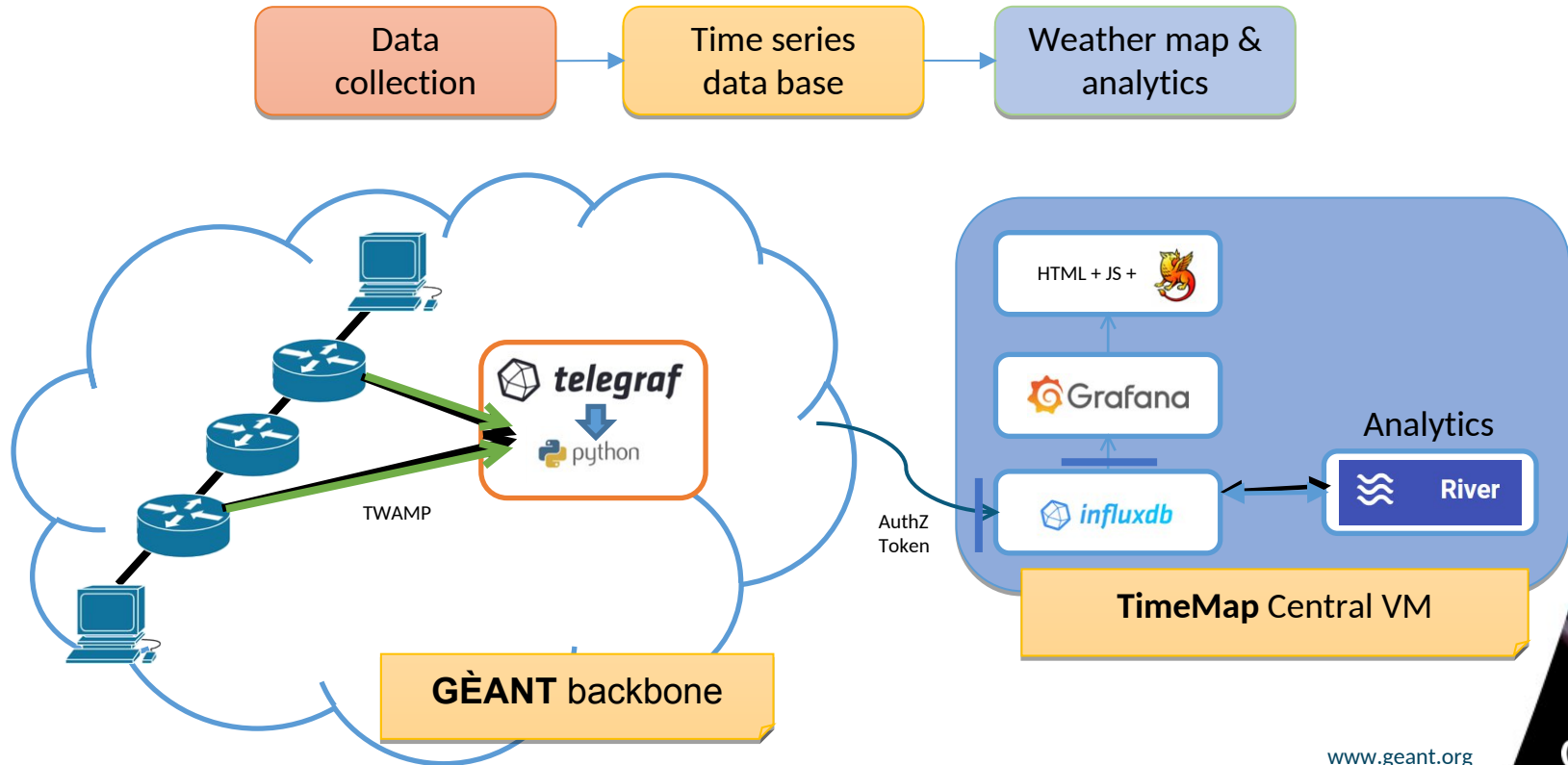


TimeMap

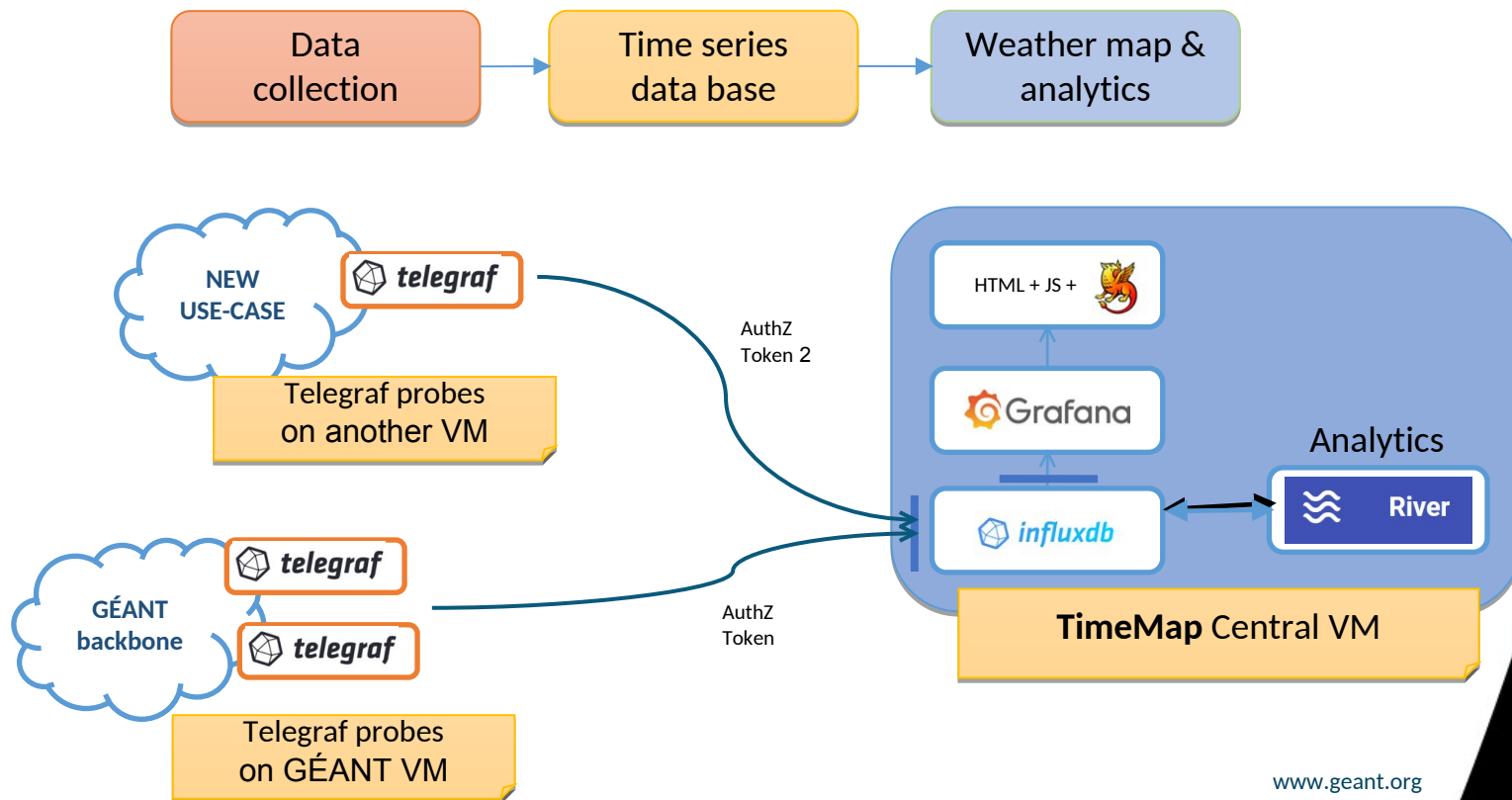
TimeMap technical requirements

- **Agile design:**
 - Scalable micro-services, easy to deploy, **minimal custom code**
 - As neutral as possible: **monitoring standards and FOSS**
- **Security**, with federated access control:
 - **eduGAIN** authentication
 - Role Based Access Control, API tokens, multi-tenancy
- **Dynamic:** almost no changes needed when networks change

TimeMap architecture



TimeMap architecture



Current Status: TimeMap instance for the GÉANT backbone

- The service on GEANT backbone

<https://timemap.geant.org/>

- Documentation: source code, user and admin guides, customization

https://gitlab.software.geant.org/gn4-3-wp6-t1-lola/timemap_public

Current Status



TimeMap

Welcome to TimeMap! TimeMap is a tool that collects and visualises latency and jitter measurements over the Géant backbone. TimeMap helps in verifying network anomalies and performance issues.

