



Proposal for a perfSONAR Multi Domain Monitoring Service for LHCOPN



Service Overview and Site Responsibilities

Service overview

The perfSONAR Multi Domain Monitoring (MDM) service provides users with access to network measurement data from multiple network domains. Users can collect monitoring data from all domains where the service is deployed in order to visualise network characteristics and troubleshoot related issues.

For the specific monitoring of the LHC Optical Private Network (LHCOPN), DANTE, CERN and the 11 Tier-1 sites are collaborating on a customised version of the perfSONAR MDM service.

This customised service will be used to monitor the IP and circuit operations of the LHCOPN. Probes will be placed at the 12 nodes (the 11 Tier-1 sites and CERN) in order to monitor the interconnections between these nodes. The perfSONAR MDM service desk at DANTE will operate this service.

Users of this service and of the collected measurement data will be the LHCOPN IP Coordination Unit (LIPCU), the End-to-End Coordination Unit (E2ECU) and the Tier-1 sites who are the contributors to the LHCOPN operations.

As part of a public trial phase, a similar service has already been rolled out to 6 network domains in Europe with 5 further networks to be introduced in the first quarter of 2008. The GÉANT2 project will extend this trial to LHCOPN monitoring. Similarly ESnet and Internet2 are distributing compatible perfSONAR measurement systems to their backbones and to various customer locations.

Features

The MDM service's measurement tools and the hardware and operating system they require are packaged in an appliance that can be deployed at any location. For LHCOPN it will be deployed close to the border router(s) of the Tier-0/1 sites.

Active and passive measurement techniques will be used to monitor the network connectivity between Tier-0 and Tier-1 sites. Regular active measurements will probe the network connections in order to determine:

- one-way delay and delay variation
- TCP achievable bandwidth
- ICMP-based round-trip time
- traceroute information to monitor routing path changes

Regular passive measurements will be carried out to collect utilisation, input error and packet discards statistics from the sites' network elements.

LHCOPN-specific network weathermaps and diagnosis tools will be provided to visualise the measurement results. The service desk will use these data to generate monthly service reports.

The monitoring infrastructure will be operated in a secure mode with well-defined responsibilities. The service specifications [1] provide an overview of risks assessment. Network configurations and router firewalls play an important role in the mitigation of these risks. Therefore, all Tier-0/1 sites are required to meet specific responsibilities in order to maximise network security and reliability.

Benefits of a managed service

The service will provide up-to-date information about network health and assist operational teams in diagnosing network-related issues. Deploying the monitoring infrastructure at the administrative boundaries (the Tier-0/1 border routers) establishes demarcation points that help distinguish network issues in the LHCOPN from those at the sites. The advantage of a centrally managed service is that it provides a common view of the network status with low overheads for the Tier-0/1 network operators involved.

The service provides reports based on the monitored data that can be used to analyse network statistics (for example, usage or errors) and performance bottlenecks. Reports can also be used to monitor adherence of network providers to Service Level Agreements and to detect usage trends.

Deployment of identical tools and the use of a common service in all the Tier-0/1 sites will provide a unified network information view across all sites. The tools can be used on a day-to-day basis as part of normal site operations as well as for network engineering and capacity planning. The Tier-0/1 sites can also use the tools to demonstrate the quality of the wide-area networking service they deliver to the LCG project using the LHCOPN.

Service desk responsibilities

The perfSONAR MDM service desk at DANTE will:

- Manage the measurement tools, data archives and visualisation tools.
- Manage the hardware and operating systems in order to ensure the reliability of the measurement tools and the data.
- Ensure the integrity of the monitoring infrastructure, availability of the measured data, data quality and its archival.

Site responsibilities

All sites are required to contribute the following components to the MDM service:

- a terminal server
- dedicated IP interface on the border router(s)
- a PSTN/ISDN line for out-of-band access
- a Gigabit Ethernet switch
- a GPS antenna
- a protected power source
- rack space

These contributions are further detailed in the service specifications set by the service desk.

In addition, sites also need to assign local administrators whose responsibilities include:

- Securing the deployed measurement infrastructure by controlling access for third party support personnel (when required by the service desk).
- Carrying out the initial hardware installation and assisting the remote software installation.
- Updating the service desk with site network topology and configuration changes.
- Providing End-to-End monitoring (E2Emon) status information about circuits ending at the site.
- Securing network access to the infrastructure. The appliances must be connected to a dedicated IP interface on the border router(s). At each site, the appliances, the terminal server and the dedicated IP interface require a dedicated subnet with 11 public IP addresses. These IP addresses must be within the LHCOPN address range, so that measurements are routed via the LHCOPN circuits. They also must be reachable by the DANTE service desk and the operation coordinators (LIPCU and E2ECU).
- Traffic flows on the dedicated router interfaces must be restricted to: measurement activity between the appliances at the 12 sites, management access for the perfSONAR MDM service desk which is outside the LHCOPN, and monitoring data access for users of measurement data. These users are operation coordinators (LIPCU and E2ECU) and the operators at the Tier-0/1 sites. In order to collect statistics from the border router interfaces which connect the site to the LHCOPN, the appliances must be allowed to poll the IP interfaces using read-only SNMP access.

Possible future enhancements

Once the LHCOPN monitoring service has been securely established, the appliances could possibly be used to extend the scope of monitoring to sites outside the LHCOPN. The effect of such extensions, if requested by the Tier-0/1 sites, will be explored by the service desk and made available, if they don't jeopardise the LHCOPN monitoring itself.

Further details of the service and its implementation are available in the GN2-07-308 document [1]

[1] [http://www.geant2.net/upload/pdf/GN2-07-308v10_perfSONAR_MDM_service_for_LHCOPN -
_Service_specification.pdf](http://www.geant2.net/upload/pdf/GN2-07-308v10_perfSONAR_MDM_service_for_LHCOPN_-_Service_specification.pdf)