

Quality of Service (QoS) in Cloud Computing

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Abstract-Recent years seen the tremendous shift of enterprise mobile application to the cloud. One of the challenges raised by cloud applications is Quality of Service (QoS) management, which is the problem of allocating resources to the mobile application to guarantee a high level of service toward with performance and availability. This paper aims to at supporting research in this area by providing a solution to achieve the QoS of mobile cloud computing. We also review the problems arising in cloud QoS management.

Keywords: QoS, Quality, Cloud, scheduling etc.

INTRODUCTION

Currently, cloud computing system used by the companies because the features provided by cloud application. We need to ensure about the quality of the services provided to a company to achieve high manner of work. We will discuss about the quality and its factors, quality of service QoS, Cloud computing, advantages, disadvantages and its architecture and techniques used to provide QoS for cloud application.

Quality and effecting factors

Quality defined as the degree to which a set of inherent characteristics meet requirement. Characteristics defined by ISO as well-known feature that means the other features are not included in the definition of the quality. Inherent characteristics are the necessary part of the system and cannot be separated from the system.

According to definition, Quality should be related to requirement, to imply that requirements should be there. So, no requirements, no quality [1]. There are many factors that will affect the quality of a system or application.

Flexibility, the ability of the software to manage the functionality without destroying the system.

Maintainability and readability, maintainability is a little similar with flexibility but it focus on modifications about error correction. **Performance and efficiency**, performance is about the response time of the software.

Scalability, a scalable system responds user's actions in acceptable amount of time. **Availability and Robustness**,

A robust software should be available even if there is failure state. **Usability and Accessibility**, User interface is the visible part of the software to the user, so it must be easy to use. **Platform Compatibility**, A quality software should run on as much various platforms as it can. Therefore, it will cover many users to use the software. The meaning of platform means operating system and internet browsers. **Security**, Security is important factor to specify the quality of software. You should implement a security policy and apply it correctly on the software and do not leave any entrance gap. Security policies like authentication

and authorization techniques, data encryption with high-level algorithms and network attack protection [2] [3].

QUALITY OF SERVICE (QOS):

Users of internet network in increasing day by day, network requirement also increases to achieve good performance. Therefore, many online services need a very large bandwidth and network performance. Network performance is the element that disquiet the users and service providers. Internet service providers should bring new technologies to provide the best services before competitors strike them.

Quality of Service refers to the ability of networks to attain maximum bandwidth and handle other network elements like latency, error rate and uptime. Quality of Service include the management of other networks resource by allocating priorities to specific type of data (audio, video and file).

Basic implementation of QoS need three major component:

- QoS within one network element.
- QoS policy and management functions to control end-to-end traffic across network.
- Identification techniques for coordinating QoS from end-to-end between network elements.[4]

Cloud Computing:

Cloud computing, the old dream of computing became true recently. It has the potential to transform a large part of the IT industry and making the software having qualities as a service [5]. Many cloud-computing operators are now active on market, providing good services including Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS) solutions [6].

Cloud computing is a type of computing that deals with shared computer resources and data to provide the data for large number of users over the internet network.

Cloud computing have strong points make it better than the normal computing system like **Mobility**, mobility term means that spreading service in a wide space that you can use this service from anywhere you have access to the internet. You can access your documents you uploaded to cloud storage services like Drop Box. **More Storage**, initially, memory storage was limited. When you ran out from memory, some functionality of your software will not work properly. You also need to get USB drive to back up your current files. Cloud computing provides increasingly storage, so you will not be worry about running out of space on your memory. **Easy Set-Up**, Setting up cloud computing service would done in a few of minutes. Adjusting your setting, choosing password for your network or service is very simple. After that, you can

immediately start using your service and data. **Automatic Updates**, Cloud computing providers are responsible to provide updates and make it available, you just need to download and install them. This does not need you to be expert to update your device; cloud-computing providers will notify you when updates area available and will give you instructions to ease this process for you. **Cheap Service**, Cloud computing is inexpensive comparing to the other memory storage. The software already installed online, so no need to install it by yourself. Many cloud-computing providers provide spaces free like Drop Box. As there is strong points, there are some weak point in cloud computing, for example **Security**, when you are using cloud-computing services that mean you essentially handing over your service and data with third party. As well as many users from different places in the world are accessing the same server can access security issues. **Privacy**, Cloud computing comes with the risk that unauthorized users might access your information. To protect against this happening, cloud-computing services offer password protection and operate on secure servers with data encryption technology. **Internet Reliance**, While Internet access is increasingly widespread, it is not available everywhere just yet. If the area that you are in does not have Internet access, you will not be able to open any of the documents you have stored in the cloud. **Loss of Control** Cloud computing entities control the users. It include what information you can store in your cloud, places where you can access your information. Everything depend on cloud-computing providers for update and backups. Nevertheless, suppose for some reasons, their server fall down, you will face the risk of losing all your data [7].

