MSME Hackathon

PROFORMA FOR SUBMISSION OF IDEA - STAGE 02

PART A		
A.	Name	Hemanth Karthick T
B.	Email Id	hemanthkarthick03@gmail.com
C.	Phone No.	+91 9500020510
D.	Briefly explain newness/uniqueness of the innovation	• Prescriptions and other file records are stored using NFT and retrieved easily into Blockchain. • It creates Visualizations with query outputs from the Electronic health records (EHR) using Dune Analytics. • It provides a descriptive medical and business tactical report based on the insights from data visualization for diagnosis, logical investigation, commercial applications, and administrations using the dashboards. • Serverless WebApp integrated with dApp, Metamask digital wallet, InterPlanetary File System (IPFS) and Decentralized Private Ethereum blockchain with two user interfaces UI, and tested with Ganache provider. • Optimizing the Smart Contracts for reducing the Gas Amount Transactions. • Uses Public-key cryptography (Asymmetric Cryptography) that use pairs of related keys for Encrypting the HER to enhance the piracy of the patients. • HIPPA Compliance as the records are managed based on the HIPAA Act by the US in 1996 which promotes data privacy and has restrictions for healthcare providers in maintaining the patients' records to prevent exploitation. • Deep Interoperability • The App allows the doctor to check the progress and prefer diet plans for the patient accordingly.

E.	Concept & Objective	• To create an app that makes the patient understand their condition clearly and progress based on the reports by doctors. • To display a dashboard of descriptive analytical report and doctor prescribed diets and medications. • To promote transparency, immutability, and privacy of EHR. • The data has already been identified, collected, prepared, and organized, which provides a rich storehouse of information for analysis • To find more insights and descriptive-analytical reports from the records in dashboards without revealing the patients' data. • To ensure Blockchain scalability, an off-chain database based on IPFS is used to store data. • To speed up the data storage process, we use an Ethereum Blockchain-based proof of authority.
F.	Specify the potential areas of application in industry/market in brief	❖ Healthcare Industry ❖ Pharmaceutical industry ❖ Insurance Industry ❖ Analytics Industry
G.	Briefly provide the market potential of idea/innovation	❖ WebApp can have a greater impact on the global medical market as it can ensure both patient and healthcare center data with its decentralized ledger system and analytical dashboards. The medical industry is rapidly transforming from a paper-based system to a digitized system, accelerating the demand for healthcare IT services. ❖ Various sectors like billing, transportation, etc. can be added to the network to implement a full-fledged healthcare management system. ❖ Healthcare Industry – This proposal will help to improve the accuracy of disease diagnosis and promote research in the medical field. Healthcare comprises hospitals with medical devices, clinical trials, outsourcing, telemedicine, medical tourism, health insurance, and medical equipment. The Indian healthcare sector is growing exponentially due to its strengthening coverage, services, and

		increase in expenditure by both public and private. ❖ Pharmaceutical Industry – Electronic health records can be made helpful for pharmacists in monitoring medical sales by adding them to the system as another participant. Based on the medication reports from the Dune analytics, Healthcare providers can find the high-demand drugs and can inform to increase the stocks of that drugs. ❖ Insurance Industry – Only the required data from the EHR will be made available to Insurance Companies. Since this plan works with HIPAA Compliance, it has a set of restrictions for assuring the portability and renewability of health insurance coverage to prevent exploitation and fraudulent activities. ❖ Analytics Industry – To predict a more accurate and detailed explanation of the data visualization and analytics applied to the data, they can hire an analyst.