For security reasons, to access this website eduGain login is required.
The service does not involve processing of personal data.
Find more information about the processing of your data [here](#)

NEW GEOMAP WITH
EDUGAIN

LEGACY VIEW WITH
EDUGAIN

OR LEAVE THIS PAGE

TimeMap has been created by the GN4-3 WP6 T1 group. 2020-2022
For information write to [WP6-T1 contact](#)



As part of the GÉANT 2020 Framework Partnership Agreement (FPA), the project receives funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 856726 (GN4-3)

Home-page

<https://timemap.geant.org/>

www.geant.org



The legacy view: right-click on link

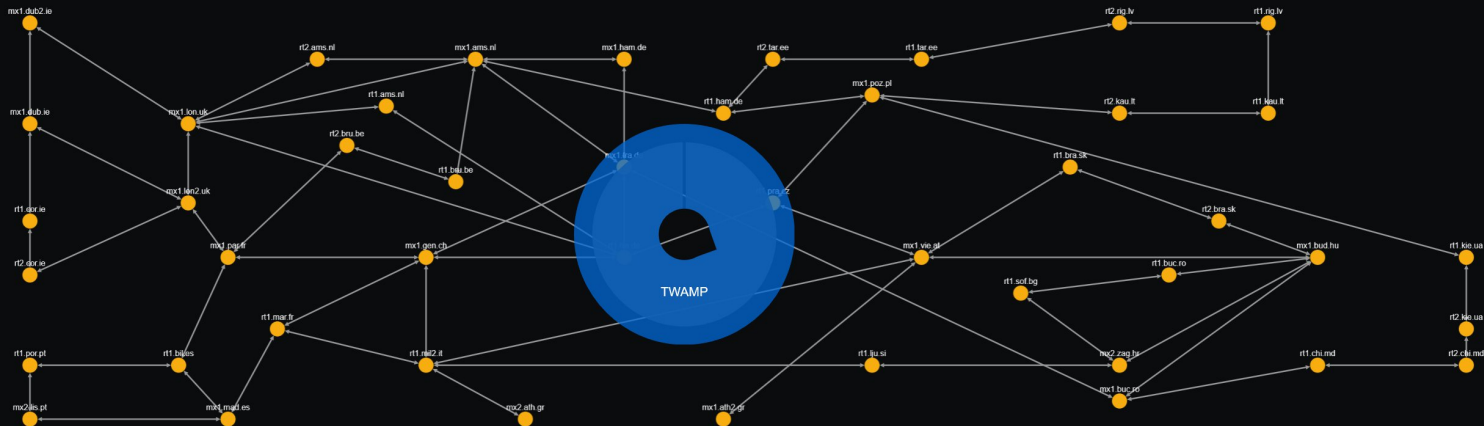
Latency-Jitter Weathermap

Click on a link to select

Hold click to open the menu. Drag'n'drop to pan and zoom

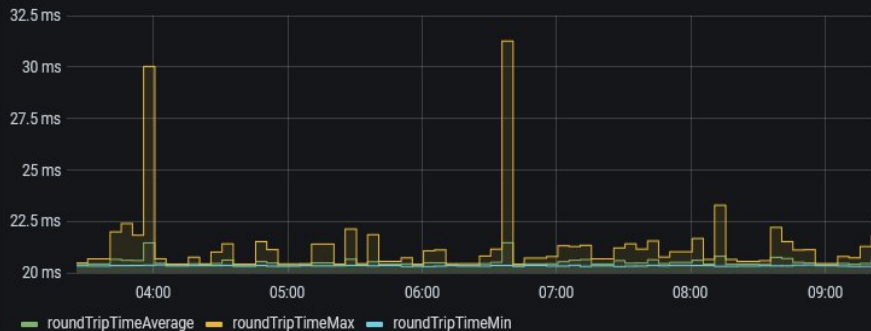
Preferred browsers: Chrome, Chromium-like, Firefox

