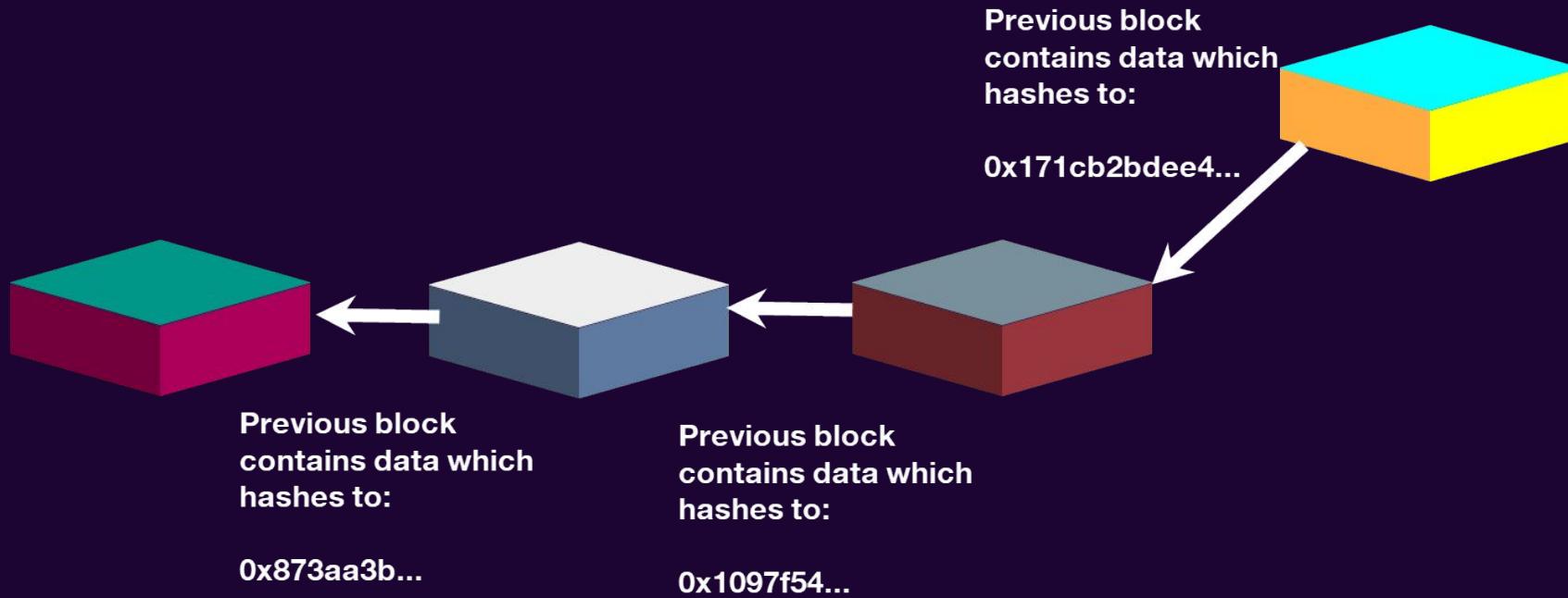


POLKADOT AND PARACHAINS



Radhakrishna Dasari
@DrW3RK

BLOCKCHAIN



For everything that needs to be “set in stone” digitally

Web3 - Powered by Blockchain Technology



LEGACY BLOCKCHAINS HAVE VARIOUS LIMITATIONS



CAN'T COMMUNICATE

Legacy blockchains can't easily communicate with each other



CAN'T SCALE

These networks can't handle a lot of traffic



POOR SECURITY

Many networks have been attacked by hackers



NO CUSTOMIZATION

One-size-fits-all application platforms do not work



POOR GOVERNANCE

Decisions on many legacy networks are made by one powerful individual or group



UPGRADES ARE DIFFICULT

Users of the network must independently upgrade their software; otherwise the chain can split into two!



HOW DO WE
SOLVE THESE
CHALLENGES?



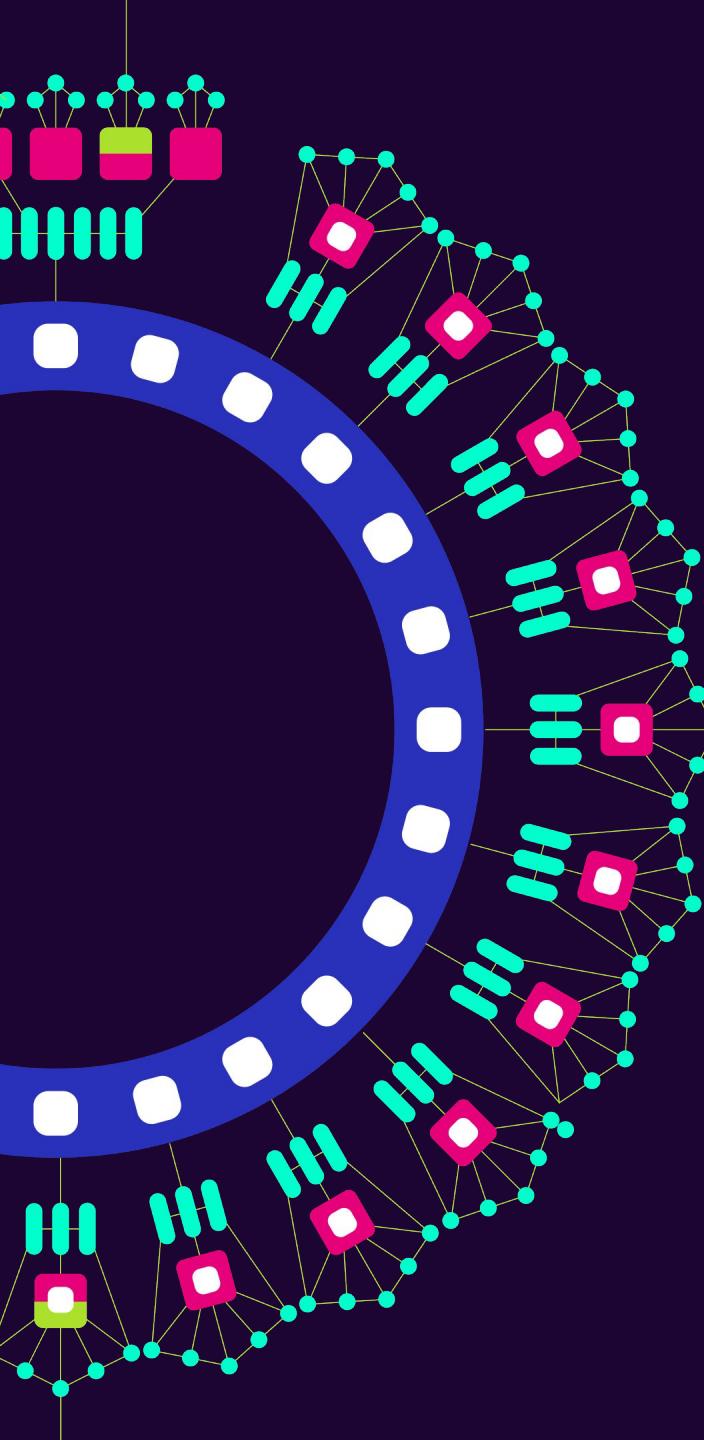
**THE FUTURE OF WEB3 ISN'T BASED
ON A SINGLE BLOCKCHAIN.**

THERE IS NO 'ONE SIZE FITS ALL'.

**WEB3 DEPENDS ON OPENNESS AND
INTEROPERABILITY.**



**POLKADOT IS A HETEROGENEOUS
MULTICHAIN PROTOCOL THAT
CONNECTS AND SECURES
BLOCKCHAINS WITH POOLED
SECURITY AND INTEROPERABILITY.**



TRANSLATION:
**POLKADOT IS A SET OF
BLOCKCHAINS THAT WORK
TOGETHER AND TALK TO EACH
OTHER.**



Connects
networks
together



Handles heavy traffic
at scale



Industry-leading
security



Enables
custom-made
platforms built for
specific apps



On-Chain Governance
through open,
community-driven
decision-making



Self-upgrades
allowing it to be
future-proof

POLKADOT WAS FOUNDED BY SOME OF THE BLOCKCHAIN INDUSTRY'S LEADING BUILDERS



**DR. GAVIN
WOOD**

Polkadot co-founder
Web3 Foundation founder;
co-founder and former chief
technology officer at Ethereum
Foundation



**ROBERT
HABERMEIER**

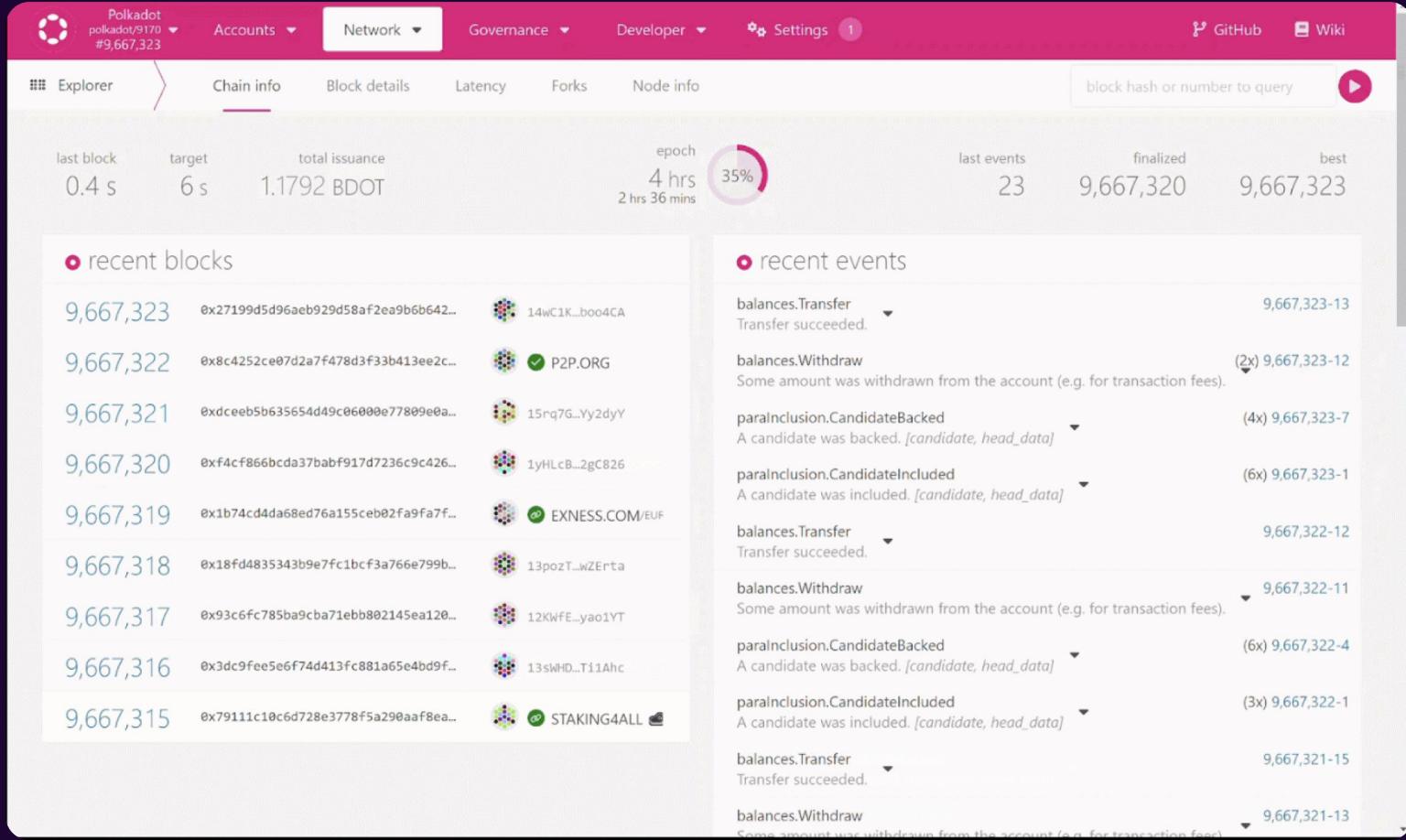
Polkadot co-founder
Thiel Fellow



**PETER
CZABAN**

Polkadot co-founder

POLKADOT NETWORK



The screenshot shows the Polkadot.js Network dashboard with the following data:

Network Status:

- Last block: 0.4 s
- Target: 6 s
- Total issuance: 1.1792 BDOT
- Epoch: 4 hrs (2 hrs 36 mins)
- 35% completed
- Last events: 23
- Finalized: 9,667,320
- Best: 9,667,323

Recent Blocks:

