



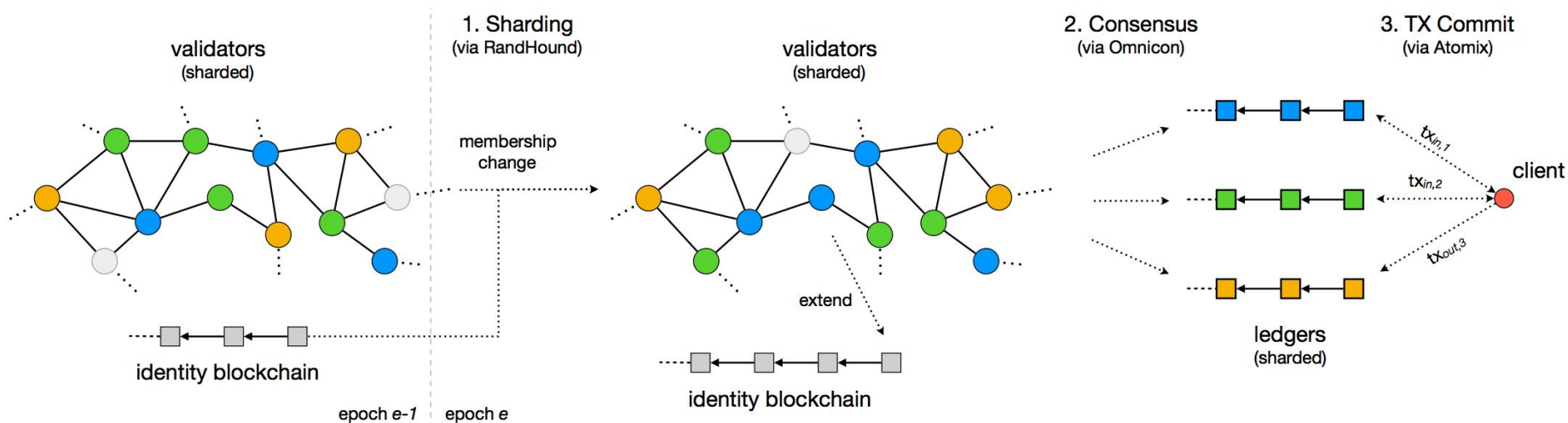
Open Consensus for 10 Billion



Harmony is a **Fast & Secure** blockchain

*To scale trust for billions of people
and create a radically fair economy*

Bring Research to **Production**

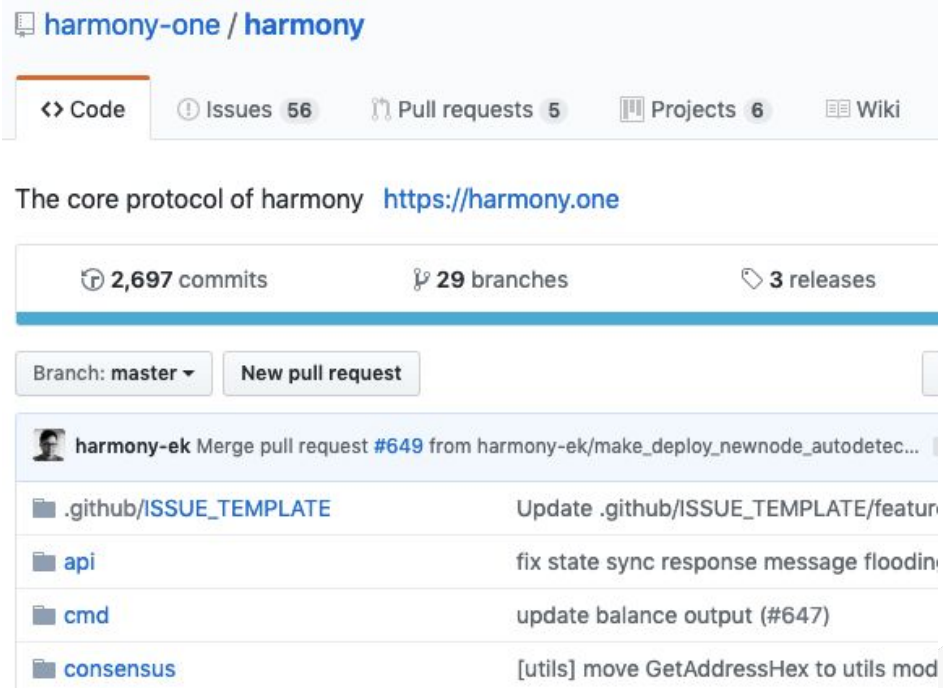


A high-performance blockchain demands **10x innovations** in transport networks, consensus protocols & systems tools.

