DARWINIA

GENEPAPER

Preview Version v0.8.7

DARWINIA

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Background

The world is being blockchainized and tokenized. Fungible token, which has been generally used in the financial industry, together with Non-fungible token, which is becoming more and more recognized in the game industry, will greatly enhance the openness and collaboration of finance and game sector.

These tokens are being connected and merged, and the ways of such connection and merge are trends to diversified as well. Such connection might be performed with smart contract, Dapp, or appchain protocol, that leads to the formation of an open token-network. Darwinia network powered by polkadot app-parachain technology, via develop infrastructure and core-applications, to support the growth of token-network. Darwinia focus its major application in games and de-fi sector.

Open Game in Open Finance

Technical Architecture

Blockchain network is being layered and specialized, while public chains cover consensus, security and cross-chain transfer of data or asset, second-layer networks and sidechains are now targeting specific applications.

The innovation of new technologies as Polkadot and Substrate in lines with the trends of progression. Under such circumstances, Darwinia, an app-chain network of cross-chain interaction that focusing on application scopes, chooses to join these trends of ecology and technology, with layered networks, cross-chain interactions, application-oriented design, user experience, etc. conducted as our key design features and principles.

In the process of using blockchain technology to create new DAPP, we found several problems for the mass promotion and utilization of blockchain technology:

1. The current blockchain infrastructure is not yet able to meet the requirements of user experience.

At present, the user experience problem of blockchain games is mainly reflected in two aspects. First, crypto wallets is still not easy to use for those who have never accessed to blockchain and cryptocurrency. The necessity of private key backup and the inability to retrieve assets if password forgot are still big cognitive thresholds for users. Second, low-TPS of the public chain, and the gas fee costs are also big obstacles for users that are accustomed to free services

2.Traditional game vendors lack blockchain experience

The development of blockchain games require certain accumulation of blockchain technology and it could be costly for traditional game developers to build a complete blockchain development platform from the start. .

3.Blockchain games are split among different public chains

Due to the heterogeneity of public chains, blockchain game developers need to develop the same game for each public chain in order to reach multiple public chain community, and the cost is relatively high.

We hope to use the most advanced blockchain technology and framework to construct an open network and application suite to solve these problems. This network and application suite combines blockchain trusted technology with a Web3 infrastructure with the following features: layered network design, cross-chain interaction, developer-friendly, best user experience, and high concurrency and customization

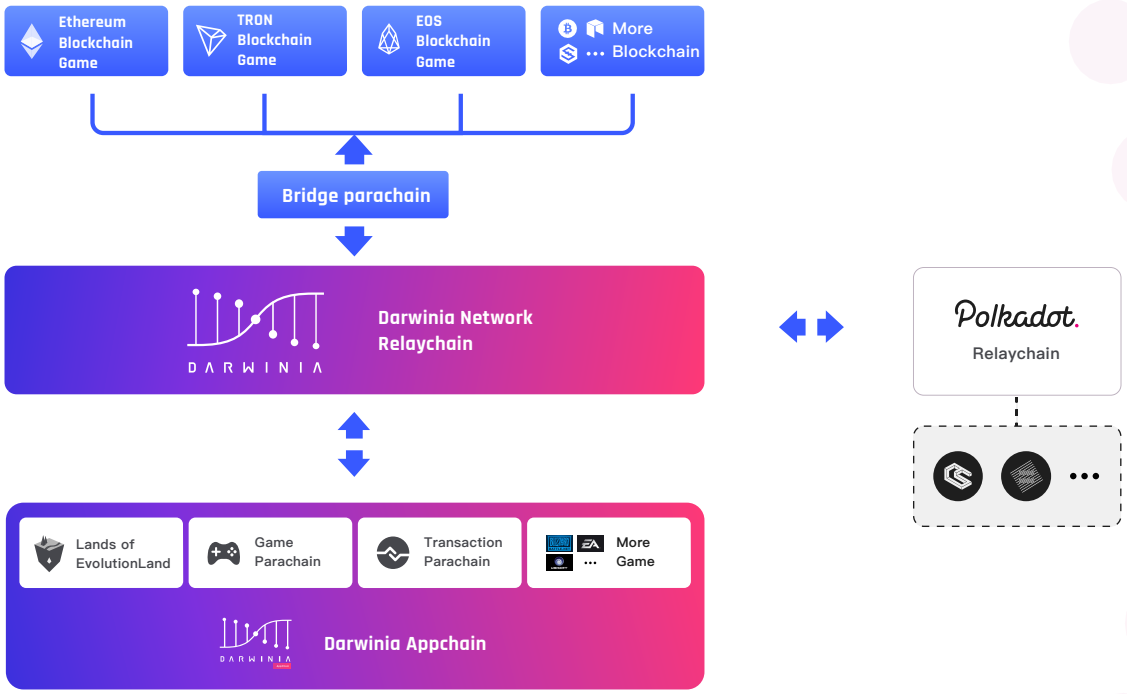
This network is the Darwinia Network, this application suite is the Darwinia AppChain SDK.

