A Survey Paper on How Blockchain Can be used as an Alternative for Generic/Traditional Database

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Abstract: *Blockchain is a technology that has been popularized as the introduction to cryptocurrency. But Blockchain is first and foremost a database or a collection of records. If used correctly it can be one of the most secure data storing technology (database). It can be a very reliable and secure storage technology as compared to traditional technologies such as SQL and MongoDB. SQL stores data in tabular format and MongoDB uses JSON format which is a name/value format whereas Blockchain is stored in blocks that are connected using a hash. So the data in one block is not connected to the second block and hence if one block has been tampered with, the other blocks cannot be found. In this paper, we will go into detail about these major and minor differences about these databases when compared to Blockchain.*

Keywords: Blockchain, SQL, JSON, MongoDB, Cryptocurrency

I. INTRODUCTION

What is Blockchain:

Blockchain is an irreversible (which cannot be changed) chain of group of information used for recording various data and that keeping track of linked information. It can be tangible or intangible. Anything can be recorded, sold and transferred using blockchain. It also reduces risk without cutting cost.
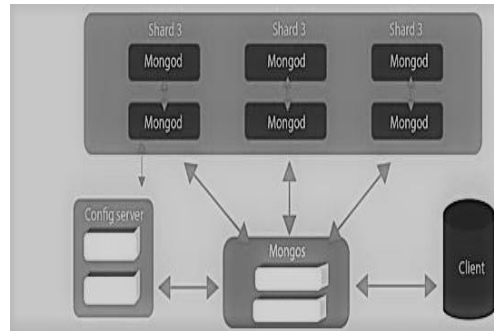
How Blockchain Works?

Blockchain can be compared to a train in which each compartment can be visualized as a block that is linked to each other. In each blockchain there are 3 basic components:

- **Blocks:** Blocks are the base of a blockchain. Blocks contain records of transactions that can be extended on demand Different blocks in a blockchain are interlinked via a chain using hash code. To create a new block the hash code on the previous block is solved. Miners solve complex hash codes to stimulate change in a blockchain network. Every new block can only be added after solving these codes.
- **Chain:** Every block in a blockchain is connected using hash code to create a chain that can grow in one direction
- **Node:** Blockchain can be small or very big and they can store a million records. Nodes are the different systems that store these huge amounts of data. It can be computers, laptops, and big servers, or even all of them at once. Every node in a blockchain network is linked together. Nodes contain the whole blockchain network. It can keep a track of every transaction, like which block was added or which block is being edited Nodes are used to check the validity of the block. Only after validation can the new block be added.

What is SQL?

SQL (Structured Query Language) is the most common language for extracting and storing data in a relational database. A database is primarily a table. SQL is used to retrieve specific information from databases that can be used for analysis. SQL can manage a large amount of data.
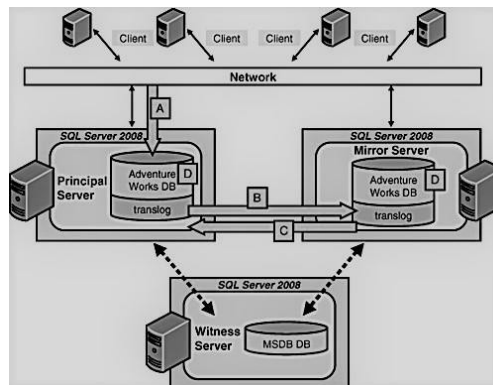
How Does SQL Work?

There are different versions and frameworks for SQL, where MySQL is preferred. MySQL is an open-source IDE that handles the management of back-end data for web applications. When an SQL query is processed by a query optimizer which the query reaches the SQL server. It is then compiled in three phases-

- Parsing – In this process, the syntax is checked
- Binding – In this process, the semantics/logic of the query is checked
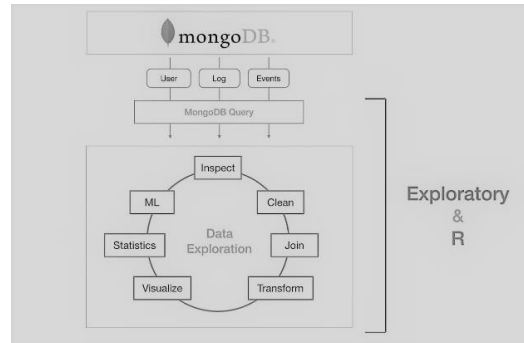- Optimization – In this process, the query execution plan is generated.

What is MongoDB?

