



VPLedger



VPLedger

VPLedger Technical Whitepaper

Business made simple with Vimple



A Protective Blockchain VPLedger

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1. ABSTRACT

The essence of this document

This document presents a vision of a blockchain ecosystem designed for the needs of small and medium-sized enterprises as well as large corporations, at any time and anywhere in the world. The platform operates within the legal framework provided by national regulators, delivering all the advantages of existing blockchain technologies and the opportunities offered by the global cryptocurrency and financial markets. The blockchain is designed to solve the chief problem experienced by every platform seeking to use a distributed network: the risks posed by open platforms lacking legal protections and professional structures.

Background

Existing blockchain projects provide the user with no guarantee of network stability and offer no protection of legal rights. This causes a lack of interest in blockchain platforms from conventional business (the kind of business which is not normally associated with cryptocurrencies and blockchain technologies).

Decision

To develop a legal blockchain, created from the ground up for enterprise needs, enabling businesses to leverage all the advantages of peer-to-peer tools and services in organising their processes with domestic and global counterparts.

How to achieve the vision

- 1) Cooperation with financial industry heavyweights - building partnerships with world banks, traditional and cryptocurrency exchanges, payment operators, representatives of the business community, and other service providers in all sectors of the economy.
- 2) Cooperation with national executive authorities — legitimizing blockchain activities by establishing contractual relations with public regulatory authorities (national banks, ministries of finance, securities commissions) and ensuring compliance with all relevant regulations in the target jurisdictions.

VPLedger: objectives

To enable the world's businesses to access all the advantages of services and tools built on blockchain technology, in a safe and compliant manner.

Target markets

Europe – European Union countries;
North America — USA, Canada;

South America – Brazil, Argentina;
Asia – Japan, South Korea, India;
Africa – South Africa, Egypt.

Target audience

The global business community:

- SMEs: control and streamline the flow of your organisation's financial processes
- Banks and financial Institutions: maintain accounts and credit customers with cryptocurrencies and stablecoins
- Governments: enforce compliance with all national laws and regulations
- Payment and Remittance Providers: use a high-scalability blockchain to build your own payment platform
- Digital Exchanges: leverage the blockchain to run a stable, reliable exchange service
- Accountants: track the transparent movement of funds and assets within the blockchain
- Auditors: easily audit a company's online activities
- Traders can enjoy the advantages of peer-to-peer trading of tokenized assets
- Expatriates: transfer funds to relatives around the world in seconds for free
- Developers: leverage the power of the VPLedger toolkit
- Gig economy freelancers: organise secure payments, settled in seconds using escrow and multisig features
- Gamers: transfer your favourite tokenized in-game items to anyone, anywhere, in seconds

Key benefits

- Interact with counterparties within an enforceable legal framework
- Private transactions
- Free transfers and messaging between users
- Influence core economic decisions and network characteristics
- Rating system underpinned by user voting mechanism
- Secure, reliable and transparent distributed ledger
- Sophisticated tools for minimising financial and counterparty risks, including smart contracts, escrow facilities, stablecoins and more
- Up to 100,000 operations per second
- Transaction fees as low as 0.01%
- Work with both fiat and digital currencies and assets
- Decentralised model of development and improvement of blockchain protocol
- Well-developed and diverse ecosystem of services
- Instant response to hacking and malicious activity against network users via legal instruments and recourse
- Multi-level user protections to facilitate effective business operations

The protective blockchain VPLedger (Veritas Persona Ledger) is an ecosystem of services that uses all the technical advantages of blockchain technology. The ecosystem is created and serviced by OpenLedger ApS.



Basic services:

- 1) **Digital asset exchange** for crypto and fiat assets, stablecoins, multi-wallets, margin trading, leverage, cross-chain Atomic Swaps and more;
- 2) **Crowdfunding platform**, including ICO, STO, IEO, TGE, escrow mechanism and investment protection;
- 3) **Freelancer exchange** with qualification tests and freelancer ratings, continuous payment mechanisms, and project-specific freelancer selection algorithms;
- 4) **Services for business management**, including financial flows management, business statistics, analytics, reporting and other tools.

Safety and legality

Security and compliance systems:

- 1) User verification
- 2) Delegated KYC
- 3) AML compliance
- 4) Adoption of 'laissez-faire' principle
- 5) Ability to create escrow transactions using smart contracts
- 6) Hierarchical principles of account management
- 7) Trustless nodes

Tools and functions

- smart contracts
- smartcoins, stablecoins and user-issued assets
- API
- JavaScript and C++ libraries, as well as compilers from these languages
- Dapps
- Private keys
- hierarchical account management system
- 80-100% of fees go to owners of non-core tokens
- ability to generate business reports (structure of revenue and expenses, etc.)
- Cross-Chain
- Direct transfer from wallet to wallet
- Decentralized P2P Shared Orderbook
- Unlimited transferring Amounts
- Utility Tokens
- Transparency of Team Identity and Funding
- Decentralized Organization/Development
- Decentralised Multi-Wallet
- Block explorer

Ways to use VPLedger

Commercial use cases for the VPLedger blockchain are numerous, ranging from fast, legal and compliant cross-border transactions to mutual settlements between contractors,

from the purchase of real products to the creation and promotion of decentralized applications.

Technical details of the blockchain

- 1) The consensus mechanism - Veritas Persona by Governance (modified PoA based on Graphene 3.0)
- 2) Scalability - up to 100,000 operations per second
- 3) Block confirmation time is about 5 seconds
- 4) Total software tokens supply is limited and set to 10.2 billion; The first 200 million will be sold from the corporate entity OpenLedger ApS, and the remaining 10 billion from the nonprofit VPLedger foundation

Problem domain and solution

There are currently hundreds of blockchains on the market, which provide their users with tremendous opportunities, whether it is a global decentralized currency or a platform for creating decentralized applications and services. But despite the potential of the technology, these blockchains are unable to meet the needs of global business, replace existing centralized solutions and ensure the simplicity of interaction between the cryptocurrency market and the existing financial system.

VPLedger (VPL) is a new type of blockchain – a protective blockchain designed for transnational compliant business operation in a secure, scalable and high-speed infrastructure, using all the advantages of blockchain technology. It achieves this with an innovative consensus mechanism based on democratic principles, where each user can influence key decisions within the proposed blockchain economic system.

The combination of the features of the VPLedger network and the potential of services based on it will provide users with the opportunity not only to the use of smart contracts and cheap international payments but implement the entire cycle of creation, development, and implementation of decentralized applications.

The used technology is a blockchain architecture that can eventually scale to hundreds of thousands of transactions per second and allows to deploy and maintain decentralized services and applications quickly and easily while providing full technical and legal protection to users.

We believe that blockchain technologies could ensure the reliability of scalable networks and facilitate the removal of barriers between businesses across countries at the same time. The main purpose of creating a protective blockchain VPLedger is to provide the world community with a fast and easily scalable protective blockchain for business, which will protect its users from potential technical and legal problems of the real world and have a developed ecosystem of useful services.

The need for a new type of blockchain

Democracy is an integral part of modern society and ensures its further improvement through evolutionary changes. The traditional definition of democracy implies a system based on collective decision-making, wherein each participant has equal impact on the process outcome. We are currently witnessing the embodiment of the principles of democracy in blockchain ecosystems.

Blockchain is a great place to experiment with and implement the most ambitious ideas that have existed for centuries but cannot be realized in modern society. It is here that we can achieve, at minimal cost, the principles of an ideal democracy, where all key decisions about the issues of functioning and development are made directly through the will of each member of the community (user). Blockchain provides an opportunity to reveal the user's opinions in an undistorted form, and to make informed, legitimate decisions taking them into account.

We understand that it is impossible to create an ideal blockchain that would suit everyone, but it is feasible to develop a network upon which the blockchain ecosystem would work for business and which would be acceptable to regulators; a network that would be simple, fast and understandable. Accordingly, such a blockchain should not promise complete anonymity or allow developing anarchic ideas that are detrimental to the business community.

We are well aware that people are a part of society, and blockchain is also a part of the world economic system, one which cannot exist on its own.

Therefore, the organic combination of the ideas underlying cryptocurrencies, decentralized platforms, and modern financial foundations of society is an inevitable consequence of the evolutionary development of social systems and institutions.

Most of the wrong decisions in the management of any system arise as a result of an information gap. Thanks to the voting power of each active member of our community, community users have the opportunity to use their personal experience to make informed decisions, and thus most effectively translate the idea of real democracy.

However, such a democratic blockchain requires a functioning relationship with the wider society and state authorities. This indicates a need for an unbiased entity which will be limited to servicing potential obligations arising from the functioning of the blockchain, and which will be committed to ensuring its sustainable operation. This entity can in no way affect the economic life of the network participants, but is legally and technically bound to ensure the network's functioning.

However, we would like to emphasize that there is no real democracy in modern society, there is only a democratic plutocracy retaining a universal law, according to which a minority in the form of an elite always deceives the masses. The reasons for this are the

biological limitations of man, the specifics of the political struggle (the dominance of populism) and developmental characteristics of complex social systems. That is why we do not intend to duplicate the imperfect democracy inherent in modern society within the blockchain. We want to shoulder all these tasks, and allow users to realize their goals within the framework of the developed free blockchain economy.

If we try to transfer the principles of protective democracy to the real world, there are many problems, primarily associated with the imperfection of governments that ensure the functioning of states. Therefore, interference of the authorities in the life of society, including the economic sphere, is inevitable.

However, thanks to the development of digital technologies, democracy in its best protective form can be integrated into the blockchain (protective blockchain) and thus ensure the fair, efficient and legitimate functioning of blockchain platforms.

