MEDIBLOC WHITEPAPER

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MediBloc: Blockchain-based Healthcare Information Ecosystem

Abstract

The current state of electronic health records are centrally-stored by medical institutions. In addition, medical privacy laws have restricted health records to be only obtainable by the patient, giving healthcare providers primary stewardship of patient data. Centralized repository of medical data have prevented a holistic understanding of patient medical status, and this scattering of data across various organizations have diminished the quality of patient care. While demand for medical data continues to increase, there is just a lack of reliable, quality data for medical research and Artificial Intelligence. And despite the large amount of data being produced, the actual data that can be applied is limited. Which goes back to the core problem of valuable healthcare data being siloed and distributed among various institutions.

MediBloc is an open-source healthcare data platform built on the blockchain. It compiles a complete indexed history of all patient medical information; validating and securing every change along the day. It can safely secure and integrate scattered data from various institutions, and also collect data from devices like the smartphone. Patients manage their personal medical records based on individual needs, setting grounds for exercising ownership and control over personal medical records. Patients have full access to their data and can assign access permissions for medical institutions and allow authorization for those who can write data on MediBloc. Also other participants- individuals, research institutions, private corporations interested in obtaining medical information will be able to access with permission. In addition, software engineers and developer communities can build new services with the MediBloc platform API and SDK to exchange data with the platform and drive innovations in the healthcare applications market.

MediBloc will issue Medi token(MED), the cryptocurrency used on this platform, to build a competitive ecosystem. MediBloc users will be incentivized for their contribution on the MediBloc platform. This will reward participants- ranging from patients to healthcare providers- with MED. MED can also be used to complete transactions for medical and pharmaceutical expenses, insurance premiums, etc. at institutions associated with MediBloc.

MediBloc offers a healthcare data exchange platform/ecosystem, that will promote interoperability and allow all entities- patients, practitioners, medical institutions- to freely take part in exchanging data. We believe that the MediBloc platform will revolutionize the healthcare industry by redistributing the rights to data ownership and viewing permission of healthcare data.

1. Introduction

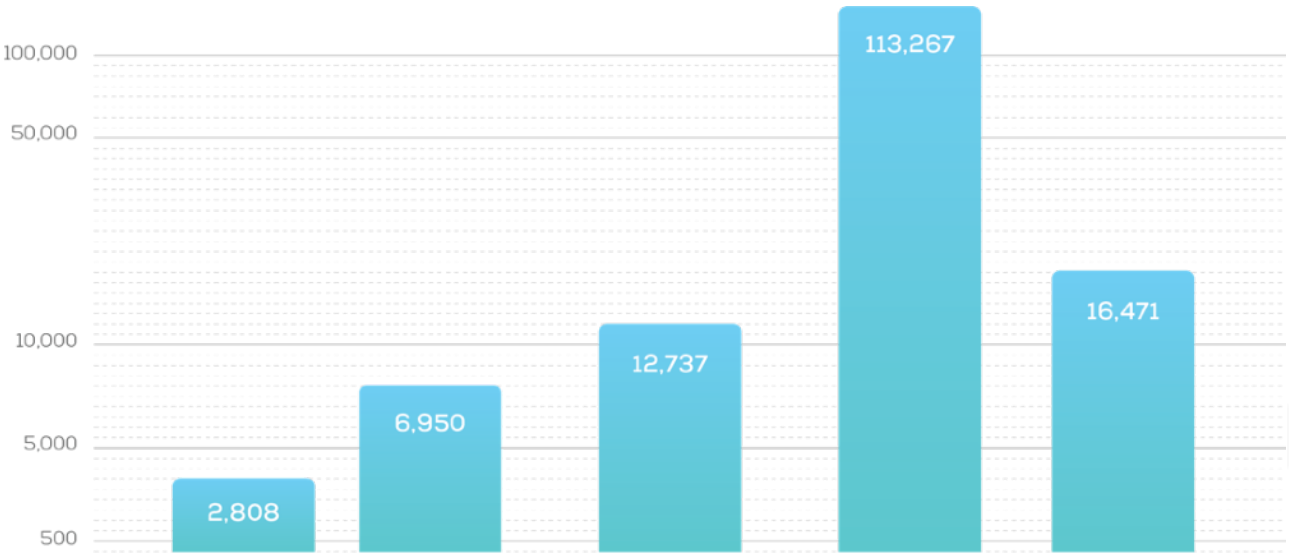
Individual medical institutions have the sole authority to medical data of patient, prohibiting any exchange of medical data outside of the specific institution, with the exception of patient's request for personal information. It is extremely difficult to utilize data because the records are not compatible between different hospital systems. With increased demand for medical data exchange by professionals in the medical field and also patients, various entities have made attempts to gather health information. Examples of these efforts include the Blue Button Connector[1], a US government led project, Apple's Mobile Healthcare Application [2], and Samsung's Mobile Healthcare Application [3]. Although many other services are being introduced, digital healthcare services have not yet satisfied the requirements for an ideal healthcare information system, such as security, reliability, and transparency. As a result, they have not received active participation from healthcare service consumers, healthcare service providers, and the healthcare industry in general[4]. However, the MediBloc team is certain that it can create a system that can satisfy all requirements of an ideal healthcare information system by using blockchain technology, which is rapidly developing in finance. Taking one step further, we hope to bring an innovation in the industry of healthcare by providing a platform that can offer services or applications related to health and medicine by using healthcare data and by building a system that supports patient-centered care, precision medicine and predictive care.

1.1 Problem Overview

Anyone who has ever visited more than one hospitals have experienced taking one medical examination, then repeating the same test that was previously done at a previous hospital. It is because in many cases, your information in the previous hospital is not transferable to a different hospital. Inefficient exchange of medical information becomes prevalent as the current system is centered around medical institutions. Along with government regulation considers private healthcare information as highly classified information. HIPAA(Health Insurance Portability and Accountability Act) of the United States [5] states the regulations which all medical service providers and medical institutions should oblige to for the protection of medical information. According to HIPAA, the party which can deal with medical information is highly limited. Sharing medical information is allowed to a minimum level, only in cases when it is necessary to share. As a result, medical information is managed by the medical institution in which a patient was treated or by insurance companies. Other countries have accepted similar regulation like the HIPAA, so it is highly likely that medical information exchange will not be swiftly executed in most countries. Another factor that makes exchange of medical data difficult is the lack of digitalization of data. According to a research by U.S. Center for Disease Control and Prevention, only a half of total medical institutions has an EMR/EHR system which has complete functionality. [6]

Under the current state of centralized repository of medical data, there is no guarantee in the integrity and security of patient data. Moreover, risk in terms of data loss or hacking is inevitable. In this situation, individuals cannot autonomously utilize their medical information, have little trust in data credibility, and are exposed to high risk of personal information leakage. In fact, the number of healthcare data breaches are only increasing. In 2015, more than 112 million healthcare records were breached just in the United States and annual financial loss is recorded to be over $6.2 billion [7,8].

