Enterprise-Grade Blockchain Platform

TokenD is a state-of-the-art white label blockchain software platform that consolidates the experience gained by Distributed Lab in building the production-ready tokenization solutions. It allows you to issue, transfer and exchange your assets with high level of privacy, security and auditability while following regulations of your jurisdiction. TokenD is designed for enterprises who are willing to take advantage of tokenization or experiment with the blockchain technology without the need of maintaining the expensive team of blockchain experts and within the shortest time to market.

TokenD includes production-ready web and mobile applications and wallets, admin panel, and integrations with external systems like fiat payment gateways, blockchain networks as well as identity verification systems. With intuitive REST API, SDKs documentations and reference implementations the required customization efforts are reduced to minimum.

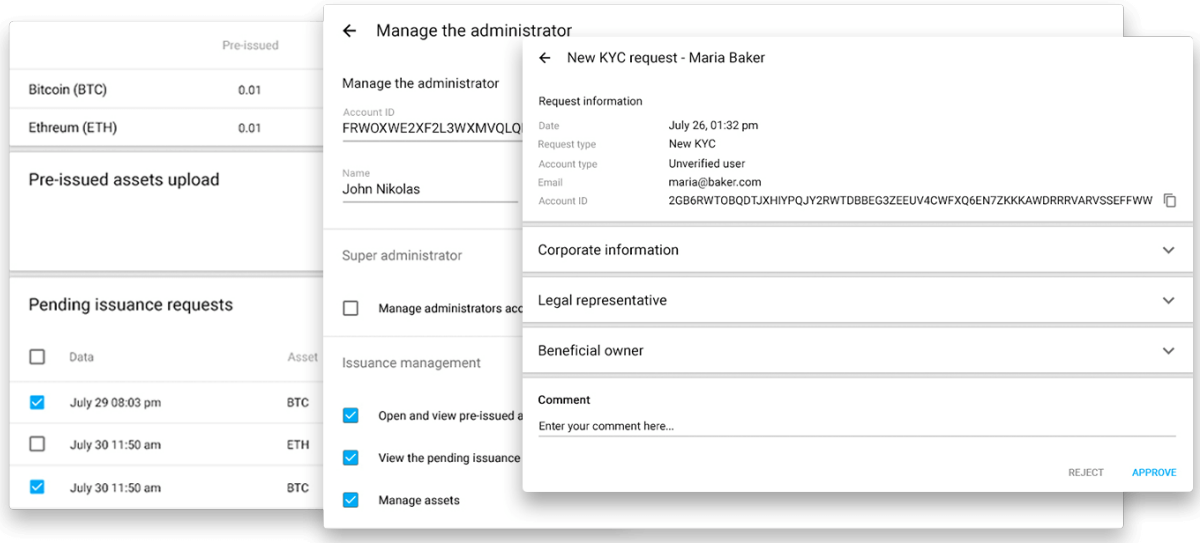

Figure 1. Example of TokenD UI components

TokenD uses the Federated Byzantine Agreement (FBA) protocol, which provides a way to reach consensus without relying on a closed system to accurately record transactions. FBA has a set of provable safety properties that optimize for safety over liveness — in the event of misbehaving nodes or partition, it halts the progress of the network until the consensus is reached. FBA simultaneously enjoys four key properties: decentralized control, low latency, flexible trust, and asymptotic security.

Advantages of the TokenD platform

- Vast software ecosystem with various ready-to-use auxiliary modules and reference implementations:
    - low entry threshold for developers;
    - shortest time to market;
    - no hidden fees;
    - low customization cost.
- Modular architecture:
    - easy interconnection with external systems;
    - database-agnostic (PostgreSQL, SAP HANA);
    - real time data backups;
    - simple application development (fully functional web, iOS, and Android applications are available).
- Private blockchain network:
    - predictable operational cost;
    - high level of privacy;
    - known validators;
    - full control over decision making rules.

Key Features

Advanced Tokens Management

- Issue and distribute your tokens within a few API calls.
- Easily manage risks by using offline application for pre-authorization of a certain amount of tokens to be issued.
- Interconnect your token with the tokens from external systems like ERC20 tokens in the Ethereum Network or Stellar Tokens.
- Define and change the properties of the token in a few API calls:
    - should the token be fungible or non-fungible;
    - should a user initially complete KYC process before holding the tokens;
    - should the token be transferrable or tradeable;
    - should the token be divisible or indivisible.
- Integrate your existing system using REST API to process withdrawal or redemption requests.
- Define the limits on holdings and transfers to be compliant with regulations.