The model of protective democracy used in our blockchain will provide a direct link between users and economic decisions: all economic decisions are taken on referendums, where each user can vote. It ensures the availability of complete information at all levels of the social process: all steps taken and previously taken and decisions affecting the functioning of the blockchain are public and each user has access to them around the clock; and it provides users with a completely free-to-use economic blockchain system.

What does blockchain VPLedger give to its users?

- Blockchain provides users with a cloud platform for collaboration between independent contractors, which allows them to exchange data and transactions
- Each transaction on the blockchain necessarily passes the procedure of signing with the private key of a particular network participant and assigning a date
- A distributed blockchain database is an immutable, secure, and reliable system protected by cryptography and encryption. The applied database model has no central weak point that can fail or be disabled, and does not envisage a single administrator that can be compromised;
- Transparent and reliable information stored on the blockchain promotes trust between independent contractors without the need to involve intermediaries;
- All transactions within the blockchain are checked in real time, which favorably affects the speed of the network
- The data is encrypted using the public keys of users, meaning the range of data users can be limited to users who have granted permission. This right is unconditional, and no other parties will not be able to access the data limited by such a mechanism
- The maintenance and security costs of such a database are much lower than those of traditional data systems, but at the same time the VPLedger blockchain provides the highest level of security. This is why the VPLedger blockchain does not need to have a large staff of specialists to ensure the maintenance of the system and its security, like that of traditional payment processing systems such as PayPal or Visa, which significantly reduces the cost of maintaining the system

Target audience

The target audience of the VPLedger protective blockchain is the global business community, including any business that wants to access a simple, reliable and democratic network that allows it to carry out the usual business processes using the advantages of modern blockchain platforms.

Thanks to the ecosystem of services created by VPLedger, small and medium-sized enterprises, startups, individual entrepreneurs, freelancers and the self-employed fall into the target audience, as well as people who use remittance transactions. Furthermore, crypto enthusiasts and developers can use a stable blockchain with a solvent audience to implement their projects.

The need for verification and KYC procedure

Business processes are complex and diverse, and their effective interaction within the blockchain cannot be ensured by the safe transfer of tokens from account to account and the use of smart contracts. In many cases, these mechanisms are insufficient, and additional tools are needed to ensure a stable and trusting relationship between two or more counterparties within the blockchain. First among these is the ability to identify users who remain completely anonymous within the whole blockchain, but who can, if necessary, disclose their data to their counterparty.

Identification, in this case, means a procedure which makes it possible to identify a network participant uniquely. However, if the users themselves fill in the identification data, there is a possibility that they will indicate false information, which in the future may adversely affect the relationship with the counterparty and lead to damage to the latter. Therefore, there is a need for an independent, unbiased, and transparent mechanism to identify individual users.

User identification is directly related to the KYC (Know Your Customer) procedure, which came to the world of blockchain and cryptocurrencies from the banking sector and exchange trading. This procedure implies that each company that works with the funds of individuals must identify the counterparty before carrying out a financial transaction.

In general, KYC is not an integral component of decentralized financial services, but the multibillion-dollar turnover of the ICO space drew the attention of state regulators from around the world. In order to counteract the legalization of proceeds from crime and the financing of terrorism, government agencies oblige blockchain projects which operate with the funds of individuals to identify their users. Therefore, KYC is likely to become the standard for all popular platforms using blockchain technologies.

Despite the deanonymization of the user for public authorities, the KYC procedure contains some advantages both for an individual subject of the blockchain network and for the entire network as a whole:

- simplification of interaction with banking authorities
- simplification of work with institutional investors

- legalization of income within the blockchain
- rapid development and growth of the number of users
- avoidance of various kinds of sanctions by state bodies

This mechanism should contain a set of methods that allow authorities to identify users who have passed the verification procedure. Verification means a process where the correctness of the identified user data is proved by using several formal methods. This mechanism is designed to ensure the highest degree of trust, both between remote contractors who wish to disclose their data within their relations, and from public authorities. So from our point of view, such a mechanism should be an integral part of any blockchain that is interesting and useful for business.

Verification of users at the initial stage will be carried out by OpenLedger ApS; after the commercial launch, verification will be carried out by a third-party, proven operator. The ability to verify users on the basis of the data received from third-party KYC services will be implemented with the API used in the VPLedger blockchain.

After passing the KYC procedure, all data is encrypted and has the following features:

- no one can decrypt and learn personal data without entering the user's private key
- the user can optionally disclose his data to the counterparty (for example, only for a specific counterparty, forever or merely for this transaction)
- disclosure of data to third parties (national authorities) can occur only by a court decision

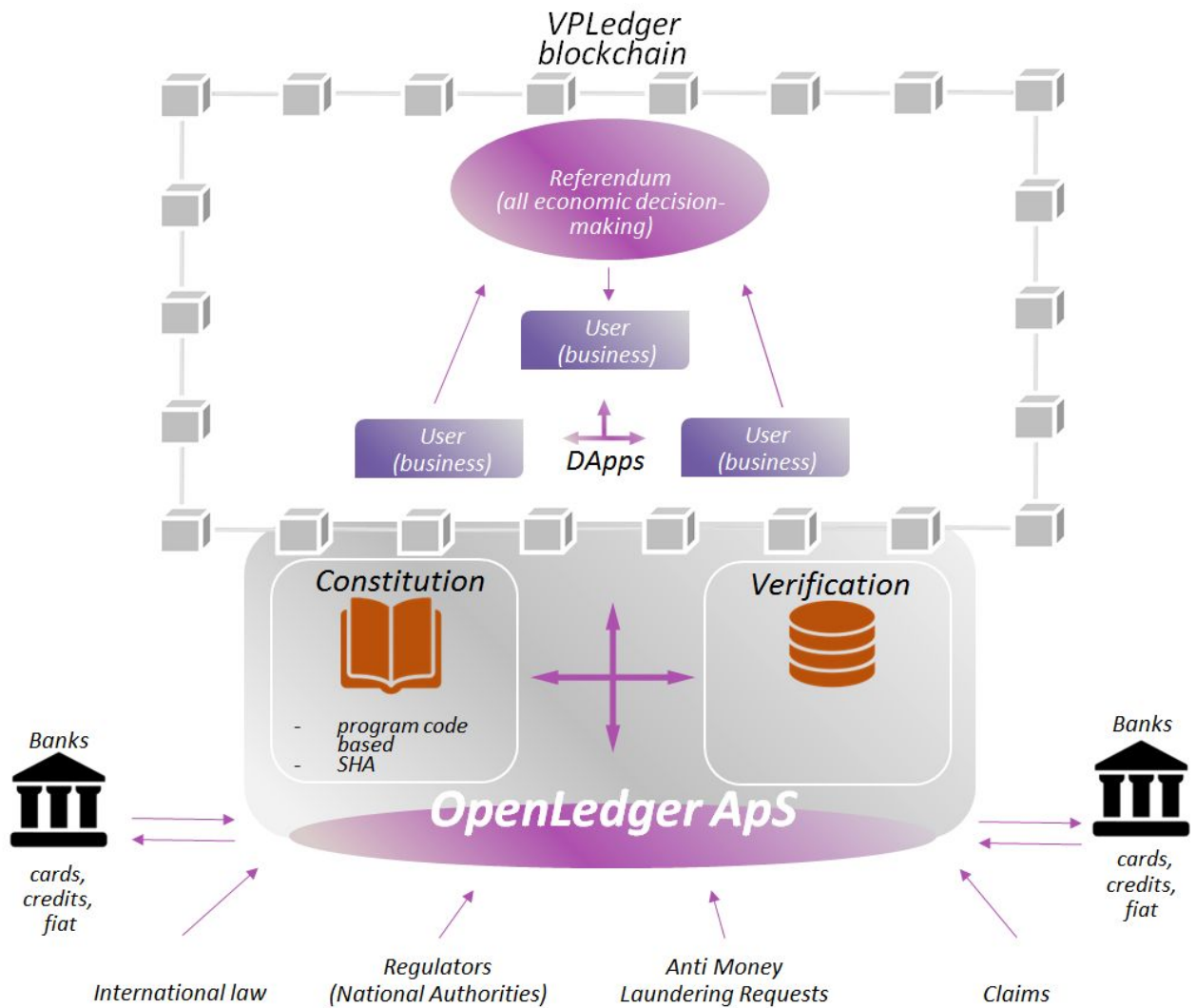


Figure - Features of operation of VPLedger protective blockchain

2. THE BLOCKCHAIN DESCRIPTION

The consensus mechanism

The consensus mechanism used by VPLedger, Veritas Persona by Governance (VPG), is a reinterpretation of the Proof of Stake mechanism, which uses the identification of validators (Proof of Authority) rather than the proportion of ownership to achieve consensus. In the VPLedger network based on the mechanism of VPG, operations and blocks are validated by confirmed accounts (validators). However, it does not require the maintenance of a large number of nodes, and the first validator, which is the legal entity OpenLedger ApS, chooses a new validator. In the future, validators will choose new nodes by democratic voting. This process repeats dozens of times, leading to a system of decentralized validation of new blocks. The required number of validators, in this case, does not exceed 25 units, a number chosen to ensure efficient use of computing resources, flexible network security management, and immense scalability.

The main characteristic of a network based on the mechanism of consensus VPG is low requirements for computing power. The stability and reliability of the network does not depend on the number of nodes, as all functioning nodes have been identified and verified previously. Validators are required to pass several checks to confirm their reliability. The probability of the next transaction formation by the administrator is proportional to its reputation. The principle of the consensus mechanism is that each transaction is collected in size-regulated blocks, which are written in order of appearance in the blockchain, and the validators conduct transactions and write them into the blocks.

