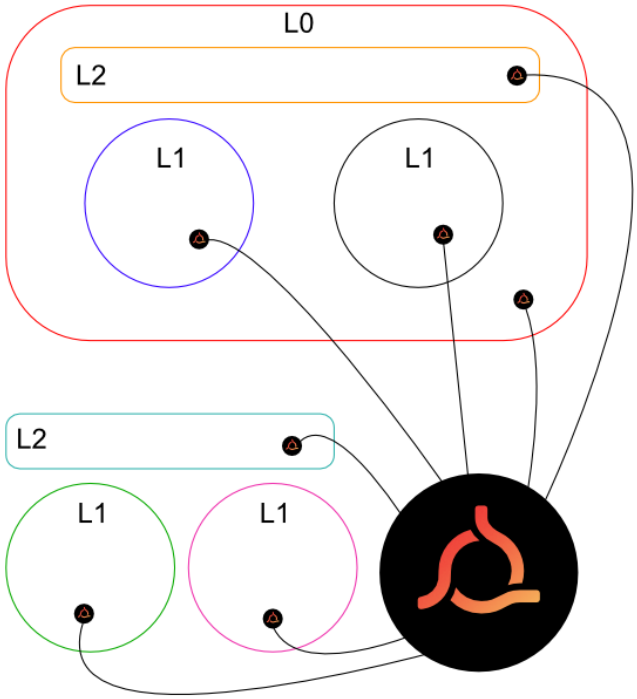
What is Unilayer

The Unilayer is a high-efficiency communication blockchain on top of other blockchains.
The UniLayer works as an omnichain interoperability platform. The Unilayer platform is designed for lightweight data passing across different chains.
The UniLayer is built on the Bitcoin-based blockchain with gas-efficient DPOS consensus. It takes the philosophy of the Cosmos protocol for native integration of different blockchains into a single network and adds unique cross-chain logic to enable simultaneous communication with different blockchains.

How it works

The UniLayer can be **natively integrated with every kind of blockchain**: L0, L1, and L2. It works as an intellectual data bus across them.



Moreover **the UniLayer is an L1 blockchain** that can natively embed its nodes into other chains (i.e. they become both the UniLayer nodes and nodes of connected networks). The UniLayer receives signed messages verified by the other chains and validates these "snapshots" on its blockchain. The UniLayer simultaneously validates its transactions and those that came from connected networks.
Capturing and storing the history of all possible cross-chain transactions in any blockchain as blocks inside Unilayer DLT is a market disruptive technology.
Such an approach **eliminates the use of oracles and complex/expensive backend infrastructure**. Reducing the total cost of ownership for existing projects in discrete blockchain ecosystems.

Smart contract development

For Smart Contract development the UniLayer uses the latest EVM implementation from the Ethereum Foundation (Solidity) with a few extensions. Smart contracts can be coded in a wide range of languages: Rust, JavaScript, Go, even ABAP is listed as a feature.

Privacy

The UniLayer is designed as a custom Zerocash Protocol implementation based on ZK-Snarks. It is a new generation Zerocoin protocol with a strong focus on privacy.

Architecture

UniLayer is an L1 blockchain consisting of a masternode with a DPOS consensus sequence. A masternode validates transactions and takes part in network governance. For each transaction, a masternode receives rewards in native token *ULR*.

Masternodes

There are three masternode types:
1. Validator
2. Collator
3. MTN (Mixed Type Node)

Validators

These masternode types verify collators, verify proofs and achieve the consensus with the other validators. The validators are responsible for internetwork transaction security. They add new blocks to the UniLayer blockchain, and afterward, the data are available for all participants of the UniLayer ecosystem UniLayer.

Collators

This node is for two main functions:
1. Collators collect information about transactions in partner-owned chains, match and unite these transactions into prospective blocks in the UniLayer network and create proofs for validators.
2. Collators act as the cooperation distributor for connected blockchains as if it was a native node partner network. Thus,

information is not sent directly from one chain to another but is coded as a signed message in the UniLayer network and distributed in the assigned network.
The Collator redirects and constantly traces the status of the sent message in the connected networks. Collators as the distributors cannot change the messages, because they pass additional validation for compatibility with the accepting blockchain.

