

Available at: www.researchpublications.org

THE ROLE OF CLOUD COMPUTING IN MOBILE

Rajesh A. Dhote

Smt. R. S. arts, commerce and sciences college
Anjangaon Surji
rajeshdhote89@hotmail.com

Satish B. Belsare

Smt. R. S. arts, commerce and sciences college
Anjangaon Surji
satishbelsare@gmail.com

ABSTRACT:

The mobile cloud computing approach has emerged as a promising way to address the new challenges in the application development and implementation of resources sharing or distributed computing. The capabilities of mobile devices have been improving quickly than computers. Many researchers focus on the area of mobile computing and cloud computing. The mobile computing means to access shared data or infrastructure through portable devices like PDA, smart phone, tablet and so on. Independently from physical location and cloud computing means a virtual computing, distributed computing or resources sharing. Mobile uses the cloud for both application development as well as hosting. The most of application in mobile is cloud based application i.e. IE, social networking apps like facebook apps, that accessible through cloud (internet). It provides the user to interface the data and services on the cloud platform. The mobile computing needed to be limited energy than regular cloud computing. The main purpose of this paper is to discuss about the role of cloud computing in mobile which is very useful for mobile users to access internet on mobile and to interface the social applications through online.

1. INTRODUCTION

In the recent years the growth of portable devices users increasingly in the world. The every person required a portable device for improving their businesses strategy and communication media. E.g. the various banks use mobile banking application for banking purpose and synchronize data on web. As a major application model in the era of the Internet, Cloud Computing has become a significant research topic of the scientific and industrial communities since 2007. cloud computing is described as a range of services which are provided by an Internet-based cluster system[1]. So the internet based cluster consist of set of computer connected to each other through fast and safe transparent data accessing and computing to the server and client. "Cloud computing" is the next natural step in the evolution of on-demand information technology services and products. To a large extent, cloud computing will be based on virtualized resources [2].

The mobile devices like smart phone, android, windows mobile blackberry become more popular area for to accessing web applications and web services. Execution of any mobile application is not going to be dependent on handset with advance configuration any more. According to Senior Analyst Mark Beccue for Mobile application developers, today's major challenge is the existence of such a wide range of mobile operating systems [3]. They are create application for specific operating system or create same application copy for different OS users. The application developer creates application for specific device configuration that device capable of supporting that corresponding application.(eg.facebook application

for java mobile and same application for android mobile).The cloud computing supports application users to execute mobile application on servers to access distributed data of users with respective security.

2. MOBILE COMPUTING

The portable devices is very popular in word and increasing its growth day by day in computing area both field development as well as hosting. The mobile computing is based on three major terms software like OS,applications ,hardware like portable devices and their components and communication includes mobile networks, protocols (Eg.CSMA/CD) so on. Mobile computing is human-computer interaction by which a computer is expected to be transported during normal usage. "Mobile computing being able to use a portable device even when being PDA, Smartphone or other from its physical location." Fig 1shows the interaction of mobile device and radio tower with dual modes wiMax and gprs and the radio towers access data from servers.

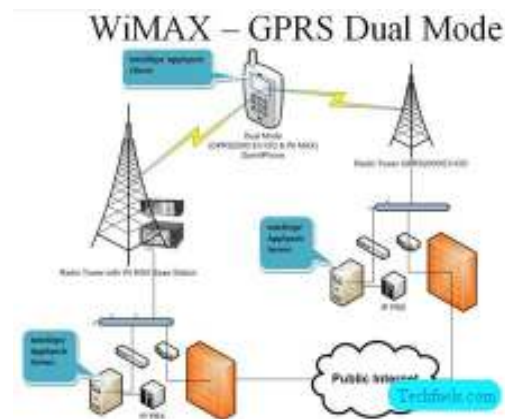


Fig 1: Mobile Computing

The features of mobile computing are as follows:

- Mobility:** The mobility in mobile computing is ability to handled computing as well as communication between mobile nodes. i.e. to establish the connection.
- Low power consumption:** The mobile device consumptions low battery power than other devices .i.e. limited energy availability on portable devices.
- Communication capabilities:** The capabilities of mobile device to establish wireless connection to access data or user profiles from host and communication between user to user. Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor. It is also possible communication like voices communication, video calling and massages. Service provider also

Available at: www.researchpublications.org

provides communication technology such as GSM, CDMA, 3G and recently 4G technologies.

d) *Security issues*: The mobile security in mobile computing has become increasingly (e.g. the security of personal information now stored on the portable device). Many users and businesses use portable device like Smartphone, PDA, laptop etc for secure its data.