The validator to form each separate block is selected conditionally at random. If the node is offline and skips its turn of the unit formation, the next node creates the block instead. For example, if only two nodes are working, the blocks will be forming by each node in random order, but the total value of the formed blocks by one node will be about 50%.

Validator anonymity for network participants is provided by data encryption. The VPG consensus mechanism is considered to be more reliable and efficient than, for example, PoS and PoW. The PoW consensus algorithm used in Bitcoin and Ethereum is secure and robust. However, it does not have broad scalability capabilities. PoW blockchains have inherent performance limitations in terms of the number of transactions per second, since these blockchains use an extensive distributed network of nodes, all of which need to reach consensus. Before the new block is confirmed, it must be checked and approved by the majority of nodes in the network, which limits the potential of using PoW blockchains for the work of hundreds of millions and billions of users. At the same time, a network using the PoW mechanism consumes enormous computing power, which in itself is an inefficient use of limited energy resources.

The PoS mechanism distributes rights by the relative size of each user's share in the network, which contributes to the manifestation of oligarchic structures within the network management and negatively affects the stability of the entire blockchain. PoS networks also lack transparency, and validators can remain anonymous, allowing them to access the

network an unlimited number of times, even after they have attempted to damage the network.

Users with a more significant share make all critical decisions aimed at improving and developing the network. Meanwhile, susceptibility to 51% attack is a significant drawback of PoS blockchains. In the mechanism of VPG, this problem is absent, since the authorized node has legal obligations to the users of the blockchain.

Popular blockchains, for example EOS, have a disadvantage in the form of high requirements for RAM and ROM for storing information about the current status of contracts and their history. In the VPLedger blockchain, users can limit storing of history to selected accounts, which significantly reduces memory requirements. Also, VPLedger adds the ability to store information in an external distributed database, which eliminates the need to rescan the blockchain when restarting the node.

The disadvantage of popular blockchains is the lack of official public tools (available official information portals) from developers, giving users the complete information necessary to make a decision within the voting procedure on the functioning and development of the blockchain. The VPLedger legal entity will provide users with aggregated information about the blockchain work, including in the form of infographics, on the official website. The only shortcoming of the VPG mechanism is its higher degree of centralization, which is offset by its advantages in speed, scalability, and security, which are more preferred characteristics for the target audience of the VPLedger blockchain — the global business community. VPLedger is positioned as a blockchain for business, which should fully meet the requirements of the target audience.

Table - Comparison of blockchain features with existing competitors

Feature	VPLedger	Bitcoin	Ethereum	Ripple	EOS
High scalability and speed	yes	no	no	yes	yes
Decentralization	no	yes	yes	no	yes
Transaction privacy	yes	no	no	no	no
Free transfers	yes	no	no	no	yes
Smartcoins, stablecoins and user assets	yes	no	no	no	yes
User impact on economic decisions	yes	no	no	no	no
Smart contracts	yes	no	yes	no	yes
Multi-level user protection	yes	no	no	no	no
Legality of use in various jurisdictions	yes	no	no	yes	no

KYC and AML	yes	no	no	no	no
Developed Ecosystem of Services	yes	no	no	no	no
Platform for digital assets trading	yes	no	no	no	no
Crowdfunding platform	yes	no	no	no	no
Freelancers' exchange	yes	no	no	no	no
Dapps	yes	no	yes	no	yes
Compliance with Laissez-faire	yes	no	no	no	no
Ability to create escrow transactions	yes	no	yes	no	yes
Hierarchical accounts management	yes	no	no	no	yes
Private Keys	yes	yes	yes	no	yes
API	yes	no	yes	no	yes
Independent verified nodes	yes	no	no	no	yes
A simplified mechanism for working with fiat	yes	no	no	no	no
Cross-Chain	yes	no	no	no	no
Decentralized P2P Shared Orderbook	yes	yes	yes	no	yes
Unlimited transferring Amounts	yes	yes	yes	yes	yes
Utility Tokens	yes	no	yes	no	yes
Transparent Team Identity and Funding	yes	no	yes	no	yes
Decentralized Organization/Development	yes	yes	no	no	yes
Decentralised Multi-Wallet	yes	no	no	no	no

Requirements for validators

To become a validator in a VPG (Veritas Persona by Governance) consensus, each user needs to go through several processes confirming good faith. The identity of potential validators must be approved through available free access data (for example, through the public notary databank). The complexity of the process of obtaining validator status, and its uniformity for all applicants, should assure the financial and reputational reliability of the potential validator, in turn ensuring the sustainable operation of the network in the long term.

Any validator acting maliciously can be easily removed from the block validation process. The result for such a validator would be a loss of reputation as well as a loss of future financial earnings. We suggest that the loss of such an actor's reputation through its identification is substantial in the modern world, since creating a positive reputation requires considerable effort and time. Awareness of the possibility of losing business reputation should serve as a powerful incentive for validators and promote their honest behavior within the blockchain; in the case of an update of illegal actions by the validator, the verified validator information will be disclosed to blockchain users.

To identify and verify validators, our team developed an approach that requires obtaining a special public notarial license, which was designed in conjunction with the VPLedger team to approve data relating to the actual location and nationality of the validator. It assumed that the validators must have notarial licenses of those countries where the blockchain VPLedger will receive the status of an official financial service provider. To establish the correctness of the identification data validators must pass the verification of data comparison through the services of Openledger ApS and the public database of notaries. These checks are independent, and if they return mismatched information obtained from different independent sources the affected candidate will not be allowed to become a validator. Even if the validator can bypass this mechanism, and attempts to carry out fraudulent activity against the network, the notary license can be used to identify them. In the process of obtaining a notarial license, each potential validator will undergo comprehensive checks on notarial databases, which will help participants to trust validators operating within the blockchain.

This is why the process of identifying validators in the VPLedger protective blockchain must be public: because the validator will then have to work according to the existing rules of the network or risks loss of reputation and worsened economic well-being. In PoS blockchains, even if the validator is removed from the process of block validation for fraudulent actions, they may return and continue their activities protected by their anonymity. In the case of such behavior in the VPG consensus blockchain, their reputation will be spoiled for many years.

Besides the requirement for computing power and passing the verification process, the validator also needs to purchase VPL tokens. The amount of the tokens recommended for purchase by the validator is a configurable parameter and can be changed as a result of a referendum. At the initial stage, to become a validator, the user will need to purchase at least 1,000 VPL tokens.

The problem of blockchain centralization

It can be assumed that the consensus mechanism used, and the limitation on the number of network validators required to create blocks, will make the blockchain more centralized in comparison with the Proof-of-Work blockchains (Ethereum, Bitcoin), where the number of validators is unlimited. However, it is essential to note that these blockchains consume enormous computing power, and despite a large number of validators, the dominant computing resources are concentrated in the hands of a small number of pools. Those pools have made significant investments in mining equipment, and they coordinate the efforts of a broader range of miners, unable to independently provide sufficient computing power to establish a block. In the leading PoW blockchains, more than 50% of the network's processing power is supplied by only a few miners (pools): thus, these system has approximately the same level of centralization as a VPG blockchain, where the number of validators is limited to several tens of units, but without the countervailing checks and balances built into VPG. Therefore, we can say that most blockchains are centralized to varying degrees. However, thanks to a higher degree of centralization, VPLedger is a flexible blockchain which constitutionally guarantees the security and stability of the network, as well as the full economic freedom of users within the blockchain.

Speed, scalability, safety

Bearing in mind the shortcomings of the considered consensus mechanisms, we propose a VPG consensus mechanism that will ensure the security, scalability, and high speed of the network without involving significant computing resources.

Any blockchain that wants to provide simultaneous interaction of several million users, and used Graphene 3.0 technology together with the selected consensus mechanism, will provide a transaction confirmation speed of about 1 second. The upgraded Graphene 3.0 technology underlying the VPL blockchain provides the ability to process up to 100,000 operations per second and tremendous scalability capabilities.

Currently, increases in performance and scalability of blockchains are achieved through parallelization of calculations and the use of various cluster solutions. VPLedger approaches the resolution of this problem from the other side – through the effective use of the computing power of validators. One of the most problematic areas for high blockchain performance when processing single-threaded block chains is the limited performance of CPU cores used in validators' equipment.

Theoretically, operations on two separate accounts can be carried out in parallel if they do not have a common dependence. In practice, the identification of pairwise independent operations using smart contracts is a difficult task. In VPLedger, this problem is solved by using ledgers, which minimize unnecessary calculations in the process of business logic. While traditional blockchains (Bitcoin, Ethereum) sequence your transaction to one thread of the blockchain, VPLedger parallelizes transaction processing, improving network speed. The key information required for transaction processing is stored in RAM to

ensure high scalability of the VPLedger network, since it is the memory bandwidth that critically affects the performance of the blockchain. This enables the software to simulate real-time relationships between data because the Business Logic Processor can use markers to the required data located in memory instead of relatively slow queries to external databases. Furthermore, it is possible to change the data immediately in memory, which enhances the productivity of this type of network by orders of magnitude in comparison with traditional blockchains which have to access databases continually.

