An Efficient System for Implementation of Goods and Service Tax in India using Blockchain

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***Abstract*—In India, Goods and Service Tax (GST) is an indirect taxation system imposed on the supply of goods and services and is aimed to replace issues of direct taxes. GST is paid by all the users in the transaction system where the total cost of the product and profit is added and based on the total amount, the tax is calculated. This tax is paid to the Central Government and State Government. The tax refunds are calculated based on the tax liability of the user and returned back to the users. This refunding system normally takes a duration of 30 days from filing a GST refund form. The period may alter in some cases depending on the amount of GST refunds to be processed. In general, the refund value is high creating a financial burden to the users and the business in turn. Hence, we aim to create a web application to compute and levy GST by employing Blockchain Technology. Use of blockchain technology enables to securely host the public transactions where multiple customers/ vendors/suppliers all are all users who don't trust each other are brought onto a single system. The distributed ledgers are efficient, transparent and more secure because of Hash Function used for calculating unique hash numbers. The information flow can be tracked from an end-to-end basis in real-time. Thereafter, Smart Contract does the needful calculation of taxes and adjust the amount of tax to be paid back to the user and to the Government.**

Keywords—Blockchain, Smart Contract, Hash Function, Goods and Services Tax.

I. INTRODUCTION

The Goods and Services Tax (GST) came into effect from July 1, 2017 in India. The tax replaced the existing multiple flowing taxes levied by the central and state governments. There are two main categories of taxes: Direct Tax and Indirect Tax. Direct Tax is a kind of tax that is collected straightforwardly from corporate entities and people. This tax is such a type of tax that can't be paid by others or can't be moved to any other person. While thinking about direct tax, we incorporate income tax, wealth tax, gift tax, capital gains tax. Indirect taxes are such taxes that are indirectly levied on the people by selling goods and services. The sellers of the goods and services are supposed to collect the tax from various individuals. The collected amount needs to be then submitted to the government bodies by these them. GST system is mainly classified into two broad components; the state GST (SGST)/union territory (UGST) and a central GST (CGST). Goods and services are divided into five different tax slabs for collection of tax - 0%, 5%, 12%, 18% and 28%. However, certain products such as petroleum products, alcoholic drinks, electricity are not taxed under GST and instead are taxed separately by the individual state governments, as per the previous tax regime. The tax rates, rules and regulations are governed by the GST Council which consists of the finance ministers of central and all the states.

The blockchain technology actually came from the financial sector, i.e., the concept of digital currency. Blockchain is a distributed ledger, which simply means that a ledger is spread across the network among all peers in the network, and each peer holds a copy of the complete ledger. Blockchain is a database that is shared across a network of computers. Once a record has been added to the chain it is very difficult to change.

Let us see that without the blockchain environment how this GST system works. Whenever we purchase certain things, a GST Invoice is issued by the seller. We (the buyer) pay that bill along with the GST. This information about the GST is entered by the seller to a GST portal that this amount of GST is collected, say, over a fortnight and the seller pays this entire collected amount to the government. At the same time, it happens that the seller is actually working as a production house just like a shoe company which is purchasing multiple raw materials. And whenever they are purchasing the raw materials, the seller also pays certain GST to the suppliers. That way there is a kind of loop. Everyone in the production house, they collect a certain amount of GST and this entire amount of GST goes to the government. Now the task of the government is to make this huge calculation like which part of the GST needs to be refunded back to the intermediaries of this production chain, and which part would be finally, collected and get

it distributed among the central government and the state governments. This entire adjustment is done by the government employees who are connected with this tax department. The government tax department has to manually do this entire calculation or with the help of certain software. After doing the calculation they may adjust the amount of GST at individual production stages, and the entire final amount which is being collected gets distributed among the state governments and the central government.

GST is multi-staged tax which is imposed at every step in the production process, but is meant to be refunded to all parties in the various stages of production other than the final consumer and as a destination based tax, as it is collected from point of consumption and not point of origin like previous taxes. This refund process generally takes around 30 days and needs to be tracked by each stakeholder which is a tedious and painstaking process.

Employing a decentralized Blockchain system to overcome this issue can be a key to solve the centralized GST system issue. The designed system includes generation of Smart Contract that do the needful calculation of taxes and adjusts the amount of tax to be paid back to the user and to the government, thus speeding up the traditional process of GST refund.

II. LITERATURE REVIEW

A number of existing literature on GST and use of Blockchain technology has been studied. The same is as summarized below.

