

BLOCKCHAIN FOR IoT AND DATA SECURITY

LAURA GARCÍA GARCÍA

Índice

01 **What is Blockchain?**

02 **Blockchain use cases and applications**

03 **Creating our own Blockchain network**



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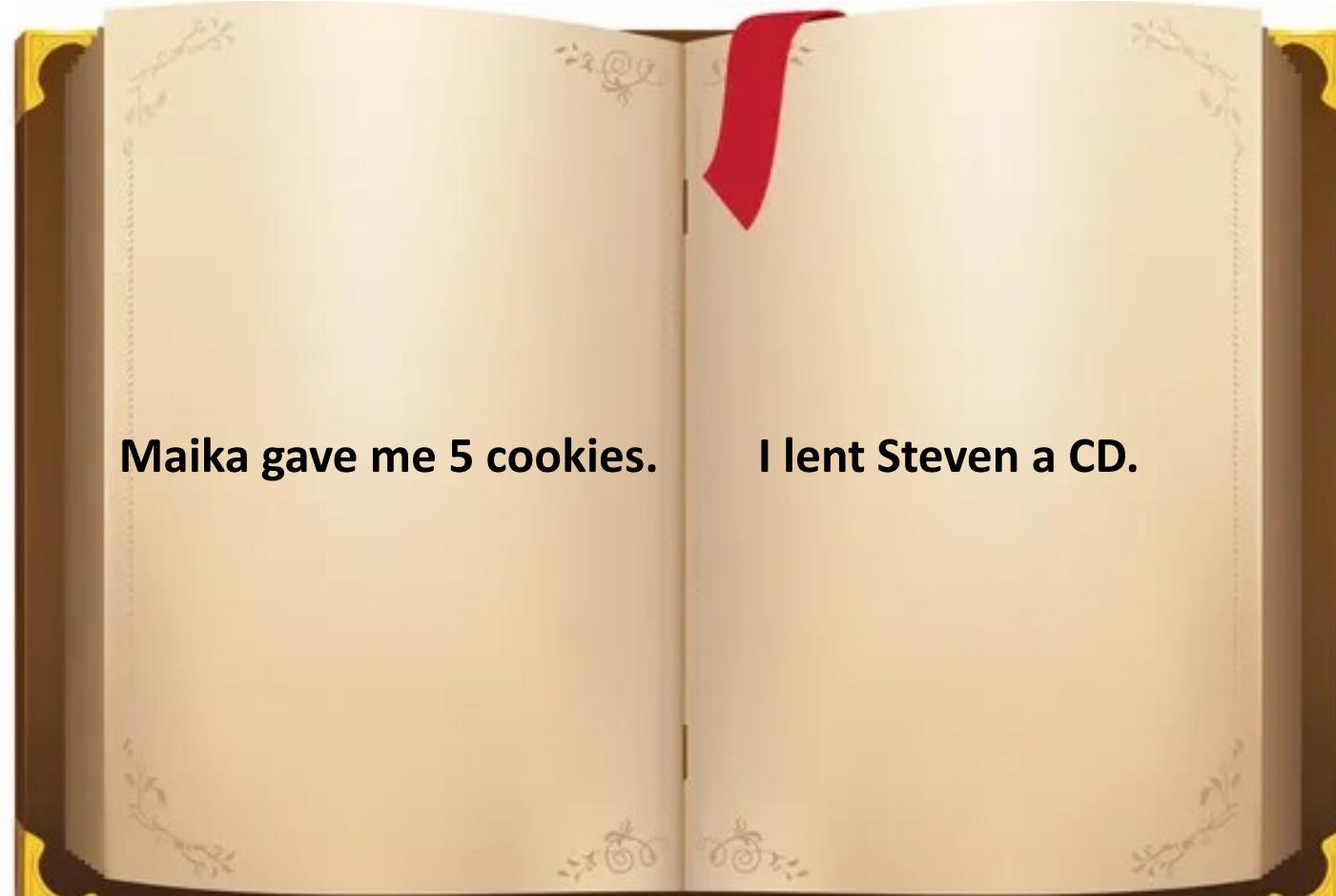
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Part 1.

What is Blockchain?

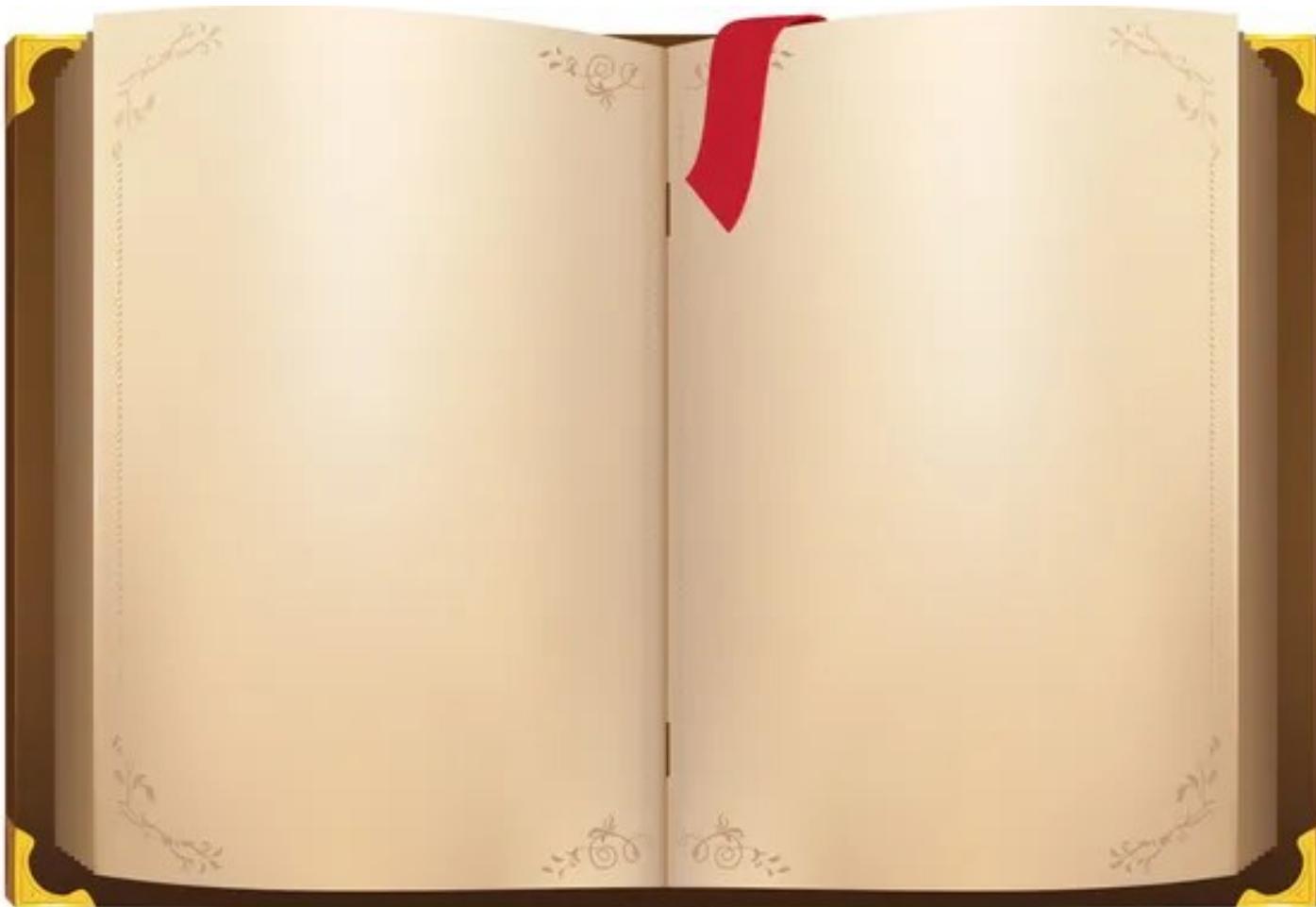
Blockchain



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Long premises 5903 Arch st. recorded
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page 216 d.c.
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Rec. 4/24/19 of John Adams &
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Mary J. Gates premises
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Page 132 ✓
Mary Gates

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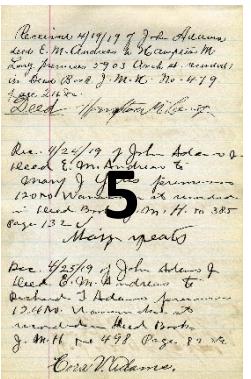
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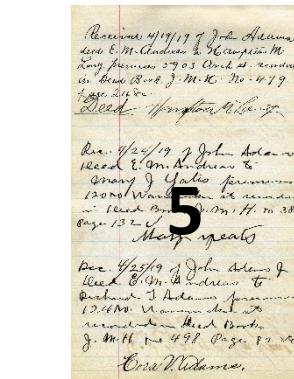
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Blockchain



Distributed database

Shared

Immutable

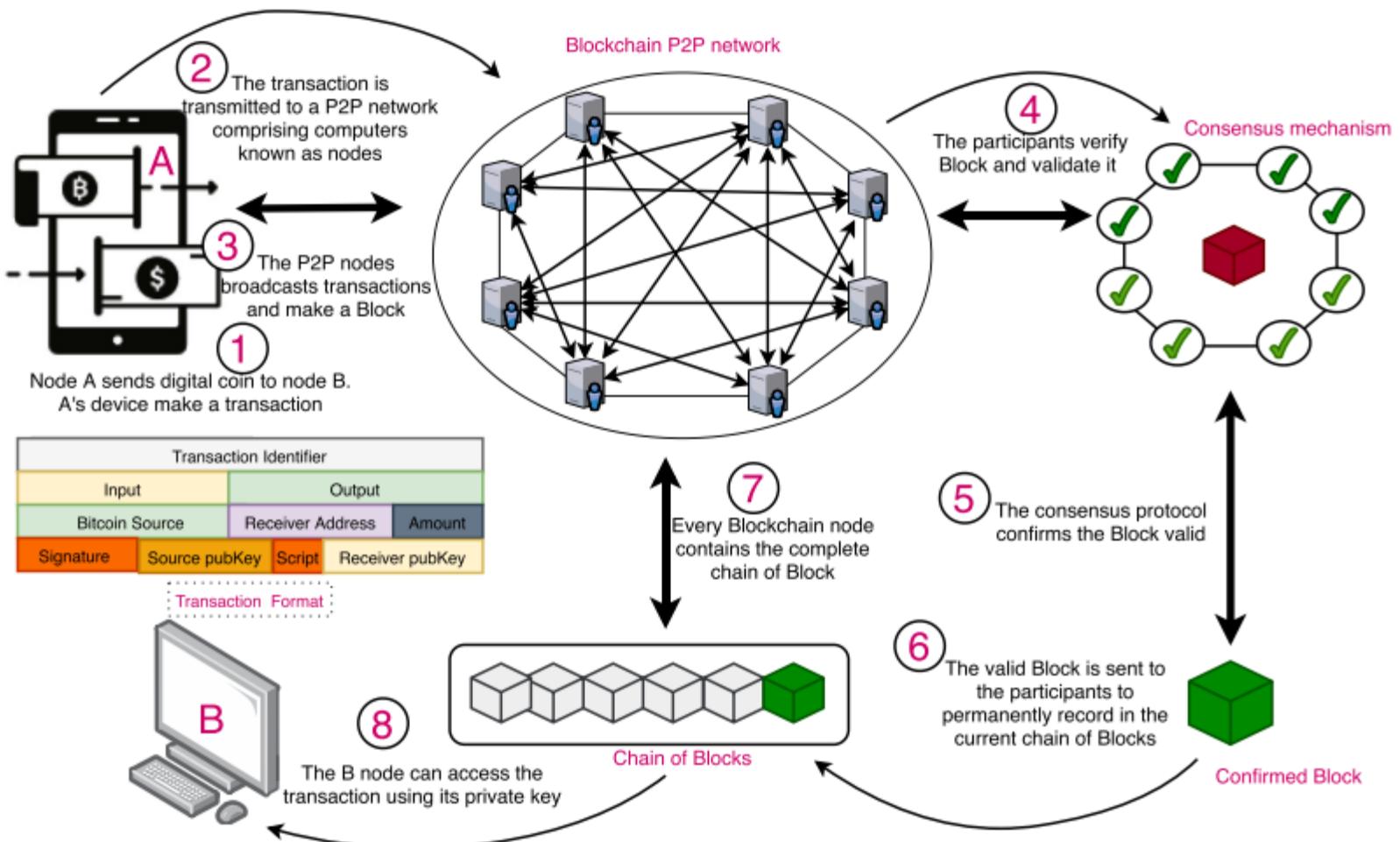


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How blockchain works



Uddin, M. A., Stranieri, A., Gondal, I., & Balasubramanian, V. (2021). A survey on the adoption of blockchain in iot: Challenges and solutions. *Blockchain: Research and Applications*, 2(2), 100006.



