

Food Supply Chain Traceability using Block Chain

S.Kayalvizhi, D. Amirtha Sughi, G.Shivasree, J.Shruthi



Abstract: In this paper, the main idea is to have a transparent food supply chain by the use of blockchain technology. The architecture uses an authentication protocol which is similar to the protocol involved in the crypto currency technology. For this feature to be available in all the products a radio frequency identification (RFID)-based sensor was used. The architecture is built by having the cyber layer having the Blockchain and RFID sensor in the physical layer. The main idea of RFID is to provide real time monitoring of data by the use of a unique identifier. For a food supply chain to be transparent, every product has to have a proper link to the concerned origin and the status of the products. In order to achieve this blockchain provides a highly secured digital database for each of the food products. In order to prevent cyber-attacks different security analysis was being conducted at different architectural stages.

Keywords: RFID, cyber-attacks.

I. INTRODUCTION

Internet of things has a really big effect on the supply chain management considering the growth of the level of the food products. It's not surprising, that the food supply chain issue has become a key issue in the food and beverages department. An essential area where meals furnish chains can grow to be opaque is in a lot of manipulating visibility. This is a major issue in the transportation of products, such as fresh produce, that are supplied via limitless growers and prone to bacterial infections. Each batch of product has a lot of control numbers, and failure to hold song of these numbers creates risky visibility gaps.

Transparency has long gone mainstream. Initially just the pet venture of dark green consumers, it is now gaining traction globally with many customers caring about ingredient sourcing, labelling and what influence the manufacture and distribution of merchandise has on the surroundings and society.

The net of factors (IoT) has huge potential to impact global food supply chain (FSC) by using a way of growing productivity in terms of delivering chain overall performance. Among many demanding situations, agro-meals protection and it's have an impact on the surroundings due to meals wastage are of most important issues.

Other than infection, economically and criminally brought on meals adulteration is likewise a growing hassle because of globalization and huge growing deliver chain networks actual-time monitoring of the meals pleasant and visibility of that best index would prevent outbreak of food-borne ailments, economically encouraged adulteration, infection, food wastage due to false impression of the labelled expiry dates, and losses due to spoilage, that have sizeable effects on the food protection.

II. RELATED WORK

The contributions of various authors are surveyed and analyzed to determine the merits and demerits of the existing systems in order to make the proposed system work better.

A. A New Approach to Integrate the RFID in the Internet of Things Using The MQTT Protocol and 6Lo-RFID

The authors Y.Mouzouni, M.Taouzari, A. Mouhsen, S.Benalla, J.Elaoufi and H. Nasraoui they have addressed approximately the way the RFID tag developed from the legacy passive Tag and the role they play in clever environment in IOT. It moreover gives us a gritty view on how troublesome their development has ended up being. Another approach to blend RFID astute and heritage tag inside the IOT utilizing posttest with MQTT (Message Queuing Telemetry transport) convention and a proposed 6Lo-RFID structure. They have utilized the post/buy in test to coordinate the RFID Tag with the web of components. The MQTT used here's a many-to-many verbal exchange protocol, which allows more than one purchasers to alternate messages the use of a significant broker who is in fee of routing incoming messages primarily based on posted offerings. MQTT is greater matured and at ease than CoAP. It's far fine used whilst a node sends facts at abnormal intervals of time i.e. match pushed gadget that's well for RFID functions with requirements for constantly reporting sports of RFID Tag reads (EPC codes) from many distinct origins. In this article, a singular method based mostly on IPv6 framework and publish/subscribe pattern the use of MQTT protocol has been designed to transparently integrate RFID systems into the IoT area and enable IPv6 verbal exchange and networking over UHF RFID clever Tags. This approach makes use of a new packet layout of statistics saved within the UM of the RFID Tag referred to as 6Lo-RFID. This framework includes an IPv6 header, TCP header, MQTT header. This approach is well suited with the widely recognized EPC worldwide Gen-2 protocol which makes it bendy to apply.

