The Swiss Blockchain Winter School 2019

Approaching blockchain scalability and governance with Polkadot and Parity Substrate

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One size doesn’t fit all

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The two sides of blockchain

State transition function

- ‘Runtime’ / Business logic
- What are the changes that are agreed upon?
- Transactions, balances, contracts etc. all abstracted

Consensus

- Safety and liveness
- How do we agree on what changes to include
- Game-theoretically sound incentivization scheme

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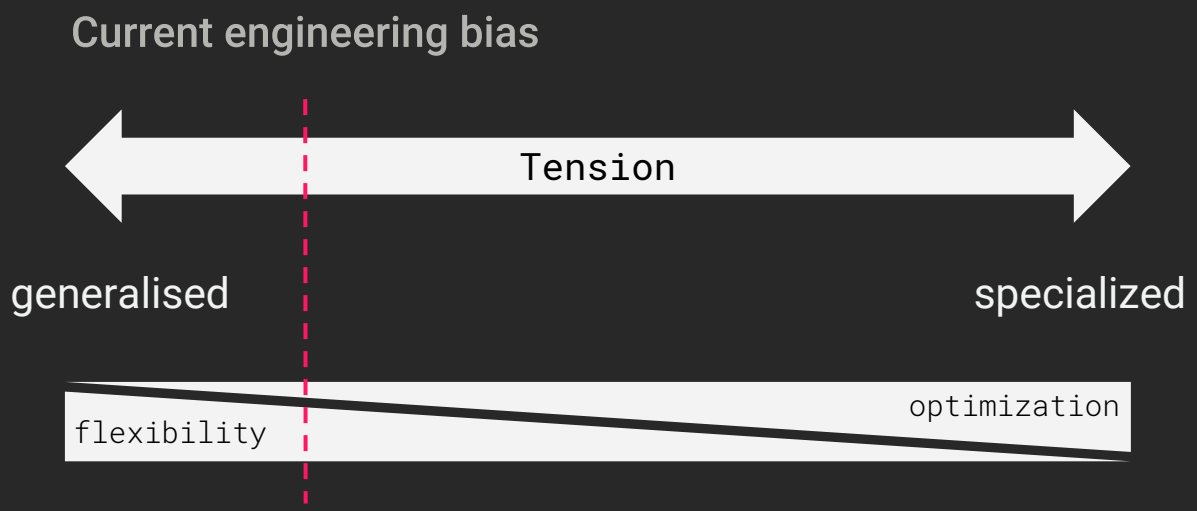
Specialization vs generalization



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Application-specific blockchains

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- **Performance** Single-app optimised state machine
- **Security** Attack surface of VM is smaller
- **Sovereignty** Not dependent on platform governance
- **Flexibility** Not bound to platform limitations

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- **Network effects** Loss of access to data on other chains
- **Engineering effort** Building a blockchain from scratch

