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# A Three Layer Secure File Storage Scheme in Cloud with Fog Computing

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**ABSTRACT:** Ongoing years witness the improvement of distributed computing innovation. With the touchy development of unstructured data, cloud stockpiling innovation shows signs of improvement advancement. Be that as it may, in current stockpiling diagram, client's information is completely put away in cloud servers. At the end of the day, clients lose their privilege of control on information and face protection spillage hazard. Customary security insurance plans are generally founded on encryption technology, but these sorts of techniques can't successfully oppose assault from within cloud server. So as to take care of this issue, we propose a threelayer stockpiling structure dependent on mist processing. The genius presented structure can both exploit distributed storage and ensure the protection of information. Additionally, Hash-Solomon code calculation is intended to separate information into various parts. At that point, we can put a little piece of information in nearby machine and mist server so as to secure the protection. Besides, in light of computational intelligence, this calculation can register the dispersion extent put away in cloud, mist, and neighbourhood machine, separately. Through the hypothetical wellbeing examination and exploratory assessment, the possibility of our plan has been approved, which is extremely an incredible enhancement to existing distributed storage plot.

**KEYWORDS:** A threelayer stockpiling structure; Fog Computing; Hash-Solomon code calculation;

## I. INTRODUCTION

Distributed computing has pulled in extraordinary consideration from various areas of society. Cloud figuring has steadily developed through such a significant number of individuals' endeavors. At that point there are some cloud-based advances getting from distributed computing. Distributed storage is a vital piece of them. With the quick improvement of system transfer speed, the volume of client's information is rising geometrically. Client's necessity can't be fulfilled by the limit of nearby machine any more. Therefore, individuals endeavor to discover new strategies to store their data. Pursuing all the more dominant stockpiling limit, a developing number of clients select distributed storage. Putting away information on an open cloud server is a pattern later on and the distributed storage innovation will wind up across the board in a couple of years. Distributed storage is a distributed computing framework which gives information stockpiling and the executive administration. With a group of uses, organize innovation and circulated record framework innovation, distributed storage makes an expansive number of various stockpiling gadgets cooperate coordinately. These days there are a great deal of organizations giving an assortment of distributed storage administrations, for example, Dropbox, Google Drive, iCloud, Baidu Cloud, and so on. These organizations give vast limit of capacity and different administrations identified with other well known applications, which thus prompts their achievement in pulling in humorous endorsers. Notwithstanding, distributed storage administration still exists a ton of security issues. The protection issue is especially critical among those security issues. Ever, there were some celebrated distributed storage security spillage occasions.

This occasion caused a hubbub, which was in charge of the clients' nervousness about the protection of their information put away in cloud server. Along these lines, the Cloud Server Provider (CSP) will occur of client to deal with the information. In outcome, client do not really control the physical stockpiling of their information, which results in the detachment of proprietorship and the board of data. Contrasted and conventional strategies, our schemecan give a higher security insurance from inside, especially from the CSPs.

## II. RELATED WORK

The CSP can uninhibitedly access and hunt the information put away in the cloud. Then the assailants can likewise assault the CSP server to acquire the client's information. The over two cases both make clients fall into the threat of

data spillage and information loss. Traditional secure distributed storage answers for the above issues are normally concentrating on access limitations or information encryption. These techniques can really dispose of most piece of these issues. In any case, these arrangements can't comprehend the between an assault well, regardless of how the calculation improves. There-fore, we propose a TLS conspire dependent on mist processing model And structure a Hash-Solomon code dependent on Reed-Solomon code. Mist registering is an all-inclusive figuring model based on distributed computing which is made out of a great deal of mist nodes. These hubs have a specific stockpiling limit and handling capability. In our plan, we split client's information into three sections and separately spare them in the cloud server, the fog server and the user's neighbourhood machine. In addition, contingent upon the property of the Hash-Solomon code, the plan can guarantee the first data cannot be recuperated by fractional information. On another hand, using Hash-Solomon code will create a part of repetitive data blocks which will be utilized in an traveling method. Increasing the number of excess squares can build the dependability of the capacity; however it likewise results in extra information stockpiling. By a reasonable portion of the information, our plan can truly protect the security of client's information. The Hash-Solomon code needs complex estimation, which can be helped with the Computational Intelligence (CI). Ideal models of CI have been effectively used in ongoing years to address different difficulties, for instance, the problems in Wireless sensor systems (WSNs) field. CI professional videos versatile instruments that display shrewd conduct in complex and dynamic situations like WSNs [9]. Subsequently in our paper, we exploit CI to do some computing works in the mist layer. Contrasted and conventional strategies, our scheme can give a higher security insurance from inside, especially from the CSPs.

