

Review on Mobile Social Cloud Computing

Kiran Patidar , Priti Maheshwary , Dr.Piyush Kumar Shukla, Anand Motwani

Ph.D Scholor, AISECT University, Bhopal, Madhya Pradesh , India

CSE Department, AISECT University, Bhopal, Madhya Pradesh , India

CSE Department, RGPV University , Bhopal, Madhya Pradesh , India

CSE Department, SISTECH-R, RGPV University, Bhopal, Madhya Pradesh , India

kiranpatidar21@gmail.com,pritimaheshwary@gmail.com**,
pphdwss@gmail.com***, motwani.personal@gmail.com*****

Abstract: Together with massive growth of mobile devices, social network applications and emerging field of Cloud Computing (CC), Mobile Social Cloud Computing (MSCC) has been introduced to be a potential domain for researchers in technology for mobile services. This paper examines the current state of the art in the fusion of these popular technologies, which we refer to as Mobile Social Cloud Computing (MSCC). Mobile computing enables social networking services needed irrespective of user movement, hence supporting location independence. Indeed, 'mobility' is one of the characteristics of a pervasive computing environment where the user is able to continue his/her work seamlessly regardless of his/her movement. The paper also presents a survey of MSCC, which facilitates reader, have an overview of the MSCC including Definition, Architecture and Applications. We discuss a taxonomy based on the key challenges in this area and different approaches to handle these issues. The need and importance of paradigm is also discussed. Finally, we conclude the survey and outline the future research directions.

Keywords: Cloud Computing, Content Addressable Network (CAN), Fault tolerance, Mobile Social Cloud Computing (MSCC), Quality of Service (QoS), Scheduling, Social Networking, Privacy, Virtualization.

I Introduction

In the recent years, CC frameworks, such as AWS (Amazon Web Services), Microsoft Azure and Google AppEngine have become progressively more popular among IT developers and organizational clients. Simultaneously, we have seen an exceptional boost in the usage and deployment of smart phone platforms and social networking applications worldwide. Mobile devices are progressively becoming essential part of one's life as these are most convenient and effective communication tools

these days and not bounded by time and place. The rapid progress of mobile computing (MC) [1] becomes a powerful trend in the development of IT technology as well as commerce and industry fields.

Cloud computing (CC) [10] has been extensively accepted as the next generation computing framework. CC offers some use of infrastructure (e.g., servers, storages and networks), platforms (e.g., operating systems and middleware services), and softwares (e.g., ERP application) provided by cloud providers (e.g., Amazon, Salesforce and Google) at low cost. In addition, CC enables users to access on-demand, pay-as-you-use and elastically utilizable resources. As a result, mobile applications can be quickly provisioned and released with just effortless management by service provider.

Social Computing is blend of social communication and computational systems. In Social Networking or computing, individual users build relationships online and on real world relationships to communicate with each other. Based on this relationship in the form of SN using SNS, users develop basic level of inherent trust for data and information sharing. Users share media and other files among each other with less or no authentication because users are eager to provide their data to other SN members even through mobile devices. With the explosion of social networking applications and the support of CC for a variety of services for mobile users, Mobile Social Cloud computing (MSCC) is introduced as an integration of Social Networking and CC into the mobile environment.

This paper presents a broad survey on MSCC and issues. Section 2 provides a brief overview of MSCC including definition, architecture, and representative effects of paradigm. Section 3 establishes the need and importance of MSCC. Then, Section 4 discusses major technical challenges (problems) that arise in MSCC and the opportunities that can be realized to overcome the

challenges. Finally, we conclude the survey and outline the future research directions in Section 5.

II. Mobile Social Cloud Computing - MSCC

The popularity mobile applications are evident by looking through mobile app download centres such as Google Play Store and Apple's resources. MSCC is a computing environment that integrates social network-based cloud computing and mobile devices [2]. The Paradigm is evolved keeping mobility in mind known as the Mobile Social Cloud. Nowadays most of applications are available on mobile and handheld devices. Thus a device of mobile user may belong to several SNs. Mobile devices in MSCC create SNs based on real world human relationships among mobile users. Members of a SN share cloud services based on basic authentication of the SN without Any.further.authentication.