- Number of records exposed (1000 records)



[Source: Department of Health and Human Services' Office for Civil Rights]

Restrictions in healthcare information exchanges also limit healthcare providers and medical experts from performing the best care, and unnecessary repeated tests and attempts for data reconciliation can cost a lot of time and money. A research has shown that when healthcare information exchange is well conducted, the overall laboratory tests and radiology examinations can be reduced by more than 50% in the emergency department [9]. The current healthcare data

system, specifically the insurance industry, is dealing with losses every year due to its inability to prevent health insurance fraud. It costs more than $487B world wide, and records from 2011 show that, in the US, this cost consists of one-fifth of all medical expense [10]. In addition, falsification or forgery of information by healthcare providers happen quite frequently. However, there are lack of system today that prevent this broader societal issue.

The existing problems of the process of collecting healthcare data do not end here. Digital health data is highly sought after by biomedical and public health researchers and other business stakeholders in the healthcare industry [11]. In order to conduct precise evidence-based research, experts require high-quality, organized records for analysis, but in most of the cases, data is transferred without informing patients, resulting the growth of concern about this. Furthermore, the rights and issue to personal healthcare data is increasingly drawing attention because medical institutions are abusing their rights and make information exchanges without informing patients [12]. Currently, in the US, certain cases allow for sharing of information that has been de-identified. But it has become very easy to re-identify the exact patient, with all of the personal data available and with the help of social media [13, 14].

1.2 Mission statement of MediBloc Team

"Improve healthcare access and experience by redistributing value of personal healthcare data, accelerating the world's shift to private information decentralization."

The MediBloc team brings medical expertise to disrupt the way in which electronic medical data is managed in the healthcare industry, through decentralization. We have designed an interoperable healthcare data system that is both secure and transparent, that empower patients to own and gather their own health data. Using this dataset, the MediBloc platform can be used by healthcare professionals and other stakeholders in building a variety of health-related applications and services. We will also offer a special opportunity to incentivise every participant that helps build and sustain the platform.

2. MediBloc, New Medical Information System

There have been many attempts to liberate and analyze the current health record system- kept by large medical organizations. It remains difficult, as the healthcare data industry serves multiple entities, all with different interests. In order to overcome the barrier, there needs to be a dramatic shift in the current system.

MediBloc uses blockchain technology that re-envisions the healthcare data system to be consumer-centered. It will provide an ideal Personal Health Record (PHR) [15] platform that brings reliable and transparent dataset for medical records. MediBloc is more than a data exchange service. It is a healthcare data platform that opens the possibility for variety of services. Developers will be able to use the open-source API and SDK to create services using the MediBloc platform. MediBloc uses a cryptocurrency, Medi token (MED), that will build a medical information economic ecosystem in which consumers are at the core. We will also provide a unique opportunity to receive incentive for participating on this healthcare data platform.

The following sections will more closely dive into the characteristic of MediBloc

2.1 Maximum Security

According to the HIPAA privacy rules, all medical information must be kept confidential. The current state of electronic healthcare data is collected and stored by individual healthcare providers, risking and opening the various people involved in healthcare to have access to the data. According to recent studies, it is more likely for private information to be released from inside leaks/mistakes rather than breaches from the outside [16]. MediBloc hopes to block the possibility of these leaks and reduce access to private health data by taking the rights from big corporations and giving it to the

individual patients. Patients themselves will have the authority to access, decrypt and collect all of their healthcare information with the blockchain technology. This will minimize the number of people involved in collecting private healthcare data and also lower the risk of leaking of healthcare data. In addition, it will prevent the recurring cases of thousands of medical data breaches through attacking of large medical institutions [17].

2.2 High Reliability

MediBloc stores healthcare information in a decentralized data storage. In order to prevent data loss, we will continuously generate backup data, verify the integrity of the data and when modulations are surfaced, recover the original data by using the backup data. Making it impossible for users to easily delete and modify data will ossify the integrity and reliability of medical data stored on MediBloc. We also allow only verified medical practitioners through the healthcare provider's credential system and further strengthen the reliability of our system by keeping a record of the specific writer and confirm through blockchain. Only when given the authority can a medical practitioner view the healthcare data of another person.

2.3 High level of Transparency

MediBloc records the activity of those who write/read/access that information on the blockchain. Currently, it is difficult to track where and how an individual's healthcare information is being used, but MediBloc will transparently provide information on when, where and for what purpose the healthcare information was used. By allowing consumers to have authority and manage personal healthcare data, MediBloc can fundamentally stop exploitation of healthcare information.

2.4 High Interoperability

MediBloc is an open-source platform. Various platform applications can freely be connected using the healthcare data stored on the platform. Already standardized data such as medical images or genetic information can be easily interoperable and transferred through MediBloc. For data that not yet has a standardized format like medical records, laboratory results, test results, etc., we choose to enhance interoperability by supporting various formats, rather than selecting a single standardized recording format. In order to support this, MediBloc plans to provide API/SDK for diverse formats, starting with the most widely used HL7 CDA(Clinical Document Architecture)[18], and also allow anyone to develop a code supporting other formats. With high level of flexibility and scalability as a basis, MediBloc offers interoperability that tops any of the current healthcare information system.

2.5 High Accessibility

MediBloc stores all healthcare information in a decentralized database, where users can easily access it anywhere through the Internet. Healthcare data is restricted outside the medical institution and there are still limitations in some cases where services to access healthcare data are provided. MediBloc provides a system that separates itself from any single medical institution, no longer relying on big institutions to provide access healthcare information to customers and practitioners.