Manuscript received on April 02, 2020.

Revised Manuscript received on April 15, 2020.

Manuscript published on May 30, 2020.

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B. KARMA: A Secure Economic Framework for Peer-to-Peer Resource Sharing

The authors Vivek Vishnumurthy, Sangeeth Chandrakumar and Emin Gun Sirer have discussed Shared frameworks square measure unremarkably structured round the supposition that everyone friends can volitionally contribute assets to an overall pool. They have proposed a well-known economic framework for averting freeloaders in peer-to-peer systems. Their gadget works by way of monitoring the asset utilization and asset commitment of each member. The standard of every participant within the device is diagrammatical by employing a single scalar value, spoken as their destiny.

A group of nodes, referred to as a bank-set, maintains music of each node’s destiny, increasing it as resources square measure contributed, and lowering it as they’re consumed. The framework is immune to malicious attempts by the resource supplier, consumer, and a fraction of the contributors of the financial organization set. They have a tendency to illustrate the application of this framework to a node-node file sharing application.

C. RFID-Based Multi-level Sensing Network for Industrial Internet of Things

The authors S. Amendola, C. Occhiuzzi, S. Manzari and G. Marrocco inform us approximately a Wi-Fi tool community totally supported battery-less oftenest identification (RFID) gadgets that is here projected as an application to the growing commercial internet of factors. The hierarchical statistics structure of the community allows a multilevel view of superior areas website hosting business devices. A multi-antenna configuration lets in to choose the zones of the house to be monitored even as custom RFID boards, capable to host many types of sensors, allow to seize every environmental parameters (e.g., temperature, humidity, and mild) and the human interaction with things. The gadget offers the time period detection of a plethora of superior events starting from critical environmental injuries, up to the (un)authorized get entry to an crucial area and also the tampering / overloading of device's. The capacity of the projected device community is finally incontestable via companion diploma utility to the observance of a true electric secondary station cabin. The projected decision might understand winning application to the empowering of SCADA (supervisory control and knowledge acquisition) and video police paintings structures which rectangular degree presently applied in commercial infrastructures, so production of each complementary and backup knowledge. Moreover, in evaluation to the a number of ordinary stressed out /Wi-Fi equipment’s for environmental looking and access control that sanely be afflicted by the dearth of a unique infrastructure projected community relays onto a properly enormous and standardized protocol and on a developing set of COTS gadgets with clear advantages for the potential among services and therefore the combination with present industrial infrastructures. The machine is for that reason appropriate to be virtually tailor-made and customized for blended get admission to management environmental still as component-stage monitoring with negligible installation, protection, and disassembly times and prices.

D. Privacy of the Internet of Things: A Systematic Literature Review

The authors Noura Aleisa and Karen Renaud have discussed ‘The net of things’ capability for predominant privateer’s invasion might be a difficulty. This paper reviews on a scientific literature evaluation of privacy-keeping answers displaying in the evaluation literature and within the media. They have analyzed projected answers in phrases of the techniques they deployed and additionally the quantity to that they happy middle privacy ideas. They tend to have determined that very few answers happy all middle privacy concepts. They also identified form of key data gaps in the course of the evaluation. Exceptionally, they have determined that majority answer suppliers assumed that end customers could be willing to deplete effort to maintain their privacy that they are probably actuated to act to keep their privacy. The legitimacy of this supposition ought to be demonstrated, in light of the fact that it can't just be accepted that guardians would fundamentally interface with these arrangements. They counseled this as a subject for destiny analysis. The generation of the net of factors has arrived. Contemporary studies is disproportionately targeted at the protection concerns of IoT. Nevertheless the privacy disadvantage is equally pressing. Destiny studies need to assess privacy perceptions associated with IoT, to discover whether or no longer people could act to protect their own privacy while mistreatment IoT. Furthermore, they've tested whether or not or now not they might well worth and use a management device that expressly prevents private invasions via IOT gadgets, particularly if some quantity of attempt is worried.

