



Mobile Cloud Computing and Its Challenges

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Abstract: Mobile Cloud Computing (MCC) has given the mobile users the flexibility to use the mobile phone with no storage, enabling the users to store huge amount of data on cloud rather than storing it in the mobile phone, these all happening with the help of the internet. The mobile cloud apps is the state of art of the mobile Cloud Computing (MCC). The mobile device is just an interface to access the apps which are available on the mobile cloud. The Mobile Cloud Computing (MCC) makes the access of apps faster and easier. Soon there will be mobile phones without SIM allowing the contacts stored and accessed in and from cloud. The major challenges are its security and privacy. The security of mobile apps is one of the security issue of mobile cloud computing. Ensuring the data security in the mobile cloud is also one of the major challenge. With the increase in the use of mobile devices, the concerns over the security and privacy of Mobile Cloud Computing (MCC) has also increased. Mobile Cloud Security Assessment is an emerging solution to ensure security.

Keywords: mobile phones, Mobile Cloud Computing (MCC), security, privacy.

I. INTRODUCTION

Cloud computing is a paradigm for enabling a convenient way, on-demand easy network access to a shared pool of configurable computing resources like networks, servers, storage, applications and services and also provides a high level abstraction of computation and storage with a very less management effort with the help of service models and the deployment models.

A. Cloud Service Models:

Software as a Service (SaaS): In general this model facilitates the customers to access the applications hosted on the cloud. Instead of installing the apps on their own mobiles, the users access these applications installed on the cloud using the browsers in the mobile.

Platform as a Service (PaaS): In this model the cloud service providers provide application development platform for the developers[8]. They also deliver a set of APIs for the developers to develop and launch their own customized applications. They do not need to install development tools on their mobile device. In simple words the mobile users can use the application development platform on the cloud using mobiles.

Infrastructure as a Service (IaaS): In general in this model the cloud providers offers the cloud services like hardware resources, storage and network infrastructure services. The virtualization is the base of this model. A virtualized environment is created for the mobile users[4].

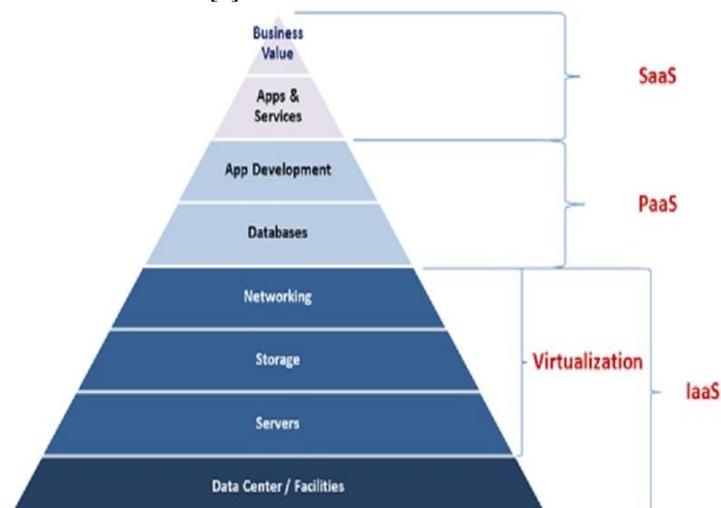


Fig 1: Cloud Service Models



B. Cloud Deployment Models:

Private Cloud: The cloud infrastructure is operated solely for an organization. It may be managed by the organization or a third party and may exist on premise or off premise.

Public Cloud: The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services.

Hybrid Cloud: The cloud infrastructure is a composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability (e.g. cloud bursting for load-balancing between clouds).

Community cloud: It is a collaborative effort in which infrastructure is shared between several organizations from a specific community with common concerns (security, compliance, jurisdiction, etc.), whether managed internally or by a third-party and hosted internally or externally. The costs are spread over fewer users than a public cloud (but more than a private cloud), so only some of the cost savings potential of cloud computing are realized. It may be managed by the organizations or a third party and may exist on premise or off premise.

