CMPSC 390
Blockchain Scalability.

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Scalability Problem

Goal:

Provide all of the services that a blockchain offers to all users, independent of how many users there are.

Layer 1 vs. Layer 2

Layer 1:

- refers to the main blockchain architecture
- the Bitcoin Blockchain, the Ethereum Blockchain

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Layer 2:

- refers to a secondary framework or protocol that is built on top of an existing blockchain
- the Lightning Network, Ethereum Plasma

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- **Idea**: If signature validation is faster, much of the network can run faster (more throughput).
- Taproot replaces ECDSA signatures with Schnorr Signatures.

Benefits of Taproot + Schnorr

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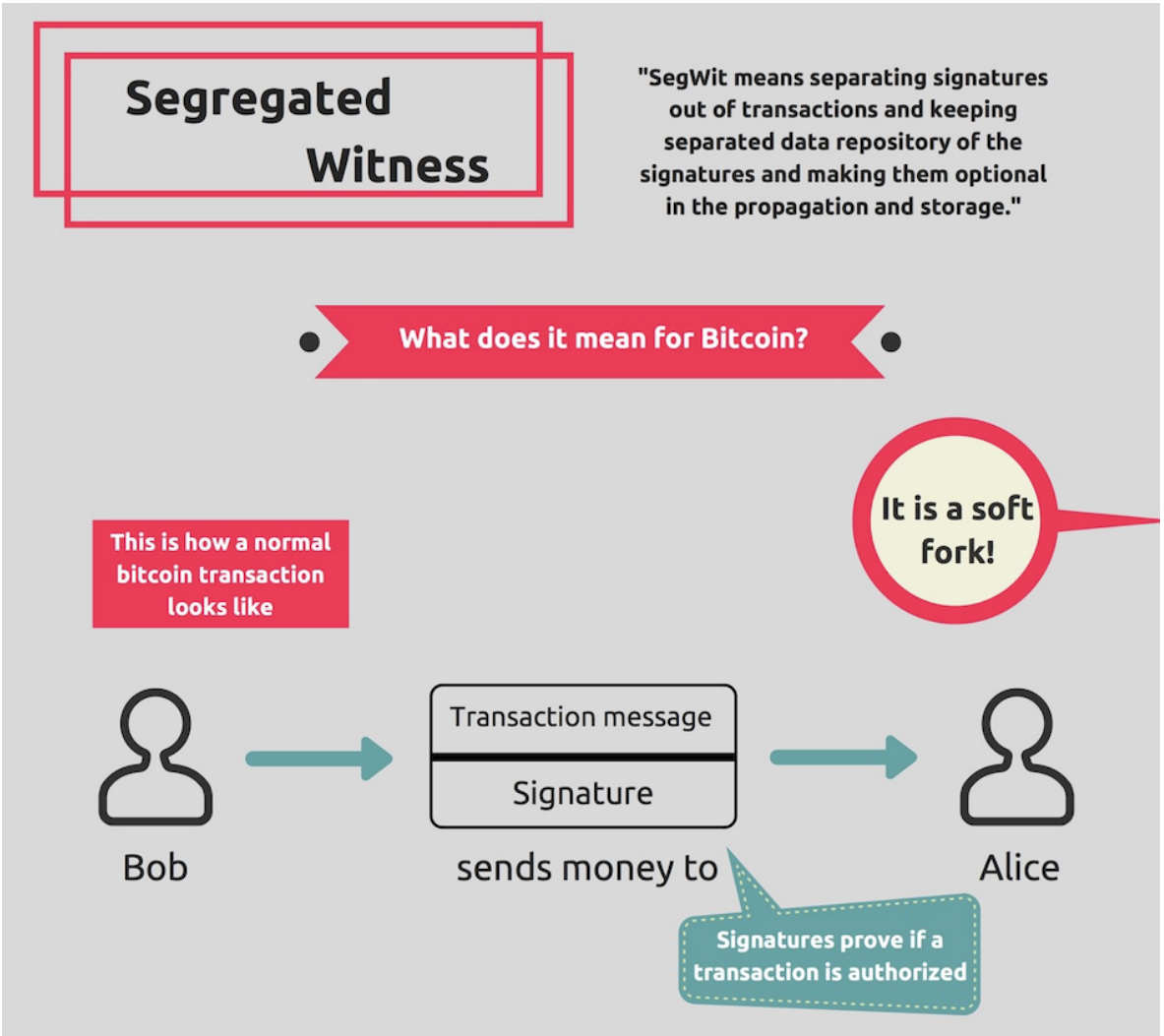
Batch validation:

