Detecting anomalous latency and jitter in Timemap

Fabio Farina (GARR)
*On behalf of GN4-3 WP6 T1 Team*

2nd Performance Management Workshop
March 8th 2022

Public

www.geant.org
Outline

• Why Timemap
• Current status
• Beyond observation: anomaly detection
• Further development
Road report: on HWY 101 there are 364 vehicles per minute

it may be nice…

Or lots of stop & go
Current weather maps are useful for bulk data transfer!
Applications which need “cruise control” on are on fast rise!

- LoLa
  + 30%
Involved NRENs: do they all know about this?

Rhnet*  PSNC
Jisc     ARNES
RedIris  AMRES
RENATER  NIIF
BELnet   RoEduNet
SURFnet  GRNET
GARR     Litnet
SWITCH   EEnet
DFN      FUNET*
Uninett* BASNET
Sunet*   ASNET-AM
DeIC*    AZscienceNet
ACOnet   RENAM
CESnet   * Nordunet

LATNET
IUCCL

GARR
ACOnet

3 x 450Mbps
RTT:
- 15ms
- 25ms
- 37ms
TIMEMAP architecture and features

- Latency & Jitter data collection
  - RPM from all GÉANT routers
  - TWAMP from selected perfSONAR VMs and GÉANT routers

- Simplicity: almost zero footprint
  - Docker + Linux packages
  - Minimal custom code
  - Dynamic weather map GUI

- Security
  - eduGAIN authentication
  - RBAC and multi-tenancy
TIMEMAP v1 architecture – 1+ year of data taking

- **telegraf**
  - python
  - twping

- **RPM over SNMP**

- **TWAMP**

- **HTML + JS +**

- **Grafana**

- **influxdb**

- **Central data lake**
  - Docker-compose IaaS

- **AuthZ Token**

- **Telegraf probes**
Have a look

• The service

https://timemap.geant.org/

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

https://gitlab.geant.org/gn4-3-wp6-t1-lola/timemap_public
Timemap useful examples
Timemap useful examples: rerouting and periodic events
Timemap useful examples: trends
Anomaly Detection (AD) in Timemap - requirements

• Move beyond the simple observation
  • AD for Analytics and Alerting
  • Co-occurring events correlation

• Requirements on AD machine learning
  • Real-time or micro-batch learning/inference
  • Robust estimation
  • Light footprint
Anomaly Detection in Timemap – toolset

• Anomaly Detection, in short
  • Std.Dev classification
  • Unsupervised
  • Sensible to overfit

• Streaming ML in Python
  https://riverml.xyz

Half-space Random Trees

One-class Support Vector Machine

Model bagging
Anomaly Detection in Timemap – architecture

Software architecture extension

- HTML + JS +
- Grafana
- influxdb

Sidecar Python container

Network topology and ML models

www.geant.org
Almost the same look and feel
One more plot
Performance and efficiency

• AD frequency == sampling frequency (5m)
• ~3500 observations every micro-batch (3s execution time)

• Learning rate
Conclusion and next steps

• Anomaly Detection
  • Up and running, requirements satisfied
  • Streaming ML, multi-model over network topology
  • About 200 lines of code in a Docker image

• Coming soon
  • Timemap hand-over to Géant Operations
  • Timemap @ GARR
  • Alerting & Events correlation

• More deployments @NRENs
Thank you

Any questions?

gn4-3-wp6-t1-lola@lists.geant.org

www.geant.org