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Mobile in cloud computing

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Abstract
Mobile Cloud Computing is the combination of cloud computing, mobile computing and wireless networks to bring rich computational resources to mobile users, network operators, as well as cloud computing providers. The ultimate goal of MCC is to enable execution of rich mobile applications on a plethora of mobile devices, with a rich user experience. MCC provides business opportunities for mobile network operators as well as cloud providers. MCC can be defined 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-use principle.

Keywords: Cloud Computing, Mobile Computing, Security, challenges, and Advantages

1. Introduction
Mobile devices (e.g. smartphone, tablet pcs, fablet etc) are increasingly becoming an essential part of human life as the most effective and convenient communication tools not bounded by time and place. Mobile users accumulate rich experience of various services from mobile applications (e.g., iPhone apps, Google apps, etc), which run on the devices and/or on remote servers via wireless networks. Cloud computing (CC) has been widely recognized as the next generation's computing infrastructure. CC offers some advantages by allowing users to use infrastructure (e.g., servers, networks, and storages), platforms (e.g., middleware services and operating systems), and softwares (e.g., application programs).

2. Cloud Computing
In cloud computing there are different categories of cloud services. These services delivered to the users in real time via internet.

2.1 Software as a Service (SaaS)
In this model an application is hosted as a service to customer who accesses it via the Internet For example web user can use Google doc and they do not need to install any application for that. Other providers like Amazon provides cloud services and subscriber need to pay only for the amount of services they want to use.

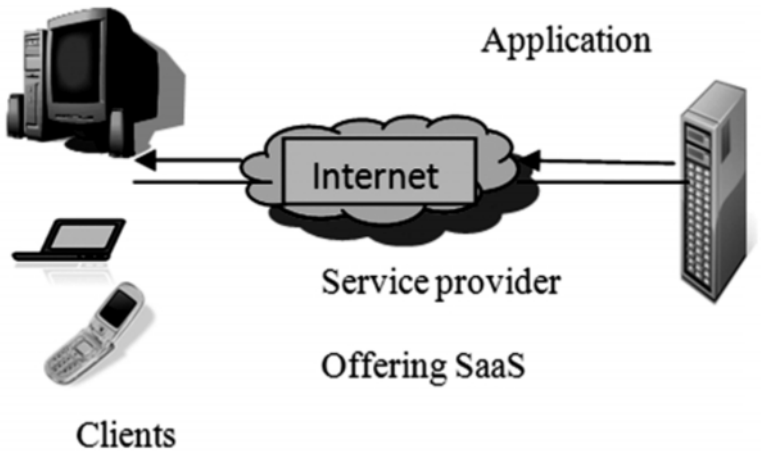

Fig. 1: Software as a Service (SaaS)

2.2 Platform as a Service (PaaS)

PaaS services include application design, development, testing, deployment and hosting. In this not only services (application software etc) but server, memory and other platforms can be used and subscriber needs to pay as per terms and conditions.

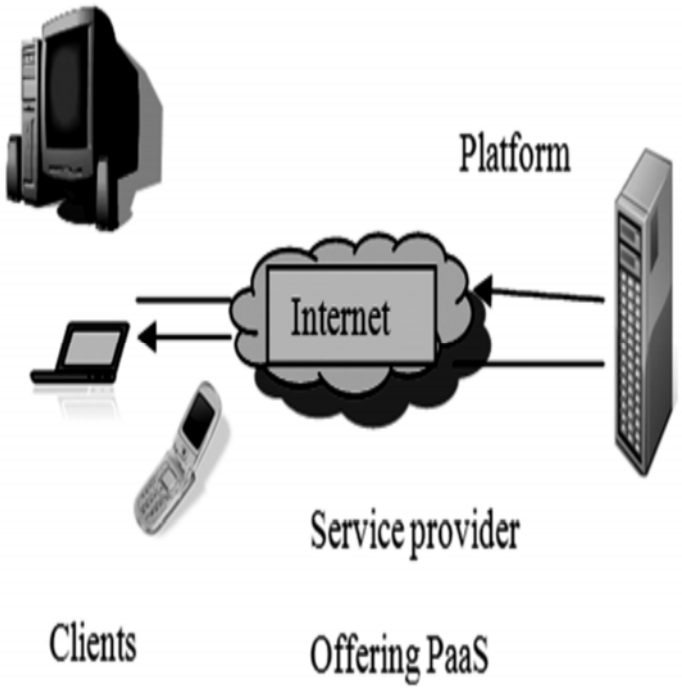

Fig. 2: Platform as a Service (PaaS)