Block Number	Hash	Author
9,667,323	0x27199d5d96aeb929d58af2ea9b6b642...	14wC1K...boo4CA
9,667,322	0x8c4252ce07d2a7f478d3f33b413ee2c...	P2P.ORG
9,667,321	0xdceeb5b635654d49c06000e77809e0a...	15rq7G...Yy2dyY
9,667,320	0xf4cf86bcda37babf917d7236c9c426...	1yHLcB...2gC826
9,667,319	0x1b74cd4da68ed76a155ceb02fa9fa7f...	EXNESS.COM/EUF
9,667,318	0x18fd4835343b9e7fc1bcf3a766e799b...	13pozT...wZErta
9,667,317	0x93c6fc785ba9cba71ebb802145ea120...	12KWF...yao1YT
9,667,316	0x3dc9fee5e6f74d413fc881a65e4bd9f...	13sWHD...Ti1Ahc
9,667,315	0x79111c10c6d728e3778f5a290aaef8ea...	STAKING4ALL

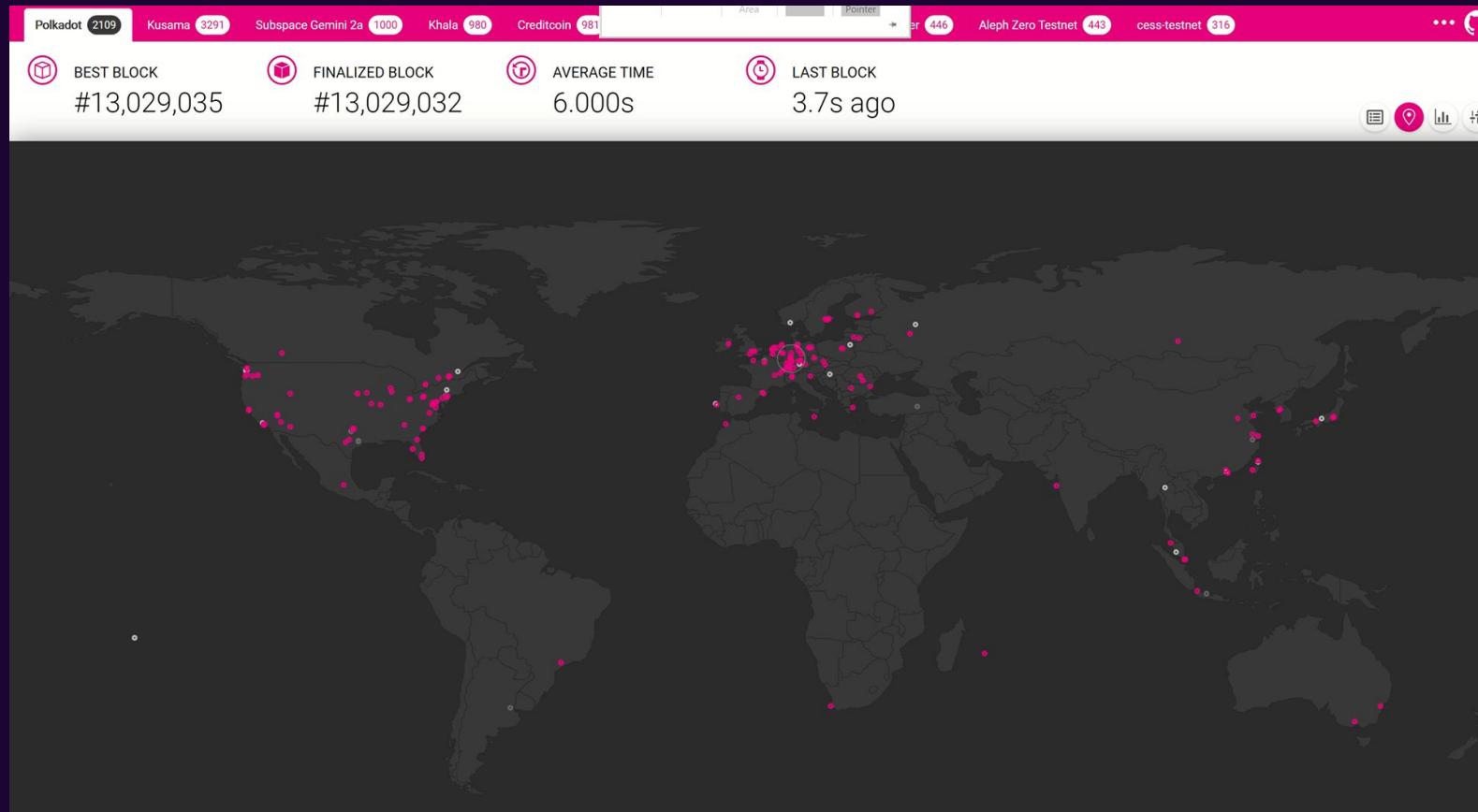
Recent Events:

Type	Description	Block Number
balances.Transfer	Transfer succeeded.	9,667,323-13
balances.Withdraw	Some amount was withdrawn from the account (e.g. for transaction fees).	(2x) 9,667,323-12
paralInclusion.CandidateBacked	A candidate was backed. [candidate, head_data]	(4x) 9,667,323-7
paralInclusion.CandidateIncluded	A candidate was included. [candidate, head_data]	(6x) 9,667,323-1
balances.Transfer	Transfer succeeded.	9,667,322-12
balances.Withdraw	Some amount was withdrawn from the account (e.g. for transaction fees).	9,667,322-11
paralInclusion.CandidateBacked	A candidate was backed. [candidate, head_data]	(6x) 9,667,322-4
paralInclusion.CandidateIncluded	A candidate was included. [candidate, head_data]	(3x) 9,667,322-1
balances.Transfer	Transfer succeeded.	9,667,321-15
balances.Withdraw	Some amount was withdrawn from the account (e.g. for transaction fees).	9,667,321-13

[HTTPS://POLKADOT.JS.ORG/](https://polkadot.js.org/)



POLKADOT NETWORK



HTTPS://TELEMETRY.POLKADOT.IO/



**SINGLE BLOCKCHAINS CAN
BE BUILT TO DO ONE THING
REALLY WELL**

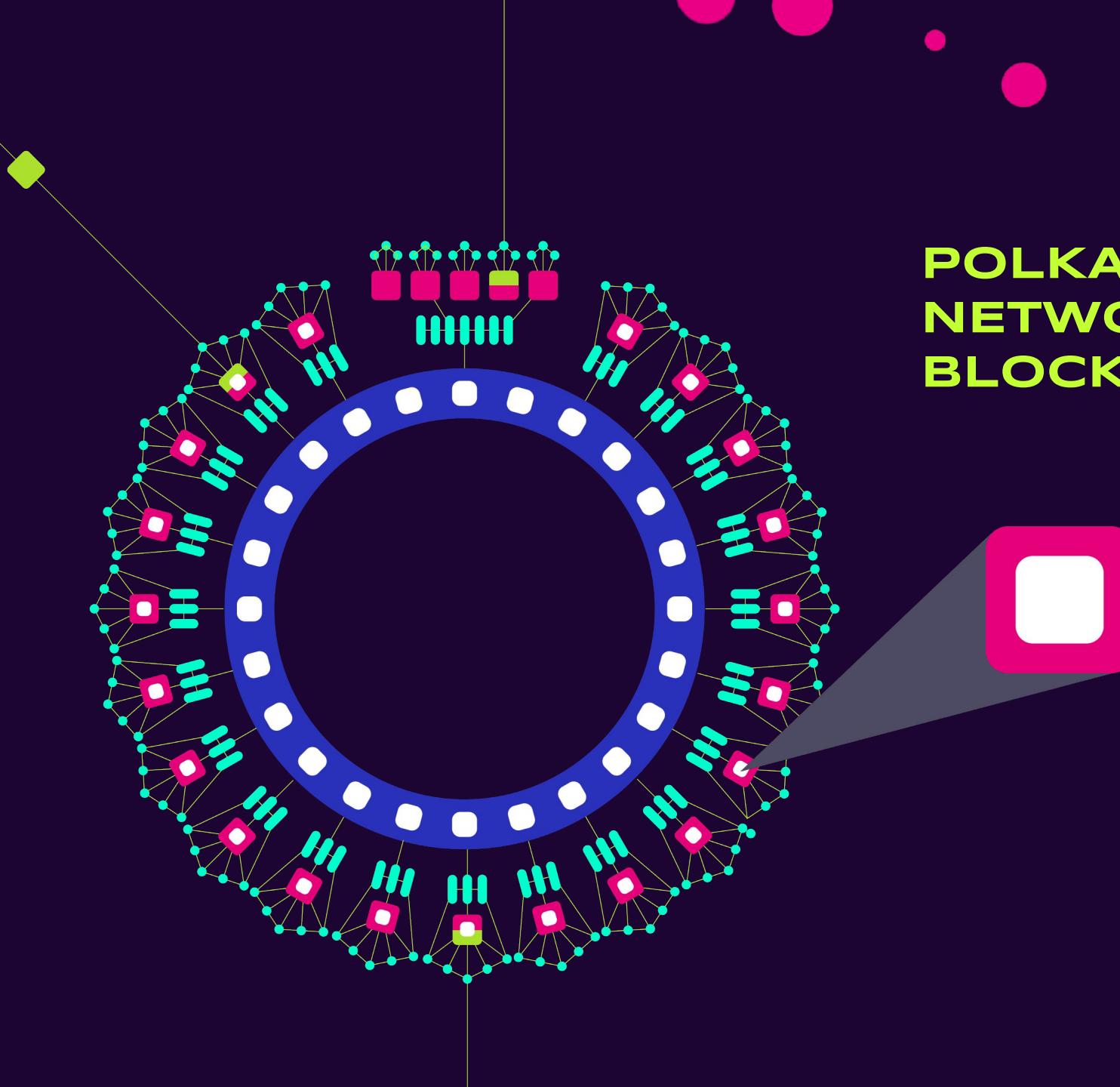


**SINGLE BLOCKCHAINS
CAN ALSO BE BUILT TO
ATTEMPT TO DO A LOT OF
THINGS JUST OK**



CUSTOM BLOCKCHAIN BUILT
ON TOP OF POLKADOT



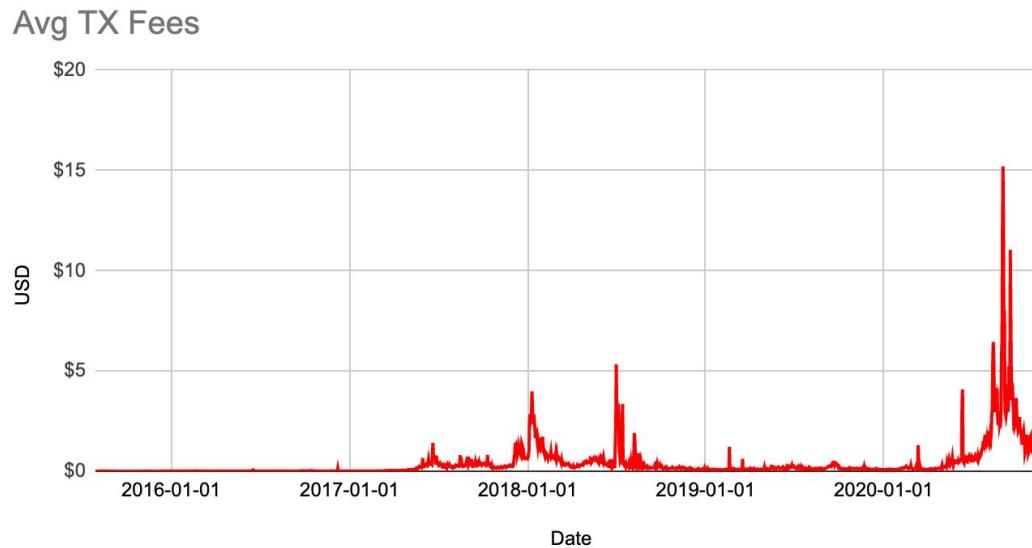


**POLKADOT CONNECTS A
NETWORK OF CUSTOM-BUILT
BLOCKCHAINS & DAPPS**



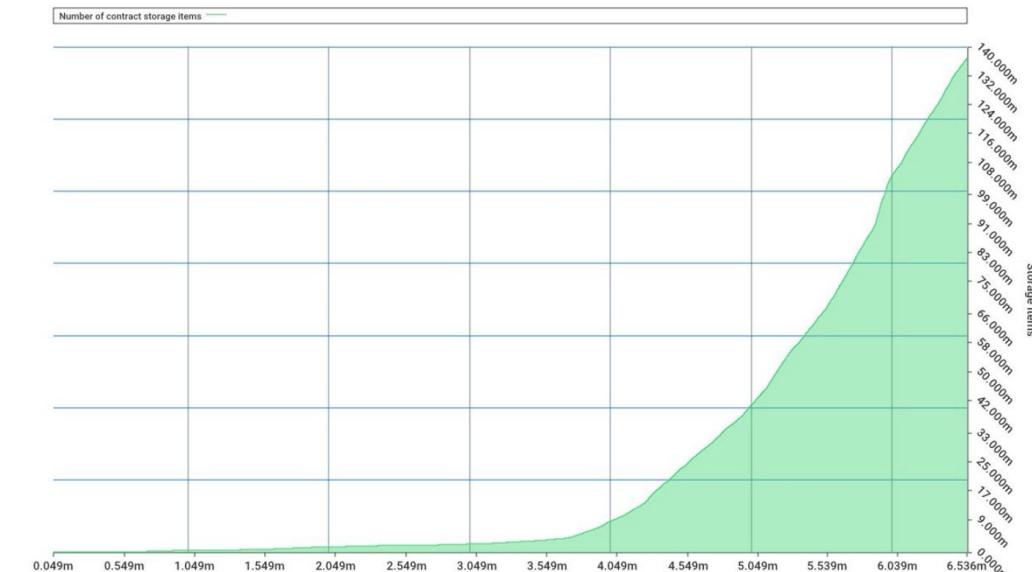
**PARACHAINS ARE
CUSTOM-BUILT ON POLKADOT
FOR SPECIFIC USES**

Congestion and high fees



Average Ethereum transaction fees

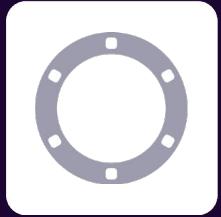
State bloat



Ethereum State Growth

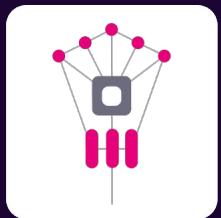
EVM != complex innovations

POLKADOT ARCHITECTURE



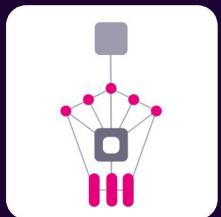
RELAY CHAIN (LAYER 0)

The connector chain of Polkadot that provides strong economic security and an interoperability protocol.



