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Building the Next Generation Financial Services for ASEAN

Powered by Secure Multi-party Data Collaboration Protocol

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Background

A data collaboration protocol is needed for the new era

Today, data is being created at an exponential rate. And this rate is speeding up more every day. IDC's latest Digital Universe study predicts that about 1.7 megabytes of new information will be created every second for every human being on the planet by 2020. Yet, IDC found that only 0.5 percent of the data created was ever used or analyzed.

The reality demands a new data collaboration protocol. According to a recent Harvard Business Review study, two-thirds of organizations are already trying to blend together five to fifteen sources of data for analysis. A large number of organizations who use manual analysis with Excel spreadsheets are coming to realize that it's not a viable solution anymore. Today, the use of Artificial Intelligence (AI) can lead to more data being employed to train and improve models and achieve faster outputs. At the same time, recent misuse of data has brought attention to ensuring more robust and extensible security frameworks with respect to data usage. This creates a strong case for a future where decentralized and aggregated models for data collection and analysis need to be deployed.

Furthermore, the global regulators are imposing more and more strict regulations on personal data usage. The General Data Protection Regulation (GDPR) (EU) 2016/679 is a regulation in EU law on data protection and privacy for all individuals within the European Union (EU) and the European Economic Area (EEA). It also addresses the export of personal data outside the EU and EEA aeas. The GDPR aims primarily to give control to citizens and residents over their personal data and to simplify the regulatory environment for international business by unifying the regulation within the EU.

The regulation contains provisions and requirements pertaining to the processing of personally identifiable information of individuals highlighted as below:

- *Informed consent for processing*
- *Data protection by design and by default*
- *Pseudonymisation*
- *Right of access*
- *Right to erasure*
- *Records of processing activities*

Credit data marketplace and credit scoring is still under developed

Looking back into history, credit reporting began as a diverse collection of local information sharing arrangements between banks and community merchants. In the second half of the twentieth century, Americans returning home from World War II generated an unprecedented demand for housing and mortgages. In the next decades, such trend resulted in market consolidation and technology improvement. Credit reporting companies started to operate at national level. More advanced modelling techniques and objective credit scoring helped companies assess risk and make faster, cheaper and more statistically sound decisions, replacing manual, subjective decision process.

Today, the credit scoring system still treats billions of people as “invisible” and leave them with little access to much-needed capital. This includes the fast growing millennial generation, the immigrants and many low income households.

Additionally, the credit scoring method is undergoing major changes and improvements. While the FICO score is still the most widely adopted approach (~90% market share), it is outdated given the change of economic activities in recent decades. After the invention of FICO in 1956, many new types of economic behavior data about borrowers have become available, driven by the prevalence of e-commerce and internet-based social apps. Yet, the FICO system does not incorporate such data. Therefore, besides the traditional credit scoring such as FICO, big data credit scoring and alternative credit scoring are emerging. Big data credit scoring relies on a bigger set of data—10X-100X more variables than the traditional credit scoring—and uses emerging advanced techniques including machine learning. Alternative credit scoring further explores the prediction power of non-conventional data such as attesting of lender’s traits.

While credit related data is the foundation for credit scoring, the current data collection process has many problems—it is expensive, inefficient and full of privacy concerns. 1) For lack of an effective data-sharing mechanism, many lending institutes collect repetitive data about the same borrower, spending time and money on redundant efforts. Yet, at the same time, credit data about a large proportion of the population is still missing. 2) Data acquisition is expensive and the process oftentimes involves sale of personal data in black markets in developing countries, causing security and privacy concerns. 3) Personal data owners do not receive benefits for the usage of the their own data, despite the huge profit generated from the data every year. At the same time, much of the data acquired from black market or even central credit bureaus are partial or inaccurate and do not provide valid insights into the lender’s credit-worthiness. The poor data quality distorts the credit market and harms the consumers.

Despite the massive potential efficiency improvement for building a shared database, existing data owners, mostly institutions, are unwilling or unable to collaborate with each other, out of the following concerns:

a) Security and fear of competitors taking control of the data
b) Lack of incentive for early participants: the benefits of data sharing is driven by network effect and hence offers limited incentive for early contributors
c) Throughput and latency requirements for such massive, real-time data exchange

Defi aims to solve the problems of data collaboration

Defi believes that a blockchain-based data collaboration protocol has some natural advantages in extracting value from the data, while providing incentives for data contribution. The blockchain-based system records the ownership history of data, while the underlying token economics provides incentives to participants to contribute data at scale.

From the perspective of security and privacy preservation, properly designed and implemented blockchain-based data exchange and computation system leads to more robust data privacy by reducing the possibility of leakage through negligent handling of raw data by individuals. Such architecture also provides opportunities to fully deploy advanced encryption and data handling techniques including zero-knowledge proof, differential privacy, asymmetric cryptography, and data obfuscation.

Ultimately, when the security and incentive concerns are both addressed, a more comprehensive and accurate data network would provide a strong foundation for unlocking the full potential of AI.

Defi Protocol aims to be the world's leading enterprise-grade blockchain-based multi-party credit data collaboration platform that can accomodate credit information for the next billion consumers. Correspondingly, Defi Protocol supports 10,000 transactions per second (TPS), provides scoring results within seconds vis secure multi-party computation framework and ensures high security and privacy.

To achieve these metrics, Defi Protocol features high performance consensus design, zero-knowledge-proof based authentication, automated trade negotiation and enforcement by smart contract, decentralized data storage and exchange via asymmetric cryptography, and data authentication mechanisms.

What's even more exciting is that use for a fairer and more efficient and comprehensive financial service market for consumers in the new era. A decentralized data collaboration protocol allows participants to improve data quality, reduce the cost of data acquisition, expand data coverage, and ultimately create better credit scoring models through AI. Through the Defi ecosystem, built on top of the Defi Protocol, we see the potential to substantially improve multiple financial service verticals.

