Introduction to perfSONAR

Loukik Kudarimoti, DANTE
27th September, 2006
SEEREN2 Summer School, Heraklion
Overview of this talk

- Answers to some basic questions
  - The need for Multi-domain monitoring
  - What is perfSONAR? Who is involved?
  - Objectives of perfSONAR
- The perfSONAR Framework
  - Service Oriented Architecture for network monitoring
  - perfSONAR services, Illustrations
  - Implementation of some services
- Collaboration with other projects
- Multi-domain data visualisation using clients
  - Demos
- Who is currently using perfSONAR?
- Future work and conclusions
Need for Multi-domain Monitoring

- Observations
  - e2e troubleshooting is not straightforward
    - End system vs. network based problem
    - Don’t want to spend too much time when the problem isn't on your network
  - IP e2e doesn’t stop at the boundaries of a domain
    - Monitoring is done “locally” to your network
- Examples: Video-conference, high data rate transfer.
- Network researchers needs network information
- The end-users currently don’t have any or very little view about the networks
- Visualisation currently dictated either by the tool or the data provider

Facilitate the retrieval of monitoring information from multiple administrative domains.
What is perfSONAR?  

• perfSONAR is a software  
  – Wraps around existing measurement tools & data stores  
  – Helps in exporting measurement data  

• perfSONAR is an infrastructure  
  – Provides a set of services (software)  
  – Help in locating data, making measurements, retrieving data, authentication & authorisation of users  
  – Provide seamless access to multi-domain data  

• perfSONAR provides a framework  
  – Many types of measurement tools & data stores are in use today  
  – Framework allows them to be easily integrated into a pS service
What is perfSONAR? 2

* This slide has animations

Connect. Communicate. Collaborate

Get Data
Make Measurement

My own visualisation tool

Data Store

Tool

Users

Data Store

Tool

Domain A (ex: GEANT2)

Domain B (ex: GRnet)

LS

LS

My own visualisation tool

Data Store

Tool
perfSONAR partners

- perfSONAR is a joint effort:
  - ESnet
  - Fermilab
  - GÉANT2 JRA1
  - Internet2
  - RNP

- Internet2 includes:
  - University of Delaware
  - Georgia Tech
  - Internet2 staff

- GÉANT2 JRA1 includes: (16)
  - Arnes
  - Belnet
  - Carnet
  - Cesnet
  - Cynet
  - DANTE
  - DFN
  - FCCN
  - GRNet
  - GARR
  - ISTF
  - PSNC
  - Nordunet (Uninett)
  - Renater
  - RedIRIS
  - Surfnet
  - SWITCH
perfSONAR Objectives

- Network Transparency

Information available (credential based)

Last Mile

User A

User B
perfSONAR Objectives

- Ubiquity
  - Wide deployment of software – large footprint of available data
  - Data can be found – use of discovery mechanisms
  - Data can be accessed – “community of trust” allows access across administrative domain
- Reliability
  - Reliable data
  - Reliable access to data
- Usability (Valuable data)
  - Access to the necessary metrics
  - Analysis of data
  - Automation – applications which can act on data (ex: alarms, etc)
perfSONAR Objectives

- Access to **at least** the following metrics
  - Delay: OWD, IPDV, OWPL, RTT, traceroute
  - Bandwidth: Link utilisation, TCP achievable bandwidth
  - Router information: interface drops, interface errors
- Additional techniques
  - Netflow, Packet capture
- Support needs of projects such as LHC
  - Lightpath status, Alarm notifications
- Trouble Ticket System integration
Overview of this talk

• Answers to some basic questions
  – What is perfSONAR? The need for perfSONAR
  – Who is involved?
  – Objectives of perfSONAR
• The perfSONAR Framework
  – Service Oriented Architecture for network monitoring
  – perfSONAR services, Illustrations
  – Implementation of some services
• Collaboration with other projects
• Multi-domain data visualisation using clients
  – Demos
• Who is currently using perfSONAR?
• Future work and conclusions
perfSONAR and Service Oriented Architecture (SOA)

- SOA is a collection of one or more services
  - A Service is a well defined, independent entity, which has a well defined interface and can be accessed directly
- Services in SOA can be used either singularly or in conjunction, to accomplish a particular task
- SOA is at the heart of perfSONAR
  - 5 base services and 3 additional services identified
perfSONAR Architecture

- Postulate: All measurement systems contain a combination of
  - Measurement tools
  - Data Storage
  - Security and Policy implementation
  - Topology information
  - Visualization

- Services have been identified
  - Based on the above ‘ingredients’
  - Based on requirement for other functionalities such as
    - Service Discovery, Resource protection, Data formatting
perfSONAR Architecture

- Measurement Tools = Measurement Point Service
- Data Storage = Measurement Archive Service
- Security and Policy = Authentication Service

