**meDapp(Medical Dapp)**

**Describe Your Project:**

Authenticity, trust issues, regulatory requirements that enable safety and confidentiality, and security issues are barriers to information sharing. The healthcare industry needs a more efficient and secure system for managing medical records.

**meDapp** is a blockchain based solution for managing your medical records and data- all in a secure and decentralised blockchain network. This kind of blockchain-based healthcare network holds the complete medical history for each patient, with multiple granularities of control by the patient, doctors, regulators, hospitals, insurers, and so on, providing a secure mechanism to record and maintain comprehensive medical histories for every patient.

**Why I have Chosen This Project:**

Medical records are something very important for a person but also are very tedious. Often times we tend to lose our prescription, reports, and diagnostic results. Storing them in a database would be a solution but medical records are something extremely private to a person and should be not be subject to cyber or natural threats. With this project I have decided to support in the reformation of the technology for the safeguard of medical data.

By leveraging the power of blockchain I’ve decided to work on this project.

Even in these contemporary days we hear a lot about cyber-attacks. The WannaCry virus first infiltrated a hospitals network in England through which it got access to many medical records and spread out. Recent twitter hack has also made us reanalyse our trust on popular and so-called secure technology. Also, with this covid-19 situation going on we need to manage data efficiently to tackle medical emergencies and help the government on making decisions. Exploring in the field of computer science, I came across how blockchain can help in this field other than its major use in cryptocurrencies. This innovative and rather new technology has always intrigued me and with this project I hope to learn the most out of it. I reached out to some of my friends and with Aniket and Sheershak aboard we hope to make

meDapp a success.

In these COVID times, I wanted to create a project that would somehow be a valuable addition to our current medical facilities. I thought about how nowadays everybody wants everything to be interconnected, like a remote control for everything at our mobile phones. But when it comes to medical records, why does everyone have to find partly damaged receipts and scan results in old bags? Why can't there be a method which stores all the medical history of a person all at one place in a secure manner? That was when it hit me about using blockchains, an innovative idea to collect data in a private and user-inclined manner. Hence, I discussed the idea with my idea with my teammates and after some research, we came up with meDapp.

**What Problem(s) it solves:**

**Digitization:** Many medical records in our country are available only on paper. This approach is not scalable and risky. A natural disaster can easily destroy these records. When a patient changes physician, the old records are not transferred. Due to the loss of old records, some medical tests may need to be redone, resulting in additional costs and inconvenience. **Timeliness:** Since a patient's medical records are physically maintained at multiple offices, sharing the records is difficult and time-consuming. This approach is slow, expensive, and insecure. **Ownership:** A patient's medical information can potentially be seen by unauthorized parties and can be used for malicious purposes. Medical records are the health history of a patient. The patient should be the owner of the medical data. A doctor's office is merely the custodian. In reality this is rarely the case, whoever maintains the medical records becomes the de facto owner and makes decisions on how the data is used or accessed.

**Who will be the potential clients?**

Our idea is what motivated me to finalise this for our project. We see every citizen as our user, but we’ll impact heavily to patients, senior citizens, medical institutions, surveyors, researchers, and the government.Since medical records are on paper and scattered at doctors' offices, individual and institutional users such as medical researchers, government agencies, and insurance companies do not have a convenient way to access aggregated medical information for legislative and research purposes. Access to this information, which does not involve confidential information about individuals, can be beneficial for the advancement of medical research, prioritizing medicine development, or making government health policies.

**What will be the innovation in this project?**

Electronic medical records are currently maintained in data centres (in a cloudlike environment), and access is limited to hospital and care provider networks. Centralization of such information makes it vulnerable to security breaches and can be expensive.

Our whole idea is basically making a big shift on how we manage and store data and potential threats we expose it to. Some of the advantages of meDapp are that it eliminates the cost and delays of complexity, regulatory processes; makes the data much more secure

and confidential. Which in turn provides complete patient medical history for precise drug recommendations by physicians and reduced time in insurance claims resolution and increased efficiency in providing insurance quotes. **Shared ledger:** Blockchains changes the model from data held by a single owner to a shared history of an asset. Users can verify transactions and verify identities and ownership. Important information can be accessed by others based on their roles and access privileges. **Permissions:** A blockchain for business network can be set up like where every member has a different identity, and they must meet certain requirements to make transactions. They can conduct transactions knowing that the person they’re dealing with is who he/she claims to be. **Cryptography:** Advanced encryption, along with permissions, ensures privacy on the network, preventing unauthorized access to transaction details, and deterring fraudulent activity.

