ContractLand

Powering The Decentralized Economy

Abstract. ContractLand is an asset tokenization, exchange, and management platform to enable businesses and end-users in the decentralized ecosystem of web 3.0. The platform is built on top of Terra-Chain; a next generation application specific blockchain built for scalable and interoperable transactions, enabling the liquidity of tokenized assets across an internet of blockchain ecosystem.

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Contents

Background

Blockchain technology was revolutionary in enabling the creation of tokenized assets that are fungible, transferable, and verifiable. It allowed anyone to own and transfer assets across an open financial network without the need for a trusted third party. The inception of smart contracts extended these capabilities to a far greater degree - disrupting the fundamental form of human trust and interaction.

One of the most promising concepts spawned from smart contract adoption is **tokenization**. Differing from traditional cryptocurrency, a token allows for business logic and relationship models to be imbued in the token - providing unprecedented efficiency to **value transfer, contractual relationships, and capital management**. This not only has the potential for immense impact on modern digital constructs, but also brings several opportunities to revolutionize traditional business models. Since the inception of Ethereum, hundreds of new businesses have been conceived on this new decentralized medium, forming an entire new industry of blockchain-centric companies.

The adoption of the tokenization model has been substantial within the blockchain community, with innovation atop smart contracts bringing us closer to a more collaborative and fair economy. But to inspire wider utilization amongst traditional industries, we need to overcome obstacles imposed by barriers of entry, insufficient standards, and a lack of supporting infrastructure.

Technical Barriers

The process of development and execution of smart contracts is often complex, time-consuming, and error-prone. The demanding requirements of technical expertise and industry experience for blockchain-based development limits its benefits to a handful of groups. These groups, such as early adopters and established corporations financially capable to hire the necessary talent, cover a small spectrum of those willing to explore and incorporate the technology to business needs.

Lack of Standards

The rapid growth of the tokenization ideology spawned a variety of ways to perform token system design and distribution. The chaotic development of the ICO market in 2017 was a testimony to how the lack of standards can put both investors and businesses at risk. It is impractical to expect a non-blockchain-centric business to enter the space and navigate the technology without ending up on a similar path. A standardized process for designing business and value generation models based on crypto-token systems and distribution needs to be set in place.

Lack of Liquidity

Various public, consortium, and private blockchain systems are being developed and running as their own individual closed networks. Currently centralized exchanges and wallets plays the critical role in providing transfer of value and liquidity across different closed blockchain systems. However, the interests of cryptocurrency exchanges are not aligned with the interests of businesses. Enormous listing fees[1] and artificial volume inflation[2] are unsuitable for genuine businesses that need a stable, transparent and sustainable marketplace for their tokens. This will change as the need to transfer values across systems natively drives the advancement of technology on inter-blockchain communication.

ContractLand as an asset tokenization, exchange, and management platform will ground itself into the decentralized economic ecosystem, and provide liquidity to tokenized assets through:

- Simplifying and standardizing the utilization of smart contract and tokenized assets

- Build cross-chain exchange infrastructure to enable token liquidity of critical mass

- Improving end-user experience of blockchain and cryptocurrency

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[1] "Cryptocurrency Exchanges Are Making Millions from Just Listing Coins." 12 Mar. 2018, https://news.bitcoin.com/cryptocurrency-exchanges-are-making-millions-from-just-listing-coins/. Accessed 21 Mar. 2018.
[2] "Chasing fake volume: a crypto-plague – Sylvain Ribes – Medium." 10 Mar. 2018, https://medium.com/@sylvainartplayribes/chasing-fake-volume-a-crypto-plague-ea1a3c1e0b5e. Accessed 21 Mar. 2018.