PART B		
1.	Project Title	Patient Management System using Blockchain
2.	Category (ST/SC/OBC/General)	OBC
3.	Address	3-2-5, Hansa Bellisimo, 86 & 87, Erukkanchery High Rd, Erukkanchery, Chennai, Tamil Nadu - 118
4.	Whether the idea involves use of existing intellectual property or not, give brief detail there of	Healthcare centers are increasing rapidly due to the increase in the human population. A patient has the right to have his or her medical records treated as confidential and read only by people with a need to know. To provide a satisfactory diagnosis to patients, there is a greater importance on adapting to new technologies. The current implementation of data management is based mainly on a client/server architecture. It raises several challenges regarding security and privacy that make healthcare systems more susceptible to various attacks by penetrators. Therefore, EHR is subject to strict regulatory and security requirements. To overcome these challenges and comply with security regulations of HIPAA act, the adoption of a distributed architecture is a necessity. Firstly, considering the data access and availability, interoperability is identified as a key issue in concerns the absence of

		a consistent and compatible methodology for sending, receiving, and handling data between healthcare entities. The system provides patients with a comprehensive, unchangeable log and easy access to their medical data, regardless of the facility and software system. The decentralized data system of these study manages authentication, trustworthiness, accountability, and data exchange through the use of characteristic blockchain mechanisms such as smart contracts mining and proof of work (PoW). In addition, it can be integrated into existing local data storage solutions and enables a data economy between patients, researchers and authorities. The research found that secure storage and easy access to complete patient data across different facilities and systems are becoming increasingly important.
5.	Name and details of Mentors	
6.	Experience and Qualification of Mentors	
7.	Contact Details of Mentors	
8.	Current Development Status of innovation	Innovation is at the pre-final stage of development but it works. Currently, I created a dApp connected with the Metamask digital wallet that creates NFT and stores the medical records of patients on the Ethereum Blockchain and InterPlanetary File System (IPFS). I made a Smart contract in Solidity using Remix IDE which consists of various modifiers and functions for access control. A performant, reliable, and intuitive IPFS API. IPFS is a distributed system for storing and accessing files, websites, applications, and data. I built a basic React UI for doctors and patients to receive a Unique Hexadecimal Hash Key and a role to access and request access to the EHR. The Remix IDE is connected with the Truffle suite (Truffle React) to link the UI with Blockchain. Data Analytics on the records is made with the Panda, Seaborn, and MatPlotLib modules in the Jupyter Notebook of the Anaconda Distribution. This part of the implementation is integrated with the Ethereum blockchain using the Web3.py module helps to convert raw data into data visualization models and diagnostic reports to improve their efficiency. But there are still many features like prescription management, diet-plan generator, and diagnostic reports based on the insights produced within the blockchain.

9.	Expected time of completion of idea	This Proposal can be implemented within 6 month of time where the plan as follows: 1st Month – Deploying a Ethereum Private Blockchain. 2nd Month – Creating the React UI for various users. 3rd Month – Integrating React User Interfaces and IPFS with the Ethereum. 4th Month – Creating a Record Analysis file. 5th Month – Connecting Dune analytics and Web3 with the Deployed Blockchain. 6th month – Testing and Delivery
10.	Total idea project cost (Max Rs.10 lakhs)	10 lakhs
11.	Charges for mentor/handholding supporting team - Max (3.00 lakhs).	3 lakhs
12.	Travelling Expenses or any other item not coverd as above may be allowed as per need for development of the idea - Max (2.00 lakhs).	2 lakhs
13.	Please give name of other students/Entrepreneurs ssociated with this project/idea, if any	No
14.	If Yes (Name & Aadhar No/Udhyog Aadhar No//Udyam Registration)	Hemanth Karthick - 4197 5487 1923
15.	Summary of the idea. This is the section reviewers read to understand the technical solution. Please state the solution clearly. Reviewers may ask: What is the actual technical advancement or improvement provided by this solution?	A Blockchain can be useful for healthcare applications which needs decentralization, and permits conveyed usage of applications without depending on a centralized specialist. The information present within the block chain is reproduced between all hubs within the organize makes straightforwardness and openness that permits healthcare partners, in specific patients, to know how their information is being utilized as well as by whom and when. This ensures security of information from potential misfortune, debasement, or security assaults and its unchanging nature property makes it inconceivable to modify or adjust any record that has been connected to the chain, guaranteeing the judgment and legitimacy of quiet records. The information which has as of now been distinguished, collected, arranged, and organized within the blockchain gives a wealthy storage facility of data for investigation. The creation of analytics begins with giving a dashboard or an information visualization, called graphic analytics, which can advance into more progressed