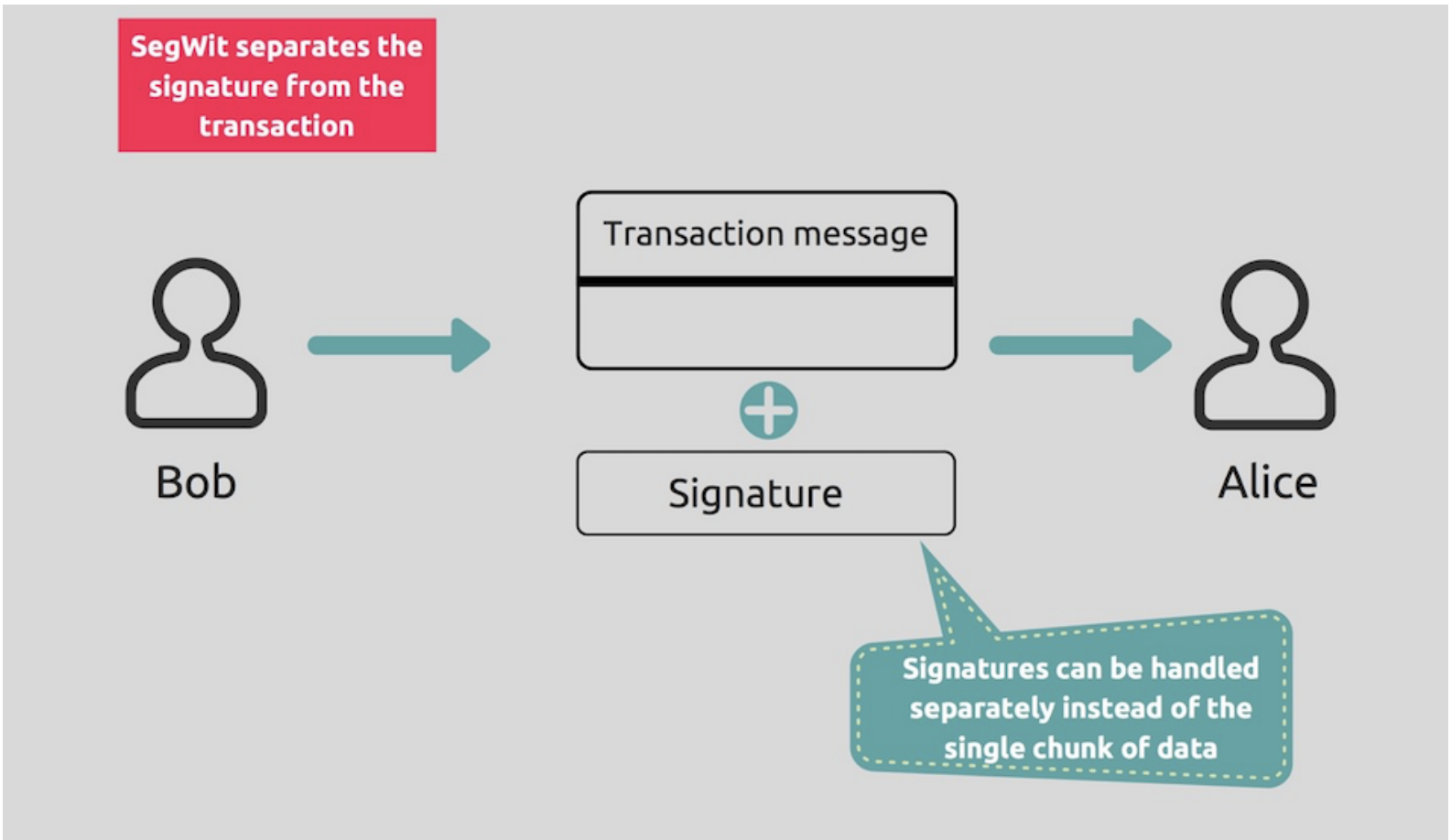
- Many signatures can be verified at once.
- Speedup grows logarithmically with the number of sigs to verify.
- When a transaction has many scripts, they do not need to be revealed or evaluated on the network.

