# AN ANALYTICAL STUDY ON THE PROBLEMS WITH MOBILE CLOUD COMPUTING AND ITS POSSIBLE SOLUTIONS

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**Abstract**
Nowadays, the primary computer device is a mobile phone. People are often requesting more resources than a mobile device can provide. To counteract this, a mobile device needs get assistance from an outside source. One of such channels is cloud computing. The emergence of mobile cloud computing and its potential development are discussed in this essay on cloud computing. It compares the ideas of mobile cloud computing and cloud computing, as well as their features, benefits, implementations, implementation issues, potential solutions, future scope, and analysis.
**Keywords:** Mobile Cloud Computing; Mobile Computing; Cloud Computing; Research Directions

## INTRODUCTION

With the help of mobile devices and cloud computing, mobile cloud computing develops a new system that performs complex computations and stores enormous amounts of data. Data processing and storage are done outside of mobile devices in this current architecture. Technologies for cloud computing are employed in the creation, administration, and hosting of mobile apps. By using a mobile cloud method, developers are not restricted by the smart phone's mobile operating system, processing power, or storage capacity when developing apps with a focus on mobile consumers. Modern technology in general, mobile cloud computing centers may be accessed using a mobile device from a remote web server without typically installing a client software on a receiver computer. With mobile cloud computing, the necessary resources can be accessed through cloud for the operation of these applications in terms of computing, storage and platform support, and a larger number of devices can be supported. MCC offers business opportunities both for mobile network operators and cloud providers. MCC can be further defined by a rich mobile computing technology which utilizes unified elastic resources of different clouds and network technologies to provide unlimited functions, storage and immovability to support a large number of mobile devices anywhere on the Ethernet or on the Internet, regardless of heterogeneous pay-as-you- go environments and platforms.

### Cloud Computing V/S Mobile Computing

Cloud computing and mobile computing all have to do with transmitting data using wireless networks. Cloud computing refers to the specific design of new technologies and services that enable data to be transmitted to a remote, secure location, typically managed by a supplier, over distributed networks via wireless connections. Usually, cloud service providers support many customers. They arrange access between the local or closed networks of the client and their own systems for data storage and data backup. This ensures that the supplier can gather data that is sent to them and store it safely, while providing services through these carefully managed ties back to a customer.
The introduction of modern devices and interfaces applies to mobile computing. Mobile devices that can do a lot of what conventional desktop and laptop computers do are smart phones and tablets. Mobile computing functions include accessing the Internet through browsers, supporting multiple core operating system software applications, and sending and receiving various types of data. As an interface, the mobile operating system assists users by offering intuitive icons, popular search technologies, and basic commands on the touch screen.
Cloud computing is something that is used by many organizations and businesses, but mobile computing is mainly a consumer-facing service. Cloud computing can also support people, although some of the most advanced and advanced cloud computing systems are targeted at companies. The advent of smart phone and

tablet operating systems and, on the cloud end, new networking services that can support these and other devices is an evolving image of the gap between cloud computing andmobile computing.

**ARCHITECTURE**

The following categories of cloud services areincluded in the MCC:

- Distant Cloud for Smartphone
- Distant Cloud Immobile
- Proximate entities in mobile computing
- Proximate entities in immobile computing
- Hybrid

The following diagram illustrates the mobile cloud computing architecture framework:

The general architecture of the MCC can be seen in Figure from the definition of MCC. Mobile devices are connected to mobile networks through base stations (e.g., base transceiver station, access point or satellite) which create and control connections (air connections) and functional interfaces between networks and mobile networks.

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 authentication, authorization, and accounting based on the home agent 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). Generally, a CC is a large-scale distributed network system implemented based on a number of servers in data centres. The cloud services are generally classified based on a layer concept. In the upper layers of this paradigm, Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) are stacked.

**Data centres layer.** This layer provides the hardware facility and infrastructure for clouds. In data centre layer, a Although it is possible to divide the CC architecture into four layers, it does not mean that the top layer must be constructed on the layer immediately below it. For instance, instead of Peas, the Seas application can be deployed directly on Iasi. Also, it is possible to classify certain services as part of more than one layer. Data storage facilities, for example, may be interpreted as either Iasi or Peas. Given this architectural model, users can make versatile and effective use of the services.

**Advantages**

There are several explanations why mobile apps areused for cloud computing. The MCC offers a solution to the challenges usually faced by mobile subscribers.

