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Technical Concept Paper

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Overview

The purpose of this document is to evaluate LaneAxis' vision and to reverse engineer the technical requirements needed to deploy a customized blockchain-powered platform. This analysis will provide the team with a recommended system architecture along with the different components and functions required at each level of the tech stack. Ultimately, this concept paper should provide the foundation for the development of a consensus layer (database) and its integration with an application layer. In addition to the technical architecture, this report will also provide a series of market assessments and recommendations to identify the state of the industry and highlight recent successful use cases. By using these success stories as reference points, LaneAxis will be better equipped to raise capital via a feasible and attractive technology solution.

The technical architecture recommendations can be summarized into the following options:

- LaneAxis Blockchain: A proprietary blockchain based on Ethereum Geth nodes, involves bootstrapping a community of miners and network infrastructure. Current LaneAxis platform is considered to be a dApp on top of the blockchain. AXIS tokens are used as global settlement currencies in the "decentralized fedex". Miners are rewarded AXIS tokens for securing these transactions. Some of the risks associated with this solution include: educating buyers and sellers of the marketplace (carriers and shippers) in order for them to accept the payment AXIS token, depth of exchange (investors will want to see liquidity prior to engaging, and finally bootstrapping the mining operation itself.
- LaneAxis Sidechain: Consists in having two blockchain integrations. The ERC20 token (AXIS) will be deployed on the Ethereum mainchain, while the rest of the application containing frequently used smart contracts will be held in the sidechain (private Ethereum blockchain). A export/import module will be used to export the tokens generated via mining or reward smart contracts in the sidechain to ERC20 on Ethereum mainchain.

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- LaneAxis AXIS Rewards: And ERC20 contract is deployed representing AXIS tokens. Several Ethereum-based contracts are activated when users complete a specific task on the platform rewarding them with tokens. This model isn't too innovative and is not as attractive for investors.

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Glossary

- **2FA** (Two-Factor Authentication) – A method for confirming a user's claimed identity in which a user is only granted access after successfully presenting two pieces of evidence (or factors) to an authentication mechanism, usually a password and a generated one-time code.

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- **API** (Application Programming Interface) - A set of functions and procedures that enable the creation of applications to access the features or data of an operating system, application, or other service.
- **Blockchain** – A growing list of records, called blocks, which are linked using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data.
- **ECC (Elliptic-Curve Cryptography)** - An approach to public-key cryptography based on the algebraic structure of elliptic curves over finite fields. ECC requires smaller keys compared to non-EC cryptography (based on plain Galois fields) to provide equivalent security.
- **ERC20 Token** – A token designed to be used on the Ethereum blockchain that corresponds to the ERC20 standards, allowing them to be shared, exchanged for other tokens or transferred to a crypto-wallet.
- **Gas** - The execution fee for every operation made on Ethereum.
- **Geth, Parity -** Utilities that enable connection to a blockchain or creating your own blockchain.
- **Keystore File** - The file that holds encrypted information about an account on the blockchain.
- **Hash Function** - Any function that can be used to map data. The values returned by a hash function are called hash values, hash codes, digests, or simply hashes. They are utilized by various technologies including OTP implementations, file integrity checks or value checks without revealing the actual value.
- **HOTP** (HMAC-based One-time Password) – A one-time password (OTP) algorithm based on HMAC (hash-based message authentication code), which involves a cryptographic hash function and a secret cryptographic key.
- **Identity** - A user connected to the LaneAxis network to interact with service providers using his/her own key pair managed by the LaneAxis mobile app, allowing them to sign transactions on the LaneAxis blockchain.
- **KYC** (Know Your Customer) - The process of a business verifying the identity of its clients and assessing potential risks of illegal intentions for the business relationship.
- **Ledger** - The principal book or computer file for recording and totaling economic transactions (the blockchain is an example of a ledger).
- **Mainnet** - The main Ethereum network.
- **MASVS** (Mobile Application Security Verification Standard) - A standard that establishes baseline security requirements for mobile apps.

