

Kalima

Blockchain & IoT
Notarize and Monetize

WHITE PAPER

Kalima Vision

The rapid transition from Web2 to Web3 is replacing centralized infrastructure and applications with decentralized infrastructures and dApps (decentralized applications). By 2025, 80% of data processing and analysis will take place in smart connected objects, such as vehicles, gateways, manufacturing robots, and computing facilities.

Whether it is for smart cities, supply chain, healthcare, or the energy sector, networks of connected devices will be used to collect, manage and analyze data, creating tremendous value for IoT and Big Data applications.

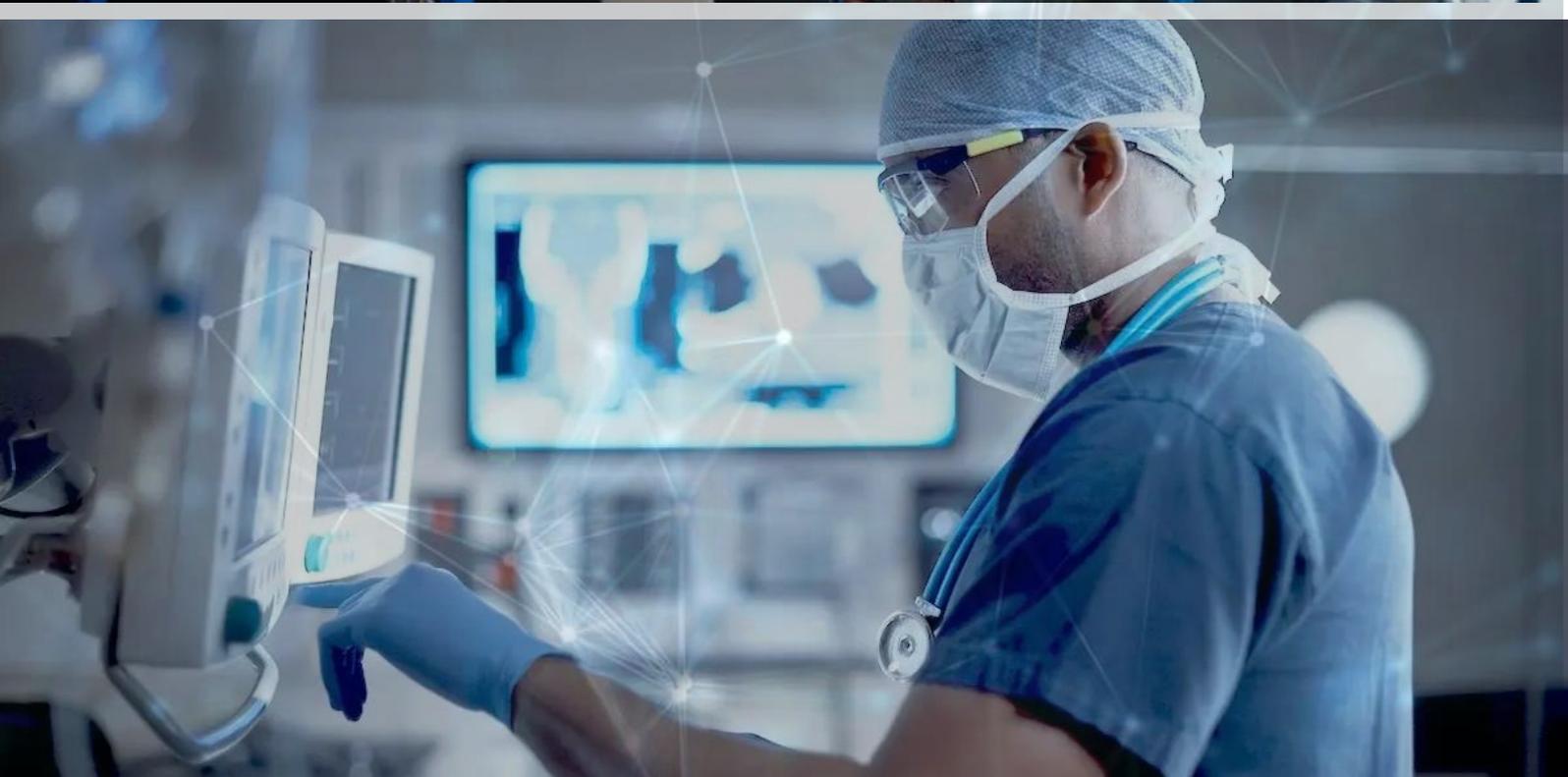
Kalima's goal is to provide a blockchain infrastructure to enterprises which will allow them notarize, tokenize and monetize data.

As infrastructure providers, it is paramount for Kalima to give absolute freedom, flexibility, and independent governance capabilities to those building on the network. Kalima being fast, cost-effective, low energy consumption, and highly scalable, users will be able to tailor our solution to specific needs, creating, expanding and improving their business models.

The Kalima protocol ensures the integrity of the data transmission and the immutability of the data storage and the possibility to monetize the data collected.

The Kalima protocol is particularly well designed for industries and companies using IoT data collection and storage with edge computing facilitated by client-side smart contracts.

André Charles Legendre
CEO of Kalima



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Kalima Blockchain

Everyday, massive amounts of sensitive data are collected and transmitted by IoT, Internet of Things, in the major industries.

Smart city, supply chain, healthcare industry, automotive industry... all these sectors use connected devices networks to collect, manage and analyse their data, it's the IoT.

Kalima was built to secure, facilitate and accelerate the data collection, transmission and storage of the industries using IoT systems.

Kalima Blockchain ensures the integrity of the data transmission and the immutability of the data storage and the possibility to monetize the data collected.

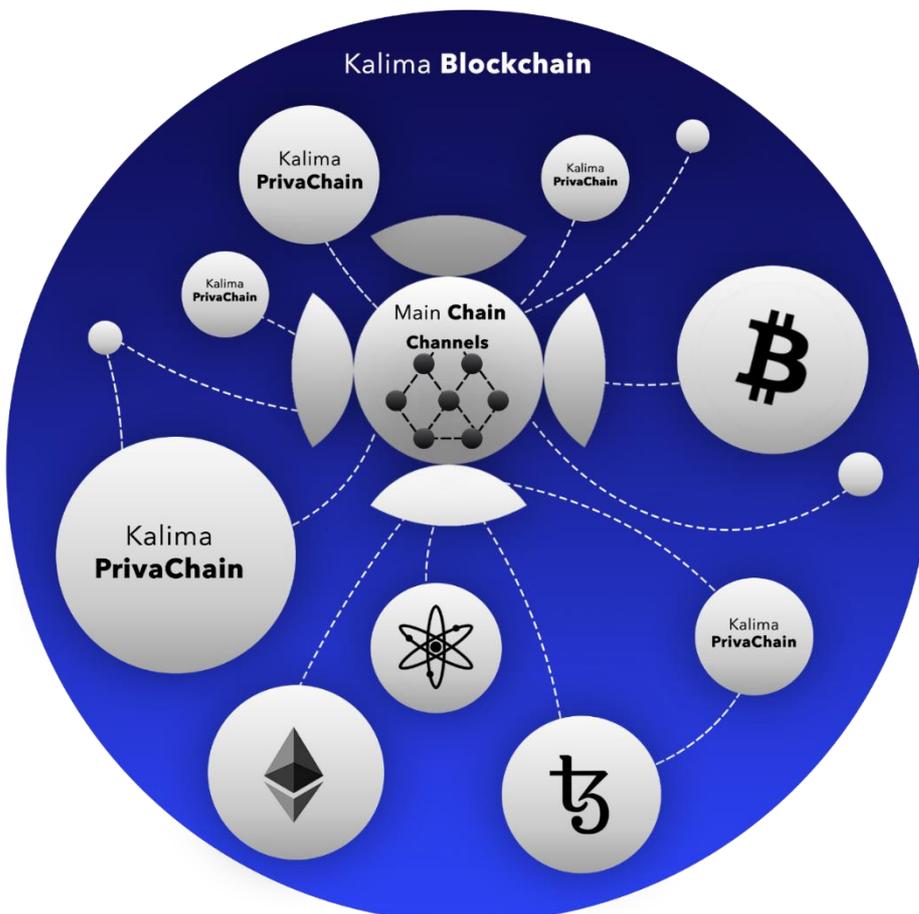
KALIMA ECOSYSTEM : A NETWORK OF BLOCKCHAIN

Kalima Blockchain is an ecosystem composed of the **Kalima MainChain** and a decentralized network of **independent permissioned blockchains** called **Kalima PrivaChains**. It is a third generation blockchain, proposing a network of blockchains to its users as a new paradigm to achieve decentralization, independence and scalability.

The **Kalima MainChain** is a network of blockchains called **“Channels”**.

Each **Kalima PrivaChain** is independent with **its own governance and has the option to connect** with other Kalima PrivaChains, or with public blockchains such as Tezos, Lightning network and soon Polygon.