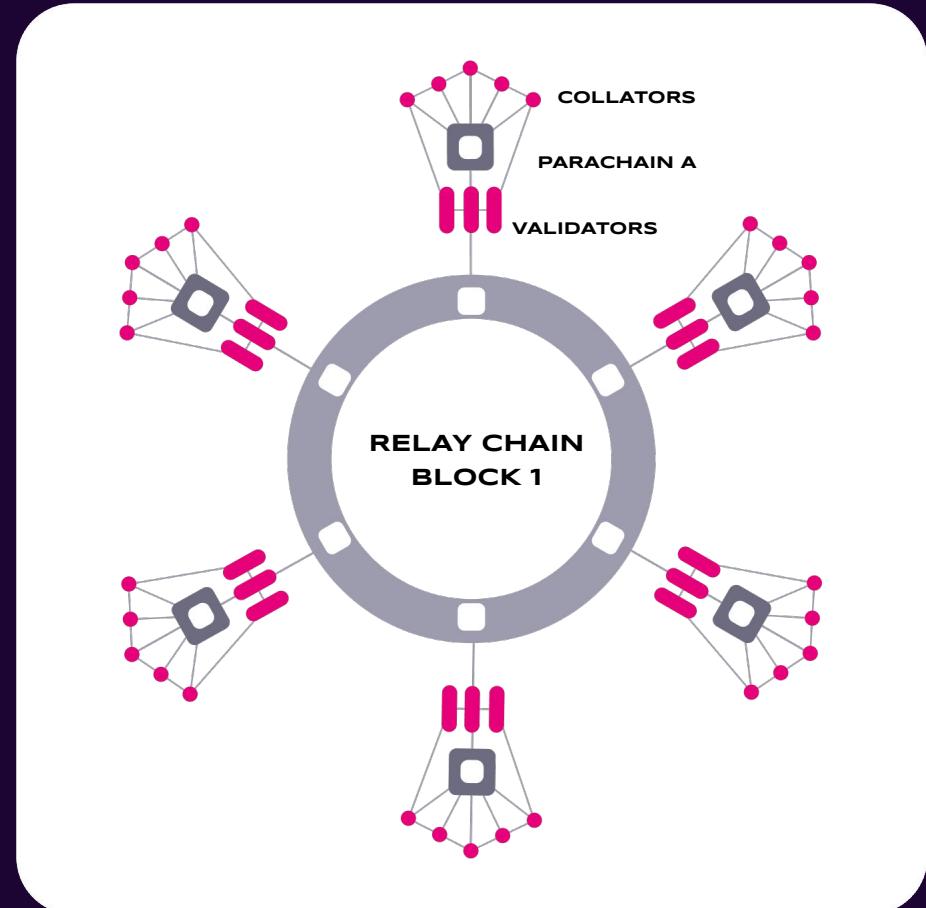
PARACHAINS (LAYER 1)

Sovereign blockchains that connect to Polkadot for interoperability, scalability, and pooled security.

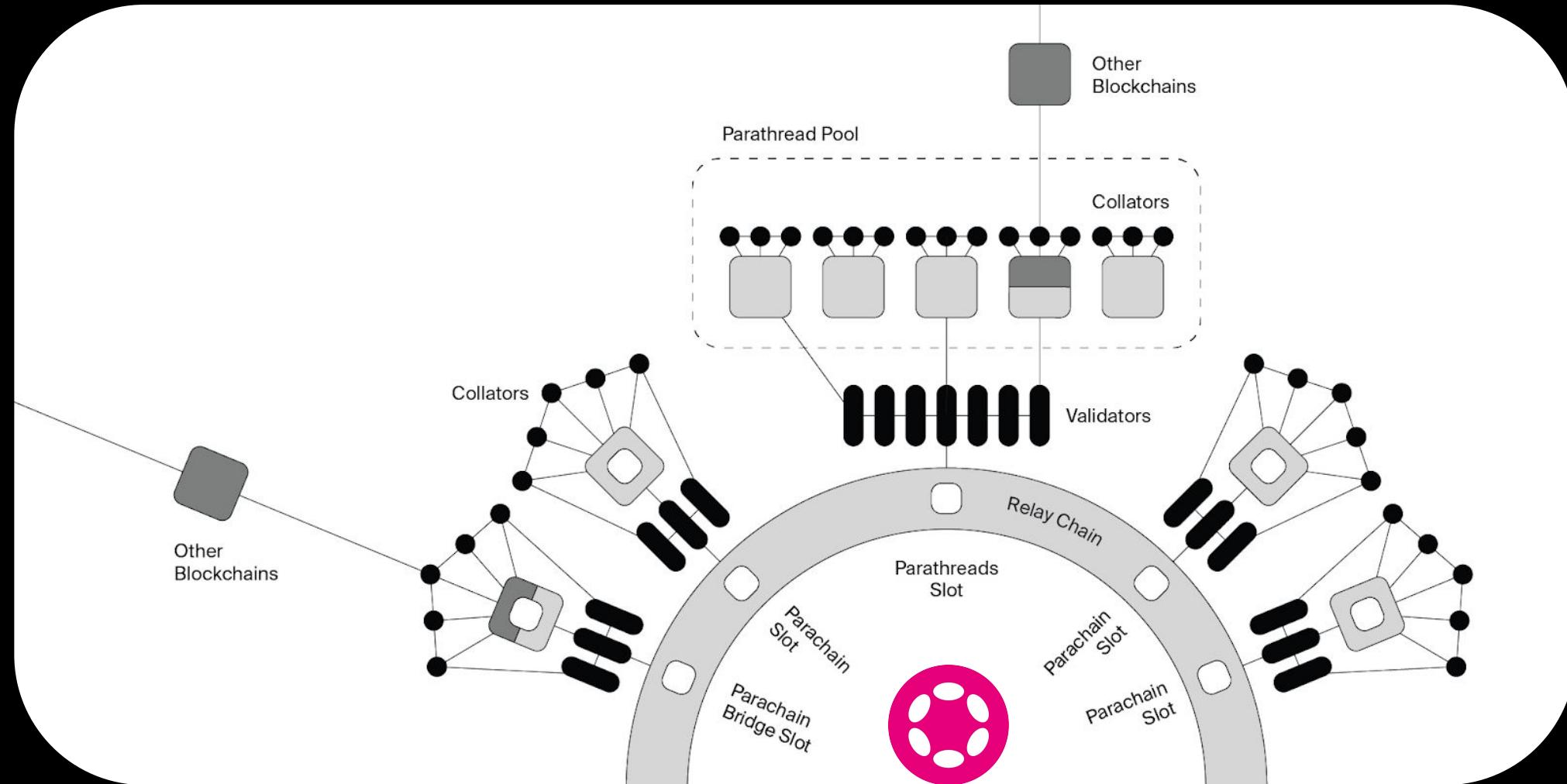


BRIDGES

Smart contracts, pallets and specialised protocols that allow Polkadot parachains to connect to and communicate with external networks like Ethereum and Bitcoin.

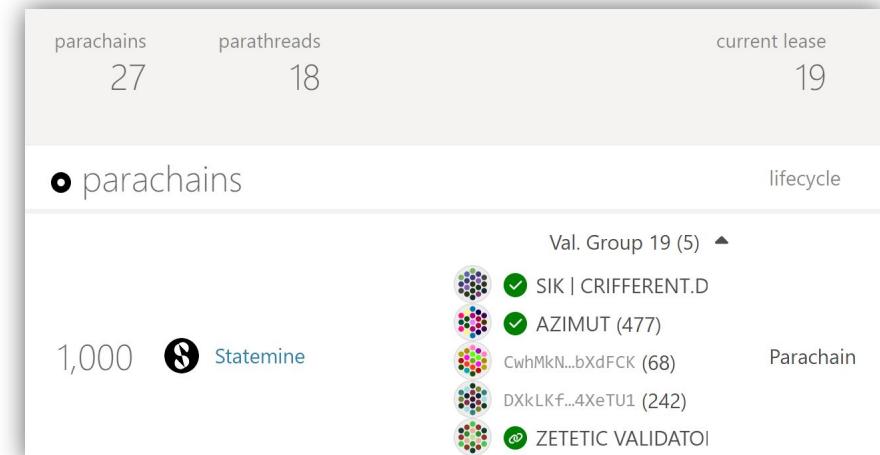
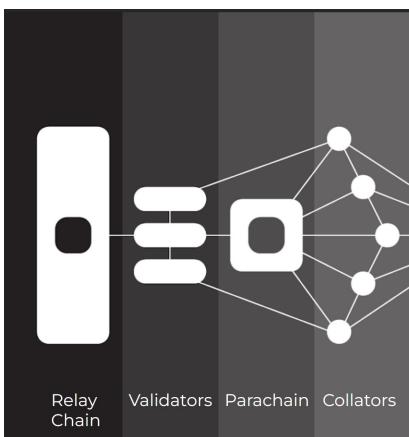


Polkadot Network Architecture



Validators and Collators

- The parachain selects a collator to submit a block to the relay chain
- Polkadot shuffles and assigns a set of validators to this parachain
- The collators and validators open connections to submit a block.



