

# **What is Cryptocurrency ?**

**Why you need to know about Cryptocurrency?**



# Criticism of Crypto

- Cryptocurrencies **failed at their main design intent of creating a distributed anonymous currency** not controllable by any government. Nowadays every crypto transaction is a taxable event in US (similar to trading stocks or bonds)
- Crypto networks **consume ~ 1% of planet's electricity** and cause electronic chips shortages (being fixed by "proof of stake")
- **Crypto networks are slow** (being fixed by "proof of stake")
- Crypto caused lots of **fraud and criminal activity**
- Crypto is very **volatile**
- Some **countries prohibit crypto** (like China)
- Billionaire John Paulson Calls Crypto "A Limited Supply of Nothing"
- Billionaire Warren Buffet advises against it as well:  
"It does not meet the test of a currency, ... it is not a durable means of exchange, it's not a store of value."
- "" The world has never been fond of crypto. Famous economists have called it a **Ponzi scheme**, notable investors have called it "rat poison squared," the Fed president described it as a "giant garbage dumpster," and governments around the world have **banned**, financially strangled and booted out crypto companies. ""

Proof of Stake Validation makes Crypto faster than VISA – and takes little electricity:

- Cardano
- Solana
- Algorand
- Ethereum

## Total TPS (Transactions Per Second):

- Solana: 65,000
- Ethereum: 20 (will be 100,000)
- Cardano – 250 (will be Millions)
- **Visa: 24,000**
- Algorand: 1,300
- Ripple: 1,500
- PayPal: 193
- Bitcoin Cash: 60
- Litecoin: 56
- Dash: 48
- Bitcoin: 7 (slow!!)

<https://www.fool.com/investing/2018/01/14/which-cryptocurrencies-have-the-fastest-transactio.aspx> -

# But ...



Years after calling Bitcoin "**rat poison**", **Warren Buffett** just invested \$1 Billion in a crypto-friendly bank. February 2022  
<https://fortune.com/2022/02/16/warren-buffett-invested-1-billion-crypto-bank/>

---

# Revolution in Cryptocurrencies

Shifting validation from "**proof-of-work**" to "**proof-of-stake**"  
increases speed of crypto-transactions x1000s times  
(Ethereum 2.0 projected speed ~ 100,000 transactions/sec),  
and correspondingly decreases transaction fees to small fractions of a cent.

Fast speed and low transaction costs is already a reality for some networks, like, for example, Solana:



Solana's performance is unparalleled, and specifically built for high-frequency and massive-scale applications.

59,490	400ms	\$0.00001
Transactions/second	Block times	Per transaction

# China - Digital Yuan

China has released the new **digital yuan** app , **e-CNY**, for iOS and Android.



- **It is NOT a decentralized cryptocurrency**
- It does NOT operate on a blockchain
- It is controlled and issued by the China's central bank – PBOC (The People's Bank of China). It was developed since 2014
- It is designed to replace the cash and coins already in circulation
- China is pushing for broader use of its digital currency
- China is way ahead of its global peers. The **US Federal Reserve** is only discussing the idea of issuing a U.S. digital currency similar to China's **CBDC (Central Bank Digital Currency)**

The two dominant payment systems in China are:

- **Tencent's WeChat Pay** announced support of digital yuan for its morethan a Billion WeChat users
- **Alipay (Alibaba)** is also a partner for the digital yuan.



**Tencent** 腾讯



 **Alipay**

# Central banks strike back against crypto with their own digital currencies.

Almost 100 countries are actively investigating launching their own digital currency, according to the IMF (International Monetary Fund).

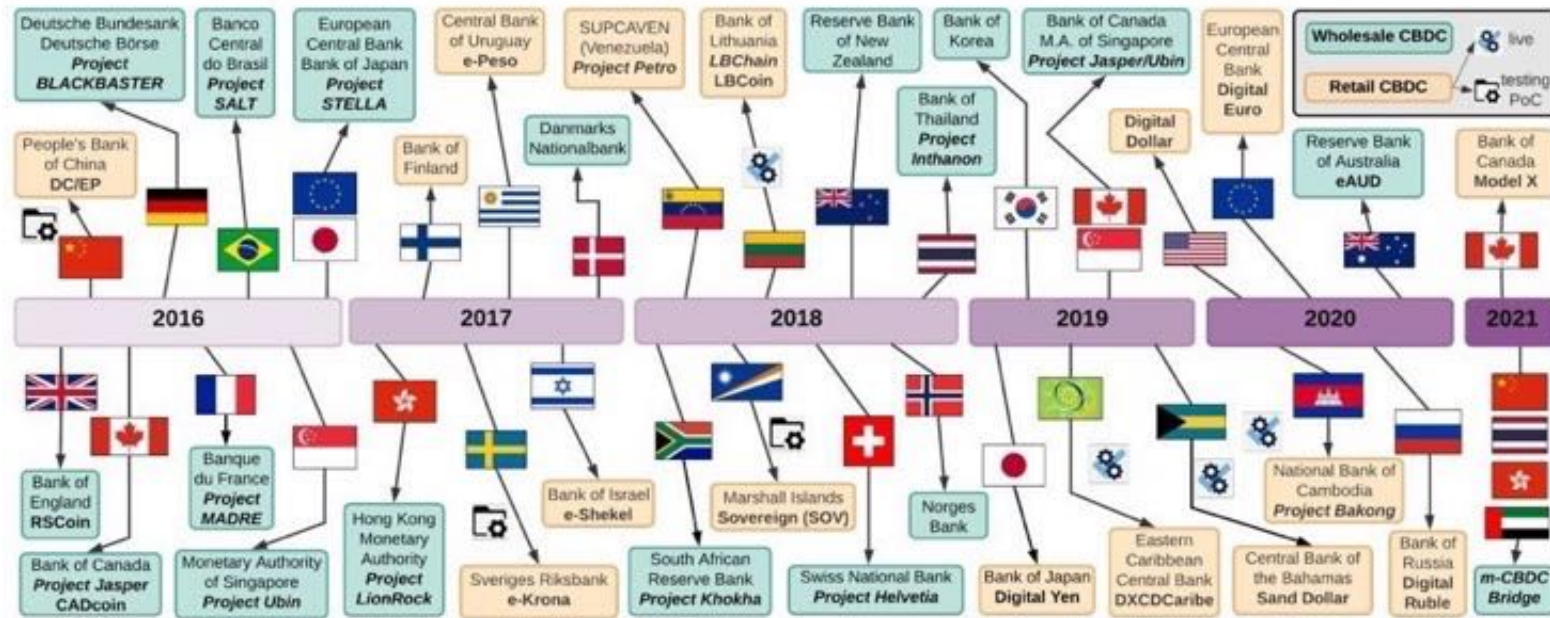
If you can't beat them, copy them. Some central banks have decided to create crypto competitors that they control. The value of this **CBDC** (Central Bank-controlled Digital Currency) mirrors the price of its physical equivalent.

**CBDC** is not similar to cryptocurrencies like Bitcoin and Ethereum, which are distributed (not centrally-controlled) and whose values aren't pegged to any fiat currency (thus can swing wildly).

Benefits of **CBDCs** could include letting people without bank accounts use digital payments, and giving central banks a lower-cost alternative to cash for providing a national payment method.