Kalima’s network of blockchains is optimal for developers and businesses to adopt blockchain technology at a large scale. The fact Blockchains on the **Kalima Ecosystem** are **permissioned blockchain**, where only predetermined nodes can see the ledger and participate in the consensus, compliments the modular aspect with independent data governance, so that each PrivaChain is fully controlled by its owners.



The multichain approach aims to solve transactions speed issues and bring smart contract on the edge for blockchains.

This opens an all-new world of possibilities for combining blockchain and IoT.

ENTERPRISE DATA GOVERNANCE SOLUTION

Designed for enterprises & IoT

Kalima was built to notarize, tokenize and monetize data for enterprises including IoT systems.

Thanks to the modularity of the Kalima protocol, the PrivaChain building process is fit for an independent notarization, tokenization and monetization of data for any enterprises.

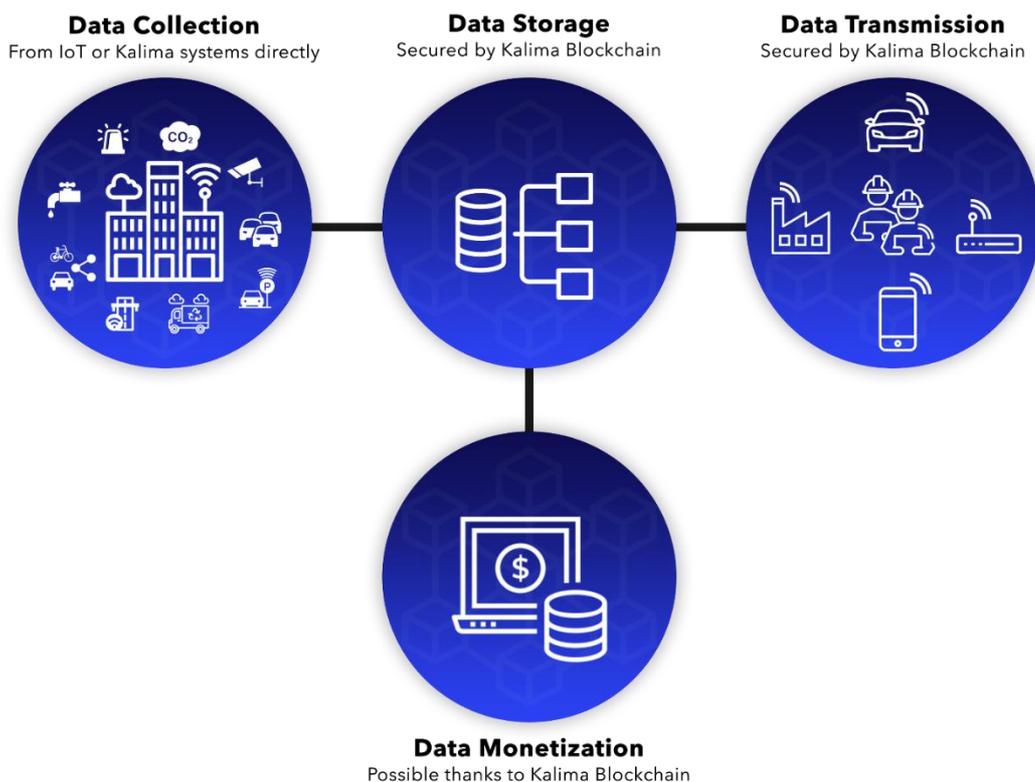
Examples of Kalima blockchain use case :

1. An alarm is triggered on a nuclear power plant which has its own Kalima PrivaChain

1. Data is immediately collected from the sensors and secured on the PrivaChain.
2. The data is quickly transmitted to a client nodes connected to the alarm, allowing a very rapid processing thanks to Kalima's low latency.
3. All the crucial data is secured end-to-end by Kalima.

2. A smart building owner wants to monetize its data thanks to Kalima

1. The building is equipped with gateways collecting environmental (or other) data.
2. The connected gateways notarize the data to the PrivaChain.
3. From here the company can tokenize and monetize its data via an oracle, independently or using the Kalima Marketplace, all while using its proprietary token or the KLV, Kalima's native token



KALIMA IS CURRENTLY THE MOST POWERFUL IOT BLOCKCHAIN



Mature & Scalable

Kalima blockchain is already used and approved by many industries since few years.



Client Side Smart Contract

Guarantees more scalability, safety and freedom to the parallel chains.



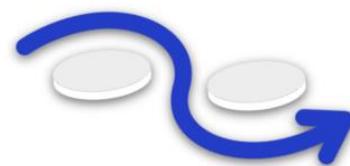
Fast & Secured

Optimized to reduce delay.
Latency lower than 1s.
1000 tx / second / blockchain.



Low Energy

Memcached, heartbeat, a unique tx/block are developed to reduce energy consumption.



PrivaChains

Kalima Ecosystem is composed of independent public chains and private chains, the PrivaChains.

KALIMA PROTOCOL

An ecosystem of decentralized permissioned blockchains

Kalima Blockchain has been **designed from scratch to meet the requirements of modern data**, including data from the Internet of Things.

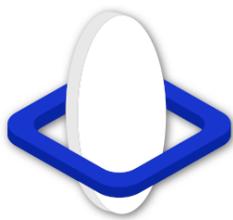
Kalima provides its users with the unique feature of **client-side smart contracts**, enabling its users to independently customize the smart contract models governing their PrivaChains, with the opportunity of integrating AI models within smart contracts.

Kalima Blockchain's **low latency** enables real time data transactions, all the while having an exceptionally **low environmental impact**, with a **very low transaction cost**.

Possessing a very small memory and CPU footprint, **Kalima can be embedded in small IoT devices**. This entails that **Kalima Smart Contracts are executed at the edge**, where the majority data is generated, limiting data clustering and improving scalability. Kalima acts as a **second layer blockchain for Tezos, Lightning network**, and soon Polygon.

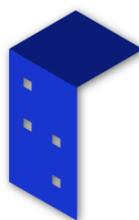
Kalima Blockchain provides data lakes which expose authorized data from one or several blockchains to run different types of analytics, dashboards, visualizations, statistics, big data processing or machine learning to have a clear vision on your data.

Kalima client nodes can run in mobile device (iOS/Android) and in small form factor IoT gateways.



Embedded

Embedded Kalima Blockchain in small IoT devices for an end-to-end blockchain communication.



Open SDK

Allows developers to build Dapps in simple languages: Java, C#, C, Java Script, Python...



Multichain

Kalima Blockchain is interconnected with major blockchains: Tezos, Ethereum, Bitcoin, Cosmos.

Build a decentralized IoT network with gateways powered by Kalima Blockchain

Kalima Blockchain is installed on IoT gateways including LoRaWAN gateways around the world to create a new decentralized IoT network providing real world qualified data to the Kalima ecosystem.

Join Kalima and take part in this new decentralized IoT network to provide and monetize your data to the world.



Use Cases & DApps

The fund raised by the ICO will allow Kalima to recruit and assist developers, creators and companies around the world to develop their own DApps on Kalima, thereby contributing to the growth of the Kalima ecosystem.

To launch and boost this ecosystem Kalima built three companies in charge of creating sector-based DApps:

Kalima Inc in the United States, which will develop Dapps in the energy, automotive, industry 4.0 and Food&Beverage sectors.

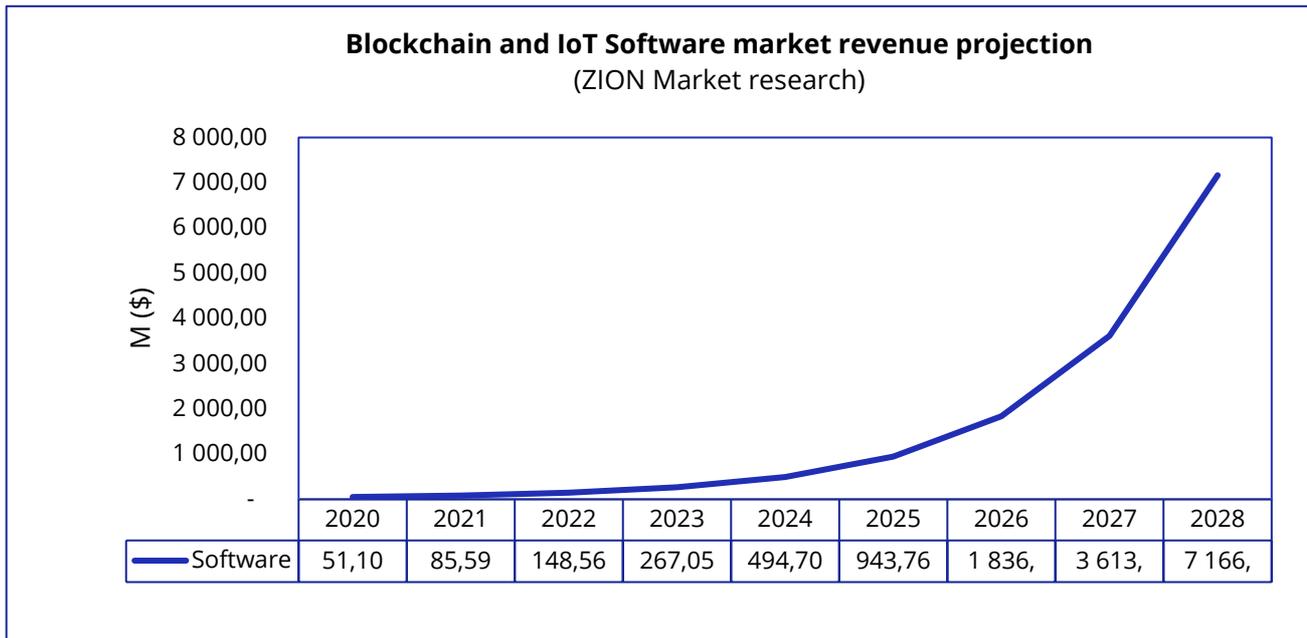
Kalima Middle East, which will take care of developing Dapps in the nuclear and oil industries.

