

Verifying wallets

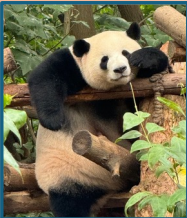
Devcon 2024 Bangkok

Wallet

4.75 ETH


0.1
BTC

500
USDC



→ theprotocolguild.eth
2024-11-12 -50 USDC

← vitalik.eth
2024-11-11 1 ETH

 Block #123 produced
2024-11-09 0.08 ETH

ETH balance

Tokens / NFTs

Metadata

Balances & allowances

Exchange rates

History

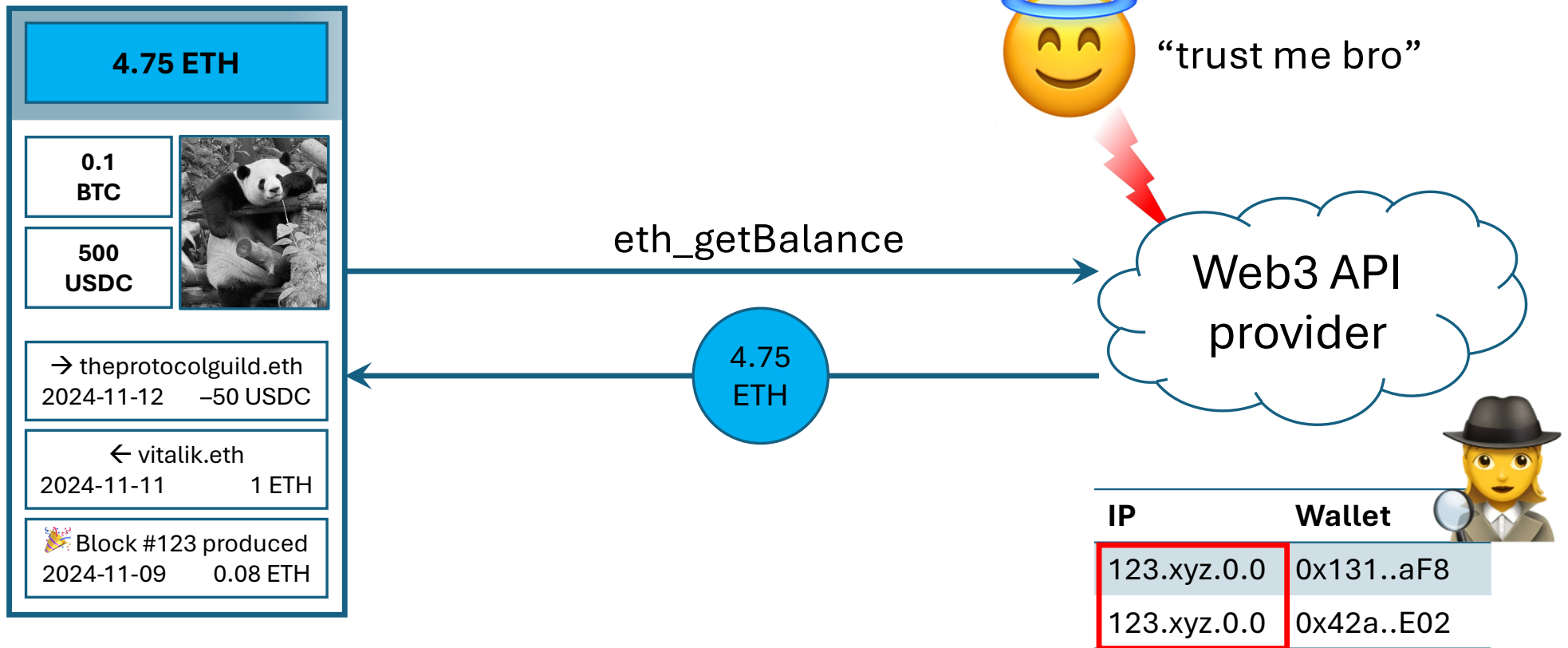
Transaction details

Fees & gas usage

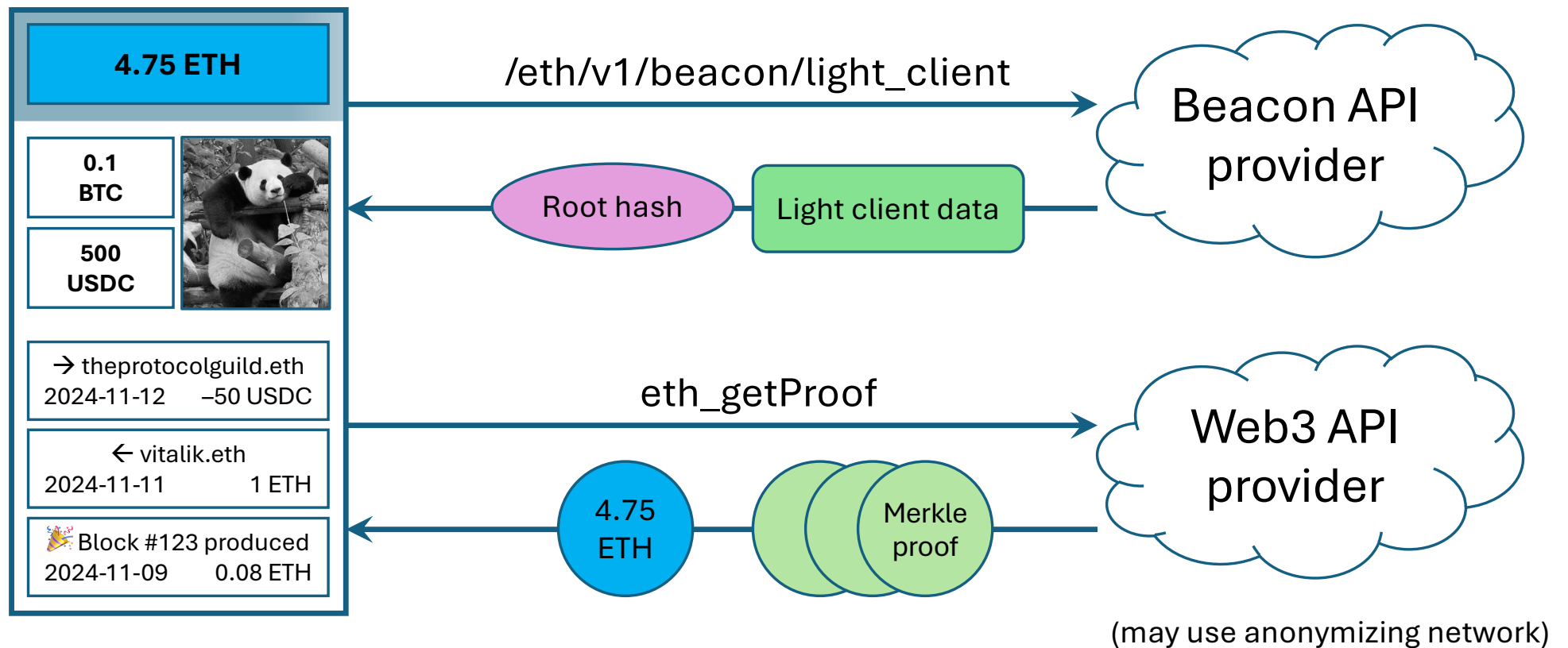
Staking operations & rewards

No missing entries

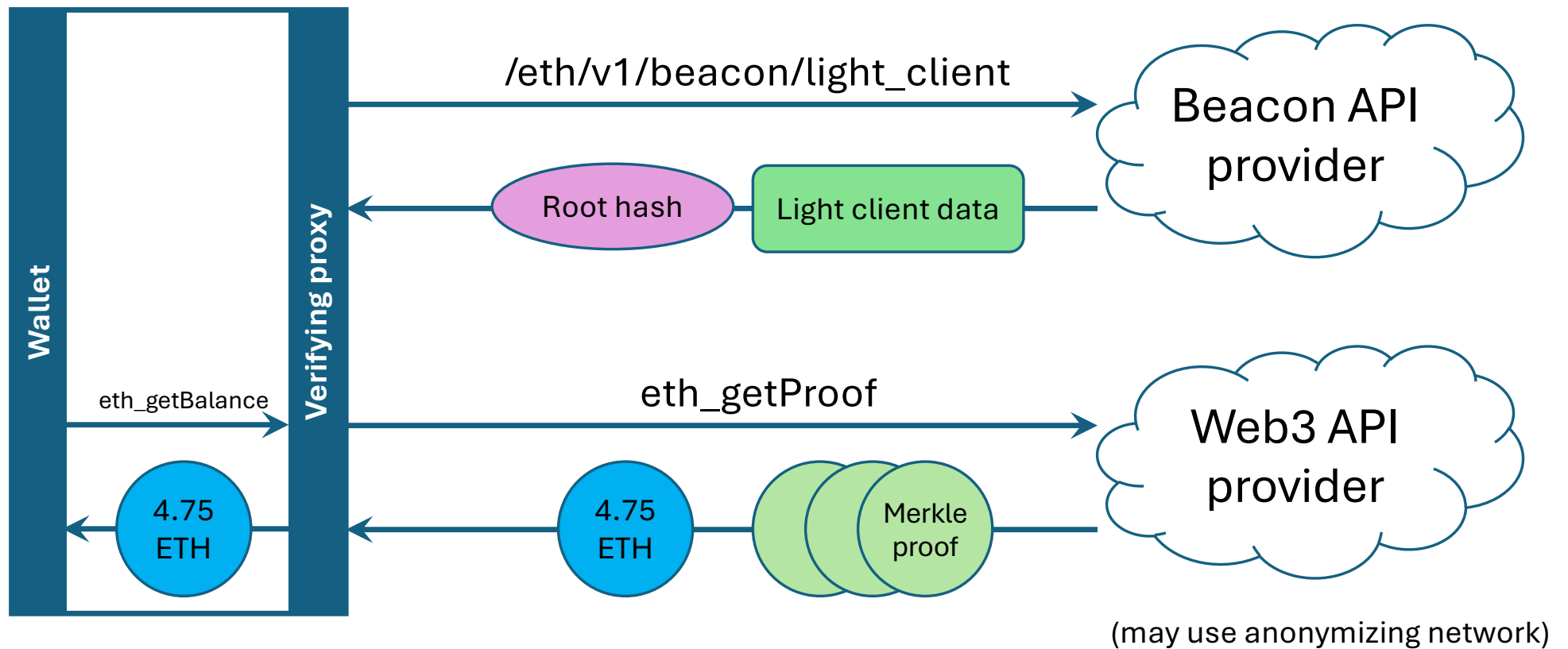
ETH balance



ETH balance (trust-minimized)



ETH balance (verifying proxy)



