

SEPTEMBER, 2018

# **TESTNET ALPHA & BLOCKCHAIN EXPLORER**

## What Does the TestNet Alpha Consist of?

The TestNet Alpha consists of the following components:

Boot Node

Network Node

PoA Node

PoW Node

The current network protocol implementation assumes single Boot Node in the network. This will not be a rigid condition in upcoming releases. Even in current form we expect 1000 Network Nodes as a manageable load. Load-balancing for PoW and PoA Nodes is done automatically. In theory, one Network Node is capable of supporting up to 10,000 clients.

### Boot Node

Currently, a Boot Node instance requires a machine with a public IP, works as the entry point to the TestNet for new nodes and performs only load-balancing function.

### Network Node

Network Node guarantees network consistency, stores unpublished transactions in the pending, balances a workload among multiple clients, stores shards and computes state changes in the distributed ledger.

### PoW

PoW Node is implemented as a desktop application for Windows and Linux. The key function of a PoW Node is mining K-blocks searching for a hash matching the current difficulty level. This process is called mining.

### PoA

PoA Node is implemented as a mobile application. The key function of a PoA Node in the network is mining microblocks and including transactions from the pending to these microblocks. This process is called publishing.



## Workflow

The workflow is currently implemented in the following way:

PoW Nodes mine K-blocks matching the current difficulty level and broadcast them over the network. When a K-block reaches another PoW Node or a Network Node it is verified and upon successful verification is added to the local copy of the blockchain stored on the node.

Upon entering the network, PoA Nodes are organized into PoA Teams and listen for a K-block event. When such event happens and a K-block reaches a PoA Team, its members request a certain number of transactions from the pending of a Network Node, create microblocks using those transactions and publish them into the network.

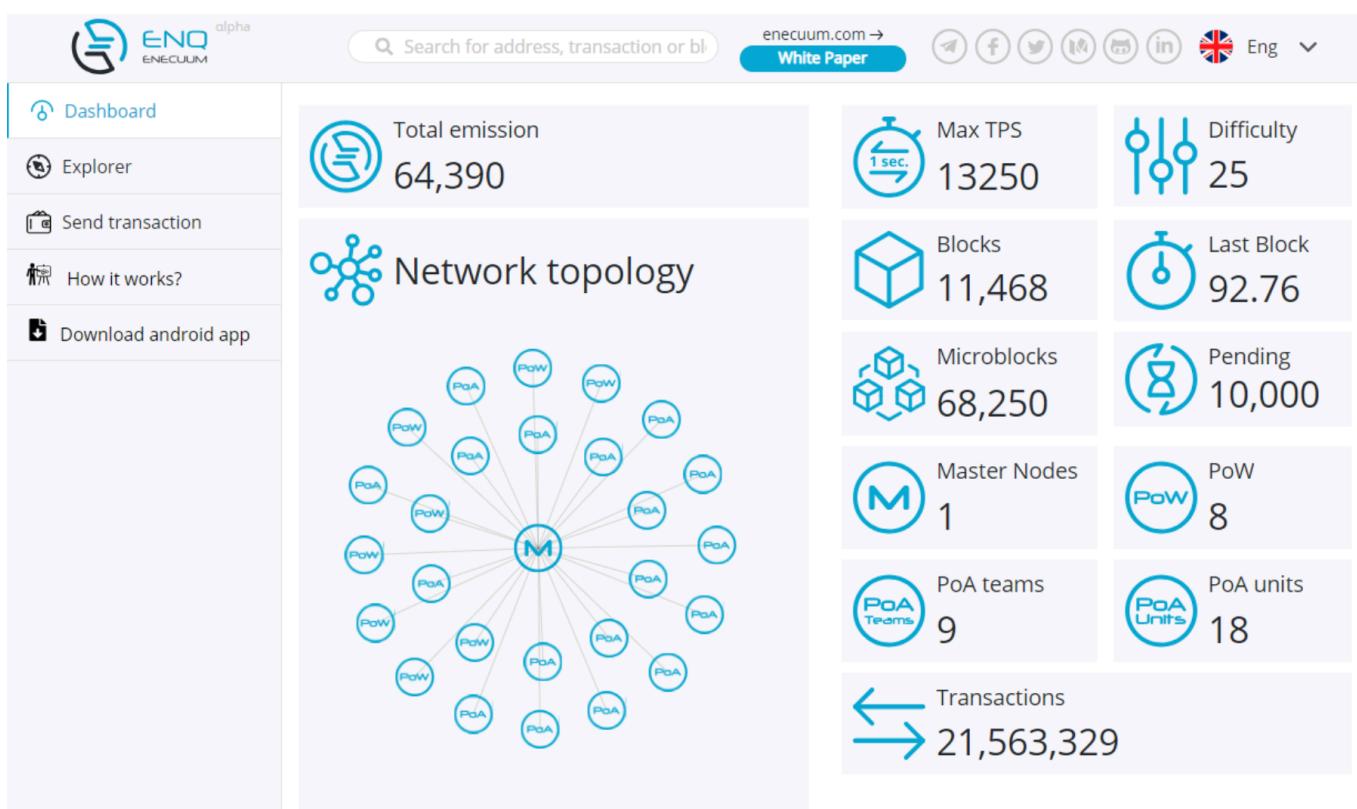
All published microblocks are verified and, upon successful verification, are added by all Network Nodes to their local database, and are used in computing state changes in the distributed ledger.