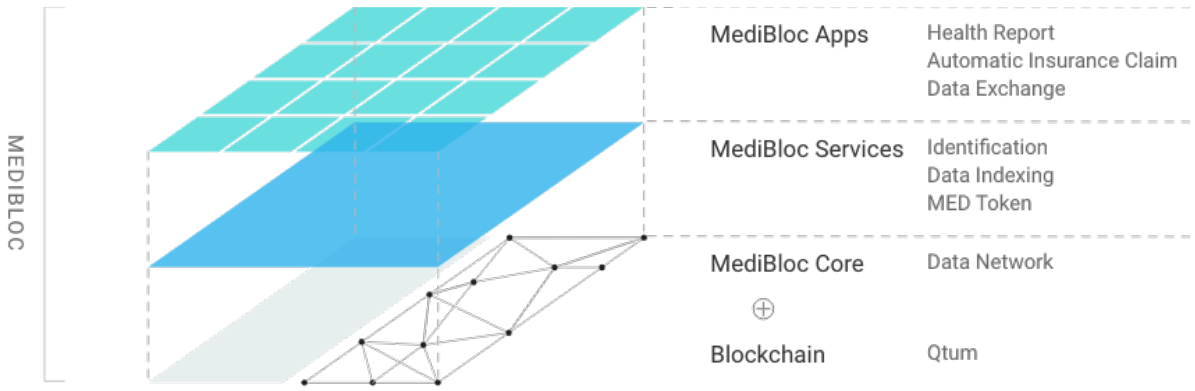
2.6 Patient-centered Healthcare Information System

MediBloc will use blockchain- the symbol of decentralization- to disrupt the current healthcare data system and to achieve data integration. MediBloc not only allows for storing healthcare data produced by a medical institution, but also collectively stores Patient-Generated Health Record (PGHR). Information produced outside of the hospitals, along with data recorded by patients themselves can all be stored in MediBloc. Integrated healthcare data can be widely used for, from general treatment at local hospitals to personalized mobile healthcare services.

3. MediBloc Technical detail

3.1 Platform Structure

The MediBloc platform consists of three layers: Core, Service, and Application.



3.1.1 First Layer: MediBloc Core

The Core layer is a healthcare data network, a distributed database that uses the latest encryption technology to safeguard data. Since the amount of data that can be stored in the blockchain is very limited, separate storage is required to efficiently store healthcare information and this separate storage is provided in the Core layer. The data generated and transferred by applications using MediBloc-provided SDK is first encrypted with individual private key - only the owner of the data can decrypt it. The Core layer is accessible through the Service layer. In addition, MediBloc Core Layer provides a backup and recovery system so that data can be safely stored without being lost.

3.1.2 Second Layer: MediBloc Service

MediBloc's Service Layer provides fundamental services that connect the Application Layer and Core Layer. The Service Layer uses information based on blockchain, and allows for data input/output through connection with the Core Layer. Internally, the service layer can be divided into: 1. EVM (Ethereum Virtual Machine) based Smart Contract and 2. connecting Application and Core layers. Smart Contract account information includes MED balance, and medical information within the Core layer, etc. MediBloc hopes to minimize operational costs by minimizing data stored on the actual blockchain, including Smart Contact data.

3.1.3 Third Layer: MediBloc Application

In the MediBloc Application layer, various applications, from web, mobile, etc., can manage and utilize the healthcare information. These applications are accessible through the Service Layer of the platform. For easier and faster app development, we offer SDK, which will help create applications that can be linked to the MediBloc platform. However, we do not restrict users to any use of SDK, as long as developers follow the communication protocols for the future platform. We will provide more specific examples of application use in Chapter 5. Use Cases.

3.2 MediBloc Platform Compoinents

The MediBloc platform is an EVM-based decentralization application (DApp). EVM is currently most widely used for smart contract development. Therefore, with time, cost, versatility, and reliability in mind, it is the most productive to develop MediBloc as a DApp based on EVM instead implementing the whole blockchain network. In addition, EVM is supported by multiple blockchain platforms such as Ethereum (ETH) [19] as well as Qtum[20] and EOS [21], opening the possibility for MediBloc to flexibly choose the best platform depending on the situation. The advantage of using Qtum is that it has the positive characteristics of both Bitcoin (BTC) and Etherium and it is currently the most scalable public blockchain due to the use of POS (Proof of Stake) consensus algorithm. Qtum is also a China-based platform and will help MediBloc advance into the Chinese market.

The MediBloc platform mainly holds three categories of information: MED balance, personal information, and healthcare data. It would be optimal to be able to hold all these information on the blockchain, but due to practical constraints such as cost, storage capacity and performance, large data including personal information, healthcare data, etc. should be encrypted and saved outside of the blockchain. Only the hashed value of these data will be recorded onto the blockchain. To construct a decentralised database system, Inter Planetary File System (IPFS) [22] will be used.

3.2.1 MediBloc Account

There are three different types of accounts that can be created in the MediBloc platform: General Users, Healthcare Providers (medical practitioners, institutions) and Data Researchers (medical researchers, healthcare apps/services). The different accounts will have different authority and roles in the MediBloc ecosystem. The table below goes into more specifics on accessibility of the three accounts.

	General Users	Healthcare Providers	Data Researchers
Read and write personal healthcare data	Full access	All possible	All possible
Read others' healthcare data	• No access, unless with the consent of account owner. (Option to disclose to family)	• In emergency situations (some information accessible without permission) • Account owner consent required. - Marked as "Access request by a Healthcare Provider"	• Account owner consent required. - Marked as "Access request by Data Researcher"
Write on others' healthcare information	• No access, unless with the consent of account owner. (Option to disclose to family) - Marked as "Patient-Generated Record"	• Only possible with account owner's approval and marked as healthcare provider-generated record	• Not possible by default, but it can be done at the account owner's approval - Marked as non-healthcare professional-generated record

Healthcare Providers and Data Researchers must show proof of their certification. In order to distinguish the data generated by General Users and Healthcare Providers, and Data researchers, we have provided the information in the chart above. For General Users, no access will be granted to other users. However, there may be instances where the account is managed on behalf of a family member who has difficulty using the MediBloc directly. Therefore, it is possible to access the other person's account with the patient's consent. In other cases, where a patient loses consciousness due to an accident or illness, and make it difficult for him or her to pass their medical information, the healthcare consumer may collect important information (eg. blood type) for emergency separately marked by the patient. Healthcare providers have the right to this information under special circumstances without the approval of the account owner.

There are two main cases for a patient to receive a request to access their healthcare information. First, if a practitioner requests to view your data for a medical examination, Second, for either medical researchers or developers wanting to use the patient's data to do a research or to develop healthcare services.

3.2.2 Healthcare Provider Credential System

In order to distinguish general users from healthcare providers, we offer the "Healthcare Provider Credential System." In order to keep information on the MediBloc platform reliable, medical practitioners and institutions must give proof of their certifications. The data provided by medical practitioners will naturally have more weight on the MediBloc platform.

MediBloc will operate a certification system that is a hybrid of verified decentralization approach and peer-to-peer method, both from trustworthy and certified systems. To increase reliability of the P2P method, the authenticator will deposit a fixed Medi Point (MP). Those who honestly participate and verify will be rewarded, while those who fail to veri-

fy will be penalized. P2P verification ultimately makes final decision based on participant votes. Individual judge's votes will be disclosed and Indorse[23] be supported by a method similar to ATP.

