

BLOCKCHAIN

BEGINNER FRIENDLY WORKSHOP

By:

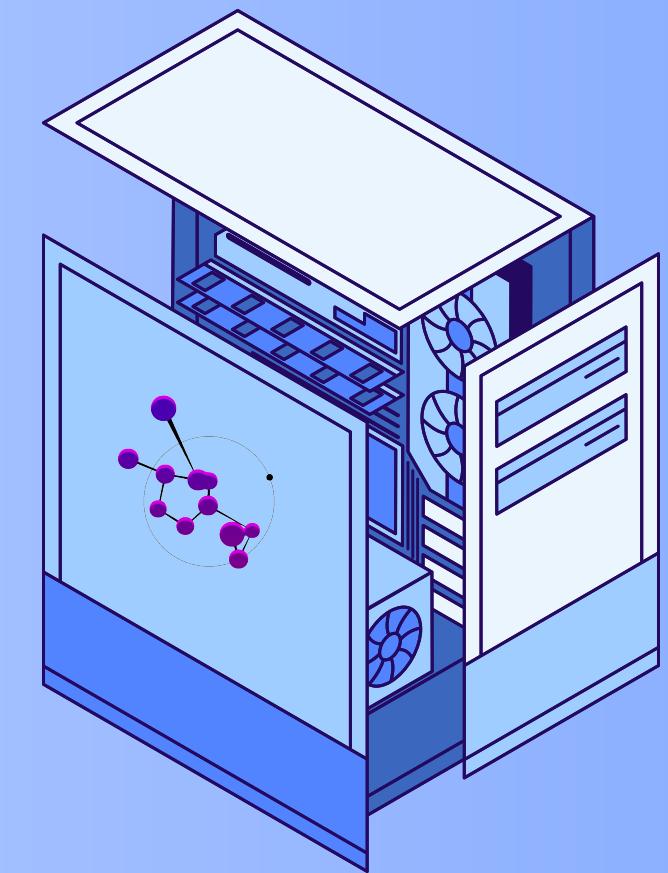
Manish Bharti

Varun Somanna



AGENDA

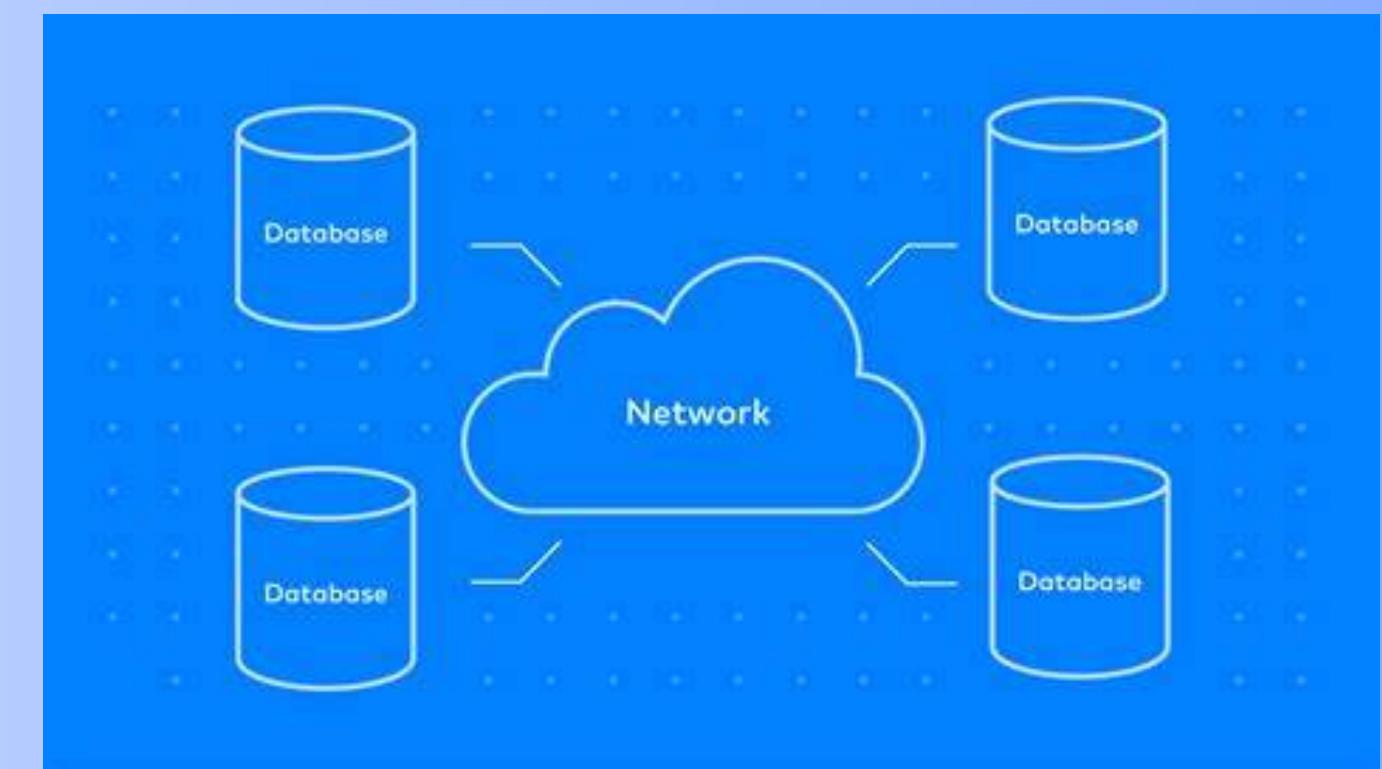
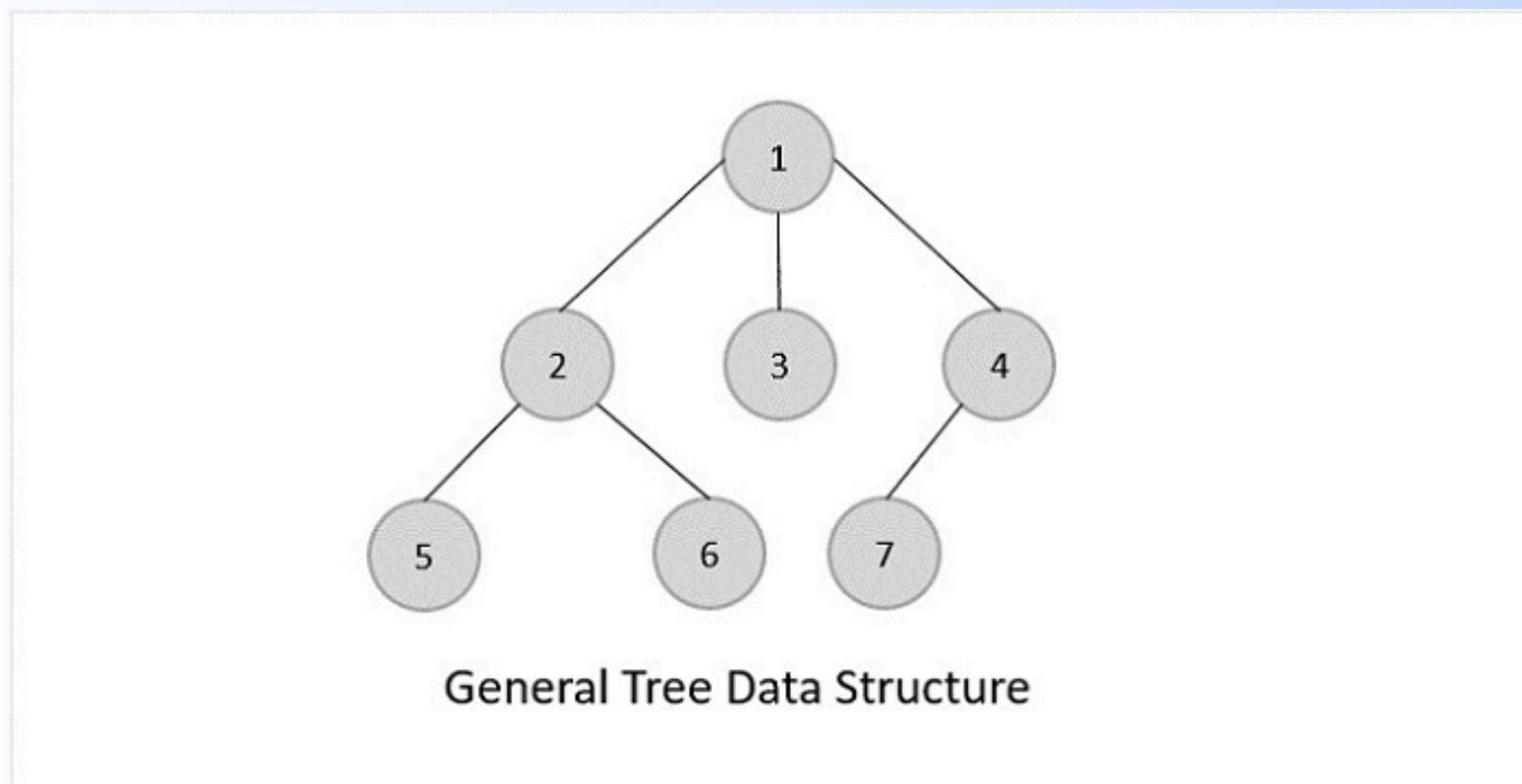
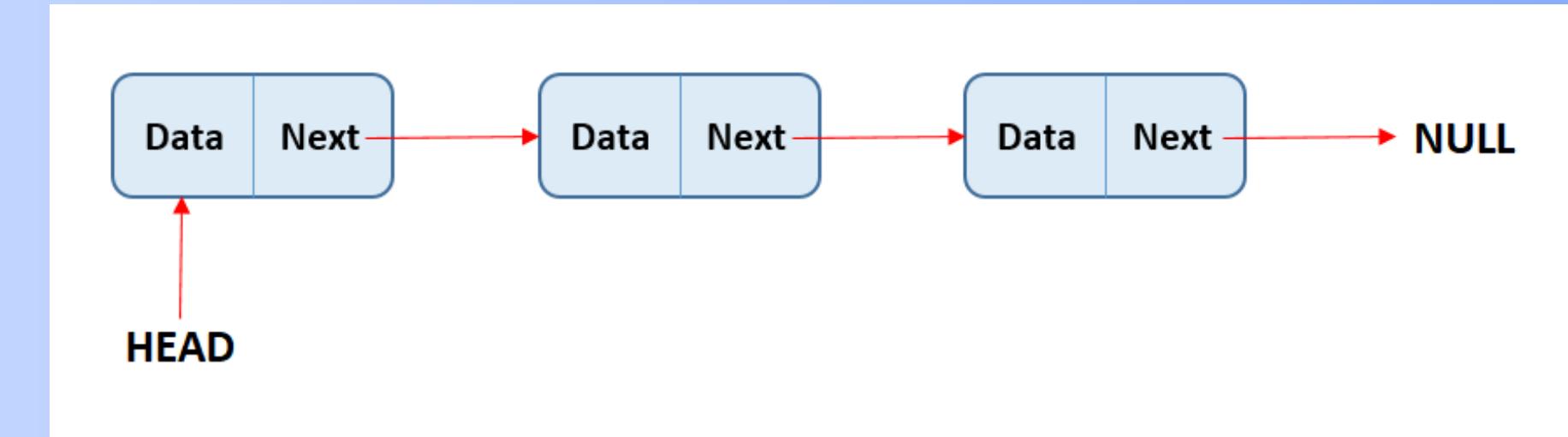
- Introduction to Blockchain Technology
- How Blockchain Works
- Hands-on Activity: Build a Simple Blockchain
- Smart Contracts and Ethereum
- Real-World Applications and Challenges
- Q&A