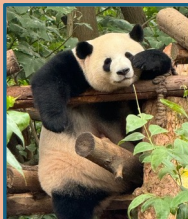
Wallet



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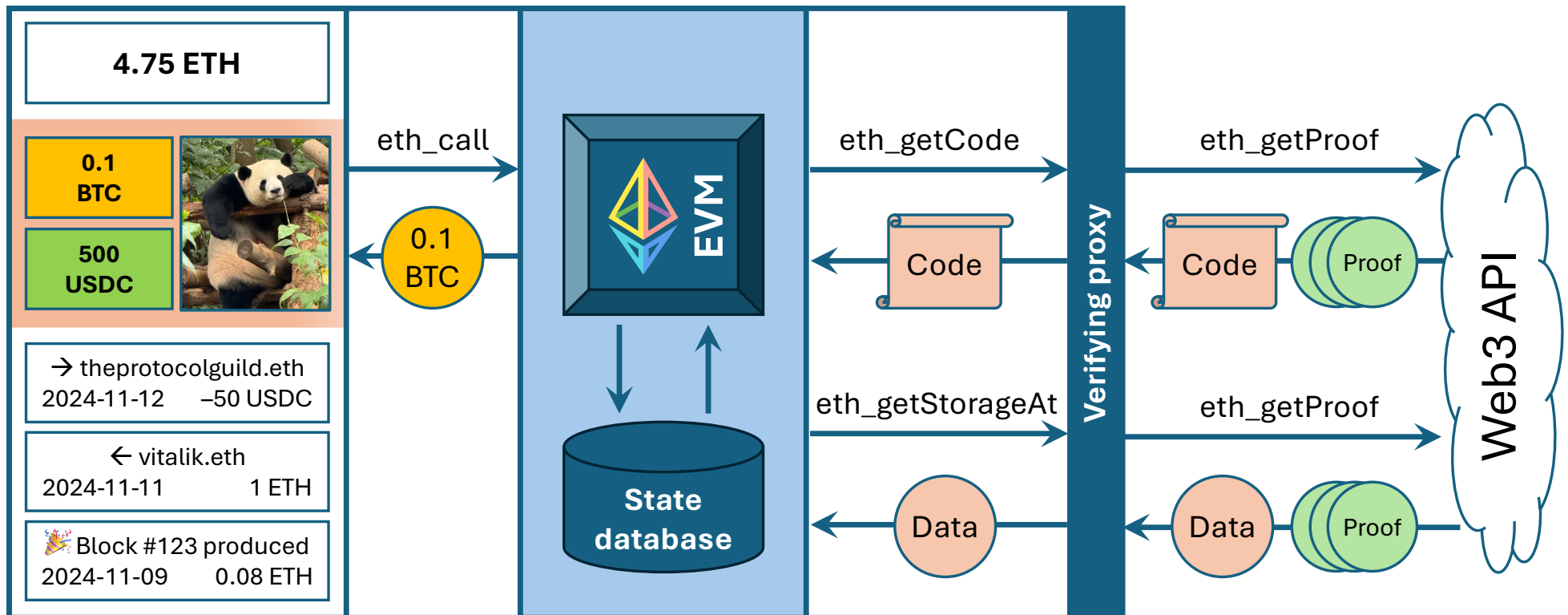
Transaction details

Fees & gas usage

Staking operations & rewards

No missing entries

Token balance

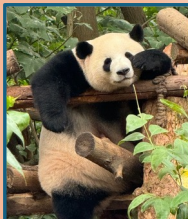


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Access lists are best effort
Lots of round trips

Transaction details

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From address



To address



Value transferred



Transaction data




Gas fees

Transaction details

4.75 ETH


0.1 BTC

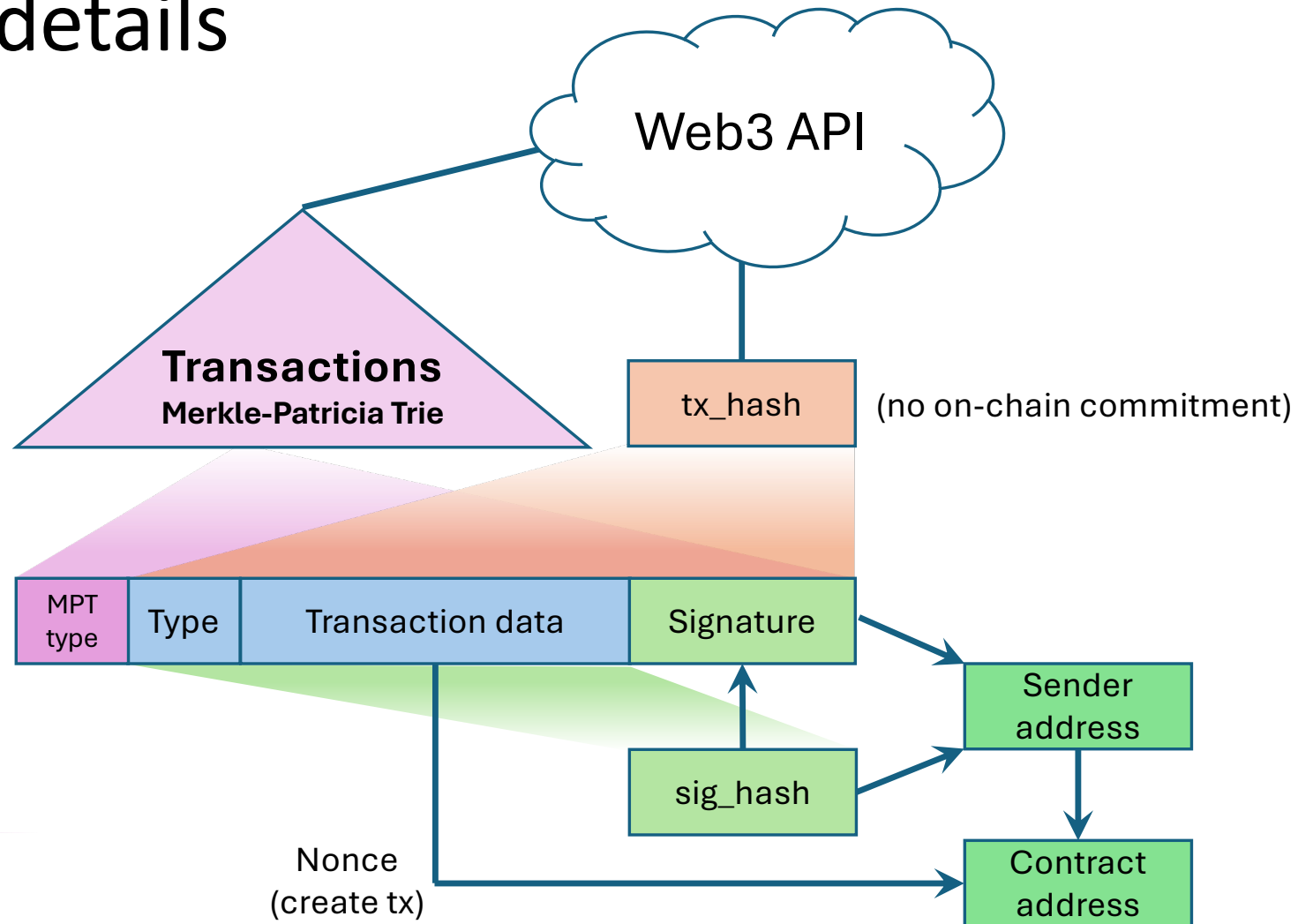
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Transaction details

