ABSTRACT
In the present era, Mobile Cloud Computing (MCC) is an emerging cloud service-model following the trend to extend the cloud to the edge of social networks in mobile environment; services offered are dynamic and scalable in nature. It includes numerous mobile devices of different configuration and sizes which are closely associated with users. Social Networking has become very popular during the past few years, and it plays a significant role in our every affairs. These technologies have been providing a platform for easily sharing of data and applications over the internet. Essentially reflects real world relationships and allow users to communicate, create blogs, conduct real time conversations, and share information in medium such as text, picture, audio, video or multimedia. Form digital relationships between one another and in groups for both personal and professional affairs. Social networking sites like Facebook, MySpace, LinkedIn, twitter, Spotify, Pinterest, CLUBPENGUIN, Foursquare, TAGGED, and reddit are gaining more popularity among the internet users in general and intensive users in particular. Cloud has truly impact on social network; increased unprecedented growth in usage over the wireless-heterogeneous network environment too. Whereas mobile could provide much more sustainable resource sharing mechanisms on demand and pay for use; exclusively in dynamic environment. We investigate the impact of cloud on social networks and usage analysis in mobile environment. This work, will definitely a measuring tool for service provider to understand the future trend of mobile usage; encourage all the stakeholders to upgrade the infrastructure and enhance the services more reliable and highly secure.

General Terms
Performance, Measurement, Human Factors.

Key Words
Cloud; Mobile Cloud; Social Networking Sites;

1. INTRODUCTION
Connecting people together is the objective of social life where as Social networking is built on the idea of how people know should know and interact with each other. It gives people the power to share, making the world more open and connected [1]. It has become one of the most important communication tools among people over the internet; an each second part of many peoples’ life and supported by the large user communities. Few communities even exceeded the population of large countries; such as Facebook has 1 billion, twitter has over 500 million, LinkedIn has 174 million and Google+ has 100 million active users [2]. The advent and fast adoption of Web 2.0 technologies has drastically changed the Internet, brings more and more sophisticated services, inspired entrepreneurs brought many of these services together into sites that aimed to connect people. It enabled people to build social relations online regardless of their geographical locations. Popular online social networking sites, such as Facebook, LinkedIn, Academia allow users to explore other users with similar interests, share personal and professional information, data, applications, Digital Intellectual Property (DIP) applications of similar interest with friends, friends' friends, their friends' friends and so on, showcase photos, engaged on live conversations, etc. It provides a platform, to share huge amount of information among the users, chat to friends, individual as well as group discussion, debates, job searching, business operations, marketing, kitty parties, seminars, exhibitions, entertainments, news, blogs and games, therefore modeling real world relationships. It has been creating strong association among people over 80,000 cities across the world.

The most important features of social networks are: actors, ties, and relationships. Actors are the most important features to describe the events, people, and objects. Today, we make some kind of relationship with different types of people. Ties are one of the best processes for making relationship among the peoples. It is used to establish the relationship between actors directly or indirectly through the path. There are two types of ties: strong and week. Strong ties are construct relationship with closer relative, our greatest buddies, with people like us and the other people which have depth connection. On the other hand weak ties
are creating relationships which have no close relation and no depth connections. Whereas relationship features are used to illuminate the contact and link between two actors. Furthermore the structure of a Social Network is essentially a dynamic virtual organization with inherent trust relationships between friends [3]. Creating a dynamic virtual environment that is feasible for social networks has been challenging for its designers. Dealing with the limitations (discussed in section 4) such maximizes their tasks in general and specifically in mobile environment. However the challenges and limitations of mobile access to online social network can be minimized, by deploying the evolved service-centric cloud technology. Sites like Facebook and Twitter already had been offering a data access subscription plan. Sites which are implementing on cloud infrastructure called Social Cloud and defined as A Social Cloud is a resource and service sharing framework utilizing relationships established between members of a social network [4]. Our interest is to study the impact of cloud on social networks at large and analyze the efficiency of usage performance in mobile environment specifically.

Figure 1. Mobile Social Cloud

Rest of the paper is organized as below: in section I, introduction will be introduced. Section II related research of impact of cloud computing on social network. Section III presents the architecture social mobile cloud architecture. Section IV introduced the social networking sites. Section V designs the architecture of social networking sites. In Section VI focus on impact of mobile cloud computing on social networking sites. Section VII, this paper outlines the privacy and challenges of mobile cloud. Finally section VIII provides the concluding remarks.

