



دانشگاه صنعتی امیرکبیر  
(پلی تکنیک تهران)

تحمل پذیری اشکال در بلاکچین

# Fault-Tolerance in Blockchains

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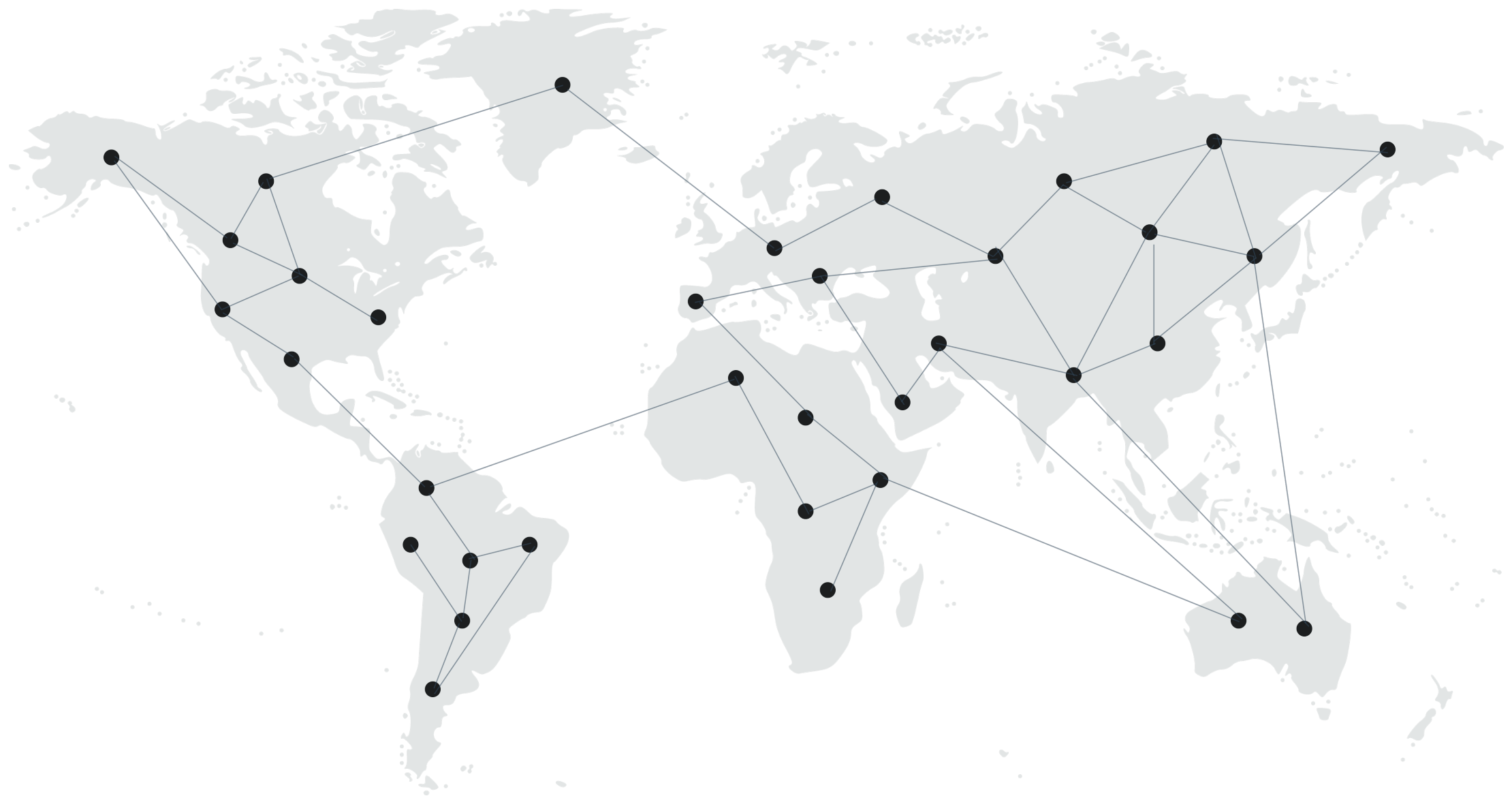
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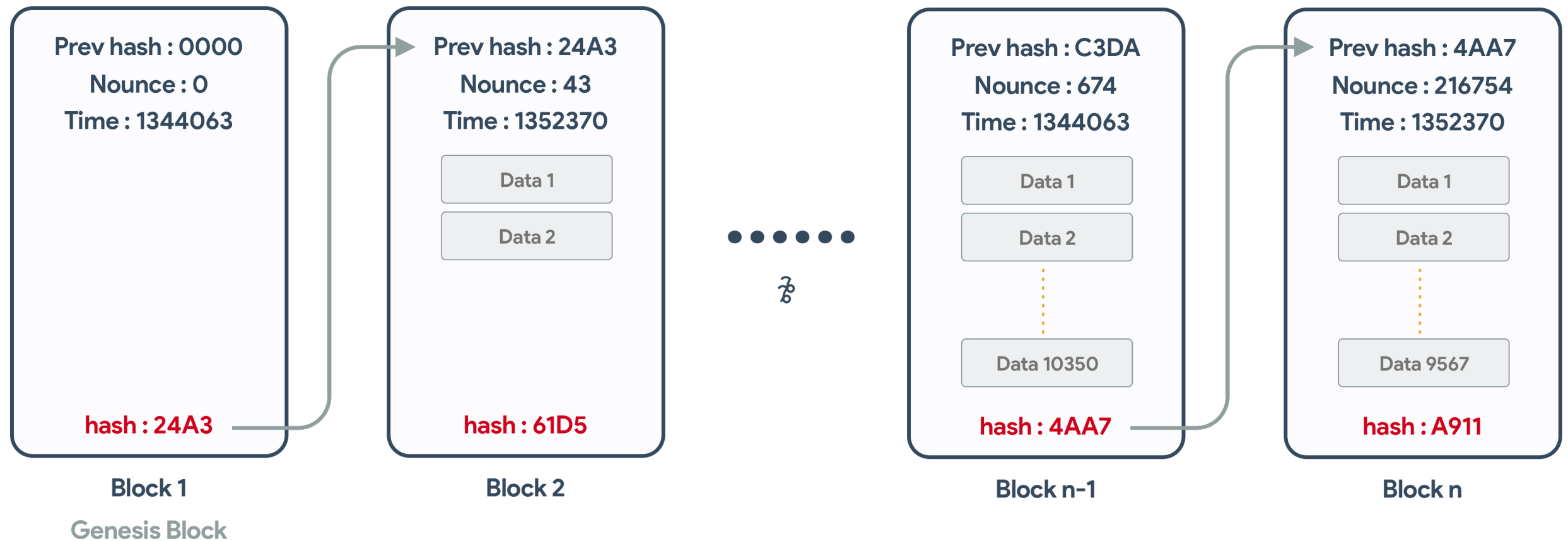
# What Is Blockchain



