

Recent Advances in Big Data Storage and Security Schemas of HDFS: A Survey.

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Abstract

Technological revolution in the digital world has led to huge data generation from many sources in various formats, which results in changing its native data type (Homogeneous to Heterogeneous). The digital data has increased approximately 350 times from 140 Exabytes in last decade to 50,000 Exabytes in ending of 2020. As an experiment of the technological improvement, the increasing big data becomes major issue in the government sector, science, research and business enterprises. It is very difficult to store, process and secure the huge data using conventional database tools and database management systems at traditional cloud centers. To overcome all these challenges, the management of huge data is to be done by maintaining Hadoop based cloud data centers. This paper has two sections, section-1 explains different big data storage, security mechanism and HDFS security mechanisms. Section-2 finds out recent advances in Hadoop for securing the big data in cloud. This paper ultimately examines and studies storage, security and privacy

mechanisms and suggest a solution for securing huge data in cloud by using Hadoop eco systems.

Key Words:Big Data, HDFS Security, Hadoop, Data Storage, Security Mechanisms.

1 Introduction and Characteristics of Big Data.

Data which is beyond the storage and processing capacity is called as big data [1]. The various issues of big data can be explained by using 3Vs which are typically meant to characterize the big data as Volume, Velocity, and Variety. Volume refers to quantity of data, Velocity refers to the speed of generating data and Variety is about consisting of different categories of data such as structured, semi-structured and unstructured. The above big data characteristics are helpful for extracting its hidden patterns. These characteristics make it difficult for storing and processing massive data using Traditional information processing applications.

2 Hadoop:

Hadoop [2] is an open source Java-based programming framework that supports storing and processing big data in a distributed computing environment. Hadoop is parallel and distributed File System for storing huge data which groups with constellation of low cost hardware and with streaming access configuration. Hadoop follows a principle write once and read any number of times, but dont change the content of the file. Hadoop undertakes mainly two tasks, they are huge data storage called Hadoop Distributed File System [3][4] (HDFS) and parallel processing called Map Reduce[5]. Hadoop stores the data as it is without encryption to mend proficiency. HDFS supports running access to file system data and it affords substantiation, seclusion and security.

Section-1

2.1 Storage, Security of Big Data using HDFS.

Hadoop File System was established using distributed file system design that provides high-performance to data across hadoop clusters. Disparate other distributed systems, HDFS is highly fault tolerant and planned using low-cost hardware. HDFS holds very comprehensive amount of data and provides easier access. To store such huge data, the files are stowed through numerous machines. These files are stored in terminated fashion to rescue the system from possible data losses in case of failure. HDFS also require applications available to parallel processing. The input le is rst split into blocks of equal size but the last block which is then replicated across Data Nodes. Currently, default block size is 128MB which was previously 64MB and default replication factor is 3. Blocksize and replication factors are congrurable parameters. Hadoop distributed procedure framework is not developed for security concern. Later, Hadoop has become a widespread platform, as an outcome security precautions have started to advance. Hadoop chains trusted environment between client (user) and Name Node which is module of HDFS and copes the Data Node. Many arbitrary encryption methods are smeared on data which is deposited in Data Node for securing data. The user himself need to authenticate Name Node in order to access.

3 REVIEW OF RELATED WORKS

In the literature survey, numerous approaches have been anticipated for the Storage, Refuge and Privacy Stabilizing of big data in Cloud, and security perception by using Hadoop. Among the most lately published works are those presented as follows. This is divided into two categories i.e. storage techniques, Security and Secrecy methods.

