perfSONAR

and Latency

A tale of tests and tools

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Latency BoF • TNC 2026

perfSONAR is developed by a partnership of

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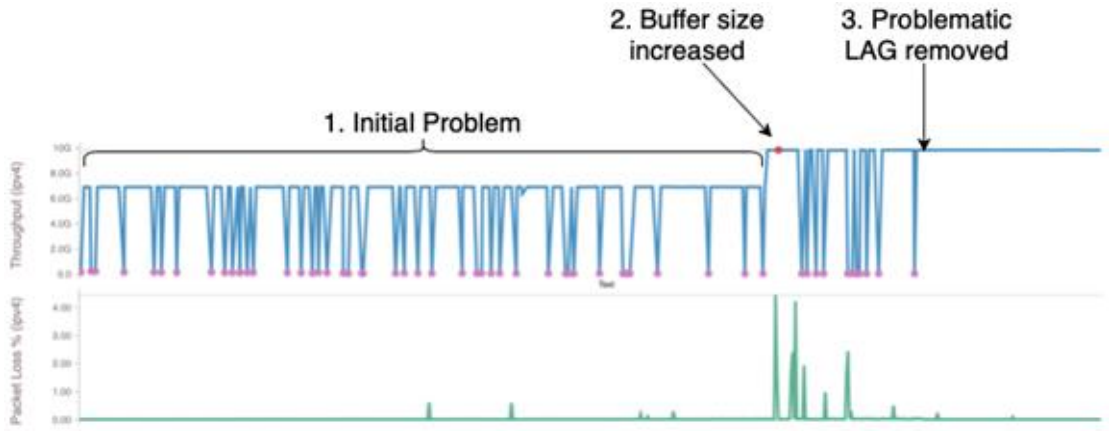
perfSONAR

- perfSONAR is an **open source software suite** that runs, stores and displays **active measurements** such as **throughput, packet loss, latency and traceroute**
- Primarily maintained by consortium of **ESnet, GEANT, Indiana University, Internet2, RNP** and the **University of Michigan**
- **Over 2000 registered public deployments** around the world across hundreds of institutions

Map of perfSONAR deployments around the globe



Graph of low throughput from Pan-STARRS Hawaii to Queen's University Belfast

Example perfSONAR use cases:

- Solving global network performance issues for for researchers transmitting data from **Pan-STARRS Hawaii** to **Queen's University Belfast** *(see above graph)*
- Identifying packet loss issues at **UT Arlington**
- Identifying performance bottlenecks as **Large Hadron Collider (LHC)** prepares for the "high luminosity" era
- https://www.perfsonar.net

Once upon a time, in the pScheduler land…

- Every tale (**task**), in the **pScheduler** world, begins with requesting a test which in turn will be carried-out by a tool.
- A **test**: measure or do something, examples:
  - latency
  - throughput
  - service response time
  - mtu
- A **tool**: something that run a test, examples:
  - ping
  - trace
  - (O|T)WAMP based tools

ESnet GÉANT INDIANA UNIVERSITY INTERNET2 RNP

pScheduler: test plugins

```
geantadmin@psmall:)~$ pscheduler plugins tests

clock                   Measure the clock difference between hosts
disk-to-disk            Network testing of throughput and Read/Write speeds
dns                     Measure DNS transaction time
http                    Measure HTTP Response Time
idle                    Consume time in the background
idlebgm                 Consume time in the background - NOT FOR PRODUCTION
idleex                  Consume time exclusively - NOT FOR PRODUCTION
latency                 Measure network latency between hosts
latencybg               Run one-way latency tests in the background
mtu                     Measure Maximum Transmission Unit (MTU)
noop                    Do nothing
psresponse              Measure pScheduler Response Time
rtt                     Measure the round trip time between hosts
s3throughput            Test throughput of S3 web service storage
simplestream            Test communication between two hosts using TCP
throughput              Measure network throughput between hosts
trace                   Trace the path between IP hosts
wifibssid               Outputs a list of BSSIDs in json format with the given SSID
```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pScheduler: tool plugins

```
geantadmin@psmall:)~$ pscheduler plugins tools

curl                    cURL-based tool for HTTP tests
dnspy                   Measure DNS transaction time
ethr                    Measure network throughput with ethr
fwmtu                   Measure Maximum Transmission Unit (MTU)
halfping                halfping tool for approximate latency
iperf2                  Measure network throughput with iperf2
iperf3                  Measure network throughput with iperf3
nuttcp                  Measure network throughput with nuttcp
owping                  Determine one-way latency with OWAMP
paris-traceroute        Determine the route between hosts with Paris Traceroute
ping                    Measure the round-trip time to another host with ping
powstream               Repeatedly measure latency with OWAMP's powstream
psclock                 Compare the clocks on two pScheduler nodes
pstimer                 Measure pScheduler response time
s3-benchmark            Tool for measuring perfomance of an S3 web server
simplestreamer          Stream data from one node to another with TCP
sleep                   Sleep for periods longer than 15 seconds
sleepbgm                Consume time in the background multiple times
snooze                  Sleep for periods of 60 seconds or less
tcpping                 Measure the round-trip time to another host with tcpping
tracemtu                Measure Maximum Transmission Unit (MTU) using traceroute
tracepath               Map the route between hosts with tracepath
traceroute              Map the route between hosts with traceroute
twping                  Determine latency with TWAMP
```