<https://polkadot.js.org/apps/#/parachains>

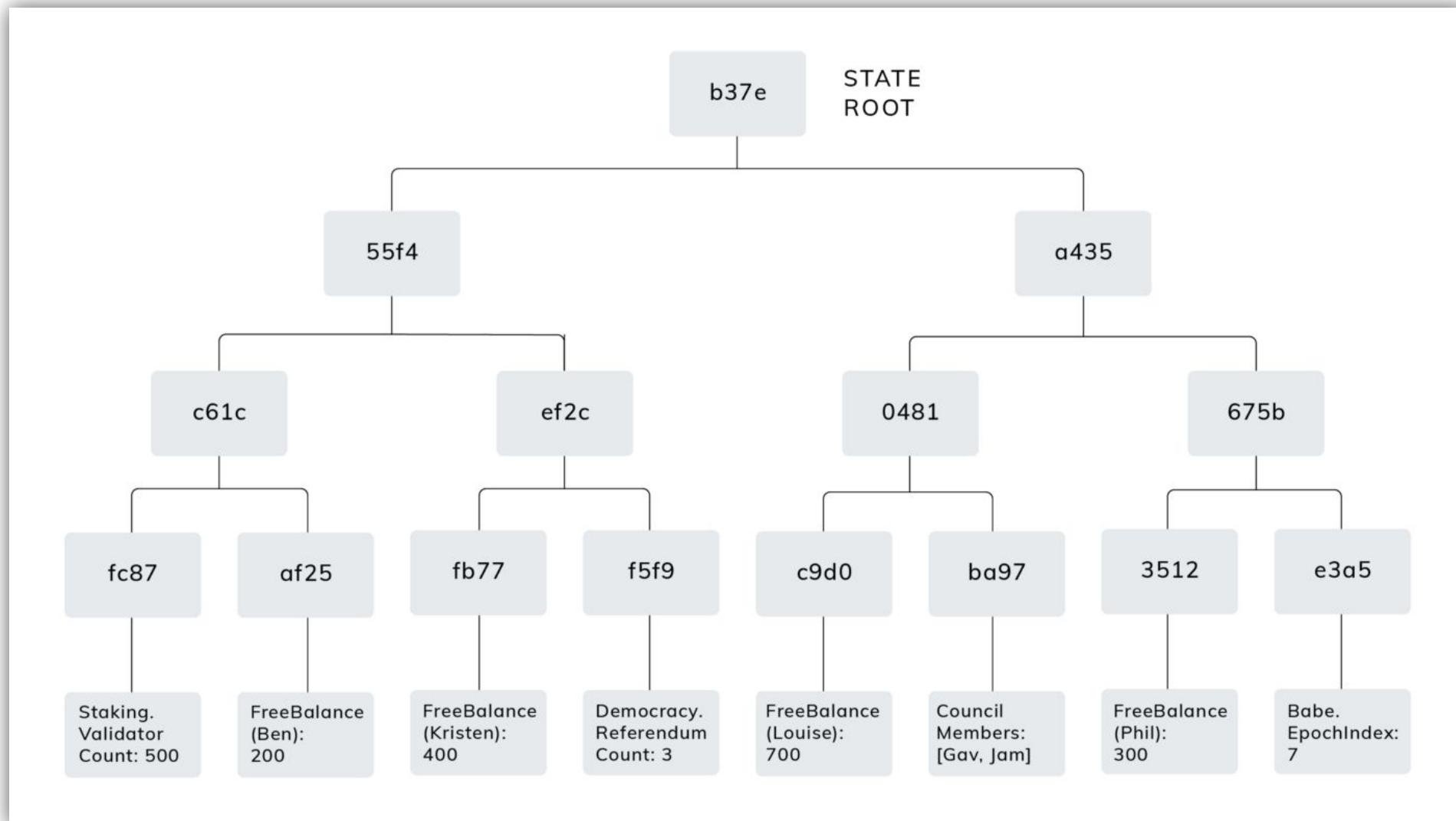


Path of a Parachain Block

A screenshot of a dark-themed web page. At the top left is the Polkadot logo and "EN" text. To the right are links for "Lightpaper", "Whitepaper", "Wiki", and social media icons for GitHub, LinkedIn, and Twitter. Below the header is a navigation bar with links for "Technology", "Community", "About", "Blog", "Build", and "Contact". The main content area features a large, semi-transparent watermark of a 3D block diagram composed of colored rectangular blocks with diagonal hatching. Overlaid on this watermark is the title "The Path of a Parachain Block" in white text. Below the title is a timestamp "February 6, 2020" and categories "Polkadot", "Parachains", "Parathreads". A small profile picture and the author's name, "Joe Petrowski", are also present. The bottom right corner of the watermark contains a small white arrow pointing upwards and to the right.

<https://polkadot.network/blog/the-path-of-a-parachain-block/>

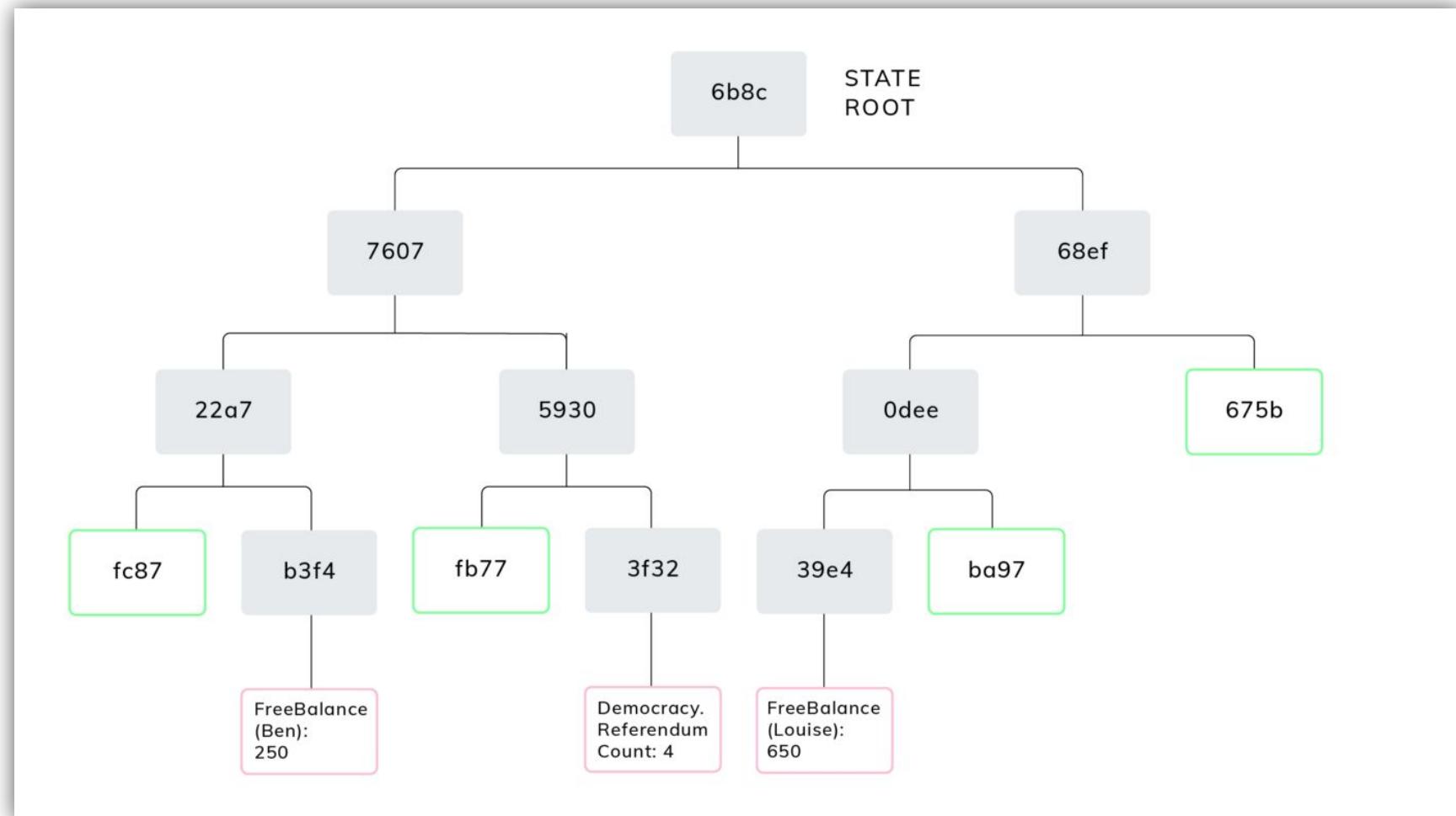
Parachain State



Parachain State Transition

```
parent_hash: 7a42
number: 2
state_root: 6b8c
extrinsics_root: 3bf9
digest: vec<consensus, ...>
```

```
democracy.on_initialize(),
balances.transfer(
    Louise,
    Ben,
    50
)
```



Proof of Validity

A validator can verify a state transition without having access to the entire state. It only needs:

- The block (list of state transitions)
- The values in the parachain's database that the block modifies
- The hashes of the unaffected points in the Merkle tree.

```
parent_hash: 7a42
number: 2
state_root: 6b8c
extrinsics_root: 3bf9
digest: vec<consensus, ...>

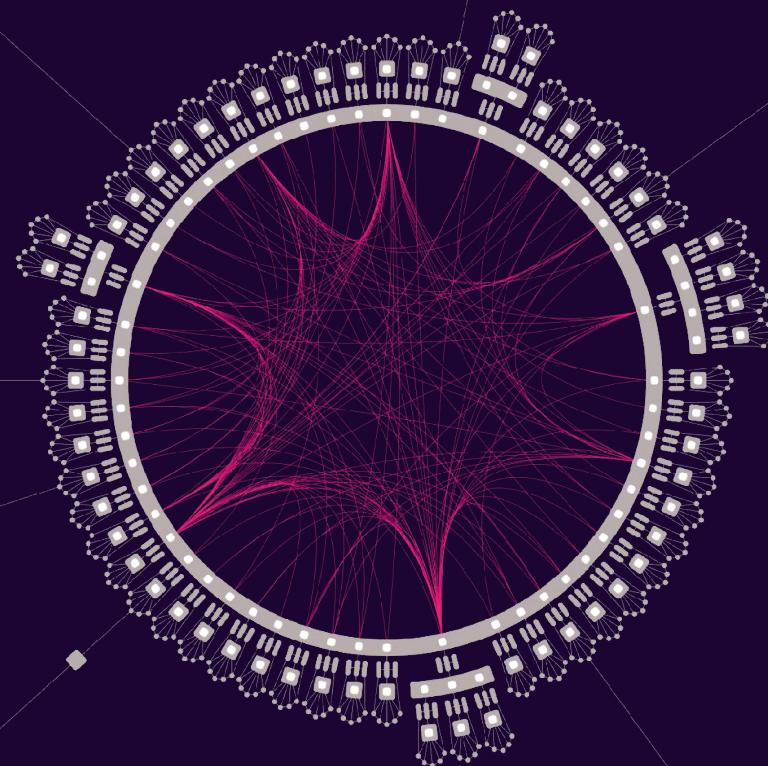
democracy.on_initialize(),
balances.transfer(
    Louise,
    Ben,
    50
)
```



The Kusama logo consists of the word "KUSAMA" in a bold, white, sans-serif font. A small, white silhouette of a bird is positioned above the letter "A".

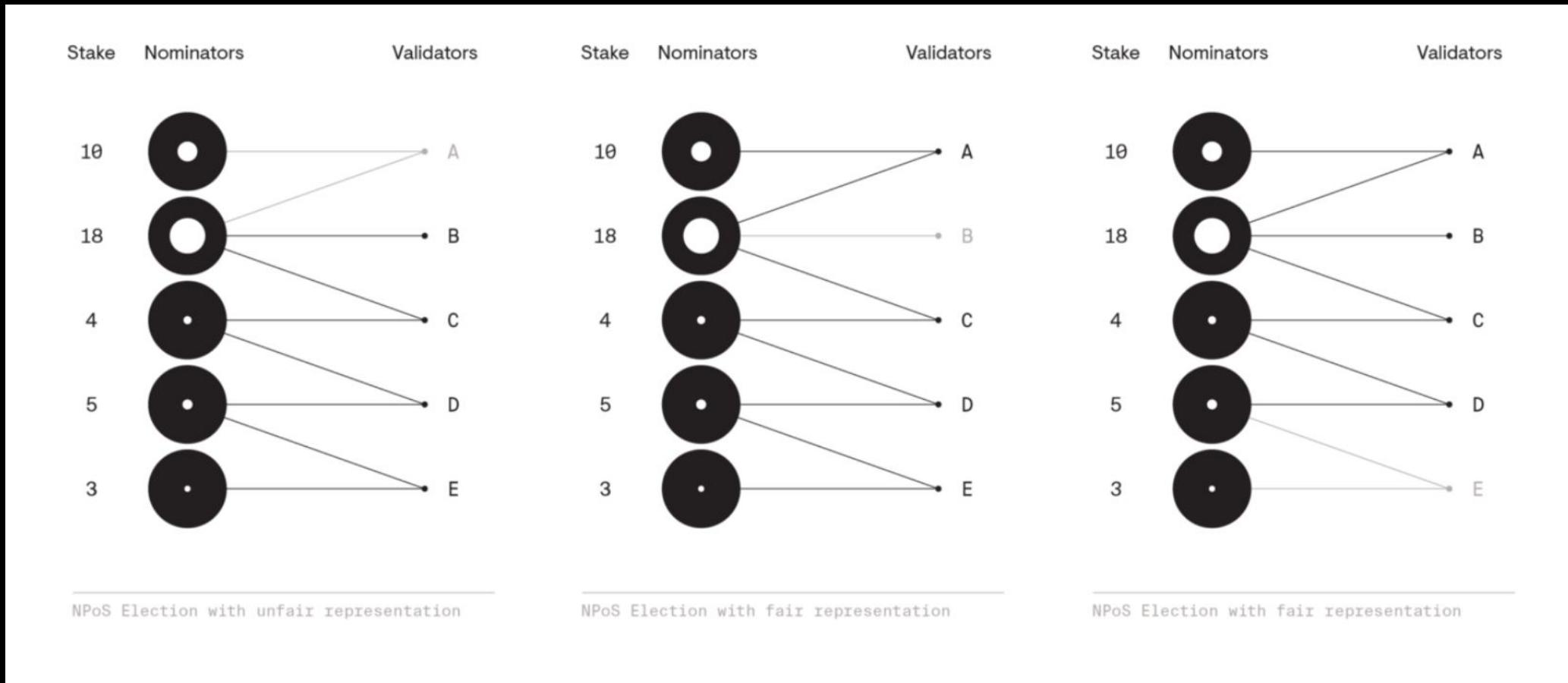
Kusama: Polkadot's Canary Network

**POLKADOT MAKES SECURITY EASY FOR NEW
BLOCKCHAIN TEAMS BY ALLOWING THEM TO
PLUG RIGHT INTO AN EXISTING SECURITY
SYSTEM...**

