1. Introduction

The National Institute of Standards and Technology, U.S. defines Cloud computing as a model for sanctioning omnipresent, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) which will be quickly provisioned and free with minimal management effort or service supplier interaction. Development of technologies like Virtualization, Utility and Grid Computing, information Centre Automation, Service orienting design, etc., result in the evolution of cloud computing.

2. Cloud Computing

2.1 Delivery Models

The three major delivery models of cloud computing are as follows:

- Infrastructure as a Service (IaaS) - delivery of computer infrastructure as a service using platform virtualization, net property, utility computing billing\(^1\)\(^2\).
- Platform as a Service (PaaS) - for developing web-based applications,
- Software as a Service (SaaS) - may be a software distribution model within which software is created available via internet in pay-as-you-go model\(^3\).

Apart from the above models, anything can be made as a service called Everything as a Service (XaaS). Examples of XaaS are Storage as a Service (StaaS), Security as a Service (SaaS), etc.

3. Mobile Cloud Computing

As of Cisco web Business Solutions analysis cluster, Mobile Cloud Computing is outlined as mobile services and apps delivered from a centralized (and may be virtualized) information center to a mobile device like a sensible phone\(^3\).
With Mobile Cloud Computing, all the mobile applications square measure deployed on the cloud victimization Infrastructure as a Service (IaaS) and Platform as a Service (PaaS). Also, it’s accessed through sites victimization net widgets.

Mobile cloud services will be divided into 2 classes, supporting the options particularly ancient and distinctive. Conjointly ancient mobile cloud services, because the name implies that the feature of cloud enabled regular cloud service for mobile devices. On the otherhand, distinctive mobile cloud services square measure supported the options of the mobile device itself. A number of the options embrace GPS, camera and voice recognition (e.g., Siri on iPhone).

R. Fakoor, et al., planned a cloud based mostly framework, Mobile Application as a Service (MAaaS) for people-centric cross domain applications with democratic sensing and mobile social networks. In MAaaS, user mobile has afreelance multi-modal information supply. Additionally, it coordinates several users and applications as per the resource needs of individual applications.

3.1 Benefits of Cloud Computing for Mobile Users

Instead of mainframe and PCs, information further as applications will be managed in central remote servers and square measure accessed through web with the arrival of Cloud Computing. Also, it provides computing as a metered service for different utility services like electricity or water and may be monitored through movable applications.

On the otherhand, IT firms need not have to take a position on enormous capital for IT infrastructure. Instead, they can go for pay-per-use with the cloud service suppliers. Also, through movable applications one will proportion and scale down the computing resources as per their needs and demands. Throughout high computing demands in an exceedingly hybrid cloud, the personal cloud will mechanically access public cloud referred to as cloud exploding.

Furthermore, attributable to hardware limitations, solely few mobile applications on the sensible phone will be put in and accessed. With the assistance of mobile cloud, several mobile applications will be hosted on the cloud. Additionally, they will be accessed, distributed, processed with delivery of knowledge. Mobile Cloud Applications exploit the options of sensible phones like location of the user for road traffic and pollution management. On the opposite hand, cloud-based social networking sites square measure helpful for disaster management. With the arrival of Long Tenn Evolution (LTE), mobile users will even offload their multimedia system knowledge to cloud servers.

Smart Mobile Phones with sensing capabilities helps to attain present computing. GPS (location), Gyro-scope and measuring instrument (orientation), social (textual) and video (multimedia) square measure samples of sensory knowledge. Golf shot of these in an exceedingly single platform for implementation is a motivating analysis downside.

Cloud service supplier rents their computing resources among multiple cloud users, helps them to remain within the current competitive market. Virtualization Associate in Nursing previous methodology of running multiple totally different in operation systems nearly over one server is employed by the cloud service supplier to lend computing resources supported user needs. Moreover, it conjointly helps mobile users to store a lot of knowledge on the cloud, rather than worrying regarding increasing further storage drives for his or her mobile phones.

4. Impact of Mobile Cloud Computing in India

Reports show that there square measure eight million little and medium sized businesses for Cloud computing in Bharat. Moreover, the cloud market in Bharat is predicted to extend to three billion America bucks by 2015. Gartner survey shows that the simple fraction of CIOs in Bharat believes that there’ll be Brobdingnagian adoption of cloud within the IT business inside 2 years. The positive impact of cloud computing in Indian economy square measure a lot of foreign investments, Associate in Nursing foreign firms putting in an Indian Cloud computing base. Additionally, Indian firms particularly health care also as telecommunication domains migrated to hybrid cloud.