The authors Mehta, P., Mathews, J., Suryamukhi, K., Kumar, K. S., and Babu, C. S. [1] aims to identify return defaulters who avoid paying his/her true tax liability. This model is developed for the commercial taxes department and it helps all taxpayer to avoid additional payment of tax.

The objective is to build a predictive model which will help tax officials to predict whether a given firm (business entity) will file GST return or not in the coming month. This model based on the firm's past returns filing behavior, volume of business, value of interactions with the other firms and MAD value of the first digit benford's law on the sales transactions of this firm. Benford's law is a technique for detecting fraud in naturally occurring numbers. It is an observation about the probability of distribution of the leading digit in naturally occurring numbers.

The authors 'Chen,P.W.,Jiang,B.S.,and Wang,C.H.' [2] aim to overcome traditional financial transaction system. by implementing a blockchain-based payment collection super-vision system, not only for customer and merchant who respectively spend and earn digital currency, but also for government financial supervisory unit to audit digital currency transactions and helping to raise the tax collection.

The authors 'Junjun Lou, QichaoZhang, Zhuyun Qi,Kai Lei '[3] try to show how a Named Data Network which is a Blockchain based Information-Centric Networking (ICN) system, is completely different from the traditional IP network that is based on channel security, which requires SSL/TLS to encrypt the channel at the application layer or the session layer to ensure that data cannot be eavesdropped during transmission. The authors do not blindly or mechanically copy the key management mode in the IP network, nor do they grip the blockchain to the trust model of Named Data Network, rather they use the advantages of blockchain (such as distributed, data cannot be easily tampered with) to propose a key signature and verification method similar to partial decentralization.

The authors Kshetri, N., and Voas, J. [4] aim to provide a teaching material for the Blockchain technology to student for getting basic concept of Blockchain. The author developed an application called ChainTutor a which help student to learn basic blockchain concept and also it can be used in classroom teaching or as self learning. The application is built by using Java. The application consists of the core Blockchain modules, plus Learn Module, Set Up module, Build Wallets module, Build Transactions and Blocks module, and a Build Nodes and Network module. These modules work together under the same graphical user interface and allow students to create, verify, and validate different components of a Blockchain.

The author Liu, X.[5] conveys that Blockchain can reduce friction and conflict, as well as the costs associated with property registration. Bitcoin blockchain usually takes much longer time, since the number in "to-be-confirmed" field is needed to be secured against double spending after the transaction broadcasting to Bitcoin P2P network and stored to the cache pool, because blockchain has the potential to make up for a lack of effective formal institutional rules, laws, regulations, and their enforcement.

The authors 'Wang,S.,Ouyang,L.,Yuan,Y., Ni, X.,Han,X.and Wang,F. Y.' [6] try to show how Smart Contracts are providing helpful guidance, how they automatically facilitate, verify and enforce the negotiation and implementation of digital contracts without central authorities, how they help to achieve security through Ethereum Blockchain and how they aim to provide a reference for future research efforts. The paper strives to present a systematic and comprehensive overview of blockchain-enabled smart contracts, aiming at stimulating further research toward this emerging research area. Further, the paper proposes a research framework for smart contracts based on a novel six-layer architecture. Various recent research progresses are listed along with several typical application scenarios of smart contracts. Also, discussion of the future development trends of smart contracts. At the end, the paper aims to providing helpful guidance and reference for future research efforts of Smart Contract.

The authors Zheng, Z., Xie, S., Dai, H., Chen, X., Wang, H. [7] presents a comprehensive overview on blockchain by giving overview of blockchain technologies including blockchain architecture and key characteristics of blockchain along with discussion of the typical consensus algorithms used in blockchain.

The authors C. Wright and A. Serguieva [8] introduces some of the interdependent components in a multifaceted solution for accelerating the functionality of blockchain-enabled services through distributed scalability and agent-based automation. The focus is particularly on components that enhance the functionality of blockchain-enforced smart contracts. These include the method/system for automated management of smart contracts with hierarchical conditionality structure.

The authors S. Singh and N. Singh [9] gives a brief description of how Blockchain will transform each and every field and will be the future of Cyber Security. The paper also explains the concept, characteristics, need of Blockchain and how Bitcoin works. It attempts to highlight role of Blockchain in shaping the future of banking, financial institutions and adoption of Internet of Things(IoT).

