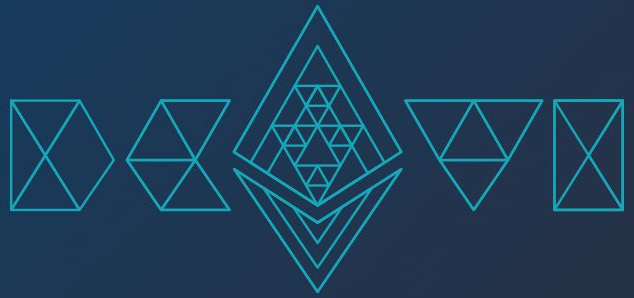

Run Your Own Beaconcha.in

The open source ethereum explorer

https://github.com/gobitfly/eth2-beaconchain-explorer

Patrick & Stefan

Developer, Bitfly

Bitfly

Contents

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Before we begin, let's pray to the wifi-gods 🙏

Also we will setup all the things now so we do not have to do later:

- Install docker if you haven't yet:
  - curl -fsSL https://get.docker.com -o get-docker.sh && sh get-docker.sh
  - sudo usermod -aG docker $USER
- git clone https://github.com/guybrush/explorer-workshop-bogota
- cd explorer-workshop-bogota
- (sudo) docker pull redis postgres bigtable

Section 1

Introduction

Who we are

- We work for bitfly and are located in Vienna, Austria
- The company was incorporated in 2017
- Developed the first ethereum block explorer called etherchain.org
- Operated and retired ethermine.org
- Migrated the business model to offer custodial and non-custodial staking services (staking.ethermine.org & ethpool.org)

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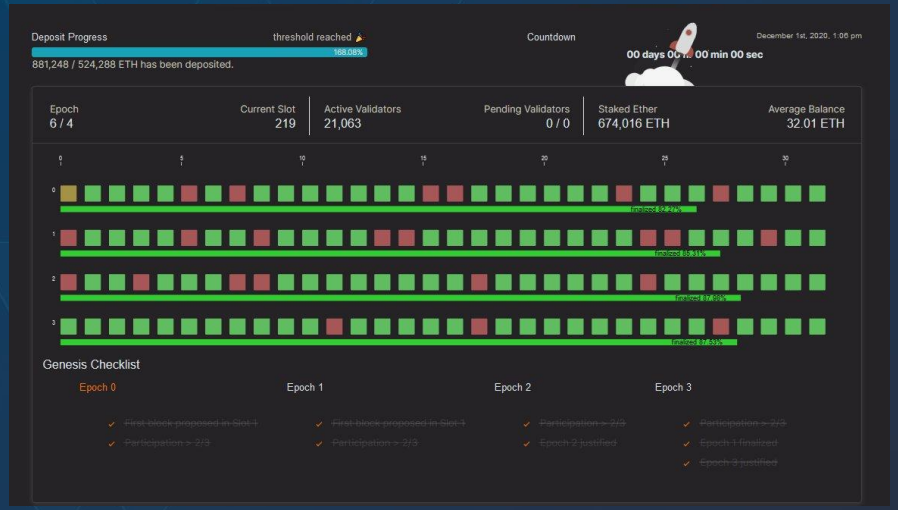

Beaconcha.in during genesis

Brief History

The beaconcha.in explorer started as an open source block explorer for (Phase 0) the Beaconchain. It has since evolved to support a wide range of features.

- First commit in 2019
- We participated in the public test networks (Zinken, Spadina, Medalla)
- In the beginning the explorer could be used to understand and monitor validator duties.
- After the merge we also added execution data