INTRODUCTION

INTRODUCTION

- What is a database?
 - Types of databases
- Data Structures (Trees , Linked List)
- What is a ledger?



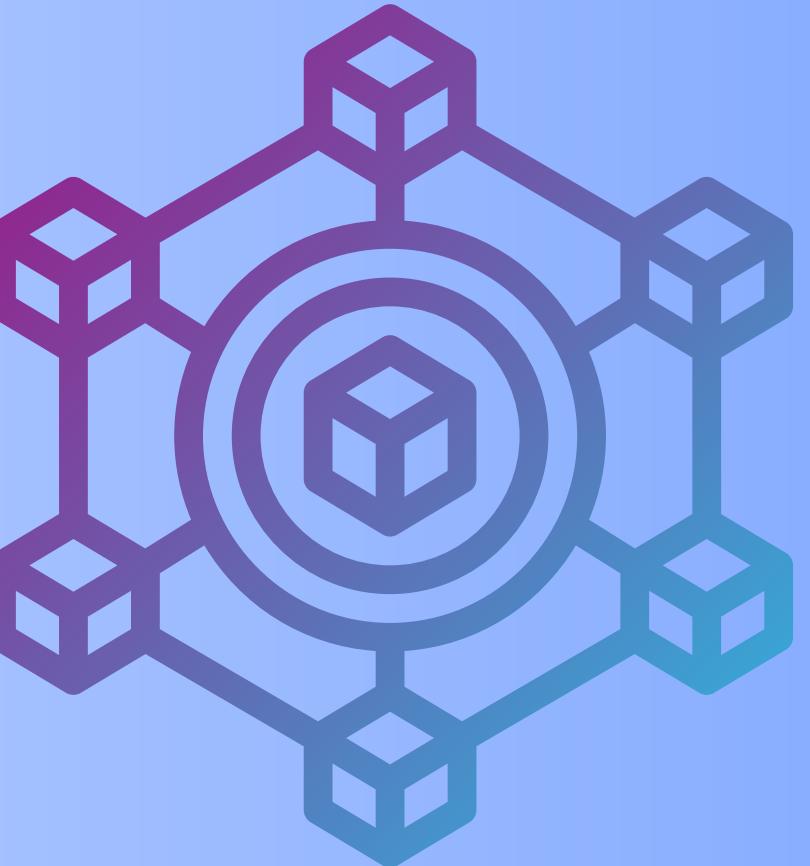
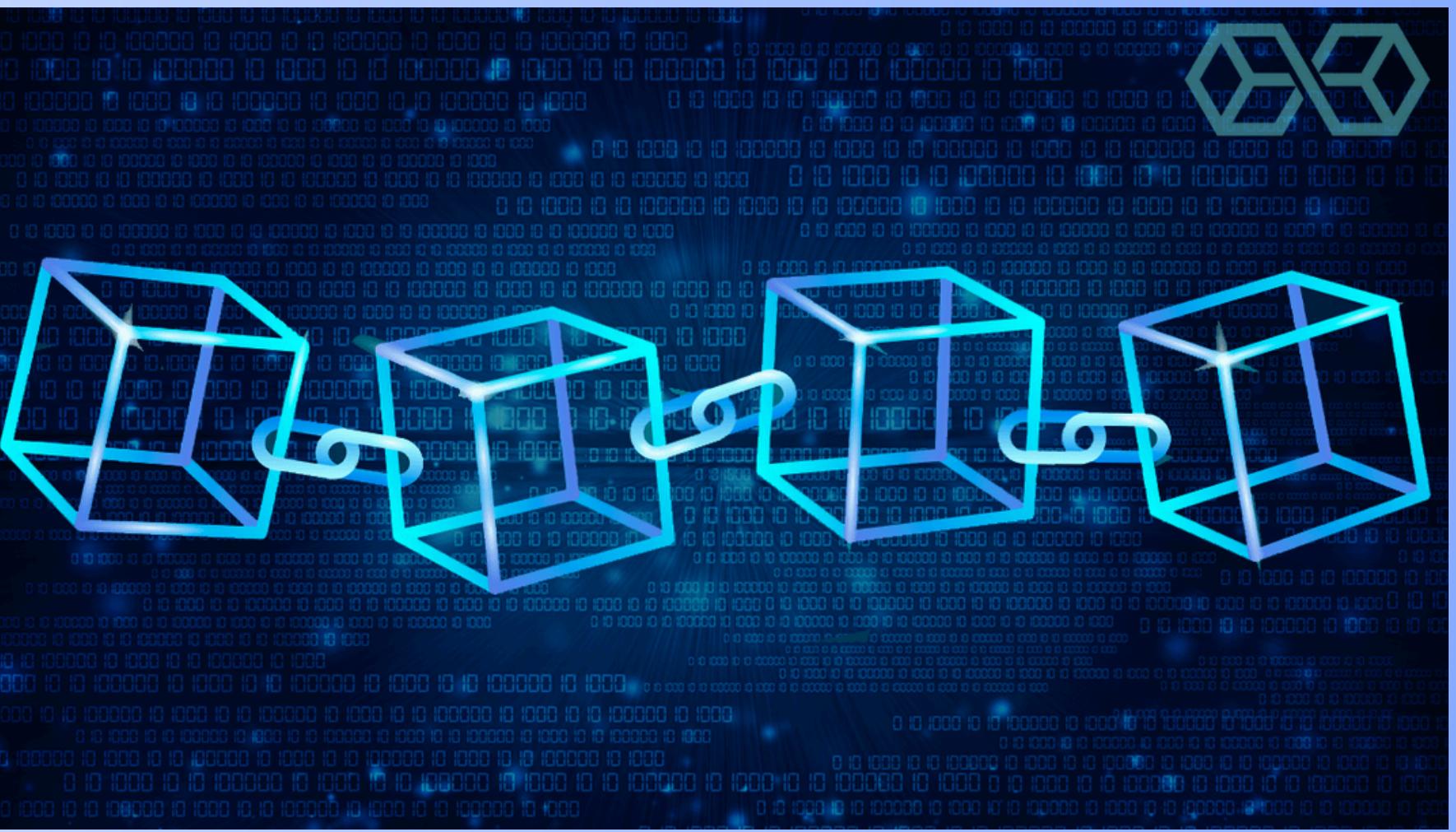


WHAT IS BLOCKCHAIN?



WHAT IS BLOCKCHAIN?

- Distributed Database Mechanism that stores data in chronologically consistent blocks that are linked together with a chain.
- Transactions or digital events that have been executed, verified and shared among participating parties.



HISTORY OF BLOCKCHAIN



1991

Stuart Haber and W. Scott Stornetta, published their work in cryptography.

