

Chapter 10

Secure Data Deduplication of Encrypted Data in Cloud

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ABSTRACT

In the present digital scenario, data is of prime significance for individuals and moreover for organizations. With the passage of time, data content being produced increases exponentially, which poses a serious concern as the huge amount of redundant data contents stored on the cloud employs a severe load on the cloud storage systems itself which cannot be accepted. Therefore, a storage optimization strategy is a fundamental prerequisite to cloud storage systems. Data deduplication is a storage optimization strategy that is used for deleting identical copies of redundant data, optimizing bandwidth, improves utilization of storage space, and hence, minimizes storage cost. To guarantee the security parameter, the data which is stored on the cloud must be in an encrypted form to ensure the security of the stored data. Consequently, executing deduplication safely over the encrypted information in the cloud seems to be a challenging job. This chapter discusses various existing data deduplication techniques with a notion of securing the data on the cloud that addresses this challenge.

INTRODUCTION

Recent technology improvements have given rise to acceptance and progress of cloud computing. Through various advantages of distributed storage, for instance, ease of access, optimizing bandwidth etc. end users across the globe be likely to move their valuable information to secure distributed platform like cloud storage. According to the report by International Data Corporation (IDC), the huge data content in the whole world will reach around 40 trillion gigabytes by the year 2020 (Chen, Mu, Yang & Guo, 2015; Gantz & Reinsel, 2012). As the quantity of the data content which is being produced continuously increases with the passage of time, there is an urgency to eliminate the duplicate data content which is being stored on the distributed data storage medium like cloud storage to give sufficient storage to the

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users (Movaliya & Shah, 2016). But, when outsourcing the data to a third party like cloud storage server; it causes the security and privacy issues to turn out to be a serious concern. Distributed storage providers utilize distinctive strategies to enhance storage effectiveness and one of the prominent strategies utilized by numerous cloud storage providers is deduplication, which claims to be saving a huge amount of storage (Douceur, Adya, Bolosky, Simon & Theimer, 2002). Figure 1 illustrates the data deduplication process. Data deduplication, at times also named as intelligent compression or single-instance storage which is frequently used in combination with other forms of reducing data.

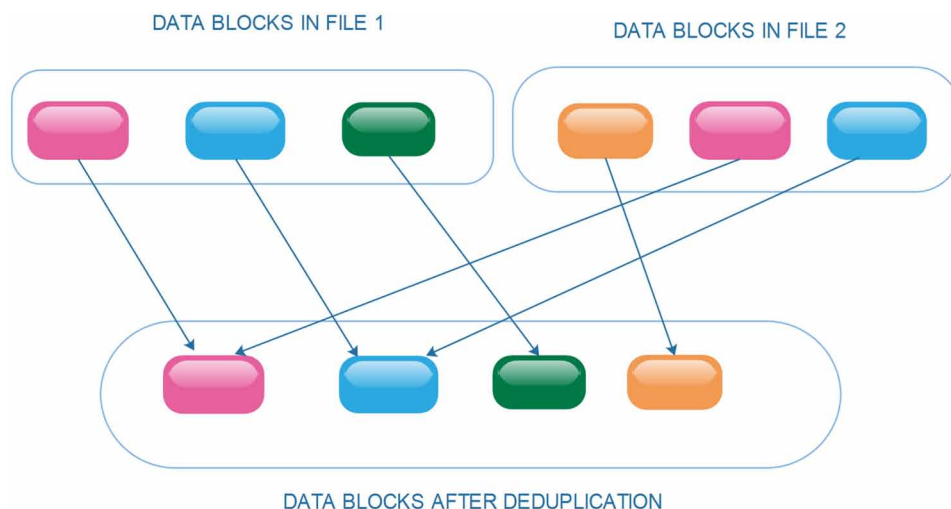
Presently, data deduplication technique is broadly utilized by different commercially known cloud storage providers i.e. Dropbox, Amazon S3, Mozy, Google Drive, Memopal etc. to save a lot of storage space and maintenance cost (Akhila, Ganesh & Sunitha, 2016; Di Pietro & Sorniotti, 2012; Harnik, Pinkas, & Shulman-Peleg, 2010).

WORKFLOW OF DATA DEDUPLICATION

Data deduplication is accomplished in three major steps: chunking, fingerprinting and indexing of fingerprints. The workflow of data deduplication is shown in figure 2. Chunking partitions the input data file stream into small blocks known as chunks. There are mainly two distinct approaches to divide these input data file stream into chunks: fixed size chunking and variable size chunking. The deduplication detection ratio of variable-size chunks is better than fixed-size chunks.

After the process of chunking, some cryptographically secure hash signature (SHA-1, SHA-256, MD5) is applied on chunks to calculate their fingerprints. The process is referred as fingerprinting. There must be a unique Fingerprint value for each chunk. Only unique chunks are placed on the disk after verifying their uniqueness using their fingerprints and redundant chunks are only referenced with old chunks. Indexing is a way to organize fingerprints on disk. Numerous strategies have been suggested for on-disk index-lookup process but their search time and running cost are high. Indexing must be fast enough so that it can check the uniqueness of any fingerprint in least time (Singhal, Kaushik & Sharma, 2018).

Figure 1. Data deduplication



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