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- **Miners** - Participants of the blockchain that solve the PoW problem and add blocks to the blockchain. They usually receive rewards in cryptocurrencies for their work as an incentive to participate.
- **Node** – In the LaneAxis ecosystem, nodes are peers on the Ethereum network represented by software running on the users' machines, which connect to and interact with the LaneAxis blockchain.
- **OTP** (one-time password) - A password that is valid for only one login session or transaction.
- **OWASP** (Open Web Application Security Project) – An online community that produces freely-available articles, methodologies, documentation, tools and technologies in the field of web application security
- **PoW** (Proof of Work) – A protocol used in blockchains whose main goal is to deter cyber-attacks such as distributed denial-of-service attacks (DDoS). It tasks miners with providing solutions to difficult mathematical puzzles in order to produce new blocks and gain rewards.
- **SDK** (software development kit) - A set of software development tools that allows the creation of applications for a specific software package, software framework or hardware platform.
- **Sharding** - A type of database partitioning that separates very large databases the into smaller, faster, more easily managed parts called data shards.
- **Service Provider** - Service provider is an entity that provides services, such as a trading platform or an exchange, to a LaneAxis identity within the LaneAxis network.
- **Smart Contract** - A computer protocol intended to digitally facilitate, verify or enforce the negotiation or performance of a contract. Smart contracts allow the performance of credible transactions without third parties that are trackable and irreversible.
- **State Channel** - A two-way discussion channel between users, or between a user and a service (a machine). Messages are sent in the form of transactions, such as "I want to buy a beer for 3$" or "I want to rent this TV channel for one hour for 5$". Participants digitally sign each message in the discussion, making all transactions impossible to refute in the future.
- **UI** (User Interface) - The part of a platform/project that the users interact with.
- **Whitelist** - A group of users/addresses that are permitted to execute actions.

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Market Assessment

At the point in time when this report was developed (November 2018), the team responsible for conducting the research behind this report had identified a series of market trends in the blockchain/distributed computer industry. The following paragraph will provide a timeline of successful technology deployments that are considered to be success stories in the recent past:

- Bitcoin: Contains the Nakamoto consensus algorithm (Proof of Work). Consists of three main technologies including merkle trees, hash pointers and distributed computing. The type of transactions in this architecture only allows to transfer the native currency (Bitcoin), although messages can be encrypted within transactions. The network of distributed computers reach consensus via a byzantine fault tolerance solution (PoW). Much of the success behind this architecture is granted by the idea that the currency itself is rewarded back to miners, and the currency aims to to be fiat replacing, meaning mining can be conducted and paid locally (with different currencies) and the reward (Bitcoin) can be liquidated into cash locally too.
- LiteCoin, DogeCoin: Both architectures are considered to be Proof of Work based currencies. Forked from Bitcoin Core.
- Ripple: Not considered to be a blockchain, however has two main components that may consider it a public ledger. REST API open access allows users to publish transactions. On the other hand, servers executing these transactions are validated independently by nodes within Ripple labs, meaning it is not a blockchain or public/permissionless ledger. The aim of the currency however is to real-time settlement system. Focus is for financial institutions and private banking sector. In summary - Ripple uses a hash tree data structure rather than a blockchain and mainatians the network via an internal set of miner/validators.
- Dash (Dark Coin): First blockchain to introduce a system of “Master Nodes”, this sub-group of nodes receive client transactions and act as a governance mechanism (authority) within their network to publish a record of transactions between other master nodes. This architecture is not meant to be distributed but decentralized. Scales better than Bitcoin or any other byzantine fault tolerance (BFT) alternative given this form of node governance.
- MasterCoin (Omni Protocol): Also known as the first ICO, MasterCoin holds a similar architectural body as Bitcoin as much of the code was taken from the Bitcoin core repo. Also considered to be a fiat replacing currency, project had

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not gained much traction as the ethos was not necessarily aligned with rest of the space.

- Ethereum: Similar to Bitcoin and other BFT architectures, the distributed computing component of the chain is secured via Proof of Work, although other mechanisms have already been developed (Proof of Authority for forked or spun out private chains) and is likely to transit into Proof of Stake by 2019. In the Proof of Stake mechanism, block reward are reduced asymptotically down to zero to the point where miners receive transactions fees only. There is a governance issue at hand where many miners might want to fork Ethereum (for a 2nd time) in order to maintain the profits from the current Proof of Work mechanism (block rewards). The main innovation in Ethereum was found in the transaction type and in the database architecture of the chain. Rather than containing the proof of all previous transactions in the current block (as in the Bitcoin Architecture) the Ethereum architecture is setup to be "state machine" machine, meaning users/miners are required to scan the whole blockchain in order to output the current state of the Ethereum ledger (including ledgers; ERC20, ERC721, etc). In Ethereum, native code (soldity) can be used to program scripts under a specific address. The content within this address can be accessed via the owner of the contract (only.Owner function on solidity). In summary - Ethereum is a distributed computer that allows users to deploy and amend scripts. These scripts may contain the logic for digital scarcity, tokenized real world assets, proof of existence (receipts, invoices, merkle roots).
- Beyond Ethereum: Other blockchains have emerged after Ethereum, many of them do not include marginal improvements, however other chains have been designed to specifically tackle certain industries within the market. Cardano (identity), EOS (scalability, digital scarcity), Stellar (security tokens). Next generation: The next generation of immutable distributed virtual computers appear to not contain a blockchain architecture. Hedera Hashgraph and Dfinity, which are both considered to be highly successful cases have deployed DAGs (or Directed Acyclic Graphs) which are a separate data structure that allows for immutability and is highly scalable.

