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Mobile Cloud Computing Applications and Challenges

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***Abstract*- Mobile Cloud Computing (MCC) combines mobile computing and cloud computing. Cloud Computing includes application and services that run on distributed network using virtualized resources and excess by common internet protocol. Cloud services are having major impact on Mobile phone technology. Now days Cloud computing is spreading into mobile. That is why mobile cloud computing is becoming a new and fast growing technology today. We discussed the architecture of MCC (Mobile cloud computing) with the different services needed by the client and the server in MCC. This paper focus on Architecture, Applications and Challenges in MCC. MCC integrates the cloud computing into the mobile environment and overcomes obstacles related to the performance (e.g., battery life, storage, and bandwidth) and security (e.g., reliability and privacy).**

***Keywords*- Mobile Cloud Computing, Architecture of Mobile Cloud Computing, Challenges among MCC, Applications of Cloud Computing, Advantages of MCC.**

I. INTRODUCTION

Mobile Cloud Computing describes a model where processing is done in the cloud, data is stored in the cloud and mobile device serve as the presentation platform or display. In future because of MCC there will be no need of downloading and installing applications on the mobile Handsets (smart phones, tablets, etc.) users can access them directly in the cloud and display through the mobile browser. With the explosion of mobile applications and the support of Cloud Computing for a variety of services for mobile users, mobile cloud computing (MCC) is introduced as an integration of Cloud Computing into the mobile environment. MCC brings new types of services and facilities mobile users to take full advantages of Cloud Computing.

Alternatively, MCC can be defined as a combination of mobile web and cloud computing, which is the most popular tool for mobile users to access applications and services on the Internet.

MCC offers data processing and storage capabilities in the cloud which the mobile user can access using mobile device's web browser. The mobile users do not need high data processing and storage capabilities services on their mobile devices since cloud resources are used for all the data processing and storage. Therefore, the MCC popularity among the mobile users is increasing rapidly.It brings attributes such as on demand access, no on premise software and "XaaS" (Everything as a Service) to the mobile domain, adding Network as a Service (NaaS) and Payment as a Service to the maximum of on demand capabilities and allowing applications to leverage the full power of mobile networking and billing without the need for specialist application servers.

Table1: A List of Acronyms used in this paper is as follows[1]

Acronyms

AAA	Authentication, Authorization, Accounting
APDV	Application Protocol Data Unit
API	Application Programming Interface
BTS	Base Transceiver Station
CC	Cloud Computing
CSP	Cloud Service Provider
EC2	Elastic Compute Cloud
GPS	Global Positioning System
IaaS	Infrastructure as a Service
ISP	Internet service provide
MC	Mobile Computing
MCC	Mobile Cloud Computing
MSC	Mobile Service Cloud
PaaS	Platform as a Service
QoS	Quality of Service
SaaS	Software as a Service
URI	Uniform Resource Identifier

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II. ARCHITECTURE OF MOBILE CLOUD COMPUTING.[3]

MCC includes four types of cloud resources:

- Distant mobile cloud
- Distant immobile cloud
- Proximate mobile computing entities
- Proximate immobile computing entities
- Hybrid

A general Architecture of Mobile Cloud computing is shown in figure below:

Mobile devices are connected to the mobile networks via base stations(e.g., base transceiver station, access point, or satellite)that establish and control the connections (air links) and functional interfaces between the networks and mobile devices. Mobile users' requests and information (e.g., ID and location) are transmitted to the central processors that are connected to servers providing mobile network services.