Architecture design

Darwinia network is a blockchain network based on Substrate[1] technology. The architecture design refers to the cross-chain network framework of Polkadot [2], including Relay chain, Parachain, bridge and other designs. Darwinia network is part of the Polkadot ecosystem, and at the same time differentiated from Polkadot, Darwinia network focuses on game and application scopes with cross-chain and application chain operations..

Blockchain games or Dapps can easily perform cross-chain interactions for game assets and game operations through the Darwinia network. For example, Cryptokitties can transform its NFT (Kitties) on the Ethereum into NFT on EOS through the Darwinia chain; players on the Ethereum and players on the EOS can play Evolution Land game simultaneously through the Darwinia network. **At the same time, thanks to the Polkadot ecosystem, Darwinia Network can link to a wider range of games and players.**

The architecture relationship of Darwinia Relay Chain, Darwinia AppChain, Polkadot Relay Chain, etc. is shown as below.



Darwinia Relay Chain

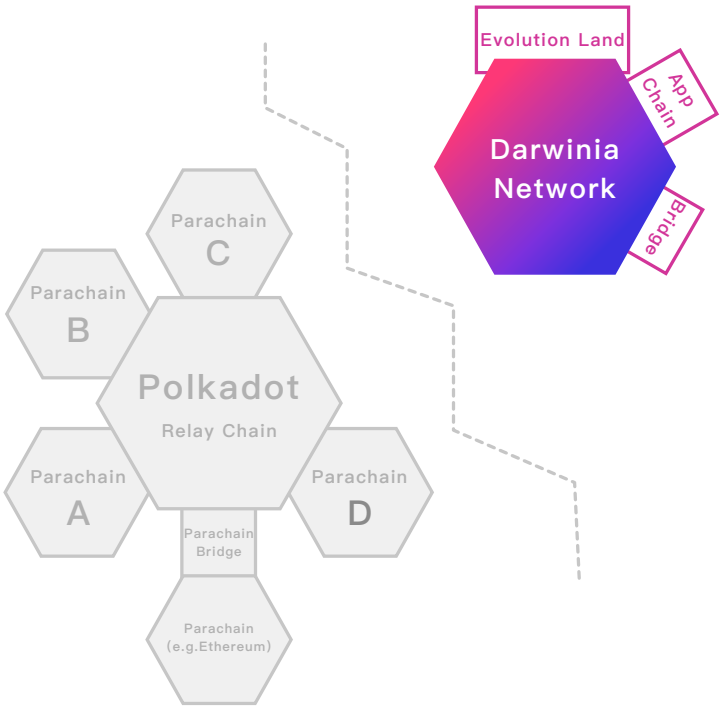
Darwinia Relay Chain is the most important role in the Darwinia Network, it is also the hub of each App-Parachain.

