Usages of Mobile Cloud Computing and their Issues work through

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Abstract

We all are going with cyber circle and we all admit that a thousand of new technologies and architecture has been born in every day that we hope it will make a human life to be more comfortable, safe and convenient. In the garden of new technologies, mobile computing is already placed a role of human daily life. Although mobile network infrastructures are suddenly improving, and they are become more popular with their partner Web Services(WS). However, we all faced some problems when connecting with mobile devices and WS. The architecture includes a platform independent design of mobile service client and a middleware for enhancing the interaction between mobile clients and WS. In there, the middleware can provide a personal service platform for the mobile device clients. Finally, this middleware can enhance to the scalability and reliability on Amazon EC2 and can deployed on Cloud Platforms, like Google App Engine. They have served us from the simple activities like entertainment to the complicated one as business operations. As playing the most important part, mobile devices deserve to work in the environment which they can trust for serving us better. After addressing the challenges of mobile cloud computing (MCC), we already studied the main case of mobile cloud computing, in terms of energy performance and efficiency, as well as to perform structure of mobile cloud computing model that named Droplock. Moreover, need to take advantages of trusted platform module functionality and, we introduced a novel schema of remote attestation to secure mobile devices in the context of Mobile-Cloud based solution. To control the security level, we already used fuzzy logic combining with ant colony system to assess the trust and reputation for securing another mobile cloud computing model based on the cloudlet notion.

Keywords: *mobile cloud computing, trusted computing, fuzzy logic, attestation, energy efficiency, colony system, private cloud service and Web Service.*

1. Introduction

Mobile Cloud Computing (MCC) is the combination of cloud computing, mobile computing and wireless networks to bring powerful computational resources to mobile users, network operators, and also cloud computing providers. [1][2][3] MCC support business opportunities for mobile network operators and cloud providers. The main purpose of MCC is to enable execution of rich mobile applications on a plethora of mobile devices, with a rich user experience.[4][5] The MCC can be meaning as "a rich mobile computing technology that leverages unified elastic resources of varied clouds and network technologies toward unrestricted functionality, storage, and mobility to serve a multitude of mobile devices anywhere, anytime through the channel of Ethernet or Internet regardless of heterogeneous environments and platforms based on the pay-as-you-go principle." These services can be accessed via mobile browser from a remote web server without any addition requirement of client applications. In generally and simple terms, mobile cloud computing is a combination of mobile development and cloud computing. By using cloud services, we can be built quickly on the mobile cloud computing application. We purposed that the applications can be delivered to different devices placing on any operating systems. The main advantages of mobile cloud computing include better processing, scalability, flexibility, and data storage.

2. Cloud computing deployment models

This model can give the convenience and versatility of the cloud, while preserving the management, security and control to local data centers. The private cloud services are delivered from a business's data center to internal users. The internal users may or may not be billed for services chargeback. Most common private cloud technologies and vendors are used VMware and OpenStack. A third-party cloud service provider is delivered to the cloud service over the internet in the public cloud model. PCS are on demand, typically per minute or per

hour, and then long-term commitments are able for many services. The customers are only need to pay for the CPU cycles, bandwidth or storage they consume. Leading public cloud service providers are include IBM, Microsoft Azure, Amazon Web Services (AWS), and Google Cloud Platform. A hybrid cloud is the combination of PCS and on-premises private cloud, with orchestration and automation between the two. The companies can run mission-critical workloads or sensitive applications on the private cloud and use the public cloud to handle workload bursts or spikes in demand. The goal of a hybrid cloud is to create an automated, scalable environment and unified that takes advantage of all that a public cloud infrastructure can provide, while still maintaining control over mission-critical data.

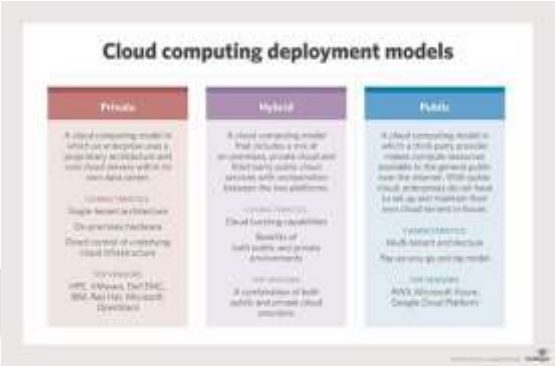

Fig.1: Cloud computing deployment models

In addition, the organizations are increasingly using on multicloud model, and the use of multiple infrastructure-as-a-service providers. Organizations adopt multicloud for various reasons. This application to migrate between various cloud providers or to even operate concurrently across two or more cloud providers. Multicloud implementation and their application development will be face a challenging because of the differences between application program interface (API) and cloud providers' services. Multicloud deployments will become easier, but, the providers' services and APIs converge are become homogeneous industry initiatives such as the Open Cloud Computing Interface.