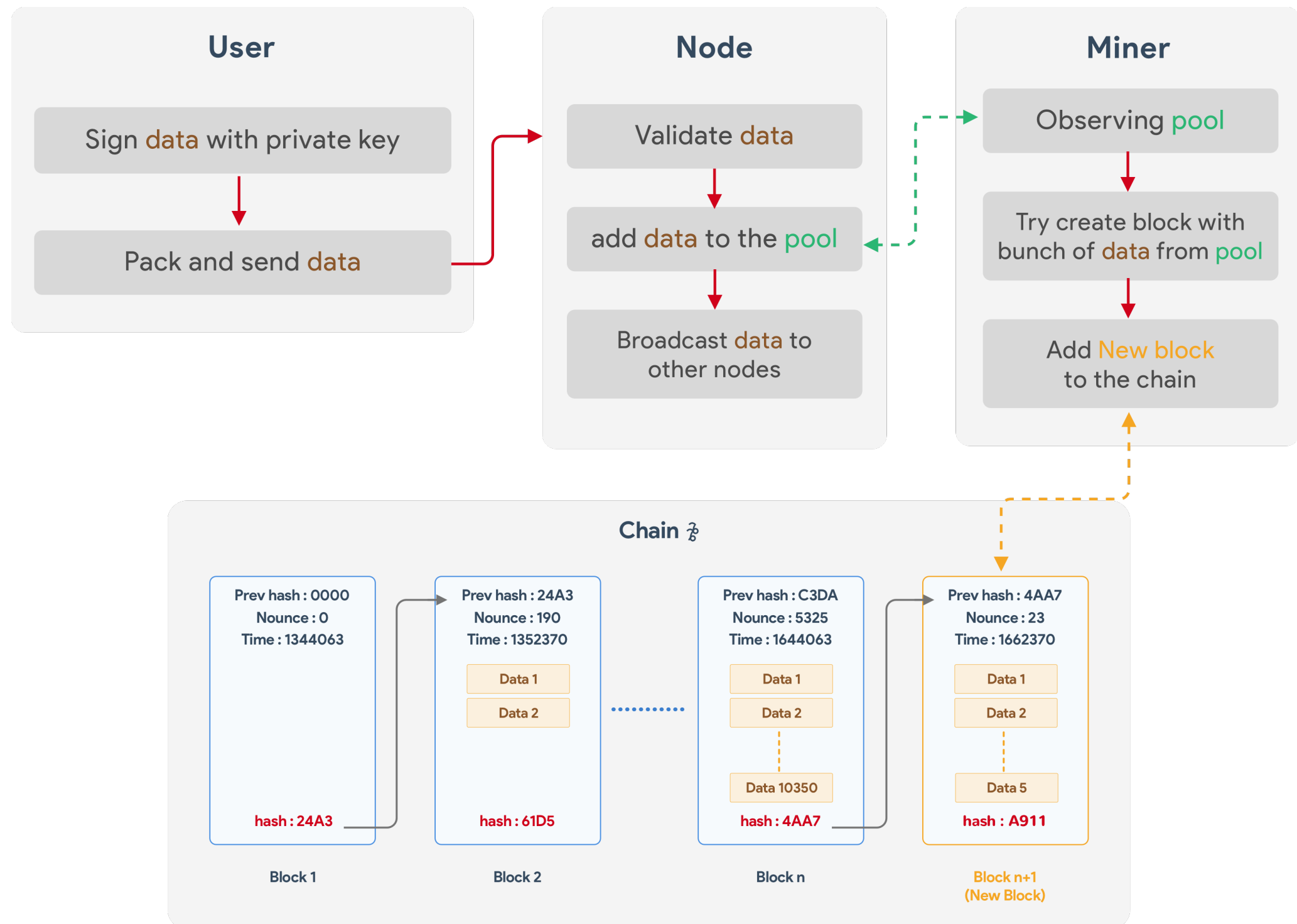
# Propagating The Chain



# Chaining The Blocks

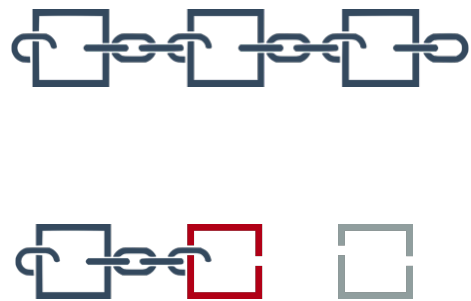


# How It Works



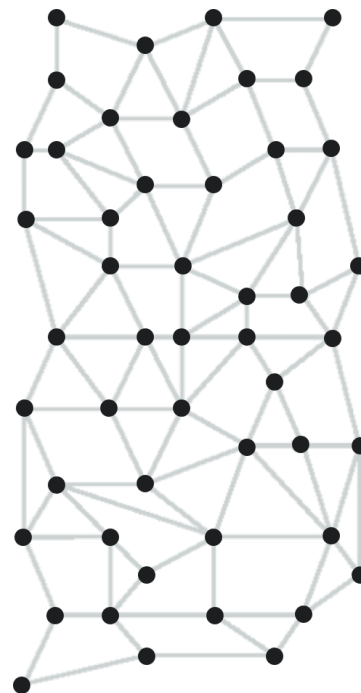
