Vivechana: National Conference on Advances in Computer Science and Engineering (ACSE-2016),
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Task Scheduling in Cloud Computing

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----------**ABSTRACT**----------
Cloud Computing is also known as on-demand computing. Cloud Computing is based on the concept of centralized storage when computation in distributed data centers is maintained by service provider. Applications of cloud computing are more than a simple internet. Cloud computing use internet as to provide several type of services to users on demand. These services provide with pay per use basis. It processes large amount of data and scheduling of this data in a manageable fashion is a big task. This paper features the concept of cloud computing, review several services and deployment models. It also explores several types of task scheduling mechanism.

Keywords- Cloud computing, Cloud Services, Deployment Models, Scheduling mechanism, Virtualization.

1. Introduction

Cloud Computing can be defined as a model for providing on-demand network access to virtually shared pool of resources (network, server, databases, applications, etc.) in ubiquitous and simple way to the user with a little management effort [1].

The cloud computing provides resources as hardware and software. These resources are available on the internet as per user need that is why it is called as on-demand computing. Cloud computing is an emerging technology because of two reasons: it's rather inexpensive and very convenient for use. The word cloud computing is a combination of two entities: cloud and computing; cloud is the metaphor for the internet and large collection of objects that is viewed from a distance as a cloud. Computing term related to the computation based on particular used tools [2]. Cloud Computing provides more effective computing by centralizing data storage, resources, scheduling tasks and memory.

1.1 Features of Cloud Computing: As per the introduction we can define five essential features of cloud as:

1.1.1 Easy to use Services: Cloud Computing is an on-demand computing because users can demand the service on the internet, use the available resources on the server and pay on the basis of time it has used [2]. Customers use the resources according to their requirements, thus avoiding wastage of resources.

1.1.2 Simple Network Access: Cloud Computing makes the use of internet so simple since a user who need to access a cloud just need a device and an internet connection. With the help of browser, resources are requested from the cloud [3].

1.1.3 Resource Constructiveness: It can be defined as the key concept of cloud computing because it divides a physical computing device into one or more "virtual" devices which is used and allocated to users as per their demand [4].

1.1.4 Flexibility and Elasticity: It is the most important feature of cloud computing as it dynamically scale up and quickly scale down the traffic fluctuations and demand from user side [5].

1.1.5 Available Services: Cloud computing is not just an application for large enterprises but it is also being used by small level enterprises. So it is very affordable that user can access service and pay only for the type of services it has used.

2. Service Model of Cloud

In cloud computing, users have permission to utilize the resources which actually reside at the location other than a user's own device with minimum management effort [3]. Now a day's cloud provides different services such as, platform as a service, hardware resources as a service, data storage as a service and software as a service. According to services which are provided by cloud, there are three service models as:

1. Software as a Service (SaaS)
2. Platform as a Service (PaaS)
3. Infrastructure as a Service (IaaS)

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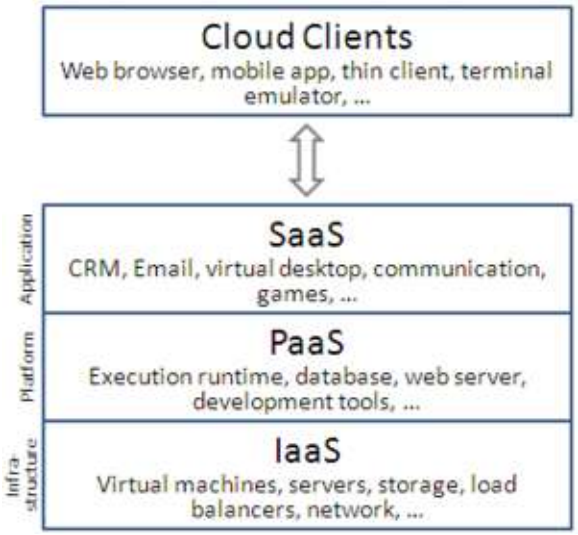

Figure 1: Service Model Anatomy [6]

2.1 Software as a Service (SaaS): The topmost layer of cloud computing service model is known as SaaS. This layer makes the user to get rid of installing and operating the applications on user's own device. It terminates the load of software maintenance as all these work is now done on the fly by the service providers and user just pay for what it used. There are SaaS vendors who takes responsibility for deploying and managing the IT infrastructure [2].