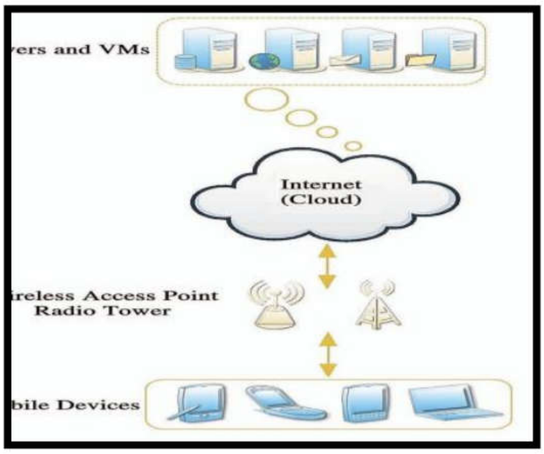


Fig.1. Mobile cloud computing

**Battery:**

In the mobile world, battery life is one of the key concerns. By improving CPU efficiency, using diskscreen in an efficient way to minimize power consumption, there are already many solutions for extending battery lfe. But these solutions usually require improvements in the structure of the mobile devices or a new hardware that raises the price. It isproposed that computing or data offloading techniques move enormous and complex computations from limited resource devices such asmobile devices to powerful machines such as cloud servers. This avoids taking a long execution timeon mobile devices for the application, resulting in a large amount of electricity.

**Data storage capacity/Process power:**

Another challenge is mobile device storage space. Generally, mobile devices have minimal capacity. MCC can be used to view, query or store large data via wireless networks on the cloud to solve this issue. There are many frequently used examples, such as Amazon Easy Storage Service (Amazon53)

In addition, MCC decreases the arid energy consumption of time for compute-intensive applications, which is too applicable when thinking or using devices with limited resources.

**Reliability:**

Using the CC paradigm it is possible to improve reliability since the data and application are restored and saved on several numbers or cloudcomputers. This is what is available

More confidentiality by reducing the likelihood of lost data on mobile devices. In addition. In addition. Digital content copyright and prevent illegal distributions such as music, More video can be found in this model. Security services such as viral detection applications can also be easily provided and used without efficiency

**Privacy**

Privacy is an important issue in private data thinking. As in the CC era, mobile networksuppliers and cloud providers have the sameconfidence problem.

They can monitor all communication and data stored in cloud or network providers, although encryption mechanisms are in place for encrypting or transmitting data.

Stored. Stored. It is therefore a great headache to beresolved from this point of view.

**Communication E**

The communication s composed from multiple parts from mobile subscriber to thecloud provider Therefore there can be some problems like poor network speed orlimited bandwidth. It can be a big concern because the number or mobile and cloud users is dramatically increasing .

**Applications**

The millions of subscribers, hundreds of network providers and cloud providers have been widelyused and are an enormous part of the world's mobile market. There are a number of mobile applications which have begun to benefit from beck; here some typical examples are explainedbriefly.

**Mobile Commerce**

Mobile commerce offers trade using a mobile device, such as mobile telephone, digital personal assistant (PDA). Smartphone’s or other emerging mobile devices such as mobile dashed devices. In m-commerce applications, many functions, such as mobile transactions and payments, mobile messaging and mobile ticketing, are performed. Some services and products include mobile tickets, mobile sellers, vouchers and cards. Mobile banking, mobile brokerage, mobile marketing and advertising services. With multiple products andapplications in m-commerce, there are several challenges such as low network bandwidth, high complexity of mobile device configurations and security/privacy. This results in m-commerce applications being navigated into the cloud computing environment. Certain safety solutions are based on P1. This mechanism uses encryption- based access to secure private access to the data stored in the cloud for subscribers.

**Mobile Healthcare**

Medical applications for treatment of medicines, patient tracking. Etc. Etc. The aim of applying MCC in medical applications is to reduce disadvantages of conventional medicalapplications, such as small physical storage, safety, confidentiality and medical errors. Mobile health provides the following facilities:

1. Patient health monitoring services to be monitored at any time and through Internet or network providers.

2. Emergency vehicle management system for effective and timely access to or management of vehicles in the event of incident or accident calls.
3. Mobile healthcare devices for the pulse, blood pressure and alcoholic integrity detection of the system in the event of an emergency.
4. Store patient health information for medical experiments or research.

Mobile healthcare applications offer easy and fast users access to resources from anywhere at all times. Mobile health applications offer a range of on-demand cloud-based services instead of standalone applications on local computers and servers with cloud. However, solutions must be proposed to protect the health information of participants in order to increase the privacy of users, as in traditionalapplications.

**Mobile Learning**

Mobile learning is context-wide learning and mobile device learning. Its design is based on mobility and electronic learning. Traditional e- learning applications have limits due to high deviceand network costs, low transmission rates of networks and limited educational resources. To solve these problems, cloud-based (mobile learning) m-learning applications are introduced. For example, the applications offer learners much richer services in terms of data (information) size, faster processing speed and longer battery life with the aid of powerful processing skills in large arid clouds.

