SPPU

BLOCKCHAIN TECHNOLOGY

UNIT 3

Blockchain Platforms and Consensus in Blockchain

CONTENTS

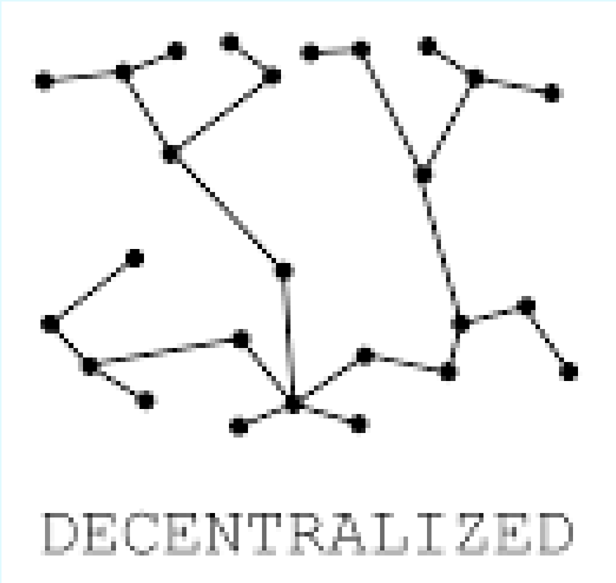
- **Types of Blockchain Platforms**: Public, Private and Consortium, Bitcoin, Ethereum, Hyperledger,IoTA, Corda, R3.
- **Consensus in Blockchain**: Consensus Approach, Consensus Elements, Consensus Algorithms, Proof of Work, Byzantine General problem, Proof of Stake, Proof of Elapsed Time, Proof of Activity, Proof of Burn.

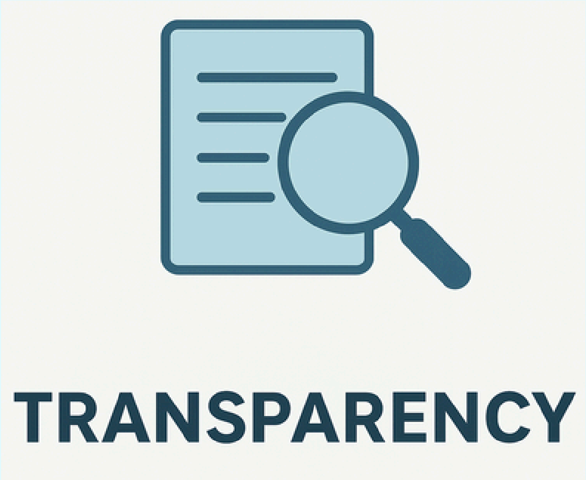
TYPES OF BLOCKCHAIN PLATFORMS

Blockchain is a distributed ledger technology that records transactions across multiple nodes securely.

Key features:

- Decentralization
- Transparency
- Immutability
- Security





TYPES OF BLOCKCHAIN PLATFORMS

Public Blockchain

Definition: Open to everyone; anyone can read, write, and participate.
Examples: Bitcoin, Ethereum
Features:

- Fully decentralized
- Transparent and secure
- Slower transactions due to consensus

Use Cases: Cryptocurrencies, decentralized apps (DApps)

Private Blockchain

Definition: Permissioned blockchain; controlled by one organization.
Examples: Hyperledger Fabric, R3 Corda
Features:

- Restricted access
- Faster and efficient transactions
- Centralized governance

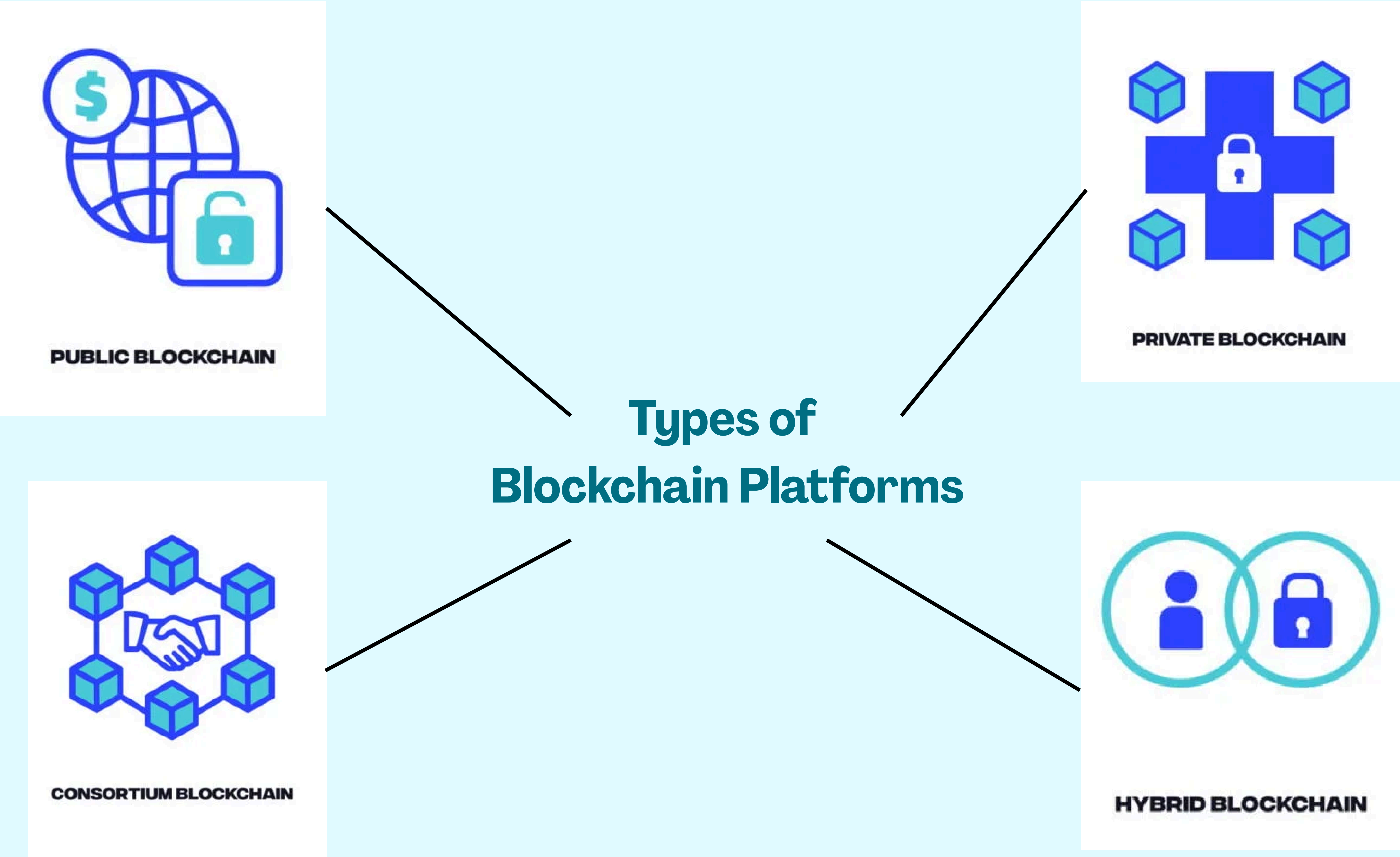
Use Cases: Supply chain, internal audits, enterprise solutions