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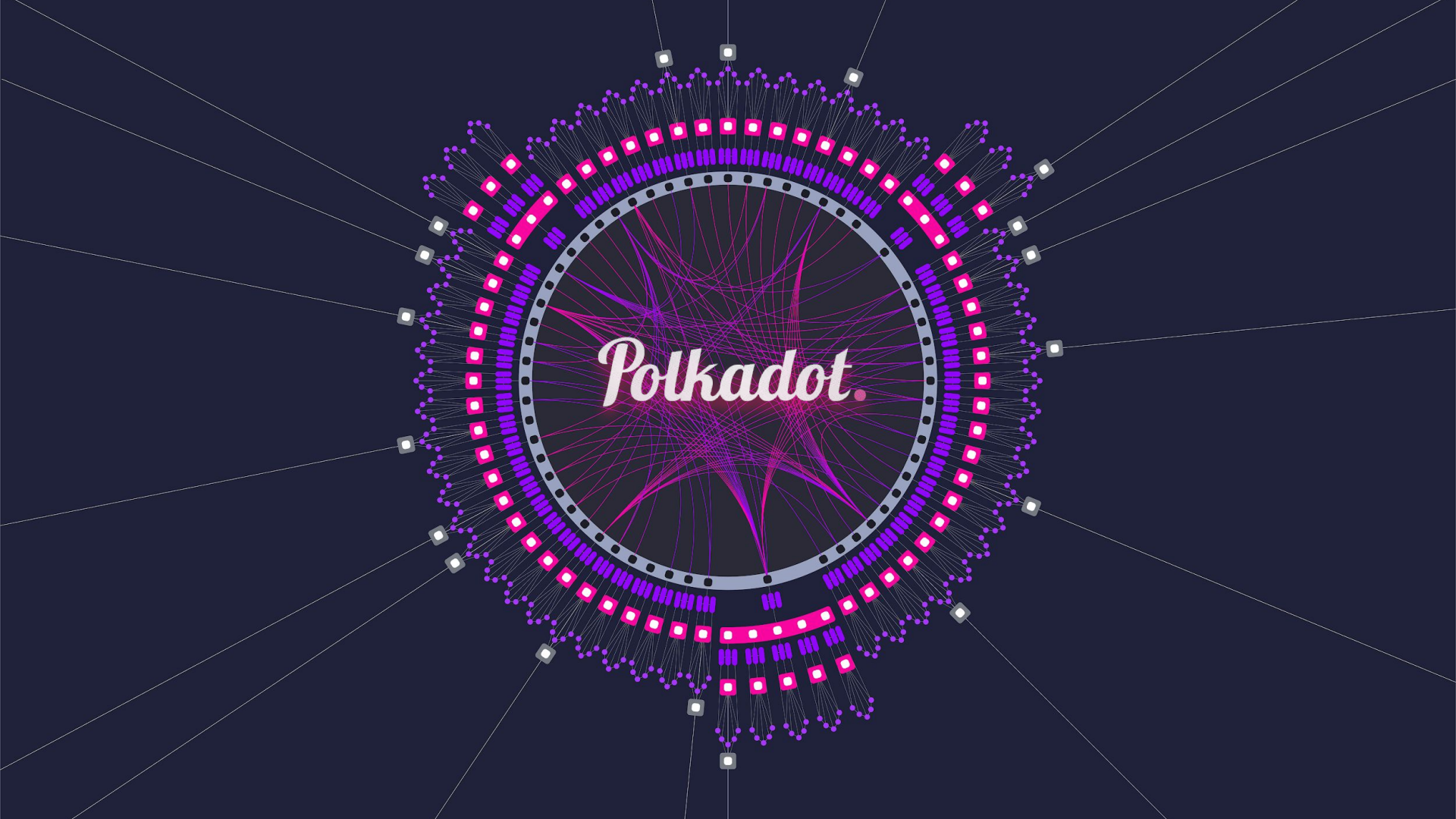
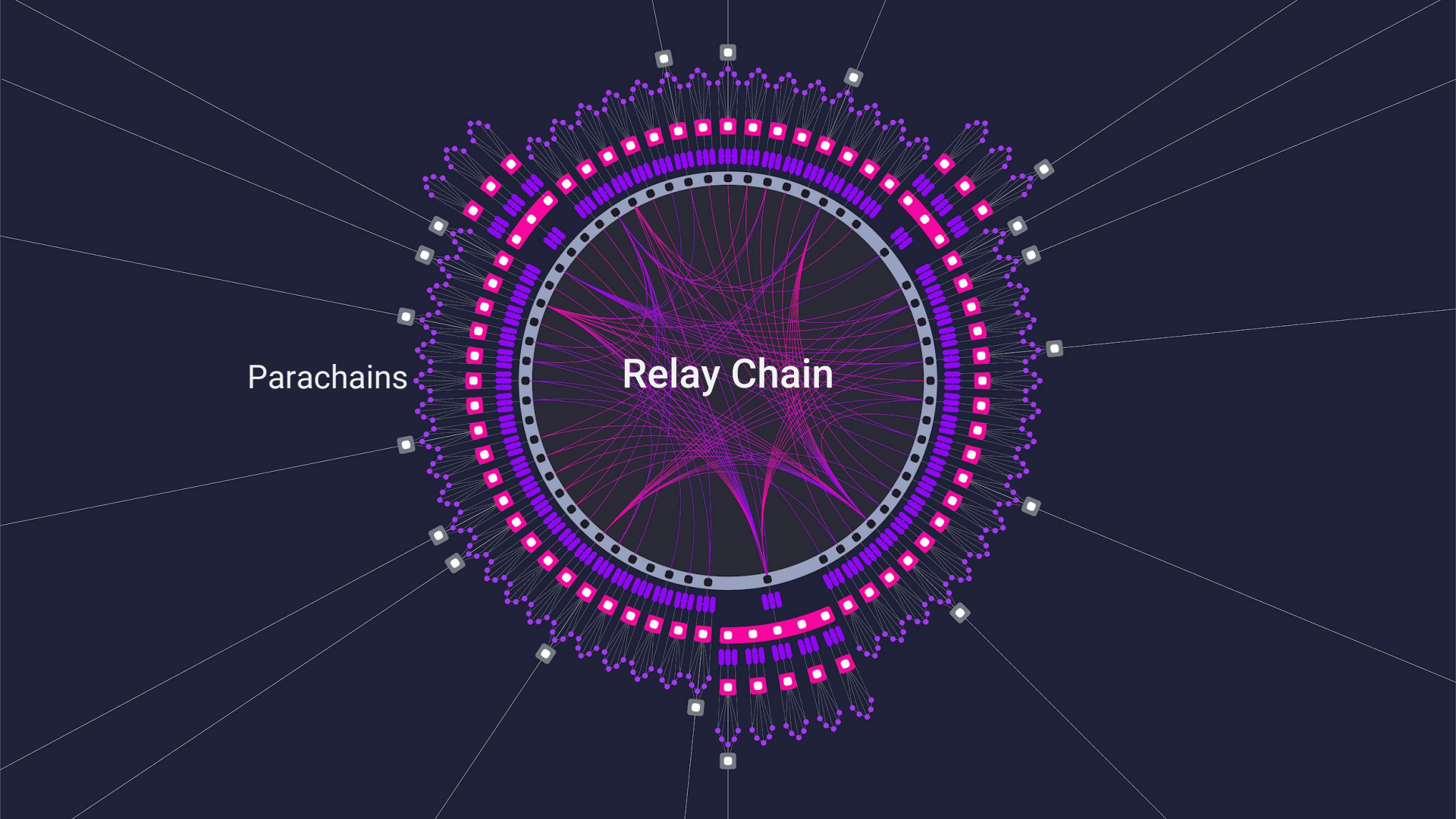
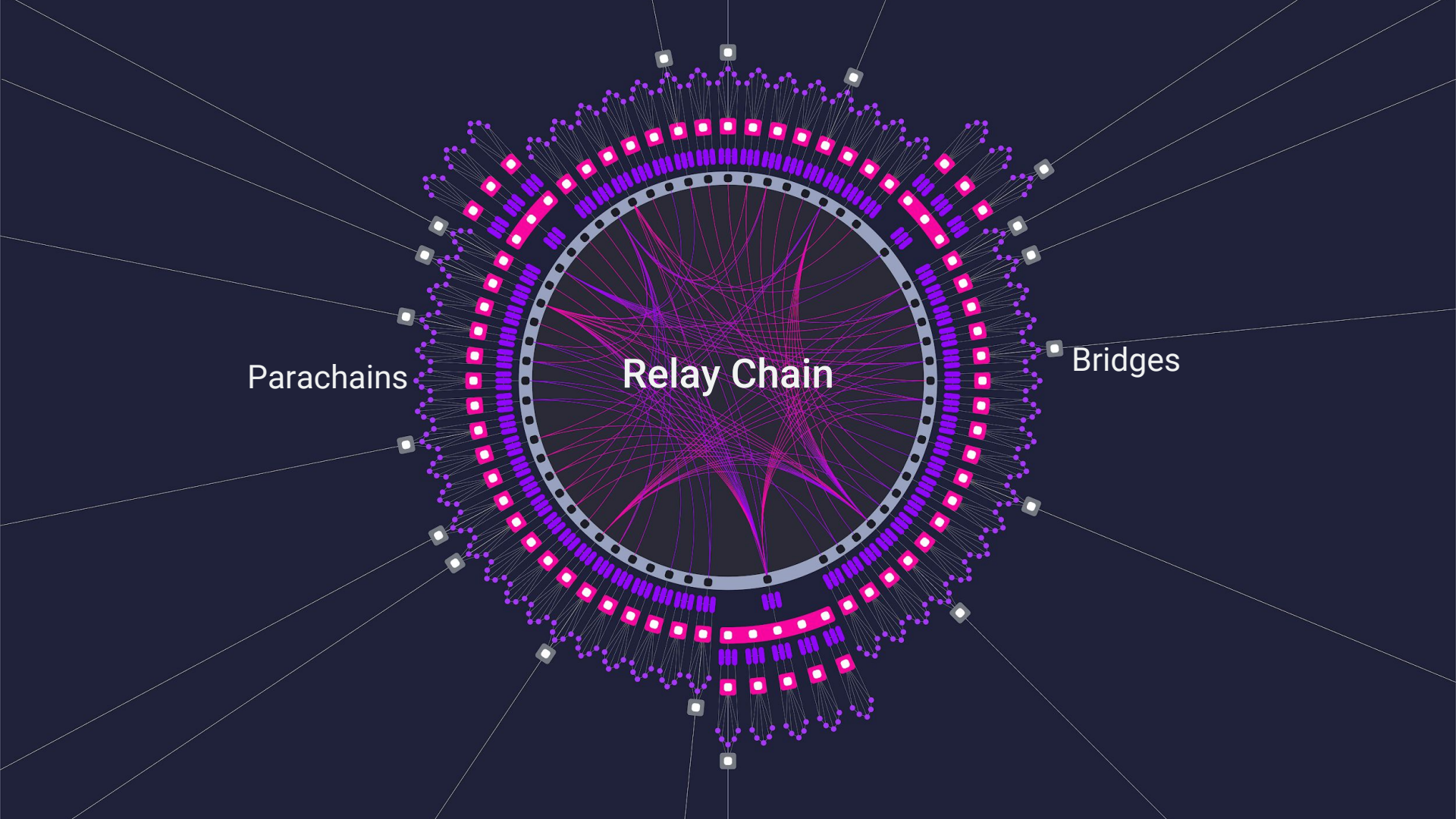