**Mobile Gaming**

Mobile games tend to be small in size and are oftendependent on playing rather than graphics due to the lack of mobile device processing power. Mobile games are a potential service provider income market, since games can be fully downloaded, so that massive computer resources such as graphic rendering can be operated on the cloud andcustomers can only handle the interface on their mobile devices. This paradigm brings many benefits, such as saving energy, increasing game speed due to the processing power of the cloud. In the case of a steady communication infrastructure, the costs of network communication are a parameter to prevent garnering, on the other hand. In addition, the development and implementation of games is necessary by thinking of such a multiple paradigm that is already well-known in thecloud era.

**CHALLENGES IN MOBILE CLOUD COMPUTING**

Mobile cloud computing, as stated in the previous section, has many advantages and good application examples for noble users and service providers. On the other hand, there are some challenges related to cloud computing and mobile network communication, as mentioned in some parts. This section explains these obstacles and solutions.

Mobile Side Challenges2.

The main obstacles and solutions on the mobilenetwork side are listed below:

Low Bandwidth:

In mobile cloud environments nearby, the bandwidth is one of the important issues, because mobile network resources are much smaller than traditional networks. P2P Media Streaming therefore allows users to share a limited bandwidth with the same area for the same content as the samevideo. This method allows each user to transmit or exchange parts of the same content with other userswhich improve the quality of the contents, particularly for videos.

Availability

Network failures, signal failures and poor performance issues associated with high traffic are the main threats preventing users from connecting to the cloud. But mobile users can be helped by some solutions if the clouds are disconnected. One of these is Wi-Fi Multi-port MAPdET. This is an infrastructure-free distributed content sharing protocol [7). In this mechanism, nearby nodes are detected in this case, mobile users can connect withthe cloud through neighbouring nodes rather than having a direct link to the cloud? While some considerations are made about security problemsfor these mechanisms, these problems can also be resolved.

Heterogeneity:

Network types, such as WCDt4A, GPRS, IMAX, CDMA2000, and WLAN, are used in a mobile environment. As a result, it becomes very difficult to handle the like of heterogeneous network connectivity while meeting mobile cloud computing needs, including connectivity on demand, scalable connectivity and the arid energy efficiency of mobile devices. This can be addressed by using standardized interfaces and messaging protocols for reaching, managing and distributing content.

Pricing:

Using multiple services in mobile requires with both mobile network provider and cloudservice provider. However, these providers have different methods of payment and prices for services, features and facilities. Therefore, this has possibility of leading to many problems like how to determine price, how the price could be shared among the providers or parties, and how the subscribers can pay. As an example, when a mobile user wants to run a riot tree mobile application on the cloud, this participates three stakeholders as one of them is application provider for application licence, second one is mobile network provider for used data communication from user to cloud, and third one is cloud provider for providing and running application on the cloud.

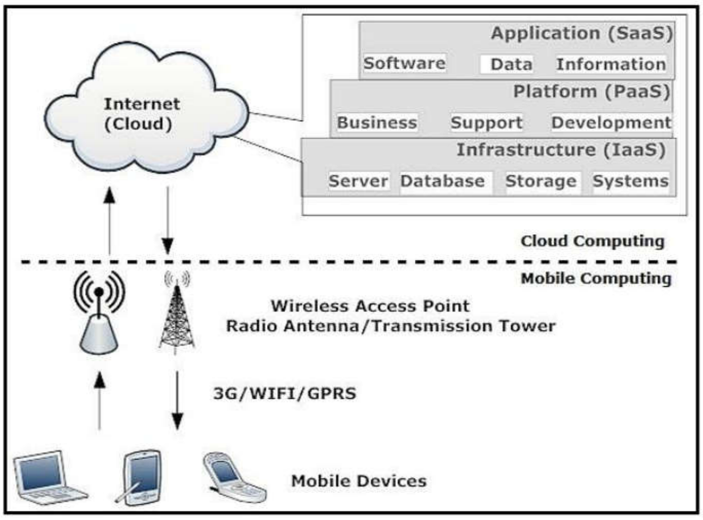


Fig.2. Architecture of Mobile cloud computing

**Computing Side Challenges**

Computing Offloading:

As previously mentioned, offloading is one of MCC's key features for improving battery life and increasing the performance of applications using the cloud? While this solution is very useful for process power and storage, in my situations it can be ineffective. For example, mobile devices can use the cloud rather than local processing to consume more energy for an application. The use of the mobile device rather than the cloud could be more effective at a critical threshold. Therefore, it is difficult to estimate or calculate the optimal means of trade-off between communication and calculation costs for mobile applications. The cost of communication mainly depends on the size and bandwidth of the transmitted data and the calculation costs can be defined with the calculation time. Optimal decisions or partitioning of programs can be made by using and operating cost algorithms dynamically at runtime.