State Sharding with Secure Staking

Open source & Solidity support
 $O(n)$ consensus & $O(1)$ resharding

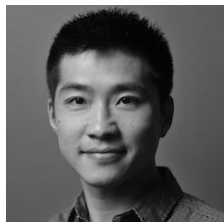
Tx benchmark with 41k nodes
 $O(\log n)$ cross-shard routing
Failure-resilient propagation in 1.3s



The screenshot shows the GitHub repository page for `harmony-one / harmony`. The repository is described as "The core protocol of harmony" with a link to <https://harmony.one>. It has 2,697 commits, 29 branches, and 3 releases. The current branch is `master`, and there is a button to "New pull request". A recent pull request by `harmony-ek` is shown, titled "Merge pull request #649 from harmony-ek/make_deploy_newnode_autodetec...". The pull request includes a list of files that were updated:

File	Description
<code>.github/ISSUE_TEMPLATE</code>	Update .github/ISSUE_TEMPLATE/featur
<code>api</code>	fix state sync response message floodin
<code>cmd</code>	update balance output (#647)
<code>consensus</code>	[utils] move GetAddressHex to utils mod

(Hungry & Foolish) Security Protocol Ph.D



Stephen Tse has been obsessed with protocols and compilers since high school. He reverse-engineered ICQ and X11 protocols, coded in OCaml for more than 15 years , and graduated with a doctoral degree in security protocols and compiler verification from the University of Pennsylvania.

Stephen was a researcher at Microsoft Research, a senior infrastructure engineer at Google, and a principal engineer for search ranking at Apple. He founded the mobile search Spotsetter with institutional venture capital; Apple later acquired the startup.

Adaptive-Thresholded Proof of Stake

Sharding by Voting Shares

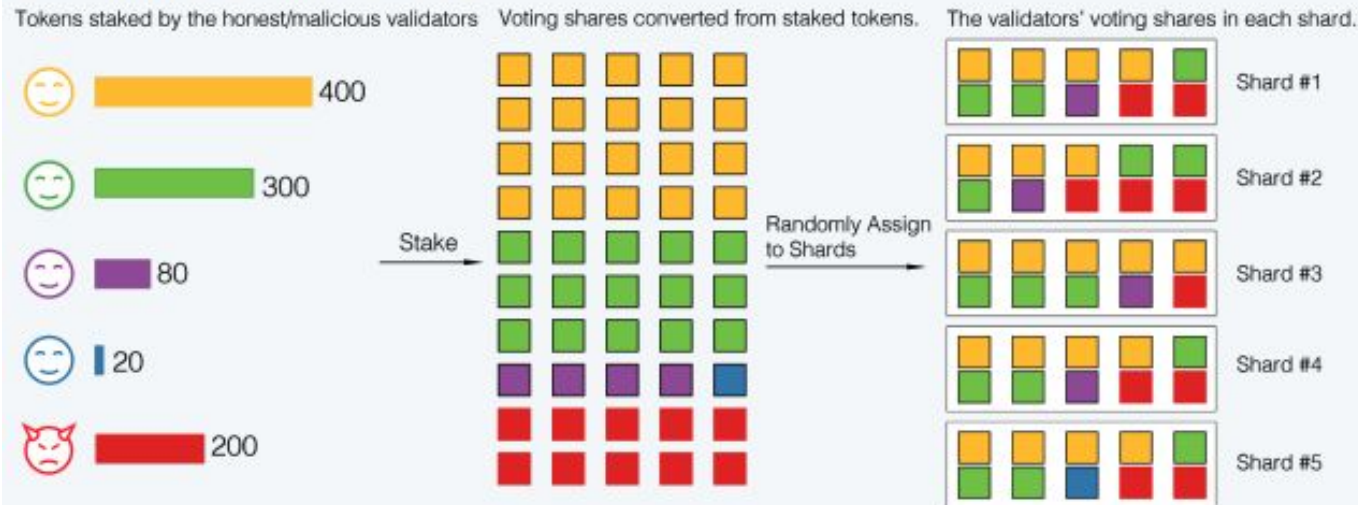


Figure 3. The stakers obtain voting shares proportional to their staked tokens. Voting shares are then randomly assigned to shards. Stakers become validators for the shard(s) where their voting shares are assigned.

