

# Survey on Mobile Cloud Computing [MCC], its Security & Future Research Challenges

G. Kishore Kumar<sup>1</sup>, Dr. M. Gobi<sup>2</sup>

<sup>1</sup>Research Scholar, Dept. of Computer Science, Chikkanna Government Arts College, Tiruppur, India.

<sup>2</sup> Asst. Professor, Dept. of Computer Science, Chikkanna Government Arts College, Tiruppur, India.

\*\*\*

**Abstract** - Cloud Computing is a fast-growing area in the recent past times and Mixture of Mobile Computing and Cloud Computing termed as Mobile Cloud Computing (MCC). MCC is the incorporation of cloud computing into the mobile environment. This paper enlightens the current trend in Mobile Cloud Computing, its security issues/challenges and associated research challenges in which our research would be focusing on.

**Key Words:** Cloud Computing, Mobile Cloud Computing, MCC, Algorithms, Research issues, challenges, Cryptography, ECC, HECC.

## 1. INTRODUCTION

### 1.1. Cloud Computing

Cloud computing is denoted as “cloud” which means the supply of on-demand computing resources to store, manage, and process data over the internet on pay-for-use basis. It is an Internet-based computing type, which is offered on demand to computer/other devices that needs data and shared processing resources.

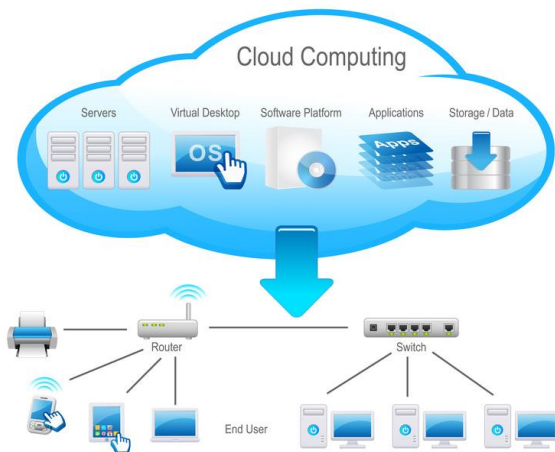


Fig. 1 Cloud Computing Overview

Cloud consists of the below given essential characteristics:

- On-Demand self-service
- Ubiquitous network access
- Location-independent resource pooling
- Rapid elasticity
- Measured service

Below given are the Cloud delivery models:

- Application/Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)

Below given are the Cloud deployment models:

- Private
- Public
- Community
- Hybrid
- Virtual Private Cloud

### 1.2. Mobile Cloud Computing

Mobile Cloud Computing is a new model in which the Cloud Computing resources and services made available for mobile devices. Mobile computing is not meant just for smart-phone users but also for wide-ranging mobile subscribers as well. This MCC technology is defined based on three major concepts: software [mobile applications available in the device], hardware [mobile devices] and communication [network, data delivery and various protocols].

The below given diagrams describes the MCC architecture:

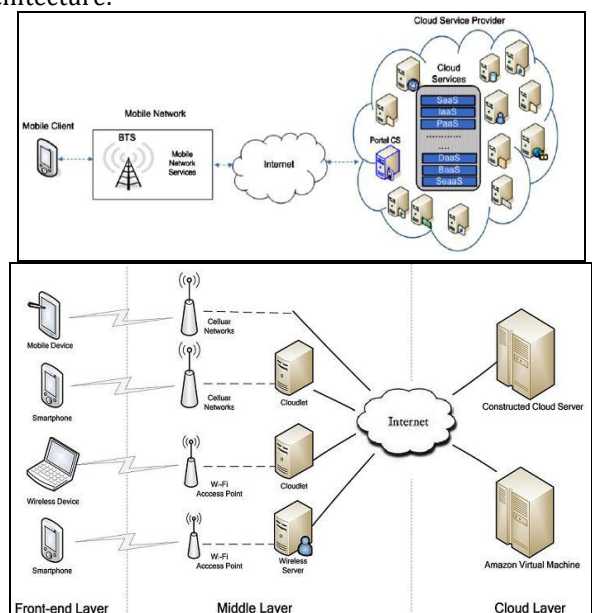


Fig. 2 MCC Architecture

## 2. NEED OF SECURITY IN MCC

Security is very much essential as mobile devices can encounter various security threats as they are exposed to the outer world, which can cause virus attacks. While using mobile in cloud environments, the users and/or application developers must be very cautious on authentication and integrity of data/application. The mobile security can be easily achieved by any security software installation like mobile anti-virus programs. GPS causes privacy issues and LBS as well as they provide the current location details, which is a private information.

The Mobile Cloud Computing security issues can be categorized as given below:

- Mobile threats
- Cloud threats.