MTN

Mixed Type Nodes combine the functions of a Validator and a Collator.

Addressing

Since a **UniLayer-node acts as a masternode of a partner chain** (in terms of interaction), it sees all connected nodes in this chain (not a lightnode).
To interact with the exact node (or usually a smart contract) the address of that node must be set in a UniLayer's smart contract.
Each node has a service that deals with the nuances of connecting to every chain. Once nodes are synced, they watch vault addresses. If they ever see an inbound transaction, they read it and convert it into a UniLayer transaction.
The UniLayer transaction has the identification and from/to-address parameters that are essentially the same for each chain, no matter the type.
Unilayer processes each observed transaction and waits for consensus. Once a super-majority of validator nodes agrees on a particular transaction, it moves from a pending state to a finalized state.

Onion-like transactions

Cross-chain transactions create the "onion"-like structure, packing real addresses and their statuses into meta-data hash.
After this UniLayer sequentially validates this hashed data with its DPOS consensus algorithm and puts it into its blockchain.
The UniLayer smart contracts interact with information in UniLayer blocks and redirect necessary data to endpoints (collator nodes) at appropriate networks, where the transaction is repacked into native messages for the accepting networks.

Cross-chain Transport Control Protocol (CTCP)

The UniLayer CTCP allows moving data between addresses on any connected blockchains as a universal transport bus does.

Nowadays the main problem is that blockchains are designed as isolated systems. The UniLayer **CTCP** technology splices blockchains and opens a broad spectrum of possibilities. Among them:

1. Fast liquidity transfer across blockchains.
2. Transfer of digital property objects across blockchains (NFT).
3. Cross-chain applications development.

The UniLayer **CTCP** solves the problem of transferring data across blockchains by creating the L1 blockchain where the cross-chain messages are validated by the decentralized network and recorded as blocks on DLT. The UniLayer **CTCP** consists of two parts:

1. L1 blockchain;
2. A set of governance smart contracts with cross-chain logic.

The UniLayer Collator and Validator nodes compose the distributed ledger technology L1 blockchain that processes cross-chain calls across partner blockchains. Each cross-chain message is signed by a unique collective signature of validator nodes. The signed cross-chain call is stored on the UniLayer L1 blockchain.

To prevent malicious actions by nodes, each node must put a deposit into the special smart contract in ULR governance tokens. In case the node performs its job properly, it receives ULR tokens as a reward. If the node takes malicious actions, then its collateral will be slashed. The UniLayer blockchain is infinitely scalable and anyone would be able to join cross-chain message validation.

UniLayer CTCP step-by-step explanation

Step 1. The user or a smart contract in blockchain A packs the data into the message and sends it to the special smart contract located in the source blockchain;

Step 2. Blockchain A (source) validates the transaction.

Step 3. The smart contract inside Collator node packs the data and notifies UniLayer Validator nodes about the new cross-chain call;

Step 4. The UniLayer Validators sign the metadata received from Collators and store it as a new block in the UniLayer blockchain.

Step 5. The governance cross-chain smart contracts take the signed message and send it to the Collator in the destination network;

Step 6. Smart contract in the destination Collator node checks whether the cross-chain message was signed correctly by the validator nodes and repacks the message accordingly by the rules of chain B;

Step 7. If the signature and the state of the message are valid, Collator pushes the data further into the destination smart contract on chain B (receiver).

Revert transaction

Stuck transactions are quite a common problem in blockchain interaction. Especially, when we deal with cross-chain transactions. To prevent possible loss of liquidity all the transactions might be reverted since it meets some issues.
Transaction keeps pending status till the sender receives the approval or failure answer from the destination. These issues include unavailability or incorrect state of a destination node, timeout by transaction-gas expiration, non-compliance with conditions of the smart contract, etc.
By a smart contract, a user can also create his conditions to revert a transaction.

UniLayer CTCP vs Cosmos IBC comparison

1. **Based on full history**. CTCP allows tracking a whole bunch of transactions directly in a partner blockchain (with access to the full history recorded in blocks). IBC instead provides a limited way to refer to specific addresses in blockchains prewritten in a list.