- Define the fee rules for the specific account and account type for various range of operations.
- Securely exchange tokens with assets from external systems using atomic swaps.

Flexible KYC (Know Your Customer) procedure

- A powerful set of data agnostic tools for easy implementation of custom KYC procedure based on the regulations of a specific jurisdiction.
- Ability to define the data to be collected at each step of the KYC process and rules to be applied to each account.
- Easily verify the data using Admin Panel.
- Integrate with external KYC/AML/Fraud prevention systems to maintain a proactive compliance program.

Anchoring to public chain

- Broadcast hashes of blocks to one or several public blockchains on the predefined schedule.
- Combine privacy and costs of a private blockchain with the transparency and non-repudiation of a public chain.

A complete suite of TokenD

TokenD provides a unified platform of pre-integrated services that are extremely powerful when used together. These services include:

- **Web/iOS/Android applications and wallets**
  These modules provide a user-friendly interface for interaction with the rich functionality of TokenD. They can be used as a reference implementation for your own solution or as the main interaction point.
- **IdentityMind KYC integration module**
  This module creates a secure bridge between TokenD and IdentityMind Global system to securely verify the user-data. IdentityMind Global 2.0 RegTech compliance platform brings machine learning and automation to perform global digital identity verification, extended sanction screening and patented fraud prevention.
- **Fees Management Module**
  This module allows a system administrator to easily specify the account type or account-specific fees for a wide range of operations available in the system.
- **Limits Management Module**
  This module allows system administrators to ensure compliance with regulation. Admin

is able to specify the asset-specific income, withdrawal and expense limits with auto conversion to the predefined asset.

- **Payment System Integration Module**
  This module performs a role of the bridge between two independent systems, that allows users to safely and fast deposit or withdraw assets from/to the external system.
- **TokenD Decentralized Exchange (DEX)**
  This service stores the order book, settles transactions, and has matchmaking built into its protocol.
- **RatesSyncer**
  This module ensures that most recent prices for tokens are available in the system. It uses feed from several most popular exchanges and streams the data secured with multisig to the core of the system.
- **Notifier**
  This module monitors the state of a blockchain and, in case of significant events, such as transfer, update of access policies, etc, sends notifications to end-user or admin.

Product Capabilities

High-level overview of a rich set of capabilities provided by TokenD and the modules that surface these capabilities are specified in the table below.

Specification	Description
Decentralized Exchange	• Orders management • Automatic price discovery • System escrow • Monitoring of orderbook and transactions • Fees management • Crowdsales
System administrating	• Validator/auditor/backup node management • Auto-failover mechanism • Management of node/ledger status/health • Management of blocks and transactions settings • Management of consensus settings
Gateway	• Crypto/fiat deposit management with multisig • Crypto/fiat withdrawal management with multisig • Crypto hot/cold wallet management
Security	• 2FA management • Account blocking • Notifications management for logins and transactions

	• History reports • Flexible 1-factor recovery • Secure key encryption/storage/retrieval • Anchoring to public chains • Manual admin recovery based on KYC • Recovery with the backup key
Admins Management	• Create/update/delete admins • Flexible admins' permissions management • Admin role/weight management
Limits Management	• Limits management (annually, monthly, weekly, daily) • Applying limits to system/account types/accounts • Management of user change requests • Management of limits for specific assets
Fees	• Tokenization and auto distribution of collected fees • Fee management (fixed, percentage, combined) • Applying fees to system/account types/accounts • Management of range for which fees are applied • Multi-level fee collection (agent scheme)
KYC	• Flexible multi-step KYC process • KYC process for individuals/SMEs/companies • KYC request/update/approve management • KYC data anchoring to blockchain
Wallet	• Signup/login/logout • p2p/escrow/multisig transactions • Integration with crypto/fiat gateways • Asset management • KYC integration • Invoices integration • History management
Ledger viewer	• Permission management • Event listeners • System transaction review • Inspection of details of a particular transaction
Tokens Lifecycle	• Creation of assets by the admin • Management of asset redemption/withdrawal rules • Management of asset holding/distribution rules • Review/Approve/Reject an asset creation request • Manage asset properties (transferability, turnover, info) • Auto/Manual review/rejection of issuance requests • Interest/Demurrage • Offline issuance functionality for assets generation • API of issuance requests generation

Table 1. Product Specification

External Systems Integration

TokenD provides a consistent sequence of all operations occurring in the system. It can be used to easily integrate various sets of event tracking tools, CRMs, ERPs, and SCMs. Each operation also includes a set of changes applied to the ledger. They allow to easily calculate a partial state of the ledger at a specific moment in time. It can be used by the off-chain applications to calculate interest or demurrage, and perform real-time audit.