3. Mobile Cloud Computing

"Mobile Cloud Computing at its simplest refers to an infrastructure where both the data storage and the data processing happen outside of the mobile device. Mobile cloud applications move the computing power and data storage away from mobile phones and into the cloud, bringing applications and mobile computing to not just smartphone users but a much broader range of mobile subscribers".

MCC can be described as a new paradigm for mobile applications whereby the data processing and storage are moved from the mobile device to powerful and centralized computing platforms located in clouds. These centralized applications are then accessed over the wireless connection based on a thin native client or web browser on the mobile devices. The mobile devices do not need a powerful configuration (e.g., CPU speed and memory capacity) since all the complicated computing modules can be processed in the clouds.

3.1 Key Requirements for MCC

There are some key features of Mobile Cloud Computing that make it possible to implement seamless service delivery in across the network environment. From the perspective of the enterprise solution provider or web/mobile application developer, the objectives of the Mobile Cloud Computing platform are:

- Simple APIs offering transparent access to mobile services and requiring no specific knowledge of underlying network technologies.
- The ability to deploy applications across multiple carrier networks, under a single commercial agreement.
- Seamless handling of each carrier's specific network policy, such as chosen mobile subscriber confirmed opt-in confirmed opt-out and privacy management principles.

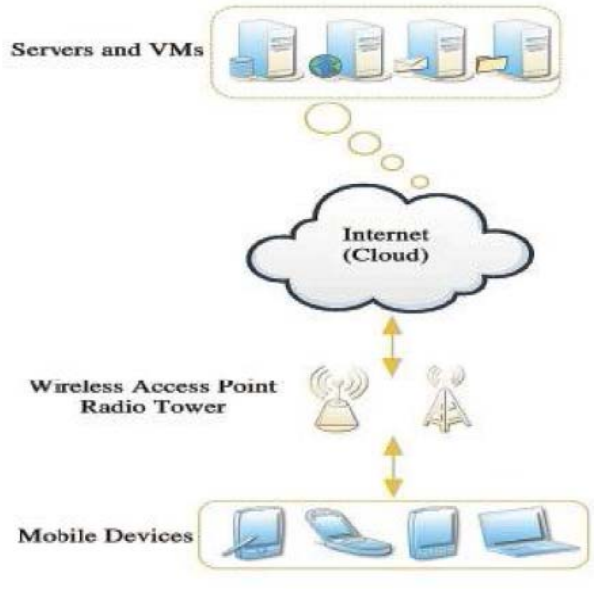

Fig 3. Mobile Cloud Computing

4. Advantage of Mobile Cloud Computing

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

Fig 4: Advantage of Cloud Computing

4.1. Extending battery lifetime:

Battery is one of the main concerns for mobile devices. Computation offloading technique is proposed with the objective to migrate the large computations and complex processing from resource-limited devices (i.e., mobile devices) to resourceful machines (i.e., servers in clouds). This avoids taking a long application execution time on mobile devices which results in large amount of power consumption. In addition, many mobile applications take advantages from task migration and remote processing.

5. Mobile Cloud Computing System Architecture

We first give an overview of the current cloud computing architecture, and how current mobile cloud services make use of cloud computing resources. We then discuss recently proposed alternative or complimentary architectures—Cloudlet and peer. Finally, we offer our vision and open questions.

5.1 Current cloud computing architecture and mobile cloud service

Current cloud computing providers typically allow customers to rent computation and storage such that customers can start instances of their cloud applications as VMs within the provider's cloud of servers. Cloud providers may provide additional services, such as backup and traffic accounting, to ease the process of managing VMinstances. The distribution of the VMinstances is largely transparent to the customers, and cloud providers mainly focus on providing guarantees of CPU time, memory usage, storage, server availability, networking throughput, etc.