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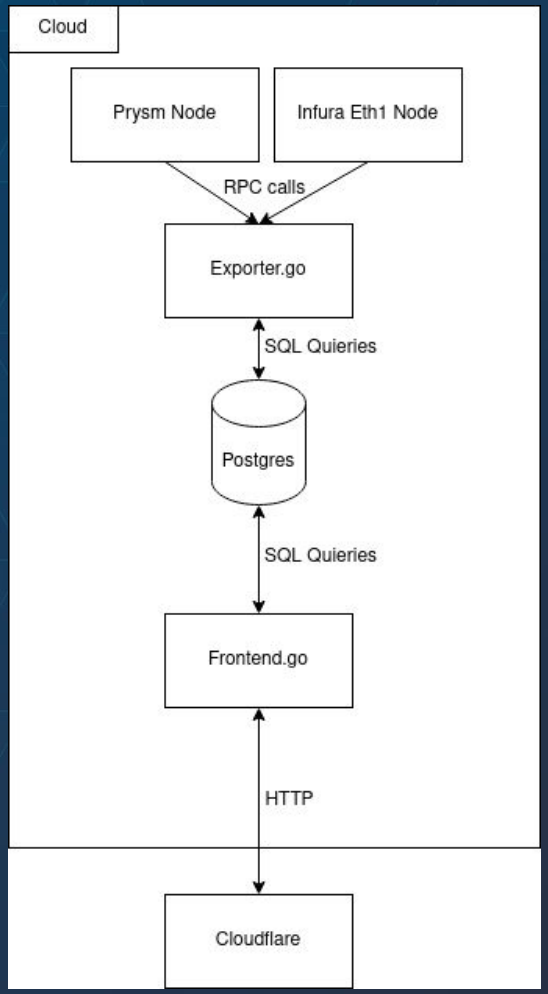
Section 2

Architecture



Initial setup

Our initial architecture was relatively simple. It included a postgres database, a consensus node, an execution node and some golang code. Unfortunately it did not scale well.

- State July 2021
  - Prysm **567 GB**
  - Erigon Node **1.4 TB**
  - Postgres Database **2 TB**
- State October 2022
  - Lighthouse **5 TB** (32 slots)
  - Erigon **2.1 TB**
  - Postgres **10 TB**

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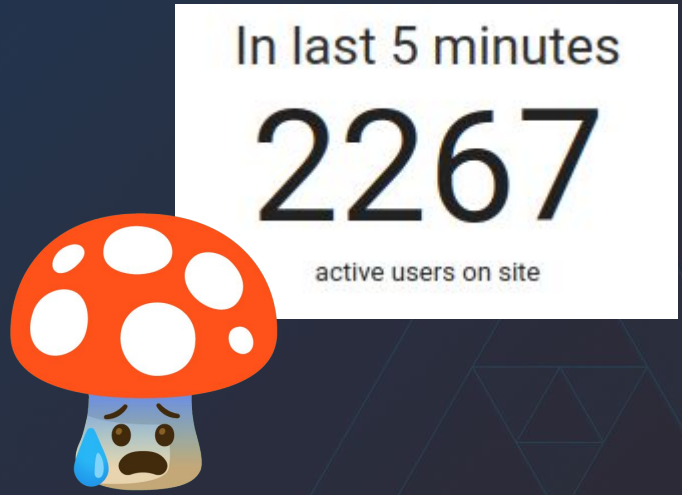
Scaling challenges

- Table locking and contention
- Expensive indexing
- Data pressure increases with the number of validators
- No caching of frequently executed queries across frontend instances
- Read replica lag & downtime during merge
- Extract services from our monolithic binary into smaller micro services
- Manage technical debt