		analytics in the Web Application. Analysing healthcare information organization's information can give valuable data for logical investigate, commercial applications, and administrations too.
16.	Is it a new concept?	No, but I have integrated many unique features into the idea like creating a dashboard through which a patient or his companions can clearly understand his diagnosis irrespective of the medical terms used or preparing a diet plan based on the doctor or a dietician and so on. Most importantly, most of the Indian Medical management system doesn't have any proper law on how the records must be secured and used whereas this idea is HIPAA compliance which is almost adopted globally.
17.	Prior art on the concept, if any	• Healthcare Management System by Christine lee and Grover Lee Pub. No: Pub. No.: US 2012/0166226A1 Managing HER in a database rather than in a blockchain. An electronic medical record is dis played having data related to a patient on an electronic device using a graphical interface that emulates a standard paper medical chart. Additional information from a healthcare provider regarding the patient is received at the electronic device wherein the additional information is received in data fields associated with the graphical interface. The additional information is sent to a database which comprises data related to medical records of the patient integrated from multiple Sources. An alert regarding a gap in a treatment of the patient and the alert displayed on the electronic medical record at the electronic device wherein the gap in treatment is discovered using data from the data related to medical records. This data will be shared to different organizations as the medical records is rich storehouse of information for analysis.
18.	Main Problem Being Addressed in the Project (Every solution targets a certain problem. Please use this section to highlight the specific problem the solution addresses. This section can be as short or as long as needed to describe the precise problem the solution addresses)	• The Existing systems typically only share healthcare resources internally in the medical and healthcare field and are not fully compatible with external systems. Nonetheless, evidence indicates numerous benefits from integrating these networks for interconnected and better healthcare, calling for interconnection between different organizations for health informatics researchers.

		• It neither promote cost effectiveness nor cost efficiency. Cost efficiency is about reducing the cost of delivering your services, without undermining the services themselves. A cost-efficient approach improves the overall profitability of a business. That's true of any enterprise. But it is especially important for businesses that deliver client projects. • One of the most critical issues is multi-organizational data exchange, which demands that medical data obtained by a healthcare provider be easily available to other organizations, such as a physician or research institute. A major part of the literature is based on software frameworks and other techniques introduced prior to blockchain and its capabilities of smart contracts.
19.	Background for getting the idea?	My main intention with this idea is to promote transparency and privacy for Patient's health records. A few years ago, my grandpa was admitted to a famous multispecialty hospital nearby and he was in a critical care unit for a week. Later, he recovered at a faster rate in the hospital. The Doctors also diagnosed him and said that he will be back to normal soon and discharged him. But he got expired the next day of discharge. When my family analyzed the report, they found that medicines don't work on him due to age factor and mentioned that he will barely live for a month. If we were aware of that we might have admitted him to another multispecialty one. So, though the medical reports are positive or negative, that should be reported to them and this should not be repeated.
20.	What will it do?	Analyzing healthcare information organization's information can give valuable data for logical investigate, commercial applications, and administrations. For this reason, blockchain analytics is a basic calculate to progress organizational productivity and development since it can play an imperative part in therapeutic advancement and open health care. By and large, blockchain gives a decentralized, dependable, and permanent strategy of sharing and recording information, which can too be utilized to make strides an organization's expository execution. The objective of the developed solution is to allow the visualization of logs in real time, where analysis methods have applied.