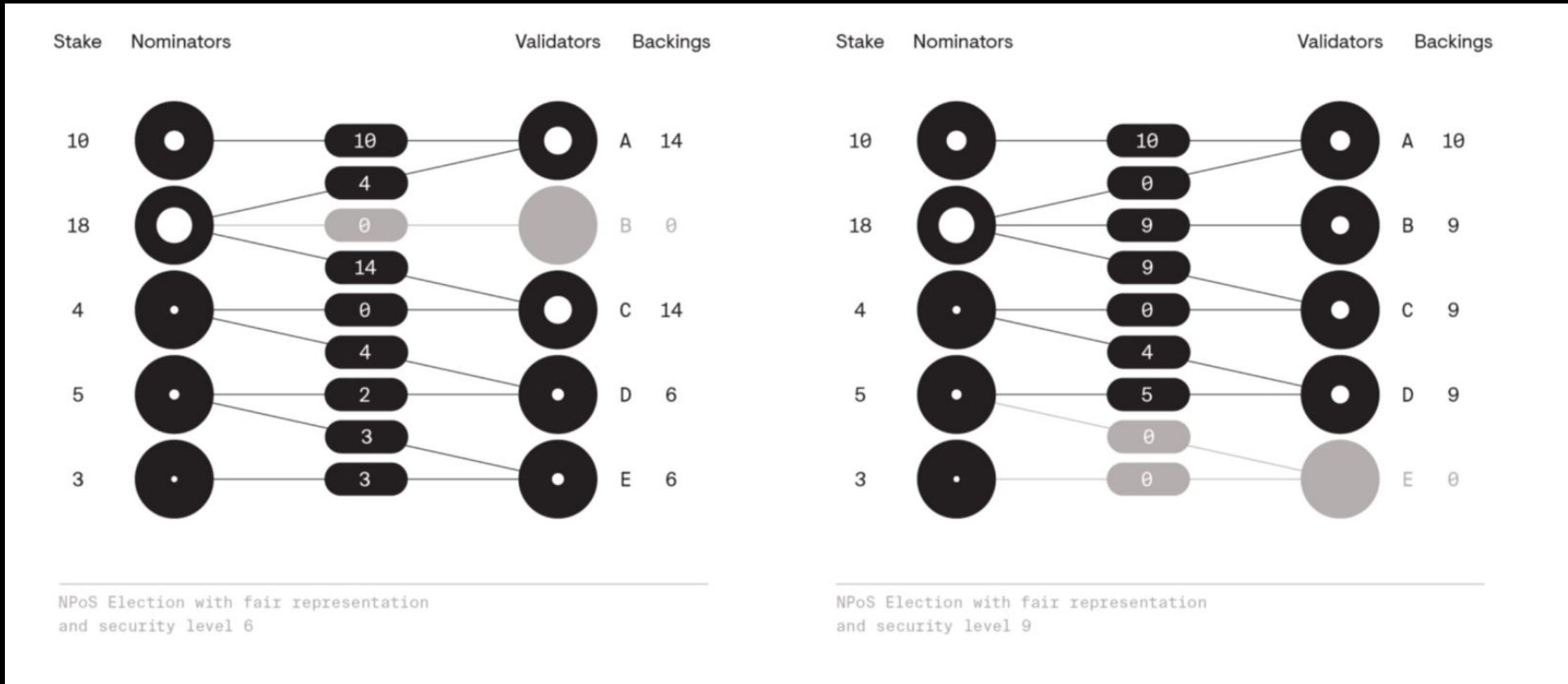


...AND FOCUS ON WHAT THEY DO BEST, CODING.

Proportionally Justified Representation in Nominated Proof of Staking



Proportionally Justified Representation in Nominated Proof of Staking



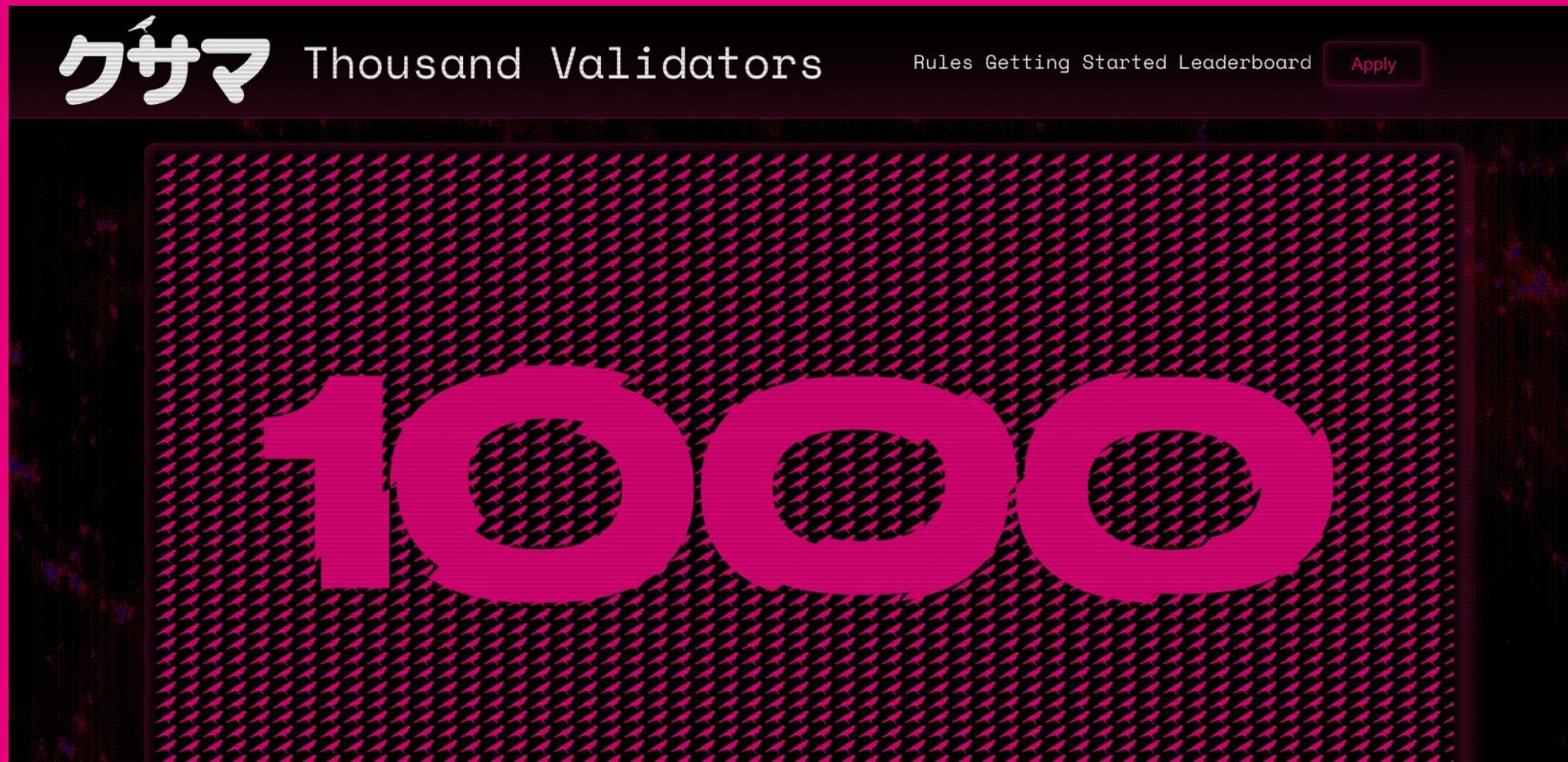
Staking Education

Why stake on Polkadot?

Polkadot's staking system is built for maximum security, decentralization, and fair representation. Get DOT for helping support the most energy-efficient blockchain technology and protect your tokens against dilution. Get started with just 1 DOT and help build the future of Web3.



Thousand Validators Program

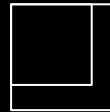




SUBSTRATE - POLKADOT SDK

**SUBSTRATE IS A MODULAR, FLEXIBLE, EXTENSIBLE
FRAMEWORK FOR BUILDING BLOCKCHAINS.**

**RE-USE BATTLE-TESTED LIBRARIES
WHILE BUILDING THE CUSTOM
COMPONENTS THAT MATTER MOST.**



FRAME

The Framework for Runtime Aggregation of Modularized Entities (FRAME) is a set of modules and support libraries that simplify runtime development.

When building with FRAME, the Substrate runtime is composed of several smaller components called pallets.

<https://github.com/paritytech/substrate/tree/master/frame>

Substrate FRAME Pallets

Aura

BABE

GRANDPA

Elections

Utility

Atomic Swap

Sudo

Multisig

Identity

Assets

Collective

Balances

Staking

Democracy

EVM

And more...

Runtime

Aura

BABE

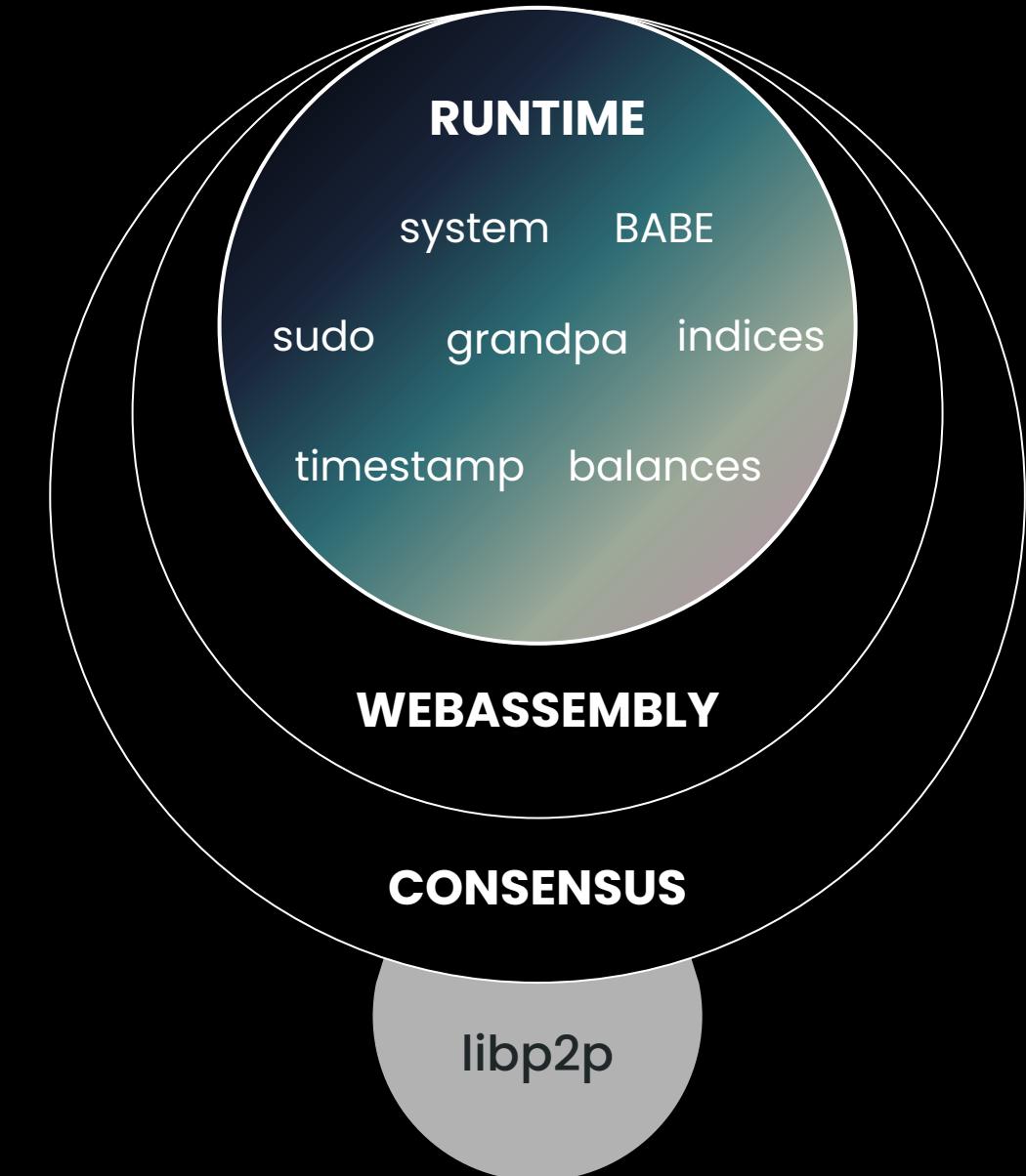
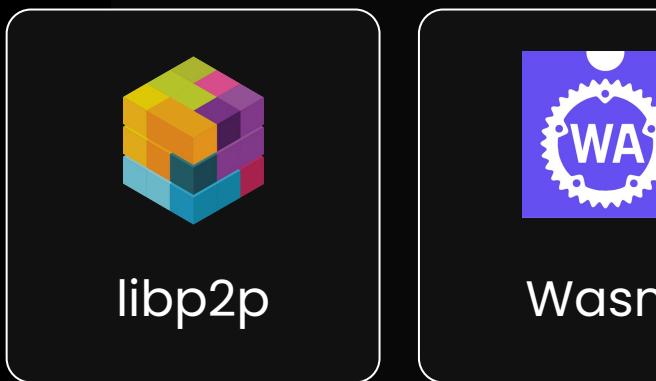
Sudo

Balances

Staking

Anatomy of a Substrate Node

Three core technologies



Substrate Node Template

A working Substrate node.

