perfSONAR: A SERVICE ORIENTED ARCHITECTURE FOR MULTI-DOMAIN NETWORK MONITORING

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Performance Measurement Goals

- Increase network awareness
  - Promote realistic expectations of network amongst users
- Reduce diagnostic costs
  - Performance problems noticed early
  - Performance problems addressed efficiently
  - Network engineers can see & act outside their domains
- Transform application design
  - Applications designed with networks in mind
Four Aspects to perfSONAR

- Architecture and protocols
  - Define web services based on roles
  - Define their communication syntax and semantics
    - Protocols based on the Open Grid Forum (OGF) Network Measurement Working Group (NM-WG) schemas
  - Allow anyone to develop web service implementations
  - A set of interoperable software implementations.
    - Java, Perl, Python etc.
  - A collaboration by many organisations
  - A deployed measurement infrastructure
perfSONAR as unifying layer across domains

Each domain has its own local monitoring

Figure by Domenico Vicinanza, DANTE, 2010
perfSONAR Use Cases

- Come from international community of European and American research networks
- Help to systematize requirements coming from other communities
- Shift focus from adding features to perfSONAR products to delivering perfSONAR products to communities as a service
- Help to better integrate perfSONAR components development
- The perfSONAR infrastructure supports use cases in terms of delivered functionality
Network Performance and Diagnostic Use Case

- **Service:** Enables users at the edge of the network to identify performance capabilities and leverage the people and tools necessary to improve their end-to-end experience.

- **Users:** Performance engineers at NRENs, national and regional backbones.

- **Functionalities**
  - Link availability (L2, L3)
  - Available bandwidth (historical/on-demand, UDP/TCP)
  - One-way delay, one-way delay variation
  - Traceroute
  - Ping

- **Measurement Points**
  - Discoverable
  - Available and accessible
  - Intra-domain, inter-domain and multi-domain paths
  - Integrated into workflows
Network Characterization Use Case

- **Service**: Makes it easy for large experiments/projects to monitor their paths of interest, and be able to identify the attributes of those end-to-end multidomain paths
- **Users**: NOC engineers and key people responsible for a large experiments data movement (e.g. Virtual Organizations)
- **Functionalities**
  - Path uptime
  - Router interface utilization, drops, and errors
  - Achievable bandwidth (end-to-end and network-to-network)
  - Packet loss / reordering / one-way delay variation (end-to-end and network-to-network)
- **Data visualization tools** to easily combine all data
Dynamic Circuit Monitoring Use Case

- **Service:** Enables the automatic creation and monitoring of multi-domain dynamic circuits within the set of participating networks
- **Users:** NOC engineers, power users such as project virtual NOCs
- **Functionalities**
  - Notifications (flexibly configurable, triggered by changes in state)
  - Cover current and historic state
  - Cover administrative and operational states
- **Measurement Points**
  - Must be reliable
  - Configuration must be automated
  - Must scale to static and dynamic circuits
  - Information model must support reporting about any potential performance metric for the following
    - *Full circuit*
    - *Each segment*
    - *Each link or interface*
Web Portal for End Users Use Case

- How am I doing?
- Is it even possible to do this?
  - If yes
    - Is this better/worse than others?
      - If worse, what’s then?
        - Educate
        - Ask for help
GÉANT Monitoring Services

- **perfSONAR MDM Basic**
  - Software (perfSONAR components) and support (Service Desk)
  - Effective federated model for NRENs and regional networks
    - *Domains deploy necessary components using their own infrastructure and resources*

- **perfSONAR MDM Managed**
  - Infrastructure (measurement servers), software (perfSONAR components), support and maintenance (Service Desk)
  - Effective solution for private networks
    - *Implemented for LHCOPN*

- **perfSONAR MDM Passive**
  - Dedicated infrastructure for passive network monitoring (dedicated optical cards), software and support
perfSONAR Suite

- **Web services**
  - Measurement Archives (MA)
    - **RRD MA, SQL MA, HADES MA**
  - Lookup Service
  - Auth/Autz
- **Measurement Point services (MP)**
  - BWCTL MP, SSH/Telnet MP, E2EMon MP

**Visualization**
- Different ways of using infrastructure and presenting data
Available In Production

- perfSONAR MDM 3.2 release
  - Bundle of perfSONAR MDM installers comprising Java and Perl web services as well as administrator’s documentation
  - DEB, RPM installation packages
  - Originated in GÉANT

- Visualization tools

- Coming soon: perfSONAR MDM 3.3 release
  - Better performance and stability
  - DVD installation
http://www.perfsonar.net

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