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Improving the Security and Speed of GST Tracking by Use of Artificial Intelligence's Blockchain Real Time Technology

[1]Ms. Gayathri B., [2]Dr. Vishwa Priya V.

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Abstract: On 1st July 2017, Goods and Services Tax (GST) was implemented by the Indian constitution. The main aim of GST was to provide a common tax format for all. VAT was replaced by Goods and Services Taxes (GST) in India for the supply of goods and services. VAT has been digitalised into GST, which can be used to track the goods & services. VAT and GST alike, are indirect taxes and have the same rates of taxation. GST has a comprehensive, multistage, destination-based and uniform structure. The biggest benefit of GST is that double taxation was removed. The imposition of GST on every step of production means that it can be refunded to all parties involved in the various stages of production excluding the final consumer. However, there are several challenges with the current imposition of GST. The GST can be implemented using blockchain technology to record these transactions. Use of blockchain technology will enable the system to be distributed, transparent, interoperable and highly secure. All the transactions in the blockchain are secured through cryptographic hash. Hence the system will eliminate unauthorized tampering of data in the chain. Many applications of Government and other industries are finding this technology efficient as it is highly secure and high speed operability with minimum cost. This can provide transparency in the finance sector. Blockchain technology is a real time technology and can make them omnipresent. In this paper we will discuss about features, applications and usage of blockchain for GST and its benefits.

Keywords: *GST, Blockchain, Cryptography, Hash algorithm*

1. Introduction

The Goods and Services Tax (GST) is a successor to VAT used in India on the supply of goods and services. GST is a digitalized form of VAT where you can also track the goods & services. It is a comprehensive, multistage, uniform destination-based tax. It encompasses all indirect taxes. GST is imposed at every step starting from the production process and meant to be refunded to all parties in the various stages of production other than the final consumer. It is destination-based tax and is collected from point of consumption at each stage.

Goods and service tax are divided into five different tax slabs. Petroleum products, Alcoholic drinks and electricity do no come under GST. They are taxed by the State Government following the old tax system. Most of the goods are expected to come on the common slab of 18% post GST. GST came into application on 1st July 2017 by the One hundred and first amendment of the Constitution. Multiple taxes levied at various stages at State and Central Government levels were replaced by this uniform tax. The Key objectives of GST are :

- minimise the cost
- Enhance productivity and efficiency
- Simple taxation format
- Improves revenue of the country
- Uniform Tax – 'One Nation, One Tax'
- To widen tax payers of the country
- Decrease cascading effect of taxation

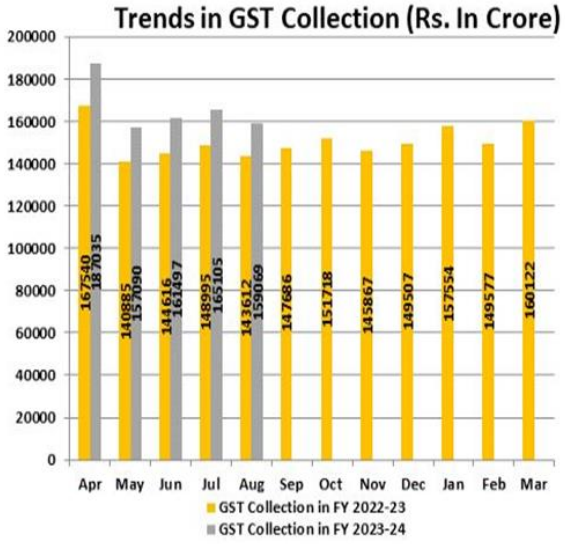

Fig. 1 : GST Revenue Collection for the financial year 2022 – 2023 and 2023 – 2024
Source : Tax India Online.com.