The security related issues are further divided into the below given broad level categories:

- Mobile Cloud Infrastructure Issues
- Mobile Cloud Communication Channel Issues

## 3. RESEARCH PAPERS PUBLISHED

Following are some of the papers published in the area of MCC & its Security:

1. A Survey on User Authentication Mechanism in Mobile Cloud Computing by A. Cecil Donald, M. Regin, Dr. A. Aloysius, Dr. L. Arockiam in International Journal of Emerging Trends in Computing and Communication Technology Volume 1, No 3, August 2015 ISSN: 2348 4454 talks about a Survey on various User Authentication Mechanisms in Mobile Cloud Computing and also the problems persist in the existing mechanisms.
2. Mobile Cloud Computing (MCC): Open Research Issues by Amit K. Sharma, Priyanka Soni in International Journal of Innovations in Engineering and Technology (IJJET) - Vol. 2 Issue 1 February 2013 ISSN: 2319 - 1058 talks about main open research issues connected with the mobile usage in cloud computing. This is useful person who reads can get an overview of MCC & their issues, current solutions and methodologies with some additional aspects for the further work.
3. MOBILE CLOUD COMPUTING AS FUTURE FOR MOBILE APPLICATIONS by C Shravanthi, H S Guruprasad in IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308 talks about the survey on mobile cloud computing applications, challenges, existing solutions and approaches to overcome these challenges.
4. Mobile cloud computing: A survey by Niroshinie Fernando, Seng W. Loke, Wenny Rahayu in Future Generation Computer Systems 29 (2013) 84–106 talks about an extensive survey of mobile cloud computing research, while highlighting the specific concerns in mobile cloud computing. We present a taxonomy based on the key issues in this area, and discuss the different approaches taken to tackle these issues. We conclude the paper with a critical analysis of challenges that have not yet been fully met, and highlight directions for future work.
5. Overview on Mobile Cloud Computing Security Issues by D. Popa K. Boudaoud, M. Cremene, in Seria ELECTRONICĂ și TELECOMUNICAȚII TRANSACTIONS on ELECTRONICS and COMMUNICATIONS M. Borda Tom 58(72), Fascicola 1, 2013 talks about an overview on Mobile Cloud Computing and it's security issues.
6. Securing Mobile Cloud Using Finger Print Authentication by IehabALRassan and HananALShaher from Department of Computer Science, King Saud University, Riyadh, Saudi Arabia proposes and implements a new user authentication mechanism of mobile cloud computing using fingerprint recognition system.
7. Towards secure mobile cloud computing: A survey by Abdul Nasir Khana, M.L. Mat Kiah, Samee U. Khan, Sajjad A. Madani in Future Generation Computer Systems 29 (2013) 1278–1299 talks about highlights the current state of the art work proposed to secure mobile cloud computing infrastructures, identifies the potential problems and provides a taxonomy of the state of the art.
8. A Study of Mobile Cloud Computing And Challenges by Pragaladan. R, Leelavathi .M in International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 7, July 2014 talks about overview of MCC and associated challenges in it.
9. Mobile Cloud Computing Security Issues: Overview by Jaspreet Kaur Aulakh, Sugandha Sharma , Mayank Arora in International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 3 Issue 5, May 2014 talks about review of MCC, concept of MCC and approaches in MCC based on various applications in MCC.
10. Security Issues in Mobile Cloud Computing by JASLEEN in International Journal of Computer Science & Engineering Technology (IJCSET) presents the concept of mobile cloud computing, new terminology Mcloud and other various MCC applications, major concerns and security concern with the preventive measures.

