Resource Management & Utilization of Virtualized Networks & Digital Services for Smart Future Cities

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Abstract— These In Cloud Environment, the process of execution requires Resource Management due to the high process to the resource ratio. Resource Scheduling is a complicated task in cloud computing environment because there are many alternative computers with varying capacities. The goal of this paper is to propose a model for job-oriented resource scheduling in a cloud computing environment. Resource allocation task is scheduled for the Process which gives the available resources and user preferences. In this paper, we propose an architecture for cloud computing and HPC as a platform with virtualized networks to implement the smart city digital & Network services. The integration of information and communication systems into the various technical systems and infrastructures of a city are fundamental bases in smart cities. A smart city must combine legacy networks and new communication architectures; in order to configure existing communication networks to achieve compatibility and interoperability.The time parameters of three algorithms, viz. Round Robin, Pre-emptive Priority and Shortest Remaining Time First have been taken into consideration. From this, it has been computed that SRTF has the lowest time parameters in all respects and is the most efficient algorithm for resource scheduling

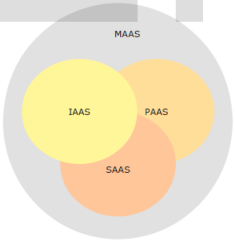
Index Terms— Networks, Scheduling, Digital Services, Data analytics

1 Introduction

A Cloud is a type of parallel and distributed system which consists of a collection of interconnected and virtualized computers. These computers are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements, which are established through negotiation between the service provider and consumers. The computing resources can be allocated dynamically upon the requirements and preferences of user. The consumers may access applications and data of the Cloud from anywhere at any time, it is difficult for the cloud service providers to allocate the cloud resources dynamically and efficiently [1]. Physical resource are Computer, Processor, disk, database, network, Bandwidth, scientific instruments and the logical resources are Execution, monitoring, communicate application and etc.

Dynamic allocation of tasks to computers is complicated in the cloud computing environment due to the complicated process of assigning multiple copies of the same task to different computers. Likewise, the resource allocation is also a big challenge in cloud computing [2]. In order to allocate cloud computing resources, nodes with spare computing power are detected and network bandwidth, line quality, response time, task costs, and reliability of resource allocation are analyzed [6]. Hence, the quality of cloud computing service can be described by resources such as network bandwidth, complete time, task costs, and reliability, etc. [15].

Technology is more accessible nowadays and it is possible to innovate optimizing resources in the cloud and improving hem on demand. At this point, we intend to build an architecture using a cloud computing environment focused to support smart cities services to be responsive on time and events keeping a green sustainable compromise with the computing resources in the city computing facilities development.



A smart city can be seen as a determined geo-graphical space able to manage resources (natural, human equipment, buildings and infrastructure), as well as wastes generated by life style; it should be sustainable and must not be harmful to the environment.

There have been various types of scheduling algorithm that exists in distributed computing system. Most of them can be applied in the cloud environment with suitable verifications. The main advantage of job scheduling algorithm is to achieve a high performance computing and excellent system throughput. Traditional job scheduling algorithms are not able to provide scheduling in the cloud environments.

The main examples based on algorithms; First Come First Served scheduling algorithm (FCFS), Round Robin scheduling algorithm (RR), Min–Min algorithm and Max–Min algorithm. By On-line mode heuristic scheduling algorithm, Jobs are scheduled when they arrive in the system. Since the cloud environment is a heterogeneous system and the speed of each processor varies quickly, the on-line

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mode heuristic scheduling algorithms are more appropriate for a cloud environment [5]