With the improved system, the project can make impacts in multiple ways:

- *Improving access to credit is one of the best practices for economic development and poverty alleviation according to the World Bank. It improves social equity and creates opportunities for the less well-off group to invest in themselves.*
- *Developing countries, such as Philippines, Thailand and Indonesia, must make a transition from the infrastructure investment-led growth model to a consumption-led growth model in order to achieve sustainability. A well-rounded consumer credit system is the foundation for such economic transformation.*
- *Expanding credit coverage to the invisible mass creates very lucrative profits by growing the pie of the credit market and the consumer market. Such growth stimulation can encourage responsible borrowing, spending and investing.*

Specific relevance of Defi in South East Asia

Most South East Asian countries are yet to unlock their full economic potential. With large populations, favorable demography, rapid rates of technology and internet adoption, and swiftly evolving fintech space, the region provides unique opportunities. There are two specific factors that make Defi specifically relevant in the South East Asian region.

Ambitious digital and financial inclusion goals among SEA countries, with favorable government policies

The governments in SEA countries have ambitious goals for both digital transformation and financial inclusion. Indonesia wants to make itself the largest digital economy in SEA by 2020 and targets the creation of 1000 tech startups, while spurring the annual e-commerce transaction value to $130 billion. To achieve greater financial inclusion and push innovation in the financial services industry, Philippines recently launched a payments system that is aimed to turn at least 20% of the company transactions into digital, from the present 4%. Vietnam aspires to increase the banking penetration to 70% by 2020 from the present 59%, along with bringing down

cash transactions to less than 10%. There is a great emphasis on creating a favorable fintech ecosystem using technologies such as blockchain to improve financial services in Thailand. The country has also been actively welcoming numerous fintech startups from other countries. To facilitate digital transformation, Malaysia too is pushing several initiatives such as Open API that is believed to revolutionize its fintech ecosystem, along with inviting higher participation from industry in areas such as P2P Lending. Singapore is already known to have one of the friendliest ecosystem for tech firms including fintech which has made the country a host to the largest number of fintech companies in the region. With such high emphasis to push fintech innovation in the region, the region is very well positioned to lead the next round of revolution in the space.

Additionally, with the regulators in the region embracing open banking through platforms such as ASEAN Financial Innovation Network (AFIN)—World's first cross-border, open-architecture platform to connect banks to fintech firms to improve financial inclusion—the relevance of a venture such as Defi in the region increases manifold. In fact, according to a Ernst & Young study on fintech in ASEAN, financial institutions in the region were seeking AFIN's support to prioritize onboarding of Fintech services into the sandbox in areas including credit scoring, KYC(know-your-customer), SME lending solution, all of which is pertains to Defi's core ambit of operations.

Rapidly increasing internet penetration, makes a case for multi-party data collaboration in countries with both low and high proportions of banked population

The internet penetration in the South East Asian Countries have exploded in the recent years. In the Philippines, the mobile internet users are growing at a rate of 1.5x (or 30 million per year). Thailand managed to ramp up the percentage of internet users from 67% in 2017 to 84% in 2018. Indonesia has more than 143 million internet users—one of the highest in the region. Vietnam has almost doubled its internet user base in the last decade.

Malaysia and Singapore already have about 85% of their population using the internet. A rapidly increasing internet penetration in the region means higher data generation through mediums including social media, streaming services, e-commerce, etc. But this data currently exists in silos and there is little practice of multiple parties collaborating with one another to share data in a secure way.

Exhibit: Internet penetration and banked population in SEA countries

Country	Internet penetration	Banked population
Indonesia	55%	49%
The Philippines	63%	31%
Vietnam	54%	59%
Thailand	84%	97%
Malaysia	85%	85%
Singapore	84%	98%

Given the availability of more data with varying levels of banked population in the region, two different milestones can be achieved in the region at the same time with Defi's decentralized data collaboration system:

1. Credit can be provided for people in countries that have largely uncatered banking needs but have very high number of internet users—such as Indonesia and Philippines. Banks would be able to grant credit to even those people who do not have any banking and credit records. That would be made feasible due to the possibility of deriving credit ratings from secure and encrypted data, sourced online from multiple players who the users interact with. More credit availability in the economies would further lead to increased consumption, and propel their economic growths.

2. For countries that have very high levels of banked population (Malaysia, Singapore and Thailand), Defi's system of credit risk assessment would provide a framework to use superior data, and consequently employ better models for risk assessment. This would enable the financial institutions to evolve their risk assessment models (which presently is highly limited) and would allow for a more comprehensive understanding of borrowers' behaviour. This would result in a drastic decrease in credit default rates for such economies with highly banked population.

The Defi Protocol

Defi Data Collaboration Protocol provides access to collaborate on high quality, secure and shareable data. The system allows easy processing, sharing and distribution of data, while keeping the privacy of both enterprises and individuals intact.

By leveraging the distributed ledger and smart contract capabilities provided by latest blockchain technology, Defi will build a new data protocol that is vastly more open, fairer and more efficient than existing data exchanges. This new infrastructure can then enable and encourage more frequent, transparent and trustful data sharing between Southeast Asia consumer finance institutions. Financial institutions can better assess and control risks, and individuals can have better access to better services.

