Secure Cloud Risk Architecture analysis for Mobile Banking system and its performance analysis based on Machine learning approaches

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Abstract. With advances in the mobile communications, many service-related tasks can be made quickly and easily. Mobile banking is one such service that has eliminated the need for a consumer to go to a branch to carry out many common transactions. In a country like India, where the last mile reach through brick-and-mortar banking facilities, mobile phones can complement the reach. This paper describes how mobile cloud architecture can be employed for banking and services to customers to enhance their banking experience as well as ensuring information security. This paper focuses on cloud-based risk architecture for banking solutions to address various issues related to mobile banking such as processing speed and storage capacity. Improved random forecast algorithm is used for the evaluation of the system. This proposed system achieves 99% of the system.

1. Introduction

Mobile communication is rapidly increasing in the business environment. Use of multiple sim cards and mobile phones is a common sight nowadays. This progress made mobile banking reach customers easily. Mobile banking evolved from e-banking with internet banking acting as its backbone. Mobile banking (M-banking) system is not only used to transfer funds through an electronic signal but has encompass various services that were happening at the bank branch. Mobile banking system is expected to hold a great future for the developing countries.

As a piece of security execution in bank’s specialized foundation different security checks as computerized endorsements for gadgets, once secret key token, program assurance strategies, exchange observing, against tax evasion and extortion recognizing frameworks are set up [20]. These gadgets and frameworks gives powerful safety efforts for the banks simultaneously they meet the administrative necessities to secure information of the clients. With development of web, company working in Banking and financial administrations began offering their items and administrations through web based stage and machines (ATMs) situated in distant areas without making clients to visit its branches. It will require adaptability. [28].These administrations can be benefited without visiting the genuine part of the bank. These items can be gotten to through web. This causes bank to accomplish operational proficiency through quicker conveyance of administrations, decrease cost of activity of branch, work with lesser staff, offer serious types of assistance, settle on quicker choice continuously for clients and spotlight on client needs to offer customized administrations. Rajeswari. etal have been focused on machine learning concepts and architecture concepts [25], [26].

Developing countries have been increasingly dependent on mobile services for various services. A mobile banking system provides various financial service operations, such as funds transfer services, bill payment facilities and other customer services. Mobile banking services are provided financial transactions through mobile devices by using smartphones. It can be operated at any
time or at any where remotely through the mobiles. Mobile banking is available 24-hour basis. So that Mobile banking system is more reliable than internet banking system. Mobile banking offers various services such as account alerts, security alerts, customer services through mobiles, account balances and updating bank account, bill payment through mobile devices based on mobile client applications and mobile commerce applications. Even access to customer services is possible through mobile banking communications.

Mobile phones provide the required user interface for basic mobile banking technology. Applications providing such services are richer and faster and provide reliable services in rural areas when compared to the traditional banking or e-banking. The combination of client applications and server components may provide access to all functionalities through strong authentication and customization. Mobile client applications are created based on different market demands. From a technical point of view, mobile client applications use handsets to access servers to provide various banking functions. This system ensures a strong authentication. The most challenging task is to develop applications that can be accessed from various models of mobile phones, which are supported by different types of hardware and software. The primary operating systems used are Microsoft Windows, Palm, Linux, ios, Symbian and Android. The major contribution of the paper are given below.

- Architecture analysis for designing the banking system
- Cloud risk management model for banking system
- Security for digital and mobile banking system.

Presently Cloud-based M-banking addresses significant issues such as processing speed and storage capacity. Herein, the basic cloud computing framework. Section 2 describes the related work. In Section 3 presents about internet banking system and Section 4 provides software architecture of the system. Section 5 explores the conceptual architecture of the banking system. Section 6 presents the cloud risk management model for the banking system. Remaining sections take a look into the mobile cloud architecture for the providing the security for digital banking system. Section 9 discusses the results and discussions. Conclusions are given in last section.