Segregated Witness (Layer 1)

https://blockchainhub.net by Valentik Kalinov



Segregated Witness



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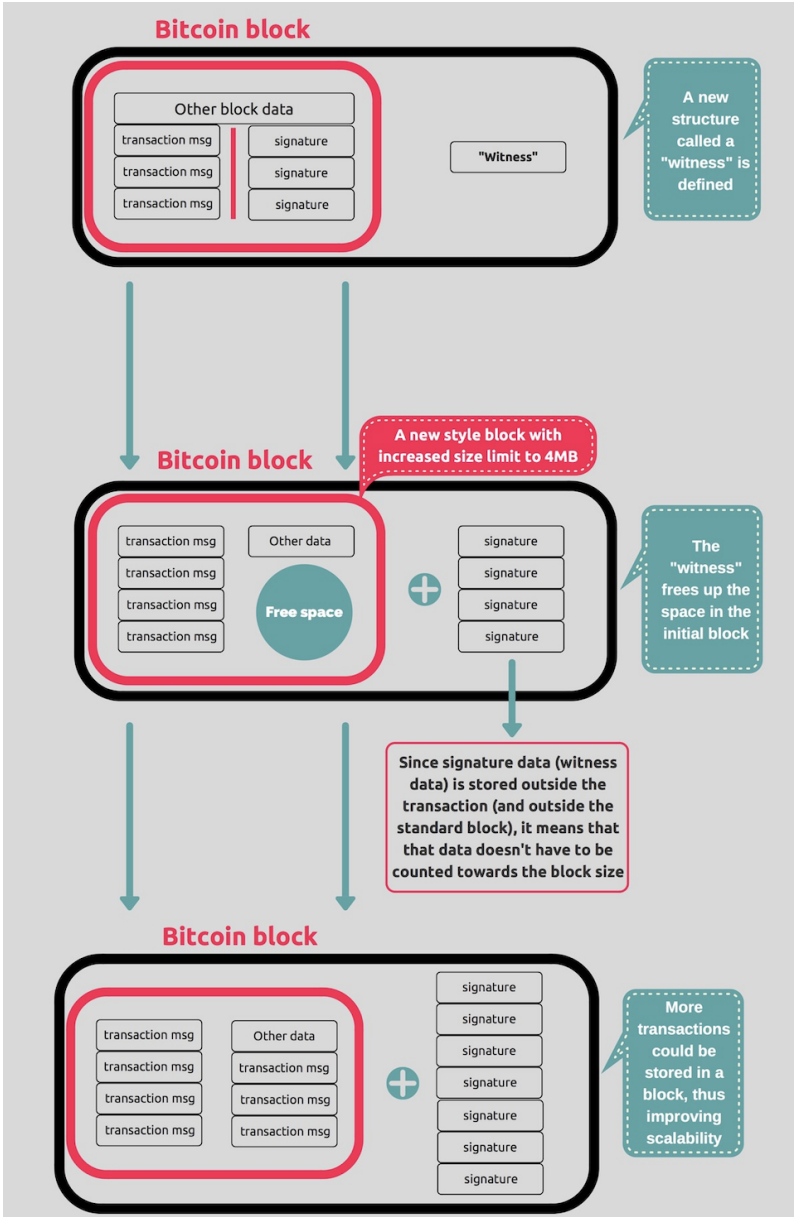

