CHAPTER 7

CONCLUSIONS AND FUTURE ENHANCEMENT

7.1 CONCLUSIONS

The main objective of this research work is to provide a better resource allocation model for Cloud environment. This research work is carried out in four stages, namely, Multi-agent based resource allocation, framework based resource allocation, AIS-DAG model based resource allocation and multi-stage framework using QoS-based resource allocation.

In the initial stage, Multi-agent based Dynamic Resource Allocation (MADRA) is implemented using multiple agents for checking resource availability and allocation process on the server side. There is a correlation between agents, though each agent has its own job. Whenever the user submits a request the request is processed and the quality score of the resource is calculated in terms of time, energy and availability. Finally, the resource with the best score is allocated. The proposed strategy, MADRA, is simulated using CloudSim software tool. On the average, the proposed strategy, MADRA, is far superior to existing scheme Improved Differential Evolution Algorithm (IDEA) as the response time and energy consumption is improved by 20.39% and 12.55% respectively. This leads to the conclusion that MADRA is suitable for dynamic allocation of resources in spite of the high user request and, also reduced response time and energy consumption.
Next, a framework to validate the request and allocating resources in Cloud environment is proposed. Due to diversity in the Cloud environment and an enormous number of resources, client and servers, validation of requests are necessitated in each stage of resource allocation. Resources will be allocated if and only if it is a valid request. The advantage of request validation for resource allocation is reduction in response time, reduction in energy consumption and reduced cost. This work is simulated in Cloud simulator software tool. The simulation results show that 80% of the requests from clients are successful. Proposed framework has overcome a great challenge in Cloud by allocating requested resource within the stipulated time and minimum energy.

The third stage of the research work focuses on providing energy efficient, and low cost resources to the clients with less response time. It is accomplished with the help of Artificial Immune System for Directed Acyclic Graph (AIS-DAG) model, which has very low power consumption. Resource allocation request is processed in less time and cost. DAG model helps the Cloud environment to take the right decision in all kinds of its processes. Then, request properties, communication properties, and resource properties with meta information of DAG model are used in the proposed AIS algorithm for choosing the best resource according based on the fitness function. Finally, the AIS algorithm assigns the best selected resources to the user. The proposed AIS-DAG approach is simulated using Greencloud Simulator software tool.

On the average, the proposed AIS-DAG model, improves the response time by 8% and 3% and completion time by 23.48% and 16.3% when compared to Improved Differential Evolution Algorithm (IDEA) and Immune Clonal Selection Algorithm (ICSA) respectively. On the average, the energy consumption is reduced by 25.62%, 21.96%, and 18.41% when
compared to existing Edges Based-DAG (EB-DAG), Communication Unaware-DAG (CU-DAG) and Communication Aware-DAG (CA-DAG) models respectively. The experimental results highlight the potential of AIS-DAG model by significantly reducing response time and completion time leading and thereby improving energy efficiency.

The final stage of the research work uses multi-stage framework which employs QoS based Resource Allocation (QRA) algorithm to improve the efficacy in Cloud and reduce the amount of data which needs to be transmitted for the purpose of processing in a Cloud. The multi-stage framework validates the user request using agents and passes the request to server manager. QRA algorithm selects appropriate resources from the nearest server manager and assigns it to the user request. The proposed QRA approach is simulated using Greencloud Simulator software tool and the results are verified and the performance is evaluated.

On the average, the proposed QRA approach has 20.52% improvement in response time, 13.29% in power consumption reduction and 1% error in prediction when compared to existing Efficient Resource Allocation (ERA) approach. The percentage of resource allocation is 99.18% when the input load frequency is 200Hz which is comparatively high with other approaches such as Edges Based-DAG (EB-DAG), Communication Unaware-DAG (CU-DAG), and Communication Aware-DAG (CA-DAG) models. It is evident from the simulation results that the proposed Multi-Stage Framework using QRA is efficient and scalable. Parameters such as response time, energy consumption, error prediction, and resource allocation have been improved using the proposed QRA approach.
7.2 FUTURE ENHANCEMENT

I. When implementing the proposed multi-agent based methodology, MADRA, parameters such as time, energy, and availability are considered for calculating quality score of resource and allocating it to a user request. The efficiency can still be improved by considering more parameters such as bandwidth and communication delay that is essential to improve efficiency of resource allocation in Cloud environment.

II. The energy efficient resource selection and allocation techniques AIS-DAG and Multi-stage framework proposed in this thesis can be further extended to Mobile Cloud (MC) which is a trending technology for energy savings and increased battery life.

III. The implementation of the proposed resource allocation methods in real time using Amazon services and Rackspace.