The ContractLand Platform

Built for the Internet of Blockchain

The future of web 3.0 lays in the ecosystem of an internet of blockchains, to enable businesses and end-users in this new paradigm, the ContractLand platform will initially pilot on the Ethereum blockchain, but ultimately run on-top of **Terra-Chain; a next generation application specific blockchain built for the ContractLand platform to facilitate scalable, and transferrable transactions across an internet of blockchain ecosystem.** Terra-Chain will be first connected with Ethereum, and other popular blockchain systems to follow.
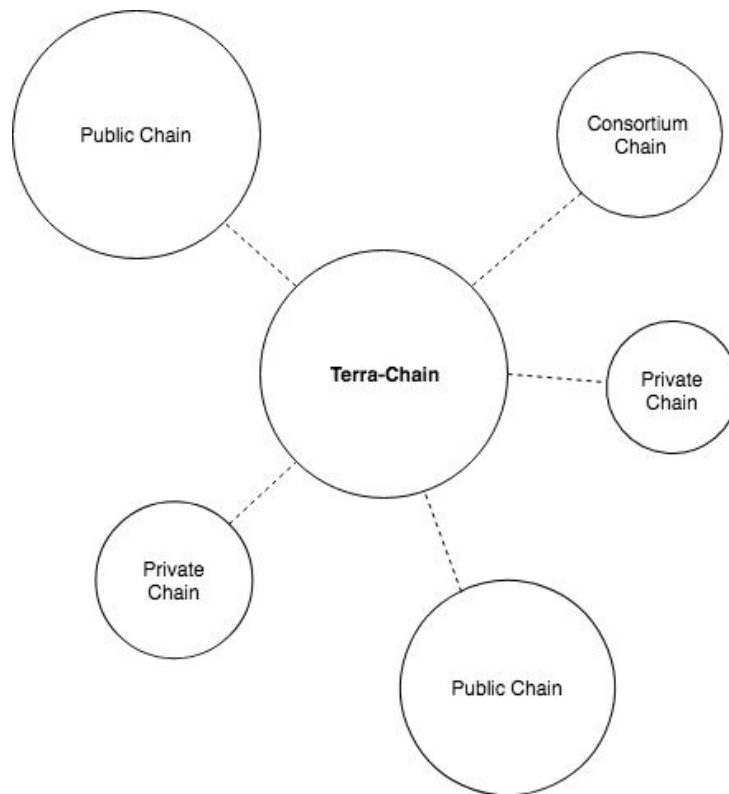
Terra-Chain connect to other blockchains via bridges

Platform Layers

The ContractLand platform is vertically integrated through the connection of the smart contract template manager, the exchange, and the wallet. The purpose of the integration is to facilitate organic and effective creation of tokenized assets while providing liquidity and and management for those assets across various blockchain systems.

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┌─────────────────────────────────────────┐
│      Smart Contract Template Manager      │
│      Deploy and manage smart contracts    │
└─────────────────────────────────────────┘
                    │
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┌─────────────────────────────────────────┐
│          Decentralized Exchange           │
│       Provide liquidity to tokenized      │
│                  assets                   │
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┌─────────────────────────────────────────┐
│                  Wallet                   │
│   Storage and management of tokenized     │
│                  assets                   │
└─────────────────────────────────────────┘
                Terra-Chain
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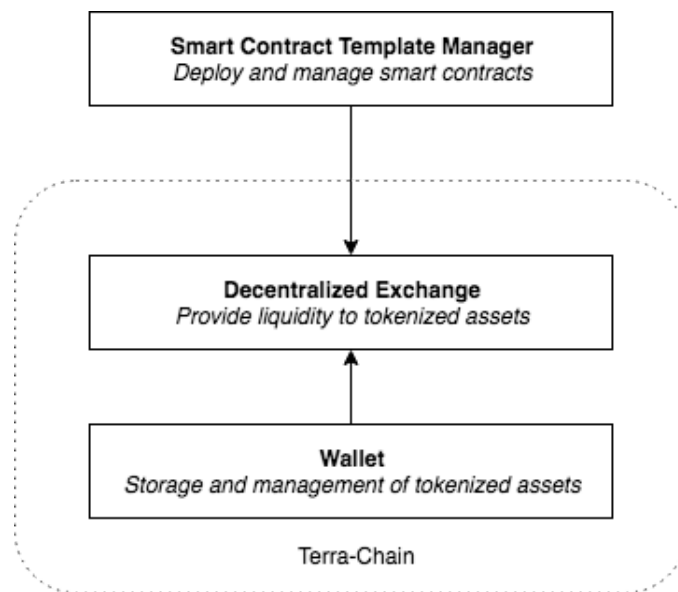
The three layers of the ContractLand platform

Smart Contract Template Manager

The platform contains a diverse set of standardized smart contract templates for the creation and management of tokenized assets, enterprise users can pick, deploy and manage their desired templates through the platform's user interface. The interface abstracts out the technical complexities of creating smart contracts, and provides plugins to make them easier to interact with for end users. Assets issued through the platform on the Terra-Chain can be freely transferred onto other connected blockchains and back.