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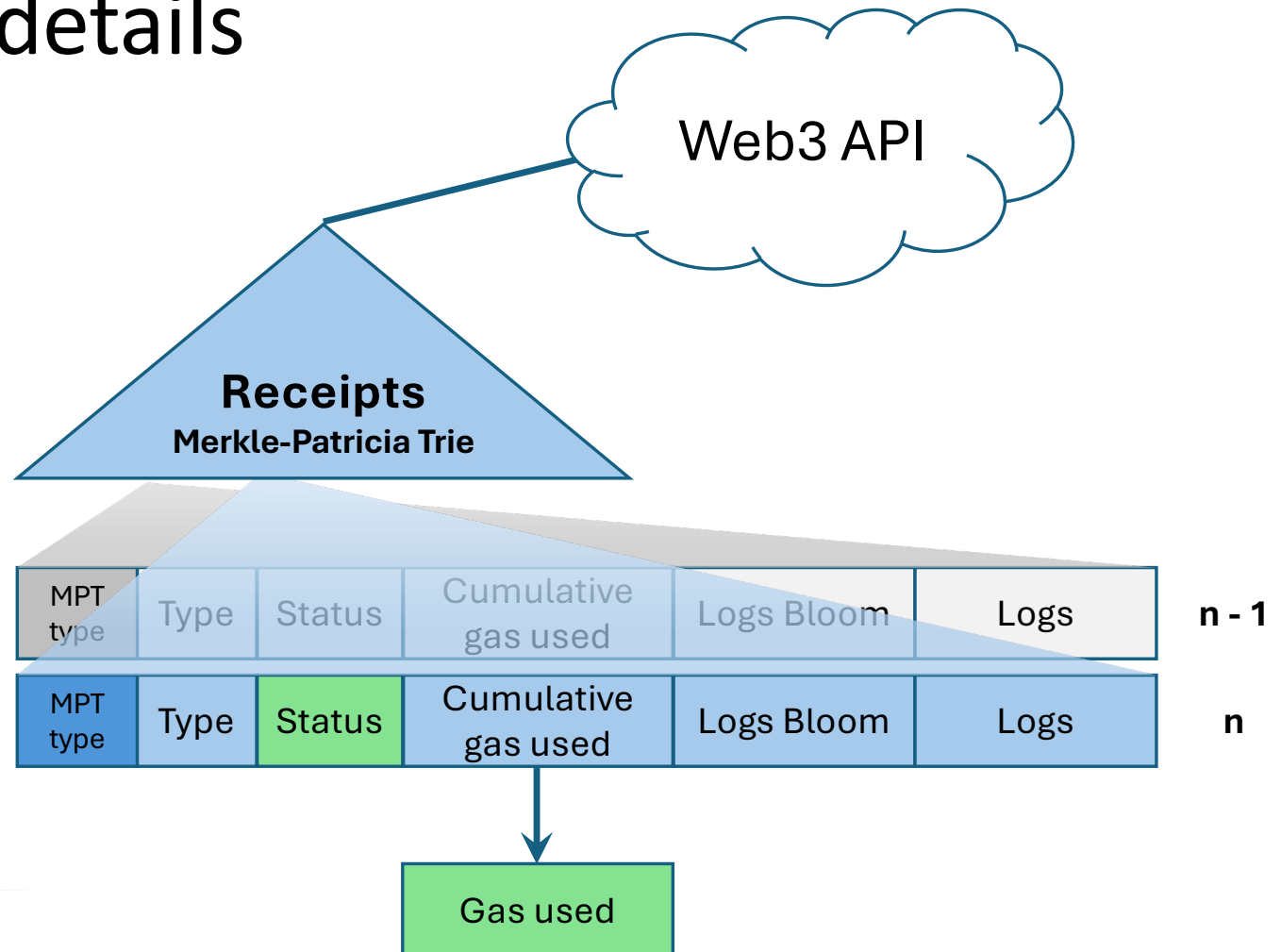
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Transaction details

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→ theprotocolguild.eth

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2024-11-11 1 ETH

🎉

Block #123 produced

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From address

Full tx data required
Expensive ecrecover



To address

CREATE contract address
requires *from* address



Value transferred



Transaction date

Tx type inconsistencies
Inefficient hashes



Gas fees

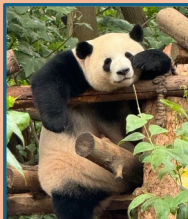
Full data required incl logs
Prior receipt needed

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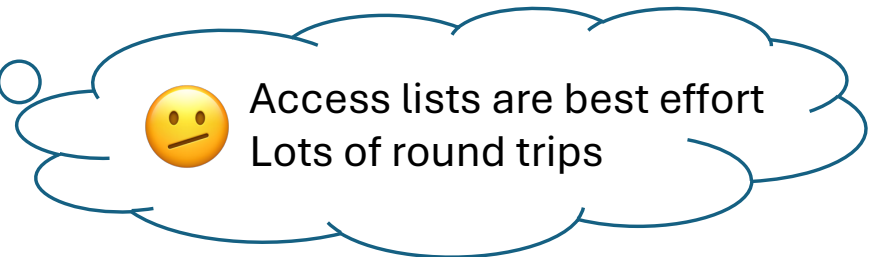
ETH balance