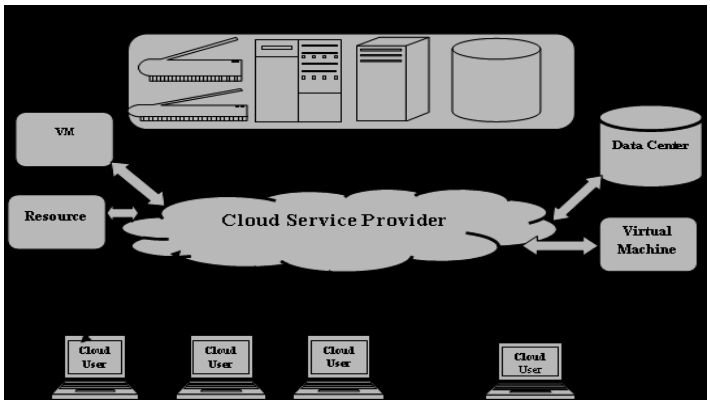

Figure 1: Basic Resource Management & Scheduling in Cloud Environment

2 Related Work

Zhongni Zheng, Rui Wang did the research of using GA to deal with scheduling problem in the cloud, we propose PGA to achieve the optimization or sub-optimization for cloud scheduling problems. Mathematically, we consider the scheduling problem as an Unbalanced Assignment Problem. Future work will include a more complete characterization of the constraints for scheduling in a cloud computing environment, improvements for the convergence with more complex problems. Lu Huang, Hai-shan Chen also presented system architecture for users to make resource requests in a cost-effective manner, and discussed a scheduling scheme that provides good performance and fairness simultaneously in a heterogeneous cluster, by adopting progress share as a share metric.

Mayank Mishra et al. in his paper has told that, the users of cloud services pay only for the amount of resources (a pay-as-use model) used by them. This model is quite different from earlier infrastructure models, where enterprises would invest huge amounts of money in building their own computing infrastructure. Typically, traditional data centers are provisioned to meet the peak demand, which results in wastage of resources during non-peak periods. Fine-grained metering. This enables the pay as- use model, that is, users pay only for the services used and hence do not need to be locked into long-term commitments. As a result, a cloud-based solution is an attractive provisioning alternative to exploit the computing- as-service model.

Anton Beloglazov and Rajkumar Buyya have proposed the plan for the future research work that consists of several steps presented in Table. Once the algorithms for all of the proposed optimization stages are developed, they will be combined in an overall solution and implemented as a part of a real-world Cloud platform, such as Aneka. In this contemporary world, Internet has been a predominant, which has presented a great opportunity for providing real-time services over the Internet.

Venkatesa Kumar. V and S. Palaniswami, in their paper, have proposed the overall resource utilization and, consequently, reduce the processing cost. Our experimental results clearly show that our proposed preemptive scheduling algorithm is effective in this regard. In this study, we present a novel Turnaround time utility scheduling proach which focuses on both the high priority and the low priority takes that arrive for scheduling. Vijindra and Sudhir shenai in their paper, have presented an algorithm for a cloud computing environment that could autocally allocate resources based on energy optimization methods.

Liang Luo et al. in their paper, have discussed about, a new VM Load Balancing Algorithm is proposed and then implemented in Cloud Computing environment using Cloud Sim toolkit, in java language. In this algorithm, the VM assigns a varying (different) amount of the available processing power to the individual application services.

Qiang Li and Yike Guo have proposed a model for optimization of SLA-based resource schedule in cloud computing based on stochastic integer programming technique. The performance evaluation has been performed by numerical studies and simulation. The experimental result shows that the optimal solution is obtained in a reasonably short time. Zhongni Zheng, Rui Wang did the research of using GA to deal with scheduling problem in the cloud, we propose PGA to achieve the optimization or sub-optimization for cloud scheduling problems. Mathematically, we consider the scheduling problem as an Unbalanced Assignment Problem. Future work will include a more complete characterization of the constraints for scheduling in a cloud computing environment, improvements for the convergence with more complex problems. Lu Huang, Hai-shan Chen also presented system architecture for users to make resource requests in a cost-effective manner, and discussed a scheduling scheme that provides good performance and fairness simultaneously in a heterogeneous cluster, by adopting progress share as a share metric. By considering various configurations possible in a heterogeneous environment, we could cut the cost of maintaining such a cluster by 28% [8-13].