Some example templates include:

- **Fungible Token**

Issuing a token can benefit businesses in a multitude of ways such as raising capital, payment processing, and community building. They achieve this by being more liquid, efficient, and transparent than their traditional counterparts. ContractLand's platform offers general implementations of these tokens that are customizable for specific business use cases on a per-deploy basis.

- **Crowdsale**

Crowdsale is the most prominent use case of smart contracts, and a powerful tool for businesses to raise capital. Combined with the property of fungible tokens, a crowdsale contract enables the trustless purchase of tokens for users. ContractLand standardizes the crowdsale process, creating a 'one-click' solution for businesses to run crowdsales.

Decentralized Exchange

ContractLand's decentralized exchange acts as the foundation layer for the platform, serve businesses and their end-users as a point of conversion and settlement for tokens. Tokens issued through the platform's template system are seamlessly integrated into the exchange for instantly tradability on the market. Dapps and wallet applications can also easily integrate with the exchange as the entirety of the logic of the exchange is written in smart contracts, allowing easy integrability to end-user applications.

The exchange can facilitate trading of assets from other blockchain systems such as existing tokens on the Ethereum blockchain. Users can simply transfer the tokens over from another chain to the Terra-Chain via the connection bridge, and start trading as if they were native assets. Assets can then be transferred back to their native chain afterwards as desired by the user.

Wallet

There are currently approximately a mere 30 million cryptocurrency users worldwide. As more businesses adopt blockchain technology, and end-user applications become more user friendly, more users will enter the space for non-trading or investment purposes. ContractLand's wallet, with direct integration into in the platform's exchange enables end-users with secured storage and utility of tokenized assets across various blockchain systems.

Terra-Chain

Terra-Chain is an application specific, permissioned blockchain based on Ethereum protocol. It uses a Proof-of-Authority[3] as its consensus mechanism as opposed to Proof of Work mechanism used by the Ethereum mainnet allowing more efficient and straightforward management of the blockchain state. Unlike the Ethereum mainnet which allows anyone on the internet to deploy turing-complete smart contracts to the network, Terra-Chain will only run a set of smart contracts necessary to support the functionality of the ContractLand platform, and will be much lighter and performant as an application specific chain. The Parity Bridge[4] is used to open up interoperability with other public blockchain networks and enable the transfer of value across different chains.

Terra-Chain mitigates blockchain scaling issues by allowing users to convert tokens from different public chains to tokens on Terra-Chain, and perform transfer and exchange operations with much lower transactions fees and faster block times. We believe Terra-Chain with its advantage on performance, cost, stability, and security over public blockchains will become a model for application specific blockchains in the internet of blockchains ecosystem.

Blockchain Technology

The Terra-Chain network is fully compatible with the Ethereum protocol, and runs on the Parity client[5]. Parity is a modular, low-footprint, and high-performant Ethereum client with plugable consensus and adjustable chain specifications.

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[3] "Proof-of-authority - Wikipedia." https://en.wikipedia.org/wiki/Proof-of-authority. Accessed 21 Mar. 2018.
[4] "GitHub - paritytech/parity-bridge: Bridge between any two ethereum ...." https://github.com/paritytech/parity-bridge. Accessed 21 Mar. 2018.
[5] "GitHub - paritytech/parity: Fast, light, robust Ethereum implementation.." https://github.com/paritytech/parity. Accessed 21 Mar. 2018.

