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Increasing QoS in SaaS for low Internet speed connections in cloud

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Abstract

Cloud providers install software on cloud servers and end users access the software through cloud clients. The availability of a SaaS application depends on a reliable and continuously available network. In the public SaaS cloud scenario, the network's reliability cannot be guaranteed either by cloud consumer or by the cloud provider because the Internet is not under the control of either one[1]. The speed of the Internet connection between the servers and the cloud clients is a main factor to benefit of cloud services, because all access to files and applications is routed through the Internet connection particularly when data located on different server. But many of users who are interested to use Software-as-a-Service don't have access to appropriate Internet speed; hence they face with many failure and errors during connection to cloud. In this paper we propose a new solution to increase QoS in SaaS for cloud clients with low Internet speed connection.

Keywords: QoS: Quality of Service, SaaS: Software as a Service

MSC: 68-06, 68M11, 68M14

1. Introduction

Cloud computing is a unique model to delivery of shared resources, software, and information via a network that the information and software are stored and installed on cloud servers and maintained and controlled by cloud provider. The availability of shared resources and cloud services depend on a reliable and secure network to access convenient and ubiquitous computing. The availability of high-capacity networks, low-cost computers and storage devices as well as the widespread adoption of hardware virtualization, service-oriented architecture, and autonomic and utility computing have led to a growth in cloud computing.[2]. In cloud business model web base applications or software as a service (SaaS), users can access to application software through Internet. In the SaaS model, cloud providers install and

operate application software in the cloud and cloud users access the software from cloud clients. Connecting to providers via the public Internet, so the dependability of connections thus depends on the Internet's infrastructure, the router infrastructure, and the inter-router links [1]. Access to the Internet grew from an estimated 10 million people in 1993, to almost 40 million in 1995, to 670 million in 2002, and to 2.7 billion in 2013[3]. Despite its tremendous growth, Internet access is not distributed equally within or between countries [4]. Many of users who are interested to use Software-as-a-Service don't have access to appropriate Internet speed; hence they face with many failure and errors during connection to cloud. Nowadays many countries especially third countries which don't have appropriate communication infrastructure cannot provide a continuously available network, so cloud consumers would be faced many problems. In this paper we have tried to propose an appropriate solution for the people who interested to use SaaS cloud services but because of their low Internet speed they are not able to consecutive access to cloud servers. The organization of the paper comes as fallow: the obstacles for access to cloud SaaS and propose solution are introduced in section 2. Our experiments and results are illustrated in section 3 and section 4 draws conclusion.

2. Proposed solution

The availability of a SaaS application depends on many requirements but the important thing is a reliable and continuously available network. In the public SaaS cloud scenario, the network's reliability cannot be guaranteed either by the cloud consumer or by the cloud provider because the internet is not under the control of either one[1]. So one one the main challenge for cloud users and providers is low internet speed for access to services. However the appropriate Internet speed is one of the pre-requirements for cloud access, but the question is why the people who are living in poor countries with inappropriate infrastructure do not have access to SaaS in cloud. One of the important point of SaaS on cloud is decreasing cost, so it would be very satisfaction for cloud researcher to find solution to serve and increasing quality of services for all users with any sort of network access. So as we mentioned the speed of the Internet connection between the servers and the cloud clients is a main factor to benefit of cloud services, because all access to files and applications are routed through the Internet connection particularly when data located on different server. Main factors which can affect Internet speed:

- Internet traffic.
- The server speed of the site you're visiting.
- Computer's hardware and software configuration.
- Traffic on your home network.

In general, Quality of service (QoS) describes as the assurance of decreasing delay and packet loss for firm types of applications or traffic, so proportional QoS tries

to refine and quantify relative QoS [8].Also in packet-switching network, Quality of Service is affected by various factors, which can be divided into "human" and "technical" factors. Human factors include: stability of service, availability of service, delays, user information. Technical factors include: reliability, scalability, effectiveness, maintainability [13]. Applying and keeping QoS in SaaS for cloud users with low access Internet is very difficult challenge to do. Our solution is use of a middleware that can use on both side of cloud client and server. This middleware role is as a consecutive network controller to assure network availability and network traffic between cloud client and server. This middleware also can manage the data stream from client to server and vice versa. However there are many middleware in both side but there is no any middleware to control traffic and manage data stream when an application is running. The mechanism of this middleware is very simple, before any data-switching between parties, the network is checked and verified by the middleware and in case of assured connection data will send. But in case of any network traffic or packet losing, the middleware can save data stream temporarily on specific databases to send them again as soon as possible. However In this solution the speed of data transmit may take time but both side can sure that data transmit will be done in SaaS cloud connection without any data losing and disconnection service. In primary method there is consecutive packet losing and disconnection but in spite of low Internet speed connection, this middleware can help to increase QoS and performance in cloud connection for different users. Figure 1 show the middleware basic components in which WBA is a small framework which is consist of classes, rules and collection of functions to provide data access and network communications to control of data stream on a specific session. And also DB part will maintain temporary outgoing data from web base software to control of data stream in latency.