Our Approach

Defi's vision is to define state-of-the-art inclusive finance system with:

- *Access to credit: the majority, especially in developing countries still have only limited access to credit due to the lack of data. Without relevant data, financial institutions are not able to assess and control the risk, thus unwilling to provide services. Defi aims to encourage data collaboration between both institutions and individuals and help everyone get access to credit.*
- *Data portability: even in today's world, data is not portable. Your data is captured and stored by different companies and organizations. If you move to another country, you have to start from the ground to build a new credit worthiness. Defi aims to solve this problem through improved financial data management tools and platforms.*
- *Identity proofing: this is a great area to build shared KYC process to benefit both financial institutions and individuals. Defi aims to apply new technologies and data to create a decentralized self sovereign identity that can: help financial institutions to better identify and authenticate customers, reduce financial fraud, and improve financial inclusion, and meanwhile serve as a financial passport for individuals to further state their financial stability.*
- *Privacy-preserving computation: data privacy is a top concern for both enterprises and individuals, especially in scenarios involving data transmission and processing. Defi puts safety and privacy first and adopts innovative technology to ensure your data is secure, only to be accessed and used by authorized parties.*

The Defi network will enable:

- *Data providers to collaborate on 3,000+ types of data without exposing the original data*
- *Model providers to offer analysis models (e.g. credit scoring) as a service*
- *Individual users to view their own data profile, dispute errors, manage how the profile can be used, and build out a more comprehensive data profile for rewards*
- *Analysis result users (e.g. financial service providers) to purchase computed results (e.g. credit scores), or to build decentralized applications (e.g. lending, asset-backed securities investment and insurance)*

In order to gain widespread use by institutions and individuals globally, we envisage the Defi secure multi-party data collaboration protocol to feature:

- *Open, fair and efficient data exchange*
  - *· All transaction history is permanently logged into the blockchain*
  - *· All transactions are automatically brokered, executed and enforced by smart contracts*
- *Low latency*
  - *· Sub-second level (i.e. same as direct data exchange) in order to be competitive with existing non-blockchain solutions*
- *Scalability*
  - *· Support thousands of participants*
  - *·*
  - *· Support exchanging data of any size*
  - *· Throughput: >1k TPS (initial phase), >100k TPS (long-term), as required in the extreme cases in some of the most populated countries*
- *Reliability*
  - *· Fully redundant architecture*
  - *· No single point of failure*
  - *· Resilient to distributed attacks*
- *Data security and privacy protection*
  - *· Data request via zero-knowledge proof*
  - *· Data transfers protected by asymmetric cryptography and data obfuscation*
  - *· Decentralized, encrypted data storage*
  - *· Personal identity information is never publicly disclosed*
- *Compliance*
  - *· Must comply with all state regulations as well as regulations and policies in key global markets*

  - *GDPR-compliant*
- *Data authenticity*
  - *Data from all providers constantly authenticated and data providers rated*

Our Products

Business: Cross Enterprise Data Collaboration

Financial institutions can contribute data and models to better identify, evaluate and control risk through risk data alliance. As a result, more individuals will have access to better financial services.

Fraud Detection via Risk Data Alliance

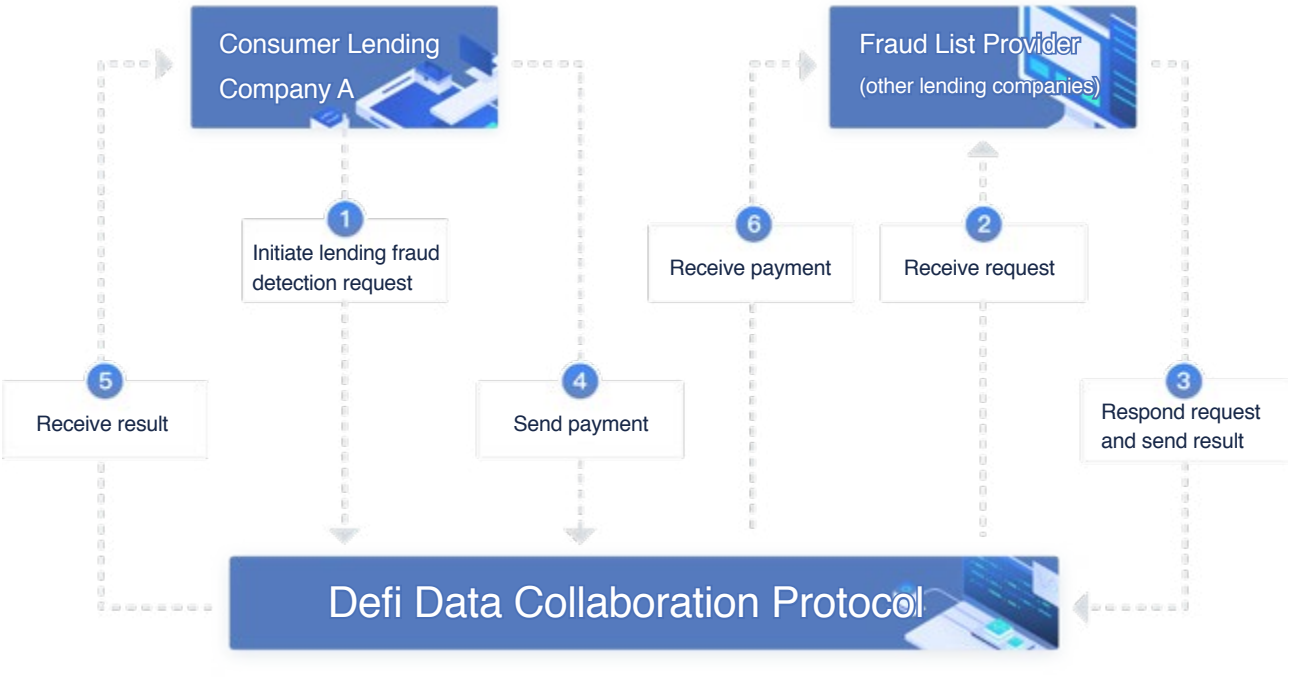
Using Defi Secure Multi-party Data Collaboration Protocol, financial companies can establish a secure risk data alliance. This will enable a a secure data collaboration environment for innovation, providing users with more stringent privacy protection, along with presenting tremendous opportunities for creating additional value from the data. Lending companies can upload, share, do joint computation and receive solutions for their risk control demands. Financial companies collaborating with one another can help create a more efficient and healthier lending market.