Active sessions during the merge

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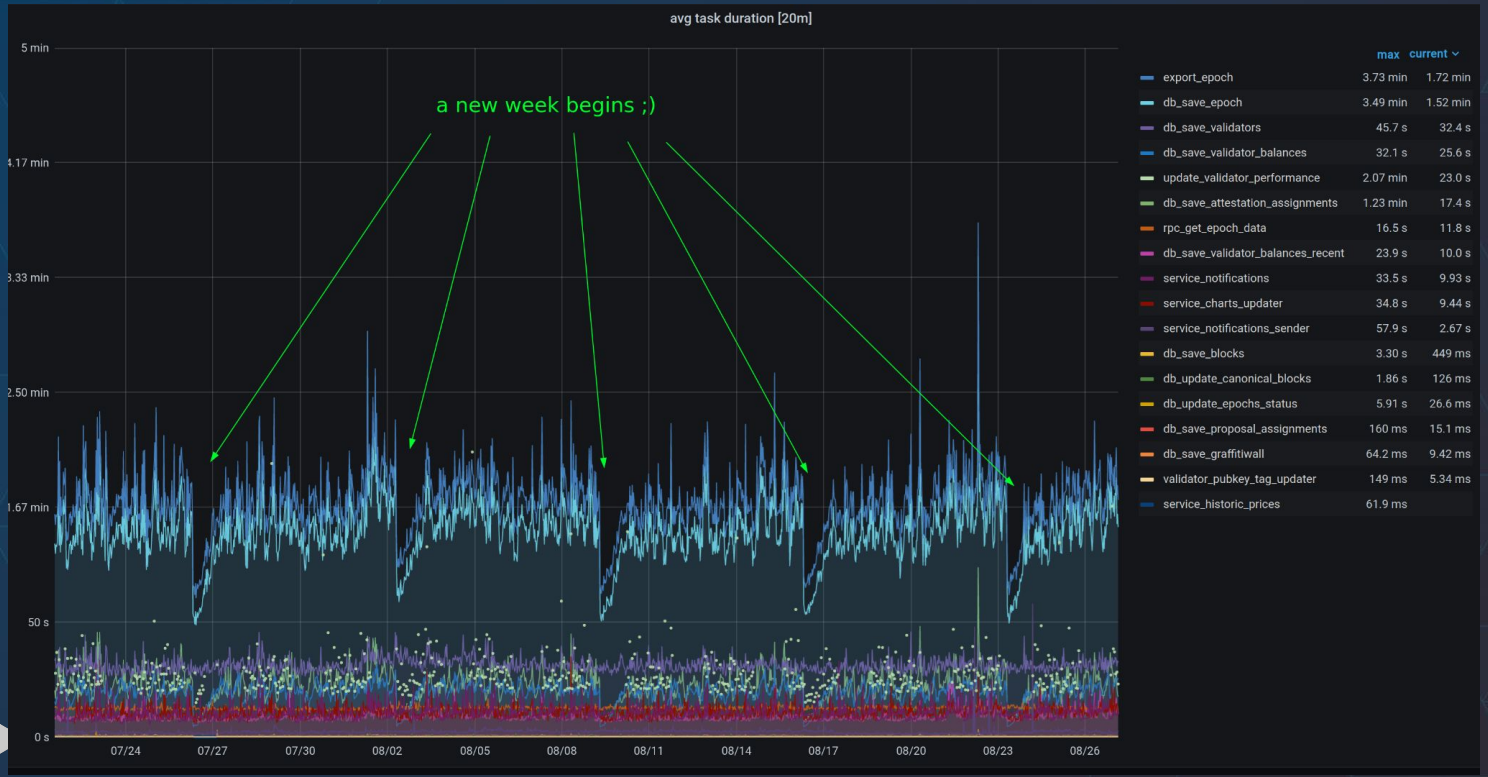
Partitioning postgres-tables helps only so much



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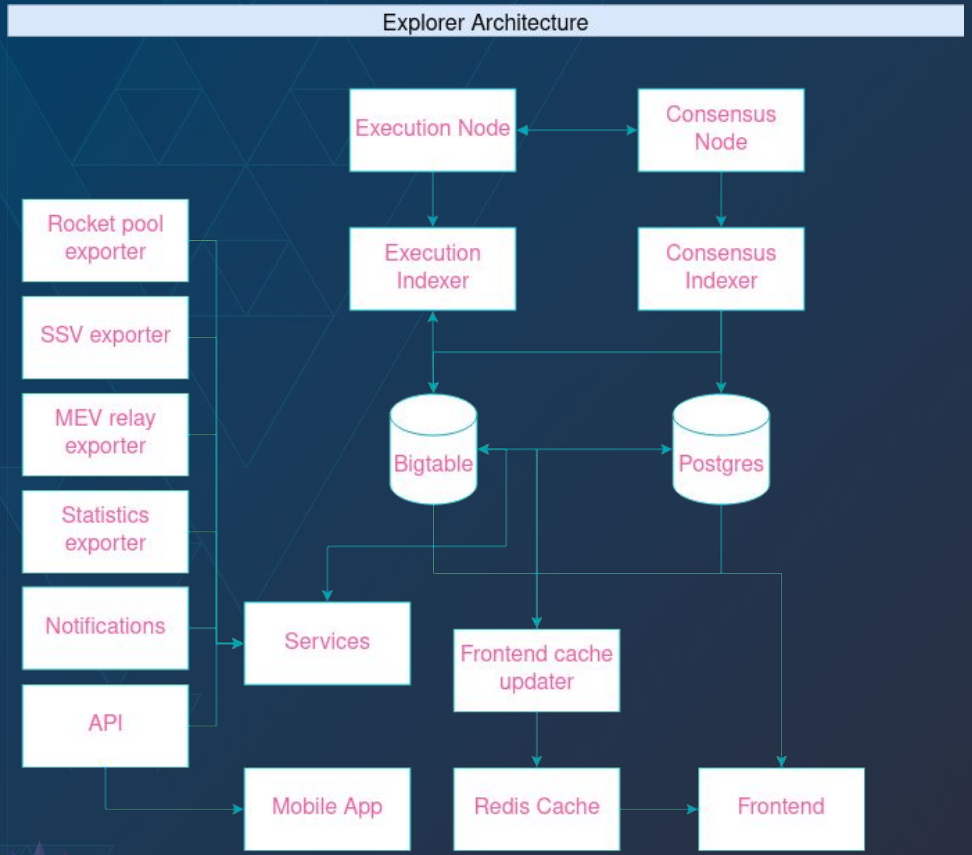
Indexing and serving large amounts of data is hard.

