

# Blockchain and its Applications

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March 14<sup>th</sup>, 2022



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## Agenda

- Origin of Blockchain
- Introduction to Blockchain
- Blockchain Technology Topology
- Blockchain Data Structure
- Features of Blockchain
- Type of Blockchains
- When do you use blockchain?
- Blockchain technologies
- Advantages of Blockchain
- Applications of Blockchain



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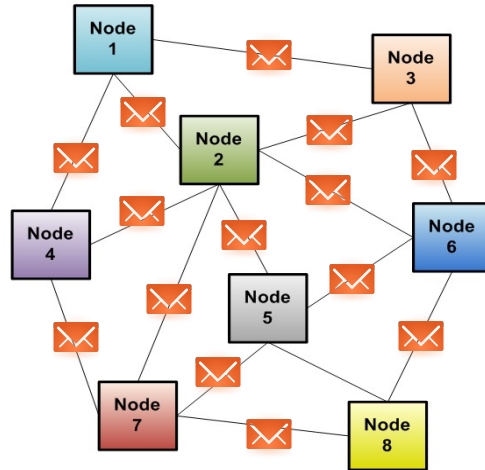
## Origin of Blockchain

- Collapse of Lehmann Brother in 2008 Financial Crisis
- “Bitcoin: A Peer-to-Peer Electronic Cash System”- Satoshi Nakamoto
- “A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. ”
- Blockchain is the underlying technology of Bitcoin

## Introduction to Blockchain

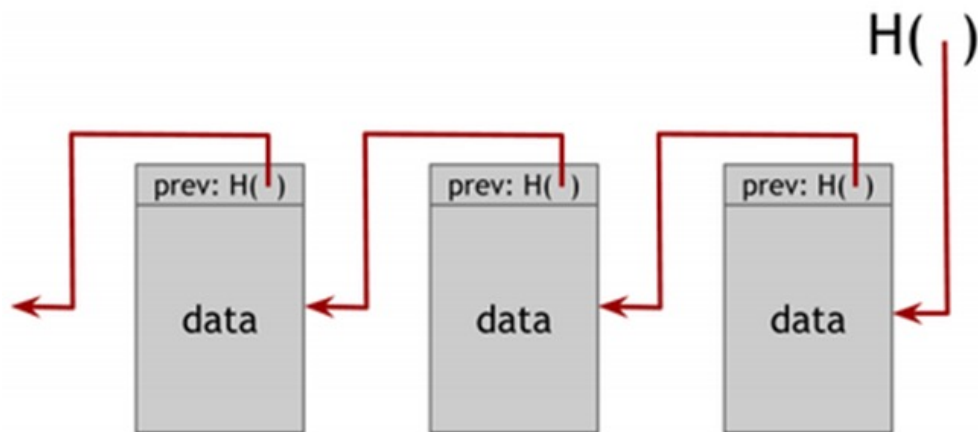
- "a decentralized and distributed database where all the transactions are recorded in a ledger"
- Data shared across a network of PCs (nodes)
- Every node has access to the data
- Data is saved in the form of blocks and are secure by cryptographic algorithms

# Blockchain Technology Topology



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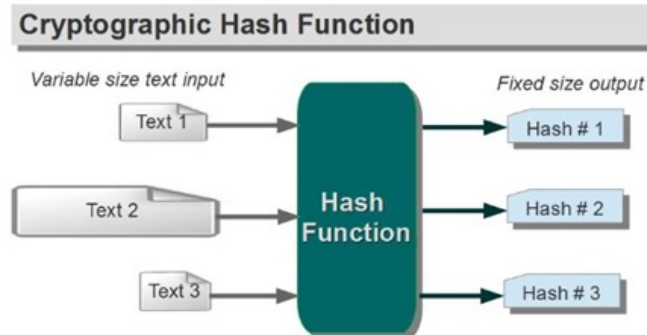
# Blockchain Data Structure



Link: <https://www.blockchain.com/explorer>

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# Hash Function



**Simulation Link:** <https://xorbin.com/tools/sha256-hash-calculator>

# Consensus Mechanism

**Proof of Work (PoW):** A consensus mechanism where miners have to solve a cryptographic puzzle to put the next legal block onto the blockchain

**Proof of Stake (PoS):** A consensus mechanism where miners who have higher stakes are randomly selected to put the next legal block onto the blockchain