Polkadot.


Parachains
Relay Chain


Parachains
Relay Chain
Bridges

Teams building on Polkadot

- 0x Protocol Decentralized exchange
- Aragon Unstoppable organizations, DAOs
- ChainX Developing a Bitcoin and Ethereum bridge
- Ocean Protocol Ecosystem for sharing data
- Edgeware Wasm-based smart contract platform

... and more

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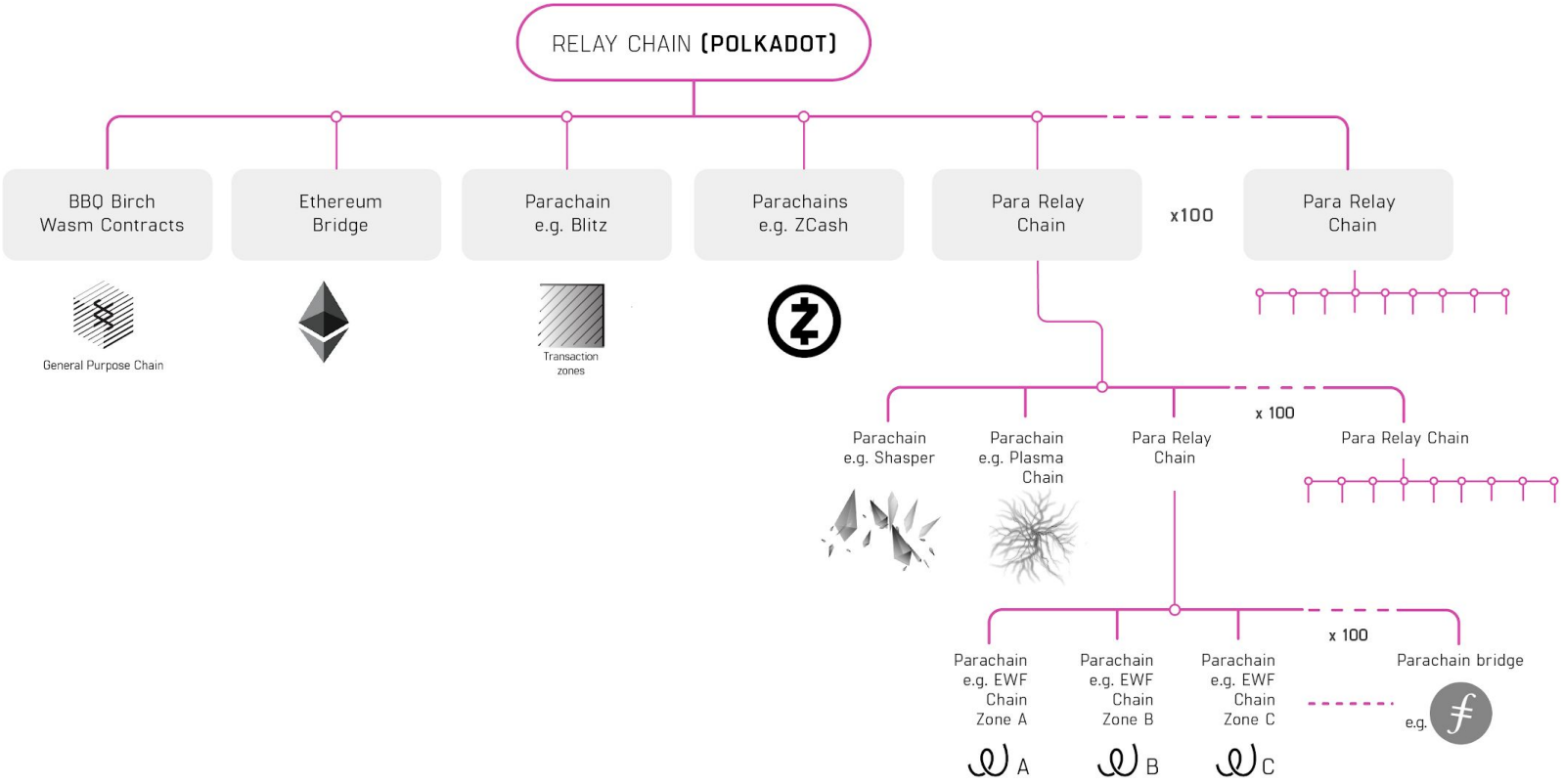