---

# Rise of Central Bank Digital Currencies....










When USA Government will get into Crypto?

As of 2022, there are only discussions of launching a "Digital Dollar" in the USA:

<https://www.investopedia.com/fed-to-release-paper-exploring-launch-of-digital-dollar-5204490>



As of the end of 2021 there are approx 8,000 crypto-currencies  
 - <https://coinmarketcap.com>

#	Name	Price	24h %	7d %	▼ Market Cap ⓘ	Volume(24h) ⓘ	Circulating Supply ⓘ
☆ 1	 Bitcoin BTC <a href="#">Buy</a>	\$46,618.58	▼ 0.72%	▼ 8.64%	\$878,519,199,085	\$37,327,543,053 803,735 BTC	18,916,243 BTC
☆ 2	 Ethereum ETH <a href="#">Buy</a>	\$3,712.33	▲ 0.31%	▼ 8.55%	\$440,010,887,398	\$14,260,280,327 3,855,773 ETH	118,972,550 ETH
☆ 3	 Binance Coin BNB <a href="#">Buy</a>	\$515.44	▼ 0.30%	▼ 5.48%	\$85,839,965,717	\$2,011,943,844 3,909,537 BNB	166,801,148 BNB
☆ 4	 Tether USDT <a href="#">Buy</a>	\$1.00	▼ 0.00%	▼ 0.07%	\$78,346,651,938	\$57,075,030,314 57,068,641,840 USDT	78,337,882,507 USDT
☆ 5	 Solana SOL <a href="#">Buy</a>	\$171.71	▼ 0.30%	▼ 11.40%	\$53,026,444,719	\$1,557,010,394 9,088,030 SOL	309,507,189 SOL
☆ 6	 Cardano ADA	\$1.33	▼ 1.43%	▼ 5.79%	\$44,197,054,818	\$1,279,211,554 969,184,311 ADA	33,485,541,926 ADA
☆ 7	 USD Coin USDC	\$1.00	▲ 0.03%	▼ 0.02%	\$42,163,137,804	\$3,262,303,085 3,261,454,917 USDC	42,152,175,777 USDC



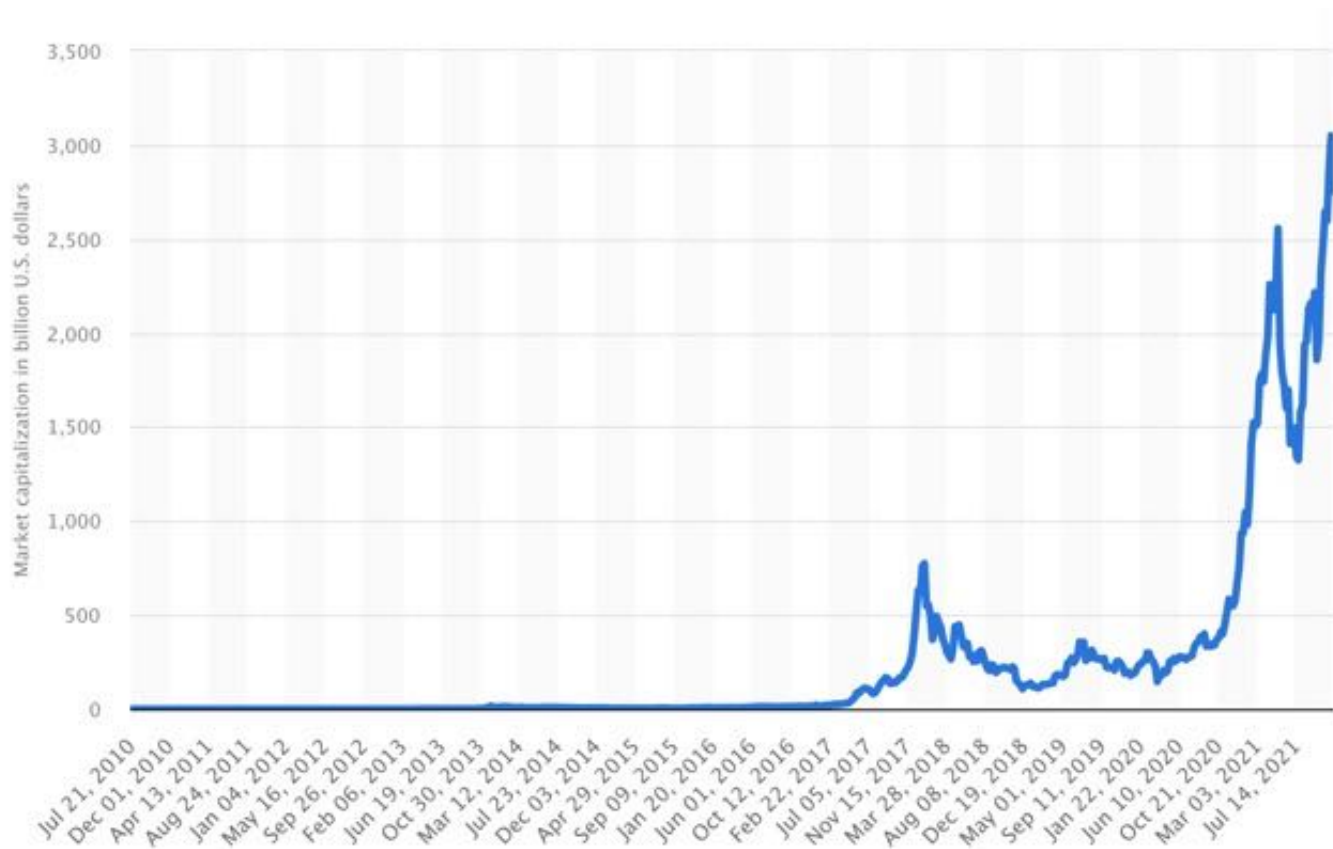
## Top 25 Cryptocurrencies as of mid-February, 2022

	Name	Market Cap
1	BTC = Bitcoin	\$761,038,243,091
2	<b>ETH = Ethereum</b>	\$334,141,565,566
3	USDT = Tether	\$78,738,030,288
4	BNB = BNB	\$65,864,119,793
5	USDC = USD Coin	\$52,494,970,088
6	XRP = XRP	\$36,922,069,357
7	<b>ADA = Cardano</b>	\$33,850,389,831
8	<b>SOL = Solana</b>	\$28,991,691,641
9	AVAX = Avalanche	\$20,896,330,175
10	LUNA = Terra	\$19,861,982,821
11	DOGE = Dogecoin	\$18,447,068,758
12	BUSD = Binance USD	\$18,185,409,339
13	DOT = Polkadot	\$17,719,838,307
14	SHIB = Shiba Inu	\$15,511,500,430
15	MATIC = Polygon	\$12,169,172,624
16	UST = TerraUSD	\$11,947,612,991
17	CRO = Crypto.com Coin	\$11,053,395,927
18	WBTC = Wrapped Bitcoin	\$10,533,626,439
19	DAI = Dai	\$10,197,240,111
20	LTC = Litecoin	\$8,130,543,341
21	ATOM = Cosmos	\$7,833,196,168
22	LINK = Chainlink	\$7,161,689,625
23	NEAR = NEAR Protocol	\$6,574,018,803
24	UNI = Uniswap	\$6,496,617,082
25	TRX = TRON	\$6,423,796,753



In 2021 total crypto market was worth more than 3 Trillion dollars

<https://www.statista.com/statistics/730876/cryptocurrency-maket-value/>



# Cryptocurrency - History

A **cryptocurrency** is a digital asset designed to work as a medium of exchange (**currency**) that uses **cryptography** to secure its transactions, to control the creation of additional units, and to verify the transfer of assets.