2. RELATED WORK

In the literature review, we could find work on Social Networks and Cloud exclusively. Some researchers relate both, integrate, and proposed models by title Social Cloud, FaceCloak, and Constructing a Cloud Computing Based Social Networks, respectively [4], [5] [6]. There are multiple instances of Social network and Cloud computing integration. However, most examples use Cloud platforms to host Social networks or create scalable applications within the Social network. For example, Facebook users can build scalable Cloud based applications hosted by Amazon Web Services [7]. We did not find any literature related to the impact of cloud on social network in specific. We present both the significant impact of cloud and increased usage in cloud-based heterogeneous wireless-network environment. Cloud computing for mobile devices has a major benefit in information dissemination, where the resource-limited mobile devices outsource computation, communication, and high performance intensive operations to the nearest cloudlet or cloud. There are already mobile applications that implement DICOM network protocol [8] and take full advantage of retrieving DICOM images from every Picture Archiving and Communication System (PACS). DICOM protocol is a complex process [9].

3. IMPACT OF CLOUD ON SOCIAL NETWORKS

The combination of Online Social Net-Work (OSNW) and Cloud technology is producing a fundamental transformation in the structure and services offered by social networking sites. The rising importance of social media has pushed the technology designers to integrate the technologies, even into mobile environment; bringing access to discrete technologies’ resources onto a single interface. Users have privileged to access on-demand, by subscription, and pay-on-consumption.

The cloud infrastructure has a great deal of impact on the site designers to incorporate most advanced and sophisticated features without bothering the operational complexities. Widespread broadband availability and the advent of cloud computing are making that happen. Cloud provides computer services by an organized system of computational servers, the idea represented here is called Social Cloud. The cloud infrastructure evolved the best to support mass storage and high performance computation for social networks. It enables users to share heterogeneous resources on a single interface within the context. The unique nature of Cloud proposed a means of regulating sharing such as of Facebook. A cloud-based usage model is used to enable virtualized resource sharing through service-based interfaces. A Social Cloud, therefore, is scalable computing model in which virtualized resources contributed by users are dynamically provisioned amongst a group of friends. It also leverages pre-existing trust relationships between users to enable mutually beneficial sharing within the context of a social network. It is important to note that sharing within a Social Cloud is not representative of point-to-point exchanges between users, rather it represents multi-point sharing within a whole community group [4]. Cloud providers like Microsoft Azure, Amazon EC2/S3, Google App Engine, open Clouds like Nimbus and Eucalyptus provide access to scalable virtualized resources. Through pre-dominantly posted price mechanisms, these computation, storage, applications resources can be accessed.
3.1 Applications for social cloud

Today, access to Internet is changed, and been encouraging into a new paradigm; by deploying social applications on cloud platforms which meet the increasing demands of Internet-scale and self-propagating usage. Due to its unique propagation patterns, researchers have been executing their efforts in the deployment of social media and for economic model.

In a typical social application, user-generated contents (UGCs) are the dominant form of contents, i.e., they are first generated by users, then collected and processed by the system, and finally distributed to other users through the social relationships [10]. Many application scenarios that benefit from Cloud models are immense (from scalable web servers through to data intensive scientific applications). Social Cloud applications can also leverage the relationships among users to deliver shared asymmetric services; leads to several potential Social Cloud application scenarios:

3.1.1 A social computation cloud

Even today, computing power remains the core of processing and widely accepted that extensive computing power remains untapped through personal computers. By implementing Social Cloud infrastructure users can easily contribute computing resources to digital friends, groups of similar interest, companies, and communities.

3.1.2 A social storage cloud

Scalable storage is needed by every intensive user. Social Storage is efficiently support for storing and sharing of user generated contents like photos. It could move the burden from the network provider to their members for increasing scalability. It also minimizes infrastructural requirements and security implications as contents are already with trusted users.

3.1.3 A social collaborative cloud

Collaborations and sharing of information resources among diverse user communities are the fundamental concept of social networking. Similar functionality can be realized using dynamic Social Clouds deployed in existing social networks [4].

3.1.4 A social cloud for public science

The Social Cloud is an ideal basis on which to create the next iteration of volunteer computing – primarily for solving scientific problems of community interest. There are many examples of such projects run as volunteer computing problems under the Berkeley Open Infrastructure for Network Computing (BOINC) [11]. The Social Cloud for Science can do this in a more accessible way and leverage a larger population base, using different resource provider groups to determine share delegation, finer grained resource control, the integration of social capital, reputation, and social incentives [4]. This approach exclusively utilized for more highly cooperative structures between research groups, small organizations and forge mutually constructive scientific communities.

