Introduction to Ethereum

What Is Ethereum?

- Ethereum was co-founded by **Vitalik Buterin** in November 2013
- Ethereum is a distributed public Blockchain platform built for any type of decentralised application

Ethereum aims to enable innovations in four key areas:

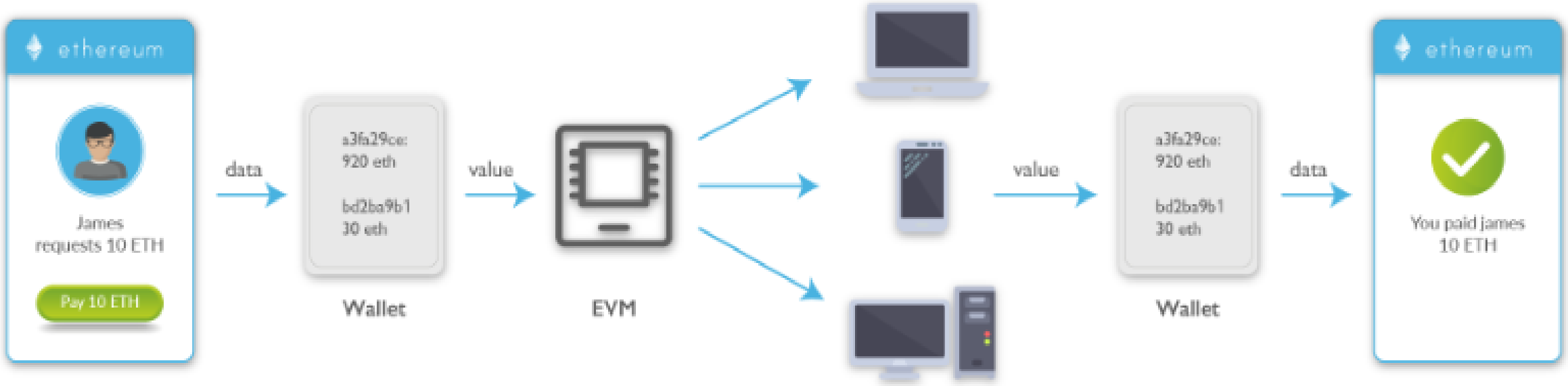
1. Currency Issuance
2. Decentralized Autonomous Organizations (DAO)
3. Smart Contracts
4. Smart Property

Comparing Bitcoin And Ethereum

Properties	Bitcoin	Ethereum
Concept	Digital money	World Computer
Cryptocurrency Token	BTC	Ether
Scripting language	Turing incomplete	Turing complete
Consensus Algorithm	SHA256	Ethash
Coin Release Method	Early mining	Through ICO
Average block time	~10 minutes	~12-15 seconds

Ethereum Virtual Machine

- The **Ethereum Virtual Machine** is an engine in which transaction code gets executed
- EVM enables the development of different applications on a single platform
- Contracts written in a smart contract-specific programming languages, are compiled into EVM readable 'bytecode'
- All the nodes execute this contract using their respective EVMs



Ether

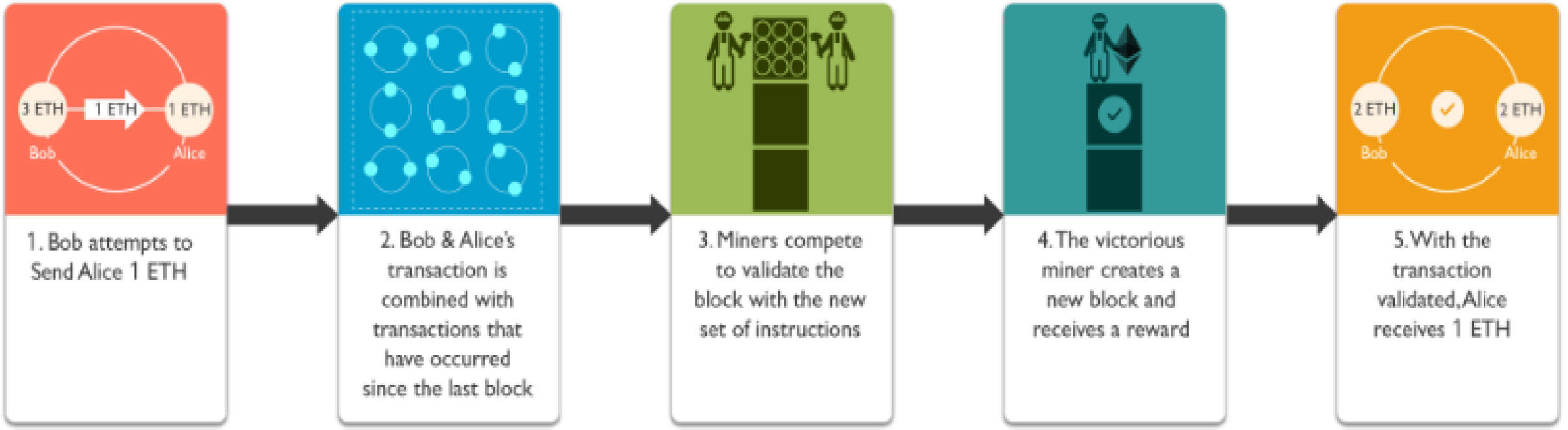
- The value token of Ethereum Blockchain is called **Ether**
- On cryptocurrency exchanges, it is traded under the code ETH
- It is also used to pay for the transaction fees and computational services on the Ethereum network
- Every time a contract is executed, Ethereum runs the computations and consumes tokens termed as **gas**