### III. PROPOSED ALGORITHM

#### A. SECURE CLOUD STORAGE BASED ON FOG COMPUTING

The security degree is a critical measurement to gauge the nature of distributed storage framework. Moreover, information security is the most vital part in distributed storage security and it incorporates three perspectives: information protection, information honesty and information availability. Ensuring information security and uprightness has dependably been the focal point of important looks into [6]. On another hand, information protection is additionally the most concerned piece of the clients. From a business point of view, organization with high security degree will pull in more clients. Hence improving security is a vital objective regardless of in the scholarly community or business. In this area, we will point by point elaborate how the TLS system ensures the information protection, the execution subtleties of work process and the hypothetical wellbeing and proficiency investigation of the capacity conspire.

#### B. FOG COMPUTING

Fog processing is normally a three-level engineering, the up-most is distributed computing layer which has incredible capacity limit and register ability. The following dimension is mist processing layer. The fog processing layer fills in as the center layer of the mist figuring model and assumes an urgent job in transmission between distributed computing layer and sensor organize layer. The mist hubs in fog registering layer has a specific stockpiling limit and process ability. The base is remote sensor organize layer [8]. The principle work of this layer is gathering information and transferring it to the mist server. In addition, the exchange rate between mist figuring layer and different layers is quicker than the rate specifically between cloud layer and the base layer. The presentation of mist figuring can help the distributed computing layer, improving the work effectiveness. In our plan, we exploit the mist registering model, receive three-layer structure. Besides, we supplant the WSNs layer by client's neighborhood machine.

#### C. THREE-LAYER PRIVACY PRESERVING-FOG COMPUTING MODEL

So as to secure client's protection, we propose a TLS outline work dependent on mist processing model. The TLS system can give client a specific intensity of the executives and successfully secure client's protection. As referenced, the inside assault is hard to stand up to. Customary methodologies function admirably in settling outside at-tack, however when CSP itself has issues, conventional ways are for the most part invalid. Unique in relation to the conventional methodologies, in our plan, client's information is isolated into three diverse size parts with encoding innovation. Every one of them will come up short on a piece of key data for classification. Joining with the mist registering model, the three pieces of information will be put away in the cloud server, the fog server and client's nearby machine as indicated by the request from extensive too little. By this technique, the assailant can't recuperate the client's unique information regardless of whether he gets every one of the information from a specific server. Concerning the CSP, they additionally can't get any valuable data without the information put away in the fog server and nearby machine in light of the fact that both of the fog server and neighbourhood machine are constrained by clients. As appeared in below Fig, the TLS structure makes full utilization of mist server's stockpiling and information preparing ability.

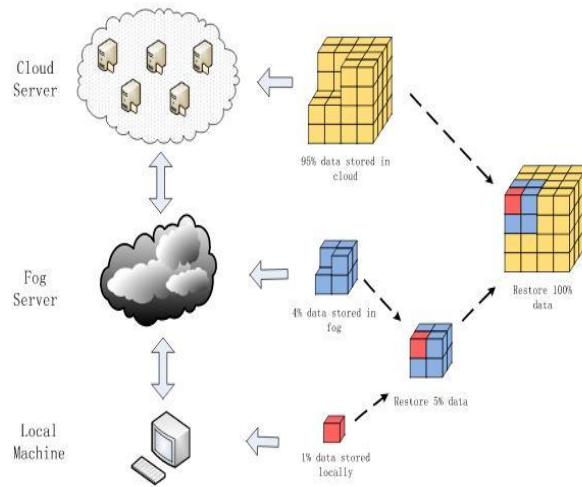


Illustration of Three-Layer storage framework based on fog computing.

The design incorporates three layers, the cloud server, the fog server and the nearby machine. Every server spares a specific piece of information; the capacity extent is controlled by clients' designation technique. Initially, client's information will be encoded on client's neighbourhood machine. At that point, for instance, let 1% encoded information be put away in the machine. At that point transfer the rest of information to the mist server. Also, on the fog server, we do comparative activities to the information which comes from user's machine. There will be about 4% data stored in the fog server and then upload the remainder data to the cloud server. The above operations are based on Hash-Solomon code. Hash-Solomon code is a kind of coding methods based on Reed-Solomon code. After being encoded by Hash-Solomon code, the data will be divided into  $k$  parts and generates redundant data. Hash-Solomon code has such property, in these  $k+m$  parts of data, if someone has at least  $k$  parts, he can recover the complete data. In other words, nobody can recover the complete data with less than  $k$  parts of data. According to this property of Hash-Solomon code, in our scheme, we let no more than  $k-1$  parts of data be stored in higher server which has larger storage capacity and let the remainder be stored in the lower server. In this way, the stealer cannot recover the complete data even if one of the three layers' data was stolen. Thus we can ensure the privacy of user's data. Then we consider the value of  $k$  and  $m$ .