Cytoscape

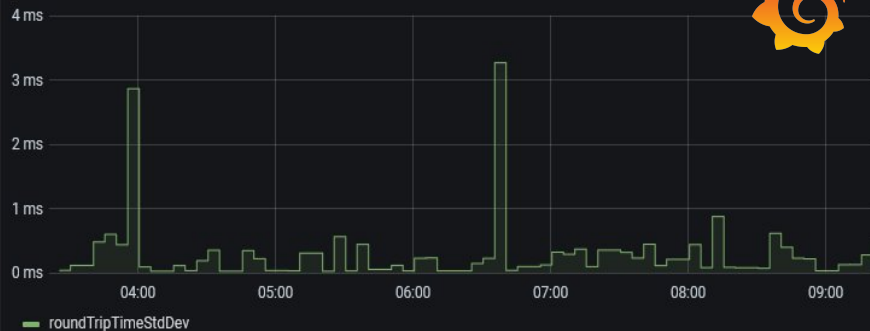


Observations

RTT



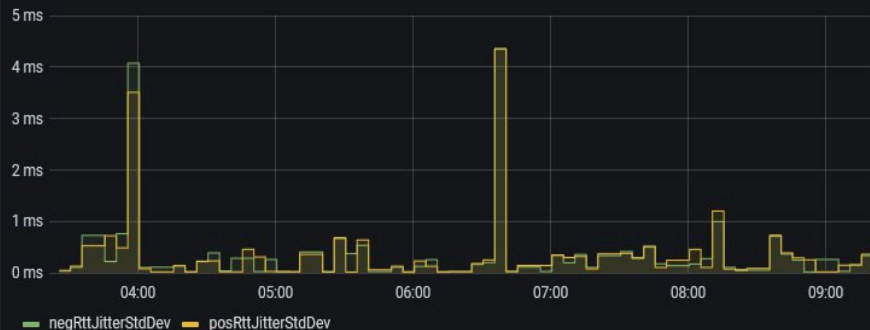
RTT Deviation ▾



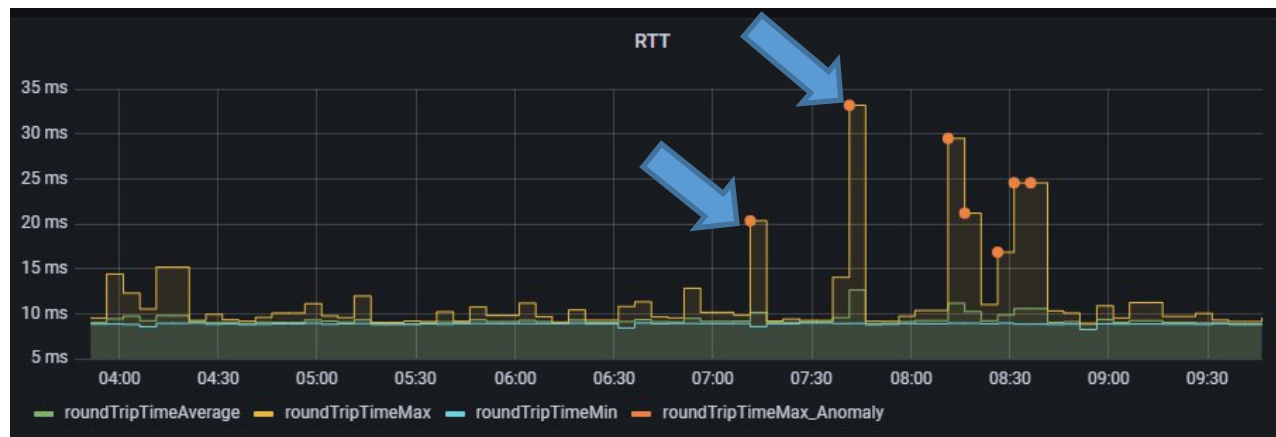
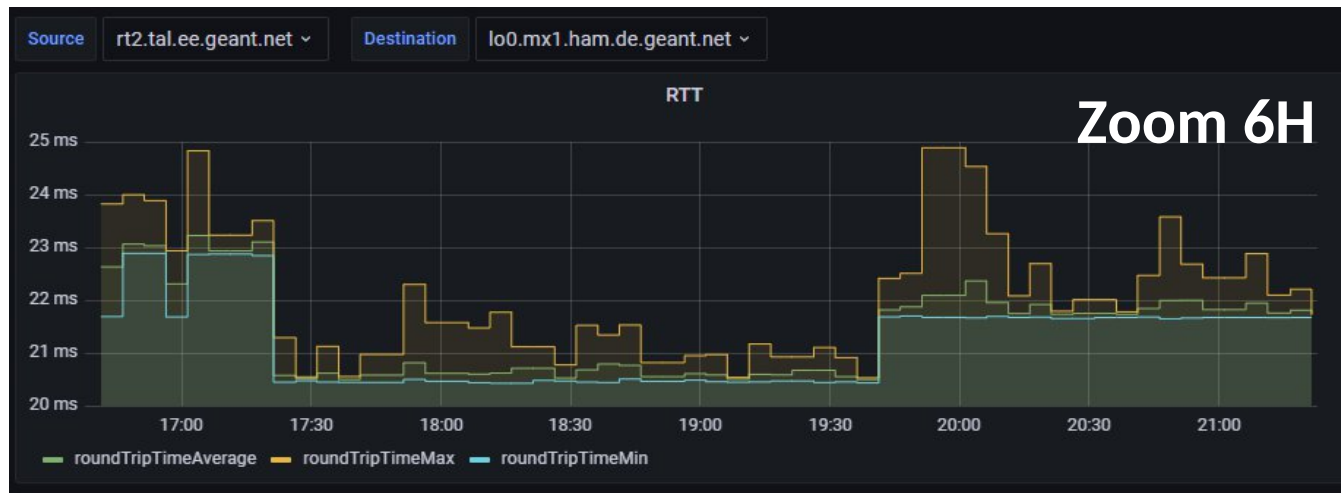
Jitter (RTT Positive/Negative)