P2P lending companies maintain their own list of blacklisted customers who have previously defaulted or were involved in fraudulent activities. The blacklist is however neither shared or made public. For a single consumer lending company, it takes a long period of lending operation to aggregate such a list. The Defi network eliminates this information silos and enables the lending institutions to collaborate in boycotting problematic borrowers.

A lending company can assume the role of a data provider along with being a data user simultaneously.

- As a data requester, financial institutions could check individual creditworthiness with the candidates' information (including bank account number, mobile phone number, and ID). With more comprehensive data-- possible due to data collaboration-- companies can use the protocol to access fraud lists from other companies too. This helps financial institutions to better identify if the individuals have the ability to pay back, evaluate their creditworthiness and help in a more comprehensive assessment of risk.
- As a data provider, companies can plug their own fraud list data into the network. They receive payment for their data if the fraud list gets checked by other companies. Using the Defi technology, the data will not be exposed to other companies.

Below is the work flow of Defi joint credit fraud detection platform:



1) When evaluating loan application risk, consumer lending company A initiates a credit fraud detection request with the Defi platform

2) Fraud List Providers (other lending companies) who have relevant data, receive the request

3) Fraud List Providers process and send the results to the Defi platform

4) Consumer lending company A makes the payment on the Defi platform

5) Consumer lending company A receives the results

6) Fraud List Providers receive the payment for data collaboration

Over-borrowing Detection System

Some borrowers apply for loans at multiple lending platforms, which increase their personal debt to a level which they may be unable to repay. As a result, they default and the lending company bears the loss. With secure multi-party data collaboration technology, the lending platforms can initiate a request for information, e.g. number of borrowings, amount of borrowings, overdue history, and overdue amount. This information would enable the lending firms make a more informed decision before disbursing the loan.

A survey showing that if an applicant borrows from multiple sources, his/her overdue rate is 3~4 times higher than average. The denial of applications from borrowers who have records of borrowing from multiple sources will effectively lower the default risk.

Credit Scoring & Assessment Platform

The Defi Credit Scoring & Assessment Platform provides a comprehensive framework that can accomodate all existing credit scoring methods and players. Such design reflects our belief that an active marketplace that allows flexibility through a wide range of service providers, maximizes efficiency and brings about the most competitive offerings to the consumers.

Defi will compute a credit score using the data from the protocol, which will include data from the applicant, credit bureau , telecom , mobile usage , social network, e-commerce transaction, financial transaction and so on.

Currently, there are three types of credit scoring methods: traditional credit scoring, big data credit scoring and alternative credit scoring.

Traditional credit scoring is still the most widely used approach today. FICO is the leader in the space with ~90% market share. Besides FICO, the in-house teams in many commercial banks also use traditional credit scoring. This method only uses credit history data. The Defi network supports traditional credit scoring by providing APIs for these model users to contribute and acquire data.

Big data credit scoring is growing quickly. The big data credit scoring method uses a much wider range of credit scoring variables, usually a combination of education history, employment history, salary history, e-commerce shopping history, online social network connections, social security and health insurance history, and asset holding.Here also, Defi Protocol APIs would allow these model providers to compute credit scores using the network.

Alternative credit scoring explores many new approaches in conducting creditworthiness assessment. Such new approaches include considering borrower behavior data as a factor and rely on data directly acquired from consumers. Defi is flexible enough to incorporate these alternative approaches.

Defi Credit Scoring Models

Defi will provide Defi Score, backed by in-house credit scoring models: Defi Score Basic uses best-in-class scoring models that have been tested and widely used by the financial industry.

$$p = \frac{\exp(\beta_0 + \beta_1 \cdot x_1 + \cdots + \beta_n \cdot x_n)}{1 + \exp(\beta_0 + \beta_1 \cdot x_1 + \cdots + \beta_n \cdot x_n)}$$

where in the above
p is the probability of default
xi is the explanatory factor i
βi is the regression coefficient of the explanatory factor i
n is the number of explanatory variables

Defi Score Plus incorporates innovative scoring concepts, including Zhang Rank proposed by Professor Shoucheng Zhang at Stanford University.

Zhang Rank further advances Page Rank by incorporating timestamps and ascribing more weight to the more recent data. Zhang Rank is critical in a blockchain-based credit scoring system as it substantially mitigates the risks of lenders gaming the scoring system with the passage of time. With emphasis on consistent collection of historical records, abusing the system would not feasible.
Inspired by Word2Vec in Natural Language Processing, Person2Vec is the next generation credit scoring method that Defi is developing in-house to contribute to the network. Person2Vec dynamically selects the best variables to describe the credit worthiness of a consumer based on different scenarios.

Community-generated Credit Scoring Models
In addition to the aforementioned models, Defi Credit Scoring & Assessment Platform welcomes the community built and contributed credit scoring models which may be more effective. Fintech companies, economists and data scientists are provided with easy-to-use tools to contribute, and profit from their own credit scoring models on the network, once the models' effectiveness are validated. We believe the combination of such marketplace and the abundance of high quality data made possible by Defi Protocol will cultivate continuous improvement in credit scoring models for different scenarios and different segments.

Cross-border Credit Scoring
Under the current system, credit scores are not portable across countries, creating much inconvenience for individuals and leading to missed opportunities for the industry. The blockchain-based Defi Protocol is by design globally portable, allowing individuals and institutions to take maximum advantage of their data and scoring regardless of their countries. This is helpful as ASEAN countries are progressing towards a deeper economic integration within the region.

Smart Co-Marketing Platform

Re-engage inactive/ former User

Campaigns to re-engage inactive users can substantially increase company revenue and improve the life time value that could be generated from the customers. The barrier to re-engage usually includes lack of up-to-date understanding of the inactive users since they have finished using the financial product they once bought. The companies can only engage their customers for a short duration as they lack information on them to develop a more tailored product or a more effective marketing strategy.