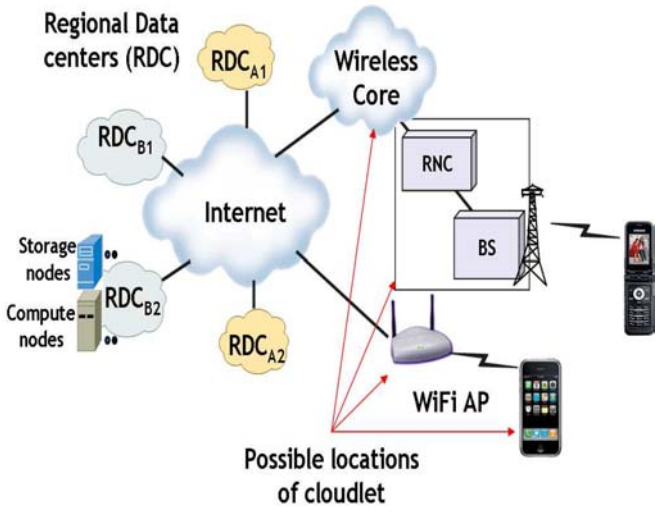

Fig 5: Components of mobile cloud architecture

However, some cloud providers offer customers the additional ability to choose geographically from among a small number of data centers where their VM instances will run, e.g. Amazon has several regional data centers such as US East, US West, etc. The intent is to lower network latency by locating data centers near where their output will be used, and as such these data centers are mostly located in places with large population densities. Such cloud computing is suitable and popular for small start-ups and medium-sized businesses, since the management of servers and many basic application services can be outsourced to the cloud. Its suitability for large organizations is still being proven in the market place, as each large company must investigate the price/performance trade off between building and managing their own private cloud or contracting out those services to a third party cloud as traffic scales to high volumes. A key consideration that factors into this decision is whether an organization wishes to store its private or proprietary data on a third party's cloud, and to what extent that cloud provider provides protection to ensure the privacy of such data.

We envision that the future of cloud computing will be heterogeneous, and include many diverse clouds with different capabilities and protections, offered by different vendors. A large company that builds its private cloud may still bridge into a larger public cloud for some of its services. The diverse application-level services embedded within these various clouds will likely be merged in a seamless manner via interoperable standards based on Web services that span these heterogeneous clouds.

Today's mobile applications have already begun to adapt to cloud computing. A common theme emerging from the large wave of mobile applications developed for smart phones such as the iPhone and Android is that these mobile applications are often linked to server instances operating in the cloud. However, there is much duplication of effort, as these server instances reimplement many of the same elements of mobile support, such as location awareness, adaptation to mobility, and computational partitioning of execution between the mobile and the cloud.

We believe that fusing mobile and cloud computing will require a rethinking of the architecture of cloud computing to accommodate common themes of mobile computing, including adaptation to limited resources and mobility.

5.2 The case for a middle tier

The key to answering this question is the end-to-end performance such as bandwidth, delay and jitter. Even with LTE, access to the closest data center will incur a latency of at least 70ms. This latency can still be problematic for perception applications. For example, it is reported in that transmitting a large image to a server on a network with RTT of 40ms degrades the frame rate to 1.8 frames per second whereas in a LAN of 100Mbps, the frame rate is about 8 frames per second. Perception applications call for a middle tier such as Cloudlet. A cloudlet is a trusted, resource rich computer or cluster of computers that is well connected to the Internet and is available for use by nearby mobile devices. One incentive for wireless providers to deploy computing and storage nodes is to reduce resource consumption within its access network. The possible places for deploying resources that are closer to mobile devices are the wireless access networks, Wi-Fi hotspots, peer mobile devices. The key advantage of deploying cloudlets in wireless access networks is that there is minimal security, privacy and trust problems because wireless providers see all traffic from its subscribers. It also simplifies billing. The key drawback for deploying cloudlet type of resources in public Wi-Fi hotspots are the lack of security, trust and billing infrastructure.