E. SHA-512/256

The creators Shay Gueron, Simon Johnson, Jesse Walker with the development of inescapable sixty four piece processing have an inclination to watch that it is extra expense viable to compute a SHA-512 than it is to compute a SHA-256 over a given size of insights. They exhort a normal approach to utilize SHA-512 and shorten its yield to 256 bits. For 64 piece models, this would yield an extra inside your spending limit 256 piece hashing calculation, than this SHA256. that they tended to choice this approach SHA-512/256, furthermore inclination to conjointly give a technique for evoking the components of the SHA-512 constants table that an execution can were given to store. All together for clients for you to recognize among a SHA-512 condensation that has been shortened and a SHA512/256 review, we by and large tend to also give new initialization constants, undifferentiated from the ones employed in SHA-384. We likewise watch the wonderful truncation strategy inside the SHA popular which may be drawn out to truncations to unmistakable lengths with the guide of choosing the following arrangement of 8 primes. This development might be very much the same as the component utilized in the Skein proposition for SHA-3. In either case, given SHA-512's by and large execution on sixty 4 piece structures, we tend to accept that SHA-512/256 disposes of an execution obstruction for the reception of more extensive hash esteems, which a shortened model of SHA-512 to 256 bits might be a practical difference to SHA-256, for sixty four piece designs.



From their general execution investigation, and experimentation on 64 piece Intel structure, we have demonstrated that the estimation of forcing a SHA-512 calculation supplies a half presentation improvement over equivalent usage of SHA-256.

F. A Security Framework for the Internet of Things in the Future Internet Architecture

The creators Xiruo Liu , Meiyuan Zhao, Sugang Li , Feixiong Zhang and Wade Trappe have talked around how The net of things (IoT) can be a present pattern that expands the limit of the web to comprise of an astonishing state of processing gadgets. Associating a few whole IoT structures through the net presents various difficulties, with insurance being the up-front seeing that impressive of the accumulated data will be revealed to a decent and once in a while obscure crowd. too bad, due to the inborn capacity cutoff points of low-end IoT contraptions, that represent a larger part of the IoT finish has, a few memorable insurance methods can't be done to lose IoT structures, which open an entryway for ambushes and adventures guided each contrary to IoT administrations and furthermore the more extensive web. This paper tends to this trouble by methods for presenting a brought together IoT system upheld the Mobility First future web plan that explicitly has practical experience in supporting assurance for the IoT. Their arrangement facilitates nearby IoT structures into the field net even as never again losing usability, point of confinement and security affirmation. In particular, they will be inclined to bring an aide IoT middleware layer that partners heterogeneous gear in nearby IoT systems to the world Mobility First social order. They have tended to prescribe partner IoT name objectives conveyor (IoT-NRS) as an inside detail of the middleware layer, and develop a delicate weight keying show that sets up recognize as substantial with between pal IoT contraption and also the IoT-NRS. They have inspected present IoT answers and separated their dangers. They concentrated altogether on confirmation parts

of the different IoT models. Starting with an outstanding security evaluation, security and private issues amazing to IoT structures. By then they have masterminded a bound together IoT position style maintained the Mobility First framework that watches out for security issues and will shoot certainty concerning the assumable action of the snare of factors. They have displayed another layer in the arrangement, to be searching for proposals from considering the way that the IoT middleware, that partners heterogeneous hardware in neighborhood IoT structures to the general Mobility.