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First concept: Encryption and Hashing



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ENCRYPTION



PLAIN TEXT

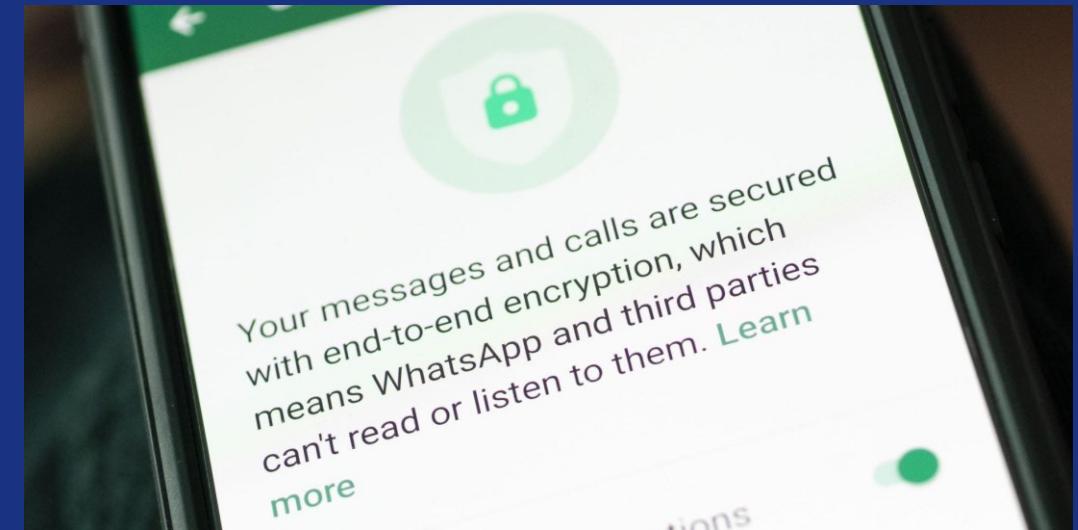


ENCRYPTED TEXT

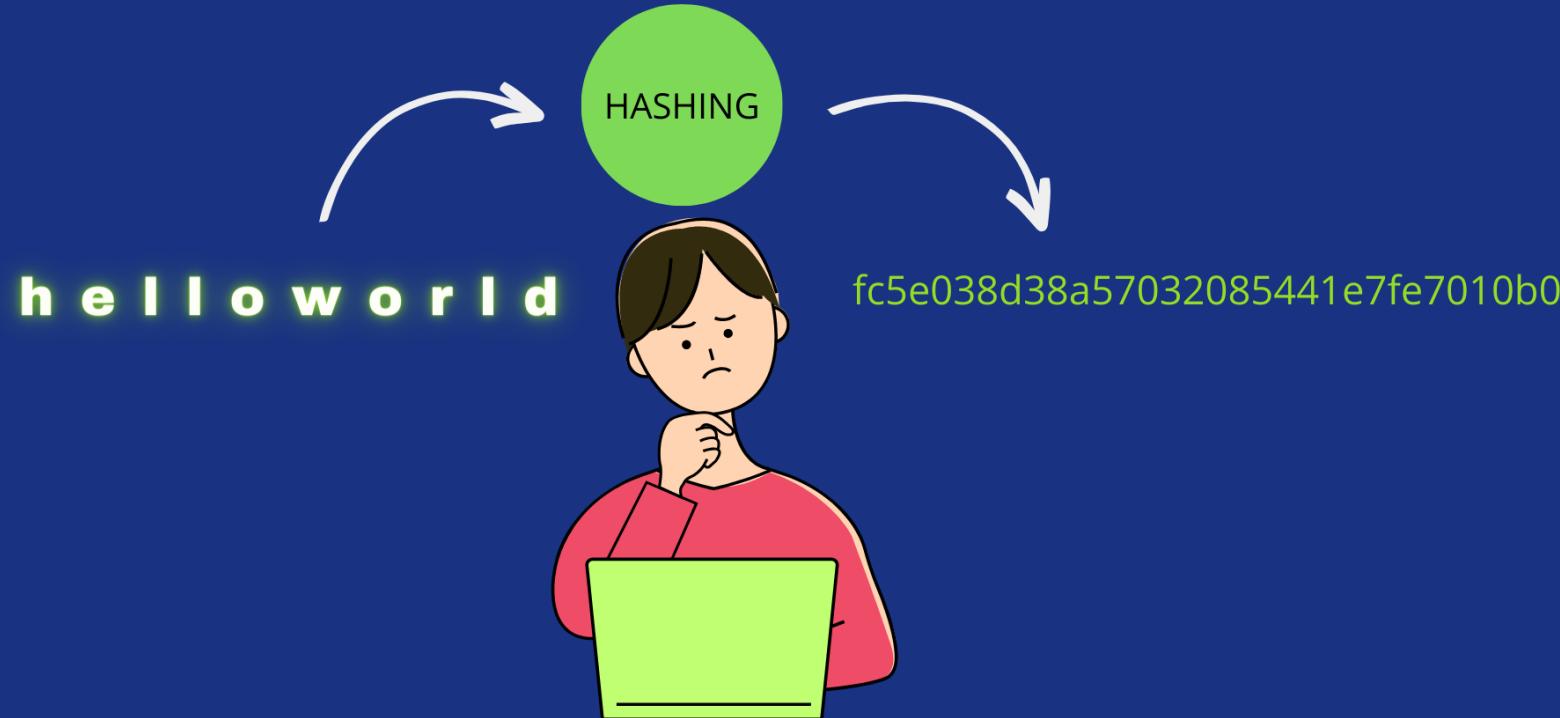


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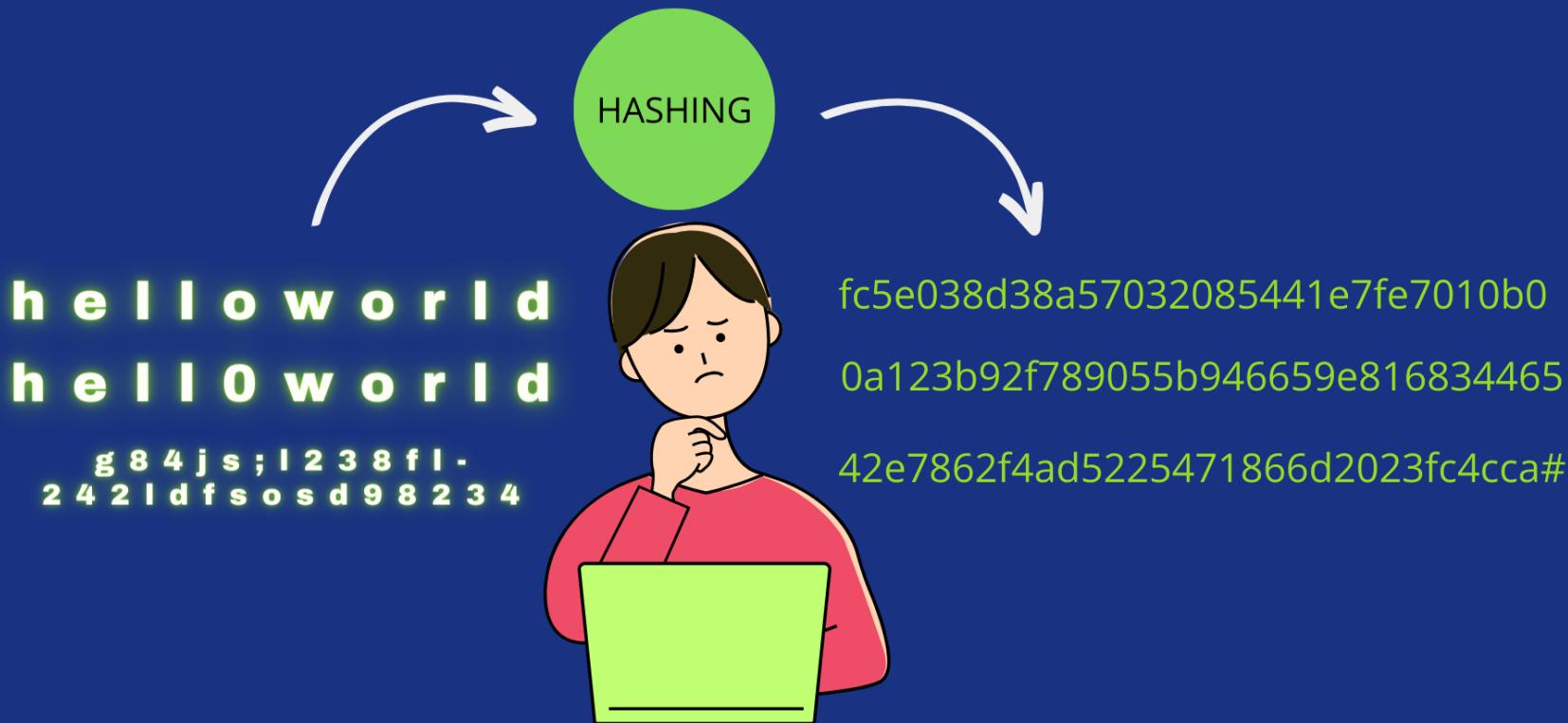
ENCRYPTION



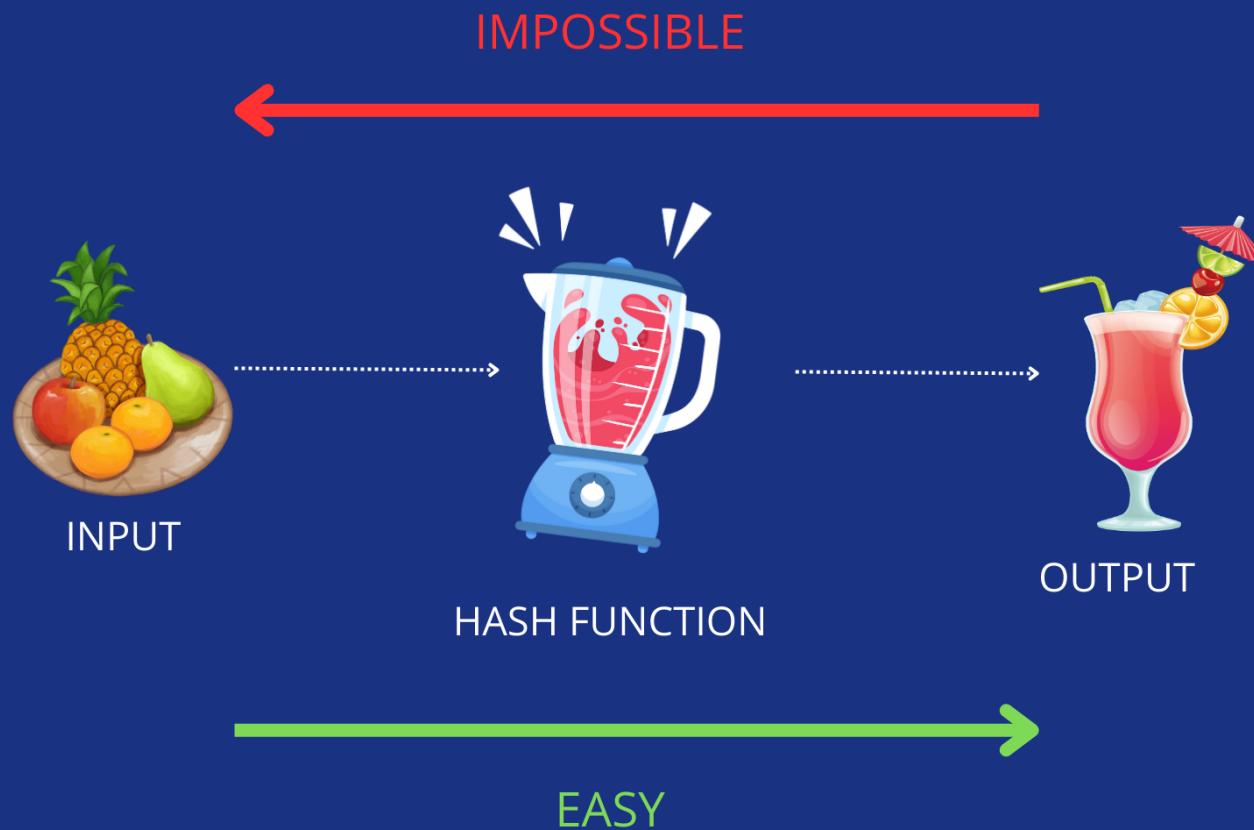
HASHING



HASHING



HASHING



HASHING

1

Data Verification: A hash is a distinct, unchanging string generated from data, often used to verify the integrity of data.

2

Enhanced Security: Hashing enhances network security by providing a unique digital fingerprint for data.

3

Efficient Verification: Hashes allow for efficient data verification, making alterations detectable.

4

Data Integrity: Hashes are used to ensure the integrity of stored data and to maintain the reliability of the network.

What are blocks?



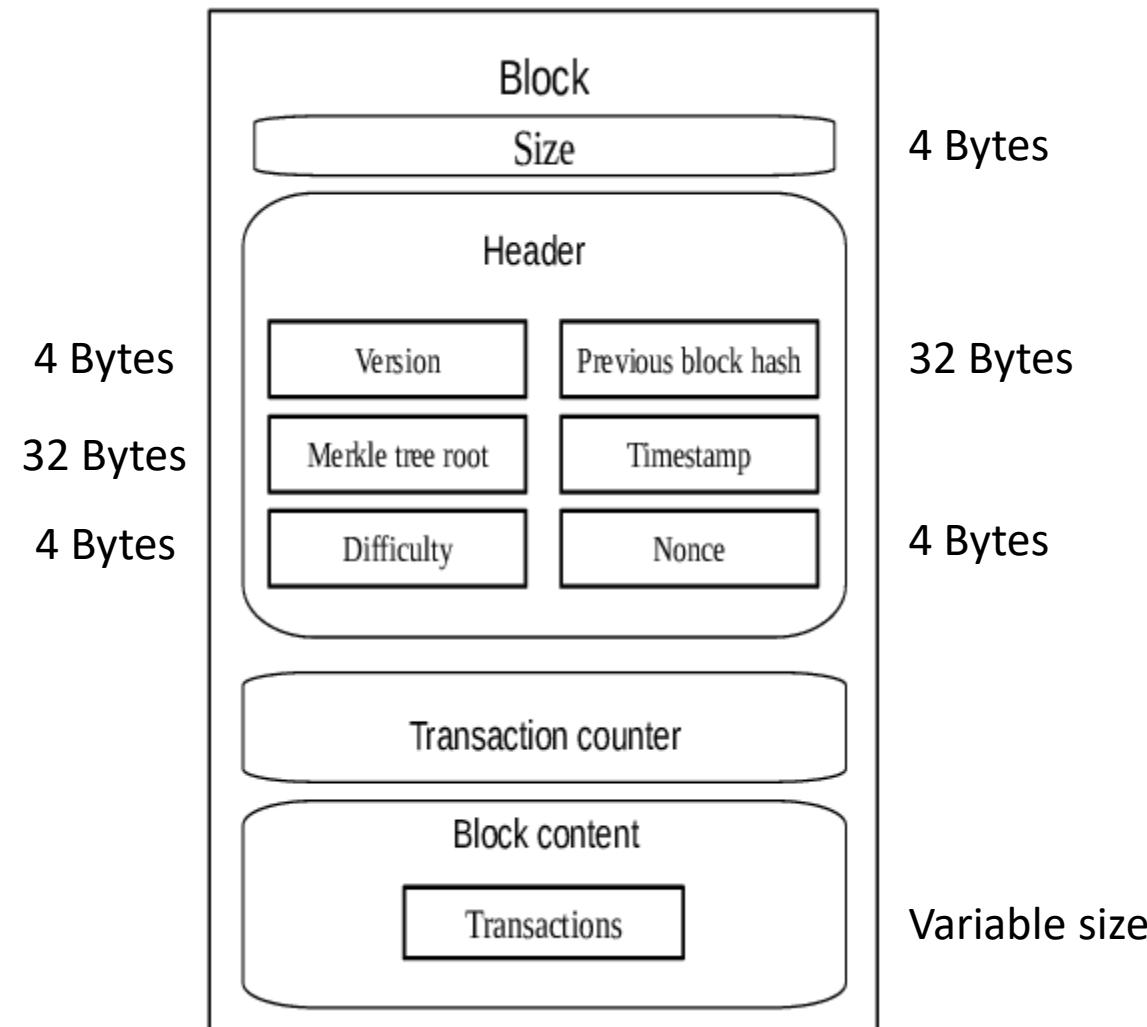
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Structure of a Block



Basegio, T. L., Michelin, R. A., Zorzo, A. F., & Bordini, R. H. (2018). A decentralised approach to task allocation using blockchain. In *Engineering Multi-Agent Systems: 5th International Workshop, EMAS 2017, São Paulo, Brazil, May 8-9, 2017, Revised Selected Papers 5* (pp. 75-91). Springer International Publishing.