3.2.3 MediBloc Database

Electronic clinical records require very small storage and is difficult to go beyond a few megabytes, but medical images can be more than hundreds of megabytes. The size of genomic data depends on the degree of data processing, but also may require several gigabytes or more. It is not ideal to save all medical data onto the blockchain. Therefore, MediBloc encrypts data using a private key that can only be decrypted by the owner, stores the data outside of blockchain and only the hash value of it is saved in the blockchain. We plan to build our own data network based on IPFS [22].

Personal devices (smartphones, computers, etc.) will be used as the primary data storage and MediBloc Core will be a backup storage to prevent from data loss. Data collected by personal devices (smartphones, computer, etc.) will be kept in off-blockchain storage. Users can enjoy various personalized healthcare services through the collected information. Integrity of the stored data can be verified through the hash value in the blockchain.

In the case of data loss on personal devices, MediBloc offers a backup system. Every user will receive 1GB of free storage space for medical data, usually enough to store all clinical records and medical images. In the case of patients with genomic data and frequent hospital visitors, the user may need more than 1GB, then we offer low costs for additional storage space. MediBloc complies with international standards set forth by HIPPA, etc. in managing all of our data storages.

3.2.4 MediBloc Data Search System

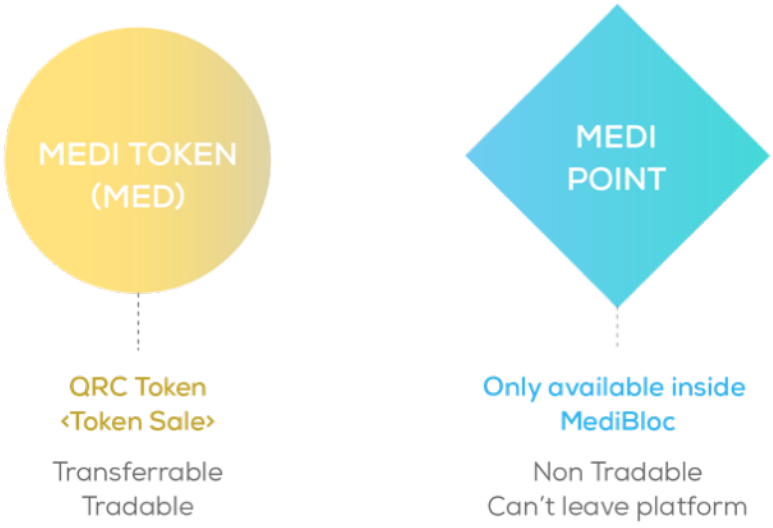
MediBloc Service Layer offers data search functions. This is one of the key functions of this service, allowing users to search for information they are looking for. For this purpose, MediBloc will operate its own search system. All users have the authority to deny access for their healthcare information to come up on the searchers. Therefore, this search function is primarily intended for users who have allowed access to be searched.

Every user can set search-related restrictions in the settings. Once a user allowed their medical data to be searched, their index information data will be stored by the MediBloc search system. Medical researchers can collect useful and relevant data through the MediBloc search system and exchange the data with the data owner in P2P manner through Smart Contract.

In order to keep any type of exposure/ breaching to a minimum, MediBloc will use Intel® Software Guard Extensions (SGX) [24], a system that blocks even the system administrator from accessing the data. Sensitive patient data will all be saved in "enclave", minimizing any risk of exposure and keeping data safe.

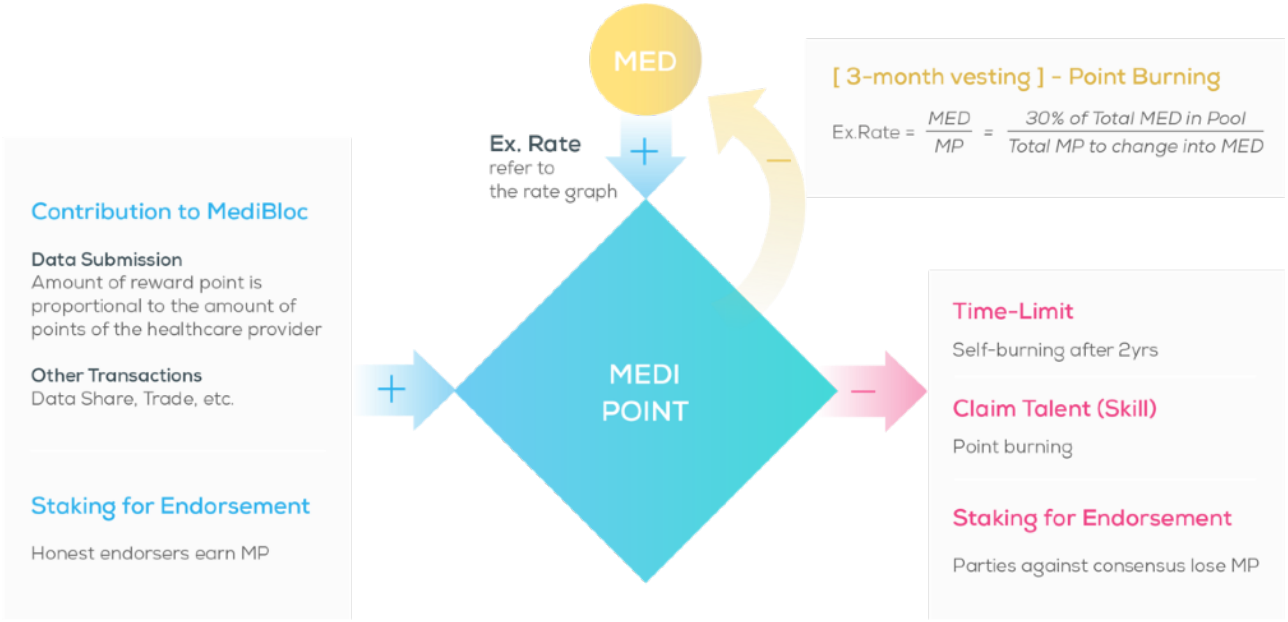
For users that want to keep their information generally out of the search system, but are willing to sell or donate their medical data for special cases, there is an option to do so. For those data researchers looking to obtain specific data, they can not only use the real-time search system, but also post a data request with data requirements and compensation for providing the data on the MediBloc network. Every MediBloc user can select certain conditions on their personal devices and set push-notifications to participate in data sharing. All of these functions are operated in the background, minimizing excessive user participation.