Consortium Blockchain

Definition: Controlled by a group of organizations.
Examples: R3 Corda (used by banks)
Features:

- Partially decentralized
- Collaborative governance
- More secure than private, faster than public

Use Cases: Banking, insurance, healthcare


PUBLIC BLOCKCHAIN
PRIVATE BLOCKCHAIN
Types of
Blockchain Platforms
CONSORTIUM BLOCKCHAIN
HYBRID BLOCKCHAIN

POPULAR BLOCKCHAIN PLATFORMS

Bitcoin

- Type: Public Blockchain
- Key Features / Description:
  - First-ever cryptocurrency introduced in 2009 by an anonymous person/group called Satoshi Nakamoto.
  - Peer-to-peer digital currency, enabling direct transactions without intermediaries.
  - Uses Proof of Work (PoW) consensus to secure transactions.
  - Highly decentralized and transparent.
- Use Case:
  - Digital currency for payments and value transfer.
  - Store of value like “digital gold.”

POPULAR BLOCKCHAIN PLATFORMS

Ethereum

- Type: Public Blockchain
- Key Features / Description:
  - Introduced in 2015 by Vitalik Buterin.
  - Supports smart contracts—self-executing contracts with coded rules.
  - Enables Decentralized Applications (DApps) and decentralized finance (DeFi) solutions.
  - Allows creation and trading of NFTs (Non-Fungible Tokens).
  - Uses PoW currently (moving to Proof of Stake in Ethereum 2.0).
- Use Case:
  - Platforms for DApps, token creation, DeFi, NFTs, and decentralized marketplaces.