2. Related work
Mobile phone technology is a well-received technology in India. The success of mobile services in India is attributed to the technology and consumer confidence. Hassan et al. introduced software reuse in cloud computing [1]. Donner et al. explore how mobile banking is closely linked with economic development. Ackermann et. al. [2], [4] proposed a roadmap for framework of risk management to implement the Cloud computing. Alliance et al. [7] Critically reviewed the security threats to cloud computing. Dimitrios Zissis et.al [6] addressing the computer risk securities. Anthony Bisong etal. provide information about information security in enterprises. C.Y. Zhang et.al. [11] have been done work on Data Intensive applications. Donner.et.al. have been done work on Mobile banking and economic development [20]. Rajeswari.et.al. have been focused on Cloud computing concepts [25]. A cloud climate is dependent upon similar dangers as a conventional corporate organization just as new roads of assault by method of shared assets, cloud supplier work force and their gadgets and outsider accomplices of the cloud supplier [8].
3. Internet Banking system
It provides virtual banking facilities, and clients can access their account through personal banking websites. Customers can perform banking transactions electronically with the help of the Internet facilities. It is an electronic payment system that allows the customers to provide money transactions such as bill payments, balance enquires, payment orders, stop transactions through bank’s website at anytime, anywhere. First, the bank customer needs to register his or her details through the bank’s website. Customers can perform banking transactions electronically with the help of the Internet facilities. It is an electronic payment system that allows the customers to provide money transactions such as bill payments, balance enquires, payment orders, stop transactions through bank’s website at anytime, anywhere. First, the bank customer needs to register his or her details through the bank’s website by setting up user name and password.

4. Software Architecture
The structural relationship between the components and connectors is provided by the software architecture, which is mainly focused on the design aspects of various systems [1]. The main aim of the software architecture for a software system is to achieve certain quality attributes for the system. Several parameters are considered during the implementation of a system. In particular for the banking system, the quality attributes of system performance are primarily considered. Other important factors are security and reliability considering that the staff of the bank and the customers carry out different transactions through the same system.

5. Conceptual Architecture of Banking System
Conceptual architecture describes a system in the terms of concepts and functions [13]. The conceptual architecture for the banking system consists of three levels. Level 1 consists of the types of banks, types of Transactions, and the different modes of transactions. Level 2 describes the type of bank: international banks, national banks and local banks. Finally, level 3 includes various methods.
6. Cloud Risk Management Model

Presently, risk management techniques are applied for the information systems on IT projects. [4]. We propose the risk management process as a solution to preserve the quality and integration of a project at low cost. It will improve the probability of the success of a software project [3]. The cloud computing risk management model can be used to improve the banking system and security [15].

7. Proposed Cloud Risk Security Model For Mobile Banking System

We propose a cloud-based framework for risk management process. This framework includes five components: cloud mobility services and cloud banking applications, cloud service operations, cloud deployment services, cloud risk management operations and cloud security services [5]. Currently, the predominantly used cloud service model is IaaS. It deals with computer and resources such as virtual machines, servers, network components and storage components with computers acting either as physical machines or as virtual machines. Currently, risk management is considered to be significant for information systems managers [10].
8. Mobile Cloud Architecture for Digital Banking System

Infrastructure layer: Cloud computing has three delivery models, namely, IaaS, PaaS and SaaS. IaaS is used to provide computer, network and storage facilities. PaaS is used to develop applications that can be used for their business applications. Cloud-based architecture provides secure public cloud and private network services [8], [12].

Data link layer: Data types range from customer data, transaction data, wire data, and customer relationship data. Hadoop can be used to support the operational data, built at a fraction of the cost and effort involved with the older types of data technology. Hadoop-based systems help retain data for a long time with predictive models on data [9]. Massive calculations can be run quickly.

API and UX layer: This provides a seamless method for performing e-banking and mobile transactions. API is closely related to the client side and predictive analysis. Predictive analysis and business layer: Financial services firms provide a great opportunity for business process automation, driving revenue and contributing to the bottom line.