4. Token Model

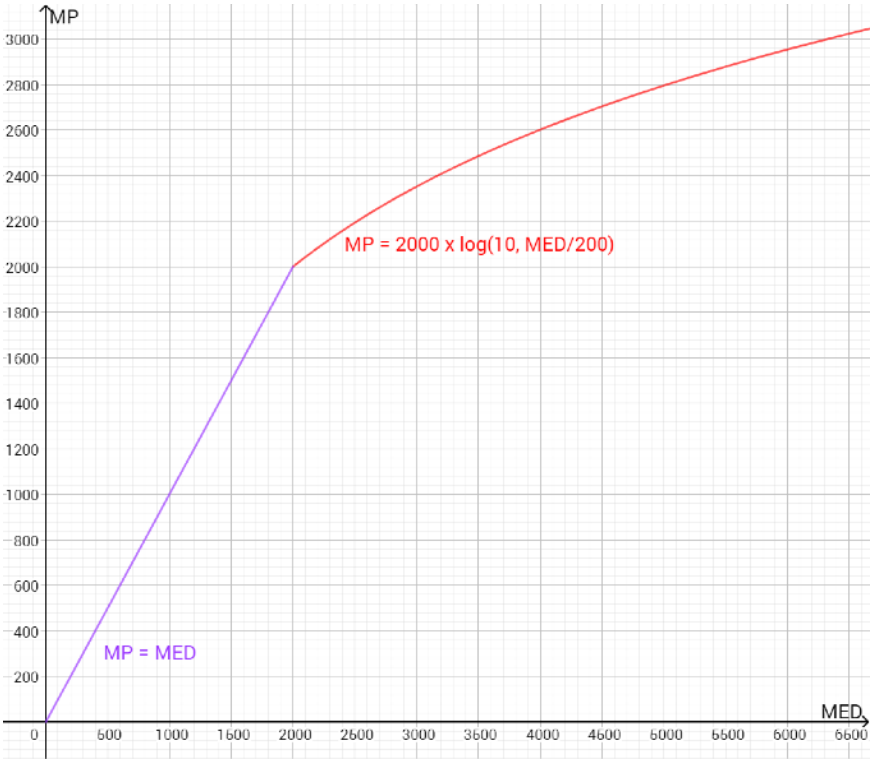


MediBloc will issue Medi Token (MED), following the QRC token standard(the Qtum token standard that corresponds to Ethereum ERC20) [25]. MediBloc is Qtum-based, but Qtum currently uses the same protocol as Ethereum when it comes to token, therefore making Qtum-based tokens included as ERC20. Medi Token is main source of socio economic exchange in the MediBloc platform and is a critical element for allowing all potential users (General Users, Healthcare Providers (medical practitioners, institutions) and Data Researchers (medical researchers, healthcare apps/services)) to interact with the various layers of the platform described under Section 3.1 above. The MediBloc platform will use within it Medi Points (MP), a points based system which measures participation on the platform (and provides a reputational 'score' within the MediBloc ecosystem). MP cannot be exchanged between users, nor be taken outside of the platform. MediBloc uses MP, along with MED in order to have an objective scaling system to maximize data exchange reliability. Therefore, an MP score will be an indicator to measure the amount of contribution to the MediBloc ecosystem. MP does not represent a medical practitioner's medical achievements/ skill level. However, MP may be one of the relevant reference points for patients to select the right medical practitioner. It should not be an indicator for skill/ experience level.

4.1 Medi Point, MP



Medi Point (MP) is the measurement of amount/ extent of contribution by users. The figure above illustrates how points are acquired/ used. The easiest way to get MP is to use MED to buy MP. The following graph illustrates the exchange rate from MED to MP. The MED and MP ratio remains constant until it shows a logarithmic function type where there is a sharp drop in the conversion rate. In order to obtain the basic MP (2000 MP in the figure below), users can simply purchase the points using MED. However, in order to obtain much more MP, users must purchase a significantly larger amount of MED or actively participate in producing or trading data. The basic MP can be viewed as the minimal contribution by medical providers or researchers seeking data from the general users. Based on the estimated published value of MED, the MED of 2000 MP is expected to be valued at $10, a fairly reasonable entry requirement.



The amount of MP basically increases in proportion to the activity on the platform. In the case of medical practitioners, MPs are paid in return for creating medical records. For general users, simply the use of MediBloc to manage personal healthcare information is contributing to the platform, and MPs will be rewarded. The amount of compensation will be determined by the type of medical information recorded and on the value of Medi Point of the data recorder at the time of the recording. In addition, a small amount of MP will be rewarded for all activities within the platform to encourage continued activity.

The MPs collected can be converted to MED after a three-month reservation period. The MP to MED conversion rate is determined by the size of the MP and 30% of MED in MED pool. Therefore, the conversion rate will be constantly fluctuating and we will provide a real-time conversion rate. All MPs used to convert to MEDs will be incinerated.

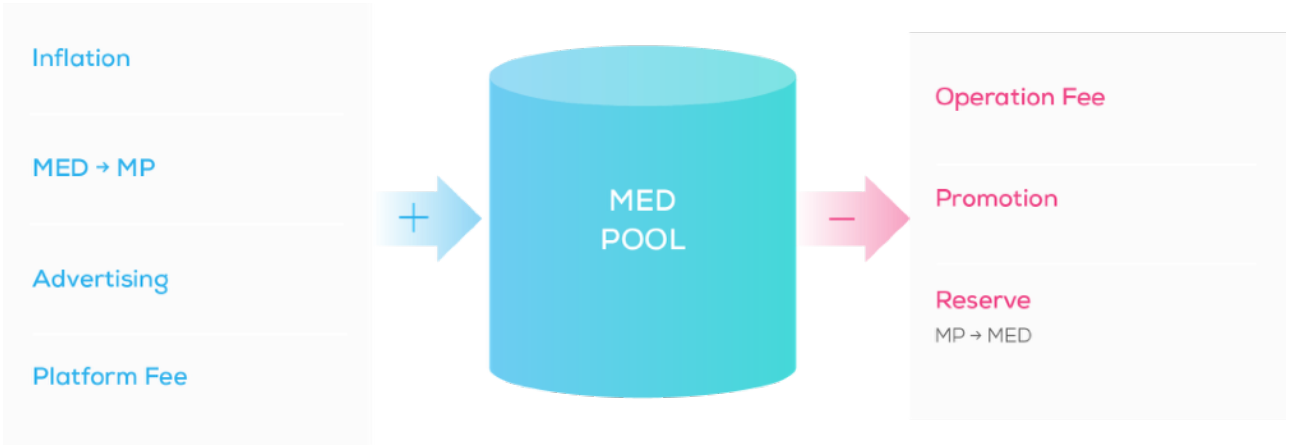
To encourage continuous activity on the platform, there will be an expiration period for MPs. MP settlements will be completed on a monthly basis and MPs will disappear after 24 months. This will prevent unnecessary inflation in the ecosystem caused by inactive MPs, which will promote a healthy ecosystem.