11. Mobile Cloud Computing: The Future of Cloud by Pragya Gupta, Sudha Gupta in International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 1, Issue 3 presents an overview of Mobile Cloud Computing which includes its architecture, benefits, key challenges, current research and open issues in MCC.
12. A Lightweight Secure Data Sharing Scheme for Mobile Cloud Computing by Ruixuan Li, Member, IEEE, Chenglin Shen, Heng He, Zhiyong Xu, and Cheng-Zhong Xu, Member, IEEE proposes a lightweight data sharing scheme (LDSS) for mobile cloud computing which adopts CP-ABE, an access control technology used in normal cloud environment.
13. A Literature Survey on Mobile Cloud Computing: Open Issues and Future Directions by Nitesh Kaushik, Gaurav, Jitender Kumar in International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 3 Issue 5 may, 2014 Page No. 6165-6172 presents a review on the background and principle of MCC, characteristics, recent research works and future research trends.
14. A Mobile Cloud Computing Architecture with Easy Resource Sharing by Debabrata Sarddar and Rajesh Bose in International Journal of Current Engineering and Technology Vol.4, No.3 (June 2014) talks about the proposed model and aims to illustrate the manner in which mobile device users would be able to use the cloud application and also take advantage of energy savings not only in terms of power consumed, but also most importantly – time.
15. A MOBILE MULTIMEDIA CLOUD COMPUTING ON THE WEB by Gayathri V, Priyadarsini K in International Journal of Computer Science and Mobile Applications, Vol.2 Issue. 4, April- 2014 talks about multimedia embedded with MCC in online personal health record (PHR) systems.
16. A Review on Distributed Application Processing Frameworks in Smart Mobile Devices for Mobile Cloud Computing by Muhammad Shiraz, Abdullah Gani, Rashid Hafeez Khokhar, Member, and Rajkumar Buyya in IEEE COMMUNICATIONS SURVEYS & TUTORIALS, VOL. 15, NO. 3, THIRD QUARTER 2013 talks about issues and challenges to existing DAPFs in developing, implementing, and executing computational intensive mobile applications within MCC domain.
17. A Review on Mobile Cloud Computing: Issues, Challenges and Solutions by Mandeep Kaur Saggi, Amandeep Singh Bhatia in International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 6, June 2015 talks about a review on the background and principle of MCC, characteristics, recent research work, and future research trends.
18. A Review on Mobile Cloud Computing by S M Shamim, Angona Sarker, Ali Newaz Bahar, Md. Atiqur Rahman in International Journal of Computer Applications (0975 – 8887) Volume 113 – No. 16 talks about the overview of mobile cloud computing technology with the architecture, applications, major characteristics, security issues, advantage and limitation and possible solutions.
19. A Survey of Mobile Cloud Computing Applications: Perspectives and Challenges by Yating Wang and Ing-Ray Chen talks about insights for the enabling technologies and challenges that lie ahead to move forward from mobile computing to mobile cloud computing for building the next generation mobile cloud applications. For each of the challenges, they have provided a survey of existing solutions, identify research gaps, and suggested future research areas.
20. A Survey of Mobile Cloud Computing for Smart Phones by P.CHOZHA RAJAN, K.JAYASHREE in International Journal of Science, Engineering and Technology Research (IJSETR), Volume 4, Issue 6, June 2015 talks about the efficient data storage for Mobile Cloud Computing (MCC) and reduces security issues and challenges.
21. A Survey of Mobile Cloud Computing: Architecture, Applications, and Approaches by Hoang T. Dinh, Chonho Lee, Dusit Niyato, and Ping Wang in Wireless Communications and Mobile Computing – Wiley talks about survey of MCC, which helps general readers have an overview of the MCC including the definition, architecture, and applications. The issues, existing solutions and approaches are presented. In addition, the future research directions of MCC are discussed.
22. A Survey on Mobile Cloud Computing Architecture, Applications and Challenges by Ms.Gayathri M R, Prof K. Srinivas in International Journal of Scientific Research Engineering & Technology (IJSRET), ISSN 2278 – 0882 Volume 3, Issue 6, September 2014 talks about an overview of MCC in terms of its concepts, Essential Characteristics, Service and Deployment models. In addition, it presents the architecture of MCC and its challenges and discusses some of the applications, advantages and current Research issues.
23. An Agent-based Optimization Framework for Mobile-Cloud Computing by Pelin Angin and Bharat Bhargava in Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications, volume: 4, number: 2 talks about a

dynamic execution time optimization framework for mobile-cloud computing.