3. CLOUD COMPUTING

The cloud computing is used computing resource like software and hardware that are delivered services over networks (Internet). Cloud computing entrusts remote services with a user's data, software and computation. National Institute of Standards and Technology (NIST) has given a definition for „Cloud computing“ which says that:

“Cloud Computing is a model for enabling 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[4].” The cloud computing is web-based processing, shared resources and information provide on demand to portable devices and computers to the users for processing.

3.1. *Services*: There are many services of cloud computing as follows[5]:

- Infrastructure as a service (IaaS)
- Platform as a service (PaaS)
- Software as a service (SaaS)
- Network as a service (NaaS)
- Storage as a service (STaaS)
- Security as a service (SECaaS)
- Data as a service (DaaS)
- Desktop as a service (DaaS - see above)
- Database as a service (DBaaS)
- Test environment as a service (TEaaS)
- API as a service (APIaaS)
- Backend as a service (BaaS)
- Integrated development environment as a service (IDEaaS)
- Integration platform as a service (IPaaS), see Cloud-based integration.

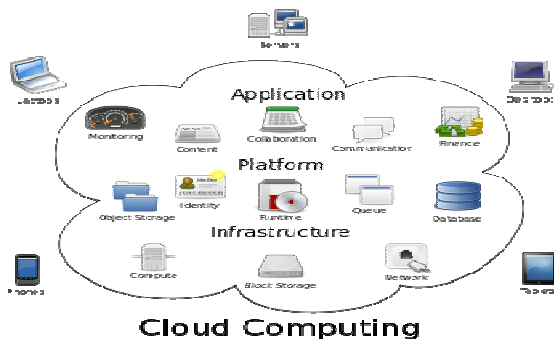


Fig 2: Cloud computing

Fig: 2 shows users and business model are accessible for software NCAICN-2013, PRMITR,Badnera

and database service, the cloud providers manage the infrastructure and platforms on which the applications run. End users access cloud-based applications through a web browser or a light-weight desktop or mobile app while the business software and user's data are stored on servers at a remote location. cloud computing allows enterprises to get their applications up and running faster, with improved manageability and less maintenance, and enables IT to more rapidly adjust resources to meet fluctuating and unpredictable business demand[6][7]. Network as a service (NaaS) is to provide for cloud service the user can use network/transport connectivity and also provide inter-cloud network connectivity services. Cloud computing providers offer their services according to several fundamental models following fig 3 shows [8]:

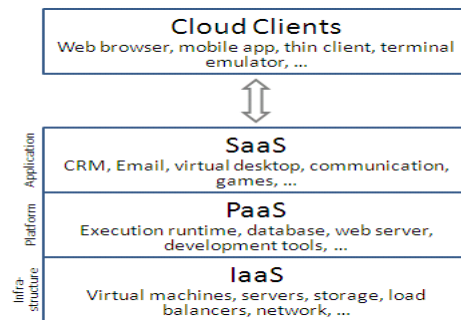


Fig 3: Service model

3.2. Systems And Concepts:

The cloud computing shared its characteristic to similar type system and concepts:

- *Autonomic computing* : Computer systems capable of self-management [9].
- *Client-server model*: Client-server computing refers request receiver (servers) and response receiver (clients).
- *Grid computing*: "A form of distributed and parallel computing, to perform very large task.
- *Mainframe computer* :Its most powerful computer to handled large and complicated task.
- *Utility computing* : The "pack or bundle of computing resources.
- *Cloud gaming* :These computing provide game users to access on-demand gaming,(e.g. the server provide online game to the independent client) .

3.3. Features:

The key features of cloud computing as follows:

1. *Agility*: the ability to improve users with re-provision technological infrastructure resources.
2. *Application Interface*: The users can interact with cloud based application same way as that of interface with computer desktop.
3. *Reliability*: The reliability is improved if multiple redundant sites are used, cloud computing suitable for business and recovery
4. *Scalability and elasticity*: via dynamic ("on-demand") provisioning of resources on a fine-grained, self-service basis near real-time [10].