1992

Merkle Trees was included

2000

Theory for cryptographically secured chains was published

2004

Hal Finney introduced a digital Cash system

2008

Concept of a Distributed Blockchain was documented by Satoshi Nakamoto

2009

Satoshi Nakamoto released the white paper for bitcoin

2014

Birth of Blockchain 2.0

2015

Vitalik Buterin created and launched Ethereum Frontier Network

2016

Bitfinex got hacked, and 120,000 bitcoins were stolen in the process

2017

Electro-Optical System (EOS) was launched

2018

Bitcoin turned ten years old in 2018

2019

Ethereum network exceeded a total of 1 million transactions per day

2020

Ethereum launched Beacon Chain for Ethereum 2.0

2021

Non-Fungible Tokens (NFT) saw a rising popularity

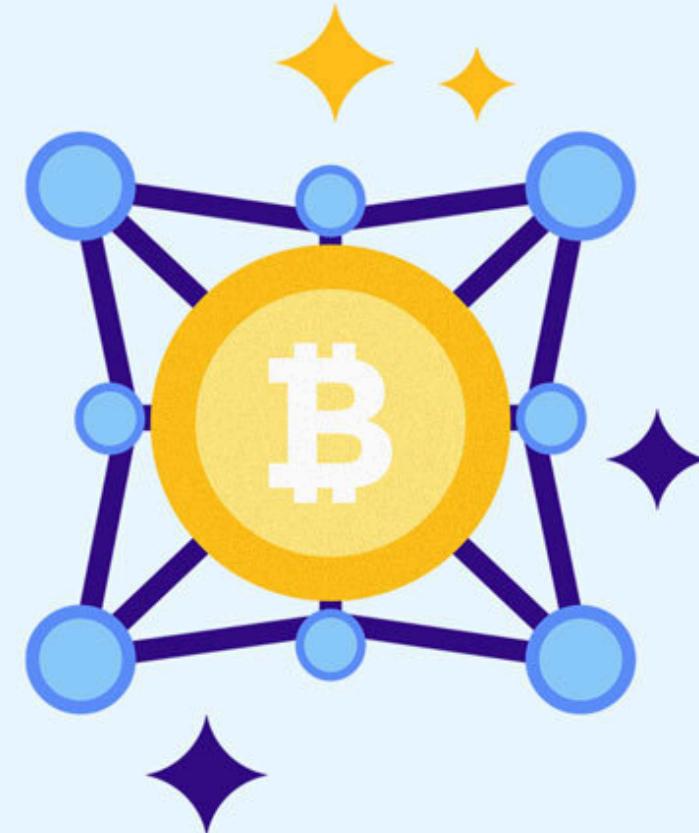
2022

Metaverse saw a rising popularity

2023

Businesses are exploring blockchain technology in all sectors with web 3.0 set to change it

Major characteristics of Blockchain



Decentralized and
Distributed



Transparent



Immutable

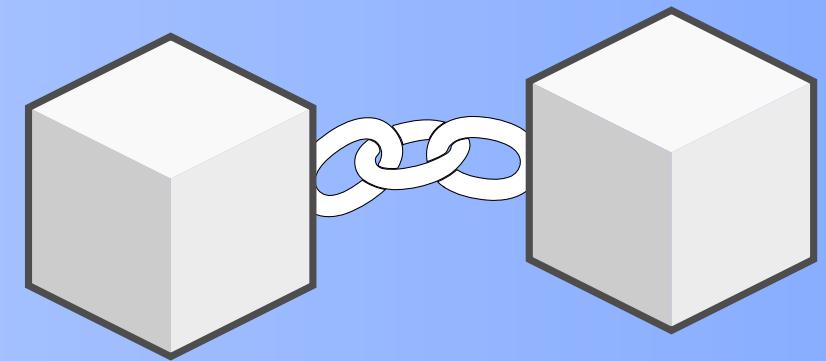


Secure and Neutral

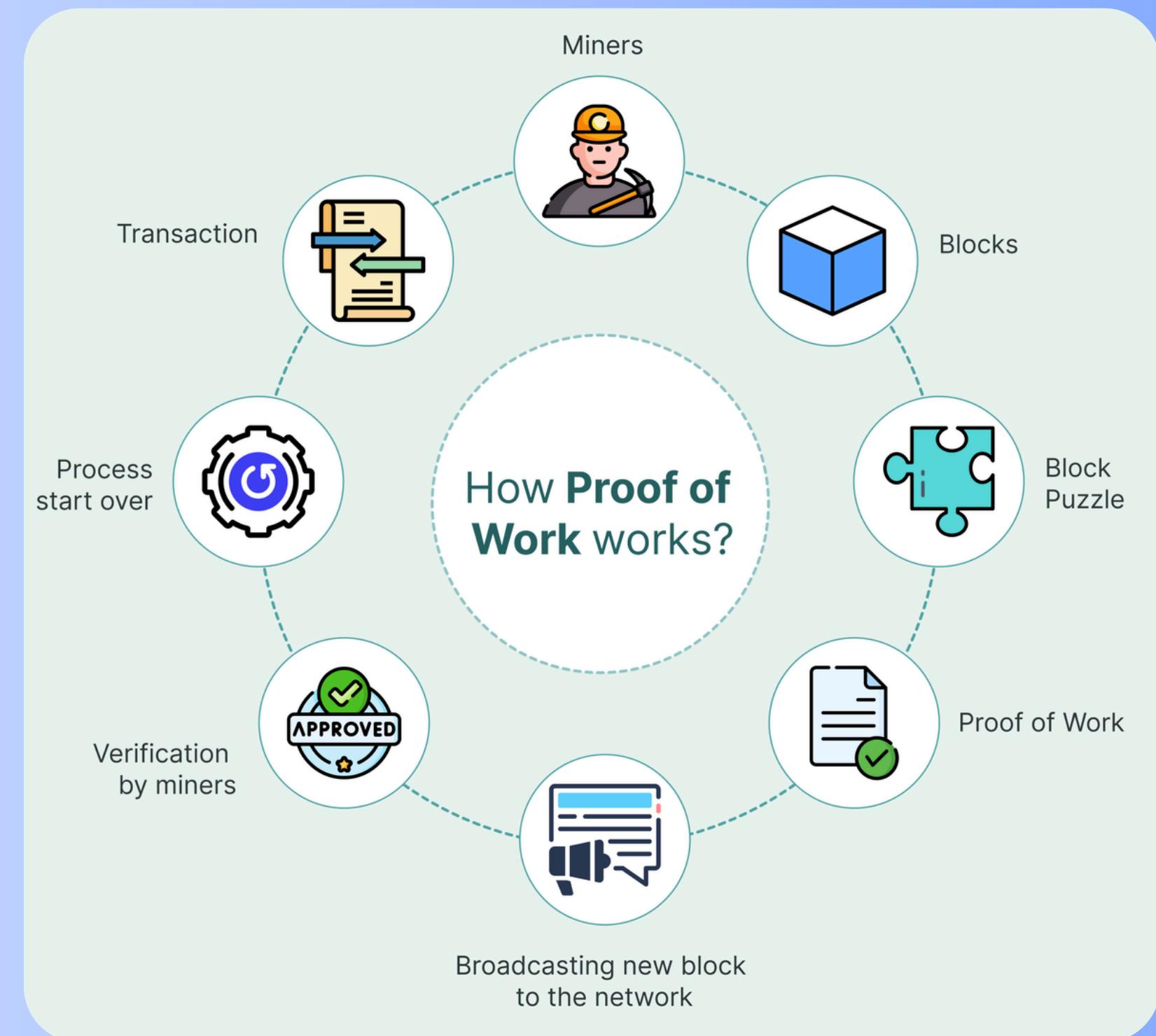
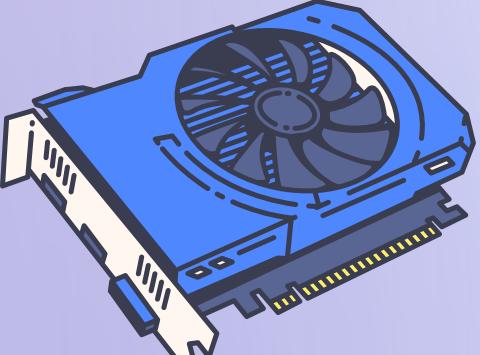


