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The Content Distribution Strategy Enhancing Cloud into Mobile Cloud

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ABSTRACT

Worldwide PC shipments totaled 87.5 million units in the third quarter of 2012, a decline of 8.3 percent compared with the third quarter of 2011, according to preliminary results by Gartner, Inc.[1], more users predicted to access the Internet from mobile devices than from PCs by 2015 [2], clearly there is a desire to be able to use mobile devices and networks like we use PCs and wire line networks today. However, in spite of advances in the capabilities of mobile devices, a gap will continue to exist, and may even widen, with the requirements of rich compute intensive applications. Mobile cloud computing can help bridge this gap, providing mobile applications the capabilities of cloud servers and storage together with the benefits of mobile devices and mobile connectivity, possibly enabling a new generation of truly ubiquitous complex applications on mobile devices. In this paper, we look at early trends, and opportunities and benefits for new mobile applications and services. The objective of this project is to share the data by multicasting the data from one mobile to a group of mobiles. The data that is shared should be easily sent and received by across all mobile OS devices, which is not possible in many mobile devices. The core of this project is to develop a cross platform (hybrid) application and thereby sharing the data using implemented private cloud to other mobiles. The sharing process is done by the sender, by uploading the data through the application and then sharing it. On sharing, a copy of shared data and the receiver details are copied into the cloud and by offload computing, thereby bridging the gap between capabilities of mobile devices and compute intensive applications. Thus the power of a cloud server is imparted to the mobile phone. The data is sent as message to the receiver devices. Data request can be made by random user, thus data can be downloaded from the cloud using a generated pass key.

KEYWORDS: *Mobile cloud computing, cloud computing, data sharing, offload computation, hybrid application.*

I. INTRODUCTION

Over the last few years, there has been an increased number of applications that have “migrated to the cloud”, and new cloud-based applications that have become popular. Most of the early adopters of cloud have been enterprise applications and IT departments; according to Juniper Research, revenue from mobile enterprise cloud-based applications and services is expected to rise from nearly $2.6billion in 2011 to $39 billion in 2016 [3]. Besides such storage and download services, a big boost to mobile consumer cloud services will come from a major shift in the mobile applications market, from primarily native applications to ones based on mobile cloud computing: utilizing the computing and storage resources available in the cloud, thereby enabling the use of cutting edge of the technologies that are much more computing and storage intensive than what mobile devices can offer, and thus enabling much richer experiences than what current native applications can offer. While according to MarketsAndMarkets.com, the global mobile applications market is expected to be worth $25.0 billion by 2015 [4], use of mobile cloud computing will enable more powerful applications, hence more significant growth. Also, initiatives such as GSMA’s One API [5], which will allow access to network information, regardless of operator, via Web applications rather than device clients, will further motivate and ease development of cloud-based mobile applications. And finally, mobile cloud computing based applications can simultaneously avail of not only cloud resources, but also the unique resources of mobile devices, like user location and device sensors, that will make such applications more powerful than either server or PC-based applications, or current native mobile applications. Utilizing available cloud computing and storage resources, we expect a heterogeneous set of Cloud Mobile services and applications to emerge, with different types of consumer experiences and advantages enabled.

According to Juniper Research, revenues from consumer cloud mobility services, initially driven by cloud based music and video storage and download services like the ones recently launched by Amazon's Cloud Drive and Apple's iCloud, are expected to reach $6.5 billion per year by 2016 [3]. Mobile and BYOD "challenge the fundamental principles by which we deliver applications," to users and protect user data, said Perkins. It means "consumer identities" will need to be tied to "corporate identities" in terms of authentication, authorization and other identity access and management functions. There will be pressure to "manage diversity" in this, he added [6]. In this paper we focus on sharing data using cloud from mobile to mobile with some added features, which will enable the mobile users and personnel of organization to share data for the particular target user group.In the rest of the paper, we discuss in section II about the system architecture and applications including their advantages. In section III, we elaborate on a few major challenges of mobile applications: mobile computing cost, Computational efficiency, Battery lifetime, processing speed. We illustrate the challenges using data sharing, one of the most compute and mobile bandwidth intensive mobile applications. Subsequently in section IV, we propose a mobile data sharing application to address the challenges associated with major challenges of mobile applications. From the user perspective, data is shared but actually the data is sent to cloud. At the cloud, does the actual computing operation for data sharing using web applications. We conclude in section V with suggestions for future research for mobile cloud computing to efficiently enable future Mobile applications.