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RTT tests

- Measure the round trip time and related statistics between hosts
  - Default tool: **ping**
  - Alternatives: twping, tcpping

```
1       psmp-gn-owd-poz-pl.geant.org (62.40.114.99)  64 Bytes  TTL 54  RTT 45.8000 ms
2       psmp-gn-owd-poz-pl.geant.org (62.40.114.99)  64 Bytes  TTL 54  RTT 46.2000 ms
3       psmp-gn-owd-poz-pl.geant.org (62.40.114.99)  64 Bytes  TTL 54  RTT 46.1000 ms
4       psmp-gn-owd-poz-pl.geant.org (62.40.114.99)  64 Bytes  TTL 54  RTT 46.1000 ms
5       psmp-gn-owd-poz-pl.geant.org (62.40.114.99)  64 Bytes  TTL 54  RTT 46.1000 ms

0% Packet Loss  RTT Min/Mean/Max/StdDev = 45.8040/46.0640/46.2250/0.1400 ms
```


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Latency tests

- Measure one-way latency and associated statistics between hosts
  - Default tool: **owping**
  - Alternatives: twping, halfping

```
Packet Statistics
-----------------
Packets Sent ......... 100 packets
Packets Received ..... 100 packets
Packets Lost ......... 0 packets
Packets Duplicated ... 0 packets
Packets Reordered .... 0 packets

One-way Latency Statistics
--------------------------
Delay Median ......... 25.05 ms
Delay Minimum ........ 24.91 ms
Delay Maximum ........ 25.14 ms
Delay Mean ........... 25.05 ms
Delay Mode ........... 25.02 ms
25.06 ms
Delay 25th Percentile ... 25.02 ms
Delay 75th Percentile ... 25.08 ms
Delay 95th Percentile ... 25.11 ms
```


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Latencybg (background) tests

- Continuously measure one-way latency and associated statistics between hosts and report back results periodically
  - Default tool: **powstream (OWAMP)**
  - Alternatives: none

```
geantadmin@bob:(~$ pscheduler task latencybg --dest psmp-gn-owd-poz-pl.geant.org
Submitting task...
Task URL:
https://bob/pscheduler/tasks/27ce6adb-4913-48e2-bca5-18e1dc437172
Running with tool 'powstream'
Fetching first run...
This task produces results asynchronously and cannot be watched.  The results it has
produced since it started running and now can be retrieved by running the
following command:

pscheduler result  https://bob/pscheduler/tasks/27ce6adb-4913-48e2-bca5-18e1dc437172
```