3.1.5 An enterprise social cloud

Organizations of different domains and dimensions essentially have public profile on social network. Social Cloud has potential to be configured accordingly the community it serves. It also offers an extensive platform for large scale users to form specialist enterprise applications best suited. Benefits are twofold: gain access to rich-set of resources when required and rewards of sharing. For example enhancing brand awareness and increasing public perception of the organization.

3.2 Social Media Features on Cloud

- Social Networking Sites- Facebook, MySpace, LinkedIn
- Microblog- Twitter, Tweetpeck, PLURK
- Discuss- Skype, Google Talk, Yahoo Messenger
- Share- YouTube, Slideshare, Flickr
- Publish- Wikipedia, Wikia
- Lifestream- freendfeed, Socialthing!
- Livecast- Yahoo Live, Justin.tv
- Virtual Worlds- CLUB PENGUIN, HABBO
- Social Games- Pogo, Three Rings
- MMO- WORLD WARCRAFT

4. SOCIAL CLOUD IN MOBILE ENVIRONMENT

Mobile technology and social affairs/factors have converged over the past few years to create a phenomenon called...
mobile social computing. Integrating with Cloud technology creates new dimensions of service-delivery model. The cloud aspect provides robust, scalable and low maintenance infrastructure. It transforms the resource-limited device into resource-rich environment; where mobile device outsources high performance computation and volume of storage to the cloud or nearest Cloudlet on-demand. Combined together, the social aspect and the overall user experience improve.

Mobile devices access Social Cloud for (computation, storage, collaborative, public science, enterprise, and etc.) anywhere, anytime (always connected). Amazon EC2/S3, Google App Engine, Microsoft Azure is one of the best commercial cloud service providers, provide services on demand, pay per uses. Social Cloud also offers extensive environment for enterprises. For example Salesforce Chatter is one of the best examples of how enterprises can leverage the mobile social cloud triple play to improve productivity. Dubbed as the “Facebook for the Enterprise”, this enterprise social app is a part of the Salesforce cloud platform. Salesforce Chatter offers mobile apps for all leading mobile platforms thereby facilitating access from a variety of mobile devices [12].

4.1 Analysis in Mobile Environment

According to latest report by ABI Research, a New York-based firm, more than 240 million businesses will use cloud services through mobile devices by 2015. That traction will push the revenue of mobile cloud computing to $5.2 billion [13]. With the different research studies we learned that, today’s growing trend is mobile technology; ambiguous access in wireless-network environment. The number of mobile devices users is growing unprecedentedly and it will continue to grow. Eventually mobile traffic increases rapidly and will leave the wire traffic behind. In February 2011, Cisco presented an analytical report on the perspectives for the development of mobile networks. According to their estimates, the volume of traffic in 2015 will be 26 times greater (and the speed, the number of mobile PCs, etc. will also increase) [14].

Social networks have become the most popular category in mobile environment. In the U.S., the number of users who are at least once a month visit different sites of a social network via their mobile phones grew by 56% - up to 58 million users. In Europe, the growth is even more - 75%, i.e. 42 million users. Especially popular social networking sites are among the owners of smartphones: in the U.S. - 57.3% (36.2 million users), and in Europe - 37.8% (27.5 million users) smartphone users regularly visit social networks [15].

India with the world’s second largest population, its 1.2 billion inhabitants have embraced social, digital and mobile technology. India has 137 million internet users, more than 60 million people use social networks – equivalent to the total population of Italy. It is also home to a staggering 934 million mobile subscriptions – equivalent to more than 13% of the world’s entire population.

4.2 Compendium of Mobile Statistics

In recent past, we have gone from a smattering of mobile statistics to an abundance of useful information. But there is still some parts of the world are not privileged the same; and the quality of statistics varies significantly. This mobile stats compendium which is for year 2012 hopefully goes some way to putting right stats. But please remember that even the best quality independent statistics are speculative to some degree; and stats are not facts.