II. ARCHITECTURE AND APPLICATIONS

In this section, we first describe the typical end-to-end control and data flow architecture of Data sharing application. Next, we categorize the existing and expected Mobile application, and analyze for each category the cloud infrastructure and platform needs, advantages and user experiences enabled, and challenges to make the applications successful. Figure 1 shows the overall architecture, including end-to-end flow of control and data between the mobile devices and the Internet cloud servers, for a typical mobile data sharing application. Though a Mobile cloud computing based application may utilize the native resources of the mobile device, like GPS and sensors, it primarily relies on cloud computing Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) resources, like elastic computing resources and storage resources, located in Internet public, private, or federated (hybrid) clouds. A typical Mobile application has a small footprint client on the mobile device, which provides the appropriate user interfaces (gesture, touch screen, voice, text based) to enable the user to interact with the application. As discussed before, Mobile Cloud Storage is the most commonly used category of mobile cloud application/service today, with offerings from Amazon, Apple, Dropbox, Funambol, and Google, among others. These services provide diverse capabilities, including storing documents, photos, music and video in the cloud, accessing media from any device anywhere irrespective of the source of the media and/or the device/platform used to generate the media, and synchronizing data/media across multiple devices a typical user owns. The Interactive Services category is expected to be a rapidly growing segment of mobile cloud applications, including mobile video conferencing, mobile remote desktop and interactive mobile advertisements. Besides the typical consideration of lower capital expense, use of the cloud will lead to easier support for multiple devices and operating platforms. One of the biggest challenges of such applications will be the potentially high latency and packet loss of the wireless network that may be experienced by the video stream, both from and to the mobile device, thereby potentially affecting the very low response time requirements of such interactive applications, depending on what transport protocol is used.

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TABLE 1: ACRONYMS.

AAA	Authentication, Authorization, Accounting
MC	Mobile Computing
MCC	Mobile Cloud Computing
ID	Identifier
BTS	Base Transceiver Station
HA	Home Agent

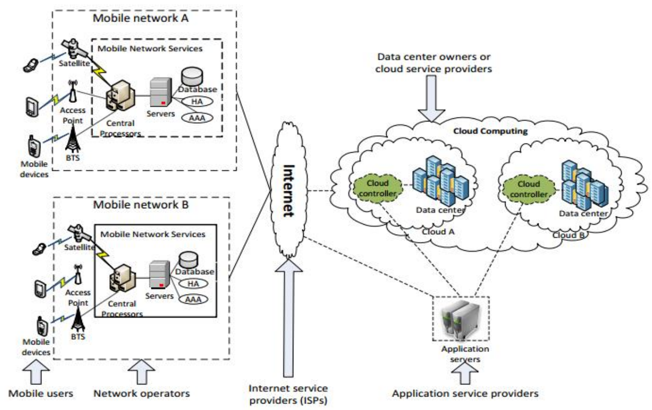

Figure1: Mobile Cloud Computing (MCC) architecture.

As in compute intensive applications, the operating cost can also be a concern, till cloud capabilities and pricing structures are improved as suggested in the previous paragraph. The ability to enable such rich experiences on all mobile devices and platforms, coupled with the inherent advantages of ubiquity and location information associated with the use of mobile devices, will have the potential to drive a new generation of cloud based mobile applications. From the concept of MCC, the general architecture of MCC can be shown in Fig. 1. In this, mobile devices are connected to the mobile networks via base stations (e.g., base transceiver station (BTS), access point, or satellite) that establish and control the connections (air links) and functional interfaces between the networks and mobile devices. Mobile users' requests and information (e.g., ID and location) are transmitted to the central processors that are connected to servers providing mobile network services. Here, mobile network operators can provide services to mobile users as AAA (for authentication, authorization, and accounting) based on the home agent (HA) and subscribers' data stored in databases. After that, the subscribers' requests are delivered to a cloud through the Internet. In the cloud, cloud controllers process the requests to provide mobile users with the corresponding cloud services. These services are developed with the concepts of utility computing, virtualization, and service-oriented architecture (e.g. web, application, and database servers).