Tokens / NFTs

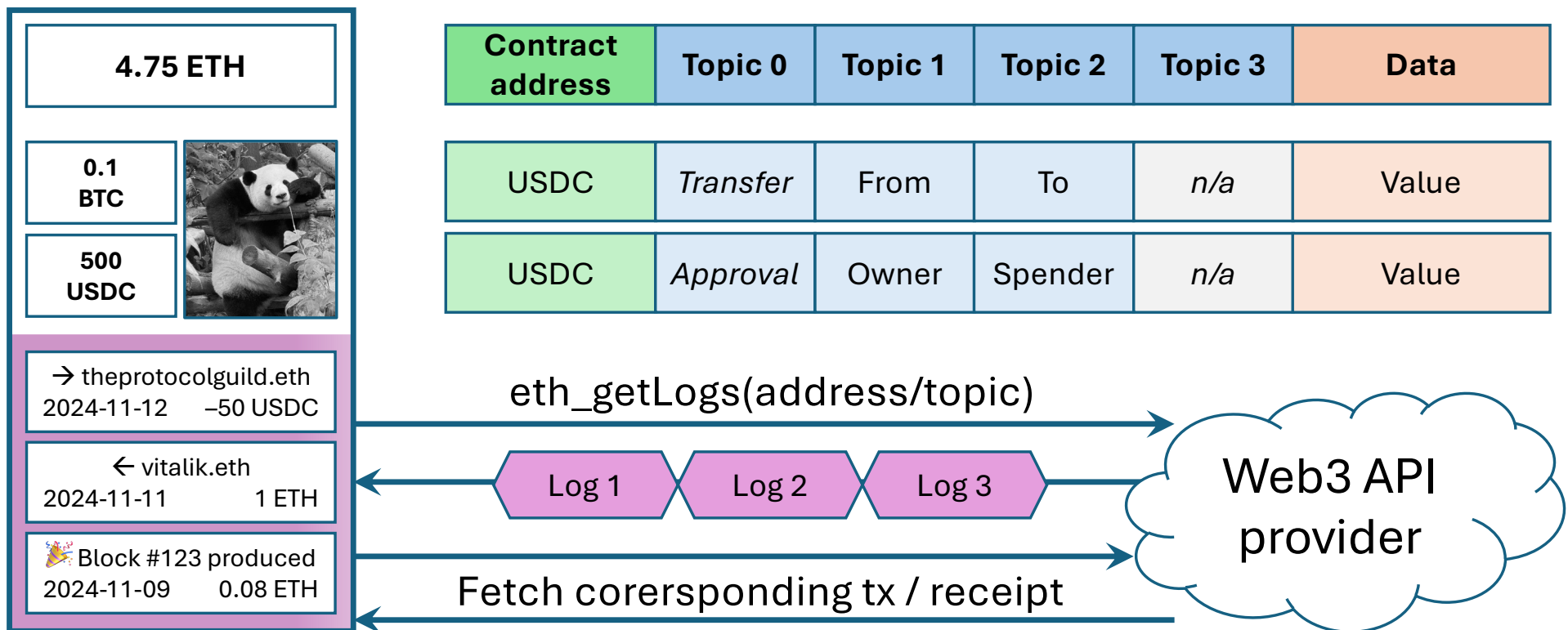
Metadata
Balances & allowances
Exchange rates

History

Transaction details
Fees & gas usage
Staking operations & rewards
No missing entries



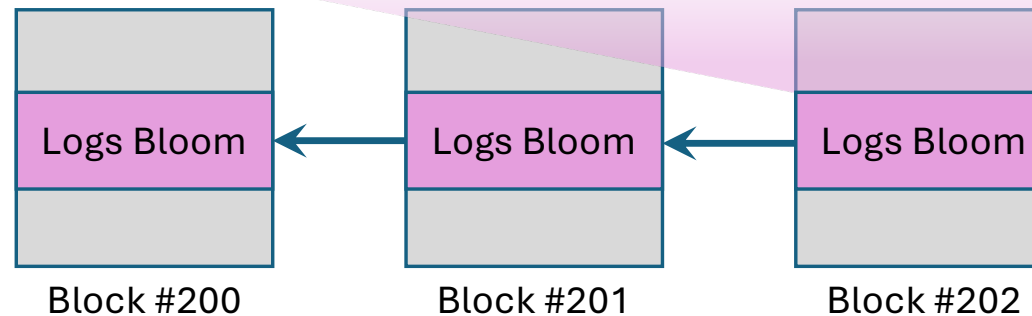
History



History (withholding mitigation)

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0.1 BTC
500 USDC
→ theprotocolguild.eth 2024-11-12 -50 USDC
← vitalik.eth 2024-11-11 1 ETH
🎉 Block #123 produced 2024-11-09 0.08 ETH

Contract address	Topic 0	Topic 1	Topic 2	Topic 3	Data
USDC	<i>Transfer</i>	From	To	<i>n/a</i>	Value
USDC	<i>Approval</i>	Owner	Spender	<i>n/a</i>	Value



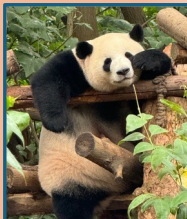
! Get *all* block headers, check Bloom, get *all* transactions / receipts...