Based on the information laid out above we can obtain a series of insights that allow us to understand where the next cycle of highly adopted distributed computers may lie. The main cryptocurrencies (BTC, LTC, XRP, DASH, ETH) will continue to be used for speculative reasons throughout both bear and bull markets. Investors are still using regular price cycles in these currencies in order to nibble on liquidity relative to their position. Future investments are likely to continue down the distributed computer route rather than read only databases. On the other hand, it is likely to find

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investors participating purely for speculative currencies which are growing at a high rate. This sub-group are likely to hold the following characteristics: consolidated mining base (PoS, PoW, algorithm is not as relevant but important as miners provide liquidity to the market), consolidated user base (thousands if not hundreds of thousands), a novel innovation or improvement to the foundational blockchain technology.

Based on this analysis the team responsible for writing this report recommends the following characteristics:

- Distributed Ledger: Can be based out of a fork of an existing blockchain, likely to be Ethereum under Proof of Authority or Proof of Work. Proof of Work is much more distributed, however a network of mining nodes has to be bootstrapped and this may be considered to be a challenge. In an alternative architecture, this distributed ledger may be powered by a Proof of Work consensus mechanism in a sidechain, merkle roots may be published in a public ledger such as Ethereum on a regular basis.
- Proof of Work: In the case that the team decides to bootstrap their own network as a separate blockchain (which is not recommended given current market conditions) it is advised that a minimum of 50 nodes out to be running the consensus algorithm. This characteristic is still relevant under the side chain.
- Transaction Volume: A minimum transaction volume is necessary to create liquidity in the market,. Proprietary research conducted by the Keter R&D team shows the velocity of transaction volume (first derivative of volume growth) should be positive throughout the majority of the counting period (annual, monthly, weekly). This pattern may trend according to the specific growth cycles of each currency.
- Market liquidity: Ideally a currency or token found within a larger exchange ecosystem that provides liquidity and market depth for the digital asset. This is considered to be one of the most important characteristics of a project when investors perform their diligence.

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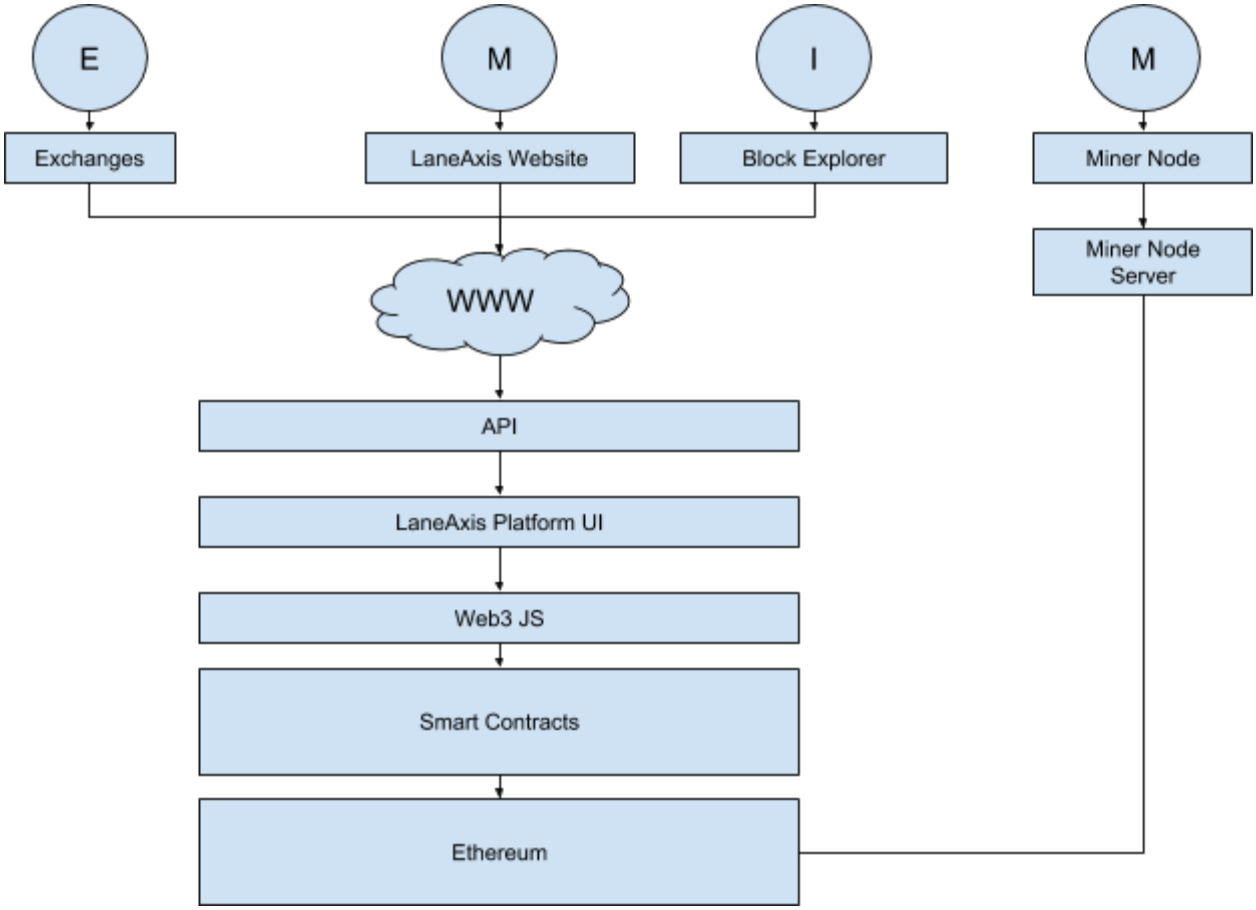
General System Architecture