# Blockchain Features

Immutability

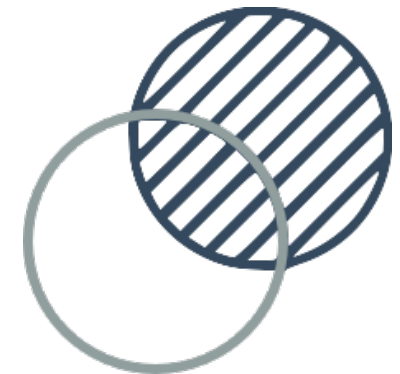


Distributed

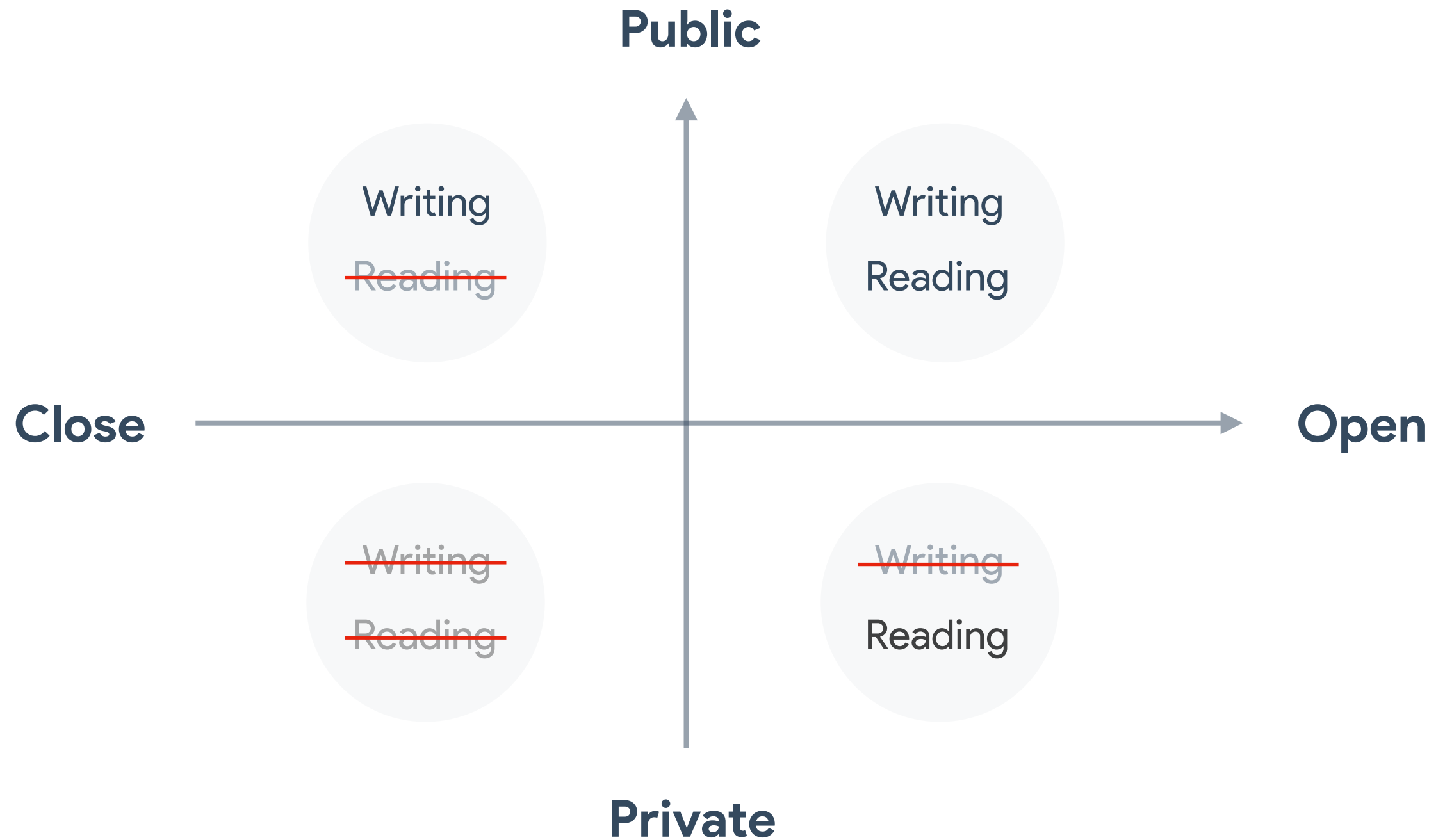
Decentralize



Transparency