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Access lists are best effort
Lots of round trips



Terribly inefficient

ETH transfers
from smart contracts

EIP-7708: ETH transfers emit a log

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0.1 BTC
500 USDC

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← vitalik.eth 2024-11-11 1 ETH
🎉 Block #123 produced 2024-11-09 0.08 ETH

Contract address	Topic 0	Topic 1	Topic 2	Topic 3	Data
System	<i>Transfer</i>	From	To	<i>n/a</i>	Value
System	<i>Fee</i>	From	<i>n/a</i>	<i>n/a</i>	Value

Transfer log

Transaction start

Nonzero-value *CALL*

Nonzero-value *SELFDESTRUCT*


Fee log

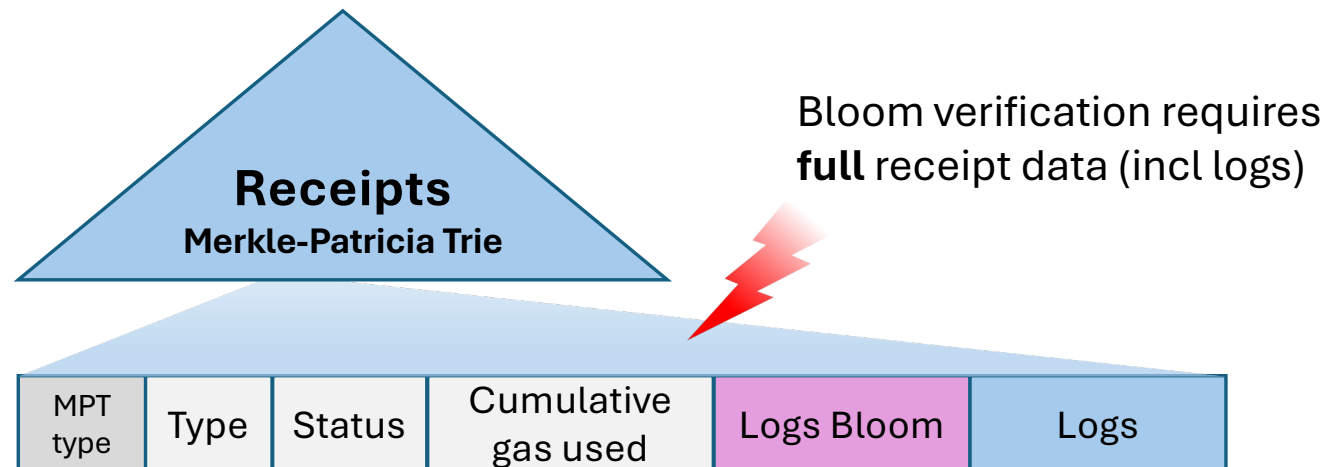
Transaction end



Accurate ETH balance history is available (without local EVM)

EIP-7668: Remove bloom filters

4.75 ETH
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→ theprotocolguild.eth 2024-11-12 -50 USDC
← vitalik.eth 2024-11-11 1 ETH
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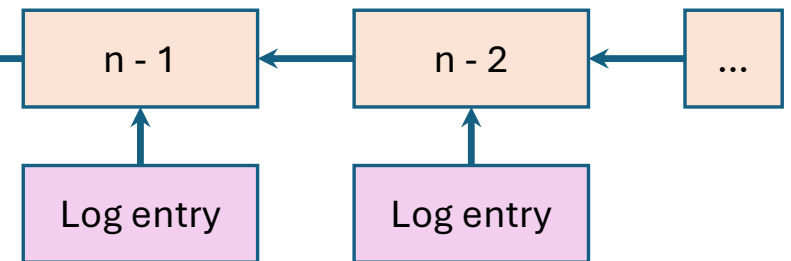
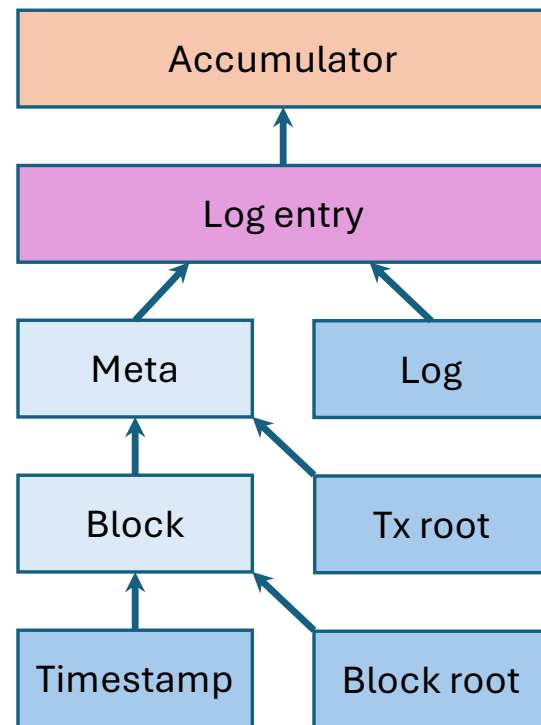
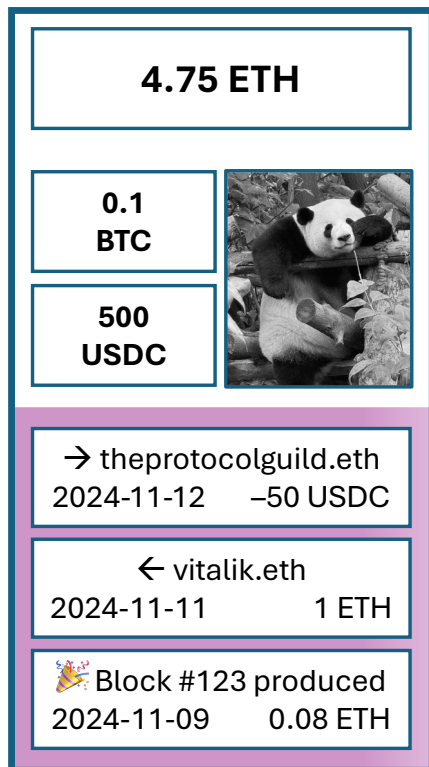
Remove Logs Bloom