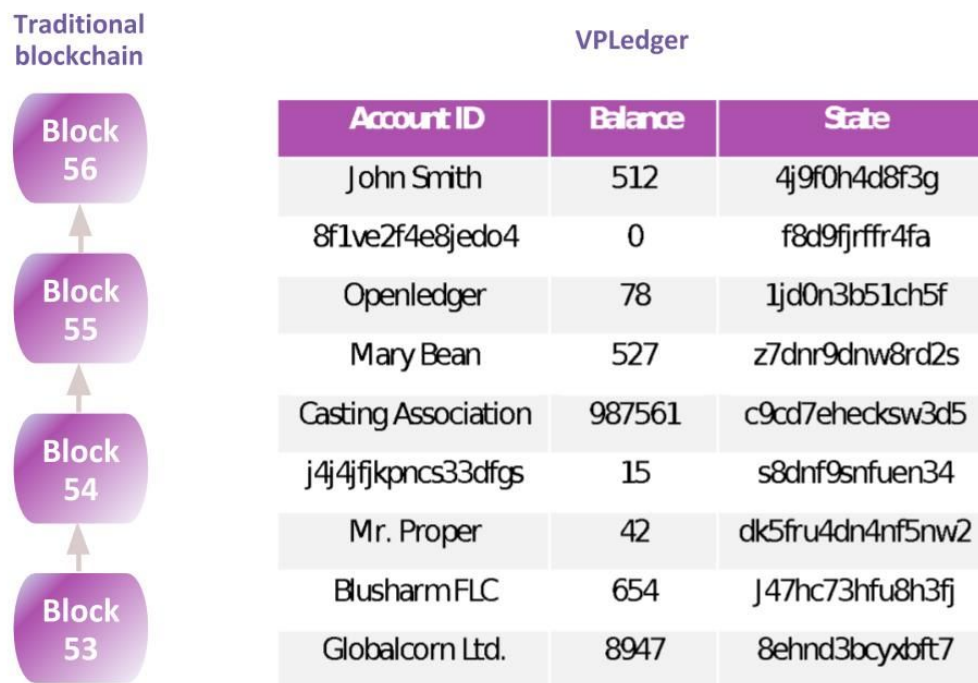


Figure - Comparing the architecture of VPLedger with a traditional blockchain

The high performance of VPLedger blockchain primarily results from the following features:

- data required for transaction processing stored directly in RAM
- unnecessary calculations in the process the business logic minimized (the main business logic in one thread, and the hashes and signatures of the blocks stored separately from the main business logic)
- object-oriented data model using

The consolidation of responsibility for the functioning of the network towards a particular legal entity, in addition, will allow users to minimize risks and, in conjunction with the proposed tools, to obtain the most secure blockchain.

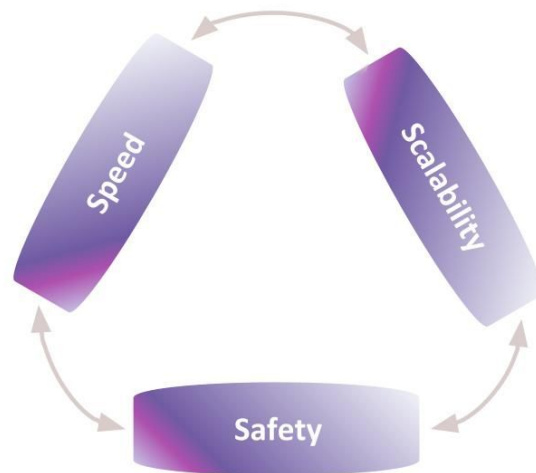


Figure - Main features of VPL blockchain

From our point of view, precisely the features of the architecture mentioned above should provide the high scalability of the blockchain for the business environment, and the possibility of democratic decision-making should contribute to the sustainable evolution of the VPLedger blockchain.

Data Storage System

The high bandwidth of the VPLedger network is achieved by using a different way of organizing the database than in the traditional blockchain. VPLedger uses the correspondence between the data identifiers (Ledger technology) for database storage instead of block structure as, for example, Bitcoin. The underlying Graphene 3.0 technology allows to check the integrity of the database and the history of its changes, as well as to quickly organize the synchronization of data with minimal costs. The technology is convenient because the last state of the database is stored in a compact form, which provides quick search, reading, and updating of the blockchain entries.

VPLedger uses the advantages of both ways of organizing the database at the same time: the blockchain and the correspondence between the data identifiers. The nodes synchronize data with each other using blocks and update the local copy of the blockchain, but verify and accept transactions focusing on the latest state of the Ledger identifier database.

Unique key identifiers

The traditional schemes of the blockchain use cryptographic hash functions for creating unique identifiers, which requires the use of high-capacity memory at volume. Obviously the search for an account by hash takes much longer than the search by the direct array index, because the larger the size of the hash identifiers, the more memory is spent on it. The memory compression mechanism cannot be used in this case because the hash identifiers are incompressible random data.

Using a unique, immutable identifier for each public key makes the signature verification in the business logic process unnecessary. The method of assigning unique identifiers to VPLedger eliminates the need for hash identifiers. Therefore, only the account name (ID) is used to access the account (including its balance and permissions). After creating the ID, the Input Disruptor verifies compliance of the cryptographic signature to the relevant ID. By the time the transaction reaches the business logic process, it remains only to check the key ID, which significantly improves performance.

Logically, a blockchain capable of quickly processing transactions of millions of users must generate large amounts of data. However, while the average transaction size in Bitcoin is about 250 bytes, it is only 100 bytes in VPLedger. The smaller the transaction size, the less data the validators have to process. All other things being equal, an average performance gain of 150- 250% is achieved compared to Bitcoin-like blockchains.

Due to these features of its architecture, the performance and scalability of VPLedger will be at the level of 100,000 transactions per second — and this is without taking into account the optimization arising from the use of a new consensus mechanism.

Hierarchical dynamic account permissions

Traditional blockchains have some disadvantages when using multi-signature mechanisms:

- in the process of cryptography, it is insufficient to use of equal weights of private keys to ensure the asymmetric ownership of the account, inherent in the traditional M-of-N model of account ownership distribution;
- secret keys cannot be changed without the consent of the other parties;
- the signature of the transaction may not be withdrawn while waiting for a response from other parties.

However, the VPLedger blockchain solves all these problems.

Multi-signature technology in the VPLedger network is aimed primarily at providing opportunities for managing one account by several natural and legal persons. The use of digital multi-signature for online transactions is one of the critical components of VPLedger blockchain security. Using a single secret key, the probability of its disclosure to third parties is much higher than when using several such keys with different storage locations. Therefore, hierarchical dynamic permissions using multi-signature empower users and the business in the VPLedger blockchain, offering a wide range of opportunities to control and account management that makes the process easier and more secure.

Features of the account permissions architecture

VPLedger uses Graphene 3.0 permissions architecture to manage accounts based on unique identifiers. Within this architecture, it is possible to create an account that does not have its own keys and depends on the approval of the managing accounts, which in turn may rely on third-party accounts. As a result of this architecture, users have the ability to create a hierarchy of accounts in which each account can change its own permissions regardless of the superior accounts (the principle of dynamic permissions). To perform different types of transactions different weights for each account in the hierarchy can be set, as well as a threshold level for the sum of specific weights required to accept the transaction.

Each account defines its rights through a set of keys or another account identifier, such as the size of the specific weight assigned by the user. If the total weight of the user, consisting of the sum of his private keys and accounts, exceeds the threshold, he is able to manage the account.

Because of the way the consensus model treats partially-signed transactions, users have the opportunity to change their decision on the transaction before reaching the threshold. Also, it becomes possible to make rapid transactions when approved by the threshold number of keys and/or accounts, even before all interested users sign and confirm.

The transaction confirmation process is as follows:

1. One user offers a transaction and reconciles it using his account;
2. Other keys owners and/or higher accounts express their consent or reject the transaction;
3. If the transaction is approved by accounts whose specific weights exceed the threshold, the transaction is confirmed.

Owner and Active Keys

Within VPLedger, only two types of rights are assigned to each account: owner authority and active authority. Active authority is expressed as a set of keys and/or accounts, which are assigned a certain weight.

Roles of the used owner and active authorities in the framework of the accounts are as follows:

- The primary role of an owner authority is to update the current action authorities or transfer of an owner authority;
- The action authority role assumes the ability to perform any transactions and actions within the account, except those assigned to the owner's authority.

With such a set of authorities, as well as the ability to transfer the owner's authority to cold storage, a VPLedger user can be sure that their account will always be under control, and no third party will be able to seize or steal it. Any VPLedger user can change their private keys an unlimited number of times without the need for permission from other account users that own the keys, or from superior managing accounts.

Core Token Model

The VPL token (core token) will be used to ensure the functioning of VPLedger protective blockchain. The VPL token is a tool that can be used for transactions inside of the blockchain and services offered on VPLedger. The token can be used both to pay the fees and to create decentralized applications and services.

As a blockchain token, VPL can be freely transferred to other VPLedger network users. Consequently, any business or entity operating on VPLedger may establish open markets for VPL against other currencies, including popular fiat and cryptocurrencies, subject to regulation in their jurisdiction.

The scalability of the hierarchical model

Theoretically, the size of the hierarchy for account management is unlimited. However, in practice, a hierarchical model that has more than two levels will require the involvement of a large number of actors, which can lead to an increase in transaction approval time. To simplify the process of collecting signatures from a large number of decision-makers, each account provides a mechanism for tracking partially signed transactions, in which the user can add/remove their permission to conduct a transaction during its signing. This is especially crucial for businesses which utilize developed hierarchical relationships.

For example, consider a single account used within one company. If the transaction confirmation process is slowed down by individual employees, a centralized decision to approve the transaction can be made by someone at the first level of the company hierarchy.