Consensus and Unanimous

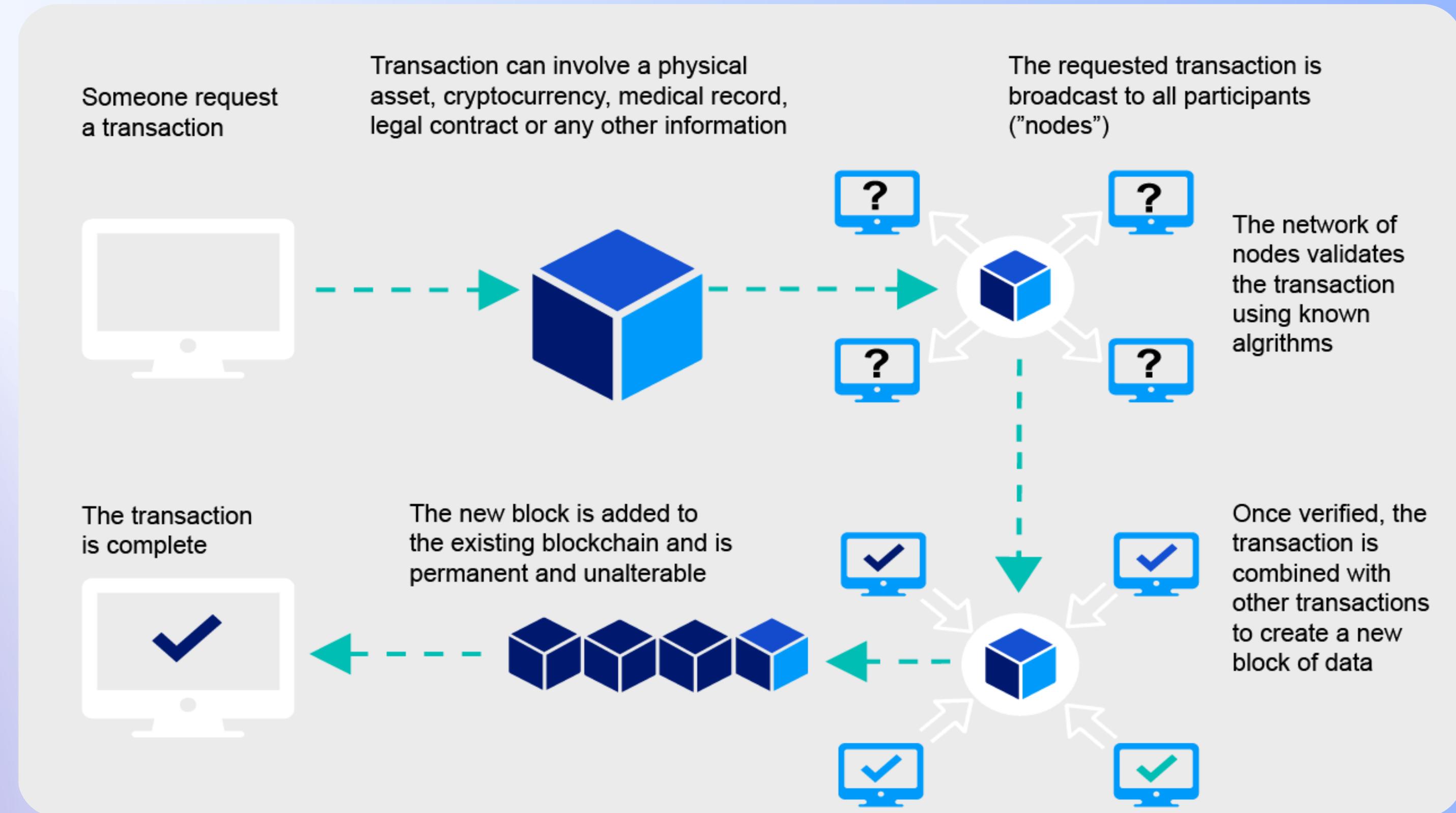
KEY COMPONENTS OF A BLOCKCHAIN



- Blocks
- Chains
- Nodes
- Consensus(Protocols) Mechanisms
 - Proof of Work & Proof of Stake

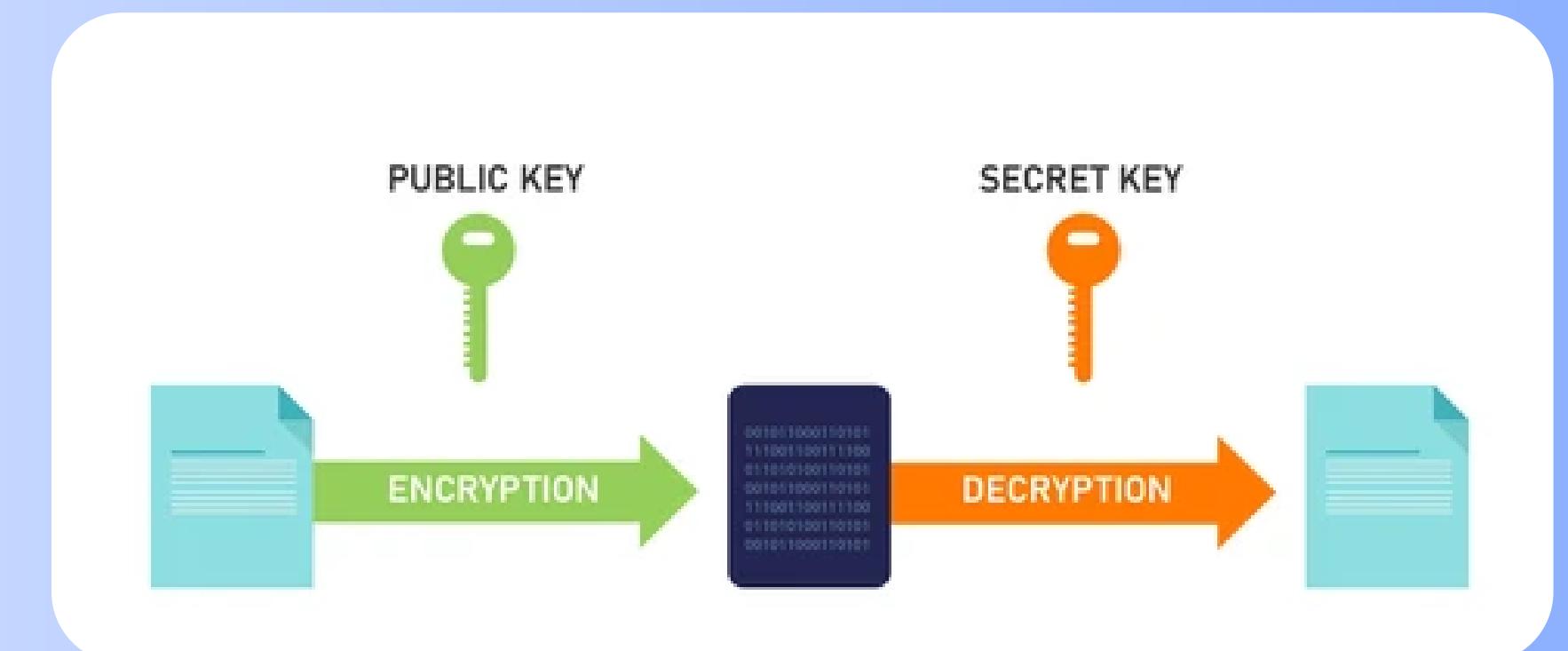
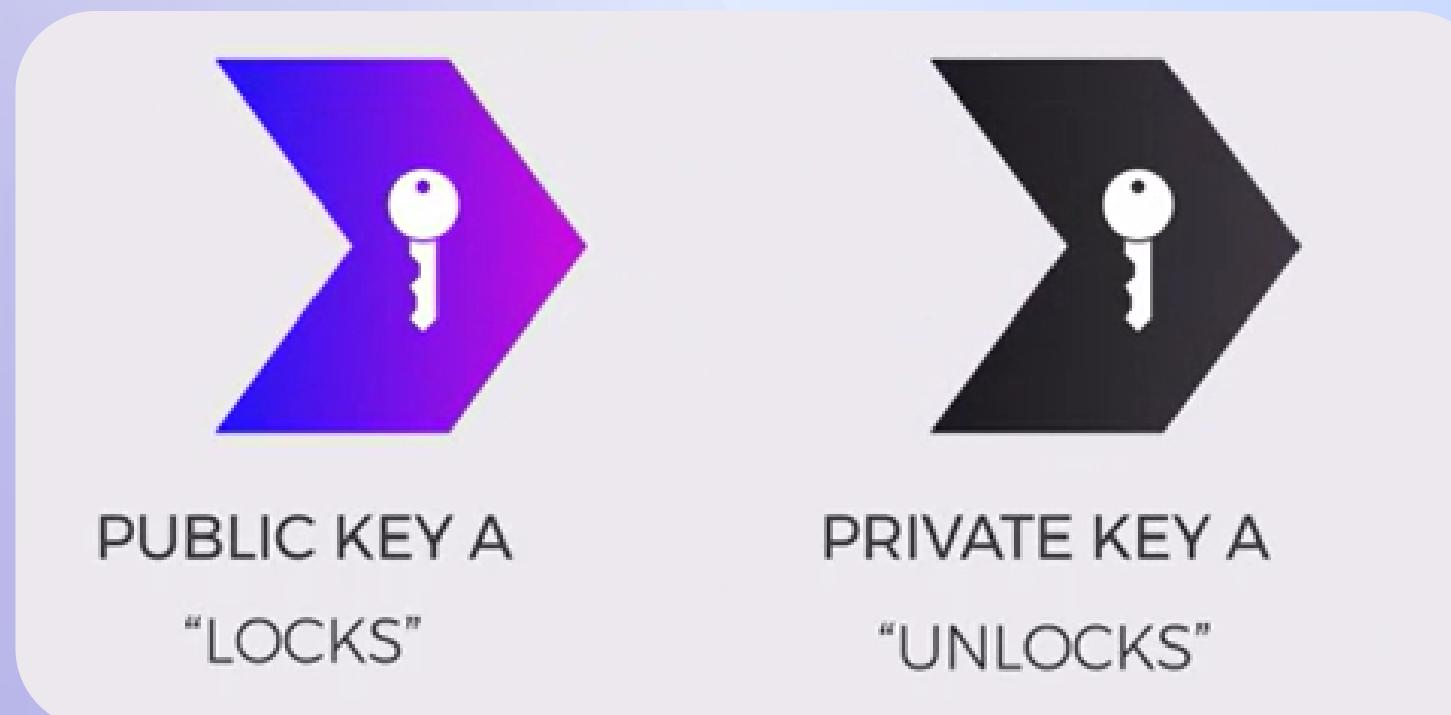
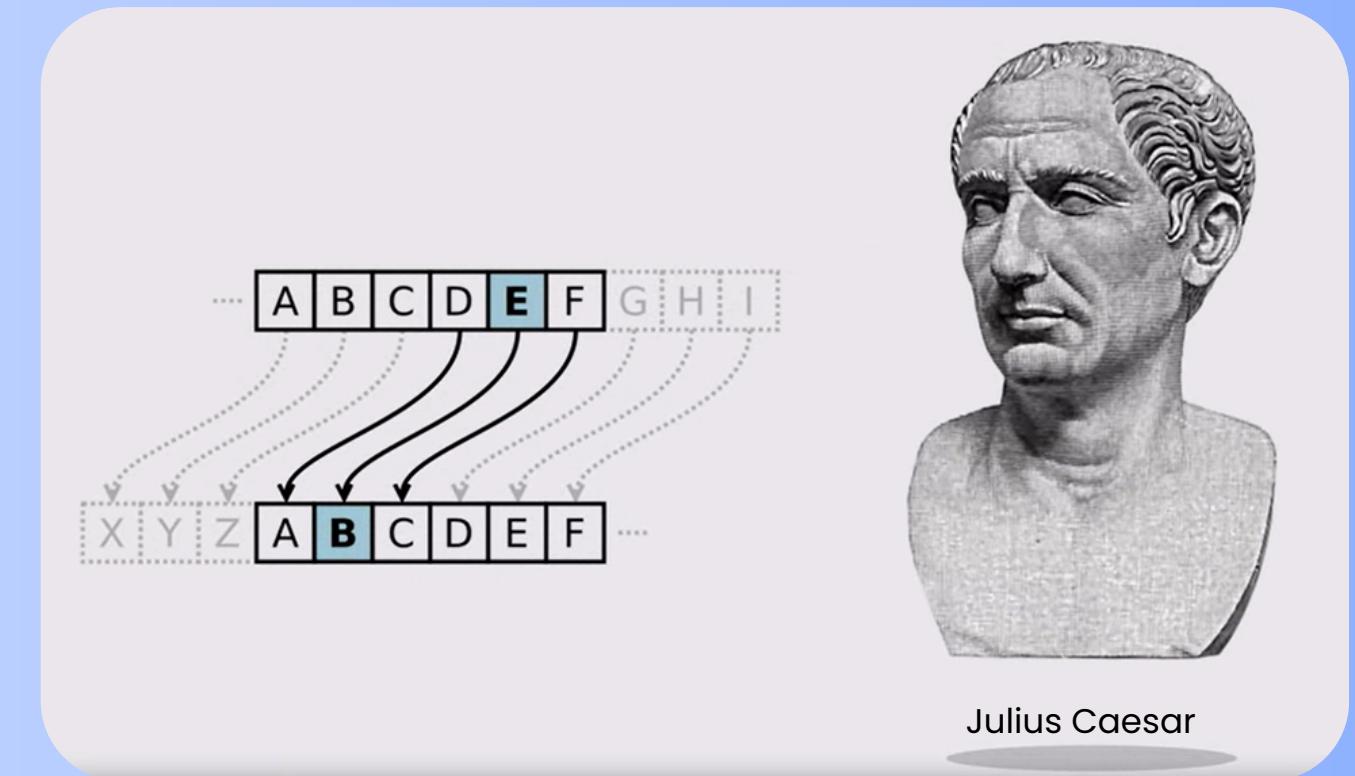