Available at: www.researchpublications.org

5. *Virtualization*: The technology allows servers and storage devices to be shared and utilization is increased. Applications can be easily migrated from one physical server to another.
6. *Large-scale*: The capability of supercomputing and mass storage, a cloud computing system normally consists of multiples of servers and Client. Google Cloud Computing, for example, has already controlled 2% of all servers or about 1 million servers located in two hundred different places in the world, and will move upward to 10 million servers in the next decade [11].
7. *Security*: The security could improve due to centralization of data, increased security-focused resources, etc; Security is often as good as or better than other traditional systems, in part because providers are able to devote resources to solving security issues that many customers cannot afford [12]. In addition, user access to security audit logs may be difficult or impossible. The private cloud computing is a part of security feature in computing.

3.4. Challenges:

The cloud based computing needed to be improve security mechanism and services invoked by application and distributed data are implemented in computing. In addition, to implementation of virtual computing for communication between server and client. The analysis of services and performance is necessary for implementation purpose.

4. THE ROLE OF CLOUD COMPUTING IN MOBILE

Now the growth of portable device users increasing and also improve the hardware and software configuration of devices for improving services (e.g. simple cell phone to Smartphone, tablet etc.). Emails and web browsing are daily necessary for users. Today's iPhone, Android, Windows Phone includes various communication application user can access personal data from social networking websites to the mobile and also navigations application like Gmap, navigator for finding its path and positions on earth. In 2010, Google CEO Eric Schmidt says mobile cloud computing in an interview that 'based on cloud computing service development, mobile phones will become increasingly complicated, and evolve to a portable super computer' [13]. The Microsoft, Google, HTC, Apple and so on provides mobile cloud services for users to synchronize mobile users data to server.

The role of cloud computing in mobile it includes mobile computing as well as cloud computing. Today's advance of mobile and cloud computing is a new paradigm shift from conventional mobile computing and wireless services to mobile cloud computing and services over wireless internet in the real world. The portable device users commonly use portable devices with limited computing power and resources for accessing wireless service and limited data. The mobile device always connect with radio towers or transmission tower for conversation, SMS etc and those tower access data from cloud(internet).(request response functionality used).i.e. rendering data form portable devices to servers through the cloud. The mobile users send request to the cloud via web browser, application Fig.3. The capability of mobile requirement is limited then the data processing and computing have been migrated to cloud very easily and data transfer rate are constantly change in mobile cloud computing. The data storage and its processing security is importance basically:

Security: The security of user data and its processing is important issue in computing. Now a day various cloud platforms offer robust built-in security measures. SSL and digital certificates provides an option to enable external security [14].i.e. to provide the privacy and confidentiality of users for processing.

5. RELATED WORKS:

The many researcher research in industrial and scientific areas. Some of these research projects are presented as follows:

a) Augmenting Execution:

By B. Chun Clone Cloud system is introduced [15] in 2011. The core functionality is to migration of virtual image of phone with the help of device configuration using virtual machine migration technology.

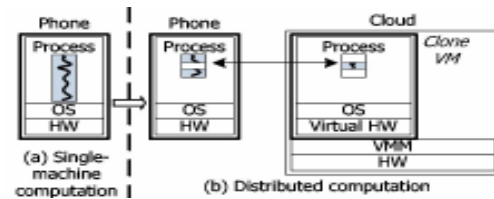


Fig 4: Clone Cloud system model [15].

In fig 4 shows the clone i.e. copy of actual image running on virtual machine. Most of the mobile application developer use virtual device image for execution of application (e.g. android developer uses android device with configuration and SDK). Once the process have been completed then transfer image from clone cloud to the mobile devices.