POPULAR BLOCKCHAIN PLATFORMS

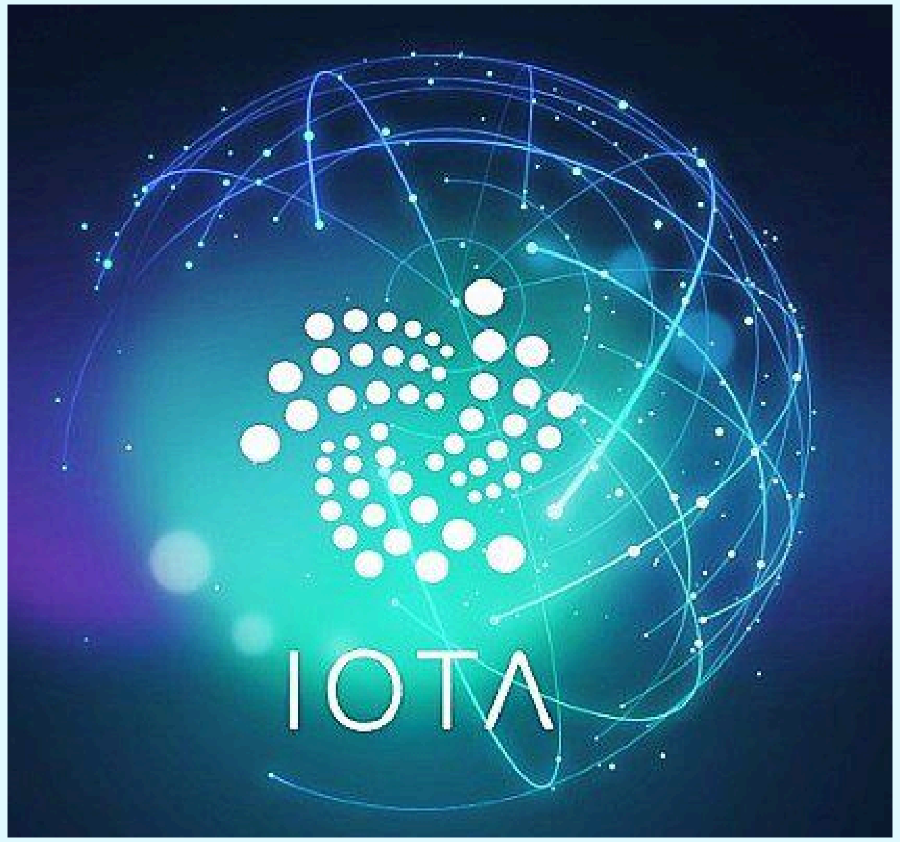
Hyperledger

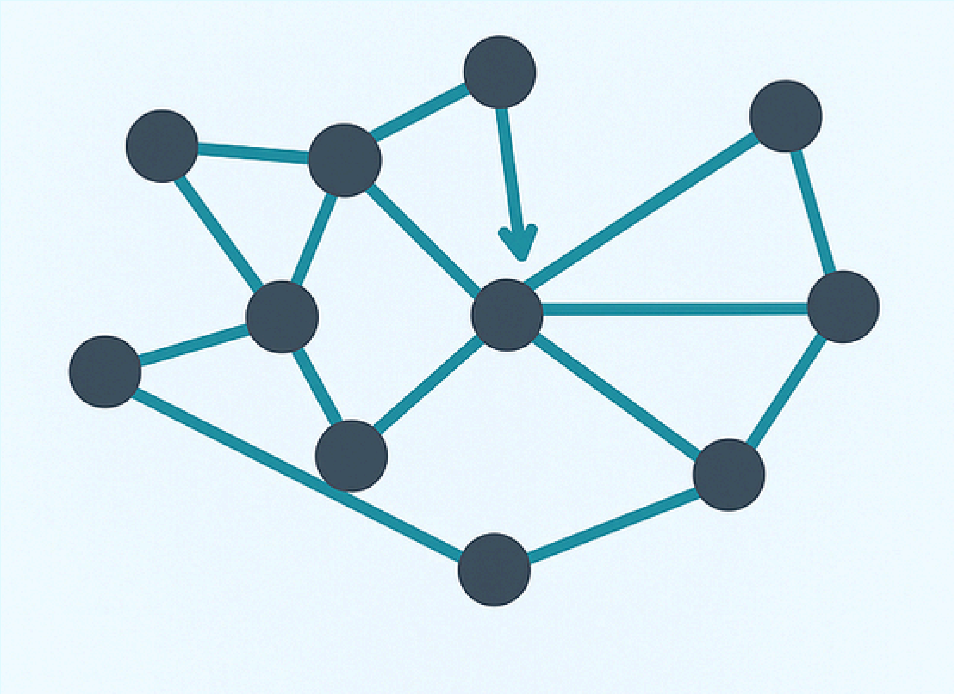
- Type: Private Blockchain
- Key Features / Description:
    - Open-source framework for building permissioned blockchains.
    - Modular design allows customization for different business needs.
    - Controlled access ensures data privacy within organizations.
    - Supports enterprise-level applications with high transaction throughput.
- Use Case:
    - Supply chain management, enterprise record-keeping, internal auditing, and trade finance.

POPULAR BLOCKCHAIN PLATFORMS

IOTA

- Type: Public Blockchain
- Key Features / Description:
  - Designed specifically for Internet of Things (IoT) devices.
  - Uses Tangle (a directed acyclic graph) instead of traditional blockchain.
  - Fee-less transactions and highly scalable for microtransactions.
  - Lightweight protocol suitable for devices with limited resources.
- Use Case:
  - IoT networks, smart devices, and sensor data micropayments.





POPULAR BLOCKCHAIN PLATFORMS

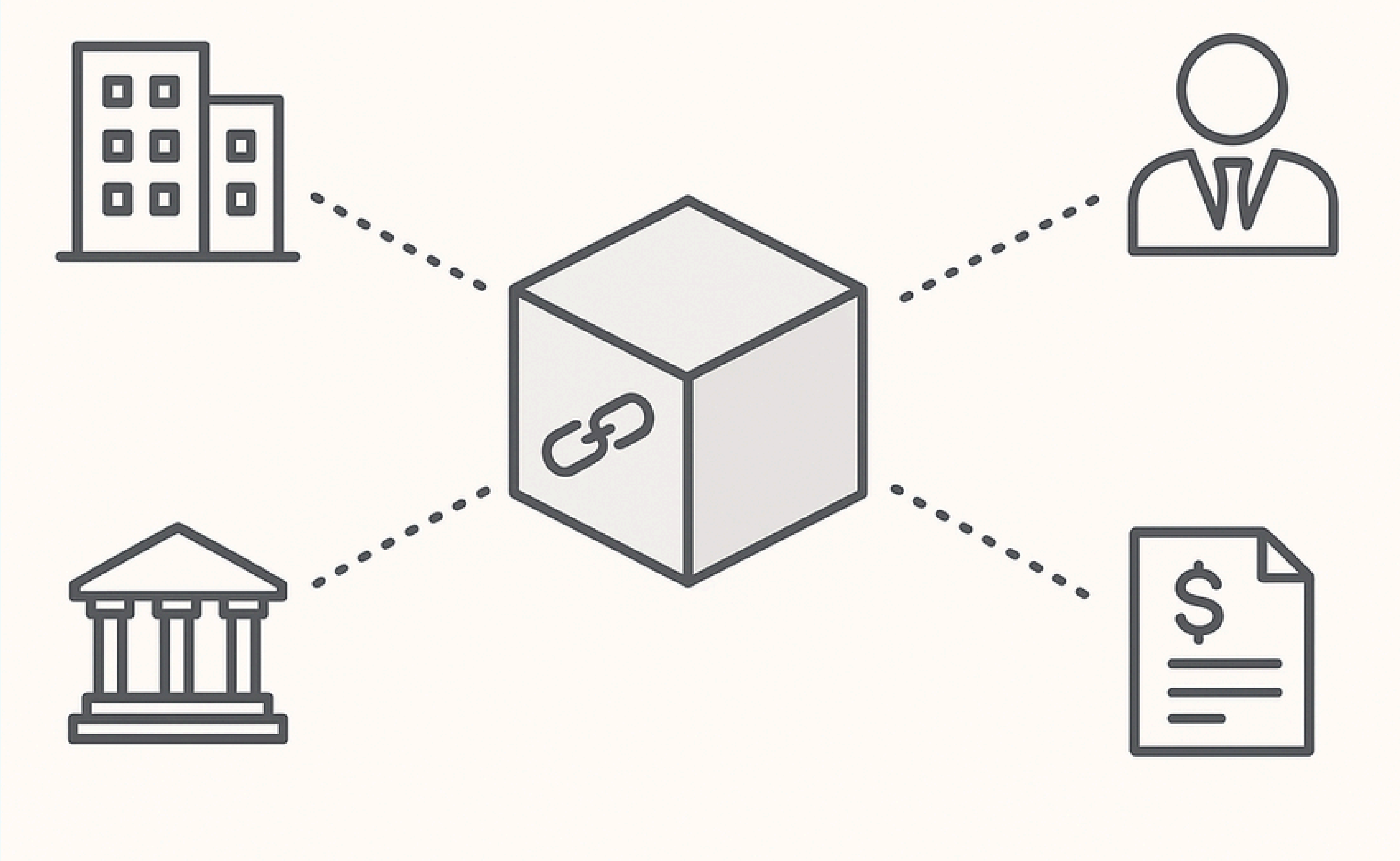
R3

- Type: Consortium Blockchain
- Key Features / Description:
  - Enterprise blockchain platform and consortium of financial institutions.
  - Focus on collaborative governance between organizations.
  - Provides tools for secure financial transactions and compliance.
  - Facilitates shared ledger solutions for banks and enterprises.
- Use Case:
  - Banking networks, cross-border settlements, regulatory reporting, and finance infrastructure projects.

POPULAR BLOCKCHAIN PLATFORMS

Corda

- Type: Consortium Blockchain
- Key Features / Description:
  - Developed by R3, specifically for regulated industries.
  - Allows private, secure transactions between authorized participants.
  - Handles complex workflows for financial and legal transactions.
  - Not a traditional blockchain—uses ledger for secure peer-to-peer agreements.
- Use Case:
  - Banking, insurance, trade finance, and other enterprise-grade financial applications.



