

CSE1006: Blockchain and Cryptocurrencies

Case Study Assignment

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Blockchain in Organ Donation

Aim:

To understand the current problems affecting data storage in healthcare in India and specifically in the area of organ donation and to explore the solutions possible using blockchain. To explore various loopholes in the organ donation law and show how various solutions using blockchain can provide an open but protected method of data storage.

Abstract :

What How Justification (paragraph 1500 words)

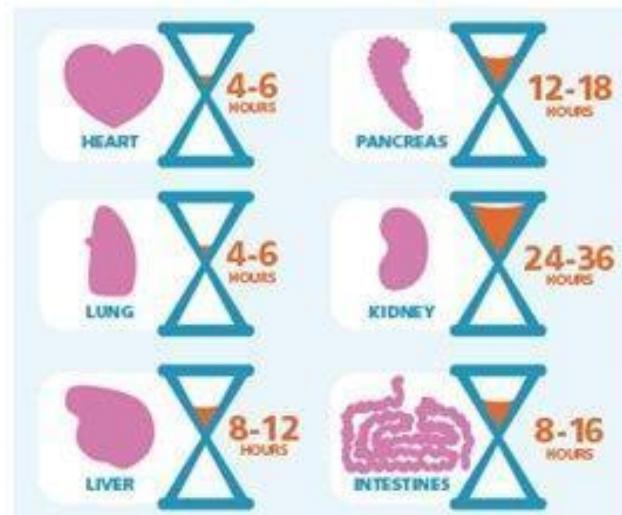
India is a country of 1.39 Billion people and storing the data of all citizens is a herculean task. All data is stored in the central government servers and is not accessible to the general public. A good example of why data should be visible to everyone is that of organ donation. The process of organ donation should be transparent and traceable so that there won't be any crimes. The most affected sector in our country for these crimes are people below the poverty line (BPL), they are lured to donate organs for money.

Body donation and transplantation are the most common treatments for patients with end-stage disease. Donor organ quality is directly related to the state of suffering from a disease or medical condition and survival after transplantation, so preservation solutions and strategies are critical. Today, the standard method for organ preservation is static cold storage. On the other hand, static cold storage has a short preservation period because it raises the risk of early graft dysfunction, which can lead to chronic complications. Furthermore, the increasing demand for marginal donor organs necessitates the development of methods for assessing and repairing organs.

While matching patients' organs on the waiting list to organs from deceased donors, many of the factors are taken into consideration. These considerations are almost the same for all organs irrespective of factors to be taken into consideration and their survival time outside the human body. Some of them include:

- Blood type (determined by the genes inherited from parents)
- Body size (some organs may be too large or too small for particular body types, for example, lungs to fit inside ribs)
- patient's medical condition Severity (how severe is a patient illness)
- Distance between the donor's hospital and the patient's hospital (distance is a major factor as the organs have less survival timing outside the human body)
- The patient's waiting time (the time receiver waited for the transplantation)
- The patient is available or not (whether the patient can be contacted and has no current infection or other temporary reason that transplant cannot take place)

A status code is assigned to people who need a heart transplant, showing the urgency of which they need one. Just 4 to 6 hours will the heart function outside the body. Lung transplants must fit inside the rib cage, and the same status codes would be given because lungs will only live for 4 to 6 hours outside the body. A candidate for a donor liver transplant should have the highest MELD or PELD (Model for End-Stage Liver Disease or Pediatric End-Stage Liver Disease) score, which suggests the greatest need, since livers will stay outside the body for up to 15 hours, allowing them to move further than hearts and lungs. Kidneys will survive for 36 to 48 hours outside the body. As a result, relative to the case of hearts or lungs, more applicants from a larger geographic region can be considered for the kidney matching and allocation procedure. The number of HLA antigens shared by the donor and recipient and a negative lymphocytotoxic crossmatch dependent on tissue are also used to match kidneys.



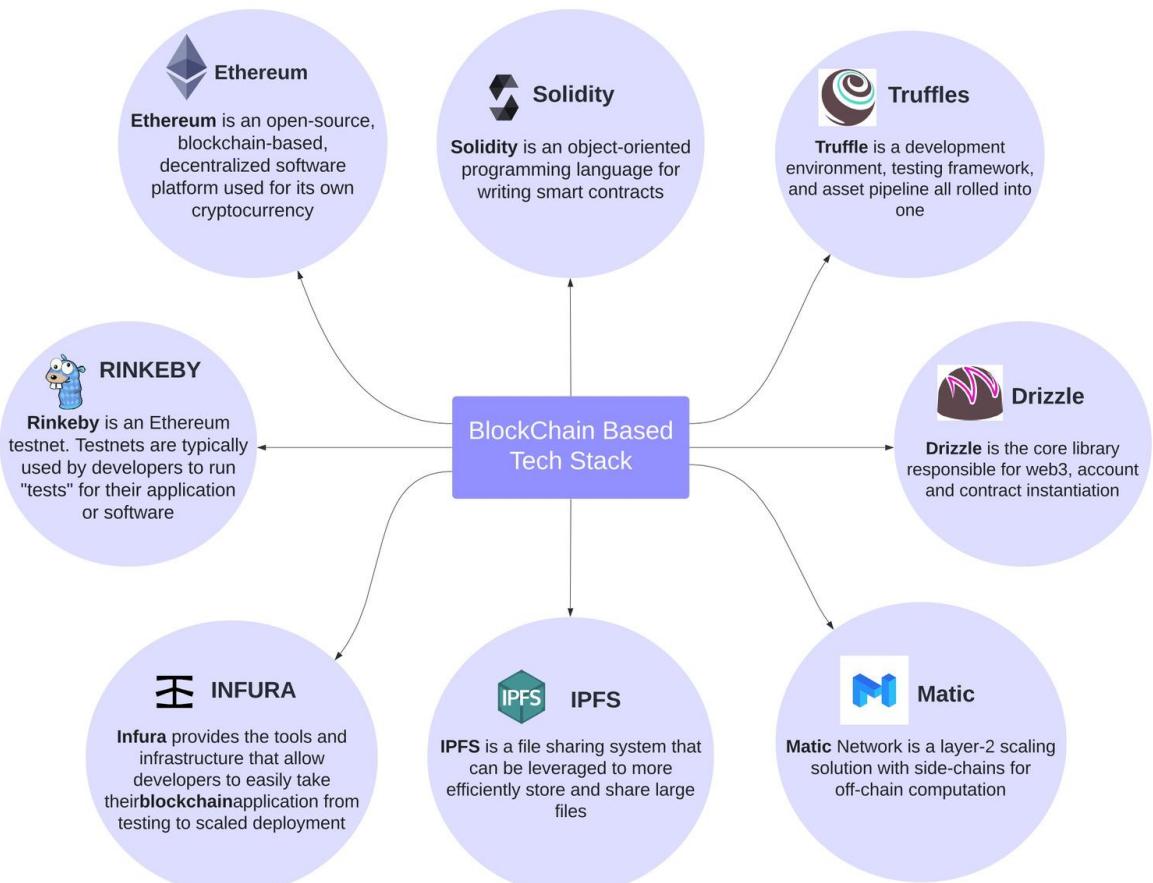
Organs survival duration outside the human body

These days major risk factors identified in organ donations are robbery or purchasing organs and exploiting being sold on an underground market for benefit. Relocate the travel industry, venturing out to another country to sell, buy, or get organs, for that, there is no framework to enrol the grumblings on. Additionally, the fundamental cycle of organ transfers is very unwieldy. Moreover, records are likewise open to digital dangers and there is no door for the beneficiaries to interface with to fix their inquiries. With the current organ gift framework in India, commonly the beneficiary who is set higher in the line to get an organ is denied an organ because of misbehaviours of compelling individuals, our framework plans to battle that by keeping an incorporated rundown of beneficiaries for the general public's viewing pleasure, to guarantee that an individual put underneath another in the need request doesn't get an organ before them.

Most of us have heard of blockchain by now, and some of us also understand what it is and how it works. Some people don't understand how this works or have a misunderstanding about it. One common misunderstanding is that blockchain is the same as cryptocurrency. This is not the case. Blockchain can exist without cryptocurrency, but cryptocurrency cannot exist without blockchain at this time.

By some turn of the imagination, however, blockchain is not a fad. And it isn't overhyped in the least. The majority of people are familiar with it as the technology that underpins bitcoin, Ethereum, and other well-known cryptocurrencies. Blockchain is being used with more than just cryptocurrencies. A blockchain is one form of a distributed ledger; however, not all distributed ledgers are blockchains. A blockchain is a form of the distributed ledger; however, not all distributed ledgers use blocks or chain transactions.

More often than not the organ recipient doesn't have the foggiest idea about the subtleties of the benefactor himself and needs to believe the organ gift focus. Organ gift misrepresentation is probably the main motivation individuals are reluctant to give and get given organs. The executing of forthcoming contributors for the benefit of the organ transplantation sting, on the foundation of the sinking amount of organ transplantation in various states in India all through current presence for the most part reasonable to extreme decrees. Subsequently, a secured, yet completely open framework is important to store contributor data in a decentralized and ensured way. This is the place where blockchain offers the solution to these problems.



Blockchain technologies applicable for this study

The organ donation process can be speeded up by not spending time in the logistics of the necessary paperwork between the different parties involved. The recipient, Donor, doctors, and government authority would have to provide the necessary documents to ensure minimum delay in the document reaching the required party by adding transparency to the whole procedure. Making sure that no recipient is denied an organ due to malpractices on the doctors' side at the government level. Each party would have to approve the different steps involved in the donation process and if they feel that the correct norms are followed they can file a complaint on the portal itself.

Each person in the supply chain will have a dashboard where he can view his entire transplantation history including the transaction hashes, the block timestamp, and view personal details of the corresponding blockchain credentials shown on the ethereum blockchain. As well the IPFS hashes for the respective documents, display analytics of growth rate of donors, able to receive monetary donations from NGOs and organizations which helps recipients in need. The concept of decentralized applications which are applications built upon the ethereum blockchain using smart contracts can be used to eradicate the problem of organ trafficking from India. The use of blockchain technology provides greater transparency because the version of the proxy can only be updated through common consensus which means everyone should agree upon it. The use of blockchain also provides enhanced security because the transactions that we have agreed upon by everyone are recorded on a public blockchain which are mined through proof of work and proof of state concepts.

Introduction

Brief description about topical statement (2 paragraphs) - 800 words

Origin (1 paragraph) - 800 words

Need (1 paragraph) - 800 words

Some sources (2 paragraph) - 800 words

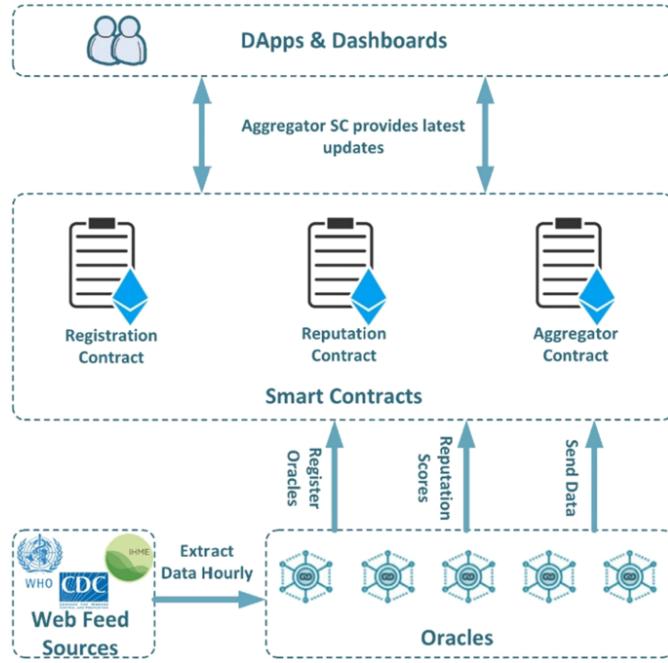
Over the past decade, blockchain technology has received growing attention from educators and practitioners in various industries, including banking, insurance, trade, and medicine. Blockchain is powerful in a variety of industries, including financial applications, supply chains, the insurance industry, and health records. By maintaining a consistent, intriguing, consistent list of transaction data on a distributed network, the blockchain has created several disruptions to existing business processes with its unique features. Having a promising ability to improve the flow of information, sharing, and transmission between participating nodes (i.e., partners in the real system), blockchain is expected to transform legacy operations through the delivery of new services and ownership transfers. The adoption of Blockchain and pilots who pioneered in various fields have demonstrated its potential in transforming traditional operational paradigms

Since the first successful kidney transplant in 1954, organ donation and transplantation has been an important medical treatment that improves the lives of thousands of patients who experienced organ failure(s). However, the allocation of scarce kidneys is a complex process, partially due to a significant imbalance between kidney supply and demand. To solve this issue, a number of allocation algorithms have been used and a few blockchain-based solutions have been proposed. To improve organ donation and cover more patients in need, organizations responsible for organ donation around the world are looking to combine their efforts. Nevertheless, there are still many unanswered questions. For instance, organ allocation policies and guidelines considerably differ depending on

the country, and hence international regulations are needed. One of the important aspects of such regulations is the fact that the data from stakeholders and the matching patients - donors algorithm is stored in the central point of these organizations. In this short survey, we investigate existing organ allocation algorithms. The focus of this paper is on blockchain-based decentralized systems.