LaneAxis Blockchain Integration

The LaneAxis blockchain solution incorporates 2 separates blockchains which are both based on Ethereum Geth nodes. The first blockchain will be the Ethereum mainchain and will deploy and manage the balance for an ERC20 token (AXIS token). The second blockchain will be private Ethereum blockchain (sidechain) and will be responsible for the deployment of frequently used smart contracts necessary for running the LaneAxis application. Some of these smart contracts includes: freight_transportation_contract, escrow_contract, and incentivization_contracts. The application running on the private Ethereum chain will contain a wallet and a

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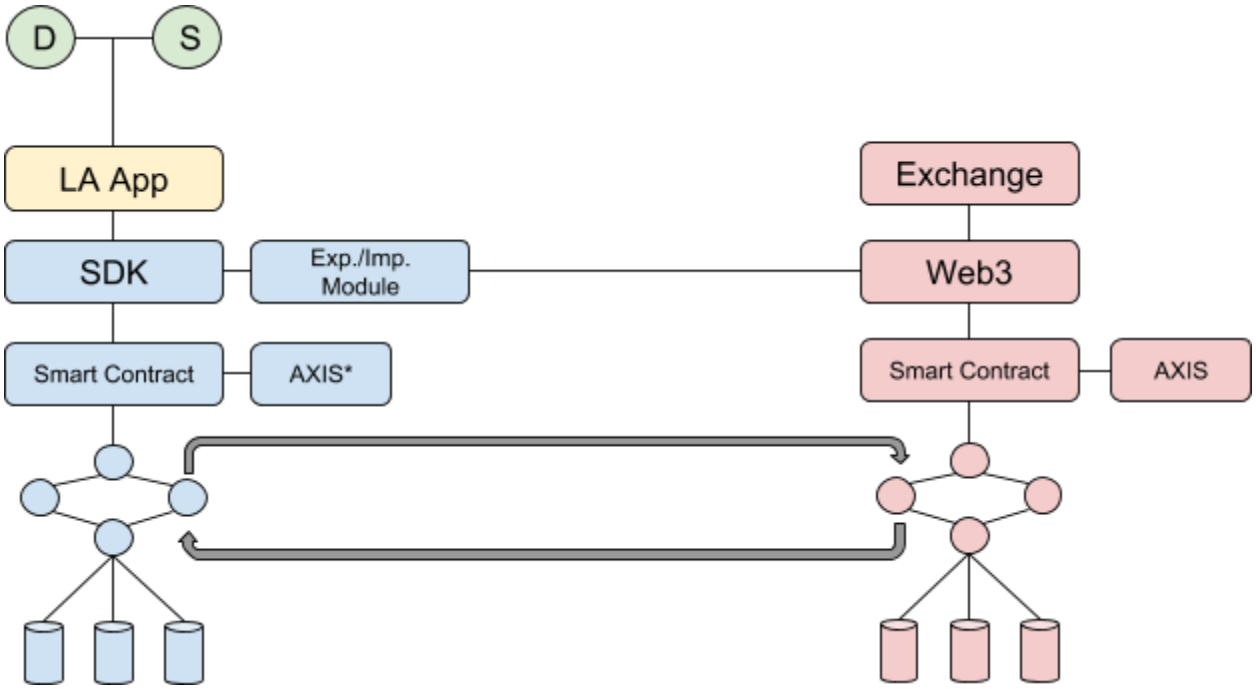
module that allows users to export their sidechain AXIS tokens into ERC20-based AXIS tokens that exist on the Ethereum mainchain. Finally, the state of the sidechain (merkle root of block) will be posted on the Ethereum blockchain periodically in order to record the state of that ledger.