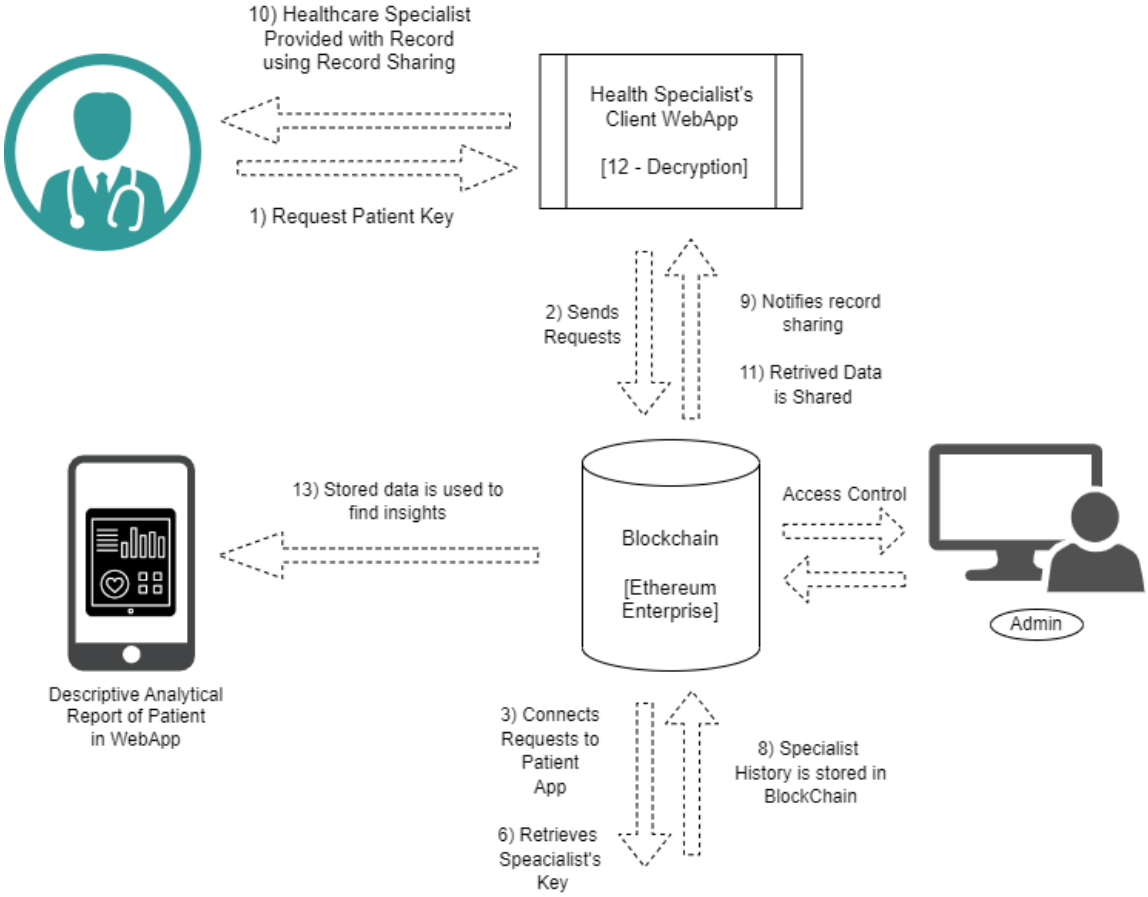
21.	Any unique features? Explain?	• The App allows the patient to book their appointments and view their medical progress and detailed report in elementary terms and the doctor to check the progress and prefer diet plans for the patient according to their health condition. It will create Visualizations with query outputs from the Electronic health records (EHR) using Dune Analytics. It provides a descriptive medical and business tactical report based on the insights from data visualization for diagnosis, logical investigation, commercial applications, and administrations using the dashboards. HIPPA Compliance as the records are managed based on the HIPAA Act by the US in 1996 which promotes data privacy and has restrictions for healthcare providers in maintaining the patients' records to prevent exploitation. The sensitive records are stored using Public-key cryptography (Asymmetric Cryptography) that uses pairs of related keys for Encrypting the HER to enhance the piracy of the patients. Smart Contract Optimization is applied to reduce the Gas amount transactions (Managing the Wei Complexity).
22.	How simple or complex will the idea's execution or implementation be? What are the risk factors involved in executing the idea?	This idea works with its best speed of transaction, greater efficiency, and offers high security to medical records. One of the major risk is that it will use all the currency in the digital wallet at some instance due to the gas transaction for creating records. This risk is managed by adjusting the chain configuration and paid amount can be claimed back to different user within the private blockchain who verifies that block as a miner.
23.	How soon could the idea be put into operation? (TRL of prototype)	We can start implementation within a month if we hire people from certain domains for work. If not, this idea can be in effect within two months after understanding the flow of blockchain and learning how to create smart contracts in Solidity and analytical queries using Python and Dune analytics to produce Data visualization models. It is mandatory to know about the algorithms like cryptography and regressions to improve the overall efficiency of the app.
24.	How much investment would you need for prototyping of the Idea?	Ethereum Enterprise membership costs up for NGOs, Government agencies, and micro and small Industries. We need a computer with a decent GPU to process the cryptocurrency faster and SSD to perform a faster testing phase. We can hire the Front End Developer to create the user interfaces and Data analyst to write algorithmic codes to extract relevant insights and reports from EHR. We