Finally, MPs can be used in the P2P verification process. The automated verification method is similar to the model of Indorse [23], a program which aims to be the LinkedIn of the decentralized world. Anyone who has special skills can claim to be verified within the platform. This claim is delivered to other users within the network and those who receive the claim can make a decision on participating in the verification process. In order to participate, users must bid with their personal MPs. Verification results are based on the majority rule vote. Those who vote according to the verification result will be rewarded with MPs and those who failed to do so will lose MPs. To avoid disclosing information about

verified participants, we will be using a zero-knowledge proof method similar to the Anonymous Indorsement Protocol, defined by Indorse.

4.2 Medi Token, MED

Medi Token (MED) is different from Medi Point (MP) in that it allows for exchange between MediBloc users and also with those outside of the platform. MED and MP can be used to pay for the cost of exchanging data and information, and for all services associated with the platform, supporting the socio-economic ecosystem of MediBloc. They can also be used to encourage participation of medical consumers and healthcare providers who have not yet joined MediBloc.



The MediBloc platform has a MED pool to continuously foster and develop the internal ecosystem. After ICO, MED will be issued in the following way: 5% inflation on the first year and 30% less inflation every following year. To be more specific, 3.5% inflation on the second year and issuing of tokens will end after 10 years. Users can advertise to others through the MediBloc platform, and all costs will be paid through MED and collected in the MED pool. It is free to use the platform, but if MED goes through a data trading, users will pay a 10% commission, which is put into the MED pool. All MediBloc users will receive 1GB of free storage (1GB of storage capacity, 1GB/ month of bandwidth), and will charge more according to the usage amount. With that said, only 0.01% of all users are expected to need more than 1GB of storage and based on Storj [26], the service currently providing storage space, the fee is expected to be small. Finally, MED used to purchase MP will all be included in the MED pool.

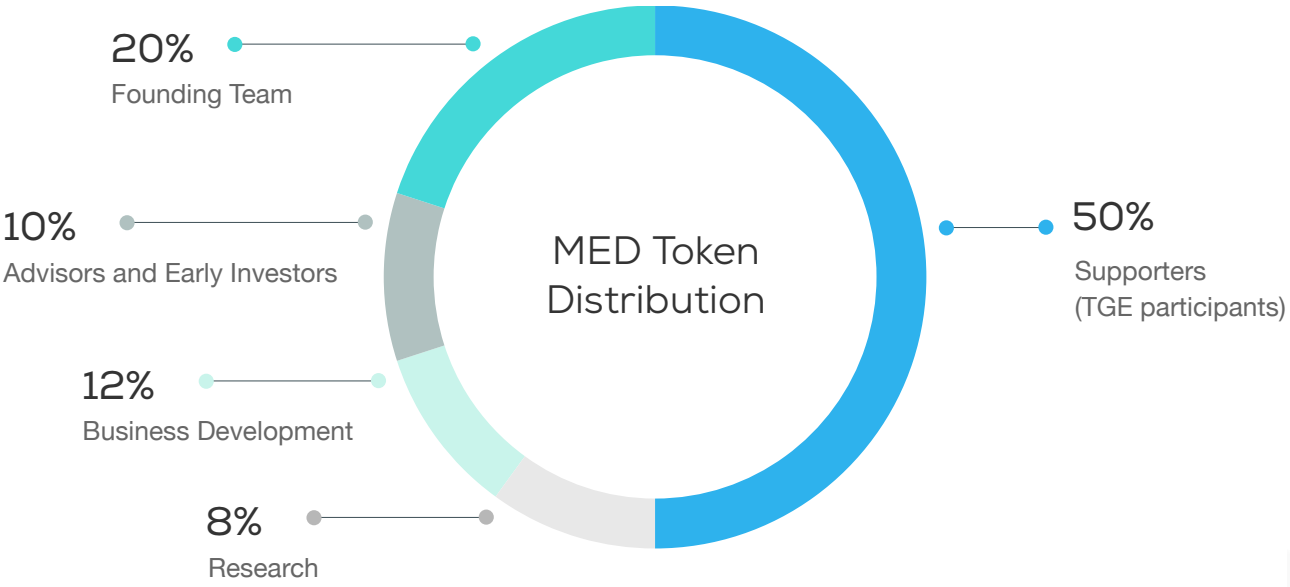
Of the MED in MED pool, 50% is set aside for promotion & network usage fee (cost of creating smart contracts for the account), basic storage capacity and etc. It may also be used for developing applications and services to expand the whole ecosystem. The rest of the 30% will be used to transfer MP to MED, and since this value is not constant, the exchange rate is predicted to fluctuate. The last 20% will be used for operation, maintenance and further development costs.

Platform users, including token holders, participate in collecting and sharing their own healthcare information through MediBloc, making the MediBloc platform more powerful and more valuable. Therefore, the MediBloc platform can be seen as a result of the activities of the token holders.

Numbers and rates related to Token Mechanism may be subject to change depending on a subsequent simulation process.

4.3 Token Generation Event

The purpose of MED generation = build MediBloc platform and support development of healthcare information ecosystem based on the MediBloc platform. Generally, people can participate with QTUM. We plan to make funding with Bitcoin (BTC) and Etherium (ETH) available and the information on accurate conversion ratio for each cryptocurrency will be available on official communication channels (our website, Slack, Facebook) and participants can access Tokens by following the "MED Token Sale Terms and Condition". 50% of the Tokens will be granted to TGE participants. Approximately 20% of the total token volume is used for the purpose of developing MediBloc. The remaining 20% will go to the MediBloc team and 10% to initial investor and advisors.



Please note, the percentages discussed above are indicative and may vary with the amount raised through the Token Sale.