Darwinia Network itself can operate as a stand-alone cross-chain network, and its relay chain will be responsible for consensus security and cross-chain interoperability. Meanwhile, benefits from Polkadot, which provides an open heterogeneous network access method, Darwinia Relay Chain can also choose to access Polkadot as a Parachain of Polkadot, then Polkadot will take over and be responsible for the security of the Darwinia relay chain. All of the Parachain in Darwinia Network will be able to connect to a wider external blockchain network via Polkadot.

To this end, we divided the operating mode of Darwinia relay chain into Solo mode and Polkadot connection mode:

Solo Mode

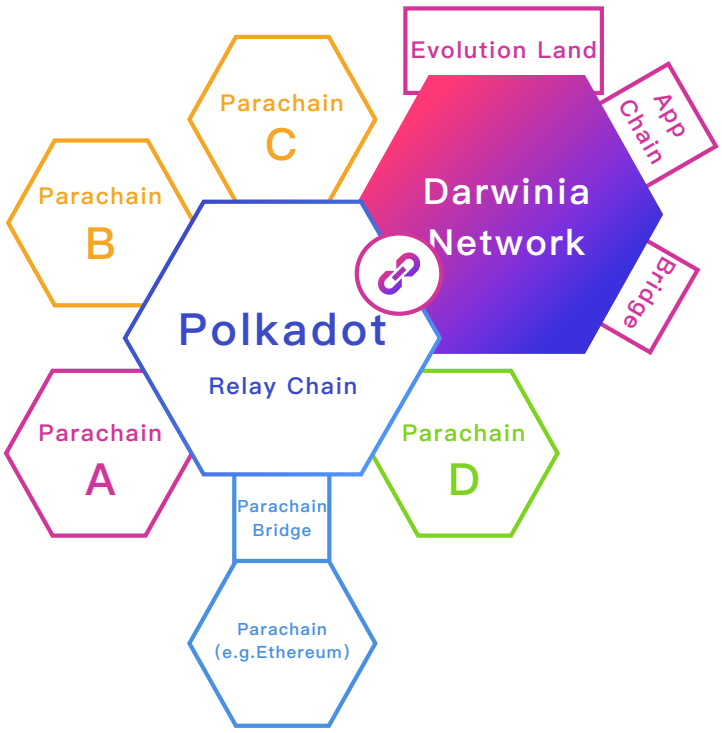
Darwinia network can choose to operate as an independent public-chain network and is responsible for its own consensus security, with its core business and application services, including the cross-chain functionality of each application chain, controlled by Darwinia Network itself.



Polkadot Connection Mode

In Polkadot connection mode, in addition to operate as a relay chain for Darwinia Network, it also serve as a Parachain for Polkadot.

Since Polkadot network adopts shared security model, the cross-chain security of the parachains will be guaranteed by the validators of Polkadot Relay Chain in the Polkadot connection mode. After Darwinia network switches to the connected mode, the original validators and Staking mechanisms will be used to ensure local consensus within the Darwin network, which will help achieve faster block confirmation and higher TPS. This local consensus mechanism will also help Collator to determine that the block submitted to the Polkadot validators does not violate Polkadot global consensus.



Appchain SDK

In order to facilitate application developers to develop blockchain networks that meet application-level requirements, without having to deeply understand blockchain technology, Darwinia Networks team developed a framework for utilize blockchains based on Substrate and Darwin Web Application Tools. This framework is called the Darwin Appchain SDK.

Its design goal is to meet the needs of the application level, the business level, rather than the platform requirements of the public chain, so Darwinia Appchain will focus on the flexibility of the framework, the diversity of components; and the consensus algorithm, the speed of the block, and the governance model will be very different from the public chain.

