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On-demand Layer VPN Support for Grid Applications

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The problem of finding the best match between jobs and computing resources is critical for an efficient work load distribution in Grids. Very often jobs are preferably run on the Computing Elements (CEs) that can retrieve a copy of the input files from a local Storage Element (SE). This requires that multiple file copies are generated and managed by a data replication system.

We propose the use of scheduled on-demand Layer 2 Virtual Private Networks (L2 VPNs) for an alternative data access model based on the possibility to connect to the same virtual LAN both CEs and SEs from remote Grid domains. The L2 VPN members are “close” to each other. In this way a CE can be selected by a Resource Broker without requiring the presence of a local file replica. This simplifies the data management and allows a more efficient use of the network resources on the links connecting the Grid to its main data sources.

In this paper we detail how L2 VPNs are dynamically provisioned through the Grid Network Agreement Service. We propose a hierarchical network resource abstraction, the Path, and we show how it can be integrated in the Grid Information Service to perform network resource discovery and matchmaking. We then describe the User Interface through which the Path negotiation terms are specified by the user and we propose a path management approach that integrates different network technologies, namely MPLS and the Differentiated Services architecture. The implementation details of a system prototype are described together with some initial experimental results.

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