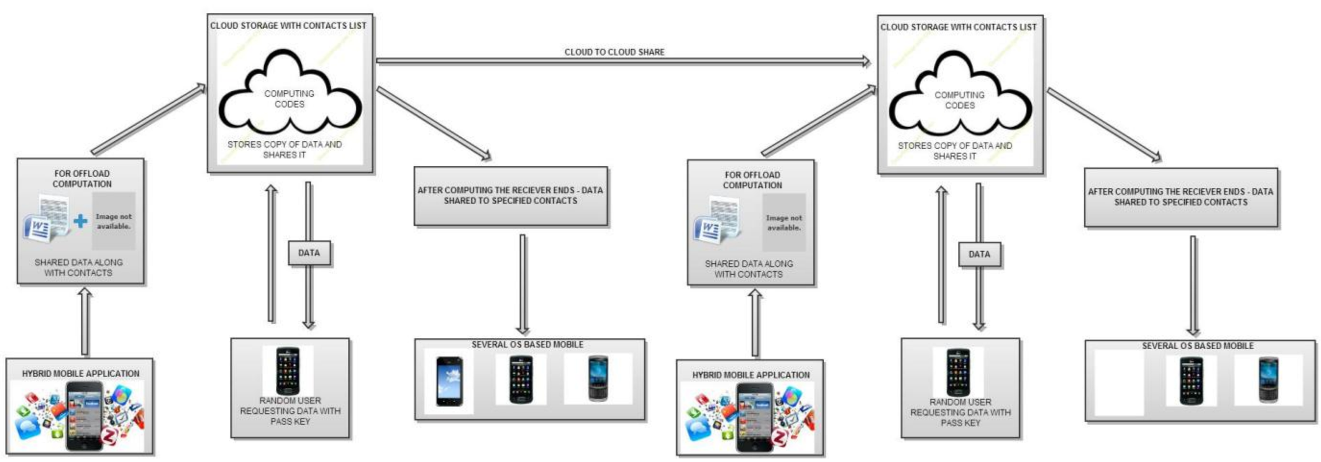

Figure 2: Mobile cloud based data sharing application across D2D and Cloud to Cloud.

In the Figure 2, the data shared from the hybrid application to the receiver is being represented and also data shared from cloud to cloud is being depicted. The architecture includes the data being shared from the mobile device using the hybrid application, which is used in the sender terminal. Followed by the data share, there occurs the offload computation block in which the data and contacts are deployed to the cloud storage, where the computational codes to share data to mentioned contacts. Once the computations are done, data is being forwarded to the receivers. A random user could get the data by requesting the data administrator, followed by a data request and a pass key generation from the cloud through which the user could get the data. From the above architecture, the data is being shared from one particular cloud (example: cloud belonging to one organization and the cloud that belongs to other organization) to another cloud.

III. MAJOR CHALLENGES OF MOBILE APPLICATIONS

As discussed in the previous section, MCC has many advantages for mobile users and service providers. However, because of the integration of two different fields, i.e., cloud computing and mobile networks, MCC has to face many technical challenges. This section lists several research issues in MCC, which are related to the mobile communication and cloud computing. Then, the available solutions to address these issues are reviewed.

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. [6] Proposes a solution to 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 content (e.g., a video file). The authors model the interaction among the users as a coalitional game. For example, the users form a coalition where each member is responsible for a part of video files (e.g., sounds, images, and captions) and transmits/exchanges it to other coalition members. This results in the improvement of the video quality. However, the proposed solution is only applied in the case when the users in a certain area are interested in the same contents. Also, it does not consider a distribution policy (e.g., who receive show much and which part of contents) which leads to a lack of fairness about each user's contribution to a coalition.[7] Considers the data distribution policy which determines when and how much portions of available bandwidth are shared among users from which networks (e.g., Wi-Fi and Wi MAX). It collects user profiles(e.g., calling profile, signal strength profile, and power profile) periodically and creates decision tables by using Markov Decision Process (MDP) algorithm. Based on the tables, the users decide whether or not to help other users download some contents that they cannot receive by themselves due to the bandwidth limitation, and how much it should help (e.g., 10% of contents). The authors build a framework, named RACE (Resource-Aware Collaborative Execution), on the cloud to take advantages of the computing resources for maintaining the user profiles. This approach is suitable for users who share the limited bandwidth, to balance the trade-off between benefits of the assistance and energy costs.

2) Securing Data on Clouds: Although both mobile users and application developers benefit from storing a large amount of data/applications on a cloud, they should be careful of dealing with the data/applications in terms of their integrity, authentication, and digital rights. The data-related issues in MCC are Integrity, Authentication and Digital rights management.

3) Availability: Service availability becomes more important issue in MCC than that in the cloud computing with wired networks. Mobile users may not be able to connect to the cloud to obtain service due to traffic congestion, network failures, and the out-of-signal. [8] And [9] propose solutions to help mobile users in the case of the disconnection from clouds. In [9], the authors describe a discovery mechanism to find the nodes in the vicinity of a user whose link to cloud is unavailable. After detecting nearby nodes that are in a stable mode, the target provider for the application is changed. In this way, instead of having a link directly to the cloud, mobile user can connect to the cloud through neighboring nodes in an ad hoc manner. However, it does not consider the mobility, capability of devices, and privacy of neighboring nodes.