Consensus

Aura - Authority Round

The Terra-Chain network runs on top of the Aura (Proof-of-Authority) consensus[6] engine for it's EVM blockchain in replacement of the original Ethash (Proof-of-Work) mechanism. The Aura consensus engine depends on a set of validator nodes (authorities) to be specified, who are responsible for creating new blocks and securing the blockchain in a round robin fashion. The consensus mechanism requires a majority (>50%) sign off by the validator set, after which finality is guaranteed. The Aura consensus mechanism is a popular choice for public chains and has been battle tested on networks such as the Ethereum Kovan testnet[7].

Benefits over PoW

There are many advantages of Proof-of-Authority over Proof-of-work for application specific blockchain networks; It is **less energy consuming** since mining does not require solving arbitrarily difficult mathematical problems, more **performant** since a smaller set of mining nodes provides lower transactions acceptance latency, more **stable** since blocks are produced in short and constant intervals of time, and it is more **secure** as unwanted connection from attackers cannot overwhelm the network and potential revert global state.

Validators

Terra-Chain will be initialized with 10 validators. Prior to the launch of the Terra-Chain network, a validator generation event will be held to select the validators from a pool of reputable applicants. The validator set is maintained in a smart contract on Terra-Chain. Each validator holds a key that authenticates it's identity. After the initialization of the network, validators can only be added or removed through a majority vote (>50%) from the existing validator set.

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[6] "Aura - Authority Round · Parity Ethereum Documentation." https://wiki.parity.io/Aura. Accessed 21 Mar. 2018.
[7] "GitHub - kovan-testnet/proposal: Kovan PoA Testnet Proposal." https://github.com/kovan-testnet/proposal. Accessed 21 Mar. 2018.

Blockchain Economics

The token generation event for the Terra-Chain network will take place prior to the launch of the network, of which will be marked into the network's genesis block. Participant in the generation event will get their purchased tokens on the Terra-Chain network upon its launch.

Once the network is launch, the validators will start creating blocks, and receive transactions fees for providing security for the network.

The Terra-Chain network will initially be set to have a **4 seconds block time**. The total number of blocks created by validators per year will be:

$$\frac{30{,}758{,}400 \; seconds}{4 \; seconds \; per \; block} = 7,689,600 \; blocks$$

Permission

Public blockchains optimizes for decentralization where all participants are able to perform all roles within the networks such as connect, mine, send transactions, and inspect blockchain state. The Terra-Chain network being an application specific chain for the ContractLand platform limits certain permissions of the network for enhanced security and performance.

Connect to Peers

Permissions on this layer determines which nodes can connect to the network and interact with other nodes. The Terra-Chain will not impose any limitations on this aspect as anyone should be able to connect to the network to use the ContractLand platform.

Mine

Terra-Chain's Proof-of-Authority consensus mechanism by default limits role of mining to the network's set of validator, enabling faster transaction confirmations, and more stable network states.

Send Transactions

There are three type of transactions on the EVM:

- Contract deployment
- Contract interaction
- Simple transfer

On the Terra-Chain network, contract interaction and simple transfers will be open to the public, while contract deployment will be only limited to network validators and existing contracts on the network. The only cases for contracts deployment on the Terra-Chain are for updates of the ContractLand platform, which will be done through the platform's validator node. And tokenized asset creation through templates, which will be done via factory contracts on the network.

Inspect Blockchain State

The inspection of blockchain state will also be available to the general public to ensure the verifiability of Terra-Chain's state integrity.

Interoperability

Interoperability is a key functionality of the Terra-Chain network. By connecting Terra-Chain to other major public blockchains, it opens up transferability and allows the ContractLand platform to become a liquidity center for tokenized assets across chains.

