

# CORONAVIRUS VACCINE PROVENENCE USING BLOCKCHAIN AND INTERNET OF THINGS

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## ABSTRACT

As a result of its continual structural development, the Novel Coronavirus Disease (COVID-19) has looked to be an immense challenge. As we begin to combat the worldwide pandemic with the rapid roll-out of covid-19 vaccine vials, the overwhelming demand and global enforcement of the vaccination campaign are critical, but the success of the campaign is largely dependent on the availability of a sustainable and efficient supply chain. This study aims to contribute a solution that utilises cutting-edge technologies such as Blockchain and IoT to enable vaccination vial provenance. This study also suggests using RFID cards as verified vaccination certificates that record immunisation status in a private and secure manner. Finally, the goal of this work is to provide a contact tracking approach that uses the mobile user's geolocation to identify potential Covid-19 affected individuals.

**Key Words:** Covid-19, RFID cards, Blockchain, IoT.

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## I. INTRODUCTION

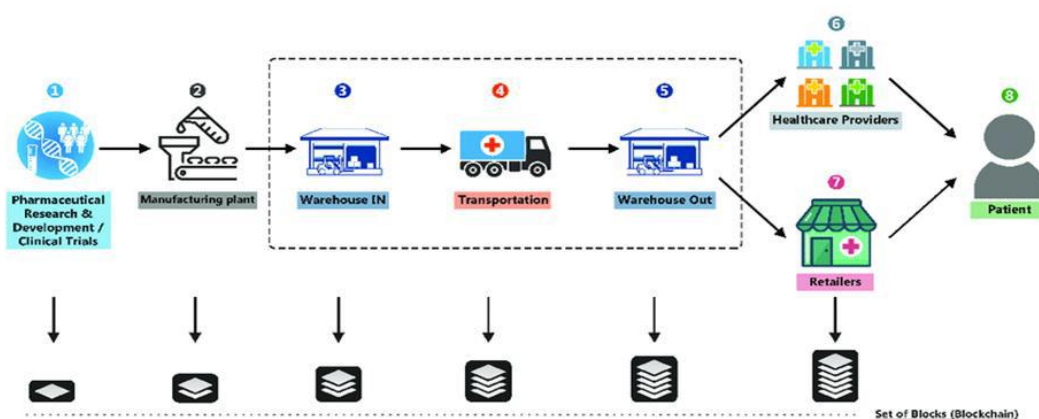
The novel corona virus (COVID-19) has been recognised as the most life-threatening occurrence in the history of the human race since World War II. Only a few nations have been lucky enough to limit the virus's spread since the virus's transmission was sudden and the rate of expansion could not be predicted in advance. The main reason for this worldwide control's success is because the capacity to track sick persons' contacts and confine them in time to cut-off the pandemic the propagation of this newly discovered illness. The most effective strategy to control the spread of this illness has been demonstrated to be vaccination and contact tracking. To tackle the difficulties of COVID-19, we propose utilising mobile phone user's geo position data for contact tracing using smart phone app-based contact tracing. Using IoT devices such as temperature sensors and location sensors, the proposed solution proposes a system for tracking vaccine vial distribution. The data collected by these sensors is encrypted with a blockchain algorithm such as the SHA-1 (also known as the hashing algorithm). RFID cards are used to speed up vaccinations while simultaneously functioning as a validated certificate. These certificates cannot be altered or defaced in any way. Along with the distribution of vials, the system aims to implement a contact tracing system that does not encroach on one's privacy. This

method aims to address current privacy issues and provide a more precise distribution of vials from coast to coast without causing harm or waste.

