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REVIEW ARTICLE

SURVEY OF QUALITY OF SERVICE FOR CLOUD BASED APPLICATION

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ABSTRACT

In the Mobile Computing technology, mobile devices like smart phones and tablets were replaces personal computers by combining network connectivity, mobility, and software functionality. In the future, these devices are expected to switch between different network providers using vertical handover mechanisms to maintain network connectivity at all times. This enables mobile devices to access Cloud Services without interruption as users move around. Using current service delivery models, mobile devices moving from one geographical location to another will keep accessing those services from the local Cloud of their previous network, which leads to move a large volume of data over the Internet backbone over a long distance. So it will result in more congestion on the Internet. This degrades the Quality of Service and, the Quality of Experience offered by the services in the Cloud. So, another approach is required to manage resources more efficiently, while improving the QoS and QoE of mobile media services. This introduces a new concept of Cloud Based Mobile Service Delivery where services run on localized public Clouds and are capable of populating other public Clouds in different geographical locations depending on service demands and network status. This prevents the Internet backbone from experiencing high traffic loads and provides resource allocation and management mechanism to service providers for their services. Due to the explosive growth of the Internet and increasing demand for multimedia information on the web, streaming video over the Internet has received tremendous attention from academia and industry. This system also removes ambiguity which occurs at the time of migrating services and also, prevents migration of recently migrated services to reduce congestion.

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INTRODUCTION

Cloud computing is everywhere. Enterprises are regularly searching for a new and advance method to increase their profits and reduce their costs. Those enterprises need different technologies that let them grow and do not strain them financially. From the existing technologies, Cloud computing has emerged as a promising solution providing on demand access to virtual computing resources, platforms, and applications in a pay-as-you-go manner. Cloud service customers can use what they require and pay only for what they use. As a result of this, Cloud computing has raised the delivery of IT services to a new level that brings the comfort of traditional utilities such as water and electricity to its users. There are various advantages of Cloud computing, such as cost effectiveness, scalability, and ease of management, encourage more and more companies and service providers to adapt it and offer their solutions via Cloud computing models. (Fragkiskos *et al*., 2013)

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Clouds provide three types of services, namely Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). IaaS Clouds offer computing resources such as processing power, storage, networks, and other fundamental computing resources. The underlying Cloud infrastructure is managed by a provider. However, users have the flexibility to select their virtual machine images and to deploy these applications. In the PaaS model, providers supply clients with tools and services to develop software applications. In addition to the IaaS restrictions, PaaS users do not have the ability to manage or control their virtual machine images and servers. SaaS providers allow customers to use the applications such as web based email, calendar or word editor running on a Cloud infrastructure. Neither the infrastructure nor the application is controlled by users in this model. In recent years cloud computing becomes popular due to its simple nature. Mobile computing allows user to change their location at the time of accessing services from cloud. So, laptops and other mobile devices become popular. Even while moving from one location to another, clients can access cloud services.

Cloud based services offer affordable and centralized computing resources. And also, the mobile devices require centralized resource pool for making up their processing power requirement. This establishes a connection between both the technologies. When client accessing the services of cloud and changes his location, still he is able to access the services from previous cloud. To reach to the client, data has to travel long distance over a network. It causes congestion in a network. It also degrades the QoS of services. So there is need to populate a services from previous cloud to next cloud which is closer to the client. Different approach is required to manage resources more efficiently, while improving the Quality of Service and Quality of Experience of mobile media services. This introduces a novel concept of Cloud Based Mobile Media Service Delivery in which services run on localized public Clouds and are capable of populating other public Clouds in different geographical locations depending on service demands and network status. Using an analytical framework, previous concept argues that as the demand for specific services increases in a location, it might be more efficient to move those services closer to that location. This prevents the Internet backbone from experiencing high traffic loads due to multimedia streams and will offer service providers an automated resource allocation and management mechanism for their services. It believes that a different approach is required to manage resources more efficiently, while improving the Quality of Service and Quality of Experience.