3 Smart Cities Design & Proposal

As Smart cities are a relatively new perception and as mentioned above, their basic goal is the efficient use of natural resources as water, electricity, air quality, waste management among many services to the citizens. There is one smart city, Dublin, which was proposed as a smart city that supports cloud computing as a natural resource [7]. Pat Howlin [7] argues that cloud has led new employs, quickly adopt of this technology by the companies and the interest of the university of creating new curricula for planning courses about cloud computing. A digital service provides information related to a specific situation in the city interacting with their citizens [6]. For example, when a user access parking and need to find a slot, a digital service can manage to reduce pollution and time. Other digital services

could be envisioned keeping a green engagement with the environment.

The goal of digital services is the mobility of them, i.e. you do not need a desktop computer to access these benefits, and it is only necessary to have some mobile device as a tablet, a smart phone or even from a car. Mobility is one of the factors to consider in digital services because they deliver real information of everything: traffic, government service, shortest path from origin to destination, bill payment and others.

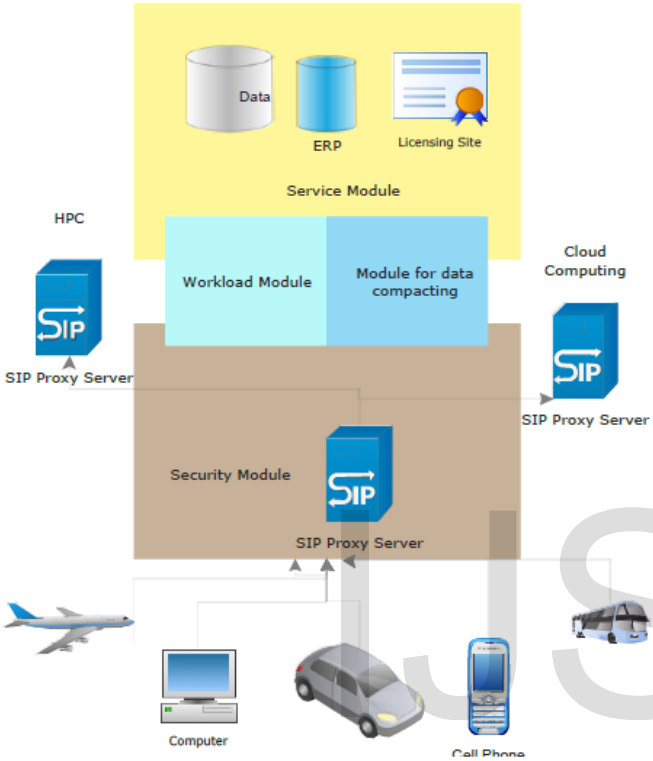

Figure 2: Architecture Proposal

Network virtualization has been propounded as a diversifying attribute of the future internetworking paradigm[5]. The emergence of several heterogeneous networks with features specific is more frequently, since multiple stakeholders have conflicting with their goals and policies; in this way, alterations to the existing Internet architecture are now limited to simple incremental updates. Network virtualization proposes decoupling of functionalities in a networking environment by separating the role of the traditional Internet Service Providers (ISPs) into two: infrastructure providers (InPs) and service providers (SPs)[5]. The latter follows the design principle from ETSI (European Telecommunications Standards Institute) and ITU (International Telecommunication Union) in accordance with NGN reference model, decoupling layers from original architecture Internet to service stratum and transport stratum.

Cloud Computing automated platform for network functions in software, SDN give a network abstraction and flexible dynamic programmability and Network Functions Virtualization enabler for cost, energy consumption and space reduction by sharing, isolating and splitting of network functions [6]. In order to deploy architectures with decomposed functions between cloud and transport network.