Basic chain with administrative governance (Sudo)

Easily add and remove pallets built with FRAME

Create your own modules to customize your chain functionality

Substrate Node Template

 Playground  Node Template  chat 5778 users

A fresh FRAME-based [Substrate](#) node, ready for hacking 

Getting Started

Follow the steps below to get started with the Node Template, or get it up and running right from your browser in just a few clicks using [Playground](#) 

Using Nix

Install [nix](#) and optionally [direnv](#) and [lorri](#) for a fully plug and play experience for setting up the development environment. To get all the correct dependencies activate `direnv direnv allow` and `lorri lorri shell`.

Rust Setup

First, complete the [basic Rust setup instructions](#).

Run

Use Rust's native `cargo` command to build and launch the template node:

```
cargo run --release -- --dev --tmp
```

[substrate-developer-hub/substrate-node-template](https://substrate-developer-hub.github.io/substrate-node-template/)

PLAYGROUND



Select a template

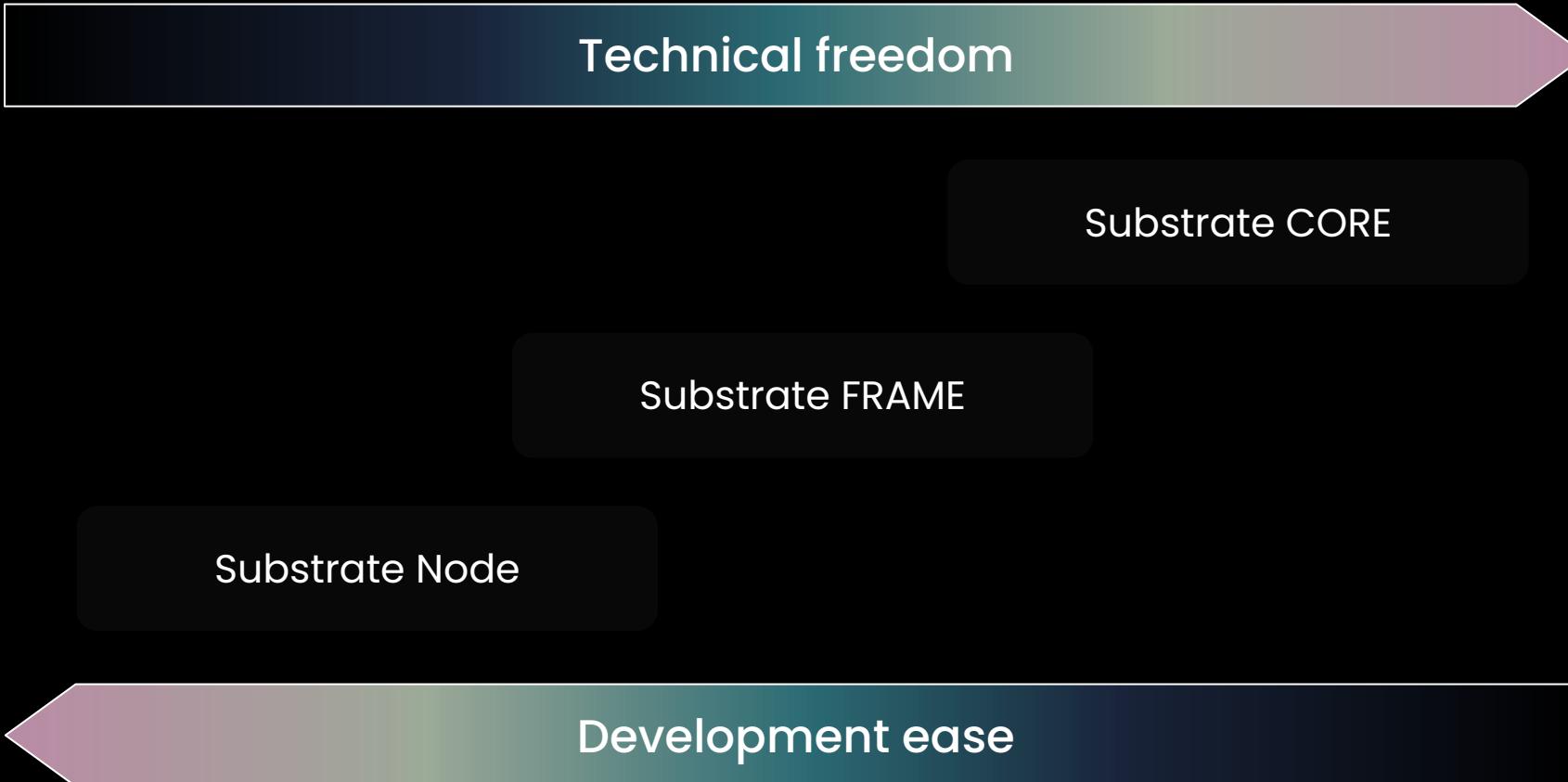
Front End template	A "skeleton blockchain" with essential capabilities, including P2P networking, consensus, finality, account, transaction and sudo governance modules. Runtime modules: <ul style="list-style-type: none">• pallet_balances• pallet_transaction_payment• pallet_sudo• pallet_template #PARITYTECH/SUBSTRATE PLAYGROUND-TEMPLATE-NODE TEMPLATE-THEIA:SHA-CBC9F0CA
Node template	
Cumulus Parachain template	
Recipes	

CREATE

Privacy Policy #9ae77769

<https://playground.substrate.dev/>

What this means for developers...



Technical freedom

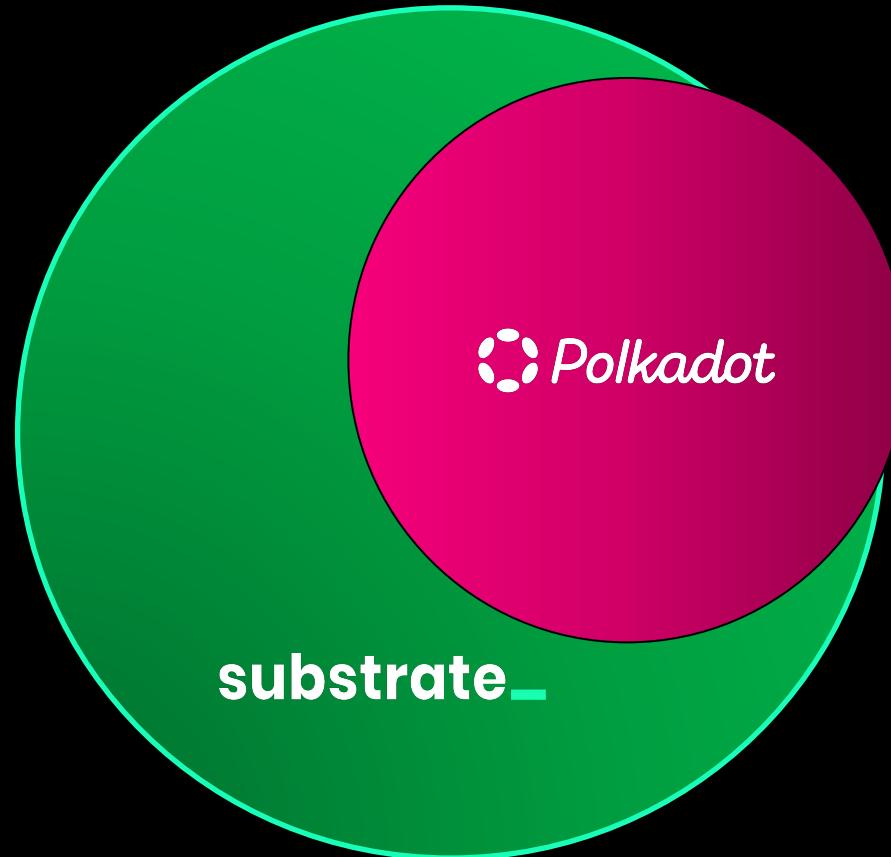
Substrate CORE

Substrate FRAME

Substrate Node

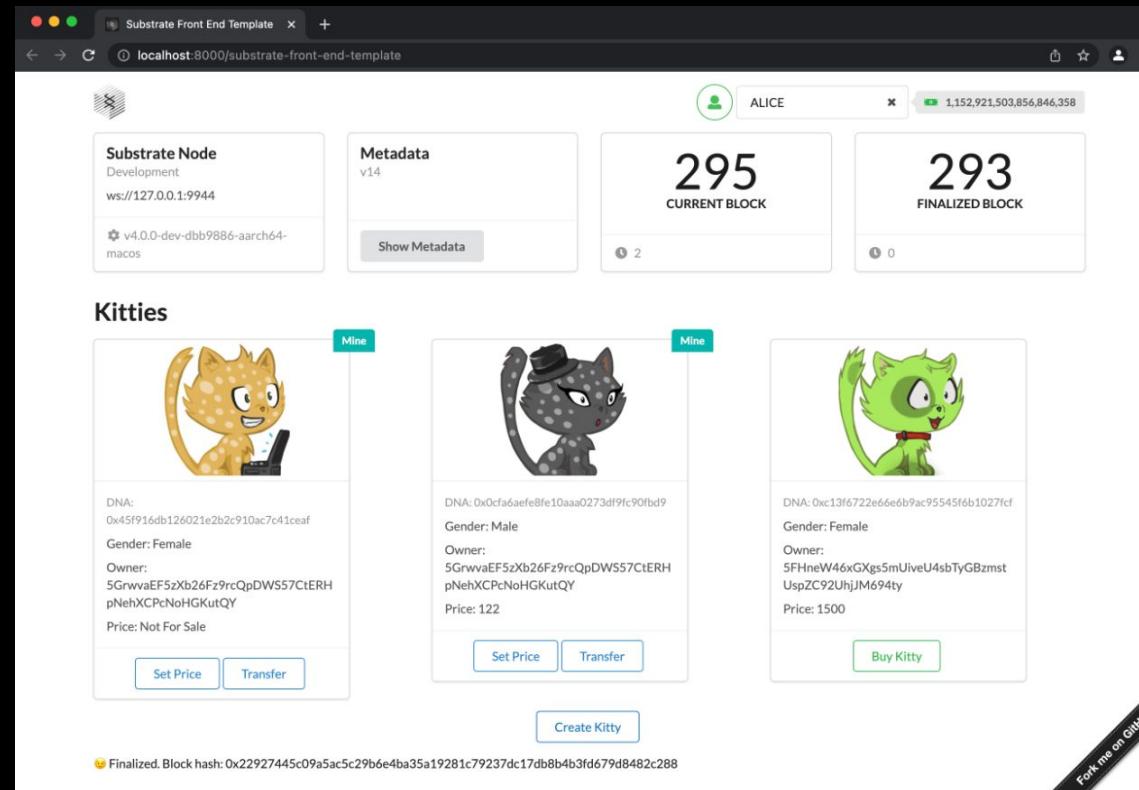
Development ease

Polkadot and Substrate



Write a Custom Pallet

<https://sacha-l.github.io/substrate-collectables-workshop/#/>



Built with Substrate

DEFI

-  Acala
-  Mangata
-  Compound Chain
-  Akropolis
-  Centrifuge
-  HydraDX
-  Rand
-  Composable Finance
-  Zeitgeist
-  Parallel Finance
-  Sora
-  Polkadex
-  Equilibrium
-  BCW
-  Zenlink
-  Konomi
-  Kylin
-  Bifrost
-  Polymath
-  Aleph Zero
-  Virto Network
-  Chainflip Labs

NFT / GAMING

-  Efinity
-  Sensorium
-  GameDAO
-  EverdreamSoft
-  Bit.Country
-  Darwinia
-  Esports One
-  Ternoa
-  Unique Network
-  Yuser
-  Readl
-  Ajuna

SMART CONTRACT

-  Edgeware
-  Astar
-  Patract
-  Moonbeam
-  Parastate
-  t3rn
-  Oak Network
-  Clover
-  Pontem Network

IDENTITY

-  KILT
-  Caelum Labs
-  Shyft Network
-  Ontology
-  Dock
-  Fractal
-  Litentry
-  Math Wallet
-  Spherity

PRIVACY

-  Manta
-  Automata
-  TEA
-  Phala
-  zClock
-  Integritee
-  ZeroPool

BRIDGE

-  Snowfork
-  Chainbridge
-  Interlay
-  ChainX

IOT

-  Nodle
-  Robonomics
-  Uplink
-  DataHighway

ENTERPRISE

-  Energy Web Chain
-  Xand
-  dipole

SOCIAL NETWORK

-  SubSocial
-  Asure
-  Acuity

ORACLE

-  API3
-  Band Protocol
-  Chainlink

DISTRIBUTED FILE STORAGE

-  DatDot
-  Crust
-  Subspace

SUPPLY CHAIN

-  Origin Trail
-  MediLedger

...and many more



ALL SYSTEMS GO

THE WAIT IS OVER. PARACHAINS LAUNCHED IN 2021



Pinned Tweet



Polkadot



@Polkadot · Oct 13

...