By X. Zhang has introduced an Elastic application programming model for mobile cloud computing in [15] with the base on clone cloud system to remove the pressure of mobile platforms by extending these mobile terminals to cloud through a distributed environment. This model is used to divide the application into the elastically (distribute application). Elastic applications as having two properties. First, following the client/server split of traditional web applications; an elastic application is split or partitioned so that execution occurs partially on the device and partially on the cloud [16]. Elastic application development should necessary SDK and tools to allowing developers to developed or implement existing and testing. Each application running on a mobile device consumes power by always running CPU cycles, memory and radio frequency for communication with cloud and services to the mobile device cannot be stable that are frequently changing. In this model required high speed communication media channel. The different communication channels have different power consumption (e.g. Wi-Fi, 3G, and GPRS). Therefore, the lightweight applications are suitable for deployment of cloud to mobile device.

b) Deployment Of Cloud On Device:

VM-based Cloudlets in Mobile Computing is presented by M. Satyanarayanan [17] from Carnegie Mellon University, which can be provides rapidly customized service to mobile devices using virtual machine (VM) technology for solving bandwidth-induced delay between devices and cloud, and so on. Wireless LAN bandwidth speed typically higher than the wireless Internet bandwidth available to a mobile device.

Available at: www.researchpublications.org

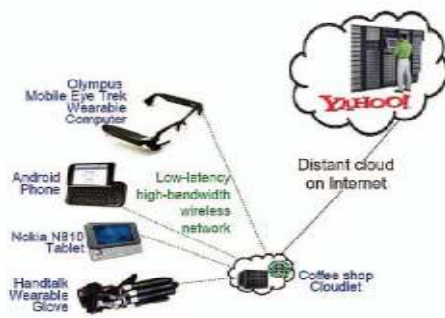


Fig 5: VM-based Cloudlets [17].

The fig 5 shows VM-based Cloudlets model the users or portable devices access cloudlet with high speed and poor network latency via Wi-Fi or wireless LAN that means the cloudlets are located in coffee shop from the distant cloud i.e. yahoo and then provides to customize the services using virtual machine technology.

c) Mobile Applications In Cloud Environment :

Open source project for mobile cloud platform called openmobster [18]. Its architecture is as given in the Figure 6. The mobile device application access users data from cloud server through radio tower over a cloud (internet). The cloud server also access from backend data and cloud services. I.e. to synchronizes data to client to server and servers to client with the help of services. The security issue is also important in development mobile cloud-based application for the authentication and authorization services to establish secure connection between portable devices to cloud server (Every device first register on server then establish the connection). The key characteristics of mobile application in cloud as follows:

- To divide embedded application across the cloud and portable devices.
- The capability to allow testing of poor network latency for faster responses.
- The network communication with High speed bandwidth for faster data transfer between cloud and portable devices.
- Users can carry portable device anywhere and monitoring your application i.e. privacy and confidentiality provides.

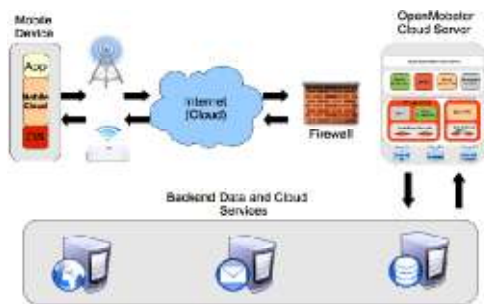


Fig 6: The openmobster architecture for MCC

5. CONCLUSION:

The concept of cloud computing and mobile computing provides the exciting new opportunity for mobile developer to develop cloud-based mobile application over the virtual environment and improving software performance. The most of the

differences are due to limited energy availability on mobile, the mobile cloud may be sensitive to network latencies caused by distance from the server more than regular cloud computing. The subsequent operation like synchronization of data of application to server or server to device (e.g. in traditional mobile device to synchronize phonebook, SMS, Emails etc). In the synchronization process only register user to establish communication. After the discussion of whole paper the researchers concluded the role of cloud computing in mobile. The cloud computing plays a very important role in mobile including the following characteristics, to divide the embedded application, to allow testing of poor latency for faster response and faster data transfer, for privacy and confidentiality purpose that means security issue.