5.3 Cloud Infrastructure Optimization for Mobile Applications

The performance of public cloud infrastructure is adequate for many mobile applications. However, they may fall short for certain demanding mobile applications. One such type of application is social games which are largely played on mobile devices. Unlike most web applications such as e-commerce or search which are read heavy, social games are write heavy. This is due to the interaction between the user and the game state and between users themselves. In social games the ratio of reads to writes can be as high as 1:1. In addition, to achieve good user experience, social games require low latency and high availability. As a result, the leading social game company, Zynga built its own cloud, zCloud.

zCloud is designed specifically for social games in terms of availability, network connectivity, server processing power and storage throughput. zCloud provides redundant power to each rack, uses state-of-theart server with high memory capacity. It is a fully non-blocking network infrastructure and uses in-line hardware-based load balancers and local disk storage. zCloud also optimized game servers. Instead of using Memcache and MySQL, zCloud makes use of Membase. Membase has built in persistence and replication mechanism. Membase is also optimized with write throughput besides reads. As a result, zCloud offers 3 times the efficiency of standard public cloud infrastructure. For example, where Zynga games in the public cloud would require three physical servers, zCloud only uses one.

5.4 Leveraging peer mobile devices

It has been demonstrated that one can leverage peer mobile devices to perform cloud computing functions. A system called Misco, a version of Map Reduce, can be handled by a "server farm" comprised of 20-odd Nokia N95 smart phones. The choice of using peer mobile devices for cloud computing faces many other hurdles. The security, trust, privacy issue is even greater. There is also the incentive issue.

5.5 Our vision and research agenda

Our vision of a mCloud architecture is the seamless integration of cloudlet and public cloud, and infrastructure specialization for mobile applications. We believe the dominant architecture will be the regional data centers of public cloud providers. Cloudlet is necessary
to reduce the delay of latency sensitive perception applications. There are two convincing deployment settings. One is for wireless providers to deploy cloudlet like nodes within their wireless access networks as a premium service for its subscribers. The other is for cloud providers to co-locate cloud resources in wireless access networks through co-location agreement with wireless providers. For optimal performance, we believe the middle tier needs to be integrated with the region data centers of public cloud seamlessly. Seamless integration reqires the following:

• The network needs to support high bandwidth and low latency connection to the regional data centers of public cloud. This can be achieved through various VPN technologies such as BGP/MPLS VPN. This support is crucial for fast migration of computation and data from Cloudlet to the public cloud due to local resource overload.

• Cloudlet and public cloud needs to support high performance VMmigration. When Cloudlet faces resource limitation, this support makes it easy for the Cloudlet to seamlessly migrate the VM to the public cloud. Support for RPC, thread migration can also be very helpful.

• Cloudlet and public cloud should have a common computing platform, and the cloud should support “automatic resource augmentation”. For example, a computing job at Cloudlet may have access to a few VMs. When the job is migrated to and executed in the cloud, the cloud should automatically expand the job to use many more VMS, e.g. hundreds according to application needs or service agreements. Map Reduce is such a common computing platform which makes automatic resource augmentation easier.

• Cloudlet should store a copy of persistent data to the public cloud, and should keep this loosely synchonized. As the zCloud example shows, public cloud infrastructure needs to be specialized for mobile applications. We believe server, file system, networking, and memcache technologies should all be specialized for mobile applications.

6. Security in Mobile Cloud Computing

6.1 Security framework in Mobile Cloud Computing

Mobile cloud computing is growing day by day due to the popularity of cloud computing and increasing uses of mobile devices. Many researchers are showing their interest towards this technology. There are many issues in mobile cloud computing due to many limitations of mobile devices like low battery power, limited storage spaces, bandwidth etc. Security is the main concern in mobile cloud computing. Security in mobile cloud computing can be
explained by broadly classifying it into 2 frameworks.

6.1.1 Security of data/files

The main issue in using mobile cloud computing is securing the data of mobile user stored on mobile cloud. The data/file of a mobile user is very sensitive; any unauthorized person can do changes in it, to harm the data. So the main concern of cloud service provider is to provide the security of data/files created and manipulated on a mobile device or cloud server. The data/file security is very essential for owner of the data/file as it can contain anyconfidential information of his.