CONSENSUS IN BLOCKCHAIN

Definition: Consensus is the mechanism that ensures all nodes in a blockchain network agree on a single version of the ledger.

Purpose:

- Maintains data integrity
- Ensures trust in a decentralized network
- Prevents double spending and fraud

Consensus Elements

- Nodes: Participants validating transactions
- Transaction Ledger: Shared record that nodes agree on
- Validation Rules: Criteria for accepting transactions
- Incentives: Rewards for honest participation (coins, tokens)

CONSENSUS IN BLOCKCHAIN

Agreement

All nodes accept the same transaction/block

Cooperation

Nodes work together for validation

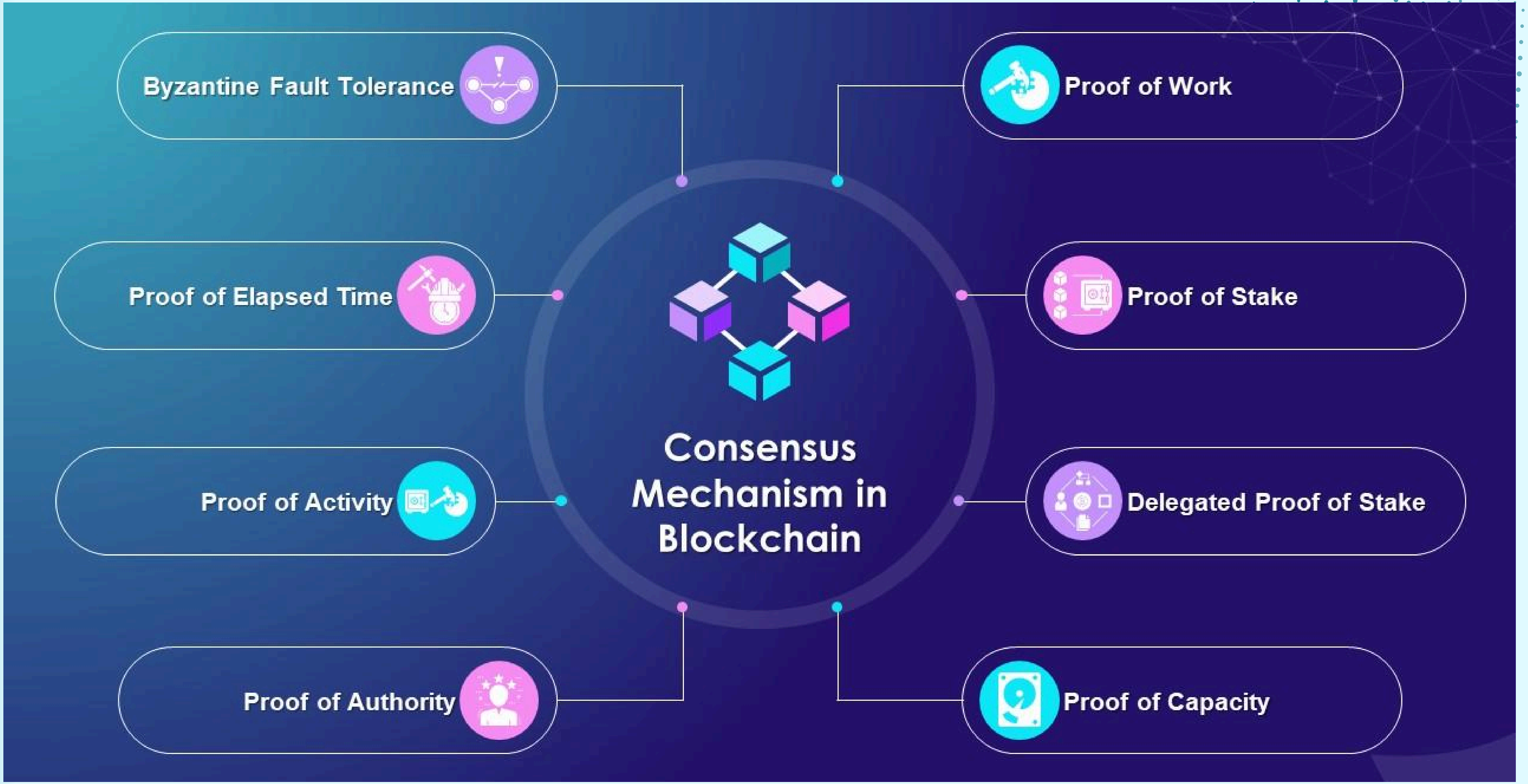
Equal Rights

Each node has equal voting power

Participation

Every node can contribute to consensus

CONSENSUS ALGORITHMS



Proof of Work (PoW)

Definition: A consensus algorithm in which network participants (miners) compete to solve a complex mathematical puzzle to validate transactions and create new blocks.