Parity Bridge

Parity Bridge is an open sourced solution for connecting EVM based blockchains and enable the passing of arbitrary message between them. The bridge works through a *HomeBridge* contract which takes token deposit from users on the *Home* chain, and the same amount of tokens will be accessible on the *ForeignBridge* contract on the *Foreign* chain. The bridge works in conjunction with Proof-of-Authority consensus mechanism, as the relay of messages between chains happen in a byzantine fault tolerant way by the validators of the *Foreign* chain. In our case, Terra-Chain will be the *Foreign* chain and connected public chains will be *Home* chains.
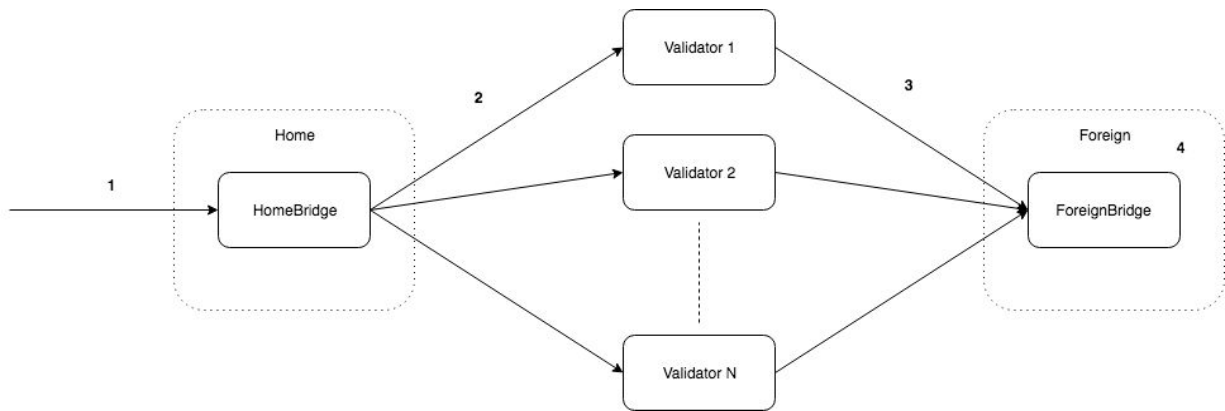
Illustration of token transfer from Home to Foreign

1. User deposit token in to *HomeBridge*

2. *HomeBridge* emits *Deposit* event, and gets picked up by validators

3. For each *Deposit* event, validators execute *deposit* method on *ForeignBridge*

4. Once a majority of the validators have confirmed the deposit, user balance will be increase on *ForeignBridge.*
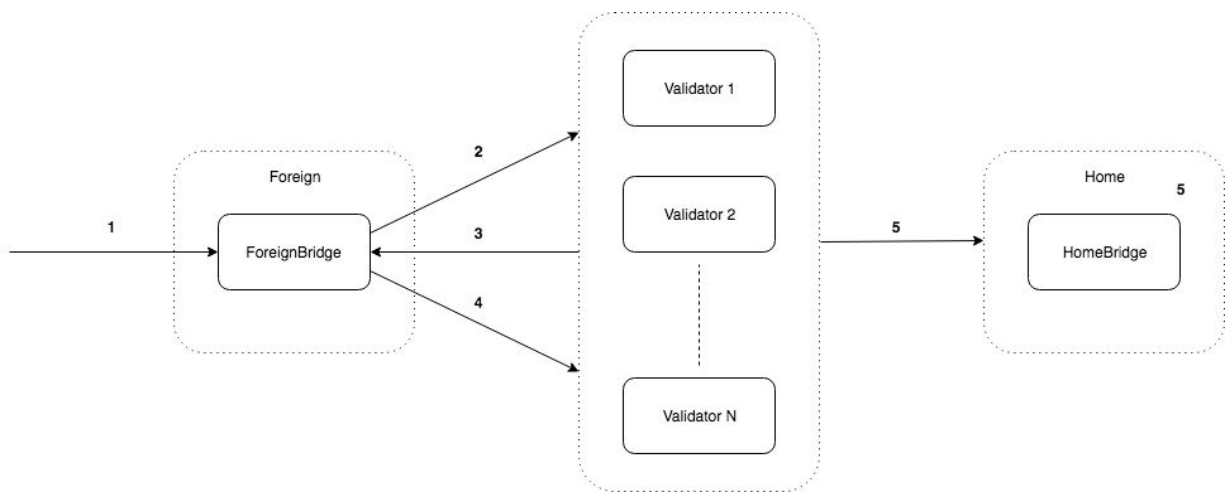
Illustration of token transfer from Foreign to Home