Figure 2. Desktop vs. Mobile Usage in 2012

<table>
<thead>
<tr>
<th>Social Networking Sites</th>
<th>Monthly Active Users(Millions)</th>
<th>Desktop Monthly Active Users (Millions)</th>
<th>Mobile Monthly Active Users (Millions)</th>
<th>% Mobile Monthly Active Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook</td>
<td>1007</td>
<td>403</td>
<td>604</td>
<td>59.98</td>
</tr>
<tr>
<td>Twitter</td>
<td>140</td>
<td>56</td>
<td>84</td>
<td>60</td>
</tr>
<tr>
<td>LinkedIn</td>
<td>187</td>
<td>74.8</td>
<td>112.2</td>
<td>60</td>
</tr>
<tr>
<td>Google+</td>
<td>100</td>
<td>40</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>MySpace</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orkut</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mobile stats 2012

- There are more iPhones sold per day (402k) than people born in the World per day (300k)
- Users accessing the web through mobile devices has almost doubled every year since 2009
- Global internet usage through mobile devices rose to 8.5% at the end of 2011 (from 4.3%)
- Mobile advertising is exploding – during Q4 2011, mobile advertising was up 39%

Amazing mobile stats

- Facebook alone accounts for 10% of all mobile data on the iPhone
Globally more people own a mobile phone than a toothbrush

There are over 500,000 apps in Apple’s App Store (as at Dec 2011)

There are 400,000 apps for the Android operating system (as at Dec 2011)

Of the world’s 4 billion mobile phones, 1.08 billion are smartphones

Smartphone users are twice more active on social media than non-smartphone users

60% admit to using their device while going to the bathroom

86% of mobile users are watching TV while using a mobile phone

Over 200 million access Facebook from a mobile device and 91% of all mobile internet use is “social” related

By 2014 mobile internet use should overtake desktop internet use

½ of all local searches are done on mobile devices

Half of Twitter’s users use Twitter on their mobile

There are 200 million + views of YouTube clips on mobiles every day

5. CONCERNS AND CHALLENGES

The Social Cloud in mobile environment is the result of combination, mergence, and integration of different technologies forces.

5.1 The Nexus of Technologies

It describes the convergence and mutual reinforcement of four interdependent trends: social interaction, mobility, cloud, and information. Social is the most accessible of the four Nexus forces, such as Facebook, MySpace, and Twitter. The widespread adoption of social drives the need for the other three Nexus forces and feeds them with content and context. Whereas mobile cloud is one of the technology trends combines the advantages of both mobile and cloud, hence providing efficient optimal services for social networking sites at large. The forces combine to empower individuals as they interact with each other and their information through well-designed ubiquitous technology [17]. Organizations like ForgeRock (forgerock.com) launches “Open Identity Stack to protect Cloud, Social, and Mobile Applications.

5.2 The Challenges

This should be the top most priority for all the stakeholders including mobile carriers, Cloud providers, Internet providers, information providers, and users. Mobile carriers and cloud providers already have been working on the key challenges and given the technology advancements in the recent times. However, the following key challenges related to the trends are the major concerns at the moment:

Social - privacy and security (location identification, data, applications)

Cloud - interoperability (services available across multiple cloud infrastructure providers)

Mobile - Bandwidth constraints (mobility, anywhere, anytime)

Information - integrity and authenticity

We strongly believe that these concerns will be laid to rest thereby triggering widespread adoption of the mobile social cloud in future too.

6. CONCLUSION

We have presented through this article the impact of Cloud on social networks in mobile environment with detail analysis. A Social Cloud in mobile environment is typically unique phenomenon in that it builds upon the social incentives and external real world relationships inherent in social networks; provides resource sharing and trading at large. This work represents a novel new approach to analyze the impact of Cloud on social media in general and usage analysis of social networking sites in mobile environment in particular. The combination of OSNW and Cloud technology with the integration of mobile brings access to discrete technologies’ resources onto a single interface on-demand, pay on-consumption. Social Cloud is scalable computing model with virtualized resources, dynamically provisioned in both static and mobile environment. The
impact of Cloud-based social media in mobile environment changed the internet into a new computing and communication paradigm. The dynamic growth of social networking sites due to Cloud implementation and changed drastically the stats of internet usage in desktop environment. The analysis presented in this work shows the wide acceptance of Social Cloud in mobile environment. In the early 2013, the usage of all sites in mobile will exceed the desktop environment. Already, it is exceeded for some social sites like Facebook and Twitter.

7. REFERENCES
[5] An Architecture for User Privacy on Social Networking Sites by Wanying Lao, Qi Xie, Urs Hengartner