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Web 1.0, 2.0 and 3.0

1.0	2.0	3.0
- It is the "readable" phrase of the World Wide Web with flat data. In Web 1.0, there is only limited interaction between sites and web users. - Web 1.0 was an information portal which was static in nature.	- It is the "writable" phrase of the World Wide Web with interactive data. Unlike Web 1.0, Web 2.0 facilitates interaction between web users and sites. - Web 2.0 was built to enable collaboration and participation.	- It is the "executable" phrase of Word Wide Web with dynamic applications, interactive services, and "machine-to-machine" interaction. - In Web 3.0, computers can interpret information intelligently like humans tailored to their preferences.

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Say Hello to Consensus Protocols!

Blockgeeks

Proof of Work	vs.	Proof of Stake
 To add each block to the chain, miners must compete to solve a difficult puzzle using their computers processing power.		 There is no competition as the block creator is chosen by an algorithm based on the user's stake.
 In order to add a malicious block, you'd have to have a computer more powerful than 51% of the network.		 In order to add a malicious block, you'd have to own 51% of all the cryptocurrency on the network.
 The first miner to solve the puzzle is given a reward for their work.		 There is no reward for making a block, so the block creator takes a transaction fee.

Public and Private Blockchains

Public Blockchain

1. Anyone in the world can join these networks i.e it's open for public.
2. The transaction ledger is visible to everyone who is on the network.
3. Completely decentralised and no one has any control over the network. Data security comes from the fact that data once validated on Blockchain cannot be tampered with.
4. This is also known as permissionless Blockchain.

Private Blockchain

1. Private Blockchains are private network channels setup between 2 or more parties who are involved in transactions.
2. The transaction ledger is only visible to those parties who are in the private network.
3. It's decentralised among the involved parties and decisions over the network are taken through consensus protocols. There are restrictions on who can participate in the network and who cannot.
4. Also known as permissioned Blockchain.

Introduction to Ethereum

- **Ethereum** was proposed in the **late 2013 by Vitalik Buterin**, a cryptocurrency researcher and programmer.
- Ethereum is an **open source, public blockchain platform** which has successfully implemented the functionality of "**Smart Contracts**".
- **Ether** is a token that is used for transactions on the **Ethereum Blockchain**. It can be transferred between accounts and can also be used to incentivise miners.
- Ethereum provides a **decentralized virtual machine known as EVM** which is used to execute the scripts using an international network of public nodes.

Evolution of Ethereum

White Paper released by Vitalik

The introductory paper, published in 2013 by Vitalik Buterin, the founder of Ethereum, before the project's launch in 2015.

2013

2015

Frontier was live

Frontier - the barebone implementation of Ethereum was live. It was intended for technical users, specifically developers.

Byzantium Fork

Block rewards were reduced from 5ETH to 3TH. Added the ability to make non-state changing calls to other contracts.

2017

2020

Beacon Chain Genesis

The Beacon chain started producing blocks on Dec1,2020 which was the first step towards Eth2.

Features of Ethereum

Ethereum Accounts

Ethereum Virtual Machine

Smart Contracts

Transactions & Gas

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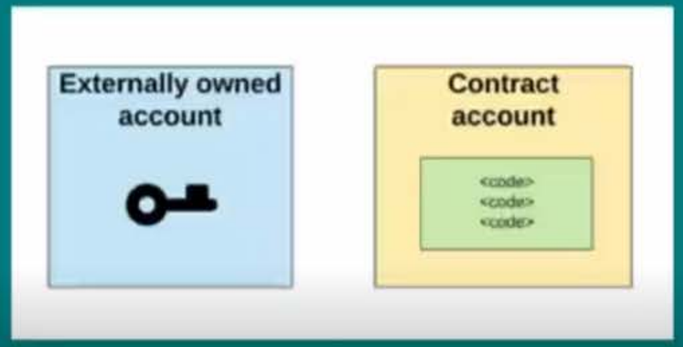
Accounts in Ethereum

There are two types of accounts in Ethereum that share the same address space:

- External accounts that are controlled by the public-private key pair
- Contract accounts that are controlled by the code(smart contract code) stored together with the account



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What is Ethereum 2.0?

- Ethereum 2 is a planned upgrade to the current Ethereum Blockchain. It is aimed to eliminate the current bottlenecks on speed, efficiency and scalability.

- It implements two major changes known as :
  - Proof of Stake
  - Sharding

- The major difference between Ethereum and Ethereum 2.0 is PoW(Ethereum) and PoS(Ethereum 2.0).

(3) WhatsApp | General (Industrial Lecture Jan- | Remix - Ethereum IDE | https://nitturl.sharepoint.com

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Sharding

PROBLEM: Low Throughput

SOLUTION: Sharding

The process of sharding seeks to split a blockchain network into separate **shards**, that contain their own data, separate from other shards.

Each node in the network does only a subset of the total work.

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ENG IN

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Understanding Ethereum ...

- Ethereum enables a powerful feature called smart contracts, which is programmable logic on blockchain.
- To support the running of smart contract, a sophisticated design is required. Therefore, we can think of Ethereum as a state machine, instead of just a cryptocurrency based blockchain.
- Ethereum's state is a large data structure which holds not only all accounts and balances, but a *machine state*, which can change from block to block according to a predefined set of rules, and which can execute arbitrary machine code.

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What is the Ethereum Virtual Machine?

- The Ethereum Virtual Machine (EVM) is a powerful, sandboxed virtual stack embedded within each full Ethereum node, responsible for executing contract bytecode.

- Smart contracts are generally written in high level languages like Solidity and compiled into bytecode, which is then executed by the EVM.

- Every node in the Ethereum network runs an EVM instance which allows them to agree on executing the same instructions.

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Features of EVM

- The EVM is Turing complete, which refers to a system capable of performing any logical step of a computational function.
- It allows anyone to execute code in a trustless ecosystem in which the outcome of an execution can be guaranteed and is fully deterministic (i.e.) executing smart contracts.
- For every instruction implemented on the EVM, a system that keeps track of execution cost, assigns to the instruction an associated cost in Gas units

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Peering into a Solidity Smart Contract

- Solidity is the development language in which a Smart Contract is written.
- A smart contract when deployed on the network has its own “Name” and “Address” using which we can access the contract from the web.
- Each Smart contract has some metadata associated with it which could contain details like “Compiler”, “language”, “output”, “version” etc.
- Each contract can be compiled to a Bytecode which is the language understood by the machine.
- An ABI associated with a contract is an Application Binary Interface which is a data encoding scheme used to work with Smart Contracts.

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