Jitter Deviations



Re-routing



Anomaly
Detection
in action

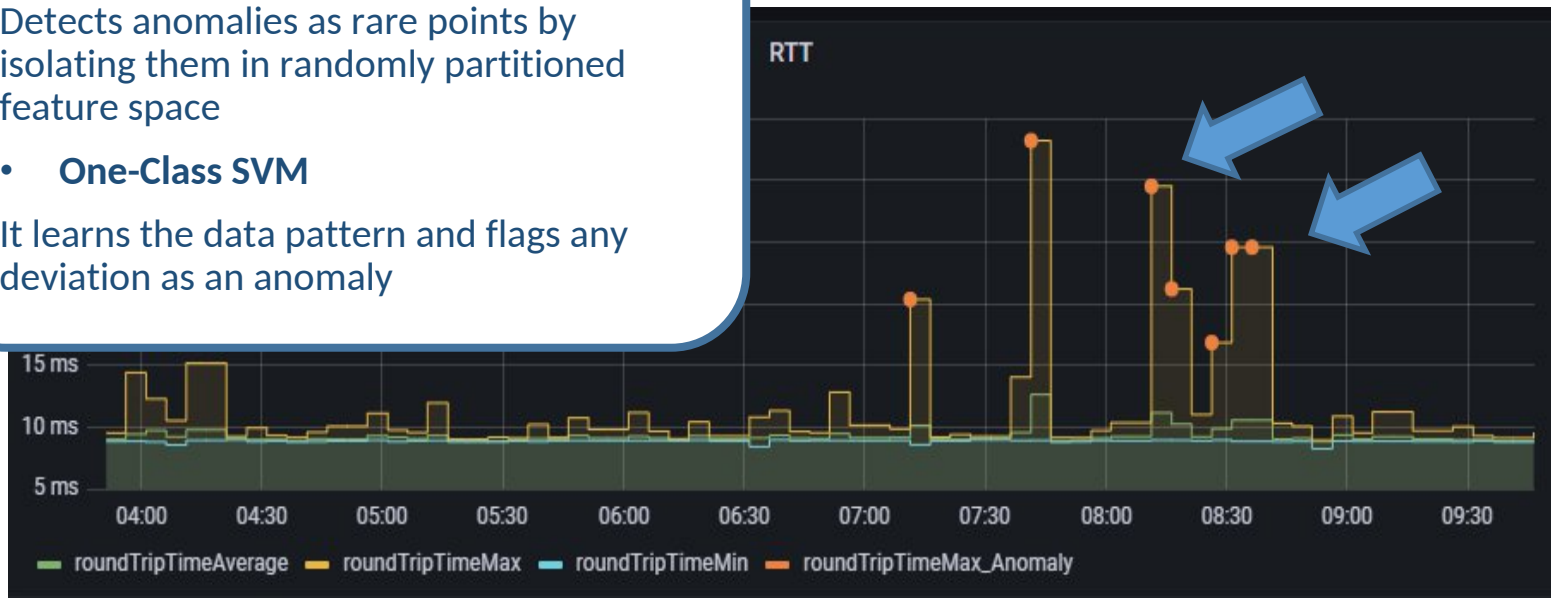
Streaming Anomaly Detection — River

- **Half-Space Trees (HST)**

Detects anomalies as rare points by isolating them in randomly partitioned feature space

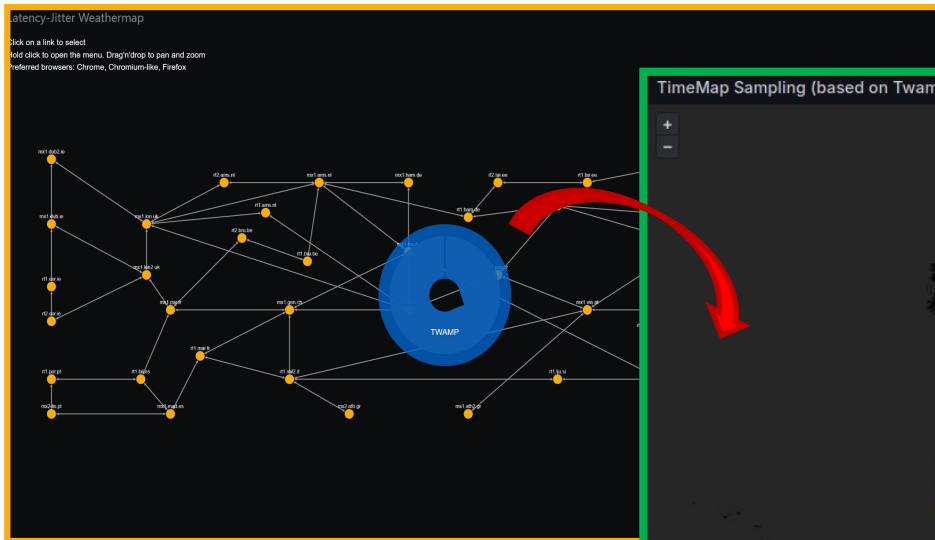
- **One-Class SVM**

It learns the data pattern and flags any deviation as an anomaly

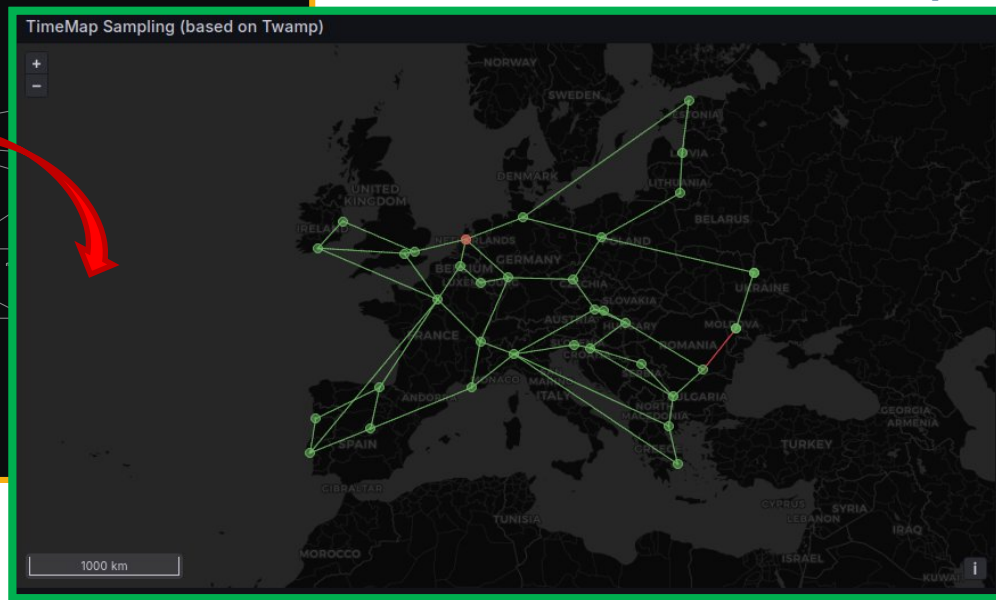


The updated GUI

HTML + JS (Cytoscape)