**Consensus:** Ensures that all transactions are validated before being appended to the blockchain, and the block- chain itself is highly tamper-resistant.

**How it will be different from similar existing solutions.**

Currently we’ve encountered only one company which is working in this domain namely Medblock. Medblock have done a very good job using IBM Blockchains Hyperledger Fabric network, but their product focuses more for the medical institution. On the other hand, meDapp we will focus on both the user and the medical institution. Eventually for the future, we have also planned to apply machine learning models in order to analyse data and make it more personalized.

In India EHR (Electronic Health Record) programme is only implemented in the state of Kerala and that to using cloud data centres. Although it is a very crucial stage in the advancement of EHR, there’s still a long way to go and we’ll like to accelerate this transition.

Many Big medical institutions and hospitals have their own databases and software solution but these are still prone to cyber and natural threats. Fire, flood or any other natural calamity can cause loss of data. Many malware and ransomware attacks are still prone which put the sensitive data at vulnerable risk.

**What makes it challenging enough to be chosen to be done in four months**

As someone who is new to the world of computer science, exploring the world of blockchain is novel to me, it seemed unattainable at the beginning but as we studied more and more we reckoned if we give proper time to study and implantation and execution we can do it in 3 months. We have to learn creating smart contracts using solidity and working on the Dapps which can take up to 2-3 weeks. For improved security we also have to learn cryptographic concepts. As all of us in our group are new in this field, we’ll be first studying and then executing which will take a lot of time and is certainly not achievable in less than 1-2 months.

**How you will measure the success/outcome/quality of your project :**

Our goal is to successfully create a blockchain network for managing EHR(Electronic Health Records). We also aim to design a dynamic web page for user friendliness with an eye-catching interface through which user has control over his own medical records. For compelling quality of a project, we would keep our focus on the security of data.

If by the end of the project we are able to create a Dapp, by which the client side(in this case the medical centres) has ease of keeping and accessing medical history, then we will call it a success.

**EVIDENCE /LITERATURE/WHAT MAKES YOU BELIEVE YOUR PROJECT WILL BE SUCCESSFUL**

There are quite a few factors in play that define the idea of this project to be successful:

1) Availability of medical records:

For any healthcare centre around the world, the method, duration of storage, and security of a patient’s data is different. Conclusions to researches by MIT and Rasmussen college (refer to:

<https://www.rasmussen.edu/degrees/health-sciences/blog/how-long-are-medical-records-kept/>)say that patient history is stored digitally for up to 6 years in the US, whereas in India, most of the medical data is stored either in paper files, computer restricted databases, or at best in cloudlike data structures. Our initiative with meDapp is to provide a secure, private, durable, and user-inclined method of storing such sensitive data using Blockchains.

2)Why Blockchain:

One of the main reasons for choosing blockchain for this project is that concern over data privacy is ever-increasing in today's world of hackers and crackers. There are several ways in which blockchain-based applications could help to protect privacy and increase transparency. The biggest is eliminating centralized control of the data: Since no single person or company can own a public blockchain, no one can own the data stored on it. There is thus a good chance that blockchains will prove important in developing the IT industry’s privacy solutions of the future.

3) Data Ownership:

Conducting some research after coming up with the idea, we found (refer to-<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6764776/#:~:text=The%20private%20patient%20health%20information,all%20the%20data%20is%20encrypted.>) that patients are currently unable to have full ownership of their own medical data, a notion that is increasing in relevance with the rise of personalized medicine and wearables. With meDapp, records are stored in blockchains that is decentralised, so our focus will be on a user-inclined method.

Research about blockchain’s applications to healthcare is currently limited, but more research becomes available every day. Blockchain is one of the most active areas of software research currently, and it can change the hierarchy of healthcare by returning authority over medical records and health data to the patient. This transfer of authority may lead to an overall shift toward patient-centred care; hence we suppose meDapp can be a success not only for a project, but also as a real-life working solution.

