Post-Merge Testnets

a close look at the public Ethereum testnet infrastructure and how it will change significantly with the merge

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About me

Head of Protocol Engineering
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Core Organizer ETHBerlin
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(EF/ESP Grants for EL/CL Testnets)

Launched Goerli Testnet w/ ChainSafe
ETHBerlin 2018 & GoerliCon 0, Berlin

Release Manager “Parity Ethereum”
Parity Technologies, Berlin

https://github.com/q9f
What we’ll cover today

**Protocol History**
Brief protocol history of Ethereum and an overview of the pre-merge testnets.

**The Merge™**
Implications of The Merge™ on the public testnet infrastructure; how does the new consensus affect the testnets?

**Testnet Selection**
Quick guide to choose a post-merge testnet for your project.
Brief Protocol History
Ethereum launched from a Testnet (2015)

Olympic Testnet:
- Ethereum Pre-Release
- Proof-of-Concept 09
- Proof-of-Work Ethash
- Network ID #0

https://github.com/ethereum/genesis_block_generator

Ethereum Mainnet:
- Ethereum Beta Release
- "Frontier 1.0"
- Proof-of-Work Ethash
- Network ID #1
- Genesis from Olympic block hash

Morden Testnet:
- Proof-of-Work Ethash
- Network ID #2
- Replaces Olympic
- Custom starting nonce for replay protection ($2^{20}$)

PoC IX May 2015
Frontier Jul 2015
Homestead May 2016

Olympic Testnet

network ID #0

hash

Ethereum Mainnet

Morden Testnet

block hash

($2^{20}$)
From Shanghai, with love

The “Shanghai Attacks” during DevCon 2 in Shanghai (2016) would have a lasting effect on the public Ethereum testnet infrastructure.

**Shanghai Attacks (2016)**

**Shanghai Attacks:**
- Ethereum Mainnet DoS during DevCon 2
- Exploit EXTCODESIZE disk read time

**Morden Consensus:**
- Chain split between Geth and Parity
- Morden specific (no issue for mainnet)

**Ropsten Testnet:**
- Proof-of-Work Ethash
- Network ID #3
- Replaces Morden
- Replay Protection (EIP 155 Chain ID #3)
Ropsten Revival? (2017)

- **Morden Testnet (†)**
- **Ropsten Testnet**
- **Ethereum Mainnet**
- **Kovan Testnet**
- **Rinkeby Testnet**

**Ropsten DoS:**
- Repeated Testnet DoS
- Unusable for weeks

**Ropsten “DoS” Chain**

**Ropsten “Revival” Chain**

**Kovan Testnet:**
- Proof-of-Authority
  - (Aura, Parity only)
- Network/Chain ID #69

**Rinkeby Testnet:**
- Proof-of-Authority
  - (Clique, Geth only)
- Network/Chain ID #4

**Spurious Dragon**
Nov 2016

Q1 2017
Goerli Testnet Idea

To give Ethereum a stable, public, cross-client testnet, two teams ideated the Goerli Testnet at ETHBerlin (2018), won a hackathon prize, and were immediately disqualified after.

https://medium.com/ethberlin/proof-of-transparency-ff31c4911462
Goerli to the Rescue (2019)

- Goerli Testnet:
  - Proof-of-Authority (Geth, Parity, Pantheon, Nethermind)
  - Network/Chain ID #5

“Open Ethereum:”
- Uncertain future for Kovan/Aura
Ropsten, Rinkeby & Kiln Deprecation Announcement

Posted by Protocol Support Team on June 21, 2022

Research & Development

https://blog.ethereum.org/2022/06/21/testnet-deprecation
Pre-merge Testnet deprecation (2022)

- **Sepolia Testnet**: Proof-of-Work, Network/Chain ID #11155111
- **Deprecation of**: Ropsten & Rinkeby
Pre-Merge Testnets

Extensive List (6)