1. User withdraw token from *ForeignBridge*

2. *ForeignBridge* emits *Withdraw* event, and gets picked up by validators

3. For each *Withdraw* event, validators submits a confirmation message to the *ForeignBridge* verifying the withdraw

4. Once a majority of the validators have confirmed the withdraw, the *ForeignBridge* emits a *CollectedSignature* event

5. Any validator can then execute the *withdraw* method on the *HomeBridge* with the collected signatures, and user tokens will be released from *HomeBridge*

Smart Contract Development

General Approach

Our team's general approach to development follows the principle of Evolutionary Architecture[8], where the fundamental concept is designing for incremental change in a system. This has been a popular practice in classic software development because change has historically been difficult to predict and expensive to retrofit. If evolutionary change is built into the architecture, change becomes easier and cheaper, allowing changes to development practices, release practices, and overall agility. However, applying this principle in smart contract development is a challenge. Unlike classic software development where the application logic runs in a centralized server, deployed smart contract codes are immutable and un-iterable. To overcome this, we have designed a framework to enable upgradable smart contracts.

Framework for Upgradable Smart Contracts

The key thing to consider when upgrading a smart contract is how to preserve the state of the original contract. In classic software engineering, data of a application are separated from its functionality. This approach can also be applied to smart contract development, allowing multiple contract iterations to share the same state.

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[8] "Microservices as an Evolutionary Architecture | ThoughtWorks." 11 Mar. 2016, https://www.thoughtworks.com/insights/blog/microservices-evolutionary-architecture. Accessed 21 May. 2018.
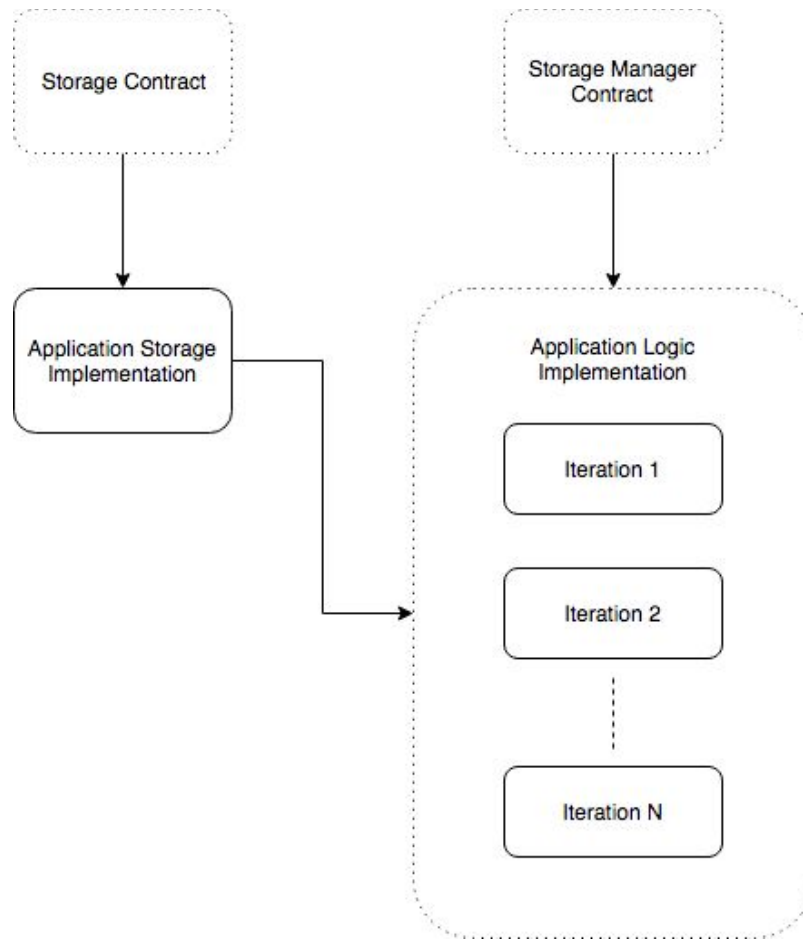
Illustration of the decoupling of data and logic in the upgradable contract framework

The framework provides abstract interfaces of a *storage* contract and a *storage manager* contract. The *storage* contract is designed as an universal data store containing all data storage types that a smart contract application will need. The contract is meant to be an immutable singleton where the expandability of the contract should allow any modification or addition of data to be directly performed on top. Concrete implementations of the *storage manager* should contain the business logics of the application, and can be upgraded frequently. Since most upgrades of an application occurs in its business logic, this decoupling of data and logic enables the upgradability of contracts without losing its existing state.