Kalima Systems in Europe, which will develop Dapps for the new economy, the luxury sector and smart cities.

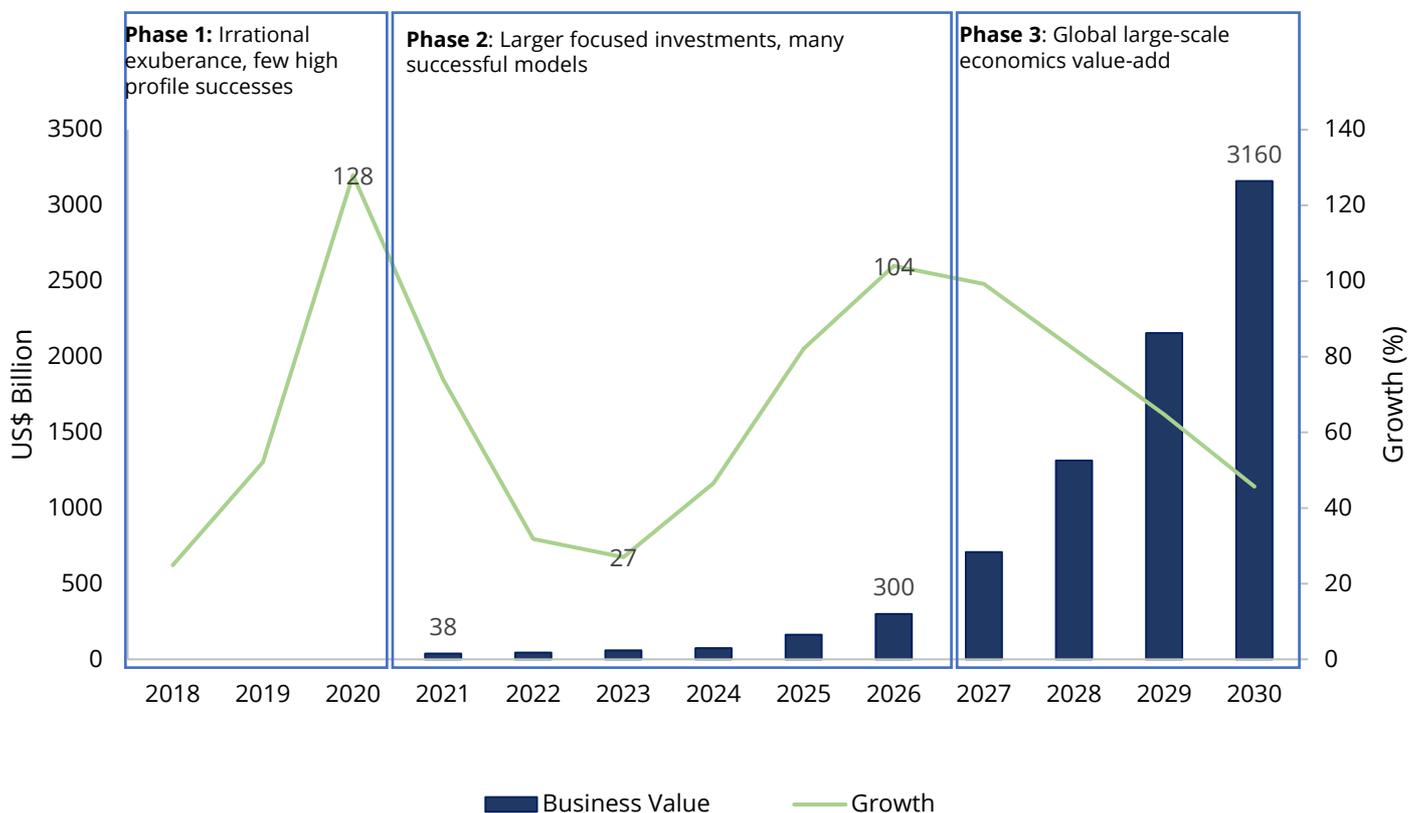
BLOCKCHAIN FOR IOT & ENTERPRISES MARKET PROJECTION

"In terms of revenue, the global demand for Blockchain IoT market stood at USD 62.39 Million in 2019 is expected to reach USD 14,165.87 Million in 2028 at a CAGR of 86.5% between 2020 and 2028."

Zion Market Research



Blockchain for enterprise, 2018-2030
(Gartner)



WHERE DAPPS CAN TAKE ADVANTAGE OF KALIMA CLIENT-SIDE SMART CONTRACTS

Kalima's functionalities allow developers to create dApps dedicated to Enterprise including IoT applications in **a multitude of sectors**.

Digital passport

A digital passport of your equipment is primarily an authenticity certificate or NFT, completed by a temper proof and secure storage of all data history of your equipment. There are digital passport applications in the Healthcare, Pharmaceutical, Luxury, Building, City, Aggrotech, Food and Beverage industries.

Digital twin

A digital twin of your equipment gives you a real time image of your equipment, allowing virtual product and asset manipulation. Applications exist in Supply Chain, Healthcare, Infrastructures, Insurances, Building, City, Aggrotech and smart economy industries.

Pay per use, utility token

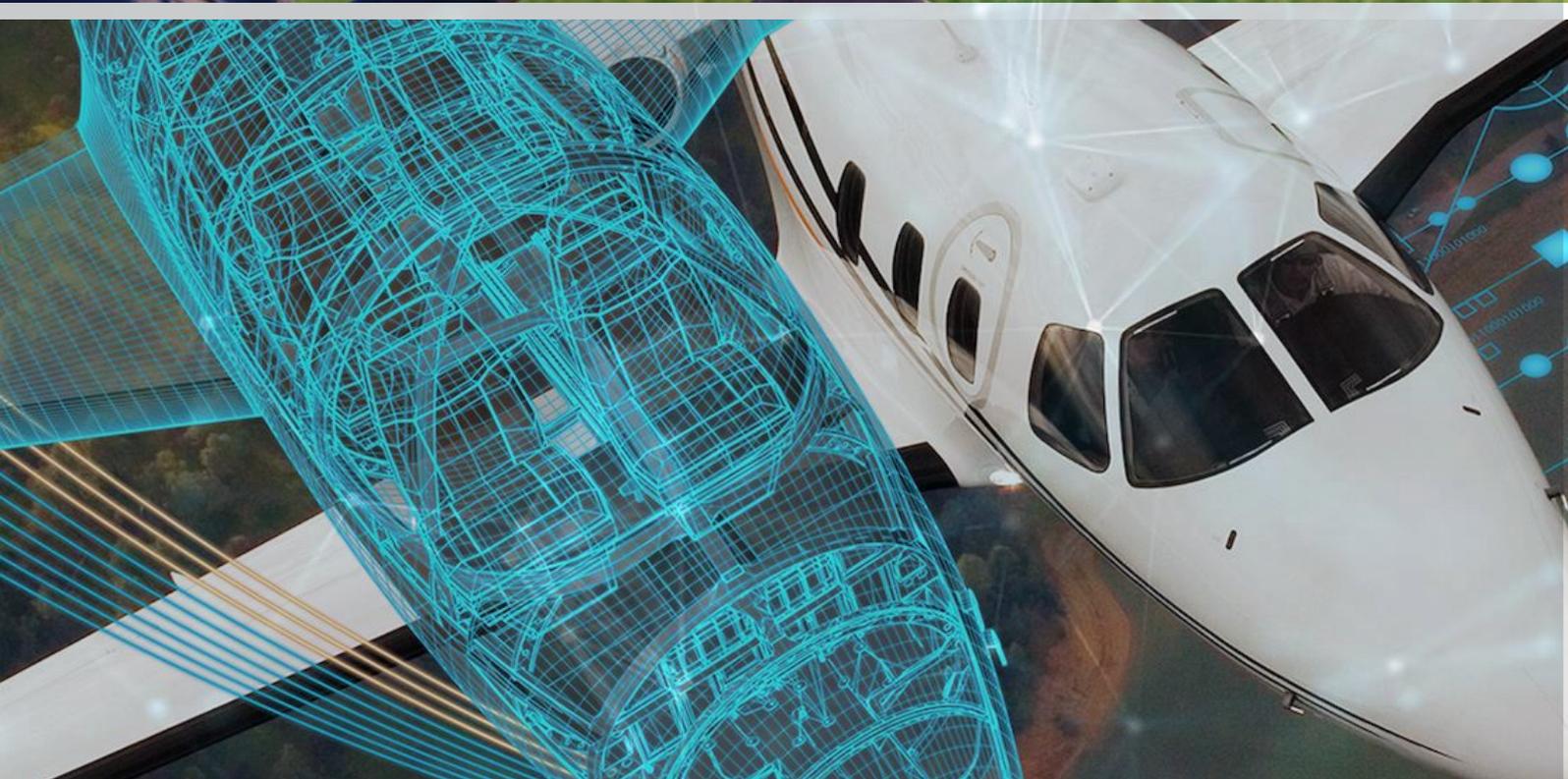
Manufacturers and Users of machines receive transparent information through Kalima to allow pay per use. Use measurement is translated in utility token quantity.