3.1 Big data Storage Perspective:

Jian Jun Luo a, LingyanFan et al.[6] have explained hardware based Self-search Storage Device beside with search engine which is entrenched with big data stowage devices like RAID and SAS. FPGA (Field Programmable Gate Array) was initially applied to setup the

SSD disk with embedded iSearch engines but its scheduling parameter caused the bottleneck enactment for high speed throughput. An assessment was done by smearing 24 iSearch embedded SSD units and the recital was close to 1GB/s corresponding to the supreme speed of the iSCSI interface associated by 10 GB/s Ethernet with server. A disk array was fabricated with 24 SSD units and each unit had 1TB density. A 24 TB database was encumbered to run the assessment program. An entire inquiry without iSearch motor is included around 24s, and hunt with iSearch motor is at a normal of 5.5ms. The more target substance were scattered in database by utilizing iSearch motor and extremely predominant spread in database. Hanadi Ahmed Hakami, Zenon Chaczko and Anup Kale et al [7] have explicated the data storage in DNA categorization prospects and the DNA stockpiling is appeared to be exceptionally viable. This research in DNA storage recommends that it can sanction for far more seclusion and security by paralleling with silicon devices. The coding method is distinguished and used to store information and examined by Cell, Risca and Bancroft. There are various encoding measures to store information under DNA movements by utilizing DNA codes. An interested Haffman capable source coding strategy is adept to decipher. DNA lattice has been utilized to epitomize the Metadata and it follows by renovating the DNA lattice into Quick Response (QR) portrayal that arrangements an expansive extent of reasonable standard. Subsequently this plan is profoundly relevant for taking care of and stowing of monstrous measures of endless sorts of information. This type of storage system is in premature platforms of research.

3.2 Security and Privacy Perspective

In Pradeep Adluru and Srikari Sindhoori Datla et al. [8] have illustrated the safety and protection of Bigdata in Hadoop eco frameworks. In this method The User himself authenticate to the Name Node in order to access data. A trustee mechanism is shaped between user and Name Node. The Name Node and Data Node have the in place control over information yet client does not have control over information. Only Authenticated user can access data directly, others are not permitted. The safe figures or encryption strategies that are actualized in this framework are RSA, Rijndael,

AES and RC6. The encryption and decoding of the data are taken care of in the Map Reduce module. The SHA-256(Secured Hash Algorithm) hashing technique is used for authentication between users of Name Node by providing hash function by Name Node

In, B. Saraladevia, N. Pazhanirajaa, P. Victor Paula et al[9] have explicated security disputes in HDFS. The HDFS is the base layer of Hadoop Architecture which contains disparate game plans of information and it is more touchy to security concerns. The following three security and privacy appliances are based on HDFS. We can progress security in big data by using any one of the following approaches or by combining these three approaches in HDFS.

a). In order to accomplish the authentication between user and Name Node for accessing data blocks from Data Node, Kerberos authentication mechanism is used for improving the security. The association between client and namenode is reached by using remote procedure call[10] in HDFS. User want to access data from Data Node, they must use Ticket Granting Ticket or Service Ticket to authenticate by Name Node. The TGT and ST can be renewed while Kerberos is rehabilitated after long running of jobs, new TGT and ST also issued and strewn to all tasks. Key Distribution Center (KDC) issues the Kerberos Service Ticket using TGT after getting request from task. The aim of this ways and means is to create endorsement between user and Name Node for retrieving data.

b). In order to screen and secure profound data like credit card numbers, passwords, account numbers, personal details and to upturn the haven in Hadoop base stratum, the Bulls Eye Approach is proposed. This exemplary outlooks all the sensitive info in 3600 and find whether all warehoused data is secured without any menace. It consents only accredited users to realm the personal information in a right way. Bulls eye approach increases security in Hadoop base stratum used in HDFS for providing security in 3600 from node to node. By applying this tactic in Data node of rack1, and it checks whether the data is put in storage properly in data block without any peril, and allows only the particular punter to store in required blocks. This is also bridge gap between original data and replicated data. When the patron wants to rescue data from replicating data nodes it is also preserved by Bull Eye Approach and it checks whether there is a proper relation between two data racks. This can be instigated below the data node where the patron read

or writes the data to store in blocks. It is not only employed in the rack 1 similarly it is implemented in Rack 2 in order to upturn the security of the lumps inside the data nodes in 360. This algorithm travels from less terabytes to multi petabytes of semi structured structured and unstructured data and stored in HDFS layer in all angles. Many companies like Data guises DGsecure and Amazon Elastic MapReduce used this approaches. DG secure Company gave a Data driven and Governance arrangements and furthermore includes security for Hadoop in the cloud. Information appearance Company chose to keep up and give security in hadoop any place it is situated in cloud.