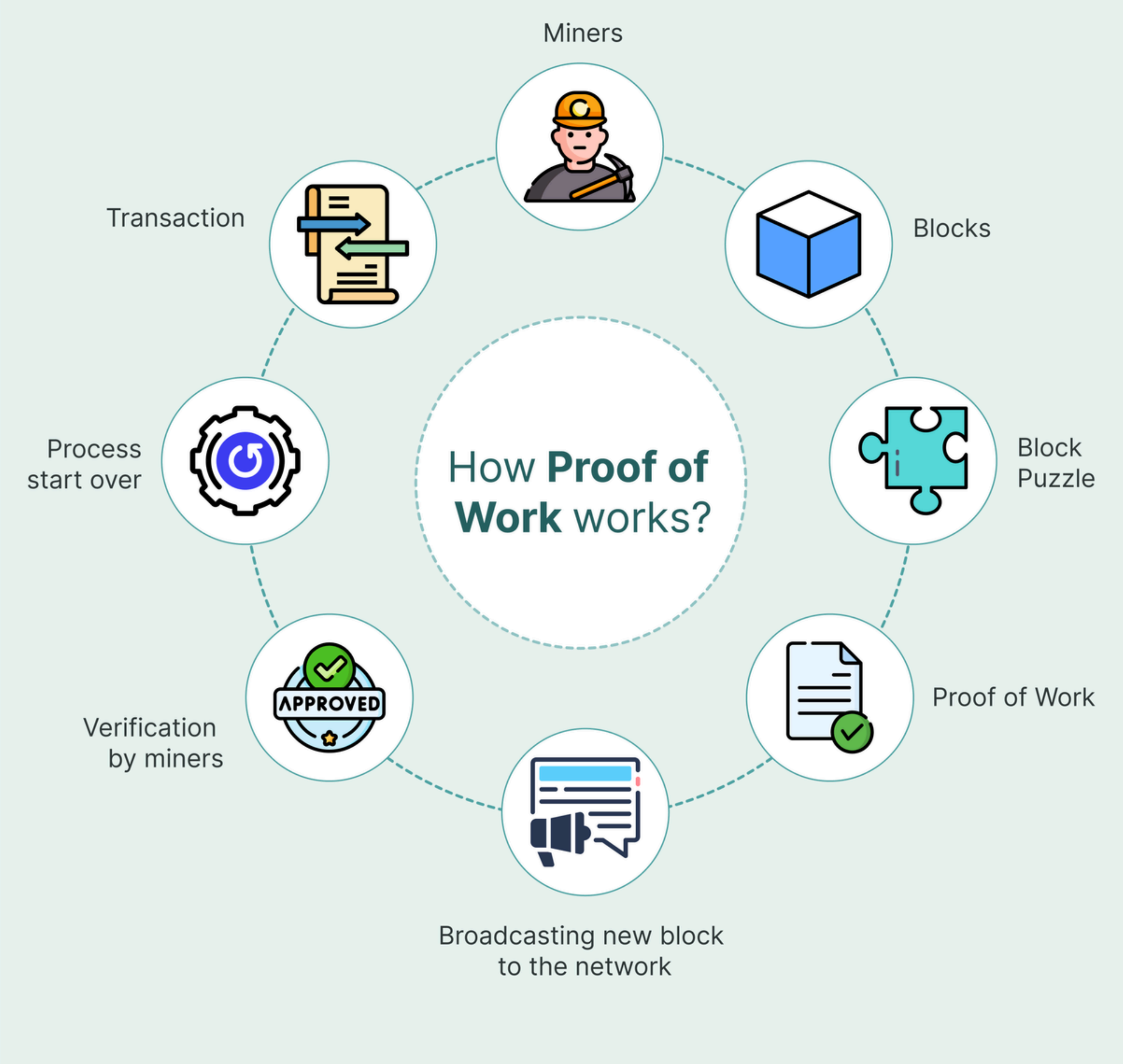
Key Features:

- Decentralized and secure
- Requires high computational power
- Prevents double-spending

Pros: Highly secure and resistant to tampering

Cons: Energy-intensive and slower transaction speeds

Example: Bitcoin



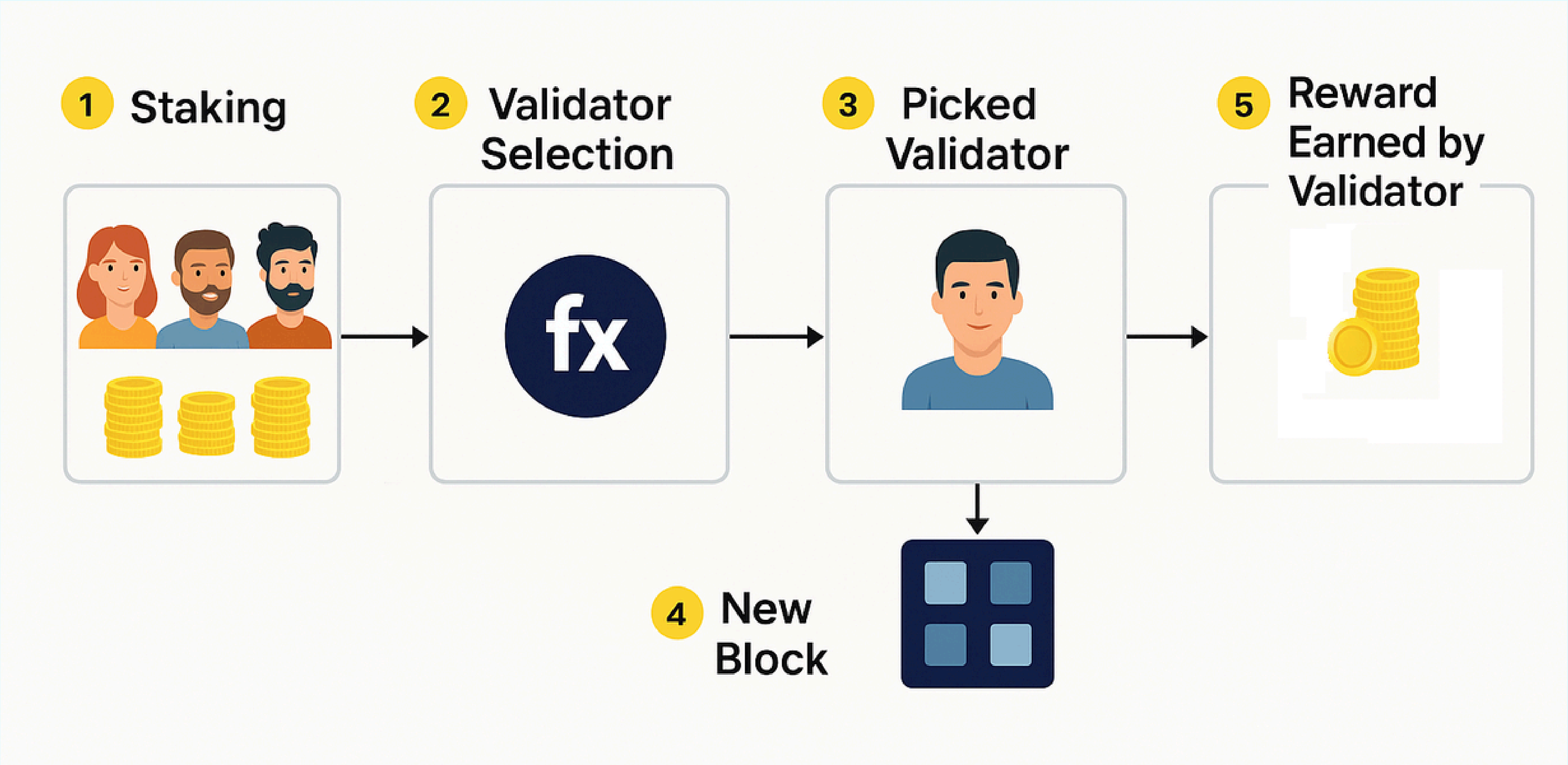
Proof of Stake (PoS)

Definition: A consensus mechanism where validators are chosen to create blocks based on the amount of cryptocurrency they "stake" as collateral.