Related Work

Cloud computing is a new approach in the delivery of information technology and services. By providing on demand access to a shared pool of computing resources in a self service, dynamically scaled and metered manner. Cloud computing offers advantages in cost, speed, and efficiency. Initially deployments require applications to be bound to a particular infrastructure. This results in low utilization, diminished efficiency, and inflexibility. Cloud computing delivers infrastructure, platform, and software that are made available as subscription based services in a pay as you go model to consumers. These services are referred to as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) in industries. The importance of these services was highlighted as: Cloud computing, the long-held dream of computing as a utility has the potential to transform a large part of the IT industry, making software even more attractive as a service. The development of Cloud based service delivery is now moving rapidly as existing Cloud service providers attempt to change the concept while new vendors try to invent their own versions of technology. The new trend has negated the need for powerful client computers and has opened the way for smaller, lighter and more portable devices such as mobile phones and tablets. Some examples of Cloud-based products that are very popular nowadays are Amazon's EC2 and Apple's iCloud (Apple, 2012) and Microsoft, are the most popular vendors. Other many vendors offers similar services with simple version.

Some mobile devices like laptops, are not actually portable i.e. they cannot be used on move because of their size. This limitation is overcame by the devices like smart phones and tablet PCs. Unlike laptops and desktops, these devices are small in size, provide long battery backup and have light weight. But these devices lack in hardware resources necessary to perform intensive tasks. Due to the limited local resources on these devices the focus for future development on them is shifting towards always-on connectivity via the use of multiple network interfaces such as Wi-Fi (Postel and Reynolds, 1988), GSM (ETSI, 2011), 3G (Inamura *et al*., 2003) and LTE (Motorola, 2012) so that they don't have to rely on local resources for storage and processing.

Amazons EC2 is offers IaaS and bills the clients according to the time and resources have been using. Also EC2 offers storage which is accessible from anywhere over a Internet. Amazons service are highly elastic, starting from micro instances offer a small amount of virtualized resources, ready to complete basic computational needs, to Compute solutions that allocate physical processors permanently to the clients. Amazon also offers Cluster Graphics Processing solutions which is suitable for rendering and media processing applications. iCloud, Apples Cloud offering, is different type of Cloud compared to what Amazon is offering. Apples solution provides storage services and the ability to synchronize _les across multiple clients, including mobile devices so that clients can have the ability to store their calendars, contacts and emails, as well as iWork documents to the Cloud and can do any changes in them consistently propagate to all their Apple devices. iCloud has the ability to track geographically devices of a user which needs for finding lost devices.

Microsoft is also offering a wide variety of Cloud based services (Amazon, 2012). Their implementation of Cloud services apart from offering SaaS in the form of Office 365 is also offering PaaS in the form of Azure and also IaaS in the form of their Private Cloud implementation. Microsoft also offers a Cloud solution that acts as a central management point for the clients. Regardless of vendor and the type of services offered, Cloud computing is used to centralize processing in a highly scalable and cost efficient manner. In fact, many Cloud providers are able to offer their services for free or at a very small cost to their clients.

However, it is also important to look at the development of Cloud technology itself and not only at the development of services that run on top of it. Researchers at the University of Minnesota are developed a migration technique for virtual machines within a Cloud that provides heterogeneity and dynamism in network topology and job communication patterns to allocate virtual machines on the available physical resources (Microsoft, 2011). The aim of that is to bring physically closer any virtual machines which exchange a lot of traffic with each other. So by using that technique they can use faster connections within the same network hierarchical level instead of allowing traffic go through slower connections between levels. Since Cloud is actually a network of computers with a hierarchical structure, it is obvious that sometimes, there can be a lot of traffic between different hierarchical levels, depending on where data is stored and processed within the infrastructure. By placing virtual machines that performs individual parts of a bigger task, closer to each other, will reduce this cross-boundary communication which goes through

slower network links compared to the much faster links which exist within the same hierarchical boundaries. Faster communication for the two VMs is the advantage of this, which improves the overall performance and reduces the congestion within the network. It will make the use of Cloud resources more efficient, which results in lower costs for the provider and more savings for the clients. Another technique invents a method called decentralized affinity aware migration technique that incorporates heterogeneity and dynamism in network topology and job communication patterns to allocate virtual machines on available physical resources (Sonnek *et al*., 2010). It monitors network affinity between pairs of virtual machines and it uses bartering algorithm coupled with migration to dynamically adjust virtual machine placement such that communication overhead is minimized. That is if the communication overhead between two virtual machine of different network is larger then there is need to place these two virtual machines closer to each other (i.e, on same rack, cluster, node or network links). It increases the performance and reduces the traffic, for that affinity aware bartering and migration algorithm is used.