The first widely successful and well known cryptocurrency is **Bitcoin** developed in 2007-2009 by **Satoshi Nakamoto** (a person or a group).

Before Bitcoin:

- **Digicash** (David Chaum, 1989-1998, electronic anonymous crypto money)
- **Hashcash** (Adam Back, 1997, a proof-of-work system used to limit email spam and denial-of-service attacks, later has become a part of bitcoin mining algorithm)
- **B-Money** (1998, Wei Dai, anonymous, distributed electronic cash system)
- **Bit Gold** (1998, Nick Szabo, decentralized, blockchain)
- **E-gold** (1996-2009) - digital gold currency, was incorporated on one of Caribbean Islands, in 2006 was processing more than \$2 Bln worth of transactions per year, grown to 5 Mln accounts by 2009, was shut down due to legal issues (under US Patriot Act)



Bitcoin, 2009



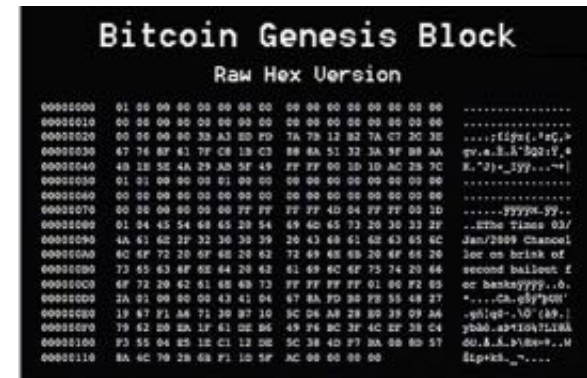
# Bitcoin History

**Satoshi Nakamoto** is the name of a person(s) who invented blockchain and created bitcoin.

**Nobody knows his/theirs true identity.**

- <https://blog.bitstamp.net/post/who-is-satoshi-nakamoto> -
- [https://en.wikipedia.org/wiki/Satoshi\\_Nakamoto](https://en.wikipedia.org/wiki/Satoshi_Nakamoto) -

- 2007 - the work has begun
- 2008 - domain bitcoin.org
- 2008 October - whitepaper on metzdowd.com  
"Bitcoin: A Peer-to-Peer Electronic Cash System"
- 2009 January - Bitcoin software released on SourceForge, network launched with the block #0 with 50 bitcoins reward
- On 17 Mar 2010 bitcoinmarket.com starts operating
- On 22 May 2010, Laszlo Hanyecz made the first real-world transaction by buying two pizzas in Jacksonville, Florida for 10,000 BTC
- 2010 - Nakamoto released control to Gavin Andresen and other members of bitcoin community
- 2011 April – Nakamoto wrote "I've moved on to other things..." and disappeared
- Nakamoto owns between 750-1,100K bitcoin (~\$73 Bln in Nov 2021).

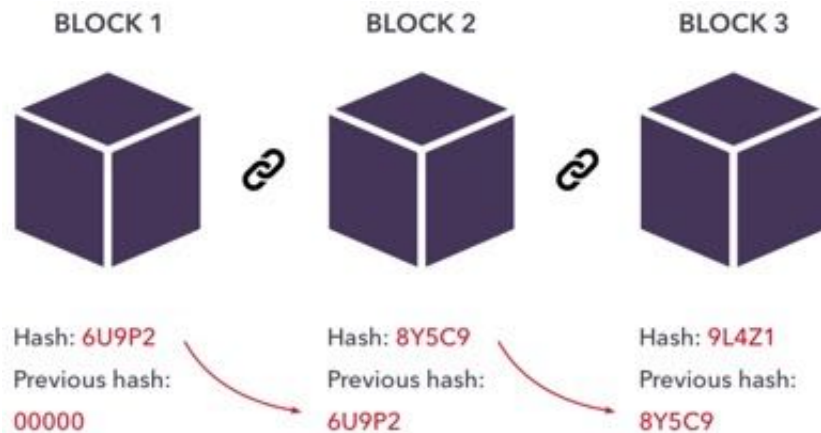


Satoshi Nakamoto message embedded in the coinbase of the first block

# Blockchain

"Blockchain is a system of recording information in a way that makes it difficult or impossible to change, hack, or cheat the system."

A blockchain is essentially a digital ledger of transactions that is duplicated and distributed across the entire network of computer systems on the blockchain."



## GitHub:

Bitcoin (C++ mostly):

<https://github.com/bitcoin>

Simple blockchain in python:

<https://github.com/dvf/blockchain>

Ethereum in Golang:

<https://github.com/ethereum/go-ethereum>

<https://github.com/ripple> -

# Ethereum

- <https://www.investopedia.com/terms/e/ethereum.asp>
- <https://etherscan.io/>
- <https://www.investopedia.com/terms/g/gas-ethereum.asp> -

- **Ethereum** is a platform powered by distributed blockchain technology
- Its own (native) cryptocurrency is called **Ether**, or **ETH**, or simply **Ethereum**
- **dApps** - decentralized apps supported by Ethereum platform
- **Smart contracts**, which originated on the Ethereum platform, are a central component of how the platform operates.
- **Solidity** – common programming language for writing Smart Contracts - <https://en.wikipedia.org/wiki/Solidity> .
- **EVM** – Ethereum Virtual Machine.
- **Miners** and **validators** who participate in operating the Ethereum network, usually by mining, earn ETH rewards for their contributions

## Programming languages used in Ethereum:

- **Vyper** – similar to Python
- **Solidity** – similar to JavaScript
- **Serpent** – similar to Python, not recommended
- **LLL** (Lisp-Like Language)

<https://merunasgrincalaitis.medium.com/dont-code-another-smart-contract-without-understanding-the-4-languages-in-10-minutes-first-1c2dea165fcf>

---

# Solidity

**Solidity** – programming language for writing Smart Contracts:

- <https://en.wikipedia.org/wiki/Solidity>
- <https://ethereum.org/en/developers/>
- <https://github.com/ethereum/solidity>

**Solidity** is very similar to JavaScript programming language.

A **contract** in Solidity is similar to a **class**, and a **deployed contract** is similar to an **instance of a class (an object) in JavaScript**.

You can create your own contracts/classes as you like. You can think of all kinds of variables and methods inside those contracts. For example, you can make a contract for shipping something. Or for making payments. You can create your own contracts for **coins, tokens, distributed apps, your own blockchains**, etc.

```
pragma solidity >= 0.7.0 <0.8.0;

contract Coin {
    // The keyword "public" makes variables
    // accessible from other contracts
    address public minter;
    mapping (address => uint) public balances;

    // Events allow clients to react to specific
    // contract changes you declare
    event Sent (address from, address to, uint amount);

    // Constructor code is only run when the contract
    // is created
    constructor() public {
        minter = msg.sender;
    }

    // Sends an amount of newly created coins to an address
    // Can only be called by the contract creator
    function mint(address receiver, uint amount) public {
        require(msg.sender == minter);
        require(amount < 1e60);
        balances[receiver] += amount;
    }

    // Sends an amount of existing coins
    // from any caller to an address
    function send(address receiver, uint amount) public {
        require(amount <= balances[msg.sender], "Insufficient balance.");
        balances[msg.sender] -= amount;
        balances[receiver] += amount;
        emit Sent (msg.sender, receiver, amount);
    }
}
```

---



# Blockchain mining hardware

## **ASIC = Application-Specific Integrated Circuit.**

Your regular computer can calculate at speeds  $\sim 2$  Kilo-hashes per second. The specialized devices (an ASIC bitcoin miner) - will do 200 Terahashes per second (1 Terahash = 1 trillion hashes) while consuming 5.5KWatts of electricity.



