

## Grid Network Performance Monitoring

### Extended ABSTRACT – All Hands 2004

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Writing about the virtues of Grid computing for members of the UK e-Science community would be a superfluous exercise. What cannot be underestimated however is the role the underlying network will play in the Grid's effectiveness. A clear and recent example of this is the real-time remote visualisation TRICEPS (Transcontinental RealityGrids for Interactive Collaborative Exploration of Parameter Space) HPC Challenge demonstration given at Super Computing 2003. UK e-Science projects played a major role in the demonstration, and it received the Award for Most Innovative Data-Intensive Application. Providing the required networking was however, a non-trivial, non-automated exercise. Further, much data belonging to the computational stage of the activity did not travel over a production network.

Network performance data is crucial to the Grid. It is required for:

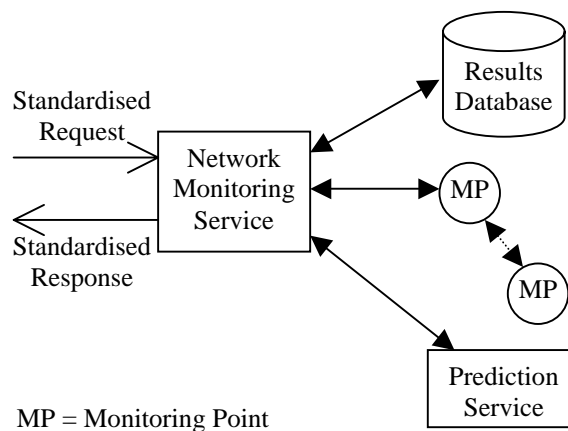
- Grid middleware and applications to be able to optimise their performance by adapting to changing network conditions (including the ability to be "self healing").
- Debugging networks for efficiency, an essential step for those wishing to use data intensive applications. Simple over-provisioning of networks is not greatly aiding the end user.
- Support the Grid "utility computing" model, via measurable SLAs.

Indeed, network monitoring is already defined as a key role of the proposed UK GOC.

To address some of these issues, a UK e-Science Grid network performance monitoring project was started in June 2002. At the inaugural All Hands Meeting that year we outlined the proposed development of a comprehensive and extensible network monitoring infrastructure for UK e-Science. At the last meeting we were able to report on the strong progress made in establishing that infrastructure. We also introduced the project's second phase, which was to investigate GridMon's integration into Grid technology via compliance with relevant web and Grid services work.

At this year's meeting we will present a further update, focusing primarily on the international Grid network monitoring work which the UK has contributed to in the last year, via the GGF:

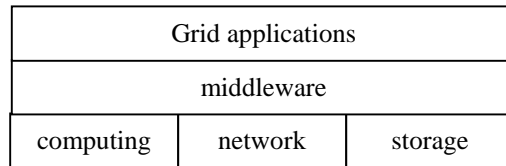
- The Network Measurements-Working Group (NM-WG) are defining schemas with which to communicate with network monitoring systems. As illustrated in figure 1, in fully interactive systems, clients will be able to request historic data, future or on-demand tests or predictions. Results can then be returned. All request and result messages can be formatted using standardised schemas, a truly powerful combination.