## What is the Blockchain Explorer?

The Blockchain Explorer is a web application that is capable of connecting to an arbitrary Network Node to obtain various network and system parameters using the API of that node.

The user interface of the Blockchain Explorer is organized in the following way:

### 1. Dashboard - the page with real-time metrics obtained from the Network Node



**1. Maximum TPS** - max number of transactions published in the network per second (transactions that have been included into microblocks).

**2. Blocks** - overall number of K-blocks (incl. forks) in the blockchain

**3. Master Nodes** - number of active Network Nodes

**4. PoA teams** - number of active PoA Teams

**5. Microblocks** - overall number of microblocks in the blockchain

**6. Transactions** - overall number of transactions in the blockchain

**7. Difficulty** - current difficulty level for mining K-blocks

**8. Last Block** - time in seconds between two last K-blocks

**9. PoW** - number of active PoW Nodes

**10. PoA units** - number of active PoA Nodes (mobile devices)

**11. Pending** - number of transactions in the pending available for publishing

**12. Total emission** - total emission (incl. emission generated by mining)

**13. Network topology** - map of the network. This map is updated in real-time and allows for minor inconsistency as it is not possible to 100% accurately depict all the details.

## 2. Explorer - the page where user can search for and view specific blockchain information (K-blocks, microblocks, transactions, wallets)

### 2.1 Overall information on blocks (no depth):

The screenshot shows the Enecuum Explorer interface. On the left is a sidebar with links: Dashboard, Explorer (which is selected), Send transaction, How it works?, and Download android app. The main area is titled "List of blocks" and displays a table of blocks. The columns are: Height, Hash, Microblocks, Prev hash,Nonce, and Miner. The table contains 20 rows of block data, each with a unique hash and height, and links to more details.