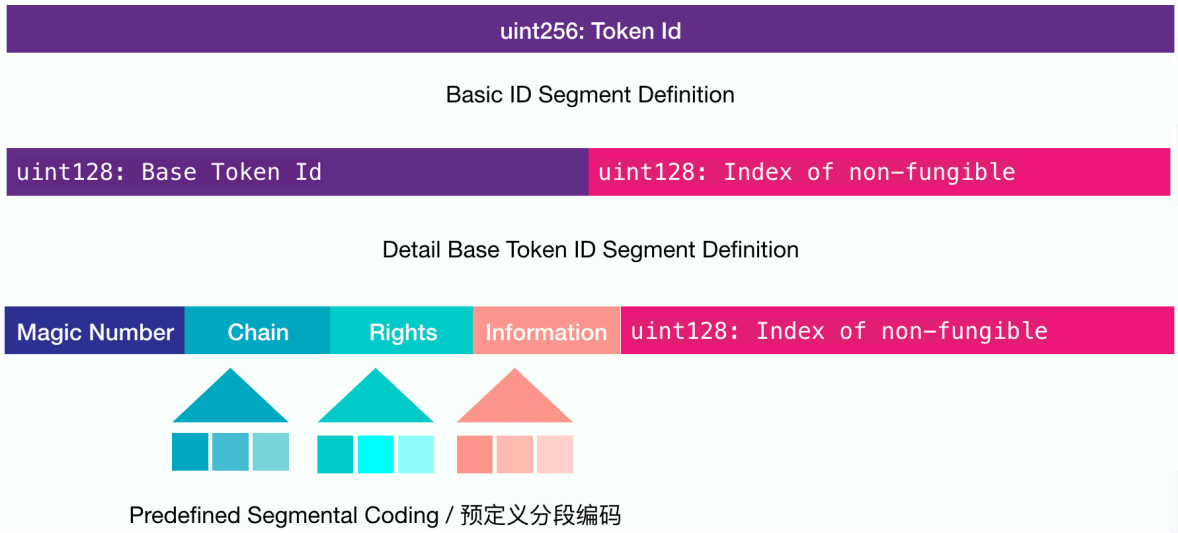
The Darwinia Appchain is a set of blockchain development kits that can be tailored to the needs of application developers for different blockchains networks. It can even create a blockchain with one-click, also provides random number services and DKMS distributed key management services. The appchains developed based on this SDK will also use Substrate kernel, which is designed to be a parachain that directly connected to the Darwin network relay chain.

Non-fungible Token Identifiability

In blockchain network, we use a single ID stand to mark different items. In the realm of virtual asset, due to the existence of different ledger or blockchain network (domain), different items with different ID are identifiable within one domain, but the observers within one realm can not identify item IDs from other domains.

The current design of many existing ERC721 blockchain applications is mainly for the identification of intra-domain assets, and does not take into account the reuse of assets from different domains, which leads to a situation that single Token ID cannot identify a unique asset when reusing non-fungible assets, and it also needs to carry a lot of domain information, which could be very complicated to implement.

To solve this issue, we designed an Interstellar Asset Coding Standard, that enable different public chain and different assets to have a single ID in darwinia network, to allow easy cross-chain transfer for NFT assets.



Economic Model

Native Assets

The native assets for Darwinia Network is RING, RING can be used as gas for transactions. Gas include transaction fees, contract execution fees, network bandwidth charges, storage fees, and more.

RING's initial supply (INITIAL_SUPPLY) before Darwinia network mainnet release is 2 billion, after which the newly issued RING will be distributed to the validators and nominators (Staking participants).

After the Darwinia network mainnet goes onlive, the total cap of the block reward (MAX_BLOCK_REWARD_YEAR) is adjusted once a year. The block reward of year N is 1 - (99 /100)^sqrt(N) of total remaining issuable.

Total remaining issuable RING = HARD_CAP - CURRENT_SUPPLY
Supply in the next year = supply in the previous year + total actual reward in the year

he total number of HRAD_CAP for RING is 10 billion.

According to the annual block reward limit and the block interval (in seconds), you can calculate the block reward toplimit (MAX_BLOCK_REWARD) for each block of the year.