Design your own post merge block explorer

Technical Requirements

- Keep indexing times for epochs below 6.4 minutes
- Handle large tables
  - Attestation assignments (50 GB / week)
  - Validator balances (50 GB / week)
  - With one row per validator per epoch thats 90 million rows per day.
- Low latency queries
- Minimal contention between tables and operations
- High availability



Post Merge Architecture Services

The biggest change is the introduction of Bigtable, which is a sparsely populated database that can scale to billions of rows and thousands of columns.

- Consensus & Execution Nodes
- Consensus & Execution Indexer
- Postgres & Bigtable Databases
- Frontend Cache Updater
- Additional services and exporters
- Golang Webserver
- Mobile App

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Export time improvements

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Section 3

Local block explorer setup

Start the beaconchain explorer locally

At this point i will try to lead on my screen and cast it to the beamer

- ./run.sh init-dbs
- ./run.sh start-eth1indexer
- ./run.sh start-exporter
- ./run.sh start-statistics
- ./run.sh start-frontend
- Browse http://localhost:8080
- ./run.sh explore-epoch <epoch>
- ./run.sh explore-address <addr>
- ./run.sh explore-block

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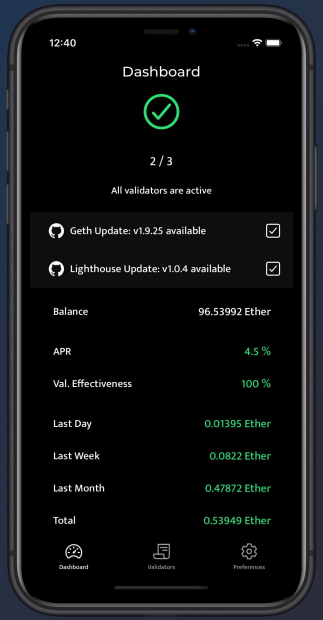
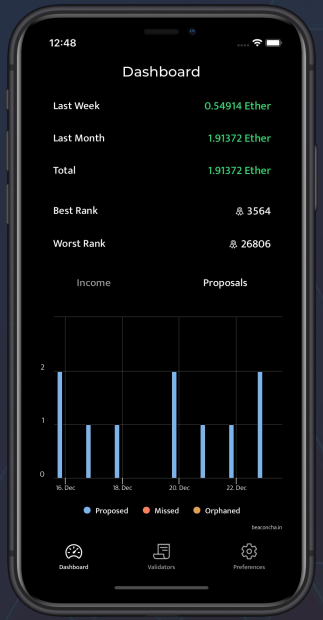
Use **bogota50** for a one-time 50% off on beaconcha.in

- beaconcha.in/premium - Mobile
- beaconcha.in/pricing - API





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Contribution

- Gitcoin Grant
- Github pull requests
- Create issues
- Tweet @beaconcha_in
- https://github.com/gobitfly/eth2-beaconchain-explorer
- https://gitcoin.co/grants/258/beaconchain-open-source-eth2-blockchain-explorer

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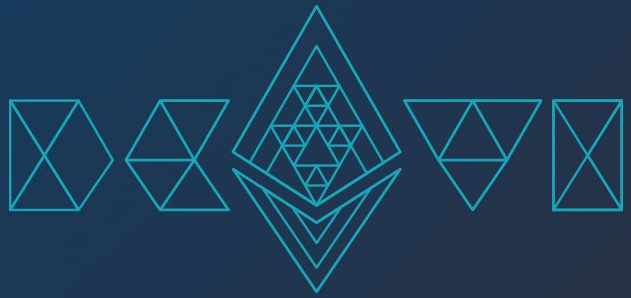

Thank you!