III. METHODOLOGY

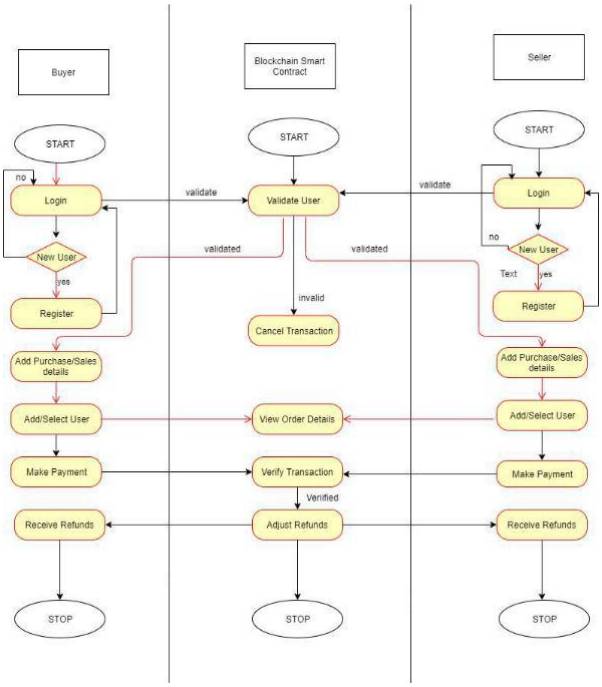

Figure: Flow of the system

The above figure shows the way in which the system works. There are three entities present:-

1. A Buyer,
2. A Seller
3. Blockchain Smart Contract

• Buyer: The buyer starts by first registering into the system if he is a new user else the buyer registers first. After registering into the system, he is redirected again to the Login page for login into the system. The validation of the buyer is done by Blockchain Smart Contract.

If the user is successful to login, he is redirected to the Dashboard. Further, the buyer adds the purchase and sales details. Then, the buyer adds or selects the user to whom he pays the amount. The verification is done by Smart Contract. He makes the payment through the Smart Contract from his wallet. The adjustment of the tax is done and refunding is done back to the Buyer.

• Seller: On the same basis, the seller performs all the similar actions as that of Buyer. The

seller starts by first registering into the system if he is a new user else the seller registers first. After registering into the system, he is redirected again to the Login page for login into the system. The validation of the seller is done by Blockchain Smart Contract.

If the user is successful to login, he is redirected to the Dashboard. Further, the seller adds the purchase and sales details. Then, the seller adds or selects the user to whom he pays the amount. The verification is done by Smart Contract. He makes the payment through the Smart Contract

from his wallet. The adjustment of the tax is done and refunding is done back to the Buyer.

Blockchain Smart Contract: The Blockchain Smart Contract

validates the user who is registering into the system. It checks for the user details from the stored data, validates the credentials and accordingly allows user to perform transaction. It aborts the transaction if the user is not a valid user. It further helps the Buyer and the Seller to View Order Details and View Transaction. After Verification, Blockchain Smart Contract calculates tax and refunds the amount back to the Buyer and Seller accordingly.

IV. IMPLEMENTATION

There are multiple parties who are involved in the entire taxation process. The current tax system can be handled with blockchain technology, since there are multiple authoritative domains who inherently do not have a trust relationship with each other but they want to come to a common platform for performing transactions. All these individual parties are actually relying on the government. For example, let us consider a pair of shoes. Here, each individual involved right from the manufacturing of the shoes till the selling, pays the tax levied for the shoes to the Central as well as State government. The main issue is that everyone needs to trust the government for whatever amount adjustment occurs at the intermediate steps of the production, that amount is refunded back to each individual or individual organizations on time. This is done by companies that submit GST refund form through which

they get refunded after doing tax adjustment. The tax officer's task is to calculate all these things and then adjust it accordingly.

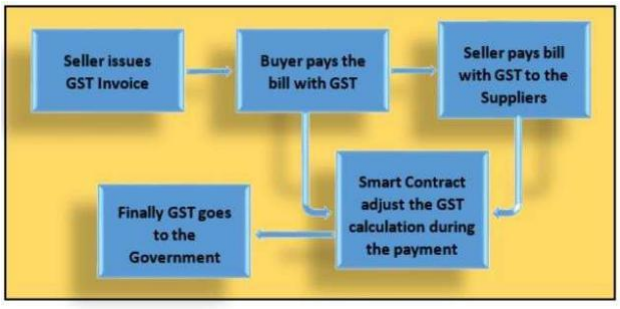

Fig: GST with Blockchain

Use of Smart Contracts can play a major role in increasing the speed of tax calculations and amount adjustments. Smart Contracts contain business executable set of codes written in any one of the programming languages such as Solidity, Go, JavaScript etc. They can check for who is paying what, which is the step of the production stage where payment is done, whether the user is the person who finally consumes the service or the goods or is an intermediary consumer. The entire chain can be controlled with the help of a smart contract by writing a certain set of codes as per the rules and regulations of the GST Act. Tax refunding can thus be easily handled and simplified in real-time by Blockchain Smart Contracts.