Radical Fairness: are you feeling lucky?

Lottery & gambling

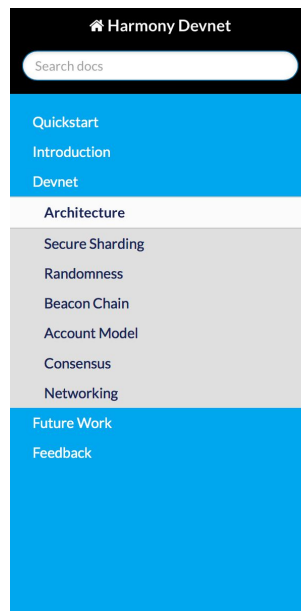
Game mechanics

Matching & ranking

Prevent single-shard overtakes

Verifiable delay functions

Zero-knowledge arguments



[Docs](#) » Architecture

Secure Sharding

Harmony adopts a Proof-Of-Stake (PoS) based sharding scheme that's both secure and scalable. Harmony contains a beacon chain and multiple shard chains. The beacon chain serves as a beacon and identity register, while the shard chains store separate blockchain state transactions concurrently. Harmony proposes an efficient algorithm for randomness combining Verifiable Random Function (VRF) and Verifiable Delay Function (VDF).

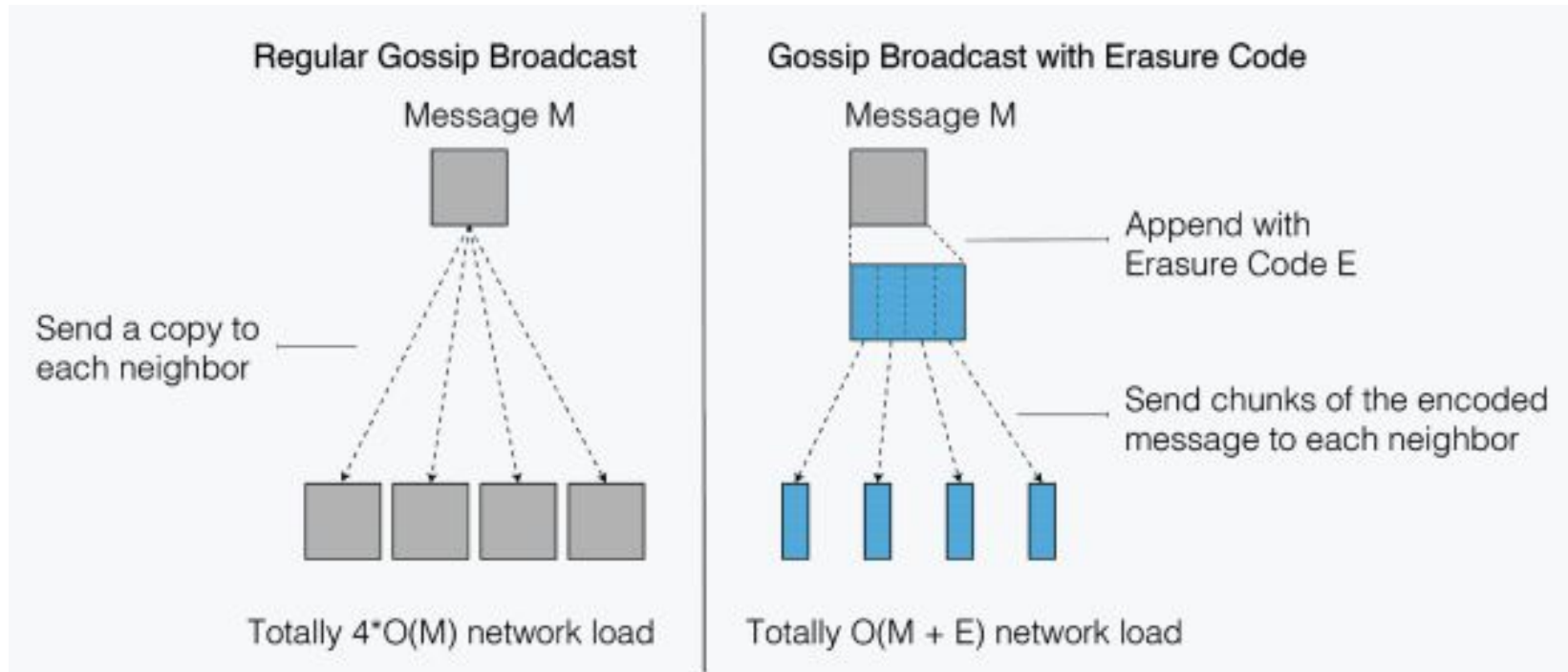
Randomness