REFERENCES:

- [1] Han Qi, Abdullah Gani, "Research on Mobile Cloud Computing: Review, Trend and Perspectives", *The Second International Conference on Digital Information and Communication Technology and its Applications (DICTAP2012)*, Bangkok, Thailand, May 16-18, 2012. (ISI-Cited Publication).
- [2] Mladen A. Vouk "Cloud Computing – Issues, Research and Implementations" *Journal of Computing and Information Technology - CIT* 16, 2008, 4, pp 235–246 doi:10.2498/cit.1001391
- [3] Deepti Sahu, Shipra Sharma, Vandana Dubey, Alpika Tripathi "Cloud Computing in Mobile Applications" *International Journal of Scientific and Research Publications*, Volume 2, Issue 8, August 2012 1 ISSN 2250-3153
- [4] P. Mell and T. Grance, "The NIST Definition of Cloud Computing," *Version 15*, 7 October 2009, <http://csrc.nist.gov/groups/SNS/cloud-computing/cloud-def-v15.doc>.
- [5] Monaco, Ania (7 June 2012 [last update]). "A View Inside the Cloud". *theinstitute.ieee.org* (IEEE). <http://theinstitute.ieee.org/technology-focus/technology-topic/a-view-inside-the-cloud>. Retrieved August 21, 2012.
- [6] "Baburajan, Rajani, "The Rising Cloud Storage Market Opportunity Strengthens Vendors." *infoTECH*, August 24, 2011". *It.tmcnet.com*. 2011-08-24. <http://it.tmcnet.com/channels/cloud-storage/articles/211183-rising-cloud-storage-market-opportunity-strengthens-vendors.htm>. Retrieved 2011-12-02.
- [7] "Oestreich, Ken, "Converged Infrastructure," *CTO Forum*, November 15, 2010". *Thectoforum.com*. 2010-11-15. <http://www.thectoforum.com/content/converged-infrastructure-0>. Retrieved 2011-12-02.
- [8] "The NIST Definition of Cloud Computing". *National Institute of Standards and Technology*. <http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf>. Retrieved 24 July 2011.
- [9] "What's In A Name? Utility vs. Cloud vs Grid". *Datacenterknowledge.com*. http://www.datacenterknowledge.com/archives/2008/Mar/25/whats_in_a_name_utility_vs_cloud_vs_grid.html. Retrieved 2010-08-22.

Available at: www.researchpublications.org

- [10] Mao, Ming; M. Humphrey (2012). "A Performance Study on the VM Startup Time in the Cloud". *Proceedings of 2012 IEEE 5th International Conference on Cloud Computing (Cloud2012)*: 423. doi:10.1109/CLOUD.2012.103. ISBN 978-1-4673-2892-0. <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&number=6253534&isnumber=6253471>
- [11] R. Cohen. (2010, O) *The cloud computing opportunity by the numbers*. [Online]. Available: <http://www.elasticvapor.com/2010/05/cloud-computing-opportunity-by-numbers.html>.
- [12] "Encrypted Storage and Key Management for the cloud". *Cryptoclarity.com*. 2009-07-30. http://www.cryptoclarity.com/CryptoClarityLLC/Welcome/Entries/2009/7/23_Encrypted_Storage_and_Key_Management_for_the_cloud.html. Retrieved 2010-08-22.
- [13] B. Marrapese. (2010, Dec.) *Google ceo: a few years later, the mobile phone becomes a super computer*. [Online]. Available: <http://www.itnews-blog.com/it/21320.html>.
- [14] Le Guan, Xu Ke, Meina Song, Junde Song. 2011. *10th IEEE/ACIS International Conference on Computer and Information Science*. "A Survey of Research on mobile cloud computing".
- [15] B. Chun, S. Ihm, P. Maniatis, M. Naik, and A. Patti, "Clonecloud: Elastic execution between mobile device and cloud," in *Proceedings of the sixth conference on Computer systems*. ACM, 2011, pp. 301–314.
- [16] X. Zhang, A. Kunjithapatham, S. Jeong, and S. Gibbs, "Towards an elastic application model for augmenting the computing capabilities of mobile devices with cloud computing," *Mobile Networks and Applications*, vol. 16, no. 3, pp. 270–284, 2011.
- [17] M. Satyanarayanan, P. Bahl, R. Caceres, and N. Davies, "The case for vm-based cloudlets in mobile computing," *Pervasive Computing, IEEE*, vol. 8, no. 4, pp. 14–23, 2009.
- [18] *OpenMobster*. <http://code.google.com/p/openmobster/2010>.