DIRECTED ACYCLIC GRAPH DATA OFFLOADING FOR IOT-ASSISTED CLOUD EDGE COMPUTING

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ABSTRACT

The most challenging problem for a mobile cloud service provider is providing the quality of service through minimizing the execution time and reducing fast discharge of mobile device batteries. Therefore, the mobile cloud service provider needs an efficient mobile application offloading algorithm for execution to edge devices and centralized datacenter. We propose a task offloading framework that reduces execution time of mobile application and drastically reduces energy consumption of mobile devices. The proposed system employs a combination of NSGA-III (non-dominated sorting genetic algorithm) with DE (Differential Evaluation) algorithms to optimize the multi-objective problem of directed acyclic graph workload offloading in cloud or edge computing(cloudlet). The proposed model is designed and simulated in Work flow Sim toolkit, analysed the experimented metrics with existing model.

Keyword: - *Cloud, Routers, JAVA, J2EE, JAVA Servlets, My Sql, Modules, Testing, Use Case Diagrams, Net Beans, etc…*

1. INTRODUCTION

Nowadays, cloud computing is considered as one of the most powerful trends and widespread computing services which are distributed all over the world. The appearing of Cloud Computing environment enables a new framework that changes the physical location of computation and storage into the network to reduce operational and maintenance costs. In high performance computing, Cloud computing is considered a new tool and asset. Cloud computing is internet-based and central service provision in order to maintain data and applications. Consumers use different applications through the internet by cloud computing without installing software. Besides, cloud computing is used in high performance computing to centralized storages, memory, processing and bandwidth. Also, in this situation, Internet of Things trying to make availability of all services on line and can be accessed globally. Sometimes, mobile devices act as an internet of things to sense the user's environment and generate huge amount of data. These data should be processed in an application running on the mobile device and provide the services to end users. When the big data are processed on a handheld instrument of mobile device which limits the availability of computational and data resources, it surpasses the constrained execution and response time and it leads to consume more energy. In this scenario, internet of mobile things searches supports from cloud resources for computational, transferring and storing data. But the mobile devices are connected through wide area network to cloud resources. Due to separation of mobile devices geographically far from cloud resource, it increases response time, delay of data transferring between computational resources and drastically reduces the performance of mobile services. To overcome this situation, edge devices help to cloud datacenter through enclosing a small datacenter between edge devices and cloud datacenter with average computational resources, base stations and access point at edge of radio access network. This small datacenter (Cloudlet) is interconnected to mobile devices via local area network with high bandwidth and low latency. The mobile devices can offload their computation tasks either to cloud datacenter or cloudlet supported edge devices to increase its performance by minimizing latency and response time. The edge device offloading processes construct a green cloud computing environment.

1.1 Existing System

- The existing model COM, represents internet of mobile things, edge devices, Cloud datacenter and Cloudlet based task offloading processes.
- Mobile device senses the user environment and generate huge amount of data towards edge supported cloud datacenter.
- The COM method, offloads the big data for processing and providing the services to mobile end users.
- Cloud datacenter includes huge amount of computational, storage and communicational infrastructural capacity to provide the services to the public on pay-as-a usage.
- The above infrastructure constructs the physical model, it receives and schedules the big data on the edge supported cloud due to the scheduling algorithm.
- The NSGA-III algorithm uses to address the multi-objectives of the proposed system.

1.2 Objective

The proposed model aims to achieve the multi-objectives in the view of improving performance of an internet of mobile things. This achievement is fulfilled through minimizing execution time and reducing energy consumption of mobile devices.

1.3 Contribution

This project needs four phases to build and experiment it, first the cloud, cloudlet and edge devices are designed with large, moderate and average computational and data resources respectively. Second, the proposed method decides where to offload the computation tasks whether on cloud datacenter or edge supported devices. Third, the offloaded tasks are scheduled on the resources and finally the edge supported cloud datacenter is monitored and calculated to improve and evaluate the performance of the internet of mobile things.