Security

Confidence is the main issue for mobile platform subscribers. When it comes to MCC, this issue is increasingly important as stakeholders increase the cloud environment to protect privacy and information confidentiality. As mobile users, there are several security threats, such as malicious codes such as viruses, worms, Trojan and horses and privacy concerns, as they look at integrated global positioning system (GPS) devices that can lead subscribers to track. To overcome this problem, safety programs can be executed on mobile devices for preventive threats, but these programs use a large amount of mobile device resources during operations. Some approaches therefore move the ability to detect threats from mobile to cloud. For example. For example. Cloud AV platform provides a multiple cloud and mobile malware detection service. A simple, light-weight component of the app runs on the mobile device and communicates in the cloud with the main component. Detection capabilities are removed from the cloud, as the mobile agent application sends background file parts WI to the cloud server application.

Authentication

Although both applications developers and mobile users benefit from the storage and processing of a large number of cloud data/applications, data or apps in terms of rights and authentication must be handled with care. Users tend to use small passwords when accessing external resources, so secure authentication mechanisms are needed. Trust Cube can be given as an example of the authentication method. It is a cloud authentication mechanism based on policy that uses open standards and integrates different kinds of authentication. The system architecture shows the security of users for authentication of resources. When a web server receives a request from the mobile device, the web server sets a request with the details of the request to the Integrated Authenticated Service (lass), extracts information and controls the message policies. You send an inquiry via a secure network connection protocol to the IA Server (TNC). IA Server takes the inquiry and answers ¡AS with a generated authentication rules report. JAS determines the result of authentication and sends it to the web server. The user can therefore be authenticated at the end ornot.

Data Access

As cloud services grow, the number of cloud data resources increases rapidly. The management of access to these data resources in the way of storage therefore becomes very challenging. Cloud storage providers, such as Amazon S3, perform jobs generally in all input-output operations, increasing the cost of data communication and processing for their mobile customers. Some solutions offer an efficient and cheaper way to use block-based I/O algorithms instead of tile level. This solution does not transmit all tiles but rather data blocks in case of need, which are very useful through time and network communication costs.

| Challenges | Solutions |
|---|---|
| **Limitations of mobile devices** | Virtualization and Image, Task migration |
| **Quality of communication** | Bandwidth upgrading, Data delivery time reducing |
| **Division of applications services** | Elastic application division mechanism |

Challenges and solutions of mobile computing

**OVERCOMING CHALLENGES**

Mobile cloud computing is confronted with unique latency challenges. The promise of access anywhere and with any device requires greater efficiency in the delivery of service applications.

Among the key challenges identified in mobile cloud computing are:

- Reducing network latency to allowinteractivity for apps and code download
- Improved bandwidth network to acceleratedata transfers within the cloud and other devices.
- A scalable way to monitor network conditions to maximize network and device costs parallel to cloud applications' performance.

These challenges are fundamental to user expectations, but they are not easy to achieve. Therefore, several network and service providers have already taken the next steps in improving mobile cloud computing services.

Improving latency setbacks The challenges of latency can be enhanced by keeping the applications as close to users as latency is substantially affected by distances. "As pushing content, such as video and podcasts nearer the device, saves bandwidth and cuts transmission delays, the distribution of [so] highly immersive applications such as real-time translation," Larsen said. This will improve the latency by enabling services to logically redirect internet traffic on location and cache capabilities, thereby efficiently saving bandwidth. Improvement of mobile cloud solutions Larsen says, "the mobile device is a resource poor device and this won't change in the years that follow. Rich interactions will also kill batteries, so that mobile applications

will store your data in the cloud compared to mobile devices, and applications will become more powerful when processing power comes to the cloud."More and more providers have offered 4G/LTE services to deal with mobile device problems which have advantages of data storage, low latency, plug and play features. LTE is also loaded at the speed thatis able to download 100 Mbps peak rates and 50 Mbps upload.
"A great question for developers is how to manage the multi-screen experience in the mobile environment," says Larsen, a scalable and dynamic monitoring network. If the user starts a tablet session and then moves to a Smartphone or car, for instance, how can we check in and out data automatically? The problem is stickiness, not just supply. You then need a decent interconnection with management consistency. "Latency and bandwidth problems may have been solved, butnetwork performance monitoring is yet another problem. It is important to have a dynamic cloud performance system that can re-route, swap and transfer traffic. In view of all these key challenges, mobile computing remains viable for the business and favored by more cloud users.

