ABSTRACT

With the advent of distributed systems, parallel programming has been a solution for many high computations and memory required engineering applications. Advancement in technology has also made mobile devices to be part of the distributed systems thus supporting Iterative Mobile grid computations. In certain class of applications, the domain of computation is divided with the need to exchange their boundary values across the sub-domain. In such critical cases, the participation of the mobile devices in the grid requires a special solution to handle the constraints associated with the mobile devices. Hence, the novel Mobile Distributed Pipe (MDP) model is proposed to handle transparent programmability of communicating parallel tasks among the mobile clusters. The work also explores solutions to enable location independent inter-task communication among processes across static and mobile nodes. The process which is linked with specific mobile or static nodes will not be resilient to the changing conditions of the mobile cluster. This novel approach enables the migration of communicating parallel tasks during runtime, which occurs according to the context and location requirements.

The thesis also explores the same model using distributed shared object thus providing solutions to allow the users to share and manage
arbitrary services, offered by both the static and mobile hosts. Hence, an enhanced mobile grid which supports inter-task communication using Distributed Shared Object Model (DSOM) with the MDP is also proposed. DSOM is based on the incorporation of Surrogate Object Model (SOM) and Distributed Shared Object (DSO) for mobile grid. SOM is chosen to enhance the resource sharing of mobile grid computing, while DSO is chosen to reduce the computational complexity. The unused computing determinant is utilized by SOM to save the processing time. The transparency of the DSO model in terms of distribution and heterogeneity reduces the computational complexity. DSO also enhances the load adaptability and fault-tolerance to parallel programs on the mobile grid.

To enhance the success ratio and to recover the jobs that are failed at the time of job execution in a mobile grid environment, a robust job check pointing and replication mechanisms for Fault Tolerant Scheduling (FTS) is proposed. This novel approach provides successful job execution in mobile grid, even in the presence of faults. The proposed mobile grid environment comprises a set of major components like Grid Information Services (GIS), Cluster Heads (CHs) and the set of Cluster Members.

Fault management is a major challenging task in mobile grid applications where interaction, omission and timing faults are more prevalent. Fault tolerance is the capability of a system to perform its task correctly even
in the presence of faults by making the system more dependable and scalable. Checkpointing is also explored to provide fault tolerance during unreliable conditions. It is a record of the snapshot of the entire methodology in order to restart the application when failure occurs. The checkpoint can be stored on temporary as well as in permanent storage. FTS paradigm is resource limited due to the fact of mobile devices in terms of processing power, runtime heap, persistent storage, screen size, battery lifetime, bandwidth and connectivity.