Key Features:

- Energy-efficient (does not require solving puzzles)
- Reduces risk of centralization with proper randomization
- Penalizes dishonest behavior by slashing stake

Example: Ethereum 2.0



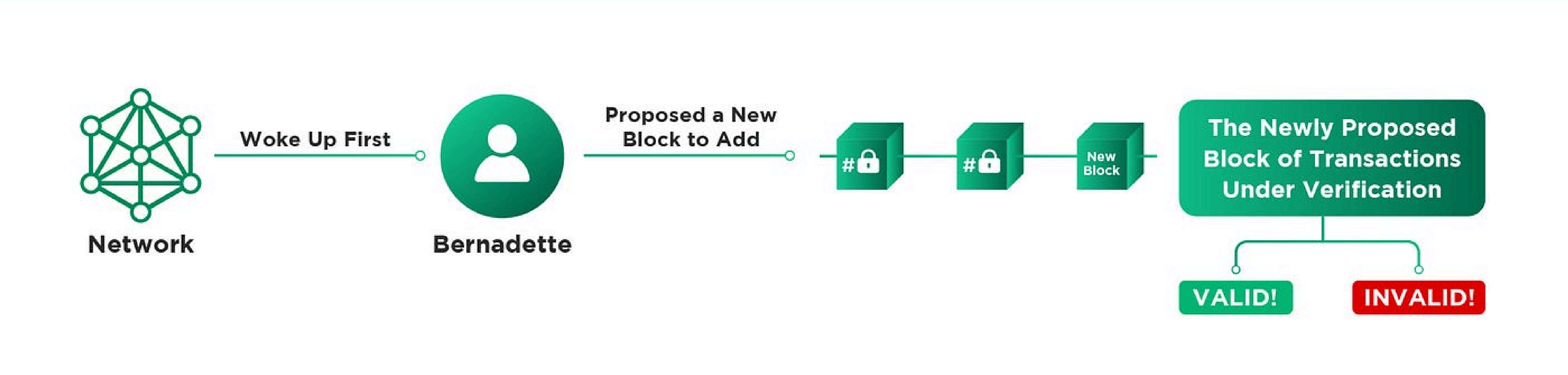
Proof of Elapsed Time (PoET)

Definition: Consensus algorithm mainly used in permissioned blockchains where each node waits for a randomly assigned time, and the first one to finish the wait gets to create the block.

Key Features:

- Energy-efficient
- Fair and random selection of block creators
- Mostly used in enterprise blockchains

Example: Hyperledger Sawtooth



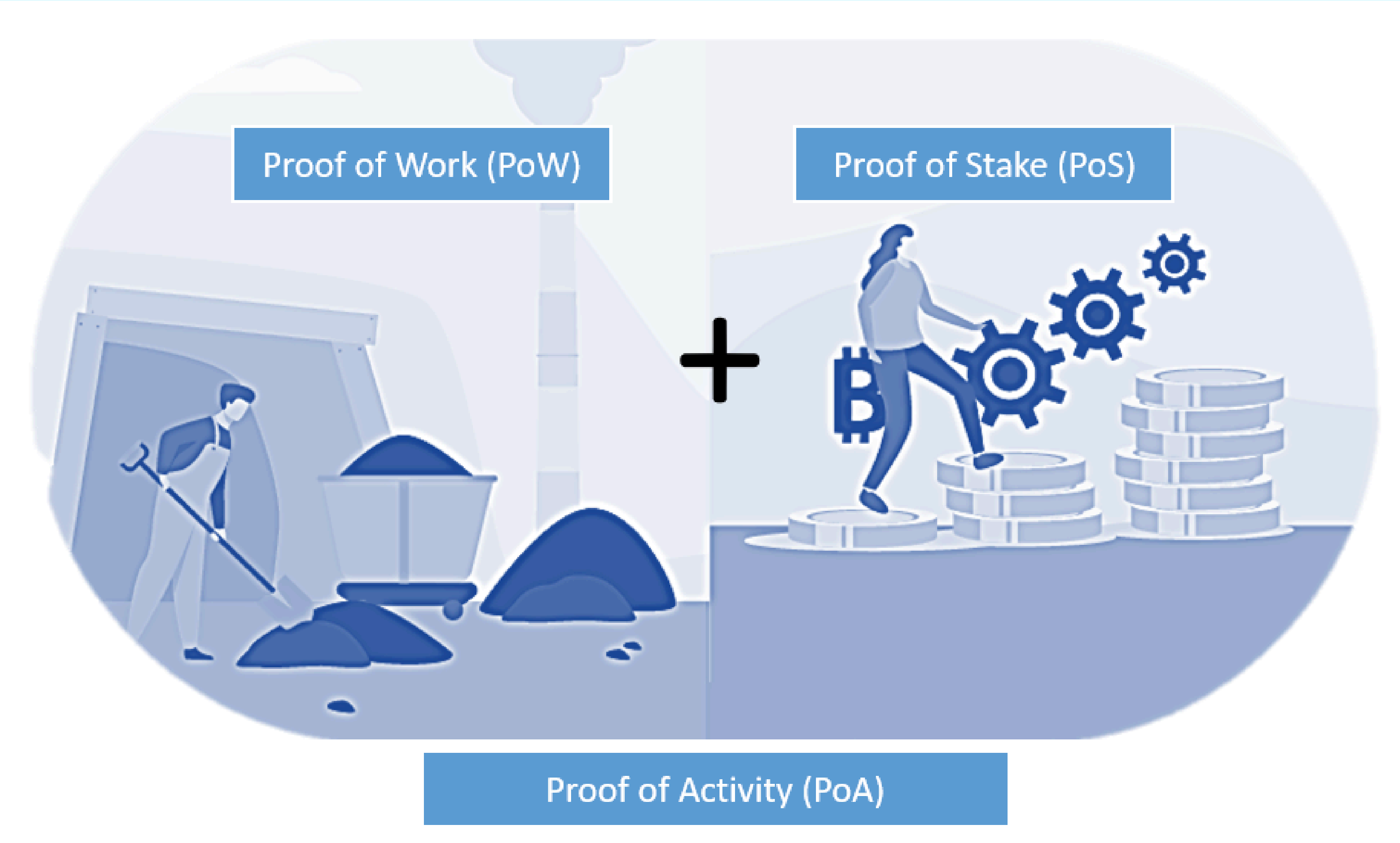
Proof of Activity(PoA)

Definition: Hybrid consensus mechanism that combines PoW and PoS.