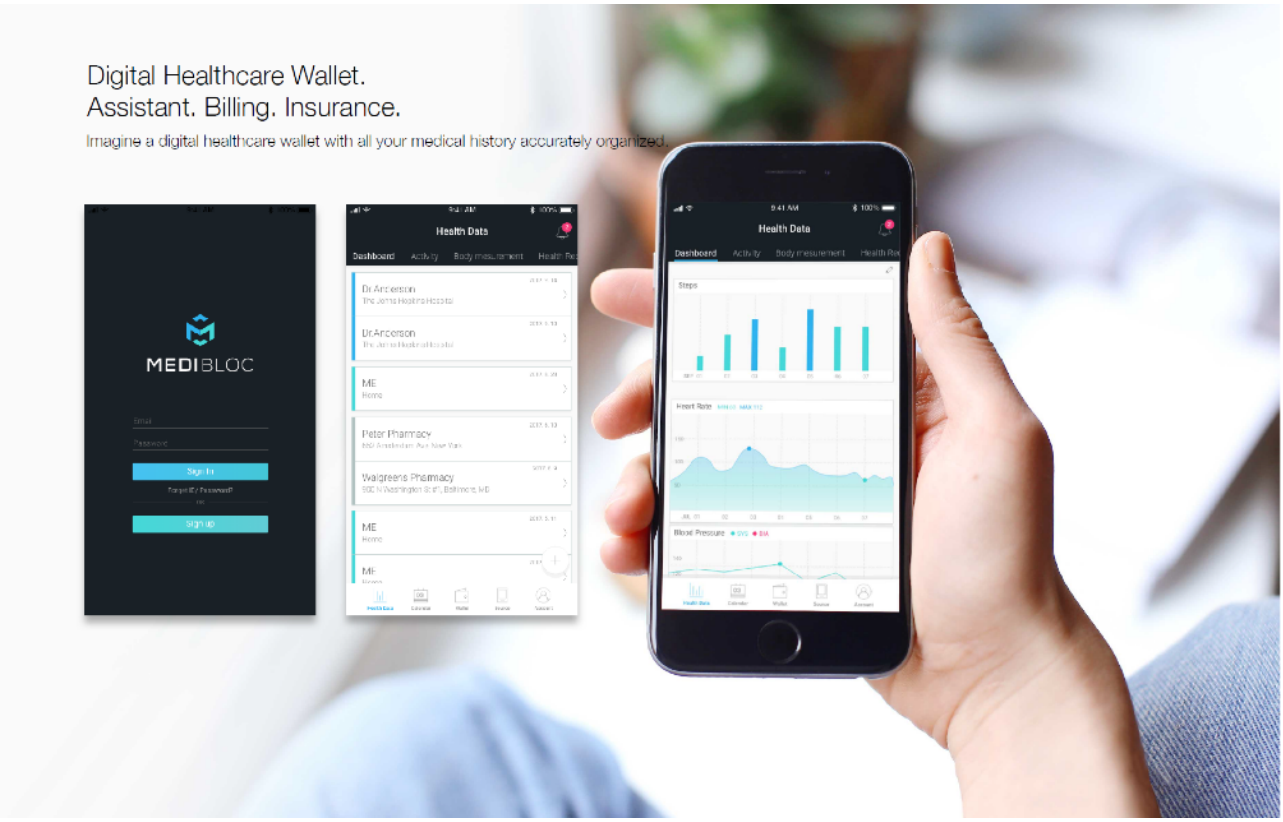
Accurate information related to token sales will be announced through the following channels.

- Website: https://medibloc.org
- Slack: https://medibloc.slack.com
- Facebook: https://www.facebook.com/medibloc

- Twitter: https://www.twitter.com/_MediBloc/

5. Use Cases

5.1 Personal Health Report



Patients will be able to combine previously scattered medical records and healthcare data collected through wearable devices. Patients can have complete record and control of the medical history. Patients will be able to use the information during clinical care and use it for personalized healthcare services, including customized medical AI application. This is an example of recurring topic in the field of medicine - on the requirements and standards for ideal personal health record (PHR) [27].

Patients can now accurately understand individual health conditions more easily and keep record of when and what medical procedures took place in the hospital. In addition, the exact name and ingredients of medication prescribed and any side effects can be recorded. Patients can also compare previous health conditions to the present, allowing for enhanced care of individual health.

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5.2 Automatic Insurance Claim

Based on the medical data collected through MediBloc, insurance claims and evaluations can be automated with “Smart Contacts”. Patients will no longer need to call/ visit medical insurance companies to ask if certain diseases, treatments, checkups will be covered. Also eliminated need to submit a claim to the insurance company post treatment. Through “Smart Contacts” used after the treatment, medical data delivered through MediBloc will automatically be billed to the patient’s insurance plan.

5.3 P2P Healthcare Data Market

MediBloc offers patients to exchange healthcare data with medical researchers, institutions, companies, etc. through a P2P healthcare information market. Until now, large medical institutions and companies have privatized the monetary benefits of monopolizing and distributing healthcare information, but MediBloc provides services that can be returned to the patients.

The healthcare data market is valued to be over $10 Billion annually in the United States alone. And with the growing demand for the data, it is predicted that the market will continue to grow. However, there is a limit on healthcare data supply and there is no guarantee in quality information. Through the MediBloc ecosystem, we hope to improve the quality of data and authority centered around the individual patient that will eventually make healthcare data more approachable. Through this we can also return the rights and monetized benefits by big institutions back to the consumers.

Through MediBloc, patients will now be aware of the value of healthcare data which will motivate them to actively participate in MediBloc. Medical researchers will be able to more easily access accurate and wholesome medical information, which could lead to acceleration in the development of medical care and create a virtuous cycle structure that will return benefits to the patients.

5.4 Artificial Intelligence

The innovation of Artificial Intelligence (AI) is applied in various industries, and the healthcare field is no exception. The intersection of medicine and AI is creating changes across the medical spectrum, from highly complex domains, like medical examination and medicine development, to more simple health management. Advancement in AI depends on the quality and quantity of the data, and developers will be given the opportunity to access more quality data through MediBloc. Through this exchange, we can predict AI will be a promising service.

Patients can get even more personalized care through communication with chatbots, provided on MediBloc. There are currently a lot of personalized medical services on personal devices like the smartphone, but it is difficult to access that information from the users. MediBloc can help solve this issue. Here, we could provide various services- recommend practitioners to patients, prescribe diagnosis, recommend treatments, and predict prognosis, etc. When these services are combined with chatbot services, it will advance personalized healthcare services.

5.5 Clinical Trial

MediBloc can be used as a platform for clinical research in medical research institutes and pharmaceutical companies. It can be used in the process of screening the patients and be an asset to research as a whole. 'Smart Contract' allows both researchers and practitioners to have access to research data anywhere at the same time. MediBloc can open more opportunities for objective research. In the case of Retrospective Study, researchers can find the subjects that meets his or her desired condition and obtain data needed to conduct research.

5.6 Telemedicine

Patients have a variety of needs for medical services. However, there are currently physical and temporal barriers that prevent patients from receiving the right medical service. Through MediBloc services, patients will be able to connect with their desired practitioner and receive medical service 24/7 anywhere around the world, making it easy for live, real-time healthcare services.