Asset tokenization

Asset tokenization opens doors to many new business models, with asset tokenization platforms bringing together sellers and buyers. Arts, Movies, Luxury, Metaverse, Infrastructures, Real Estate, new mobility and smart economy industries will all be heavily influenced by asset tokenization.

Payment token

Smart rewarding systems and monetization in P2P applications are paramount to creating value within the ecosystem. Payment tokenization is now synonymous with ease of use, trust and security, it being one of the best data protection methods that can be integrated into the different payment ecosystems. The benefits it brings to sellers and consumers have enabled it to spread quickly with low transaction costs.



A NEW POSSIBILITY TO MONETIZE DATA

Kalima's goal is to become the standard for Blockchain Enterprise applications, its protocol facilitate data's notarization, tokenization, and monetization.

Kalima empowers enterprises and developers to build the next generation of sustainable blockchain applications building bridges between the physical and the digital world. Kalima client nodes can run in mobile devices (Android and iOS) and in small form factor IoT devices or gateways.

Kalima provides real time data for a distinguishingly low environmental impact along with a very low transaction cost.

TOKENIZATION : AN OPPORTUNITY FOR ENTERPRISES

Kalima wants to help businesses and developers create their own token designed for their business model inspired by their ideas.

Kalima will allow to deploy your own custom token to monetize your business models converting physical data into a liquid token tradable in the community. All smart contracts created by the community of developers will use the technical standard token form of Kalima Ecosystem known as "KL20". This standard defines a common list of rules for all Kalima tokens such as the name, symbol supply and how transactions are approved and how they can be transferred.

NFTs ON KALIMA ECOSYSTEM

Kalima will provide tools to create NFTs and build unique digital assets that represent a proof of ownership. From art and digital collectibles to real estate, NFTs can extend physical assets.



BUILDING DAPPS ON KALIMA ECOSYSTEM

Giving you the tools you need to build your DApps on Kalima Ecosystem

OPEN SDK USING STANDARD LANGUAGES

The Kalima SDK is the tool to build and test DApps on the Kalima ecosystem. Kalima SDK uses standard languages Java, C#, C, JavaScript, Python and is compatible with Linux, Windows, Android, iOS and Mac OS.

Multichain

Kalima has multichain capabilities with Tezos and Bitcoin (through the Lightning network) and soon Ethereum (through Polygon) to offer a hybrid private/public blockchain solution.



TOKENIZATION PLATFORM

The Tokenization platform is our tool to deploy your own token on your Kalima Privachain. This will help entrepreneurs to develop new business models and financing methods by creating custom token dedicated to their own project.

DEPLOY YOUR OWN KALIMA PRIVACHAIN

Launch your own Privachain quickly and easily for a low cost. Build a next generation multichain network scalable for business and industrial applications.

CREATE YOUR OWN GOVERNANCE FOR YOUR NETWORK

You have full control on your governance choices.

BRIDGE (OR NOT) WITH OTHER BLOCKCHAINS

You can connect with other galaxies of blockchain and public blockchains. Bring network together and create value with interconnection.

KALIMA API: APPLICATION PROGRAMMING INTERFACE

Kalima, APIs are designed to be extremely usable, so that a relatively unskilled developer can write code on top of Kalima Blockchain without too much trouble.

API are open source to warranty the openness of the project. Core of Kalima technology source code is available only to "Consortium Members" now as a way to protect against uncontrolled forks which could complexify the governance and create security issues, but its governance, "Kalima Blockchain Consortium", could change this in the future.

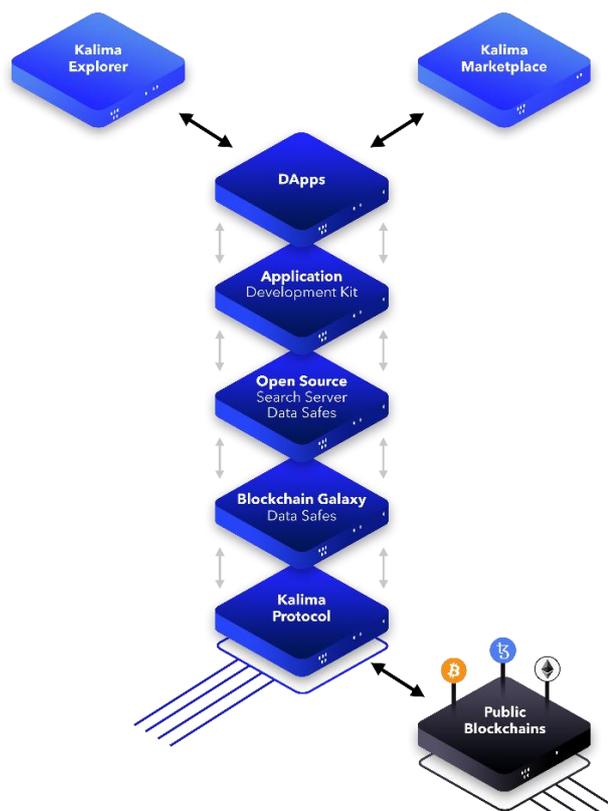
DAPPS STORE AND ECOSYSTEM PRINCIPLES

The Kalima ecosystem aims to enable the development of multiple dApps. Each developer can use the Kalima tools to develop their application based on a Kalima Privachain, interacting or not with Tezos, Lightning network and Polygon.

KALIMA MARKETPLACE

DApps developed on the Kalima ecosystem can be published on the Kalima marketplace to make them available to the community. This Marketplace will be used to browse through the dApps created by Kalima developers.

Creators of dApps can create their own economic model; they have the choice of offering free or paid services.



Tokenomics

To power this ecosystem, we designed the Kalima KLX token. This token is the native currency of the Kalima ecosystem and can be considered as the cryptographic fuel of the ecosystem. It is the key for developers, companies and investors to build and participate in project development and funding of dApps on the ecosystem.

The KLX token will be used on the Kalima Store Marketplace to use dApps and purchase community-developed services.

Users will be able to transfer their KLX with Kalima's mobile payment apps and exchange them with Tez, BTC and ETH. KLX holders will have active participation in the community by being able to participate in project development, purchase services and vote for project funding.

TOKENONMICS – TOKEN ALLOCATION AND VESTING

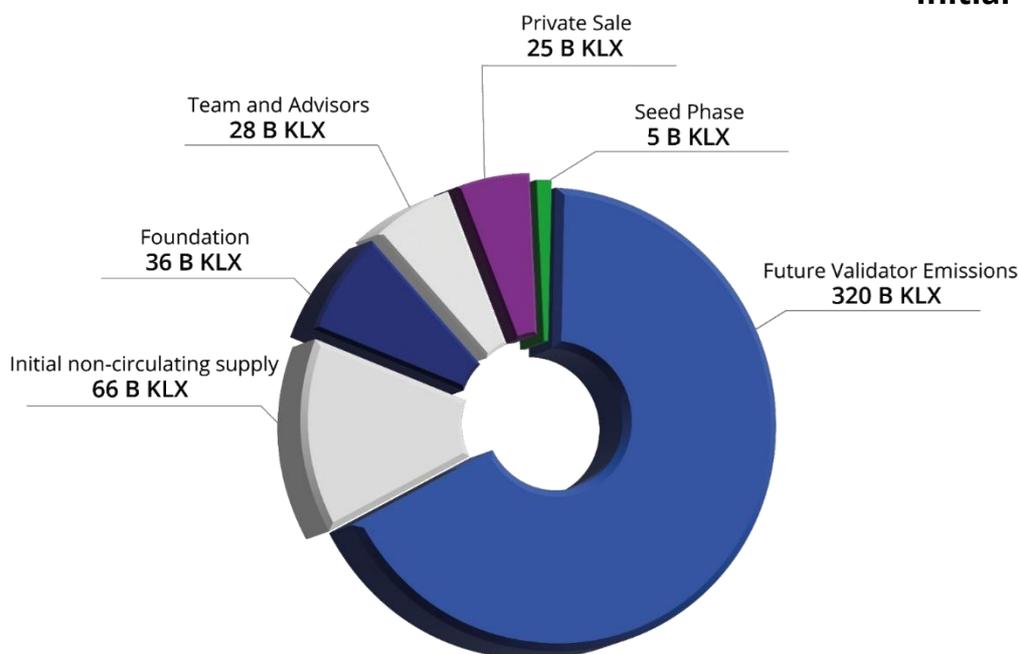
The Kalima token, named **KLX**, is the backbone of the network. The KLX is the currency used to monetize Dapps built on the Kalima network and to pay transaction fees. The KLX will first be an ERC20 Token and will later become a native KL20 token once bridged with the Kalima MainChain.