Advantages:

- Useful in thin-client applications
- Stateless
- Loosely coupled
- Minimize cost as it avoid capital investment on hardware and software resources

Disadvantages:

- Security of applications are at risk
- Multi-tenancy
- Data Security

2.2 Platform as a Service (PaaS): This is Middle layer in service model of Cloud computing. It offers platform oriented services [7]. As user cannot manage the infrastructure but user can control deployed application and sometimes their configurations also.

Advantages:

- User control over application
- Underlying infrastructure security
- Consumption of cloud infrastructure

Disadvantages:

- Multi-tenancy
- Data security

2.3 Infrastructure as a Service (IaaS): This is a basic layer of cloud service model, as its name suggests it provide basic infrastructure which support services. Virtualization is the key concept used in IaaS. Its main purpose of this layer is to make resources such as servers, network and storage more easily available to the customers. So, IaaS provide physical and virtual resources in cloud on demand. User can access to application software and operating system without any knowledge of basic architecture. This service is mainly used by the organizations to avoid spending money on new hardware installation and getting rid of updating the applications [2].

Advantages:

- Reduce Cost/Economy
- Easy access
- Scalability and flexibility
- Platform independent
- Save time

Disadvantages:

- Growth of business depends upon the service provider's capability.
- Security measures are required.

3. Cloud Deployment Models

These are divided into four categories as:

3.1 Public Cloud: public cloud model is the most popular model of cloud computing among the customers. In this model cloud services are provided through virtualized environment. This environment is created using polled shared resources [4]. In this model all the users share the same infrastructure. This model is quite easy and inexpensive as public cloud service based on-demand and then pays as per use. Public cloud is considered as less secure than other models of cloud. Examples of public cloud are: IBM's Blue Cloud and Google App Engine [2].

3.2 Private Cloud: Private Cloud is used within an organization. This cloud is for those organizations which work on the top sensitive data and cannot afford any risk on it. So the cloud can give access only to those people who have the permissible access to it and avoid outsider's interference. Private cloud is considered secure than other models. Examples of Private cloud are: Amazon Virtual Private Cloud and Microsoft Private Cloud [3].

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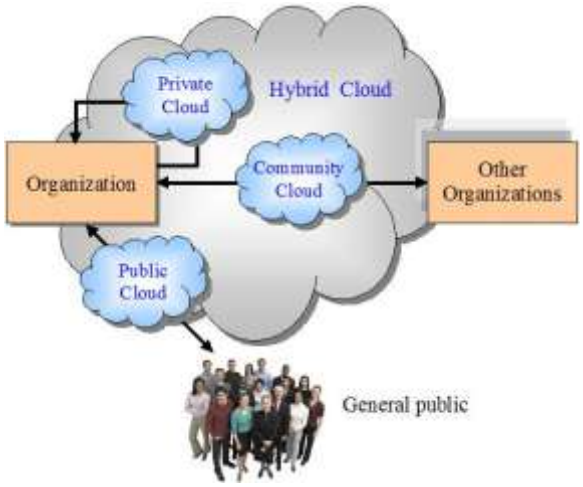

Figure 2: Cloud Deployment Model [4]

3.3Hybrid Cloud: Hybrid Cloud can be defined as the collection of multiple clouds. It is an integration of private and public cloud model. Each cloud has its own identity, but altogether is known as one unit [1].

Hybrid Cloud can perform Cloud Bursting, It is a situation when working on private cloud a user need more space so he or she can use public cloud's storage space. Organization has to pay for the extra space consumed by the application.

3.4 Community Cloud: Community Cloud can be defined as a cloud among the organizations which are in similar or related business groups. These organizations can share the infrastructure as a service among each other [1].

All organization uses the community cloud with common characteristics (as their aim, security and policies). Advantage for using community cloud is that cost is minimized as it is shared by the organizations which are in group of community cloud, so it is also economically good for individual organization.

4. Task Scheduling in Cloud Computing

Scheduling of tasks in Cloud computing is a critical process, as it deals with large amount of data. Maintenance of this large amount of data is crucial as for improving the utilization of resources in cloud and minimizing response time and completion time. For all these purpose scheduling of tasks is must [3].

Many complex applications require parallelism capabilities. If the tasks are not scheduled correctly, some of the applications which are in parallel can decrease the completion time and increase the response time of CPU resources.