TRANSACTION LIFECYCLE



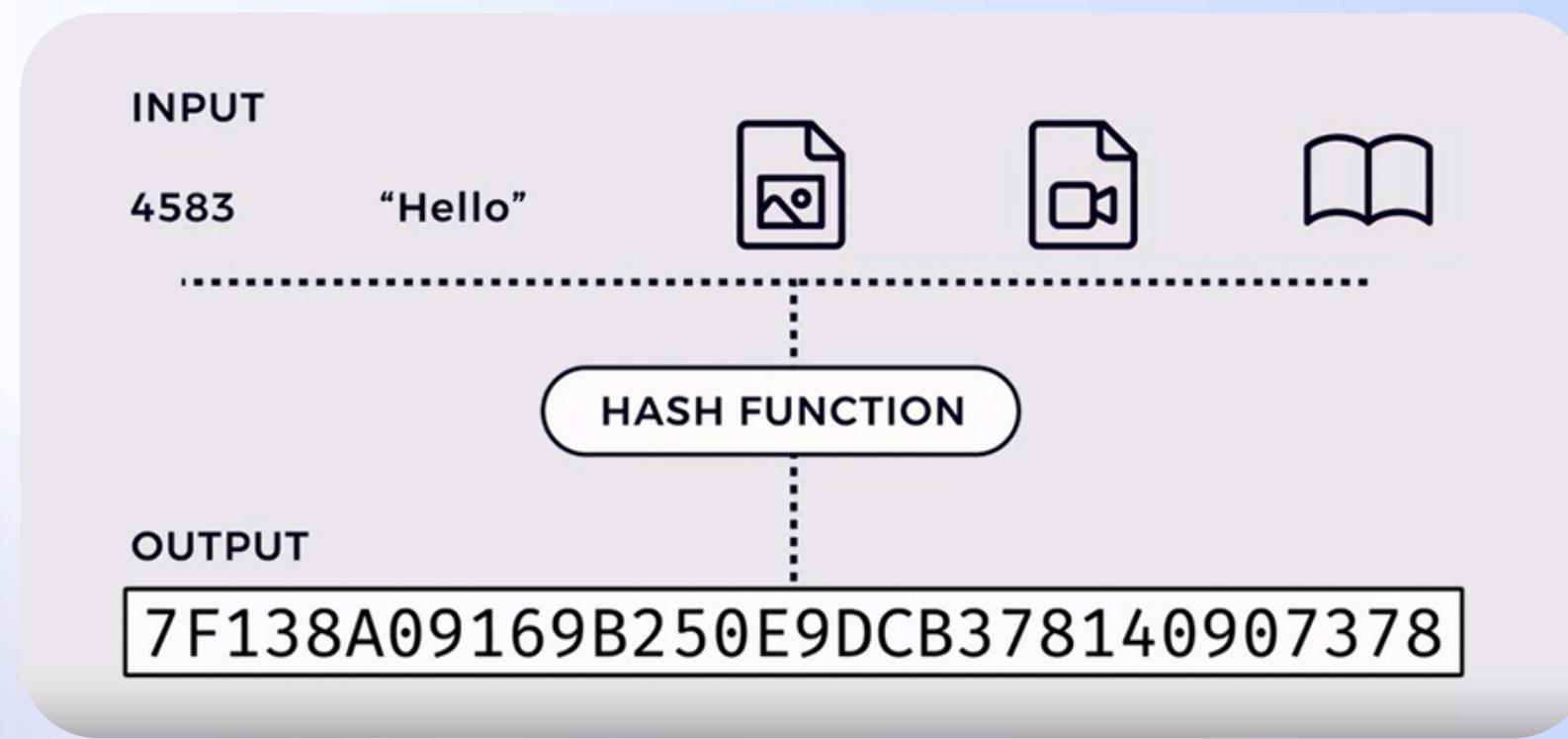
DIGITAL CRYPTOGRAPHY

- Cryptographic Principles
 - Caesar Cipher(Example code)
 - Public & private key
- Digital signature



Live transactions look-up

HASH FUNCTION



OF POSSIBLE OUTPUTS OF **2**-BIT HASH FUNCTION

$$2^2 = 4$$

OF POSSIBLE OUTPUTS OF **128**-BIT HASH FUNCTION

$$2^{128} = 340,282,366,920,938,\\463,463,374,607,431,\\768,211,456$$

PROPERTIES OF CRYPTOGRAPHIC HASH FUNCTIONS

- ④ Input can be any size (from bits to gigabytes and up!)
- ④ Deterministic (the same input always gives the same output)
- ④ Irreversible (you can't get the input from the output)
- ④ Output is a small and fixed length “fingerprint” of input
- ④ Output changes dramatically with small change to input
- ④ Function is fast, with low computational overhead

SHA-256

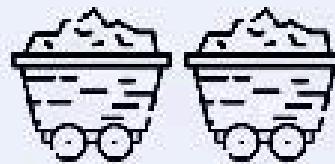
HASH FUNCTION DEMO



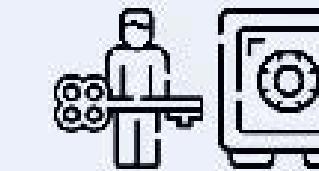
<https://emn178.github.io/online-tools/md5.html>

CONSENSUS ALGORITHMS

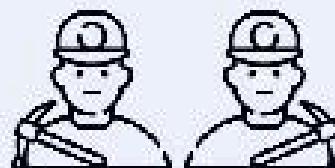
Proof Of Work (PoW) VS Proof of Stake (PoS)



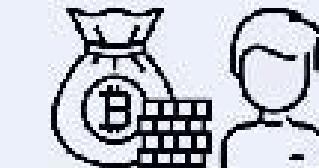
The ability to mine a block is determined by the computational power of each miner.



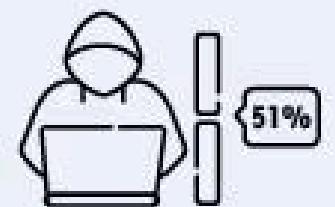
The ability to mine is determined by how many tokens of this currency the user owns.



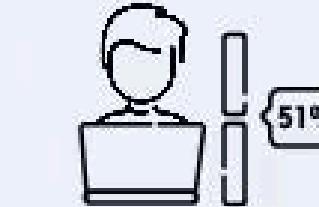
A reward is given to the miner who solves each block.



In PoS, the miner does not earn rewards but is paid with network fees.



In PoW hackers need 51% of the network computing power to add a block and execute a 51% attack, which is highly unlikely but not impossible.



In PoS a hacker would need to own 51% of all the cryptocurrencies on the network to execute an attack, which is practically impossible.

EXAMPLES OF BLOCKCHAIN

- Bitcoin (BTC)
- Ethereum (ETH)
- Hyperledger Fabric
- Ripple (XRP)
- IBM Food Trust
- Polkadot (DOT)
- Solana
- Dogecoin



Why does Bitcoins have any value?