Bitmain, one of the world's largest bitcoin mining rig manufacturers, has launched the **Antminer S19 Pro+ Hyd.**

This new mining machine will have a hashrate of 198 TH/s (Tera-Hash/sec) and consume 5.5 KW. It uses liquid cooling.

# Solana

blockchain platform – using **Proof of Stake**, written in Rust

- Solana is a public blockchain platform
- Very fast: 50,000/sec (vs 15 ETH or 7 BTC)
- Very cheap: 0.00025 per transaction (vs \$2-\$50 for ETH,BTC)
- Initial – 2019, growing very fast
- Written in Rust, developer friendly
- It achieves consensus using the proof of stake mechanism.
- Its internal cryptocurrency is SOL (Symbol: ◎)
- Developer(s): Solana Labs & Solana Foundation
- In 2021, Bloomberg journalist Joanna Ossinger described Solana as "a potential long-term rival for Ethereum", citing superior transaction speeds and lower associated costs.
- [https://en.wikipedia.org/wiki/Solana\\_\(blockchain\\_platform\)](https://en.wikipedia.org/wiki/Solana_(blockchain_platform))
- <https://whitepaper.io/document/602/solana-whitepaper>
- <https://solana.com> –
- <https://www.youtube.com/watch?v=knBQXU7fetA> – 3 min
- Market cap: \$46B (September 2021)
- Circulating supply: 308,704,493.99 SOL (as 24th Dec 2021)
- Exchange rate: US\$203 (October 2021)



**Anatoly Yakovenko**

San Francisco Bay Area

[anatoly@solana.io](mailto:anatoly@solana.io)

<https://www.linkedin.com/in/anatoly-yakovenko/>



	Solana	Ethereum
transactions per sec	50,000	15
cost per transaction	\$0.00025	\$70

# Cardano

blockchain platform – using **Proof of Stake**, written in Haskell

- Cardano is a public blockchain platform, smart contracts
- Fast: 250 /sec (it will be Millions)
- Relatively cheap: \$0.4 per transaction (will be much lower soon)
- Initial – 2017, growing very fast
- Written in Haskell, developer friendly
- It achieves consensus using the PoS (Proof of Stake) mechanism
- Its internal cryptocurrency is ADA
- Developer(s): Charles Hoskinson, Ethereum co-founder
- Cardano is named after famous Italian scientist Gerolamo Cardano (1501-1576)
- ADA is named after Ada Lovelace (1815-1852) - English mathematician and writer



**Charles Hoskinson**

Colorado,  
Cardano Foundation  
based in Switzerland.



# Consensus Mechanisms

- **Proof of Work** (Bitcoin, Ethereum, ...)  
miners solve blocks, first winner is rewarded. Need fast specialized hardware (**ASIC miners**) and **use lots of electricity**. Complexity grows with time, transactions are slow. Miners consolidate their efforts (**mining pools, staking**) – thus leading to centralisation of miners
- **Proof of Stake** (Peercoin 2012), Cardano, Avalanche, Polkadot, Solana, Ethereum 2.0, ... )  
**replaces miners with validators** who stake their coins on the network to maintain it. Proof of Stake takes **thousands times less electricity, and works much faster (and cheaper)**:

**Proof of Stake** networks in Transactions per Second (TPS):

- .. Solana – 65,000;
  - .. Cardano – 260 (projected up to 1 Mln);
  - .. Avalanche – 4,500;
  - .. Polkadot – 167;
  - .. Ethereum 2.0 (projected) – 100,000.
-

# How Does Proof of Stake work ?

- Owners of a cryptocurrency **stake their coins** and **create their own validator nodes**.
  - **Staking is when you pledge your coins to be used for verifying transactions.** Your coins are **locked up while you stake them**.
  - When a block of transactions is ready to be processed, the cryptocurrency's **proof-of-stake protocol** will **choose a validator node** to review the block.
  - The validator checks the validity of transaction, adds the block to the blockchain, and receives crypto rewards (or penalized if tried to add block with incorrect information).
  - Example: **Cardano**. Anyone who owns **Cardano** can stake it and set up their own validator node. When **Cardano** needs to verify blocks of transactions, its **Ouroboros protocol selects a validator**. The validator checks the block, adds it, and receives more **Cardano** for their trouble.
  - **Mining power** in **PoS** depends on the amount of coins a validator is staking. **Stake more coins, and you will be more likely chosen** to add new blocks.
  - Each proof-of-stake protocol works differently in how it chooses validators.
  - There's usually some randomization involved, also factors like how long validators have been staking their coins.
-

# Staking Pools vs Mining Pools

In PoS (Proof-of-Stake) system you can increase your odds to be selected by joining a **staking pool**, which is simply a group of people **pooling their coins together** for a better chance of winning new blocks. One person (pool owner) sets the validator node for the pool. Rewards are split between participants, owner may take a small fee.

*Note: you can not stake Bitcoin or other Proof-of-Work (PoW) Cryptocurrencies. You can only stake PoS cryptocurrencies.*

But in PoW system like Bitcoin you can join one of **Bitcoin Mining Pools**, which are networks of miners cooperating to mine blocks together and distribute the payments based on each entity's contribution to the pool. Contributions measured in hash rate (calculated hashes per second).

Whenever any miner in the pool finds a block, they pay the block reward to the mining pool coordinator. After taking a small fee, the coordinator pays each member of the pool based on their hash rate contribution.

For a small miner who has impossibly low chances of finding a block on their own, joining a mining pool will provide a steady stream of revenue (proportionally to the miner's size, so it will still be small, but consistent).

---

# Transition from Ethereum to Ethereum 2.0 ("Proof of Stake").

- **Phase 0** - launch the **beacon chain** in the network, start managing registry of the validators, create frameworks for next steps.
  - **Phase 1** (to be finished in mid-2022) - implement **64 shard chains** and **roll-ups**. Sharding (distributing of transactions) should greatly increase the throughput of the network.
  - **Phase 1.5** - the stopgap between phase 1 and phase 2. It is merging ("docking") of the two ecosystems. The merger will involve the docking of the **ethereum 1.0 mainnet** with the **beacon chain**, and then **the ethereum 1.0 blockchain will become one of the 64 shard chains implemented in phase 1.**
  - **Phase 2** - initiate cross-shard interoperability and allow native decentralised application (dApp) development on the network.
-



# Transition to Ethereum 2.0

Vitalik Buterin (one of the founders Ethereum) tweeted in 2020:

"ETH2 scaling for data will be available \*before\* ETH2 scaling for general computation. This implies that rollups will be the dominant scaling paradigm for at least a couple of years:  
first ~2-3k TPS with eth1 as data layer,  
then ~100k TPS with eth2 (phase 1).  
Adjust accordingly,"

Ethereum's upgrade **may cause increase in its price** mainly due to the fact that Ethereum and its DeFi network **will become far more practical**.  
Transaction fees will likely drop significantly (to fractions of a cent).  
And transaction speed will match or exceed that of VISA cards.