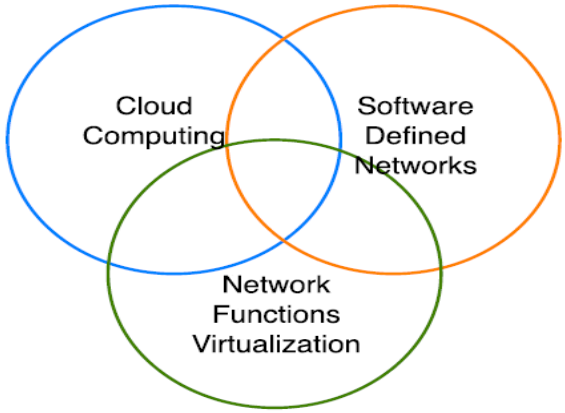

Figure 3: Convergence point of three divisions

4 Cloud Algorithm

4.1 Round robin

It is the simplest algorithm that uses the concept of time quantum or slices. Here the time is divided into multiple slices and each node is given a particular time quantum or time interval and in this quantum, the node will perform its operations. The resources of the service provider are provided to the client on the basis of this time quantum. In Round Robin Scheduling the time quantum play a very important role for scheduling, because if time quantum is very large then Round Robin Scheduling Algorithm is same as the FCFS Scheduling. If the time quantum is extremely too small then Round Robin Scheduling is called as Processor Sharing Algorithm and number of context switches are very high. It selects the load on random basis and leads to the situation where some nodes are heavily loaded and some are lightly loaded.

As an example, if there are three nodes and three VMs are to be scheduled, each node would be allocated one VM, provided all the nodes have enough available resources to run the VMs.

The main advantage of this algorithm is that it utilizes all the resources in a balanced order. An equal number of VMs are

allocated to all the nodes which ensure fairness. However, the major drawback of using this algorithm is that the power consumption will be high as many nodes will be kept turned-on for a long time. If three resources can be run on a single node, all the three nodes will be turned on when Round Robin is used which will consume a significant amount of power.

4.2 Preemptive Priority

Priority of jobs is an important issue in scheduling because some jobs should be serviced earlier than other those jobs can't stay for a long time in a system. A suitable job scheduling algorithm must be considered priority of jobs. To address this problem some researchers have considered priority of jobs scheduling algorithm. Those researches have focused on a few criteria of jobs in scheduling. In cloud environments we always face a wide variety of attributes that should be considered. Priority is an important issue of job scheduling in cloud environments. In this paper we have proposed a priority based job scheduling algorithm which can be applied in cloud environments. Also we have provided a discussion about some issues related to the proposed algorithm such as complexity, consistency and finish time. Result of this paper indicates that the proposed algorithm has reasonable complexity. In addition, improving the proposed algorithm in order to gain less finish time is considered as future work. As a scheduling policy, preemption has wide applications in many areas (e.g. Process scheduling, bandwidth allocation, manufacturing scheduling)

Algo & Testing factors	Round Robin	Preemptive Priority	SRTF
Average waiting time	Poor	Average	Best
Average turnaround time	Poor	Average	Best
Without Priority (ATA)	Average	Poor	Average
Without Priority (AWT)	Average	Poor	Average

4.2 Shortest Response Time First

The basic idea is straightforward: each process is assigned a priority, and priority is allowed to run. Equal-Priority processes are scheduled in FCFS order. The shortest-Job-First (SJF) algorithm is a special case of general priority scheduling algorithm. An SJF algorithm is simply a priority algorithm where the priority is the inverse of the next CPU burst. That is, the longer the CPU burst, the lower the priority and vice versa. Priority can be defined either internally or externally. The main thrust of the changes is to refine the process data to include a variable to count how much time to the next wait, and to the event module to explicitly cycle the clock, and see if an event is due at the current time.

5 Result & Discussion

Following observations and results can be made when considered with n no of requests with defined priority. The scheduling algorithms can have unpredictable behavior if the priority is not defined and also it varies according on the number of request/ process.

6 Conclusion

Cloud computing can be a mechanism to support an organization as important as a smart city with dynamic and flexible support of digital services. Approach for data acquisition over virtualized networks and smart resources digitization algorithms were discussed. Scheduling is one of the most important tasks in cloud computing environment. In this paper, we have analyzed various scheduling algorithm for networks based and digital works and tabulated various parameters. Existing scheduling algorithm gives high throughput and cost effective but they do not consider reliability and availability. In future enhancement will propose a new algorithm for resource scheduling and comparative with existing algorithms.

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