

CENTAUR

WHITEPAPER

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EXECUTIVE SUMMARY

Decentralized financial systems built on blockchain are poised to revolutionise traditional finance, with projects such as MakerDAO and Compound Finance achieving some level of adoption. However, these projects suffer from issues such as niche use cases, lack of adoption due to technical barriers to entry, and significant regulatory and legislative uncertainty. These issues are compounded when considering the walled garden characteristics of blockchain protocols, resulting in further complications when attempting to collaborate with other parties.

Centaur proposes a different way forward. With a set of solutions built upon a hybrid of centralized/ decentralized principles, Centaur will create offerings that are decentralized in one or more of the three aspects, yet centralized across others. The execution of these solutions would be supported by financial licenses worldwide while the underlying blockchain will focus on backward compatible interoperability.

The implementation will be conducted in three phases. The first phase will focus on building the foundation of the ecosystem by creating liquidity pools, developing the testnet and providing an interface. The second phase will involve developing the Centaur Chain and implementing core functions such as cross-chain interoperability, oracles and ecosystem rewards. Finally, the third phase will involve the development of decentralised applications such as the crypto index fund, domestic and cross-border transfers, and a lending platform.

Ultimately, Centaur aims to be the bridge between centralized and decentralized finance by combining the best elements of each, with the ultimate aspiration of moving towards a fully decentralized model.

Decentralised Finance

The advent of Bitcoin in 2008 triggered an explosion of exciting and new technologies that were built on blockchain. Arguably, the most important of these technologies are those focused on decentralised finance (“DeFi”). Decentralisation in respect of finance occurs in three planes: risk-taking, decision-making and record-keeping¹. Decentralisation allowed the industry to overcome some of the traditional problems with centralised finance, such as lack of transparency and accountability, being “too big to fail”, and failure of corporate governance and risk management. Examples of DeFi, such as MakerDAO, Compound Finance, and various decentralised exchanges (“DEX”), have achieved some level of adoption. Nevertheless, existing solutions are highly niche and, at present, there are no competitors offering the full suite of services that Centaur intends to build.

MakerDAO is a stablecoin and lending platform built upon the Ethereum blockchain. By placing ETH as collateral in the MakerDAO smart contract, the smart contracts generate DAI tokens which are pegged to USD in a 1:1 ratio. The “borrower” of DAI in this scenario pays a “stability fee” (in effect an interest) on the DAI which is determined through a vote by the holders of the governance token, Maker. In essence, the holders of Maker represent the community and the risk-taking and decision-making process is decentralised through the use of the MakerDAO platform.

Compound Finance is similar to MakerDAO in that it is also a lending platform. However, it differs in that the interest rates for loans is determined algorithmically according to supply of liquidity and demand of loans rather than a community vote. Similarly, risk-taking is decentralised by spreading the risk of default to a large pool for lenders.

We can also see an analogy to DeFi in the form of cooperative banks that have been operating for centuries. Cooperative banks are owned and controlled by its customers, and any benefit or profit accrues to them. A report by the International Labour Office² found that they are more stable, risk-averse and contribute to financial deepening³. As they were not owned by shareholders but by their customers, cooperative banks pursued objectives other than profit-maximising, resulting in less lending to insecure lenders and less risky investments. Surplus profits were used to bolster the cooperatives’ reserves which allowed them to better weather financial crises. The ILO report concluded that cooperative banks outperformed competitors during the 2008 global financial crisis. These cooperative banks were also willing to lend to individuals of lower socioeconomic status, a segment that is often neglected by investor-owned banks, and could offer financial products at a lower price as they did not have to pay out dividends to shareholders.

A DeFi platform that is by the community for the community will be able to avail themselves of the same benefits of cooperative banks. Nevertheless, a fully decentralised model is infeasible now.

1. <https://www.fsb.org/wp-content/uploads/P060619.pdf>

2. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/---coop/documents/publication/wcms_207768.pdf

3. Financial deepening refers to providing a wider choice of financial services and better access for different socioeconomic groups.



DeFi Shortcomings

Despite the hype surrounding DeFi, there are currently very few instances of successfully deployed DeFi solutions with enough adoption. In terms of legal risks, DeFi solutions often have diffused or unclear accountability, making it difficult to exercise supervisory and regulatory control over market participants; market misconduct such as wash trading, insider dealing and market manipulation would be nigh-impossible to deter.

Enforcement of legal claims is also difficult where parties are anonymous and dispute resolution would require an off-chain intermediary such as a court of law to adjudicate. Currently, DeFi lending platforms such as MakerDAO and Compound Finance circumvent this problem by over-collateralising their loans; by design, these platforms cannot offer unsecured or under-secured loans and are thus confined to very niche use cases.

As a novel technology, blockchain and DeFi have high technical barriers to entry resulting in lack of adoption. The lack of adoption may also be due in part to a misguided sense of illegitimacy associated with cryptocurrency. Lastly, DeFi solutions lack interoperability with traditional financial infrastructure. As the current financial system is built upon centralized financial institutions, a bridge between the two is needed.

MARKET OVERVIEW

Traditional Financial Markets

The global financial market comprises primarily the equity market, bond markets, derivatives market and currency markets and is one of the largest industries in the world. The size of the global financial market is truly massive and has been growing steadily through the years.

The value of the global domestic equity market increased from US\$65.04 trillion in 2013 to US\$74.43 trillion in 2018⁴, whereas the value of the deals on the international bond market has remained stable from 2015 to 2019. In the second quarter of 2019, the value of such transactions amounted to approximately US\$ 1.13 trillion⁵.

Decentralised Finance

Due to the novelty of the technology, the size of DeFi markets is miniscule compared to the size of the traditional financial markets. Nevertheless, the size of the DeFi market has experienced explosive growth recently, with the total value locked in DeFi rising from US\$247 million on 6 February 2020 to US\$907 million as of 4 February 2020⁶. The majority of DeFi dApps (decentralised applications) are built on the Ethereum blockchain, with a variety of use cases ranging from lending, derivatives, payments to tokenisation of assets. In respect of major lending platforms⁷, the aggregated interest per year amounts to US\$14.2 million with a total debt outstanding of US\$177.4 million⁸.

Apart from Ethereum, the total value of digital assets locked up within the EOSIO and Bitcoin (as of 5 June 2019) are approximately US\$600 million and US\$8 million respectively⁹.

