Information at Your Fingertips Anywhere Anytime Anyway (A3) MCC – Survey

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Abstract: *The cloud means total cost of ownership to build and maintain the datacenter infrastructure which includes both hard and soft related costs. An accurate comparison requires knowledge of all available over the life of the project or hardware. Simply the cloud computing provides a variety of computing resources from servers and storage areas to enterprise applications such as E-mail, security, backup, voice, all delivered over the Internet. The Cloud delivers a hosting environment that is immediate, flexible, scalable, secure and available – while corporations money, time and resources. This paper gives a survey of Mobile Cloud Computing (MCC), which helps for general readers also have an overview of the MCC including the definitition, architecture, and applications. The issues, existing solutions and approaches are presented here. In addition, the future research directions of MCC are discussed.*

Keywords – Mobile Cloud Computing, mobile services.

I. INTRODUCTION

The Mobile device an electronic device which works while user is on move i.e., a person who is using a mobile can move from one place to another place without disconnecting the communication of the second party. Nowadays mobile device is an essential component in human life, every person likes to use the mobile with latest technology and also wish to utilize the cloud in the mobile itself without having to pay the amount for the extra devices like the memory, resources, and also the important information. In mobile device its not possible to store data in bulk, due to the battery life time is major problem that's why users wish to store their data at the second party place for paying of the amount and would like to use the resource whenever they want to communicate from wherever they want to access or communicate the network resource to utilize the cloud efficiently without necessary to store their data in their mobile but they can access the data, can store, manipulate and the rest of the data storage and the security will be provided by the cloud party. For maintaining of the data, resources

they needs to pay the bills based on the charges charged by the cloud party. The cloud computing is defined as the it's advanced trend in which the resources are provided to local user on an on-demand basis, means by means of the internet connectivity.

In this paper we present a comprehensive survey on the mobile cloud computing.

Mobile Computing Definitions Mobile Computing is using a computer (of one kind or another) while on the move. Mobile Computing is when a (work) process is moved from a normal fixed position to a more dynamic position. Mobile Computing enables a work process is carried out somewhere where it was not previously possible. Mobile Computing is an umbrella term used to describe technologies that enable people to access network services anyplace, anytime, and anywhere.

II. LITERATURE SURVEY

1	Mobile is everywhere	91% of mobile users keep their device within arm's reach 100% of the time (*Source: " China Mobile 50k survey", Morgan Stanley Research; 2011*)
2	Insights from mobile data provide new opportunities	75% of mobile shoppers take action after receiving a location based messages (*Source: JiWire Mobile Audience Insights Report Q42011*)
3	Mobile is about transacting	96% year to year increase in mobile cyber Monday sales between 2012 and 2011 (Source: *IBM Coremetrics Retail Data – as published in 11/24/12 IBM Press Release*)
4	Mobile must create a continuous brand experience	90% of users use multiple screens as channels come together to create integrated experiences (Source: *Time, Inc. 2012*)
5	Mobile enables the Internet of Things	Global Machine-to-Machine connections will increase from 2 billion in 2011 to 18 billion at the end of 2022. (Source: *GSMA, Machina Research*)

Table1: Literature survey with source

III. CHARACTERISTICS OF MOBILE COMPUTING

Portability – As the name "mobile" implies, the devices have to be able to easily move to different locations, while remaining functional. **Connectivity** – The ease of being able to connect to the Internet and receive or transmit data is an essential component to mobile computing, Connectivity through mobile carriers over a 3G-or 4G-type network, as well WiFi capabilities, are basic requirements for mobile devices. **Interactivity**: This could almost go without saying, but like most other computing technologies, the ability for a mobile device is critical. The interactivity becomes more significant with mobile devices, as they typically have less computing power than other types of technology. **Individuality**: Individuality may sometimes be overlooked, but it is a basic component of the concept of mobile computing, Mobile devices, including smargtphones and tablets, are designed for individuals and have become a sort of extension to people in many aspects of their lives. From this perspective, how individuals interact with mobile devices remains unique. **Rapid Elasticity**: Ability to increase the scale resources to up or down as needed. **Measured Service** Cloud services are controlled, secured and monitored by the cloud provider, and the provider bills the consumer only for what they use of service on the data. **On-Demand Self-Service** The Data Consumer can use cloud services as they needed without any human interaction with the cloud provider at any instance. **Ubiquitous Network Access:** The Cloud provider's capabilities to service the data and are available over the entire network. **Resource Pooling** Resource pooling allows a cloud provider to share its physical and virtual resources according to consumer demand when ever they want to access the data.

IV. DEPLOYMENT MODELS

Public Cloud (offsite and remote) describes the cloud computing where resources are dynamically provisioned on an on-demand, self-service basis over the Internet, via web applications/web services, open API, from a third-party provider who bills on a utility computing basis.

A Private cloud environment is often the first step for a corporation prior to adopting a public cloud initiative. Corporations have discovered the benefits of consolidating shared services on virtualized hardware deployed from a primary datacenter to serve local and remote users.

