A Comparative Survey of Fault-tolerant and Load balanced MPI Implementations, Software Packages and Algorithms *

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ABSTRACT

Advancement in high-speed networks and rapid improvement in microprocessor design enabled cost-effective high-performance parallel computing on clustered low cost workstations and PCs. Systems based on message passing draw attractions in the field of high performance computing, where loop or data parallelism is a main source of parallel processing. Therefore, MPI is one of the most adopted programming models for Large Clusters and Grid deployments. However, these systems often suffer from network or node failures, because the nodes of such systems are likely to be heterogeneous with respect to computing power and workload. This raises the issue of selecting a fault tolerance approach for MPI to manage various dynamic failures appropriately. Moreover, loads should be balanced according to the performance of nodes to minimize the elapsed time of program. Various models have emerged to simplify the task of programming in network environment, but MPI approach is considered one of the most mature methods currently used in parallel programming. This paper presents an overview of Message-passing models in the context of Grid Computing and a comparative survey of fault-tolerant and load balanced system, algorithms and software packages for MPI.

Keywords: Fault-tolerant MPI, Grid Computing, Dynamic Load-balanced systems, Parallel Computing, Cluster of workstations