G. Bitcoin Mining and its Energy Footprint

The makers Karl J.O'Dwyer and David Malone have analyzed how Bitcoin may be a virtual computerized cash that has delivered basic open premium, together with each impact in well worth and busts of exchanges overseeing in Bitcoins. One of the basic examinations of Bitcoin is that work, insinuated as mining, must be acted in checking each and every fiscal trade that dynamically makes Bitcoins as a gift. A look on the power utilization of Bitcoin mining is being made. It has a bowed to consider if and while Bitcoin mining has been beneficial when contrasted with the vitality benefit of playing out the mining, and infer that proficient equipment is every so often expected to make Bitcoin mining productive. Additionally, it proposes that the limit directly utilized for Bitcoin mining is like Ireland's power utilization. They have outlined components of Bitcoin applicable to Bitcoin mining and its quality admission. In spite of the fact that the value of Bitcoin is chosen by means of the individuals who trade them, it is also associated in how to the value of solidarity. The expense of Bitcoin mining on ware equipment right now surpasses the value of the prizes. Subsequently, the restriction made in digging for Bitcoin has caused a circumstance any place for you to be monetarily plausible the equipment has expected to end up being speedier, extra force minimal efforts.

Table 1: Comparison of various techniques used for supply chain tracking and classification

| Sno | Title | Year | Author | Concept | Merits | Drawback |
|-----|---|------|---|--|--|--|
| 1 | A New Approach to Integrate The RFID in the Internet of Things Using The MQTT Protocol and 6lo-RFID | 2019 | Mohamed Taouzari, Ahmed Mouhsen, Hanane Nasraoui. | Another approach to join RFID shrewd and inheritance tag in the IOT utilizing distribute design with MQTT. | 1) The limited frame size, header compression is highly advisable to efficiently exchange data. 2) The system consists essentially of smart Tag to send their EPC and sensing data to the reader and legacy Tags their EPC to the reader. | 1) The CoAP convention isn't valuable for RFID applications with prerequisites for constantly revealing occasions of RFID Tag peruses (EPC codes) from various sources. 2)The standardization effort has not yet addressed UHF RFID |

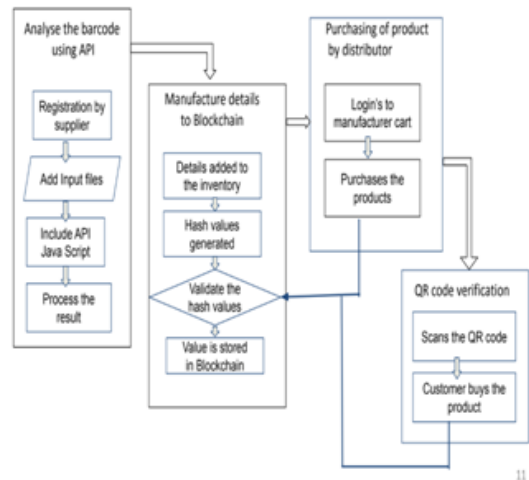
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|---|--|------|--|--|--|---|
| 2 | KARMA : A Secure Economic Framework for Peer-to-Peer Resource Sharing | 2017 | Vivek Vishnumurthy, Sangeeth Chandrakumar and Emin Gun Sirer | They have proposed a notable monetary structure for deflecting freeloaders in shared frameworks. Their gadget works by way of monitoring the asset utilization and asset commitment of each member. | Safeguards protect the device against malicious nodes which can try to manufacture karma, acquire services from friends without supplying them with karma, or accumulate karma and refuse to offer services. | 1) They suffer from freeloader, those people who spend more than what they produce. 2) There is a little advantage for those peers who contribute resources. |
| 3 | RFID-Based Multi-level Sensing Network for Industrial Internet of Things | 2018 | S. Amendola, C. Occhiuzzi, S. Manzari and G. Marrocco | The hierarchical data structure of the network permits a multilevel view of advanced areas hosting industrial equipment. | The proposed following stage abuses the consolidated preparing of simple and virtual signs to hit upon peculiar occasions. | Although numerous instances of RFID-based absolutely sensors were recently proposed by utilizing both scholarly world and, the sending of a totally free Wi-Fi sensor network completely dependent on RFID time stays in an early stage level. |
| 4 | Privacy of the Internet of Things: A Systematic Literature Review | 2014 | Noura Aleisa and Karen Renaud | They have dissected anticipated arrangements as far as the systems they conveyed and furthermore the degree to which they apply centre security standards. | The IoT application can't separate from the clients cooperation, so their own Data and activity conduct are put away, transmitted and handled in the IoT. | Yet various cases of RFID-based totally sensors were as of late proposed by using both academic world and, the sending of an absolutely free Wi-Fi sensor arrange totally reliant on RFID time remains in a beginning period level. |
| 5 | SHA-512/256 | 2015 | Shay Gueron, Simon Johnson, Jesse Walker | They propose a commonplace gratitude to utilize SHA-512 and shorten its yield to 256 bits. For 64 piece designs, this would yield an extra affordable 256 piece hashing calculation, than this SHA256. | The two hash functions: SHA-512/224 and SHA-512/256 are quicker than SHA-224 and SHA-256 on 64-piece stages, while keeping up a similar hash size and guaranteed security level. | 1) Storing a SHA-512 piece hash is costly, particularly in an obliged equipment condition, for example, a best in class processor. 2) Hashing counts have their security getting less thought than standard encryption counts and with little thought paid to their speed. |