8.1. Information Security Management Services For Banking

For banking and financial administrations, cloud foundation should inside the purview of the country. Nonetheless, the clients who are getting to cloud foundation are found distantly. Clients who are keeping up cloud administrations and information can be redistributed for cost productivity. Notwithstanding, these clients are needed to be overseen by personality access the board framework [14]. These clients may change over the period, so there will be various individuals approaching framework and information. Banking and budgetary companies might not have command over these clients [15]. Banking operational services are measured for doing the information security and privacy issues [21], [22], [23]. Secure deletion of data, and forensic capabilities [16], [17], [18].
9. Results and Discussion

9.1. Descriptive analysis of Mobile banking system

Various services are provided nowadays through mobile banking. A descriptive analysis is performed based on the design process such as services provided by mobile banking, security analysis from banking professional’s point of view. This table shows the mean, standard error, variance for various services such as deposits, withdrawal service, money transfer services, foreign remittance service and checking balance [28]. These services were offered to consumers through mobile banking [29]. Mobile banking system operations are either highly or fairly secured. We should think about confidentiality of the PIN number. According to Table 1, about someone’s PIN without proper authorization. Forty per cent of respondents think that it is too difficult to access someone’s PIN without authentication. The below table 6 shows the security of mobile transfer and figure 7 shows graphical presentation of the security of mobile transfer.

| Sl.No | Safety position of PIN | Percentage |
|-------|------------------------|------------|
| Total responses | 47 | 100 |
| Secured at high level | 25 | 53.2 |
| Secured at low level | 18 | 38.3 |
| Neither secured nor unsecured | 4 | 8.5 |
| Highly secured or fairly secured | 0 | 0 |

Table 1. Security of mobile transfer

The above fig. 8 presents the safeties of PIN/Percentage. Table 3 presents the trend analysis of mobile banking users. Table 4 shows the number of mobile phone users per each year.
9.2. Improved Random Forest algorithm

Improved Random forest algorithm can be used to increase the learning activities of the efficiency by choosing attributes and to train the bank customers. The following figures select the
subset of samples based on random selection and train the learning algorithm by using the subset. This process is to be continued to achieve certain number by using the number of learning algorithms. It is used for the classification of assembly to get prediction.

Input: A decision tree inducer
T is the number of iterations
S is the training set and the sub-sample size
N is the number of attributes used in each node
Ensure  Mt : t=1,...,T
1. T tends to 1
2. Repeat the steps
3. Si tends to sample p instances from S with replacement.

![Random forest algorithm](image1)

**Figure 9.** Random forest with different entropy values

![Precision, recall, F1 score, support values](image2)

**Figure 10.** Precision, recall, F1 score, support values

4. Build classifier Mt using decision tree inducer of N
5. t=t+1
6. Until t > T

9.3. **Experimental results and Evaluation**
System implementation can be performed by using python script language. Random forest algorithm is used to determine accuracy, precision, recall, F1 score. n specifies the number of estimators. The below figure shows the accuracy, precision, recall, F1 score. Cumulative Accuracy values: Cumulative accuracy values are to be determined by taking data values with respective positive response values. The below figures shows theCumulative accuracy curve and performance values of the system. It achieves the accuracy 0.99
Figure 11. Accuracy values of the system

10. Conclusion
Mobile banking system is considered to be an important phenomenon in India’s banking sector. Security of mobile banking is concerned with PIN confidentiality. Many difficulties are faced during the implementation phase. This type of system offer more convenient, easy to use and secured service of Indian people. Now a day’s people are moving to do their services through mobile phones. It is easy to use and provide secured banking services. This current technology may become most popular in developed world. It is operated at great speed with current fixing facing problems.

In this paper Mobile cloud architecture for banking system is presented for accessing mobile services at anytime, anywhere though cloud server with the help of mobile devices. Risks are also covered during the storage of data in cloud server based on cloud risk model. Results and discussions are presented based on descriptive analysis of Mobile banking system based on random forest algorithm. Now a day’s people are moving to do their services through mobile phones. It is easy to use and provide secured banking services. This current technology may become most popular in a developed world. It is operated at great speed with current fixing facing problems. This system achieves the 0.99 accuracy.

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