Patrick & Stefan

Developer, Bitfly

{stefan,patrick}@bitfly.at

@stefan_star

@mightiestpirate

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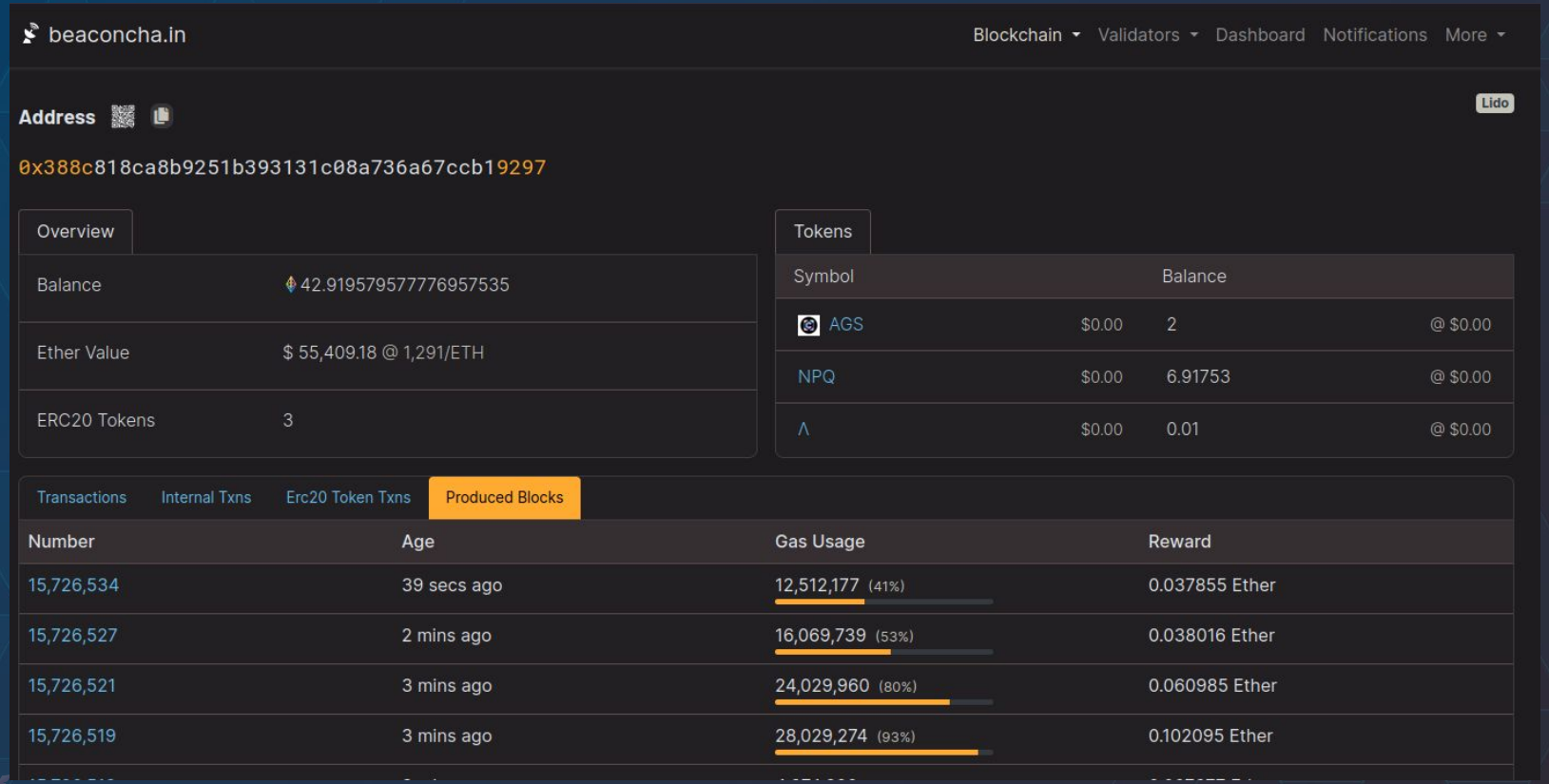
beaconcha.in
Blockchain
Validators
Dashboard
Notifications
More
Address
Lido
0x388c818ca8b9251b393131c08a736a67ccb19297
Overview
Balance
42.919579577776957535
Ether Value
$ 55,409.18 @ 1,291/ETH
ERC20 Tokens
3
Tokens
Symbol
Balance
AGS
$0.00
2
@ $0.00
NPQ
$0.00
6.91753
@ $0.00
Λ
$0.00
0.01
@ $0.00
Transactions
Internal Txns
Erc20 Token Txns
Produced Blocks
Number
Age
Gas Usage
Reward
15,726,534
39 secs ago
12,512,177 (41%)
0.037855 Ether
15,726,527
2 mins ago
16,069,739 (53%)
0.038016 Ether
15,726,521
3 mins ago
24,029,960 (80%)
0.060985 Ether
15,726,519
3 mins ago
28,029,274 (93%)
0.102095 Ether