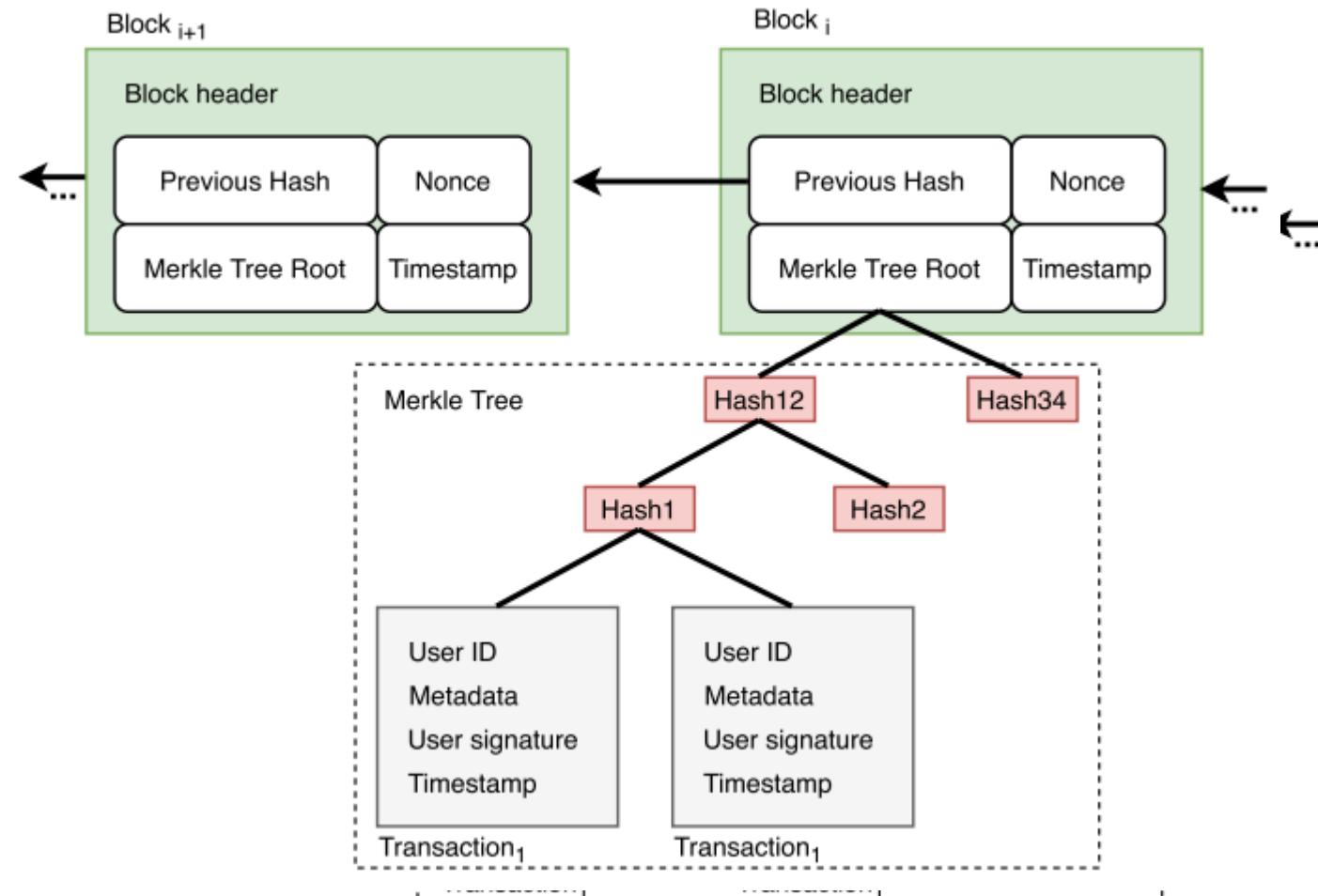


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Structure of a Block



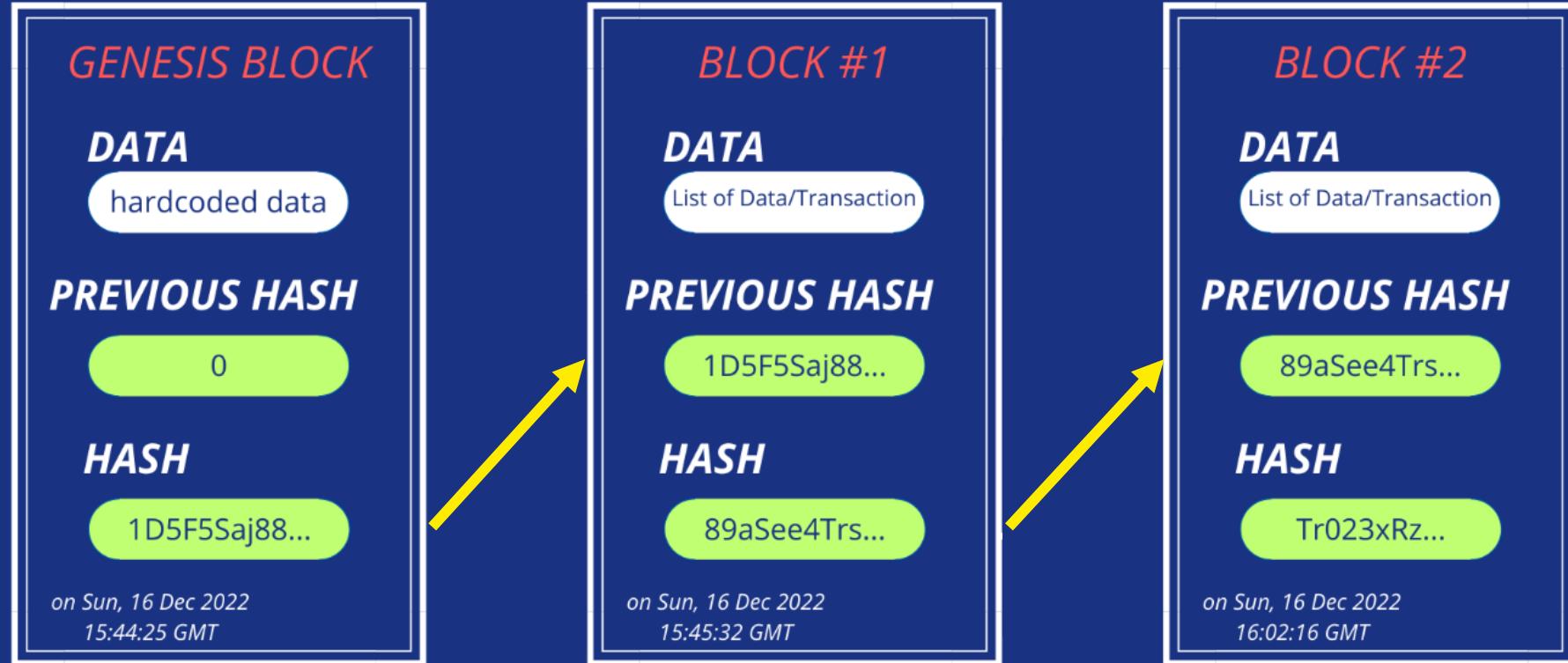
Uddin, M. A., Stranieri, A., Gondal, I., & Balasubramanian, V. (2021). A survey on the adoption of blockchain in iot: Challenges and solutions. *Blockchain: Research and Applications*, 2(2), 100006.



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DATA IN THE BLOCKCHAIN



Consensus protocols

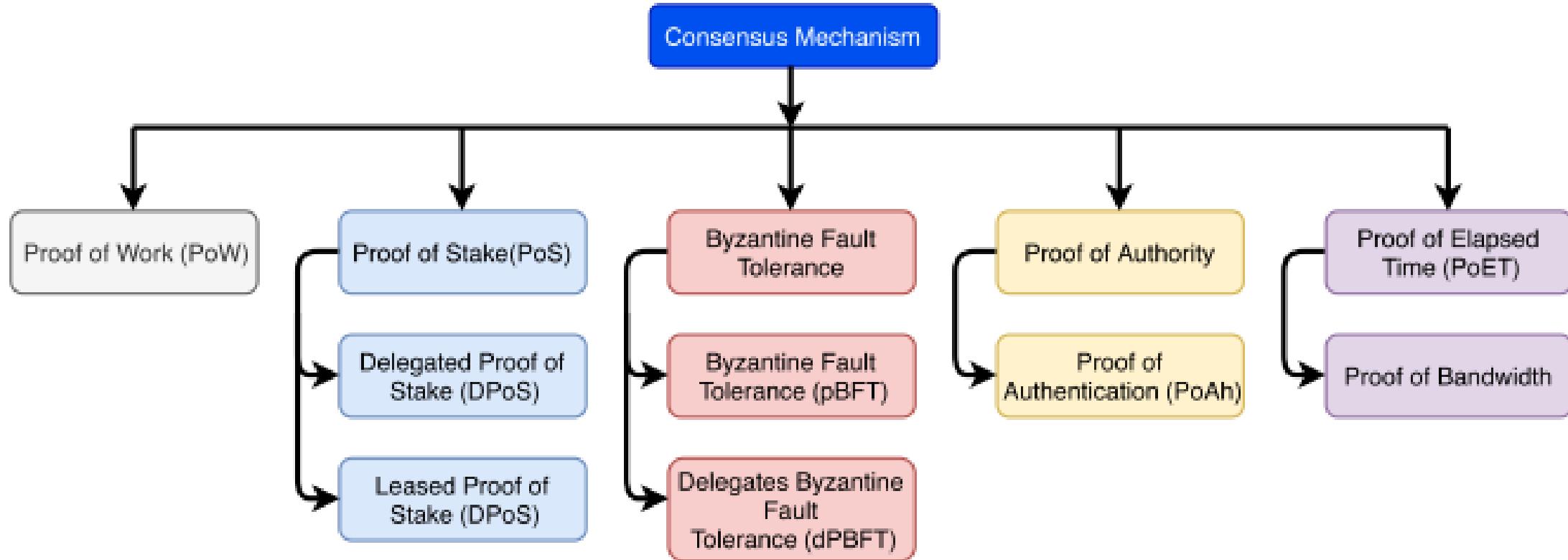


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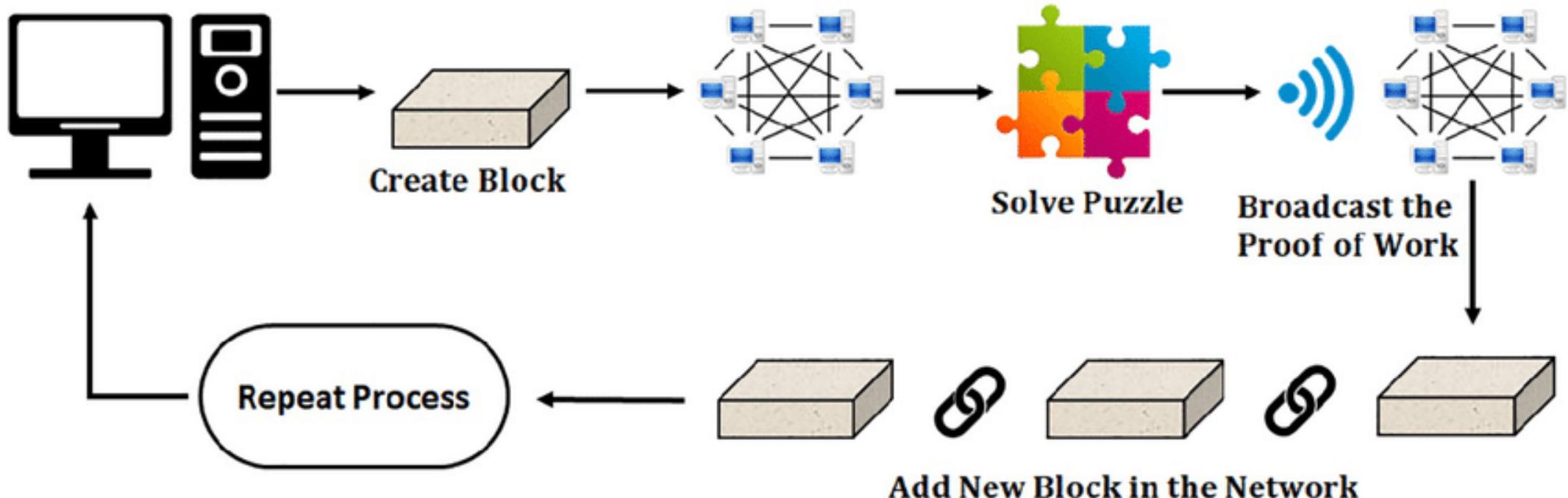
Consensus protocols



Uddin, M. A., Stranieri, A., Gondal, I., & Balasubramanian, V. (2021). A survey on the adoption of blockchain in iot: Challenges and solutions. *Blockchain: Research and Applications*, 2(2), 100006.