6.1.2 Security of mobile applications or application models

Securing the mobile applications or application model is also important because these provide better services to mobile users by utilizing cloud resources. These mobile application models use the services of the cloud to increase the capability of a mobile device. In this paper we are going to discuss the security of data or files of mobile users stored on mobile cloud.

6.2 Why data storage security is needed

The data of owner is stored on the cloud server; once the data is stored the owner does not have that data on his own device. Thus, there is risk related to data security and confidentiality of the data. It is not accepted by the owner that his data/file is disclosed to someone who is not an authorized person. Before discussing why data security is needed there is a need to discuss the security threats to the data stored on the cloud. There are following security risk related to data stored on the cloud server. These attacks affect the data stored on the cloud. For owner the integrity of the data is very important. If any unauthorized person performs changes in data of other person then it can harm the integrity of the data. Any person after finding confidential information of other person can harm that person. So, data confidentiality is also a concern of data owner. Authentication of user is also important to verify who the originator of the file is.

7. Issues in Mobile Cloud Computing

7.1 Challenges Regarding mobile communication:

1) **Low Bandwidth:** Bandwidth is one of the big issues in MCC since the radio resource for wireless networks is much scarce as compared with the traditional wired networks.
2) **Resource poverty of Mobile Devices:** Comparison of desktop pc with any mobile device shows that on what cost this feature of mobility is being achieved. So in general we can say that this resource deficiency is one of the major reason for the adoption of mobile cloud computing. In order to overcome this limitation of mobile devices, resources are added to the cloud infrastructure and can be used anytime on requirement, providing a seamless user experience for advanced applications. Even after continuous improvements in mobile device performances, the disparity between the resource constraints of mobile and fixed devices will remain and must be accounted for in the types of application selected for mobile cloud computing.

7.2 Challenges regarding network

1) **Inherent Challenges of Wireless Network:** Wireless network is base for carrying out cloud computing and it has its own intrinsic nature and constraints. Fixed broadband is supported by consistent network bandwidth while wireless connectivity is characterized by variable data rates, less throughput, longer latency and intermittent connectivity due to gaps in coverage. Subscriber mobility

and uncontrollable factors like weather are also responsible for varying bandwidth capacity and coverage.

2) **Various Network Access Schemes:** For implementing cloud computing to mobile devices basic requirement is to have an access to network. In mobile world there are heterogeneous access scenario with different access technologies like WiMAX, WLAN, 3G, GPRS and so on, each one with their own schemes, policies, offerings and restrictions. Due to the existence of different access schemes we need seamless connection handover schemes (to avoid connection failure and connection reestablishment) when we move from one network access point to another network access point.
3) **Lack of Speedy Mobile Internet Access Everywhere:** In order to get speed mobile internet access new technologies like HTML5 are being developed. They provide facility of local caching. Researchers are working to get a better way of accessing mobile web other than browser. In order to resolve connectivity problem existing with mobile devices, most of the providers are offering 4G/Long Term Evolution (LTE) services. These services provide advantages of data storage capacity, plug and play features, low latency, and they also supports both FDD and TDD using the same platform. According to the requirement, sometime LTE is also loaded on speed as it is capable of providing download peak rates of 100 Mbps and upload of 50 Mbps.
4) **Seamless Connection Handover:** In order to provide data communication using

cellular network mobile operators are trying to set up Wi-Fi Aps on street so that offload traffic of Wi-Fi systems can be reduced, resulting in reduced cellular traffic congestion.

7.3 Challenges related to Mobile Applications

1) **Interoperability**: It's possible that there is an assorted mix of mobile devices including iPhone, Android phones, BlackBerry and others being used by employees in an organization or a group of people sharing a network. And in such situation according to the nature of cloud applications being used and operating system of mobile device interoperability issue can prove to be a major challenge in pulling/ pushing data across multiple devices.
2) **Cloud Application Flexibility**: An application is going to be supported by certain mobile cloud infrastructure or not, can easily be judged on the basis of its requirements against the cloud infrastructure characteristics along the device, network bandwidth and latency vectors. Different applications respective cloud infrastructure attributes (computation intensity, network bandwidth, and network latency.
3) **Mobile Cloud Convergence :**In order to achieve advantage of mobility by integrating cloud computing to mobile world, Data distribution is the key issue. Mobile cloud convergence provides performance improvement, longer battery life, and a solution to the computation power problem. Basic approach of mobile cloud convergence is to partition application such that parts that need more computation run on the cloud and remaining parts which is associated with the user interface run on the mobile device. Wireless technologies, advanced electronics and internet are overlapped and integrated to achieve pervasive and ubiquitous computing.

