Blockchain Covid-19 Tracker for Educational Institutions

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Abstract: The current COVID-19 pandemic has changed our lives in unimaginable ways. It has brought forth the need to know our location, the people we've been in contact with, and other details like our body temperature and more to contain the spread of this virus. This information is even more vital when it comes to students, as their return to school increases their exposure level. There are quite a few existing systems that must be integrated to solve this problem. Currently, we have in use thermal sensors to record people's temperatures by scanning, we have card readers in buses to confirm the student's presence, and we have online portals where teachers can log a student's attendance for each class. Using blockchain, we can incorporate these systems to create an effective, transparent COVID-19 tracker. In this paper, we discuss a new blockchain-based tracking system that ensures transparency between the student, school and government to prevent the spread of the virus and help in contact tracing. We facilitate the integration of the above-mentioned systems using blockchain and school/national ID cards.

Keywords: Blockchain, COVID-19 pandemic, student, thermal sensors, card readers, online portals, school, transparency, contact tracing

I. INTRODUCTION

Block chain is basically a growing set of records in which new information and data is entered and monitored. This is considered as an efficient way to record data as opposed to databases as the information cannot be tampered with or erased. These are ledgers that are connected using cryptography. For quite a while, blockchain has been the most new and budding technology. The booming popularity in this sector has largely been due to the rampant and growing use of cryptocurrency. Bitcoin was the reason most people became educated about blockchain and its uses. One of the most redeeming factors about a blockchain is its complete transparency and autonomy. It often appealed to large groups of people especially while undergoing large transactions as it did not involve any third party and wasn't controlled by any one organization. This is one of the many uses of block chain. With the situation of our "new normal" due to COVID-19 and schools reopening blockchains might help the situation. Schools can implement this technology to keep track of whom the students are encountering and notify them if anyone tests positive and thus manage to control the situation better.

II. EXISTING SYSTEMS AND USES OF BLOCKCHAIN

As blockchains are a relatively newer technology, it has just recently started taking off. The complete capabilities and applications of blockchain technology have not been completely put to use yet as people have just started exploring its uses.

Using blockchain in healthcare, which is one of the most vital sectors in an economy, is just being uncovered. Blockchains are seen as a more transparent and efficient upgrade of databases and EHR (Electronic Health Records). Implementing the blockchain to log the data of the patients will give both patients, doctors and any required personnel easy access to their medical record. Patients often go to different treatment sites and doctors and thus gaining access to information compiled in one place is time and data efficient. This blockchain system uses a public key and the blockchain is distributed among trusted individuals. One very useful aspect of using blockchain technology in healthcare is the decentralized resources. The blockchain contains cryptographically signed contracts which are known as smart contracts. In healthcare, several contracts have to be upheld and respected such as the registrar contract, patient-provider relationship contract and the summary contract. All these are encoded in the blockchain. This provides a more patient centric approach. Currently, blockchains are used for data sharing, access control and health records but there is large potential for growth of blockchain in areas like supply chain and drug prescription management. There is also a lot of potential for blockchain usage in the field of education. Existing solutions such as Blockcerts, cryptocurrency and the Ethereum Blockchain (Ethereum still requires software to build smart contracts and access to databases however) are being used to permanently secure certificates, receive payments from students and provide student funding via blockchains in terms of vouchers respectively. Other potential uses of blockchain technology that is currently being explored in this field is using blockchain to verify multi-step accreditation, to facilitate automatic recognition and transfer of credits, to track intellectual property and more. Shifting our gaze away from blockchain, it is also interesting to examine the systems that have suddenly come into the spotlight due to the coronavirus pandemic and the notion of children returning to school under such circumstances .Information about a student's attendance and temperature has become essential to ensure every child's safety and well-being. To provide this information, three systems are especially significant: thermal scanners, bus card readers and digital attendance logs. Thermal cameras detect infrared wavelengths and use the received thermal energy from them to create images which reflect the temperature of that individual. The brighter the image, the hotter the object. Thermal scanners can be used to accurately state an individual's temperature to 0.1 degrees Fahrenheit.

Since fever is a common symptom of the virus, handheld thermal scanners have become a common sight to see in public places due to its non-invasive nature and no requirement of contact between the individual whose temperature is being recorded and the individual recording it. These thermal scanners can often also be linked to card readers and other systems which allows the data to be logged in a database. Another feature that has become commonly-seen in buses are card readers that log the students' presence in the bus. These readers use radio frequency identification technology to identify if a student has boarded or exited the bus and transmit the recorded information to a secure database or any other data storage system. The last system is the digital attendance log, where teachers log each student's attendance for each class of the day into the school online attendance database or corresponding system.

III. PROPOSED BLOCKCHAIN TRACKING SYSTEM

As seen previously, blockchain has a number of uses in healthcare and education. However, the pandemic has made it necessary to use blockchain in a completely new way linking these two fields: the need of the hour is to use blockchain technologies to facilitate contact tracing among school-going children, i.e. identify the people who might have come into contact with an infected individual and gather more information about these contacts. We propose the creation of a COVID-19 Tracker that will integrate the systems mentioned previously using blockchain to create a system where a student's attendance and temperature will be recorded and will be accessible to the school, the government and the individual student and their parents.
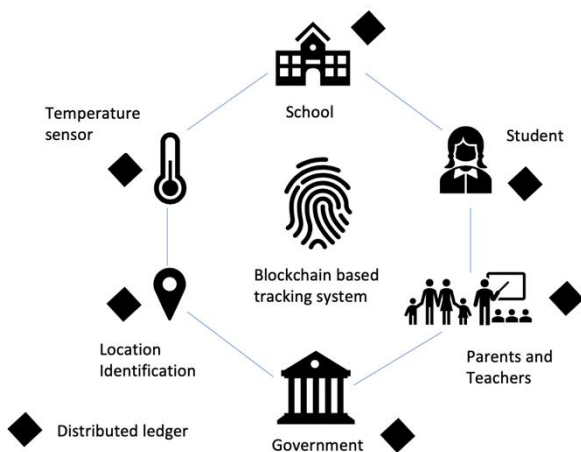