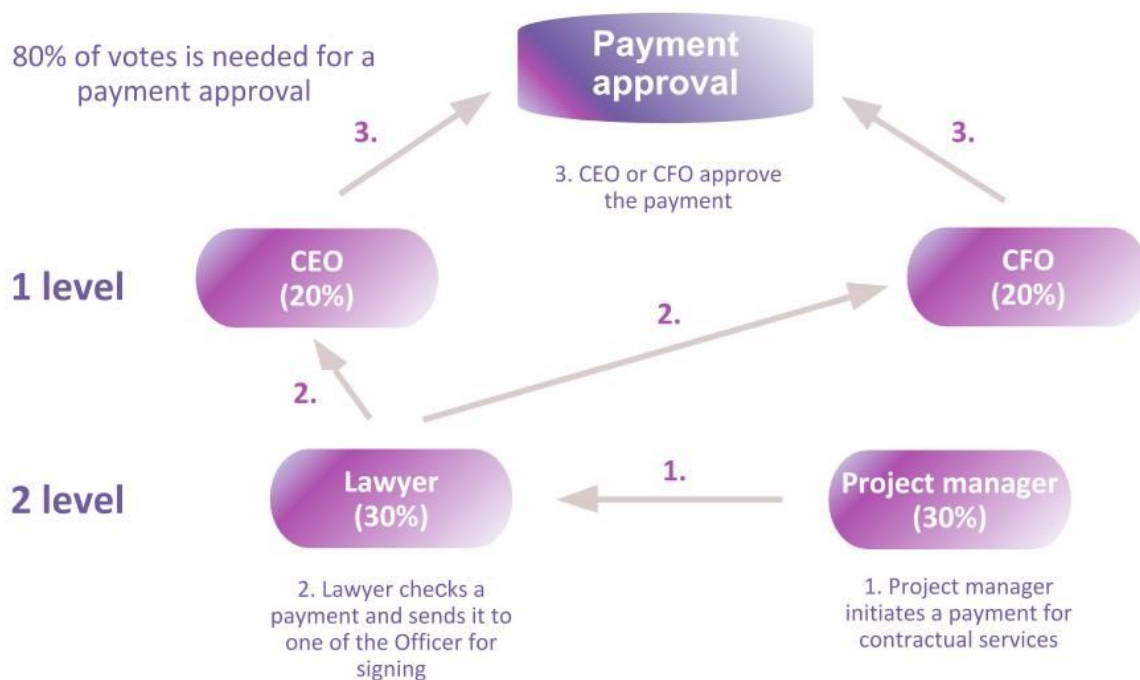


Figure - Example of a business hierarchy in the payment (transactions) conciliation process

The figure above shows an example of payment conciliation using a hierarchical model of VPLedger account. For example, to agree on a payment to a third-party contractor, the Project Manager must obtain the payment approval by a lawyer and one of the company's Officers (Executive or Financial Officer), per the established business process. In this type of transaction, it will be enough to collect 80% of the votes of managing accounts and/or keys to make a payment. In this case, it is advisable to set the following specific weight of the votes of the participants: Project Manager (30%), lawyers (30%), CEO (20%), CFO (20%). It is important to note that unlike traditional CRM\ERP systems, VPLedger provides a flexible transaction-signing process in which the sequence of the process

participants' signatures is not essential; the transaction will be signed when the established threshold of votes is exceeded.

Routing Loop problem

Within the blockchain, it is allowed to create linked accounts which can have an infinitely complex hierarchy of management. However, in theory, linked accounts can lead to looping if two accounts require each other to approve the same transaction. For example, the approval from the B and C accounts is needed for the approval of the transaction in the A account. At the same time, consent from A and D accounts is required to approve the transaction by B account. In this case, you can see that to approve a transaction on account A, account B must simultaneously get approval from account A within the same transaction, which will lead to a loop. Such a cyclic relationship can be hidden, and can occur at more than two hierarchical levels. To solve this problem at the blockchain level, VPLedger has built-in algorithms that permit detection of loops and prevent their occurrence.

Unique Account Names

When creating a new user account, users must select the name that will be displayed while they interact with other network participants. In most blockchains, account names are a chaotic sequence of letters and numbers that are extremely difficult for the user to remember. As part of the VPLedger blockchain, users have an additional opportunity to purchase beautiful names for their account, as the standard mechanism for creating an account name contains restrictions that include the need to use a long sequence of characters and the use of non-letter characters. Unique personal VPLedger accounts allow users to easily remember information about their account, making it simple to use and identify when interacting with clients.

Registered accounts can have many uses, including applying the real name of the legal entity as login. It is important to note that within the network, registered accounts can be freely transferred to other users, which makes it possible to use the account name as a separate asset. To ensure the safety of account transitions from user to user, VPLedger provides a mechanism for preserving the reputation of a user when changing the account name. In this case, all responsibility for the future use of the registered account is transferred to the new user. To transfer the account name, a particular transaction is used, which clears the entire history of the account name in the network. This mechanism protects both sides of the transaction; by comparison, a simple update of the key that controls the named account will preserve the past reputation of the account and will not lead to a legitimate change of ownership.

Our team is aware that harmonious account names will not be enough for everyone due to a large number of users, so the appointing of unique account names will be on a commercial basis, resulting from the purchase of the selected name by the user. The user has the opportunity to offer their version of the account name that they would like to purchase. A fee is charged for reserving an account name, estimated according to its

length. Embodying the ideas of a protective democracy, the users themselves can directly influence and set the price of the account name in referendums. Account names containing service characters (such as dashes), or more than nine characters in length, or containing only vowels will be entirely free for users.

Recurring and scheduled payments, daily limits

Recurring payments

The VPLedger blockchain has native support for recurring payments, which allow users to set the parameters for third parties to periodically withdraw limited amounts from their accounts by applying for custom permissions. Such permissions are incredibly convenient to use for monthly subscriptions to a variety of services or when making regular payments (for example hosting payment, office rent, accounting services).

Custom account permissions have the following key settings:

- start and end date of the permit;
- withdrawal limit (per period);
- the length of the period (for example, a week).

Within VPLedger, each account can grant an unlimited number of withdrawal permissions for any asset (token). After receiving the right to withdraw funds, the user (service) needs to carry out only one operation to withdraw funds in the period within the established limit. The withdrawal operation is initiated by the user who has received the right to withdraw funds from the account (for example, such a function implemented in subscriptions service in the iOS operating system).

Daily limits

To increase the security of their account, VPLedger users can also use the native ability to establish a daily limit on withdrawals from the account. Separate savings and checking accounts have been created to do this. As part of the savings account, the user's key is stored offline, which makes it more difficult to steal. At the same time, the withdrawal limit, which can be changed only within the savings account, is valid only for the current account.

Scheduled payments

Recurring payments do not allow users to make payments to the accounts of other users (services) automatically. Scheduled payments provided in VPLedger provide the opportunity to implement such functions. The scheduled payment feature allows users to create a transaction that can be executed at a specific time on a particular date. A scheduled operation can be a one-time transaction (completed once at a preset date) or a periodic transaction (executed once per period). The number of scheduled payments within one account is unlimited.

Smartcoins and stablecoins

Smartcoins are tokens pegged to the value of the underlying asset — for example, to the euro, gold bullion, or a barrel of oil — and 100% or more provided by VPL core tokens. Thus, a smartcoin is any token that is pegged to any market asset (for example, stablecoin, which tied to the price of fiat currency). Conversion of smartcoins to VPL is possible at any time based on the current market rate of VPL to the underlying asset, which in turn provides high liquidity of smartcoin.

There are ample opportunities to customize smartcoins in VPLedger: for example, with the help of smartcoin, users can create a token tied, not to one fiat currency, but directly to a currency basket where the share of one of the currencies (for example, EUR) can be changed in accordance with its prevalence in the world. Or users can create their own stock index, which will take into account changes in the relative value of a large number of selected basic assets.

In the VPLedger blockchain, users can create a special kind of smartcoins — stablecoins (Privatized Smart Coins) that have unique, customizable options, and can focus on the value of any underlying asset (fiat, gold, oil, stock). The set of proposed variable parameters is sufficient to realize the possibility of a highly functional predictable market, which can provide calculations at a fair price without the need for coercive estimates.

Traditional stablecoins, such as USDT (Tether), require a sufficiently reliable Issuer, as well as full security of the asset (for example, by the fiat currency). In the case of VPLedger, the value of the stablecoin remains constant, even in the case of the Issuer's disappearance. This is made possible by the mechanism of Global Forced Settlement. Stablecoin (Smartcoins with a stable price) can perform the following tasks on the VPLedger blockchain:

- provide businesses with a relatively reliable solution to predict the future value of the asset (token);
- permit the use of units of account, which are different from traditional cryptocurrency assets and lead to reduced volatility;
- provide a tool for hedging risks in highly volatile markets.

In VPLedger, most types of underlying assets can be used to create a smartcoin. The Issuer also has access to such instruments as white lists and stablecoin transfer restrictions, as well as to a mechanism that allows them to configure market restrictions.

Significantly, within the framework of VPLedger, two types of stablecoins can function: conventional stablecoins based on traditional types of restrictions (for example, fiat), and special kinds of stablecoins which can only operate within individual jurisdictions. This feature is designed to ensure compliance with currency and other restrictions used by national regulators.

Within the network, the Issuer can configure the following key parameters of the stablecoin::

- type of collateral;
- initial collateral rate;
- the supported rate of the deposit;
- Forced Settlement Fee, Delay, and Daily Volume;

- token price and rate update;
- Global Forced Settlement — a universal compulsory settlement by tokens or cash, to which a party is obligated or forced by third-party actions.