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Relays:

Validators can use Relays to outsource their Block Production to entities specialized in extracting extra revenue. These Relays exists a means of minimizing required trust under the participating entities - they only have to trust the relay itself, and not each other.
Extra Revenue is generated by reordering and/or inserting transactions in an otherwise normal block. This is often referred to as MEV, or "Maximum-Extractable-Value". The validator which gets to propose a block by a relay will get a cut of this revenue in exchange, shown below as the "block reward".
A Relay can consist of a single builder, in which case the relay builder will accept transaction bundles from searchers, or many builders, where the relay operator will pick the the block of the builder with the highest block reward.

7 Days | 31 Days | 180 Days

Network Participation: 50%

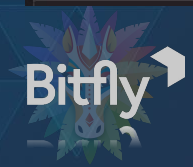
Name	Block Count	Unique Builders	Average Reward	Highest Reward	Overall Rewards	Uncensored	Unfiltered
Flashbots (Relay)	19719 (39.12%)	24	0.12309005 ETH	27.10751361 ETH (Slot 4,860,149)	2,427.21268804 ETH	No	Yes
BloXroute [Max-Profit] (Relay)	1550 (3.08%)	2	0.08767855 ETH	10.29742219 ETH (Slot 4,860,151)	135.90174964 ETH	Yes	Yes
Blocknative (Relay)	1265 (2.51%)	2	0.0665902 ETH	8.45226874 ETH (Slot 4,846,653)	84.23660738 ETH	No	???
BloXroute [Ethical] (Relay)	796 (1.58%)	2	0.05724768 ETH	0.88801248 ETH (Slot 4,854,216)	45.56915452 ETH	Yes	No
Eden Network (Relay)	715 (1.42%)	3	0.51154951 ETH	278.29152063 ETH (Slot 4,867,314)	365.75790317 ETH	No	???
Manifold (Relay)	695 (1.38%)	2	0.06212564 ETH	1.13689442 ETH (Slot 4,880,148)	43.17732285 ETH	Yes	Yes
BloXroute [Regulated] (Relay)	362 (0.72%)	2	0.10821261 ETH	10.81853595 ETH (Slot 4,861,499)	39.17296383 ETH	No	Yes