Usually, the Organ donation process is done by manual listing and allotting the organs to a donee, in some cases, if one or more of the patient's organs are torn on the contralateral side during the process, one or more organs can be used to replace them. This method removes the relevant level of organs or tissues from the donor, thereby exchanging all organs needed. Each similar type of organ in the recipient is called an organ transplant. This is also called grafting. The United Organ Sharing Network is an organization commissioned by the federal government to carry out activities. UNSOS takes into account clearly defined government support agencies and several stakeholders using communication technologies and maintains a waiting list for relevant patients who are eligible for consultation. Every registered patient is a candidate. On the waiting list for one or more organs, the candidate can be a living candidate, an inactive candidate, or a candidate for multiple organs.

Active candidates are described as candidates currently eligible for fine surgery. This means that if a specific organ is transplanted to the candidate, there is a possibility of economic success. On the contrary, inactive candidates are candidates who, for some reason, currently do not have the right to simply accept proposals from group members. For example, they can become infected after they are placed on the waiting list, and they must be treated before accepting a transplant offer. And you need to donate multiple organs to fully recover. Where the end, when the candidate receives the donated organ, he becomes the recipient. This candidate list is the result of compatibility testing. The candidate was initially provided with an organ donation. On the other hand, the donor is the patient who is the source of the donated organ. Depending on certain factors, multiple organs can be removed from a single donor. The donor can be a deceased or domino donor (The transplantation of the (cadaveric) heart and lungs of patient A into patient B, who has long-standing lung disease—e.g., cystic fibrosis—but a heart suitable for donation, which is transplanted into patient C). Healthy people can donate some organs and tissues. For example, a healthy person with only one kidney and proper care can lead a good life.



Idea about DApps

These donors are classified as alive. The deceased is a patient who has been declared dead (appropriate death state of organs i.e., can't be used for further transplantation) or has experienced imminent neurological death, clearly defined and strictly abided by the standards. The most common misconception about organ donation is that when a doctor is an organ donor, the doctor treats the patient differently. In addition, for domino donors, healthy organs must be separated from living donors due to certain diseases. Then, the healthy organ can be donated to someone. For example, if a person suffers from cystic fibrosis, lung disease, heart-lung transplantation can be an excellent result. The hearts of these recipients can be transplanted to heart transplant patients with a high success rate. Responsible for identifying potential organ donors in the area where they work, and then obtaining as many organs as possible from the donors, and transporting the organs to the selected candidates under the necessary care.

Donor hospitals refer to hospitals that have organ donors or have received treatment. Now, transplant hospitals will perform transplant operations. The transplant hospital must respond with one of the following two answers: Accepting the organ proposal will initiate the process of transplanting compatible organs and send it to the selected candidate. On the other hand, if the organ proposal is rejected, the new candidate will receive an offer: "The histocompatibility laboratory has performed a type of histocompatibility test, including HLA typing, antibody testing, compatibility testing or crossover. Match and at least one employee in a transplant hospital. "The matching system is a computerized application that can find the best candidate when organs are donated through donations. Starting matching is the process of creating an ordered list of suitable candidates for each organ donated. The order in this list depends on the

candidate's health status and the type of organ donated. The solution varies from organ to organ. Different organs can survive outside the donor body for different periods. The survival time varies from person to person.

The blockchain is an upright advanced record of monetary exchanges that can be customized to record monetary exchanges as well as everything of significant worth. In particular, blockchain is a record of distributed exchanges worked from connected exchange obstructs that are permanent and shared inside an organization. An appropriation record is a kind of information base that is shared, duplicated, and synchronized among the individuals from an organization. The conveyance record records the exchanges, like the trading of resources or information, among the members of the organization. Appropriation records can be named public or private. A public circulation record is mysterious as every client has a duplicate of the record and takes part in affirming exchanges freely, while a private dissemination record isn't unknown. An authorized blockchain necessitates that people be given a duplicate of the record and consent from an association that administers the record to take an interest in affirming exchanges. This innovation permits associations to oversee security and Health care coverage Convenience and Responsibility Act worries as most will be private and require permission.

Blockchain innovation, which is at present upsetting enterprises around the world, is appropriate for the personality of the executives, exchange preparation, record of the board,well-being-related,well-being-related, and general wellbeing observation. This problematic innovation is making creative answers for complex issues in an assortment of ventures including fishing, jewel, style, transportation, banking, and medical care, which are discussed. In a straightforward blockchain with N blocks. Each square has information, a hash of the past block, and a hash of the information in this square. Each square is connected to the past block (aside from the root block) and each square in the safety chain. Assuming any information in a square is changed, the hash for that and later squares will be wrong. The appropriated idea of blockchain implies that everyone has a duplicate of the chain and should likewise roll out similar improvements to keep the whole blockchain steady, which is exceptionally far-fetched (ie, high Byzantine adaptation to non-critical failure). This is a model of dispersed trust where at least one troublemaker doesn't bargain the trustworthiness of the data set.

Cooperation among members happens across the organization to store, trade, and view data. The record will forever record information in a consecutive chain where affirmed and approved exchange blocks are connected and affixed from the start of the chain to the most current square. When an exchange is added to the square, it can't be adjusted because each square should be confirmed from all clients with admittance to the record, which guarantees the honesty of the data being shared. As the blockchain network naturally leads a self-check, it brings about more noteworthy straightforwardness and decreased corruptibility. Blockchain innovation doesn't utilize any type of concentrated power. The records are public and effectively certain. In medical services, these squares won't be open, yet the individuals who are given authorization will be

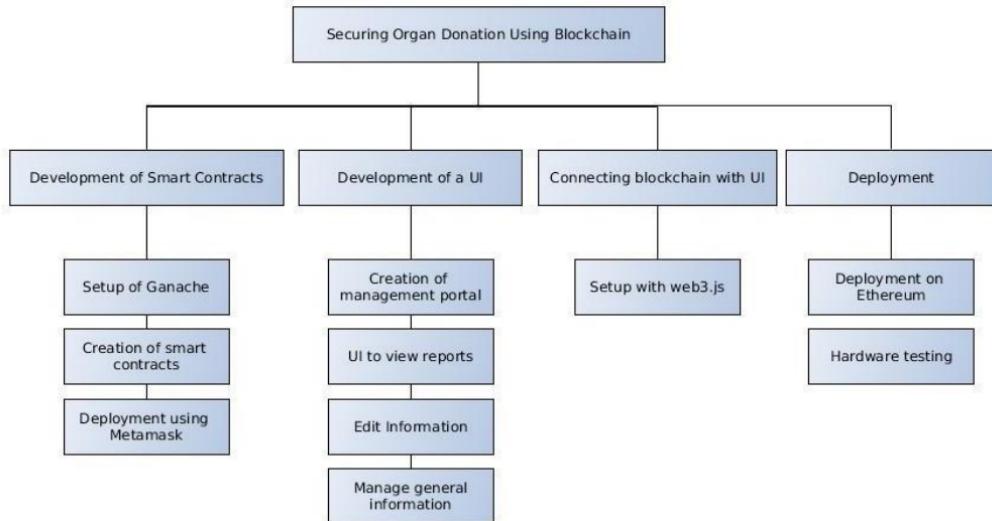
allowed admittance to check whether the data is right before it turns out to be essential for the blockchain. A review trail follows each exchange for validation purposes, and each record has a timestamp and a special cryptographic mark. The cryptographic mark, otherwise called an advanced mark, permits a client to sign with a private key to follow the start of the exchange data. Blockchain innovation utilizes encryption for security control and validation employing a public and private key. A client's public key is their location on the blockchain, through well-being related well-being-related notwithstanding a client's private key is like a secret phrase that gives admittance to information. The mix of public and private keys guarantees that the information put away on the blockchain is honest and recognizable to the beginning source while keeping that source anonymous. A cryptographic hash fills in as the advanced mark for a square of information. Hashing, alongside the utilization of public and private keys, demonstrates that data in the exchange has not been adjusted. The objective of blockchain innovation is to fill in as an advanced record that will kill the mediators with the utilization of cryptographic hashing and timestamps to set up computerized trust among clients and to permit an immediate and effective exchange of information and data.

Medical services are a perplexing industry with different compelling partners. Blockchain-based innovation can upset the coordination of the medical care industry through creative answers for the difficulties looked in the industry. Management of the enormous measure of information gathered by wellbeing frameworks presents a mechanical test for medical services frameworks, payors, administrative organizations, government administrators, and experts. Difficulties in information the executives explicitly incorporate information structure, security, information normalization, information stockpiling and moves, administration and responsibility for the information, errors, and constant appropriate investigation. The two-section confirmation framework used in blockchain innovation makes likely answers for these issues. The private or public key framework in blockchain takes into account trust to be set up to productively move information in a way that is discernible and secure.

For long-haul achievement, blockchain innovation applications should enhance the electronic wellbeing records that medical services frameworks and suppliers are right now utilizing. Positively, for numerous reasons (ie, cost, consistency, and significant use necessities to give some examples), blockchain innovation can't supplant Electronic Health Records. Store network the executives for organ transport is a genuine illustration of an application where early reception is likely because the use of this innovation is surely known and easy to carry out as it is free of the Electronic Health Record work. Blockchain advancements have effectively been created on stages like Chronicled, which tracks a scope of items including medications, blood, and organs. The potential to oversee information made by a patient experience with the Web of Things (IoT) for cross-institutional information sharing. A blockchain framework for the IoT could oversee wellbeing information from wearable gadgets. Blockchain could likewise be utilized for cross-institutional sharing of medical services information employing wellbeing data trade organizations, application programming interfaces, and the utilization of guidelines.

Cross-institutional sharing will permit huge expansions in clinical and research effectiveness through admittance to information from different medical care establishments and coherence of care across numerous medical services settings dependent on supplier admittance to predictable patient information. Fast Medical services Interoperability Assets and the savvy security foundation guarantee information protection and interoperability with Electronic Health Records. These highlights permit singular foundations to hold operational control of their information and guarantee that touchy patient information is not shared on the blockchain for security and classification measures.

In particular, FHIR takes into account full cooperation among foundations and general wellbeing associations for better consideration coordination, result-based consideration, populace wellbeing just as empowering other assorted information to be shared for research purposes. Blockchain guarantees protection, security, and trust continuously, circulated information structures. It likewise guarantees provenance, information confirmation, and information exactness. For instance, connected hashes and public or private key cryptography will help guarantee information honesty and following of possession, which can be utilized to store portions of the Electronic Health Record (or a pointer to it) on the blockchain to be accessed across various medical care frameworks. A public blockchain could be utilized as an entrance control supervisor to wellbeing records that are put away off the blockchain. This will permit admittance to information through a protected client's one-of-a-kind identifier, scrambled connection to the wellbeing record, and timestamp of every exchange. Blockchain could fill in as a permanent review log where information questioned on the blockchain is followed to guarantee that information is just gotten to be approved by staff.



Overview of methodology

One critical advantage of a savvy contract is its capacity to give cycle and capacity to contracts, project the board, and wellbeing information. Agreements and other fundamental data are put away on the blockchain, setting up an organization of trust among the gatherings in question. This permits wellbeing associations to share patient information that is unidentifiable, guaranteeing classification. The decentralized data set arrangement given by blockchain is a critical goal to interoperability and record stockpiling while at the same time keeping up wellbeing information and other well-being-related data. In medical care, issues emerge with straightforwardness and IT and following costs when following things along with the production network. Blockchain can settle these issues by making a more straightforward, immediate following of high-esteem things through its common computerized record. Inventory network directors answerable for high-esteem things would profit by the execution of a blockchain store network record. High-esteem things that emergency clinics should follow incorporate organs for transplantation, blood items, costly drugs, working room gear, and clinical embeds like heart valves, and prosthetic veins or equipment. Moreover, a portion of these things, like organs, blood items, and prescriptions, may have severe vehicle prerequisites, for example, transport time, temperature for transport, or administrative vehicle consistency arrangements, which can be followed in a conveyed blockchain log.

