The Research Monograph Series in Computing, Electrical & Communication Networks
Vol. 1 (01), January 2023, pp. 1–2

ABSTRACT

Grid computing is a large-scale virtual computing environment where geographically distributed resources collaboratively provide an exceptional infrastructure for solving complex, scientific and computing tasks. The emerging Grid Community is trying to incorporate mobile devices into the Grid forming Mobile Grid. The rationale behind creating the mobile grid is that the number of mobile device users is exploding and the present mobile devices are equipped with high speed processors and large memory with advanced technology at ever-faster pace. The mobile devices also have advantages over fixed computing resources such as mobility, portability, and pervasiveness. In addition to this, there arelots of highly capable mobile devices, idle most of the time in the same enterprise network. Further, the mobile devices can be applied in the field like wildfire prevention, e-health system, scientific, engineering and commercial purposes where Grid computing is probably employed.

Though the mobile devices offer so many advantages, they suffer with few inferior characteristics such as low network bandwidth, mobility, heterogeneity, volatility, frequent disconnections, battery power, and security flaws when employed in mobile Grid. To overcome the inevitable issues and to promote ubiquitous and high performance Grid computing, a feasible and dynamic Grid computing approach is essential. The viability can be achieved by establishing an effective job scheduler.

In general, an intellectual job scheduler should provide a highly secure and efficient fault tolerant Grid environment. It should analyse the job and allocate suitable mobile device for it. The scheduler should minimize uncertainty in job execution and strive to optimize scheduling objectives such as load balancing, load sharing and minimum response time.

Here, an efficient Mobility Aware load balanced scheduling is accomplished. The job scheduler of the proxy server receives the resource request from the grid controller and analyses the job category. It classifies the job into computing-focused and communication-focused jobs. The job scheduler considers parameters such as response time, node's mobility, capacity and capability of the resources. It allocates the computing-intensive jobs to the resources with shorter round-trip-time (RTT), high CPU speed and capacity. The communication-intensive jobs are allocated to resources with low mobility and high reliability. This

approach provides an exceptionally balanced job scheduling across the entire client set in the mobile grid environment.

This thesis also develops an effective fault detection and fault recovery technique under network disconnections, node failure and other network flaws. Accordingly, the node failures are classified into three types: Unrecoverable failures, Recoverable failures and Intermediate failures. Software failure and some form of Hardware failure are considered as Unrecoverable failures. They cannot be recovered. Under this condition the task executed in the node is terminated and rescheduled to an alternate node. The performance overload and human operation errors are considered as recoverable failures. These can be surmounted by suitable recovery technique. Some form of hardware failures, where hardware can be replaced are considered as Intermediate failures. Once replaced execution can be job resumed.

Finally, this thesis presents a security system that provides basic services such as authentication, confidentiality and also a resistance system against Wormhole attacks. This portion of the thesis employs a group key management system for providing secure data transfer among the grid users and a Worm resistance system for preventing External and Byzantine Wormhole attacks that causes malicious activities.