Side Chain

The LaneAxis blockchain is a Geth-based Ethereum sidechain running in parallel to the Ethereum mainchain. The private Ethereum setup (sidechain) will be based on the Proof of Work (POW) consensus algorithm meaning, LaneAxis will have their own network of miners providing the computations to secure transactions on the sidechain. However, there are 2 alternatives to this architecture that are worth exploring down the line. The first alternative includes a Proof of Authority mining network (federated mining) meaning the server configuration is permission based and doesn't lead to any mining rewards. And the second alternative architecture is for the inclusion of merge mining, meaning using the same hashing power used to mine the Ethereum mainnet and apply it to mine blocks within the private sidechain (this alternative would have to be conducted under Proof of Work). Ultimately the tradeoffs are clear and it is recommended the team deduces whether the Proof of

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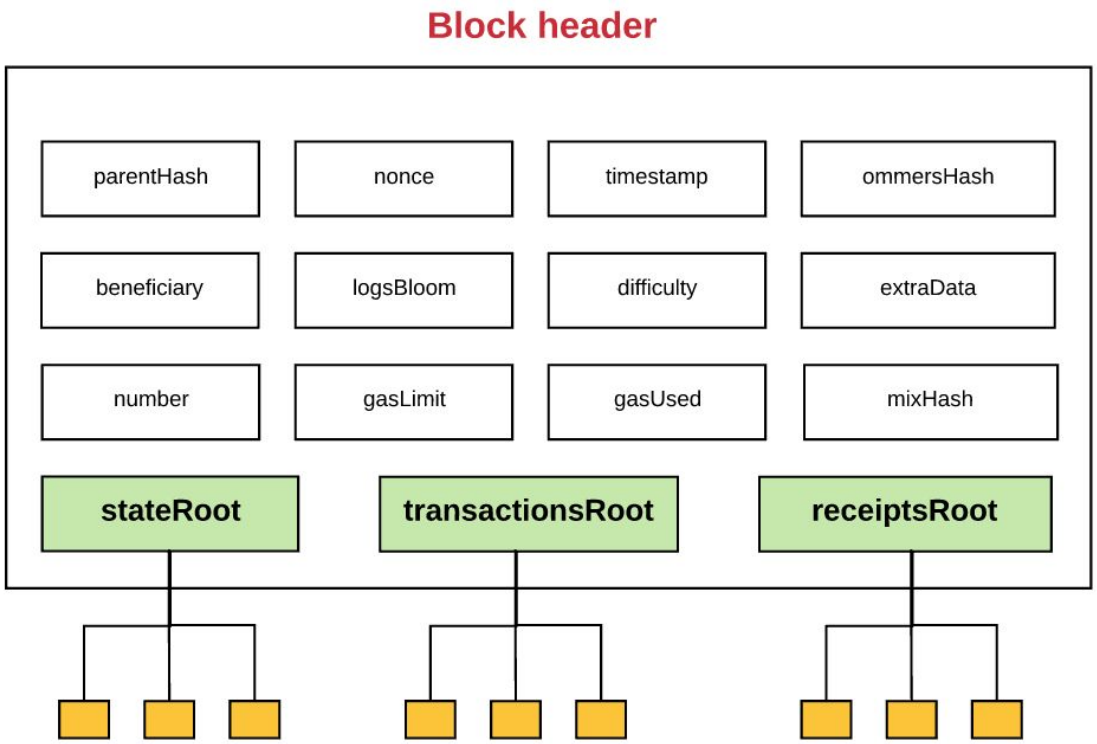
Work mining makes sense since the network of this particular blockchain will require globally executed transactions, although there might not be a great use case for a blockchain that protects transactions from adversarial events.

It is recommended that transaction types that have a high velocity (freight transportation contracts, rewards, escrow) ought to be executed within the sidechain, while an ERC20 token ought to be deployed on the Ethereum mainnet. It is also recommended that the state of the high frequency transactions ought to be recorded on the Ethereum mainchain periodically.