2. **Control update**. The UniLayer CTCP architecture assumes the Collator node sets up as a native node of a partner blockchain. And it operates strictly according to the rules of that blockchain. This approach guarantees only valid transactions and rejects all others.
3. **Direct access to consensus**. IBC does not have its blockchain to store the whole historical data of connected chains. That is why IBC transactions are generated by client's events or\and by incoming calls from smart contracts. The UniLayer CTCP operates over any connected blockchain consensus directly and can generate transactions via its own smart contract cross-chain logic.
4. **In gold we trust**. Cross-chain DApps development is much cheaper with the UniLayer. The masternode total cost ownership in different blockchains rises exponentially. The UniLayer CTCP allows scaling DApps on the existing omnichain infrastructure.

DPOS algorithm

User Delegated Proof-of-stake is a type of blockchain consensus algorithm that allows users to spend their governance tokens to vote for various delegates. Once these delegates have been elected, they can make critical decisions that apply to the whole network. For instance, the elected delegates can set protocol rUniLayeres or validate transactions. In general, delegated proof-of-stake has proven to be the most effective consensus mechanism available, which has helped to ensure that blockchain protocol remains sustainable and scalable. This kind of consensus mechanism can eliminate a mining process that consumes large amounts of energy with PoW protocols.

Staking and Leasing

The idea of profiting by staking coins has gained popularity in the blockchain community. U(ser_delegated)PoS not only implements standard staking capabilities but also enables delegated staking (Leasing). Thus not only can users make a profit by freezing, removing a sizable volume of coins from the trading turnover for the benefit of the exchange rate, but it is also possible to further decentralize the network by determining the level of user confidence in Masternodes and Validators due to the ability to choose a target of coin-transfer for

leasing purposes. This is very well visualized with the main nodes rating in the network.

Staking

Coins can be staked either by Masternode or by Validator. This is one of the main ways to prove the network's intentions. Since Itsy-Bitsy is a two-tier network, both sides of the staking tier have an interest in keeping the network healthy. Masternodes contributing to the network are rewarded either for staking in-wallet or for storing their IBY as collateral. Both ways return a profit but in different ways and numbers.

Leasing

The UniLayer uses its leasing mechanism to issue new ULR coins and to increase the circulating supply of coins. Each user can lease their coins to Validators with the "Leasing" transaction type.
Interest on leasing is collected after 30 blocks. It is collected to the main balance and can be used immediately without the need to close the lease. Using the main wallet to collect interest allows multi-staking.

Masternode rating system

The trust level of a network node depends on its rating. The base of this rating system is leasing volume, number of leasing users, and Masternode stability in the network. Each of these factors reflects not only the current state of the major nodes but also the history of their state, showing growth and confidence over the time the nodes have been in the network.

Rank of main nodes leasing value:

$$V_m = K_1 \times \left(\frac{Current\ volume\ of\ leasing}{Total\ volume\ of\ leasing}\right)^2 \times \sqrt[4]{Current\ volume\ of\ leasing} \qquad (4.1)$$

$K_1 = 0,25$ - rank of main nodes leasing value coefficient.

Rank of leasing users quantity:

$$U_m = K_2 \times \left(\frac{Current\ quantity\ of\ users\ in\ leasing}{Total\ quantity\ of\ users\ in\ leasing}\right)^2 \times \sqrt[4]{Current\ quantity\ of\ users\ in\ leasing} \quad \textbf{(4.2)}$$

$K_2 = 0,65$ - Rank of leasing users quantity coefficient.

Rank of successful blocks in the network value:

$$B_m = K_3 \times \left(\frac{Successful\ blocks\ of\ main\ node}{Total\ \ blocks\ of\ node\ in\ the\ network}\right)^2 \times \sqrt[4]{Successful\ blocks\ of\ main\ node} \quad \textbf{(4.3)}$$

$K_3 = 0,1$ - Rank of successful blocks in the network value coefficient.

Total rank of main nodes:

$$R_m = V_m \times U_m \times B_m \quad \textbf{(4.4)}$$

R_m - is a final indicator of main nodes rank in the network.