Blockchain's recognizability and straightforwardness through the computerized record can make a more productive and successful approach to oversee high-esteem things along with the inventory network. The dispersed information base will permit each gathering to come into contact with the high-esteem thing to check its area, consistency with transport necessities, and record handoffs. This will make straightforwardness of exchanges and the irreversible records entered in a disseminated inventory network data set. This empowers high-esteem things to be followed progressively, improving stock administration, limiting dispatch costs, recognizing issues quicker along with the inventory network, decreasing mistakes, and improving the utilization of restricted assets, for example, working room time. Carrying out blockchain advancements in the production network the executives of organ transportation should expand the paces of patients conveniently accepting assigned organs and will give a record that can't be changed. By overseeing organ transportation from the giver medical clinic to the beneficiary with an appropriated framework, time affectability issues are observed to such an extent that each transport group knows precisely when an organ is being eliminated, how long transportation will require, and how long after recovery the organ will show up at the beneficiary office and set into the transfer beneficiary. With the electronic following, we can likewise screen what parts of the organ transport framework fizzled or needed proficiency and work on improving the interaction. By utilizing blockchain to follow the organ in its excursion from the giver to beneficiary, it can improve effectiveness all through the whole of the cycle, guarantee consistency with administrative approaches, and take into account development in organ transport, like the utilization of robots for organ conveyance.

Blockchain in organ donation with a protected web-based framework in which organ obtainment organizers convey offers of given organs to relocate focuses with viable competitors. This framework permits organ obtainment associations to add or alter data on contributors and giver organs, start the benefactor beneficiary coordinating with interaction, and record organ position data once the organ is acknowledged by the relocating focus dependent on the Assembled Organization of Organ Sharing assigned approaches. The contributor beneficiary match measure positions all coordinated, dynamic applicants with explicit data entered for a given giver organ. The subsequent match list is the rule by which singular organs are offered to recorded transfer candidates. personnel post giver data in an electronic document designed for survey by relocating staff. Such documents incorporate the giver data structure, subordinate corroborative data, for example, ABO blood classification, past friendly history, clinical history, assent for gift, serology results for transmittable sicknesses, digitized x-beam pictures, and other UNOS-commanded data concerning the benefactor. DonorNet planned to eliminate a middle person for organ acknowledgment and discuss straightforwardly with the doctor or specialist settling on the organ acknowledgment notwithstanding choice. By reviewing posted source archives in an UNOS-indicated and predictable design in DonorNet, relocated focus workforce can arrive at an educated choice regarding whether to acknowledge the organ for their transfer applicant. Refreshing data into DonorNet is certifiably not a static interaction; in any case, as of now, it's impossible to advise the potential transfer communities of refreshed giver data other than the OPC connecting with a call.

Blockchain innovation would stay away from the time delay for a call and put in an arrangement of balanced governance with the end goal that each gathering in the organ offer exchange recognizes refreshed data, which is a significant patient wellbeing issue. Once the organ is acknowledged by the transfer place, for instance, kidney allografts, the recovery cycle may happen at significant distances from the transfer community. Presently, organs are dispatched through transport organizations, including business carriers and business messenger administrations in certain conditions. With the execution of blockchain innovation, organs could be followed all the more absolutely along their vehicle course with an account of each place of information section and actual contact alongside any significant data about the state of the organ during transport, (for example, siphon perfusion numbers). As per the selection system being utilized, applications, for example, following admittance to Electronic Health Records that have a serious level of oddity and intricacy or coordination will have moderate reception. Applications, for example, relocate organ accessibility and transport following of these organs are less inventive and require significantly less coordination with current Electronic Health Record foundation, inferring quicker appropriation. These capacities consider our organ transport guide to keeping patient data hidden and secure; in any case, it permits the transfer place to apportion restricted assets, for example, working room time, more productively. In our model, the organ and blood classification may stay in the public space as far as clients to be aware of which organ is being followed. Notwithstanding, PHIs, for example, the benefactor or the beneficiary might be ensured under encryption and just those with a private key will approach

that data. Blockchain can influence organ transfers in-store network the board as well as in keen agreements and information trade. Blockchain goes about as a swap for paper records and takes into consideration an ongoing perspective on every exchange along with the inventory network measure. As there is no focal position, all clients have the power to add exchanges, yet they may not change any set of experiences. This gives straightforwardness simultaneously and makes blockchain a protected, interoperable answer for organ relocation and other clinical innovations

After its discovery, the most important part of organ contribution is to find a donor immediately and transfer it safely. The introduction of the machine into the machine connection where everything these devices communicate is without human interference to ensure immediate action. Despite, efforts by the governments to formalize the laws regarding organ donation to prevent mistreatment of donors, there is a dire need of a secure, treble and distributed organ management and distribution system. In this paper, a Blockchain based scheme is proposed to allow auditable medical transactions to prevent organ trafficking and tracking of legitimate organ donors & recipients. This will open a new field of Smart Health services based on Blockchain to safeguard the rights of medical professional and patients. With the advancement in science and technology, new techniques have been introduced and humanity is getting benefit from these latest innovations especially in medical field there came a revolution when transplantation of human body part took place in recent history. Organ transplantation has been used as a novel medical procedure that allows grafting of an organ from donor's body to replace a damaged or missing organ of the recipient. Due to its effectiveness and importance as a life-saving technique, there is an ever-increasing number of patients waiting for transplant operations. Patients are no more on the mercy of fate to live their lives with organ disabilities. Now they can easily change them with healthy body parts of another person.

Literature Review

Description of referred sources (10 – 15 paragraphs)

Securing Organ Donation using Blockchain by Anuradati Kulshrestha, Abhirupa Mitra, Amisha

The most critical piece of organ gift after it's accessible is to in a flash discover a giver and safely move it. The acquaintance of the machine with machine correspondence where all of these gadgets impart with no human obstruction guaranteeing quick activities. It incorporates administrations that give accommodation to the gadget proprietors and alongside that direct certain exchanges. They need to keep up, follow and look after track of them also. Effectively executed circumstances use blockchains for following these exchanges without trading off the mystery of the information of the proprietor and to forestall the danger of misrepresentation and keep its uprightness flawless for medicolegal necessities. The wellbeing administrations where

e-government applications, TeleMedicine and Artificial Intelligence have been checked on. The impacts of sharing of information about patients and illnesses among wellbeing area parties through savvy contracts have been examined. Blockchain innovation will dispense with failure, what's more, will likewise cause a decrease in expenses by managing exchanges among parties without focal authority through keen contracts. Everything could be attached to a blockchain record containing obvious time-stepped records of creation and possession. These frameworks could likewise be utilized to move esteem between clients, identify changes in archives, or forestall information altering. This has been demonstrated to be an extremely confined method of move elements, for example, organs employing a reliable stage. As per NASSCOM, blockchain-driven expansion in profitability and cost decrease can make up to US\$5 billion in the Indian economy by 2023. India has probably the most complex employment of blockchain in certain spaces. For example, quite possibly the most progressed utilizations of blockchain to store property records known to date can be found in AP

Using Blockchain Technology for The Organ Procurement and Transplant Network (A Thesis)-Utsav Jain. This covers data about the interaction of organ transplantation, followed by essentials for blockchain innovation. It is spread out into four sections. In the first place, it begins with a depiction of the organ relocating measure, which falls inside the extent of this work, counting data about the current framework, the UNetSM stage. The subsequent part spreads out the fundamental highlights of blockchain innovation and the Hyperledger Fabric system. This system was utilized to make the model for this exploration. At that point, the next two segments portray the benefits and impediments of utilizing blockchain innovation for the OPTN, which depends on ebb and flow research accessible to the creator. Ultimately, a few random writings are referenced. The organ donation framework in the United States is brought together and hard to review by the overall population. This incorporated methodology may prompt information trustworthiness issues in the future. The Organ Procurement and Transplant Network (OPTN) was assembled and kept up by a non-administrative association called the United Network for Organ Sharing (UNOS) under its restrictive UNetSM umbrella stage. This stage is made up of restrictive shut source programming and doesn't give the overall population simple admittance to the organ relocate information for inspecting. This examination researches the possibility, difficulties, and benefits of a blockchain-based OPTN. A model of a blockchain-based OPTN was made utilizing the Hyperledger Fabric system. The arrangements and rules given by the United States Department of Health and Human Administrations for UNOS and the OPTN were utilized as the premise of this model. Four components were recognized to directly affect the presentation of this framework, viz. max clump break, max block size, underwriting strategy, and exchange rate. Furthermore, two variations of the blockchain code were likewise evolved. The primary variation played out the organ-applicant coordinating inside the blockchain (Scheme A), and the subsequent variation performed it outside the blockchain (Scheme B). Examination of this information showed that Plan A beat Scheme B in all tests for composing tasks. Be that as it may, the peruse activities stayed unaffected by any of the investigation factors in the given

climate. In light of these outcomes, it is prescribed to play out the organ-applicant coordinating on the blockchain with the maximum group break near the exchange rate.

Organ Donation and Transplantation-Current Status and Future Challenges, author Georgios Tsoulfas. This book with the responsibility of a fantastic get-together of world specialists in the field of organ donation and transplantation presents the troubles incorporated the good, real, and clinical issues in organ donation and the specific and immunological issues going up against experts drew in with the thought of these patients. One of the most intriguing and all the while most testing fields of drug and operation has been that of organ donation and transplantation. It is a field that has made tremendous strides during the few seemingly forever through the solidified data and attempts of researchers from various qualities including trained professionals, hepatologists, nephrologists, immunologists, ethicists, and compelling disorder topic specialists. Notwithstanding, all the while, the challenges stay basic in this manner do the suspicions, for what was before an exploratory treatment could finally transform into the fate of medicine, as it incorporates most organs including the heart, lungs, eyes, liver, kidney, pancreas, and little stomach related parcel. Despite the data shared, the essayists give their own clinical experience making this book a truly important mechanical assembly for every analyst and specialist practicing in the field of transplantation. The book is isolated into a section overseeing organ donation-related issues and challenges and another where the different sorts of transplantation are presented. The areas recall information for the current status and different sorts of donation, the troubles perceived in growing donations, and the feasible courses of action. Parts in both the organ donation and the trans estate section give us a blend of the specific and cautious perspectives, similarly as a concise gander at the odds offered by nuclear and fundamental science in achieving progress in the field of opposition. We can learn from the chronicled scenery of transplantation and, all the while, tackle the overabundant essential requests, for instance, achieving opposition, which tends to the Holy Grail of prescription. All things considered, this book tends to be a veritable show-stopper of an arrangement of subjects having to do with organ donation and transplantation. It should be centered around that the objective gathering is scientists, specialists, and experts of different strong points, which all offer all things considered an interest in transplantation, improving the presences of their patients.

When a patient's one or more organs have been damaged beyond repair, in some instances, one or more donated organs can be used to replace them. This process of taking an organ or a tissue from a donor person and using it to replace a damaged one of the same type in a recipient is called organ transplant. It is also called grafting.

Candidate for any patient registered on the waiting list to receive one or more organs. The candidate may be an active member, an inactive candidate, or a multi-member candidate. A qualified baptismal candidate is defined as a registered person who is eligible for an organ

transplant. This means that there is a good chance of success if the donated organ is implanted in the recipient.

Applications of Blockchain in Healthcare -Ganesh Chandra Deka. This book examines the uses of blockchain in the medical services area. The security of private and delicate information is of most extreme significance in the medical services industry. The presentation of blockchain techniques in a successful way will get secure exchanges in a shared organization. The book additionally covers holes in the current accessible books/writing accessible for use instances of Distributed Ledger Technology (DLT) in medical services. The data and applications talked about in the book are monstrously useful for specialists, information base experts, and professionals. The book additionally talks about conventions, norms, and unofficial laws which are exceptionally valuable for policymakers.

On the other hand, a person may have become infected after being on the waiting list, and they must be treated for the disease before they can receive commercial installation. Finally, the candidate for the multi-organ election is the one who suffers from multiple limb failure and also requires multiple dedicated organs to fully recover.

Finally, the candidate becomes the recipient when he or she receives a donated organ. However, before that, they need to appear in the list of Potential Recipients (PTR). This list of candidates is the result of the match. The recipient on top of this list is the main potential investment receiver. The first entrant is given what is offered with a donated organ.