2.1. Cloud computing characteristics and benefits

Cloud computing has several attractive benefits for both businesses and end level users. These main benefits of cloud computing are:

Self-service provisioning: This eliminates the traditional need for IT administrators to provision and manage compute resources.
Migration flexibility: Organizations can move certain workloads to or from the cloud or to different cloud platforms as desired or automatically for better cost savings or to use new services as they emerge.
Workload resilience: Cloud service providers often implement redundant resources to ensure resilient storage and to keep users' important workloads running often across multiple global regions.
Pay per use: Compute resources are measured at a granular level, enabling users to pay only for the resources and workloads they use.
Elasticity: Companies can scale up as computing needs increase and scale down again as demands decrease. This eliminates the need for massive investments in local infrastructure, which may or may not remain active.

3. Types of cloud computing services

Cloud computing has changed over/any time, cloud computing can be divided into three main broad service categories: infrastructure as a service (IaaS), software as a service (SaaS) and platform as a service (PaaS).

IaaS, known as AWS, support a virtual server instance and storage, as well as APIs that enable users to migrate workloads on a VM. IaaS providers offer small, medium, large, extra-large and memory or compute optimized instances, in addition to customized instances, for various workload needs. Users have an allocated storage capacity and can start, stop, access and configure the VM and storage as desired.

SaaS is a distribution model that can delivers software applications over the internet; they can also be called web services. The users can access SaaS applications and their services from any location by using internet access

computer or mobile. One common example of a SaaS application is Microsoft Office 365 for productivity and email services.

In the PaaS model, cloud providers host development tools on their infrastructures. Users access these tools over the internet using APIs, web portals or gateway software. PaaS is used for general software development, and many PaaS providers host the software after it's developed. Common PaaS providers include Google App Engine, AWS Elastic Beanstalk and Salesforce's Force.com.

4. Emerging cloud technologies and services

The most of cloud providers are competitive, and expand their service. This has led public IaaS providers to offer more than common compute and storage instances. Example, event driven computing or server less is a cloud service that can executes specific common functions, such as image processing and database manipulation. The traditional cloud deployments require users to establish a compute instance and load code into that instance. Then, user can decide how long it take to run and pay for that. With server less computing, developers easily create code, and then the cloud provider will load and executes that code in response to real-world events. Users only pay for the number of transactions that the function executes. Google Cloud Function, AWS Lambda and Azure Functions are the sample of server less computing services. Public cloud computing also lends itself well to big data processing, which demands enormous compute resources for relatively short durations. Cloud providers have responded with big data services, including Google Big Query for large-scale data warehousing and Microsoft Azure Data Lake Analytics for processing huge data sets. Another crop of emerging cloud technologies and services relates to artificial intelligence (AI) and machine learning. These technologies build machine understanding, enable systems to mimic human understanding and respond to changes in data to benefit the business. Amazon Machine Learning, Amazon Lex, Amazon Polly, Google Cloud Machine Learning Engine and Google Cloud Speech API are examples of these services.

5. Mobile cloud computing challenges

Mobile cloud computing has several benefits like that extra battery life and storage, need to scalability, and reliability. However, there are still challenges that must be addressed in order to enable the ubiquitous deployment and adoption of mobile cloud computing. Some of these challenges include privacy and trust, security, data management and synchronization, bandwidth and data transfer, heterogeneity and energy efficiency. We present a thorough overview of mobile cloud computing and differentiate it from traditional cloud computing.

5.1. Main challenges in Mobile cloud computing

Mobile cloud computing (MCC) is a technique that allows to use built resources like applications and it is hosted by cloud computing. Mobile cloud computing uses cloud to data storage, processing, and other thorough operations like Google Maps, mobile Email and some navigation application. However, these applications are using SaaS (Software as a Service) model of cloud computing.