This middleware can consist and manage different kind of databases and also can be customized for any web base software. It means if any company wants to release its own web base software, can customize the middleware and release, so it helps software producer to release a compatible middleware with their web base software. Figure 2 illustrate entity framework with its components in which class libraries and rules are customized with software producers for appropriate compatibility, the second part consist of security module and other appropriate module decrease the probability of passing incorrect package to the destination.

3. Simulation result

There are several simulator software for cloud architecture such as CloudSim, CDOsim, TeachCloud, networkCloudSim, GreenCloud, iCamCloud and etc. But among them there are only a few options for simulating large cloud architecture. For example, the CloudSim simulation framework has been shown to be able to instantiate 100,000 machines in less than 5 min, requiring only 75 MB of RAM[6,7,9]. CloudSim is a new, generalized and extensible simulation toolkit and application which enables seamless modeling, simulation, and experimentation of emerging

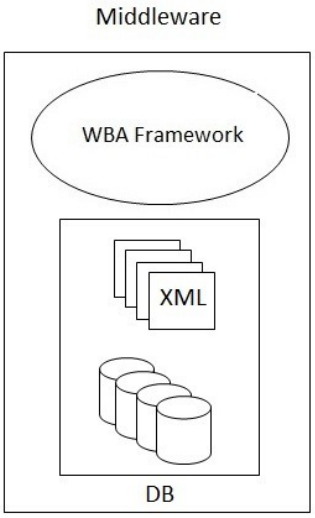

Figure 1: Middleware basic components

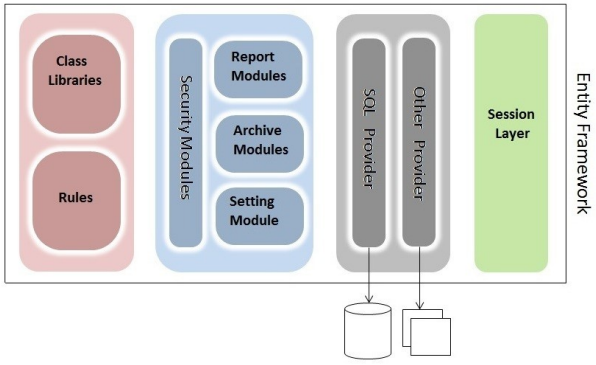

Figure 2: WBA framework components

cloud computing system, infrastructures and application environments for single and internetworked clouds [10,11,12]. So CloudSim is one of the potential simulators to simulate of our solution. However the WBA framework component can customized by producer, so we simulated a general sort of our proposed middleware that figures 3 show the results.

```
for (int i = 0; i < size; i++)
  {
    cloudlet = list.get(i);
    Log.print(indent + cloudlet.getCloudletId() + indent + indent);
    if (cloudlet.getCloudletStatus() == Cloudlet.SUCCESS)
       {
        Log.print("SUCCESS");
        DecimalFormat dft = new DecimalFormat("###.##");
        Log.printLine( indent + indent + cloudlet.getResourceId() +
indent + indent + cloudlet.getVmId() +
        indent + indent + dft.format(cloudlet.getActualCPUTime()) +
indent + dft.format(cloudlet.getExecStartTime())+
        indent + indent + dft.format(cloudlet.getFinishTime()));
        }
}
```

Figure 3: Java code in CloudSim

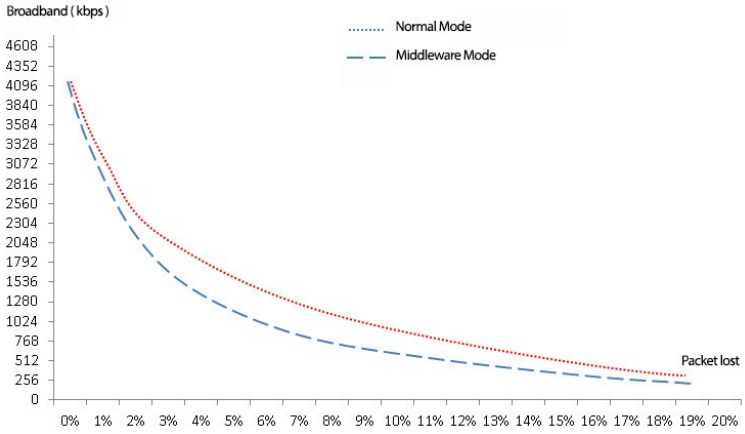

Figure 4: Throughput in both mode

4. Conclusion

However using web base Cloud services would be inevitable for any internet user, in spite of that often because of lack of access to high Internet speed in many regions, especially in poor countries, because of lack of appropriate investment in their infrastructure. So it is obvious that there are many internet connections that have latency in cloud services so to overcome such leakages, using of cheap, simple and quick solution would be the best decision to benefit of cloud services for the users with low internet connections. So to decrease frequent disconnection and increasing QoS with control and management of data flow in low internet speed by proposed middleware between web base application and cloud servers to avoid refreshing action can be an appropriate solution. However we do not clam that it would be the best solution but it can be as a proposed for cloud providers and web base application producer.

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