Height	Hash	Microblocks	Prev hash	Nonce	Miner
1645	AAAAA09jFn5W9oFtjEWz2AYIL...	0	AAAAABgckgzwuCEWB+GSMIU...	1687280	f8hglyRtpxRgCfm/X20KrwRZ9...
1644	AAAABgckgzwuCEWB+GSMIU...	8	AAAAAI2Rc4G9X0l+MxbzZXuA...	425147	f8hglyRtpxRgCfm/X20KrwRZ9...
1643	AAAAAI2Rc4G9X0l+MxbzZXuA...	9	AAAAABc4Gki0hcE6huXAdei7M...	1111749	f8hglyRtpxRgCfm/X20KrwRZ9...
1642	AAAABc4Gki0hcE6huXAdei7M...	4	AAAAAVqqlaQ+EukUxAAfkz32R...	1461852	f8hglyRtpxRgCfm/X20KrwRZ9...
1641	AAAAAVqqlaQ+EukUxAAfkz32R...	11	AAAAAB8XjSjMjmdq8m/zNF5f3R...	12938	f8hglyRtpxRgCfm/X20KrwRZ9...
1640	AAAAB8XjSjMjmdq8m/zNF5f3R...	5	AAAAAA9r8q6RwjrxPjscgpS/1A4...	925536	f8hglyRtpxRgCfm/X20KrwRZ9...
1639	AAAAAA9r8q6RwjrxPjscgpS/1A4...	0	AAAAAIzSjk7ZhZWvPmv7/NIE5...	1104907	f8hglyRtpxRgCfm/X20KrwRZ9...
1638	AAAAAIzSjk7ZhZWvPmv7/NIE5...	12	AAAAATmDeZmj7XkGist/TGdiu...	724697	f8hglyRtpxRgCfm/X20KrwRZ9...
1637	AAAAATmDeZmj7XkGist/TGdiu...	2	AAAABIPot3fQmljRjsolLxgojEeq...	45550	f8hglyRtpxRgCfm/X20KrwRZ9...
1636	AAAABIPot3fQmljRjsolLxgojEeq...	9	AAAAABBt4dblEhjlw+rnr7nbUX0z...	263420	f8hglyRtpxRgCfm/X20KrwRZ9...
1635	AAAAABBt4dblEhjlw+rnr7nbUX0z...	8	AAAAAFDH1a+OmmQLtBaL+0Z...	833463	f8hglyRtpxRgCfm/X20KrwRZ9...
1635	AAAAAFDH1a+OmmQLtBaL+0Z...	3	AAAAAAQZW9QAh1ixVkgEMtCp...	862988	S/OUWpSX4h00ucGinQaghDqs...
1634	AAAAAAQZW9QAh1ixVkgEMtCp...	8	AAAAAOz9w2/YfzcwZvEvBh5X...	698501	f8hglyRtpxRgCfm/X20KrwRZ9...
1634	AAAAAOz9w2/YfzcwZvEvBh5X...	0	AAAAAbjbK/syEHgP3ZVilcR5kN7...	1400165	S/OUWpSX4h00ucGinQaghDqs...

This screen shows general information on the blocks, where:

**1. Height** - number of the block in the chain

**2. Hash** - hash of the associated K-block (meaning each associated microblock contains the hash of this K-block)

**3. Microblocks** - number of microblocks in the macroblock (macroblock = microblocks + the associated K-block)

**4. Prev Hash** - hash of the previous block

**5. Nonce** - the winning number serving as the second part of the proof in the Proof-of-Work algorithm

**6. Miner** - public key of the solver that mined the block

## 2.2 Block details (1st level of depth):

This screen shows details for the given block, where:

1. **Height** - number of the K-block in the chain
2. **Nonce** - the winning number serving as the second part of the proof in the Proof-of-Work algorithm
3. **Microblocks attached** - number of microblocks in the macroblock  
(macroblock = microblocks + the associated K-block)
4. **Time** - time and date the given K-block was created on
5. **Solver** - public key of the miner that created the given K-block
6. **Microblocks in the block** - complete list of associated microblocks where:
  - 6.1 Hash - hash of the microblock
  - 6.2 Publisher - public key of the PoA Node that created the microblock
  - 6.3 Tx amount - number of transactions in the given microblock

## 2.3 Microblock details (2nd level of depth):

The screenshot shows the Enecuum website interface. On the left is a sidebar with links: Dashboard, Explorer (which is selected), Send transaction, How it works?, and Download android app. The main content area has a header "Microblock details". It displays the following information:

Hash:	qfIsERy0QGKzemW1TNeF9GzJkmjccj7E14tR1SVEoEA=		
Block:	AAAAABgckgzwuCEWB+GSMI...	Publisher:	Nujf9TjHDkepHcUpA14sqZK...
Tx attached:	250	<b>Transactions in the Microblock</b>	
Hash	From	To	Amount
AcXEwjK+DlykxAb+jBbZA4OWG...	8W7t3TftRWU1Doq74uxmidR5...	8hZ9TcQC18MAtrmfeaQPdPY3x...	8 ENQ
KYBAAtBJlcSyZetD3XF4aWZw9F...	8W7t3TftRWU1Doq78QnBUTM...	8hZ9TcQC18MAtrmfeaQPdRtrZj...	10 ENQ
aZO1hkMZlsX3EBJQzkoZ72aoit...	8W7t3TftRWU1Doq78UpWfwC...	8hZ9TcQC18MAtrmfeaQPdRwa...	7 ENQ
aFF9tkiKu+qEAwCmaZYI50kIB8...	8W7t3TftRWU1Doq7BydvSC9K...	8hZ9TcQC18MAtrmfeaQPdUJPE...	6 ENQ
pMW9Yw6hKPy5616BChAs50LJ...	8W7t3TftRWU1Doq7C3gFdEz1...	8hZ9TcQC18MAtrmfeaQPdUM7...	1 ENQ
JgqcJRdfGBSHALNLQ8plibjtqlqL...	8W7t3TftRWU1Doq7FYVfpVvn7...	8hZ9TcQC18MAtrmfeaQPdWhu...	7 ENQ
+wlvt5ufX9glKBjqT1NNfiSYaSIP...	8W7t3TftRWU1Doq7FcXzaYmU...	8hZ9TcQC18MAtrmfeaQPdWkd...	10 ENQ
H+qYoOM0rnByYER0YnUBUZ6...	8W7t3TftRWU1Doq7K7MQLoF...	8hZ9TcQC18MAtrmfeaQPdZ7SZ...	6 ENQ
Mn097OqlvIzB43R4SRsOs+QV...	8W7t3TftRWU1Doq7KBPjXrYwj...	8hZ9TcQC18MAtrmfeaQPdZAac...	10 ENQ
INyA8D47EKR/fYbW+nxsA4iqW...	8W7t3TftRWU1Doq7NgD9j7Vi8...	8hZ9TcQC18MAtrmfeaQPdbWy...	1 ENQ

This screen shows general information on the blocks, where:

1. **Block** - hash of the associated K-block (meaning this hash is included in the microblock; microblocks + associated K-block = a macroblock)
2. **Tx attached** - number of transactions in the microblock
3. **Publisher** - public key of the PoA Node that created the microblock
4. **Transactions in the microblock** - transaction details, where:
  - 4.1 Hash - hash of the transaction in the microblock
  - 4.2 From - public key of the sender of the transaction
  - 4.3 To - public key of the recipient of the transaction
  - 4.4 Amount - amount sent in the transaction

## 2.4 Transaction details (3rd level of depth)

The screenshot shows a transaction record on the Enecuum platform. The transaction hash is 0XQj/2p/RPDeRKqDriBvxYf4Gy6oH/4UctUmL2N6LTc=. It was sent from address 8W7t3TftRa1DsUnaQbiw11R... to address 8hZ9TcQC18MAtp456oz3tjBp... on 2018-09-13 at 00:09:36. The value sent was 8 ENQ. A 'Copy' button is visible next to the hash.

This screen shows the usual information on the transaction, where:

1. **From** - public key of the sender of the transaction
2. **To** - public key of the recipient of the transaction
3. **Time** - time and date of its generation
4. **Value** - amount of ENQ sent in the transaction

## 2.5 Public key details

The screenshot shows a wallet page on the Enecuum platform. The wallet has a balance of 150 ENQ. The associated public key is 23HkYLQRuiR8M1bspf7o8xB9z1fLmEQ46Bxb6TsULW7SC. A 'Copy' button is visible next to the balance. Below the balance, a section titled 'Committed transactions' lists two transactions. The first transaction is from hMcHD0b8imu8xM8r3HXoxux... to 23HkYLQRuiR8M1bspf7o8xB9z1fLmEQ46Bxb6TsULW7SC with an amount of 49 ENQ. The second transaction is from F4XGSZPIkVAPMczUUcpWx/Up... to 23HkYLQRuiR8M1bspf7o8xB9z1fLmEQ46Bxb6TsULW7SC with an amount of 50 ENQ.

