Message Passing Framework for Globally Interconnected Clusters

Content:
In prevailing technology trends it is apparent that the network requirements and technologies will advance in future. Therefore the need of High Performance Computing (HPC) based implementation for interconnecting clusters is comprehensible for scalability of clusters. Grid computing provides global infrastructure of interconnected clusters consisting of dispersed computing resources over the internet. On the other hand the leading model for HPC programming is Message Passing Interface (MPI). As compared to Grid computing, MPI is better suited for solving most of the complex computational problems. MPI itself is restricted to the single cluster. It does not support message passing over the internet to utilize the computing resources of different clusters in an optimal way. We propose a model that provides message passing capabilities between parallel applications over the internet. The proposed model is based on Architecture for Java Universal Message Passing (A-JUMP) framework and Enterprise Service Bus (ESB) named as High Performance Computing Bus. The HPC Bus is built using ActiveMQ. HPC Bus is responsible for communication and message passing in an asynchronous manner. Asynchronous mode of communication offers an assurance for message delivery as well as a fault tolerance mechanism for message passing. The idea presented in this paper effectively utilizes wide-area inter-cluster networks. It also provides scheduling, dynamic resource discovery and allocation, and sub-clustering of resources for different jobs. Performance analysis and the comparison study of the proposed framework with P2P-MPI are also presented in this paper.

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