Sharding

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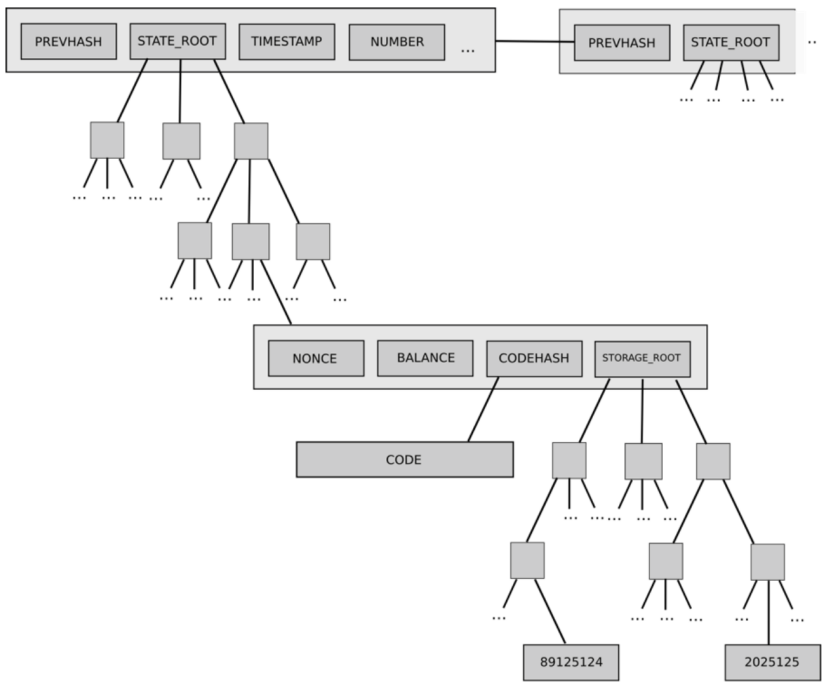

Ref.: https://eth.wiki/sharding/Sharding-FAQs

Lightning Network (Layer 2)

https://lightning.network/

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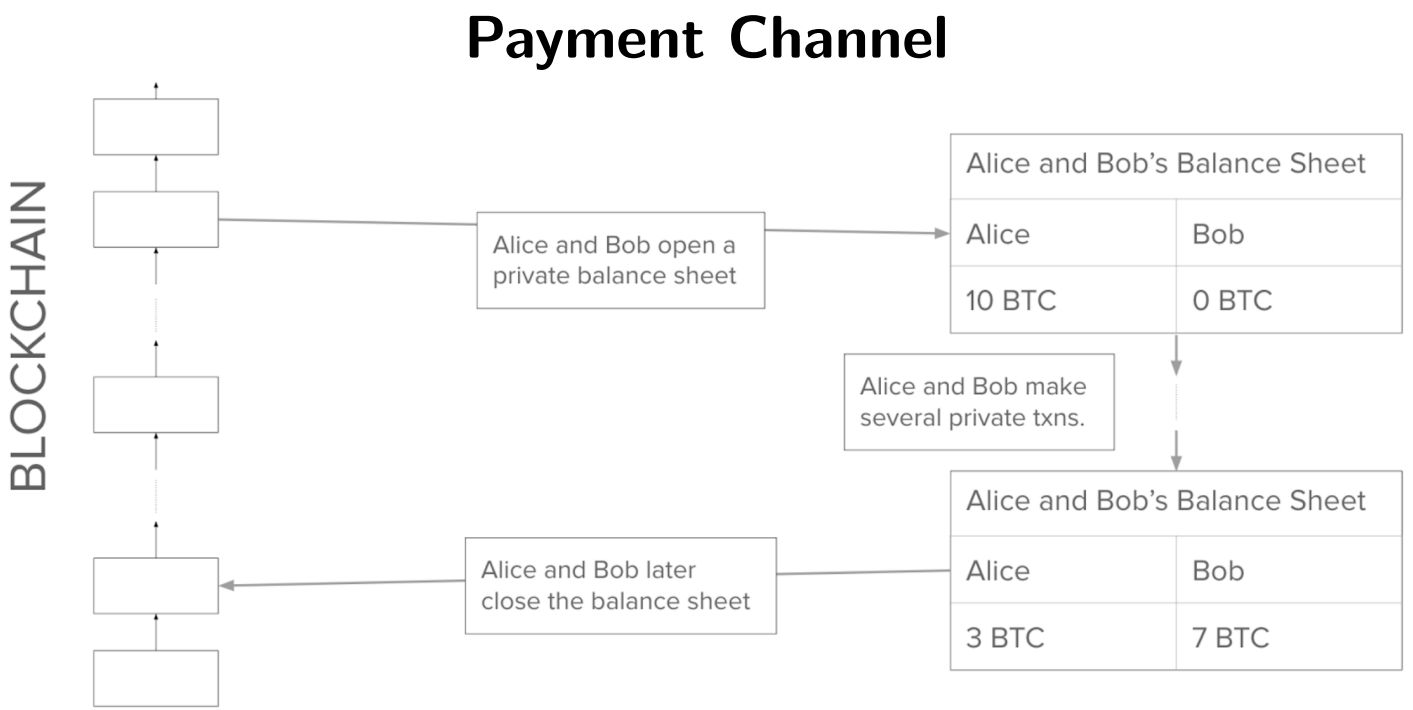