Ways to profit from asset issuance

Within VPLedger, there are several ways to benefit from the issue of assets. Users can obtain fees from Smartcoins that they issue. Therefore, users who choose the most harmonious parameters for their smartcoin can significantly increase their revenue. Smartcoins are thus a useful tool for traders, businesses and ordinary users who seek to find the best solution to work with the currency and stock markets, as well as those who want to implement their ambitious ideas in the crypto-financial sphere.

Users can accept their Smartcoins' transaction fees as a percentage or in fixed physical terms. A combined fee rate with a minimum and maximum can be used too. Users also have the opportunity to create referral programs for their assets and tokens, which should facilitate the process of attracting new customers.

Fee pools

If necessary, issuers have the opportunity to create pools of fees, within which the generated token will exchange for VPL. If the person applying the user token wants to pay the charges of the VPLedger blockchain with the user token, he will be able to do so at the rate specified by the issuer. Issuers can charge users a fee for using their custom tokens instead of VPL to pay network charges.

Fee pools should let users utilize User-Issued Assets without the need to purchase core tokens. Any user can finance the Fee Pools, while only the Issuer has the right to set the exchange rate.

Fee Backed Assets

Fee Backed Assets (FBA) are essentially crowdfunding tokens: assets designed to stimulate the development of innovations within the VPLedger protective blockchain by providing the funds necessary for their development. The financing of innovation in the case of Fee Backed Assets is carried out by distributing a portion of future revenues between entities that previously provided financial support within a specific project. By using this tool, the company can attract investments (for example, for software development) by releasing tokens, through which subsequently all the profits of the company will be distributed in equal shares.

Fee Backed Assets have the following key features that make them an attractive investment asset:

- all profits of the company issuing the token will be evenly distributed among all released FBAs;

- the token has high liquidity, as it can be traded on cryptocurrency exchanges or platforms for digital assets;
- token holders (investors) can receive additional revenue from changes in the token's market value.

A feature of the token is also that in its form it is an ordinary commodity, not security paper.

The Issuer of the FBA token, launched as part of a specific innovation project, can both immediately implement all FBA tokens on the market to fund current and future costs, and keep part of it to save share of the future income from the completed project. The owner of the token, in turn, receives a profitable asset that can quickly be sold both within the VPLedger ecosystem and outside it.

The functionality laid down in the FBA should help stimulate the activities of users of the VPLedger protective blockchain to search for resources and achieve their ambitious ideas without the need to attract additional sources.

Fee collection and network member remuneration mechanism

On the VPLedger protective blockchain, each transaction requires a fee, debited from the balance of the initiator's account at the time of transaction confirmation. Fees and other charges, for all transactions and from all accounts, go into the Reserve Fund (Reserve pool). The Reserve Fund does not belong to any of the entities of the platform, and is managed exclusively according to the Protocol. Rewards are from the Reserve Fund paid to the validators' and developer's accounts as a percentage of the Fund balance or a fixed amount. The collection and distribution of fee payments may be subject to the rules of referral and other programs that can be implemented in the blockchain according to referendum.

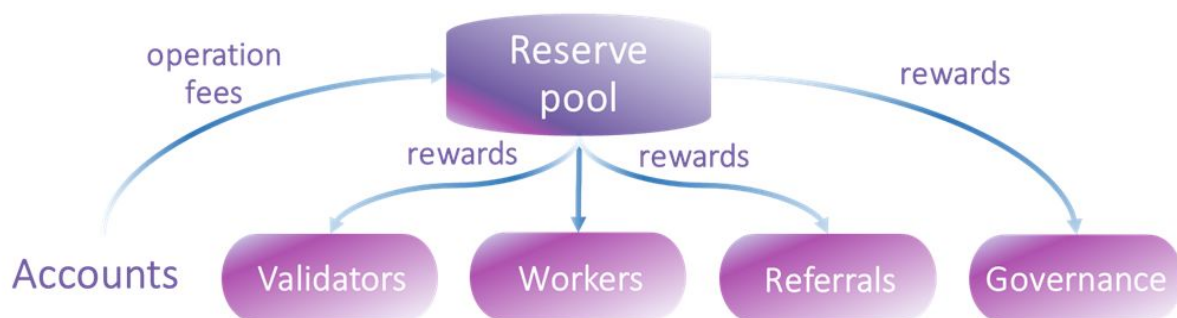


Figure - Fees distribution

When exceeding free transaction volume, the fee amount will be 0.01% of the transaction value, but not less than 0.05 VPL token. There is **no fee** for **outgoing transfers** (the operation of transferring funds from user to user), or for messaging between users. Fees are charged only on transactions — purchase, sale, exchange, conversion — and outgoing transfers.

All user transactions are private. The payment receiver and sender addresses, and the amount of tokens, remains encrypted and concealed. In the blockchain, the transaction information will look like this: "private sender" sent "private amount" VPL to "private receiver". If necessary, a user may disclose data on one or all private transactions (for

example, to obtain a cryptocurrency loan, or to provide information to shareholders during an audit of the company's activities) to their counterparty.

Configurable characteristics of the VPL blockchain

A broad set of parameters can be changed without a separation of the blockchain (creating a fork) on the VPLedger protective blockchain, based on the results of voting in a referendum or on the decision of OpenLedger ApS.

It is important to note that the simplicity of the process for changing parameters in no way affects the high level of user security within the VPLedger blockchain.

Model of block and transaction

In the VPLedger network, each block includes a block header, the validator's signature and a list of its constituent transactions. The block header combines a reasonably simple structure with a small size. The header contains the ID of the previous block, the timestamp, the Creator ID, the hash value of incoming transactions, and the ID that is responsible for maintaining compatibility with different versions of the block header.

Currently, several dozen types of transactions can be used in the VPLedger blockchain, and their number can increase in the future. Operations allow both simple changes in the blockchain (an asset transfer to another account, an asset exchange, create a new asset) and more complex mechanisms, such as smart contracts.

A transaction in the VPLedger network consists of several basic values that serve to bind it to a block (block number and block prefix), specifying the time before which the transaction can be added to the block (expiration time), the type of operation with its contents (operation vector), and the version of the transaction (extensions). These values form an unsigned transaction, and for a transaction to be signed correctly, it is necessary to analyze all transactions following their content and make a list of accounts that must confirm this transaction. As a result of this operation, the keys that will sign the transaction are determined, after which all transactions place in the block.

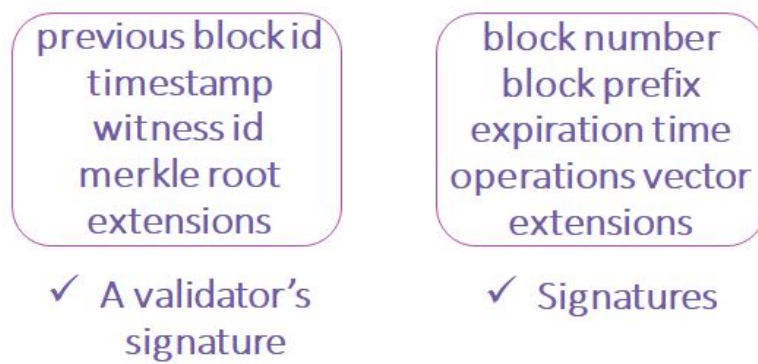


Figure - Block structure and transaction structure

Referral program

The current situation in the cryptocurrency and financial markets compel all blockchains to compete for new users. Therefore, VPLedger has a built-in mechanism with a referral program to stimulate the attraction of new users. We are well aware that the more users the blockchain has, the more valuable the services and tools offered within it, and the more valuable the blockchain itself. A transparent way to reward users who contribute to the growth of the blockchain is one of the most important ways to promote the VPLedger ecosystem. Also, the referral program will contribute to the development of blockchain infrastructure, since services will receive additional revenue for attracting new users while advertising their products. The combination of OpenLedger ApS' advertising activities and the marketing efforts of individual services within the blockchain should lead to a synergistic effect arising from the combination of different ways to involve new users to the VPLedger ecosystem.

The issues of financing the attraction of new customers constitute one of the main problems faced by the majority of newly-created companies. In any business model, the cost of attracting users should be lower than the wealth from their monetization. For VPLedger, the funds received from the distribution of VPL and paid under transaction fees should fully cover the cost of customer attraction and network security and maintenance. At the same time, transaction fees should be low enough to ensure that VPLedger can successfully compete on in the blockchain market. The VPLedger referral system is built in such a way as to ensure the sustainable development of the blockchain, so the reward for attracting a new client will be calculated as a percentage of the profit from each customer over that customer's Customer Lifetime Value. Users will be able to select one of three tiers of membership: monthly, quarterly or annually. A special lifetime membership will be available for Early Access users). The purpose of the VPLedger referral program is the rapid growth of the user base, encouraged by the distribution of a percentage of the VPLedger profit from each user acquired by referral.

The principles of voting

Following the democratic principles of the VPLedger protective blockchain, network users have full economic freedom within it. Each user can participate in referendums defining the direction of the development of the VPL blockchain and its future potential, and any user can directly initiate such a referendum.

All referendums in VPLedger has a deadline for the gathering of members votes of not more than three months. After the referendum is over, the Governance members consider its results. The proposal put forward within the referendum shall be accepted if a qualified majority of users voted for it. If more than 30% of users voted for the proposal put forward within the referendum, at least 50% of the votes from the Governance members are required for its adoption.