24. An Authenticate Cryptography based security model for handling multiple request from multiple devices for Mobile Cloud Computing by Debabrata Sarddar, Enakshmi Nandi in International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 1, January 2016 talks about systematically explore the privacy and security issues and launch a cryptography based model for handling multiple request from multiple devices for Mobile Cloud Computing.
25. Application Processing Approach for Smart Mobile Devices in Mobile Cloud Computing by Hitesh A. Bheda, Jignesh Lakhani in International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 8, August 2013 talks about the issues and challenges to the existing algorithms in developing, implementing and executing computational intensive mobile applications within MCC environment.
26. ARCHITECTURE OF MOBILE APPLICATION, SECURITY ISSUES AND SERVICES INVOLVED IN MOBILE CLOUD COMPUTING ENVIRONMENT by Swarnpreet Singh, Ritu Bagga, Devinder Singh, Tarun Jangwal in International Journal of Computer and Electronics Research [Volume 1, Issue 2, August 2012] talks about architecture of MCC (Mobile cloud computing) with the different services needed by the client and the server in MCC.
27. Authentication Methods in Cloud Computing: A Survey by Mahnoush Babaeizadeh, Majid Bakhtiari and Alwuhayd Muteb Mohammed in Research Journal of Applied Sciences, Engineering and Technology 9(8): 655-664, 2015 talks about a review on the various methods of authentication in cloud environment.
28. Authentication in the Clouds: A Framework and its Application to Mobile Users by Richard Chow, Markus Jakobsson, Ryusuke Masuoka talks about flexible framework for supporting authentication decisions called as TrustCube.
29. Biometric Authentication as a Service on Cloud: Novel Solution by Himabindu Vallabh, R V Satyanarayana in International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-4, September 2012 talks about biometric authentication on single sign-on.
30. Central Controller Framework for Mobile Cloud Computing by Debabrata Sarddar, Priyajit Sen and Manas Kumar Sanyal in International Journal of Grid and Distributed Computing Vol. 9, No. 4 (2016), pp.233-240 talks about a framework, which keeps track of the status of all other devices during the communication by running passive scan over the devices.
31. Cloud Computing in Mobile Applications by Deepti Sahu, Shipra Sharma, Vandana Dubey, Alpika Tripathi in International Journal of Scientific and Research Publications, Volume 2, Issue 8, August 2012 ISSN 2250-3153 talks about how to implement cloud computing for mobile devices providing data storage and processing outside the device along with the challenges in it and solutions as well.
32. Efficient Energy Reduction and Enhancing Security Privacy in Mobile Cloud Computing by B.Sudhanantham, M.Shankar in International Journal of Innovative Research in Computer and Communication Engineering Vol. 2, Issue 2, February 2014 talks about an encryption based scheme for the situation of single accessible CS and then a coding based scheme for the situation that multiple CSs are available without relying on encryption. They also have provided an analysis of the critical factors affecting the energy consumption of mobile clients in cloud computing.
33. Enabling Secure Location-based Services in Mobile Cloud Computing by Yan Zhu, Di Ma, Dijiang Huang, Changjun Hu in ACM MCC'13, August 12, 2013 talks about propose an innovative location-based fine-grained access control mechanism for LBSS, enabling effective fine grained access control, location-based authentication and privacy protection.
34. Enhancing Mobile Cloud Computing Security Using Steganography by Hassan Reza, Madhuri Sonawane in Journal of Information Security, 2016, 7, 245-259 talks about how steganography can be used to enhance the security and privacy of data images maintained in Cloud mobile applications.
35. FACE RECOGNITION FOR SOCIAL MEDIA WITH MOBILE CLOUD COMPUTING by Prasetyawidi Indrawan, Slamet Budiyatno, Nur Muhammad Ridho, and Riri Fitri Sari in International Journal on Cloud Computing: Services and Architecture (IJCCSA), Vol.3, No.1 talks about a face recognition system on mobile devices by combining cloud computing services.
36. Fast Dynamic Execution Offloading for Efficient Mobile Cloud Computing by Seungjun Yang, Yongin Kwon, Yeongpil Cho, Hayoon Yi, Donghyun Kwon, Jonghee Youn, and Yunheung Paek in International Conference on Pervasive Computing and Communications (PerCom), San Diego, March 2013 talks about novel techniques based on compiler code analysis that effectively reduce the transferred data size by transferring only the essential heap objects.

