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A Survey of Mobile Cloud Computing

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Abstract: ***Cloud computing is a model driven methodology that provides configurable computing resources such as servers, networks, storage and applications as and when required over the internet services. Cloud computing provides high performance networks and advanced development of internet. There are many services related to cloud computing are becoming popular to the end users. There are many smart phones, smart pads and other mobile equipment's and end users can access the cloud computing services through this devices. In Mobile Cloud Computing (MCC), there are two devices such as a physical device in real world and a virtual device in cloud computing environment. Mobile Cloud computing integrates the cloud computing into mobile environment and remove the obstacles related to the performance, and security in mobile computing. There are several security issues that are arises while integration of a mobile application in Mobile Cloud Computing environment [1].***
This paper enlightens the current trend in Mobile Cloud Computing Security, and different algorithms used for various functionality.
Keywords: Cloud Computing, Mobile Cloud Computing [MCC], projects of MCC, Issues in Mobile Cloud Computing.

I. INTRODUCTION

A. Cloud Computing

Cloud computing is the technology of distributed data processing in which some scaler information resources and capacities are provided as a service to multiple customers through internet. The cloud computing can do the storage and computing tasks for us, we only need computer with the internet connection, there is no need to install a particular application. The users didn't need to know the internal details of cloud, with direct access to the infrastructure, the related resources can be able to use. The variety of applications can be achieved on the network area and store the large amount of data.

1) Cloud Computing Has Following Characteristics

a) Shared / pooled resources
b) Broad network access
c) On-demand self-service
d) Scalable and elastic.

2) Cloud Computing Services Can Be Categorized As

a) SaaS (Software-as-a-service)
b) PaaS (Platform-as-a-service)
c) IaaS (Infrastructure-as-a-service)

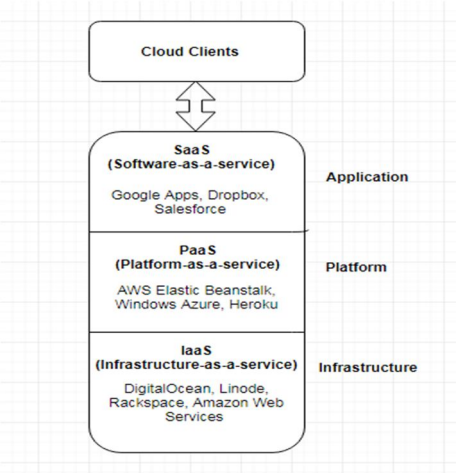


Fig 1: Cloud Computing Architecture

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B. Mobile Cloud Computing (MCC)

Mobile Cloud Computing is a concept that can be described as availability of cloud computing services and resources in terms of mobile services. "Mobile Cloud Computing is an infrastructure where data storage and data processing happen outside of the mobile device. Mobile cloud applications move the computing power as well as data storage into the cloud, bringing applications and MCC to not just smart phone users but also a much broader range of mobile subscribers."

The "computing" component of the cloud consists of a number of pre-configured, pre-built and scalable services for consumption with mobile applications. Cloud run-times provides a mechanism to offload business logic from mobile devices. All these suitable within the cloud platform as a service (PaaS) model and are collectively known as mobile back-end as a service (MBaaS).

The following are factors to the adoption of mobile cloud computing:

1) Trends and demands
2) Improved and increased broadband coverage
3) Enabling technologies

II. SURVEY ON EXISTING PROJECTS OF MCC

The existing project has number of solutions that have been proposed in the scientific journals and conferences for implementing MCC.

A. An Efficient Encryption Scheme with Verifiable Outsourced Decryption in Mobile Cloud Computing

Jing Li, Zhitao Guan [2] developed an public key encryption scheme, Attribute-Based Encryption (ABE), especially the Cipher text Policy Attribute-Based Encryption (CP-ABE), has been used for realizing fine-grained access control on encrypted data stored in MCC. The computational overhead of encryption and decryption grow with the complexity of the access policy. Hence, maintaining data security as well as efficiency of data processing in MCC is important and challenging issues. An efficient encryption method based is used on CP-ABE, which can lower the overhead on data owners as well as reduce the decryption overhead on data receivers, also an additionally a verifiable outsourced decryption scheme is imposed. Because of security analysis and performance evaluation, the proposed scheme is proved to be secure as well as efficient.