4. <https://www.statista.com/statistics/274490/global-value-of-share-holdings-since-2000/>

5. <https://www.statista.com/statistics/247092/transaction-volume-of-debt-securities-on-the-global-bond-market/>

6. <https://defipulse.com/>

7. The major lending platforms referred to are Maker, Compound, dYdX and Fulcrum.

8. <https://defipulse.com/defi-lending>

9. <https://research.binance.com/analysis/defi-1>

Market Opportunities for DeFi

The cryptocurrencies which power the various blockchain protocols all have different characteristics. This makes an apple-to-apple comparison between the DeFi industry and traditional finance difficult as it depends on correctly classifying the cryptocurrency – either as a security, commodity, derivative or currency.

Nevertheless, it is clear that, while the DeFi industry has been growing at a healthy rate, it is still dwarfed by the traditional finance industry. If DeFi accomplishes half of what it aspires to do and captures a fraction of the traditional finance industry, the potential returns for first movers in the DeFi industry is massive.

In fact, the potential for DeFi lies not only in disrupting the current finance industry, but also in tapping on a large segment of the market which hitherto had no access to traditional financial infrastructure. This segment – also known as the unbanked – includes approximately 1.7 billion adults globally¹⁰. Representing about 31% of the world’s adult population, the unbanked are found in low- and middle-income emerging markets. As income levels rise, it is estimated that banking the unbanked adults and businesses could generate about US\$380 billion of revenue¹¹.

For Micro, Small and Medium Enterprises (“MSMEs”), the figures are more striking. An estimated 131 million or 41% of MSMEs in developing countries have unmet financing needs and this gap amounts to approximately US\$5 trillion. In contrast, the current supply of finance (to MSME) is only about US\$3.8 trillion¹².

There are several reasons postulated for this untapped market, including a lack of financial infrastructure, issues with individuals in developing countries with no form of identification and lack of financial literacy. Technologies such as digital banking, peer-to-peer lending platforms and mobile technology, all of which can be developed on DeFi blockchain platforms, have the potential to bank the unbanked. Centaur aims to address these issues through the use of mobile- and web-based applications which are accessible and user-friendly. Initially, the unbanked will be introduced to basic financial necessities such as domestic and cross-border remittance; as financial literacy¹³ improves, and the accompanying infrastructure and technology develops, they will be exposed to increasingly sophisticated DeFi applications and financial products.

SEMI-DECENTRALIZED FINANCIAL SYSTEMS

As highlighted, both centralized and decentralized solutions face major shortcomings. Centaur proposes a way forward that strikes a balance between both options. Among the three aspects of decentralization; decision-making, risk-taking and record-keeping, Centaur solutions would be decentralized across one or more aspects and centralized across the others. With this approach, the intended outcome is to leverage on the strengths of the varying degrees of decentralization while ensuring the solutions are realistic, feasible and achievable.

One such implementation of this can be identified when comparing alternative financing and lending solutions across different forms.

10. https://globalindex.worldbank.org/sites/globalindex/files/chapters/2017%20Findex%20full%20report_chapter2.pdf

11. <https://www.accenture.com/us-en/insight-billion-reasons-bank-inclusively>

12. <https://www.smefinanceforum.org/data-sites/msme-finance-gap>

13. <https://www.moneythor.com/2019/09/24/unbanked-potential/>



Centralized Financing Solutions

Centralized financing solutions are provided by banks, credit unions and moneylenders. These platforms allow borrowers to take out loans based on their projected means of repayment and in the event of a default, the lender attempts to recover the funds through traditional judicial means.

Decision Making

Before borrowers can take out a loan, banks will conduct a stringent check on their background to ensure they have a means of repayment. Their financial and transaction history would also be factored into consideration in determining how much of a loan they can receive. After conducting the credit checks, the bank would then assign a credit limit to the borrower and allow them to take out a loan on that amount, with varying interest rates depending on the repayment period.

Risk Taking

Borrowers take out loans against the bank and in the event of a default, banks have to recover the funds, absorbing all the risks of the loan.

Record Keeping

Due to the sensitivity of financial information, such transactions and financing history are stored by the bank and secured in their servers. This means that external parties are not able to retrieve the information unless authorized in some manner by the bank.

Decentralized Financing Solutions

Decentralized financing solutions such as compound finance allows borrowers to put up collateral in some form of digital asset and take out loans against the collateral. In all instances, the loan amount would always be much less than the collateral to prevent any defaults. This causes all loans to be over-collateralized and funds are often not utilized to an optimum level of efficiency. This restriction also means that the available use cases are very niche, primarily used in a speculative manner for traders and investors to execute a leveraged buy order on a digital asset.

Decision Making

Interest rates for decentralized lending platforms are either derived through algorithmic calculations or by community and ecosystem consensus. This structure of a dynamic interest rate benefits from increased transparency for potential borrowers and also creates a fair structure whereby the interest rate is applied to everyone equally instead of on a case-by-case basis.

Risk Taking

Due to the overcollateralized nature of decentralized lending platforms, default risk is extremely low as positions will be liquidated prior to them resulting in debt. Additionally, funds are borrowed against a liquidity pool comprised of the assets of all lenders in the platform, resulting in any default risk being distributed across all lenders in equal proportions to their investment.

Record Keeping

Decentralized lending platforms are powered by smart contracts natively on blockchain protocols. This ensures that all loans processed by these platforms are reflected on the blockchain and recorded in a transparent and decentralized manner.

Semi-Decentralized Financing Solution

Centaur proposes a semi-decentralized financing solution that applies the strengths of both centralized and decentralized solutions.

Decision Making

Centaur will utilize partnerships with credit unions to identify and assign credit scores and limits on prospective borrowers through centralized means. This information will be compiled into a credit report pegged to the wallet address of the borrower and reflected on the blockchain. The borrower can then take out an uncollateralized loan, up to the assigned credit limit based on the report, from the liquidity pool. Interest rates and repayment terms will be standardized for all borrowers and determined through a consensus of the lenders.

Risk Taking

The liquidity pool will be built up on a decentralized network of lenders who stake their digital assets and borrowers will take out loans against the liquidity pool. In the event of a default, Centaur will pursue the borrowers and attempt to recover the funds through the traditional judicial process; by working closely with local law firms and handling claims in bulk, the cost and time needed to pursue such claims are greatly reduced. If the funds are recovered, Centaur will return the funds (less legal costs) to the liquidity pool. However, if the funds are irrecoverable or only partially recovered, any extracted amount will be put into the liquidity pool and the outstanding balance will be absorbed as losses across all lenders in proportion to the amount they have staked.

Record Keeping

All relevant aspects of the financing process will be recorded and stored on the Centaur Chain, including the credit reports and financing history of all lenders and borrowers. Over time, recurring borrowers may adjust their credit rating through historical data stored on the blockchain and will not be required to apply with a credit union prior to taking a loan.