The ContractLand Token (CLC)

CLC will be deployed as an ERC20 token.

Token Utilities

- **Template Usage Cost**

CLC is used as the service token for the ContractLand's smart contract template service. Costs for deployment and usage of templates will be charged through CLC.

- **Exchange Listing Fee**

Given the DEX is ran on an open network, it can be accessed and used by anyone. But only businesses approved by ContractLand will be visible and searchable on the official platform's user interface. This will be a standard and transparent fee structure applied to all businesses, and minimal compared to traditional crypto exchange listing fees.
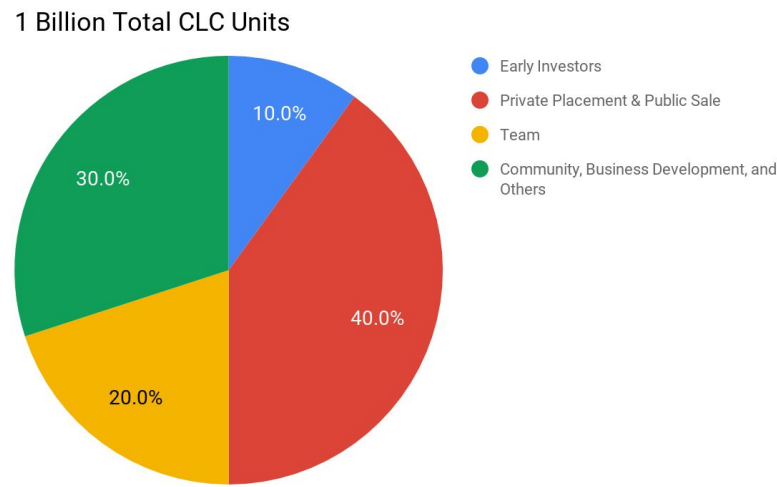
- **Exchange Trading Discount**

Holders of CLC will receive a discount on the trading fees of the DEX.

- **Terra-Chain Gas Fee**

CLC is used as the native token of the Terra-Chain network, and will be used for gas as Ether is on Ethereum.

Token Distribution & Fund Allocation

The total amount of CLC tokens will be 1 billion with the minimum unit of division being 18 digits after the decimal point.

1 Billion Total CLC Units

- Early Investors
- Private Placement & Public Sale
- Team
- Community, Business Development, and Others

10.0%
30.0%
40.0%
20.0%

Funds raised during the Contribution Period will be used solely for the purpose of development and operation of ContractLand.