LETS TRY OUT



<https://blockchaindemo.io>

HANDS-ON: BUILD A SIMPLE BLOCKCHAIN

- Code Walkthrough
- Concepts: Adding Blocks, Verifying Integrity, Proof-of-Work



<https://github.com/mbharti321/Blockchain-workshoppp>

ETHEREUM

ETHEREUM OVERVIEW

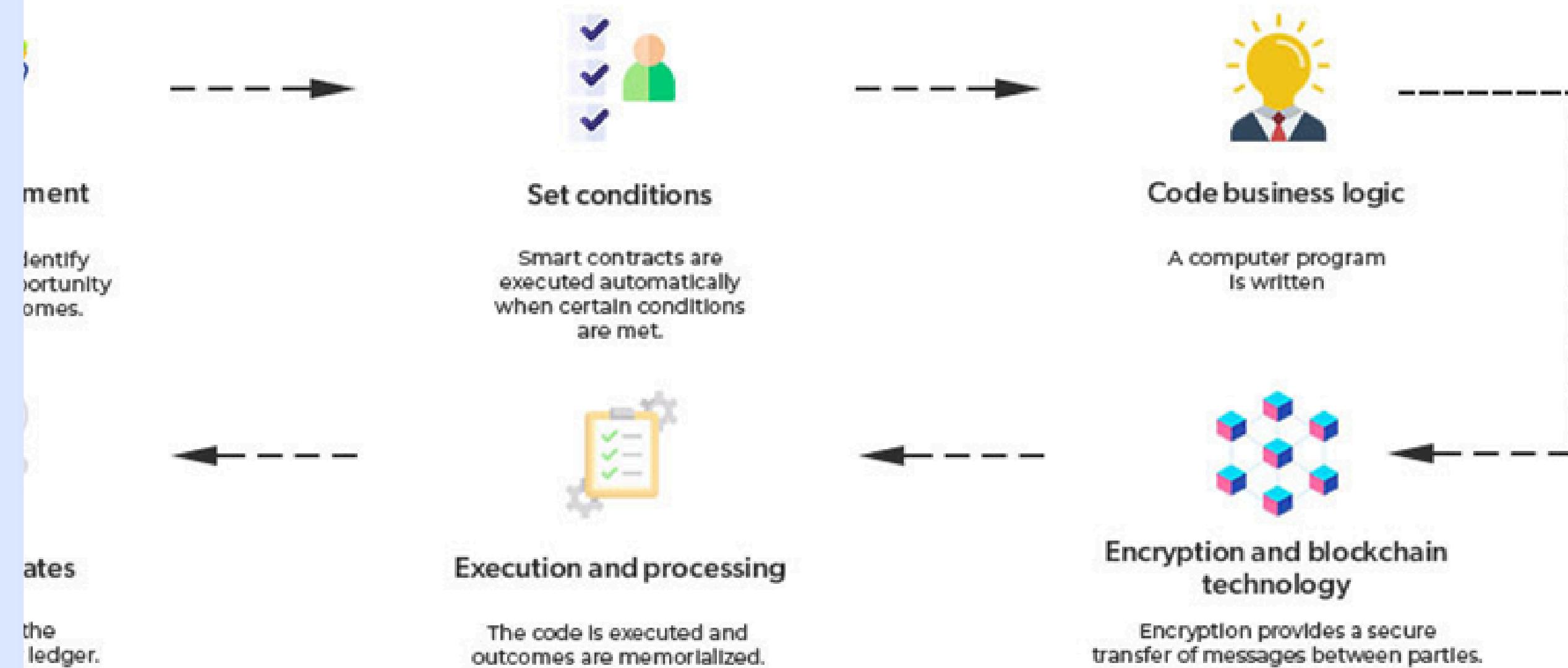
- Ethereum as a Platform for Decentralized Applications (dApps)
- Web1, Web2, Web3
- Ethereum Virtual Machine (EVM) and Its Role



SMART CONTRACTS

- Program
- Self-executing contracts
- Automatically enforce terms

How does a Smart Contract Work?



WHY SMART CONTRACTS?

Smart Contracts Benefits



NFT

- Unique Digital Assets
- Ownership and Authenticity
- Monetization for Creators
- Applications:
 - Digital art, gaming, music,
 - Virtual real estate, and collectables
 - Tokenized Physical Assets.



CryptoPunks : \$7.56 million

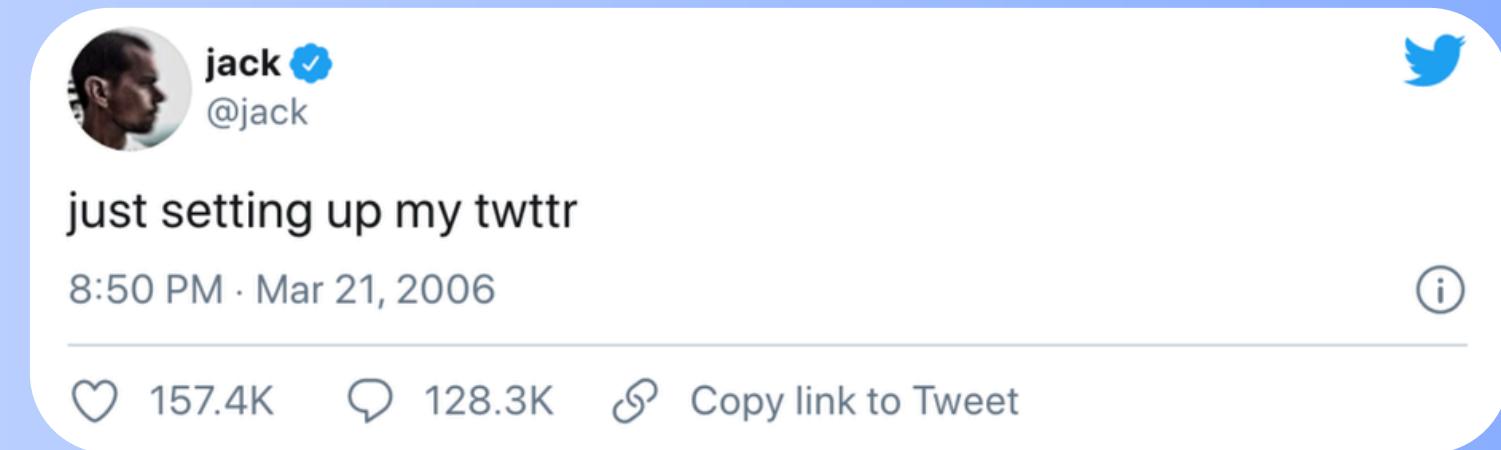
Minting ->

Selling ->

Buying ->

Selling -> ...

Royalties



\$2.9 million

CASE STUDY:

Walmart's use of blockchain technology

Walmart's problem:

In 2018, There was e-coli found in lettuce in a certain part of the USA. Walmart has a huge supply network of farms across the country, and without a way to trace the origins of its product, they may be forced to pull all lettuce from the shelves.



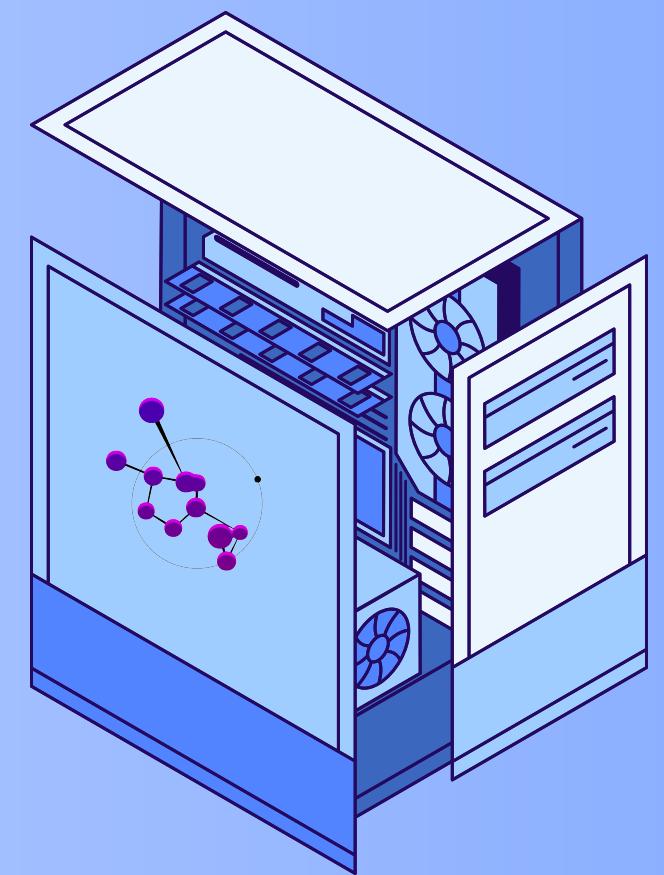
BLOCKCHAIN SOLUTION:

Walmart's use of blockchain technology

- Record all the movement of products onto a blockchain database.
- By tracking products from the farm to the store location, the blockchain provides secure, permanent and unmodifiable traceability,
- Now, Walmart can effectively manage any contamination as soon as it's detected.
- This blockchain was developed by IBM.