**Resources required for the project and the feasibility of their availability as per the plans**

After thorough research and planning we have decided to use docker for Hyperledger, Ethereum virtual machine like Truffle Suite will be used to run and execute Solidity programming language. Node.js will be required to execute Javascript code. Personal blockchain network such as Ganache to develop and modify the blockchain as per the requirement. MetaMask, a web browser extension will be used to link blockchain to the web browser itself.

**If you are a team of 2 or more then clearly define responsibilities and how each member should be assessed differently**

Sanidhya Raghuvanshi (E19CSE002) is responsible for planning and groundwork of the whole project. Backend component which is mainly smart contract development will be done by him. Multiple contracts are needed to provide rules governing transactions, including uploading medical records, accessing detailed medical records, or querying the aggregated data.

Aniket Kumar Jha (E19CSE177) is responsible for all the front end work which includes creating an interface with users and interaction with analytics component (HyperLegder or Ethereum). The interface will allow users to see and upload/update medical records and other GUI functionalities.

Sheershak Gaur (E19CSE389) is accountable for all the research, analysis and exploration of the project. Backend component will be done by him which includes dealing with smart contracts and audit trails.

These are the predecided role ideas that will be updated with each step of progress with the project.

**Short and long term planning with detailed and logical steps and timelines. \***

**Short term planning:**For the short term we are planning to learn all the languages required. Then we will make the frontend webpage which will act as an interface and include features like ability to upload the record, update an existing record or remove it from the chain. We are trying to make the client side more data centric so that they have ease of accessing data.

**Long term planning:**For the long term, we are looking to grasp deep knowledge of ethereum for creating smart contracts. We will also be working on the security side of the project as it is one of the main criterias of our project. We are also looking to add better GUI to improve the user experience. We are also planning to add an extra security feature for future purposes. We are also planning to integrate it with government issued identification documents, for example, aadhaar card, PAN card, passport, driver license etc. Since we will also this provide data to government and medical institutions for research purposes and policy making.In the long term we want our meDapp to be used widely in the entire medical field.

**Risk Analysis (What are the factors which pose risk of failure of your project and risk of not completing your project by deadline):**

User define their identity with a cryptographic key which is unique to each user. If someone gets access to the key, they can easily access and interfere with the system. Moreover, if the key is lost or destroyed, the access to all the assets on the blockchain will become inaccessible to everyone, forever. Digital signatures can add an additional layer of security to this issue.

Decentralization is hard to obtain, blockchain relies on encryption to provide security for which complex algorithms must be run. These algorithms require large amount of computing power and can be very time and energy consuming.

Blockchain is still an immature technology. It lacks scalability. standardization

and uniformity. The lack of such uniformity across blockchain protocols takes away consistency from basic processes like security, making mass adoption near impossible task.

**ETHICS**

As far as the ethics are concerned, all the project related work and research will be completely following moral grounds. Our blockchain network will be on a permissioned and private network, and only authorised personnel will be allowed to access the network. The keys will be encrypted to provide enhanced security which will only be given to the user. Use of Ethereum for cryptocurrency is not regulated by the government yet, but since we’re only looking to work with blockchains, this should not be violating any ethical laws.

**Give Names and emails of Three Persons with whom you have discussed the details of the project and what was their reaction/suggestion.**

For blockchain to be successful, it is necessary to gauge public reaction to this upcoming technology. Initially we talked to few people but they were not aware of the uses of blockchain fields except bitcoin and other cryptocurrencies. One of the seniors of Shiv Nadar University (Rahul Singh : [rahulsingh39@gmail.com](mailto:rahulsingh39@gmail.com)) provided us with web resources to help us learn more about this technology.(Prashant Kumar: [prashantkumar5877@gmail.com](mailto:prashantkumar5877@gmail.com)) was very excited to hear what we’ll be doing and said it’s going to make hospital visits very convenient.(Sumit Goswami: [sumit.goswami999@gmail.com](mailto:sumit.goswami999@gmail.com)) told us to focus more for the integration with the government institutions like connecting it with Aadhar ID to impact more people. (Aryan Singh: [aryan.singh786@gmail.com](mailto:aryan.singh786@gmail.com)) suggestions was very important to us as he advised us to use JavaScript in the backend which will make our task very easy.

Lastly (Shivansh Bakshi : [shivendrakbakshi55@gmail.com](mailto:shivendrakbakshi55@gmail.com)) also helped us greatly by suggesting us youtube channels, websites which we can use to learn skills in order to make our project more user friendly.