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Cloud-based Data Enrichment using Blockchain

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ABSTRACT: The quick response (QR) code has gained extensive popularity in information storage and identification in our daily lives due to its small printout size, high storage capacity and error correction ability. QR-code convention in decentralized business processes, facilitating organizations with decentralized solutions for product substantiation, provides chain traceability, and consumer engagement. Cloud computing is basically an outsourcing project. Cloud computing has a number of other benefits too like online storage and users have the ability to raise or reduce space according to their requirements. Cloud computing lets you store information and use hardware and software remotely over the internet, based on where and when you need them. This unique attribute, however, poses could new protection challenges which have not been well understood. In this paper how QR code can be used for cloud computing as data protection.

KEYWORDS: Blockchain, Cloud Computing, Security challenges, QR code

I. INTRODUCTION

A. QR Code

Quick response, or QR, is a type of barcode that can store a huge amount of information. The obvious variation between a QR Code and Barcode is its appearance. A QR Code is always in the shape of a square and contains smaller, even blocks related to Tetris. A Barcode, on the other hand, has vertical bars in dissimilar thicknesses and often accompanied by a serial number.

B. Formats of QR Code

A QR Code can be planned to do a multitude of things. It can be split into two formats:

- Dynamic
- Static.

A Dynamic QR Code is helpful for businesses or nonprofits in their marketing approach because of its advantages. A Static QR Code is a type of QR Code that can no longer be shortened once it's generated, hence, static. It doesn't cost anything to create and has no cessation date but you will not be able to path its scans.

C. Understanding Quick Response (QR) Codes

QR codes can be digitally scanned by devices such as mobile phones. QR codes consist of black squares set in a grid (matrix) on a white background and are read by specialized software that is able to extract data from the patterns that are present in the matrix. These codes are proficient of containing more information than traditional barcodes, and primarily handle four modes of data: alphanumeric, numeric, binary, and Kanji.

Despite the augmented data capacity, QR codes have not been as trendy with consumers as estimated. Rather than being formed by consumers to share information, they are most commonly related with advertisers and marketing campaigns.

QR codes have become more extensive in facilitating digital payments and in cryptocurrency systems such as displaying one's Bitcoin address. QR codes are also ever more used to convey web addresses to mobile phones.

D. Quick Response (QR) Codes vs. Barcodes

The amount of information that can be conveyed with reference to a product or service was conventionally restricted by the amount of space on the product's packaging or the advertisement touting its remuneration. If a consumer required

additional information about the product—availability, price, attributes—they would have to discover a salesperson or request further documentation.

Barcodes are frequently establish on the back of product packages and transmit data using a grouping of different widths of parallel lines, which can be read by machines that have an optical scanner.

E.Types of Quick Response (QR) Codes

There are a number of QR code types that may be used for dissimilar items. They include:

- **Micro QR Code:** A smaller version of a conventional QR code that is used when space is limited. Micro QR codes can vary in size but the least is 11 x 11 modules, encoding up to 21 alphanumeric characters.
- **Model 1 QR Codes:** Model 1 is the prototype of Model 2 and Micro QR. One to 14 versions are registered to the routine Identification Manufacturers International (AIMI) standard. Its maximum data capacity is 468 bytes, which can instruct up to 707 alphanumeric characters.
- **Model 2 QR Codes:** Model 2 has an alignment pattern for better position adjustment and contains greater data density than Model 1. One to 40 versions are register to the AIMI standard, with version 40 capable of storing up to 4,296 alphanumeric characters.
- **IQR Code:** Can be formed in squares or rectangles in cases where space or shape is an issue. It can be in any one of 61 formats.
- **SQRC:** Features a controlled reading function to contain private information.
- **Frame QR:** Customizable frame that can have larger data in formats such as graphics, illustrations, or photos.