Low bandwidth: The one of the main issues in mobile cloud computing (MCC) that really need to be tackled. Mobile cloud is use radio waves that are limited by compare with wired network. Available wavelength is distributed in different mobile devices. So, it has been slower in accessing speed as compared with wired network.

Service Availability: connection is another major threat in cloud computing. Sometimes customers get a low frequency signal, which affects the access speed and storage facility. Users often find complaints like transportation crowding, breakdown of network, out of coverage.

Limited Energy source: Mobile devices are generally less powerful and consume more energy. Mobile cloud computing increases battery usage of mobile devices which become an important issue. Devices should have long life battery to access applications and other operations. When the size of altered code is small, the offloading consumes more energy than local processing. Some organizations try to find ways to overcome this problem.

Alteration of Networks: Mobile cloud computing is used in different operating system driven platform like android, Windows Phone and Apple iOS. So, it has to be compatible with different platforms. The performance of different mobile platform network is managed by the IRNA (Intelligent Radio Network Access) technique.

Security and Privacy: Remain privacy is a major challenging issue in mobile cloud computing. It is harder to manage threats on mobile devices as compared to desktop devices because in a wireless network there are more chances of absence of the information from the network.

5.2. Characteristics and their architecture

Mobile cloud computing has five most important characteristics. There are:

Broadband network access: Capabilities are available over the network and accessed through standard mechanisms by either thin or thick client platforms. End User response time is supported.

On-demand self-service: The End user can provision computing capabilities as needed, such as server time and network storage, automatically without the requirement for human interaction with each services provider.

Measured services: Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service e.g. storage, processing, bandwidth, user accounts.

Rapid elasticity: Capabilities can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and rapidly released to quickly scale in.

Resource pooling: Computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand e.g. storage, processing, memory, network bandwidth, virtual machines.

Mobile cloud computing is for mobile devices, their architecture based on the security, reliability and validity to support mobile users. Therefore, it is based on 4-layer model Management, Access, Physical and Virtual.

Management Layer: The management layer of the architecture is responsible for providing management services between server clusters and the services requested by the mobile device. It provides standard protocols, notification, standard rules of operation in the cloud, interfaces, security, acknowledgments and integrity. It takes scare of billing system, environment, account configuration, task allocation, task management, task execution and lifecycle management. Since there are many different platforms or operating systems in the mobile devices, on particular function to hide the operating system difference is task of the management layer.

Access Layer: Access layer also called as control layer is responsible to provide interaction between the client and the cloud. The service interface, registration and service receive are the components. The service interface us usually the web application used to interact with the cloud and service registration is requesting particular service by the device and service receive component ensures that the acknowledgment of the service delivery on the mobile device. All the three components provide collaboration between a mobile device and the cloud.

Physical Layer: The physical layer provides the details of the physical devices such as desktop computers, mobile phones, tablets, smart phones, thin clients or unintelligent phones.

Virtual Layer Virtual: layer includes virtualization of the resources such a computing, storage, and network. These resources are pooled to provide effective and efficient services to the users. It also helps use the resource efficiently by the software or applications. The computing pool ritualized the central processing unit, memory, and the storage in the server clusters. Multiple virtual CPUs can be assigned to the application for fast execution in the cluster. Mobile devices may request different storage capacities on the cluster which is easily provided by the virtually slicing the capacity from the total capacity. Creating and storing virtual machines on the cloud also require CPU, memory and storage virtualization techniques to provide desktop environment on the mobile devices.

6. The advantages of mobile cloud computing

Cloud computing is known to be a promising solution for MC because of many reasons (e.g., portability, communication and mobility). In the following, we describe how the cloud can be used to overcome obstacles in MC, thereby pointing out advantages of MCC.

By addition, mobile cloud computing also has some advantages as follows:

- Dynamic provisioning. Dynamic on-demand provisioning of resources on a fine-grained, self-service basis is a flexible way for service providers and mobile users to run their applications without advanced reservation of resources.
- Multitenancy. Service providers (e.g., network operator and data center owner) can share the resources and costs to support a variety of applications and large number of users.
- Scalability. The deployment of mobile applications can be performed and scaled to meet the unpredictable user demands due to flexible resource provisioning. Service providers can easily add and expand an application and service without or with little constraint on the resource usage.
- Ease of integration. Multiple services from different service providers can be integrated easily through the cloud and Internet to meet the user demand.