Applications of Blockchain Technology in Business(Challenges and Opportunities) Authors -Mohsen Attaran, Angappa Gunasekaran. Blockchain innovation is perhaps the most progressive advancement of this century. It does not just give operational and administrative check efficiencies; it likewise improves manageability and permeability all through the store network. This hearty innovation is perceived as an amazing data set that could without much of a stretch consolidate with enormous information. Moreover, blockchain innovation, as depicted in the inadequate scholarly and the more extensive exchange writing, is found to reshape and decentralize numerous businesses other than monetary establishments. Notwithstanding, the innovation is youthful, misconstrued, and untested—the impacts are discovered to be contingent. Interest in misusing blockchain in different ventures, like assembling and medical services, is expanding, and organizations are beginning to acquire energy. The selection rate, in any case, is moderate, and associations are simply starting to start to expose the expected uses of this wonderful innovation. Carried out appropriately, the business advantages can be considerable. The reason for this book is to do a precise writing audit and investigate how blockchain

innovation can empower or smooth out different industries. This book investigates the changing components of blockchain, highlights the significance of this progressive innovation, surveys its timetable from initiation to development, inspects its potential applications in various businesses, recognizes determinants of execution achievement, and features a portion of its likely advantages. One of the applications is the manner by which blockchain is changing the medical services industry in the space of organ transfers. Organ transfers are muddled. Organs break down rapidly and organs should be from somebody with a viable blood classification. As per the University of Michigan Transplant Center, a heart or lung is normally relocated in under 10 h. Without an effective framework, lifesaving organs will squander. By and large, bite the dust each day. Organtree is the world's initially decentralized organ gift information base organization utilizing blockchain innovation to associate benefactors, patients, and medical care offices. Blockchain empowers Organtree to build the number of matches and make the transfers a lot quicker and less difficult than previously.

On the other hand, the donor is the patient who is the source of the donated organ. Based on some cases, multiple organs can be removed from each donor. The donor can be a living, deceased, or a domino donor.

The most important part of an organ donation after an organ has been found is to find the donor quickly and transfer it safely. The introduction of machine connections where all these devices communicate without human interference to ensure immediate actions. Services that provide ease of use to device owners and are tailored to the specific task are included. The conditions that have come into effect use blockchains to track all these transactions without compromising the privacy of the proprietary information and to protect the risk of fraud and to maintain its integrity to legal requirements.

We selected the IBM blockchain health care system as the body of the target case and integrated the business system concept with the health care context to analyze interactions, partnerships or competitions, between ecosystem members. In addition, major player roles and influences on the blockchain-based ecosystem were analyzed to provide research results.

Proposed approach

Architecture and description of the architecture

Implementation – if possible

Justification

Our approach is to construct a surrounding wherein the donors, recipients, and others can engage with every different immediately on steady strains to make the complete process greater fluid and steady. We are trying to keep away from third-party interference and protecting the integrity of the affected person's records and the identity of the donated organs. This can be attained with the assistance of clever contracts. Smart contracts will include the protocols to be able to govern

our organ transaction method and facilitate easy transactions without intermediaries. These clever contracts can be deployed on a blockchain-primarily based totally allotted computing platform, Ethereum. All transaction-associated statistics and affected person records can be bundled right into a clever settlement and pushed into the blockchain. We additionally goal at monitoring the place of the organ, at some point of its transfer, with the assistance of an RFID tag, and constantly display its weight to test that the organ field isn't being tampered with.

Blockchain is an allotted, decentralized, public ledger. Blockchain era debts for the troubles of safety and accept as true within numerous ways. First, new blocks are continually saved linearly and chronologically. That is, they may be continually brought to the “cease” of the blockchain. After a block has been brought to the cease of the blockchain, it's far very tough to move the lower back and alter the contents of the block. That's due to the fact every block contains its hash, in conjunction with the hash of the block earlier than it. Hash codes are created with the aid of using a math characteristic that turns virtual statistics right into a string of numbers and letters. If that statistics is edited in any way, the hash code adjustments as well. To extrude a block, then, a hacker might want to extrude each unmarried block after it at the blockchain. Recalculating all the ones hashes might take a vast and unbelievable quantity of computing power. In other words, as soon as a block is brought to the blockchain it becomes very tough to edit and not possible to delete. Hyperledger Fabric is a platform for allotted ledger answers underpinned with the aid of using a modular structure handing over high stages of confidentiality, resilience, flexibility, and scalability. It is designed to help pluggable implementations of various additives and accommodate the complexity and intricacies that exist throughout the financial ecosystem. At the coronary heart of a blockchain community is an allotted ledger that statistics all the transactions that take region at the community. A blockchain ledger is regularly defined as decentralized due to the fact it's far replicated throughout many community participants, every of whom collaborates in its maintenance.

Each step (paperwork, scientific tests) withinside the process of organ donation could be depicted as a checkpoint at the app/website, and the involved authority can approve their involved checkpoint and add appropriate files (reports) to validate their claim. This will ease the complete system, upload transparency to it, and offer a greater steady ledger. Recipients of the organs will be available in direct touch with NGOs, organizations, and different human beings inclined to offer economic donations to assist them inside the system making sure no one is denied an organ because of loss of funds.

Using blockchain era powered via means of clever contracts we can make certain that no cash of the recipient is wasted on a donor who backs out because of unexpected and out-of-date reasons, after promising an organ and going through the scientific procedures. Recipients could have the ability to test their rank withinside the precedence queue for receiving the organ, while not having to visit the hospital. They could additionally be capable of seeing all of the capacity

donors at the app/website. With the assistance of our website/app, direct touch with precise surgeons and those skilled within the subject could be possible. One can recognize approximately the blessings or dangers of the present process, all precautions, long-time and long-time outcomes of the equal. Direct verbal exchange can even set up the affected person to agree with within the Doctor. User delight is pinnacle precedence. A bitch portal will make certain that each grievance could be catered to. They also can file any discrepancy that they noticed, making sure a fault unfastened system.

Using traditional, paper-heavy methods, buying and selling whatever is a time-eating system is susceptible to human mistakes and frequently calls for 1/3-birthday birthday celebration mediation. However, via means of streamlining and automating those methods with blockchain, transactions may be finished quicker and with greater efficiency. Since document-retaining is executed the usage of an unrecorded virtual ledger is shared with each of the events, we shouldn't reconcile a couple of ledgers, subsequently finishing up with much less clutter. And while all people have the right to enter equal records, it becomes less complicated to agree with every difference without the need for several intermediaries. Thus, clearing and agreement can arise plenty quicker. With using blockchain, all our transactions could be obvious and as blockchain is a kind of dispensed ledger, the community and each the events concerned will proportion person copies and those files can handiest be up to date thru consensus, this is, after all, people's consent. To trade, an unrecorded transaction document could require the alteration of all next facts and the collusion of the complete community. Thus, information on our community could be all of the greater accurate, consistent, and obvious than while it's miles driven thru paper-heavy methods.

Each and each transaction taking area right here is recorded on a blockchain, subsequently finishing up with an audit path through which we will without difficulty sign each transaction at every step. This ancient transaction information can assist to affirm the authenticity of the property and save you fraud. There are numerous methods blockchain is greater steady than different document-retaining systems. Transactions should be agreed upon earlier than they're recorded. After a transaction is approved, it's miles encrypted and connected to the preceding transaction. This, in conjunction with the truth that records are saved throughout a community of computer systems rather than on an unrecorded server, makes it very hard for hackers to compromise the transaction information. Using our portal, there may be no want for as many 1/3 events or middlemen to make sure as it doesn't count if you could agree with your buying and selling partner. Instead, you simply should agree with the information on the blockchain. You additionally won't evaluate a lot of documentation to finish an exchange due to the fact all people could have permission to get the right of entry to an unrecorded, immutable version.

Main various Blockchain software used in the construction of this real-time implementation

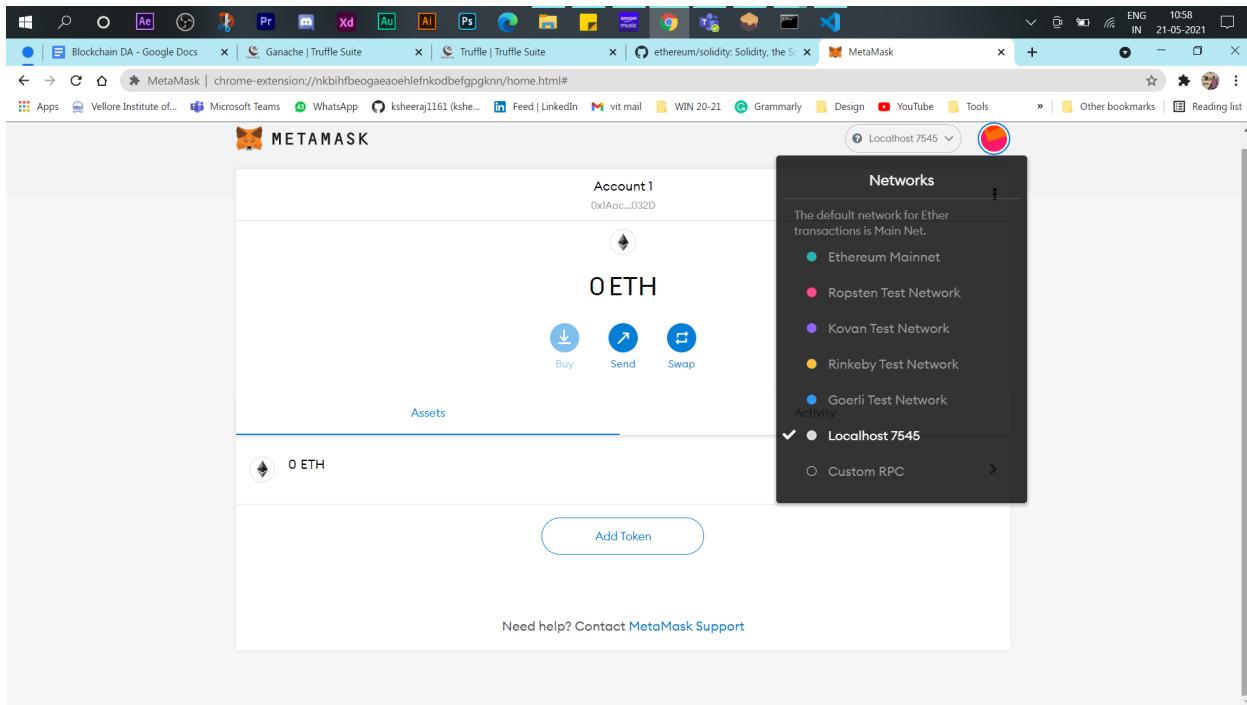
Node.js

Node.js is an open-source, cross-platform, back-end JavaScript runtime environment that runs on the V8 engine and executes JavaScript code outside an internet browser. Node.js shall use JavaScript to put in writing command-line gear and for server-facet scripting—jogging scripts server-facet to produce dynamic internet web page content material earlier than the web page is dispatched to the customer's internet browser. Consequently, Node.js represents a "JavaScript everywhere" paradigm, unifying internet application improvement around an unmarried programming language, in preference to one-of-a-kind languages for server-facet and client-facet scripts. As an asynchronous event-pushed JavaScript runtime, Node.js is designed to construct scalable community applications. In the following "howdy world" example, many connections may be dealt with concurrently. Upon every connection, the callback is fired, however, if there are no paintings to be done, Node.js will sleep.

MetaMask

It is an Ethereum Wallet on your Browser. MetaMask is an extension for gaining access to Ethereum enabled disbursed applications or "Dapps" in the browser. The extension injects the Ethereum web3 API into each website's javascript context so that apps can study from the blockchain.