To engage an inactive user is more profitable for mainly two reasons:

1. *The product conversion rate for an inactive user is higher than an active user. From knowing a product to buying a product is largely depend on the trust between a company and a consumer. Needless to say, the inactive user is more likely to buy a product from a familiar company instead of from an unfamiliar one. This will increase the lifetime value from a customer , which in-turn will increase the net profit attributable to the relationship with a customer.*
2. *By knowing more about the features of a group of inactive users, the company could create more tailored products to increase sales. For example, an online lending company can use Defi's data collaboration protocol to find attributes of a customer it once served, offer them with other financial products and related services that align with their new attributes. This will increase chances of re-engaging their inactive user, and increase their lifetime value, while bringing more profits.*

Precision Marketing

Defi's Secure Multi-party Computation Framework can help marketing teams to utilize innovative strategies in which marketers analyze the specific wants, needs, interests, and behavioral patterns of particular user segments. Because of their improved understanding, brands are better situated to fulfill the needs of individual groups and significantly increase the success and effectiveness of their marketing communications.

Precision marketing is directed at existing customers to encourage brand loyalty and spur buying behavior. Precision marketing relies less on creating persuasive ads, and more on creating deals, offers, and gimmicks that will appeal to existing customers.

In order to do this, precision marketing relies heavily on data from multiple data providers to create a customer profile and hence to have a better understanding of each customer with unique needs and make a wiser strategy to keep their loyalty.

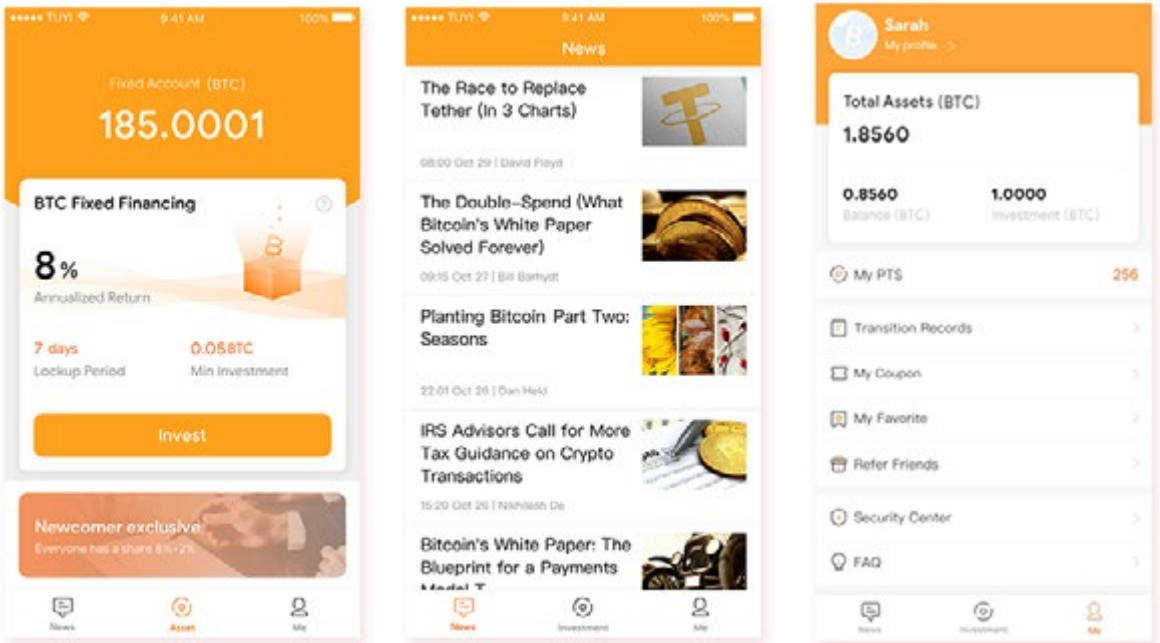
> Employing the same data trade flow and encryption mechanisms, Defi Protocol can facilitate data collaboration from multiple parties to significantly improve the accuracy of ad targeting and recommendation engines. This can be accomplished by providing many more non-traditional data participants a risk-free way of contributing their data for better user profiling of the targeted users, without exposing any one of the data provider's original data.

Consumers: Personal Data Wallet

Your data is the digital avatar of yourself. Personal data wallets help individuals store and manage personal data, such as identity information, education background, spending history, financial records, social media behaviors and much more. With appropriate management and authorization, your data could help you get better services and even make profits.

Defi makes sure your data is secure and owned only by you. By using advanced technology, we make sure your data is stored in your device and could only be requested and used under your authorization. Data transmission and processing processes are encrypted and take place in a trusted execution environment. This prevents any third party entity from hacking your data or compromising your privacy.

Defi is the pioneer in exploring the use cases of personal data wallet. We are launching the first two apps to help you manage your data, get better financial service and token rewards.



Coinsta

Coinsta is a one stop portal to better manage all your digital assets, including cryptocurrencies, news and personal data. Coinsta is envisioned to become the next generation digital wallet.

Besides allowing users to hold their cryptocurrencies, Coinsta provides BTC wealth management products, which are backed by low-risk arbitrage quant trading algorithms managed by professional teams.

Coinsta also offers personalized aggregated news feed for crypto investors to read the latest stories from the cryptocurrencies, regulatory news, or blockchain startups that you want to follow.

Last but not the least, Coinsta allows users to make better use of their data. Users are encouraged to contribute their personal data within Coinsta's digital identity management interface in exchange for credits in Defi tokens, as Coinsta is powered by Defi Protocol.