Those who stand to benefit the most from Ethereum's upgrade are those who do not have access to the modern banking system that exists today (nearly 2 billion people).

With low fees and a lowered barrier to entry, DeFi has the potential to grow significantly, and Ethereum's price along with it.



**Vitalik Buterin**  
<https://vitalik.ca>

EndGame:  
<https://vitalik.ca/general/2021/12/06/endgame.html>



# Fees (Proof of Work)

Miners are rewarded for calculating next block in a blockchain's mempool. The reward is calculated **per the length of the record and complexity of calculation** – and **in values native to the blockchain**.

When converting to dollars, the fees are very volatile.

Here is what Wall Street Journal says about fees in 2021:

"" On the Bitcoin network, the average daily transaction fee this year has been as low as **\$1.78** and as high as **\$62**, according to bitinfocharts. On Ethereum, the average fee has been as low as **\$1.59** and as high as **\$70**.

""

<https://www.wsj.com/articles/crypto-and-its-many-fees-what-to-know-about-the-hidden-costs-of-digital-currency-11639825202>



## Bitcoin

Fees are calculated in "**satoshi**" named after Satoshi Nakamoto, creator of bitcoin.

1 **satoshi** = 0.00000001 BTC = 1e-8 BTC

(Jan 2022) Estimated transaction fee \$2.34 = 5,056 satoshi

- <https://www.btcsatoshi.com/>
- <https://www.buybitcoinworldwide.com/fee-calculator/>
- <https://bitcoinfees.earn.com/>
- <https://mempool.space/>
- <https://bitcoinbriefly.com/how-to-use-mempool-space-block-explorer/>

## Ethereum

- <https://cryptotesters.com/blog/ethereum-gas>
- <https://automatedwebtools.com/usd-eth-gas-fee/>
- <https://etherscan.io/>

Cost of transaction is measured in "**Gwei**" – named after **Wei Dai**, best known as the creator of the bitcoin predecessor "**b-money**" and as the developer of the Crypto++ library.

1 gwei = 0.000000001 ether = 1/1Bln part of Ether

(Jan 2022) Estimated transaction fee \$5.61 = 70 Gwei

# Crypto Payment Services

The 5 Most Popular Crypto Payment Gateway & Processors

<https://www.merchantmaverick.com/best-cryptocurrency-payment-gateway/>

- **Coinbase** - mainstream brand in the US market. Integrates with Shopify and WooCommerce - <https://www.coinbase.com> –
  - **BitPay** - Bitcoin and Bitcoin Cash payment services for merchants. US, since 2011. Versatile payout options - <https://bitpay.com> -
  - **CoinGate** - Supports payment in more obscure coins, Integrates with a large number of eCommerce platforms - <https://coingate.com> –
  - **NOWpayments** - Supports payment in more obscure coins, Integrates with a large number of eCommerce platforms, Low fees for simple transactions - <https://nowpayments.io> –
  - **AlfaCoins** - Flexible payment options, Easy to use - <https://www.alfacoins.com> -
-

# Crypto Exchanges (and Wallets)

Best Crypto Exchanges in 2021:

- <https://www.investopedia.com/best-crypto-exchanges-5071855> -

- **Coinbase** - 89+ Mln users, 100+ countries, USA-based - <https://www.coinbase.com> - Transaction Fees: 0.04% to 0.50% (taker orders); 0% to 0.50% (makers orders), Wallet included. Very high liquidity, variety of coins
  - **Binance** - <https://www.binance.com> - Cayman Islands (Caribbean) & Seychelles (island near Africa). Hundreds of cr.currencies. Not available in US. Low fees, large variety of cryptocurrencies and trading pairs, geared for more advanced users
  - **Binance.US** - <https://www.binance.us> – US-regulated, 50 cryptocurrencies, not all states supported
  - **Abra** - <https://www.abra.com> - Mountain View, CA - operates a comprehensive, custodial cryptocurrency wallet and exchange
  - **Cash App** - <https://cash.app> – easy to use, peer-to-peer money transfer (like Venmo or Zelle), ability to withdraw Bitcoin, supports only one crypto-currency – the Bitcoin. has daily and weekly withdrawal limits. Charge when sending money via credit card
  - **bisq** – decentralized exchange - <https://bisq.network> – non-KYC platform, 18 crypto-currencies, but transaction speeds may be slow, trading volumes can be low
  - **Kraken** – Bitcoin & Crypto Exchange - <https://www.kraken.com> -
  - **Gemini** - <https://www.gemini.com> -
  - **Robinhood** - <https://robinhood.com> -
-

# Fees – [BitPay.com](https://bitpay.com)



**BitPay** is a payment gateway

- since 2011, 100+ Mln global customers,
- <https://www.owler.com/company/bitpay>
- <https://bitpay.com/blog/welcome-to-the-september-cryptie/>

**BitPay** fees ( <https://www.cryptowisser.com/wallet/bitpay/> )

1. Miner fees (unavoidable, built into the blockchain, depends on crypto, very volatile)
2. Network Cost (additional operations' cost imposed by **BitPay** starting in 2017)
3. Processing Fee (1%) added by **BitPay** for their service
4. Refund fees (if you receive a refund)