To boost GST Billing in India, Government of India introduced the "Invoice Incentive Scheme – Mera Bill Mera Adhikaar". All customers should demand invoices and bill for each purchase. The objective is to bring awareness to

[1]*Research Scholar, Department of Computer Science, Vels Institute of Science, Technology and Advanced Studies, Chennai.*
Email Id : gayaramesh0304@gmail.com
[2]*Assistant professor, Department of Computer Science Vels Institute of Science, Technology and Advanced Studies, Chennai.*
Email Id : vishwapriya13@gmail.com

general public to ask for a bill as their right. All tax payers should register their phone number and GSTIN in the GST portal. The GST Report is a type of report that gives a summary of GST paid and received. This is broken into various tax codes. This is used to determine GST Refunds and payments. GST reports are categorised as - GSTR1, GSTR2 and GST3B. GSTR1 is file

d for return of Sales. GSTR2 is filed for purchases made. GSTR3B is filed for both inward and outward supplies. Any tax payer who should file GST must file GSTR3B. This is implemented through the e-invoicing system. The phase I of electronic invoicing system was introduced on 1st October 2020 for all B2B transactions.

2. Literature Survey

An extensive study has been made upon the existing literature on GST and Blockchain technology. The same is as summarized below.

1. The authors Rishab Ranka, Niranjan Sharma, Naman Talati and Nikita Rai suggest that [1] Blockchain as a new type of database used to maintain information as digital blocks stored in a crypto digital ledger. As they are cryptographically secured they are difficult to attack. The chain is transparent. These are very helpful in real time systems in decision making and refund transactions.

2. The authors Dr. S. Harihara Gopalan, S. Akila Suba, C. Ashmithashree, A. Gayathri and V. Jebin Andrews [2] recommend the usage of blockchain as it contains hashed value with timestamp for all transactions. Each block is linked with the previous hash value making it easy to access and user friendly. It is more reliable and authentic as it is very secure and tamper proof.

3. The author Bandr Fakiha [3] discusses about the findings in the research study that in terms of speed, accuracy and efficiency, the blockchain technology based databases performed significantly better than cloud-based storage, machine learning algorithms and data-analytics methods. By using blockchain based databases we can identify whether it is susceptible to threats, and thwart malware attacks in less time more accurately. There are many advantages of blockchain. Blockchain are immutable and secure, so it is ideal for data storage and analysis.

4. The authors Ms. Sonam Nagar, Pranav Kumar, Praveen Anand, Shubh Shukla and Paras Gera [4] discusses the various features and types of blockchain. Blockchain treats every data as a block and all the blocks are interweaved and hence it is called “Blockchain”. Each block comprises of data, timestamp and a nonce. The whole block is encrypted through a hashing algorithm which generates a unique hash value of the data. The uniqueness of the most recent data is determined by the generated unique hash value. So they conclude that the blockchain technology is used to validate the voters details.

5. The authors Syed Huzaifa Ali and Hassan Tahir [5] discuss on the various applications where blockchain can be used. The modern Blockchain technology permits the records to be validated in a speedy and secure manner. They also discuss the challenges faced by blockchain, like governance, risk management and security in decentralized environment like Blockchain.

6. The authors Dr. Rhytheema Dulloo, et al [10] discuss on the various salient features of the GST System –

    - GST is destination based in contrast to the current taxation on origin.
    - It is a dual GST levied simultaneously by the Centre (CGST) and State (SGST).
    - IGST will be paid between the states including stock transfers and is distributed among the states.

It also discusses about the differences between the old and new taxation system in India. Earlier the taxation laws between the Centre and State was clearly defined. There was no connections between their fiscal powers. The introduction of GST has enabled the state and the centre to collect the tax at the same time..

7. The author Songara Manoj [11] quotes these words about GST. All sectors in India – manufacturing, Automobile, Telecom etc have got greater impact because of GST. While we compare the advantages and Challenges of GST. The advantages are more compared to challenges. Indian Economy has gained many benefits out of this smart tax system. But the country has to build a strong mechanism for the economic development of the same.

3. Problem Description

E-invoicing system records all B2B transactions which are electronically authenticated by the GSTN. This is a self help system which can be used to obtain digitally signed e-invoices. This can be generated in the prescribed format using any ERP / Business Management Software and then submitted to the IRP. Under this a unique identification number is given to all transactions against every invoice by the Invoice Registration Portal (IRP). The invoices generated by the Seller/Buyer are submitted under the e-invoicing platform of GST portal or e-way bill. E-invoicing has eliminated the major gap in data reconciliation and has greatly reduced errors This eliminated the need of manual entry in the GSTR-1 as the information is directly passed from IRP to the GST. The flow of the GST System has two parts :

- Communication between Business and IRP
- Communication between IRP, GST portal and the Buyer.