CreditMe

According to the World Bank statistics, 2.45 billion people in the world are unbanked, while over 975 million of the current banked population is not eligible for credit, which means 3.42 billion people (72% of the world adult population) is defined as "not credit worthy". Over 70% of the underdeveloped part of the world has no access to credit
and almost 60% of global population demands increase in credit usages.

CreditMe is your one stop shop to get the loan and other financial services best suited to your needs, based on your own data. By rendering your identity, education, work information, together with other integrated data, CreditMe compiles a unique credit profile, which is accepted by different financial institutions. The more data you contribute, the more accurate your credit profile is. The more accurate your credit profile is, the more likely will the financial institutions be to approve your loan or credit card, or even provide a better interest rate. Decentralized data protocol assures data privacy and security where users own their data and control access. This addresses the concern for data leak.

Furthermore, if the individual also authorize his/her spending data, social media data and other relevant data, a more comprehensive user profile will be generated through CreditMe algorithm and models. CreditMe can recommend financial products according to your interest and behavior history. For example, if your data shows you are enthusiastic about electronic devices, when the new generation iPhone comes out, CreditMe can recommend the most suitable loan for you.

High Level Technical Architecture Design

The infrastructure of Defi Protocol comprises of:

1. *A blockchain, serving as a distributed ledger and smart contract platform. Please note that the Defi Protocol is a chain-agnostic protocol and can be integrated with any public or private chains. Our first integration would be with our strategic partner, Ontology.*
2. *A Secure Postman Service, serving as a distributed, encrypted data store and escrowed data exchange*

Together, they will serve as a foundation for secure, fair and efficient data trading that we envision. Technically, such infrastructure should also provide ample performance, scalability and reliability needed to achieve all the goals stated above.

On top of the network infrastructure, we will also build a few fundamental services to enable a wide spectrum of potential network participants to contribute and benefit.

Core Technologies

1. Distributed Ledger

A distributed ledger is a consensus of replicated, shared, and synchronized digital data spread across multiple sites, countries, or institutions.There is no central administrator or centralized data storage. Blockchain is one type of distributed ledger.

The Defi Protocol is built on blockchain and utilizes Delegated Proof of Stake (DPOS) to achieve the throughput and latency requirements through a continuous approval voting system and deterministic selection of block producers. Defi allows every stakeholder to have influence directly proportional to their stake, while enabling majority of the stakeholders to focus on their own transactions instead of wasting computing resource and power on getting consensus for the whole network.

2. Smart Contract

A smart contract is a computer protocol intended to digitally facilitate, verify, or enforce the negotiation or performance of a contract. Smart contracts allow the performance of credible transactions without third parties. These transactions are trackable and irreversible.

By leveraging smart contracts, Defi is able to provide a marketplace that is ideal in terms of openness, fairness

and efficiency. Authorized participants can publish their data orders as smart contracts which are then broadcast to all relevant providers, and any such provider can freely choose to respond. A transaction is then brokered, executed and finalized automatically by the blockchain network. The smart contract mechanism ensures that the brokerage is mathematically fair, the transactions are always carried out fully and precisely as per contracts, and the market remains free of dispute or fraud.

3. Trusted Execution Environment

A trusted execution environment (TEE) is a secure area of a main processor. It guarantees code and data loaded inside to be protected with respect to confidentiality and integrity. A TEE as an isolated execution environment provides security features such as isolated execution, integrity of applications executing with the TEE, along with confidentiality of their assets.

By incorporating a trusted execution environment, Defi makes sure data and models is safe in the communication and computation process. The whole process can be measured and controlled, and securedfrom third-party attacks, thus improving the overall safety of the system.

4. Data Encryption & Obfuscation

Data encryption and obfuscation technology protects data privacy in a better way. It is the process of encrypting and removing personally identifiable information from data sets, so that the people whom the data describe remain anonymous.

Defi uses data encryption and obfuscation in data transferring and computation process which prevents data leak and privacy violation. For this bookkeeping process, Defi participants may also choose to have their transaction traces anonymized in order to further safeguard their privacy or business secrets.

5. Zero-knowledge Proof

Zero-knowledge proof is a method by which one party (the prover) can prove to another party (the verifier) that they know a value x, without conveying any information apart from the fact that they know the value x. The essence of zero-knowledge proofs is that it is trivial to prove that one possesses knowledge of certain information by simply revealing it; the challenge is to prove such possession without revealing the information itself or any additional information.

Defi uses zero-knowledge proof to protect users' sensitive data from unauthorized access, as well as data leaks through authentication itself.

6. Data Indexing & Search

Multiple parties participate in data collaboration on the Defi platform. By setting data index, each participant could more efficiently provide, exchange and use data from other sources, thus enhancing the applicability of the whole system.

Since data is stored in distributed ledger, Defi allows users to search data from different data sources to achieve higher efficiency.

7. Asymmetric Cryptography

Asymmetric cryptography is any cryptographic system that uses pairs of keys: public keys which may be disseminated widely, and private keys which are known only to the owner. This accomplishes two functions: authentication, where the public key verifies that a holder of the paired private key sent the message, and encryption, where only the paired private key holder can decrypt the message encrypted with the public key.

Defi uses asymmetric cryptography in the data transfer between participants to make sure no other party can gain unauthorized access. The two parties exchanging data would establish their own channel secured by asymmetric cryptography algorithms, which ensures that attackers are not able to get the data even if they managed to hijack or eavesdrop the transport infrastructure.

8. Differential Privacy

Differential privacy is a statistical technique that aims to provide means to maximize the accuracy of queries from statistical databases while minimizing the chances of identifying its records.

Defi uses differential privacy to ensure that the original data cannot be reconstructed, before data providers can release the data for joint computation.

9. Federated Computation

Federated computation enables mobile phones to collaboratively learn a shared prediction model while keeping all the training data on device, decoupling the ability to do machine learning from the need to store the data in the cloud. This goes beyond the use of local models that make predictions on mobile devices by bringing model training to the device as well.