C. Smart Phones:

A smart phone is a mobile phone with an advanced operating system. Smart phones typically include the features of a phone with those of other popular mobile devices, such as personal digital assistant, media player and GPS navigation unit. Most have a touch screen interface and can run third-party apps, and are camera phones. Smart phones add broadband internet web browsing, Wi-Fi etc. In the 21st century there is a drastic increase in demand of mobile phones as they are cheaply available in markets. The increased capabilities of mobile devices has saved time for mobile users to easily engage in computing using data-rich environments and multi-cloud solutions.

D. Mobile Cloud Computing (MCC):

It is a combination of cloud computing and mobile networks to bring benefits for the mobile users, network operators as well as cloud providers. Mobile cloud computing refers to infrastructure where both the data storage and data processing happen outside of the mobile device. Mobile Cloud Computing (MCC) has revolutionized the way in which mobile subscribers across the globe leverage services on the go. The mobile devices have evolved from mere devices that enabled voice calls only a few years back to smart devices that enable the user to access value added services anytime, anywhere. MCC integrates cloud computing into the mobile environment and overcomes obstacles related to performance (e.g. battery life, storage, and bandwidth), environment (e.g. heterogeneity, scalability, availability) and security (e.g. reliability and privacy).

II. MOBILE CLOUD COMPUTING (MCC)

Mobile cloud computing is referred to as the infrastructure where both the data storage and the data processing happen outside of the mobile device.

A. Mobile Cloud Computing(MCC) Architecture:

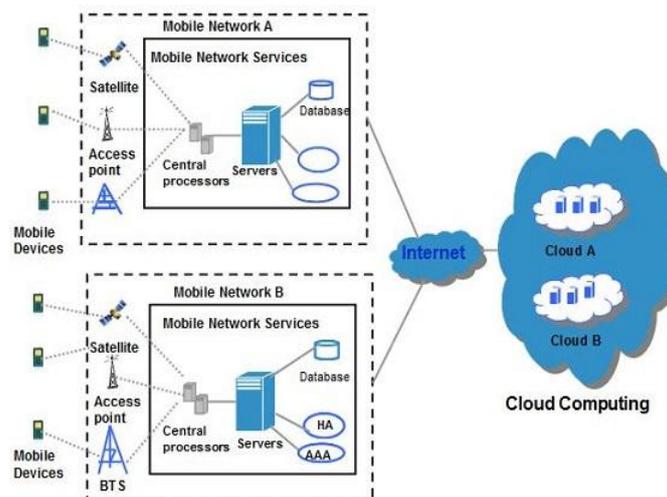


Fig 2: The general architecture of Mobile Cloud Computing (MCC)



The figure shows the general architecture of Mobile Cloud Computing (MCC) where there are two different mobile networks A and B being used by many different mobile devices through wireless access point, BTS or satellite. Mobile users request and information is transmitted to the central processors that are connected to the servers providing mobile network services. The mobile users use SaaS/PaaS (cloud controller) to get connected to the mobile network services the service provider checks the Authenticity, Authorization and Accountability (AAA) of the user and provides the full fledged services to use the services on cloud through internet with the help of Host Agent (HA). Mobile Cloud computing provides a virtualized environment as a service to the user to efficiently use the resources available on the cloud. The cloud controller (SaaS/PaaS) connects to the different clouds (Cloud service providers) based on the request of the user[5].



Fig 3: Virtualized Environment as a service using Mobile Cloud Computing

III. MOBILE CLOUD COMPUTING SERVICES

A virtualized environment as a service is been created by using Mobile Cloud Computing (MCC). The virtualized environment allows the user to use the different services in different clouds using cloud controller, the service provider enables the user to get connected to the cloud with help of internet. The mobile device just an interface to access mobile apps, contacts and data from the cloud. The mobile cloud is most often viewed as an SaaS cloud, meaning that computation and data handling are usually performed in the cloud.