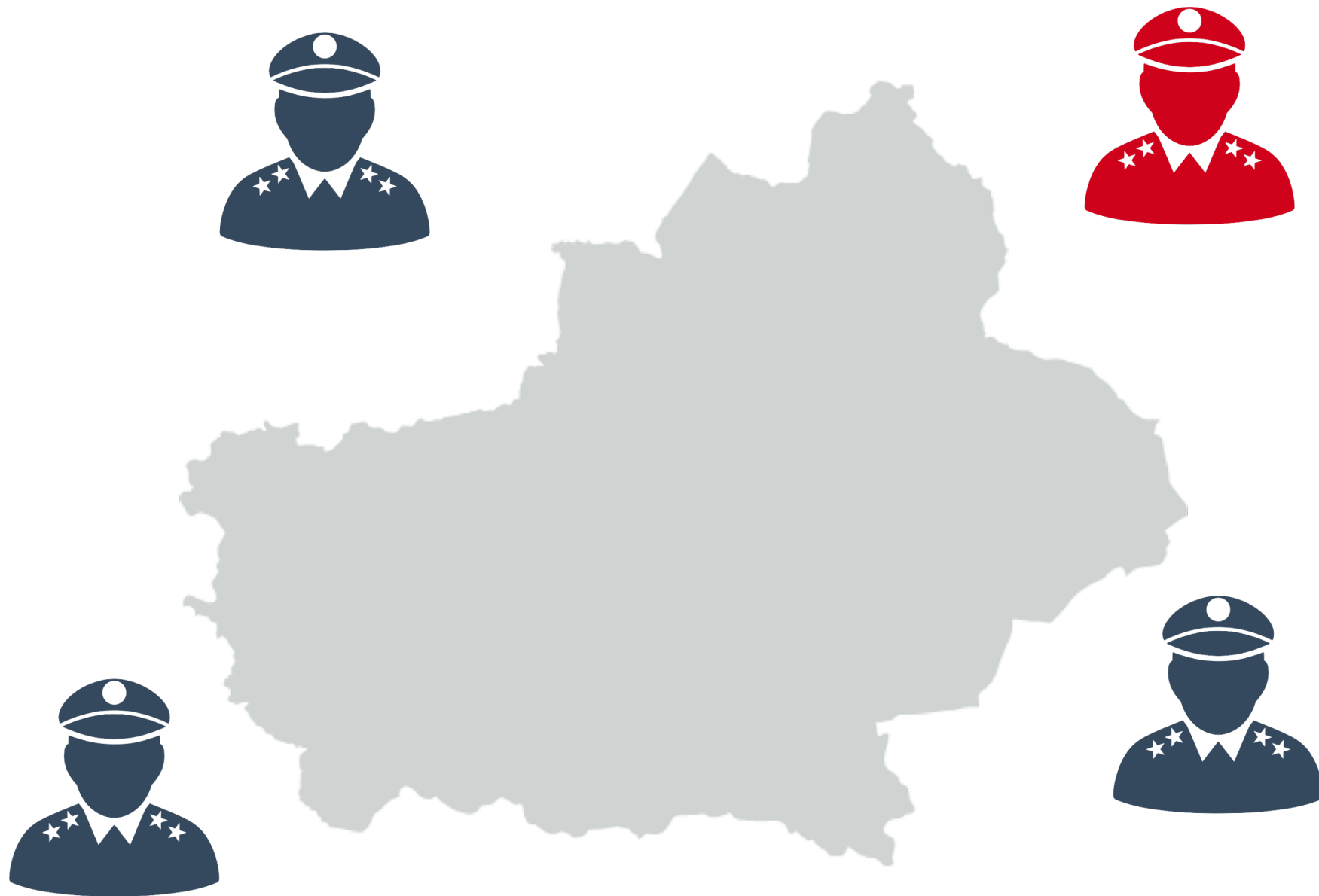


# Blockchain Types





# Byzantine Fault



# Proof Of ...

... **Work**   Miners | Mining | Computation

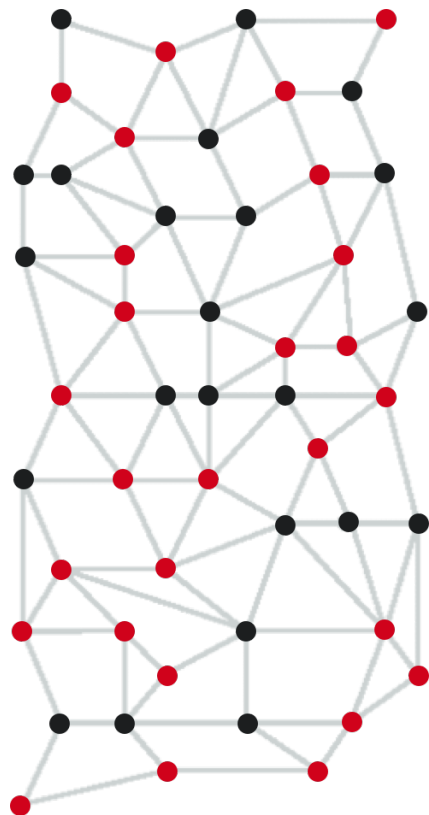
... **Stake**   Validators | Forging | Wheel

... **Burn**   PoW Without Energy Waste | Tokens

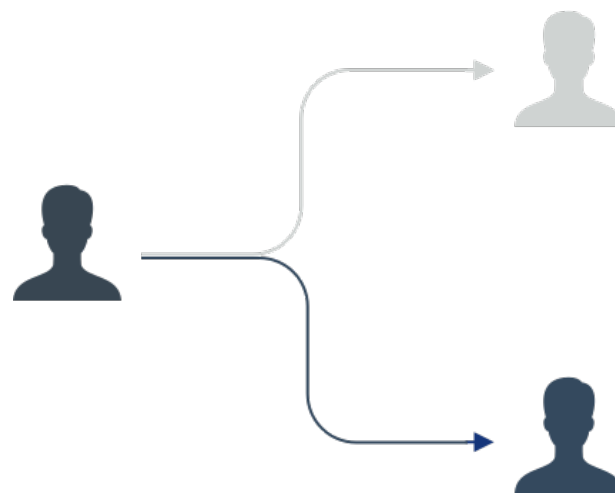
... **Elapsed Time**   Intel | Waiting Time | SGX & TEE