The IRP generates a hash parameter based the details submitted through the e-invoicing (like GSTIN-Seller, document type, fiscal year). The IRP then checks for the invoice in the GST Central Registry and confirms there are no duplicate entries. It then adds its signature and a QR Code in the invoices' JSON(Java Script Open Notation) data. The uploaded invoice is then shared with the GST system which updates the GSTR1 for the seller and GSTR2 for the buyer. This helps in determining the liability and Input Tax Credits (ITC). The main advantages of the e-invoicing system are :

- Accuracy
- Interoperability
- Tracking of invoices in real-time
- Invoices are auto populated by the GST portal and e-way billing system.
- All transactions can be accessed online
- Helps to identify fake invoices.

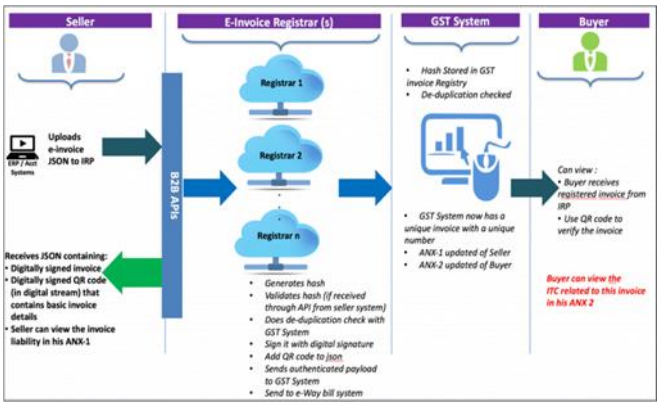

Fig 2 : Workflow of e-invoice

4. System Motivation and Research Scope

The Blockchain consists of blocks which are encrypted and arranged in a sequential manner. It is a public ledger which holds a list of transaction records. Each block is linked to the previous block called as the parent block. The first block of the chain is called as genesis block. It is composed of encrypted data blocked linked using cryptographic algorithm unlike the traditional database. The data are encrypted using SHA 256. A blockchain is distributed – multiple copies are saved on many machines. The data will be valid only if the data copies are matched. Information can be stored on a blockchain as distributed ledger by duplicating and distributing the data across the peer to peer computers.

5. Features of Blockchain

- Highly secure : Since digital signatures are used to conduct fraud-free transactions, data cannot be changed.
- Decentralized : Blockchain is maintained and controlled by all users collectively. Transactions are carried out collectively by mutual consensus of the users. This makes the transactions faster, transparent, trust-worthy, secure and risk free data manipulation. A local copy is maintained by all the participating nodes of the blockchain. The blockchain consists of a sequence of blocks containing the transactions of the ledger. Each block contains the cryptographic hash value of the previous block in the chain. The block also contains the timestamp and a link to the previous block.
- Smart Contracts : Programs stored in blockchain that run when a predefined condition is triggered is called as Smart Contracts. They are used to automate the execution of a contract so that all the members can immediately know the result of the transaction without any intermediary in less time. They can be used to automatically trigger an action when the conditions are met.

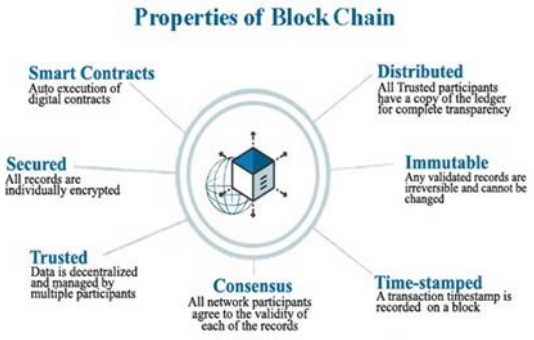

Fig 3 : Properties of Blockchain

- Immutable : Blockchain is immutable - permanent and cannot be changed. Once a transaction is recorded in the blockchain it cannot be modified or deleted.
- Unanimous : To add a new node, a majority of nodes should approve the transaction. Information in the blockchain can be modified only by consensus. Every block should be updated simultaneously and the updations must be propagated quickly.
- Transparent : The distributed ledger is public and transparent. Everyone can access and view the transactions in the network making it fraud resistant and corruption free.
- Hash Encryption : Hash is one-way mathematical function to protect the integrity of data. It works by calculating a fixed-sized unique value called "hash value" for every variable input. Its security strength lies on one-way characteristic, which is used to protect the integrity of data[2].