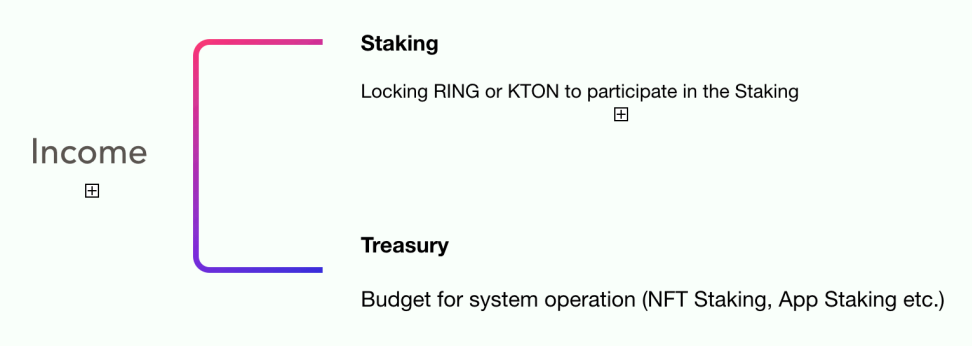
Block Reward Limit for Each Block = Total Reward Limit for the Year × Block Interval Time /Total Number of Seconds per Year (365 * 24 * 3600)

The following table shows RING's Annual inflation statistics

Total circulation	Total Remaining Issuable	Year	Issuable this year/Total remaining	Issuable this year	Inflation Rate
20	80	1	0.01	0.8	4.00%
20.8	79.2	2	0.014112789	1.11773288	5.37%
21.91773288	78.08226712	3	0.017257054	1.347469885	6.15%
23.26520276	76.73479724	4	0.0199	1.527022465	6.56%
24.79222523	75.20777477	5	0.022222592	1.671311704	6.74%
26.46353693	73.53646307	6	0.024317638	1.788233108	6.76%
28.25177004	71.74822996	7	0.02624027	1.882692906	6.66%
30.13446295	69.86553705	8	0.028026407	1.958079974	6.50%
32.09254292	67.90745708	9	0.029701	2.016919383	6.28%
34.1094623	65.8905377	10	0.031282215	2.061201934	6.04%
36.17066424	63.82933576	11	0.032783764	2.092565869	5.79%
38.26323011	61.73676989	12	0.034216302	2.112403946	5.52%
40.37563405	59.62436595	13	0.0355883	2.121929846	5.26%
42.4975639	57.5024361	14	0.036906629	2.122221074	4.99%
44.61978497	55.38021503	15	0.038176948	2.114247617	4.74%
46.73403259	53.26596741	16	0.03940399	2.098891647	4.49%
48.83292424	51.16707576	17	0.040591755	2.076961416	4.25%
50.90988565	49.09011435	18	0.041743665	2.049201292	4.03%
52.95908694	47.04091306	19	0.042862671	2.016299179	3.81%
54.97538612	45.02461388	20	0.043951341	1.978892142	3.60%

Income Distribution

The total income of Darwinia Network includes block reward and transaction fees. The transaction fees includes block fees, cross-chain staking fees, App-chain access fee and other related fees. (e.g Income from Evolution Land)



Treasury is primarily used for payment of system proposal budgets, and may include system operation proposals such as NFT mining or App mining, Polkadot slot bidding incentives, or for eco developer support.

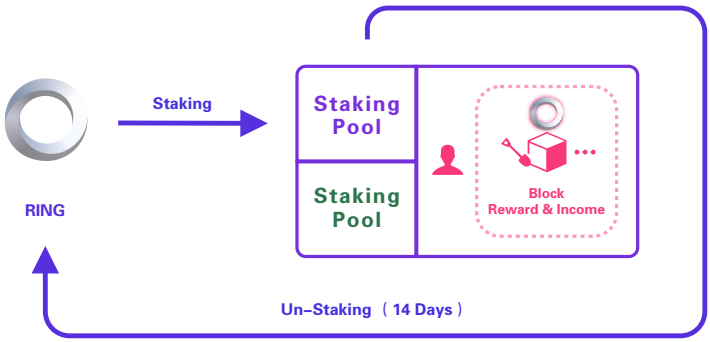
Remarks: The system Staking revenue is a percentage of the total revenue of the Darwinia Network (Y is the system parameter).