## II. LITERATURE SURVEY

The high demand for the Covid-19 vaccine, which must not be tampered with or wasted, has led to the adoption of technologies such as Blockchain and IoT to provide cost-effective and high-quality logistics for the Covid-19 vaccinations.[1] This paper proposes a system that employs blockchain technology to provide immutability, prevent fraud and identity theft, and ensure data integrity. The prototype was built using the Ethereum test network Ropsten and took into account all of the existing Covid-19 vaccine distribution tracking parameters. Numerous features were realised, including vaccination traceability and a transparent and tamper-proof adverse effect self-reporting method. In terms of scalability and output, the suggested blockchain technology looked promising.[2] The goal of this article is to offer an integrated blockchain-IoT system that will assist stakeholders sustain confidence. With the adoption of these leveraging technologies, workers' direct engagement will be reduced, lowering the risk of infection. The system improves medical foundations and details openness, privacy, and visibility.[3] In this study, a decentralised blockchain-based system was presented to automate the forward supply chain of Covid-19 medical instruments and to promote information exchange between parties involved in waste management in a safe, trustworthy, and traceable manner. Interaction rules for Covid-19 medical equipment waste management are developed using algorithms.[4] A blockchain-based strategy for digital health passports and immunity certificates is described in this paper. It included self-sovereign identification, re-encryption proxies, and association biometric data. Four smart contracts have been suggested that take use of on-chain events and alerts, as well as simple on-chain storage.[5] This study focuses on the several issues that have arisen as a result of the worldwide epidemic. Potential use cases have been designed to meet existing requirements in order to analyse the applicability of blockchain technology. [6] In this study, contact tracing is offered as a tool for controlling the spread of the new coronavirus infection. The suggested technique enables authorities to identify a large number of potentially affected individuals without the use of smart phone-based mobile applications. Based on mobile phone user geolocation provided directly from the mobile carriers, this solution provides a unique way for Covid-19 contact tracing. This system shows numerical examples that outperform the smart phone mobile application-based solution greatly.

### III. METHODOLOGY



**Fig -1:** Vaccine supply chain system design



**Fig -2:** Contact tracing system design

The entire framework is divided into five operating stages. The following are the phases and their operations:

**Phase 1: Vaccine Distribution:** During this phase, the maker distributes vaccinations to various distributors so that they may deliver the vaccine to hospitals around the country with the necessary data entered into a blockchain-based database.

**Phase 2: Vaccine Transportation:** In this phase, IoT sensors are installed on the carriages that deliver the vaccine (such as Temperature sensor and gps sensor). The criteria are monitored with the use of these sensors. This information is extremely valuable and sensitive. Implementing blockchain technology with the SHA-1 algorithm increases the desire for data security.

**Phase 3: Data Collection:** The major data for COVID-19 sufferers will be obtained from specified test locations during this phase. Then, using any map service, the affected regions will be displayed (e.g. Google map).

**Phase 4:** Using the Haversine formula, identify possible occurrences.

**Phase 5: Vaccinate the Patients** In this phase, residents are given an RFID card in order to track who has been vaccinated.

### IV. PROPOSED SYSTEM

A decentralised and immutable blockchain and IoT-based solution is offered in the proposed system, which employs blockchain technologies such as the SHA-1 algorithm to ensure data security. A hash value is created

and encrypted data is kept in the database depending on elements of data updation. Stakeholders can monitor if vaccinations are secure or have been manipulated with using IoT devices such as temperature sensors and location sensors. RFID cards are used to maintain track of vaccination campaigns and to serve as verifiable certificates. The citizen's unique id will be stored on this RFID card. This RFID card is scanned when a person gets vaccinated, and the unique identification number is obtained and delivered to the server. The server will give all of that citizen's vaccination-related information. We would want stop the spread of this Novel Coronavirus illness by using contact tracking in conjunction with the Covid-19 vaccination. There is no necessity for Bluetooth, NFC, or even wi-fi in our system instead, we employ a geolocation-based tracing technique to discover the distinctly probable contaminated persons. This strategy prevents panic trepidation from spreading among people.

#### System Modules:

**Manufacture model:** The vaccine will be managed by the manufacturer, and the vaccine vials will be delivered and tracked by distributors.

**Distributor Module:** The distributor visits the hospitals, updates the location and temperature, and then distributes the vaccinations.

**Hospital Module:** The hospital will monitor temperature and location, send out notifications to potentially infected individuals, and keep track of immunised patients.

**Citizen Module:** Citizens will get notifications, have their geolocation updated, and have their side-effects updated.

## **V. CONCLUSIONS AND FUTURE SCOPES**

An in-depth assessment of successful provenance and contact tracing systems is provided in this review paper. We proposed an integrated system that defines the logistics of the Covid-19 vaccination using cutting-edge technologies such as blockchain, IoT sensors, and RFID cards. Along with the tracking and overseeing vaccine distribution, we proposed a contact tracing approach that avoids the usage of Bluetooth/Wi-Fi/NFC. Instead, the proposed model uses the mobile user's geolocation updated by the user to determine the predicted infected citizens. The worldwide contact tracing performance improves dramatically while the user's privacy is protected. Because the system is traceable, trustworthy, scalable, and tamper-proof, it may be utilised for logistics of remdisivir and plasma from citizens who have recovered from coronavirus, which is the need of the hour to treat individuals with this nasty disease.

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