7. Some issues and their approaches

Mobile cloud computing, which are related to the mobile communication and cloud computing.

7.1. Mobile communication side issues

Low bandwidth: Bandwidth is one of the big issues in MCC because the radio resource for wireless networks is much scarce as compared with the traditional wired networks. For example, the users form a coalition where each member is responsible for a part of video files and exchanges/transmits it to other coalition members. This results in the improvement of the video quality. However, the proposed solution is only applied in the case when the users in a certain area are interested in the same contents. Also, it does not consider a distribution policy which leads to a lack of fairness about each user's contribution to a coalition. It collects user profiles periodically and creates decision tables by using Markov decision process algorithm. Based on the tables, the users decide whether or not to help other users download some contents that they cannot receive by themselves due to the bandwidth limitation and how much it should help. Jung et al. 64 considers the data distribution policy which determines when and how much portions of available bandwidth are shared among users from which networks. This approach is suitable for the users who share the limited bandwidth to balance the trade-off between benefits of the assistance and energy costs.

Heterogeneity. Mobile cloud computing will be used in the highly heterogeneous networks in terms of wireless network interfaces. Different mobile nodes access to the cloud through different radio access technologies such as WCDMA, GPRS, WiMAX, CDMA2000, and WLAN. As a result, an issue of how to handle the wireless connectivity while satisfying MCC's requirements arises (e.g., always-on connectivity, on-demand scalability of wireless connectivity, and the energy efficiency of mobile devices). Klein et al. 67 proposes an architecture to provide an intelligent network access strategy for mobile users to meet the application requirements. This architecture is built based on a concept of Intelligent Radio Network Access (IRNA 68). IRNA is an effective model to deal with the dynamics and heterogeneity of available access networks. To apply IRNA in MCC environment, the authors propose a context management architecture with the purpose to acquire, manage, and distribute a context information. As shown in Figure 3, this architecture consists of three main components: context provider, context broker, and context consumer. However, the context quality enabler is also required to facilitate the operations of other components. In this architecture, when a context consumer wants to communicate with a context provider, the context consumer will request the Uniform Resource Identifier (URI) of context providers at the context broker. Using this URI, the context consumer can communicate directly to the context provider and request the context data. Hence, this process increases the speed of context data delivery. Furthermore, when a context quality enabler receives the requirement about the context quality from the context consumer, the context quality enabler will filter out URIs of the context providers that are not suitable with the required quality level. Therefore, this architecture enables controlling context quality according to the demands of the context consumers.

Availability. Service availability becomes a more important issue in MCC than that in the CC with wired networks. Mobile users may not be able to connect to the cloud to obtain a service due to traffic congestion, network failures, and the out-of-signal. After detecting nearby nodes that are in a stable mode, the target provider for the application is changed. In this way, instead of having a link directly to the cloud, a mobile user can connect to the cloud through neighboring nodes in an ad hoc manner. However, it does not consider the mobility, capability of devices, and privacy of neighboring nodes.

7.2. Computing side issues

Computing offloading: As explained in the previous section, offloading is one of the main features of MCC to improve the battery lifetime for the mobile devices and to increase the performance of applications. However, there are many related issues including efficient and dynamic offloading under environment changes.
Context-aware mobile cloud services: It is important for the service provider to fulfill mobile users' satisfaction by monitoring their preferences and providing appropriate services to each of the users. A lot of research work try to utilize the local contexts (e.g., data types, network status, device environments, and user preferences) to improve the quality of service (QoS).
Enhancing the efficiency of data access: With an increasing number of cloud services, the demand of accessing data resources (e.g., image, files, and documents) on the cloud increases. As a result, a method to deal with (i.e., store, manage, and access) data resources on clouds becomes a significant challenge. However, handling the data resources on clouds is not an easy problem because of the low bandwidth, mobility, and the limitation of resource capacity of mobile devices.
Security: Protecting user privacy and data/application secrecy from adversary is a key to establish and maintain consumers' trust in the mobile platform, especially in MCC. The security related issues in MCC are introduced in two categories: the security for mobile users and the security for data. Also, some solutions to address these issues are reviewed.

8. References

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