# Key Features

# Secure, Random State Sharding

Harmony has transcended the blockchain trilemma by bringing the best research to production. Sharding is proven to *scale* blockchains without compromising *security* and *decentralization*.

We divide our network nodes and the *blockchain states* into shards, scaling linearly in all three aspects of machines, transactions, and storages.

To prevent single shard attacks, we must have a sufficiently large number of nodes per shard and cryptographic randomness to re-shard regularly. Each shard has 1/4 of nodes for a strong security guarantee against Byzantine behaviors. We use a Verifiable Random Function (VDF) for unbiased and unpredictable shard membership.

# Fast Consensus with Instant Finality

Harmony has innovated on the battle-tested Practical Byzantine Fault Tolerance (PBFT) for fast consensus of block transactions. Our Fast BFT (FBFT) leads to low transaction fees and 1-block-time finality in Harmony Mainnet.

We use Boneh–Lynn–Shacham (BLS) constant-sized signatures to commit blocks in a single round of consensus messages. We achieve a 2-second block time with *view changes in production* against adversarial or unavailable leaders.

Harmony Mainnet was launched in June 2019. Our network has produced 30M+ blocks with 450k+ transactions in *publicly traded, native* ONE tokens.

# Effective PoS & Token Economics

Harmony has designed a novel Proof-of-Stake (PoS) mechanism for network security and economics. Our Effective Proof-of-Stake (EPoS) reduces centralization and *distributes rewards fairly* to thousands of validators.

Our staking mechanism supports delegation and reward compounding. To support 100% uptime but fully open participation, EPoS slashes validators who double-sign, and it penalizes elected but unavailable nodes.

Harmony Economics Model caps the annual insurance at 441 million tokens (about a 3% rate in the long term). Our model gives validators a predictable and straightforward return. All transaction fees are burnt to offset the insurance, naturally leading to *zero inflation* when our network usage becomes high.