Thanks to electricity shortage and moderate net affiliation, the adoption of cloud computing could produce negative impact in Bharat. Additionally, movable user in Bharat is taking the advantage of cloud computing for all of their personal storage needs.
5. Problems Associated with Mobile Cloud Computing

In general, there are several problems associated with Cloud Computing like automatic Cloud Service Provisioning, Migration of Virtual Machines between completely different Cloud Zones, Energy economical Management, traffic management and knowledge security. Out of those analysis problems, encryption is one in every of the first reasons that hinder the adoption of cloud computing among portable users.

Although pay-as-you-go or utility based mostly charge model is taken into account to be one in every of the most advantage of cloud computing. Mobile Cloud Applications could exploit mobile phones like location of the user aside from road traffic and pollution management. If there is a hardware or package failure like disk crash or error within the application severally on the cloud server, then the mobile cloud subscriber needs to restore it from the native laptop exploitation mobile applications like iTunes and Zune for iPhone and Windows Phone severally.

Public cloud, wherever multi-tenants manage their knowledge on an equivalent server with the cloud service supplier, has the best risk than personal and hybrid clouds. To countenance this risk, the cloud service supplier needs to segregate the information of 1 company from the information of different corporations. This can be referred to as knowledge segregation.

Storage-as-a-Services like DropBox, Google Drive, Sky Drive, etc., square measure very hip among portable users. These applications alter them to store and backup their personal knowledge on to the cloud server for an inexpensive quantity of cupboard space without charge. As explicit earlier, once a user store knowledge on the cloud, like Storage-as-a-Service, the information may be blended with different users as a result of the shared servers. Hence, the essential knowledge of the portable user like belongings and private data square measure at redoubled risk. Additionally, s/he could lose management of some or all of the information. In different words, knowledge exposure could happen on a public, hybrid, or maybe on personal cloud. If the information kept in a very personal cloud of a portable user is underneath threat, then there will be a lot of lose of essential knowledge.

Just in case of public cloud, the assailant will tamper and sniff the information that is at rest or travel and fro from the cloud. On the otherhand, the information shouldn't migrate by Associate in Nursing means that while not the owner’s permission from inhouse personal cloud of an IT company to a public cloud in a very hybrid preparation model.

Over the recent years, sensors on mobile devices contend a significant role not just for security, however additionally for observance the surroundings. Also, Mobile Cloud Apps square measure won to reason these massive sensing element knowledge. However, Mobile Cloud Users acknowledge it’s terribly exhausting to try to do their daily routine if their mobile device square measure is lost or taken by somebody. On the opposite hand, it’s troublesome life if there’s a network failure thanks to natural calamities.

There square measure many issues to implement Mobile Cloud Computing on the shopper, typically on mobile phones, in context with security. Additionally the foremost rife downside is low information measure since it's a wireless network, and not a wired network, that is safer. Secondly, service convenience isn't reliable in comparison to ancient computing. This is often due to each active and passive security attacks on high of the expected network holdup on the wireless networks. Since, completely different mobile devices follow varied security mechanisms; non-uniformity is another drawback.

Furthermore, the computation price concerned within the implementation of mobile cloud security is additionally a tangle. Also, it greatly affects the performance and potency of the mobile application.

In SaaS and PaaS Mobile Cloud, multimedia system and gambling applications area unit the key concern. In IaaS Mobile Cloud, User’s Privacy and Security area unit are the key concern. Out of these, varied mechanisms like homomorphic secret writing and hardware based mostly secure execution area unit projected.

However, encoding plays a serious role in securing mobile cloud knowledge before moving it to the cloud service supplier. Encoding deals with protective confidentiality and integrity of the info, whereas it's in transit or at rest. In different words, assaulter must not get off the info, however if it happens, the info ought to be uninterpreted while not the cryptography key.
Encrypting Data before Moving it to the Cloud using Specter Encryption

6. Knowledge Security on the Mobile Cloud Computing

Data security is the one amongst the highest most challenge within the adoption of cloud computing delivery models like SaaS, PaaS and IaaS. In mobile cloud computing, knowledge security involves varied factors like data-in-transit, data-at-rest, processing, knowledge lineage, and knowledge birthplace. Although the mobile user might assume that the cloud service supplier is just the one accountable to make sure that knowledge area unit secure. But, it’s additionally the responsibility of the mobile user to make sure the info is encrypted before it’s migrated from native disk to cloud storage.

On the other hand, data-at-rest is not sometimes encrypted with the cloud service supplier so as to perform classification or looking. On the other hand, IBM recent absolutely homomorphic secret writing theme permits encrypted data-at-rest to be processed while not cryptography, however with high procedure effort. As an alternative, predicate secret writing, wherever selected encrypted data-at-rest area unit decrypted solely. Moreover, once knowledge is processed in multi-tenancy setting, unauthorized access is also potential attributable to the exploit of application vulnerability.