- Gas refers to the **unit that measures the amount of computational effort required to execute specific operations on the Ethereum network**.
- Since each Ethereum transaction requires computational resources to execute, each transaction requires a fee. Gas refers to the fee required to successfully conduct a transaction on Ethereum.

Gas In Ethereum

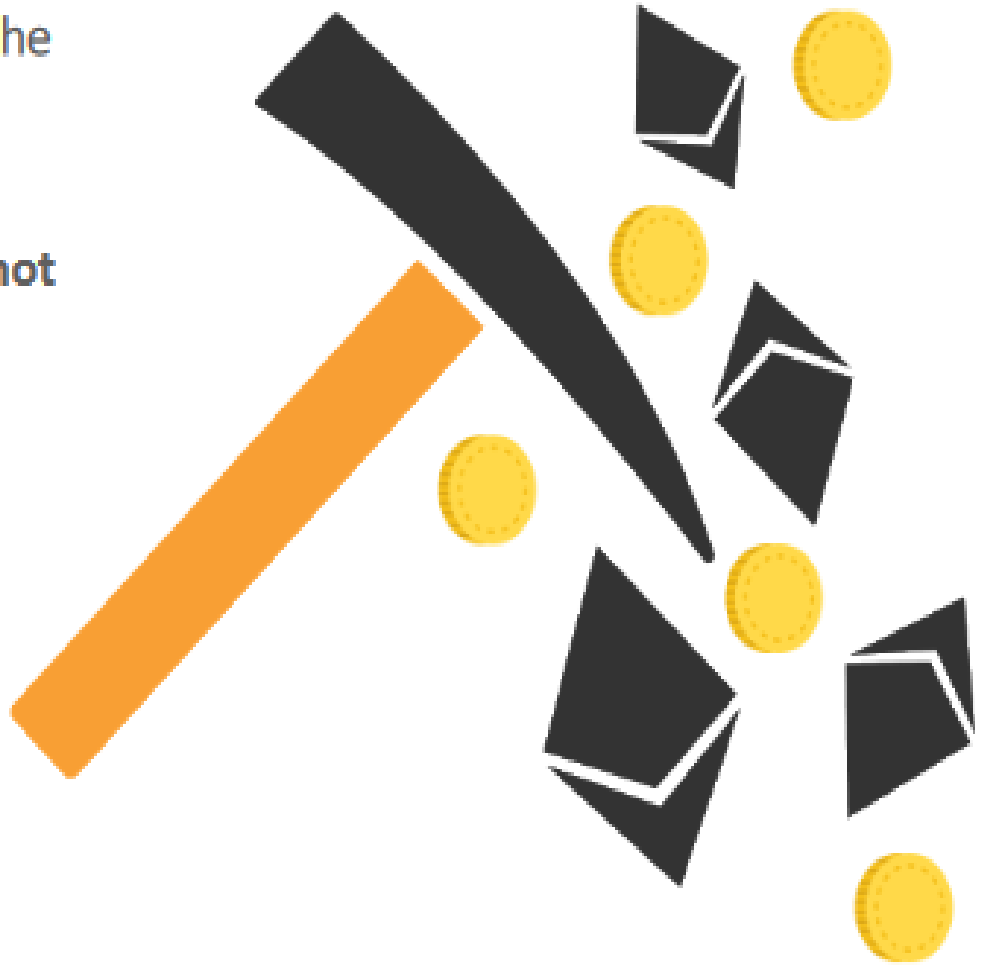
- **Gas** is paid for every operation performed on the Ethereum Blockchain
- **Ether**(transaction fee) is used to buy **Gas** to fuel up the EVM
- This fee is paid to the miners for including the transactions in a block
- Higher fee will mean chances are higher that the transactions will be picked up by the miners for the inclusion in the block

