WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

BLOCKCHAIN BASED COUNTERFEIT MEDICINE AUTHENTICATION SYSTEM

Prof. Archana Burujwale, Aishwarya Bankar, Priyanka Shinde.

Computer Department, GenbaSopanraoMoze College, Balewadi Pune

ABSTRACT

With the shifting of life-critical healthcare, it becomes an emergency to ensure substandard drugs. Because counterfeit medicine has a deadly effect on the human body and has disastrous results. To detect the falsified medicine, we proposed a drug tracing system using blockchain technology. Our system is able to detect substandard and anomaly drugs from manufacturer company to patient's hand. Also can verify the defective and expired drugs in the market using smartphones by scanning QR (Quick Response) code. Blockchain security could make the system more transparent and reliable.

Keywords*: block chain, security, smart phone, traceability, counterfeit.*

1. INTRODUTION

IoT is taking over the world; it is estimated that the number of devices connected to the Internet forming the Internet of Things will reach 50 billion by 2020 [1]. One critical application is the eHealth smart homes. In fact, this technology allows monitoring elderly or individuals with diseases and automatically sending the data to a remote server for processing by doctors. This data is recorded in the so-called EMR (Electronic Medical Record).

Counterfeiting of several products creates many issues for various manufacturing sectors and causes serious threats to medicine. This is very harmful to public health and also creates profit loss to the pharmaceuticals company. The yearly sales of counterfeit products in the world is 650 billion USD reported on the International Chamber of Commerce of Geneva [12]. To trace counterfeit drugs already several techniques have been used in the medicine supply chain. Authors in [15], proposed the usage of barcode or RFID code on medicine for verifying its legitimacy. Same as, a Data-Matrix tracking process has been proposed in [16], where every medicine has a Data-Matrix where contains Id of Product, Id of Manufacturer ID, unique ID of the package, the authentication code and optional metadata. The central verification register (CVR) is also mentioned. Most of the authors use RFID to their works on the medicine supply chain [1, 2, 16, 17]. But implementation of RFID is costly according to medicine price. In this paper we present a prototype of blockchain system for medicine traceability and regulation that rebuilds the full service architecture, ensuring authenticity and privacy of traceability data, and meantime achieves a ultimately stable

2. MOTIVATION

Counterfeiting of several products creates many issues for various manufacturing sectors and causes serious threats to medicine. This is very harmful to public health and also creates profit loss to the pharmaceuticals company. The yearly sales of counterfeit products in the world is 650 billion USD reported on the International Chamber of Commerce of Geneva [12]. To trace counterfeit drugs already several techniques have been used in the medicine supply chain. Authors in [15], proposed the usage of barcode or RFID code on medicine for verifying its legitimacy. Same as, a Data-Matrix tracking process has been proposed in [16], where every medicine has a Data-Matrix where contains Id of Product, Id of Manufacturer ID, unique ID of the package, the authentication code and optional metadata. The central verification register (CVR) is also mentioned. Most of the authors use RFID to their works on the medicine supply chain [1, 2, 16, 17]. But implementation of RFID is costly according to medicine price. In this paper we present a prototype of blockchain system for medicine traceability and regulation that rebuilds the full service architecture, ensuring authenticity and privacy of traceability data, and meantime achieves a ultimately stable .

3. FRAMEWORK

A. Medicine Supply Chain Data Storage in Blockchain In the model, the supply chain is created among drug administration, manufacturer, distributor, and pharmacy. Verification authority drug administration verifies several kinds of participants in the blockchain network. Designed systems transaction data storage is similar to bitcoin transaction data. Each participant has a public key which is shown in figure 1. Transactions between each participant share public key, hash value of previous transaction, encrypted QR code by manufacturer. Manufacturer levels medicine with encrypted QR code which consists of hash values that are generated by a hash function.