Benefits of a Semi-Decentralized Financial System

As described in the example of a lending platform, a semi-decentralized approach encapsulates the strengths of centralized and decentralized systems while reducing the impact of their flaws.

Centralized systems typically benefit from increased efficiency due after many years of improvements and resource wastage is kept to a minimum through heavy optimization. The flexibility of centralized architectures allows for broader applicability and opens up numerous use cases for financial solutions. Consumer protection is also established through governing dispute resolution structures and judicial processes. However, the primary drawback is the centralization of risks and the lack of transparency, creating a single point-of-failure for the entire system which could lead to lasting consequences for all participants.

In comparison, decentralized systems are much more transparent in nature and often encourage community and ecosystem participation. Users are often considered stakeholders and have the ability to make decisions collectively, ensuring that the direction of the platform is always aligned with their individual interests. In order to achieve this, decentralized systems are less flexible in nature and have a reduced scope of use cases. The relative youth of decentralized technologies creates an added layer of challenges as technical limitations could result in long term issues with regards to scaling the platform.

As such, Centaur focuses on hybridized solutions that best leverages on the efficiency and applicability of centralized architectures and combines them with the transparency and ecosystem participation of decentralized systems.

CENTAUR

Centaur proposes a DeFi solution with centralized elements with the ultimate aim of moving towards a fully decentralized model. However, Centaur believes in the ethos of decentralization behind blockchain and, as such, centralization will only be introduced if the decentralized alternative is impractical or abusable. In order to achieve this goal, the development and operational approach will be broken into three major phases.

The first phase of technical development involves building and integrating a number of smart contracts on existing protocols that support them. These smart contracts will function as liquidity pools by holding on to crypto-assets and providing a proof to the sender. The proofs are transferrable off-chain and can be used to withdraw equivalent assets from the liquidity pool at a later date. One outcome of using the liquidity pool is that the source of funds are not linked to the withdrawal process, resulting in a thin layer of privacy.

The second phase will involve the development of the Centaur Chain, a backward-compatible interoperability blockchain. The interoperability features will then leverage on the liquidity pools to facilitate cross-chain transactions across one or more protocols. These transactions will be executed in a decentralized manner as the interoperability functions are supported by a decentralized network of oracles.

Upon completion of the cross-chain transactions, the third phase will involve the development of decentralized applications and integrating them with existing solutions.

Phase 1 – Foundation

The first phase puts an emphasis on laying the foundation for the technical stack. This involves the development and deployment of the smart contracts, testnet and supporting software such as the node and oracle daemons, block explorer, and mobile wallet.

Centaur Liquidity Pools

The liquidity pools will allow users to stake crypto assets and receive a proof for future withdrawal. In the interim, those funds will be repurposed to provide liquidity for other services, such as cross-chain transactions through the interoperability chain or as collateral for loans. They will provide immediate access to funds for consumers and a majority of the fees collected in the process will be rewarded to members who staked their assets.

Existing public blockchains are, by design, transparent and the inability to hide one's address balance may attract malicious actors. As the liquidity pools are built using zero knowledge implementation, the transactions entering and exiting the liquidity pools are disassociated and cannot be traced, providing users with a degree of security and protection over their address balances.

The first liquidity pool will be built on Ethereum utilizing zero knowledge implementation to manage the transfer, storage and withdrawal of assets. By putting up a stake, users will also be allowed to vote on ecosystem decisions such as the dynamic fees associated with utilizing the liquidity pool.

Centaur Chain Testnet

A testnet built on Tendermint core consensus will be deployed as the prototype for the Centaur Chain. In the foundation stage, the testnet will mainly be used to work out the off-chain data propagation process powered by the oracles and nodes. The nodes will focus on consensus and block producing within the Centaur Chain while the oracles will serve to observe transactions on the Ethereum Liquidity Pool and reflect the results on the Centaur Chain. A block explorer will also be built to view data on the Centaur Chain for external parties. For the scope of the testnet, development will focus on a unidirectional flow of data, starting from Ethereum and ending with the Centaur Chain.

Centaur Interface

To support the adoption of cryptocurrencies in general, Centaur has also built a multi-asset, multi-address, decentralized cryptocurrency wallet. This wallet will serve as the interface to all products and services that are part of the Centaur ecosystem, starting with access and utilization of the liquidity pools and other existing DeFi offerings in the industry.

Conventional crypto-asset management solutions can be broadly categorised into multi-currency wallets that have no advanced functionalities and native wallets that grants users access to functionalities such as staking, voting and smart contract deployment. Centaur has built a multi-currency asset management platform that has support for both native functionalities and multi-protocol control.

Segregation by User Types

The scope of services will depend on whether the user is basic, advanced or corporate. Basic users will be able to effortlessly access and manage their cryptocurrencies across multiple blockchain protocols. These users can login to their wallet using their ID and password along with 2-Factor Authentication instead of having to manage their own private keys.

Advanced users will be able to access native functionalities such as staking, smart contract deployment and voting across multiple blockchain protocols. With blockchains using Proof-of-Stake becoming increasingly popular, the ability to stake different tokens with only a single click within the Centaur wallet is likely to be essential.

For users looking for custodianship services, whether business or private individuals, Centaur will be working towards the appropriate accreditation and licences in order to function as a licenced custodian for crypto-assets. For traditional financial instruments, some jurisdictions require institutional investors and funds to hold their assets with qualified custodians. It is expected that regulations will soon require funds holding crypto-assets to hold them with similarly qualified custodians.

Private Key Management

The private keys for these users are generated and encrypted locally onboard the device prior to storage of the encrypted keys on a centralized server. This allows users to synchronize their assets across multiple devices easily without risking access to their funds. However, if the user is more security conscious, they can also retrieve the private keys from the wallet manually and copy it onto another device or application and turning off the cloud storage feature.

Completion Objective

When Phase 1 is completed, the end state would enable the following:

- User transfers ETH to the Liquidity Pool on Ethereum
- Oracle automatically sees the transaction and creates a copy of it on the testnet to be sent to a block producer
- Block producer will receive the transaction and add it to the next block
- User can use the block explorer or the wallet to see the transaction record on the Centaur Chain as well as the data within

Phase 2 – Centaur Chain

One of the key issues faced by blockchain technology is the walled-garden structures of each protocol. Each protocol solves differing challenges and have varying approaches even when working on the same goal, leading to layer-two solutions being built across a multitude of blockchain protocols. However, on-chain data is often not enough to execute on these financial solutions and users would also have their own set of preferences. A mismatch across solution providers and consumers means DeFi ecosystems are often fragmented across multiple blockchains.