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|---|---|------|---|---|--|--|
| 6 | A Security Framework for the Internet of Things in the Future Internet Architecture | 2017 | Xiruo Liu, Mei yuan Zhao, Sugang Li, Feixiong Zhang and Wade Trappe | Interfacing a few complete IoT frameworks through the Internet presents a few difficulties, with security being up front since rich of the gathered data will be presented to a decent and now and again obscure crowd. | Fetching of personal information has become very easy by the use of sensors. | The security revelation may make genuine outcomes people, and huge security revelations may cause some social distress and even the danger to national notoriety and security. |
| 7 | Bitcoin Mining and its Energy Footprint | 2016 | Karl J. O' Dwyer and David Malone | One of the essential thoughts of Bitcoin is that work, alluded to as mining, ought to be done in checking every single budgetary exchange that progressively makes Bitcoins as a present. | The present proprietor must sign the exchange with the private key of the key pair so as to give security. | 1) The expense of Bitcoin mining on item equipment presently surpasses the estimation of the prizes. 2) This task is comparatively a bit expensive. |

III. PROPOSED SYSTEM

We use the decentralized system blockchain servers to track the manufacturing of packed food items. Here we develop three blockchain servers to monitor the activities between the suppliers, manufacturers and distributors. We propose an architecture to monitor the transparency of the food product. Whenever a product is going to be manufactured the manufacture will be purchasing the ingredients from individual suppliers. Thus the entire flow in a product manufacturing will be updated in each phase in the blockchain servers. So when a customer purchase any product they need to scan the QR code of that product and based on the product id the tracking details like batch id, product id ,expiry date and date of packaging of all individual ingredients will be listed to the customer. Thus the transparency of the product is shown to end customer.

Advantages: Customer satisfaction is enhanced. Transparency of a product is shown in blockchain each block depends upon previous block so data tampering can be prevented.



IV. IMPLEMENTATION.

List Of Modules:

- A. **MODULE 1:** Analyze the barcode number based on API
- B. **MODULE 2:** Manufacture sends product details to Block Chain
- C. **MODULE 3:** Distributor purchasing the product.
- D. **MODULE 4:** QR scan code verification and bank Interfacing

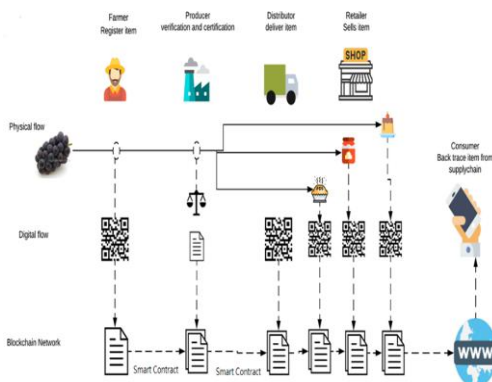


Figure 1. System Architecture

Analyze the barcode number based on API

- For each product it contains the barcode number and its number will be passing through food API then ingredients will be taken out by using barcode number.