A. Mobile phone without SIM (Subscriber Identity Module) Card:

In general the mobile phones have the SIM card to store contacts but what happens when the mobile phone is lost, all the contacts are lost and the misuse of SIM can also happen unless and until the SIM is deactivated. Mobile Cloud Computing (MCC) enables the user to use mobile phone without a SIM card. The user must have the username and password must be there to access the contacts. The 4G Technology is helping out to have mobile phone without a SIM card, example Samsung introduced the Yes Buzz 4G cloud phone in Malaysia in January 2011. It has no SIM card and allows contacts to be saved and synchronized on the Internet. No doubt the SIM cards will die soon.

B. Mobile apps the state of art of Mobile Cloud Computing (MCC):

Cloud apps have the power of a server-based computing infrastructure accessible through an app's mobile interface. Like an ipod touch which run all online apps from play store. The mobile will run all online apps from and on cloud. The mobile apps will be available on cloud, the mobile user generally download the apps from the App store, every mobile phone provider have their own cloud, the user access to that cloud and downloads the apps into their mobile like APPLE has icloud, Apple cloud were APPLE apps are available, it is called as APPLE store. Soon the downloading concept of apps on to mobile will perish, the mobile user can use the cloud controller and run the mobile apps on mobile cloud itself. The apps will be available on the mobile phone just like desktop shortcuts.

C. Huge amount of data is stored in Cloud:

The huge amount of data can be stored on private clouds which are cheaply available which enables huge amount of data to be stored in cloud. Even the mobile is lost the data is safe in cloud and even the contacts. You have an ID to access the cloud you can access it from new mobile device too but the Authenticity, Authorization and Accountability is checked before accessing to the data. The data storage is made easier. There are more chances of mini phones in future, Mobile Cloud Computing allows to store data and retrieve the huge amount of data stored in cloud, the mobile device is merely an interface to access the data and making it a powerful device.



D. Resource Management of Mobile Cloud vComputing (MCC):

Mobile Cloud Computing manages the resources and creates the virtualized environment to use all the services in different clouds as if available in the mobile device itself. The resources available on the cloud is just used on mobile devices just like desktop shortcuts in computer systems. All these are well managed by mobile cloud computing [12].

E. HTML, CSS and Hypervisor:

HTML5 enables to watch a video without a plug-in like Adobe® Flash® or Microsoft® Silverlight™, to store and access data such as e-mail messages and calendars, which helps make web applications more useful. CSS3 works with HTML5 to specify how elements of a page should be rendered. An HTML specification tells a web browser what to display, and a CSS specification tells the web browser how to display it. Hypervisor Another enabler for cross-platform applications is an embedded hypervisor, which allows a web application to run on any smart phone without being aware of the underlying architecture (mobile). The hypervisor allows other software to run in a virtualized environment [2]. Mobile platforms require the hypervisor to be built in.

IV. CHALLENGES OF MOBILE CLOUD COMPUTING (MCC)

MCC is particularly vulnerable due to multiple points at which access can be interrupted. Reception and high speed availability can vary greatly for mobile devices. In addition to this, particular services used may have downtime. Finally, there can be issues of data becoming locked in to a particular service.

A. Security of Mobile device:

The hackers use social engineering through mobile apps and SMS text messages, which take advantage of human behaviour and trust to gain access to data or infiltrate businesses, to make people click on links. It is going to affect the mobile if there is a weak security software used by any of the cloud service provider it will have affect on the cloud too which may even lead to data loss.

B. Providing privacy and security of the data stored on cloud:

Storing the data and running the software on some other cloud provided by cloud service provider, appears to be daunting, as the question arises is the cloud service provider is reliable even though services appear to be reliable. A Service Level Agreement (SLA) must be there between the user and the cloud provider so that the doubts does not arise and increases the reliability between cloud provider and the mobile user and also avoiding the theft of the data stored in cloud and also making it secure[6].