In 2017 when Bitcoin blockchain fee were very high (more than \$30),

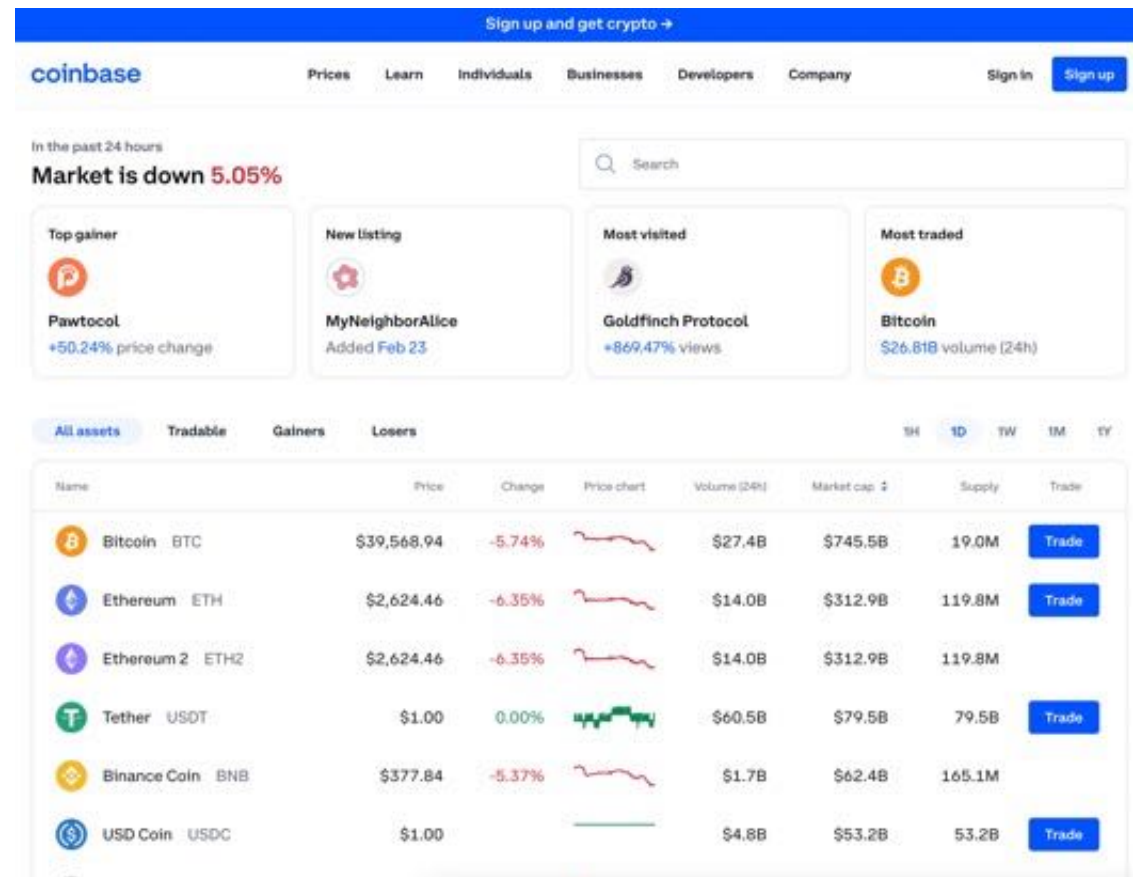
**BitPay** made a rule to refuse transactions smaller than \$100

Some alternatives to **BitPay**:

- <https://www.finextra.com/blogposting/21322/the-best-cryptocurrency-payment-gateways-for-2022>
  - <https://technicali.com/top-7-payment-gateways-that-accept-cryptocurrency/>
  - <https://wpengine.com/resources/wordpress-and-bitcoin/>
  - <https://www.nerdwallet.com/article/small-business/accepting-bitcoin-crypto>
-

# Coinbase

- <https://www.coinbase.com>
- <https://en.wikipedia.org/wiki/Coinbase>
- buy, sell, and manage crypto
- 89 Mln users in 100+ countries
- Public company (traded on Nasdaq)
- Founded in 2012 by Brian Armstrong
- 1000+ employees



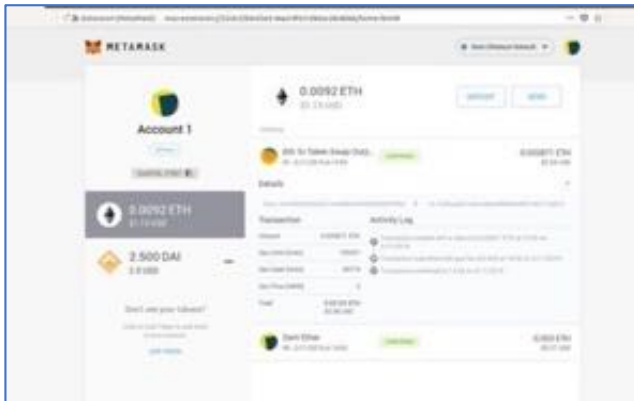
# Convert BitCoin into USD

<https://icoholder.com/blog/how-to-turn-bitcoin-into-usd/>

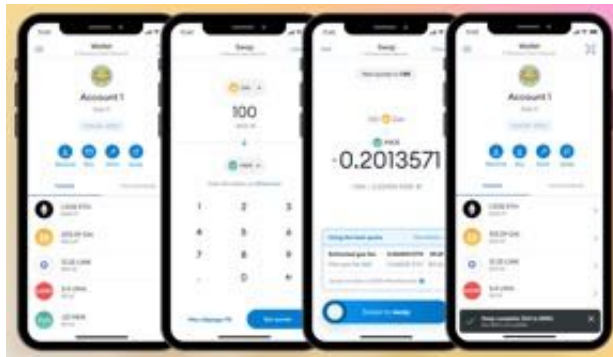
- If you and your buyer know and trust each other – you can do it by yourselves. Buyer can give you money – and you can send BTC from your account to his. You need to be aware of fees on both sides
  - You can also use facilitating service like LocalBitcoins which lists buyers (expect 1-3 days to complete transaction) - [https://localbitcoins.com/sell\\_bitcoins](https://localbitcoins.com/sell_bitcoins)
  - Otherwise you can use some (big) exchange – but for additional fee 1-2% fee. For example, Coinbase Exchange - <https://icoholder.com/blog/how-to-turn-bitcoin-into-usd/> , [https://www.youtube.com/watch?v=60Rjdv2Z\\_Gg](https://www.youtube.com/watch?v=60Rjdv2Z_Gg)
  - You can also trading platforms (like Kraken). Expect more background checks and higher fees. The process also will generally take longer ( ~5 days ) - <https://support.kraken.com/hc/en-us>
  - Currency Converters – many places, faster processing - <https://wealthpay.org> - <https://www.bestchange.com> - <https://www.okchanger.com>
  - Direct Electronic Payment System – like <https://www.worldcore.eu> - it uses BitPay under the hood - <https://bitpay.com>
-



# MetaMask



**Joseph Lubin**  
ConsenSys  
Brooklyn, New York



- <https://metamask.io/>
- <https://en.wikipedia.org/wiki/MetaMask>
- A software cryptocurrency wallet for Ethereum blockchain
- A secure browser extension or mobile app (iOS, Android)
- Allows to interact with decentralized applications
- Since 2016
- More than 20 Mln users
- Developed by ConsenSys - a blockchain software technology company founded by **Joseph Lubin** with headquarters in Brooklyn, New York
- Bitcoin cannot be stored on MetaMask, but you can store a "Wrapped Bitcoin" (WBTC) – which is an ERC-20 token that represents Bitcoin on the Ethereum blockchain

## Best Hardware Wallet

- Ledger Noan X - <https://www.ledger.com> –
- Trezor - <https://trezor.io> –
- Arculus - <https://www.getarculus.com> –
- SafePal - <https://safepal.io> –



# Uniswap Protocol

- <https://uniswap.org/>
- <https://github.com/Uniswap/v3-core>
- **Uniswap** (2018) is a decentralized open source finance protocol that is used to exchange cryptocurrencies on Ethereum blockchain. Written in Solidity.
- **Uniswap** is also the name of the company that initially built the Uniswap protocol.
- The **Uniswap** protocol facilitates automated transactions between cryptocurrency tokens on the Ethereum blockchain through the use of smart contracts.
- As of October 2020, Uniswap was estimated to be the **largest decentralized exchange** and the **fourth-largest cryptocurrency exchange** overall by daily trading volume
- **Uniswap** has been one of the shining stars of the crypto market. Investors are looking to buy **UNI** due to its impressive performance.



**Hayden Adams**

Inventor of Uniswap Protocol  
CEO at Uniswap Labs  
New York

<https://www.linkedin.com/in/haydenadams/>

---

# Decentralized Finance (DeFi) Ecosystem



# Web 3.0

The term "Web3" was coined by Polkadot founder and Ethereum co-founder **Gavin Wood** in 2014, referring to a "decentralized online ecosystem based on blockchain."