Cross-chain Interoperability

The solution to this problem focuses on cross-chain interoperability between multiple blockchain protocols and a number of projects have attempted to build blockchain networks that are interoperable. However, the existing proposals usually focus on forward-compatibility for future projects and technical solutions must conform to the frameworks and software development kits of the interoperability protocols. This creates an issue whereby existing solutions must migrate their architecture and userbase onto a compatible platform or risk losing access to a larger and more scalable network.

Centaur proposes a cross-chain interoperability settlement layer that will be backward-compatible with existing blockchain protocols. This decentralized platform will allow individuals to utilize DeFi solutions across a number of different chains concurrently. As an example, users will be able to put up collateral on Ethereum in ETH, take out a loan on Tron in TRX and utilize Dapps built on the Tron blockchain without processing it through any centralized intermediary. If the TRX loan is returned, the ETH collateral is released and can be withdrawn by the user.

Oracles

A core aspect that enables these functionalities are the usage of oracle networks. These oracles feed data onto the blockchains in an omnidirectional manner and would have to go through a round of simplified consensus prior to acceptance of their data. By combining the data from these oracles with the smart contracts deployed, transactions and balances can be reflected on the Centaur Chain. Users can then utilize the proofs of those balances for settlement on the Centaur Chain and have those transactions propagated onto the native chains while leveraging on the smart contracts for liquidity.

Ecosystem Rewards

Users are encouraged to contribute to the network through the form of token rewards on the Centaur Chain. These rewards are distributed to nodes who support the ecosystem by validating and producing blocks or by feeding off-chain data as an oracle. Oracles who provide data are rewarded with a nominal sum for their efforts after their data has been verified through corroboration with other oracles. Accurate data is then used as part of the block producing process for consolidation of balances across the different blockchains.



Phase 3 – Decentralized Applications

When the technical aspects of Centaur is completed and established, the team will focus on the development of semi-decentralized applications. The initial steps will involve the onboarding of existing DeFi projects onto the network and the Centaur wallet, in the spirit of building an inclusive and open ecosystem.

Ideally, a development community will be built around Centaur to work on solutions utilizing the technologies. Separately, there are a few key verticals that Centaur intends to work on internally that are in line with the semi-decentralized approach undertaken.

Crypto Fund

There is a growing demand for index funds in traditional financial markets with the U.S. ETF (exchange-traded funds) industry exceeding US\$4 trillion in assets in 2019¹⁴. In fact, passively managed funds now account for 45% of all assets of U.S. stock-based funds, up from 25% a decade ago¹⁵. Unfortunately, for investors hoping to gain exposure to cryptocurrencies, there are few low-cost options when it comes to cryptocurrency index funds.

As part of the Asset Management suite of services, Centaur will also offer index funds that track (for example) the top 50 cryptocurrencies by market capitalisation. Different metrics such as risk factor, rate of return and size of fund can be used to gauge a fund's performance.

Advanced users will be able to create individual funds and other users can choose to follow the composition of these funds. Users can automatically purchase the underlying cryptocurrencies of the fund according to its composition and have them stored in the Centaur wallet instead of having to purchase each cryptocurrency individually from an exchange. For protocols using Proof-of-Stake, users can also receive staking rewards directly from the index fund into their Centaur wallet.

Decentralised

Risk-taking

The user holds the private key to the wallet containing the cryptocurrencies.

Decision-making

The composition of the fund is either predetermined according to market conditions or expressly defined by the user.

Record-keeping

The cryptocurrencies are stored on the blockchain.

14. <https://www.etf.com/sections/blog/us-etf-assets-hit-new-milestone>

15. <https://www.cnbc.com/2019/03/19/passive-investing-now-controls-nearly-half-the-us-stock-market.html>

Domestic and Cross Border Transfers

Cross-border transfers have traditionally been performed by banks, financial institutions or remittance companies. These transfers are slow, expensive and can only serve those in areas with existing financial infrastructure. The ability to serve the unbanked in less developed parts of the world is an untapped industry with huge potential.

Using cryptocurrency to initiate domestic and cross border transfers allows remittance to be conducted cost-effectively and quickly, and requires only an internet connection. Through the Centaur wallet, users can choose to initiate the transfer either in fiat or cryptocurrency. If the transfer is initiated in fiat, Centaur will automatically handle the fiat-to-crypto conversion and perform the transfer using blockchain.

Centralized

Entities with the appropriate remittance licences will be incorporated in the origin and destination countries to send and receive funds. Fiat on- and off-ramp will be handled by the same entities and will be licenced as required. As part of regulatory requirements, KYC/AML may be conducted on parties sending funds over a certain threshold overseas. may be conducted on parties sending funds over a certain threshold overseas.

Decentralized

Cross-border remittance can be settled trustlessly and transparently on the blockchain.

Lending Platform (Unsecured)

Currently, there are several crypto lending platforms such as MakerDAO and Compound Finance on the market. However, they can only function as over-collateralised lending platforms by design and cannot offer credit to those without collateral. Therefore, their use cases are restricted to issuing stablecoins (as in the case of MakerDAO) or leveraging on the underlying collateral (as in the case of Compound Finance).

Centaur will operate a lending platform where funds of lenders will be pooled and borrowers can borrow against the pool. Initially, the borrowers will be restricted to SMEs/MNCs/institutions to reduce default risk. Credit unions will generate credit reports based on users' financial health. Eventually, as the user transacts more frequently on the platform, the credit reports will be generated based on the user's on-chain financial history.

Interest rates for the loans for each tier of credit rating can be adjusted and decided by the community or adjusted algorithmically based on supply and demand. The community may also choose to exclude borrowers below a certain credit rating or to blacklist past borrowers who may have defaulted on loans on the platform. Centaur will handle disputes relating to the loans through using traditional legal institutions such as litigation or mediation, and proceeds will be redistributed into the lender's pool.

Centralized

Decision-making: Credit reports for borrowers will initially be generated by credit unions. Disputes will be settled by Centaur on behalf of the lenders via conventional legal institutions.

Decentralized

Risk-taking

The risk of default/bad debts are spread across the lenders.

Decision-making

Interest rates for loans are decided by the community and borrowers with high default risks may be completely excluded from borrowing.

The Centaur Ecosystem

The vision of Centaur is to build an open ecosystem that supports the integration of existing and future financial solutions. With the Centaur Chain serving as the interoperability backbone and the Centaur wallet serving as the front-end interface to facilitate interactions, users will be able to tap onto services across a myriad of protocols in a seamless manner. Products that were once isolated from others due to technical constraints can now be reimaged with advanced use cases by leveraging on supporting features developed by others.