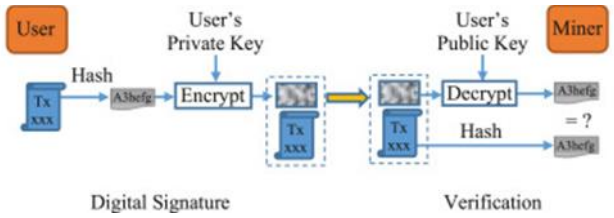

Fig 4: Digital Signature and Hash used in Blockchain

Few properties of Cryptographic hash functions which make them secure are :

1. They are one-way; it is computationally infeasible to compute the input given some output value. (eg, given digest, find x such that hash(x)-digest).
2. A specific hash cannot be created using any other message. Cryptographic hash functions are designed in such a way that given a particular input, it it computationally infeasible to find another input that generates the same hash value. (eg, given x. find y such that hash(x)- hash(y)). The only approach available is to exhaustively search the input space, but this is computationally infeasible to do with any chance of success.
3. They are collision resistant. No two input messages can generate same hash value. It is computationally infeasible to produce the same digest using same inputs.ie. no two inputs can produce the same hash value. it is computationally infeasible to find any two inputs that produce the same digest (eg, find an x and y which hash(x)-hash(y)).

6. Benefits of using Blockchain over Cloud Storage and Databases

Blockchain eliminates the dependency on a central authority to maintain the integrity of the data. The data in blockchain are encrypted using has and distributed across multiple nodes on the network.

Blockchain technology provides more authentication facility than cloud storage and traditional databases. The comparison is a

a) Cloud storage stores data on central servers and involves a centralized authority to manage the security of the data. Cloud storage uses central servers to store data. The security is compromised by the involvement of trusted third parties. So, a new technology needs to be introduced.
b) In cloud storage an optimization algorithm is required to optimize resource and minimize data processing time to increase network performance.
c) Security of cloud storage depends on the integrity of the central authority who manages it. Security of data is compromised and the whole structure is disturbed. The traditional encryption, access control, and integrity methods store information in one or more completely trusted authorities or centralized systems, this may be replaced with a decentralized storage service like blockchain.
d) Blockchain allows for quicker settlement of trades and is not lengthy.
e) In Blockchain we can only insert new data. Data can neither be removed or modified.
f) Blockchain transactions can be easily verified. This removes duplication of records and accelerates the transactions.

7. Applications of Blockchain

Many Government organizations have now started using the blockchains for various verification process.

- The Certificate Chain system is a very popular application of blockchain which allows our certificates to be accessed online by any authorized person/institution. It is tamper-proof and no intermediary are involved in the verification process.
- Document Chain is a single platform that provides a standard procedure for storage and retrieval of any document issued by the government such as birth certificate, death certificate, community certificate etc. This helps the Government departments, educational institutions, companies and financial organisations to verify the documents without any third party interference.
- Blockchain enabled property management enables the distributed ledger of the property documents to be accessible through online platform. All the stakeholders will be benefited by this technology in determining the complete history of transaction and take necessary decisions. The buyers of the property will be greatly benefited by easy verifications of the owner details and can be used to overcome the disputes.
- One the most popular use cases of blockchain is supply chain. The Aushada of Karnataka is integrated to blockchain to record and movement of drugs from production units to hospitals. Smartcontracts may be used to check for available balances at each stage of shipment and ensures the quality of drugs throughout the movement. It is easily traceable and transparent.

8. Conclusion

As per the constitution of India, the government can charge taxes on the people of the country based on their income. Tax collected from the citizens is used for creation of revenue which can then be used for public works projects. The prime objective of GST is to reduce corruption and fake invoicing. The income generated from the Tax collected plays a vital role in the economy of the country. Verification of the GST income can be verified using blockchain technology. The implementation framework of the same has to be studied in the future research papers.

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