Staking

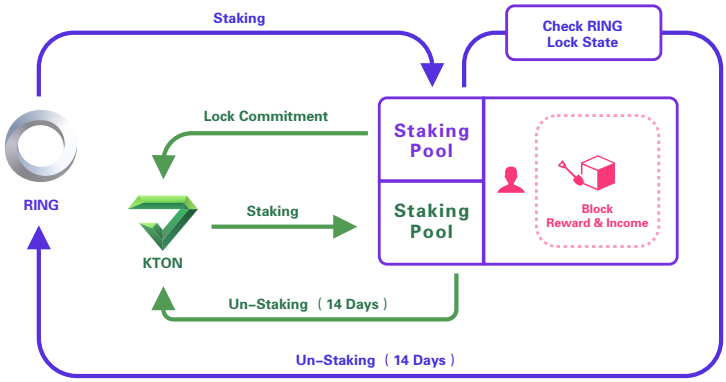
The Darwinia Network will distribute the main income as an incentive to the participants of Staking. The process of Staking can also be understood as the POS mining process, where the miner obtains Staking energy by pledging assets for POS mining.

Generally speaking, users can perform POS mining by pledge the base asset “RING”. If users starts to retrieve the RING from Staking pledge, the mining will stop, and the unpledge “RING” will take 14 days to fully arrive.

According to complexity, Staking can be divided into basic and professional versions



Basic Staking



Professional Staking

KTON

To encourage users to make long term commitments and pledge, users can choose to lock RING for 3 - 36 months in the process of Staking, and the system will offer a KTON token as reward for users participating in Staking. During the committed pledge period, users can not unlock their RING. (Unless pay triple amounts of KTON as penalty)

As a result, during RING staking process, user can choose to lock RING for a period to receive KTON. The initial supply amount of KTON should be zero, yet before Darwinia Mainnet launch, some users have already started locking their RING in Evolution Land, so there will be some KTON supply at the time of mainnet launch. The earliest design to obtain the KTON by locking the RING appears in the Gringotts of Evolution Land. The related introduction can refer to the Gringotts KTON model [5].

KTON can be pledged to receive Staking power, so as to participate POS mining as well. User may Staking via pledge KTON, if user take back their staking KTON, then related POS mining is stopped, and it takes 14 days for unpledged KTON to arrive.

Staking Hash Rate

The Staking hash rate for certain account represents the current contribution of this account, Staking hash rate can be analogized to the Hash Rate in POW. The hash rate for each account is determined by the amount of pledged RING and KTON, once unpledge, corresponding hash rate will vanish.

The Staking hash rate for an account is constantly changing with the amount of assets pledged. Staking Participant can change their voting validator without unpledge asset.

Hash Rate may plays an important role in system governance. (Note 2)

Hash Rate Percentage is the Hash Rate Proportion of one account to total Hash Rate.

Hash Rate = Total Hash Rate × Hash Rate Percentage
Hash Rate Percentage for THE account = Hash Rate Percentage(RING) + Hash Rate Percentage(KTON)

Staking benefit of THE account:

Staking benefit of THE account = (Total income of Darwinia Network × Y) × Hash Rate Percentage for THE account

Voting weight formula for THE account:

Voting weight = Total Voting weight × Hash Rate Percentage for THE account

Remark 1: Default hash rate Contribution ratio of RING is 0.5

Remark 2: Because KTONs can be sold to others, so KTON with liquidity may not fully represent long term commitments. Only pledge “assets×days” can accurately represent the commitment to Darwin’s network. .

Slash Algorithm

In order to prevent the network from validators’ attacking or unstable block validate, when the attack or error occurs, system needs to punish the validator (and the voters) by

slashing its pledged assets . The process and mechanism of the penalty is the Slash algorithm.