2. LITERATURE SURVEY

Compared with the cloud, Edge Computing is an emerging technology that aims at pushing applications and content close to the users to reduce latency, improve the quality of experience and ensure highly efficient network operation and service delivery, which has the potential to address the concerns of response time requirement, battery life constraint and bandwidth cost saving. In a system of mobile cloud computing based on unmanned aerial vehicles (UAVs) to reduce the mobile energy consumption through computation offloading. In the system, joint optimization of bit allocation and trajectory of cloudlet was proposed. Jin et al. proposed an incentive compatible mechanism (ICAM) to distribute cloudlets based on the demand of mobile services. The proposal of a Markov Decision Process (MDP) to seek a hybrid offloading strategy in mobile devices, the edge and the cloud, while optimizing the execution time and the energy consumption. A research offloading from a mobile device to several edges. In such scenario, task allocation and central process unit frequency of the mobile device are optimized to reduce the execution latency and energy consumption of the mobile device.To demonstrate the feasibility of the proposed approach, we have used the framework and scenario into a edge computing based environment using CloudSim (Calheiros et al., 2011) and WorkflowSim-1.0. In this project work, event simulation functionalities of CloudSim have been used to implementing functionalities of WorkflowSim architecture. CloudSim entities such as datacenter and communication amongst datacenter through message sending operations are included. Therefore, the core CloudSim layer is responsible for handling events between fog computing components in WorkflowSim. One of the scheduling issues is to allocate the correct resource to the arriving tasks. The dynamic scheduling process is considered complex if several tasks arrive at the same time, Therefore, they have introduced a system to avoid this problem by allowing the arrived tasks to wait in a queue and the scheduling will recompute and sort these tasks. Therefore, the scheduling is done by taking the first task from the queue and allocated to the resource that will be the best fit using GA. The objective of this system is to maximize utilization of resources as also reduce execution time.
Also, cloud computing provides computational resources to users on the Internet as a public service based on the pay-as-you-go model which this services demand by the cloud consumers. From the other point of view, scheduling is considered as a decision-making process that is commonly used in the majority of production and service-providing industries and is employed to optimize efficiency. Constraint Programming (CP) and Linear Programming (LP) can be used to create exact formulations of the VM placement and consolidation problems and find optimal solutions for those problems. However, due to the inherent complexity and NP-hard nature of those problems, the time complexity of such exact solutions turns out to be exponential and thus impractical for large problem sizes.

Furthermore, such programming languages do not allow the optimization of multiple objective functions simultaneously. VMs' consolidation aims at improving resources' usage efficiency by placing under-loaded resources in a suspension or idle state. This is achieved by grouping dispersed VMs on a minimal number of active PMs, then switching off or suspending unused servers – thus saving energy. There are several challenges associated with the VMs' placement and consolidation problems. The first challenge is associated with the NP-hard nature of such optimization problems, which are time and resource consuming to solve. Another challenge is the potential impact of energy saving on the system's performance.

3. PROPOSED SYSTEM

- The proposed system enhances the COM model as DCOM (Directed acyclic graph Computation task Offloading Method) through an implementation of effective resource scheduling algorithms of the combination of novel Genetic Algorithm and Differential Evolutionary Algorithm.
- The DCOM framework comprises the physical resources for mobile devices, edge devices, cloudlet and public cloud to offload the computational tasks of mobile applications towards cloud resources.
- The DCOM method, performs the operations of offloading of tasks from mobile devices and can be scheduled on edge device, cloudlet or cloud datacenter.
- The multi-objective optimization of the proposed system performs through the scheduling of tasks on computational resources. The combined algorithms of Non-dominated Sorting Genetic Algorithm-III with Differential Evolutionary algorithm (NSGA-III - DE).
- The proposed model of edge supported cloud resources helps to offload the computational tasks from mobile applications towards cloud resources.
- The DCOM method, provides the mobile services to end users by minimizing response time, latency and energy consumption.

3.1 Advantages of Proposed System

- DE is better and simpler to be applied compared with other algorithms due to its simple implementation and fast convergence characteristics.
- Trial and target vectors were involved in the operations in producing the next generation children.
- Better fitness trial vector will be selected to replace the old generation. Hence, new generation is produced. The operations will be continued until the termination criteria are reached.
- If termination criteria are not fulfilled, Mutation: 3 indices (r1, r2, r3) are randomly chosen from the population to form the mutant vector in producing the children. Else, the algorithm is terminated.