Consensus protocols

Proof of Work (PoW) → Bitcoin



Latif, S., Idrees, Z., e Huma, Z., & Ahmad, J. (2021). Blockchain technology for the industrial Internet of Things: A comprehensive survey on security challenges, architectures, applications, and future research directions. *Transactions on Emerging Telecommunications Technologies*, 32(11), e4337.

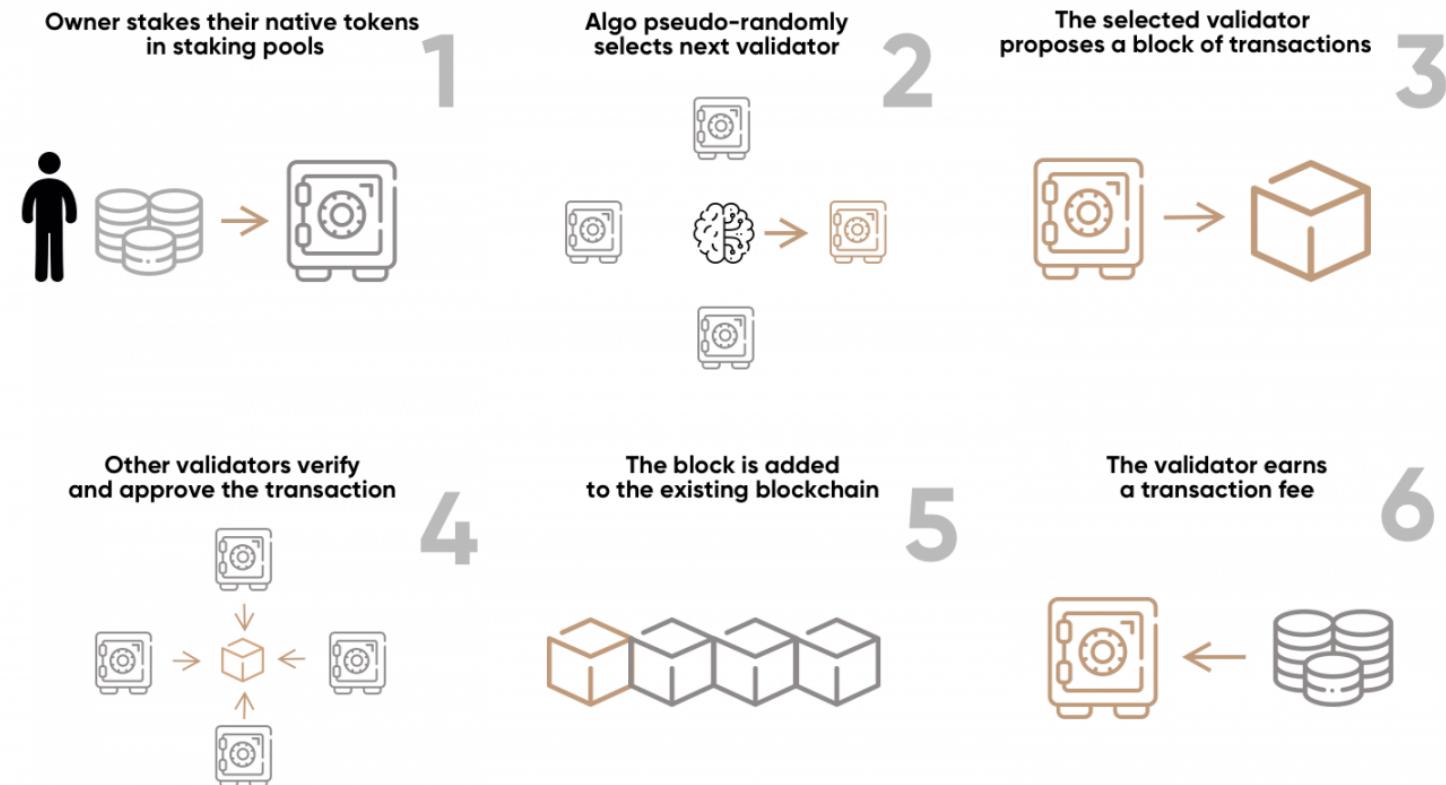


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Consensus protocols

Proof of Stake (PoS) → Ethereum



Consensus protocols

Two Ways to Validate Cryptocurrency Transactions



PoS Proof of Stake

Owners of the cryptocurrency can stake their coins, then the protocol selects a validator who adds a new block of transactions and earns rewards.

Low

PoS doesn't require validators to purchase specialized equipments or to solve complex equations.

ENERGY USAGE

PoW Proof of Work

The first miner to solve the puzzle (finding a target hash) gets to add a block of transactions and earn rewards.

High

PoW requires hardwares and energy, because mining capacity depends largely on a miner's computational power.



The Motley Fool.



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Nodes



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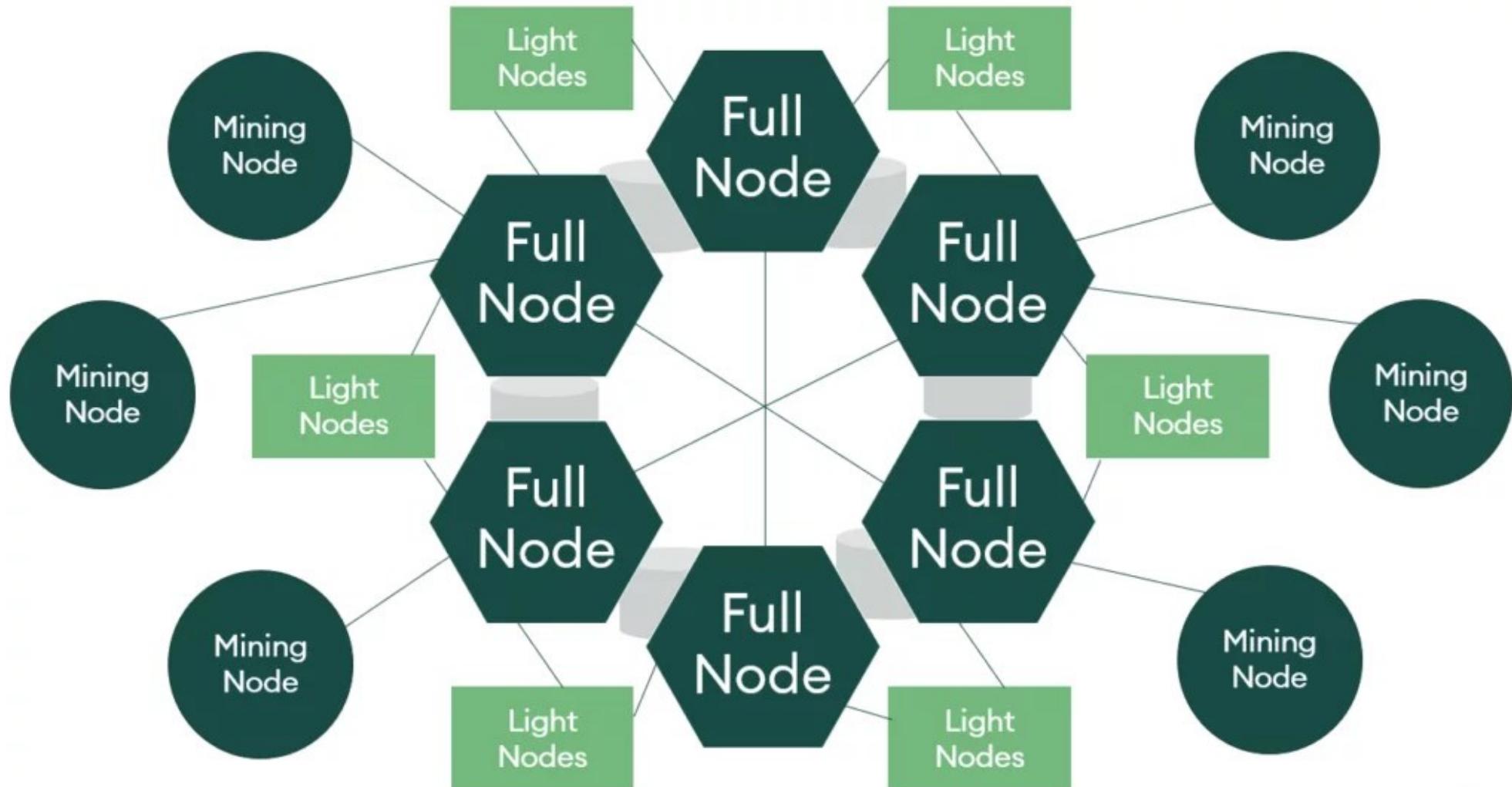


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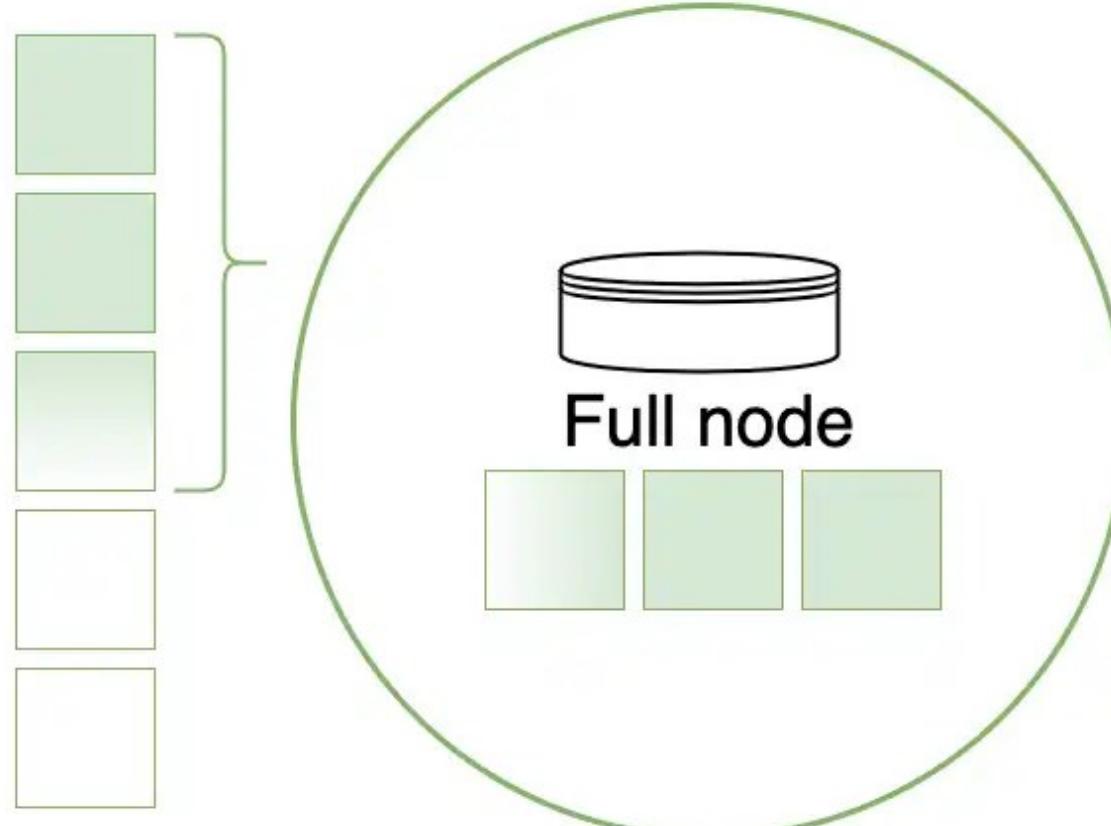


Nodes



Full Nodes

Synchronize recent blocks



Blockchain

Source: Substrate



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Full Nodes

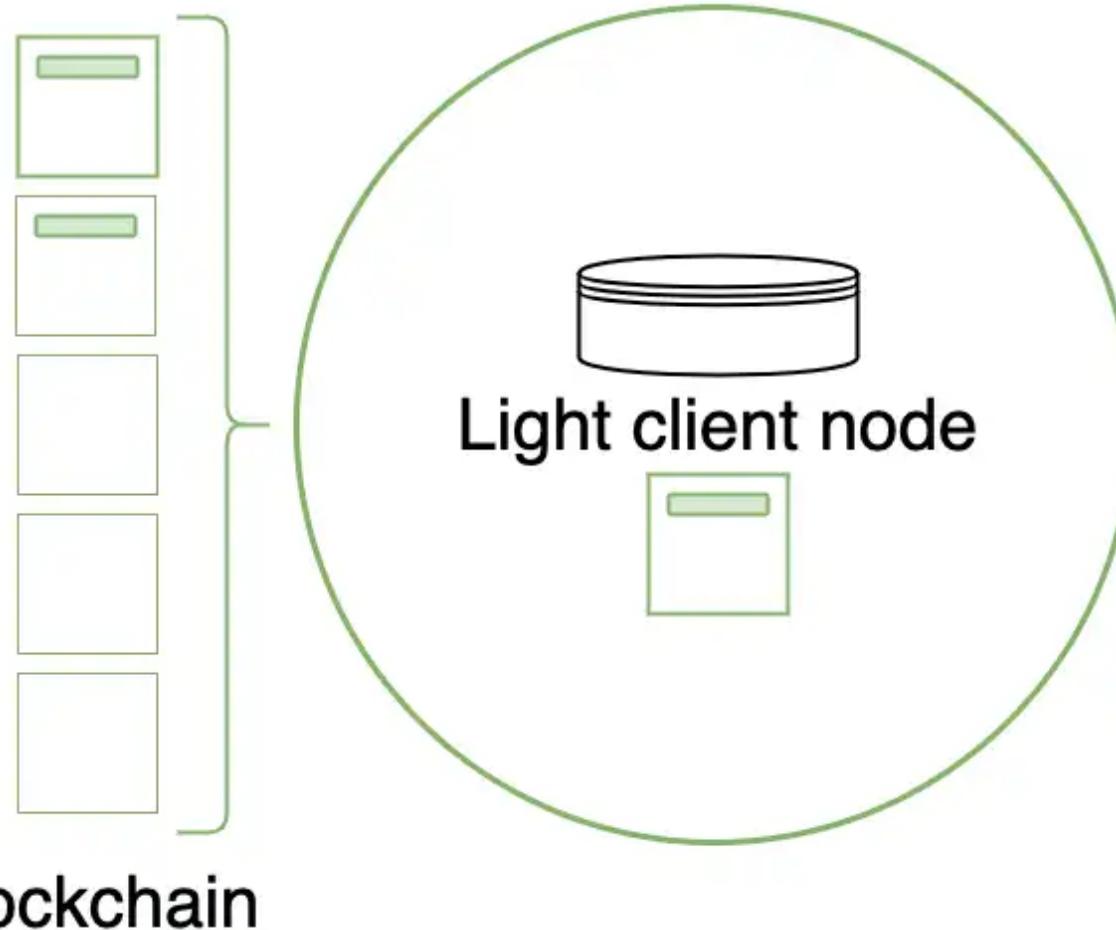
- Store full blockchain data.
- Participate in block validation, verifying all blocks and states.
- All states can be either retrieved from local storage or regenerated from 'snapshots' by a full node.
- Serve the network and provide data on request.