		also have a subscription for IPFS based on the capacity of files.
25.	How do you intend to protect your idea (i.e. your intellectual property or IP)? Status of IPR (If any)	I will probably apply for intellectual property under the guidance of my mentor.
26.	Related Background. This section is used to highlight information that can be used by the reviewers or patent attorney to help put the solution in proper context. You can think of this section as something similar to the introduction section of an academic publication. This section is specifically reserved for other people's work (please include competitive work) as well as your past work that you believe will aid the reviewers in understanding the technical landscape. Data related to or supporting your solution should not be in this section, it should be in Section III: "How is this Solution Made and Used."	• MedicalChain: (A Start-up in London, UK) Medicalchain is a decentralised platform that enables secure, fast and transparent exchange and usage of medical data. They use blockchain technology to create a user-focused electronic health record and maintain a single true version of the user's data. Medicalchain will enable users to give conditional access to different healthcare agents such as doctors, hospitals, laboratories, pharmacists and insurers to interact as they see fit. MedicalChain is built on the permission-based Hyperledger Fabric architecture which allows varying access levels; users control who can view their records, how much they see and for what length of time. They have their own currency for transactions for Initial coin Offering (ICO) called "MedTokens".
27.	How is this project made and used: Please describe in as much detail as possible how the innovation is implemented. This includes details on how you actually make, assemble, synthesize, or build the solution and details on how the solution is used once it is made. Reviewers will ask: How does the technical innovation actually work – or – what is the detailed process to achieve the technical innovation? Please help convince the reviewers with supporting statements using as much of the following that is available: your thoughts, logic, supporting literature, and/or experiments.	Enterprise Ethereum will be the permissioned network that has many features to control access for users to the stored data. The Blockchain has to get configured with various settings like block size, gas limit, and others. The next step is to create smart contracts for managing the records in the blockchain. The roles, modifiers, functions, and additional features like appointment scheduler and patient care plan are prepared in the contract using Solidity via Remix IDE. Next, the digital wallet and contracts are connected to the blockchain which makes it a Dapp. We will be using the MetaMask digital wallet for triggering executions of back-end or smart contracts. Digital wallets also help in interacting with the blockchain for managing the blockchain addresses and cryptographic keys. Then the IPFS stores and serves the files in distributed file storage protocol with a large peer to peer network. Now we will be creating the dashboards with data visualization models that help us to find insights from the cluster of data. It also supports any smart contract created on those blockchains and displays the data produced using the SQL queries or we can create a Python code that helps to perform

		this analysis and can use the “Web3.py” module to import the records from the blockchain. It is a must to provide the set of standard medical records as samples to compare the issues and can process the outputs based on the ML algorithms to check the current condition of the patient. It is best to hire a doctor for the ideal medical record for a sample. The following phase will be the designing of a WebApp with various interfaces using React. We can use Web3.js and React Bootstrap to link the Ethereum blockchain with the interfaces. The local blockchain network with Ganache will provide more tools for testing and they can help you avoid the time delay for testing contracts.
28.	Upload Block diagram/ flow chart/ Circuit Diagram/Pictures	[Upload only pdf,File size should not exceed 5 MB]
29.	Aadhar Card	[Upload only pdf, File size should not exceed 5 MB]