What is the token allocation for Kalima (KLX)?

Total supply KLX Allocation

Total Supply : 480.000.000.000 KLX

Initial Supply : 160.000.000.000 KLX



Initial Token allocation : First 160.000.000.000 KLX

Allocation	KLX	Vesting
Seed Phase	5.000.000.000	18 Months
Private Sale	25.000.000.000	18 Months
Initial non-circulating supply	66.000.000.000	Progressive release
Team	19.800.000.000	24 Months of Vesting with 12 Months of Cliff
Advisors	8.200.000.000	18 Months of Vesting with 6 Months of cliff
Foundation	36.000.000.000	Managed by the DAO

TOKENOMICS

KLX – Kalima DAO

Kalima aims to govern its ecosystem under the form of a DAO, a blockchain-governed organization working towards making Kalima function and evolve optimally, with the KLX as its utility token.

The Kalima DAO will enable like-minded people to globally manage the KLX's tokenomics with trust given via Kalima's blockchain.

KLX – Foundation

KLX tokens allocated to the foundation are used to sustainably deploy the resources to support the long-term success of the KLX.

The objective of the foundation is to protect holders of the KLX and ensure that the independent organizations and developers on the Kalima ecosystem can get resources to build on Kalima and develop the ecosystems.

These tokens will be used to provide grants and manage the burn of the KLX.

What is the KLX Supply Release Schedule?

The KLX will reach its total supply of 480,000,000,000 through the years via two means:

The **Initial Supply Release**, and **Future Validator Emissions**.

Within the Initial Supply, there will be a circulating supply and a non-circulating supply :

- **The Circulating Supply** is the amount of KLX that is currently circulating across CEXes, DEXes and user wallets, and includes both staked KLX, and unstaked KLX.
- **Non-circulating Supply** takes two main forms. It can either be KLX that is locked in a stake account (investment in KLX, foundation grants), or KLX that is also kept in stake accounts but is not locked.

With time, the non-circulating supply will be released and counted as circulating supply.

TOKENOMICS – Initial supply

Initial Supply Release Schedule

Initial Supply Release : 160 000 000 000 KLX

As the name indicates, there will be an initial number of KLX that will be put into circulation, and another that is considered non-circulating

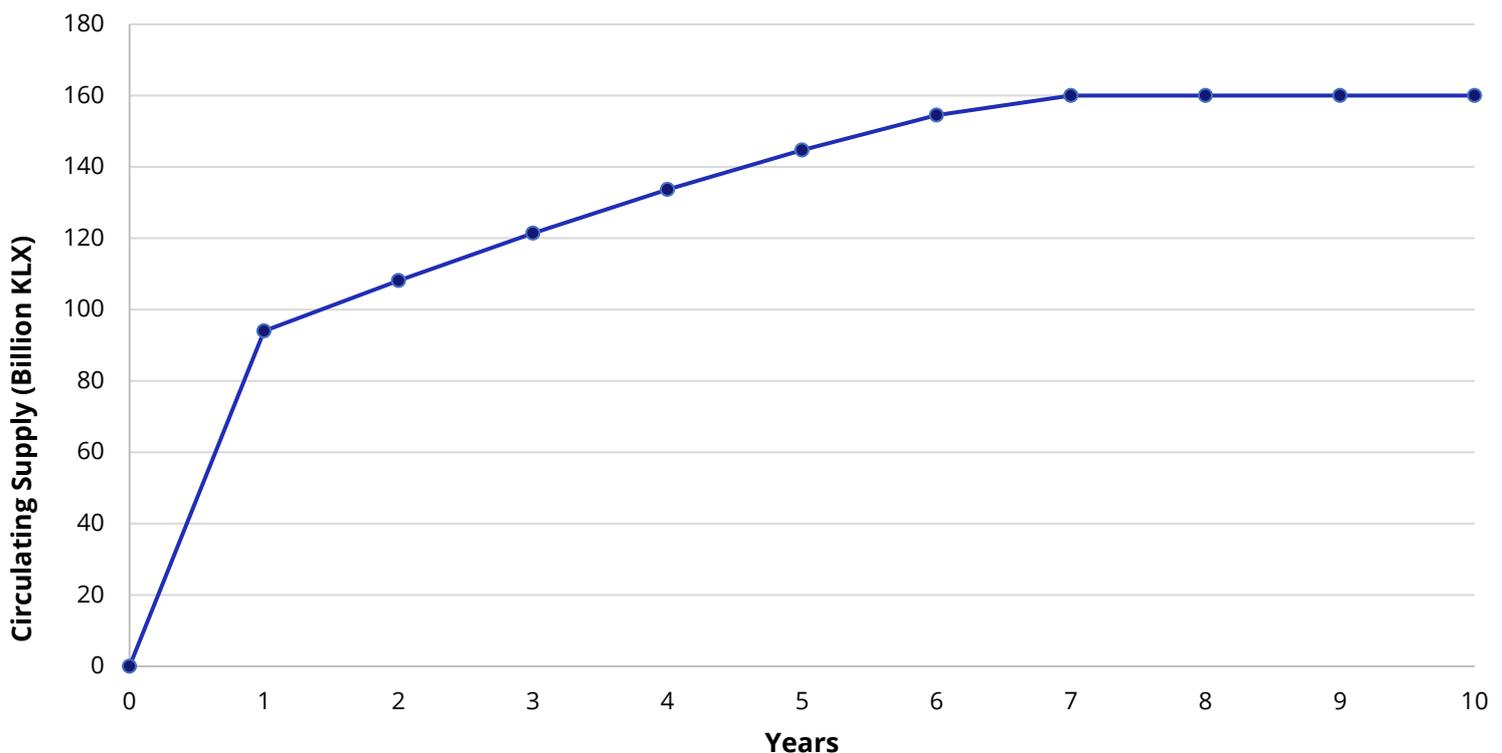
1. The Initial Circulating Supply : 94 000 000 000 KLX

- Team and Advisors : 28 000 000 000 KLX
- Seed and Private Sales : 30 000 000 000 KLX
- Foundation : 36 000 000 000 KLX

2. The Initial Non-circulating Supply : 66 000 000 000 KLX

The Kalima DAO will release the non-circulating supply within 6 to 7 years, according to its Initial Supply Release model. This model will put in circulation an initial 14.1 billion KLX (15%) from the non-circulating supply, with this number decreasing by 18% every year, until all the non-circulating supply is in put into circulation.

Initial Supply Release Schedule



The Kalima DAO will determine within a certain margin the yearly release of supply, depending on the different market conditions, for the benefit of KLX holders. This means that the Initial Supply Release Schedule will follow closely the shown trend, reaching the hard cap of 160 000 000 000 KLX around the given timeline.

TOKENOMICS – Future validator emissions

Future Validator emissions release Schedule

Future Validator Emissions : 320 000 000 000 KLX

As the Kalima Protocol enables high scalability for its ecosystem, its tokenomics takes into account the potential for a high number of deployed PrivaChains.

With each PrivaChain requiring multiple Validator and Master nodes, a planned 320 billion KLX will count as Future Validator Emissions for the rewarding of Validators.

Validators, including Master nodes will be rewarded in KLX for every transactions they validate in the network. Validation rewards will be divided by 2 after every halving, occurring every time 16 billion KLX tokens are emitted, up until the maximum limit of 480 billion KLX is reached.

At the time of the KLX launch, the reward per validated block will be of 10 KLX. The first halving will take place after the emission of 16 billion KLX tokens, whereby the reward per bloc will be divided by 2 and become 5 KLX per bloc.