Types of task scheduling are:

4.1 Cloud Service Scheduling: This can be categorized at two level as user and system level. At User level, problems arises due to resource provision between providers and customer are handled. In case of system level scheduling, it deals within datacenter for management of resources [5].

4.2 Customer Side Scheduling: for controlling the supply and demand of the resource, at User level scheduling can be categorize as Market based and Auction based.

As in cloud computing, demand of services from the user side is dynamic in nature so to deal with this type of scale up and down in resource demands, market based resources allocation has been proposed. This mechanism is implemented by IaaS. Auction based Scheduling is used for every virtual machine type by service providers. Main aim of these providers is to achieve maximum profit over time [3].

4.3 Static and Dynamic Scheduling: In static scheduling, it allows to get the detail of data in advance. This data is to be used for the parallel processing using pipelining concept. So it needs less time to run. In dynamic scheduling, the execution time of the job is not known to the server in advance so tasks are allocated on the fly [8].

4.4 Heuristic Scheduling: This scheduling scheme is used in Optimization problems. These are classified as NP-hard problems. For these type of problem optimization solution is needed. There are several scheduling algorithms for this purpose such as Enumeration method, Approximation method or Heuristic method. Enumeration method selects the optimal solution by comparing each solution one by one, but as the number of solution increases effectiveness of enumeration algorithm decreases. In this case heuristic scheduling is used to find suboptimal solution with reasonable fast response time [5].

4.5 Workflow Scheduling: This scheduling considers the applications as in Directed Acyclic Graph (DAG). In the DAG of tasks, each node is considered as the tasks available as the solution of user's problem and edges represent inter task dependencies. Each task in the workflow can communicate with another task.

4.6 Real-time Scheduling: Main aim of this type of scheduling is to increase throughput and decrease average response time [8].

For some application in which Quality of Services (QoS) is very important, they apply the real-time scheduling and known as QoS–aware scheduling algorithm called QASA.

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5. Conclusion

In this paper various type of Cloud Computing Services, its Deployment Models and various Task Scheduling techniques used in it were discussed. Several algorithms and protocols regarding the scheduling mechanism of Cloud Computing as Improved cost-based algorithm, Particle Swarm Optimization (PSO), Aggressive Migration Supported Back Filling (AMCBF) were proposed by researchers. For proper utilization of resources we need an efficient scheduling mechanism. Cloud Computing is a rising term in the IT field but it has its own issues as security, privacy, testing. Therefore there are risks as security and processing complexities in managing the cloud but we can say that a balance between the hidden risks and business benefits is the key for successful Cloud Computing.

References

[1] Nazir Mohsin, "Cloid Computing: Overview & Current Research Challenges", IOSR Journal of Computer Engineering, Vol. 8, Issue 1, pg.14-22 2012.

[2] Nandgaonkar V.Suruchee, Raut A.B., "A Comprehensive Study on Cloud Computing", International Journal of Computer Science and Mobile Computing (IJCSMC), Vol.3, Issue 4,pg 733-738, 2014.

[3] Sriram llango, Hossani Ali Khajeh, "Research Agenda in Cloud Computing Technologies." Dept. of Computer Science, University of Bristol, UK..

[4] Hu Fei, Qin Meikang, "A Review on Cloud Computing: Design Challenges in Architecture and Security", Journal of Computing and Information Technology (JCIT), Vol. 1, pg. 25-55, 2011.

[5] Chawla Yogita, Bhonsle Mansi, "A Study on Scheduling Methods in Cloud Computing", International Journal of Emerging Trends & Technology in Computer Science (IJETTCS), Vol. 1, Issue 3, 2012.

[6] A. Kanwal, Anant Kumar, Chandure O.V, "Review paper on Cloud Computing", International Journal of Research In Science & Engineering (IJRSE), Vol. 1, Issue 1, page no. 60-65, 2011.

[7] Sharma Seema, Godra Jyoti, "Review Paper on Cloud Computing", International Journal of Emerging Trends and Technology in Computer Science (IJETTCS), Vol. 4,Issue 6,2015.

[8] Tripathy Lipsa, Patra Rasmi Ranjan,"Scheduling in Cloud Computing", International Journal on Cloud Computing: Services and Architecture (IJCCSA), vol. 4, Issue 5, 2014.