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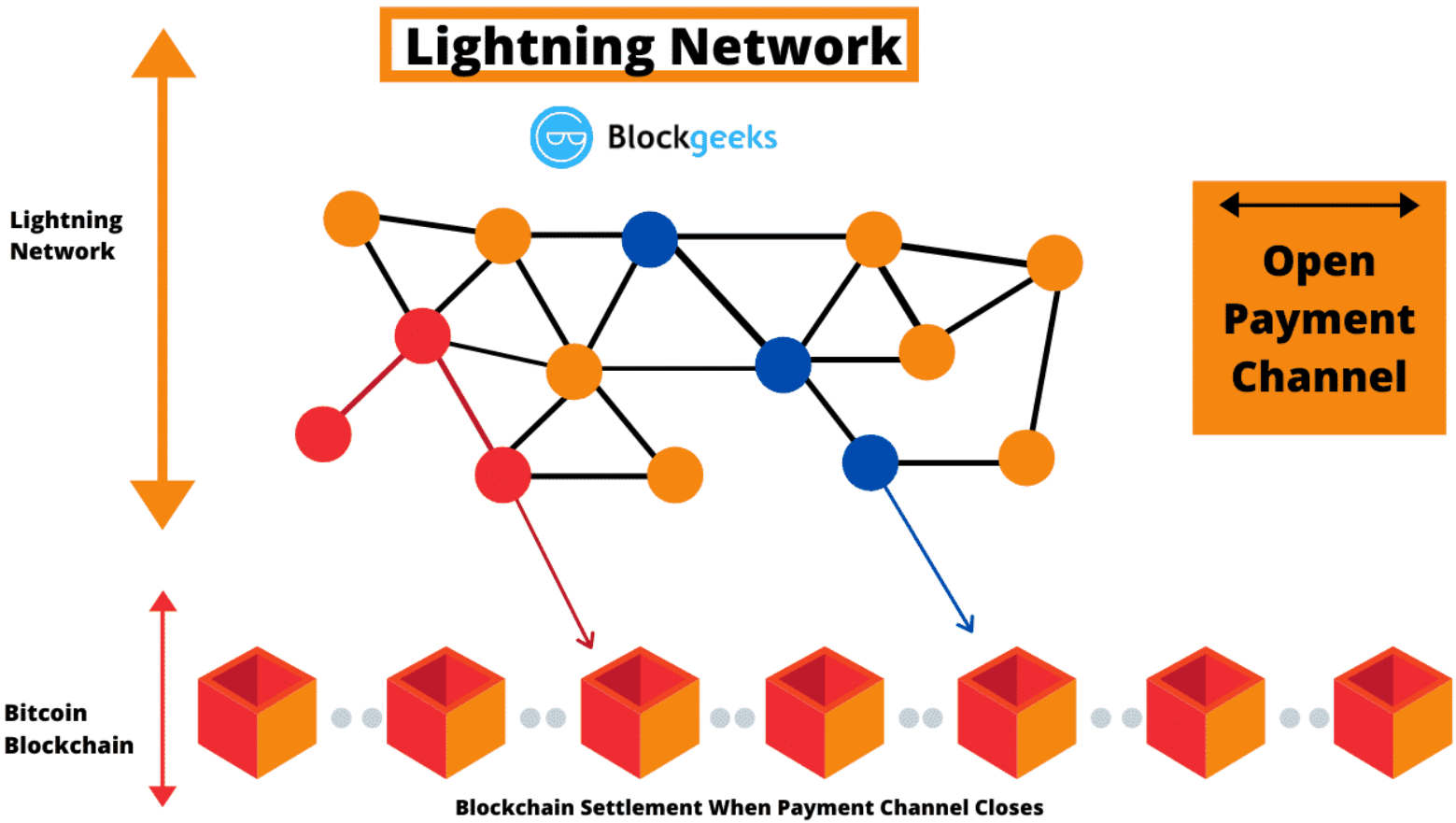

Ethereum 2.0

Multi-year timeline.

- *Phase 0*: Transition to Proof of Stake.
- *Phase 1*: Data Sharding.
- *Phase 2*: State + Execution (computation and smart contracts).
- *Phase 3+*: Other scaling solutions.