Cross-Border Remittance and Asset Management

Bob is not familiar with cryptocurrencies and blockchain. He wishes to transfer money to Alice and Jane in different countries. As Jane is living in a part of the world without developed financial infrastructure, this is not possible. Meanwhile, although Alice has access to traditional financial institutions, cross-border transfers using banks and remittance companies are expensive.

With the Centaur mobile application, Bob can convert his fiat currency to cryptocurrency which can then be transferred to Jane and Alice. This process is completed instantaneously and cost-effectively, and only requires an internet connection.

If he so chooses, Bob can also store any excess cryptocurrencies in the Centaur wallet without having to generate and manage his own private key. The process is seamless and requires only his login ID and password.

Hoping to generate a return on his assets, Bob lends them out to interested borrowers through the integrated lending platforms. He receives an interest based on the supply and demand of loans which is calculated automatically.

Privacy Based Investments

Charles has been in the crypto space for a while and wishes to tap into the more advanced functionalities that blockchain has to offer. He has significant amounts of crypto-assets and does not wish for everyone to see his wallet balance for fear of attracting malicious actors. As such, he runs his transactions through the Centaur liquidity pool so as to preserve the privacy of his transactions.

Charles has also been interested in diversifying his cryptocurrency portfolio. Using the Centaur platform, he purchases a broad market index of the largest cap cryptocurrencies. This is done without the hassle of purchasing each cryptocurrency individually from an exchange. The purchased cryptocurrencies are transferred to his Centaur wallet – which can only be accessed by his private key..

IMPLEMENTATION AND TECHNOLOGY

Given the ambitious scope of the Centaur platform, the platform will be developed incrementally in three phases.

- 1 Centaur will build and deploy smart contract liquidity pools that allow users to stake assets and withdraw them at a later date. These contracts will be able to receive and hold funds for users, with a primary objective to establish an accessible pool of funds to provide liquidity for the following phase
- 2 Centaur will build a blockchain focusing on interoperability across protocols. Cross chain transactions will be executed by leveraging on the liquidity pools created in the first phase.
- 3 Centaur will build a suite of decentralized applications based on the core concept of semi-decentralization by leveraging on the interoperability of the Centaur Chain.

Phase 1 – Foundation

The Phase 1 solutions are targeted at jumpstarting the Centaur ecosystem. These blockchain-agnostic solutions can be deployed on most blockchain protocols with smart contract functionalities such as Ethereum and Tron. The bedrock of these solutions are the smart contract liquidity pools. These liquidity pools will be developed using stealth addresses and ring signatures to achieve zero-knowledge and will have an added benefit of addressing privacy issues by masking the senders and receivers of all routed transactions.

Stealth Addresses

The liquidity pools would utilize Elliptic Curve Cryptography (ECC), an approach to public key cryptography based on elliptic curves over finite fields. ECC utilizes smaller keys compared to non-EC cryptography to provide equivalent levels of security. The specific curve that the Centaur liquidity pool will utilize is the Barreto-Naehrig (BN) Curves to generate a Secret Key and a Public Key from a 128-bit random number, achieving a higher security and efficiency level.

Ring Signatures

To achieve anonymity, the liquidity pools would be employing the Linkable Spontaneously Anonymous Group (LSAG) signature scheme. The LSAG signature scheme is a one-out-of- n group signature scheme which allows any member of a group of n signers to generate a signature such that any public verifier can determine if the signature is generated by a group member.

Process

1. Alice generates a random secret key and creates a stealth address
 - Secret Key: SKA
 - Stealth Address: $H(\text{SKA})$
2. Alice sends a transaction to the smart contract with token amount and the stealth address
 - Function: `deposit(stealth address)`
3. The smart contract inserts the stealth address into either an existing Ring or a new Ring of similar token amount and outputs the index of the Ring.
 - Ring: A ring consists of a group of participants whom deposited the same token amount.
 - Index: An index pointing to the position of the ring.
4. Alice sends the secret key, the amount sent and the ring index to Bob.
5. Bob retrieves all the stealth address of the ring using the amount sent and ring index from the smart contract.
 - Function: `getPublicKeys(amount sent, ring index)`
6. Bob generates a ring signature using all the stealth addresses and the secret key.
 - Ring Signature: A ring signature is a type of digital signature that can be performed by any member of a group of users that each have keys. A verifier can verify that the signature came from someone of the group, but unable to identify which.
7. Bob sends the signature, the amount sent and the ring index to the smart contract to withdraw the funds.
 - Function: `withdraw(target wallet address, signature, amount sent, ring index)`
8. The smart contract verifies that the signature is valid and releases the funds if and only if the Ring is closed.
 - Closed Ring: A ring is only closed when there are sufficient participants in the ring to ensure anonymity and privacy. The number of participants can be defined in the smart contract.

Reusability

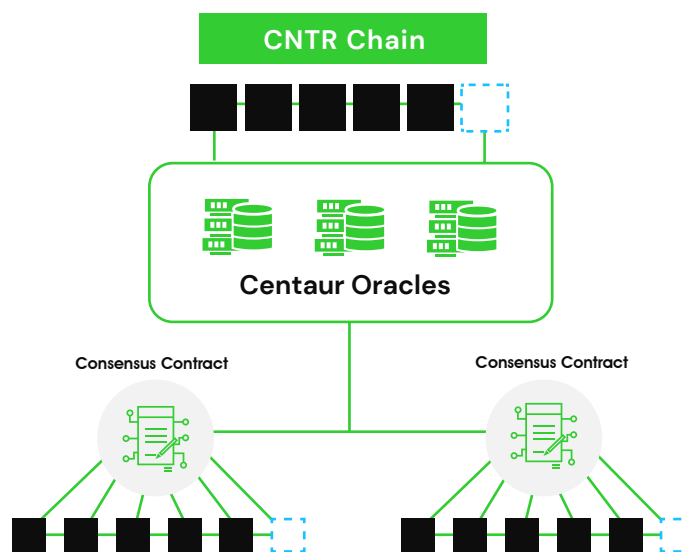
Due to the fact that the liquidity pools will be built upon existing blockchain protocols such as Ethereum, privacy functionalities can exist even on public, transparent blockchains. These solutions would be provided as an optional feature for users who are looking for an enhanced level of privacy, without converting the entire chain into a privacy centric one and running the risk of delisting the protocol from exchanges for compliance reasons. An added benefit would be that it allows the development team to rapidly build the smart contracts. as the underlying concepts are similar and replicable across different protocols.