Saves 256 bytes per transaction



ETH transfer logs can be stored in saved disk space

EIP-7792: Verifiable logs



Separate accumulator per filter

Address

Topic

Address & topic combination


Accumulators stored in state

Fetchable with `eth_getProof`



Incomplete `eth_getLogs` responses can be detected

EIP-7799: System logs

4.75 ETH
0.1 BTC
500 USDC

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🎉 Block #123 produced 2024-11-09 0.08 ETH

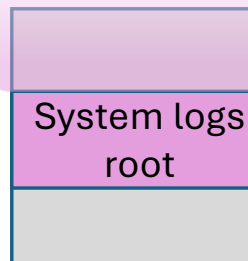
Contract address	Topic 0	Topic 1	Topic 2	Topic 3	Data
System	Priority Rewards	To	n/a	n/a	Value
System	Withdrawal	To	n/a	n/a	Value

Priority Fees (EIP-1559)

No longer paid after each tx

Single combined credit after all txs

Better parallel tx execution



Block #456



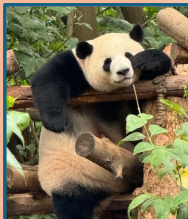
Accurate staking reward tracking (without historical block headers)

Wallet

4.75 ETH


0.1
BTC

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ETH balance

Tokens / NFTs

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ETH transfers
from smart contracts

EIP-6466: SSZ Receipts

4.75 ETH


0.1 BTC

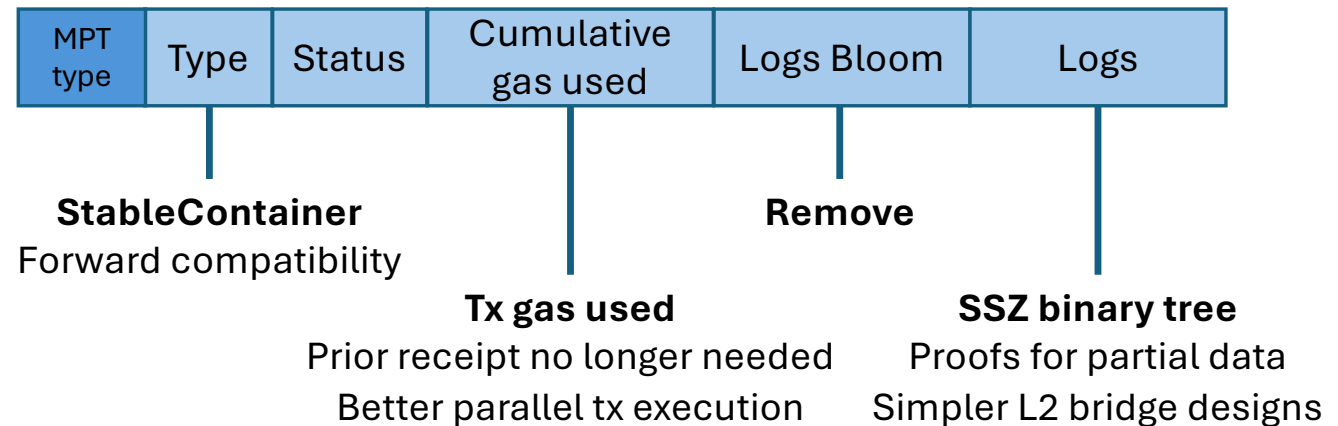
500 USDC

→ theprotocolguild.eth
2024-11-12 -50 USDC

← vitalik.eth
2024-11-11 1 ETH

🎉 Block #123 produced
2024-11-09 0.08 ETH





Add **From**, **Contract (CREATE)**, and **Authority (EIP-7702)** addresses

Transaction data and *ecrecover* no longer needed for verification
Reduced dependency on EVM internals




On-chain commitments to relevant data (fewer round trips, more efficient)

EIP-7706: Separate gas types

4.75 ETH

0.1 BTC

500 USDC



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2024-11-11 1 ETH

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Nonce	Max fee per gas	Gas limit	To	Value	Input	Replayable signature		Legacy					
Nonce	Max fee per gas	Gas limit	To	Value	Input	Signature + Chain ID		EIP-155					
0x01	Chain ID	Nonce	Max fee per gas	Gas limit	To	Value	Input	Access list	Sig				
0x02	Chain ID	Nonce	Prio fee per gas	Max fee per gas	Gas limit	To	Value	Input	Access list	Sig			
0x03	Chain ID	Nonce	Prio fee per gas	Max fee per gas	Gas limit	To	Value	Input	Access list	Fee per blob gas	Blob hashes	Sig	
0x04	Chain ID	Nonce	Prio fee per gas	Max fee per gas	Gas limit	To	Value	Input	Access list	Auth list	Sig		
0x06	Chain ID	Nonce	Gas limit	To	Value	Input	Access list	Blob hashes	Auth list	Max fees per gas	Prio fees per gas	Sig	




Normalized gas fee computation

EIP-6404: SSZ Transactions

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0x1f	n/a	Nonce	Gas limit	To	Value	Input	n/a	n/a	n/a	Max fees per gas	n/a	Sig
0x1f	Chain ID	Nonce	Gas limit	To	Value	Input	n/a	n/a	n/a	Max fees per gas	n/a	Sig
0x1f	Chain ID	Nonce	Gas limit	To	Value	Input	Access list	n/a	n/a	Max fees per gas	n/a	Sig
0x1f	Chain ID	Nonce	Gas limit	To	Value	Input	Access list	n/a	n/a	Max fees per gas	Prio fees per gas	Sig
0x1f	Chain ID	Nonce	Gas limit	To	Value	Input	Access list	Blob hashes	n/a	Max fees per gas	Prio fees per gas	Sig
0x1f	Chain ID	Nonce	Gas limit	To	Value	Input	Access list	n/a	Auth list	Max fees per gas	Prio fees per gas	Sig
0x1f	Chain ID	Nonce	Gas limit	To	Value	Input	Access list	Blob hashes	Auth list	Max fees per gas	Prio fees per gas	Sig