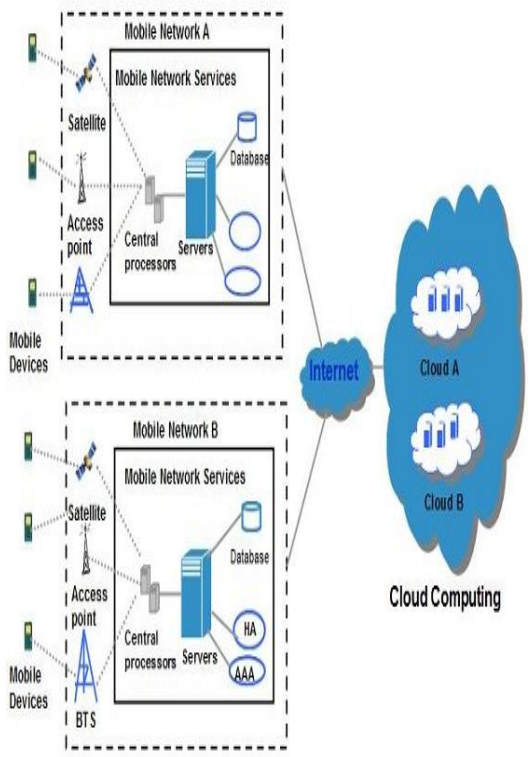

Fig.1

Here, mobile network operators can provide services to mobile users as authentication, authorization, and accounting based on the home agent and subscribers' data stored in databases. After that, the subscribers' requests are delivered to a cloud through the Internet. In the cloud, cloud controllers process the requests to provide mobile users with the corresponding cloud services. These services are developed with the concepts of utility computing, virtualization, and service-oriented architecture (e.g., web, Application, and database servers).

Software as a Service
Platform as a Service
Infrastructure as a Service
Data centers

Fig.2

Service-oriented cloud computing architecture[2]

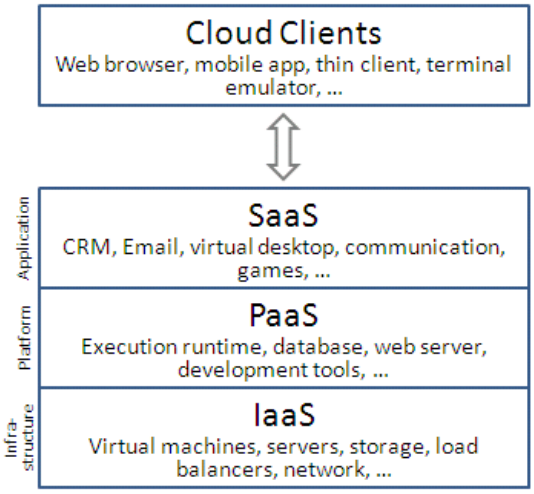

Fig.3

SaaS:
This cloud application services basically employs the use of the Web to deliver applications. These services are provided to the concerned client by a third-party vendor. Since most of these applications can be accessed directly from a Web browser, clients do not need to install or download anything onto their own mobile.
In this case, the cloud provider supervises everything from applications, data, runtime, servers, storage, virtualization and networking. Using SaaS makes it easy for enterprises to maintain their systems, as most of the data is managed by the third-party vendor.

PaaS:
Platform-as-a-Service is the toughest to manage from among the three. As the name suggests, the resources here are offered via a platform. Developers then use this platform to create and customize applications based on the framework made available to them. PaaS makes it very easy for development, testing and deployment of apps in a simple and cost-efficient manner.
Paas lies in fact that the responsibility of managing the system is shared by the user or client and the provider as well. In this case, providers still manage servers, storage, runtime, middleware and networking, but it is up to the client to manage applications and data.
This service is most preferred by large companies, which have the manpower for, also seeking to enhance interaction among their staff.

IaaS:

Infrastructure-as-a-Service basically provides computing infrastructure, such as virtualization, storage and networking. Clients can purchase fully outsourced services, which are then billed in accordance with the resources they use up. The provider in this case charges a rent to install the clients' virtual server on their own IT infrastructure.
While the vendor is responsible for managing virtualization, servers, storage and networking, the client has to take care of data, applications, runtime and middleware. Clients can install any platform as required, based on the type of infrastructure they opt for. They will also have to manage updation of newer versions as and when they become available.

III. ADVANTAGES OF MCC

A. Extending battery lifetime:
Computation offloading migrates large computations and complex processing from resource-limited devices (i.e., mobile devices) to resourceful machines (i.e., servers in clouds).
Remote application execution can save energy significantly. Many mobile applications take advantages from task migration and remote processing

B. Improving data storage capacity and processing power:
MCC enables mobile users to store/access large data on the cloud. MCC helps reduce the running cost for computation intensive applications.Mobile applications are not constrained by storage capacity on the devices because their data now is stored on the cloud.