Phase 2 – CNTR Protocol

Phase 2 involves building the native Centaur Chain. The Centaur Chain will function as an interoperability protocol, creating a communication layer across multiple blockchains. This process is supported by a network of community configured oracles to feed data from other chains onto the Centaur Chain.

Consensus contracts will be deployed on each chain for multiple oracles to feed data and agree on. The resulting output of these contracts will then be used to perform settlement on transactions originating from other chains.

Data captured across the different chains will be propagated to the Centaur Chain by the Centaur Nodes. The changes in state of each chain can then be reflected on the Centaur Chain as a settlement layer. In order to ensure the integrity of transactions proposed to be executed on different chains, a Centaur Admin Node will exist with the power to veto transactions prior to execution, however, the Admin Node will not be able to propose transactions or blocks.



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Consensus Algorithm

The Centaur Chain will utilize Tendermint Core for its high throughput, finality and ease of customization. Tendermint Core is comprised of two major parts, a partially synchronous Byzantine Fault Tolerant (BFT) consensus engine and an Application Blockchain Interface (ABCI). The consensus engine will be configured with a proof-of-stake structure where voting power is determined by the number of tokens staked by validators as collateral, as opposed to traditional BFT algorithms where each validator has an equal amount of voting power.

To ensure the protocol is secure, malicious validators can be penalized by having their stake slashed if they are proven to have behaved in a negative manner. If such evidence is available on-chain, their stake will be slashed immediately and they will no longer qualify to be a validator, otherwise, a majority of validators can coordinate together to enforce the penalties.

Limitations

Due to the increasing amount of communication as more validators partake in the consensus process, Tendermint based blockchains slow down due to communication latency and complexity. Therefore, unlike Bitcoin or other proof-of-work blockchains, it would be ideal to set an upper limit to the number of validators. Centaur Chain will support a maximum of 150 validators on genesis. As technology advances and the mean computational power, storage and bandwidth increases, Centaur Chain will increase the number of validators supported.

Becoming a Validator

Any individual can become a validator on the Centaur Chain by putting up CNTR as collateral (otherwise known as staking), as long as the current number of validators does not exceed the maximum set by Centaur Chain. In that case, the amount of CNTR collateralized must be more than the amount of collateral put up by the lowest validator. If the stake is lower than the minimum amount required to be a validator, the node can also opt to direct their voting power to a delegate, thereby increasing the voting power of that validator and earning a portion of the rewards. When a new validator replaces an existing validator, the existing validator will be deemed inactive and the stake will either be uncollateralized or redelegated.

In the early stages, all node candidates will need to complete an approval process with Centaur before they can qualify as a node. This process is required for security reasons to prevent whales from gaining control of the network and consensus prior to network maturity. Qualification of a node does not imply that they would automatically be a validator, rather, it allows them to take part in the validator voting process.

Data Flow

Upon completion, the Centaur Chain will function as the settlement layer for transactions occurring across other protocols. This is achieved through the support of the liquidity pools built in the first phase and the oracles that exist to read and record data. When a user deposits an amount of ETH on the Ethereum liquidity pool, the user receives a proof that allows him to withdraw the equivalent amount afterwards. That transaction would be observed by the oracles that would then update the Centaur Chain with the new balance of the Ethereum liquidity pool, along with the relevant supply and demand data of that chain. This process is repeated for all other chains that have been integrated with the Centaur Chain. When a user wants to make a withdrawal, he can then use the proof to withdraw the ETH he put into the pool and any rewards garnered since, or withdraw from other liquidity pools such as TRX on Tron, subject to the supply and demand variance between the two cryptocurrencies.

Approach

For the testnet, Centaur will utilize the Cosmos SDK and focus more on the integration of the oracles and liquidity pools. This allows for a prebuilt framework based on Tendermint Core with the bare necessities of an ABCI and enables the developmental focus to be on the DeFi aspects. Once that has been achieved, the ABCI will be modified to better suit DeFi use cases.

When compared to Cosmos, the Centaur approach to building the ABCI focuses more on catering to DeFi use cases as opposed to interoperability. One major difference lies in the liquidity pools utilized by Centaur as opposed to the bond and peg system implemented by Cosmos. The peg system creates a more stable approach as each voucher deployed on the non-native protocol is backed by assets locked up on the native protocol. In the case of Centaur, the collateral within the liquidity pools are not locked up within the smart contracts and are instead repurposed for DeFi use cases. When the collateral is utilized, the assets start to churn additional value (in the form of interest for loans as an example) and those returns are ultimately returned to the users who contributed to it.

As the “peg” structure in the Centaur Chain is handled by zero knowledge proofs, the beneficial owners of the assets are not recorded at the point where they are collateralized, and instead only recorded when a withdrawal is made. This provides a layer of security for the owner of those assets through the privacy it provides, and because the proofs are transferrable off-chain, the withdrawal could be executed from an address protocol disassociated from the initial deposit.




Admin Node

This implementation of cross-chain transactions creates the possibility of a cross-chain attack. In a conventional Proof-of-Stake model, malicious actors must accumulate and stake the majority of the tokens in order to mount an attack on the blockchain protocol. Such an attack will devalue the tokens, making it economically infeasible as any gains of tokens from the attack will be nullified by the devaluation of the tokens (both staked and stolen). However, in a cross-chain implementation, the value of the tokens that must be staked (CNTR) is decoupled from the value of the assets held on other blockchain protocols via the liquidity pools (e.g. ETH). An attack on the Centaur Chain may result in the devaluation of CNTR but may allow the attacker to gain access to assets on other blockchain protocols. For instance, if the total asset value of ETH in the liquidity pool on Ethereum exceeds the cost required to execute a takeover of the Centaur Chain, attackers would then be incentivized to attack the Centaur Chain and accept the losses of their CNTR stake in order to gain access to the ETH in the liquidity pool.

To resolve this issue, a semi-centralized approach is proposed, where an Admin Node is operated by the Centaur team autonomously through the use of heuristics. Its only function is to ensure the integrity of transactions proposed to be executed on different chains. It has the power to veto all transactions proposed before they are executed, but it is not able to propose blocks on its own to prevent abuse. In practice, the veto power will virtually never be used as the mere possibility of its use will dissuade possible attackers.