Nested Relay Chain Design

Polkadot.

Implications on security and governance

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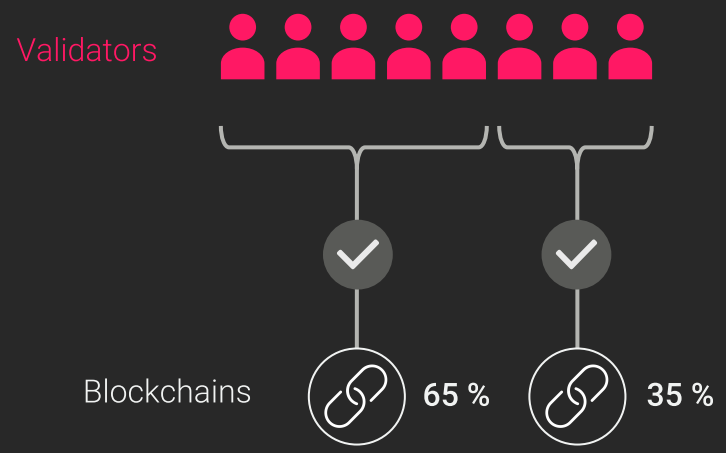
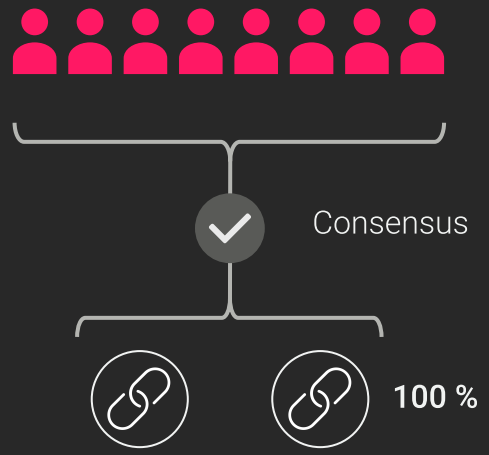
Pooled security

Traditional isolated security



Multichain pooled security



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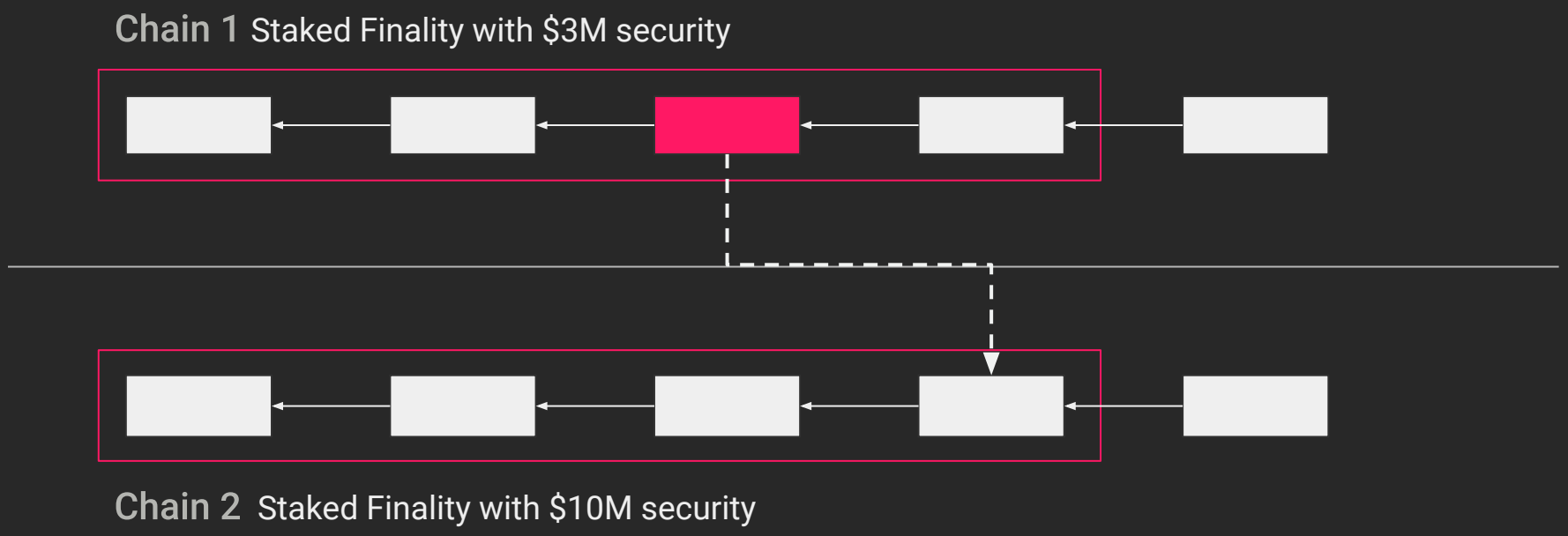
Name	Symbol	Market Cap	Algorithm	Hash Rate	1h Attack Cost	NiceHash-able
Bitcoin	BTC	$60.71 B	SHA-256	41,485 PH/s	*$252,749*	0%
Ethereum	ETH	$11.28 B	Ethash	135 TH/s	*$64,834*	5%
Bitcoin Cash	BCH	$2.09 B	SHA-256	1,360 PH/s	*$8,285*	3%
Litecoin	LTC	$2.06 B	Scrypt	205 TH/s	*$21,301*	6%
Bitcoin SV	BSV	$1.09 B	SHA-256	1,190 PH/s	*$7,253*	3%
Monero	XMR	$726.91 M	CryptoNightV8	693 MH/s	*$4,986*	2%
Dash	DASH	$585.42 M	X11	2 PH/s	*$5,030*	28%
Ethereum Classic	ETC	$420.47 M	Ethash	8 TH/s	*$3,828*	85%
Zcash	ZEC	$281.30 M	Equihash	3 GH/s	*$11,104*	6%
Bitcoin Gold	BTG	$167.54 M	Zhash	3 MH/s	*$704*	13%