Key Features:

- Combines security of PoW with efficiency of PoS
- Reduces energy consumption compared to pure PoW
- Encourages both mining and staking participation

Example: Particl



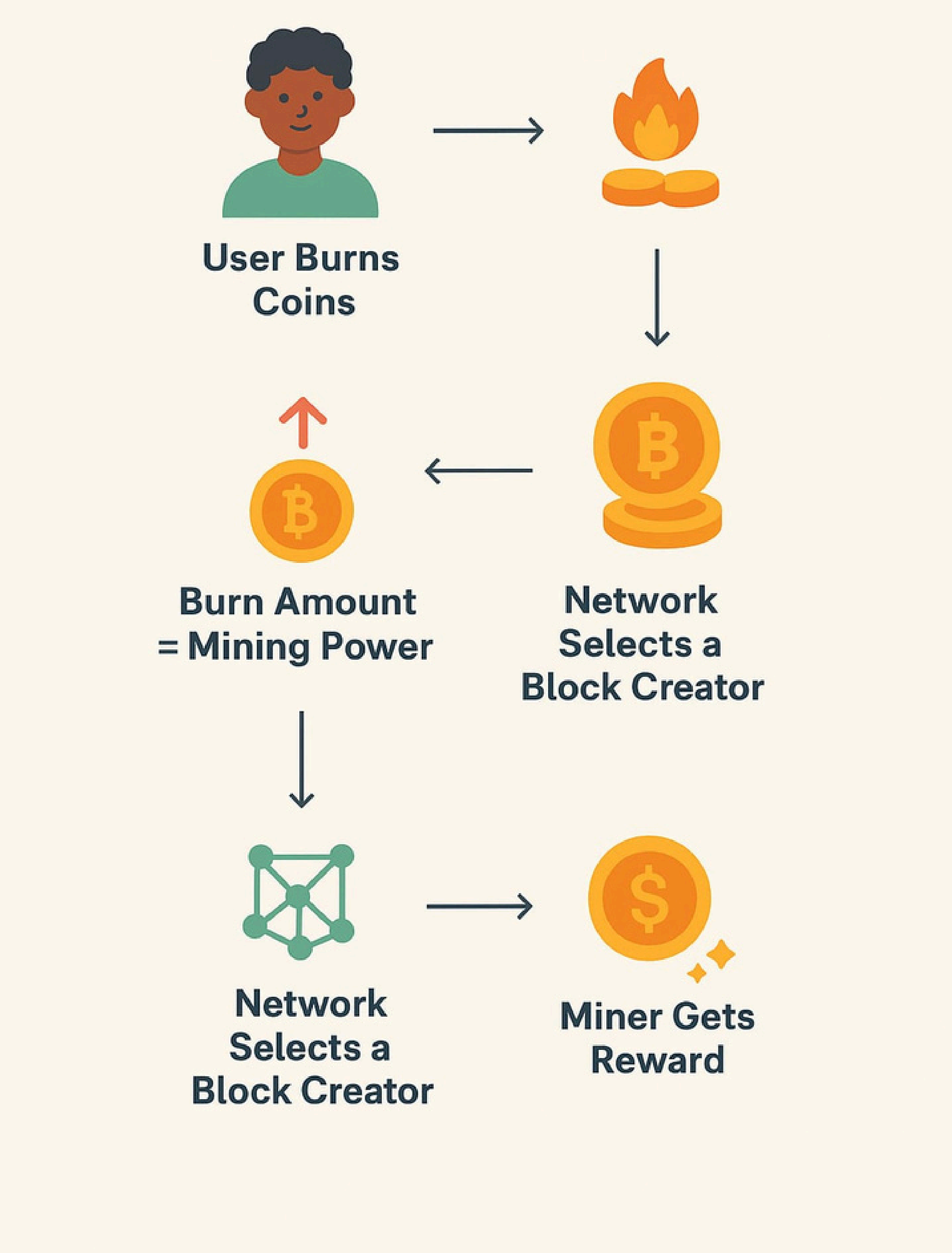
Proof of Burn

Definition: A consensus algorithm where participants "burn" (destroy) coins to earn the right to mine new blocks.

Key Features:

- Reduces energy consumption
- Introduces a cost to participate, deterring spamming
- Some coins are permanently destroyed, reducing total supply

Example: Slimcoin



Byzantine General Problem

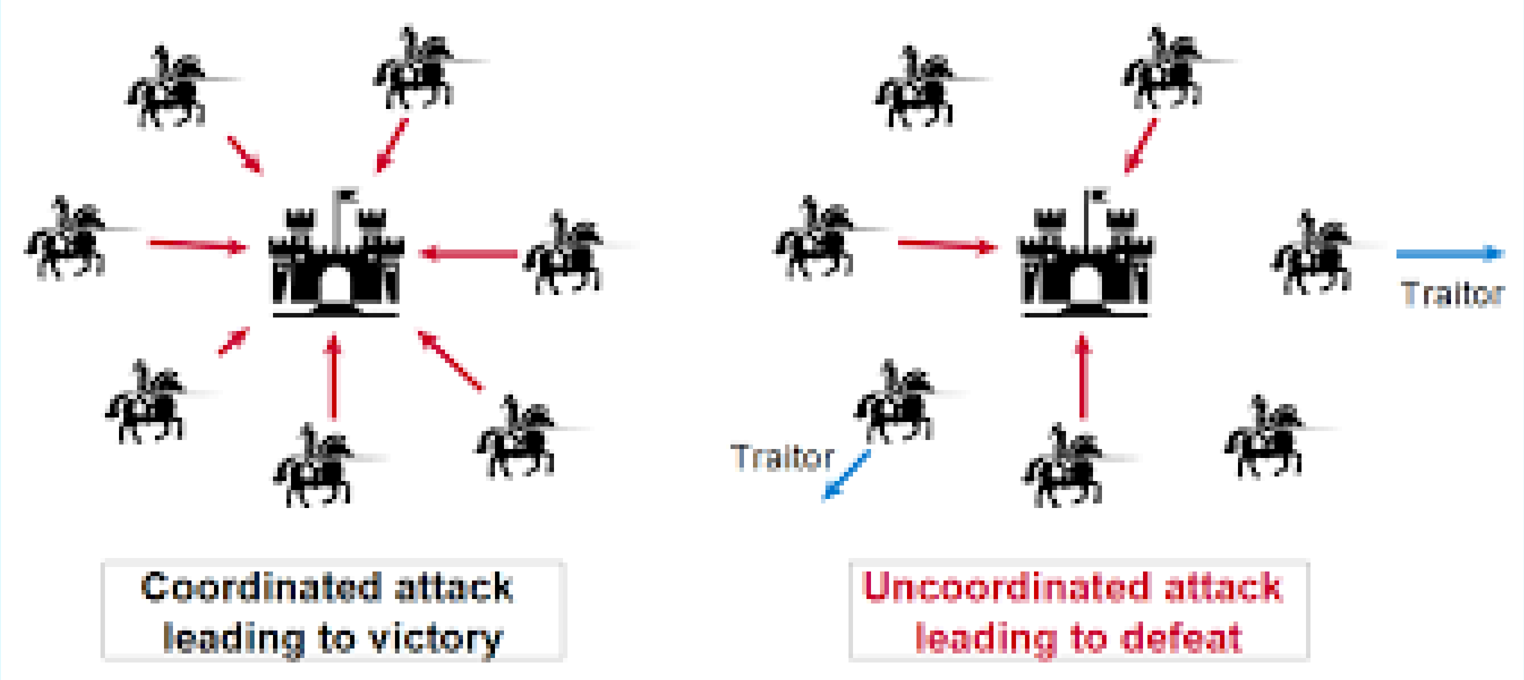
Definition: A classic problem in distributed computing describing the challenge of reaching agreement in a network where some nodes may be unreliable or malicious.