Source: Ethereum documentation



Light Nodes

Synchronize without storage



Source: Substrate



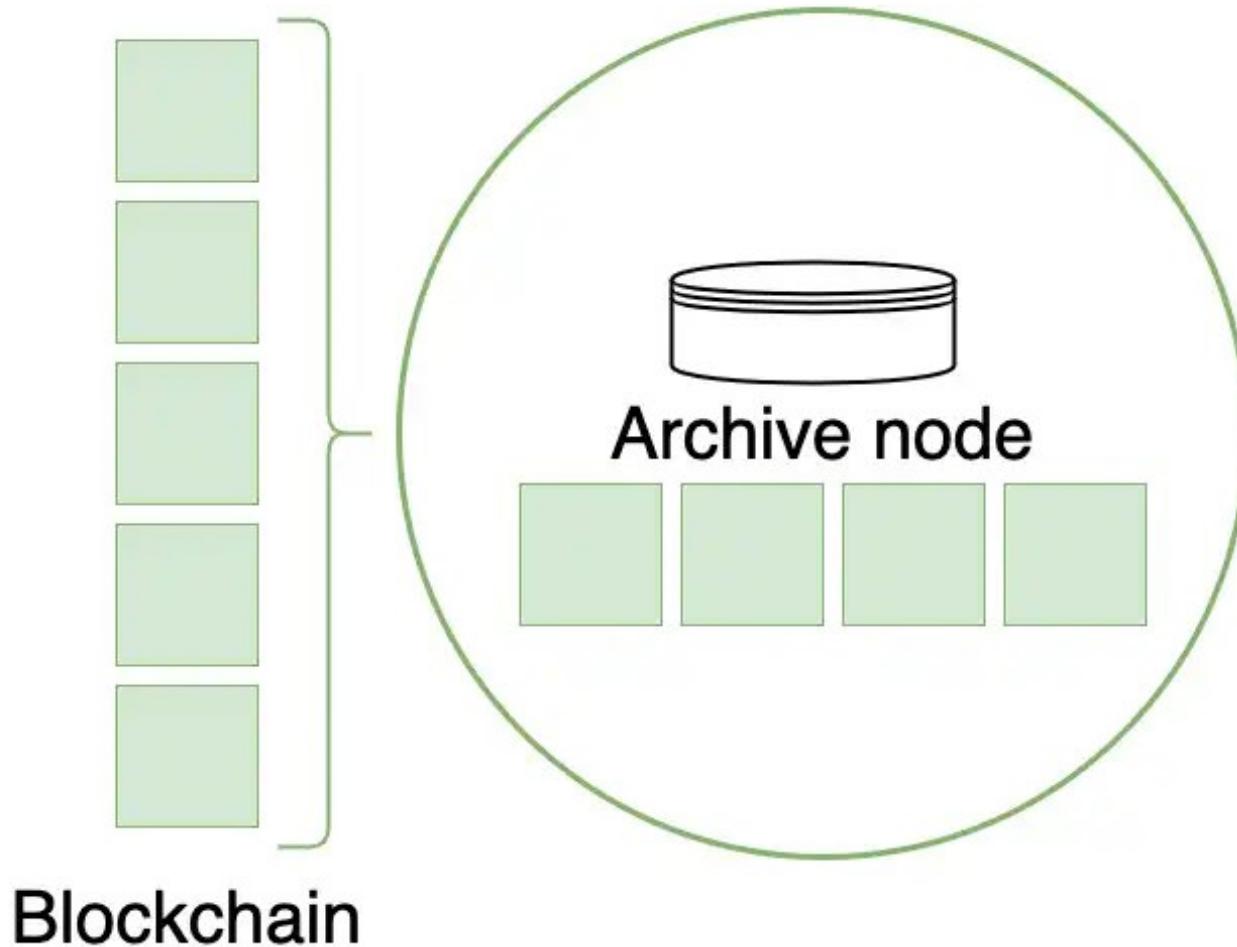
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Nodes types

Archive all blocks



Source: Substrate



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Benefits of higher number of nodes in the network

- Full nodes enforce the consensus rules.
- Can perform a social recovery in case of attack.
- Provide robustness.
- Provide access to the blockchain for lightweight nodes.



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Clients

A node is made up of two pieces of software (clients) that communicate directly via a JSON-RPC interface and externally via their own P2P interfaces.

Consenus Client

- Beacon chain
- Beacon state
- Execution chain
- Operational mempool
- P2P Interface



Execution Client

- Ethereum Virtual Machine
- Execution state
- Transaction mempool
- P2P Interface

Source: Ethereum



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Execution Clients

Client	Language	Operating Systems	Networks	Sync Strategies	State Pruning
<i>Geth</i>	Go	Linux, Windows, macOS	Mainnet, Sepolia, Goerli	Snap, Full	Archive, Pruned
<i>Nethermind</i>	C#, .NET	Linux, Windows, macOS	Mainnet, Sepolia, Goerli, and more	Snap (without serving), Fast, Full	Archive, Pruned
<i>Besu</i>	Java	Linux, Windows, macOS	Mainnet, Sepolia, Goerli, and more	Snap, Fast, Full	Archive, Pruned
<i>Erigon</i>	Go	Linux, Windows, macOS	Mainnet, Sepolia, Goerli, and more	Full	Archive, Pruned
<i>Reth</i>	Rust	Linux, Windows, macOS	Mainnet, Sepolia, Goerli, and more	Full	Archive, Pruned



Consensus Clients

Client	Language	Operating Systems	Networks
<i>Lighthouse</i>	Rust	Linux, Windows, macOS	Beacon Chain, Goerli, Pyrmont, Sepolia, Ropsten, and more
<i>Lodestar</i>	TypeScript	Linux, Windows, macOS	Beacon Chain, Goerli, Sepolia, Ropsten, and more
<i>Nimbus</i>	Nim	Linux, Windows, macOS	Beacon Chain, Goerli, Sepolia, Ropsten, and more
<i>Prysm</i>	Go	Linux, Windows, macOS	Beacon Chain, Gnosis, Goerli, Pyrmont, Sepolia, Ropsten, and more
<i>Teku</i>	Java	Linux, Windows, macOS	Beacon Chain, Gnosis, Goerli, Sepolia, Ropsten, and more



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Accounts

Externally-owned	Contract
Creating an account costs nothing.	Creating a contract has a cost because you're using network storage.
Can initiate transactions.	Can only send transactions in response to receiving a transaction.
Transactions between externally-owned accounts can only be ETH/token transfers.	Transactions from an external account to a contract account can trigger code which can execute many different actions, such as transferring tokens or even creating a new contract.
Made up of a cryptographic pair of keys: public and private keys that control account activities.	Contract accounts don't have private keys. Instead, they are controlled by the logic of the smart contract code.



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Transactions



Financiado por
la Unión Europea
NextGenerationEU



Plan de Recuperación,
Transformación y
Resiliencia



AGENCIA
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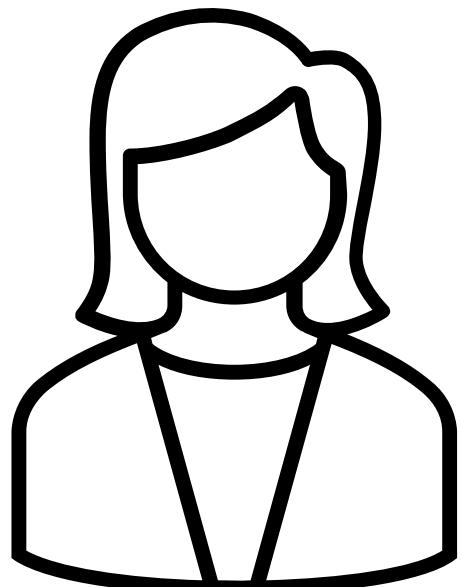
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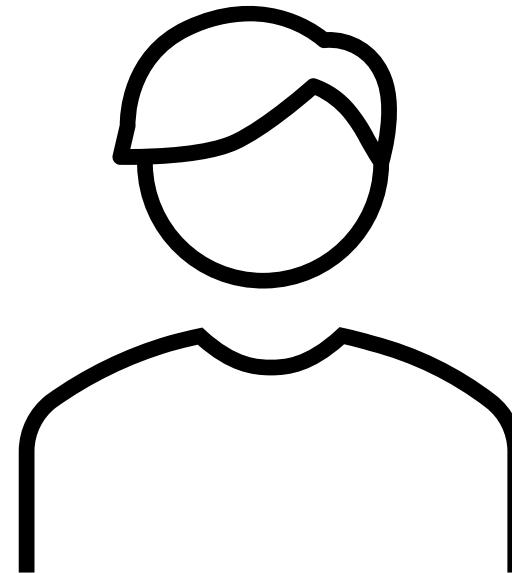
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What is a transaction?



Maria's account



Pedro's account

Information in a Transaction

Information element	Description
From	The address of the sender.
Recipient	The receiving address.
Signature	The identifier of the sender.
Nonce	A counter that is incremented sequentially.
Value	Amount of ETH or coins to transfer from sender to recipient.
InputData	Optional field to include arbitrary data
GasLimit	The maximum amount of gas units that can be consumed by the transaction.
MaxPriorityFeePerGas	The maximum price of the consumed gas to be included as a tip to the validator.
MaxFeePerGas	The maximum fee per unit of gas willing to be paid for the transaction.



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Types of Transactions

- **Regular transactions:** a transaction from one account to another.
- **Contract deployment transactions:** a transaction without a 'to' address, where the data field is used for the contract code.
- **Execution of a contract:** a transaction that interacts with a deployed smart contract. In this case, 'to' address is the smart contract address.



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Gas and fees (Ethereum) (Transssaction cost)