PoW 51% attack cost

crypto51.app

The weakest link problem



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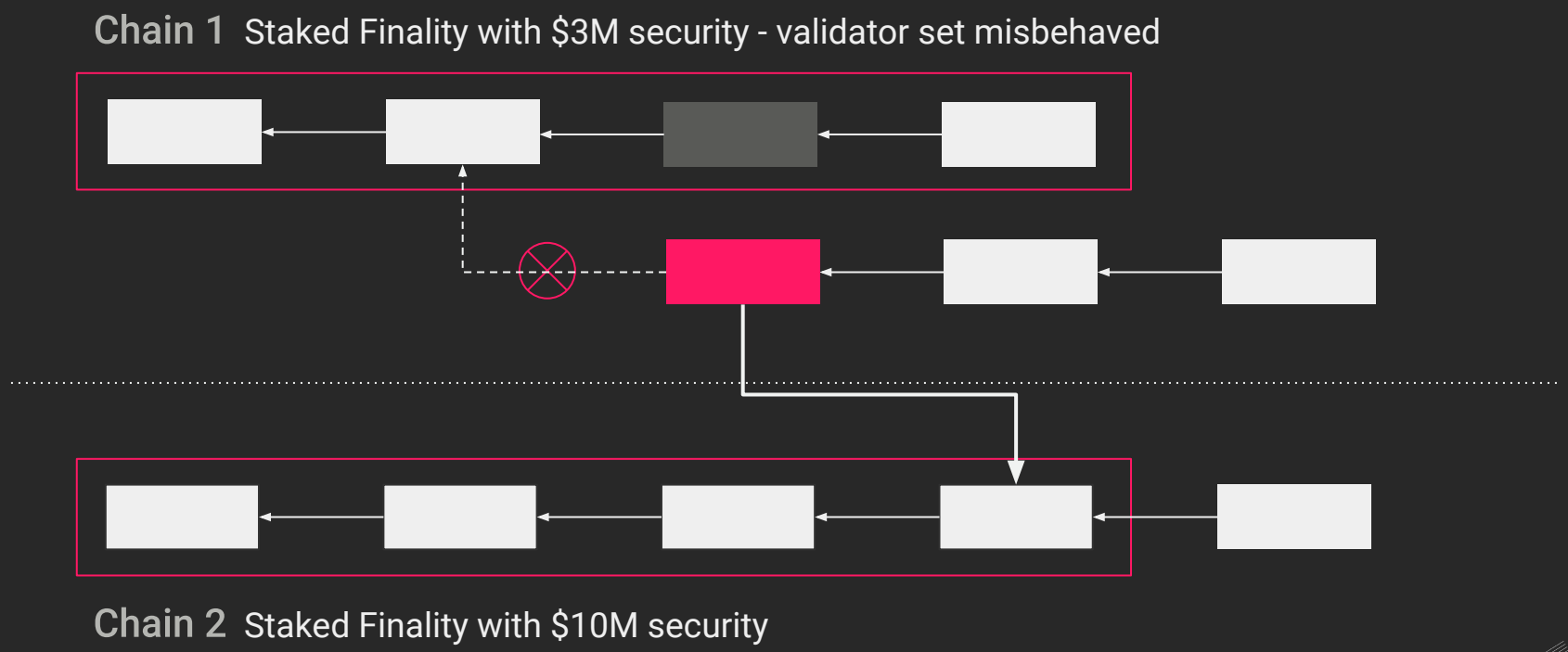

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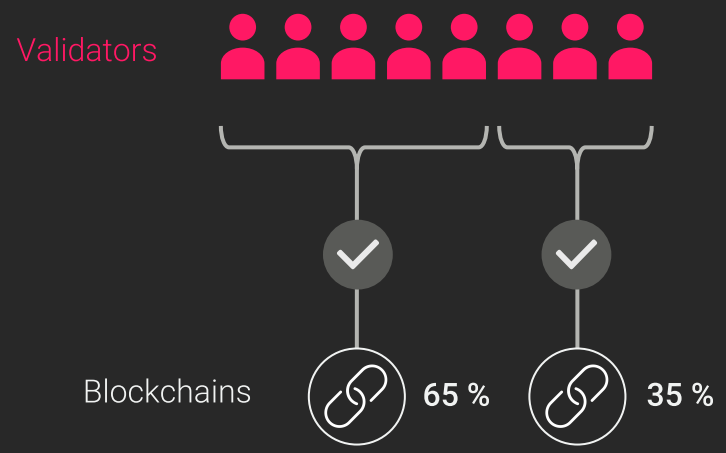
Pooled security