Figure 1: Mobile Social Cloud

A number of mobile devices in MSCC are requesting services over cloud and providing resources for computing for serving the requests. By computing resources we mean mobile devices and cloud servers.

Architecture of MSCC

These devices utilize wireless infrastructure along with wired networks. These mobile devices can communicate with wired computers and other devices through AP (Access Point). MSCC comprise of multiple cloud servers and each user device can access a cloud server.

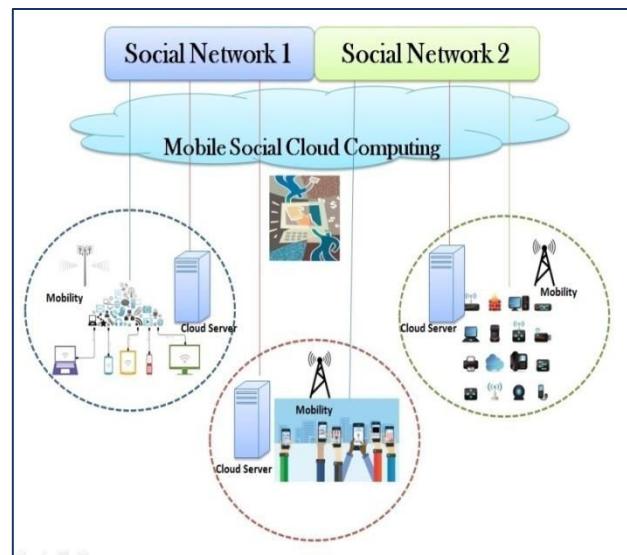


Figure 2: Global View of MSCC Environment

Figure 2 depicts the global view of an MSCC environment. MSCC includes wired servers and mobile infrastructure to support mobility of mobile users and devices. Mobile users' uses devices such as smart-phones, PDAs, laptops etc. and requests cloud services in network. Mobile devices form a SN with other devices and cloud servers, and a cloud server can be a member of every SN to provide cloud services. These servers can offer services to a number of devices. Each mobile device is managed by a main cloud server to which it is registered after joining the network. The devices periodically convey their information to the server

Mobile users can join and become a member of a SN to share the data or cloud service without further authentication. Now, in addition to servers the mobile devices can also provide cloud services to other users of the SN, so mobile devices act as resources. Mobile devices determine their position by GPS in the network and recognize other's position from cloud server. To know the members of their SN the devices access the information from the main cloud server. Therefore, a mobile device requests cloud services to the closest cloud server or mobile device that is also a member of SN. Thus results in better service response time as it permits the sharing of cloud services without or less authentication.

III. Need and Importance of MSCC

To establish the need and importance for mobile CC we discuss unique advantages of applications based on mobile computing. The different applications and scenarios

presented in recent literature [3] are: described in detail below:

1. Multimedia search: In the context of searching multimedia content on mobile cloud, the search operation could be executed as service, on the contents of nearby mobile devices. Rather than searching the media in central databases the search is carried out on nearby devices.
2. Social networking: Integrating a mobile cloud into social networking infrastructure could open up automatic sharing and P2P multimedia access, and this will also reduce the need to back up and serve all of this data on huge servers [3].

Thus work is focused on (MSCC), which put together mobile devices, CC, and social networking.

IV. Major Technical Challenges In MSCC And Opportunities

4.1 Inherent Issues in MSCC

There are several issues inherent in MSCC and each category of issues like Security, Service Level Agreements etc. demands separate research in the domain. In this paper, few issues are addressed. Below mentioned (refer Figure 3) the various categories of issues in MSCC.

Authors [4] stated that MSCC can address the faults (problems frequent disconnections due to resource scarcity and mobility) by executing mobile applications on providers external to the mobile device. Also, an extensive survey of research in mobile CC highlighting the issues, challenges and future work is presented. The paper [4] focused on: Operational level, End user level, Service and application level issues. Other issues addressed are Privacy, security, trust, Context-awareness and Data management.

