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A PATH FOR HORIZING YOUR INNOVATIVE WORK

GEARING THE RESOURCE POOR MOBILE DEVICES INTO RESOURCEFULL BY USING THE MOBILE CLOUD COMPUTING &USER CENTRIC APPROACH

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Abstract: Mobile cloud computing is an emerging technology to improve the quality of mobile services. 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.Mobile cloud computing is an emerging technology to improve the quality of mobile services. Mobile cloud computing has revolutionized the way in which mobile subscribers across the globe leverage services on the go. The mobile devices have evolved from mere devices that enabled voice calls only a few years back to smart devices that enable the user to access value added services anytime, anywhere. MCC integrates cloud computing into the mobile environment and overcomes obstacles related to performance (e.g. battery life, storage, and bandwidth), security (e.g. reliability and privacy). In this article, we provide a comprehensive study to lay out existing mobile cloud computing service models and key achievements, and present a new user-centric mobile cloud computing service model to advance existing mobile cloud computing research.

Keywords: Mobile Cloud Computing, Cloud Computing, Service Model

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INTRODUCTION

Mobile computing research is to study how portable devices sense and learn the status of devices and the context related to their mobility and networking in order to better support mobile applications in an ad hoc communication environment. Cloud computing research mainly focuses on how to manage computing, storage, and communication resources that are shared by multiple users in a virtualized and isolated environment. Mobile cloud computing cannot be simply illustrated as merging mobile computing and cloud computing technologies. An illustrative example of mobile cloud computing is how a smart phone can best utilize the cloud resource to reduce its energy consumption. A computing task can be either executed on the mobile device or outsourced to the cloud. Mobile cloud computing originally is rooted from interdisciplinary research of mobile computing and cloud computing. MCC distinguishes its research focuses on tight interaction between, and construction and integration of the cyber physical system (CPS) and cyber virtual system (CVS) in which the CPS is immensely composed by computational and physical smart and mobile entities, and the CVS is mainly formed by cloud-based virtualized resources and services. This article first focuses on a comprehensive study of existing MCC service models, and then a user-centric MCC service framework is presented. The rest of this article is arranged as follows. We summarize current mobile cloud service models based on the role of mobile devices. We illustrate the current representatives according to the different service models previously defined. We state the transformation from the traditional Internet cloud to the mobile cloud and highlight features of MCC. The future research directions of MCC are proposed, focusing on a new user-centric service model and corresponding application scenarios. Finally, we conclude this article.

MATERIALS & METHODS

Current Mobile Cloud Service Models

Current Internet clouds have been broadly classified in three service models: infrastructure as a service(IaaS), platform as a service(PaaS) and software as a service(SaaS).However, due to the involvement of both CPS and CVS, MCC's service models are more appropriately classified according to the roles of computational entities within its service framework, where the classification of MCC service models can use the roles and relations between mobile entities and their invoked cloud-based resource provisioning. Based on this view, existing MCC services can be classified into three major models: mobile as a service consumer (MaaSC), mobile as a service provider (MaaSP), and mobile as a service broker (MaaSB).

Existing Mobile Cloud Applications

We discuss three major MCC service types and corresponding representatives. Each service or application can be categorized into one or multiple service models. MaaSC is the most common MCC service model because most existing mobile devices are still restricted by their computation and energy capacities. As an example, clone cloud ([1]) provides computation task offloading service for mobile devices. In this case, the mobile device is the service consumer since it only benefits from the service provided by the cloud rather than providing services for other users.

Mobile Cloud Computation

Computation task offloading is a demanding feature for mobile devices relying on Internet clouds to perform resource intensive computation tasks. Partitioning computation tasks and allocating them between mobile devices and clouds can be very inefficient during the application runtime considering various performance metrics such as energy consumption, CPU usage, and network delay. How to efficiently and intelligently offload the computation tasks onto the cloud is one of the main research issues of MCC. CloneCloud ([1]) is the pioneer project in this area. It can automatically offload computing tasks to the cloud. CloneCloud serves as an application practitioner as well as an execution runtime environment that allows unmodified mobile applications to seamlessly offload parts of the executions from mobile devices onto a cloud server. Mobile Cloud Storage Storage capacity is another constraint of mobile devices. There are many existing storage services for mobile devices, such as Dropbox, iCloud, Google Drive and Skydrive([2]). Besides manually uploading the files or data onto the cloud, one desired feature of mobile cloud storage services isthe automatic synchronization between mobile devices and the cloud. Multimedia data generated by mobile devices demands a stable and highly available storage solution. This is the reason why many smartphone operating systems natively implant the multimedia data synchronization feature (iCloud for iOS, Skydrive for Windows Phone, Google Drive for Android etc.). Where Store([3]) is a location-based data storage solution for smartphones. It uses filtered replication (a filter expressing the set of data items that are likely to be accessed in the near future) along with each device's location history to distribute data items between smartphones and the cloud.