Sharding involves assigning nodes into different shards or branches. Nodes within a shard form a committee and run consensus in parallel. Various approaches have been proposed for assigning nodes into shards such as randomness-based sharding in [OmniLedger](#) and [RapidCh](#); centrally-controlled sharding. Out of all the approaches, randomness-based sharding is recognized as the most secure solution. In randomness-based sharding, an agreed random number is used to determine the sharding assignment for each node. The random number must have the following properties:

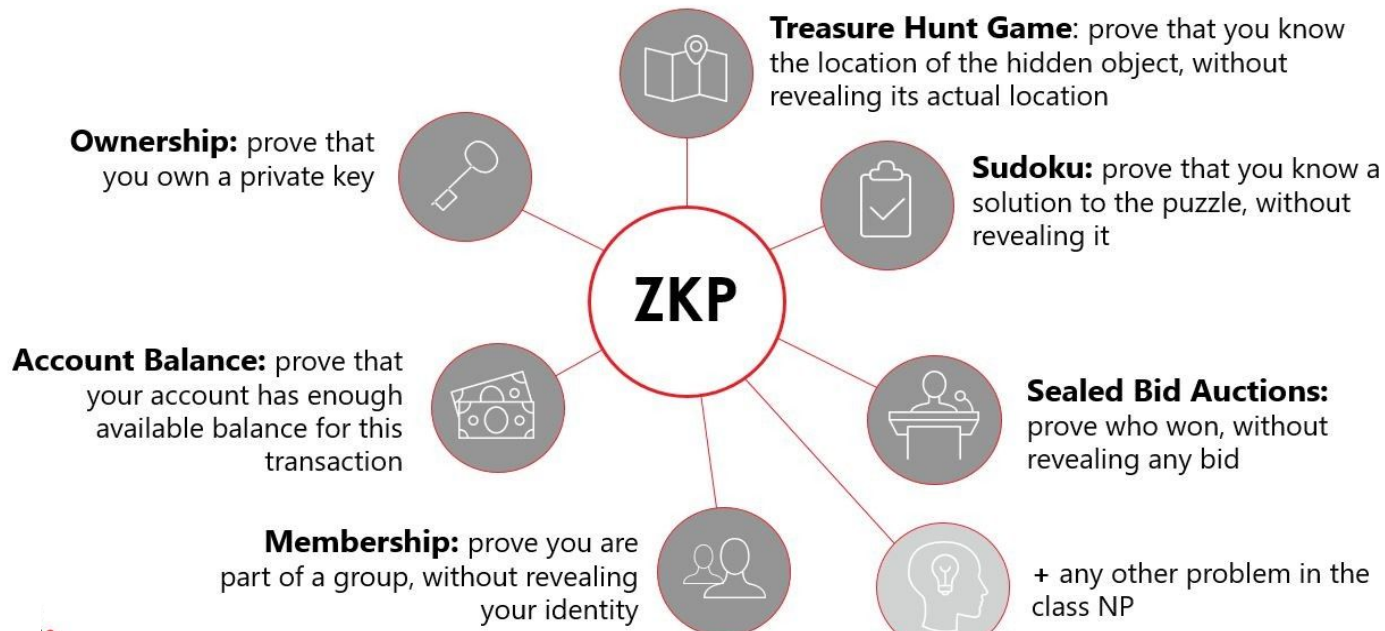
Unpredictable: No one should be able to predict the random number before it's generated.

Unbiasable: The process of generating the random number should not be biasable.