Scenario:

- Imagine generals of an army need to agree on a coordinated attack, but some generals may be traitors sending conflicting messages.
- The problem is to reach consensus even with malicious actors.

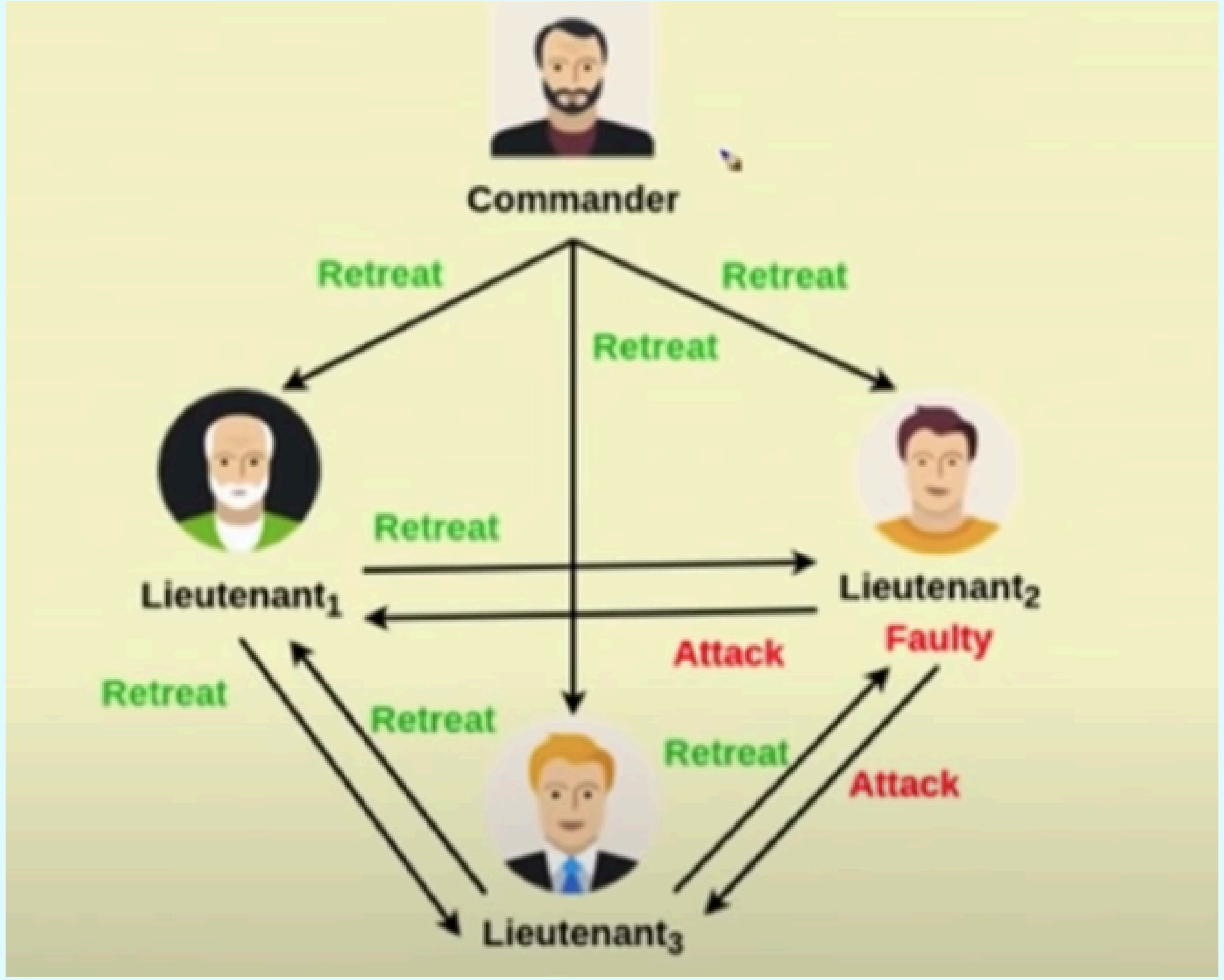
Relevance to Blockchain:

- Blockchains solve this problem using consensus algorithms like PoW, PoS, and PBFT.
- Ensures all honest nodes agree on the same version of the ledger



Byzantine Fault Tolerance (BFT) is the ability of a distributed system to continue operating correctly and reach a common agreement even when some of its nodes behave arbitrarily, maliciously, or send incorrect or inconsistent information.

A BFT system ensures that all honest nodes can agree on the same valid state of the system despite the presence of faulty or compromised participants.



GYAAN
SANDHI
YOUR BRIDGE TO BRILLIANCE

THANK YOU

LIKE

Share

SUBSCRIBE