Cloud computing is an emerging paradigm where ABE is widely used for realizing access control in cloud. Generally, users encrypt their data in local and store them into cloud. However, maintaining data security and system efficiency meanwhile is a challenging issue. Existing schemes seldom take efficiency of data encryption into consideration. To solve this problem, this paper proposes an efficient encryption scheme based on CP-ABE, which can guarantee secure data access as well as reduce overhead both on DO and DR.

B. Development of Electronic Locks Using Gesture Password of Smart phone Base on RSA Algorithm

Chin-Tan Lee, Yi-Chin Chung [3] uses Following process to developed electronic locks:-

A smart phone is connected to a development board at the receiver-end via Bluetooth. After getting the gesture password, users can upload the door lock information onto the cloud server via Wi-Fi without using their personal computer (PC). This project focused on the use of RSA algorithm for data encryption before initiating Bluetooth transmission. When the receiver-end receives data, the data are decrypted using a microcomputer, which enhances the security of Bluetooth transmission. Also enhances the security of Bluetooth transmission. This study was conducted in four phases:

1) Unlocking application by using gesture password
2) RSA encryption/decryption
3) Hardware circuit integration
4) Integration of cloud service platform and monitoring system.

IoT is critical in the development of electronic application. Almost all electronic products are integrated with IoT technologies. However, whether consumer electronic products will be prevalently used is determined by their cost and convenience of use. The RSA algorithm developed in this study was applied in a novel gesture password electronic lock system, using smart phones as the communication carrier and unlocking device. The proposed system features the strengths of RSA encryption, is convenient to use, and involves low manufacturing cost, making it an affordable choice for consumers. Given that data can be securely transferred using a mobile phone with RSA-based gesture password, this study concludes that during data transmission, using RSA algorithm for data encryption is considerably more secure. This is comprehensive door lock system that features a simple, easy-to-use human–machine interface and can be used by all age groups.

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C. *Resource Scheduling Based on Improved FCM Algorithm for Mobile Cloud Computing*

With the development of mobile devices, mobile cloud computing is becoming increasingly important. One of the basic questions in mobile cloud computing is how to match user demand with cloud server resources. Based on Improved FCM (IGAFCM) Algorithm, Wu Hong-Qiang, Li Xiao-Yong [4] proposes a scheduling scheme which is provided for mobile resources to cluster continuously, so as to reduce the size of the matching requirements during the search. Moreover, Experiments have proved that matching strategy is dynamically adjusted according to the matching score and feedback training. An improved FCM (IGAFCM) algorithm is proposed in the process of mobile resource scheduling. IGAFCM algorithm can reduce the scale of resource scheduling and screen candidate results in real time by customized rating mechanism to provide users with satisfied results. Besides, the IGAFCM algorithms have a certain dynamic resource monitoring capabilities. Under normal circumstances, it can re-clustering quickly to maintain a good operating efficiency and ensure the good user satisfaction.

D. *Process State Synchronization for Mobility Support in Mobile Cloud Computing*

Mobile Cloud Computing extends cloud services to the resource-specific mobile devices. Compute- intensive mobile applications can be implemented using cloud either in client/server model or through cyber foraging. Because of long or permanent network disconnections found that user motility increase the execution time and in certain cases abstain the mobile devices from getting response back for the remotely performed execution. Ejaz Ahmed, Anjum Naveed [5] uses process state synchronization (PSS) as a mechanism to attenuate the impact of network disconnections on the service continuity of cloud-based interactive mobile applications. They propose a mathematical model that incorporates the disconnection and synchronization duration, and mobile device capabilities along with cloud to validate the PSS-based execution. This research studied the impact of smart phone user mobility on the execution of cloud-based mobile applications. In this project, they proposed process state synchronization based execution management as a solution to the problem where the execution state of the cloud-based mobile application was periodically synchronized with the mobile device. Prototype implementation of PSS with the computed synchronization intervals confirmed the analytical results. They compared PSS with the state of the art and found that PSS outperformed the distributed shared memory based solution for thread synchronization by up to 47% and optimized VM overlay based solution by up to 35%.

