Monitoring and exploring virtual digital infrastructures with perfSONAR

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Introduction

- The global Research & Education network ecosystem is comprised of hundreds of international, national, regional and local-scale digital infrastructures.
- While these networks all interconnect, each network is owned and operated by separate organizations (called “domains”) with different policies, customers, funding models, hardware, bandwidth and configurations.

» This complex, heterogeneous set of networks must operate seamlessly from “end to end” to support your science and research collaborations that are distributed globally.
Multi-Domain VPN Service in GÉANT

• Helping to enable international digital infrastructures secure connectivity
  • Data services isolated from general IP traffic
• Multi-Domain VPN (MD-VPN) enables establishment of Virtual Private Networks through multiple domains
• BGP and MPLS based L3/L2 (multi)point-to-(multi)point service for the end users
  • Universities, researchers, multi-country projects
• Multi domain
  • Between two or more NRENs / organisations
  • Through GÉANT network
  • Through other R&E networks
Challenges

• Delivering end-to-end performance on distributed platforms
  • Get the user, service delivery teams, local campus and metro/backbone network operators working together effectively
    • Have tools in place
    • Know your (network) expectations
    • Be aware of network troubleshooting

• Current monitoring of VPNs done at service level, by service provider (GÉANT)
  • BGP / IP / MPLS
  • Fault monitoring

• Performance monitoring of physical interfaces only, not inside VPN

• Requirements
  • Basic network performance metrics in each VPN
  • Scale and deploy easily for digital infrastructure team members
  • Separating measurements and management traffic
What is perfSONAR?

- perfSONAR is a tool to:
  - Set network performance expectations
  - Find network problems (“soft failures”)
  - Help fix these problems

- These problems are all harder when multiple networks are involved
  - Troubleshooting capabilities across a single or multi-domain environments

- perfSONAR provides a standard way to publish monitoring data

- This data is interesting to network researchers as well as network operators

- It’s infeasible to perform at-scale data movement all the time – as we see in other forms of science, we need to rely on simulations
perfSONAR smart solution to challenges

- The right performance monitoring service for VPN-connected digital infrastructures
- Linux Network Namespaces separation
- Works with multiple virtual interfaces on a single MP
- Allows for overlapping IP address space
- A single scheduler with namespace awareness
  - pScheduler driving multiple measurements through multiple virtual interfaces
- Per VPN measurements
- Scalable solution
  - Multi-homed perfSONAR Measurement Points
  - Centrally managed and controlled measurements by pScheduler
  - Central dashboard for measurement visualisation and archive browsing
- Easy to setup and configure and can be automated
  - SLA monitoring and reporting

One Measurement Point in each NREN
Each MP connected to multiple VPN
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/ordering (for some sampling of packets, do they all make it to the other side without serious abnormalities occurring?)

We can get many of these from a selection of measurement tools – the perfSONAR Toolkit

The “perfSONAR Toolkit” is an open source implementation and packaging of the perfSONAR measurement infrastructure and protocols

All components are available as RPMs, DEBs, and bundled as a CentOS ISO

Very easy to install and configure (usually takes less than 30 minutes for default install)
perfSONAR monitoring for digital infrastructures

- perfSONAR can perform measurements in virtual interfaces
  - In addition to the physical interfaces
  - Available from perfSONAR **4.0.2 (just released)**
    - [https://www.perfsonar.net/release-notes/version-4-0-2/](https://www.perfsonar.net/release-notes/version-4-0-2/)

- Suitable for monitoring and measuring Virtual Private Networks
  - MD-VPN service used in GÉANT community

- Context Plug-in support
  - New plug-in type added called Contexts that allows modification of execution environment before a task is run
  - This plug-in of this type has ability to setup Linux network namespaces prior to task execution to allow alternate routing
http://www.perfsonar.net/
http://docs.perfsonar.net/

perfsonar-user@internet2.edu

https://www.youtube.com/channel/UCjK-P49pAKK9hUrrNbbe0Sg
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Thank you

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