37. The Future of Mobile Cloud Computing: Integrating Cloudlets and Mobile Edge Computing by Yaser Jararweh, Ahmad Doulat, Omar AlQudah, Ejaz Ahmed, Mahmoud Al-Ayyoub, and Elhadj Benkhelifa in 23rd International Conference on Telecommunications (ICT) proposed a hierarchical model that is composed of MEC servers and Cloudlets infrastructures to increase the coverage area for the mobile users by which the users can accomplish the requested services with minimal cost like power and delay.
38. Increasing The Performance Of Mobile Smartphones Using Partition And Migration Of Mobile Applications To Cloud Computing by Hatem M. Abdul Kader, Mohie M. Hadhoud, Salah M El-Sayed, Diaa Salama AbdElminaam in INTERNATIONAL JOURNAL OF TECHNOLOGY ENHANCEMENTS AND EMERGING ENGINEERING RESEARCH, VOL 2, ISSUE 5 ISSN 2347-4289 developed an architecture that uses cloud to do computations that consume resources badly on mobiles. It targets at finding the right spots in an application automatically where the execution can be partitioned and migrated to the cloud.
39. Smart Phone and Mobile Computing: An Introduction by Rambabu V, Dr. R. Shanmugavadivu in International Research Journal of Engineering and Technology (IRJET) Volume: 03 Issue: 03 | Mar-2016 talks about explains about the similarities, differences and the cutting edge technologies and emerging applications of next generation of mobile computing with some challenges, issues in the mobile domain.
40. Security in Offloading Computations in Mobile Systems Using Cloud Computing by S.Masiperiyannan,C.M.Mehathaf Begum, I.Mohammed Farook Ali, G.Mayuri Priya, S.Sudhakar in International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 3, Issue 3, March 2014 talks about offloading techniques in mobile, its privacy concerns and privacy protection techniques such as encryption and steganography.
41. Secure Mobile Cloud Computing Based-On Fingerprint by Alaa Hussein Al-Hamami, Jalal Yousef AL-Juneidi in World of Computer Science and Information Technology Journal (WCSIT) ISSN: 2221-0741 Vol. 5, No. 2, 23-27, 2015 talks about the fingerprints to prove the users identity to determine if this user is authorized or not in which The results showed that this scheme is very strong and difficult to break it.
42. SDSM: A Secure Data Service Mechanism in Mobile Cloud Computing by Weiwei Jia yz, Haojin Zhuy, Zhenfu Caoyx, Lifei Weiy, Xiaodong Lin in The First International Workshop on Security in Computers, Networking and Communications talks about a secure mobile user-based data service mechanism (SDSM) to provide confidentiality and fine-grained access control for data stored in the cloud.
43. Review On Digital Library Application Services Of Mobile Cloud Computing by Dr Abdulrahman M. Al-Senaidy, Tauseef Ahmad in INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 2, ISSUE 2, FEBRUARY 2013 ISSN 2277-8616 talks about the basic concept of mobile cloud computing and its growth also as well as its mobile cloud architecture, and also deal with digital library services and synchronization with mobile cloud application.
44. Mobile Cloud Computing: Security Challenges for Threats Reduction by Farhad Soleimanian Gharehchopogh, Raheleh Rezaei, Isa Maleki in International Journal of Scientific & Engineering Research, Volume 4, Issue 3, March-2013 ISSN 2229-5518 talks about study mobile technology and MCC security challenges facing this technology have discussed. And with respect to services provided in cloud environment, they have proposed a new MCC to provide security
45. Research on Mobile Cloud Computing: Review, Trend and Perspectives by Han Qi, Abdullah Gani in University of Malaya, Kuala Lumpur, Malaysia talks about a review on the background and principle of MCC, characteristics, recent research work, and future research trends.
46. Reduce Resources for Privacy in Mobile Cloud Computing Using Blowfish and DSA Algorithms by Tawfiq S. Barhoom, Mahmoud M. Abu Ghosh in International Journal of Research in Engineering and Science (IJRES) Volume 4 Issue 1 talks about a proposed solution to the problem of privacy with saving and reducing resources power energy, processor and Memory through data encryption in the mobile cloud computing by symmetric algorithm and sent to the private cloud and then the data is encrypted again and sent to the public cloud through Asymmetric algorithm.
47. PROTECTION ISSUES IN MOBILE CLOUD COMPUTING by V.Gayathri, G.Nithya, K.S.Saravanan, M.Jothilakshmi in INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATIONS AND ROBOTICS Vol.2 Issue.1 talks about the concept of mobile cloud computing with M-Cloud. It also describes about MCC applications, major concerns and security concern with the preventive measures.
48. Protection concern in Mobile Cloud Computing- A Survey by Mrs. Yogita D. Mane, Prof. Kailas K. Devadkar in IOSR Journal of Computer Engineering (IOSR-JCE) ISSN : 2278-0661, ISBN : 2278-8727, PP

: 39-44 talks about security issues in mobile cloud computing.

49. Privacy and Security in Mobile Cloud Computing: Review by Sapna Malik, MM Chaturvedi in International Journal of Computer Applications (0975 - 8887) Volume 80 - No 11 talks about privacy and security issues of Mobile Cloud Computing.
50. Mobile Cloud Computing Perspectives and Challenges by SUGANYA V, SHANTHI A L in International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2163 Issue 7, Volume 2 talks about the background and principle of MCC, characteristics, challenges and recent research work.
51. Mobile Proactive Secret Sharing in Cloud Computing by Vaibhav Kumar, R. P. Ojha in IJRREST: International Journal of Research Review in Engineering Science and Technology (ISSN 2278-6643) | Volume-1 Issue-2 talks about a scheme to secure any secret value in cloud network by Mobile Proactive Secret Sharing (MPSS) which is an extension of proactive secret sharing.
52. Mobile phones and cloud computing by Oskar Hamrén in Department of informatics, Human Computer Interaction Master's programme talks about A quantitative research paper on mobile phone application offloading by cloud computing utilization.
53. Mobile Cloud Security Issues and Challenges: A Perspective by A. Cecil Donald, S. Arul Oli, L. Arockiam in International Journal of Engineering and Innovative Technology (IJEIT) Volume 3, Issue 1 talks about the working concepts of MCC and its various security issues and solutions given by researchers have analyzed.
54. Mobile Cloud Computing: The potential, Challenges & Applications by Swati Verma, Deependra Rastogi in International Conference of Advance Research and Innovation (ICARI-2014) talks about an overview of Mobile Cloud Computing that includes architecture, benefits, key challenges, present research and open issues.
55. Mobile Cloud Computing Security Considerations by Soeung-Kon(Victor) Ko, Jung-Hoon Lee, Sung Woo Kim in 보안공학연구논문지 (Journal of Security Engineering), 제 9권 제 2호 2012년 4월 talks about different security issues that arise about how safe the mobile cloud computing environment is.