III. ISSUES IN MOBILE CLOUD COMPUTING

Cloud has more powerful computation ability while computation ability of mobile devices has a many limits, because of that so many issues occur at mobile level. So there are some issues in implementing cloud computing for mobile devices. Some issues are explained as follows

A. *Limited Resources*

Mobile devices have a limited no of resources because of that implementing cloud computing in mobile devices is difficult. There are some basic limitations related to limited resources are limited computing power, limited battery and low quality display [6].

B. *Network Related Issues*

The processing of MCC is performed on network. There are some issues related to the network like latency, availability, Bandwidth and heterogeneity.

C. *Security*

Mobile devices have almost same functionalities like a computer. So mobile devices also have to face problems related to security and privacy. Mobile devices have numerous security threats like malicious codes and their vulnerability. To overcome the problem of threat detection services are now run on cloud but they also face some security issues are like device security, privacy of mobile user and storing data on cloud etc. There are so many security threats like hacking, viruses, Trojan horses in mobile devices also. The global positioning system (GPS) can cause the privacy issues for users [7].

Name of the Attack	Description
Information disclosure	The secure information of owner is disclosed to any unauthorized user.
Tampering	When any unauthorized person does some Changes in other user's data.
Repudiation	When a person refused after sending a message that he did not send it.
Viruses and worms	These are very known attacks. These are the codes which degrade the performance of any application.
Identity Spoofing	In this attack a person impersonate as someone who is the owner of the data.

Table 1: Different Security Threats

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D. Low Bandwidth

This is one of the biggest issues, because the radio resource for wireless networks is much more insufficient than wired networks. To overcome this problem share the limited bandwidth among mobile users who are located in the same location, same workspace etc. and involved in same content [8]. Because of sharing the limited bandwidth among mobile users it will balance the trade-off between benefits of the assistance and energy costs.

E. Service Availability

Service availability is most important issue in MCC as compared to cloud computing with wired networks. Mobile users may not able to connect to the cloud to obtain service due to network failures, traffic congestion, and the out-of-signal.

F. Pricing

MCC involves with both cloud service provider (CSP) and mobile service provider (MSP) with different customers management, services management, methods of payment and prices. This will lead to many issues. The business model including revenue sharing and pricing has to be carefully developed for MCC.

IV. FUTURE RESEARCH DIRECTIONS

Nowadays, MCC has facing so many issues we have to overcome all those issues like, Security, privacy, Bandwidth and data transfer, Data management and synchronization, Energy efficiency, Heterogeneity etc.

The security should be assured in different levels of MCC including access control level, communication level and data center level. The end to end authentication should be done to cover all the layers of MCC architecture (i.e., mobile user layer, mobile network layer, and cloud service provider layer.)The bandwidth optimization should be done and loading scheduling can help mobile users to effectively share wireless network bandwidth. There should be a proper offloading scheduling base on energy consumption metrics as well as Execution partitioning models based on energy consumption metrics. Heterogeneity should be approached in different levels of mobile cloud computing including mobile devices level, network level and cloud level.