Ethereum Mainchain and Merkle Root Stamps

In the taxonomy of an Ethereum block header we find the following properties:



The stateRoot contains the hash of the root node of the state trie (recall how we learned that the state trie is stored in the header and makes it easy for light clients to verify anything about the state. The transationRoot is the hash of the root node of the trie that contains all transactions listed in this block. Finally, the receiptsRoot is

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the hash of the root node of the trie that contains the receipts of all transactions listed in this block. It is highly recommended that the stateRoot of the sidechain is published as a message on the Ethereum mainchain. Here are a list of important information know regarding the block header:

- parentHash: a hash of the parent block's header (this is what makes the block set a "chain")
- ommersHash: a hash of the current block's list of ommers
- beneficiary: the account address that receives the fees for mining this block
- stateRoot: the hash of the root node of the state trie (recall how we learned that the state trie is stored in the header and makes it easy for light clients to verify anything about the state)
- transactionsRoot: the hash of the root node of the trie that contains all transactions listed in this block
- receiptsRoot: the hash of the root node of the trie that contains the receipts of all transactions listed in this block
- logsBloom: a Bloom filter (data structure) that consists of log information
- difficulty: the difficulty level of this block
- number: the count of current block (the genesis block has a block number of
- zero; the block number increases by 1 for each each subsequent block)
- gasLimit: the current gas limit per block
- gasUsed: the sum of the total gas used by transactions in this block
- timestamp: the unix timestamp of this block's inception
- extraData: extra data related to this block
- mixHash: a hash that, when combined with the nonce, proves that this block has carried out enough computation
- nonce: a hash that, when combined with the mixHash, proves that this block has carried out enough computation

By publishing a periodic stateRoot of the sidechain onto the Ethereum mainchain, the project will be able to secure a record of the database in case of the event of hack or problem in the mining operation of the private chain.

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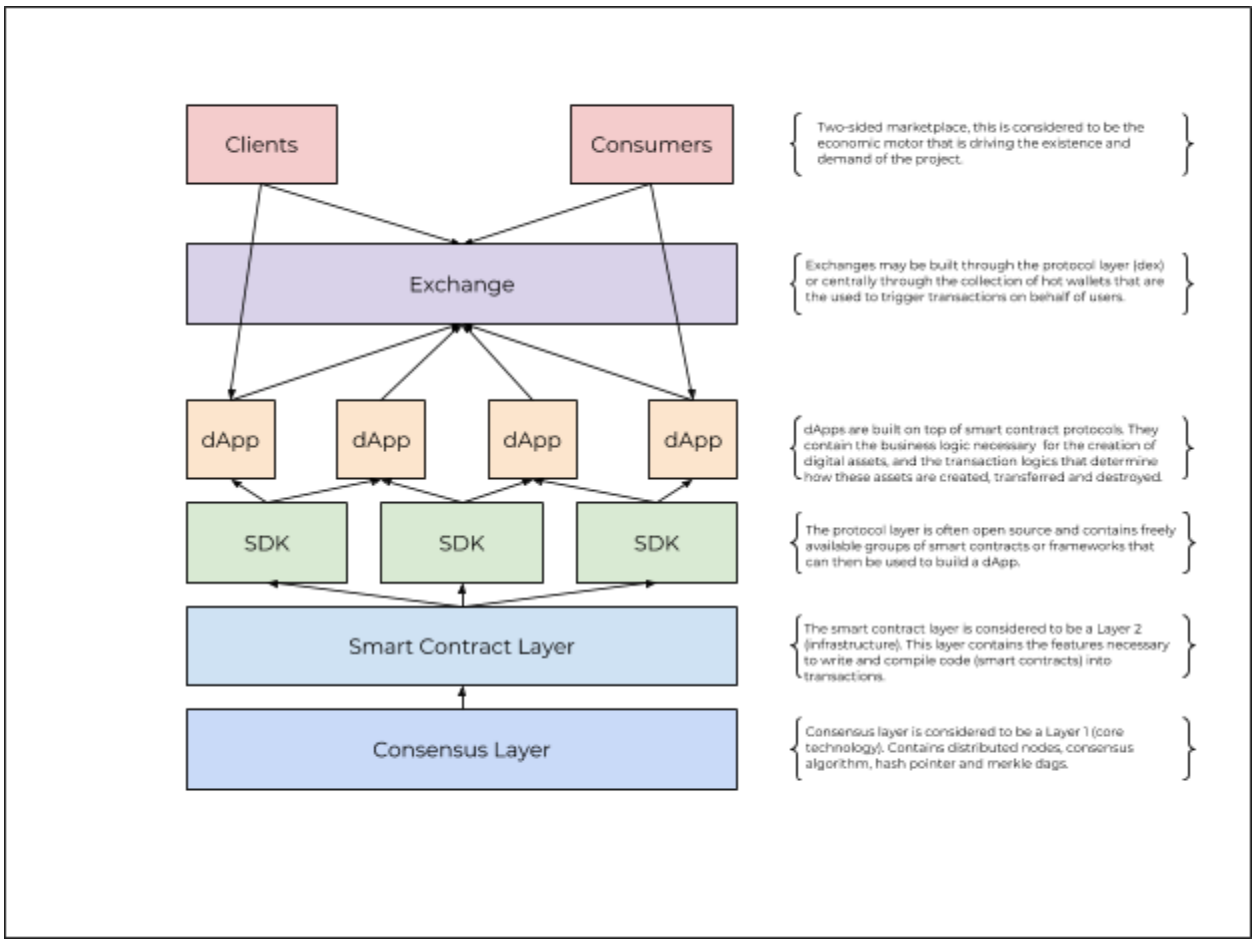
Technical Stack Overview