MongoDB is a documentational oriented NoSQL database, stores a huge amount of data. Instead of using tables the relational databases, MongoDB uses collections and documents. Data is stored in key-value pairs which are the basic unit of data in MongoDB. Collections contain documents and functions which is the equivalent of tables in a relational database.

Key Components of MongoDB

- **_id:** Every MongoDB documents require this field. The _id field stores unique values in the MongoDB document. The _id field is equivalent to the document's primary key. MongoDB will automatically create the field, if you create a new document without an _id field,
- **Collection:** Grouping of MongoDB documents is called a collection which is equivalent to a table
- **Cursor:** This acts as a pointer that points to the result set of a query. Iteration is done through a cursor to retrieve results.
- **Database:** Collections are stored in the database. Each database contains a set of files in the system
- **Document:** The document is a collection of records in MongoDB. The document consists of field names and values.
- **Field:** It is a name-value pair in a document. A document has zero or more fields.

Impact Factor: 6.252

Comparison between Blockchain, SQL, and MongoDB

As you have learned the basics of Blockchain, SQL and MongoDB WE will see the comparison between them on some key points

Data Storage

Data storage is required to process the data into information. Unique information can be found in the way data is stored. Basically how data is stored can play an important role in finding the required information. Following is how data is stored:

Blockchain	SQL	MongoDB
In the blockchain, data is stored in the form of blocks and chains. Data stored in blocks are added to the chain to create a blockchain.	In SQL data is stored inside tables. Further inside tables data is stored in the format of rows and columns.	In MongoDB data is stored in the form of key and value pairs. Further in file system data is stored in JSON format

Administrative Privilege:

Admin refers to the one who has access to the data storage and hence the one with Administrative privilege can change the data.

Blockchain	SQL	MongoDB
In blockchain data storage, there is no administrator.	In SQL data storage requires admin for the database, so administrator privileges are required.	In the MongoDB database, the admin database contains privileges like applying changes to the master admin database, other databases, or the cluster resource of the database and can be inherited from roles that are from other databases as well as from the master admin database.

Data Access:

As we learned from the above point admin only can access the data but a user can ask the permission of the admin to access it. Data access is an important part of managing the data as a person with bad intentions can unfavorably change the data.

Blockchain	SQL	MongoDB
In a blockchain database, the user does not require permission for modifying data. Modifying data does not affect the main master data storage.	In an SQL database, the user requires permission from the admin to make any kind of data modification.	In the MongoDB database, the admin grants permission to modify master data storage.

Security:

As data access requires the admin permission some people try to bypass him to access data. Hence security is required to safeguard the data.

Blockchain	SQL	MongoDB
Blockchain provides security through cryptography, where users of the network have their secure and private keys. These keys are assigned directly to each block update and act as a personalized digital signature. Blockchain technology also uses a hashing algorithm to secure data inside blocks.	SQL uses different steps like server authentication, server logins and roles, and data encryption for security. Data encryption further contains technology checks like secure sockets layer, Transparent data encryption, Backup encryption, and cell/row-level encryption.	MongoDB server provides various security techniques like server authentication, access control, data encryption to secure different server deployments. MongoDB provides TLS/SSL network authentication. The network connection used in MongoDB is encrypted.

Compatibility:

Lastly, compatibility plays a huge role in deciding the way the data is stored. Some of the ways of data storage are not compatible with the way to process the data.

Blockchain	SQL	MongoDB
Blockchain provides cross-platform compatibility. It allows various blockchains to connect without any medium. Different blockchains can perform transfer values with each other.	In SQL Server compatibility level is associated with each separate database. It provides different associates with a specific version of the SQL server.	In MongoDB, server Compatibility is associated with the version of the MongoDB server.

Why blockchain is important?:

In the 21st century, information means power. Data without a proper way of storing it is just as useless as alphabets without words. The more processed and the better stored is as important as its accuracy and the speed at which it is received.

Blockchain excels in delivering that information in an immediate, shared, and completely transparent way where information is stored on a chain that is immutable and scan be accessed only by members with permission. In a blockchain, one can track professional content like orders, payments, accounts, production as well as personal content like doctor's prescriptions, family expenditure, etc

As members can share a single view of the truth, you can show all details of a transaction with security measures, giving you greater trust, efficiency, opportunities as stopping all unnecessary and unwanted prying eyes.

II. CONCLUSION

The implementation of blockchain is not only for cryptocurrency but can be used for various other things. Blockchain can not only be used as an alternative for traditional databases but also be used to get better results in some of the fields such as medical information and also money transfer. We propose that before using databases such as SQL or MongoDB once consider blockchain as it is as effective as them.

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