4. RESULT

Fig.No.1 Screen Shot of the Project

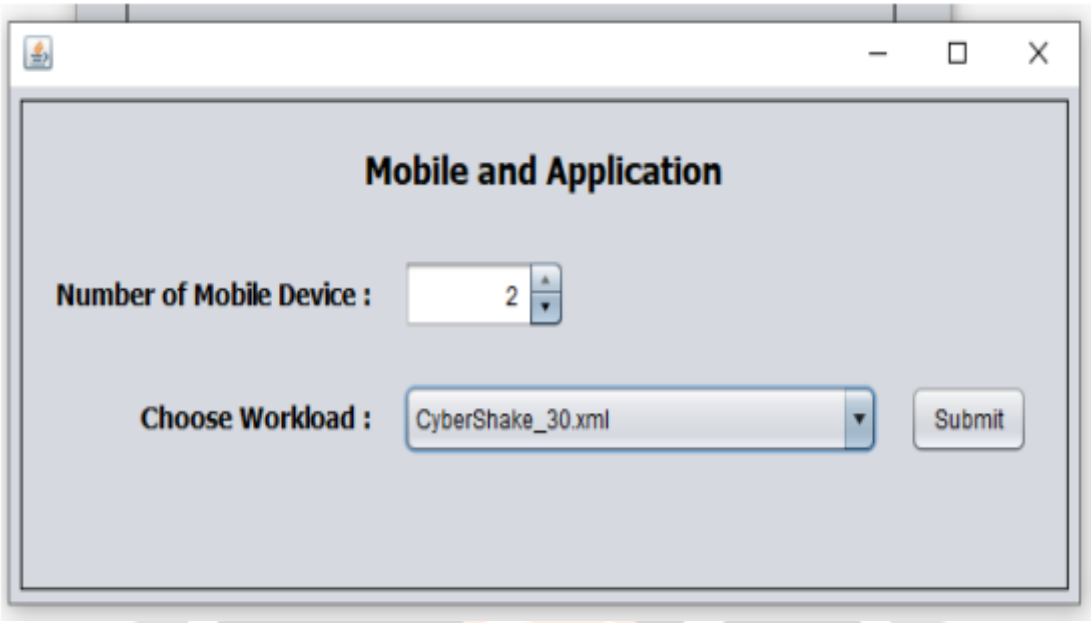

Fig.No.2 Screen Shot of the Project

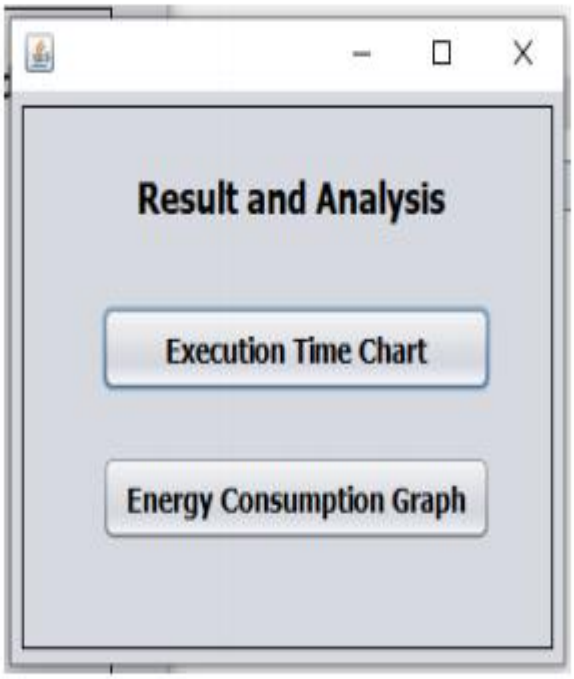

Fig.No.3 Screen Shot of the Project

Fig.No.4 Screen Shot of the Project

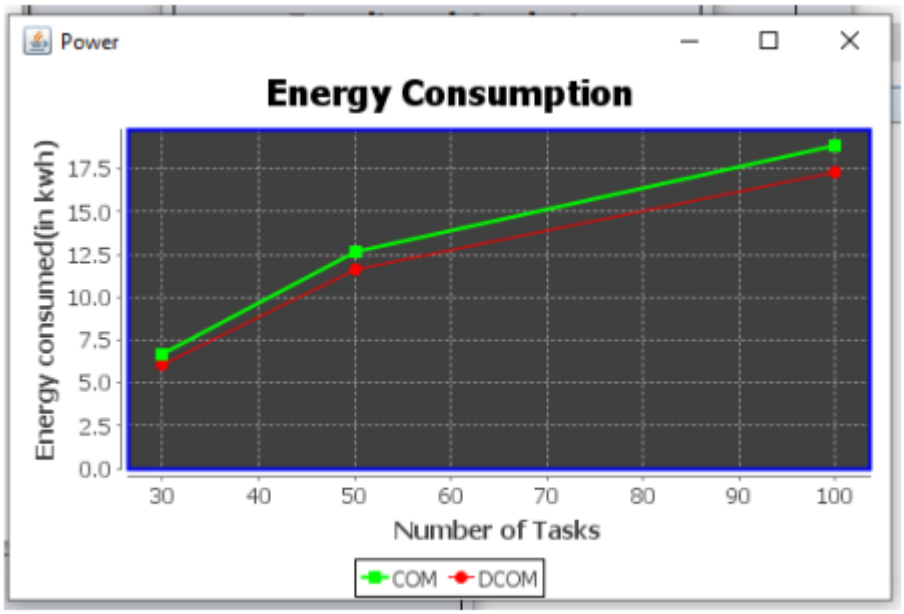

Fig.No.5 Screen Shot of the Project

5. CONCLUSIONS

We proposed a method DCOM (DAG Computation task Offloading Method) for IoT mobile application which is running on a mobile device and uses the techniques to offload computation tasks and analysed the proposed dynamic scheduling algorithms NSGA-III with DE to perform the multi-objective optimization problems. Furthermore, extensive experiments and evaluations are conducted using WorkflowSim toolkit to encourage the proposed method DCOM performs well in solving the optimization problem.

6. REFERENCES

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