Roadmap

- 
- Q1/19**
 - Conceptualization of project
 - Initial Feasibility Testing for Relevant Technologies
 - Start Seed Round
 - Q2/19**
 - Development of Liquidity Pools
 - Development of Wallet
 - Conclude Seed Round
 - Q3/19**
 - Development of Testnet V1 (Consensus Algorithm)
 - Sourcing of Strategic Partners
 - Q4/19**
 - Development of Testnet V1 (Node Configurations, Oracle Data Feeds)
 - Start Private Sale
 - Q1/20**
 - Launch of V1 Testnet
 - Launch of Centaur Wallet
 - Community Building, Marketing, PR
 - Q2/20**
 - Development of Testnet V2 (ABCI)
 - Conclude Private Sale
 - Public Sale
 - Q3/20**
 - Development of Testnet V2 (Zero Knowledge Module)
 - Development of Lending Platform
 - Integration of UK and EU Partners
 - Q4/20**
 - Launch of V2 Testnet
 - Onboarding of Third-Party DeFi Dapps
 - Acquire Partnerships and Licenses in SEA
 - Q1/21**
 - Launch of Mainnet
 - Launch of Lending Platform (UK and EU)
 - Q2/21**
 - Integration of Cross-chain Transactions
 - Integration of SEA Entities
 - Q3/21**
 - Launch of Lending Platform (SEA)

CENTAUR TOKEN (CNTR)

Centaur Token (CNTR) will be the native token for all Centaur related solutions. An equivalent representation will exist across all protocols that the Centaur Chain is interoperable with (e.g. ERC20 on Ethereum, BEP-2 on Binance Chain) and such representations will be backed by CNTR locked on the Centaur Chain.

Utility

CNTR as a Medium-of-Transfer

CNTR would be the value carrier of the Centaur Chain, to be spent as gas payments for all transactions or used as collateral for staking and block producing. Rewards for block producing and data feeds provided by oracles will also be provided in CNTR.

CNTR as Voting Rights

CNTR will be used as voting power for decision making and governance for all network decisions, whether in reference to the Centaur Chain or the Dapps. These decisions could range from amending fees and rates for Centaur solutions to changes in the codebase.

CNTR as Fees

CNTR will be used in a transactional nature for Centaur solutions such as to function as collateral and loans or Dapp fees.

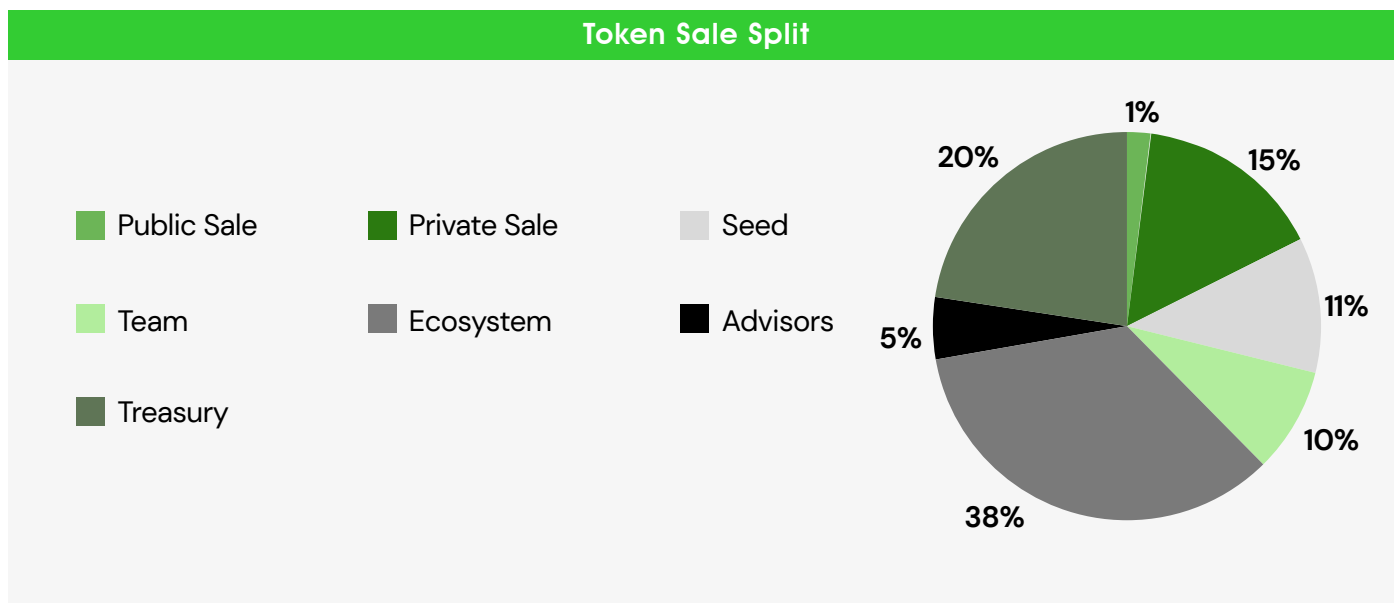
Supply Controls

For solutions that utilize CNTR directly, a portion (80%) of fees incurred in CNTR will be redistributed as staking rewards and the balance will be used to supplement operational expenses, any excess from the operational expenses will be burnt (up to a maximum 25% of the total supply). For solutions that do not utilize CNTR directly, the fees will be incurred in the native tokens of the protocols instead and collected by a smart contract. These fees would periodically be used to buy CNTR and the purchased CNTR will then be distributed accordingly.

Tokenomics

CNTR is minted with a fixed supply cap of 6,000,000,000 CNTR, with a portion released for the initial launch and the balance to be gradually released through block producing on the main net.

The planned breakdown of CNTR is as follows:



- The tokens allocated to the team and advisors are vested over three years with a nine-month cliff.
- The tokens allocated to the private sale investors are vested over eighteen months and released on a quarterly basis, starting from the end of the first quarter following the public sale.
- The tokens allocated to the seed sale investors are vested for ten years with 10% released at the end of each year.
- The tokens sold in the public sale are the only ones not subjected to any form of lockup or vesting.

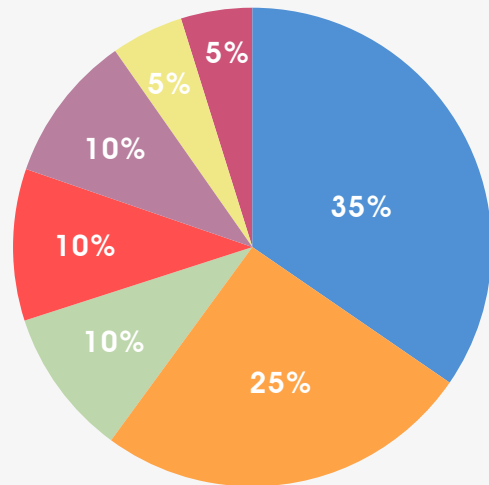


Fundraising

Centaur is conducting a fundraising round through the sale of CNTR tokens to accomplish its vision of a decentralized financial system. The fundraising target is US\$7,000,000 budgeted into the following breakdown:

Fund Allocation

- 4.9M (35%)** – Ecosystem*
- 3.5M (25%)** – Protocol Development
- 1.4M (10%)** – Business Development
- 1.4M (10%)** – Operations
- 1.4M (10%)** – Marketing
- 700k (5%)** – Legal
- 700k (5%)** – Reserves



*A significant portion of these funds will be used to jumpstart the liquidity pools by committing to a minimum number of daily transactions for each smart contract

Partners

Centaur has received support from numerous partners to accelerate the growth and development of the project.

