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Mobile Cloud Computing

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Abstract: Mobile Cloud Computing (MCC) which combines mobile computing and cloud computing, has become one of the industry buzz words and a major discussion thread in the IT world since 2009. As MCC is still at the early stage of development, it is necessary to grasp a thorough understanding of the technology in order to point out the direction of future research. With the latter aim, this paper presents a review on the background and principle of MCC, characteristics, recent research work, and future research trends. A brief account on the background of MCC: from mobile computing to cloud computing is presented and then followed with a discussion on characteristics and recent research work. Then it presents an overview of MCC in terms of its concepts, distinct features, research scope and motivations, as well as advantages and benefits. Moreover, it discusses its opportunities, issues, and challenges. Furthermore, the paper highlights a research roadmap for MCC.

Keywords: Cloud, Services, Security, etc.

I. INTRODUCTION

Mobile cloud computing (MCC) is the method of using cloud technology to deliver mobile apps. Complex mobile apps today perform tasks such as authentication, location-aware functions, and providing targeted content and communication for end users. Hence, they require extensive computational resources such as data storage capacity, memory, and processing power.

Mobile cloud computing takes the pressure off mobile devices by harnessing the power of cloud infrastructure. Developers build and update rich mobile apps using cloud services and then deploy them for remote access from any device. These cloud-based mobile apps use cloud technology to store and process data so that the app is usable on all types of old and new mobile devices.

II. ARCHITECTURES OF MOBILE CLOUD COMPUTING

The first significant component is the virtualized computing core (VC), a hosted cloud service that hosts multiple cloud computing services required to run on the mobile device. The client-side application (CSA), the second important component, runs the MCC apps on the host device. When executing programs on a customer's behalf, the CSA uses a cloud execution service.

The MCC program can leverage various cloud services while running in the CES to expand its functionalities. From the concept of MCC, the general architecture of MCC can be shown in Figure 1. In Figure 1, 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.

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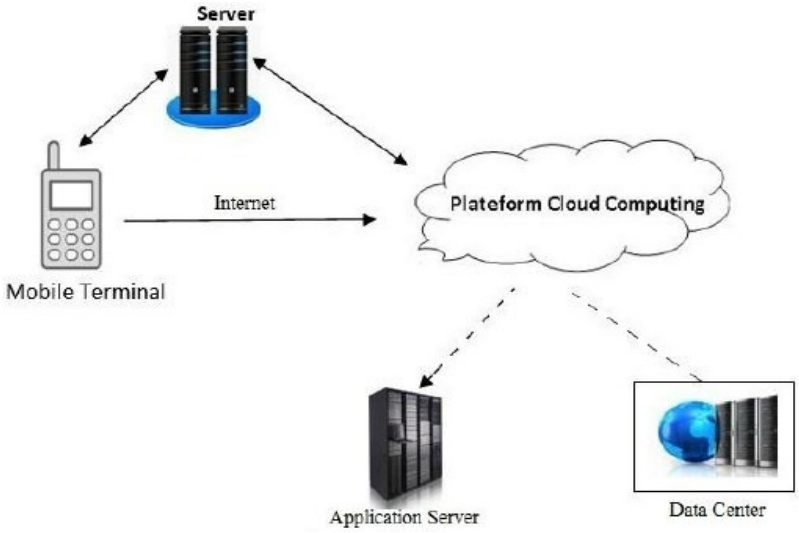

Figure 1: Mobile Cloud Computing

2.1) Mobile Commerce

Mobile commerce (m-commerce) is a business model for commerce using mobile devices. The m-commerce applications generally fulfil some tasks that require mobility (e.g., mobile transactions and payments, mobile messaging, and mobile ticketing). The m-commerce applications can be classified into few classes including finance, advertising, and shopping (Table II). The m-commerce applications must face various challenges (e.g., low network bandwidth, high complexity of mobile device configurations, and security).

2.2) Data Centre Layer:

This layer provides the hardware facility and infrastructure for clouds. In data centre layer, several servers are linked with high-speed networks to provide services for customers. Typically, data centers are built in less populated places, with high power supply stability and a low risk of disaster. Enterprise data centers increasingly incorporate cloud computing resources and facilities to secure and protect in-house, onsite resources. As enterprises increasingly turn to cloud computing, the boundaries between cloud providers' data centers and enterprise data centers become less clear.

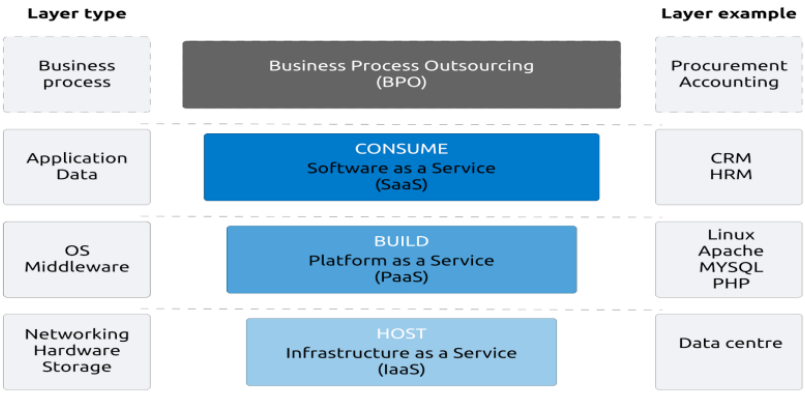

Figure 2: Cloud Services Layers

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III. LITERATURE REVIEW

The phenomenon of cloud computing has its genesis in other technologies, namely the grid, parallel and distributed systems, virtualization, multi-core chips, and Internet technologies (Buyya et al., 2009). Features that distinguish cloud computing from related technologies are on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service (Buyya, Broberg, & Goscinski, 2011). There is still not a standard definition of cloud computing but both academics and industry players are making significant strides to bring to bear a standard definition of the technology.

An attempt by Buyya et al., (2009) define cloud computing as "a parallel and distributed computing system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements established through negotiation between the service provider and consumers."

According to the United States National Institute for Standards and Technology (NIST) "cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell & Grance, 2011). In this study, cloud computing is defined as the delivery of IT infrastructure and applications as a service on-demand to individuals and organizations via Internet platforms (Senyo et al., 2016).

The types of service models that have emerged under cloud computing technology are Softwareas-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service (IaaS) (Zissis & Lekkas, 2012). SaaS is a cloud computing model where applications reside on the cloud infrastructure of service providers and are delivered to users through web interfaces and programs.

The main notion behind SaaS is to eliminate the practice of applications residing locally on devices of individual user as the computing powers of these individual devices cannot be leveraged to provide high computing efficiency and performance to users. Cloud computing is believed to have built its genesis from Software as a Service (Mell & Grance, 2011)

IV. CONCLUSION

Mobile cloud computing is one of the mobile technology trends in the future because it combines the advantages of both MC and CC, thereby providing optimal services for mobile users. That traction will push the revenue of MCC to $5.2 billion. With this importance, this paper had provided an overview of MCC in which its definitions, architecture, and advantages have been presented.

The applications supported by mobile cloud computing including m-commerce, m-learning, and mobile healthcare have been discussed which clearly show the applicability of the MCC to a wide range of mobile services. Then, the issues and related approaches for MCC have been discussed. The goal of mobile cloud computing is to provide rich mobile computing through unified communication between front users (cloud mobile users) and end users (cloud providers) regardless of assorted, wireless environment and underlying platforms in global roaming.

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