A Hybrid Cloud environment consists of some portion of computing resources on-site (on premise) and off-site(public cloud). By integrating public cloud services, users can leverage cloud solutions for specific functions that are too costly to maintain on-premise such as virtual server disaster recovery, backups and test/development environments.

A Community Cloud is formed when several organizations with similar requirements share common infrastructure. Costs are spread over fewer users than a public cloud but more than a single tenant.

Mobile Computing Dimensions
- Location awareness
- Network connectivity quality of services (QoS)
- Limited device capabilities
- Limited power supply
- Support for a wide variety of user interfaces
- Platform proliferation
- Active Transactions

Constraints of Mobility

- Mobile elements are resource-poor relative to static elements.
- Mobility is inherently hazardous
- Mobile connectivity is highly variable in performance and reliability
- Mobile elements rely on a finite energy source.

Social Network Usage Analysis – Key Findings

1. Active usage of the major, global social platform is growing worldwide with mobile being the key driver.
2. Google+ remains the second most actively used social network with 318.4 million active users in 31 markets.
3. Emerging platforms have experienced notable growing in popularity since Q2 2012 with Pinterest and Tumblre

V. MOTIVATION

Mobile devices are becoming an increasingly an essential part in the human life, Dream of Information at your fingertips anywhere anytime anyway the mobile devices still having the lack in resources compared to a conventional information processing device such as PCs and Laptops.

Sol: Mobile Cloud Computing

Utility –Utility computing is also one of the major packaging of computation resources which is used for

process computation and storage the data, it is also metered as a service similar to traditional public utility.

Cluster – A cluster is a group of computers linked together to work closely so that they look like a single computer in computing cluster.

Grid Computing – Grid Computing is the application of several computers to a single problem at the same time usually to a scientific or technical problem that requires a great number of computer processing cycles or access to large amounts of data.

Cloud Computing- is a style of computing in which dynamically scalable and often virtualized resources are provided as a service over the internet.
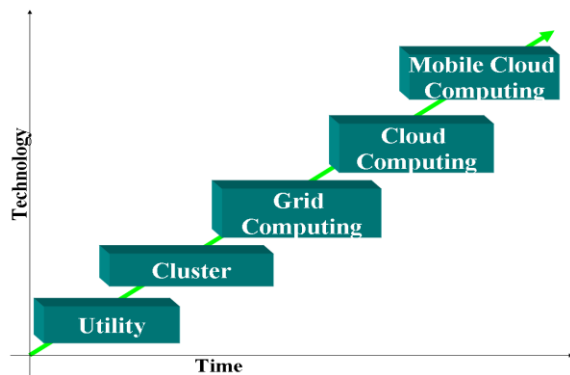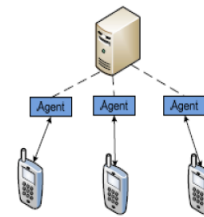

Fig 1: Improvement technology with time

Where is the MCC?

- Mobile Cloud Computing (MCC) 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.

Different Perspective for Architecture of MCC
- Agent-Client Scheme
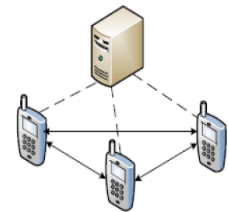- Collaborated Scheme

Fig 2: Different perspective for architecture

VI. PROTOCOL MODEL

The concept model of cloud computing cannot be directly applied to MCC. While MCC focuses on the connection between client and cloud, which may differ from common features of cloud computing.
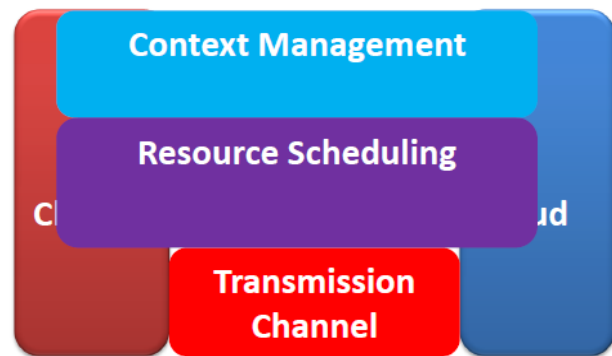

Fig 3: Protocol Model

Resource Scheduling

Resource scheduling components address the schedule of resource, such as computing resource and storage resource.
Assign the appropriate pricing mechanism to maximize the revenue of mobile cloud computing systems and provide incentives for mobile users,
Considering different cases, e.g, resource may be stable but applications may transmit to other places.

Context Management – Context Enabled features of mobile device allows us to ascertain additional information from the computing device itself without the need for explicit user input:
Two major classes of contexts:

- Social Context
- Spatial Context

Two major approaches
- Application partition and offloading technology play an important role for the implementation of elastic applications.
- Application participation decompose complex workload to atomic ones, thus can be processed concurrently.
- Offloading application can free burden of mobile devices.
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Advantageous of MCC
- Extending battery lifetime
- Improving data storage capacity and processing power
- Improving reliability

How MCC can Extended Battery Lifetime?