General Identity

Identity within the private Ethereum blockchain will be assigned by a public and private key pair. This identity will be managed internally in the LaneAxis platform. The LaneAxis platform should associate the following features internally within the database:

- Internal Wallet (Private Ethereum chain key pair)
- Ethereum ERC20 compatible key pair
- KYC Identity
- DOT Number

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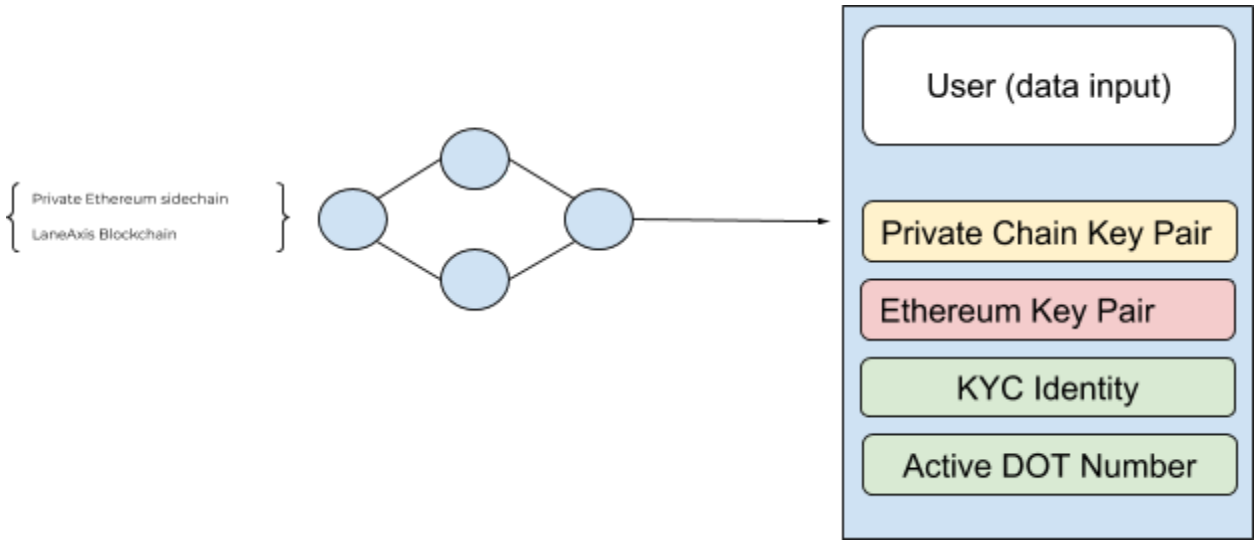
Internal Representation of Database from the LaneAxis server:



Identity will also be declared on the LaneAxis application, meaning drivers have to declare what their ERC20 compatible public key (address) is. This will help connect the tokens deployed in the sidechain as rewards to the real ERC20 AXIS tokens existing in the Ethereum main chain.

SDK

Smart Contracts Logics

2-Factor Authentication

Freight Transportation

Escrow Contract

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Cryptoeconomics

Mechanism Design within Sidechain

In the LaneAxis blockchain, there will be two types of incentives mechanisms that secure the distributed database. The first mechanism includes a block reward that is adjusted given the volume of transactions at any point in time and the velocity of records on the ledger. The second incentive mechanism consists of transaction fees only. The LaneAxis incentive mechanism algorithm implements a hybrid between both of these incentives. Miners who successfully compute verify the legitimacy of transactions submitted by client and server nodes using the merkle root are eligible for block submission. Following the submission of block dictated by the current "round robin" consensus algorithm the miner will be rewarded a block reward in addition to the mining fee. The incentive mechanism has been designed to only provide transaction fees are rewards as mining reward rates fall asymptotically to zero over time.