4) Mobile computing cost: As service availability and bandwidth becomes scarce, the computational costs including the cost that are involved in the mobile service providers cost and the cost that are involved in providing high compute performing cloud servers for a large number of users.

5) Computational efficiency: Battery lifetime and processing speed are made into higher degree of considerations when there is more need in usage of the mobile computations and mobile power which in effect makes an automatic decrease in the battery lifetime and processing speed of the mobile's efficiency.

IV. MOBILE DATA SHARING APPLICATION

The mobile data sharing application comes with the idea of sharing the data between multiple users over a cross platform. The data is shared from the mobile supported by many OS to multiple mobile devices supported by many other operating systems. There are number of application that is created for the mobile devices. They are the native application, mobile web application and hybrid application. Native applications are built for a specific platform with the platform SDK, tools and languages typically provided by the platform vendor. Mobile web applications are server side application built with any other server side technology that render html as styled so that it renders well on a device from factor. Hybrid apps, like native apps, run on the device, and are written with web technologies (HTML5, CSS and JavaScript). Hybrid apps run inside a native container, and leverage the device's browser engine (but not the browser) to render the HTML and process the JavaScript locally. A web-to-native abstraction layer enables access to device capabilities that are not accessible in Mobile Web applications, such as the accelerometer, camera and local storage. Hybrid apps use a web view control (UI Web View on iOS, Web View on Android and others) to present the HTML and JavaScript files in a full-screen format, using the native browser rendering engine (not the browser itself). Web Kit is the browser rendering engine that is used on iOS, Android, Blackberry and others. That means that the HTML and JavaScript used to construct a hybrid app is rendered/processed by the Web Kit rendering engine (for you Windows 8 folks, this is what the IE10 engine does for Metro style apps that use Win JS) and displayed to the user in a full-screen web view control, not in a browser. No longer are you constrained to using HTML and JavaScript for only in-browser implementations on mobile devices.The real secret sauce of hybrid apps is the implementation of an abstraction layer that exposes the device capabilities (read: native APIs) to the hybrid app as a JavaScript API. This is something not possible with Mobile Web implementations because of the security boundary between the browser and the device APIs. Through this abstraction layer a common set of APIs is exposed in JavaScript, and these JavaScript APIs work on any device supported by the framework. When the native wrapper is compiled around the HTML, CSS and JavaScript resources, there is an interoperability layer added that connects the JavaScript APIs with the platform specific APIs.

This application is built as a hybrid application which establishes a cross platform. This Hybrid application shares the selected data to the cloud which can be downloaded by other mobile devices. The application works by selecting the data that is to be sent and the contacts for whom the data is to be sent is selected and the file is uploaded into the cloud. On the cloud an application is built on with server side coding (php) for receiving the data that is uploaded to the cloud. The cloud receives the data and shares the data to the selected contacts that I obtained from the mobile device through the application. The data is shared over the cloud for the selected candidates. The random user who wants to download the file can download the data from the cloud with a pass key that was used while uploading. The data can also be shared from cloud to cloud. Data from one cloud can be shared to another cloud seeking the permission of the receiver with a passkey. The sender should provide the pass key for sharing the data from his cloud to the receivers cloud. Thus there will be not being any difficulty to download the data and again upload the data to another cloud. This application shares the data over a cross platform using the mobile cloud computing. As the data is processed on the cloud the performance is faster. Computational offloading is used for increasing the process speed and the performance of the mobile devices. The data is shared to the cloud and hence the storage for mobile device increases considerably. The data is efficiently transferred through this application achieving fast computational efficiency.

V. CONCLUSION AND FUTURE DIRECTIONS

In this paper, the future of content distribution over the mobile cloud concept is established by sharing the data from a mobile device to multiple mobile devices over a cross platform and also sharing the data from cloud to cloud. Thus the data can be shared through any mobile devices supported by any OS. This new architecture fits the needs of users who would like to enjoy the data to be shared efficiently over a cross platform. On future the security and privacy of data can be delivered with the efficient encryption and decryption algorithm and authentication for the user can also be promoted while sharing the data with each other. For the actual sharing among mobile devices new technologies such as network coding are the key enabler for support of energy saving, privacy, security, data protection, and fast exchange of data. It should provide better interface to view shared files and easy synchronization with the pc should be established. A better authentication can be provided. In order to boost cooperation, especially for users who know one another the data is shared to the specific person on his acceptance .In future users might also share other resources such as spectrum ,onboard sensor information with each other, using there porting capabilities.

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