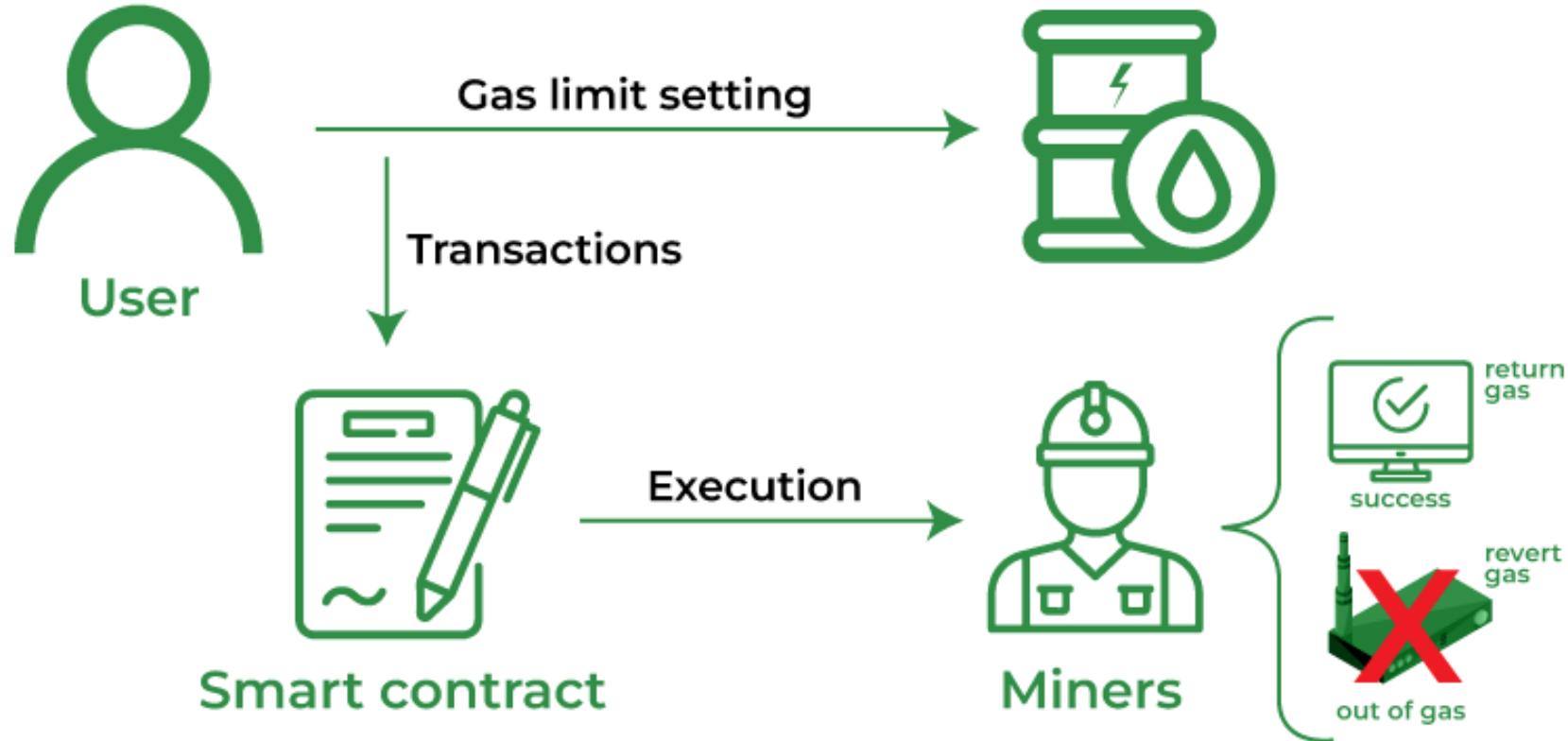


Image source: geeksforgeeks



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Mining



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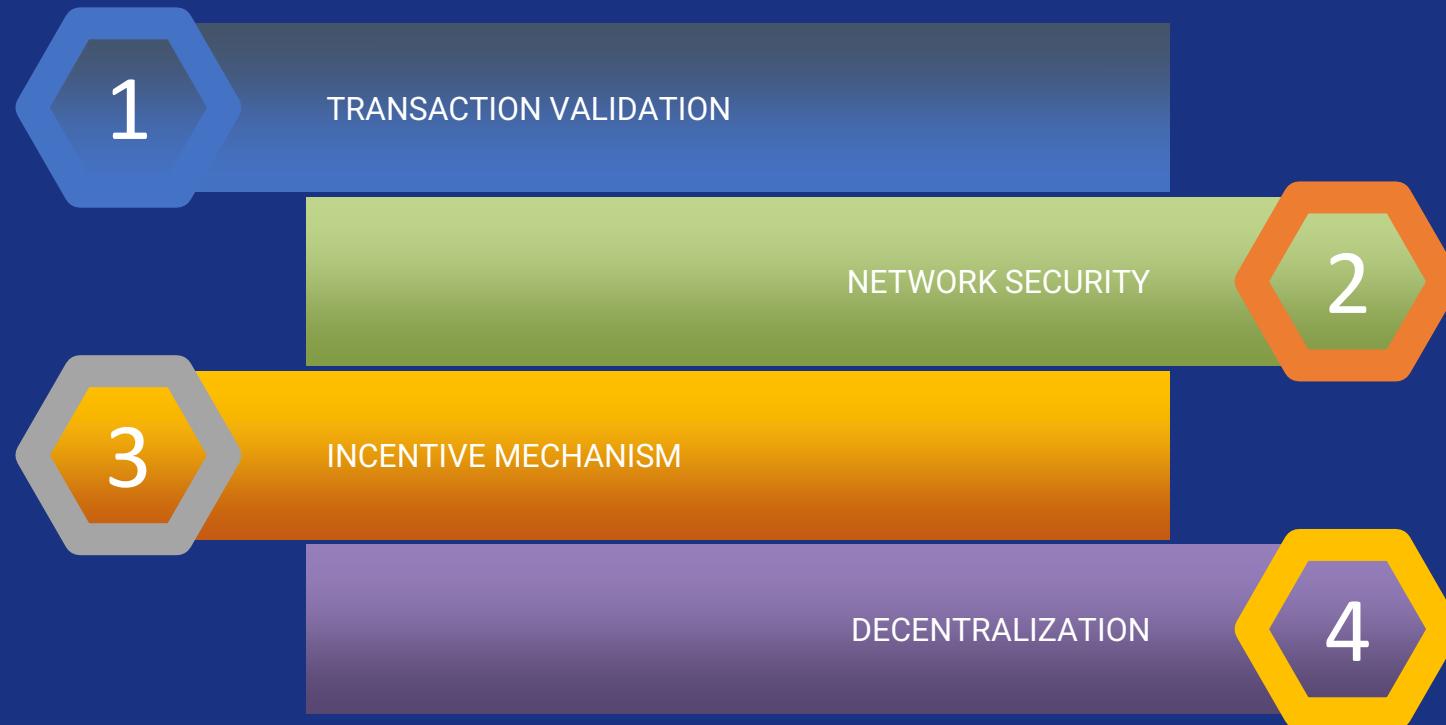


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MINING



Types of blockchain networks



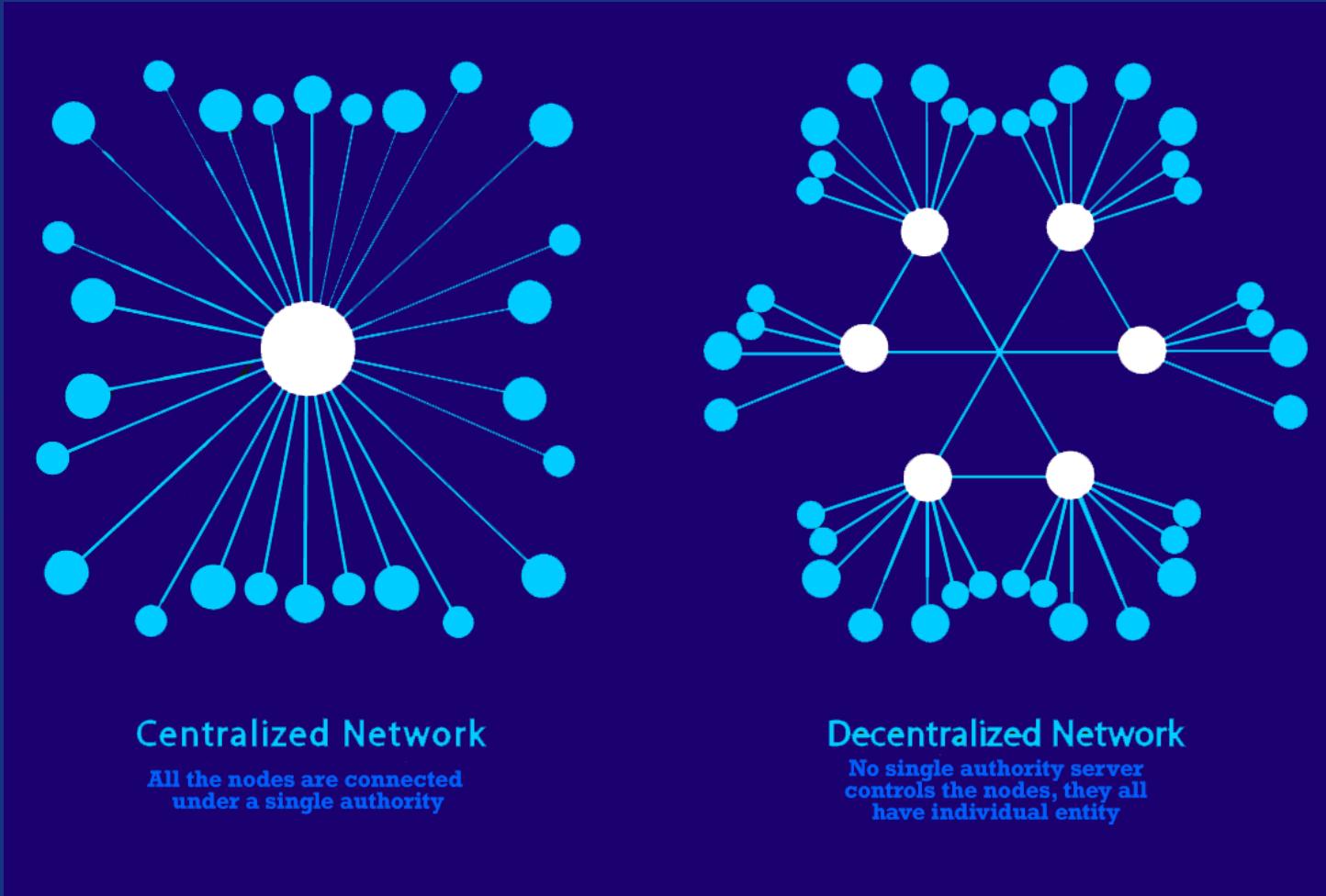
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CENTRALIZED VS DECENTRALIZED BLOCKCHAIN

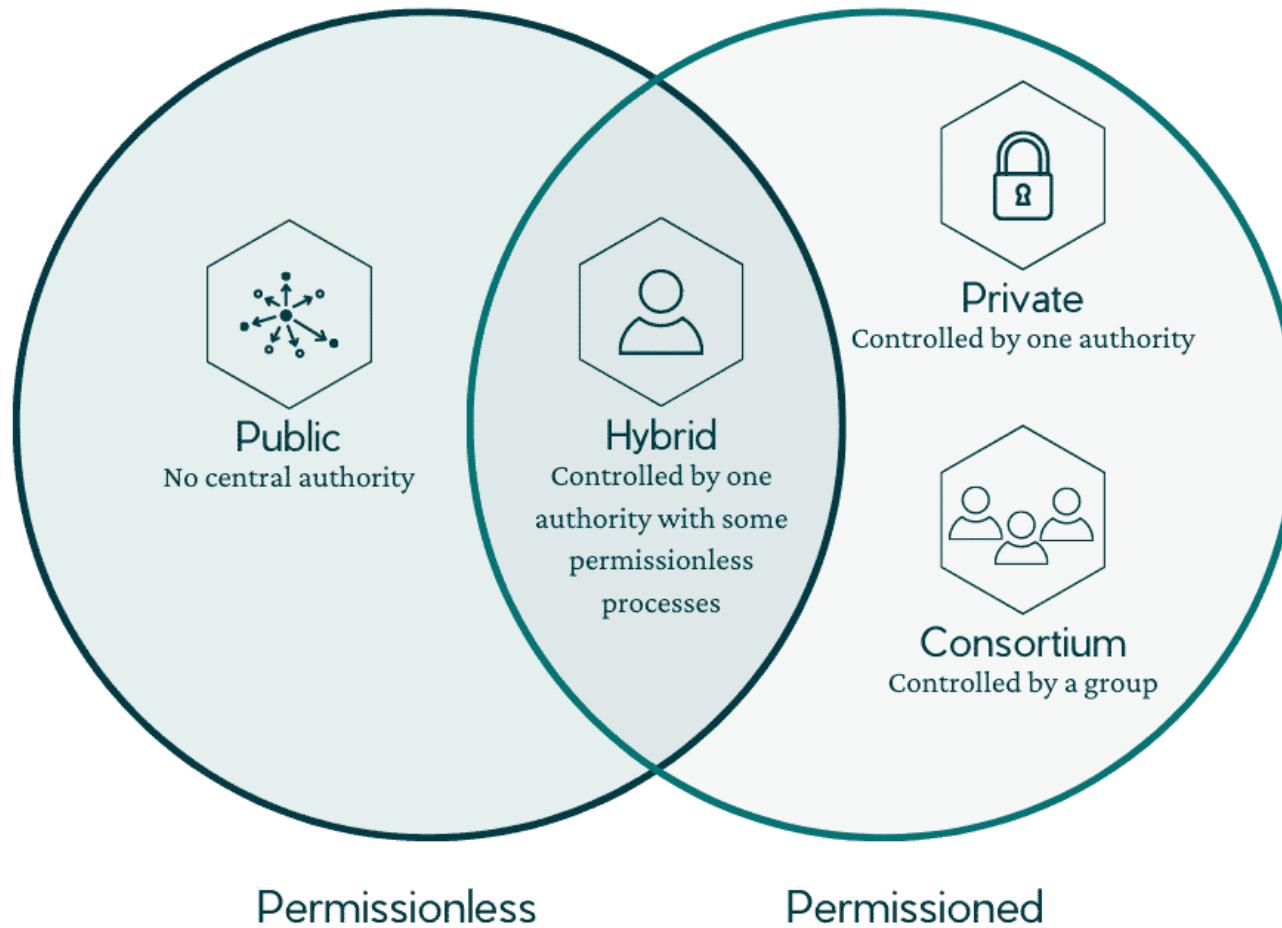


CENTRALIZED VS DECENTRALIZED BLOCKCHAIN

CENTRALIZED		DECENTRALIZED
1	<ul style="list-style-type: none">• SINGLE VALIDATOR	▷
2	<ul style="list-style-type: none">• CENTRAL AUTHORITY	▷
3	<ul style="list-style-type: none">• LIMITED TRANSPARENCY	▷
4	<ul style="list-style-type: none">• RESTRICTED PARTICIPATION	▷
		<ul style="list-style-type: none">• MULTIPLE VALIDATORS• DISTRIBUTED AUTHORITY• FULL TRANSPARENCY• FULL PARTICIPATION

Types of blockchain networks

ELEVATE X



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PRIVATE VS PUBLIC BLOCKCHAIN

	Public Blockchain	Private Blockchain
Access	Anyone	Single Organization
Authority	Decentralized	Partially Decentralized
Transaction Speed	Slow	Fast
Consensus	Permissionless	Permissioned
Transaction Cost	High	Low
Data Handling	Full	Partial
Immutability	Read and Write access for anyone	Read and Write access for single organization
Efficiency	Low	High

Ethereum networks

Public Networks

Network	Description
Mainnet	Mainnet is the primary public Ethereum production blockchain, where actual-value transactions occur on the distributed ledger. The Ethers or coins used in this network have real value.
Testnets	These are networks used by protocol developers or smart contract developers to test both protocol upgrades as well as potential smart contracts in a production-like environment before deployment to Mainnet. There are different testnets that use different consensus mechanisms. The coin used in most of these testnets don't have real value.



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Types of blockchain networks

Private Networks

Network	Description
Development	It is possible to create a local blockchain instance to test decentralized apps and smart contracts.
Consortium	The consensus process is controlled by a pre-defined set of nodes that are trusted.