What is more, TokenD system has convenient methods to integrate external payment systems (Core Banking, Fiat Payment Gateways, Cryptocurrency Networks). TokenD on the blockchain level ensures that there is no double spending on withdrawal and each issuance operation corresponds to one deposit operation in the external system. Reference implementation of integrations with popular cryptocurrencies and fiat payment processors and intuitive REST API will significantly reduce the time needed for custom integration.

Platform customization and Application development

TokenD is a highly flexible and configurable system that greatly facilitates the implementation of various use cases by the team that shouldn't obligingly have any experience in building the so-called DApps (Decentralized Applications). Most customizations for developing MVP solutions do not require any changes to the core of the system, which significantly reduces time to market and at the same time provides high level of security.

Data agnostic approach allows to securely exchange custom data without the need to introduce these changes to the core module. In case of a custom KYC (know your customer) flow, MVP (minimum viable product) development team will only have to update client and admin facing applications, and in case of integration with external KYC processor – an auxiliary module to connect two systems.

TokenD provides various sets of highly configurable tools. It makes it possible to change the behaviour and properties of tokens, token pairs, issuance, and deposit flows with few API calls or through the TokenD Admin Panel.

Intuitive REST API, SDKs and reference implementations of various modules, mobile wallets, and web applications significantly reduce the amount of resources needed to train a team with no experience in the development of blockchain applications.

TokenD Ecosystem

TokenD can be divided into two parts: DLT-based logic (node) responsible for the key functionalities such as tokens management and distribution, rights management, etc.; auxiliary modules, which interconnect DLT with external systems, store user data, etc. A detailed overview of these modules and their connections is specified in Figure 2.