7.4 Challenges regarding Security

1) **Information Security:** Since cloud computing basically deals with data storage and its processing so security is of paramount importance. Now days various cloud platforms offer robust built-in security measures. SSL and digital certificates provides an option to enable external security. As far as mobile devices are concerned security remains a key concern. As if a device gets stolen or misplaced, crucial data may be compromised. Data misuse from stolen/ misplaced devices can be avoided by wiping of mobile device remotely. Simplest way to detect security threats (e.g., virus, worms, and malicious codes) of any mobile device is by installing and running security softwares (like Kaspersky, McAfee, and AVG antivirus programs etc.). We can move the threat detection capabilities to clouds.
2) **Privacy and Confidentiality:** There are various policies and schemes (such as Fair Information Practice Principles (FIPP)) being proposed which require rigorous controls and procedures to protect the privacy of individuals. Encryption provides most effective way to maintain integrity and confidentiality of information.
3) **Malicious Attacks:** All networks are susceptible to one or more malicious attacks. As more as external Web sites are being accessed malicious actors will have more opportunities to access the network and operational data of that organization. Implementing security controls across all Web 2.0 servers and verifying these rigorous security controls can reduce the threats to internal networks and operational data. Additionally, separating Web 2.0 servers from other internal servers may further mitigate the threat of unauthorized access to information through social media tools and Web sites.
4) **Network Monitoring*:*** In addition to latency and bandwidth problems network performance monitoring is also an important issue which needs proper concern and care. It is critical to have a dynamic cloud performance system that can allow traffic re-routing, access swapping and handover. With all these key challenges given mobile computing is still viable business and is being preferred by more cloud users.
5) **Compliance and Enforcement:** For now there is no formal set of standards that should be followed for events and policies of cloud computing implementation. It may be difficult or unrealistic to use public clouds if our data is subjected to legal restrictions or regulatory compliance. We can expect providers to build and certify cloud infrastructures to address the needs of regulated markets.
6) **Incident Response:** Even after implementing best measures for safeguarding data and information and having users trained with best "safe-surfing incidents will inescapably occur. Every cloud provider organization must plan and develop some measures that can be implemented as a quick response and recovery from data spill, misinformation and rumor, or from any malicious attack.

8. Conclusion

Mobile Cloud Computing, as a development and extension of Cloud Computing and Mobile Computing, is the most emerging and well accepted technology with fast growth. The combination of cloud computing, wireless communication infrastructure, portable computing devices, location-based services, mobile Web etc has laid the foundation for the novel

computing model. In this paper we have given an overview of Mobile Cloud Computing that includes architecture, Challanges, Security and advantages.

References:

1. http://www.gartner.com/it-glossary/cloud-computing/
2. http://www.mobilecloudcomputingforum.com/
3. http://aws.amazon.com/s3/
4. http://www.flickr.com/
5. Portio Research Mobile Fact book, Portio Research http://www.portioresearch.com/resources.html (2013)
6. Scott Paquette, Paul T. Jaeger, Susan C. Wilson, A research paper on Identifying the security risks associated with governmental use of cloud computing, Govt. Information Quarterly, Volume 27, Issue 3, July 2010, Publication Elsevier, Pages 245-253.
7. http://www.mobilecloudcomputingforum.com/ (2013)
8. Li H, Hua X-S. Melog: mobile experience sharing through automatic multimedia blogging, In Proceedings of the 2010 ACM multimedia workshop on Mobile cloud media computing (MCMC), 2010; 19–24.
9. Forman GH, Zahorjan J. The Challenges of mobile computing, IEEE Computer Society Magazine1994; 27(4): 38–47.
10. IBSG Cisco, “Mobile Consumers reach for the Cloud”