## CONCLUSION

The goal of mobile cloud computing is to provide smooth and robust services to mobile users regardless of the resource constraints on their mobile devices. Although it is still in its infancy, mobile cloud computing has the potential to replace traditional mobile application models in the future.
We did a thorough review of recent research on mobile cloud computing in this study. We also highlighted the reason for mobile cloud computing by presenting several meanings of the term in the literature. A taxonomy of the concerns in this field and solutions to those problems have been developed, with an emphasis on operational level, end-user level, service and application level, safety, and context awareness. With recent workshops in the area of mobile cloud computing, such MobiSys22MCCTA,23 CMCVR24 and MCNCS25 they are still in their infancy. A mobile cloud framework can allow numerous new mobile applications, when much more resources are made available for the mobile device (via the mobile cloud facility). The future can also explore the potential of local mobile clouds, which are computer collections in omnipresent devices such as shoes, clothes, watch making, jewelry, furniture and other everyday objects. And so there will be new forms of infrastructure, platform or application that are available as services: the infrastructure might be a powerfully massively distributed set of cameras on stationary and mobile devices, formed ad hoc and measured to cover an event or a collection of distributed computers that can seamlessly compute a job on the user's mobile devices while the user shopping. A car can sell its computer resources and pay for its own parking or computer collection on crowds of people in a busy environment forms a 'elastic' ad hoc resource. Context sources or sensors (and sensor networks) may also be found in the vicinity of a mobile user sold for mobile users to support context-aware applications. There are, however, challenges to "elastically" form service and resource clouds efficiently, seamlessly and robustly.

## REFERENCES

1. M. Satyanarayanan, “Fundamental challenges in mobile computing,” in Proceedings of the 5th annual ACM symposium on Principles of distributed computing, pp. 1-7, May 1996.
2. Xinwen Zhang, Joshua Schiffman, Simon Gibbs, Anugeetha, and Sangoh Jeong. Securing elastic applications on mobile devices for cloud computing. In CCSW "09: Proceedings of the 2009 ACM workshop on Cloud computing security, pages 127–134, New York, NY, USA, 2009. ACM.
3. C. Hewitt, “Orgs for scalable, robust, privacy-friendly client cloud computing,” Internet Computing, IEEE, vol. 12, no. 5, pp. 96–99, 2008.
4. R. Buyya, C. Yeo, and S. Venugopal, “Market-oriented cloud computing: Vision, hype, and reality for delivering it services as computing utilities,” in High Performance Computing and Communications, 2008. HPCC"08. 10th IEEE International Conference on. IEEE, 2008, pp. 5–13.
5. L. Youseff, M. Butrico, and D. Da Silva, “Toward a unified ontology of cloud computing,” in Grid Computing Environments Workshop, 2008. GCE"08. IEEE, 2008, pp. 1–10.
6. M. Satyanarayanan, “Mobile computing: the next decade,” in Proceedings of the 1st ACM Workshop on Mobile Cloud Computing & Services: Social Networks and Beyond (MCS), June 2010.

7. A. Zahariev, "Google app engine," Helsinki University of Technology, 2009. [8] (2011) Microsoft azure homepage. [Online]. Available: http://www. windowsazure.com/en-us/
8. M. Ali, "Green Cloud on the Horizon," in Proceedings of the 1st International Conference on Cloud Computing (CloudCom), pp. 451 - 459, December 2009.
9. Jacson H. Christensen, "Using RESTful web-services and cloud computing to create next generation mobile applications," in Proceedings of the 24th ACM SIGPLAN conference companion on Object oriented programming systems languages and applications (OOPSLA), pp. 627-634, October 2009.
10. L. Liu, R. Moulic, and D. Shea, "Cloud Service Portal for Mobile Device Management," in Proceedings of IEEE 7th International Conference on e-Business Engineering (ICEBE), pp. 474, January 2011.
11. I. Foster, Y. Zhao, I. Raicu, and S. Lu, "Cloud Computing and Grid Computing 360-Degree Compared," in Proceedings of Workshop on Grid Computing Environments (GCE), pp. 1, January 2009.
12. N. Loutas, V. Peristeras, T. Bouras, E. Kamateri, D. Zeginis, and K. Tarabanis, "Towards a reference architecture for semantically interoperable clouds," in Proc. IEEE 2nd International Conference on Cloud Computing Technology and Science (CloudCom"10), Dayton, OH, USA, Dec. 2010, pp. 143–150.