Another research project by the University of Minnesota involves the reshaping of the physical footprint of virtual machines within a Cloud (Sonnek and Chandra, 2009). The aim is to lower operational costs for Cloud providers and improve hosted application performance, by accounting for affinities and conflicts between co-placed virtual machines. It is achieved by mapping virtual machine footprints and then comparing them. When similarities are found in the footprint then the virtual machines are migrated to the same physical location and content-based memory sharing (Sonnek and Chandra, 2009; Waldspurger, 2002; Wood *et al*., 2009). Its aim is to build control systems for Cloud environments which generates such footprint reshaping to achieve various objectives such as lower power consumption, higher reliability and better performance. It also reduces costs for providers and make Cloud services cheaper for clients.

Another proposed architecture aimed at improving the performance of Cloud technologies is called Media-Edge Cloud (MEC). It is an architecture that aims to improve the QoS and Quality of Experience (QoE) for multimedia applications (Gupta *et al*., 2008). It is achieved by a Cloudlet of servers which is running at the edge of a bigger Cloud. The main objective of that is to handle requests closer to the edge of the Cloud which reduces the latency.

Any other processing is needed, then requests are sent to the inner Cloud, so the Cloudlets are reserved for QoS sensitive multimedia applications. So the aim is to divide the network hierarchy within the Cloud, such a way that physical machines that are closer to the Clouds outer boundaries will handle QoS sensitive services. Since these machines reside on the border of the Cloud, the data has to travel less distance within the Cloud ti reah to the clients. It improves QoE for clients and also reduces network congestion within the Cloud. All these concepts and research of improving Cloud performance, do not think about user mobility. Service delivery on mobile clients is the new trend in computing.

Methodology

All the concepts and researches for improving Cloud performance, don't consider user mobility. All the research at present assumes that only the provider is in control of a Cloud so that different providers cannot share resources to improve the utilization efficiency of their hardware. That can lead to problems in the future as mobility and multimedia rich content becomes more popular and high bandwidth data streams will have to travel great distances and reach moving targets. Cloud providers may find themselves in situations where their hardware resources are not adequate and they may have to create more Clouds to handle the load and relieve network congestion. Now a days, the Internet and networking in general works in a resource centric way. In that clients directly contact with physical resource to get services and then ask for a service, for example by typing a URL, we generally type the name of a server on the Internet. Then the name is resolved into an IP address and we then connect directly to that server to retrieve the service. Cloud services also work in a same fashion. Clients connect to the Cloud and they are presented with possible services they can access. The redundancy is the main disadvantage of this in that users must have to know the name of a physical resource in order to reach a particular service and if the physical resource which offers the service is experiencing problems then redundancy occurs. This redundancy problem is solve by running multiple servers and using DNS (Zhu *et al*., 2011) techniques for failover and load-balancing purposes. But, it is not a viable solution for smaller entities who want to offer a service at low cost.

Envision Service Scenario

In future, a service-oriented approach can be thought of. In this approach clients simply request for service ID and the network infrastructure to search where the required service is executing and connects the client. Because of this approach same service can run on multiple physical locations. The client request can be diverted or migrated to the appropriate location based on network status.

In order to find the network status, QoS aware service model is required. i.e. it should take into account what the network status is between client and the service. The main focus will be on Quality of Service (QoS) and Quality of Experience (QoE). For example, consider a client, which will connect to the same Cloud no matter their location or network conditions. However if the network status degrades because of congestion and there is no other path, then the service will be out of reach or may be severely affected. This may result into degraded QoS and QoE.

The other limitation with the current service model is that clients from any geographical location have to connect to same Cloud to get services that run on it, no matter how far they are the Cloud. This overloads the network interfaces on the Cloud and also the processing load of that Cloud increases very high.

Therefore a new method for service delivery is required, that will take into account Quality of Service (QoS) in order to provide better Quality of Experience (QoE) to the clients. Also,

it will provide better load management to the providers. It will also reduce the network congestion on global state.

With this new service delivery model the client request will be directed to the physical location where the service is running and also fulfils QoS requirement.

Although a single service provider may not own multiple Clouds in different geographical locations. So, in the new envisioned scenario service providers will register their services globally and will not be tied or restricted to a specific Cloud provider. Such services can be freely populated or can jump to a different Cloud based on the Quality of Service (QoS) parameters and the source location of service request.

Conclusion

Thus we propose framework that addresses challenges arise due to user mobility. The current models of service delivery are inefficient and will not scale to cover the future needs. The various systems that offer various solutions to overcome these challenges. The scope for the improvement is also highlighted here. Previous models of service delivery, were inefficient and not scale to cover all the needs of mobile users. The current model is efficient to provide better management of resources and good service to the clients

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