Traditional isolated security



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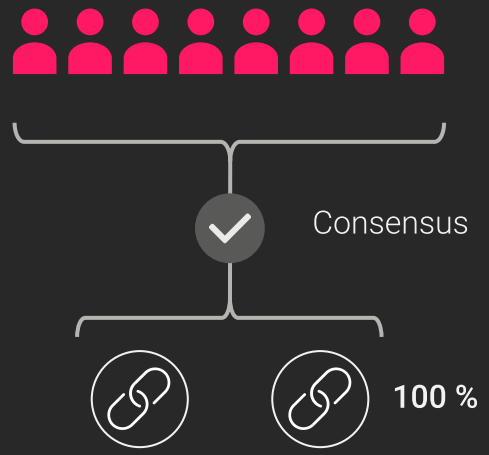

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Implications on security and governance

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Governance

- Referenda
- Adaptive quorum biasing
- Council
- Lock-voting Hodler Bonus
- Delayed enactments
- Treasury
- Delegated voting Planned

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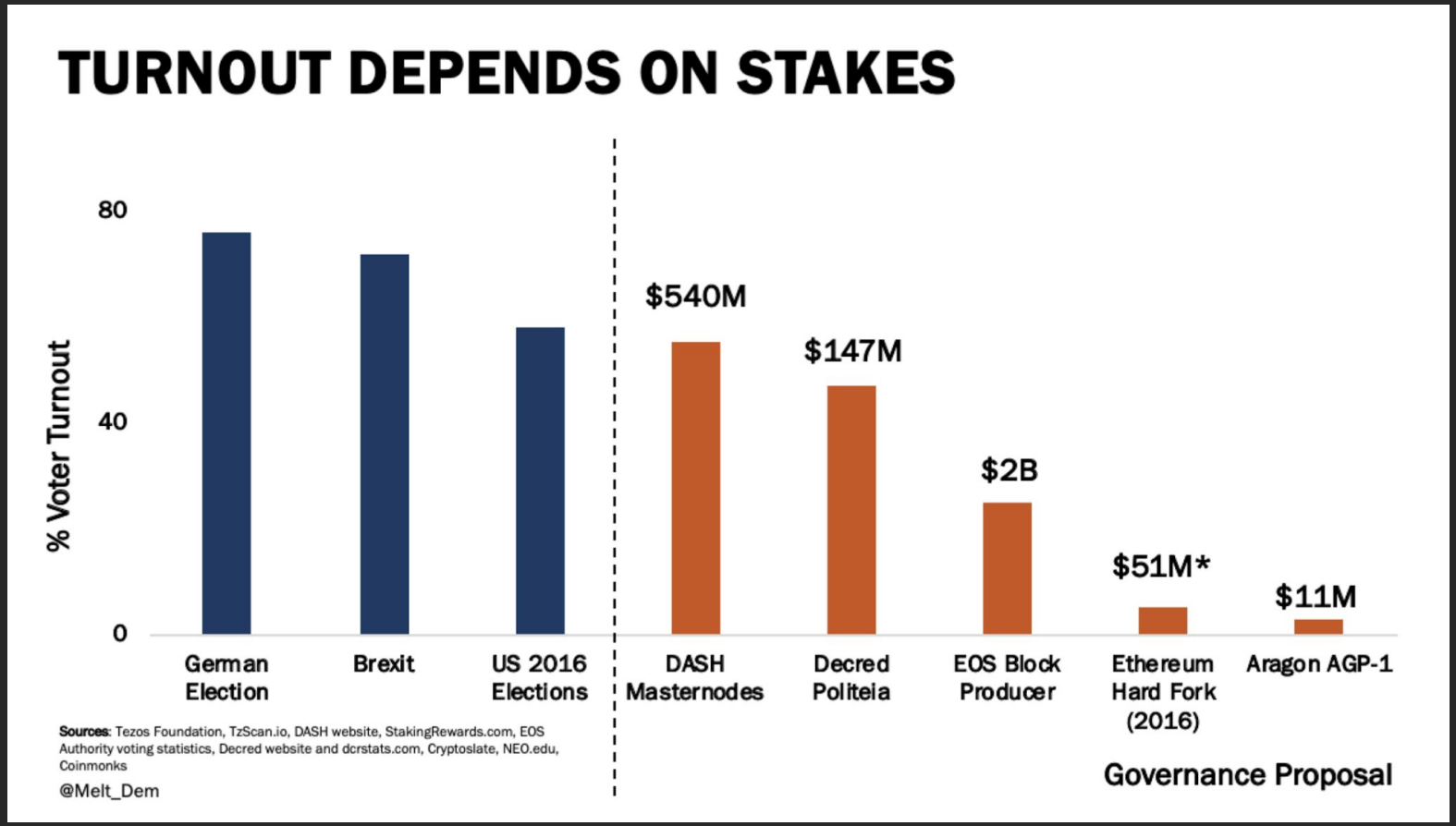

Adaptive quorum biasing

Governance

- Referenda
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aye * √turnout > nay Positive turnout bias

Turnout	Ayes to carry (Voting)	Ayes to carry (Electorate)
1%	91%	0.9%
5%	82%	4%
20%	69%	14%
50%	59%	29%

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Governance

- Referenda
- Adaptive quorum biasing
- Council
- Lock-voting ‘Hodler Bonus’ Votes = Tokens * Weeks Max. 12 weeks
- Delayed enactments
- Treasury
- Delegated voting Planned

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Forkless upgrades

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Application-specific parachains