- First registration. The registration form contains supplier details. Then login. Supplier sells the products to all manufactures what the procedure.

Manufacture sends product details to Blockchain by updating the database connection

- The manufacturer initially creates the account. They will analyze the raw materials and the manufacturer will request the quantity of raw materials to the supplier.

- Then suppliers will accept the request from manufacturer and raw material will be added to the manufacturer inventory.

- The manufacture will send the product ID, expiry date, number of packets, etc. to the blockchain and then the created product will be added to manufacturer shipment.

- From the blockchain the manufacturer will retrieve the product.

Distributor purchasing the product:

- First registration. The registration part contains distributor details and login.

- The distributor will be seeing the product in the manufacturer cart and then buying product by the distributor will be added to the Blockchain.

QR scan code verification and bank interfacing:

- Consumer buys the product from distributor.
- The consumer scan the QR scan by using the mobile app and then view the product in the mobile such as manufacturing date, packing date etc.

- The consumer will check the product and they will buy the product by using online transaction.

- Finally user transaction ID, product name and cost will be added to the Blockchain.

V. RESULT AND DISCUSSION:

The project is designed to help customers, have clear and transparent knowledge about the product they are consuming. This project is designed in method which ensures that the system has a sequential tracking of the food supply chain system. The system is structured in such a way that the consumer can monitor the food supply chain from the scratch where the raw materials are being bought then from the Suppliers to Manufacturer to Distributer under one roof. Here the result of the work has been shown as snapshots.

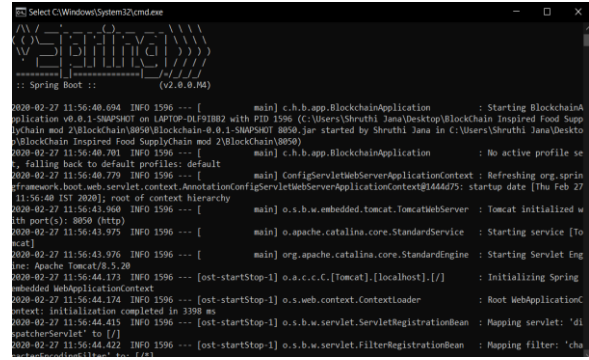


Figure 1. Blockchain Connection Establishment With Server.