II. USAGE OF QR CODES

QR codes are 2D matrix barcodes that can grip thousands of alphanumeric characters of information. They are simple and free to make and can be made via automatic QR-code-generating websites. These codes are not too dissimilar from usual bar codes but they are able to contain much more information. These 2D codes can re-invent your SEO strategy and improve its performance, here's how:

- 1) **User Convenience.** QR Codes supply an easy one-step process to direct users to a website, campaign, video or other information.
- 2) **Increased page traffic.** These codes quickly transmit mobile phone users to a webpage and promote people to act.
- 3) **Media Integration.** QR Codes can be incorporated with a wide range of marketing materials (e.g. print collateral, direct mail, billboards and more) to merge different information in one place.
- 4) **Device independent.** All the web pages QR codes are associated to, can be viewed on all popular smart phone software.
- 5) **Measurable analytics.** The actions associated to QR Codes are appreciable with web analytics or other tools for marketing campaign measurement.
- 6) **Competitive Differentiation.** Companies presently employing QR codes in their marketing campaigns tactically set themselves apart from competitors as this is still supposed as an innovative strategy.
- 7) **Inexpensive.** QR Codes cost nothing to construct and can be routinely and instantaneously generated by imputing a URL into a QR code maker.
- 8) **Broad user demographic.** Consumers of a huge age group are utilizing them.



Fig. 1.Types of QR Codes

III. STRUCTURE OF THE QR CODE

The structure of QR code consists of an encoding region (cell) and a efficient pattern. Efficient patterns are such as finder pattern, alignment pattern, timing pattern and a quiet zone which makes the understanding of the data easier and supply an area for storage. Besides the finder pattern are located at three corners with purpose to ease the location and identification of its position, size and inclination.

Moreover the alignment pattern acts as a rectification pattern that will exact the distorted QR code. While the black and white patterns allows the timing pattern to better recognize and exact the central coordinate of the data cell at the time the QR code symbol is distorted. The quiet zone is the margin space required for reading of QR code, while the data will be stored in the data area in the symbol. Presently there are 40 versions of QR code and four levels of error correction.



Fig. 2. Structure of QR Code

IV. INTEGRATION OF CLOUD AND BLOCKCHAIN

A. Blockchain Support for Cloud Computing

Blockchain integration with cloud computing brings us into the next era of data protection and service accessibility. Blockchain overcomes most of the research issues of the cloud with its uniqueness.

1) Interoperability: In public clouds, internal communication is not tolerable, and it makes many industries back off from using the cloud. When cloud incorporated with blockchain, replicate on the different clouds as nodes. Inter-node communication is feasible in the blockchain. All the nodes current in the same network split the data among themselves so that every node contains a copy of transactions. It brings us simplicity into the network. Update every next operation into the ledger, which publishes to all other nodes. In this way, companies can add any number of networks and can conserve the ease of the data, which brings legality into the network

2) Data Encryption: The data is decrypted before storing it in the cloud, which questions the data reliability. In the blockchain network, all the block data is curved into a hash code using cryptographic algorithms, and it generates a hash key for each block. Let us think about a scenario in which blockchain is used to conserve task scheduling in the cloud. To ensure rightness and stable data integrity, the control system that gather data from the task scheduling produces hash code and records it in the blockchain network directly. Because the blockchain has the ability for block invention consensus mechanisms, block data integrity is maintained. Each node in the network contains a copy of each transaction that provides us with the convenience and resolve that helps the network withstand possible fault points and attacks. While cloud-collected data is consistent, the blockchain nodes construct best use of data convenience and data authority by projecting it as an on-demand service with no downtime.

3) Service Level Agreements: These agreements in the cloud are constructive to the service provider or customer without equal justice. To solve this problem, we can make use of blockchain smart contracts. A Smart contract in blockchain helps to build trust involving the parties who do not know each other. In a blockchain, Smart Contracts are different as a program written in programmable languages that run in a container. The smart contract allows self-execution when a exact condition is met on all nodes present in the blockchain network. It also helps the parties expect

the outcomes as the contract execution depends on the code offered on a public network, and they are supportable as they are already signed.

4) Cloud Data Management: The data stored in the cloud is in a much unstructured manner. The data stored in the blockchain is a very prearranged manner. The data can be traced using the hash key generate for each block. Each block contains the prior block's hash key, and it's key to keep track of the network. The data in the block is validated and can be accessed by the nodes present in the network. Cloud supports elasticity and can feel the fluctuations in computational loads when required. Using a Distributed ledger, this can be easily handled by running a large number of events that cause a diversity of smart contracts, ensuring service quality.

Blockchain also ensures the user's ambiguity, and the user's record can be safely detached from the system to check third party access to the user's information. The integration of the cloud with blockchain will also ensure that many businesses have confidence, and it would happen to an On-demand service.