Clicking on a public key, user can see the current balance and transaction history of the associated wallet. If there are no transactions for the wallet, the page will show only the balance, i.e. the emitted mining reward.

There is also a search bar on all the screens for searching for a specific transaction/microblock/K-block using its hash.

## 3. Search bar

There is also a search bar on all the screens for searching for a specific transaction/microblock/K-block using its hash or wallet using its public key.

## 4. Send transaction

In the TestNet, there are two types of transactions:

Technical transactions generated by Network Nodes to keep up the remittance flow at 10,000 transactions in the pending.

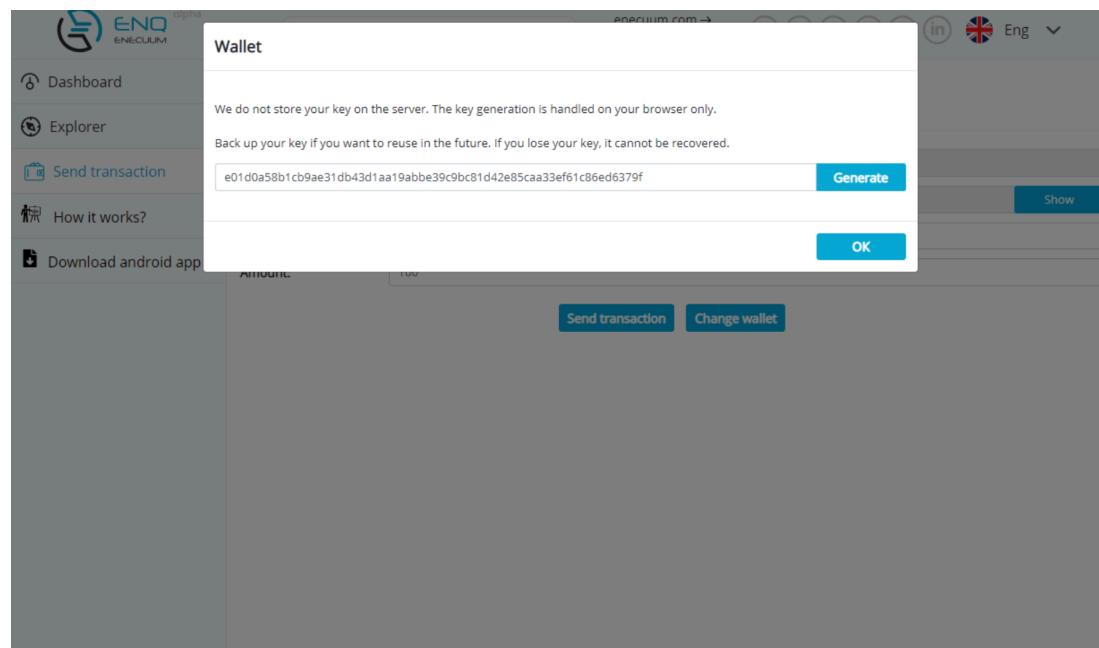
User-generated transactions that have priority over the technical transactions and are processed before them to show immediate results to the live users.

Every address receives 100 ENQ when appear in ledger for the first time. It is made for a possibility to send a Tx from new generated wallets.

