perfSONAR at your fingertips
Open. Extensible. Worldwide

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www.geant.org
Heterogeneous world

• The global Research & Education network ecosystem is comprised of multiple networks

• All interconnect but owned and operated by separate organizations

• This complex, heterogeneous set of networks must operate seamlessly from “end to end”

• To support science and research collaborations that are distributed globally
What is perfSONAR?

• perfSONAR is a tool to:
  • Set network performance expectations
  • Make optimal use of the network for applications
  • Find network problems (“soft failures”)
  • Help fix these problems

• All in multi-domain environments as problems are all harder when multiple networks are involved

• perfSONAR provides a standard way to publish monitoring data

• Part of the Science DMZ model for supporting efficient data transfers

• This data is interesting to network researchers as well as network operators
perfSONAR Toolkit

- Network performance comes down to a couple of key metrics:
  - Throughput (e.g. “how much can I get out of the network”)
  - Latency (time it takes to get to/from a destination)
  - Packet loss/duplication/order (do they all make it to the other side?)
- But we measure more. And we can get these from a selection of measurement tools – the perfSONAR Toolkit

  The Toolkit is an **open source** implementation and packaging of the perfSONAR measurement infrastructure and protocols
- All components are available as RPMs, DEBs, and CentOS ISO
- Easy to install and configure

- perfSONAR is developed by a partnership of ESnet, Indiana University, Internet2, RNP, University of Michigan
  - And GÉANT community under GN4-3 EU project
Bulding meshes

• Mesh deployment style involves coordinating several nodes
• Nodes can potentially be maintained in different networks
• Nodes share mesh configuration

Source: www.perfsonar.net
The importance of regular testing

• We can’t wait for users to report problems and then fix them
• Important to continually collect, archive, and alert on active test results
• perfSONAR includes tools to
  • describe and configure a topology of tasks
  • define and publish configuration of meshes
  • collect and present monitoring data grids
Extensible architecture

Discovery

Lookup Service Registration

Visualization

Traceroute Viewer

Graphs

MaDDash

pSConfig

WebAdmin

Toolkit UI

Archiving

Esmond

Configuration

pSConfig

Scheduling

pScheduler

Tools

iperf3

iperf

nuttcp

ping

tracepath

traceroute

paris-traceroute

twping

owping

powstream

Source: www.perfsonar.net
Plug-in architecture

• Opens community involvement in system’s extensions
• pScheduler allows integration of new:
  • Tests (ways to describe measurements)
  • Tools (applications to do the measurements)
  • Archivers (ways to store test results)
  • Contexts (measurement environments)
• Well documented REST API with JSON data format
• Plugin development toolkit (PDK)
  • Supports integration of 3rd party tools with pScheduler API
  • Automates building the environment to develop plugins
  • Reduces time and effort
Worldwide

• ~2000 advertised instances in the world
• A component of NRENs and Virtual Organisations
• Many of which available for open testing
Example use case

• Main actors
  • Queens University, Belfast, UK
  • ATLAS Project (Institute for Astronomy, University of Hawaii, USA)

• Application
  • Astronomy – detecting comets - https://panstarrs.stsci.edu/
  • Large data transfers from experiments / measurements

• Networks involved
  • QUB
  • Janet
  • GÉANT
  • Internet2
  • University of Hawaii

Source: panstarrs.stsci.edu

Thanks to T.Chown, D.Rand from Jisc for their contribution to this part of presentation
Example use case (2)

• Problem
  • Approximately 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

• Investigation -> use perfSONAR traceroute and loss output to troubleshoot

• Observations
  • Test results show drop in performance
  • Loss plots shows slow, steady increase in loss from 24th October to fix around noon on 29th October
Example use case (3)

• 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 that were hashed onto that link
  • Faulty optic on one interface needed replacement

• (Interim) solution
  • Taking the faulty link out of the aggregate
perfSONAR in the future

• Archived data integration
  • An archive is a place where visualization retrieves data
  • We have Esmond but there are many good open source alternatives for storing time-series data
  • Move to OpenSearch (open source derived from Elasticsearch)

• AI
  • Data anomaly analysis

• OS support change
  • Due to CentOS release strategy change
More info

• www.perfsonar.net
• docs.perfsonar.net
• www.youtube.com/perfSONARProject/

• www.geant.org/Services/Connectivity_and_network/Pages/perfSONAR.aspx
• pmp-central.geant.org/maddash-webui/
Thank you

Any questions?
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