QR code contains the details of medicine which is manufactured by drug organizations. The medicine labels, ingredients, manufacturing-expire date, quantity on the medicine package taken as input to the CRC-32. Each medicine has a unique QR code using a hash function to prohibit reused leveling by the manufacturer. The transaction of the supply chain is secure and unshakeable for complex algorithms. This design gives the successful validation of the sender cryptographic signature. Unauthorized parties cannot get access to the data storage due to the public key and sender's digital verified signature, and encrypted QR code prevents the duplication of medicine. Fig. 1. Drug chain storage for medicine safety. B. Detecting counterfeit medicine In this system, we take some affordable and easily usable steps to detect the falsified medicine in the drug supply chain. To make it simple we implement some features into our blockchain prototype, which makes the work unique. Generally, a block of a chain consists of some basic elements such as the previous block's hash, information of this block, and the hash value of this block [8]. Information of a block can be a timestamp, transaction details, or transaction quantities. The hash value of the current block is made by a hashing algorithm that takes the information of this block and output the hash value for the current block. In this section, we add a location tracker that takes the current location where the transaction created. As a result, if the location of the transaction doesn't match the authorized participant's location the block will not be valid and it would not add to the chain. To get the location we use google Geolocation API [9]. The pseudocode in Pseudocode 1: Pseudocode 1 Matching with the location. 1. getLocation( ){ 2. navigator.geolocation.getCurrentPosition(x,y); 3. x ← position.coords.latitude; 4. y ← position.coords.longitude; 5. } 6. 7. isBlockValid(location){ 8. if Other_conditions && (location === this.fromAddress.location) 9. then return true; 10. } Here, fromAddress is the address of a participant of the network from where medicine will be supplied. If unknown address is detected on any transaction then it will not match with the recorded location of a valid participant also the block will not be valid and will not be added in the chain. As a result, unauthorized sellers or fraud cannot mix falsified medicine in the authentic supply chain from unknown address. Pseudocode 2 illustrates bellow: Pseudocode 2 validation at the customer end. 1. qrScanning(scannedValue, buyQuantity){ 2. for (value ← this.chain.block){ 3. if value === scannedValue 4. then chain.block( ); 5. } 6. x ← this.fromAddress.quantity('Medicine name') 7. if buyQuantity <= x 8. then valid; 9. x - = buyQuantity; 10. else invalid; 11. } We mentioned before the use of QR code on the medicine pack to test the authenticity with the QR code reader. When someone scans the code, it immediately shows the information associated with the medicine from the blocks of this chain. Actually QR code return an identity number or identity key that will use as an input to the blockchain Network. There will run an iteration on the blocks of the blockchain for finding the medicine associate with the same identity number or key of the input value. If it does not find the desire medicine it will shows that the medicine is not authentic and if it is found on the blockchain, it will shows that the medicine is authentic. But still there remains a security question that QR code reader is available and it is very much.

Drug chain storage for medicine safety.

B. Detecting counterfeit medicine

In this system, we take some affordable and easily usable steps to detect the falsified medicine in the drug supply chain. To make it simple we implement some features into our blockchain prototype, which makes the work unique. Generally, a block of a chain consists of some basic elements such as the previous block's hash, information of this block, and the hash value of this block [8]. Information of a block can be a timestamp, transaction details, or transaction quantities. The hash value of the current block is made by a hashing algorithm that takes the information of this block and output the hash value for the current block. In this section, we add a location tracker that takes the current location where the transaction created. As a result, if the location of the transaction doesn't match the authorized participant's location the block will not be valid and it would not add to the chain. To get the location we use google Geolocation API [9]. The pseudocode in

Pseudocode 1:

Pseudocode 1 Matching with the location.

```
1.  getLocation( ){
2.      navigator.geolocation.getCurrentPosition(x,y);
3.      x ← position.coords.latitude;
4.  y ← position.coords.longitude;
5.  }
6.
7. isBlockValid(location){
8.  if Other_conditions && (location ===
this.fromAddress.location)
9.          then    return true;
```

```
10. }
```

Here, fromAddress is the address of a participant of the network from where medicine will be supplied. If unknown address is detected on any transaction then it will not match with the recorded location of a valid participant also the block will not be valid and will not be added in the chain. As a result, unauthorized sellers or fraud cannot mix falsified medicine in the authentic supply chain from unknown address. Pseudocode 2 illustrates bellow:

Pseudocode 2 validation at the customer end.

```
1.      qrScanning(scannedValue, buyQuantity){
2.        for (value ← this.chain.block){
3.            if value === scannedValue
4.              then chain.block( );
5.         }
6.        x ← this.fromAddress.quantity('Medicine name')
7.        if buyQuantity <= x
8.        then valid;
9.        x - = buyQuantity;
10.   else invalid;
11.   }
```

4. CONCLUSION

In this paper, we develop a practical blockchain based secure infrastructure for the medicine AUTHENTICATION. Our application stands on blockchain security to identify the drugs uniquely and individually therefore, a Falsified medicine or fraud distributor can be identified Easily without any complexity. The prototype reconstructs the whole traditional medicine supply chain service Architecture that can provide medicine security as well as Authenticity of the manufacturer. It also introduce the current location of every transaction that makes the system more reliable. Optimization of blockchain data storage by removing expired medicine data makes the chain stable and acceptable.

REFERENCES

[1] Bocek, B. B. Rodrigues, T. Strasser, B. Stiller, "Blockchains every- where - a use-case of blockchains in the pharma supply-chain", in IEEE IFIP/IEEE Symposium on Integrated Network and Service Management (IM), May. 2017, pp. 772-777.

[2] M. Mettler, "Blockchain technology in healthcare: The revolution starts here", in IEEE 18th International Conference one-Health Networking, Applications and Services (Healthcom), Sep. 2016, pp. 1-3.

[3] J. Kurki, "Benefits and guidelines for utilizing blockchain technology in pharmaceutical supply chains: case Bayer Pharmaceuticals", Bachelor thesis, Aalto University, 2016.

[4] Ethereum. Available: https://www.ethereum.org

[5] T. T. A. Dinh, R. Liu, M. Zhang, G. Chen, B. C. Ooi and J. Wang, "Untangling Blockchain: A Data Processing View of Blockchain Systems," in IEEE Transactions on Knowledge and Data Engineering, vol. 30, no. 7, pp. 1366-1385, 1 July 2018, doi: 10.1109/TKDE.2017.2781227.