GOVERNANCE

- **Master Nodes** : Nodes in charge of validating and coordinating the validation of transactions
- **Validation nodes** : Nodes elected to validate and timestamp transactions

The KLX tokens are stored in the “Kalima MainChain”, a network of “Channels”, each Channel being a blockchain. The MainChain is managed by members of the consortium. For the beginning of the project there will be 5 members within the consortium. Each member of the Kalima consortium will have the option of owning a master node. Each Channel in the MainChain requires a minimum of 50 validators with at least 5 master nodes for the MainChain. Privachains require 5 master nodes.

Rewards for Kalima MainChain validators

Validators, including master nodes will be rewarded in KLX for every transactions they validate in the network. Validation rewards will be divided by 2 after every halving, occurring every time 16 billion KLX tokens are emitted, up until the maximum limit of 480 billion KLX is reached.

At the time of the KLX launch, the reward per validated block will be of 10 KLX. The first halving will take place after the emission of 16 billion KLX tokens, whereby the reward per bloc will be divided by 2 and become 5 KLX per bloc.

Delegates

Members of the ecosystems can candidate as a validator or can delegate their vote by pooling their tokens into a staking pool and linking those to a candidate. Holders do not physically transfer their tokens to another wallet, but instead stake the tokens in a staking pool with a minimum lock-up period of 1 month.

Elected candidates (validators) will receive the transaction fees from the validated block, and that reward is then shared with users who pooled their tokens in the successful delegate’s pool. The more you stake, the higher the share of the block reward you receive. The rewards are shared proportionally based on each user’s stake. For example, if your stake represents 10% of the total staking balance, you will receive 10% of the block reward.

DIFFERENT TYPES OF NODES

Kalima ecosystem consists of 5 different types of nodes

1. Master Nodes (full nodes)

Master nodes are the main element in charge of validating transactions in the Kalima blockchain, they ensure traceability, integrity and immutability of all transactions. You can install as many master nodes as you need to set up a Kalima Privachain with a minimum of five of them. Master nodes store blockchain data and they publish them to the client's node after validation. Master nodes are the only nodes with administration nodes that are authorized to access all the data contained within the blockchain, including authorization data.

2. Validation Nodes

Validation nodes participate in the consensus to elect the Leader Node in charge of timestamping and hashing of all transactions. Validation nodes and master nodes are in charge of controlling transactions integrity and blockchain data immutability

3. Administration Nodes

Administration node give authorizations to the client nodes. All nodes benefit from strong device identification. Devices must be authorized before any connection is made. Authorizations can be limited to a subset of data.

4. Voting Nodes

Voting nodes enable validators to vote for governance management choices and to confirm logging access to administration nodes in a multi signature way. They are also used by "Stakers" for "Staking" purposes. Each "Validator" owns one "Governance voting node". Each "Staker" owns one "Staking voting node".

5. Client Nodes

Client nodes synchronize data to which they are authorized from Master Nodes, create new transactions and execute smart contracts. Client nodes can add and receive data to and from the blockchain depending on their authorizations. Smart contracts are executed in the client nodes on data arrival. Smart Contracts must have been controlled and authorized by Validation nodes before being executed. Client nodes can be developed by our users and partners with the help of Kalima SDK. Kalima SDK provides tools to develop java, C#, C, NodeJS, Android and iOS client nodes.

Data lake and Data safe Nodes

Data Lake and data safe nodes are Client nodes which collect data of one or multiple blockchain, depending on the authorizations, to compile and publish them to facilitate data search, machine learning, statistics or to provide a highly secure storage.

STAKING MODEL

Staking is the process of locking tokens on the chain as a mean of securing the network. Security of the network depends on the amount of capital locked on the chain. The more the capital locked, the lower the chance of an attack on the network, as the attacker needs to incur a heavy loss to orchestrate a successful attack. Stakers can pool their stake together to obtain a greater cumulative stake within a validation pool, further increasing security.

Network validators do not have to compete to solve mathematical puzzles. They are instead pre-selected to produce all blocks. Token holders can lock funds on the chain and for doing so, they are getting staking rewards. There is thus an economic incentive for token holders to become active participants who contribute to the economic security and stability of the network.

Become a staker on Kalima

Stakers are one type of participant in the security system of Kalima. They are responsible for delegating their stake to the validators who are the second type of participant. By appointing their stake, they can vote for a validator of their choosing and share in the rewards that are paid out.

While the validators are active participants in the network that engage in the block production, stakers take a slightly more passive role. Being a staker does not require running a node of your own or worrying about online uptime. However, a good staker performs due diligence on the validators that they elect.

Minimum staking requirements

A minimum of 100\$ worth of KLX is necessary for staking within a given validation pool.

Note that a small transaction fee of (~0.00025\$) will have to be paid to execute the staking smart-contract.

Unstaking

The unstaking process on Kalima is quite straightforward. After a user has staked their tokens, they can choose to unstake them at any time. The user must simply go to the same pool they chose to stake their KLX tokens to and click "Unstake". An unbounding countdown of 28 days will begin, after which the user will be able to use their tokens how they see fit. Once the 28-day unstaking period is over, the user can retrieve their tokens in their wallet and use them how they see fit.

Restaking

Once the unstaking period of 28 days is over, a user will receive their KLX back into their wallets, along with the accumulated rewards within that epoch. The user will then be able to stake to any other listed validation pools.

Staking Rewards

Validators who produce a block are rewarded with tokens, and they can share rewards with their delegators. Both validators and delegators can stake their tokens on-chain and receive staking rewards at the end of each epoch. The staking system pays out rewards equally to all validator pools regardless of the total stake. This avoids the centralization of power to a few validators. However, having more stake in proportionally to other stakers in that same validation pool, influences the number of rewards the staker receives.

In other words, the rewards are equally distributed between validator pools. But within each pool, rewards will be proportionally distributed between stakers (or delegators), with regard to their stake.

Soft Slashing

When validating blocks on the Kalima Blockchain, all validators must validate all blocks. If a validator has missed or failed to validate a block in the allocated time, the validator will see himself automatically slashed.

- If a staker finds himself in a validation pool that has elected a validator that has failed to validate a block, they will not see their right to stake taken away, however:
- Their rights to candidate as a validation pool delegate (person that chooses the validator for his validation pool) taken away for 28 days

This shows the importance of correctly choosing which validation pool to stake in, and which candidate to elect as a node manager. This can include past validating history, slashing history...

KALIMA VALIDATORS

Validators have two crucial roles in maintaining the Kalima network. First, they participate in consensus with other validators. Second, they verify and timestamp transactions in the Kalima blockchain

In return for their work and performance, they receive rewards in the form of KLXs. Their rewards come in two forms:

- From staking rewards & KLX emission
- From transaction fees (Master Nodes)

Should they not comply with the consensus algorithm (see technical summary) by going offline, attacking the network, or running modified software, they and their delegators will face a penalty by seeing their right to validate transactions or stake KLX taken away.

Becoming a validator requires some technical skills, hardware requirements, as well as trust and support from the community, in the form of stake.

Types Of Validation Nodes

There are 2 different validation nodes you can opt for:

Master Nodes

Master nodes are the main element in charge of validating transactions, they ensure traceability, integrity, and immutability of all transactions.

They participate in the consensus to elect the Leader Node in charge of timestamping and hashing of all transactions.

You can install as many master nodes as you need to set up a Kalima PrivaChain with a minimum of five of them. Master nodes store blockchain data and they publish them to the client's node after validation.

Master nodes are the only ones with administration nodes authorized to access all the data contained within the blockchain, including authorization data. Master Nodes are special validation and full nodes, they implement standard Kalima consensus and when higher security is required, add a second level of validation with simple validation nodes.

Validation Nodes

Validation nodes oversee controlling transactions integrity and blockchain data immutability. Simple validation nodes do not have to be full nodes, they don't have to store all the ledger. Validation Nodes are elected to validate and timestamp transactions. (see Validation Pool guide)

Each validator must validate all blocks and blocks with respect to their arrival time. The same reward is given to all validators for all block validations, preventing delayed or blocked transactions for economic reasons.

Slashing

Slashing is a popular way of punishing harmful behavior within a network. These measures usually involve taking away the tokens from the user/validateur who has done harm to the network (i.e., not validating a block in due time).

Since Kalima's validation models involves stakers voting for validators, where slashing would affect all the stakers within a validator's validation pool, Kalima introduces "Soft slashing"

When validating blocks on the Kalima Blockchain, all validators must validate all blocks. If a validator has missed or failed to validate a block in the allocated time, the validator will see himself automatically slashed.

The validation pool, where the stakers have staked their tokens, will also be impacted by the slashing, which highlights the importance of electing a validation delegate (done via staking, where your stake represents your vote) with a good validation history.

Since stakers are impacted, it would not make sense to take any token away tokens from stakers which is why Kalima introduces "soft slashing"

"Soft slashing"

Soft slashing will affect stakers (see staking) and validators in different ways.