Mining At A Glance



Mining Reward

- For motivating the validators to support the Ethereum network, a block reward is awarded to the lucky validator who generates the **correct** block
- The **block reward** is currently set at 3 ether. Ether and it **does not halve** as in case of Bitcoin rewards
- Also, contrary to Bitcoin, Ethereum does not have a maximum total number of Ethers but does cap the amount released each year
- This will contribute to the inflation in the number of Ether available and hence, the value of each Ether



Consensus Algorithm Used In Ethereum

For any distributed computing system to function properly, there has to be a mechanism by which the entire network can come to an agreement on its state and its token supply division among registered addresses on the network.

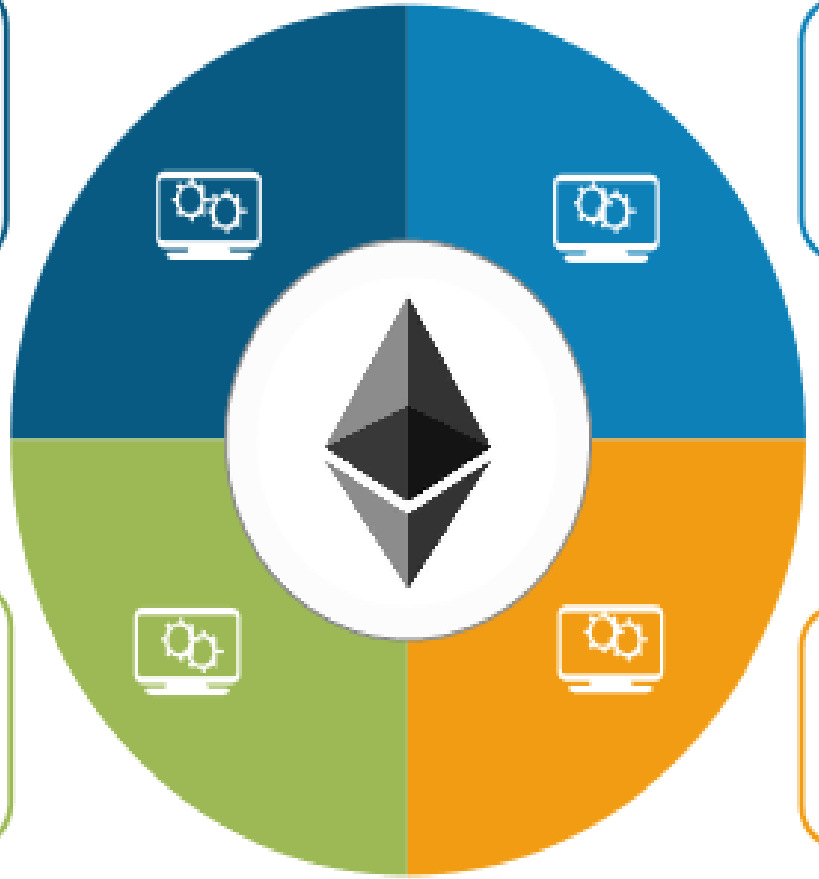
- Currently, Ethereum uses a Proof-of-Work protocol known as **Ethash**
- Similar to Bitcoin, the mining is done to find a nonce that once hashed, results in a predetermined difficulty level
- It uses different cryptographic primitive for its hashing function, known as **keccak256**

Ethash -
Ethash is designed to make Ethereum resistant to the high-powered mining chips. It also makes Ethereum more accessible to light client implementations.

Solidity

It is a high level contract-oriented programming language for implementing smart contracts

Solidity is statically typed which verifies and enforces the constraints at compile-time as opposed to run-time.