5.7 Social Networking Service, SNS

MediBloc will create communities specifically for patients, especially those with rare diseases. Patients who must fight the same diseases can benefit from sharing information and establishing a relationships. In addition, Medical providers and researchers who are interested in the disease can naturally engage with the community, enriching the experience of righting diseases.

6. Roadmap

The future roadmap for MediBloc can be divided into the roadmap for the platform and associated applications.

6.1 Platform Roadmap

Specific timeline of the MediBloc platform development can be seen below.

MediBloc presents the future blueprint for MediBloc by presenting a White Paper October 2017 and releasing the Proof of Concept (PoC). In Nov 2017, MED will be issued through ICO (Initial Coin Offering), which will be followed by development of the platform and basic application.

In May 2018, we plan to release APIs and SDKs for applications that will run in conjunction with the MediBloc platform. We plan on releasing the Alpha version in July and the Beta version in October. The Alpha version will primarily support the Clinical Document Architecture (CDA®) [29] of Health Level Seven® (HL7) [28], the most widely used standard for clinical record exchange. In addition, we will support Digital Imaging and Communications in Medicine (DICOM) [30], a standard for exchanging medical images, which will enable both clinical record and image exchange within the plat-

form. In the Beta version, we plan to make IPFS-based MediBloc Core (Data network) open to allow users to easily backup data. We plan on completing the test phase and releasing the full version of MediBloc in December 2019.

In 2019 we plan to launch support standards separate from HL7 CDA® and we plan to release SDKs and APIs accordingly. In February, the MediBloc Core will be updated with the software and platform that will fit the HIPAA-compliant repository. Once sufficient storage has been obtained through this process, support for genomic data will start in March. Any future platform development plans will be posted and updated on the website.

'17 Oct	White Paper Ver 1.0 Release
'17 Oct	Proof of Concept (PoC) Application Release
'17 Nov	Initial Coin Offering (ICO)
'18 May	MediBloc Platform API & SDK Release
'18 Jul	MediBloc Platform Alpha Release - HL7 CDA®, DICOM Support
'18 Oct	MediBloc Platform Beta Release - MediBloc Core (Data Network) Support
'18 Dec	MediBloc Platform Open
'19 Jan	Begin supporting standards other than HL7 CDA®
'19 Feb	3rd Party Data Network (HIPAA Compliant repository) Support
'19 Mar	Genetic Data Support

6.2 Basic Application Roadmap

Since the MediBloc ecosystem is on an open platform, anyone can freely develop applications and connect it with the MediBloc platform. We are planning on providing a bounty that will encourage third party participation to enrich the MediBloc ecosystem. In addition, we will develop basic MediBloc applications that will demonstrate the effectiveness and value of the platform. The roadmap for the basic app are listed in the following.

	MediBloc App	MediBloc EHR	MediBloc Researcher App
17 Dec	App Plan & Design		Research App Plan & Design
18 Jan		EHR Plan & Design	
18 Mar	Start App Development		
18 Apr		Start EHR Development	
18 May			Start Researcher App Dev
18 Jul	App Alpha		Researcher App Alpha
18 Aug		EHR Alpha	
18 Sep	App Beta	Start Test Run	Researcher App Beta
18 Oct		EHR Beta	
18 Nov			
18 Dec	App Release		Researcher App Release
19 Jan		EHR Release	

MediBloc plans to develop three applications which include: 1) personal healthcare information management application for patients 2) EHR for medical practitioners and institutions and 3) Data retrieval programs for researchers. All applications are scheduled to start being designed and planned at the end of 2017 or beginning of 2018. We aim to release these applications at the end of 2018/ early 2019. Unlike other programs, EHR will add tests that is geared towards practitioners in hospitals.

7. Others (Legal considerations, etc.) - TBD

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As of the date of publication of this whitepaper, MED tokens have no known or intended future use (other than on the Medibloc Platform, as more specifically defined in this White Paper).

No promises of future performance or value are or will be made with respect to MED Tokens, including no promise of inherent value, no promise of continuing payments, and no guarantee that MED Tokens will hold any particular value. Unless prospective participants fully understand and accept the nature of the Medibloc Platform and the potential risks associated with the acquisition, storing and transfer of MED Tokens, they should not participate in the MED Token Sale. MED Tokens are not being structured or sold as securities or investments. MED Tokens hold no rights and confer no interests in the equity of the company. MED Tokens are sold with an intended future functionality and utility on the Medibloc Platform and all proceeds received during the Token Sale may be spent freely by Medibloc on the development of its business and the underlying technological infrastructure.

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Participation in the Token Sale carries substantial risk and may involve special risks that could lead to a loss of all or a substantial portion of your contribution. Further information about the risks of participating in the Token Sale are set out in the Token Sale T&Cs. Please ensure that you have read, understood and are prepared to accept the risks of participating in the Token Sale before sending a contribution to us.

The Token Sale and/or MED Tokens could be impacted by regulatory action, including potential restrictions on the ownership, use, or possession of such tokens. Regulators or other competent authorities may demand that we revise the mechanics of the Token Sale and/or the functionality of MED Tokens in order to comply with regulatory requirements or other governmental or business obligations. Nevertheless, we believe we are taking commercially reasonable steps to ensure that the Token Sale mechanics and issue of MED Tokens do not violate applicable laws and regulations.

CAUTION REGARDING FORWARD-LOOKING STATEMENTS

This whitepaper contains forward-looking statements or information (collectively “forward-looking statements”) that relate to our current expectations of future events. In some cases, these forward-looking statements can be identified by words or phrases such as “may”, “will”, “expect”, “anticipate”, “aim”, “estimate”, “intend”, “plan”, “seek”, “believe”, “potential”, “continue”, “is/are likely to” or the negative of these terms, or other similar expressions intended to identify forward-looking statements. We have based these forward-looking statements on current projections about future events and financial trends that we believes may affect our financial condition, results of operations, business strategy, financial needs, or the results of the Token Sale.

In addition to statements relating to the matters set out here, this whitepaper contains forward-looking statements related to the Medibloc’s operating model. The model speaks to our objectives only, and is not a forecast, projection or prediction of future results of operations.

Forward-looking statements are based on certain assumptions and analysis made by Medibloc in light of its experience, current conditions and expected future developments and other factors it believes are appropriate, and are subject to risks and uncertainties. Although the forward-looking statements contained in this whitepaper are based upon what we believe are reasonable assumptions, there are risks, uncertainties, assumptions, and other factors which could cause Medibloc’s actual results, performances, achievements and/or experiences to differ materially from the expectations expressed, implied, or perceived in forward-looking statements. Given such risks, prospective participants in the Token Sale should not place undue reliance on these forward-looking statements.

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