**Gavin Wood**

- **web1** (1994-2004): content provided by website owner, visitors are consumers.
  - **web2** (a.k.a. Web 2.0, 2004 - present) – "**social web**", "**web as a platform**". Content created by website users (social media - blogs, facebook, youtube, etc.). Amazon market place and even Wikipedia can be considered as web2 websites too. Content is stored in big "central" repositories (web sites).
  - **web3** (a.k.a. Web 3.0) – data is stored and interconnected in decentralized way.
    - .. using blockchain and other modern technologies to enable **decentralized economics**.
    - .. DAOs - decentralized autonomous organizations (DAOs)
    - .. DeFi - decentralized finance
    - .. self-sovereign identity (without the need of authentication server)
    - .. AI-driven interfaces understanding voice, human images, emotions, understand meaning ("semantic web"), 3D-graphics, virtual reality
    - .. AI-driven bots for data discovery and operations
-

# Blockchain networks, platforms, companies

Number of nodes (2021):

Bitcoin: 12K+

Ethereum: 7K

Some Blockchain Platforms:

- IBM Blockchain
- Corda
- Ethereum
- MultiChain
- Tron
- Stellar

Some Blockchain companies

- BRD
- BitMEX
- Chainalysis
- Coinme
- Netki
- Paxful
- Republic
- Spring Labs
- SALT Lending
- TQ Tezos
- Mythical Games
- Gemini
- Circle
- Coinbase
- Chronicled
- IBM
- Voatz
- Steem
- Shipchain

Page Under Construction

## Summary of Features of top 5 Blockchain Platforms for Enterprises

	Ethereum	Hyperledger Fabric	R3 Corda	Ripple	Quorum
Industry-focus	Cross-industry	Cross-industry	Financial Services	Financial Services	Cross-industry
Governance	Ethereum developers	Linux Foundation	R3 Consortium	Ripple Labs	Ethereum developers & JP Morgan Chase
Ledger type	Permissionless	Permissioned	Permissioned	Permissioned	Permissioned
Cryptocurrency	Ether (ETH)	None	None	Ripple (XRP)	None
% providers with experience <sup>1</sup>	93%	93%	60%	33%	27%
% share of engagements <sup>2</sup>	52%	12%	13%	4%	10%
Coin Market Cap <sup>3</sup>	\$91.5 B (18%)	Not applicable	Not Applicable	\$43.9 B (9%)	Not Applicable
Consensus algorithm	Proof of Work (PoW)	Pluggable framework	Pluggable framework	Probabilistic voting	Majority voting
Smart contract functionality	Yes	Yes	Yes	No	Yes

1. Based on responses from 15 leading blockchain service providers

2. Based on a random sample of set of 50 enterprise blockchain engagements across multiple industries

3. Coinmarketcap.com as of Feb 20, 2018, 6:20 PM UTC

Source: HFS Research, 2018

# Blockchains

Page Under Construction

public blockchains

- <https://www.gartner.com/reviews/market/blockchain-platforms>

- BitCoin
- Ethereum
- Solana
- IBM Blockchain
- Hyperledger Fabric
- Binance Smart Chain
- NEO (Antshares)
- WAVES
- EOS
- Stellar
- Monero (XMR)
- Bitcoin Cash (BCH)
- Ripple ?

- private blockchains
  - consortium blockchains
  - hybrid blockchains
-



# NFT = Non-fungible token

[https://en.wikipedia.org/wiki/Non-fungible\\_token](https://en.wikipedia.org/wiki/Non-fungible_token)

- With NFTs, artwork can be "tokenised" to create a digital certificate of ownership that can be bought and sold (sometimes for millions of \$\$)
- NFTs are cryptographic assets on a blockchain with unique identification codes and metadata that distinguish them from each other
- NFT provide a public certificate of authenticity or proof of ownership
- NFT is separate from a copyright
- NFT differ from crypto-currencies: there is no trading, no interchangeability (fungibility)
- NFT do not restrict the sharing or copying of the underlying digital files



- **NFTs can be sold or bought on many crypto market places**  
<https://www.fool.com/investing/stock-market/market-sectors/financials/non-fungible-tokens/nft-marketplaces/>
- **OpenSea** - <https://opensea.io> - first and largest. Helps to mint your own NFTs, supports 150+ different payment tokens.
- **Axie Marketplace** - video game Axie Infinity. Ethereum.
- **Larva Labs/CryptoPunks** - digital art, Ethereum
- **NBA Top Shot Marketplace** (Basketball collectibles), Flow blockchain
- **Rarible** - similar to OpenSea, its own token Rarible built on Ethereum
- **SuperRare** - similar to Rarible. Ethereum. New token announced
- **Foundation.app** - use Ethereum to buy/sell digital art
- **Nifty Gateway** - the art curation platform, uses **Gemini**. Ethereum
- **Mintable** - similar to OpenSea. Ethereum. Minting of NFTs
- **Theta Drop** - video and TV, its own blockchain, Theta Token



# Stable Coins

- <https://www.investopedia.com/terms/s/stablecoin.asp> -

**Stablecoins** are **cryptocurrencies** that attempt to peg their market value to something external, like a currency (USD), or commodity's price (gold), etc.

**Stablecoins** achieve their price stability via either collateralization (backing) or through algorithmic mechanisms of buying and selling the reference asset or its derivatives

Currency	Market value
Tether / USDT	\$ 73.32 billion
USD Coin / USDC	\$ 34.35 billion
Binance USD / BUSD	\$ 13.54 billion
Dai / DAI	\$ 6.47 billion
TerraUSD / UST	\$ 2.88 billion
TrueUSD / TUSD	\$ 1.25 billion

# Lightning Network

[https://en.wikipedia.org/wiki/Lightning\\_Network](https://en.wikipedia.org/wiki/Lightning_Network)

The Lightning Network (LN) is a "layer 2" payment protocol layered on top of a blockchain-based cryptocurrency such as bitcoin or litecoin.

It is intended to enable fast transactions among participating nodes and has been proposed as a solution to the bitcoin scalability problem

Cryptocurrency exchanges such as **Bitfinex** use Lightning Network to enable deposits and withdrawals.

**Laszlo Hanyecz**, who gained fame in the cryptocurrency community for paying **10,000 BTC** for two pizzas in 2010, bought two more pizzas in 2018 using Lightning Network and paid **0.00649 BTC**.

Zion (The Bitcoin Social Network) utilizes the Lightning Network running LND (LN Daemon) to send content peer-to-peer through channels.