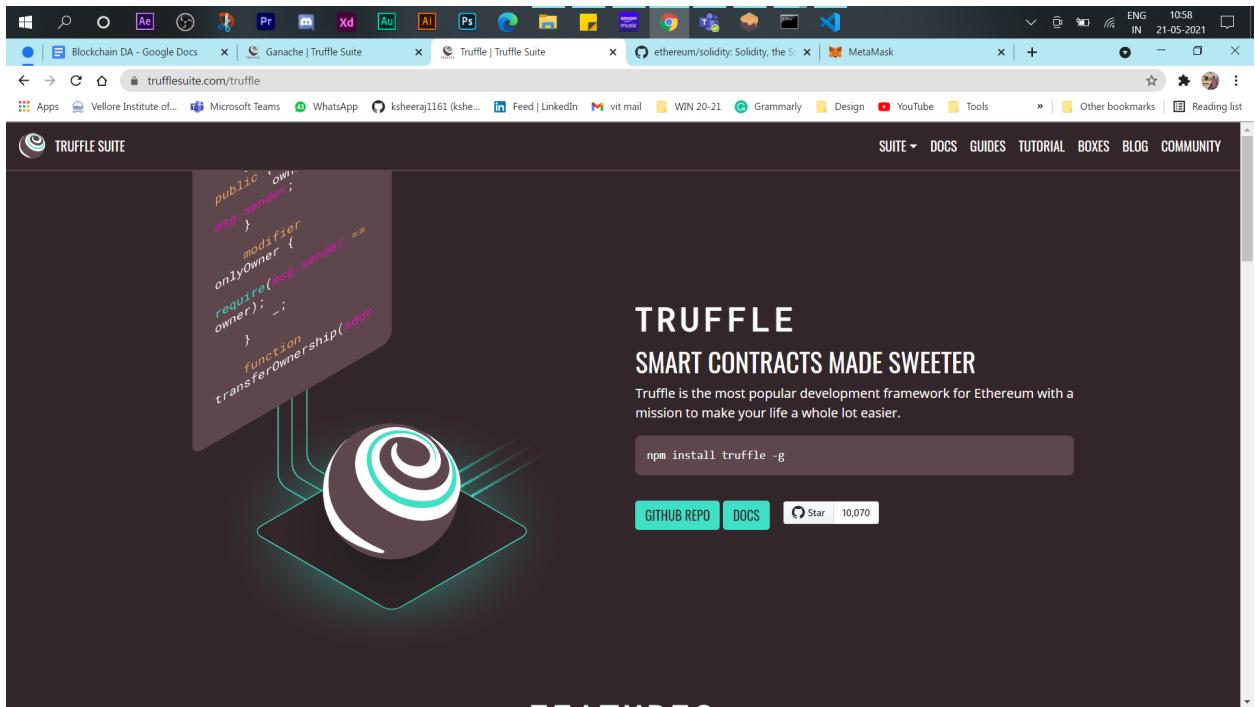
MetaMask additionally we could the person create and manipulate their identities (through personal keys, nearby patron wallet and hardware wallets like Trezor™), so whilst a Dapp desires to carry out a transaction and write to the blockchain, the person receives a stable interface to evaluate the transaction, earlier than approving or rejecting it.



Truffle

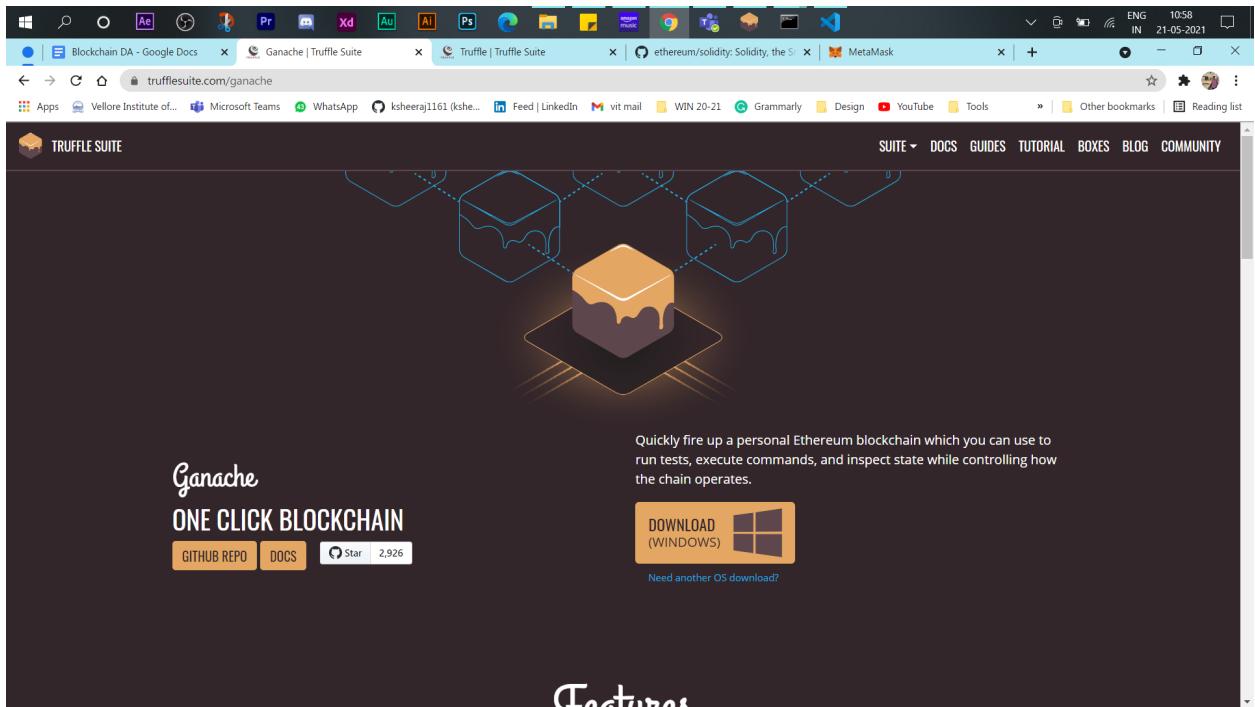
Truffle is the popular improvement framework for Ethereum with a challenge to make your lifestyles an entire lot easier. Truffle looks after handling your settlement artifacts so that you don't have to. Includes guide for custom deployments, library linking, and complex Ethereum applications. Bring your app improvement to the twenty-first century. Write computerized assessments on your contracts in each JavaScript and Solidity, and get your contracts advanced quickly. Write simple, conceivable deployment scripts that renowned your software will extrude over time. Foster your dapps evolution and make sure you may preserve your contracts ways into the future. Don't manipulate community artifacts up blockchain broadens notwithstanding ever again. Let Truffle do it for you, and place your awareness on dapp improvement wherein it belongs.

Use Truffle to store time and speak for your contracts through an interactive console, which incorporates get entry to all of your constructed contracts and all to be had Truffle commands. Use Truffle to bootstrap your contracts and run a community-conscious script, without hassle. An international magnificence improvement environment, checking out framework and asset pipeline for blockchains the usage of the Ethereum Virtual Machine (EVM), aiming to make lifestyles as a developer easier.



Ganache

A private blockchain for Ethereum improvement you may use to install contracts, broaden your applications, and run assessments. It is to be used as a laptop software in addition to a command-line tool (previously referred to as the TestRPC). Ganache is to be had for Windows, Mac, and Linux. Quickly stir up a private Ethereum blockchain which you may use to run assessments, execute commands, and look into the kingdom at the same time as controlling how the chain operates. Quickly see the modern reputation of all accounts, together with their addresses, personal keys, transactions, long-time, and balances.

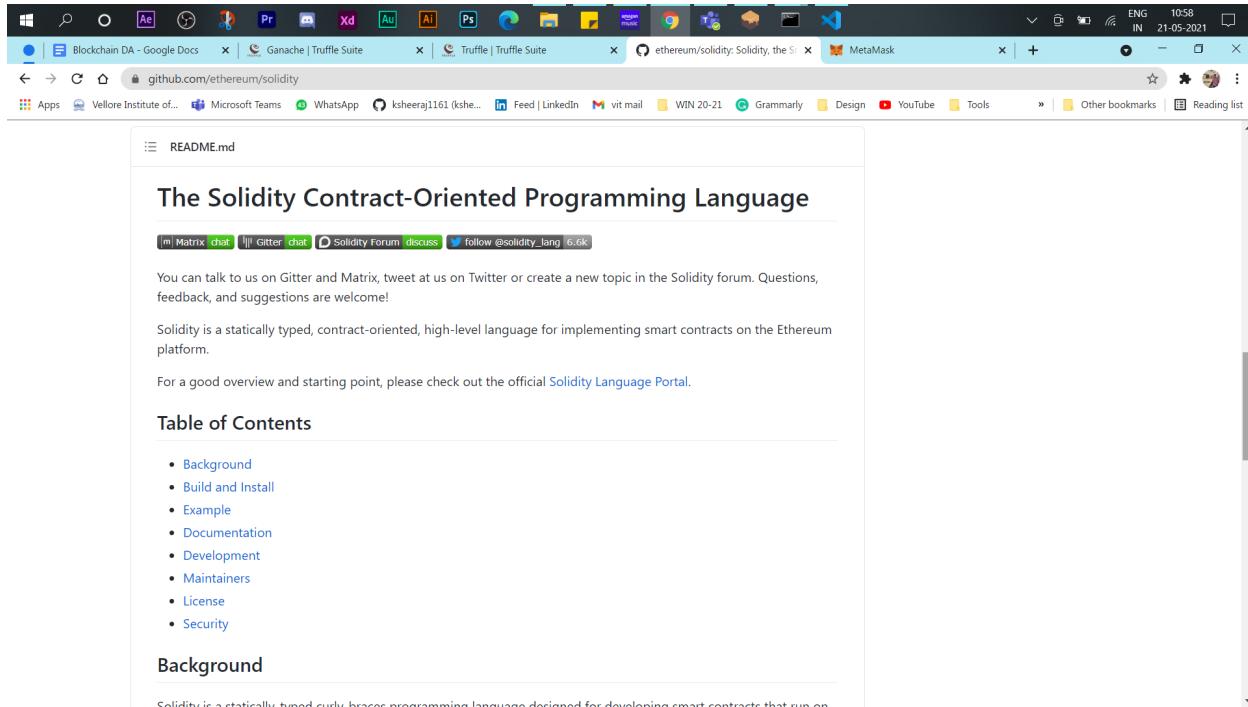


Results if Implemented

1. The constructing of smart contracts with actually described protocols to perform the organ transaction process.
 - i. Setup of Ganache and create a non-public blockchain that runs domestically on our terminal.
 - ii. Creation of a Solidity clever agreement, compilation into JSON, and deployment right into a non-public blockchain.
 - iii. Creation and deployment of clever contracts the use of the Metamask extension of Chrome.
2. Development of a consumer interface to permit a clean transaction process.
 - i. This includes developing a separate management portal to manipulate facts for legal hospital doctors.
 - ii. Develop an interface to facilitate viewing of news and matching facts.
 - iii. Editing statistics.
 - iv. Managing trendy statistics approximately donation facilities and patients.
3. Connecting the blockchain with the consumer interface the use of a javascript framework web3.js
4. Deploying the blockchain-powered net portal and consequent checking out and adjustments to be made.

The constructing of smart contracts with actually described protocols to perform the organ transaction process.

Developing Smart Contracts:



Administration: Manage facilities, Manage trending Information, Donation center, Manage donation facts, View matching report, Search.

Donor: Apply as a donor, Edit touch statistics, View statistics approximately Donation, View map, Check request status.

System: Hashing facts, Distributing facts, Matching facts. Contracts directory: This is in which all clever contacts live. We have already got a Migration agreement that handles our migrations to the blockchain.

Migrations directory: This is in which all the migration documents live. These migrations are just like different net improvement frameworks that require migrations to alternate the kingdom of a database. Whenever we install clever contracts to the blockchain, we're updating the blockchains kingdom, and consequently want a migration.

node_modules directory: This is the house of all of our Node dependencies.

src directory: This is in which properly broadens our client-side application.

check directory: This is in which we properly write our exams for our clever contracts.

truffle.js report: This is the principle configuration report for our Truffle challenge