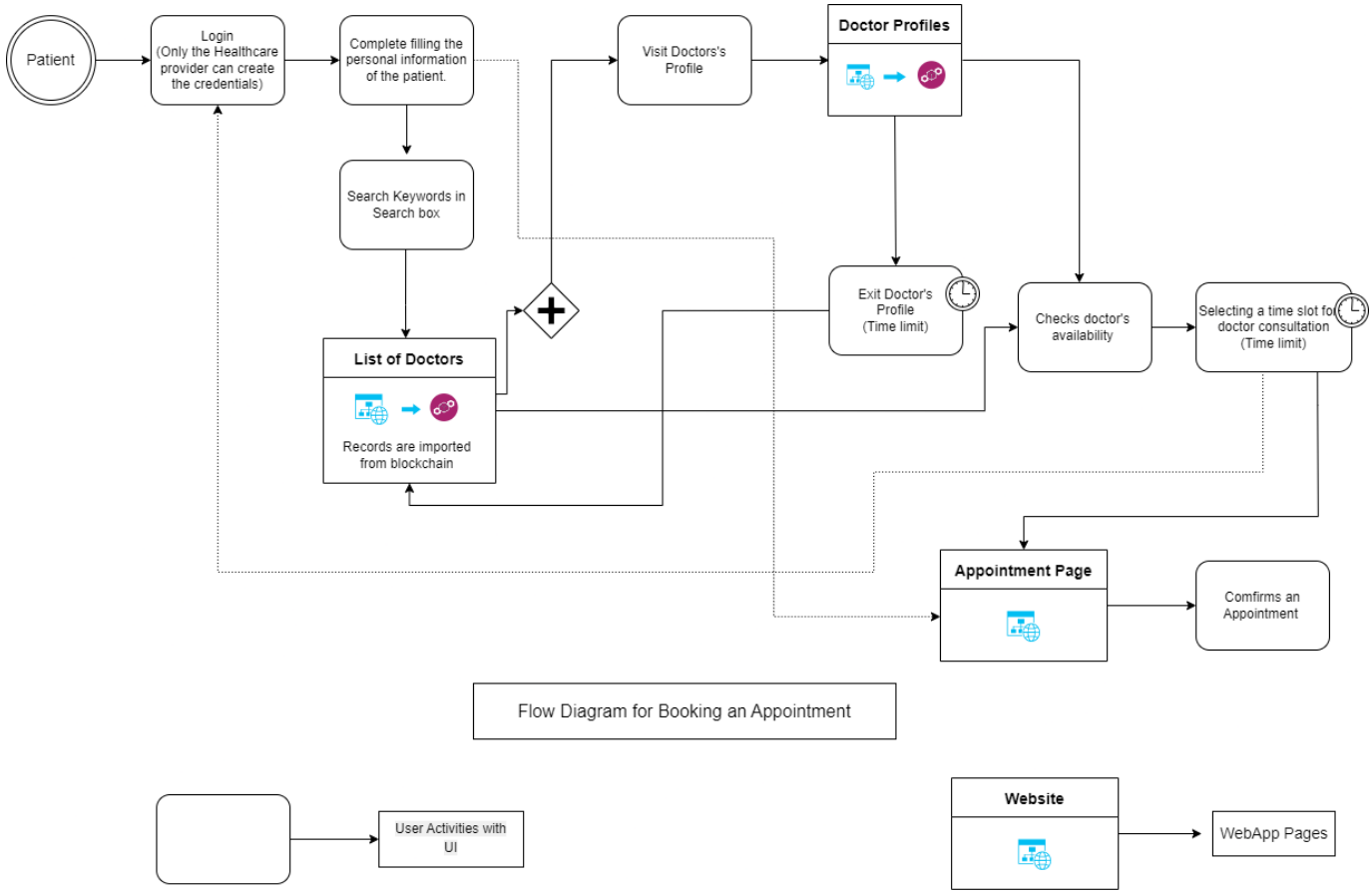
Aadhar Card:

Block Diagrams:



Storing and Retrieval of EHR

Flow Diagram :



Flow Diagram for Booking an Appointment