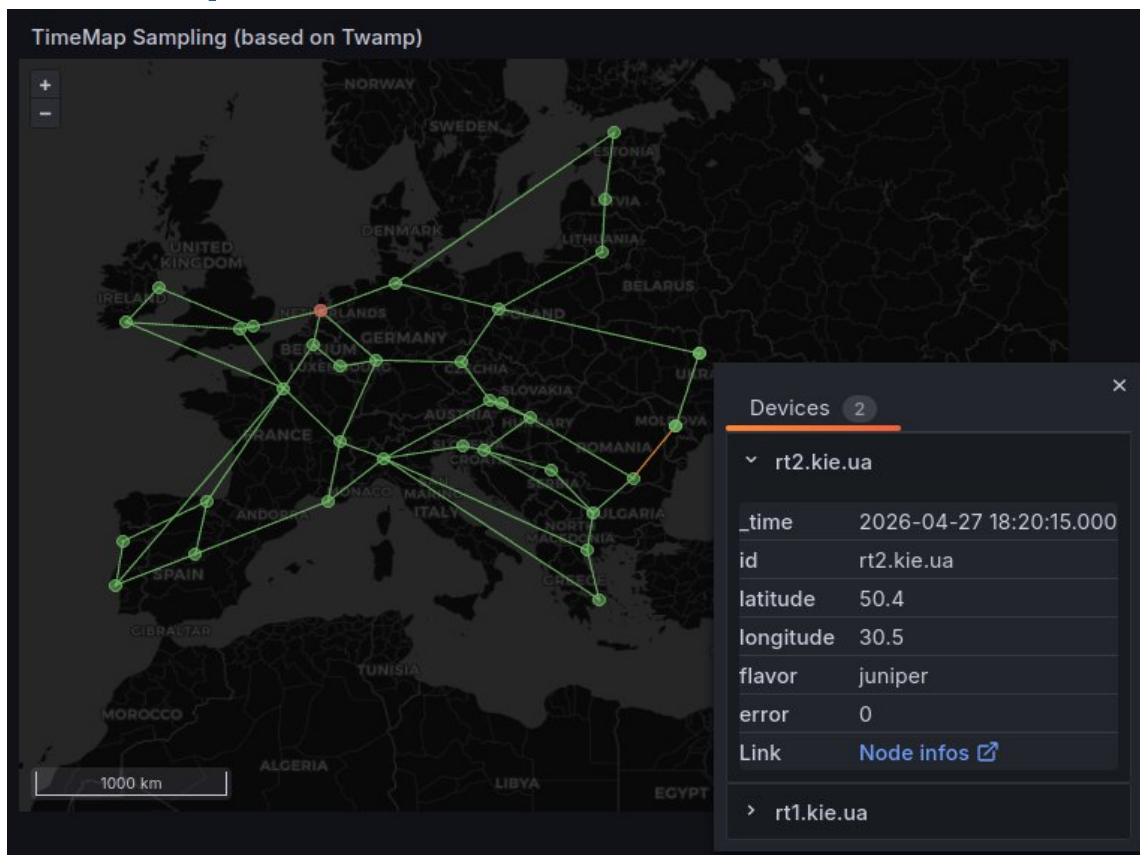


Grafana Geomaps



<https://grafana.com/docs/grafana/latest/panels-visualizations/visualizations/geomap/#network-layer-beta>

GeoMap visualization



Updates:

- Topology overlay on **geographical map**
- **No more custom code**
- Dynamic **topology evolution**
- **Measurements** displayed directly on graph