Challenges: Battery is one of the main concerns for mobile devices; Traditional approaches need to changes the structure of mobile devices. The additional cost for the end mobile users is not appealing in wireless networks.

MCC's Solution:

- Computation offloading technique: Immigrate 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 amounts of power consumption.

How MCC can Improve Storage Capacity?

Challneges:
- Users need more and more capacity for saving the essential information on mobile devices.
- Need to change the device.
- More capacity, more weight

MCC's Solution
- MCC is developed to enable mobile users to store/access the large data on the cloud through wireless networks.
- Examples of existing services:
  - Amazon Simple Storage Service (Amazon S3)
  - Image Exchange
  - Flickr, ShoZu.

How MCC can Improve Reliablitiy?

Challenges:
- Users need reliable backup for their information
- Lack of data security model for both service existing mobile users
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MCC's Solution:
- Storing data or running applications on clouds is an effective way to improve the reliability since the data and application are stored and backed up on a number of computers.

Scalability – Even if the number mobile computing devices increase in near future then also our system performance gives more efficiency without any delay.

Multi-Tenancy - Multiple independent users share the same physical infrastructure, So an attacker can legitimately be in the same physical machine as the target.

Applications of MCC
- Mobile Commerce
- Mobile Healthcare
- Mobile Learning
- Mobile Gaming

ISSUES AND APPROACHES OF MCC

Due to the integration of two different fields, i.e., cloud computing and mobile networks. MCC has to face many technical challenges.

Network Latency and limited bandwidth

Solutions Share the limited bandwidth among mobile users who are located in the same area (e.g., a workplace, a station, and a stadium) and involved in the same context (e.g., a video file).

(**Source:** X. Jin, etal, "Cloud Assisted P2P Media Streaming for Bandwidth Constrained Mobile Subscribers", (ICPADS), pp. 800, January 2011)

Data distribution policy which determines when and how much portions of available bandwidth are shared among users from which networks (e.g., WiFi and WiMAX).
> *(Source: E. Jung, etal, "User-profile-driven collaborative bandwidth sharing on mobile phones" in MCS, no. 2, 2010.)*
- Availability
- Heterogeneity

VII. ISSUES IN COMPUTING SIDE

1.   *Computing offload -* Issues and solutions in computing offload for small calculation and depending on the transmission technology Tradeoff between communication and computation cost For the dynamic environment, offloading encounter new problem as: Changing connection statues and bandwidth. Data may reach not to the end users.

Changes	Priority Level	Description
Client side power level	1	Power can be divided into sufficient and insufficient power levels, which will depend on the particular situation
Connection status	2	The connection status can be faded, disconnected from the mobile network, or re-connected to the mobile network
Bandwidth	3	The bandwidth varies from time to time, and depends on several factors, such as the network traffic condition, etc.

Table 2: Major challenges in Cloud Computing

Security of data on cloud

The Intergrity and An authentication enhancing the efficiency of data access Context aware mobile cloud services
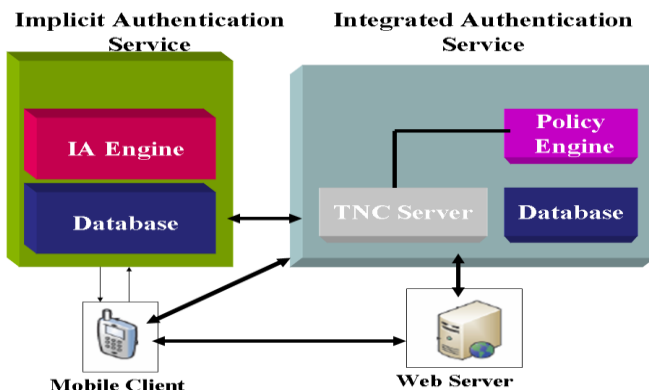

Fig 4: Data Security on cloud

3. Security: Security for mobile users, Security for mobile applications, Privacy Security of data on cloud Integrity Authentication Enhancing the efficiency of data access context aware Mobile Cloud services

Service Convergence:

The development and competition of cloud service providers can lead to the fact that in the near future these services will be differentiated according to the types, cost, availability and quality. A single cloud is not enough to meet mobile user's demands. The new scheme is needed in which the mobile users can utilize multiple cloud in a unified fashion. The mobile sky computing, will enable providers to support a cross-cloud communication and enable users to implement mobile services and applications.

VIII. CONCERNS AND CHALLENGES

Use of cloud computing means dependence on others and that cloud possibly limit flexibility and innovation. The others are likely become the bigger Internet companies like Google and IBM, who may monopolise the market. Some argue that this use of supercomputers is a return to the time of mainframe computing that the PC was a reaction against.

Security could prove to be a big issue, It is still unclear how safer out-sourced data is and when using these services ownership of data is not always clear. There are also issues relating to policy and access. If your data is stored abroad whose policy do you adhere to? What happens if the remote server goes down? How will you then access files? There have been cases of users being locked out of accounts and losing access to data.

Requires a constant internet access always because if there is no internet access then the cloud is not possible to access anywhere any way without internet connection.

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