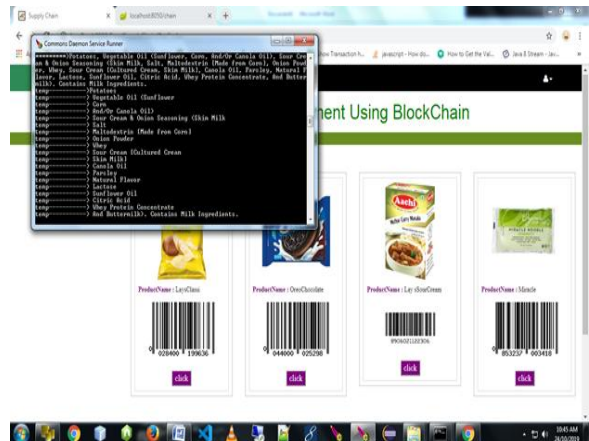


Figure 2. Analyze The Barcode Number Based On Api

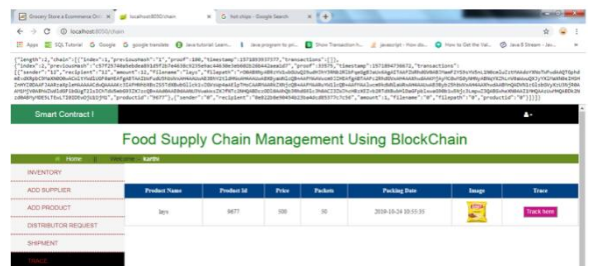


Figure 3. Manufacture Sends Product Details To Blockchain

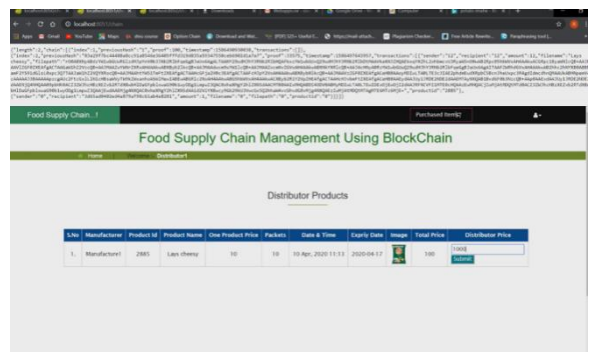


Figure 4. Distributor Purchasing The Product.

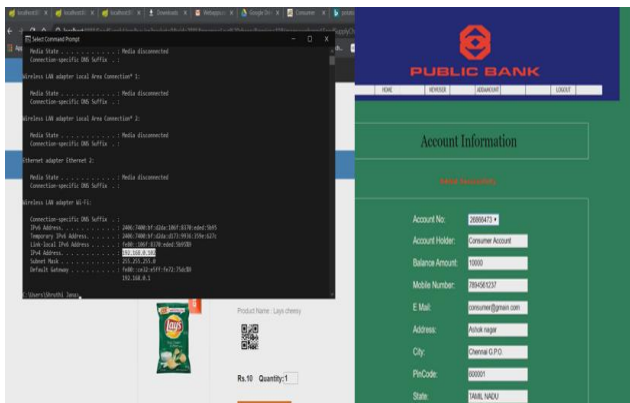


Figure 5 .Qr Scan Code Verification & Bank Interfacing.

VI. CONCLUSION AND FUTURE WORK

The above mentioned phases are accumulatively implemented to ensure that the system acts as a complete support to provide customer satisfaction. To improve the time efficiency in updating the process of Food Traceability. Eurostat has recently launched a brand new food value watching tool visualizing the event of agricultural costs, import costs and producer and shopper costs, determined by product classes and/or country. The tool will show to what extent value will increase and reduce the area unit transmitted from one stage of the provision chain to future, what impact they need and the way quickly.

There are units presently in development traceability technologies that use polymer, genetic, molecular or isotope following to mechanically track, trace and check foods as they move through their worth chain. The key to the long run of prospects is popping all this knowledge into meaty info; to use this information to realize information; associated to touch that knowledge to realize an understanding of the approach we tend to manufacture and consume foods.

REFERENCES

1. Mohamed Taouzari, Ahmed Mouhsen, Hanane Nasraoui, A New Approach to Integrate The RFID in the Internet of Things Using The MQTT Protocol and 6lo-RFID, International Research Journal of Engineering and Technology (IRJET), Volume: 06 Issue: 11, 2019
2. Vivek Vishnumurthy, Sangeeth Chandrakumar and Emin Gun Sirer, KARMA: A Secure Economic Framework for Peer-to-Peer Resource Sharing,
3. S. Amendola, C. Occhiuzzi, S. Manzari and G. Marrocco, RFID-Based Multi-level Sensing Network for Industrial Internet of Thing, New Advances in the Internet of Things, pp.1-24, (2018).
4. Noura Aleisa and Karen Renaud, Privacy of the Internet of Things: A Systematic Literature Review, IEEE International Conference on Mobile Services (MS), pp.108-115, (2014).
5. Shay Gueron, Simon Johnson, Jesse Walker, SHA-512/256, Information Technology: New Generations – ITNG 2011. pp. 354-358, (2015)
6. Xiruo Liu, Meiyuan Zhao, Sugang Li, Feixiong Zhang and Wade Trappe, A Security Framework for the Internet of Things in the Future Internet Architecture, J. Inf. Security Appl., vol. 38, pp.8-27, 2018
7. Karl J. O’ Dwyer and David Malone, Bitcoin Mining and its Energy Footprint, Proc. ISSC/CICT, pp. 280-285, (2016).

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