Solidity is has a similar syntax to scripting language of JavaScript

It has to be compiled into byte code and EVM assembly

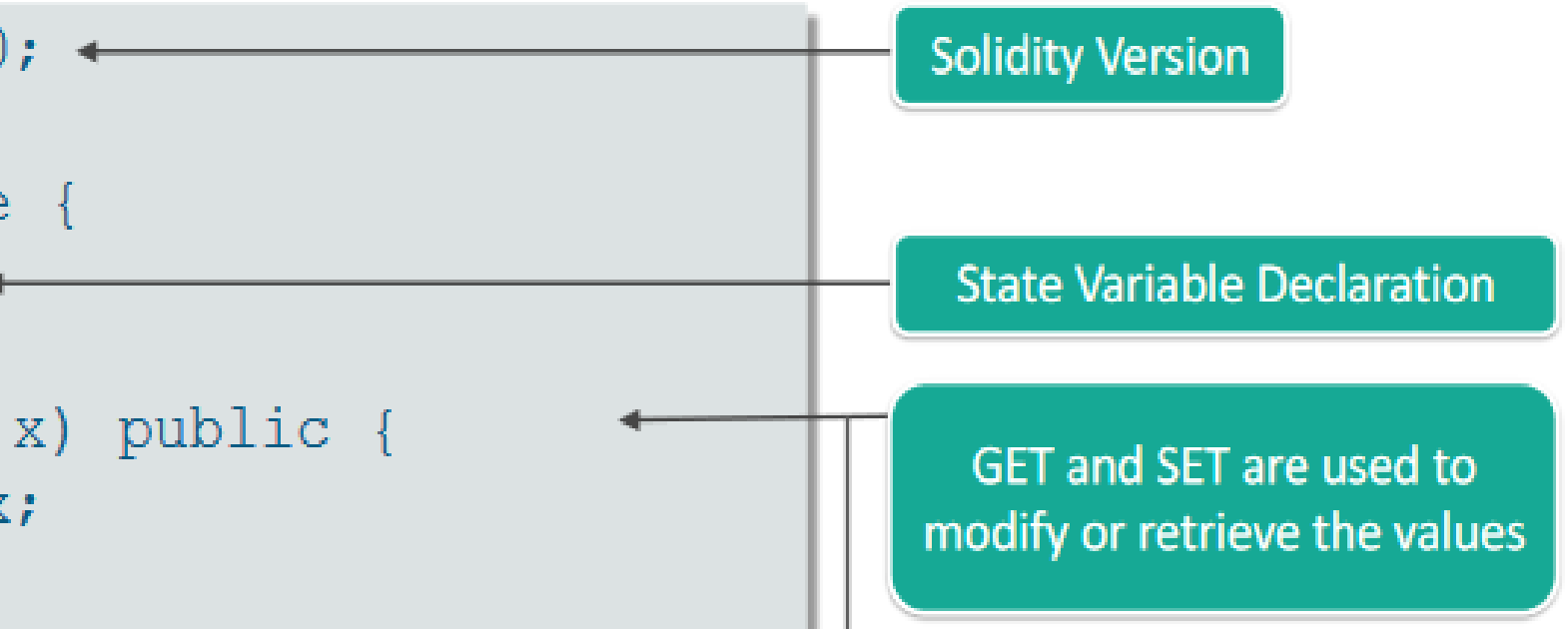
Sample Code

```
pragma solidity ^0.4.0;

contract SimpleStorage {
    uint storedData;

    function set(uint x) public {
        storedData = x;
    }

    function get() public constant returns
(uint) {
        return storedData;
    }
}
```



Dapps

- Dapps are decentralized apps.
- They are like normal apps, and offer similar functions, but the key difference is they are run on a peer-to-peer network, such as a blockchain.

What are the benefits of dapps?

- **Censorship-resistant--**With no single point of failure, it's very difficult for governments or powerful individuals to control the network.
- **No downtime**--Relying on a peer-to-peer system ensures the dapps continue to work even if individual computers or parts of the network go down.
- **Blockchain-based**--As they are made of smart contracts, they can easily integrate cryptocurrencies into the basic functionalities of the Dapp.
- **Open-source**--This encourages the widespread development of the dapp ecosystem enabling developers to build better dapps with more useful or interesting functions.

Ethereum Test Networks

List of Ethereum Test Network available for testing various DApps

1. Ropsten
2. Kovan
3. Rinkeby