Smoke Testing: We will make sure that we've installed our challenge nicely and that we are able to install the agreement to the blockchain successfully.

```

Windows [Version 10.0.18363.1556]
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C:\Users\kandr>npm install truffle -g
npm WARN deprecated mkdirp@0.5.0: This package is broken and no longer maintained. 'mkdirp' itself supports promises now, please switch to that.
npm WARN deprecated request@2.88.2: request has been deprecated, see https://github.com/request/request/issues/3142
npm WARN deprecated har-validator@5.1.5: this library is no longer supported
npm WARN deprecated ethereumjs-tx@2.1.2: New package name format for new versions: @ethereumjs/tx. Please update.
npm WARN deprecated ethereumjs-common@1.5.2: New package name format for new versions: @ethereumjs/common. Please update.
npm WARN deprecated multicodec@0.5.7: stable api reached
npm WARN deprecated urix@0.1.0: Please see https://github.com/lydell/urix#deprecated
npm WARN deprecated node-pre-gyp@0.10.2: moved to @mapbox/node-pre-gyp
npm WARN deprecated redux-devtools-core@0.2.1: Package moved to @redux-devtools/redux-devtools-core
npm WARN deprecated redux-devtools-instrument@1.10.0: Package moved to @redux-devtools/instrument
npm WARN deprecated redux-devtools-serializers@0.1.9: Package moved to @redux-devtools/serializers
npm WARN deprecated core-js@2.6.12: core-js@2.6.12 is no longer maintained and not recommended for usage due to the number of issues. Because of the V8 engine whims, feature detection in old core-js versions could cause a slowdown up to 100x even if nothing is polyfilled. Please, upgrade your dependencies to the actual version of core-js.
npm WARN deprecated axios@0.20.0: Critical security vulnerability fixed in v0.21.1. For more information, see https://github.com/axios/axios/pull/3410
npm WARN deprecated circular-json@0.5.9: CircularJSON is in maintenance only, flattened is its successor.
npm WARN deprecated debug@4.1.1: Debug version >=3.2.0 <=3.7.7 || >=4.3.1 have a low-severity ReDoS regression when used in a Node.js environment. It is recommended you upgrade to 3.2.7 or 4.3.1. (https://github.com/visionmedia/debug/issues/797)
C:\Users\kandr\AppData\Roaming\npm\truffle -> C:\Users\kandr\AppData\Roaming\npm\node_modules\truffle\build\cli.bundled.js

> sqlite3@4.2.0 install C:\Users\kandr\AppData\Roaming\npm\node_modules\truffle\node_modules\sqlite3
node-pre-gyp install --fallback-to-build

node-pre-gyp [WARN] Using request for node-pre-gyp https download
node-pre-gyp [WARN] Tried to download(403): https://mapbox-node-binary.s3.amazonaws.com/sqlite3/v4.2.0/node-v83-win32-x64.tar.gz
node-pre-gyp [WARN] Pre-built binaries not found for sqlite3@4.2.0 and node@14.15.1 (node-v83 ABI, unknown) (falling back to source compile with node-gyp)
gyp [BB] find VS
gyp [BB] find VS msvs version not set from command line or npm config
gyp [BB] find VS VCINSTALLDIR not set, not running in VS Command Prompt
gyp [BB] find VS could not use PowerShell to find Visual Studio 2017 or newer
gyp [BB] find VS looking for Visual Studio 2015
gyp [BB] find VS - not found
gyp [BB] find VS not looking for VS2013 as it is only supported up to Node.js 8
gyp [BB] find VS ****
gyp [BB] find VS ****
gyp [BB] find VS You need to install the latest version of Visual Studio
gyp [BB] find VS including the "Desktop development with C++" workload.
gyp [BB] find VS For more information consult the documentation at:
gyp [BB] find VS https://github.com/nodejs/node-gyp#on-windows
gyp [BB] find VS ****
gyp [BB] find VS ****
gyp [BB] configure error
gyp [BB] stack Error: Could not find any Visual Studio installation to use
gyp [BB] stack   at VisualStudioFinder.findVisualStudio (C:\Program Files\nodejs\node_modules\npm\node_modules\node-gyp\lib\find-visualstudio.js:121:47)
gyp [BB] stack   at C:\Program Files\nodejs\node_modules\npm\node_modules\node-gyp\lib\find-visualstudio.js:74:16
gyp [BB] stack   at VisualStudioFinder.findVisualStudio2013 (C:\Program Files\nodejs\node_modules\npm\node_modules\node-gyp\lib\find-visualstudio.js:351:14)

Select Command Prompt
E:\> node scripts/postinstall.js
E:\> node-pre-gyp [ERR] build error
node-pre-gyp [ERR] stack Error: Failed to execute 'C:\Program Files\nodejs\node.exe C:\Program Files\nodejs\node_modules\npm\node_modules\node-gyp\bin\node-gyp.js configure --fallback-to-build --module=C:\Users\kandr\AppData\Roaming\npm\node_modules\truffle\node_modules\sqlite3\lib\binding\node-v83-win32-x64\node_sqlite3.node --module_name=node_sqlite3 --module_path=C:\Users\kandr\AppData\Roaming\npm\node_modules\truffle\node_modules\sqlite3\lib\binding\node-v83-win32-x64\node_sqlite3.node "-napi_version=7" "-node_abi_napi=napi" "-napi_build_version=0" "-node_napi_label=node-v83"
E:\> cd C:\Users\kandr\AppData\Roaming\npm\node_modules\truffle\node_modules\sqlite3\lib\binding\node-v83-win32-x64
E:\> node-pre-gyp [ERR] node-pre-gyp -v v14.15.1
E:\> node-pre-gyp [ERR] node-pre-gyp -v v5.1.0
E:\> node-pre-gyp [ERR] not ok
node-pre-gyp [ERR] stack Error: Failed to execute 'C:\Program Files\nodejs\node.exe C:\Program Files\nodejs\node_modules\npm\node_modules\node-gyp\bin\node-gyp.js configure --fallback-to-build --module=C:\Users\kandr\AppData\Roaming\npm\node_modules\truffle\node_modules\sqlite3\lib\binding\node-v83-win32-x64\node_sqlite3.node "-napi_version=7" "-node_abi_napi=napi" "-napi_build_version=0" "-node_napi_label=node-v83' (1)
node-pre-gyp [ERR] stack   at ChildProcess.emit (events.js:315:20)
node-pre-gyp [ERR] stack   at ChildProcess._handle.onexit (internal/child_process.js:288:5)
node-pre-gyp [ERR] System Windows_NT 10.0.18363
node-pre-gyp [ERR] command "C:\Program Files\nodejs\node.exe" "C:\Users\kandr\AppData\Roaming\npm\node_modules\truffle\node_modules\sqlite3\lib\binding\node-v83-win32-x64\node_sqlite3.node" "configure" "--fallback-to-build" "--module=C:\Users\kandr\AppData\Roaming\npm\node_modules\truffle\node_modules\sqlite3\lib\binding\node-v83-win32-x64\node_sqlite3.node" "--module_name=node_sqlite3" "--module_path=C:\Users\kandr\AppData\Roaming\npm\node_modules\truffle\node_modules\sqlite3\lib\binding\node-v83-win32-x64\node_sqlite3.node" "-napi_version=7" "-node_abi_napi=napi" "-napi_build_version=0" "-node_napi_label=node-v83"
node-pre-gyp [ERR] code 1
node-pre-gyp [ERR] node-pre-gyp -v v14.15.1
node-pre-gyp [ERR] node-pre-gyp -v v5.1.0
Failed to execute 'C:\Program Files\nodejs\node.exe C:\Program Files\nodejs\node_modules\npm\node_modules\node-gyp\bin\node-gyp.js configure --fallback-to-build --module=C:\Users\kandr\AppData\Roaming\npm\node_modules\truffle\node_modules\sqlite3\lib\binding\node-v83-win32-x64\node_sqlite3.node "-napi_version=7" "-node_abi_napi=napi" "-napi_build_version=0" "-node_napi_label=node-v83' (1)
+ truffle@5.3.6 postinstall C:\Users\kandr\AppData\Roaming\npm\node_modules\truffle
+ node ./scripts/postinstall.js

- Fetching sole version list from solc-bin. Attempt #1
npm [BB] optional  SKIPPING OPTIONAL DEPENDENCY: fsevents@2.1.2 (node_modules\truffle\node_modules\chokidar\node_modules\fsevents):
npm [BB] optional  SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@2.1.3; wanted {"os":"darwin","arch":"any"} (current: {"os":"win32","arch":"x64"})
npm [BB] optional  SKIPPING OPTIONAL DEPENDENCY: sqlite3@4.0.2 (node_modules\truffle\node_modules\sqlite3):
npm [BB] optional  SKIPPING OPTIONAL DEPENDENCY: sqlite3@4.0.2 install: 'node-pre-gyp install --fallback-to-build'
npm [BB] optional  SKIPPING OPTIONAL DEPENDENCY: Exit status 1

+ truffle@5.3.6
added 8 packages from 11 contributors and updated 1 package in 229.974s
C:\Users\kandr>

```

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.18363.1556]
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C:\Users\kandn\Desktop\EEEVAN-main>truffle migrate

Compiling your contracts...
=====
> Compiling .\contracts\Doctor.sol
> Compiling .\contracts\DonateOrganFactory.sol
> Compiling .\contracts\Migrations.sol
> Compiling .\contracts\Person.sol
> Compiling .\contracts\Transplant.sol
> Compiling .\contracts\Doctor.js
> Compiling .\contracts\Person.js
> Compiling .\contracts\Transplant.js
> Artifacts written to C:\Users\kandn\Desktop\EEEVAN-main\src\abis
> Compiled successfully using:
  - solc: 0.5.16+commit.9c3226ce.Emscripten clang

Starting migrations...
=====
> Network name: 'development'
> Network id: 5777
> Block gas limit: 6721975 (0x6691b7)

l_initial_migration.js
=====
Replacing 'Migrations'
-----
> transaction hash: 0xfabdbe0cea20b1090bf0c36138f02275aa00cc89050f140b6bf314afffdb5b6b
> Blocks: 0
> contract address: 0x52c366526d7f3fE0438c7a7b0950558006382384
> block number: 1
> block timestamp: 1621529441
> account: 0xf888Ab597A0c123151035370fd64b13f5a6982B1
> balance: 99.9967165
> gas used: 164175 (0x2814f)
> gas price: 20 gwei
> value sent: 0 ETH
> total cost: 0.0032835 ETH

> Saving migration to chain.
> Saving artifacts
-----
> Total cost: 0.0032835 ETH
```

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.18363.1556]
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Replacing 'Migrations'
-----
> transaction hash: 0xfabdbe0cea20b1090bf0c36138f02275aa00cc89050f140b6bf314afffdb5b6b
> Blocks: 0
> contract address: 0x52c366526d7f3fE0438c7a7b0950558006382384
> block number: 1
> block timestamp: 1621529441
> account: 0xf888Ab597A0c123151035370fd64b13f5a6982B1
> balance: 99.9967165
> gas used: 164175 (0x2814f)
> gas price: 20 gwei
> value sent: 0 ETH
> total cost: 0.0032835 ETH

> Saving migration to chain.
> Saving artifacts
-----
> Total cost: 0.0032835 ETH

2_deploy_contracts.js
=====
Replacing 'DonateOrganFactory'
-----
> transaction hash: 0xcb4bf4fcf725d0d5961f34d7e77739e636a57b432c423da2caae7ef643cd5ead4
> Blocks: 0
> contract address: 0xce89C7df7a3305663F813531f89E20129b61fc08
> block number: 3
> block timestamp: 1621529446
> account: 0xf888Ab597A0c123151035370fd64b13f5a6982B1
> balance: 99.92078932
> gas used: 3754018 (0x394822)
> gas price: 20 gwei
> value sent: 0 ETH
> total cost: 0.07508036 ETH

> Saving migration to chain.
> Saving artifacts
-----
> Total cost: 0.07508036 ETH

Summary
=====
> Total deployments: 2
> Final cost: 0.07836386 ETH
```

The screenshot shows the Visual Studio Code interface with the following details:

- File Explorer:** Shows the project structure under "JEEVAN-MAIN". The "contracts" folder contains "Doctor.sol", "Migrations.sol", "Person.sol", "Transplant.sol", and "DonateOrganFactory.sol".
- Code Editor:** The main editor window displays the "Doctor.sol" file. The code defines a "Doctor" contract with fields for patient, name, email, phone, transplants, myaddress, and aadhar_number. It includes modifier isAdmin, constructor, function approveStage, and function createStage.
- Terminal:** The bottom terminal tab is labeled "Doctor.sol - JEEVAN-main - Visual Studio Code".
- Status Bar:** Shows "Ln 1, Col 1 Tab Size: 4 UTF-8 CRLF Plain Text Go Live".

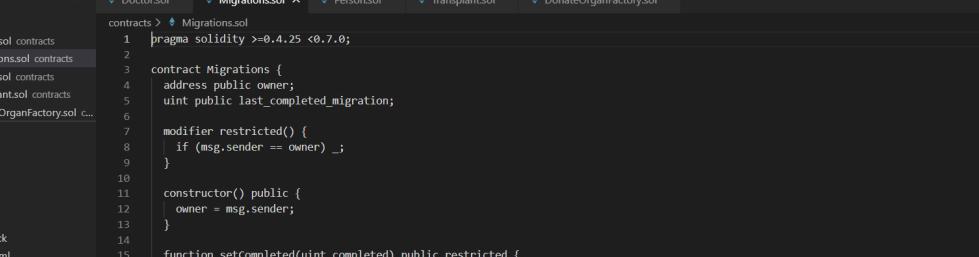
```
Doctor.sol x Migrations.sol Person.sol Transplant.sol DonateOrganFactory.sol
pragma solidity >=0.4.25 <0.7.0;
import './Transplant.sol';

contract Doctor {
    address[] public patient ;
    string public name ;
    string public email ;
    uint public phone;
    address[] public transplants ;
    address public myaddress;
    string public aadhar_number ;

    //events approveStage
    //events complete stage
    //events complete current stage

    modifier isAdmin () {
        require(tx.origin == myaddress , "Not the admin of Doctor contract ");
        _;
    }
    constructor( string memory _name , string memory _aadhar_number , address _myaddress ) public
    {
        name = _name;
        aadhar_number = _aadhar_number;
        myaddress = _myaddress ;
    }
    function approveStage (address _contractAddress) external isAdmin {
        Transplant tr = Transplant(_contractAddress);
        tr.currentStageApproval();
    }
    function createStage ( address _contractAddress ) external isAdmin {
        Transplant tr = Transplant(_contractAddress);
        tr.startNextStage();
    }
}

function completecurrentStage ( address _contractAddress ) public isAdmin {
```



The screenshot shows the Visual Studio Code interface with the title "Migrations.sol - JEEVAN-main - Visual Studio Code". The left sidebar displays the file structure under "OPEN EDITORS" and "JEEVAN-MAIN". The "contracts" folder contains several Solidity files: Doctor.sol, Migrations.sol (which is currently selected), Person.sol, Transplant.sol, and DonateOrganFactory.sol. The "Migrations.sol" file is open in the main editor, showing the following Solidity code:

```
pragma solidity >0.4.25 <0.7.0;

contract Migrations {
    address public owner;
    uint public last_completed_migration;

    modifier restricted() {
        if (msg.sender == owner) _;
    }

    constructor() public {
        owner = msg.sender;
    }

    function setCompleted(uint completed) public restricted {
        last_completed_migration = completed;
    }
}
```

The screenshot shows a Visual Studio Code interface with the following details:

- File Bar:** File, Edit, Selection, View, Go, Run, Terminal, Help.
- Status Bar:** ENG IN 21-05-2021 10:57
- Editor Area:** The main editor window displays the file `Person.sol - JEEVAN-main - Visual Studio Code`. The code is a Solidity contract named `Person`.