DAPPS EXAMPLE

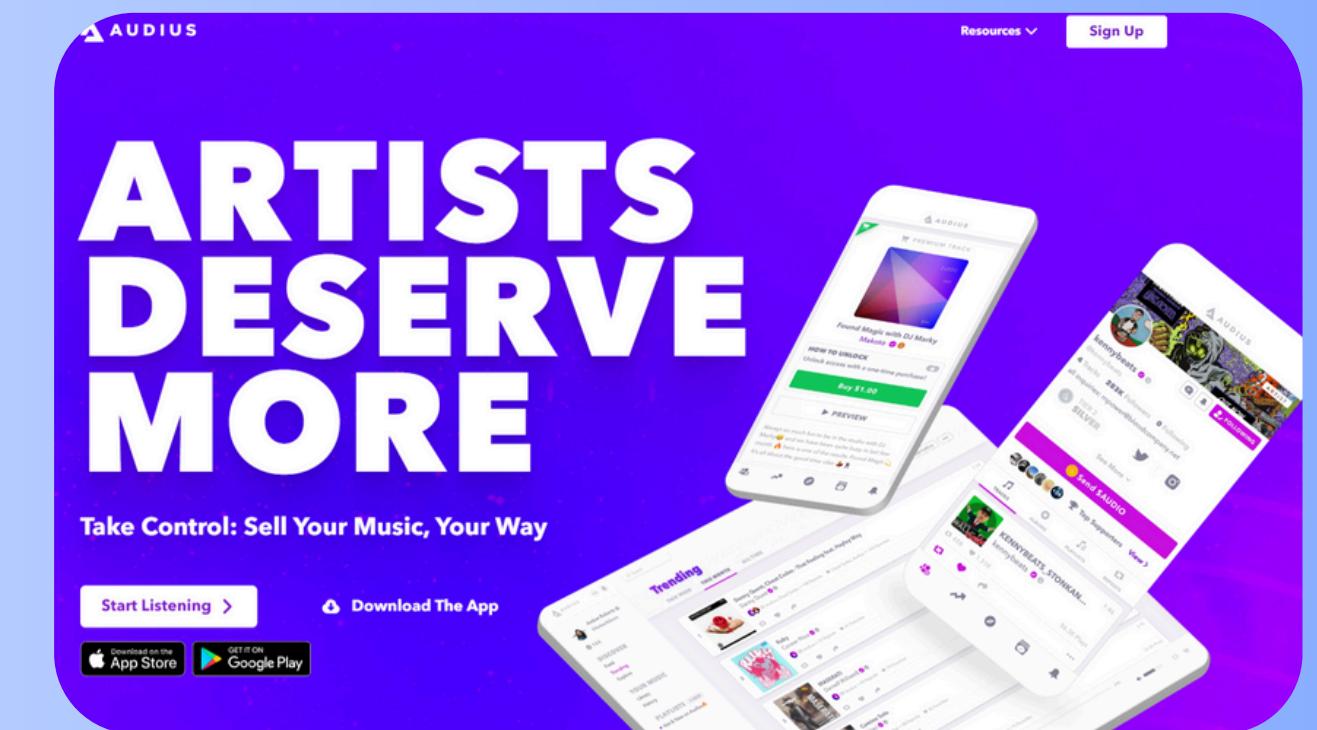
- Blockchain in Finance,
- Healthcare,
- Music industry
- Logistics, etc.



DAPP: AUDIUS.CO

Take Control: Sell Your Music, Your Way

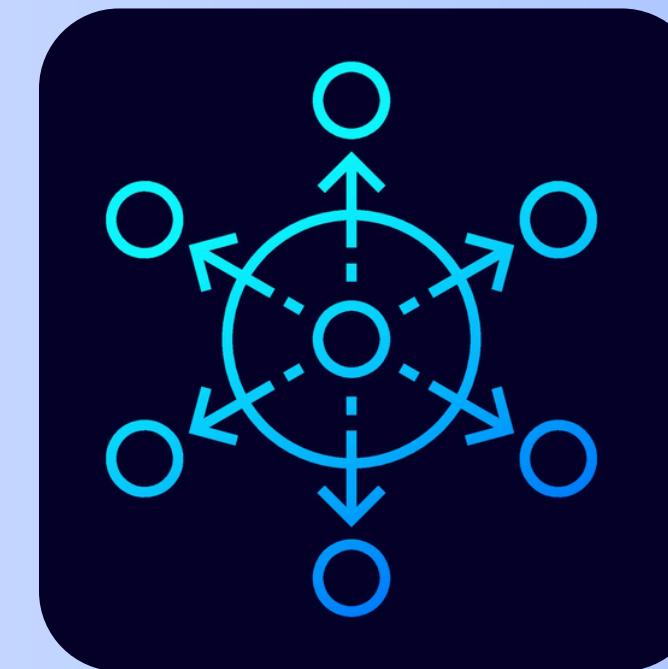
- Direct Artist-to-Fan Interaction
- Smart Contracts for Revenue Distribution
- Decentralized Streaming
- Tokenization of Music (NFTs)
- Transparent Royalty Payments



<https://audius.co>

REAL-WORLD USE CASES

- Bitcoin
- Ethereum
- DogeCoin



Decentralization



Can't rely on third-party



Non-trusting entities



Transparency

REAL-WORLD USE CASES

- Supply Chain Management
- IoT
- Property chain (PC)
- Health Care: MedRec
 - Record, insurance claim
- Gambling Industry
- Brave Browser (BAT)

More examples:

<https://bernardmarr.com/30-real-examples-of-blockchain-technology-in-practice/>



Property chain (PC)

Blockchain powered property management system enables the availability of common ledger of the property facilitating a single source of truth. The property details and all the transactions on the property (pledge, release of pledge, inheritance mutation, sale, gift, acquisition initiation, alienation, etc.) would be stored in the blockchain so that even while the process of the mutation is being executed in the land records system to reflect the transactions on



BLOCKCHAIN CHALLENGES

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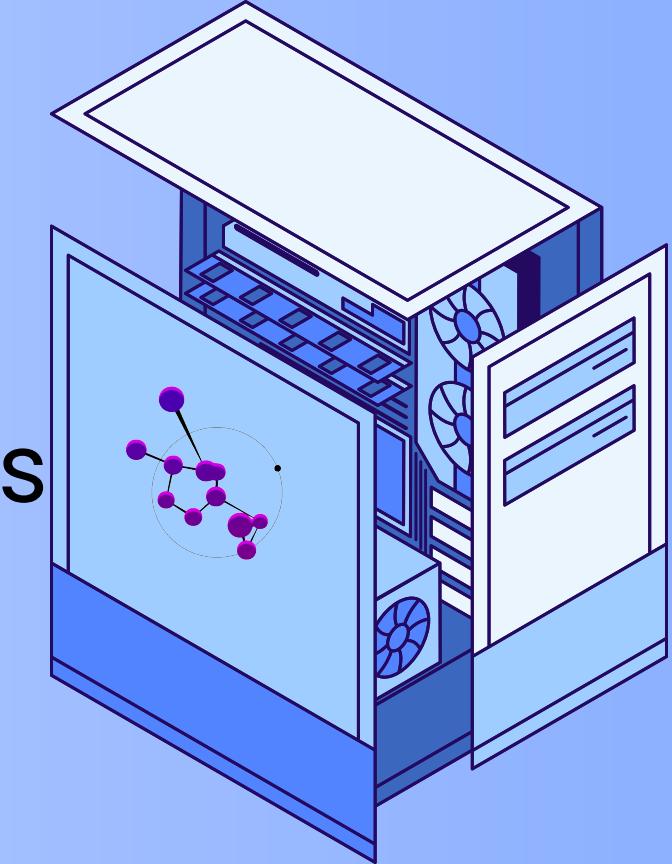
- Scalability
 - Size more than 100GB
- Speed: only 7-10/sec
- Energy Consumption
- Interoperability
- Regulatory Uncertainty
 - Tax on crypto
- Privacy Concerns
 - Hybrid blockchain
- Security Vulnerabilities
 - smart contracts and off-chain integrations

Solutions:

- Layer 2
- Sharding

BLOCKCHAIN & AI: BHAI-BHAI

- Decentralized AI Governance: Blockchain ensures AI transparency and accountability.
- Data Security: Immutable blockchain protects AI data integrity.
- Efficient Smart Contracts: AI enhances decision-making in smart contracts.
- Fraud Detection: AI identifies fraud; blockchain secures records.



WHATS NEXT?

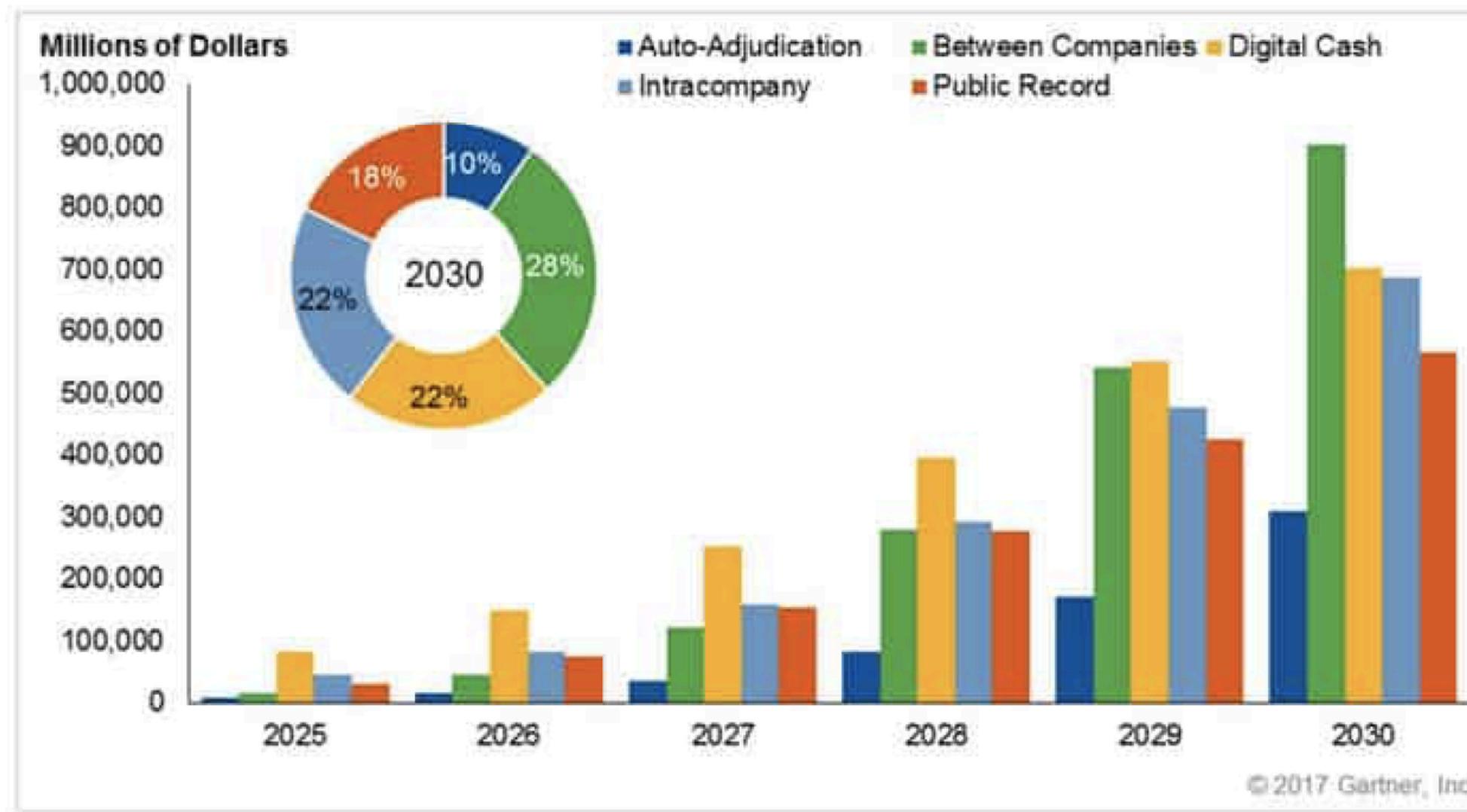
- Practice
- Blockchain Foundation Coursera course
- Solidity learning course: <https://cryptozombies.io/en/course>

The card features the Consensys Academy logo at the top left. The main title "Blockchain: Foundations and Use Cases" is centered in large, bold, black font. Below the title, a small note says "Taught in English | 22 languages available | Some content may not be translated". At the bottom left is a blue button labeled "Go To Course". To its right, two smaller text lines say "Already enrolled" and "Financial aid available". At the very bottom left, it shows "87,280 already enrolled".