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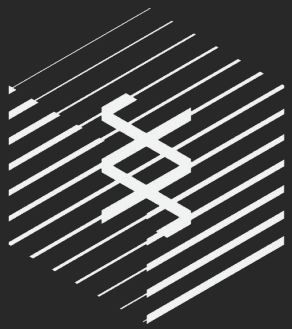
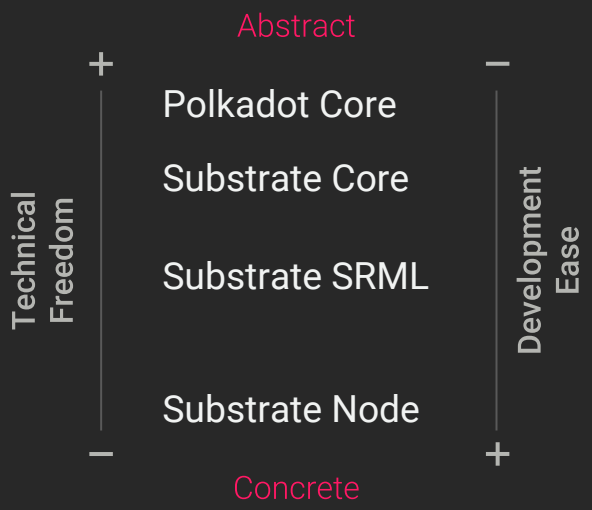
What is Parity Substrate?



Substrate is an open source, extensible framework for building blockchains.

It is modular.

It allows hot-upgrades of the internal runtime through WebAssembly.



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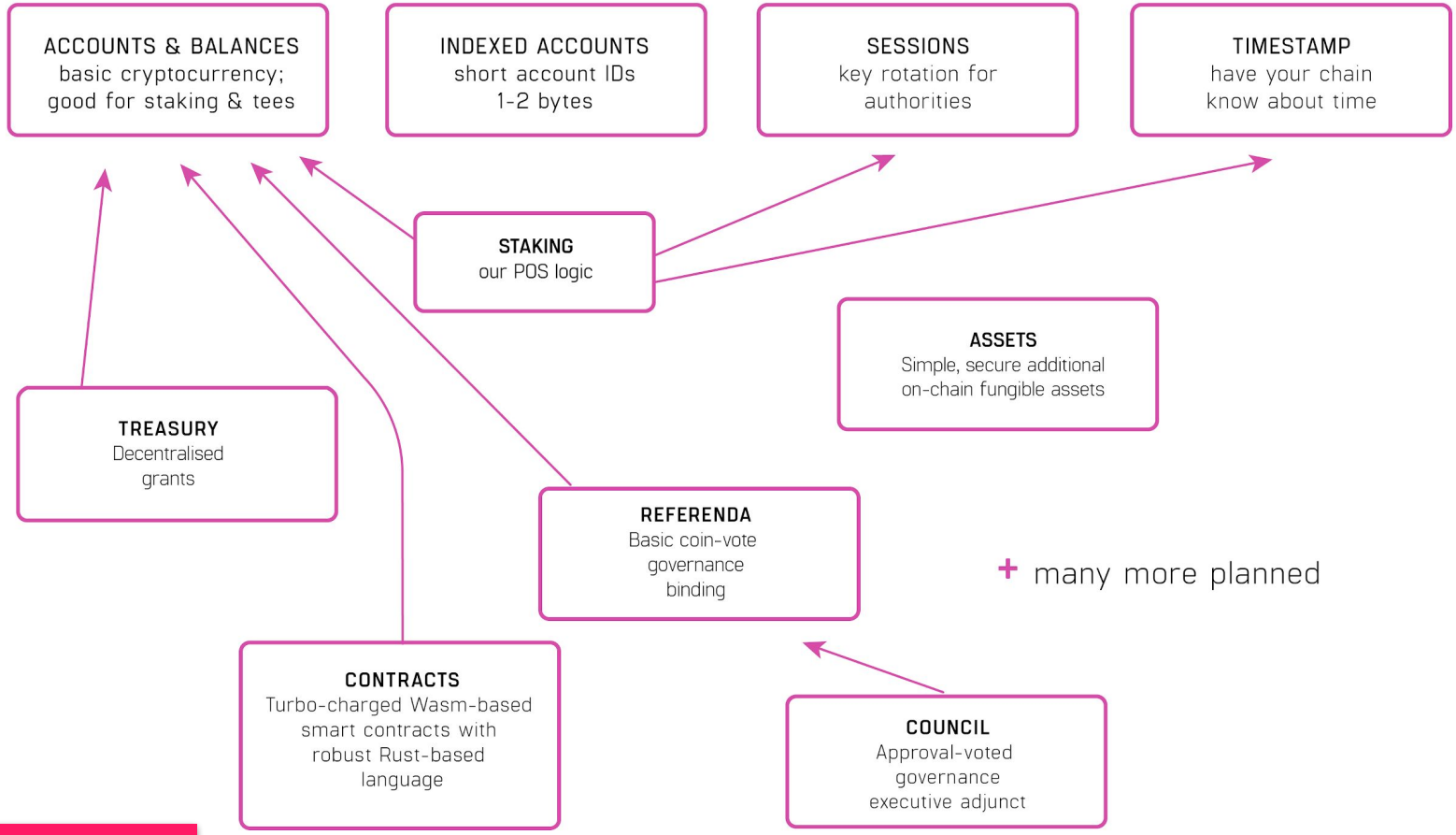