C. Improving reliability and availability:
Keeping data and application in the clouds reduces the chance of lost on the mobile devices.MCC can be designed as a comprehensive data security model for both service providers and users Protect copyrighted digital contents in clouds.Provide security services such as virus scanning, malicious code detection, and authentication for mobile users.With data and services in the clouds, then are always (almost) available even when the users are moving.

D. Dynamic provisioning:
Dynamic on-demand provisioning of resources on a fine-grained, self-service basis.No need for advanced reservation.

E. Scalability:
Mobile applications can be performed and scaled to meet the unpredictable user demands.Service providers can easily add and expand a service

IV. APPLICATIONS OF MOBILE CLOUD COMPUTING[6]

A. Mobile Commerce:
M-commerce allows business models for commerce using mobile devices.Examples: Mobile financial, mobile advertising, mobile shopping

B. Mobile Healthcare:
M-healthcare is to minimize the limitations of traditional medical treatment (eg. Small storage, security/privacy, medical errors, …).M-healthcare provides mobile users with convenient access to resources(eg. medical records).
M-healthcare offers hospitals and healthcare organizations a variety of on-demand services on clouds.
Examples:Comprehensive health monitoring services, Intelligent emergency management system, Health-aware mobile devices (detect pulse-rate, blood pressure, level of alcohol etc)

C. Mobile Gaming:
M-game is a high potential market generating revenues for service providers. Can completely offload game engine requiring large computing resource (e.g., graphic rendering) to the server in the cloud. Off-loading can also save energy and increase game playing time (eg. MAUI allows fine-grained energy-aware offloading of mobile codes to a cloud

D. Assistive technologies:
Pedestrian crossing guide for blind and visually-impaired.Mobile currency reader for blind and visually impaired. Lecture transcription for hearing impaired students

E. Other applications:
Sharing photos/videos, Keyword-based, voice-based, tag-based searching, Monitoring a house, smart home systems

V. ISSUES AND CHALLENGES

The paper emphasis on the issues and challenges are given below:

A. Data Security and Privacy Issues:
Here we have highlighted some common data concerns in the cloud.

- Data theft risk
- Privacy of data belongs to customers
- Violation of privacy rights
- Loss of physical security
- Handling of encryption and decryption
- Keys
- Security and auditing issues of virtual
- Machines
- Lack of standard to ensure data integrity
- Services incompatibility because of
- Different vendors involvement

B. Architecture and Cloud Service Delivery Models Issue:

- Computing off loading
- Security for Mobile Users/
- Applications/ Data
- Improvement in Efficiency Rate of
- Data Access
- The Context Aware MC Services
- Migration and Interoperability

- Service Level Agreement (SLA)
- Cost and Pricing

C. Mobile Cloud Infrastructure Issues:

- Attacks on Virtual Machines
- Vulnerabilities exists at platform level
- Phishing
- Authorization and Authentication
- Attacks from Local Users
- Hybrid Cloud Security Issues

D. Mobile Cloud Communication Channel Issues

- Access Control Attacks
- Data Integrity Attacks
- Attacks on Authentication
- Attacks on Availability

E. Mobile communication side issues

- Low Bandwidth and Latency problems
- Availability of Desired Services
- Heterogeneity
- Limited Resources

VI. CONCLUSION

This paper is to give an overview of the mobile cloud computing possibilities. Mobile cloud computing will be a source of challenging research problems in information and communication technology. For many years to come. This paper discuss about Application and challenges of MCC. The Concept of cloud computing provides a brand new opportunities for development of mobile applications since it allows the mobile devices to maintain a very thin layer for user applications and shift the computation and processing over head to the virtual environment.

VII. FUTURE SCOPE

The future of MCC is full of opportunities, but it has certain challenges such as Key challenge for cloud computing is network availability and intermittency. Because all services will provided via Internet. Virtualization giant VMWare is working on creating virtualized instances to run from the cloud. It allows users to access their desktop, file documents and other data from an iPhone, Android and iPad. Mobile platform developers and app makers will invest heavily in mobile and cloud computing. The future of Microsoft's Windows Phone Mango platform is also making use and betting big on cloud integration. It seamlessly integrates with multiple networks and services for accessing documents, email and media, and building more hooks for the cloud into its developer SDK. Mobile cloud computing has a long way to go and could take more time to develop, but it is making way and taking off into the future.

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