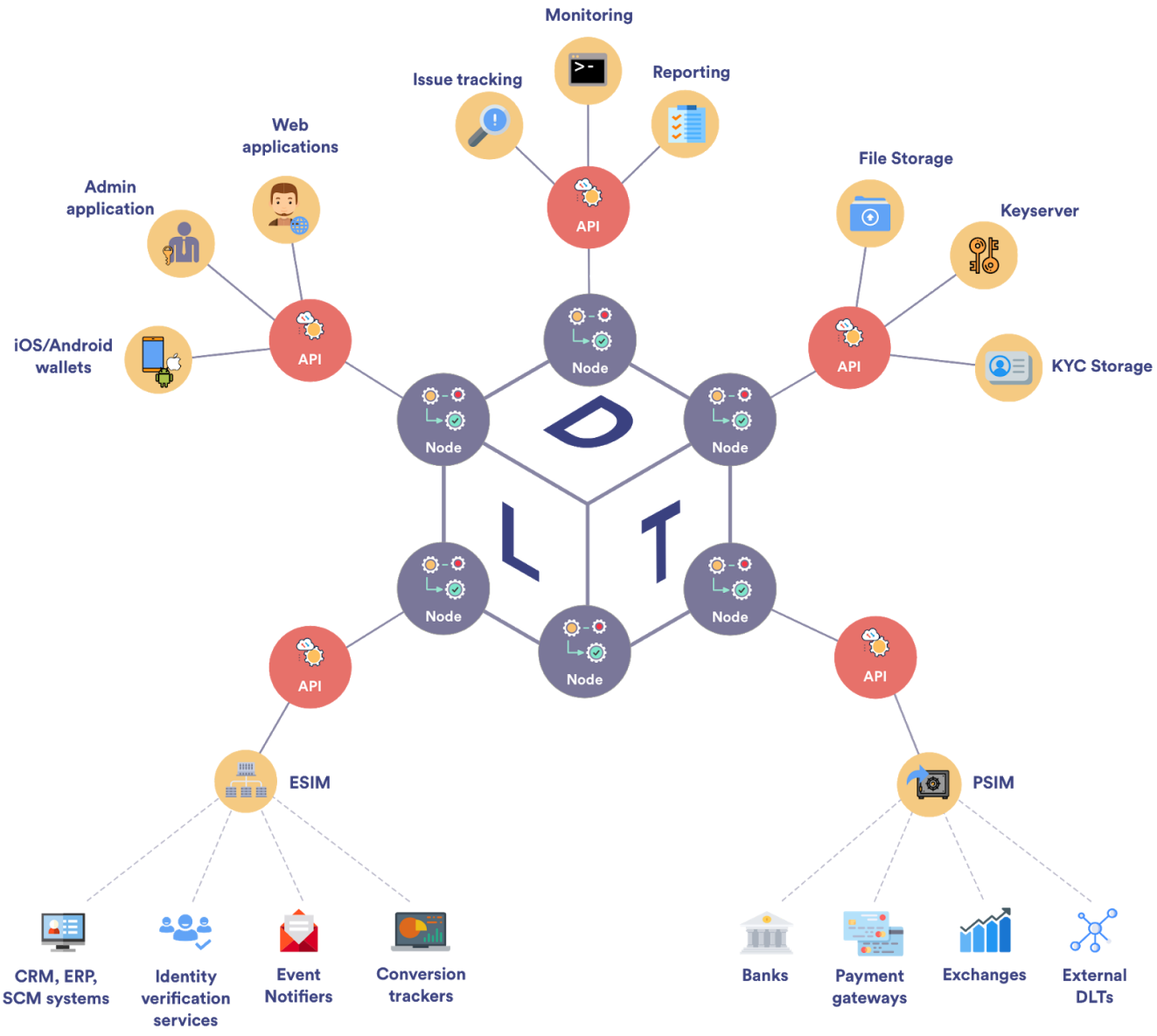

Figure 2. TokenD Ecosystem

- Node is a key component of the platform. It processes transactions, manages history, and provides an easy to use API to access the blockchain data. It consists of two modules:
  - Core — a replicated state machine that maintains a local copy of cryptographic ledger and processes transactions against it in consensus with a set of peers. It

implements the federated consensus protocol and is responsible for tokens accounting and roles management.

- Horizon is the client-facing REST API server. It acts as an interface between the core and applications that want to access the network. It allows submitting transactions to the network, checking the status of accounts, and viewing transaction history.

- PSIM (Payment Services Integration Module) is a set of modules that play the role of a bridge between TokenD-based platform and cryptocurrencies' public blockchains, banks, payment gateways, exchanges. They reflect corresponding operations like deposit, withdrawal and exchange rate changes in another system.
- ESIM (External System Integration Module) is a set of modules that interconnects TokenD-based platform with various external systems. They are responsible for a wide range of functionalities: from transfer notifications to automatization of user identity verification.
- KYC Storage is a GDPR compliant module which stores data collected during the KYC (know your customer) procedure. To access the data, a user or admin needs to provide the digital signature, which is verified against the most rest state of the ledger. Such an approach provides a high level of security which can be further improved with full data encryption at rest and transit.
- Key-server is a module which stores client-side-encrypted private keys of users and admins. This prevents a malicious actor from getting access to the accounts of the system even having a full access to the storage.
- Web, iOS, Android wallets are client facing applications that provide a wide range of functionalities: from storage of encrypted private keys on the device to token transfers, withdrawals, and trading. They interact with the core of the system directly through the Horizon module and sign all transactions and requests locally. Such an approach ensures that users' private keys are safe even in case of MITM (man in the middle) attacks.

System Requirements

TokenD is a highly modular system built using the microservices architecture. Such approach used on top of FBA ensures high level of scalability and fault tolerance. The table below specifies software and hardware requirements for the TokenD platform.

vCPU number	RAM (GiB)	Purpose	Required number	Additional requirements
2	8.0	Core, Horizon	4	200 GB disk and S3-compatible object storage
2	4.0	PSIM	2	500GB NVMe disk storage
2	4.0	API, Frontend	2	S3-compatible object storage, Managed DB instance
2	4.0	Events Checker	1	100 GB disk
2	4.0	Monitoring services	1	100 GB disk
1	2.0	VPN gateway	1	—
1	2.0	Admin Key Server	1	Managed DB instance
2	4.0	Notificator	1	Managed DB instance

Table 2. System Requirements

Summary

TokenD is a blockchain agnostic platform that consolidates best practices of tokenization solutions. It provides flexible, user friendly and secure functionalities for managing the full lifecycle of tokens, which allows customers to implement MVP solutions for various use cases with low customization and fastest time to market. Potentially, it could be ported to any blockchain platform like HyperLedger Fabric, R3 Corda, etc., which makes it even more valuable in an emerging but rapidly growing industry.

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