The reward rate "r" is represented in the equation below, where "s" dictates the current reward rate. Miners are also rewarded with "f" which is the aggregate transaction fee paid to secure the block.

$$r = \frac{s}{\sum_{i=1}^{k} \cdot d} + f$$

In this equation, the mining reward "s" falls by a factor of "e" after every mining period, assuming "t" is the current mining period and "T" is the end mining period.

$$s = s_0 \cdot e^{-\frac{t}{T}}$$

"T" represents the time at which the reward falls by a factor of "e". This reward adjustment can take place after a given number of blocks. S_0 is the initial reward rate.

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Miners will need to compute the differential equation of "s", in order to obtain the current reward rate "s". The following equation can be computed internally within the platform to obtain the floating point rate:

$$s = \frac{dS}{dt} = s_0 \cdot \frac{S_{max} - S}{S_{max} - S(t=0)}$$

S_{max} is the maximum supply of coins provided at $t = \infty$, while S($t=0$) is the initial supply of coins. The output of this equation provides the total amount of coins awarded in that specific block.

Monetary Policy

The monetary policy of the LaneAxis blockchain is determined directly by a Monetary Policy Board and indirectly by AXIS holders who are eligible to vote for Monetary Policy Board Members (TCR mechanism) and participate in other list-based referendums. This governance mechanism allows the cryptoeconomics of the platform to adapt and evolve responsibly and with the input and participation of stakeholders. The initial board, comprising a minimum of 5 members and a maximum of 9, will be appointed by LaneAxis Inc. prior to the TGE. AXIS coin holders can vote for board members on an annual basis via a governance module on the platform. The governance module can be summoned by any coin holder. A Token Curated Registry is developed . The TCR is deployed when a minimum of 3 mining nodes "second" the TCR. Once deployed, coin holders are able to stake their tokens in different smart contract addresses representing different governance decisions. Voting periods last anywhere from 12 hours to 72 hours. Ultimately, however, the objective of the TCR is to be wrapped around a seamless user interface similar to a referendum.

Monetary Policy Goals

A goal-based Monetary Policy determined and implemented by participatory board provides stability at the outset. We expect the occasional refinement of policy tools to achieve the stipulated goals, while the goals themselves remain relatively static. The two primary goals are:

1. To reward early adopter and promoters of the network through an appreciating coin;

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2. To ensure that there is sufficient liquidity of AXIS tokens on the platform exchange and public exchange

Related to 1), in the long term, token appreciation should be comparable to the underlying
growing market for real estate issuance and trading activities. As this asset
class grows, AXIS's serviceable obtainable market grows as well, leading to increased volume on the platform and consequently, increased coin usage (higher velocity).

A total of 1,500,000,000 (one billion five hundred million) coins will be generated over time. At point of mint (genesis block) only 1,000,000,000 (one billion) coins will be generated and distributed among the allocations stated in the offering below. An additional 500,000,000 (five hundred million) coins will be generated through mining and distributed as block rewards.

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Roadmap

Release Date	**Feature**
Q4 2018	• End of public sale • Start of private sale
Q1 2019	• Release of LaneAxis Web App (v.XX) • Release of technical paper (v.XX) • ERC20 AXIS token deployment
Q2 2019	• Integration of token and reward smart contract within current LaneAxis platform • Start of Professional Driver Network Campaign
Q3 2019	• Integration of 2FA, freight transportation and escrow smart contracts • Release of LaneAxis Blockchain-integrated Web App

References

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Appendix

Feature	**Description**
Incentive Layer	• Layer designed to increase the velocity/usage of a token • Includes rewards and penalties • This layer could include alliances/ strategic partnerships
Legal Agreement	• Contracts that stipulate rights and obligations of users/providers • Services agreements • Insurance contracts • Escrow payment systems

Tokenized Assets	1. Physical assets
	  • Ex. real estate tokenized asset
	2. Digital assets
	  • Internet, electricity, bandwidth

Financial Instruments	• Dividend streams • “Shares” • Currency • Loans
Governance	• DAOs • Monetary policy ○ To reward early adopter and promoters of the network through an appreciating token;

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	○ To ensure that there is sufficient liquidity on the Platform and exchange to facilitate usage for the Platform
Utility Tokens	● Platform wide gift-cards ● The right to use platform ● Unit of exchange within the platform