Legal Opinion

To ensure that the platform offers businesses full, reliable compliance, a comprehensive legal opinion on all aspects of user account functioning within the VPLedger protective blockchain will be provided. This legal opinion should identify the presence or absence of any risks users might encounter as a result of using the VPLedger projective blockchain; prohibitions and restrictions imposed by regulators across ; the legal position of core tokens; legal and regulatory issues arising from user privacy and data protection concerns; and the validity of legal documentation of the VPLedger blockchain.

This procedure will provide an opportunity to get recommendations from qualified lawyers to minimize the risks faced by users (primarily legal entities) and to optimize the tax burden in the most popular jurisdictions. Also, the legal opinion will reassure businesses that OpenLedger ApS complies with the requirements of their jurisdiction, including AML (anti-money laundering) and CFT (combating the financing of terrorism).

This functionality will be implemented within a few years after the launch of VPLedger, with the participation of a partner company.

User protection principle

OpenLedger ApS is liable for its obligations under the Constitution, including legal liability.

OpenLedger ApS has no right to interfere in or influence the economic activities of the protective blockchain's users. However, under the Constitution, the rules of international and domestic law are an integral part of the blockchain, and if international or domestic laws

contain rules other than those provided by the Constitution or referendums, the rules of international law apply. Therefore, the responsibilities of the legal entity VPLedger include establishing the compliance of existing and future tools operating on the blockchain according to the norms of international and domestic law. Release of noncompliant tools will be forbidden to ensure the integrity of the protective blockchain ecosystem.

User-Issued Asset

Any user of the VPLedger blockchain can produce custom assets (tokens) (User-Issued Assets). The available functionality of User-Issued Assets primarily focuses on businesses, which can use this type of tokens to provide new services and create their own products.

User-Issued Assets can be used and traded within the VPLedger blockchain within prescribed limits. For example, when users can select a restricted list of accounts that can act as token holders, or set fees for various transactions and transfers.

There are many options for User-Issued tokens, some of which are listed below:

- as shares or bonds – traditional securities are subject to strict regulation by national securities laws. Currently, tokenized analogs in most jurisdictions are not subject to this type of regulation and can be used as equity and debt securities, as well as derivatives, though this is changing in the USA and may change in other jurisdictions;
- as Depositary receipts – User-Issued tokens allow the creation of an analog of securities, certifying ownership of equity and debt securities (produced on the basis of both fiat and cryptocurrency), which can be used in combination with the advantages provided by smart contracts and escrow accounts;
- as a digital property right – a token asset can be used to issue various types of licenses (for example, for music, movies or software), which makes it easier to control the use of copyright;
- as an internal currency for entertainment services – token assets can be used as a means of payment in online games or casinos;
- as a crowdfunding tool – the emission of a User-Issued token is an effective tool for raising funds within a specific project;
- as tickets for events – ticket sales can be conducted using special tokens by auctioning them, which guarantees the acceleration of the sales process and ensure the maximization of the Issuer's profit by reducing the costs of organizing the ticket sales process;
- as a loyalty program – User-Issued Assets (tokens) can be used as the basis of loyalty programs, which provide various incentives to customers.

Currently, cryptocurrency legislation around the world is taking shape, imposing various requirements on cryptocurrencies and token assets, depending on national jurisdiction. Hence a wide range of tools is available to VPLedger users, which will allow issuers of crypto assets to comply with the national laws of specific countries. This functionality should have a positive impact on VPLedger's acceptance as a financial services provider in target markets.

Below are a number of tools that allow adapting User-Issued Asset (tokens) for use in different jurisdictions:

- as a tool for KYC - the Issuer can use whitelists, and trusted VPL users can apply a User-Issued token-asset without the need for the additional KYC procedure; limit the turn of User-Issued token for individual clients (for example, remove a user from the whitelist at the request of national regulatory authorities, which will automatically lead to the freezing of that user's funds);
- as a tool for observing Market Restriction – the national currency legislation may impose restrictions on direct trade between fiat currencies, and fiat and cryptocurrencies, and as the Issuer can realize necessary limitations within VPLedger, its User-Issued token may circulate under a vast number of different jurisdictions or under a particular jurisdiction;
- as a tool for observing Transfer Restrictions – a User-Issued token asset that allows their owners to trade them on the market without transferring the token asset from one person to another.

Wallet

VPLedger Wallet supports the Core token and other tokens of the VPLedger blockchain. In addition to the standard set, the wallet has several levels of authorization, and supports text messaging and voting within the VPLedger network. The desktop client will be available for Mac OS X, Windows, and Linux, and includes the browser version.

The lightweight mobile wallet client will offer users all the features of a desktop analog, but at the same time has additional biometric protection features, such as fingerprint verification or iris verification. Initially, the mobile client will be available on the leading mobile platforms, iOS and Android; in the future, it is possible to port the client to other mobile operating systems.

The wallet has its own user identification mode: VPLedger Passport, where users upload and edit their own personal data, which is encrypted with the user's private key and not available to anyone until the user decides to disclose them to another account within the blockchain. Users control which information is revealed, choosing to share only their full name (or the name of the legal entity), verified data (phone, mail) or other information that a particular service may require.

Block Explorer

Our team already has experience developing a multi-functional block explorer, BitShareScan, so the development time of a new explorer will significantly be reduced despite the increase in functionality.

In the framework of the VPLedger projective blockchain, a highly-usable, mobile, multilingual blockchain explorer provides users with information about the operations, accounts, and assets of the VPLedger. Dynamic search will allow users to conveniently get data on the transaction accounts (according to access rights) and the tokens, information about Workers (see Worker funding, below), verified accounts, smart contracts, and reports on referendums (voting), and track the latest actions and changes in the blockchain.

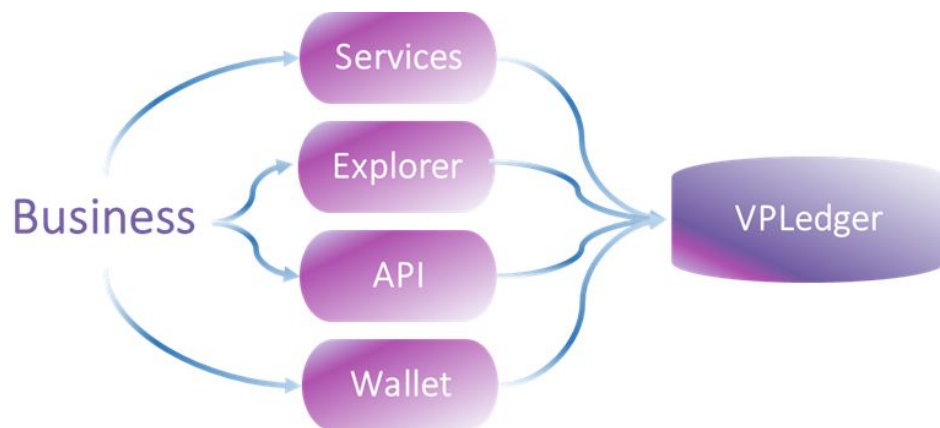


Figure - Business software model

Virtual Machine

In the development of the VPLedger protective blockchain, the Ethereum virtual machine was introduced in Graphene 3.0 technology. A virtual machine is a runtime environment for small applications that can be executed by a VPLedger network.

This virtual machine is a quasi-Turing-complete machine based on a stack architecture. The stack elements are 256 bits in size, and the memory model is represented as a byte array that uses addressing. The virtual machine memory model is non-volatile, and its code is stored in a localized virtual ROM instead of shared memory.

Fees in the VM are expressed in “gas” and charged in three different cases preconditioned for the execution of the transaction: a fee for the transaction, a fee for calling a subordinate message or creating a contract, and a fee for an increase in memory used.

The virtual machine allows to run various applications (smart contracts), with execution guaranteed at the software level, so any tasks that can be performed using a computer can be expressed in the form of applications and performed within the VPLedger protective blockchain. That allows each user of VPLedger to create smart contracts, which operate with assets and smartcoins, to use the ICO and decentralized cryptocurrency exchanges mechanisms, to create a robust system for the payment of dividends, the placement of the various games and promotions, and implement dozens of other diverse use cases. Therefore, combining the strengths of the two platforms (the flexibility of Ethereum smart contracts and Graphene bandwidth) allows users to access a symbiosis of advantages and eliminate the shortcomings of these technologies.

Decentralized data storage in the virtual machine is organized in the form of files and documents through the IPFS system, proven in the EOS blockchain.

For more flexibility, the virtual machine API is divided into 2 parts:

- Blockchain API, which is used to request data from the VPLedger blockchain (accounts, assets, trading history, etc.);
- Wallet API, where the user's private keys are loaded, and which is used when interacting with the blockchain and new transactions.

All requests to read information are performed via the public API. However, confidential requests to read and write are performed through a local shell. This architecture allows VPLedger to block third-party access to user data and tools and provide the maximum degree of connection security to ensure the confidentiality of business processes. Libraries and SDKs in different languages and platforms (Python, Node.JS) are available to facilitate integration into existing systems and frameworks.

To form an effective DApps market within the VPLedger blockchain, a mechanism of permissions for operations with smart contracts (to create, customize and publish smart-contracts) is employed, and users can create a hierarchy of publishers, business clients, and end users.

Table - Advantages of VPLedger Virtual Machine

Advantage	Description
High speed	The current performance of the virtual machine allows processing more than 3,500 transactions (including smart contracts) per second, which exceeds the number of VISA and MasterCard transactions by 15-20%
Flexibility and security	The virtual machine has the perfect balance between flexibility, through the use of Turing-complete language, and the highest security that has been tested by millions of people and hackers. The compatibility of the virtual machine with Ethereum-like blockchains allows the use of ready-made open source solutions, which are now widely available on the market.
DApps development simplicity	Through the use of Turing-complete Solidity language, a virtual machine lets users develop DApps capable of solving any significant computational problems. The large number of programmers using this language, as well as many available ready-made solutions on Solidity, allows to use functionally-objective information from outside the blockchain, mechanisms for updating smart contracts and system versions, interpreters from various programming languages, and more.