#### 4. Abbreviations and Acronyms

Abbreviation	Meaning
CSA	Cloud Security Alliance
ECC	Elliptic curve cryptography
HECC	Hyper elliptic curve cryptography
SLA	Service Level Agreement
MCC	Mobile Cloud Computing
IBE	Identity Based Encryption
PKI	Public Key Infrastructure
MCC	Mobile Cloud Computing
LDSS	lightweight data sharing scheme
SMD	Smart Mobile Devices
DAPF	Distributed Application Processing Frameworks
LBS	Location Based Services
MEC	Mobile Edge Computing
GPS	Global Positioning System

#### 5. CONCLUSIONS

The prevalence of Mobile cloud computing is blocked by its security widely. The need of security is very much essential on various concerned areas. Our future research would be focusing on enhancement of existing security frameworks & multi-factor authentication technologies for highly secured data using cryptography. Our research goal is to offer a more reliable security in Mobile cloud computing.

#### REFERENCES

- [1] Mobile Cloud Computing Forum, available online: <http://www.mobilecloudcomputingforum.com>
- [2] White Paper, "Mobile Cloud Computing Solution Brief," AEPOA, November 2010.
- [3] Amit K. Sharma, Priyanka Soni, " Mobile Cloud Computing (MCC): Open Research Issues", International Journal of Innovations in Engineering and Technology (IJJET) - Vol. 2 Issue 1 February 2013 ISSN: 2319 - 1058
- [4] C Shrvanathi, H S Guruprasad, "MOBILE CLOUD COMPUTING AS FUTURE FOR MOBILE APPLICATIONS", IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308
- [5] Niroshinie Fernando, Seng W. Loke, Wenny Rahayu, "Mobile cloud computing: A survey", Future Generation Computer Systems 29 (2013) 84-106