For validators, there are two scenarios for misconduct on the network:

- They have failed to validate a block in time due to their local network malfunction
 - o The validator will see his right to validate taken away for 7 days
 - o Their right to stake will be taken away for 28 days
- They have purposefully wrongfully signed a block
 - o The validator will see his right to validate taken away for 28 days, and indefinitely if conducted again.
 - o Their right to stake will be taken away for 28 days

In a validation pool, there are 2 different actors, who will be affected differently by the soft slashing:

For the validation pool/node manager, who is elected by the votes of other stakers in that pool, through staking:

- They failed to sign a transaction due to their local network malfunction
 - o The delegate will see his right to candidate as a node manager taken away for 28 days
 - o Their right to stake will be taken away for 28 days
- They purposefully failed to sign a transaction
 - o The delegate will see his right to candidate as a node manager permanently taken away
 - o Their right to stake will be taken away for 28 days

Validator Rewards

Validators who produce a block are rewarded with tokens, and they can share rewards with their delegators. Both validators and delegators can stake their tokens on-chain and receive staking rewards at the end of each epoch. The staking system pays out rewards equally to all validator pools regardless of the total stake. This avoids the centralization of power to a few validators. However, having more stake in proportionally to other stakers in that same validation pool, influences the number of rewards the staker receives.

In other words, the rewards are equally distributed between validator pools. But within each pool, rewards will be proportionally distributed between stakers.

VALIDATION POOLS

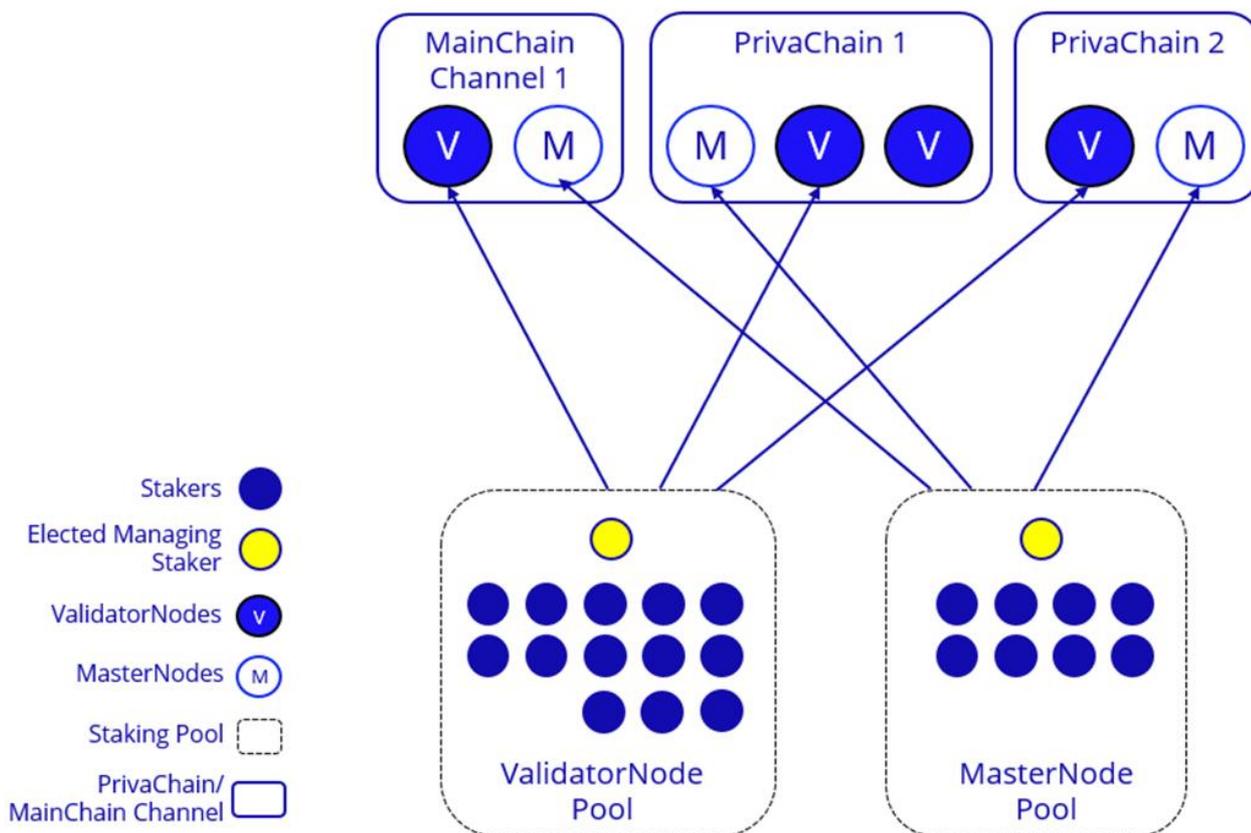
There are 2 types of validation pools on Kalima:

- Validation Node pools - in charge of validating and coordinating the validation of transactions
- Master Node pools - elected to validate and timestamp transactions

How they differ

Validation Nodes validate transactions and create new blocks

Master Nodes have the same tasks, but additionally store blockchain data and publish it to the client's node after validation. Master nodes are the only nodes with administration nodes that are authorized to access all the data contained within the blockchain, including authorization data.



How they are organised

In 2023, after the token launch on February first, 6 Master Node pools and 30 Validator pools will be put at disposition for Kalima holders to delegate (or stake) their KLX tokens.

- A Master Node can be delegated up to 6400 million KLX (4% of initial supply)
- A Validation Node can be delegated up to 720 million KLX (0.45% of initial supply)

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Only effective validators (validation pools that have fulfilled the requirements) can receive and distribute rewards to the stakers in their pool. This means that if a staker stakes in a pool that hasn't met the requirements, they will receive no rewards.

In the case where a pool struggles to meet the requirements, users will be able to unstake their tokens, without any 28-day cooldown period, allowing them to immediately stake in another validation pool.

As the rewards are distributed evenly between stakers in each pool, pools with higher amounts of cumulative stake may require more KLX than a pool with little cumulative stake, since larger amounts will dilute your percentage stake in any given pool. This therefore incentivizes an even spread of stake across available validation pools, since the ones with the least stake will offer more rewards due to your percentage stake being higher in that given pool.

Longer-term

In the longer term, 10 Master Node pools and 100 Validation Node pools will be available. The maximum percentage of the KLX they can hold will remain the same, 4% and 0.45% of the initial supply, respectively.

POOL CREATION PROCESS

Once validation pools have been opened, a user will be able to access the list of pools from which the user will choose one to delegate their KLX to.

In a Validator Pool, the creator of the pool will become an effective validator of the Kalima blockchain when their pool has reached a stake in of 360 Million KLX (0.2% of the initial supply) representing half of the maximum stake a validation pool can receive.

In a Master Node pool, the creator will become an effective Kalima blockchain Master Node when he reaches a stake in his master node pool of KLX 3200 million (2% of the initial supply), representing half of the maximum stake a Master Node validation pool can receive.

As long as the stake ratios are not reached in the validation pools (360 million KLX for validators and 3200 million KLX for Master Nodes) these pools will be considered ineffective, their holders will not be Master Node or validator of the Kalima blockchain and the pool will not receive nor distribute rewards.

Requirements

The creator of any pool is the designated node manager for that pool. However, a minimum amount of stake is required for making a given pool an effective validator.

To create a validation, pool a user must:

- **Validation Node pool:** Stake a minimum of 20m KLX (5000\$ at initial value)
- **Master Node pool:** Stake a minimum of 60m KLX (15,000\$ at initial value)

Note that this is only the amount required for creating a pool. The required cumulative stake in a pool for it to become an effective validator is:

- **Validation Node pool:** 2% of initial KLX supply
- **Master Node pool:** 0.2% of initial KLX supply

This implies that the creator of a pool, can stake 0.2% of initial KLX supply in their own pool, electing themselves as an effective validator.

Validation Pool Delegators

Members of the ecosystems can candidate as a validator or can delegate their vote by pooling their tokens into a validation pool (or staking pool). Holders do not physically transfer their tokens to another wallet, but instead stake the tokens in a staking pool with a minimum unstaking period of 28 days.

Pool creators, who are the designated node managers for their given pool (validators) will receive the transaction fees from the validated block, and that reward is then shared with users who pooled their tokens in the successful delegate's pool. The more you stake, the higher the share of the block reward you receive.

Reward System

The staking system pays out rewards equally to all validator pools, regardless of the total stake. This avoids the centralization of power to a few validators. However, the rewards within a given pool are shared proportionally based on each user's stake. For example, if your stake represents 10% of the total staking balance of any given validation pool, you will receive 10% of that reward.

Reward Distribution Ratios

When creating a pool, a user must set parameters visible by potential stakers, which will influence their chances of being delegated another user's stake. Reward distribution ratio represents the ratio with which the validator will share the associated validation rewards with their respective stakers.

For example:

- If a validation pool creator sets the distribution ratio to 30%/70%, the pool creator will receive 30% of all rewards allocated to them.
- The remaining 70% will be proportionally allocated to all stakers with respect to their stake.