3. THE TESTNET

The objective of the testnet launch

The aim is to identify network limitations in high-participation conditions and to confirm the potential for high network scalability. This public testnet should be launched in

the fourth quarter of 2019, and at the end of 2019, the test blockchain will already have millions of generated blocks and tens of millions of operations performed.

Software

The test network backend software will be available on GitHub, as will the tools used for the stress test. The number of involved network validators will be at the level of 7-12 subjects, depending on whether the equipment used meets the requirements of the network for scalability and speed. Wallet and node will be available in the above terms at the following addresses: test.vpledger.one, node.test.vpledger.one

Limits

Blockchains using Graphene 3.0 technology can combine several operations into one transaction. The user can put a combination of different operations in one transaction, which are guaranteed to be performed sequentially. When examining the limits of the VPLedger protective blockchain, it is therefore essential to distinguish between the number of operations and the transactions bandwidth.

The bandwidth of the blockchain is not affected by the number of current network validators, provided that their technical capabilities meet the requirements of the network. However, the imperfection of network protocols and the need for constant communication between network nodes that have different computing power leads to limited network speed and scalability. Therefore, using proven validators with high-performance equipment can enhance the performance and scalability of the blockchain.

To run an efficient stress test, it is necessary to simulate a realistic platform usage scenario and ensure that the testnet reaches the load level that would be achieved with the simultaneous use of the blockchain by tens of millions of users.

By our calculations, the upgraded Graphene technology should provide the network capacity at the level of 100,000 operations per second with a block time of 1 second. The technology has the potential for further optimization and increase of the declared indicators.

We believe that the critical factor limiting the network bandwidth would be insufficient computing power of each individual validator, so for the success of the stress test, the validators will be subject to strict requirements on the specification and capacity of their equipment, as well as geographical location.

Configurable parameters of testnet

The flexibility of Graphene 3.0 technology makes it possible to change the parameters of the blockchain in real time, without the need for a protocol update procedure and the creation of forks. This feature will allow us to conduct a variable stress test using a wide range of parameter values, including a gradual increase in the number of processed transactions.

As part of testing, the main modified parameters will be the block size, the number of operations in the transaction, and the block time. Changes in the parameters of the testnet will be

carried out directly by OpenLedger Aps, taking into account the wishes of users participating in the testing.

The block size can vary from 1 to 20 MB. In turn, the block size will be limited by the need to support a high data rate and the ability of validators to produce blocks within a certain time interval. Within a testnet, a transaction can contain between 50 and 2000 operations, with a single operation size between 22 and 40 bytes. The block confirmation time will be in the range of 3 to 0.3 seconds; however, we assume that block time less than 0.5 seconds may cause problems affecting the stability of the network.

Worker funding

VPLedger is a self-sufficient blockchain that independently finances its activities and determines the areas of application of its available funds. The VPLedger monetization mechanism provides for using both the developer team's efforts (for maintaining its security and expanding its functions) and third-party services (workers).

Outsourced workers may include both freelancers, including users of VPLedger freelance exchange, and renowned software developers. Worker terms of reference will be developed by both OpenLedger ApS and users of the blockchain.

Distribution of the worker funding costs will be prioritized according to the implemented project relevance: top-priority funding is provided to projects that, according to VPLedger users, help enhance the security and expand the functionality of the VPLedger ecosystem. Workers for specific tasks are selected by voting of OpenLedger ApS, primarily on the basis of their experience and qualifications.

OpenLedger ApS will set forth a daily ceiling on worker remuneration. The funds will be distributed among workers based on a list with workers ranked by categories set by OpenLedger ApS. New workers will be included into the list according to user votes, though each new worker must be approved by the governance. Payments will begin with the first worker in the list and it end when the daily ceiling is reached for the next worker in line.

Workers shall be remunerated under smart contracts setting forth a remuneration transfer period in addition to daily remuneration rates and work commencement and completion dates. Workers can establish a longer remuneration transfer period than the one set forth in the smart contracts. The use of that option signals the worker's readiness to cooperate with VPLedger in the long term (as they do not intend to receive their remuneration immediately).

The volume of daily financing of those workers whose interim performance outcomes do not satisfy OpenLedger ApS and VPLedger users may be reduced drastically, which incentivizes workers to improve work quality and speed within their commitments. Information about work timelines, daily payment amounts and worker data shall be published on the VPLedger official website.

Workers will be funded within the framework of improvements in the blockchain and addition of new functions to it: VPLedger will provide for the option of funding worker operations aimed at developing new decentralized applications and services, which should, according to users or governance, supplement the VPLedger ecosystem and enhance its attractiveness for business.

The worker funding model provides for financing all blockchain improvement and development operations from the Worker Fund, while the VPLedger ecosystem development, such as changes in the network configuration or new functionality development, will be funded from the Captive Fund. The governance will decide on budget allocation from the special fund for financing worker operations. It should be noted that, in addition to the VPL token transaction fees, worker operations may be funded with fee-backed assets under individual projects.

Token Models

Graphene 3.0 enables the VPLedger protective blockchain to include other tokens and token assets. All token assets will be equal technologically and they will have similar functions, meaning they can all be transferred and exchanged. The differences between them are exclusively economic in nature.

User Issued Assets

A freely-tradable token is created by users and has multiple application options, such as shares, reputation points, etc.

Market-Pegged Assets (Smart Coins)

This token asset is a crypto-derivative capable of monitoring the value of a conventional underlying asset value (fiat currency, security, precious metal).

Privatized Bit-Assets

This token combines the properties of the above-listed token assets and enables a third party/user to create their own derivative crypto assets based on the underlying asset index (e.g., reflect oil price changes, while incrementing its own value by a certain percentage on an annual basis).

Fee Backed Assets

Fee-backed assets are essentially crowdfunding token assets designed to induce innovations within VPLedger protective blockchain by providing funds needed for their development.

Exchange Backed Assets

This token asset is a promissory note that allows writing off an underlying asset amount, with fee, from the centralized depository.

Prediction Market Asset

This token asset is a specific crypto derivative whose ultimate value depends on the occurrence of a specified event (such as quantified sales growth). The token value is between 0 and 1, and its price flow may be realized by the selected parameter after the programmed event has occurred. Hence, the token market price is construed as a forecast of a specific event or a parameter value. The token may be used for creating complex financial indices, bookmaking arrangements, as well as for other purposes, where the occurrence of a certain event plays the key role.

User asset creation

Any network user may initiate a transaction with a new asset creation through a relevant smart contract that defines all user asset parameters. The user then has to pay a certain fee, set the asset parameters and directly proceed to issue relevant tokens. Users can control each transaction with their asset, setting the transfer fee, enabling/disabling certain types of operations, and so on, and use the allowed account list-making tool, which will enable them to comply with KYC requirements. Users can pay for token operations both with VPL tokens and with user tokens.

4. ROADMAP

2019



Q1 2019

- formation and substantiation of the prospective blockchain idea
- survey and analysis of the prospective market

Q2 2019

- development of the blockchain memorandum
- development of terms of reference for the blockchain design
- development of the White Paper
- development of a democratic consensus mechanism

Q3 2019

- launch of a testnet of VPLedger protective blockchain
- listing of bundle offers and top-up options on online stores and retail outlets worldwide
- settlement of legal issues in European countries

Q4 2019

- launch of the core network (including Wallet and Block Explorer)
- fund raising (initial closed sale of tokens)

2020 ●

Q1 2020

- launch of the key network functions (smart contracts, crypto assets, API)
- launch of the euro-based VPLedger stablecoin
- launch of a mechanism of interaction between the blockchain and developers
- security audit of the network

Q2 2020

- launch of a decentralized cryptocurrency exchange
- adding (activation) of partner payment providers

Q3 2020

- launch of a crowdfunding platform
- launch of a freelance exchange

AND BEYOND

- conclusion of partnerships with the business community and national executive authorities

In the coming years, OpenLedger ApS plans to actively expand its regular membership and facilitate the development of a consolidated global business community. Our team will keep focusing efforts in the field of marketing on raising demand for VPLedger-based services and worldwide acceptance of the blockchain.

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7. CONCLUSION

The VPLedger protective blockchain, by combining Graphene's technological advantages with failure-free execution of smart contracts, creates a legally compliant bridge between the traditional finance and the blockchain world, simplifying transnational business conduct by globalizing and internationalizing the global business environment.

VPLedger is founded upon the principles of protective democracy, where economic decisions are made by the users directly. The blockchain is developed and maintained by the legal entity OpenLedger ApS, which is liable for its obligations according to the Constitution of VPLedger blockchain

Every day, the international team works on making this project interesting and useful for businesses and users around the world. The VPLedger team does it because it believes that the project facilitates the globalization of businesses and the global economy, reduces transactional/overhead costs and supports the users' financial freedom owing to the opportunities offered by fast and inexpensive transactions within the framework of the high-speed, scalable and secure blockchain.

The advanced technologies used in this blockchain enable the business community to develop its future on the basis of an efficient, democratic model of economic system management. There are numerous ways of using the VPLedger blockchain, from fast international transactions, mutual payments between partners and purchase of real products to creation and promotion of decentralized applications. This combination of a legal entity in charge of the technical and legal security, a highly scalable consensus mechanism, and the blockchain technology opens a new stage in the development of blockchain security and reliability.