Security and Privacy

Security related services aim to provide data security protections through the cloud. The security of mobile devices can be enhanced under the help of cloud security mechanism including cloud-based secure proxy, remote anti-virus, remote attestation etc. CloudAV([4]) advocates such a cloud-based security model for malware detection for end hosts by providing antivirus as an in-cloud security service. Secure web referral services ([5]) enable antivirus and

ant phishing services through the cloud. Referral services depend on a secure search engine to validate URLs accessed by a mobile device to prevent mobile users from accessing phishing websites. An increasing number of security features can be enabled in the cloud, in which a reliable and secure connection between a mobile device and the cloud is the main challenge for this type of solution.

Transitions from Internet Clouds to User-Centric Mobile Clouds Mobile clouds should be shifted from the traditional Internet cloud by using the following principles:

Principle1:User-centric MCC applications should be designed in such a way that a user can control their own data and activities with strong privacy and security protection. Cloud resources should be collected and allocated according to mobile applications customized for each individual user.

Principle 2: Mobility efficiency

MCC resources should be dynamically allocated and managed according to the need of mobile cloud applications. The mobility of MCC should be confined through a set of mobile cloud application constraints to maximize efficiency using a set of system performance evaluation metrics such as availability, computing power, storage, and their special-temporal boundaries.

Principle 3: Virtual representation

MCC maintains a trusted, reliable, and accessible virtual representation for each user. The virtualized representation can be considered as an assistant for mobile users and performs actions such as sensing a user's daily activity to build the user's behavior and activity profiles, and delegate the user's activities in the virtual environment.

Mobile as a Representer: A User-Centric Approach

The future mobile cloud service model should be delivered based on the principles illustrated. Besides previously presentedService models (i.e., MaaSC, MaaSP, and MaaSB), we present a new user-centric MCC service model called mobile as a representer (MaaR). In MaaR, each user can be represented by a virtualized entity in the cloud through his/her physical entity (i.e. mobile device).Users behaviors and attributes can be collected from the real world (people, environment, or mobile devices) in real time and sent to their corresponding virtual entities in the cloud to perform further analysis and processing. MaaR can be regarded as the next-generation MCC service model in that both physical systems and virtual systems are seamlessly integrated through virtualization technologies to provide services. In MaaR, the mobile devices and clouds are highly interactive, and as a result, the service flow can be presented as

bidirectional arrows. In addition to helping mobile entities execute tasks more efficiently, MaaR is able to accomplish some tasks that are impossible to realize in current MCC.

RESULTS & DISCUSSION

Smartphone's are now capable of supporting a wide range of applications many of which demand an ever increasing computational power. This poses a challenge because smart phones are resource-constrained devices with limited computation power, memory, storage and energy. Fortunately, the cloud computing technology offers virtually unlimited dynamic resources for computation, storage, and service provision. Therefore, researchers envision cloud computing services to mobile devices to overcome the smart phones constraints and present a new user-centric mobile cloud computing service model to advance existing mobile cloud computing research.

CONCLUSION

In this article, we describe mobile cloud computing, a new transdisciplinary research area based on traditional mobile computing and cloud computing. The description is based on the current development of the mobile cloud system. This article focuses on the introduction of MCC concepts and is tutorial in nature so that readers are able to have a holistic viewof the current development of and vision for user-centric mobile cloud computing. We first provide a classification and representative achievements of current MCC service models. Then we discuss the transformation from the traditional Internet cloud to the user-centric mobile cloud and its design principles. Finally, MaaRservice model presented for achieving the user-centric MCC.

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