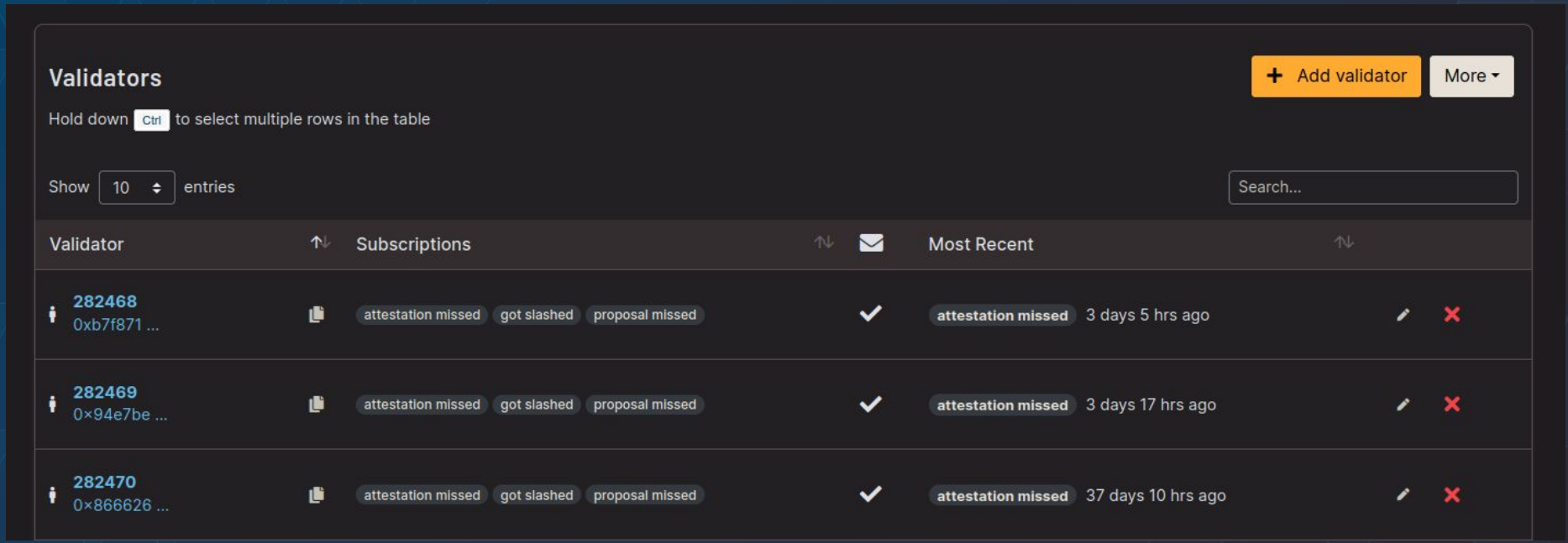
Blocks:

Blocks proposed using Relays contain a block reward paid out to the validator. Blocks themselves can be published by builders/relays to other relays as well, causing them be tagged under multiple Relays.

Latest Blocks | Top Blocks

Slot	Proposer	Relays	Block Reward	Block Extra Data	Proposer Fee Recipient	Builder
4,867,314	371162	Eden Network (Relay)	278.29152063 ETH		0x388c81…b19297	0x8e3984…b70a8b
4,702,849	245856	Flashbots (Relay)	43.9140042 ETH	Illuminate Dmocratize Dstribute	0x388c81…b19297	0xa1dead…ef27fc
4,768,529	4448	Flashbots (Relay)	40.91641779 ETH	Illuminate Dmocratize Dstribute	0xe98842…1ce621	0xa1dead…ef27fc
4,787,666	67588	Flashbots (Relay)	36.53754998 ETH	@builder69	0xe94f1f…86ca0c	0xb194b2…2d3027
4,738,717	79139	Manifold (Relay)	31.9242307 ETH	Ø gethgo1.18.6linux	0x535b91…2990a3	0xa25f5d…64e943
4,838,986	385120	Flashbots (Relay)	30.89585557 ETH	Illuminate Dmocratize Dstribute	0x388c81…b19297	0x81babe…8e80f9
4,824,087	191756	Flashbots (Relay)	29.32735946 ETH	Illuminate Dmocratize Dstribute	0x7a1a48…5390d6	0xa1dead…ef27fc
4,860,149	377093	Flashbots (Relay)	27.10751361 ETH	Øgethgo1.19.1linux	0x388c81…b19297	0xa1daf0…f514e9
4,852,498	275895	Flashbots (Relay)	23.93986197 ETH	Illuminate Dmocratize Dstribute	0xffee08…b1143b	0xa1dead…ef27fc




Validators
Add validator
More
Hold down Ctrl to select multiple rows in the table
Show 10 entries
Search...
Validator
Subscriptions
Most Recent
282468
0xb7f871 ...
attestation missed
got slashed
proposal missed
attestation missed
3 days 5 hrs ago
282469
0×94e7be ...
attestation missed
got slashed
proposal missed
attestation missed
3 days 17 hrs ago
282470
0×866626 ...
attestation missed
got slashed
proposal missed
attestation missed
37 days 10 hrs ago

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