Cloud Computing Architecture:

Cloud computing architecture is the system design of software components inside the delivery of cloud computing which involves cloud components collaborate with each other over a messaging queue. Cloud computing architecture refers to the component and subcomponent necessary for cloud computing. These components contain the frontend platforms (mobile application), backend platforms (storage, servers, and service) and cloud based system and network (Internet, Intranet and Intercloud). The diagram illustrate the cloud computing architecture [8].

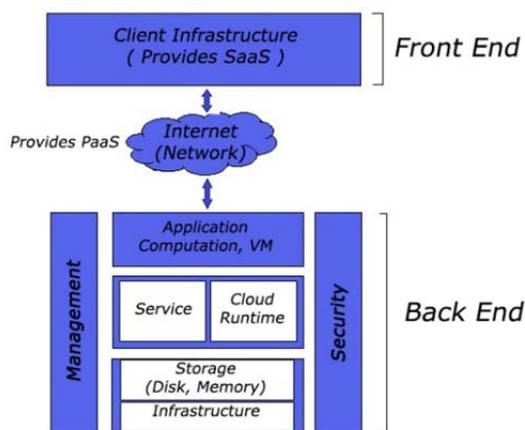


Figure 1: Cloud Computing Architecture.

Techniques to Provide QoS of Cloud Application:

As we explained before about the QoS, it is a challenge to implement QoS in cloud computing applications. There are many techniques to provide quality of service to the cloud applications. *Scheduling, admission control and dynamic resource provisioning* are some techniques used to achieve that goal.

1- Scheduling:

Cloud service scheduling categorized into two categories: user level and system level. At user level scheduling deals with problems raised by service providing between both service provider and customer. Market based and auction based schedulers are fit for ruling the supply and demand of cloud resources. Market based resource allocation is powerful in cloud computing environment where resources are handed over to user as a service. The system level scheduling handles with resource management in datacenter. Datacenter contain many physical machines, Million request sent from user’s side, scheduling these requests to the physical machines done in datacenter. This scheduling affect the performance of datacenter. Service provisioning in cloud systems based on Service Level Agreement (SLA). SLA is the contract between service provider and customer mentioning the terms of agreement including the nonfunctional requirement represented as QoS. [9]

2- Admission Control:

The main purpose of admission control is to provide strong performance. At admission control time, the Infrastructure Provider (IP) must consider the extra requirement along with the fundamental computational and networking necessities that may be required to be added to runtime so it become flexible. In many cases, these flexible requirements may be very large comparing it to the normal requirements. For example, if there are many users are working on cloud application with high divergence, the number of virtual machines are required more and that may be added at runtime many times multiple of the number of the basic ones. So that, the number of flexible requirements plays important role in the total requirements and therefore the cost of hosting the service [10].

3- Resource provisioning:

Dynamic resource provisioning is the process of assigning available resources to the cloud application. Resource allocation will make services suffer if the allocation not managed in the right way. Resource provisioning will solve this problem by allowing the service providers to manage the resources of modules individually. Resource Allocation Strategy (RAS) is all about integrating service provider services activities to allocate insufficient resources within the limit of cloud environment so that it meets the needs of the cloud application. It need the demand and type of resources for each application to complete the user task. The order and allocation time for resources are inputs for optimal RAS. The optimal RAS should avoid the following the criteria as following:

- Resource contention: Suppose two cloud application are requesting the same resource at the same time, there will be conflict that requested resource will be allocated to which application; this situation is called resource contention.
- Resource scarcity: when number of resources are fixed (let say K) and the demand on these resources (m) is very high ($m > K$) the scarcity of resources arise.
- Resource fragmentation: Suppose K number of resources will be divided in n number of smaller chunks (i.e. $k_1, k_2, k_3, \dots, k_n$ and $k_1 < K, k_2 < K, \dots, k_n < K$). Now if an application is requesting for m number of resources (where $m < K$), system we not allocate the requested number of resources to that application even though enough resources are available. This situation known as resource fragmentation.
- Over provisioning: Suppose an application is requesting for n number of resources, but system is providing m number of resources to that application (where $m > n$), then over provisioning will arise.
- Under provisioning : Suppose an application is requesting for n number of resources, but system is providing m number of resources to that application (where $m < n$), then under provisioning, will arise [11].

CONCLUSION:

While developing a software, QoS is very important factor to consider. In this paper, we discussed about the QoS for the software application and how it will be related to the cloud computing application according the factors of quality. QoS of a cloud computing application can be improved by using many techniques such as scheduling by managing the supply and demand of cloud services. Admission control technique taking care about the performance of the cloud services. Finally, Resource provisioning dealing with the available resource and allocate it to the cloud applications.

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