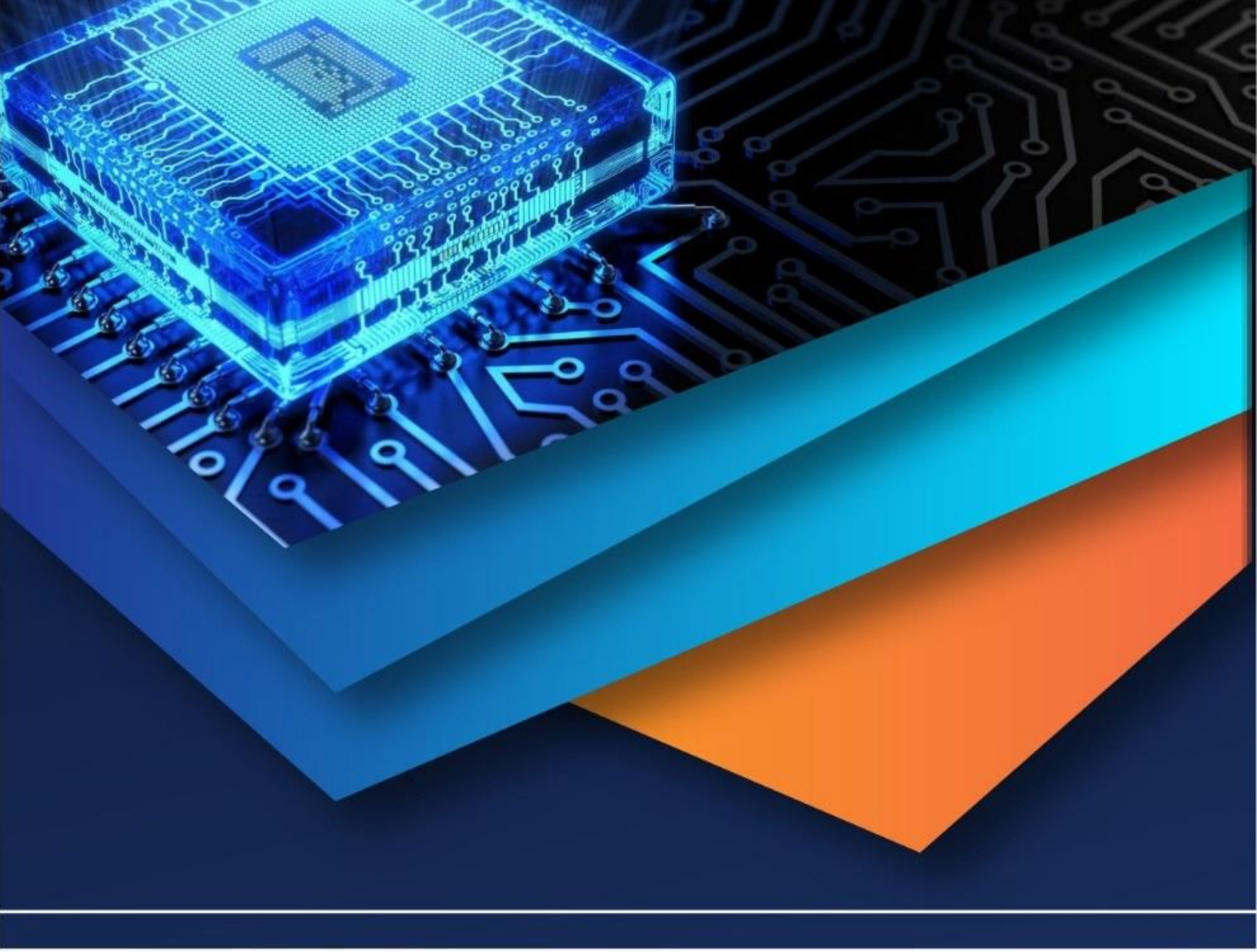
V. CONCLUSION

This paper surveys recent research activities on Mobile Cloud Computing. Mobile Cloud Computing aims to utilize cloud computing techniques for processing and storage of data on mobile devices, thereby reducing their limitations. Several problems would challenge the development, including intrinsic nature of mobile device and wireless connection. To overcome that problems there are different algorithms developed. Using that algorithms we can overcome to that problems.

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