7. Specter Secret Writing

7.1 Purpose
In this model, the user knowledge is encrypted through a mobile knowledge security application, before it’s migrated to the cloud. The appliance encrypts a file by generating a positive identification for it. Then, it uploads the positive identification protected file on to the cloud server as shown in Figure 1. This model ensures solely documented user has access to the file, which is extremely helpful in state of affairs like the user shares the file to the opposite users.

7.2 Algorithm
The Specter (Geometric Host) algorithmic rule could be an easy and simple crypto logical technique. The following steps area unit carried out:

- Settle for a file from the user employing a mobile application.
- Produce a positive identification for the file mistreatment hash techniques like MD5.
- Convert the resultant positive identification into binary.
- Generate geometric co-ordinates.
- For example, if the positive identification is Associate in Nursing 16-bit, 1111111111111111. Then, divide it into 2 bytes, specifically 11111111 11111111. For each computer memory unit, produce geometric co-ordinates as per the Table 1.
- In Table 1, A - Position of the Bit, B - Geometric co-ordinates, C - Input, D - price of the Geometric co-ordinates, E - Output.
- For each little bit of a computer memory unit, a corresponding co-ordinate is generated. However, the position of the bit might not correspond to the amount of geometric co ordinates. Within the higher than example, this is often not true. Hence, the position little bit of the computer memory unit corresponds to the amount of co-ordinates as shown below: 01 0011 001100 00110011000110011 00110011001000110011001101.
- Concatenate all the resultant co-ordinates. For the higher than example, it’ll be as follows: 01001100110001100110010001100110011001100100011001100110011001100110011001100110011001100110011001100110011001100110011001100110.
- Divide them in triple digits and convert it into Decimal as per the Table 2.
- Store it during a graph within the random order and fill the remainder of the node with redundant co-ordinates as shown in Figure 2.
Then, produce the ultimate cipher text from the graph mistreatment algorithmic rule. For the higher than example, the resultant cipher positive identification might be:

0100000011000011001100111100110000110011
110011001100011110011001110011000110011
00110011110000110011.

Table 1. Geometric mapping table

| A  | B   | C   | D   | E   |
|----|-----|-----|-----|-----|
| 1  | x, y | 1   | 0, 1| $\lor$ XOR 1 = 1 |
| 2  | x, y | 1   | 0, 0| O ANDOXOR |
|    | x, y | 1   | 1, 1| 1 AND 1 = 1 |
| 3  | x, y | 1   | 0, 0| O ANDOXOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |
|    | x, y | 0   | 0   | $\lor$ AND 0 = 1 |
| 4  | x, y | 1   | 0, 0| $\lor$ AND 0 XOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |
|    | x, y | 0   | 0   | $\lor$ AND 0 XOR |
|    | x, y | 1   | 1, 1| 1 AND 1 = 1 |
| 5  | x, y | 1   | 0, 0| O ANDOXOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |
|    | x, y | 0   | 0   | $\lor$ AND 0 XOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |
|    | x, y | 0   | 0   | $\lor$ AND 0 XOR |
| 6  | x, y | 1   | 0, 0| $\lor$ AND 0 XOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |
|    | x, y | 0   | 0   | $\lor$ AND 0 XOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |
| 7  | x, y | 1   | 0, 0| $\lor$ AND 0 XOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |
|    | x, y | 0   | 0   | $\lor$ AND 0 XOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |
|    | x, y | 0   | 0   | $\lor$ AND 0 XOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |
| 8  | x, y | 1   | 0, 0| $\lor$ AND 0 XOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |
|    | x, y | 0   | 0   | $\lor$ AND 0 XOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |
|    | x, y | 0   | 0   | $\lor$ AND 0 XOR |
|    | x, y | 1   | 1, 1| 1 AND 1 XOR |

Table 2. Binary to Decimal

| Binary | Decimal |
|--------|---------|
| 000    | 0       |
| 001    | 1       |
| 010    | 2       |
| 011    | 3       |
| 100    | 4       |
| 101    | 5       |
| 110    | 6       |

8. Conclusion and Future Work

As expressed earlier, knowledge Security is the highest challenge within the adoption of cloud computing. Hence, during this paper, we tend to propose a mobile knowledge security model for securing the info before it’s moved to the cloud service supplier from the mobile device. Within the close to future, the author is attending to implement and add heap of safety features within the Specter secret writing model. Hence, the projected could be a basic encoding model.

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