The card features the CryptoZombies logo at the top left. The main title "Solidity: Beginner to Intermediate Smart Contracts" is centered in large, bold, white font. Below the title, a sub-note says "Get up to speed with the basics of Solidity.". At the bottom center is a blue button labeled "Start Course". Navigation arrows are located at the bottom left and right corners.

JOB OPPORTUNITIES

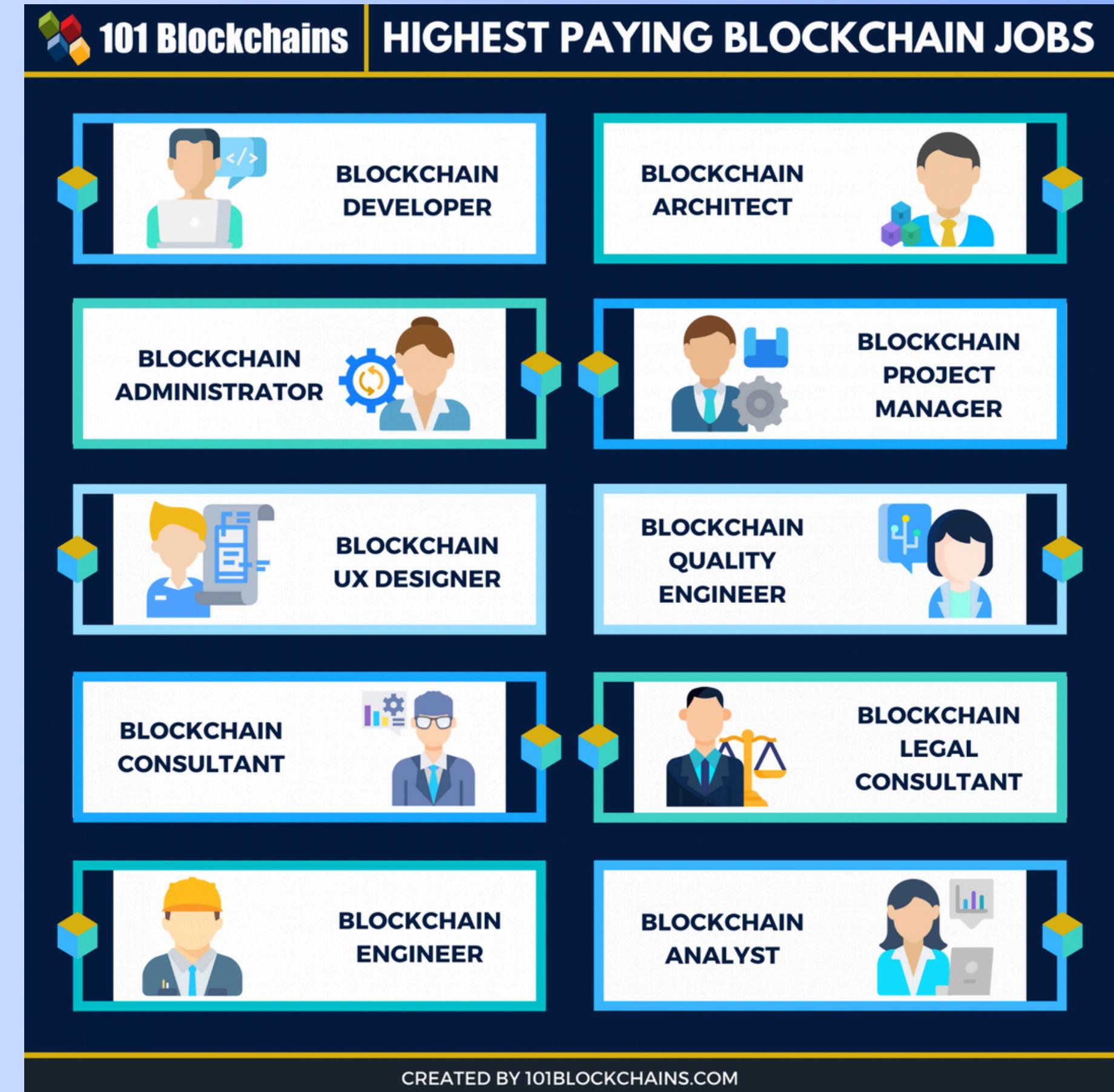
**Business value-add of Blockchain - \$176 billion by 2025,
\$3.1 trillion by 2030**



Source: Forecast: Blockchain Business Value, Worldwide, 2017-2030

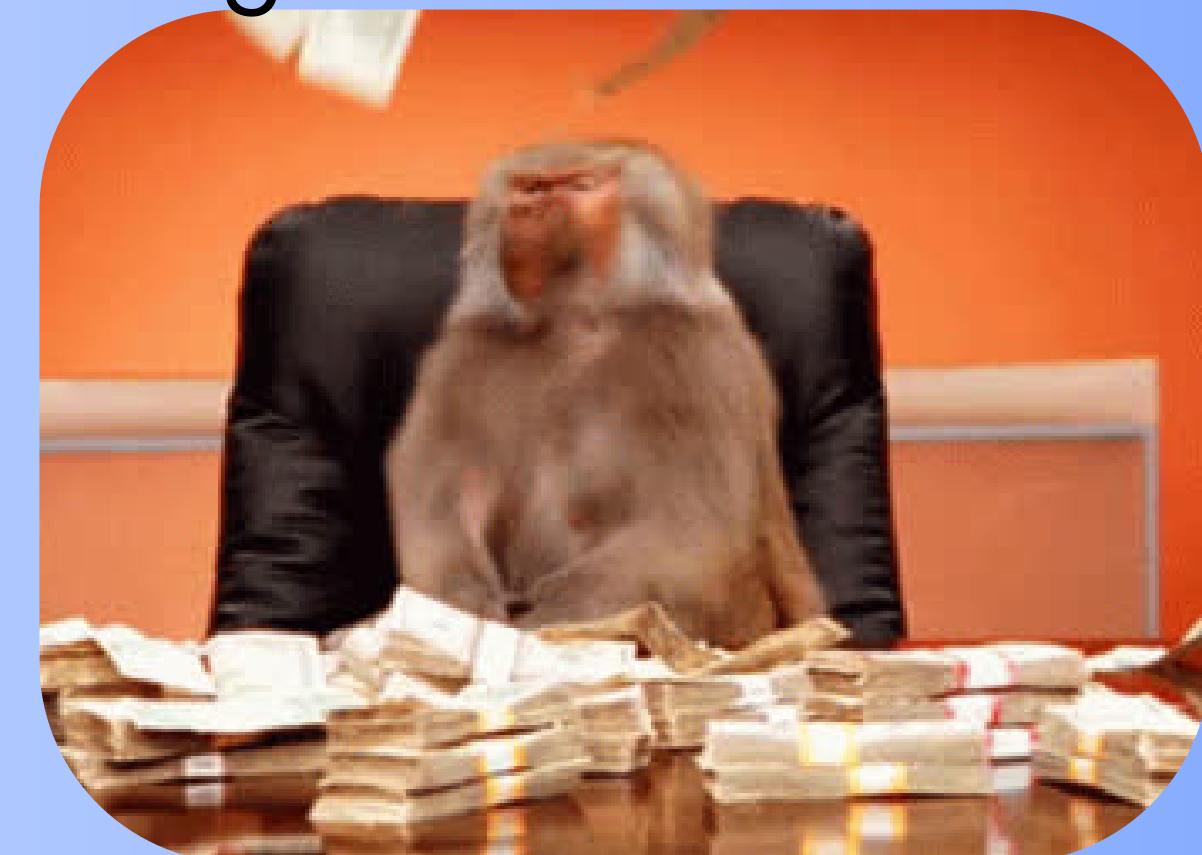
JOB OPPORTUNITIES

Salaries for blockchain positions are typically higher than in other areas of expertise since there are few qualified candidates.



HOW TO ENTER THE BLOCKCHAIN JOB MARKET

- Learn Blockchain Development
- Work on Blockchain Projects
 - Open-source blockchain projects
 - Your own decentralized apps (dApps).
- Certifications
 - ConsenSys Academy's Blockchain Developer Program
 - IBM Blockchain Certification.
- Networking:
 - Join blockchain communities
 - Attend conferences
 - Hackathons to build connections.



ANY USECASE YOU HAVE IN MIND?

QUESTIONS ?

THANKS!

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