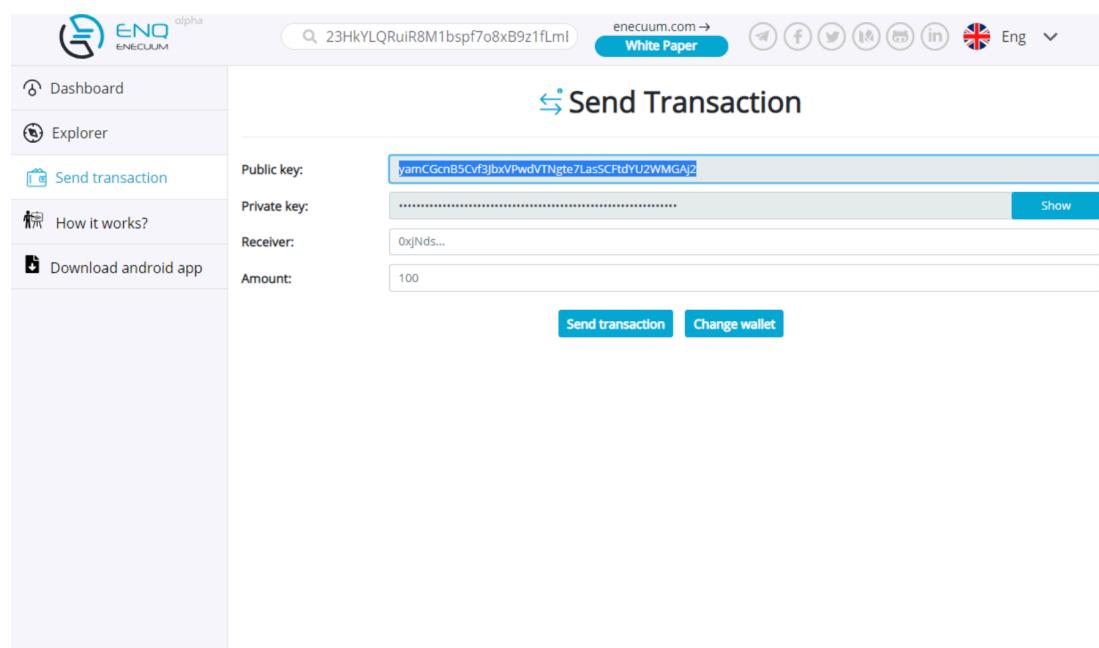
Amount field is an integer value. Think of it as like times  $10^{10}$  in future.

### 4.1 Generate private key

Press Generate to create a new key or enter your own secp256k1 private key in hex format here



### 4.2 Send transaction



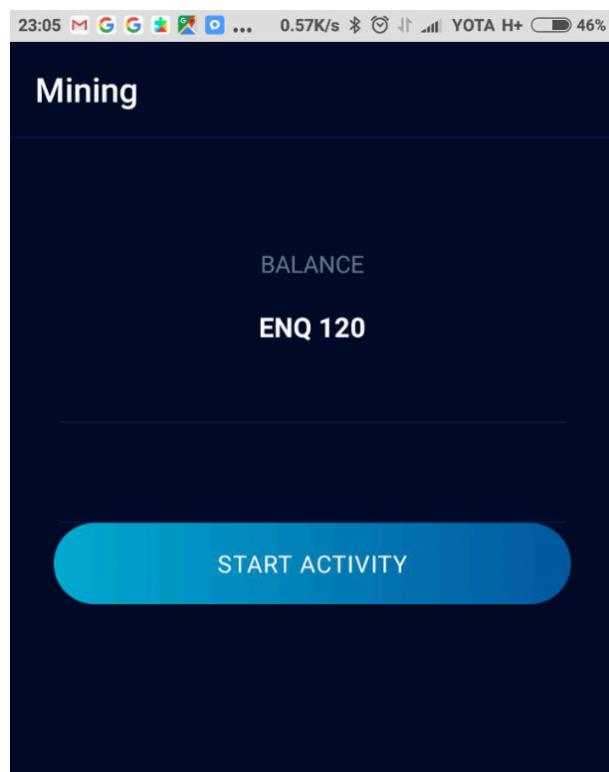
This screen allows to fill in Receiver address with its public key, amount to send and has two buttons:

Send transaction - to publish a transaction with entered values

Change wallet - to go to Generate or enter private key step

## 5. Download Android app

This is a download link to Enecuum Android application installation file (.apk) that can be downloaded, opened and installed from a cell phone having higher than 5.0 Android OS version.



Microblocks history ↑

gXnfLfMKcG+NIKsLZ6YzmNVD2jnArh1S... >