Fig 3: Benefits of Block Chain on Cloud

V. QR CODE IMPLEMENTATION PROCESS FOR BLOCK CHAIN

The process of storing and retrieving the data protected in a cloud computing environment. First achieving original authentication by the secure random number generation used for creating a unique key for each user. Then the uploaded file is encrypted by homomorphic authentication and then mutual with QR code. This combination of encryption code is stored in three different servers. A key is given to the user at time of download. The data is downloaded from servers if key is correct. The data is combined and decrypted before display to the user. The pseudo code is given below:

```
// Module for uploading data
Upload ( )
{
If (user authentication success)
{
Split and encode + combined QR;
Distributed to servers
}
Else
Return authentication failed;
```

```

}
// Module for downloading the data Download ( )
{
If (key is ok)
{
Collect from the server;
Decrypt the file;
}
Else
Failed;
}

```

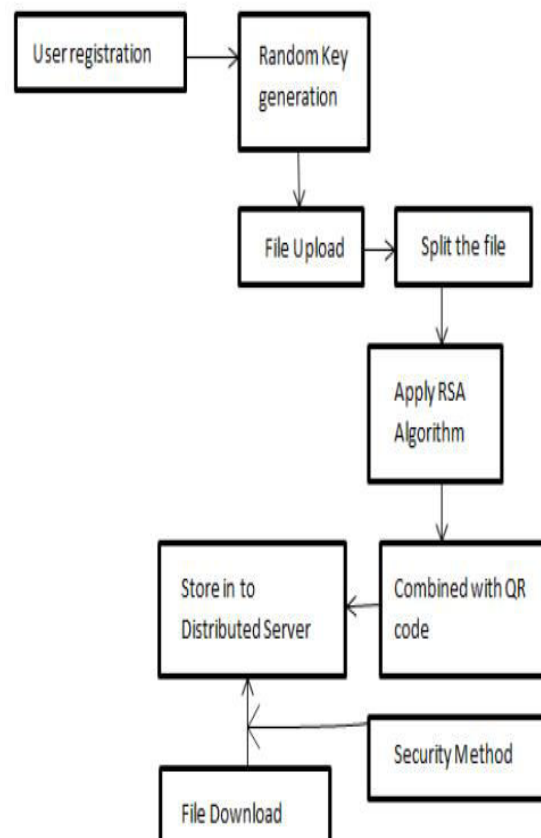


Fig 4: QR Code implementation process

Blockchain was initially devised for the cryptocurrency Bitcoin but the tech community has now established other potential uses for it. A blockchain carries no transaction cost, it is a easy way of passing information from A to B in a fully automatic and safe manner. Bitcoin is using this model for economic transactions, but it can be deployed in other ways such as working in combination with QR codes. It allows digital information to be dispersed but not copied, blockchain technology produced the backbone of a new type of internet.

Presently, QR codes are broadly used for authentication, payments, contact information exchange and much more. For instance, Safe Wallet the decentralised cryptocurrency wallet is initiation a new QR code-based user identification system that will replace mnemonic phrases and private keys. QR code is extremely encrypted and thus cannot be

decrypted by scanning them with other software. Platforms such as Safe Wallet do not store up an individual's QR code on their servers.

VI. CRYPTOGRAPHIC HASH FUNCTION

A hash function can be accepting variable-length communication and produces constant length hash message process, it does not need any key in its work. The hash function required for security implementations is mentioned to as a role of encoding hash function, that hash function is computationally infeasible to realize a message or the hash value that is equal for two. At most times the hash value is protected by using encryption techniques.

The term role of encoding that has been used in computer application from logically long time is referred to a role uses string of uninformed input to a string of fixed length. However, should it meet some extra needs (as detailed further), then it can be useful for encoding applications which is known as role of encoding hash. Roles of encoding hash are one of the most significant tools in the field of encoding and are functional to realize group of confidence protected purposes such as authenticity, digital monograms, quasi number generation, digital thrashing secret data in sorting mode, and real time stamping, The encryption techniques be able to be adding to encrypt the Hash function; any methods can be used to encrypt the hash function.