**Figure 1:** request-response mechanism

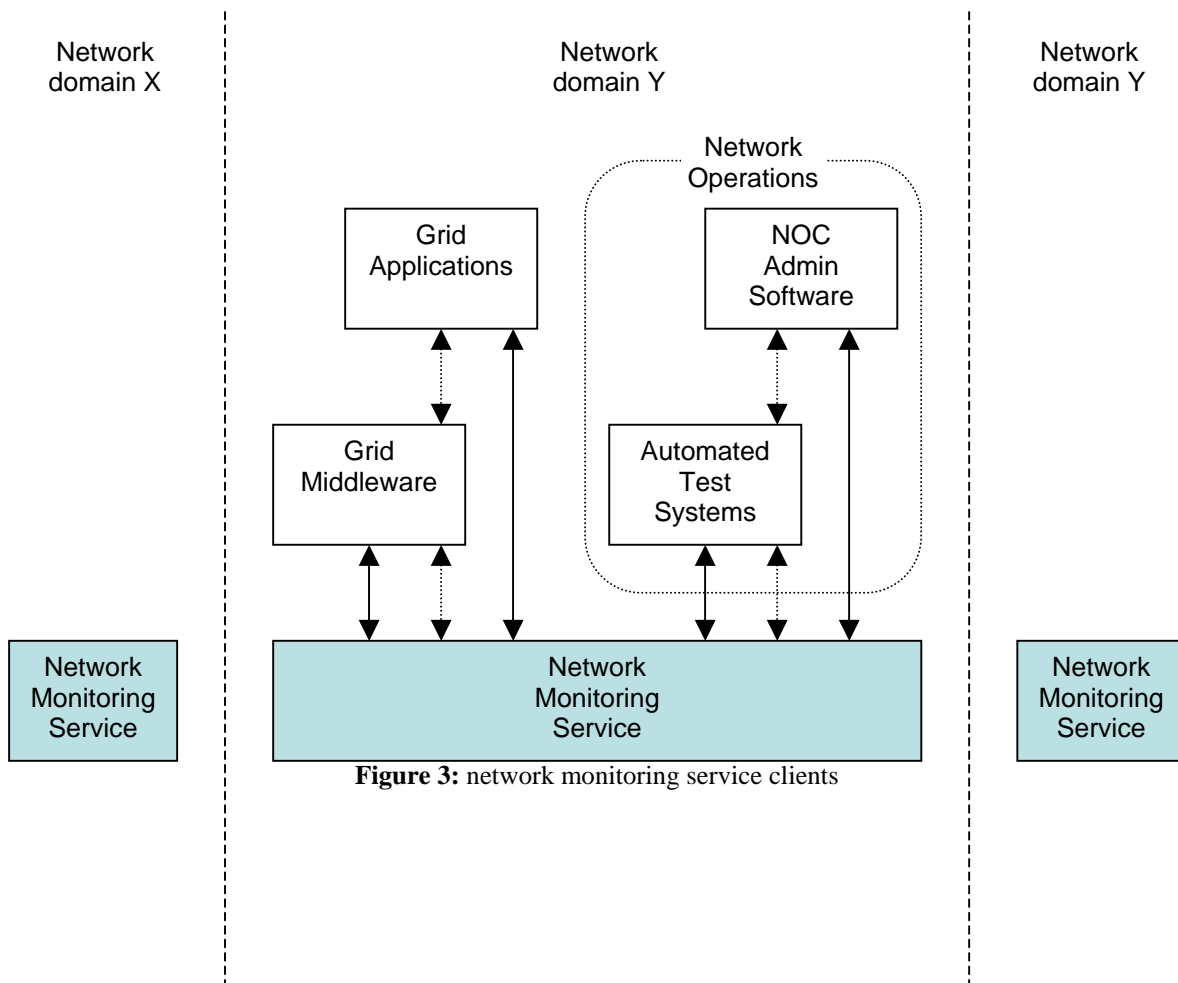
- The Grid High Performance Networking Research Group (GHPN) are producing proposals for delivering network functions as Grid services, with examples being data transport and resource

management services. It is hoped that a combination of these services will produce a holistic “network” service, allowing the network to be treated as a manageable Grid resource. Figure 2 shows the network as part of an integrated Grid stack. The potential advantage is hopefully clear: the ability to leverage existing/planned Grid technologies (advanced reservation, negotiation etc.) and apply them to the network.



**Figure 2:** integrated stack

A network monitoring service is also part of this proposal, and its potential clients (numerous and varied) are shown in figure 3.



**Figure 3:** network monitoring service clients

Finally, some consideration will be given to new work, funded as part of the GridPP2 programme: development of a network diagnostic engine, a “search and identify” troubleshooting tool for use in Grid and Network Operations Centre environments. The work, which has applicability for GridPP, UK e-Science and Europe’s EGEE programme, hopes to benefit from collaboration with Internet2’s piPEs initiative.