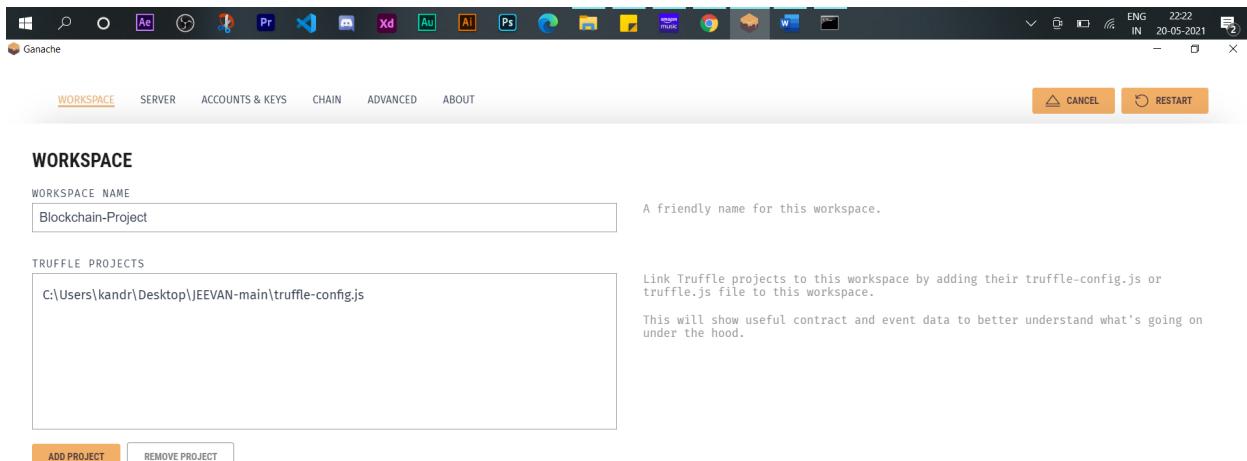
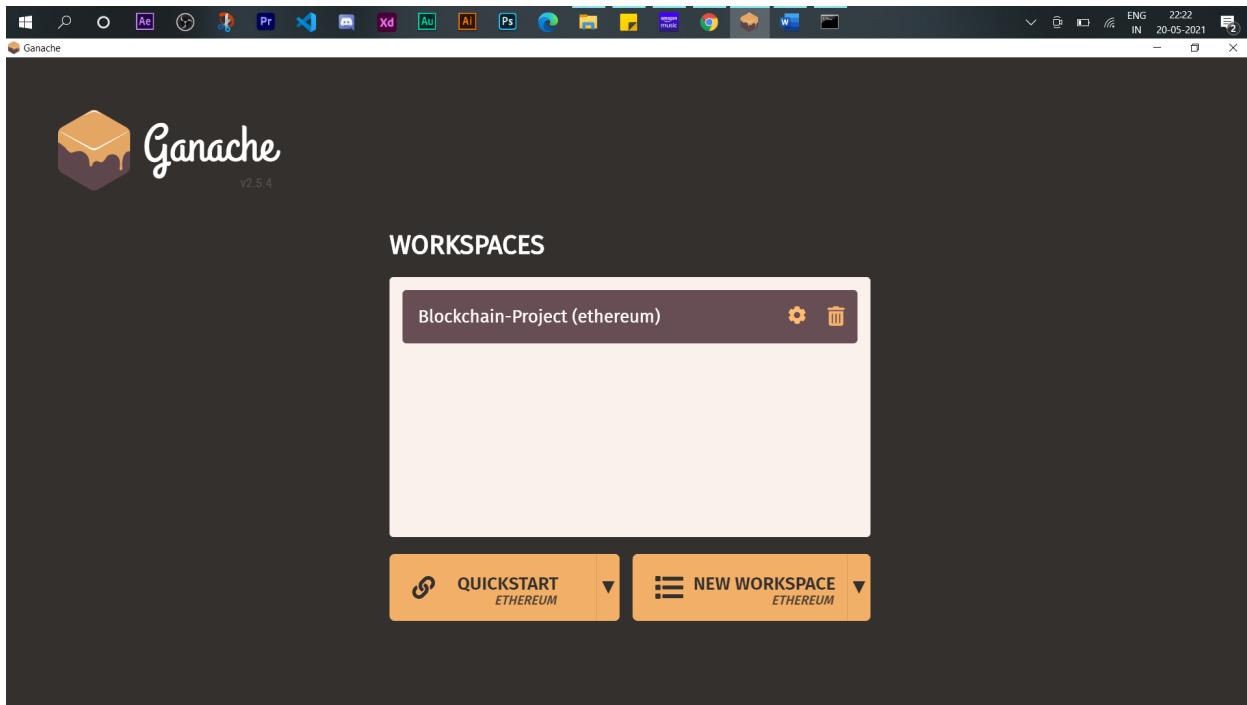
```
1 pragma solidity >=0.4.25 <0.7.0;
2
3 import './Transplant.sol';
4
5 contract Person {
6     address[] public doctor;
7     string public name;
8     string public email;
9     uint public phone;
10    address[] public transplants;
11    address public myaddress;
12    string public aadhar_number;
13    mapping(address =>bool) doctorexists;
14
15    modifier isAdmin() {
16        require(msg.sender == myaddress, "Not the admin of this person contract");
17        _;
18    }
19    modifier restrictedDoctor() {
20        require(doctorexists[tx.origin] == true, "the doctor does not exists in the approved list of doctors ");
21        _;
22    }
23
24    //events adddoctor
25    //approveStage
26
27    constructor(string memory _name, string memory _aadhar_number, address _myaddress) public {
28        name = _name;
29        aadhar_number = aadhar_number;
30        myaddress = _myaddress;
31    }
32    function addTransplant(address _transplant) public {
33        transplants.push(_transplant);
34    }
35    function adddoctor(address _doc) public isAdmin{
36        doctor.push(_doc);
37    }
38}
```
- Left Sidebar:** Explorer, Open Editors, JEEVAN-MAIN folder containing app, contracts (Doctor.sol, Migrations.sol, Person.sol), Transplant.sol, and DeployOrganFactory.sol, README.md, pubspec.lock, pubspec.yaml, LICENSE, package-lock.json, package.json, and OUTLINE.
- Bottom Bar:** Line numbers 1-38, Col 1, Tab Size: 4, UTF-8, CRLF, Plain Text, Go Live, and other icons.

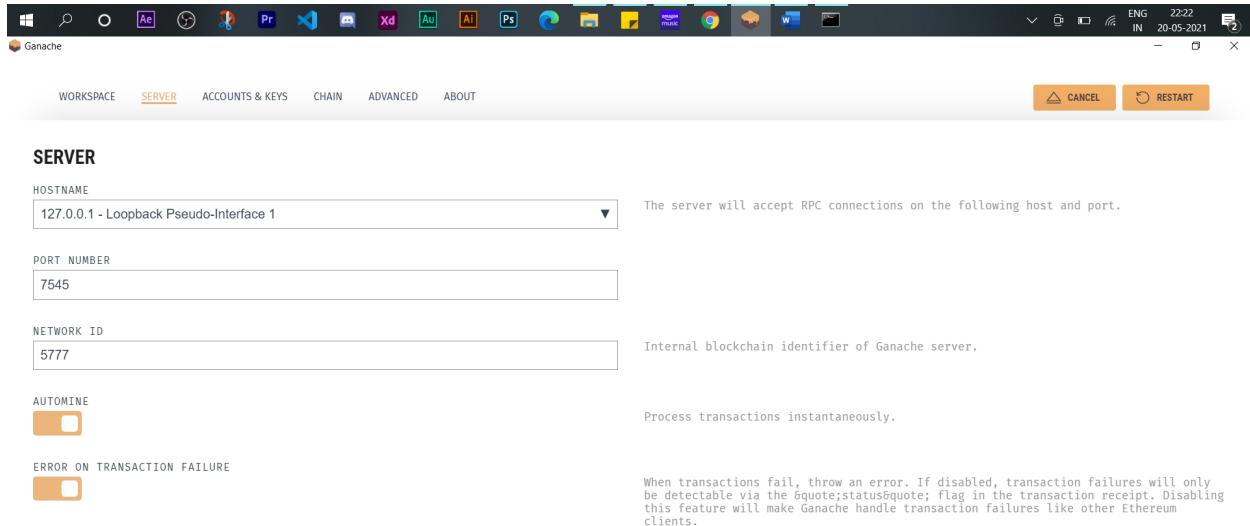
The screenshot shows the Visual Studio Code interface with the Transplant.sol file open in the editor. The code defines a contract named Transplant with various functions and variables related to organ transplantation.

```
1 pragma solidity >=0.4.25 <0.7.0;
2
3 //complete the transplant function is left
4
5 contract Transplant {
6
7     struct doc {
8         address uploader;
9         string hexCode;
10    }
11
12    struct Stage {
13        bool started;
14        bool completed;
15        uint voteCount;
16    }
17
18    uint organ;
19    uint cost;
20    string status;
21
22    address public doctor;
23    address public recipient;
24    address public donor;
25    address approvalAuthority1;
26    address approvalAuthority2;
27
28    uint256 public stageNo;
29    Stage[] public stages;
30
31    //mapping user address => stage no => bool
32    mapping(address => bool) entity;
33    mapping(uint256 => mapping(address => bool)) public approval;
34    mapping(uint256 => doc[]) docs;
35
36    modifier onlyDoctor() {
37        require(tx.origin == doctor, "is not the doctor of this transplant --> transplant contract");
38    }
39}
```

The screenshot shows the Visual Studio Code interface with the DonateOrganFactory.sol file open in the editor. The code defines a contract named DonateOrganFactory with various functions and variables related to organ donation.

```
1 pragma solidity >=0.4.25 <0.7.0;
2
3 import './Transplant.sol';
4 import './Doctor.sol';
5 import './Person.sol';
6
7 contract DonateOrganFactory {
8
9     contract Doctor {
10         address public admin;
11         address public authority1;
12         address public authority2;
13
14         mapping(address => address) public people;
15         mapping(address => address) public doctors;
16         address[] public transplants;
17         uint256 public count;
18
19         event personEvent(
20             address indexed sender,
21             address indexed personAddress,
22             string name
23         );
24
25         event doctorEvent(
26             address indexed sender,
27             address indexed doctorAddress,
28             string name
29         );
30
31         event transplantEvent(
32             address indexed sender,
33             address indexed transplantAddress
34         );
35
36         //events person created
37         //events doctor created
38         //events approved
39    }
40}
```





CHAIN FORKING

⚠️ Forking can only be updated when creating a new workspace.

Forking is Disabled

The screenshot shows the Ganache application interface with the "ACCOUNTS" tab selected. The top navigation bar includes "ACCOUNTS", "BLOCKS", "TRANSACTIONS", "CONTRACTS", "EVENTS", and "LOGS". There's also a search bar for block numbers or tx hashes. The workspace is set to "BLOCKCHAIN-PROJECT".

Below the navigation bar, there's a row of status indicators: CURRENT BLOCK (4), GAS PRICE (20000000000), GAS LIMIT (6721975), HARDFORK (MUIRGLACIER), NETWORK ID (5777), RPC SERVER (HTTP://127.0.0.1:7545), and MINING STATUS (AUTOMINING).