Advantages of SRML

Written in Rust

Built into both Wasm & native

Wasm stored on-chain

Written in Rust

Built into native

Substrate building components

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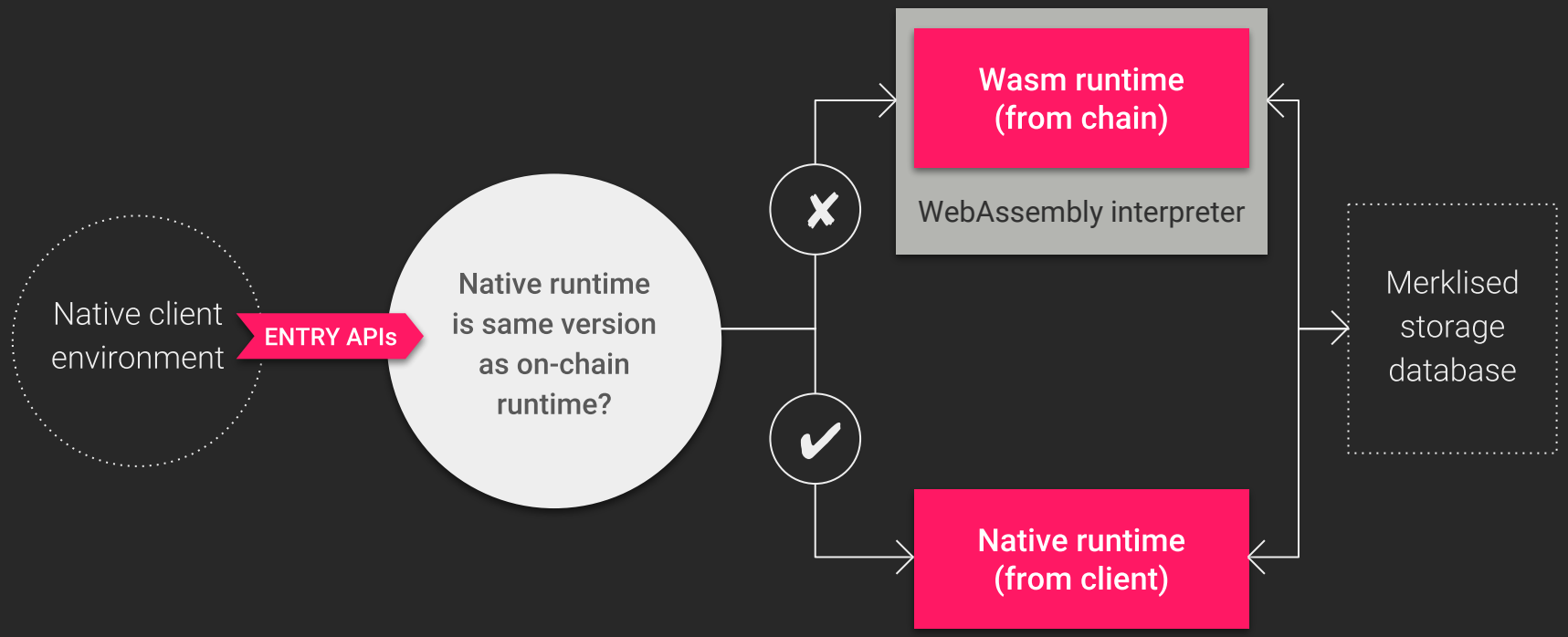

Forkless runtime upgrades

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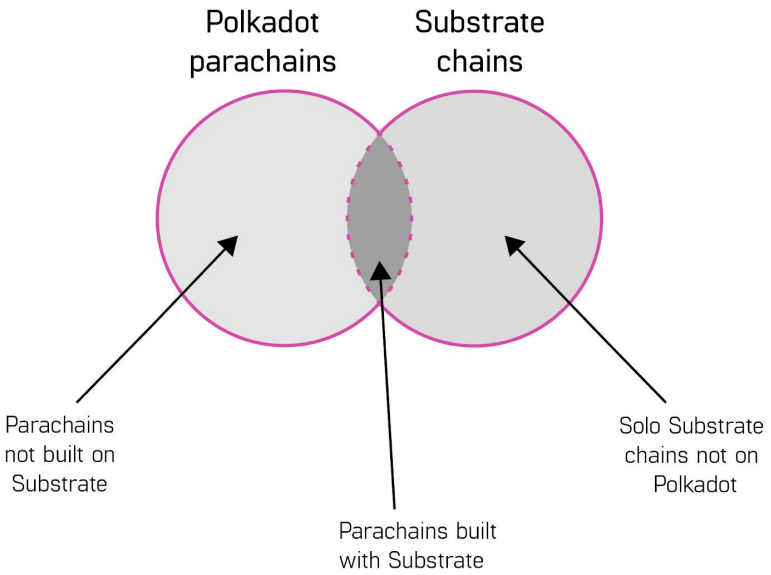
Polkadot	Protocol	“Ethernet”
Substrate	Software	“PC”

Polkadot:
Web3 Foundation, protocol, token, many teams, implementations

Substrate:
Parity Technologies, software stack, Substrate chains, many tokens and chains



Parity updates and events

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We're hiring!

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Questions?

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THE STATE OF CHAINS
Substrate

SOLO CHAIN

Consensus

Needs economic incentivisation

Completely Sovereign

SOLO CHAIN + BRIDGE

SAME + CONNECTIVITY

Communication Possible

Restricted state possible

Own consensus possible

Completely sovereign

COMPLETELY SOVEREIGN

PARACHAIN

Uses Polkadot Relay Consensus

Uses Polkadot Relay Validation

Open for all to verify/ validate

No economic incentivisation needed

Sovereign over state transitions

	2018 June	Oct	Nov	Dec	2019 Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Polkadot	**POC-2**	**POC-3** Final Consensus GRANPA			**POC-4** Interchain Messaging Final Staking Algo		**POC-5** Audit - Ready Security Final Slashing & Consensus	Polish & Optimisation			**1.0 RELEASE CANDIDATE 1**		1.0 RCL	1.0 FINAL	**GENESIS**	
Substrate	**POC-2**	**1.0 beta**			**1.0 RCI** Docs Final API Consensus		**1.0**	**1.1** Improved SC Tooling		**1.2** Collator Parachain Node	Bridge beta					

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Cosmos 15.0%	Dash 7.0%	Ethereum Q4-19	NuCypher 75.0%

$2.5BN+

Proof of Stake is replacing Proof of Work

~25% of the total cryptocurrency market (~$25 billion today) will use proof-of-stake (PoS) as a security model by the end of 2019. Investors of

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