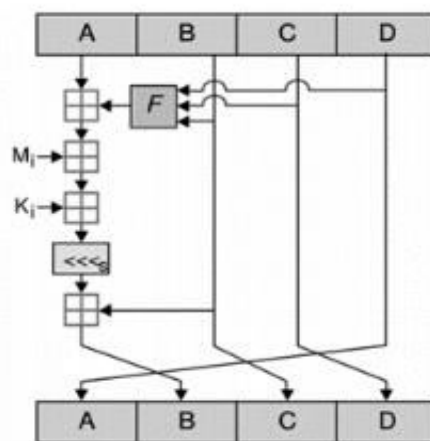


Fig 5: Structure of Hash Function

VII. CONCLUSION & FUTURE SCOPE

Quick response, or QR, is a type of barcode that can store a huge amount of information. Blockchain integration with cloud computing bring us into the next era of data protection and service availability. Cloud computing is a eminent technology as it has existed for many years. But people are still struggling to defeat some challenges of cloud computing like data security, data management, interoperability, etc. The benefits of integrating the blockchain network with a scalable cloud environment to develop confidence, server service, data security, and user data management.

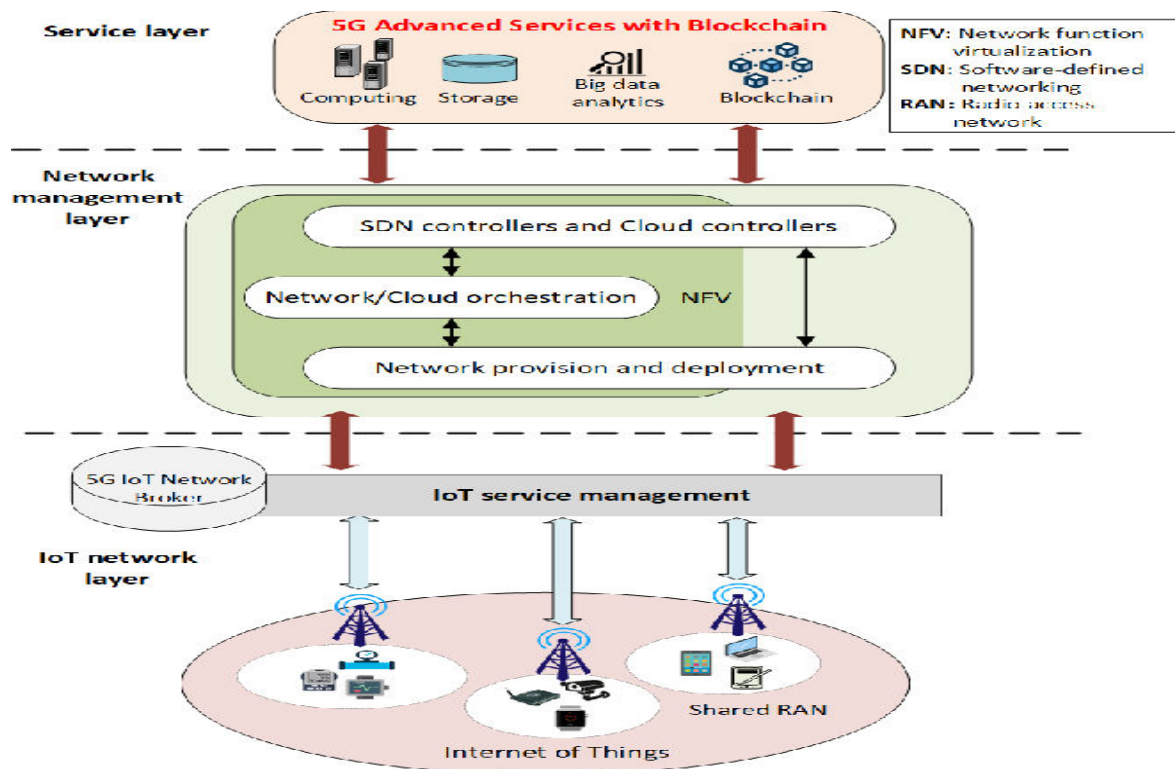


Fig 6: Architecture of Cloud Integrated with Block chain

Blockchain technology is an emerging technology well known for its security and authenticity, which are the main characteristics that are creation the world turn to its side. By integrating blockchain with cloud computing, there will be various advantages in usability, trust, security, scalability, data management, and many other advantages. It will be a good practice for data protection which can be implemented in cloud computing to avoid the cloud storage difficulty and manage the security.

Future enhancement of this work is to apply additional mechanism to enlarge the speed of access of data from the cloud environment and can be focused with the new consensus algorithm to develop scalability, processing time which helps to reduce the computation cost. The new image code based algorithm to improve the throughput of the transaction in cloud environment for block chain technology.

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