The main content area displays a table of accounts:

MNEMONIC	ADDRESS	BALANCE	TX COUNT	INDEX	HD PATH
settle vendor whip program useful glow cruel hundred cabbage knock addict hammer	0xf888Ab597A0C123151035370Fd64b13f5a6982B1	99.92 ETH	4	0	m/44'/60'/0'/0/account_index
	0x31F61103b3DC360f1d29a09390109E05378ECB77	100.00 ETH	0	1	
	0x7E68F9258D3aA4451bb9A91345Af1088eAeF2eA8	100.00 ETH	0	2	
	0x20315D03aA7421122B976c951d5C22B8c0b1172A	100.00 ETH	0	3	
	0x615065D0A1f73d15e70CdB6Df9A371917A45Dba9	100.00 ETH	0	4	
	0x97e6C4Df366cEa35f6d291D4eE24D2Ef2F94C3E5	100.00 ETH	0	5	
	0x9e986Ea9C2f42b5Ee79Ab043eAB4E3dcBeB03117	100.00 ETH	0	6	

Blockchain Project Overview						
Accounts		Blocks		Transactions		Logs
Current Block	GAS PRICE	GAS LIMIT	HARDFORK	NETWORK ID	RPC SERVER	Mining Status
4	20000000000	6721975	MUIRGLACIER	5777	HTTP://127.0.0.1:7545	AUTOMINING
BLOCK 4	MINED ON 2021-05-20 22:20:48			GAS USED 27341	1 TRANSACTION	
BLOCK 3	MINED ON 2021-05-20 22:20:46			GAS USED 3754018	1 TRANSACTION	
BLOCK 2	MINED ON 2021-05-20 22:20:42			GAS USED 42341	1 TRANSACTION	
BLOCK 1	MINED ON 2021-05-20 22:20:41			GAS USED 164175	1 TRANSACTION	
BLOCK 0	MINED ON 2021-05-20 21:47:02			GAS USED 0	NO TRANSACTIONS	

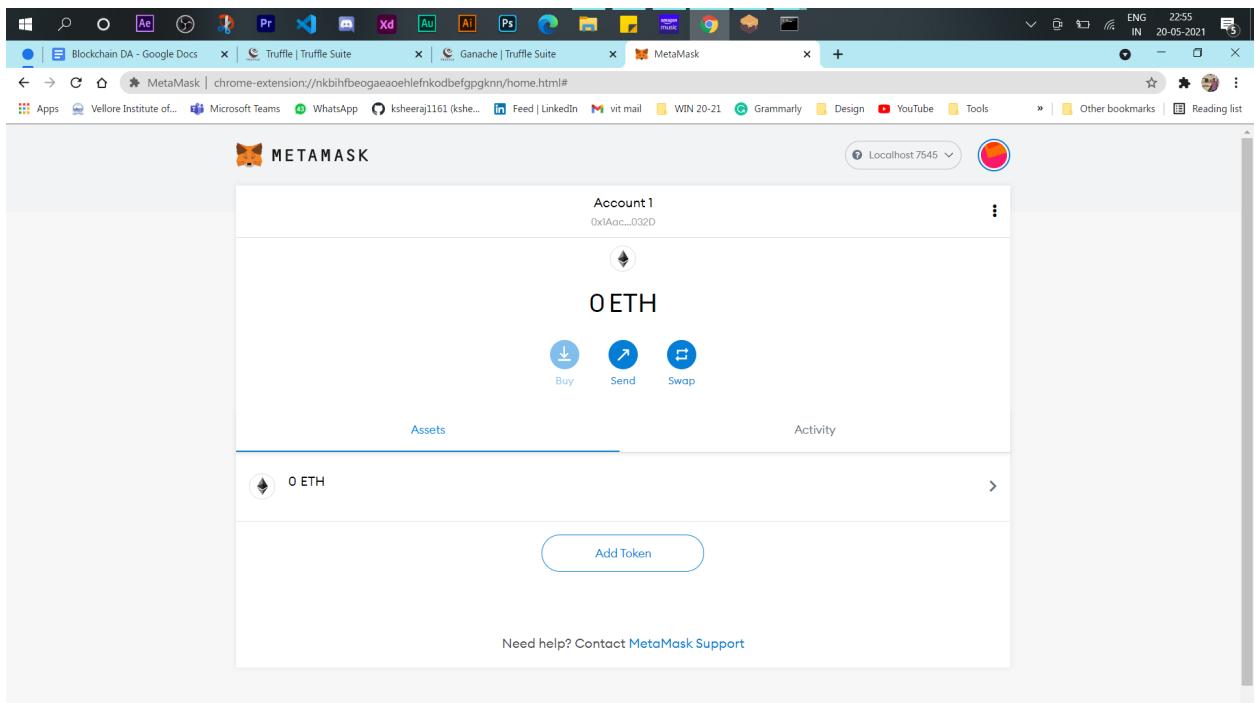
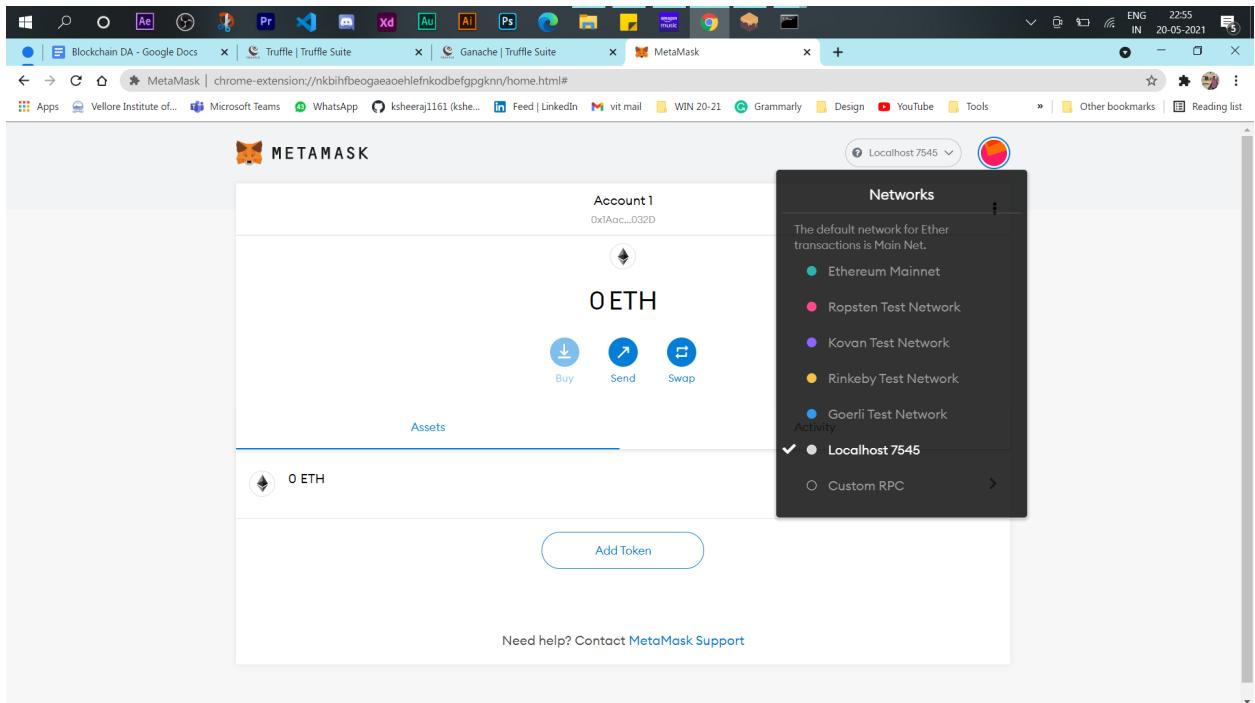
Blockchain Project Overview						
Accounts		Blocks		Transactions		Logs
Current Block	GAS PRICE	GAS LIMIT	HARDFORK	NETWORK ID	RPC SERVER	Mining Status
4	20000000000	6721975	MUIRGLACIER	5777	HTTP://127.0.0.1:7545	AUTOMINING
TX HASH 0xd43f0b71228ef3510c091be4dc611f13b048e57357b5495ddf52481b7e726373						
FROM ADDRESS 0x888Ab597A0C123151035370Fd64b13f5a6982B1	TO CONTRACT ADDRESS Migrations			GAS USED 27341	VALUE 0	
TX HASH 0xcb4f4cf725d0d5961f34d7e77739e636a57b432c423da2caae7ef643cd5eada4						
FROM ADDRESS 0x888Ab597A0C123151035370Fd64b13f5a6982B1	CREATED CONTRACT ADDRESS 0xce89C7df7a3305663F813531fB9E20129b61fCD8			GAS USED 3754018	VALUE 0	
TX HASH 0xfb3b74560dc16bb1a7ff5639599918da38ae28312d9775d44d41a71166e97b4d						
FROM ADDRESS 0x888Ab597A0C123151035370Fd64b13f5a6982B1	TO CONTRACT ADDRESS Migrations			GAS USED 42341	VALUE 0	
TX HASH 0xfbabdbe0cea20b1090bf0c36138f02275aa00cc89050f140b6bf314afffdb5b6b						
FROM ADDRESS 0x888Ab597A0C123151035370Fd64b13f5a6982B1	CREATED CONTRACT ADDRESS 0x52C366526d7f3fE0438c7a7bD9505580063B23B4			GAS USED 164175	VALUE 0	

NAME	ADDRESS	TX COUNT
Doctor	Not Deployed	0
DonateOrganFactory	0xce89C7df7a3305663F813531fB9E20129b61fCD8	0
Migrations	0x52C366526d7f3fE0438c7a7bd9505580063B23B4	1
Person	Not Deployed	0
Transplant	Not Deployed	0

```

[10:22:20 PM] eth_unsubscribe
[10:22:20 PM] eth_unsubscribe
[10:22:20 PM] eth_unsubscribe
[10:22:21 PM] eth_unsubscribe
[10:22:21 PM] eth_subscribe
[10:22:21 PM] Starting service with initial configuration:
{"gasLimit": 6721975, "gasPrice": 20000000000, "hardfork": "muirGlacier", "hostname": "127.0.0.1", "port": 7545, "network_id": 5777, "default_balance_ether": 100, "total_accounts": 10, "unlocked_accounts": []}, {"locked": false, "wantsLogsOnRPCResponse": true, "verbose": false, "db_path": "C:\\Users\\kandr\\AppData\\Roaming\\Ganache\\workspaces\\Blockchain-Project\\chaindata"}
[10:22:26 PM] Ganache started successfully!
[10:22:27 PM] Waiting for requests ...
[10:22:27 PM] eth_getCode
[10:22:27 PM] eth_getCode
[10:22:27 PM] eth_getLogs
[10:22:27 PM] eth_subscribe
[10:22:27 PM] eth_getCode
[10:22:27 PM] eth_getCode
[10:22:27 PM] eth_getLogs
[10:22:27 PM] eth_subscribe
[10:22:27 PM] eth_getCode
[10:22:27 PM]

```



Conclusion 1 paragraph with 800 words.

Transplantation of patients with end-stage diseases can be a risk factor for a variety of postoperative complications. Pre-surgical anticipation of the outcome depends on the interaction between donor and recipient. This paper ambitions to reply to the questions about the evolution and improvement of blockchain generation in healthcare studies and the way stakeholders co-evolve with the environment. From the attitude of the commercial enterprise ecosystem, we recognized study articles in blockchain in healthcare and blanketed prototype designs and main pilot cases in the last few years. The evolutionary trajectory and interactions amongst predominant healthcare stakeholders may also probably formulate a blockchain-primarily based healthcare ecosystem.

In blockchain expertise, information is stored as ledger characteristics that protect and inspect intruders in capturing health documents. These have become the most important motives in supporting the development of blockchain technology. In blockchain technology, they not only provide security and convenience but provide additional manufacturing fundamentals in supervision and adhere to confidentiality, ethics and authentication. Thus the most important objective of this investigation is to afford protected administration in accepting health verification through blockchain technology through exclusive recognition of information security.

The current Organ Procurement and Transplant Network is a system that keeps a log for applicants for transplants and their medical details then compare them to a given organ based on a set of well-organized algorithms and habits. The study found that blockchain technology could replace this process. In addition, it can also bring potential benefits, such as the visible light, which is universal organ transplants, as well as simple tests

It is safe to expect that scientific institutions, especially government-sponsored institutions, may focus too much on the use of some new technologies. This positive outlook concludes with a quest for consistent studies on the use of blockchains for this purpose. However, there are many unanswered questions about the problems associated with confidential and operational information, which require further investigation.

Github Link: <https://github.com/ksheeraj1161/Blockchain-in-Organ-Donation>

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Using Blockchain Technology for The Organ Procurement and Transplant Network2

Securing Organ Donation using Blockchain

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