In terms of work flow, your device downloads the current model, improves it by learning from data on your phone, and then summarizes the changes as a small focused update. Only this update to the model is sent to the cloud, using encrypted communication, where it is immediately averaged with other user updates to improve the shared model. All the training data remains on your device, and no individual updates are stored in the cloud.

Network Participants

- Data Providers
  - Provide data to Data Users and charge tokens
  - Data types
  - Public records: e.g. real estates, vehicle registration
  - Data aggregators
  - Alternative data: e.g. cell phone records and health records
  - Personal data hosting services: provide individual users ability to contribute and control their own data. The services store the data and proxy the requests to Data Users

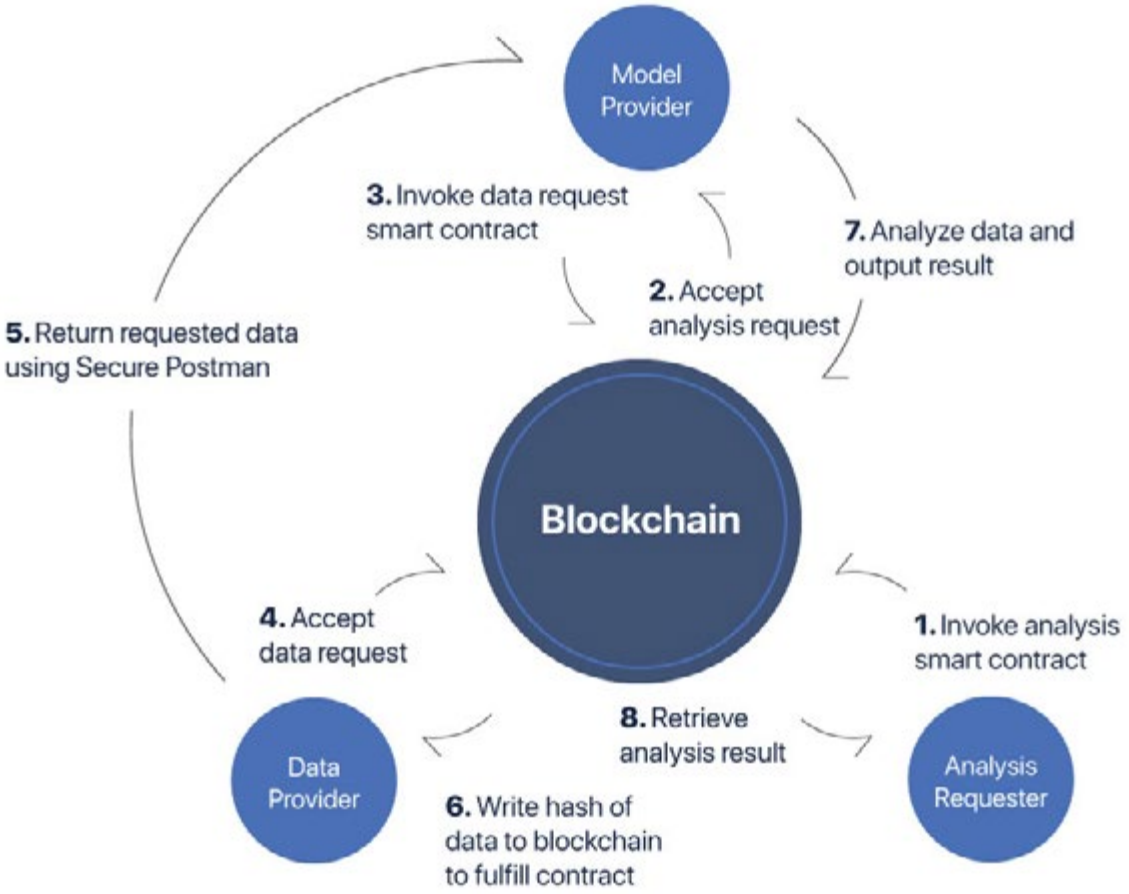
- Model Provider
  - Accept analysis requests, retrieve corresponding data from Data Providers and output results
  - Multiple model providers in the network to meet the different analysis needs of various industries

- Data User
  - Analysis Requester

Trade Flow

Trade Flow Example

A lending company initiates a credit score request after receiving a loan application. Upon receiving the request, Defi Protocol retrieves the corresponding credit scoring model for the request, then collects the variables needed for the model. The computed result is then sent back to the bank, completing the transaction.



GDPR Compliance

The General Data Protection Regulation (GDPR) (EU) 2016/679 is a regulation in EU law on data protection and privacy for all individuals within the European Union (EU) and the European Economic Area (EEA). It also addresses the export of personal data outside the EU and EEA areas. The GDPR aims primarily to give control to citizens and residents over their personal data and to simplify the regulatory environment for international business by unifying the regulation within the EU.

The regulation contains provisions and requirements pertaining to the processing of personally identifiable information of individuals highlighted as below:

- *Informed consent for processing*
- *Data protection by design and by default*

- *Pseudonymisation*
- *Right of access*
- *Right to erasure*
- *Records of processing activities*

Defi as a data collaboration protocol is designed with the following characteristics and features, in order to be compliant with GDPR, should the protocol users need it.