c). In HDFS, if the Name Node is lost entire Hadoop system will fail. The Name Node is Master Node which vittles metadata and user cannot admittance their data without Name Node. With a specific end goal to upsurge security in information attainable quality is achieved by including Secondary Name Node. Two Name Node servers are supported to run beneficially in a similar group and two excess Name Nodes are conveyed by Name Node Security Enhance (NNSE), and it holds bull eye algorithm. Hadoop Administrator can access both nodes, one node act as master node and other act as slave node. The master Name Node in order to clutter the administrator, it needs to ask NNSE to prove data from slave node in order to recuperate unavailability of data in fortified manner. Admin cannot access data from slave node without approval from NNSE and it may condense complex recovery issue. If Name node acts as a master node, there transpires a incessant risk, diminishes secured information accessibility and bottleneck execution over a neighborhood or Wide Area Network. Along these lines in future we can likewise rise withdraw by utilizing imperative setup that gives and guarantees information accessible to customer in a secured route by duplicating many Name hub by Name Node Security Enhance in HDFS hinders between voluminous server farms and groups.

Section-2

Recent Advances Big Data Security and Storage in HDFS.

Author	Proposed Schema	Advantages
Prashant Johri et al[]	Hadoop Security framework for perceptive and high-speed data storage and accessibility on big data platform. Encryption is performed on data using Map Reduce.	Provides additional security constraints such as Dynamic One Time Code and policies that bind with data and flexible to be used on any application. By using Map Reduce for encryption it provides faster encryption and decryption time.
Michael Kenyeba et al[]	Discussed issues related to Hadoop Security in cloud environment and discussed possible solutions to those issues in hadoop security and authentication.	
Bikash Agrawal et al[]	Modification of NameNode using CheckerNode for secure deletion.	By implementing checker node with addition to the name node, checker node eradicates the problem of maintaining false copies of data at different data nodes which are not in the name node. Deletion is taken care by checker node at regular frequent intervals of time. Checker node tracks undeleted data blocks and deletes it.
Bowen Tian et al[]	Allocation of Data depending on its type in order to improve security.	Performance levels are always little less in heterogeneous databases when compared to homogeneous database. So, to scale up performance following a data allocation scheme would result in improving both performance and security levels such as SecHDFS. SecHDFS addresses the increased risk issue caused by data replication in HDFS by allocating fragments of a file to as many different types of DataNodes.
Hua Xu et al[]	Proposed Novel location aware data block allocation by solving disadvantages in virtual nodes of HDFS based cloud.	Finding the problems of Data reliability loss and performance degradation for Hadoop on cloud mainly caused by the co-location of Virtual Machines. The proposed schema improves performance and data reliability for HDFS based application in cloud.
Yoon-Su Jeong et al[]	A token-based authentication scheme that protects sensitive data stored in HDFS against replay and impersonation attacks.	Provides more secure protection of sensitive HDFS data without overburdening authentication operations.

4 Conclusion

The Storage, security and protection for Big data administrations is exceptionally thought - revoking. The solution to the above can be provided by Hadoop framework rather than any other big data tool. There is a rapid increase in the security features of Hadoop from version to version since last decade. According to section-2 of this paper Hadoop is still facing Data leakage, lack of metadata security and authentication issues. To overcome all the above problems, a complex security mechanism like DNA cryptography can be used to give optimal solution. Converting the entire big data into DNA for storage and security purpose is highly computational task. In this particular area, the research is still going on and further there may be scope in our research. One can try for the optimal solution for this problem. Instead of converting entire data into DNA form, its better to develop DNA based authentication for accessing HDFS which can give optimal solution for fortifying data in HDFS framework. This may jettison NNSE hindrances for security metadata in name node of HDFS.

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