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Key elements of a blockchain

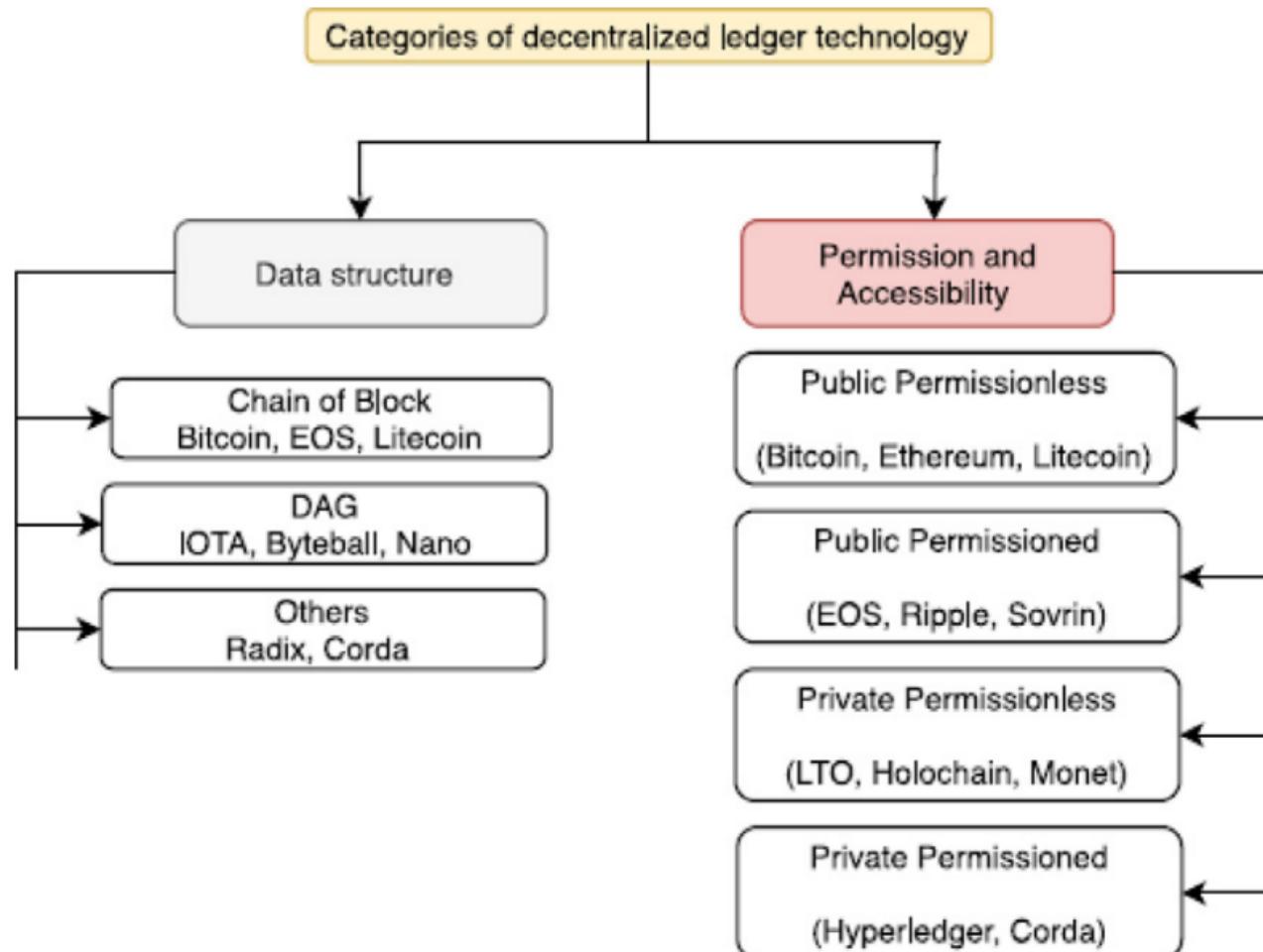


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Distributed Ledger Technology



Uddin, M. A., Stranieri, A., Gondal, I., & Balasubramanian, V. (2021). A survey on the adoption of blockchain in iot: Challenges and solutions. *Blockchain: Research and Applications*, 2(2), 100006.



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Smart Contract

How does the
Smart Contract work?



Pre-defined Contract



Business Logic



Execution



Settlement

SMART CONTRACT



RECORD
STORING



TRADING
ACTIVITIES



SUPPLY
CHAIN



MORTGAGE



REAL STATE



EMPLOYMENT
ARRANGEMENTS



COPYRIGHT
PROTECTION



VOTING



INSURANCE
CLAIMS



INTERNET OF
THINGS

SMART CONTRACT FOR AIR QUALITY IoT



- This could be related to air quality sensors at various city locations, setting a maximum allowable pollution limit.
- If pollution levels exceed that limit, the smart contract could automatically trigger traffic closures in specific areas or throughout the entire city, using verifiable data obtained through blockchain technology.

Smart Contract

SOLIDITY

- Object-oriented, high-level language for implementing smart contracts.
- Curly-bracket language that has been most profoundly influenced by C++.
- Statically typed (the type of a variable is known at compile time).
- Supports:
 - Inheritance (you can extend other contracts).
 - Libraries (you can create reusable code that you can call from different contracts – like static functions in a static class in other object-oriented programming languages).
 - Complex user-defined types.



Smart Contract

VYPER

- Pythonic programming language.
- Strong typing.
- Small and understandable compiler code.
- Efficient bytecode generation.
- Deliberately has less features than Solidity with the aim of making contracts more secure and easier to audit. Vyper does **not** support:
 - Modifiers
 - Inheritance
 - Inline assembly
 - Function overloading
 - Operator overloading
 - Recursive calling
 - Infinite-length loops
 - Binary fixed points



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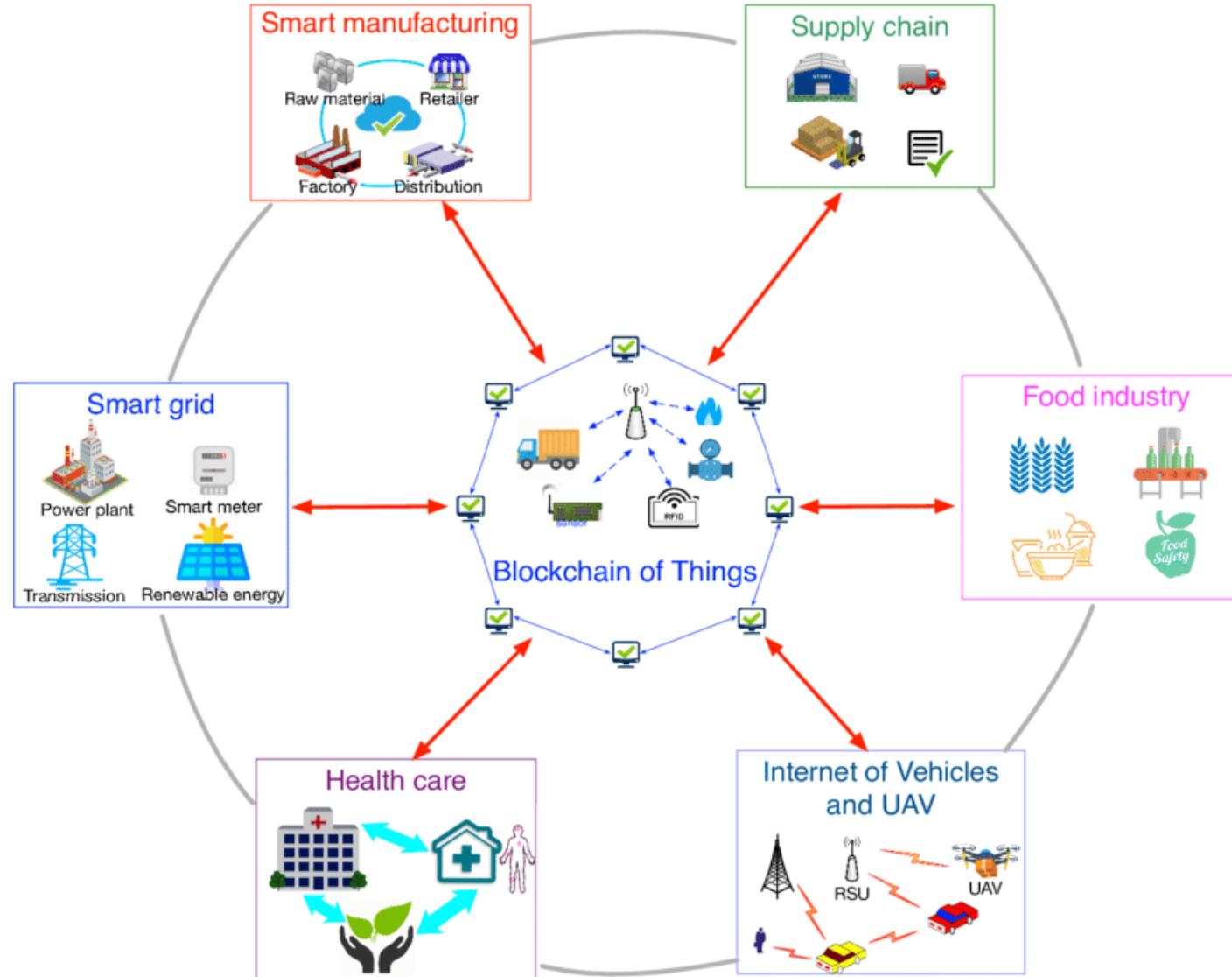
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Part 2.

Blockchain use cases and applications

IoT



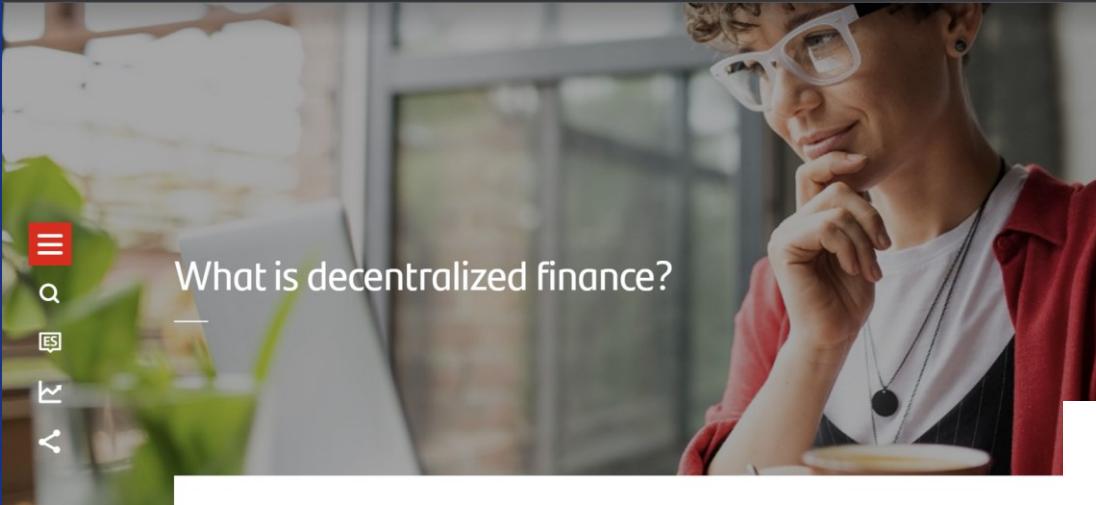
Dai, H. N., Zheng, Z., & Zhang, Y. (2019). Blockchain for Internet of Things: A survey. *IEEE Internet of Things Journal*, 6(5), 8076-8094.



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DeFI (DECENTRALIZED FINANCE)



What is decentralized finance?

03/05/2022

Decentralized finance (or "DeFi") is a financial ecosystem on [blockchain](#) technology. It lets users buy and sell asset [financial services](#) as a form of [investment](#) or financing wi



Institutional DeFi

The Next Generation of Finance

We believe a version of decentralized finance (DeFi) called "Institutional DeFi", which combines the innovations of DeFi protocols with the safeguards of today's finance industry, has the potential for growth and transformative impact.

The aim of this joint report by the Oliver Wyman Forum, DBS, Onyx by J.P. Morgan, and SBI Digital Asset Holdings is to help business executives understand the potential benefits of adapting decentralized finance (DeFi) protocols in the finance industry using tokenized real-world assets.

This paper explains what industry participants need to do to achieve regulatory clarity, drive commercial adoption, and get the greatest benefits out of Institutional DeFi for their clients and themselves.

[Read the report →](#)



Decentralized finance is on the rise

Decentralized finance is a blockchain-based set of applications that, in principle, need no intermediaries to work. These financial products have similar characteristics to traditional services and their boom period could, to some extent, change the financial sector and give rise to both opportunities and challenges.

DeFI (DECENTRALIZED FINANCE)

- Financial products with features similar to traditional services, but created within a blockchain
- Open-source protocols capable of issuing assets, processing transactions, and facilitating financial agreements.
- Use of smart contracts for monetary transactions.
- Difference from traditional finance: no bank account is needed, only internet access or a digital wallet.

DeFI - BENEFITS



- Autonomy and Control.
- Decentralization and Censorship Resistance.
- Efficiency and Security.
- Transparency and Resilience.

TOKENIZATION

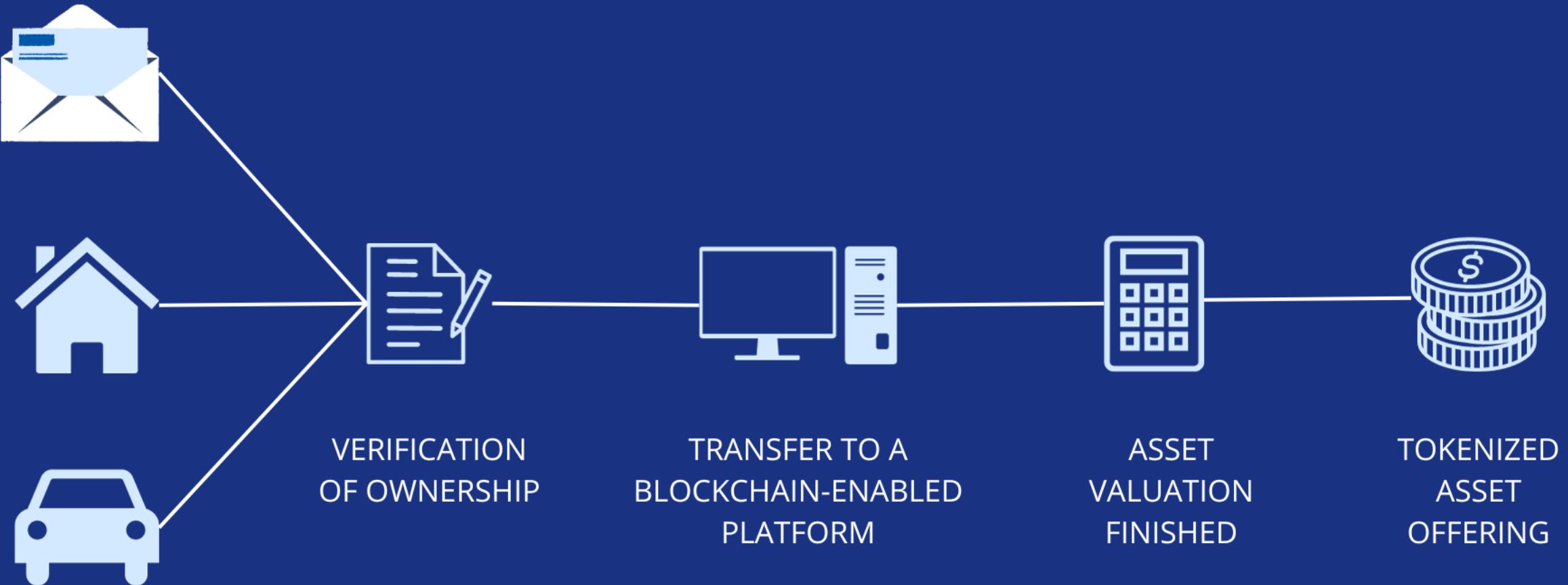
- Cryptographic assets that do not have their own blockchain.
- They have secondary markets that depend on the value of their utility.
- Commonly created by companies, organizations, or individuals.
- Multiple use cases (especially in DeFi).

