Supporting networks for Grids

Grid technologies often make novel demands of networks, both in terms of performance and by their use of new protocols. It is therefore essential to have processes both to assess what proposed Grid activities will require of site and external networks, and to ensure that any changes to provide for these do not undermine existing measures that have been implemented on networks and servers to reduce security risks. Many technical and design solutions exist that allow Grids to be used on existing production networks (these are discussed in the Deploying Grids Technical Guide), but unless an appropriate solution is chosen then serious damage may be done both to the Grid and to the network service.

Network Design

It is unlikely that the use of Grid technologies will be successful unless the design of the network has taken them into account. Providing connections that allow the required protocols to be transmitted with the necessary characteristics of bandwidth, delay, packet loss and jitter may require adjustments at any level of the network, from physical connections to transport and application layers. New control points, such as application gateways, may be required both to ensure the Grid performs adequately and that its use does not damage other applications with which it shares the network. Many different technical solutions exist that will allow most requirements to be met; however, this will only be achieved if there is a clear understanding of the requirements of both the Grid and the network service, a reasonable assessment of the risks to both, and adequate resources provided to satisfy both the performance and security requirements. Unless Grid and network providers and operators work together to create and maintain a Grid service, it is very unlikely that it will deliver the expected results.

As Grid technology – and the organisation's use of it – develops, it is likely that the demands on the network will change. This may involve greater demands on the network, or may allow simplification. A continuing process must therefore be established to review the service, to identify problems and opportunities, and to evaluate, implement and maintain solutions.

Network Performance

The intensive use of networks involved in some Grid applications means that performance issues are particularly important. For traditional network applications, available bandwidth and packet loss have been the most visible performance metrics for end-users; however, some Grid applications may also be adversely affected by latency and jitter, which are less commonly measured and may change more frequently. The use of Grids is therefore likely to require new performance measurement and diagnostic tools for network operators, as well as processes for users to characterise and report problems as they are occurring. For some applications, network behaviour all the way to the workstation may have an impact on perceived performance. Measuring and diagnosing problems in this area may well require the assistance of the user, aided by appropriate user-friendly tools. Some Grid systems attempt to

tune their behaviour to the current network performance: this can be helpful but such behaviour must be controlled so that it does not affect other uses of the network.

Assessments of network performance will be needed at three different stages of the use of Grid technologies. Users will wish to be assured of an adequate level of performance before they commit effort to using new technology, so it will be necessary to validate the network's capabilities in advance; routine monitoring both of the performance of Grid networking activities and their interaction with other uses of the network will be required to manage and develop the service; and effective and prompt data gathering and analysis will be needed to resolve faults and incidents. Each of these will require its own processes and may require some specific tools and expertise.