... **Authority**   Reputation | Set of Nodes

# Attack



Attack 51%



Double spending

*Finney*

*Selfish Mining*

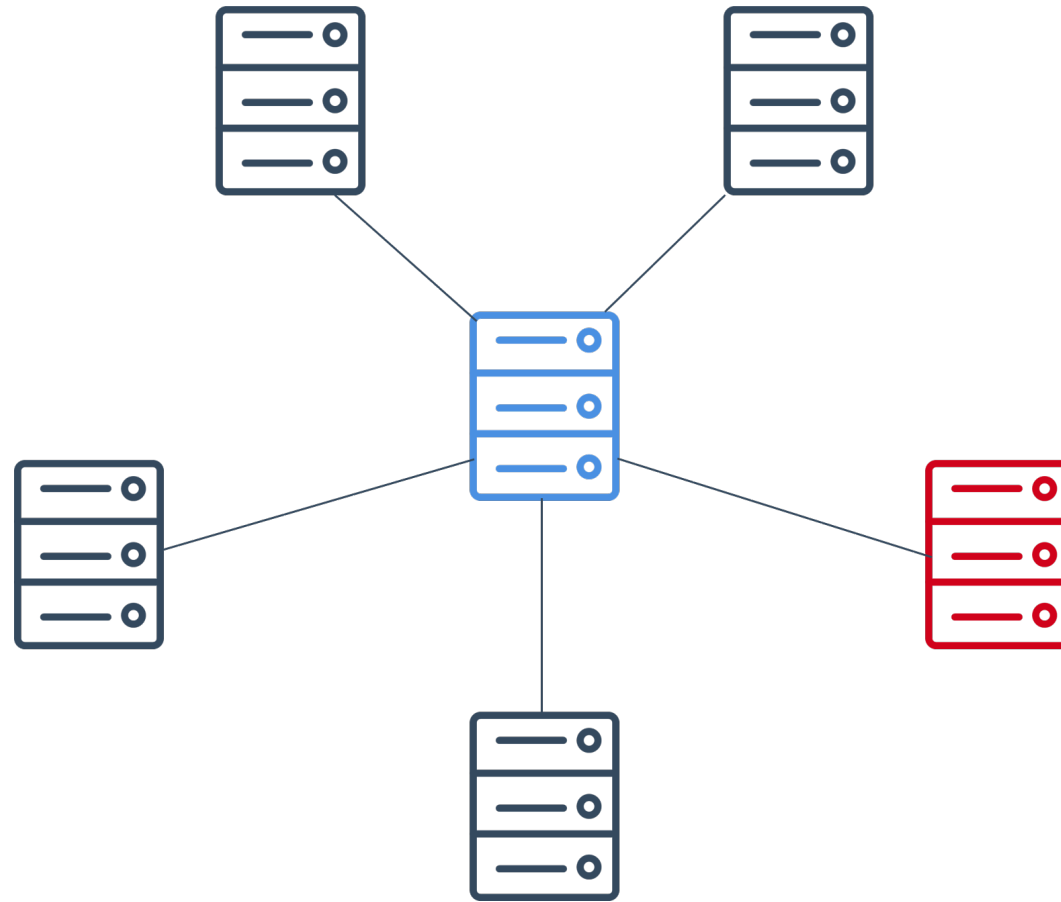
*Brute-Force*

*Sybil*

*Block Withholding*

Other Attacks

# Faults In Blockchain



# Fault Tolerance

Inefficiency and redundancy —————> Immutability + Extreme level of fault tolerance.

Reliability

Safety

Redundancy Type

# Resources

- Vokerla, Rahul Rao, et al. "An Overview of Blockchain Applications and Attacks." 2019 International Conference on Vision Towards Emerging Trends in Communication and Networking (ViTECoN). IEEE, 2019.
- Weber, Ingo, et al. "On availability for blockchain-based systems." *2017 IEEE 36th Symposium on Reliable Distributed Systems (SRDS)*. IEEE, 2017.
- Park, Sehyun, et al. "Nodes in the bitcoin network: comparative measurement study and survey." *IEEE Access* 7 (2019): 57009-57022.
- Liu, Ying, et al. "Evaluating the Reliability of Blockchain Based Internet of Things Applications." *2018 1st IEEE International Conference on Hot Information-Centric Networking (HotICN)*. IEEE, 2018.
- Melo, Carlos, et al. "Dependability evaluation of a blockchain-as-a-service environment." *2018 IEEE Symposium on Computers and Communications (ISCC)*. IEEE, 2018.

# Resources

- <https://www.hcltech.com/blogs/byzantine-fault-tolerance-bft-and-its-significance-blockchain-world>
- <https://www.betterlives.world/blog/blockchain-nutshell-basics/>
- <https://innovationincubator.com/features-of-blockchain/>
- <https://dci.mit.edu/51-attacks>
- <https://www.fxempire.com/education/article/51-attack-explained-the-attack-on-a-blockchain-513887>
- <https://www.mycryptopedia.com/double-spending-explained/#:~:text=Double%2Dspending%20is%20a%20problem,been%20broadcast%20on%20the%20network.>
- <https://distributed.com/guides/byzantine-fault-tolerance-the-key-for-blockchains>
- <https://medium.com/coinmonks/blockchain-what-is-a-node-or-masternode-and-what-does-it-do-4d9a4200938f>