perfSONAR - 20 years monitoring Internet performance

Andrijana Todosijevic / Katarina Simonovic / Antoine Delvaux • AMRES / GÉANT project • perfsonar@lists.geant.org
RIPE 85 - Belgrade
October 2022

©2022 The perfSONAR Project and its Contributors • Licensed CC BY-SA 4.0 • https://www.perfsonar.net
GÉANT network – international connectivity

- The global Research & Education network ecosystem
- Must operate seamlessly from “end to end”
What is perfSONAR?

**Performance Service-Oriented Network monitoring Architecture:**

- Monitoring and assuring network performance
- Make optimal use of the network for apps
- Detect “soft failures” in the network
- Help fix these problems

- Testing is done actively, by placing traffic onto the network(s) under test
Partners and collaboration

• Developed for and by the Research & Education community but useful to any network operator
• Current development partners are:
  • ESnet - US
  • GÉANT - Europe
  • Indiana University - US
  • Internet 2 - US
  • RNP - Brazil
  • University Michigan - US
Packages and bundles

- CentOS ISO image
- RPM packages
  - CentOS 7
  - Alma 8
- Deb packages
  - Debian 10
  - Ubuntu 18
  - Ubuntu 20
- Docker container for testpoint
- Ansible playbooks and roles
A coordinated measurement mesh

The most complete deployment type

Step 1: Create Central Configuration File

Step 2: Publish to Web

Step 3: perfSONAR Hosts Download Configuration
perfSONAR Lookup Service Directory

https://stats.es.net
https://www.perfsonar.net
https://docs.perfsonar.net
Example Use Case

- **Hawaii to Queen’s University Belfast**
- **Main actors:**
  - Queens University Belfast, UK
  - Institute for Astronomy, the University of Hawaii, USA - ATLAS Project ([https://fallingstar.com/](https://fallingstar.com/))

- Large data transfers from experiments and measurements

[https://outerspace.stsci.edu/display/PANSTARRS/](https://outerspace.stsci.edu/display/PANSTARRS/)
Hawaii to Belfast (11,000 km, 180ms RTT)
Example Use Case 1

Problem:

1 in 8 transfers, which typically ran at 4.8 MB/s FROM Hawaii, were running very slowly, down to about 50-100 KB/s, which was causing transfers to become backlogged

- Troubleshoot: perfSONAR traceroute and loss output
- Observations:
  - Tests results showed drop in performance
  - Slow, steady increase in loss within a couple of days
Example Use Case 1

• More observations
  • This was an intermittent or "soft" fault
• Problem found
  • One of eight aggregated 100 Gb/s links between London and Birmingham was faulty
  • (very low) error rate not initially seen by NOC, but enough to affect TCP transfers
  • Faulty optic on one interface needed replacement
• (Interim) solution – Taking the faulty link out of the aggregate
Example Use Case 2

- Max (Baltimore) to Jisc (Slough)

Not just Hawaii to Belfast, also present between completely different perfSONAR hosts
Example Use Case 2

UH IfA - 10G Bandwidth Tests - Throughput

- Throughput >= 5Gbps
- Throughput < 5Gbps
- Throughput <= 1Gbps

✓ No problems found in grid

Average throughput from Institute for Astronomy (IfA) Hawaii to Jisc host in Slough is 3.3 Gbps

Average throughput is 3.276 Gbps
Example Use Case 2

- ITC (Hawaii) to Jisc (Slough)
Example Use Case 2

- **GÉANT (London) to Jisc (Didcot)**
  Also noticed continuous packet loss
Example Use Case 2

- **Max (Baltimore) to Jisc (Slough)**
  
  Diagnosis: faulty optic in 6 x 100G aggregate between Janet London Harbour Exchange and London Powergate
  
  Janet NOC removed the faulty link from the aggregate and drops in throughput disappear

- **GÉANT (London) to Jisc (Didcot)**
  
  Janet NOC removed the faulty link from the aggregate and packet loss disappears
Architecture

Visualization
- Traceroute Viewer
- Graphs
- MaDDash
- pSConfig WebAdmin
- Toolkit UI

Archiving
- Esmond

Configuration
- pSConfig

Scheduling
- pScheduler

Tools
- iperf3
- iperf
- nttcp
- ping
- tracepath
- traceroute
- paristraceroute
- twping
- owping
- powstream

Discovery

Lookup Service Registration
What is Esmond?

- Default archive that most users run
- Django app with custom REST API
- Use two backend databases
  - PostgreSQL
  - Cassandra
Architecture change for 5.0
Elasticsearch, Logstash, Kibana (ELK) and Grafana

- **Elasticsearch** - Stores and indexes documents and lets you do searches
- **Logstash** - Accepts input from lots of different sources, enriches with location data and more, can output it to different places (like Elasticsearch)
- **Kibana** - Visualizes data in elasticsearch
- **Grafana** - Visualization platform for ElasticSearch and more
Moving to OpenSearch

• Because of licensing changes
• Default perfSONAR bundles will rely on OpenSearch

• Will maintain compatibility with Elasticsearch for those with existing installations
The Software Pieces
Other features of 5.0

- Various pScheduler improvements and some new plugins
- Some Toolkit UI improvements
- pSConfig Web Admin (PWA) changes
- Optional packages if you want
  - to keep Esmond
  - to use Kibana
perfSONAR Elasticsearch API

GET/POST http://35.223.142.206/lookup/_search

{
query....
}
perfSONAR Lookup Service records
2177 8537 2399
Thanks!

For more information, please visit our web site: https://www.perfsonar.net