Development & Research

Team Building

Legal

Community Building

Operations

Marketing
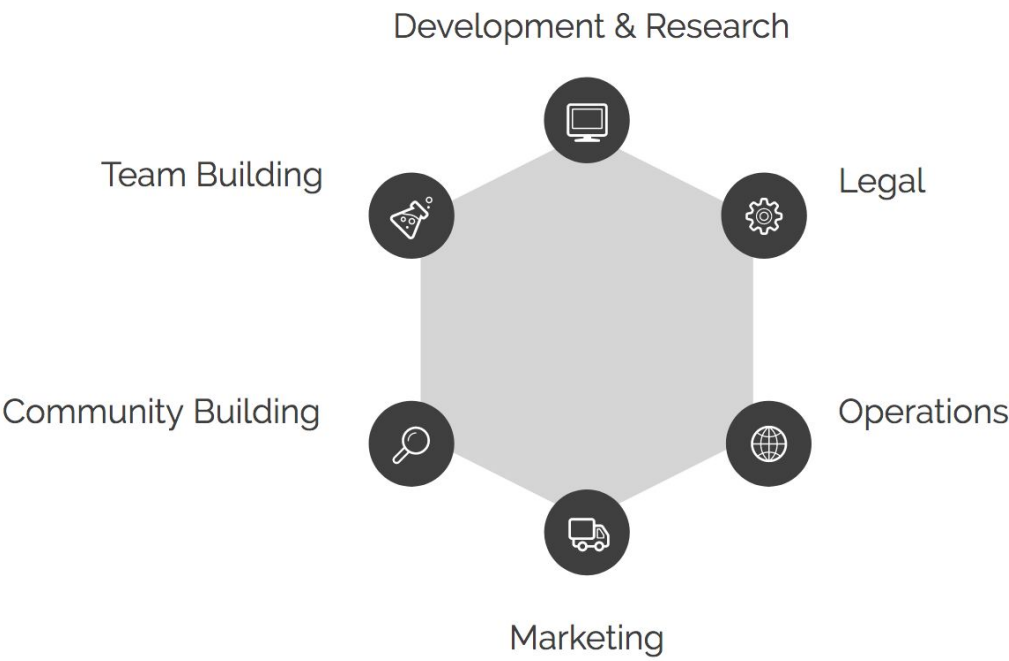
Project Milestones

Q4 2017 - Team Formation

- Team formed

Q1 2018 - Ideation

- Whitepaper released
- Design platform and DEX infrastructure

Q2 2018 - Open Alpha on Ethereum Testnet

- Templating service deployed on testnet for private testing
- DEX deployed on Ethereum testnet for public testing

Q3 2018 - Open Beta on Ethereum Mainnet

- CLC tokens deployed to mainnet
- Deploy DEX on Ethereum mainnet
- Enable ERC20 token creation and crowdsale template

Q4 2018 - Terra-Chain Testnet

- Create Terra-Chain testnet with Ethereum bridge
- Deploy market, exchange, and wallet on testnet

2019 - Terra-Chain Mainnet

- Create Terra-Chain mainnet with Ethereum bridge
- Deploy market, exchange, and wallet on mainnet

2020 - Interchain

- Enable bridges for additional blockchains

Our Team

Peter He - CEO
Peter is an active entrepreneur having founded Nimbusfly Technology Inc, a medicinal marijuana delivery platform in Toronto out of university. He is also a long-time investor and supporter of blockchain technology. Graduated from Computer Engineering at University of Toronto, Peter has led the effort in creating the first blockchain development community at Bloomberg NYC. Coming from a technical background, Peter is an expert on blockchain and DApp development.

Han Ke - CTO
Han is a former trading and applications engineer at FinTech firm Betterment, and led their first blockchain product in the space. Long-time dabbler of cryptocurrencies. Experienced in blockchain, algorithmic and high-frequency trading, data processing and predictive forecasting, as well as web and mobile frameworks.

Forrest Li - CMO
Forrest is a blockchain Entrepreneur and crypto investor. Graduated from Master of Financial Engineering from University of Toronto. Forrest has worked at Cinda securities, specializing in risk management.

Bingyang Li - Advisor
Bingyang is the founder of Ipetram, a data analysis and mining services for the world's leading scientific research institutions, financial institutions, and consulting companies. He later served as COO of SmartMesh (blockchain mesh network), and has established a strong network in the Chinese blockchain space through his tenure.

Jiahua Zhou - Advisor
Jiahua is the co-founder of Hnapay, one of the first digital payment service in China. He later served as the COO of the Shanghai Culture Asset and Equity Exchange. Jiahua is an expert in digital finance and exchange.

Zeyang Xu - Advisor
Zeyang has decades of investment and entrepreneurship experience in the digital finance space. He led the design of financial products at the Shanghai Culture Asset Exchange

where he served as the Director of Product. He later founded FirstMatrix, a popular fantasy sport platform.

Chang Liu - Advisor
Chang is an early investor and advocate of culture assets. He is the authorized agent of the Nanjing Culture Asset Exchange, the Beijing Culture Asset Exchange amongst many others. An accomplished trader of commodity assets, and experienced community manager with a strong media network in the blockchain space.