A Review:Study Of Document Oriented Databases And Their Security

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Abstract: Document oriented databases are the major type of non relational databases. These are growing and very popular these days because of their advantages over the relational databases. In this paper we will discuss the document oriented databases and also the security features as well as security problems in these databases.

Keywords: Non relational, document oriented databases, security.

I. INTRODUCTION

Non relational databases are the databases which do not store data in relational form. Document oriented databases are the category of non relational databases. They store the data in the form of document like JSON or BSON[8]. They do not follow the rigid schema. They can store structured and semi structured data. These are highly scalable and flexible. Today many commercial document oriented databases are available which are listed below[1][2].

A. Couchdb:

CouchDB is a "NoSQL" database, categorized in document stores. A CouchDB database lacks a schema, or rigid pre-defined data structures such as tables. Data stored in CouchDB is a JSON document. The structure of the data, or document, can change dynamically to accommodate evolving needs. It is written in Erlang[4][5].

B. Mongodb:

MongoDB is an open source document-oriented database system developed and supported by 10gen. MongoDB stores structured data as JSON-like documents with dynamic schemas making the integration of data in certain types of applications easier and faster. It is written in C++. MongoDB is a scalable, high-performance, open source NoSQL database[3].

C. Ravendb:

RavenDB is a transactional, open-source Document Database written in .NET. RavenDB allows you to build high-performance, low-latency applications quickly and efficiently. Data in RavenDB is stored schema-less as JSON documents. Internally, RavenDB make use of indexes which are automatically created based on your usage, or were created explicitly by the consumer. RavenDB is built for web-scale, and is offering replication and sharding support out-of-the-box[6].

Other databases available are listed below[9]:
   a. SimpleDB
   b. OrientDB
   c. Jackrabbit
   d. IBM Lotus Domino
   e. Couchbase server.\

II. COMPARISON WITH REALTIONAL DATABASES

Document oriented databases have various advantages and limitations as compared to the relational databases. In the following table we have compared the document oriented databases with the relational databases.

Table 2.1 Comparison of document oriented databases with relational databases.[1][2][8]

DOCUMENT ORIENTED DATABASES	RELATIONAL DATABASES
They store the data in the form of documents like JSON or BSON.	They store the data in the form of tables.
They can store structured, semi-structured and unstructured data.	They can store only structured data.
These are schemaless. No need to predefine the schema.	These follow the rigid schema. Schema must be predefined.
These are highly scalable.	These are less scalable as compared to document oriented databases.
These are highly flexible while storing the data.	These are less flexible.
They are less reliable than relational database.	They are highly reliable.
They are less secure than relational databases.	They provide high security of data.

There are many advantages and disadvantages of document oriented databases as compared to the relational databases. The main disadvantage or issue in document oriented databases is security lacks. In database management systems security is very important. Relational databases are in use from a long period of time but document oriented databases are new, so they have many security issues which are discussed in the following section.

III. SECURITY IN DOCUMENT ORIENTED DATABASES

The databases store very important data that need to be secure and protected from unauthorized access, intruders and other types of security attacks. There are various types of security attacks which are given below:
   a. Unauthenticated or unauthorized access to the database data by intruders.

b. Malware infections causing unauthorized access to data, deletion or editing the data stored in database.

c. Data integrity should be maintained.

d. Data confidentiality and copyright or ownership preservation from intruders or attackers.

e. Data editing, updating, deletion by the authenticated persons.

In relational databases there are various techniques to handle all of above security threats. There is strong authentication and authorization techniques, data encryption techniques, audit log, database watermarking and many other techniques have been developed to handle security issues. But document oriented databases are developing and they have lack of security techniques which can handle the security threats to the databases [7][10].

Some security issues and lacks in document oriented databases like mongodb and couchdb are listed below:

a. Data files are unencrypted and no method to encrypt automatically. This means that any person who has access to the files can get the data from the files. So, there should be a mechanism to encrypt the data files to provide security [7][12].

b. No method to protect data ownership and copyright protection. Like in relational databases watermarking is used for ownership and copyright protection, there should be such a technique which provides copyright preservation.

c. Lack of audit log in some document oriented databases like mongodb. Audit log is a log file which keeps the history of changes made to the database, the date, time and also the information about the person who made that changes. It helps in detecting the fraud and finding the person who misuse the data. So, there should be a file like audit log which should store the informationa bout the changes that have been made in the database.[7].

d. Authentication is simple based on user name and password. In sharded mode Mongodb does not support authentication, but in standalone and replica set mode authentication can be enabled. [7][10]. So, in there should be a certificate based authentication for more security.

e. Authorization techniques are simple . In sharded mode Mongodb does not support authorization, but in replica set and standalone mode authorization can be enabled.[7][10]. So, authorization techniques Need to be improved in various document oriented databases.

f. Mongodb supports binary wire level protocol using port 27017. This protocol is the most efficent way to communicate with Mongodb. This port is neither encrypt nor compressed. Binary client port 28017 is used as HTTP server. The default distribution of Mongodb does not support SSL. It has to be enabled separately. Couchdb has default port 5984. If any attacker find any of these port open then he has the access.[7][10]

So, the above security issues cause problems related to security in document oriented databases which should be handled.

IV. CONCLUSION

We have study the document oriented databases, compare these with relational databases and list various security issues and problems in document oriented databases as compared to relational databases. There are various security issues in document oriented databases which cause major problems in data safety. In future the techniques should be developed to resolve these security issues and to ensure data safety in document oriented databases.

V. REFERENCES

[1]. C. Strauch, "NoSQL Databases," February2011. [Online]. Available: http://www.christofstrauch.de/nosqldbs.pdf.

[2]. Neal Leavitt " Will NoSQL Databases Live Up to Their Promise?" IEEE Computer Society0018-9162/10/$26.00 © 2010 IEEE.

[3]. Mongodb [online]. Available: http://www.mongodb.org/.

[4]. Couchdb [online]. Available: http://couchdb.apache.org/.

[5]. Couchdb [online]. Available: http://en.wikipedia.org/wiki/Apache_CouchDB.

[6]. Ravendb [online]. Available: http://ravendb.net/.

[7]. Okman, L.; Gal-Oz, N.; Gonen, Y.; Gudes, E.; Abramov, J.; , "Security Issues in NoSQL Databases," Trust, Security and Privacy in Computing and Communications (TrustCom),2011 IEEE 10th International Conference on ,vol., no., pp.541-547, 16-18 Nov. 2011 doi:10.1109/TrustCom.2011.70.

[8]. Document oriented databases [online]. Available: http: //en. wikipedia. org/ wiki / Document _ oriented _ database.

[9]. NOSQL databases [online]. Available :http://nosql-databases.org/

[10]. Sullivan Bryan "NoSQL but even less security: Attacking and defending NoSQL" RSA conference Europe 2011.

[11]. Security in NoSQL databases[online]. Available: http://searchsecurity.techtarget.com/answer/Comparing-relational-database-security-and-NoSQL-security.

[12]. Security issues in NoSQL databases [online]. Available http://blog.astyran.sg/2011/11/there-is-no-security-in-nosql.html.

[13]. Security in NoSQL databases [online]. Available http://www.darkreading.com/database/does-nosql-mean-no-security/232400214.