- Morden (+)
- Ropsten
- Kovan (+)
- Rinkeby
- Goerli
- Sepolia
Section 1

Implications of The Merge™
The Merge™ (2022)

- **Ethereum Mainnet** (PoW) → PoS
- **Ropsten Testnet** (PoW) → PoS (†)
- **Prater Testnet** (PoS)
- **Goerli Testnet** (PoA) → PoS!
- **“Bepolia” Testnet** (“PoA”) → “PoA!”
- **Sepolia Testnet** (PoW)
Implications of The Merge™

Consensus
- Proof-of-Work: permissionless
- Proof-of-Authority: permissioned
- Proof-of-Stake: permissionless (*)

Networks
- Mainnet: PoW $\rightarrow$ PoS, unchanged (*)
- Goerli: PoA $\rightarrow$ PoS, now permissionless
- Sepolia: PoW $\rightarrow$ “PoA,” now permissioned
Goerli–Prater Merge

Pre-Merge
- Proof-of-Authority: Clique
- Predefined validator set (community)
- Access to consensus permissioned

Post-Merge
- Proof-of-Stake: Gasper / LMD GHOST
- Open validator set (given access to GoETH)
- Access to consensus permissionless
Mining through The Merge™ (here: Sepolia)
Sepolia-Bepolia Merge

Pre-Merge
- Proof-of-Work: Ethash
- Nakamoto consensus ("one CPU, one vote")
- Access to consensus permissionless

Post-Merge
- Proof-of-Authority: Gasper / LMD GHOST (*)
- Permissioned validator set through token
- Access to consensus permissioned

https://sepolia.etherscan.io/address/0x7f02c3e3c98b133055b8b348b2ac625669ed295d
The Merge™ (2022)

“Beacon Chain” (PoS)

Ethereum Mainnet (PoW)

“Bopsten” Testnet (PoS)

Ropsten Testnet (PoW) ➔ PoS (+)

Prater Testnet (PoS)

Goerli Testnet (PoA)

“Bepolia” Testnet (“PoA”)

Sepolia Testnet (PoW) ➔ “PoA!”
Extensive List (3)

- Ropsten (†)
- Goerli
- Sepolia
Section 2

Testnet Selection Guide
## Post-Merge Supported Testnets

<table>
<thead>
<tr>
<th>Goerli</th>
<th>Sepolia</th>
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<tbody>
<tr>
<td>Open validator set, stakers can test network upgrades</td>
<td>Closed validator set, controlled by client &amp; testing teams</td>
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<tr>
<td>Large state, useful for testing complex smart contract interactions</td>
<td>New testnet, less applications deployed than other testnets</td>
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<tr>
<td>Longer to sync and requires more storage to run a node</td>
<td>Fast to sync and running a node requires minimal disk space</td>
</tr>
</tbody>
</table>

[https://blog.ethereum.org/2022/06/21/testnet-deprecation](https://blog.ethereum.org/2022/06/21/testnet-deprecation)
Dos and Don’ts

Do use Goerli Testnet
- Most similar to mainnet
- Test your validators

Do use Sepolia Testnet
- Most stable
- Long-term guarantees
- Test your applications

Don’t use Ropsten
- Expect interruptions (†)

Don’t use Kovan
- Dependence on Parity (†)

Don’t use Rinkeby
- No protocol upgrades (†)
Caveats

Goerli Testnet
- Goerli Ether supply issues
  - Testnet-only protocol upgrade?
- Fairly old (in terms of testnet age)
  - More difficult to synchronize

Sepolia Testnet
- (lack of infrastructure)
Dos (simplified)

Goerli: Validators  Sepolia: Applications
Any Questions?

Do use Goerli Testnet
- Most similar to mainnet
- Test your validators

Do use Sepolia Testnet
- Most stable
- Long-term guarantees
- Test your applications

Hit me up for free Testnet Ether!!

Testnet Workgroup? Anyone?
Thank you!

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