Re-usable verifier (all transaction profiles share same SSZ Merkleization)

EIP-7807: SSZ execution blocks

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2024-11-11 1 ETH

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Block metadata

Parent hash	Miner	State root	Number	Time-stamp	Extra data	Mix hash	Parent CL root
-------------	-------	------------	--------	------------	------------	----------	----------------

Gas accounting (separate gas types)

Gas limits	Gas used	Base fees	Excess gas
------------	----------	-----------	------------

Removed fields (PoW era / Bloom)

Ommers hash	Difficulty	Block nonce	Logs Bloom
-------------	------------	-------------	------------

Operations

Transactions root	Withdrawals root
Receipts root	System logs root
Requests hash	



Merkle-Patricia Tries (MPT) removed, encoding and hashing normalized

Inclusion proofs

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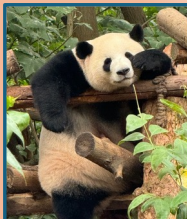
2024-11-09 0.08 ETH



No extra data
required to
verify tx

```
{
  "jsonrpc": "2.0",
  "id": 1,
  "result": {
    "blockHash": "0xe0f3b04a0078ee51f14bfed3f77fc70611273641f942d29781f7bb29a9b2f45d",
    "blockNumber": "0x405f",
    "from": "0xd3248ba3e5492d767f8e427cb9c7b9d5c3972d7b",
    "gas": "0x5208",
    "gasPrice": "0x8",
    "type": "0x0",
    "chainId": "0x1a4e45926",
    "hash": "0xbec73925f3102c03ac9a53303aaae0828e7c1a97cd30f38c3db87c16c52a0b2f",
    "input": "0x",
    "nonce": "0xc7b",
    "to": "0x6177843db3138ae69679a54b95cf345ed759450d",
    "transactionIndex": "0x0",
    "value": "0xaa87bee538000",
    "v": "0x349c8b270",
    "r": "0xa782fb270090da86dfb9be131597edb76f71893d274b0f5de4e9b53feca97182",
    "s": "0x67b2d07f4041a505396fdaf222062bec5afa96172e9e3f5bf2a54ea9d635d725",
    "inclusionProof": {
      "merkleBranch": [
        "0xa75164113ab3274e55321265025c9598a3254467cecf175b626488fa61439d5f",
        "0x3611b3df675ce8ac4da791d332bdd11b027de2b51db46877c02a6ba2680a5560",
        "0x372723f5d8765dee1779fff846dd4897ccf27a72b4c1355f4400a3222977c3e9",
        "0xc78009fd07fc56a11f122370658a353aaa542ed63e44c4bc15ff4cd105ab33c",
        "0x536d98837f2dd165a55d5eeae91485954472d56f246df256bf3cae19352a123c",
        "0x9efde052aa15429fae05bad4d0b1d7c64da64d03d7a1854a588c2cb8430c0d30",
        "0xd88ddfeed400a8755596b21942c1497e114c302e6118290f91e6772976041fa1",
        "0x87eb0ddb57e35f6d286673802a4af5975e22506c7cf4c64bb6be5ee11527f2c",
        "0x26846476fd5fc54a5d43385167c95144f2643f533cc85bb9d16b782f8d7db193",
        "0x506d86582d252405b840018792cad2bf1259f1ef5aa5f887e13cb2f0094f51e1",
        "0xfffff0ad7e659772f9534c195c815efc4014ef1e1daed4404c06385d11192e92b",
        "0x6cf04127db05441cd833107a52be852868890e4317e6a02ab47683aa75964220",
        "0xb7d05f875f140027ef5118a2247bbb84ce8f2f0f1123623085daf7960c329f5f",
        "0xdf6af5f5bbdb6be9ef8aa618e4bf8073960867171e29676f8b284dea6a08a85e",
        "0xb58d900f5e182e3c50ef74969ea16c7726c549757cc23523c369587da7293784",
        "0xd49a7502ffcfb0340b1d7885688500ca308161a7f96b62df9d083b71fcc8f2bb",
        "0x8fe6b1689256c0d385f42f5bbe2027a22c1996e110ba97c171d3e5948de92beb",
        "0x8d0d63c39ebade8509e0ae3c9c3876fb5fa112be18f905ecacfecb92057603ab",
        "0x95eec8b2e541cad4e91de38385f2e046619f54496c2382cb6cacd5b98c26f5a4",
        "0xf893e908917775b62bfff23294dbbe3a1cd8e6cc1c35b4801887b646a6f81f17f",
        "0x0500000000000000000000000000000000000000000000000000000000000000"
      ],
      "transactionsRoot": "0xb3b114e634754c6bfa0ecc90e6d28243cd956ed2f063994b61ed8bad2f0ee8f8",
      "transactionRoot": "0x8d669cc4f99769216442cd514013930b7e21bf37ca4f4eca1cfd1d58a71c05f4"
    }
  }
}
```

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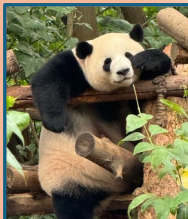
ETH transfers
from smart contracts

Learn more

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Devnet

Nimbus + EthereumJS + Helios

Buidling guides

Verifying wallets

Verifying proxies

Developer tools

Kurtosis network config

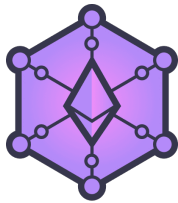
RLP → SSZ converting explorer

SSZ StableContainer implementations



<https://fusaka-light.box>

Related sessions



Gajinder Singh, Jason Chaskin

Today Verkle + Tomorrow ZK = Everything Stateless, Everything Lightclient

Nov 13th — 4:30 PM - 5:00 PM

Talk - Stage 2



Noah Citron

The Future of Light Clients

Nov 13th — 5:30 PM - 6:00 PM

Talk - Stage 5