The implementation is as follows: The GST invoice is being issued by the seller to the buyer. The buyer pays the bill of the goods along with GST. Along with the buyer, the seller too pays the bill with GST to the supplier. All these payments are done with the help of the smart contract platform.

Mathematical calculations get applied on the amount. The Final Tax goes to the Government thus making the system easy, user-friendly and efficient.

V. RESULTS AND OUTPUT

Figure: Connecting WebApp with MetaMask.

As shown in the above figure, the consumer can register himself by clicking on the "START HERE" button and entering the correct details in the registration form opened. Then the User Interface of the GST system connects the user to the Blockchain account using MetaMask.Once the connection with metamask is successful, the centralized application gets converted into a decentralized application (DApp).

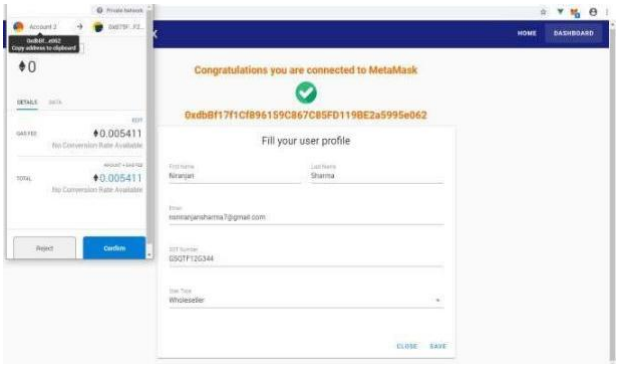

Figure: User connecting to blockchain

The above figure shows the registration form that the user needs to fill. The user before completing the form, gets connected to MetaMask where to complete the registration task, a small amount of gas fee is paid to complete the transaction faster. User can also perform transaction without paying the gas fee. Also, user gets a blockchain address which is unique and is used as a representation of unique GST Number.

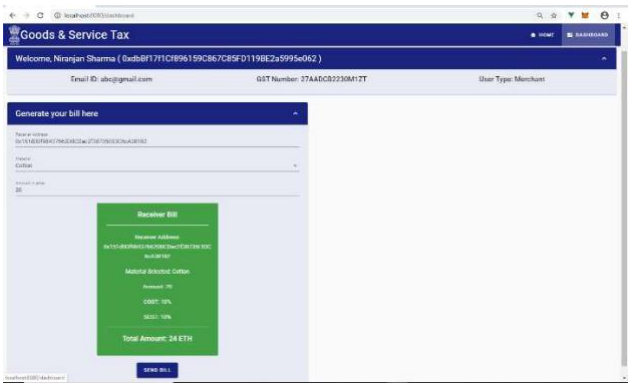

Figure: Bill Generation

The figure shown above depicts the bill that is generated by the user. The bill contains the fields receiver address which is the blockchain address, the type of material purchased on which tax is applied and the tax to be paid to the Central and State Governments. The final bill amount is calculated using various mathematical calculations and bill is send to the payer on his/her blockchain address.

VI. CONCLUSION

The IT module under GSTN is not capable of handling huge transactions that daily occur inside the centralized GST system. A successful GST system stands only because of its strong I.T. fundamentals. Many mismatch issues

related to the IT side of things are a curse to the current system. It has been difficult to handle this amount of big data with multiple field characteristics and carrying out transactions and refunding on the basis of GST All stakeholders including the government are facing challenges. Blockchain is a new type of database which retains all historical information in digital blocks and is created in a crypto digital ledger. Distributed ledgers are inherently difficult to attack. A totally transparent and complete audit trail is maintained throughout the chain. It will not only help in monitoring of correctness and fast decision- making for refunds and other compliances but would also help assess transactions and their chain of source in real-time. Tax invoices contain significant information. Using Solidity Programming Language for creating Smart Contract helps to derive and design tax invoices would mitigate major compliance issues like filing returns and claiming ITC (Input Tax Credit) etc. The implemented system is thus, user friendly, easy and accessible to all the valid entities. It has made easy tax calculation and refunding process.

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