5 years after the vision of a heterogeneous multichain framework was first outlined in the Polkadot Whitepaper, parachains are now ready to launch on Polkadot. Motion 118, to schedule the first auctions, has passed council & now gone to public referendum.

[TWITTER.COM/POLKADOT/STATUS/1448348274537156611](https://twitter.com/polkadot/status/1448348274537156611)



**BLOCKCHAINS ON POLKADOT ARE
CUSTOM-BUILT AND OPTIMIZED FOR
SPECIFIC USES**

THE CASE FOR APPLICATION SPECIFIC BLOCKCHAINS



PERFORMANCE



SECURITY



SOVEREIGNTY

THE CASE FOR APPLICATION SPECIFIC BLOCKCHAINS



OVERHEAD

It takes years and \$\$\$ to build a blockchain from scratch.



ISOLATION

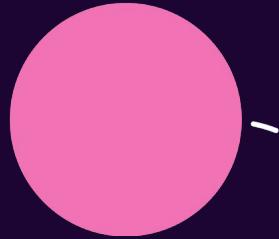
Blockchains couldn't talk to each other without going through centralised services.



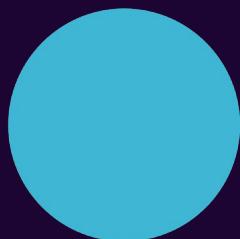
SECURITY

Blockchains would naturally compete with each other over security resources; leaving each one of them less secure.

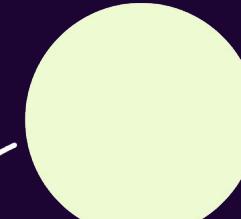
THE PATH TO POLKADOT



WHITEPAPER WRITTEN IN
2016 BY GAVIN WOOD
(AUTHOR OF
ETHEREUM'S YELLOW
PAPER)

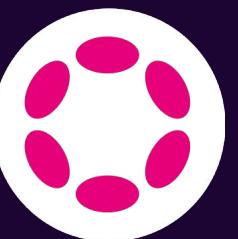


NEED FOR THE NEXT GENERATION
PLATFORM FOR PROGRAMMABLE
DECENTRALIZED ASSETS



NEED TO DESIGN A NEW
BLOCKCHAIN SYSTEM FROM
SCRATCH

FIRST LINES OF CODE
WRITTEN IN 2017, NETWORK
LAUNCHED IN MARCH 2020



POLKADOT

WHAT ARE PEOPLE BUILDING ON POLKADOT?

450+ PROJECTS

-  Infrastructure & Tooling
-  IoT & Robotics
-  Finance
-  Social Networking
-  Oracles
-  Privacy
-  Scaling
-  NFT
-  Wallets
-  Smart Contracts
-  User Interface
-  Social Impact & Humanitarian
-  Supply Chain & Logistics
-  Communications and Media
-  Identity
-  Bridges
-  DeFi
-  AI & Computing
-  Gaming and metaverse
-  Retail & E-commerce
-  Energy
-  Healthcare
-  Government & Public Sector
-  Enterprise & Consortium
-  Distributed File Storage
-  Data & Analytics

GOVERNANCE -> EXECUTION

- Polkadot nodes run software which in turn runs a “blob” of Wasm bytecode. This bytecode is stored on-chain and is modifiable via the system itself.
- This means that many parameters, up to and including the actual code of the core relay chain state transition function, can be updated.
- Governance determines how we allow that to happen.



Code is Law

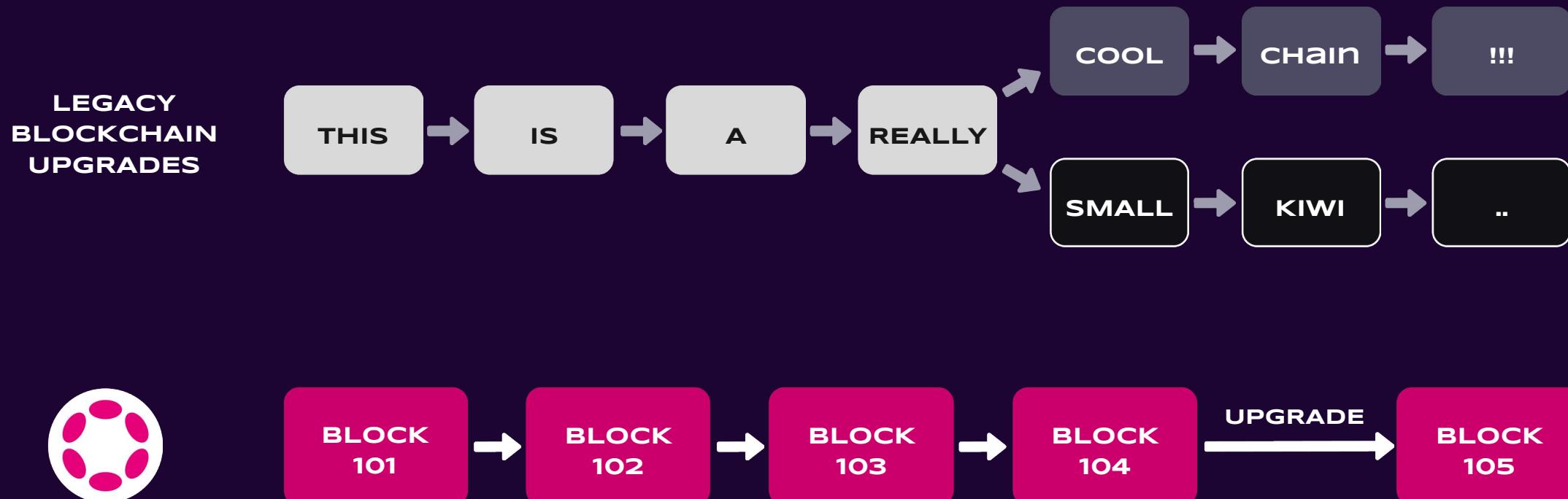
FUTURE-PROOF

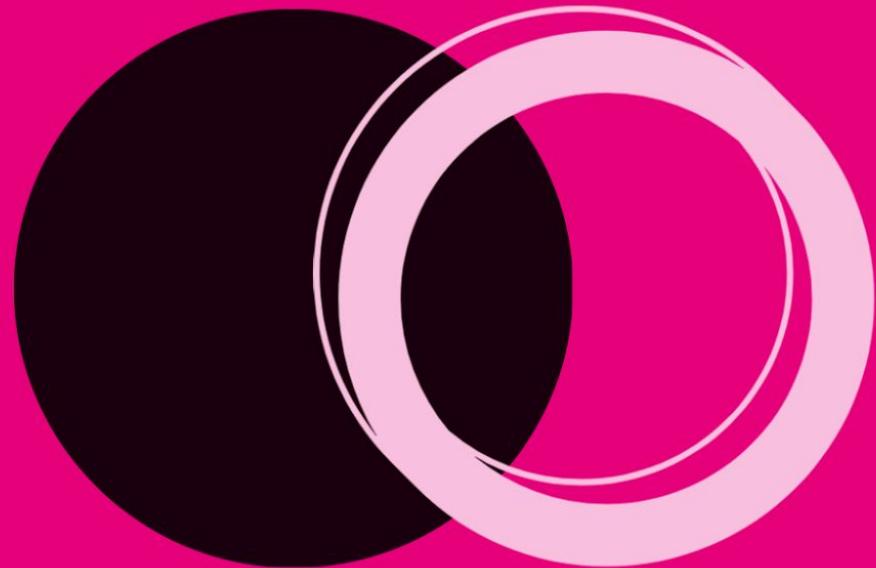
**POLKADOT CAN CONTINUOUSLY UPGRADE AND
REMAIN FUTURE-PROOF LIKE A TESLA CAR THAT
CAN BE UPGRADED OVER THE AIR**



FUTURE-PROOF

POLKADOT CAN EASILY UPGRADE ITS ENTIRE NETWORK WITHOUT SPLITTING THE COMMUNITY AND SPLITTING THE CHAIN

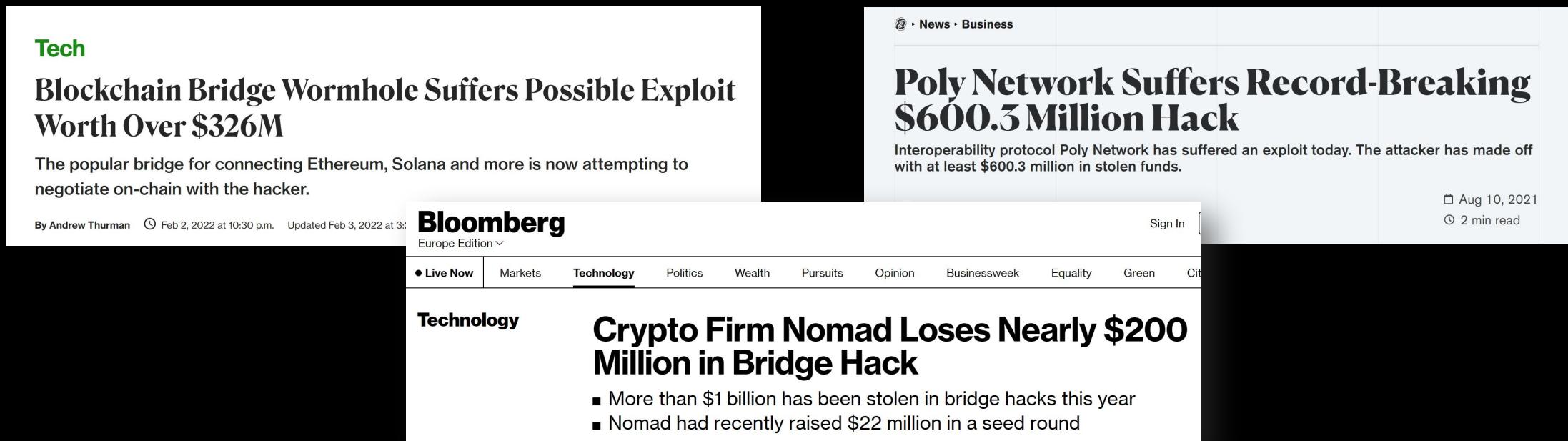




Blockchain Interoperability

Bridge Security

The more value on them, the more susceptible they are for attacks



Tech

Blockchain Bridge Wormhole Suffers Possible Exploit Worth Over \$326M

The popular bridge for connecting Ethereum, Solana and more is now attempting to negotiate on-chain with the hacker.

By Andrew Thurman | Feb 2, 2022 at 10:30 p.m. | Updated Feb 3, 2022 at 3:

Bloomberg
Europe Edition ▾

• Live Now Markets **Technology** Politics Wealth Pursuits Opinion Businessweek Equality Green Cities

Technology

Crypto Firm Nomad Loses Nearly \$200 Million in Bridge Hack

- More than \$1 billion has been stolen in bridge hacks this year
- Nomad had recently raised \$22 million in a seed round

@ • News • Business

Poly Network Suffers Record-Breaking \$600.3 Million Hack

Interoperability protocol Poly Network has suffered an exploit today. The attacker has made off with at least \$600.3 million in stolen funds.

Aug 10, 2021 | 2 min read

XCM Overview

XCM: Cross-Consensus Message Format

XCM aims to be a generic and extensible language for communicating ideas between different consensus systems, across various transport protocols.