- *Data providers own the users' data and there is no data stored in the network*
- *All data processing activities are recorded in the blockchain, which PTS can provide API that allows users to view*
- *Defi Protocol implements mechanisms to inspect and enforce participants to be GDPR compliant when processing EU users' data*

Roadmap

Our development roadmap is as follows:

Timeline	Deliverables
Q1 2019	• Release Defi Credit Fraud Detection service and on-board first batch of ASEAN lending companies onto the platform. • Release Coinsta, personal data asset management platform.
Q2 2019	• Defi token integration supports multi-currency conversion mechanism. • Release CreditMe App, one-stop personal loan shop with data wallet, first version. • Release Over-borrowing Detection Platform.
Q3 2019	• Launch Defi Credit Scoring & Assessment system to enable multi-party computation based on distributed data sources.
Q4 2019	• Release privacy-preserving model training service. • based on distributed data sources. • Supports privacy-preserving data renting among ecosystem partners.
1H 2020	• Broaden the use cases to enable ad targeting & user acquisition/retention with the release of Defi Smart Co-marketing Platform, starting with silent user reactivations and customer acquisition support.
2H 2020	• Continue to grow user base for the protocol and applications. • Empower more partners to develop on Defi Secure Multi-party Computation framework.

Defi Token

Defi tokens play an important role in facilitating the Defi ecosystem. The initial supply of Defi tokens is 1,000,000,000 units. The principal usages of Defi tokens are to service as one way of payment for the data collaboration activities in the Defi network. While fiat payment for services are also supported by the Defi network, the Defi token owners enjoy the further benefits of profit sharing and accelerated request processing with our deposit-based early confirmation process.

Governance

Defi is governed by Defi Foundation, which is a public interest company registered in Singapore. Defi Foundation is committed to build and maintain the healthy and sustainable development of the Defi Protocol and the Defi Ecosystem.

To ensure proper governance of the project, Defi Foundation will commit to below community governance programs:

- *Defi Foundation will publish monthly development report to the community to inform the community of the progress in network development.*
- *Defi Foundation will host annual community meeting to allow community members to hear annual report in person and ask the Foundation members project-related questions. Remote participation in the annual community meeting will be enabled through online channels.*

Defi Foundation will build sub-committees to provide expertise and oversight to Defi related subjects. We are committed to build a world-class cross-disciplinary cohort of talents, in both economics, computer science and governance, to collaborate in bringing alive the world's next generation financial service infrastructure and applications.

Team

CEO - Kate Shen

- *Managed software development as program manager at Microsoft and Hulu, led design and development of Hulu's second generation search engine (~10 million monthly users).*
- *Built Xiaomi's presence in early international markets, and served as country manager Singapore and Malaysia. Track record in building global market presence and community-based consumer marketing for tech products.*
- *B.S. in Computer Science, Carnegie Mellon University.*

Engineering - Yupeng Liao

- *Principal architect at Hulu, full stack engineer, 10 years of experience in software development and architecture design. Track record to build scalable and secure architecture that supports billion level daily transactions.*
- *Early designer of Hulu's Digital Rights Management (DRM) technology on Android, with industry-proven encryption design and deployment.*
- *B.S. in the Electronic Engineering, Tsinghua University.*

Product - Pillie Wang

- *Former product lead of Lefinance and Blockchain Lab, with extensive experiences in fund products, fixed income products and crowdfunding business.*
- *Former product lead of Venture Capital Circle, in charge of product development and business growth, developed intelligent search engine, recommendation system and transaction system for primary market.*
- *Former product lead of P2peye, built the first P2P ETF product in China with more than one billion CNY of transactions each year.*
- *Bachelor in Journalism, Renmin University.*

Operation - Vincent Lu

- *Former Director of monetization at China's #1 mobile fitness app. Built up the ecommerce business and realized exponential revenue growth to $8 million in year one and $32 million in year two.*

- *Former User Operations Manager at Xiaomi and former management consultant at Accenture.*
- *Bachelor in Finance, Renmin University.*

Partnership - Summer Zhang

- *Former Strategy Investment Manager at 9fbank, China's leading fintech company with a full spectrum services including consumer lending, credit cards. Specialized in blockchain investment and business expansion in Southeast Asia.*
- *Former Corporate Risk Advisory Consultant at Deloitte.*
- *Master in Accounting, The University of Texas at Dallas; Bachelor in Public Finance & Accounting, Shanghai Finance & Economics University.*

Marketing - Lynne Zhang

- *New media operations manager and marketing manager of CBNweekly, having many mainstream financial media resources;*
- *Bitcoin's early investor. Built a blockchain goddess global community, and jointly launched nearly 100 media, project, and exchange platforms to launch airdrop activities, brought about 300,000 new registered users.*
- *One of the founding team members of the world's first blockchain app store— BYBstore, led the BD and marketing department, with 300+ blockchain media, project parties, and community resources. planned several currency theme activities, and influenced nearly one million digi tal currency investors.*

Advisors

Jason Lu

- *Former VP/CRO of Ant Financial, world's largest fintech company with 450 million users and operator of Alipay (world's largest mobile and online payments platform) as well as Yu'e Bao (world's largest money-market fund). In charge of fraud risk, trust and safety, cybersecurity, big data & analytics, biometrics AI and CS divisions globally.*
- *Former Sr. Director of Paypal. Served as risk technology and data science executive with 20+ years of experience in PayPal, Reuters, 1st Financial Bank and UBS.*
- *Extensive expertise in the development of complex real time financial systems and products.*

Bin Zhang

- *Ex-CEO of China Cheng Xin Credit, one of the largest credit scoring and credit rating companies in China.*
- *Founder & ex-CEO of UMF, a top fintech company and one of the largest third-party payment companies in China; Under Mr. Zhang's leadership, UMF joined Hyperledger as one of the earliest Chinese member.*

Ding Fei

- *Founder of Ledger Capital. Specialize in investment on digital assets and blockchain projects, early investor of Red Pulse, Gifto, ICST, Origo, Atlas, Coinsuper and Arpachain.*
- *Former Executive Director in Warburg Pincus and oversaw the TMT investments in China and Southeast Asia. Investment portfolios include unicorn projects: NIO (NYSE: NIO), Youxin (UNASDAQ: UXIN), Talent Liepin (HKEx: 6100), Kuaishou and Go-jek.*