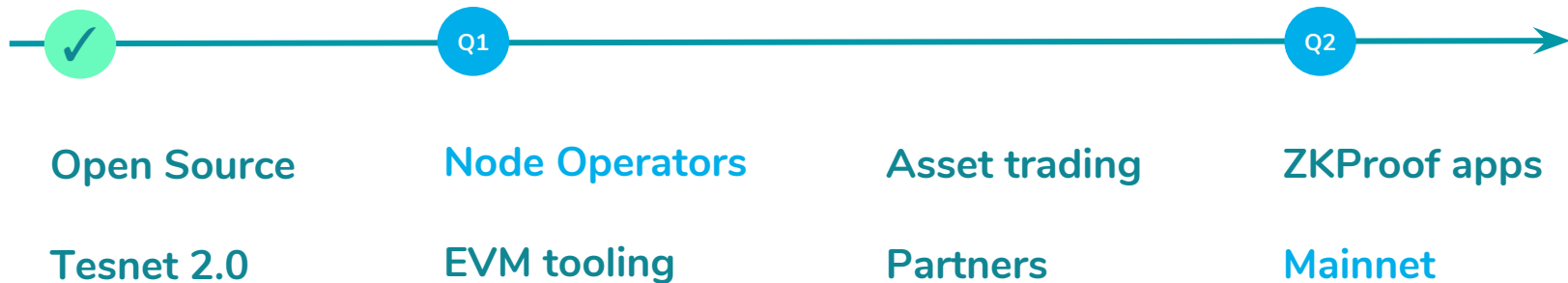
P2P with $O(\log n)$ routing & erasure coding



Zero-knowledge: privacy in data marketplaces



Harmony Nodes & Mainnet



Roadmap: Ethereum 2.0 **Now**

Q3

Popular apps (DeFi, Dai, lottery) at 200%+ faster, storage rent (not gas price)

Deployed prototypes of Zero-knowledge proofs (zkDAI, AZTEC, Zether)

Q4

WebAssembly backend

Fountain code (rateless erasure encoding) over libp2p

Light clients with fraud proofs

Democratizing Credit, Data & Marketplaces



Confidential asset trading
ERC20/721 but
privacy-preserving



Decentralized credit

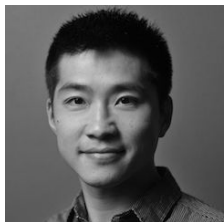


Data sharing & marketplaces



VPN on Internet
Private computation and
consortium platform on
public blockchain

7 Google/Apple/Amazon Engineers & 2 PhDs



Stephen
Protocol PhD



Nicolas
VR Startup Founder



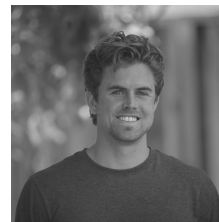
Alok
Apple Siri



Rongjian
Google Search



Minh
Google Voice AI



Nick
Stanford AI



Sahil
Harvard Business



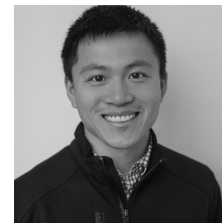
Eugene
AWS Networking



Leo
Amazon Lab126



Kunal
Samsung Security



Li
GSV Capital



Chao
Math PhD



Partners & Community at talk.harmony.one



Animoca



Timeless



Nolica



Hyperion



Blue Vista



NoIZ



Picolo



Quanta

hBits

hBits

Category

Topics

Latest

Announcements

16

Upcoming events, [monthly newsletter](#), press coverage, [team blogs](#), [instagram photos](#).

Introductions

46

3 unread

[Welcome](#) to Harmony! [Introduce](#) yourself and share your LinkedIn / Twitter / Github profiles. Tell us what you are building – it can lead to a partnership!

Applications

5

What decentralized applications are you building and scaling?

Sharding

6

Harmony scales to tens of thousands of nodes with full sharding of computation, states and communication. Inspired by Omniledger and [Rapidchain](#), our approach incorporates staked voting and secure randomness for a modern scalable architecture.

Consensus

4

Consensus is the core of any blockchain. Harmony integrates an efficient consensus protocol that combines POS with practical Byzantine fault tolerance (PBFT).



Governance in
[Cryptoeconomics](#)



Allen from NKN
[Introductions](#)



Still taking new
[Nodes](#)



Introduce yours
[Introductions](#)



@sahil & @lija
Feb 24
[Announcements](#)



Harry from Stat
[Introductions](#)



E-commerce E
Investor



Research & Community on Forum

talk.harmony.one

Wear Your Ambitions on Sleeve

harmony.one/2019-roadmap

Harmony Tokens & Node Operators

harmony.one/partners

Mainnet Launch in 2019 Q2

harmony.one/newsletter

harmony.one/cmu-talk