The Operational issues refer to underlying technological matters such as the method of offloading computations, cost-benefit models that aid in taking the decision to offload or not, how the mobility of devices is managed/supported, and connection protocols used. Other issues are shown in Figure 3. Authors [5] defined MCC, explain its major challenges, discuss heterogeneity in convergent computing and divide it into two dimensions, namely vertical and horizontal. Authors also outlined open issues that help in identifying new research directions in MCC. The paper [6] discusses state of the art in the

MSCC. Authors [6] illustrated the applicability of MCC in various domains including Social Networking, learning, health/wellness and commerce.

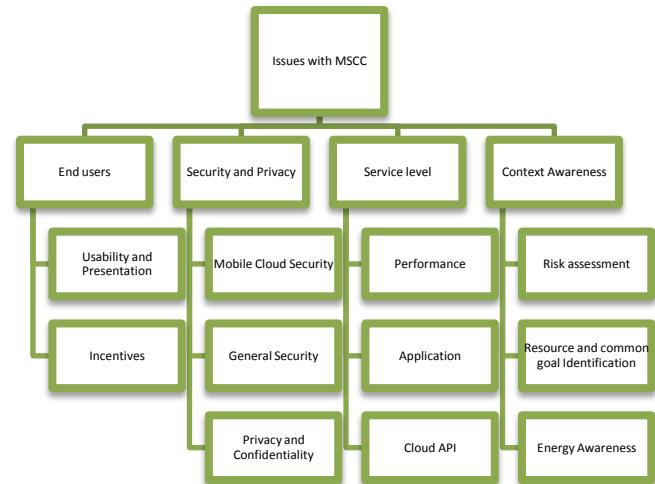


Figure 3: Issues in MSCC

This work [7] presents a survey of MSCC that includes overview of the definition of MCC, architecture, and applications. MSCC issues, existing solutions, and approaches are presented. In addition, the future research directions of MCC are discussed.

Sook Kyong Choi et al. [2] proposed fault tolerance and QoS (Quality of Services) scheduling using CAN (Content Addressable Network) in Mobile Social Cloud Computing (MSCC).

Elio Goettelmann et al. [8] proposed an approach for deploying business processes on the cloud supporting security constraints; thereby ensuring sensitive data exchange. They considered additional requirements related to data-dependencies and Quality of Service (QoS) disparities to optimize the execution of the outsourced process.

Sushil Kumar Sah et al. [9] focused on the integration of Diameter AAA mechanisms for authentication, authorization and accounting (AAA) into cloud system architecture.

4.2 Opportunities/ Motivation

To address the issues inherent in MSCC, the research works proposes Efficient Service Delivery, Reliable and

QoS Algorithms for enhancing QoS in Privacy Preserved MSCC. Besides basic QoS, extended QoS such as reputation, reliability, availability and security can also be addressed. Cloud Service **Replication** helps in improving availability and overcoming faults. This also minimizes waiting time for serving requests thus improving performance. Efficient resource scheduling also helps in improving QoS. **Reputation** determines whether a mobile device is in a Mobile Social Cloud network or is malicious. For higher value of reputation mobile is reliable and lower value for malicious.

V . Conclusion And Future Work

Recently, the domain of cloud computing and Mobile based Social Networking applications has created a fresh research momentum in expansion of MSCC. The ultimate goal of MSCC is to offer rich mobile computing and communication between cloud end-users through cloud providers regardless of underlying platforms and heterogeneous systems. Several providers have approached consumers with different infrastructures, strategies, and platforms. The differentiation hinders data extraction from various clouds and executing applications. The problems arises due to the inherent problems like resource scarcity, frequent disconnections that are associated with mobility, MSCC is utilizing its full potential by executing tasks or applications not only on the cloud providers but on the resources provided by mobile devices also. The goal of this paper is to discuss in detail the current research that addresses MSCC, inherent issues and research opportunities in the field. MSCC could become the dominant model for in the future, it essentially includes another user requirement such as QoS. QoS based methods, scheduling and efficient fault tolerant models are still requires research attention.

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