Due to limited amounts of validation nodes (10 for Master nodes, 50 for Validation nodes), validation pools with unrealistic or unfair distribution ratios will be disregarded by stakers and therefore will not be elected as a validator.

GAS FEES ON KALIMA BLOCKCHAIN

Gas fees on Kalima Blockchain

Each transaction carried out on the Kalima network will generate gas fees. These fees remain very low within the Kalima ecosystem and have an essential role.

- Provide compensation for network validators for the necessary resources required for validating transactions, as well as storage
- Reduce and prevent network spam by introducing a real cost for transactions.

For this purpose, a gas fee system is set up on the Kalima blockchain which will be applied to each transaction.

The gas fee will be 0,00025 € per kb for each transaction.

Transaction fees, or gas fees, will be distributed as follows :

- 25% are attributed to the Kalima foundation to guarantee the safety and smooth functioning of the network.
- 1% are attributed to the token burn for controlling inflation
- 30% are attributed to master nodes to cover storage costs.
- 44%, or the remaining part, is allocated to a special fund used to give out grants for dApps and PrivaChains creators and developers to encourage network development.

This gas fee distribution is designed to guarantee the security and sustainability of the network as well as encouraging the developer community to grow the Kalima ecosystem.

The gas fee amount, as well as the way they are distributed are subject to future changes carried out by the Kalima consortium as a mean of supporting the ecosystem by guaranteeing a fair revenue for validators alongside a small enough cost for users.

Gas fee payments

A payment will have to be made by the PrivaChain owner every 1000 transactions occurring on it. This payment to the Kalima MainChain will entail a cost of à 0,00025€ .

The payment frequency will be divided by 2 every time the minimum required amount of tokens held for owning a PrivaChain is doubled.

For example, if the amount held is of 200 million KLX (4x the minimum required amount), the payment frequency will be of 1 every 4000 transactions (4x base frequency).

A minimum of 1 such payment will be implemented per day to the Kalima MainChain in the case where a PrivaChain realizes less than 1000 transactions on a given day.

BURN ON KALIMA BLOCKCHAIN

Burn provisions on Kalima MainChain

The Burn mechanism is the process in which KLX tokens are bought back and removed from circulation which reduces the number of KLX in use.

A 1% burn provision will apply on each transaction fee occurring on Kalima Blockchain as to complete halving effects as well as maintaining inflation to a stable level. This means 1% of each transaction fee will be accumulated until it becomes necessary for a burn to occur.

For example, a 5Kb transaction representing a gas fee of 0.00125€, will trigger a burn of 0.0000125€ value in KLX.

The burn mechanism does not have any effect on the total supply which will keep a maximum circulating supply of 480.000.000.000 KLX.

PRIVACHAINS

Conditions for deploying a Privachain

To deploy a PrivaChain on the Kalima ecosystem a user must hold the equivalent of 12,500€ in KLX (50m KLX at ICO price). These KLXs can be staked.

The PrivaChain owner can hold over 12,500€ in KLX for their PrivaChain so as to benefit from reduced frequency of payments of transaction costs on their PrivaChain. This mechanism is described below.

Rewards for Privachains

As a mean of bootstrapping the Kalima network, the first 1084 PrivaChains will benefit from obtainable rewards once deployed.

For this, 10 reward levels have been put in place, rewarding further earlier PrivaChains, and will work in the following way:

Level	Number of Privachain	KLX Reward / Privachain	KLX Total Reward	Vesting
1	10	200 000 000	2 000 000 000	No Vesting
2	15	133 333 333	2 000 000 000	6 months
3	22	90 909 090	2 000 000 000	12 months
4	33	60 606 060	2 000 000 000	18 months
5	49	40 816 326	2 000 000 000	24 months
6	73	27 397 260	2 000 000 000	24 months
7	109	18 348 623	2 000 000 000	24 months
8	163	12 269 938	2 000 000 000	24 months
9	244	8 196 721	2 000 000 000	24 months
10	366	5 464 480	2 000 000 000	24 months
TOTAL	1084	20 000 000 000	20 000 000 000	24 months

Each PrivaChain can obtain 100% of the reward of from its respective level. It is by realizing transactions on its PrivaChain that rewards will be unlocked.

For every 100 transactions realized on a PrivaChain, 1 KLX will be emitted, until that reward ceiling is reached for that level.

A reward level is unlocked only if the number of active PrivaChains goes past the required threshold for that reward level.

A PrivaChain is considered active when a minimum of 1000 transactions are realized on it per day.

For example, for the reward level 1 containing the first 10 PrivaChains, 1 single PrivaChain can realize 200 000 000 000 transactions so as to obtain the total of rewards available for the level in which it finds itself.

For every level, apart from the first one, the emitted KLX will be subject to a vesting period specified above.

KALIMA MAINCHAIN RULES

We have listed below the initial governance rules of the Kalima MainChain. These rules are subject to change in the future by vote of the KLX ecosystem :

When the KLX migrates to its native chain, each individual exchange will have to manage a Client node in order to write KLX transactions in the MainChain channels.

The total number of channels and PrivaChains referenced in the KNS (Kalima Name Service) is limited to 99.900

The maximum number of exchanges will be initially set to 100. Each Exchange will have a maximum number of 1.000.000 addresses.

Theses limits are fixed to protect KLX platform against deny of services attacks.

Validation nodes on cloud platforms

Validators can run a voting and non-voting machine on a cloud computing platform or on premise. Client nodes can take advantage of small memory footprint of Kalima and its capacity to run in small devices, IoT gateways or smaller.

Also note that egress internet traffic usage may turn out to be high.

- **Docker**

Running validator for live clusters (including mainnet-beta) inside Docker is not recommended. This is due to concerns of general Docker's containerization overhead and resultant performance degradation unless specially configured.

- **Software**

Prebuilt validators binaries are available for x86_64 CPUs (Ubuntu 20.04 recommended).

- **Networking**

Internet service for validators should be at least 300Mbit/s symmetric, commercial. 1Gbit/s preferred

HOW TO BECOME A KLX VALIDATOR ?

Any user can aim to participate in the consensus if a reserve of KLX is held by that user. Only validators chosen by the network itself will become validators for the Kalima MainChain. This election ensures a sufficient level of rewards for the validators elected. The first validators will be the consortium members, among the early investors who have made it possible to finance development of the network during the pre-sale.

Hardware recommendations

CPU : 6 cores / 12 threads, or more 2.8GHz, or faster

AVX2 instruction support (to use official release binaries, self-compile otherwise)

Support for AVX512f and/or SHA-NI instructions is helpful

GPU : not necessary at this time

RAM :16 GB, or more

Disk NVME SSD, or better

Accounts: 100GB, or larger. High TBW (Total Bytes Written) suggested

Ledger: 500GB or larger. High TBW suggested

OS: (Optional) 500GB or larger. High TBW suggested

Testing has shown better performance with the ledger on its own disk. Due to high IOPS it is not recommended to store Accounts and ledger on the same disk

KALIMA NAME SERVICE (KNS)

The KNS allows the identification of channels and PrivaChains inside the Kalima blockchain network.

These blockchain names are easier to manage for users than the corresponding IP addresses similarly to Web domain names.

In the same way, inside a PrivaChain the addresses have a correspondence in the form of a URL allowing, if necessary, to better identify the addresses.

- **Similar to DNS or ENS**

Initially you had to use IP addresses on the Web, nowadays, you can use alphanumeric values in the crypto and Web3 space. Since the beginning, Kalima has been proposing a URL type naming associated to classical addresses.

- **KNS and PrivaChains**

When you create a PrivaChain you have a domain associated to it
You can easily create and own its subdomains to name your enterprise, establishments, services, machines, buildings, connected objects etc..

- **KNS and Channels**

In the same way, each Channel has its own domain which simplifies the global view of the mainchain

RoadMap & Team

TOGETHER TO AN INTERNATIONAL ADOPTION

The Kalima Team has a strong experience in IoT and Blockchain

Roadmap

We are more than ever ready to impose Kalima on the international IoT market

Q1 2022

- C SDK
- Data Lake
- Kalima Client side Smart contract for Tezos

Q2 2022

- Kalima Client side Smart Contract for Lightning Network and Bitcoin (Layer 2 and 3)
- Kalima – Kerlink : Embedding Kalima Blockchain in Kerlink's Gateway
- ICO - Seed Phase

Q3/Q4 2022

- ICO - Private Sale
- Security Bounty
- Blockchain Certification
- Data Safe

Q1/Q2 2023

- Kalima Consortium
- ICO - 1st Round
- Apps Marketplace
- Listing on DEXs

Q3/Q4 2023

- Listing on CEXs
- Go SDK launch
- Kalima Mobile Payment App
- Kalima Polygon - Bridge

2024

- Bridge ERC20 to native KLX token
- ICO - 2nd Round
- ICO - 3rd Round

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