Since there are two different assets (RING and KTON) exists in Darwinia network, supplementary explanation of Slash algorithm is required.

The punishment related parameter in Staking system are in percentage, in the occurrences of Slashing event, assets pledged by the validator and the voters will be punished by certain percentage, no matter whether the assets are RING or KTON.

In the Staking system of Darwinia network, there are four main states for RING: account balance, in Staking, Staking lock, un-Staking. So there exists two different states for pledged RING asset: in Staking and Staking lock, and the RINGs in Staking lock may have different unlock date. In the occurrences of Slashing, it is essential to confirm the sequential and priority of RINGs that been Slashed. The Staking system will follow the order of unlocking expiration, and Slash assets with earlier expiry date first. The pledge assets that is not locked will be Slashed First, and then comes the assets that locked and with earlier expiry date.

Community Ecosystem

Protocol Researcher

The protocol and standard research's work is divided into two parts. The first part comes from the community. Darwinia Network accepts any RFC submission from the community, including new additions, improvements and modifications. These RFCs will be open to the community and fully discussion and research to reach a consensus. The second part is from the core research team, which is responsible for organizing RFCs, organizing RFC peer audits and security audits, using Darwinia Network governance models and tools for protocol governance and voting, and forming a final agreement design draft for delivery to the protocol development team.

The submission and management of RFC documents is currently carried out on Github [3] and can be accessed if you are interested.

Developer

Develop and improve Darwinia Network, Darwin AppChain and related services, and develop applications and services using the Darwinia Network and the Darwinia AppChain. Early community open source software development, especially important infrastructure software development (including network protocol design, protocol implementation, node software, wallet, browser, etc.), will be sponsored and supported by the Darwinia Network

Foundation, currently the mainly Darwinia Network open source software developer is **Itering Tech**.

In addition to software development for infrastructure, the developer community includes application developers, which can be divided into Dapp developers and Appchain developers, Evolution Land, and more.

Dapp Developer

Dapp developers include developers who develop applications based on the Darwin Web Smart Contracts module, as well as developers who develop Dapp on the public chain, such as blockchain games or Defi applications on platforms such as Ethereum, TRON or EOS. For the Dapp and game assets on the public chain, bridge parachain of Darwinia network can be connected to the Darwinia network for cross-chain transfer operations.

AppChain Developer

Application chain developers developing with the Darwinia Web Application Suite (Darwinia AppChain).

Ecosystem & Application

Open Gaming Application

We use Evolution land as an example to discuss the connection method of Darwinia Network. Evolution Land is a virtual management game based on blockchain and autonomy. Its first, second and third continents are based on Ethereum, Tron and EOS development. The way the

Evolution Land connects to the Darwinia network is as follows:

1. The first, second, and third continents, as heterogeneous other public chains, will access the Darwinia network through bridge parachain.

2. Subsequent continents will be developed based on the Darwinia AppChain and can be directly connected to the Darwinia network relay chain.

Defi Application

With the increasing amount of crypto assets, the demands of crypto related payment, lend, pledge, leverage lease are rising as well. Except of Defi application, which is the majority for now, the combination of game NFT with Defi will also have acturly demand. The requirement of NFT trading market, NFT pledge and lease are pretty landed deal.

Darwinia Fund

A non-profit open source fund established by the community to support and promote the development, construction and promotion of the early Darwinia network. [WIP]

Polkadot Ecosystem

Under Polkadot connection mode, Darwinia network will connect to polkadot parachain slot, so polkadot ecosystem is a vital part of darwinia network.

When Darwinia Network connect to the Polkadot network, according to the model of Polkadot Parachain Auction[4], Darwinia relay chain will need to lock enough DOTs to participate in the Parachain Slots bidding. Darwinia Network will design a crowdfunding lock-up mechanism to motivate Darwinia community participants to help bidding.