The first group of partners are those who hold licenses in various jurisdictions. They will be assisting in the processing of transactions and coordination with regulators.

	<p>Valtuus and its associated entities, Valtuus EU, Valtuus Ltd and Valtuus Capital AG will be supporting with the centralized aspects of Centaur. Valtuus EU has an EU Electronic Money Institution license, Valtuus Ltd is acquiring services for Visa and Mastercard, and Valtuus Capital AG is a member of a Swiss Self-Regulating Organization, allowing it to operate as a licensed financial intermediary.</p>
	<p>iMillion has a UK Electronic Money Institution License and processes digital payments for many businesses.</p>
	<p>Finaura OU is a UK based crypto exchange that holds an Estonian Cryptocurrency Exchange license under the Money Laundering and Terrorism Financing Prevention</p>
	<p>Allanite Capital is a hedge fund operating with a license provided by the United Arab Emirates.</p>
	<p>Q-Gen is a Maltese company offering compliance solutions relating to anti-money laundering, know-your-customer and politically exposed person</p>
	<p>Arie Capital is a neobank operating in Mauritius and working on Fintech and DeFi solutions</p>
	<p>IOST is a consistent Top 100 crypto and an ultra-fast, decentralized blockchain network based on a next-generation consensus algorithm, "Proof-of-Believ-</p>
	<p>DIFY is one of the leading public relations and marketing agencies in the blockchain industry, with a portfolio of Top 10 exchanges as their clients.</p>
	<p>Elrond is a massively scalable protocol that focuses on high throughput by enabling parallel transaction processing.</p>
	<p>Vision247 is the leading playout and OTT services provider in the UK, offering end-to-end broadcast solutions to television channels and content owners</p>
	<p>M3 Market Access is a financial technology company specialising in solutions for the world of FX and treasury management.</p>
	<p>Manhattan Fish Market is an award-winning, fast casual restaurant with global franchises in outlets in Singapore, Thailand, Saudi Arabia and Indonesia.</p>
	<p>Lab Moneta provides advisory and solutions using emerging technology like AI, IOT and Blockchain for corporate users.</p>

Team

<p>James Hong Co-Founder</p>	<p>An entrepreneur by nature, James brings with him 15 years of experience in business growth and management garnered from numerous successful ventures. He started out as a Life Coach certified by the International Coach Federation (ICF) and served as an Executive Committee member in local communities and non-profit organizations in Singapore. Prior to the advent of blockchain technology, James thrived as an industry leader within the Marine and Offshore sector, at the helm of the regional distributor for Hyundai Heavy Industries. He has since conceptualized several go-to-market strategies for enterprise level blockchain solutions while actively contributing to the digitalization and implementation of new technologies in traditional industries such as marine, offshore and power.</p>
<p>Mark Harris Business Development</p>	<p>Mark has two decades of financial service experience within the United Kingdom's foreign exchange markets and payments sector. He has built a number of independent brands and has a proven track record of success, specializing in highly sophisticated solutions. Across his portfolio, he has managed 2,500 trading clients with over £8m of recurring revenue.</p>
<p>Dhanraj Dadhich Co-Founder</p>	<p>Dhanraj has close to two decades of experience in software design and development. He possesses a varied expertise ranging from FinTech solutions addressing capital markets, equities research, insurance, banking and credit related applications to Deep Technologies such as machine learning, big data analytics, distributed ledgers, cybersecurity and cryptography. His solutions are currently deployed in enterprises, managing a portfolio of accounts amounting to over US\$10M in annual revenue each. Within the blockchain space, Dhanraj has built decentralized applications on Ethereum and Hyperledger and integrated other blockchains such as Bitcoin and OmniCore into consumer facing products.</p>
<p>Kor Kiang Sean Co-Founder</p>	<p>Sean has five years of technical experience in the blockchain industry ranging from mining rig configuration to smart contract and blockchain development. He first started with hexa-GPU mining rigs for Litecoin and gradually delved into the software side of distributed ledger technologies, working on smart contract development, consensus algorithm design and business use cases for DLTs. Sean has since worked on multiple blockchain projects and provided support with the digital transformation of traditional firms.</p>

<p>Low Jianhui General Counsel</p>	<p>Jianhui is admitted to the Singapore Bar and has extensive courtroom experience while practicing as a litigator previously. While at a pioneering ICO consultancy firm in Singapore, he was responsible for regulatory compliance of numerous blockchain projects and has liaised with a network of lawyers around the world, including US, Malta, Switzerland and Brazil, to develop a multi-jurisdictional approach to legal compliance for ICOs and STOs.</p>
<p>Christopher Makolski Business Development</p>	<p>Christopher has a Masters in quantitative finance and years of experience in algorithmic trading, statistical arbitrage and financial modeling. He has founded two companies within the FinTech space that provide digital services to financial institutions. One of the notable institutions was Nomura, where his solutions improved the accuracy and efficiency of the booking and reconciliation process. Recently, Christopher has been working with</p>
<p>Au Xing Xian Technology</p>	<p>Xane has a degree in Computer Science with a background in information security. He has over 10 years of full stack and 4 years of blockchain development experience. He completed a scholarship provided by ConsenSys, one of the more prominent blockchain development firms.</p>
<p>Lum Jun Chi Operations</p>	<p>Jun Chi has a degree in engineering with a background in building maintenance. He has over 5 years of experience in engineering. He was featured on the first-ever collaboration program with Mango TV and Discovery channel on a ten-episode entrepreneurship program where he emerged as the program's winner.</p>

Legal Disclaimer

PLEASE DO READ THIS SECTION VERY CAREFULLY. IF YOU ARE IN DOUBT ABOUT ANY ACTION YOU SHOULD TAKE, PLEASE CONSULT YOUR LEGAL, FINANCIAL, TAX OR OTHER SUITABLE PROFESSIONAL ADVISOR(S).

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