- [6] D. Popa K. Boudaoud, M. Cremene, M. Borda, "Overview on Mobile Cloud Computing Security Issues", Tom 58(72), Fascicola 1, 2013
- [7] Abdul Nasir Khana, M.L. Mat Kiah, Samee U. Khan, Sajjad A. Madani, "Towards secure mobile cloud computing: A survey", Future Generation Computer Systems 29 (2013) 1278–1299
- [8] Pragaladan. R, Leelavathi .M, "A Study of Mobile Cloud Computing And Challenges", International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 7, July 2014
- [9] Jaspreet Kaur Aulakh, Sugandha Sharma , Mayank Arora, "Mobile Cloud Computing Security Issues: Overview", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 3 Issue 5, May 2014
- [10] JASLEEN, "Security Issues In Mobile Cloud Computing", Jasleen / International Journal of Computer Science & Engineering Technology (IJCSET)
- [11] Pragya Gupta, Sudha Gupta, " Mobile Cloud Computing: The Future of Cloud", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 1, Issue 3, September 2012
- [12] Nitesh Kaushik, Gaurav, Jitender Kumar, " A Literature Survey on Mobile Cloud Computing: Open Issues and Future Directions", International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 3 Issue 5 may, 2014 Page No. 6165-6172
- [13] Mandeep Kaur Saggi, Amandeep Singh Bhatia, "A Review on Mobile Cloud Computing: Issues, Challenges and Solutions", International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 6, June 2015
- [14] Debabrata Sarddar and Rajesh Bose, "A Mobile Cloud Computing Architecture with Easy Resource Sharing", International Journal of Current Engineering and Technology Vol.4, No.3 (June 2014)
- [15] Gayathri V, Priyadarsini K, "A MOBILE MULTIMEDIA CLOUD COMPUTING ON THE WEB", International Journal of Computer Science and Mobile Applications, Vol.2 Issue. 4, April- 2014.
- [16] Muhammad Shiraz, Abdullah Gani, Rashid Hafeez Khokhar, Member, and Rajkumar Buyya, "A Review on Distributed Application Processing Frameworks in Smart Mobile Devices for Mobile Cloud Computing", IEEE COMMUNICATIONS SURVEYS & TUTORIALS, VOL. 15, NO. 3, THIRD QUARTER 2013
- [17] Mandeep Kaur Saggi, Amandeep Singh Bhatia, "A Review on Mobile Cloud Computing: Issues, Challenges and Solutions", International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 6, June 2015
- [18] S M Shamim, Angona Sarker, Ali Newaz Bahar, Md. Atiqur Rahman, "A Review on Mobile Cloud Computing", International Journal of Computer Applications (0975 – 8887) Volume 113 – No. 16, March 2015
- [19] Yating Wang and Ing-Ray Chen, "A Survey of Mobile Cloud Computing Applications: Perspectives and Challenges"
- [20] P. CHOZHA RAJAN, K. JAYASHREE, "A Survey of Mobile Cloud Computing for Smart Phones", International Journal of Science, Engineering and Technology Research (IJSETR), Volume 4, Issue 6, June 2015
- [21] Hoang T. Dinh, Chonho Lee, Dusit Niyato, and Ping Wang, "A Survey of Mobile Cloud Computing: Architecture, Applications, and Approaches", Wireless Communications and Mobile Computing – Wiley
- [22] Ms. Gayathri M R, Prof K. Srinivas, "A Survey on Mobile Cloud Computing Architecture, Applications and Challenges", International Journal of Scientific Research Engineering & Technology (IJSRET), ISSN 2278 – 0882 Volume 3, Issue 6, September 2014
- [23] Pelin Angin and Bharat Bhargava, "An Agent-based Optimization Framework for Mobile-Cloud Computing", Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications, volume: 4, number: 2
- [24] Debabrata Sarddar, Enakshmi Nandi, "An Authenticate Cryptography based security model for handling multiple request from multiple devices for Mobile Cloud Computing", International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 1, January 2016
- [25] Hitesh A. Bheda, Jignesh Lakhani, "Application Processing Approach for Smart Mobile Devices in Mobile Cloud Computing", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 8, August 2013
- [26] Swarnpreet Singh, Ritu Bagga, Devinder Singh, Tarun Jangwal, "ARCHITECTURE OF MOBILE APPLICATION, SECURITY ISSUES AND SERVICES INVOLVED IN MOBILE CLOUD COMPUTING ENVIRONMENT", International Journal of Computer and Electronics Research [Volume 1, Issue 2, August 2012]
- [27] Mahnoush Babaeizadeh, Majid Bakhtiari and Alwuhayd Muteb Mohammed, "Authentication Methods in Cloud Computing: A Survey", Research Journal of Applied Sciences, Engineering and Technology 9(8): 655-664, 2015
- [28] Richard Chow, Markus Jakobsson, Ryusuke Masuoka, "Authentication in the Clouds: A Framework and its Application to Mobile Users"
- [29] Himabindu Vallabhu, R V Satyanarayana, "Biometric Authentication as a Service on Cloud: Novel Solution", International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-4, September 2012
- [30] 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 ISSN 2250-3153
- [31] B. Sudhanantham, M. Shankar, "Efficient Energy Reduction and Enhancing Security Privacy in Mobile Cloud Computing", International Journal of Innovative Research in Computer and Communication Engineering Vol. 2, Issue 2, February 2014