C. Data Storage:

The cloud is now much cheaper and mobile users prefer to store data in the cloud rather than storing in mobile phones. The multi-tenancy model and the pooled resources in cloud computing resources in cloud computing has introduced a new challenge of how the data is stored. There is a demand to use a novel technique to organize the data, so that the information retrieval becomes easier without any delay and main concern is not to have data loss during data storage and also during the retrieval. The Data loss because of hacking can be avoided to some extent by using Honey Pot System Technique [1]. The Honey Pot systems are just like intrusion detection system ensuring that there is no hacking.

D. Network latency and transmission delay:

since in Mobile cloud computing has multiple clouds ,in general it is a multi-tenancy model with multiple points at which data transmission takes place due to change in the bandwidth at multiple points there is a possibility of transmission delay.

E. Congestion Management:

The mobile agent facilitates the congestion management and improves the data transmission across the clouds.

F. Ensuring secure connectivity:

As mobile cloud computing uses security as service ensuring scanning, email security [7]. Since Mobile Cloud computing is a multi-tenancy model, ensuring secure connectivity is important and preventing the hacker to gain access over the connection .The strong encryption techniques may be used in order to avoid hacking.

G. Avoid Phishing::

Avoid phishing is important. The unknown apps should not be downloaded and the unknown pop up window should not be opened. If the unknown apps are downloaded, if it's a hacker app then it will affect the cloud, were the app is downloaded and also mobile device then the cloud security may be at stake.



V. ADVANTAGES OF MOBILE CLOUD COMPUTING (MCC)

A. Good Mobile battery durability:

As huge amount of data stored in cloud and no data is stored in mobile phone it the durability of the battery will be good.

B. Increased Performance of Mobiles:

As the processing is done on the cloud outside the mobile device, it increases the performance of the mobile device.

C. Reliability:

The ability of the cloud computing system to perform and maintain providing its resources under unexpected failures, storage, network connectivity and computing power, for a predefined amount of time[4]. This ability can be supported by

- (i) supporting replication of objects and services,
- (ii) using redundant communication

D. Scalability

The Mobile cloud computing system has ability to expand the amount of resources and services to large scales to satisfy rapid increases in service demand. This ability can be satisfied by

- (i) support for massive sharing of content,
- (ii) flexible, fault-tolerant and distributed data bases,
- (iii) fast and consistent content replication support.

E. High Availability:

The Mobile cloud computing system provide and support a large amount of different computational resources which are easily accessible and are operating in optimal performance conditions for a predefined agreed amount of time.

F. Improved Processing Capabilities:

The scheduling algorithms are used to improve the processing capabilities on cloud. The processing is done by efficient mapping of tasks to available resources.

G. High Bandwidth:

The cloud performance has increased due to high bandwidth making data transfer faster [15].

VI. MOBILE CLOUD SECURITY ASSESMENT

A. Security Controls:

i. Security controls can be used to assess the

Security of mobile apps at all service levels.

ii. Security controls are the Security

Technologies [2] and are security requirements of the mobile cloud service provider. Security Technologies help in encrypting mobile data and also making mobile apps on cloud accessible and controllable by the mobile user.

B. Auditors:

The auditors can be used to assess the authentication. Security Controls are used by auditors ensuring both the privacy and security [2]. Auditors access logs and records to check the authenticity and authenticity of apps accessed by the right mobile app user.

C. Configuring Services:

These services can be used to managing mobile cloud users authorization.

D. Intrusion Detection Systems (IDS):

The IDS can be used to ensure security of the data. Honey Pot is the IDS which is most preferable [1].

VII. CONCLUSION

Mobile Cloud Computing provides a high level abstraction of computation and storage with a very less management effort with the help of service models and the deployment models. Giving mobile users a flexibility to store contacts on



cloud and to use mobile apps on cloud and running them on cloud itself. Mobile Cloud Security assessment using security controls, auditors, configuring services and IDS ensure security to the mobile cloud to a great extent. In spite of challenges, Mobile cloud computing emerged as reliable, high availability of data, increased processing capabilities and performance.

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