Fig. 1. Parties involved in the blockchain-based COVID tracker

The student must download and install the COVID Tracker for easy access, and submit information about their identity which will need to be verified. This would include the details present on their Emirates ID (national identification) and school ID card (student identification) so that both parties can check the individual's information and since both parties must be privy to this tracker. Once the student has been verified as a citizen and registered as a student of a particulat school, other details that are important for the school must be added, such as grade, section and bus number. It is also to be noted that the sensitive information

provided for verification is only for that one step and will not be accessible to anyone after that instance to ensure safety and security. When the student boards the bus, their presence is logged into the blockchain through the card reader that they use to scan their school ID card. Upon arrival in school, their temperature is taken, and that information as well is added to the blockchain from the thermal scanner. Throughout the day, each teacher takes attendance of the students present in each period and logs that in as they normally would, with the only addition being that this information is now also being added to the blockchain and being linked to each student in such a way that one can access each student's attendance through the day individually. A final temperature reading is taken at the end of the day and the presence of the student is recorded on the final bus trip back home. This information can also be legitimized by the school to ensure accuracy and then is finally uploaded. Students can check their data as well and request for a change in case of incorrect attendance or any other change. The advantages of using a blockchain system are that it is an extremely secure system which cannot be tampered with, users have unique identification and are authenticated, and it provides vast amounts of information that is easily accessible, which is especially important in the case of an emergency, such as a COVID case. In case a student tests positive for the virus, his/her classmates and all those that he has come in contact with can be easily traced using his/her attendance records. This helps in finding out who all must be quarantined and who all are at significant risk of contracting the virus. Temperature records can also be examined if required. All information is added to the blockchain through smart contracts, making the information secure and private, as the blockchain system ensures that other students cannot access another student's data, which is important to maintain security and to prevent mass panic and chaos in case of a coronavirus case in school. The decentralized system also ensures that the data can be accessed by the school and the government with ease. It is not only important for school officials to have access, but we must also remember that the government would also require this information for official numbers and tracking in such a scenario, and hence the decentralized system would increase efficiency not only within parties but also between parties. The system is also distributed, which prevents potential data loss. In totality, blockchain helps integrate key systems to create an efficient record-keeping process that is easily accessible to all officials and to individual students, ensuring transparency and quickness in the process, rather than records being stored separately and only being available to a few record keepers.
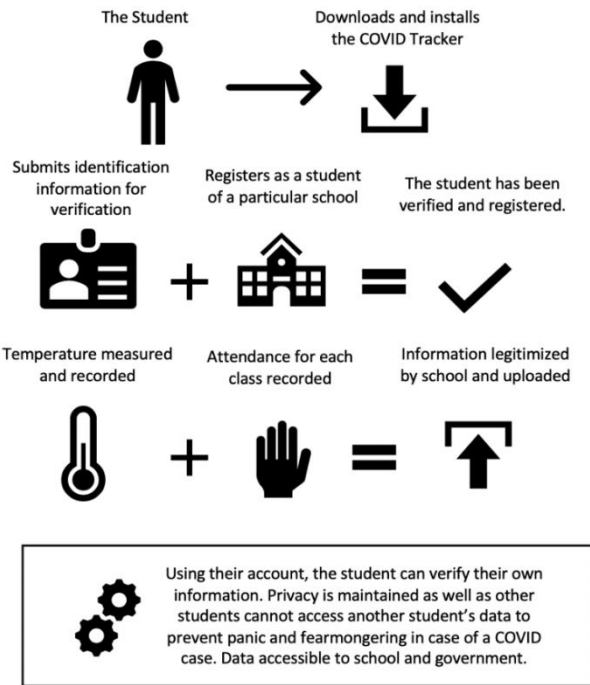
Fig. 2. Outline of the blockchain-based tracking system

IV. CONCLUSION

The times we are facing today are undoubtedly difficult and we must thus proceed with great care. As the 'new normal' is accepted, schools and educational institutions have started opening all over the world. Our proposed system of COVID-19 tracing can be a very efficient way of minimizing and taking control of this situation. This method can help governments and schools estimate the number of patients and provides important data that can be used to figure out how we can better handle the situation. As this might continue for a while, new systems have to be implemented in order to ensure the safety of students, teachers, school staff, drivers and parents. There are a large number of stakeholders in this situation and this guarantees their health to a certain extent. This will also open several unexplored realms of blockchain which will help further integrate technology into our daily lives.

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AUTHOR PROFILE

Anoushka Kapur is a Grade 12 student at GEMS Modern Academy, Dubai. She is very passionate about STEM and is looking forward to pursuing Computer Science in her higher education. She thinks that technology's biggest use is to facilitate social good and to create solutions for a brighter tomorrow. She completed a research opportunity at MAHE Dubai in the field of blockchain with her co-author, MaleehaMatto, which led them to write this paper. She is 17 years old and is based in the UAE.

MaleehaMatto is a 17-year-old student studying at GMA who has taken a keen interest in computer science; though this interest wasn't always prevalent, but rather an eventual growth over time. Her interest in blockchain piqued while talking with one of her teachers about the same. Though this topic seemed a bit boring and complex at first, after reading more about it, she found it to be one of the most interesting topics in IT. Many of her research papers in school also revolved around blockchainand its working and she did an internship which further fueled her curiosity and interest in such topics.