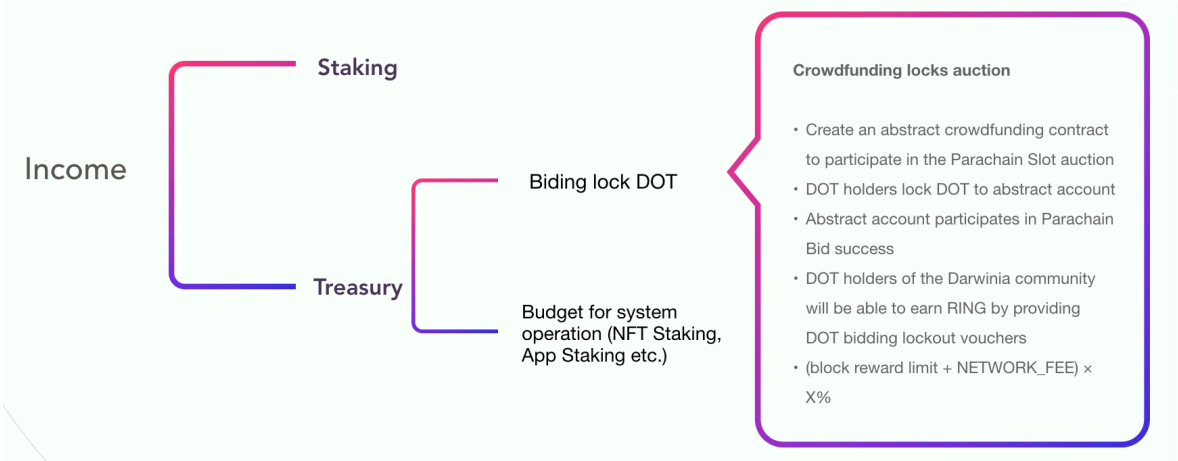
Polkadot's Parachain Slot auction allows any type of abstract account to participate in the auction, including general address accounts, smart contract accounts, and parachain accounts. This extensive abstract account support provides flexibility for participating bidders to design a variety of decentralized bidding models.

Darwinia Network will design a way for the Polkadot connection model to participate in the Parachain Slots auction through crowdfunding DOT. The crowdfunder does not need to transfer the DOT ownership, only need to lock the DOT and provide the locking credentials, and open a certain vote or bidding permissions for the Darwinia Relay Chain. DOTs participating in bidding locks are secure because the entire process is done through smart contracts (or relay chains) and no one can control these partially locked assets.

Polkadot Slot Bid Incentive Proposal

In the connection mode, Darwinia network may initial such proposal under these design, to take few budget from Treasury and make payment to those who lock their DOT and support Darwinia to its Polkadot Parachain slot bid.

When Darwinia network switch to polkadot connection mode, DOT owners in the Darwinia community may lock their token through biding lock, and receive rewards from the incentive proposal.



Node and Relay chain Validators

By participating in Staking as a validator to obtain the Staking benefits of the Darwin network by protecting the system security and validate new blocks.

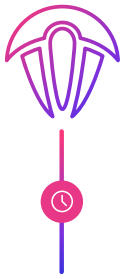
Like Polkadot's participants, Darwinia Network has nominators, collators, fishermen besides validator.

User

Users of Darwinia Networks and Darwinia AppChain related products and services.

Roadmap

2019–07 Launched



Darwinia Trilobita Testnet

2019–09

Darwinia Crayfish Testnet

2019–11

Darwinia NFT Identifiability

2019–12

Darwinia Mainnet Launch

2020 Q2

Darwinia Appchain SDK

Reference

(1) https://github.com/paritytech/substrate
(2) https://polkadot.network/PolkaDotPaper.pdf
(3) https://github.com/darwinia-network/rfcs/tree/master/zh_CN
(4) https://wiki.polkadot.network/en/latest/polkadot/learn/auction/
(5) https://forum.evolution.land/topics/55
(6) https://research.web3.foundation/en/latest/polkadot/Token%20Economics/#treasury