Programmability



Functional Multichain Decomposition

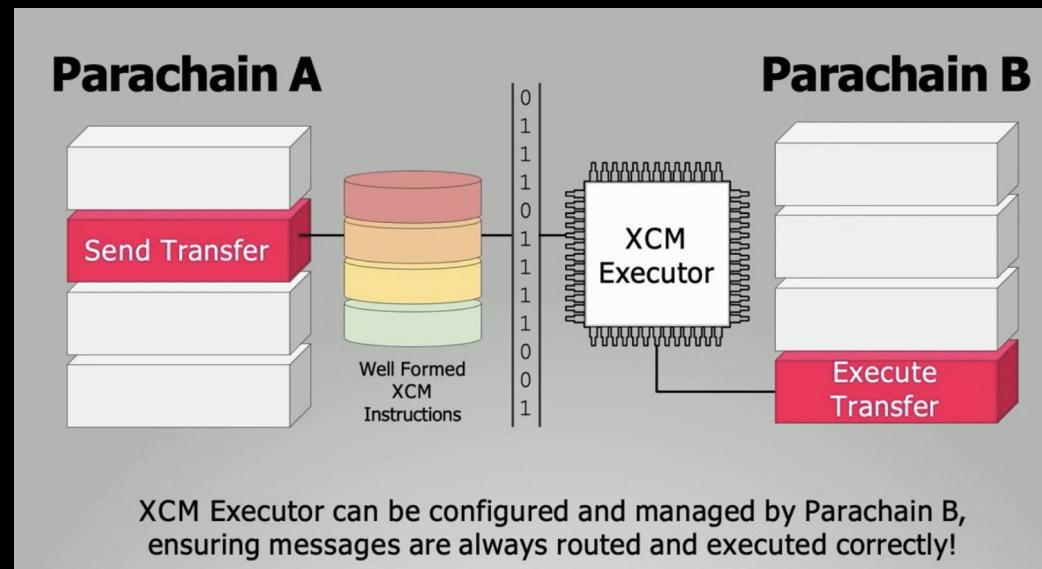
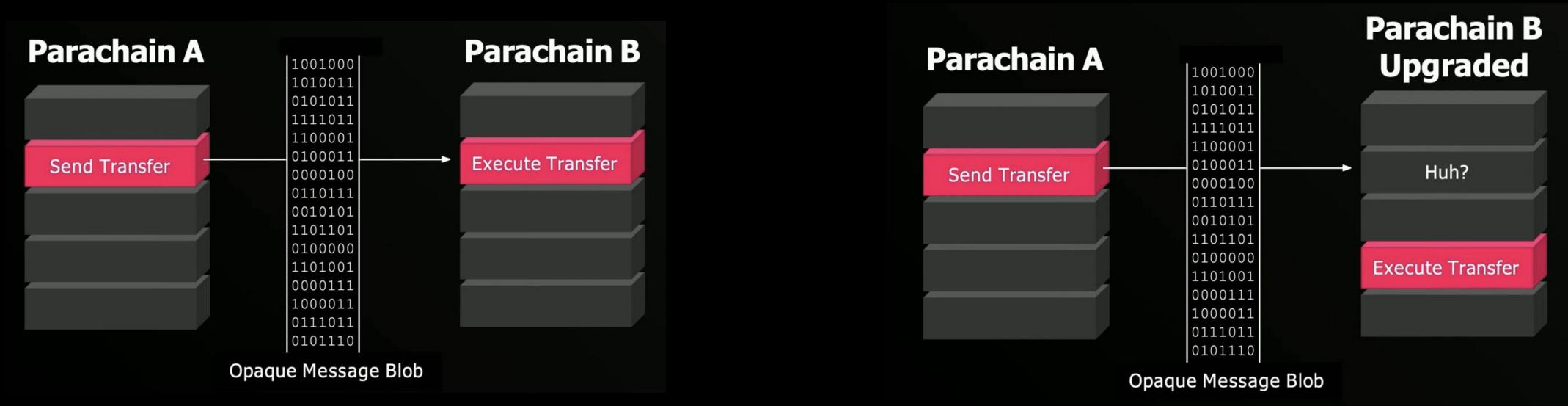


Bridging

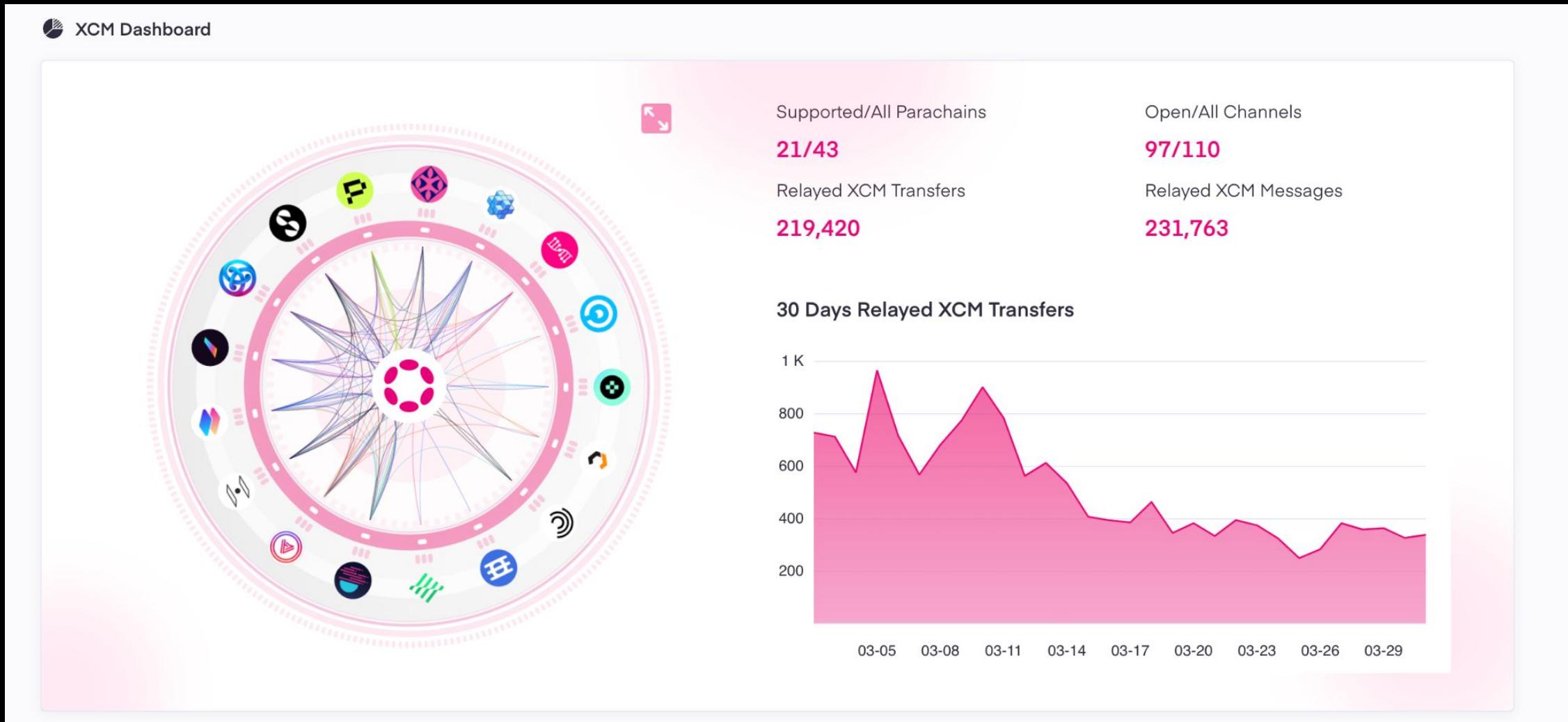
XCM is a versioned messaging format. Version 2 of the protocol is currently in use in Polkadot/Kusama

XCM v3 which is under development and is scheduled to be the next major release.

XCM powers Multichain Future

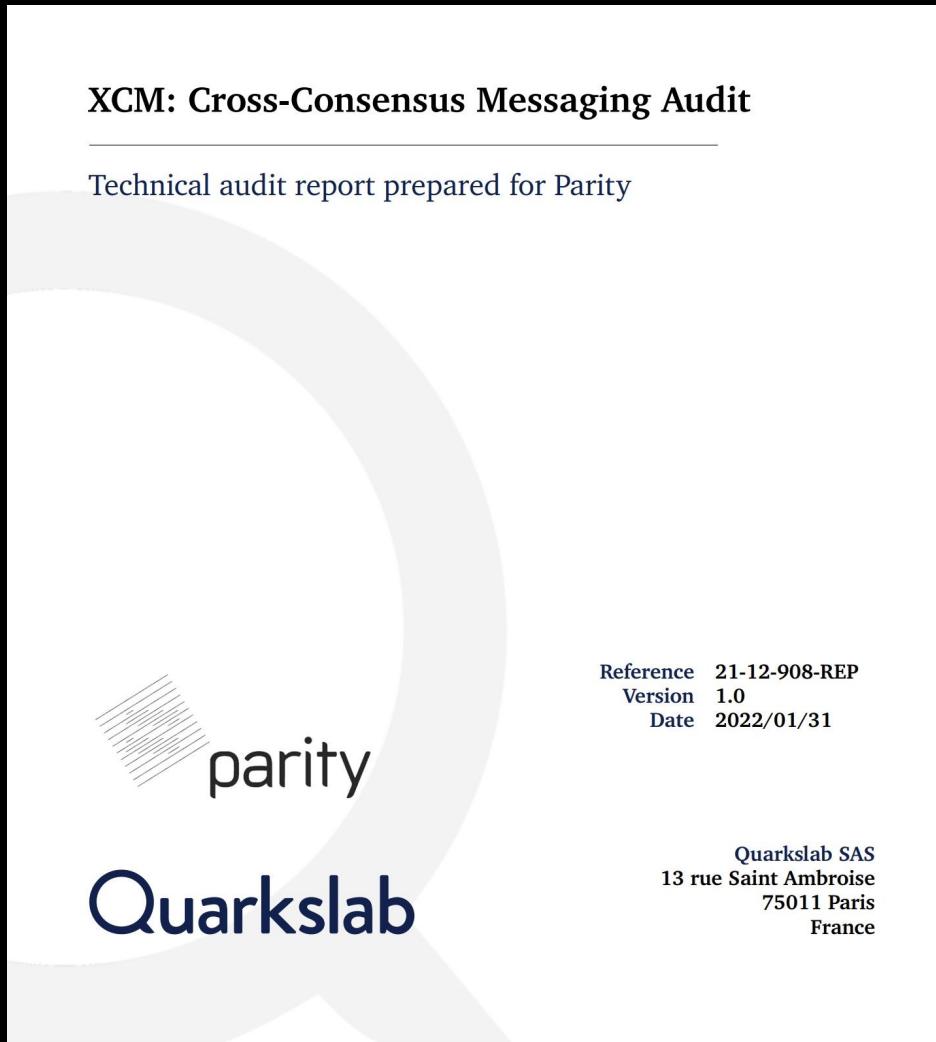


XCM is live!



https://polkadot.subscan.io/xcm_dashboard

XCM code Audit



Cross-chain-related security issues, like incorrect lock/unlock or burn/mint on both chains, or any fairness issues between chains.

This also includes logical bugs, denial-of-service and any misconfiguration (of default settings) that can have a security impact.

The audit did not reveal any meaningful security-related issues.

Polkadot: a protocol to pave the way towards Web3 by supercharging blockchain innovation

	What was needed	What we built
Benefits of custom blockchains	 Performance High throughput	→ Heterogeneous sharding
Catering to challenges of custom blockchains	 Sovereignty Network with true agency	→ Explicit on-chain governance
	 Security Secure & efficient consensus	→ Nominated Proof-of-Stake
	 Overhead Low cost of building	→ Substrate - modular blockchain SDK
	 Isolation Highly composable	→ Cross-chain messaging
	 Customizable Customizable	→ Runtime development
	 Upgrades Guaranteed network evolution	→ On-chain treasury ensures funding



THE TEAMS BEHIND THE PROTOCOL



POLKADOT PROTOCOL DEVELOPMENT



web3
foundation



WEB3 FOUNDATION | [HTTPS://WEB3.FOUNDATION](https://web3.foundation) | @WEB3FOUNDATION

PARITY TECHNOLOGIES | [HTTPS://PARITY.IO](https://parity.io) | @PARITYTECH

News



Jun 20, 2023 at 17:12 UTC

Energy Web and Polkadot Link Up to Build Pioneering Renewable Energy Solutions



Jun 17, 2023 at 22:28 UTC

Kintsugi has won Kusama Auction #88



Jun 15, 2023 at 15:54 UTC

Explore Polkadot OpenGov [video](#)



Jun 12, 2023 at 08:33 UTC

Altair has won Kusama Auction #87



Jun 8, 2023 at 10:35 UTC

Parathread 3342 has won Polkadot Auction #44

[more news »](#)

Total Projects 190



43



39



2



No Live

Parachains

Crowdloans

Auction

133m+ DOT | \$625m+ | 10% of Total Supply
Locked in Parachains and Crowdloans



39



0



• 89th

Parachains

Crowdloans

Auction

108k+ KSM | \$2.59m+ | 1% of Total Supply
Locked in Parachains and Crowdloans

Events



Jun 21, 2023 at 16:00 UTC

Centrifuge Governance Call #18



Jun 22, 2023 at 14:00 UTC

Moonbeam Universe: Navigating the Web3 Era of Gaming



Jun 27, 2023 at 22:00 UTC

IVS Crypto 2023



Jun 28, 2023 at 07:00 UTC — Jun 29, 2023 at 23:59 UTC

Polkadot Decoded 2023



Jun 28, 2023 at 07:01 UTC — Jun 29, 2023 at 13:00 UTC

Polkadot Decoded Viewing Party 2023 (Singapore)

[more events »](#)<https://parachains.info/#projects>

TECHNICAL AND FINANCIAL ASSISTANCE

- **ON-CHAIN TREASURY**
 - TIPS
 - TREASURY PROPOSALS
 - BOUNTIES
- **WEB3 FOUNDATION GRANTS PROGRAM**
- **SUBSTRATE BUILDERS' PROGRAM**
- **SEVERAL COURSES (AND MORE ON THEIR WAY)**

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*Thank,
you!*