- [32] Yan Zhu, Di Ma, Dijiang Huang, Changjun Hu, "Enabling Secure Location-based Services in Mobile Cloud Computing", ACM MCC'13, August 12, 2013
- [33] Hassan Reza, Madhuri Sonawane, "Enhancing Mobile Cloud Computing Security Using Steganography", Journal of Information Security, 2016, 7, 245-259
- [34] Seungjun Yang, Yongin Kwon, Yeongpil Cho, Hayoon Yi, Donghyun Kwon, Jonghee Youn, and Yunheung Paek, "Fast Dynamic Execution Offloading for Efficient Mobile Cloud Computing", International Conference on Pervasive Computing and Communications (PerCom), San Diego, March 2013
- [35] Yaser Jararweh, Ahmad Doulat, Omar AlQudah, Ejaz Ahmed, Mahmoud Al-Ayyoub, and Elhadj Benkhelifa, "The Future of Mobile Cloud Computing: Integrating Cloudlets and Mobile Edge Computing", 23rd International Conference on Telecommunications (ICT)
- [36] Hatem M. Abdul Kader, Mohie M. Hadhoud, Salah M El-Sayed, Daa Salama AbdElminaam, "Increasing The Performance Of Mobile Smartphones Using Partition And Migration Of Mobile Applications To Cloud Computing", INTERNATIONAL JOURNAL OF TECHNOLOGY ENHANCEMENTS AND EMERGING ENGINEERING RESEARCH, VOL 2, ISSUE 5 ISSN 2347-4289
- [37] Rambabu V, Dr. R. Shanmugavadivu, "Smart Phone and Mobile Computing: An Introduction", International Research Journal of Engineering and Technology (IRJET) Volume: 03 Issue: 03 | Mar-2016
- [38] S.Masiperiyannan, C.M.Mehathaf Begum, I.Mohammed Farook Ali, G.Mayuri Priya, S.Sudhakar, "Security in Offloading Computations in Mobile Systems Using Cloud Computing", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 3, Issue 3, March 2014
- [39] Alaa Hussein Al-Hamami, Jalal Yousef AL-Juneidi, "Secure Mobile Cloud Computing Based-On Fingerprint", World of Computer Science and Information Technology Journal (WCSIT) ISSN: 2221-0741 Vol. 5, No. 2, 23-27, 2015
- [40] Weiwei Jia yz, Haojin Zhuy, Zhenfu Caoyx, Lifei Weiy, Xiaodong Lin, "SDSM: A Secure Data Service Mechanism in Mobile Cloud Computing", The First International Workshop on Security in Computers, Networking and Communications
- [41] Dr Abdulrahman M. Al-Senaidy, Tauseef Ahmad, "Review On Digital Library Application Services Of Mobile Cloud Computing", INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 2, ISSUE 2, FEBRUARY 2013 ISSN 2277-8616
- [42] Farhad Soleimanian Gharehchopogh, Raheleh Rezaei, Isa Maleki, "Mobile Cloud Computing: Security Challenges for Threats Reduction", International Journal of Scientific & Engineering Research, Volume 4, Issue 3, March-2013 ISSN 2229-5518
- [43] Han Qi, Abdullah Gani, "Research on Mobile Cloud Computing: Review, Trend and Perspectives", University of Malaya, Kuala Lumpur, Malaysia
- [44] Tawfiq S. Barhoom, Mahmoud M. Abu Ghosh, "Reduce Resources for Privacy in Mobile Cloud Computing Using Blowfish and DSA Algorithms", International Journal of Research in Engineering and Science (IJRES) Volume 4 Issue 1
- [45] V.Gayathri, G.Nithya, K.S.Saravanan, M.Jothilakshmi, "PROTECTION ISSUES IN MOBILE CLOUD COMPUTING", INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATIONS AND ROBOTICS Vol.2 Issue.1
- [46] Mrs. Yogita D. Mane, Prof. Kailas K. Devadkar, "Protection concern in Mobile Cloud Computing- A Survey", IOSR Journal of Computer Engineering (IOSR-JCE) ISSN : 2278-0661, ISBN : 2278-8727, PP : 39-44
- [47] Sapna Malik, MM Chaturvedi, "Privacy and Security in Mobile Cloud Computing: Review", International Journal of Computer Applications (0975 - 8887) Volume 80 - No 11, October 2013
- [48] SUGANYA V, SHANTHI A L, "Mobile Cloud Computing Perspectives and Challenges", International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2163 Issue 7, Volume 2
- [49] Vaibhav Kumar, R. P. Ojha, "Mobile Proactive Secret Sharing in Cloud Computing", IJREST: International Journal of Research Review in Engineering Science and Technology (ISSN 2278- 6643) | Volume-1 Issue-2, September 2012.
- [50] Oskar Hamrén, "Mobile phones and cloud computing", Department of informatics, Human Computer Interaction Master's programme
- [51] A. Cecil Donald, S. Arul Oli, L. Arockiam, "Mobile Cloud Security Issues and Challenges: A Perspective", International Journal of Engineering and Innovative Technology (IJEIT) Volume 3, Issue 1, July 2013
- [52] Swati Verma, Deependra Rastogi, "Mobile Cloud Computing: The potential, Challenges & Applications", International Conference of Advance Research and Innovation (ICARI-2014)
- [53] Soeung-Kon (Victor) Ko, Jung-Hoon Lee, Sung Woo Kim, "Mobile Cloud Computing Security Considerations", 보안공학연구논문지 (Journal of Security Engineering), 제 9권 제 2호 2012년 4월

## BIOGRAPHIES



**G. Kishore Kumar** is a research scholar in Department of Computer Science, Chikkanna Government Arts College, Tirupur, India. He has completed Master of Computer Applications [MCA] in Alagappa University, Karaikudi, India. His major field of study in Network Security and Cryptography.





**Dr M.Gobi** is an Associate Professor in Department of Computer Science in Chikkanna Government Arts College, Trippur, India. He teaches courses for BSc Computer Science, BCA and Master of Computer Science (MSc). His research areas of interest include Cryptography, Java, Software Engineering and Information Systems Security.