#### IV. SIMULATION RESULTS

##### Stored Procedure:

When user wants to store his file to the cloud server, the procedure is shown above Fig. First of all, user's file will be encoded with Hash-Solomon code. And then, the file will be divided into several data blocks and the system will also feedback encoding information simultaneously. Assuming that 1% data blocks and the encoding information will be stored locally. The remainder 99% data blocks will be uploaded to the fog server. Secondly, after receiving the 99% data blocks from user's machine, these data blocks will be encoded with Hash-Solomon again. These data blocks will be divided into smaller data blocks and generates new encoding information. Similarly, assuming that 4% data blocks and encoding information will be stored in the fog server. The remainder 95% data blocks will be uploaded to the cloud server. Thirdly, after cloud server received the data blocks from fog side, these data blocks will be distributed by cloud management system [2]. Finally, the storage procedure ends when all the related information be recorded in different servers.

Diagram of stored procedure:

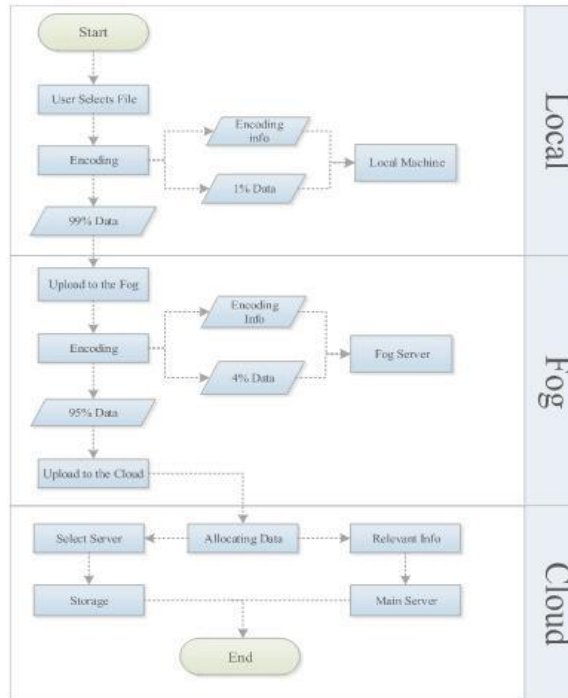
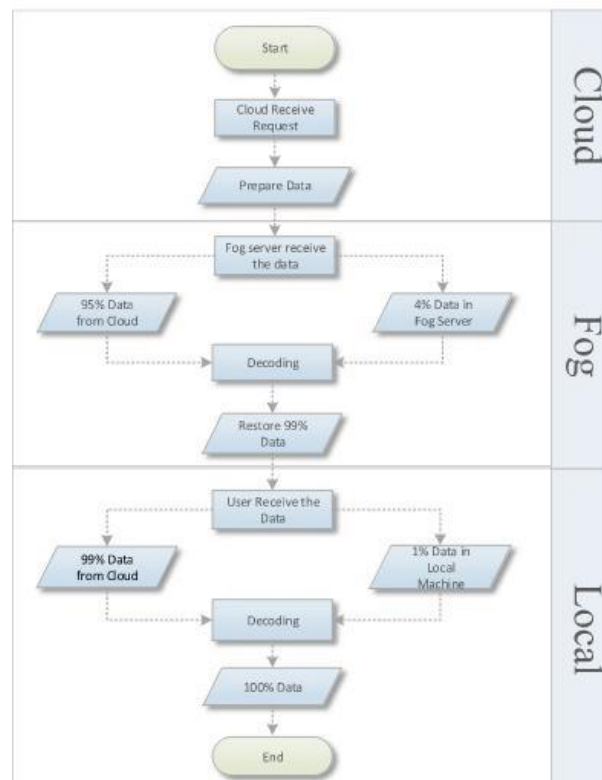


Diagram of Download procedure



#### Download Procedure:

When user wants to download hisfile from the cloud server, the procedure is shown in above Fig. Firstly, cloud server receives user's request and then integrates he data in different distributed servers. After integration, cloudserver sends the 95% data to the fog server. Secondly, the fogserver receives the data from the cloud server. Combining withthe 4% data blocks of fog server and the encoding information,we can recover 99% data. Then the fog server returns the 99%data to the user. Thirdly, the user receives the data from fogserver. User can get the complete data by repeating the abovesteps.

#### IV. CONCLUSION AND FUTURE WORK

The development of cloud computing brings us a lot of benefits. Cloud storage is a convenient technology which helps usersto expand their storage capacity. However, cloud storage alsocauses a series of secure problems. When using cloud storage,users do not actually control the physical storage of their dataand it results in the separation of ownership and management ofdata. In order to solve the problem of privacy protection in cloudstorage, we propose a TLS framework based on fog computingmodel and design a Hash-Solomon algorithm. Through thetheoretical safety analysis, the scheme is proved to be feasible.By allocating the ratio of data blocks stored in different serversreasonably, we can ensure the privacy of data in each server.On anotherhand, cracking theencodingmatrix is impossibletheoretically. Besides, using hash transformation can protectthe fragmentary information. Through the experiment test, thisscheme can efficiently complete encoding and decoding with-out influence of the cloud storage efficiency.

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#### BIOGRAPHY

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