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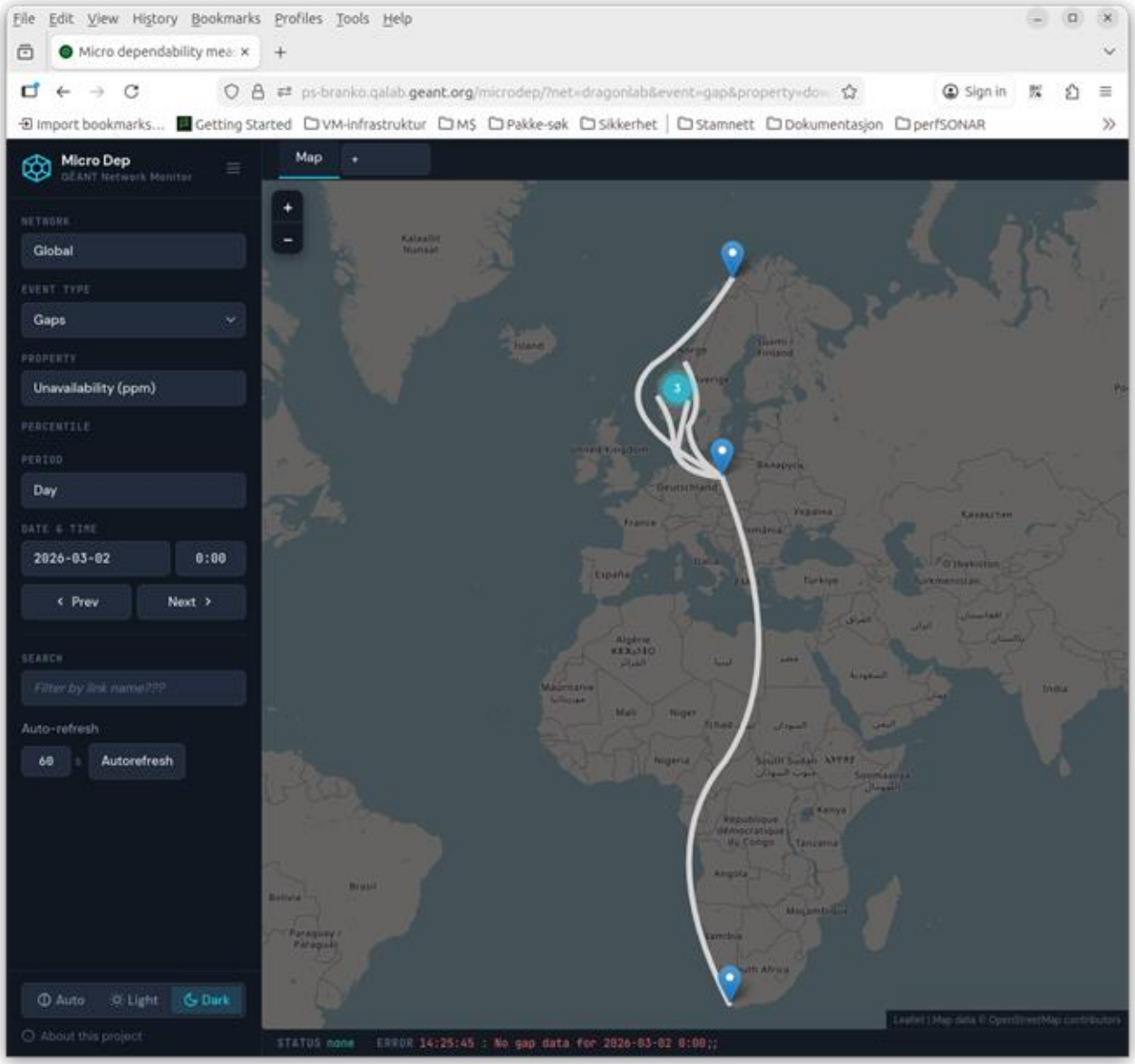
Latencybg plotted in Grafana

Microdep

- Latency bg tests to spot packet gaps, latency and jitter changes
- Packet traces to spot routing changes
- And some analysis

- Will be distributed with perfSONAR 5.3
- More info at https://sikt.no/en/micro-dependability



Question and answer icon by iconosphere from The Noun Project

Questions and Answers

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Resources

- **pScheduler** doc: https://docs.perfsonar.net/pscheduler_intro.html
- perfSONAR hosts in **GÉANT network**: https://network.geant.org/perfsonar
- perfSONAR team in **GÉANT project**: perfsonar@lists.geant.org
- **perfSONAR global users list**: https://lists.internet2.edu/sympa/info/perfsonar-user

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Thanks!

For more information,
please visit our web site:
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Thanks icon by priyanka from The Noun Project

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