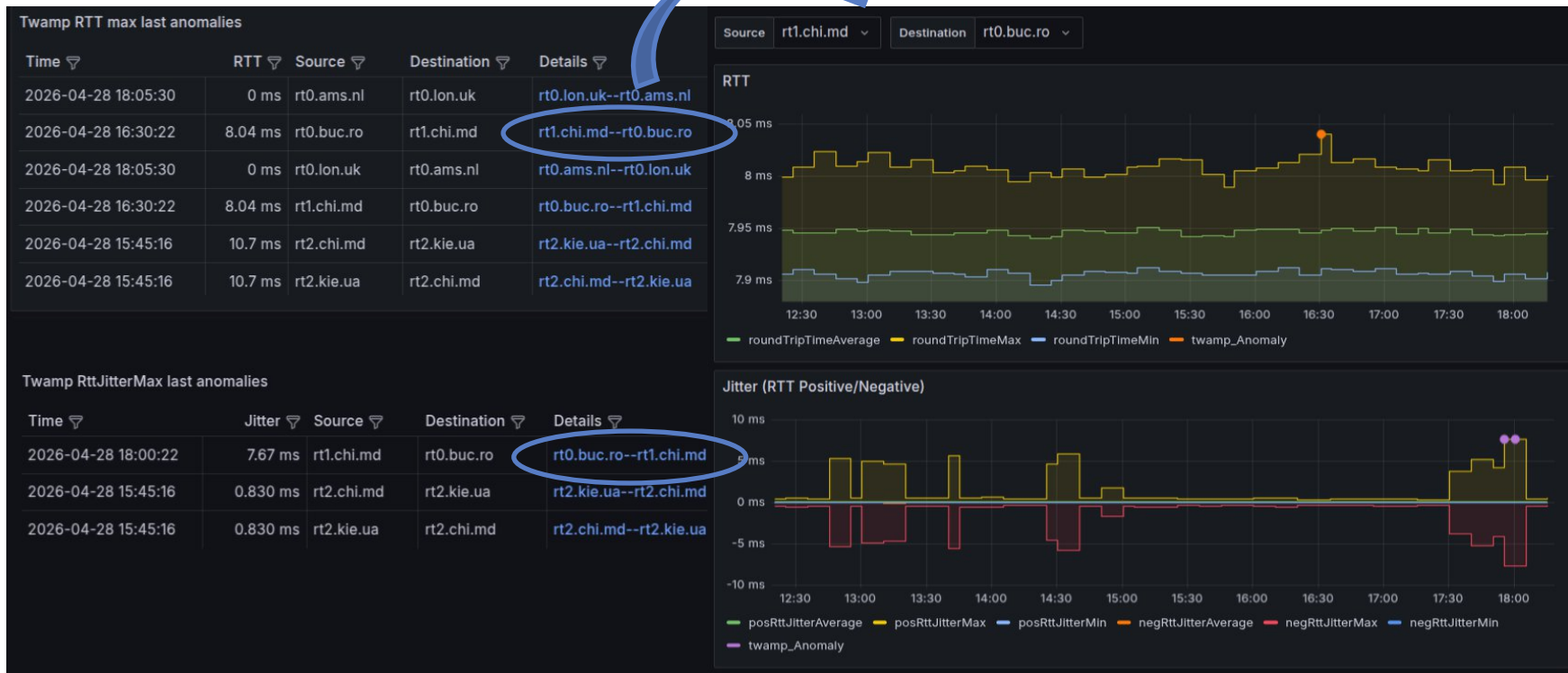
Grafana Node Graph



In addition to the normal link measurements visualization

- Preview of the **dynamic** sub-graph

GeoMap visualization



Customizations and new use-cases

Home > Dashboards > OTFN-Dev > OTFN Dev data export

n8n data exporter

Get data from InfluxDB

start-date *
07 / 07 / 2025

duration *
5

metric *
K+K DIFF Ch 2-3

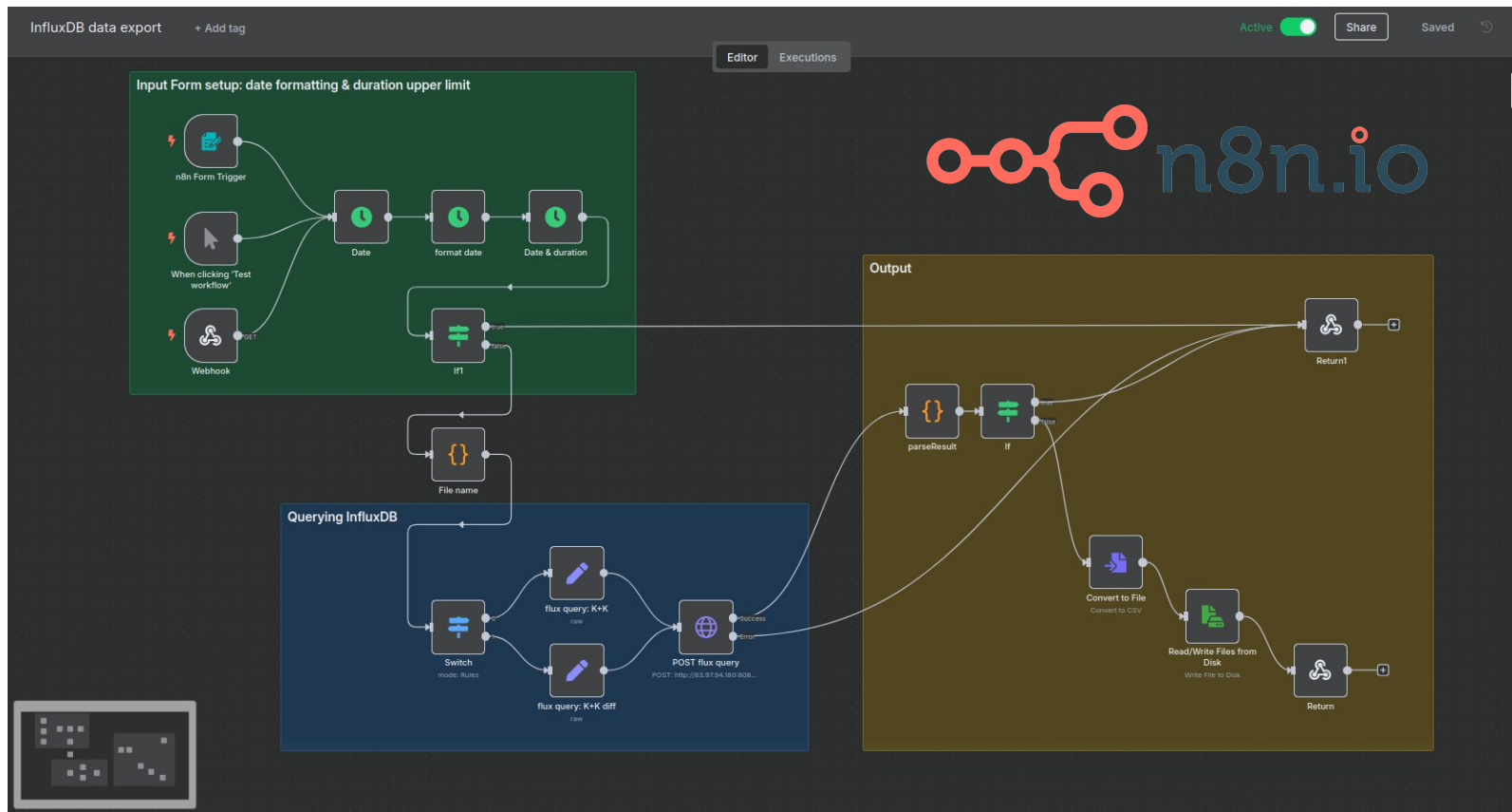
Submit

Data Exporter

n8n data exporter

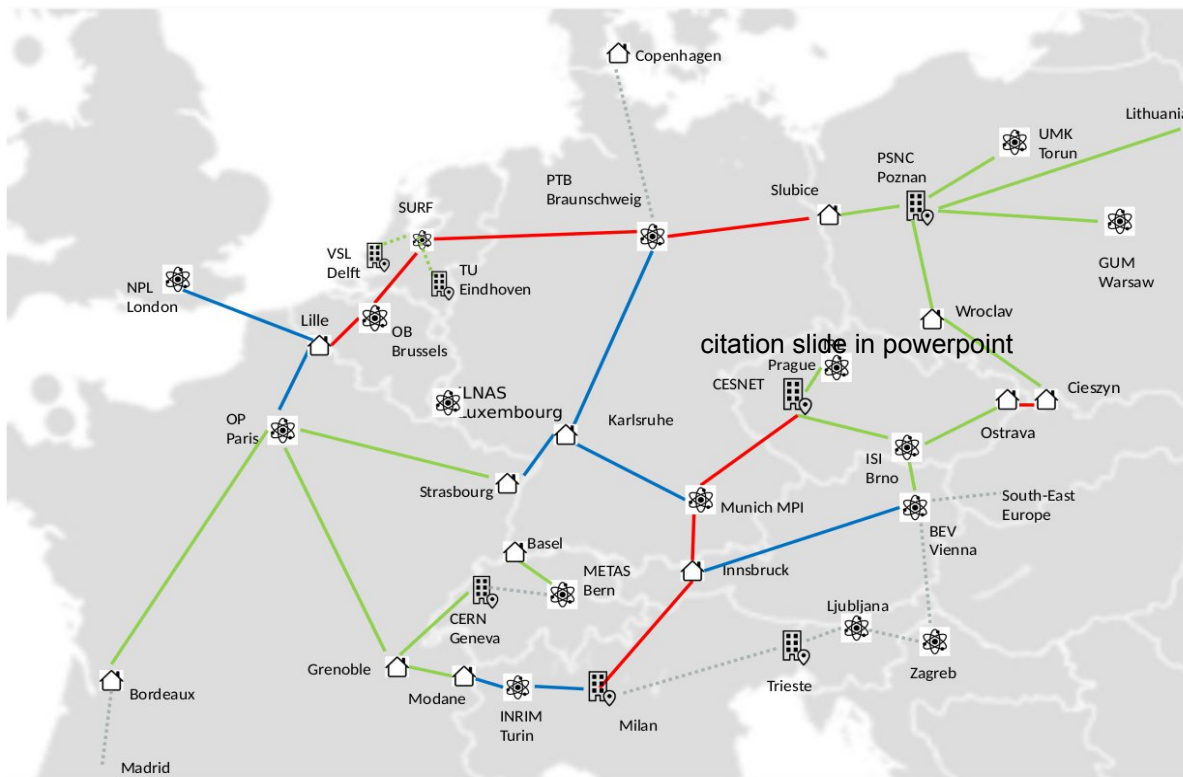
Download file:
[dump-1751616522195.csv](#)





The OTFN use-case

Proposed C-TFN



Included:

- 10-year IRU for fibre on red routes
- Bidirectional amplifiers as needed to light the fibre on the red routes

Excluded:

- Green lines – fibre built by NRENs
- Blue lines – fibre built by NMIs
- Dashed grey – proposed future links
- flywheels, counters frequency combs needed are to be funded by the national time/frequency providers
- Time/Frequency overlay services

-  NMI Frequency reference
-  Research institute
-  Hut for housing RLS

The OTFN use-case

Proposed C-TFN



Included:

- 10-year IRU for fibre on red routes
- Bidirectional amplifiers as needed to light the fibre on the red routes

Excluded:

- Green lines – fibre built by NRENs
- Blue lines – fibre built by NMIs
- Dashed grey – proposed future links
- flywheels, counters frequency combs needed are to be funded by the national time/frequency providers
- Time/Frequency overlay services



NMI Frequency reference

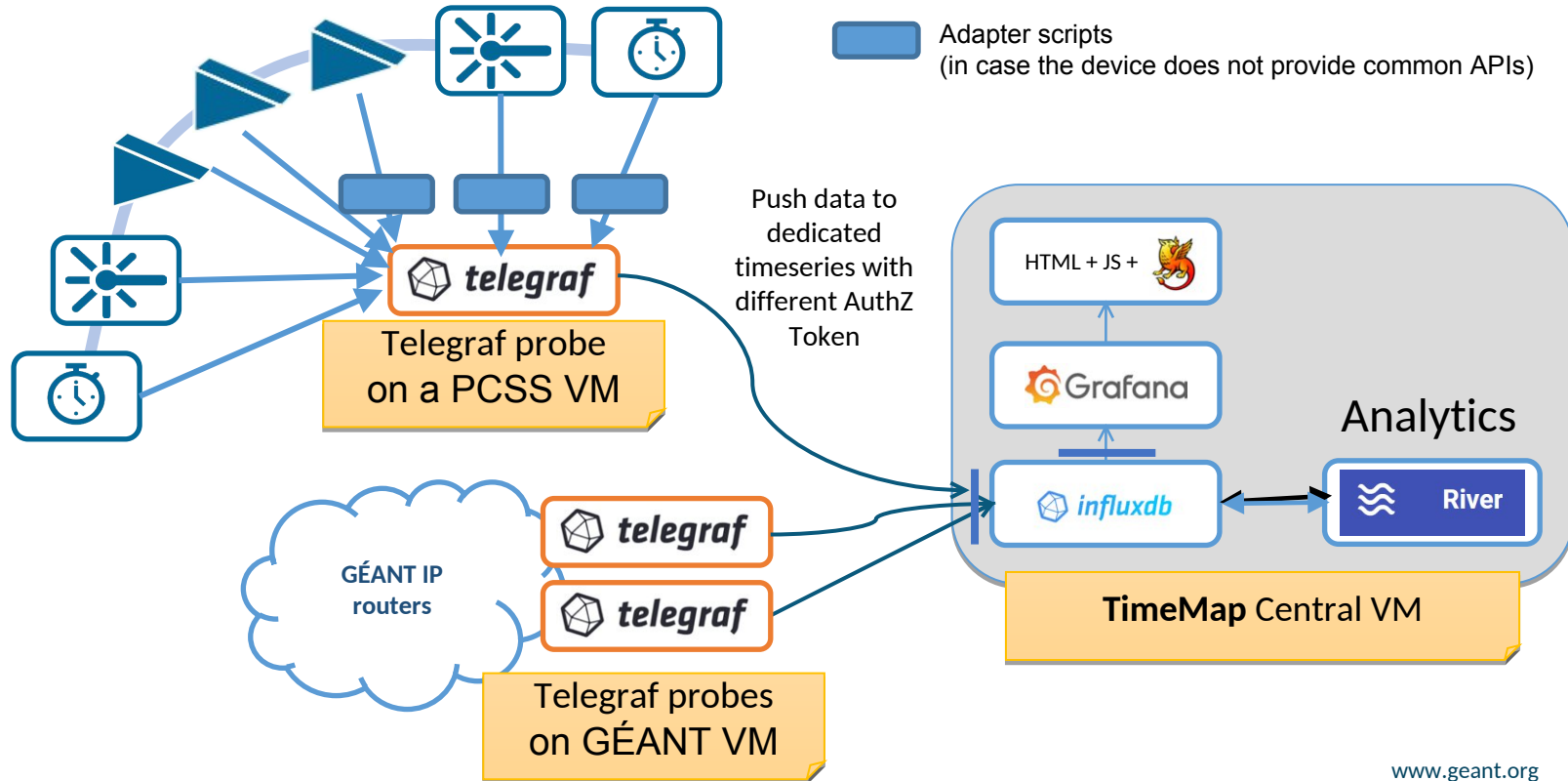


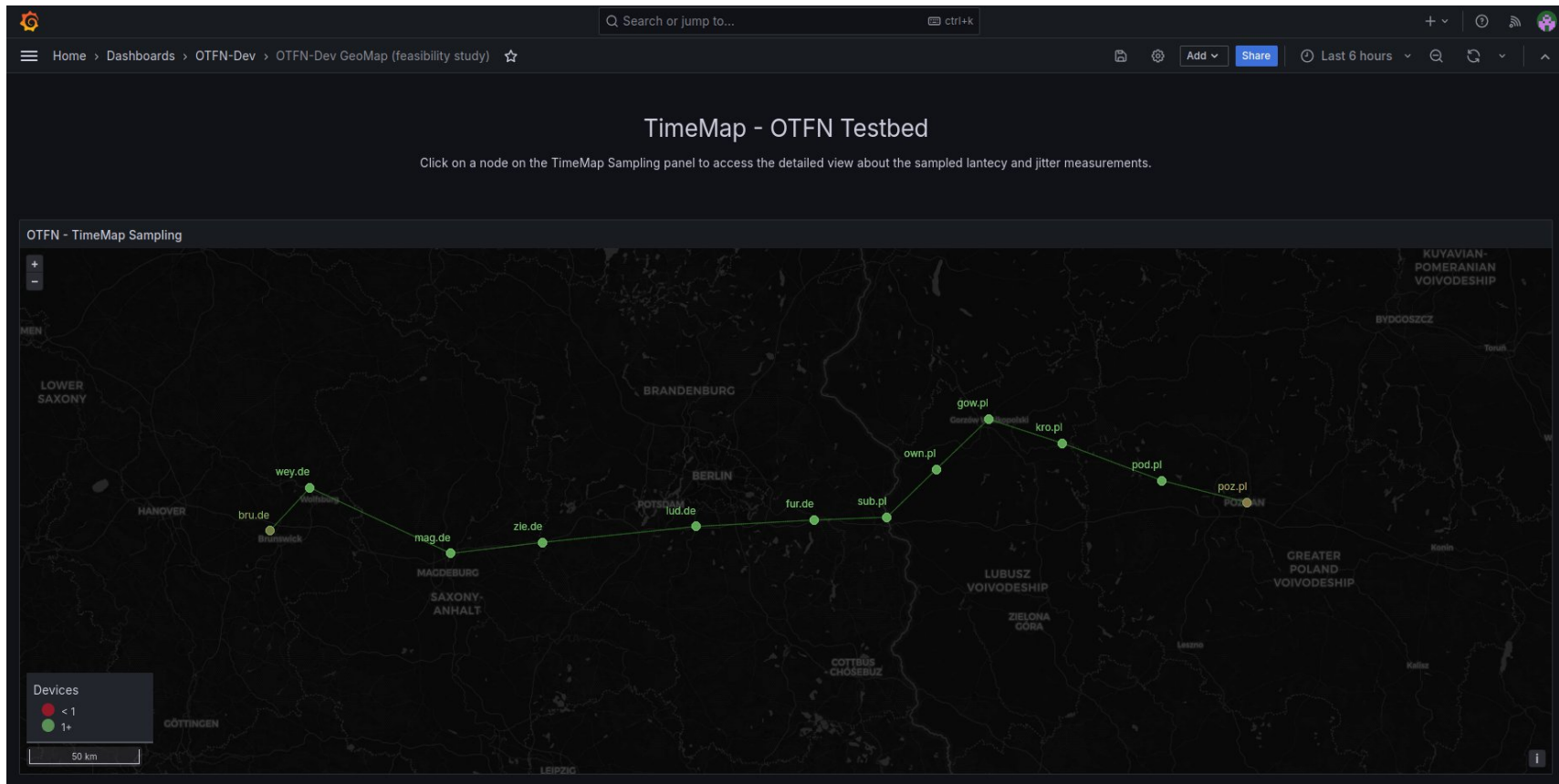
Research institute

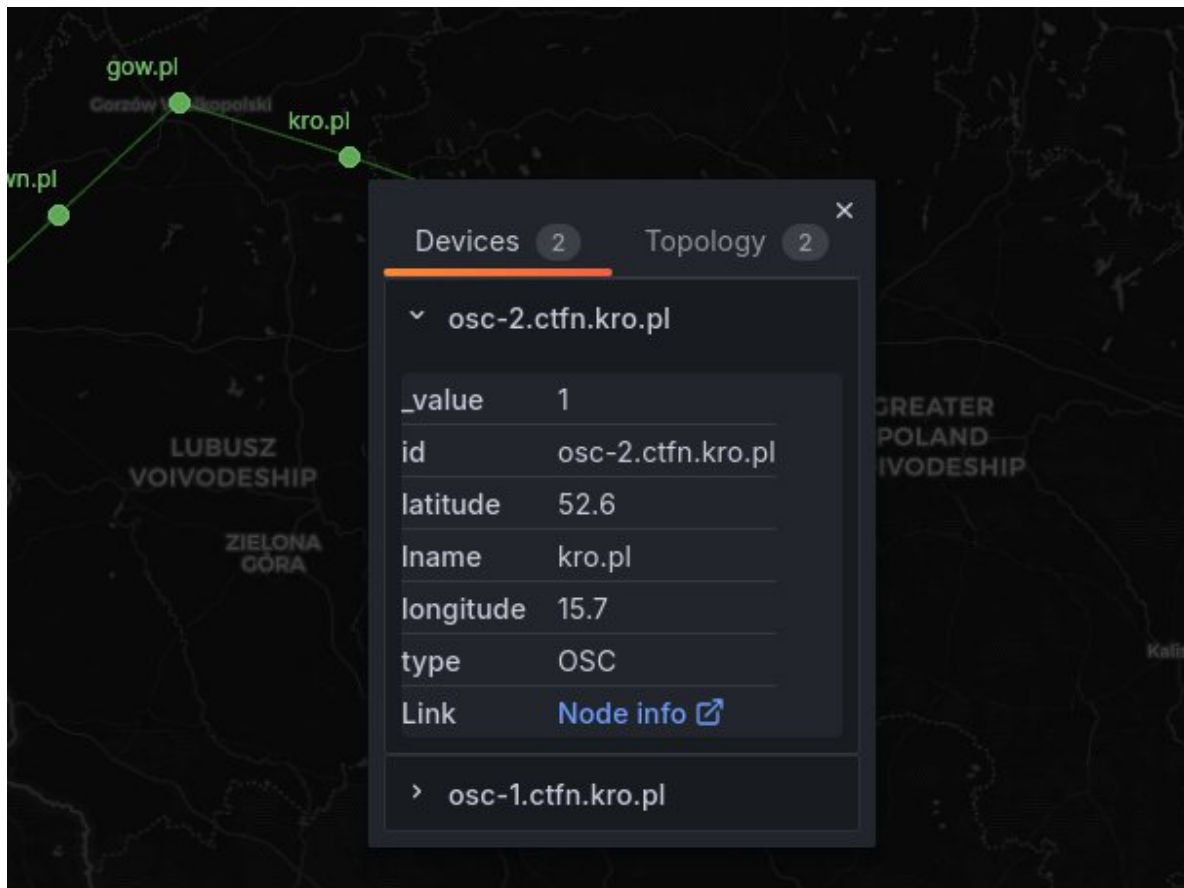


Hut for housing RLS

TimeMap architecture for OTFN









Search or jump to...

ctrl+k

Home > Dashboards > OTFN-Dev > OTFN-Dev K+K ☆

K+K Channels Timed Moving Average (every 30s, period 5m)



K+K Channels Derivative Histograms



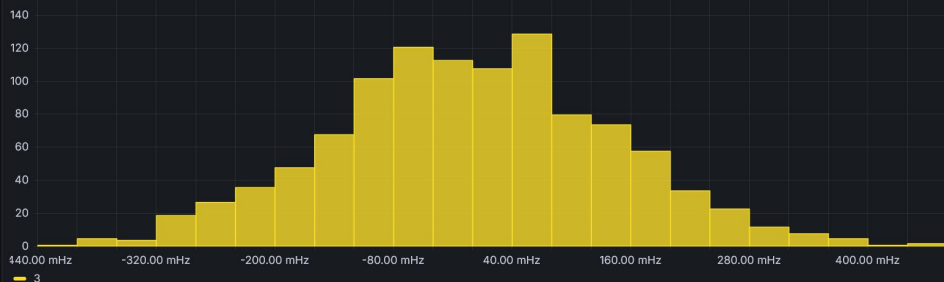
K+K Channels Derivative



K+K Channels Derivative



K+K Channels Derivative Histograms



Conclusions

- TimeMap **continuous improvements**
 - Simpler code-base, less effort on technicalities
 - Focus on new use-cases
- TimeMap as a **solution to adopt and adapt**
 - Not just a service to consume
 - Different deployments built on top of the available code

I want to deploy TimeMap to my network, how?

1. Find the **source code** on:
https://gitlab.software.geant.org/gn4-3-wp6-t1-lola/timemap_public
2. **Deploy** the observability stack
3. **Enable TWAMP** on your network devices and set up your data probes
4. Need some help? timemap-dev@lists.geant.org

Next steps

- New domains for the T/F pilot
- Refactoring of AD
- ClickHouse
- Mapgl



Thank you!

Questions?

timemap-dev@lists.geant.org

www.geant.org