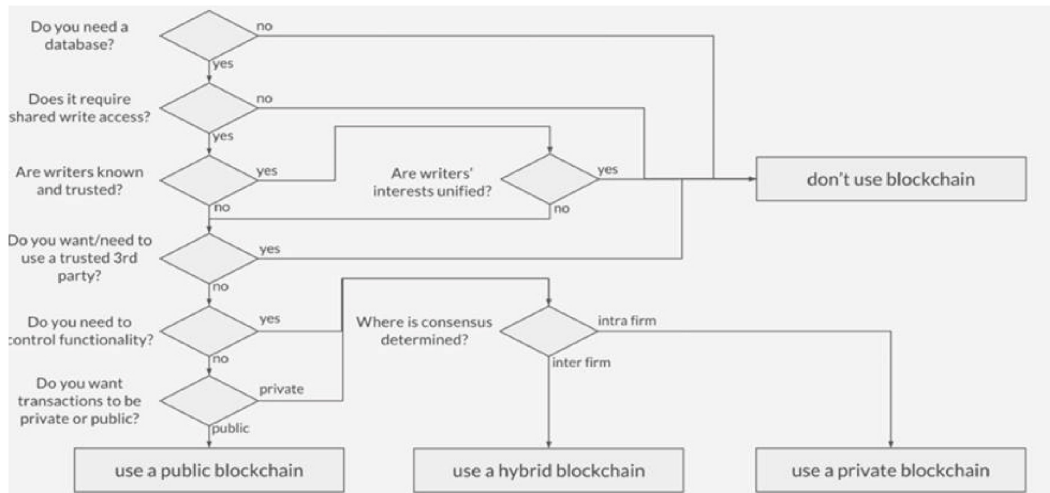
## Features of Blockchain

- Immutable
- Decentralized
- Open/Auditable
- Scalable

## Types of Blockchain

- **Public Blockchain:** All the data present in the blockchain will be available to the everyone in the world and anyone can join a public blockchain.  
Example: Bitcoin
- **Private (Permissioned) Blockchain:** The access privileges are restricted to very few individuals in the company. Participants on the blockchain needs to obtain an invitation in order to join the blockchain and these invitations are sent by a regulatory authority within the company.  
Example: Hyperledger Fabric
- **Consortium Blockchain (Hybrid):** The access to data is not just restricted to a single company. It is shared to some permissioned entities among a group of companies.  
Example: Corda

# When to Use Blockchain



# Blockchain Technologies

- Hyperledger Fabric
- Corda
- Ethereum

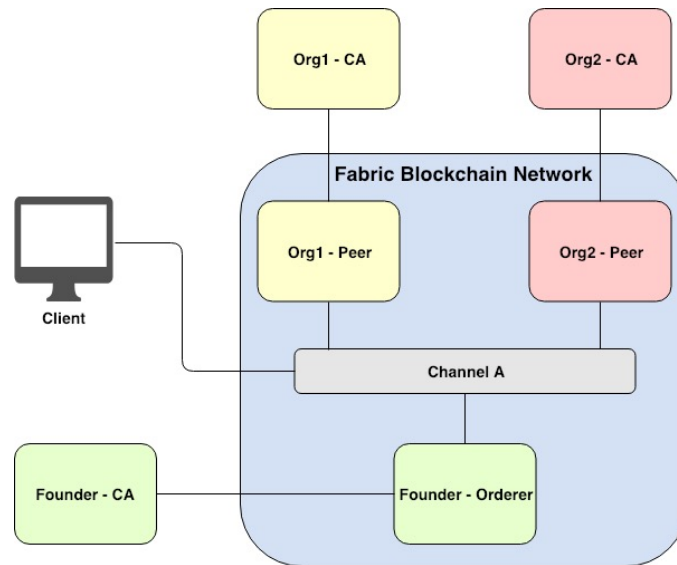
# Hyperledger Fabric

- Open-source enterprise-grade permissioned distributed ledger technology (DLT) platform developed by Linux Foundation
- Fabric has a highly **modular** and **configurable** architecture
- Smart contracts authored in general-purpose programming languages such as Java, Go and Node.js
- **pluggable consensus protocols** that enable the platform to be more effectively customized to fit particular use cases and trust models

# Hyperledger Components

MEMBER	- The organizations that take part in building hyperledger fabric network
Peer	- Each member organization are represented as peers in the network
Orderer	- Builds the block and delivers to all peers, central communication
CA	- Registration of identities, enroll, renew, revoke certificates
Channel	- Private subnet of communication between specific members

# Hyperledger Architecture



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# Overview of Corda

Corda is a Distributed Ledger Technology to be used by businesses, such as financial institutions, to keep a shared ledger of transactions

Corda is an open-source platform with impressive scalability, transaction privacy, state consistency and workflow flexibility

In Corda, “Law is Law”, unlike Ethereum where “Code is Law”

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## Corda Key concepts

The network - The ecosystem that Corda exists in

The ledger - The ledger, and how facts on the ledger are shared between nodes

States - The states represent shared facts on the ledger

Transactions - The transactions update the ledger states

Contracts - The contracts govern the ways in which states can evolve over time

Flows - The flows describe the interactions that must occur between parties to achieve consensus (to satisfy some business requirement)

## Ethereum

Open-source blockchain platform for decentralized applications

Decentralized applications (DApps) are applications, programs, or tools that utilize smart contracts built into the Ethereum network.

Smart Contracts are written in a language called as solidity

Gas is required to execute the code

## Advantages of Blockchain

- Helps unknown parties to transact with each other
- Removes the need of a trusted third party
- Reduces cost and increases the speed of transactions
- Globally scalable system

## Application of Blockchain

- BlockCerts (Malta) academic certification
- Lantmäteriet (Sweden) and property transactions
- Voatz (US): Blockchain-based complementary distance voting
- Estonian Information Systems Authority (RIA) and KSI Blockchain (Estonia): Private blockchain-backed government records
- Swedish unemployment agency and Axa insurance agency (Sweden): Digitalising the unemployment certificate process
- NFT in Gaming (Play to Earn model)

**Thank you**

**Questions?**