- But how do we locate all these services and their capabilities?
  - Lookup Service
- How do we protect resources?
  - Resource Protection Service
- Topology information is required for all services and users
  - Topology Service
perfSONAR Architecture

- Common rules for all services
  - Advertise capabilities and existence to a Lookup Service
  - Each Service has local policies for Authorization and Resource protection
    - Delegating decisions to Authentication Service and Resource Protector Service respectively is also supported
- Usage of services in a multi-domain scenario
  - Multiple Lookup Services (ideally one per domain)
    - Lookup Services peer with one another
  - One Authentication Service per realm/domain
perfSONAR Architecture 5

Connect. Communicate. Collaborate

* This slide has animations
perfSONAR -
Current Implementations

• Measurement Archive for RRD files
  – Wrapper around existing RRD files
  – Link Utilisation Metric, easily extensible
• Measurement Archive for SQL databases
  – Wrapper around MySQL andpostgresql databases
  – Link Utilisation metric
  – Path status (for dedicated lightpaths)
  – Can work with any database schema
• Measurement Archive for IPPM / HADES
  – One Way delay measurements
perfSONAR -
Current Implementations

• Lookup Service
  – Currently, Single Domain only
  • Talk to LS in each domain to discover services
• Measurement Point for BWCTL
  – Wrapper around BWCTL
  – Achievable bandwidth metric
• Measurement Point for SSH/Telnet
  – Looking glass like features
• Measurement Point for SNMP
  – SNMP Get
• Measurement Point for Command line tools
• And a few more

• perfSONAR suite 1.0 released
  – RRD MA, LS (single domain)
  – ‘Hands on’ installation during the lab session
perfSONAR Collaborations

• perfSONAR service implementations required by many applications/projects
  – GÉANT2 JRA3
    • Monitoring of Bandwidth-On-Demand circuits
  – GÉANT2 JRA4
    • SDH Monitoring
    • Status of dedicated ‘lightpaths’
  – EGEE (I & II)
    • Grid Monitoring requirements
  – GÉANT2 JRA5 (eduGAIN)
    • User Authentication and Authorisation
Overview of this talk

• Answers to some basic questions
  – What is perfSONAR? The need for perfSONAR
  – Who is involved?
  – Objectives of perfSONAR
• The perfSONAR Framework
  – Service Oriented Architecture for network monitoring
  – perfSONAR services, Illustrations
  – Implementation of some services
• Collaboration with other projects
• Multi-domain data visualisation using clients
  – Demos
• Who is currently using perfSONAR?
• Future work and conclusions
DFN CNM

- http://sonar1.munich.cnm.dfn.de/cnm-app/def/jnlp/topoapplet.jnlp
- Requires username and password
- DEMO!
BWCTL

- Requires username and password
- DEMO!
Looking Glass

- Download application from

- DEMO!
perfSONAR UI

- Hands on session from Luchesar Iliev
- After this talk
Monitoring the service deployments

• URLs
  – [http://netmon.acad.bg/smokeping](http://netmon.acad.bg/smokeping)

• Provides status graphs based on ping
• Automatically raises alarms if service unreachable for a certain period
• Monitors if the Application Server is reachable
  – Intelligent monitoring in future
perfSONAR Users

- Deployments of perfSONAR software
  - 13+ RRD MA Installations (Europe, USA, Brazil)
  - IPPM MA, BWCTL MPs, SSH Telnet MPs
  - SQL MA starting to be deployed
- E2ECU
  - End-2-End Co-ordination unit
  - Status of dedicated lightpaths
  - Support projects
- EGEE
  - Accessing data using their visualisation tools
  - Visualisation tools to help Grid Operations Centre
- NOC personnel and Users in different networks
Future Work

• Ensuring High quality software
• Supporting deployments
  – Helpdesk
• Authentication and Authorisation
  – Ensure data protection policies of domain are upheld
• Lookup Service
  – LS of one domain peering with LS of another domain
  – Aggregated information available in most domains
• Topology Service
  – Access to topology of different networks
• Improvements and extensions to existing software
  – More functionality
• More measurement tools
Conclusions

• perfSONAR is an open source development
  – On going effort, already demonstrating results
  – Anybody welcome to join and contribute
• We want to make it easy for you to
  – Deploy this software and use it
  – Allow multi-domain access to your networks’ data
    • Respect your data protection policies
• Following lab sessions designed to help you in
  – Installing the widely deployed RRD MA
  – Using the perfSONAR UI Visualisation tool
• Questions?
• Discussions with the audience
Resources

• GEANT2 pages (and all activities) – www.geant2.net
• perfSONAR pages
  – www.perfsonar.net
• perfSONAR wiki
  – http://wiki.perfsonar.net
• perfSONAR downloads
  – http://www.perfsonar.net/download.html
• perfSONAR snapshot downloads
  – http://wiki.perfsonar.net/jra1-wiki/index.php/PerfSONAR_Downloads
• EGEE Project
  – http://public.eu-egee.org/