TOKENIZATION IN REAL STATE

- Real estate tokenization is a process involving the conversion of real property into digital tokens.
- These tokens can be bought, sold, and traded on a blockchain platform.
- Benefits: increased liquidity, transparency, and accessibility for investors.

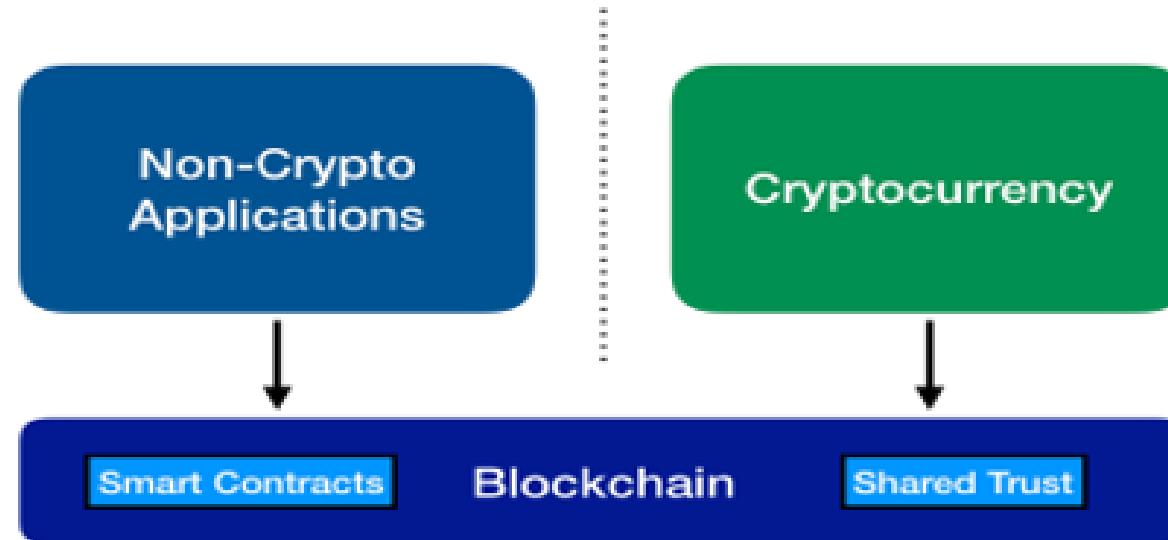
TOKENIZATION PROCESS

VARIOUS
ASSETS



Difference between blockchain and bitcoin

Blockchain vs Cryptocurrency



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Part 3.

Creating our own Blockchain network

Existing blockchain platforms

Platform	Blockchain	Popularity & Active	Consensus Algorithm	Pricing	Supported Languages	Smart Contracts
Bitcoin	Public	High	PoW	Fees per transaction	Script and C++	No
Ethereum	Public and permissioned	High	PoW, PoS GHOST	Ether for translation and computational service	Python, Go, C++, Java Scripts	Yes
Hyperledger-Fabric	Private, Permissioned	High	PBTF	Open Source price	Python, Golang and Java	Yes
Multichain	Private, Permissioned	Medium	PBTF	Free, Open Source price	Python, C#, JavaScript, PHP, Ruby	Yes
Quorum	Public, Permissioned	High	Raft, IBFT	Fees per transaction	Python, Go, C++, Java Scripts	Yes
Lisk	Public and permissioned	Medium	DPoS	Fees per transaction	JavaScript	Yes
LiteCoin	Public	Low	Scrypt	Fees per transaction	C++	No
HDAC	Public and permissioned	Low	EPoW	Fees per transaction	Web Assembly	Yes
IOTA	Public, Permissioned	Low	PoW, TANGLE	Pricing not clear as yet	Python, C, JavaScript	No

Abdelmaboud, A., Ahmed, A. I. A., Abaker, M., Eisa, T. A. E., Albasheer, H., Ghorashi, S. A., & Karim, F. K. (2022). Blockchain for IoT applications: taxonomy, platforms, recent advances, challenges and future research directions. *Electronics*, 11(4), 630.



TECHNOLOGIES USED



- Built our Blockchain using a framework called Truffle Suite, based on Ethereum technology and programmed in languages like Solidity and JavaScript.
- The data we use is processed with Telegraf and collected in an InfluxDB database.
- Additionally, we use the block generator Geth connected to our wallet and our Truffle Suite to run our Blockchain.

OUR OWN PRIVATE BLOCKCHAIN

The terminal log displays the following blockchain activity:

```
[09-27] [13:30:28.271] B block reached canonical chain
[09-27] [13:30:29.633] Commit new mining work
  xis=0 fees=0 elapsed=4.1326s
[09-27] [13:30:29.643] Mined potential block
[09-27] [13:30:29.643] Successfully sealed new block
  563" elapsed=1.32s
[09-27] [13:30:29.643] B block reached canonical chain
[09-27] [13:30:31.502] Commit new mining work
  xis=0 fees=0 elapsed=1.1915s
[09-27] [13:30:31.555] Mined potential block
[09-27] [13:30:31.555] B block reached canonical chain
  3c4" elapsed=1.9115s
[09-27] [13:30:34.320] Commit new mining work
  xis=0 fees=0 elapsed=4.2765s
[09-27] [13:30:34.320] Mined potential block
[09-27] [13:30:34.320] Successfully sealed new block
  445" elapsed=1.77s
[09-27] [13:30:34.332] B block reached canonical chain
[09-27] [13:30:39.398] Looking for peers
[09-27] [13:30:40.760] Commit new mining work
  xis=0 fees=0 elapsed=5.238s
[09-27] [13:30:40.760] Mined potential block
[09-27] [13:30:40.760] Successfully sealed new block
  340" elapsed=6.446s
[09-27] [13:30:40.779] B block reached canonical chain
[09-27] [13:30:40.938] Mined potential block
[09-27] [13:30:40.938] Commit new mining work
  xis=0 fees=0 elapsed=0.159..573ms
[09-27] [13:30:41.151] Successfully sealed new block
  cd4" elapsed=0.162.565ms
[09-27] [13:30:40.947] B block reached canonical chain
[09-27] [13:30:41.712] Mined potential block
[09-27] [13:30:41.712] Commit new mining work
  xis=0 fees=0 elapsed=0.1466s
[09-27] [13:30:41.712] Successfully sealed new block
  67C" elapsed=0.768.944ms
[09-27] [13:30:41.726] B block reached canonical chain
[09-27] [13:30:41.726] Commit new mining work
  xis=0 fees=0 elapsed=0.1466s
[09-27] [13:30:41.726] Mined potential block
[09-27] [13:30:41.726] Successfully sealed new block
  68B" elapsed=0.768.944ms
[09-27] [13:30:41.734] B block reached canonical chain
[09-27] [13:30:41.734] Commit new mining work
  xis=0 fees=0 elapsed=0.1466s
[09-27] [13:30:41.734] Mined potential block
[09-27] [13:30:41.734] Successfully sealed new block
  69D" elapsed=0.768.944ms
[09-27] [13:30:41.741] B block reached canonical chain
[09-27] [13:30:41.741] Commit new mining work
  xis=0 fees=0 elapsed=0.1466s
[09-27] [13:30:41.741] Mined potential block
[09-27] [13:30:41.741] Successfully sealed new block
  70F" elapsed=0.768.944ms
[09-27] [13:30:41.758] B block reached canonical chain
[09-27] [13:30:41.758] Commit new mining work
  xis=0 fees=0 elapsed=0.1466s
[09-27] [13:30:41.758] Mined potential block
[09-27] [13:30:41.758] Successfully sealed new block
  728" elapsed=0.2.644ms
[09-27] [13:30:45.840] B block reached canonical chain
[09-27] [13:30:46.100] Commit new mining work
  xis=0 fees=0 elapsed=0.248.330ms
[09-27] [13:30:46.100] Mined potential block
[09-27] [13:30:46.100] Successfully sealed new block
  0f0" elapsed=0.259.308ms
[09-27] [13:30:46.100] B block reached canonical chain
[09-27] [13:30:46.855] Commit new mining work
  xis=0 fees=0 elapsed=0.754.981ms
[09-27] [13:30:46.855] Mined potential block
[09-27] [13:30:46.855] Successfully sealed new block
  944" elapsed=0.763.957ms
[09-27] [13:30:46.864] B block reached canonical chain
  number=2722 hash="f71cb9_44c88e"
  number=2730 sealhash="245d8f_f56597" uncles=0 txs=0
  number=2729 hash="71471d_4ae781"
  number=2730 sealhash="245d8f_f56597" hash="3c1ec3_bca
  number=2723 hash="4f4350_1210f6"
  number=2731 sealhash="7e93c1_35162" uncle=0 txs=0
  number=2728 hash="3c1ec3_bca563"
  number=2731 sealhash="7e93c1_35162" hash="b0fb61_af
  number=2724 hash="a296de_572f2f"
  number=2732 sealhash="2c7d14_55a112" uncles=0 txs=0
  number=2731 hash="b0fb61_af73c4"
  number=2732 sealhash="52e104_d87
  number=2725 hash="459988_262c31"
  peercount=0 tried=0 static=0
  number=2733 sealhash="6511fd_6250c9" uncles=0 txs=0
  number=2722 hash="52e104_d87445"
  number=2734 sealhash="7e93c1_35162" hash="cc2ba8_e0
  number=2726 hash="dd2773_a6fde0"
  number=2733 hash="c27d14_ebc340"
  number=2734 sealhash="02759f_0804d" uncles=0 txs=0
  number=2735 sealhash="02759f_0804d" hash="8e6504_52e
  number=2727 hash="584df6_a0f663"
  number=2734 hash="8e6504_52e0d4"
  number=2735 sealhash="61749d_27624" uncles=0 txs=0
  number=2735 sealhash="61749d_27624" hash="59a3c1_ff0
  number=2728 hash="373af_180d0"
  number=2730 sealhash="d9d663_1b7bd9" uncles=0 txs=0
  number=2735 hash="59a3c1_ff0d7c"
  number=2736 sealhash="b9d663_1b7bd9" hash="ee6cd7_e9a
  number=2729 hash="71471d_4ae781"
  number=2737 sealhash="6dc18a_c3c56" uncles=0 txs=0
  number=2726 hash="ee6cd7_e90bb"
  number=2737 sealhash="6dc18a_c3c56" hash="3210ef_5b6
  number=2730 hash="3c1ec3_bca563"
  number=2738 sealhash="aeff46e_0857b4" uncles=0 txs=0
  number=2737 hash="3216ef_5bb728"
  number=2738 sealhash="aeff46e_0857b4" hash="4b785b_ae6
  number=2731 hash="b0fb61_af73c4"
  number=2739 sealhash="02566a_7ea27" uncles=0 txs=0
  number=2738 hash="4b785b_ae00b6"
  number=2739 sealhash="62506a_7ea27" hash="3602f3_85a
  number=2732 hash="52e104_d87
```

Our own Ethereum-based Blockchain network, creating a secure environment tailored to our specific needs, such as our own currency, data validation, and transactions.

OUR OWN PRIVATE BLOCKCHAIN

The screenshot shows a web browser window with the URL geth.ethereum.org/docs/fundamentals/private-network. The page title is "Private Networks". The left sidebar has a "Fundamentals" section selected. The main content area contains a "Prerequisites" section and a "Private Networks" section. The "Private Networks" section includes a note about the difference between private and isolated networks.

docs / fundamentals / private-network

Private Networks

Last edited on September 20, 2023

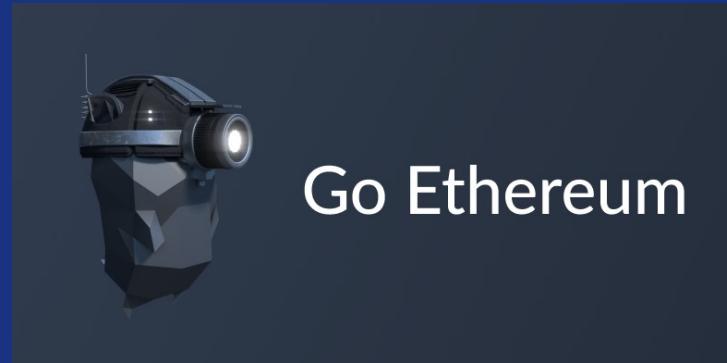
This guide explains how to set up a private network of multiple Geth nodes. An Ethereum network is private if the nodes are not connected to the main network. In this context private only means reserved or isolated, rather than protected or secure. A fully controlled, private Ethereum network is useful as a backend for core developers working on issues relating to networking/blockchain syncing etc. Private networks are also useful for Dapp developers testing multi-block and multi-user scenarios.

Prerequisites

To follow the tutorial on this page it is necessary to have a working Geth installation (instructions [here](#)). It is also helpful to understand Geth fundamentals (see [Getting Started](#)).

Private Networks

A private network is composed of multiple Ethereum nodes that can only connect to each other. In



- Ethereum Node.
- Open-Source.
- Supports Ethereum Network.
- Block Generator.
- Used for Private Networks.

OUR OWN PRIVATE BLOCKCHAIN

```
{  
  "config": {  
    "chainId": 12345,  
    "homesteadBlock": 0,  
    "eip150Block": 0,  
    "eip155Block": 0,  
    "eip158Block": 0,  
    "byzantiumBlock": 0,  
    "constantinopleBlock": 0,  
    "petersburgBlock": 0,  
    "istanbulBlock": 0,  
    "berlinBlock": 0,  
    "ethash": {}  
  },  
  "difficulty": "1",  
  "gasLimit": "8000000",  
  "alloc": {  
    "7df9a875a174b3bc565e6424a0050ebc1b2d1d82": { "balance": "300000" },  

```



Creation of our Genesis Block with its own network ID.



A private group of entities start their blockchain and use it as a permissioned blockchain.

In conclusion

- 1 New possibilities for secure, decentralized, and authenticated data management.
- 2 It can help improve data transparency and traceability.
- 3 It can be deployed in various production environments.
- 4 Great potential.



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That's all!