Note about **Litecoin** : Litecoin (2011) is a bitcoin fork (faster block generation, larger max number of coins, different hashing algorithm, etc.) <https://en.m.wikipedia.org/wiki/Litecoin>



Laszlo Hanyecz



# Dogecoin

- <https://en.wikipedia.org/wiki/Dogecoin> -
  - <https://dogecoin.com> -
  - <https://www.reddit.com/r/dogecoin/> -
- 
- Dogecoin - cryptocurrency created as a joke in 2013
  - started growing via online community (Reddit, ...)
  - Market cap \$85 Billion in 2021
  - authors - Billy Markus and Jackson Palmer
  - known as a "meme coin" or "dog coin"
  - (Shiba Inu dog from the "Doge" meme)



# Bitcoin Cash, Bitcoin SV

[https://en.wikipedia.org/wiki/Bitcoin\\_Cash](https://en.wikipedia.org/wiki/Bitcoin_Cash)

## Bitcoin Cash:

- 2017 – hard fork of Bitcoin (spin-off, altcoin)
- increased block size to 8 MB
- faster throughput for transactions (60 tr/sec)
- BCH – currency code

## Bitcoin SV:

- 2018 – hard fork chain split of Bitcoin Cash
  - .. Bitcoin ABC (Adjustable Blocksize Cap) - 32 MB blocks
  - .. Bitcoin SV (Satoshi Vision) – up to 128 MB blocks
- 2019 - Bitcoin SV expanded block size to 2 GBytes, enabling (theoretically) 10-15K transactions per second
- The Bitcoin SV blockchain is the largest of all Bitcoin forks

## Prices (1/31/2022):

- BTC – \$38,300
- BCH – \$288
- BSV – \$91



Bitcoin Cash  
BCH



Bitcoin SV  
BSV



# Million token

<https://www.milliontoken.org>

Million is a cryptocurrency:

- limited supply of 1 Mln tokens, min \$1 each
- no upper bound on price
- fully Web 3.0 capable
- multi-chain currency supported across 6+ different blockchains
- unlike first-gen memecoins (like Dogecoin or Shiba), Million is serious about supporting smart-contracts, DeFi, staking, NFTs, DAOs, Proof-of-Stake high scalability, fast transactions, and the gaming metaverse.
- Decentralized Finance staking with the Million Pool, including a decentralized governance DAO for stakeholder rights
- Metaverse - strong community, developer ecosystem of social media, digital art, gaming, chat spaces, avatars, and NFT metaverse
- Transparency & Trust - 100% transparent with code fully audited by Certik, Million was founded by ex-Google/ex-Facebook TechLead



Patrick Shyu  
TechLead



The Web 3.0 memecoin  
("King of the Jungle of  
dog coins")

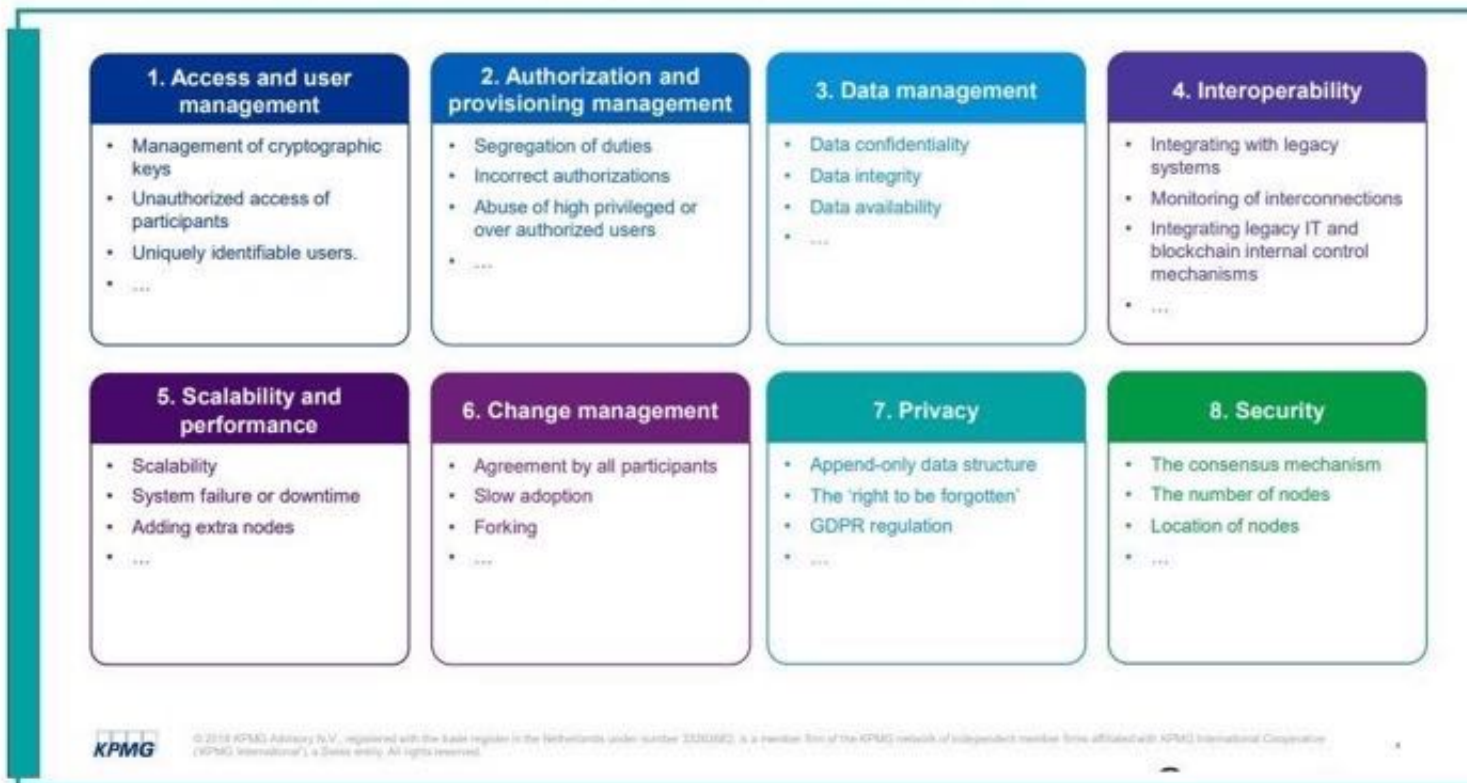
## QUICKSTART GUIDE

Create a **Metamask Wallet** using either a desktop computer or mobile device. <http://metamask.io>

Send **Ethereum** to your wallet. You can buy Ethereum on MetaMask directly, or through sites like **Coinbase**, **Crypto.com**, or **Binance** and then send them to your wallet.

Connect to **Uniswap** and trade for Million.

# Blockchain Maturity Model



## Hyperledger

- <https://www.hyperledger.org/>
- open source tools (blockchains and related)
- started in December 2015 by the Linux Foundation.
- **Hyperledger Fabric** - a blockchain framework
- **Hyperledger Sawtooth** - modular platform for building, deploying, and running distributed ledgers

## Numerai

- <https://numer.ai/>
  - new type of a hedge fund launched in 2015:
  - make competitions to do financial predictions
  - pay winners in cryptocurrency (their own currency - **Numeraire**)
-



## JP Morgan

- JPM Coin - a wholesale payment digital currency that is pegged 1:1 to the U.S. dollar. It is now transacting **billions of dollars every day**
- JP Morgan uses blockchain unit **Onyx**: <https://www.jpmorgan.com/onyx> – organization & brand
- JPMorgan built the **Quorum blockchain** using the **ethereum** network (software behind **ether** cryptocurrency). **Quorum** will remain open-source, it is being used by the bank to run the Interbank Information Network, a payments network that involves more than 400 banks. It is supported/developed by ConsenSys – a Brooklyn-based startup  
- <https://github.com/ConsenSys/quorum> -

## Amazon Web Services (AWS)

AWS provides **Ethereum** on Amazon Managed Blockchain. AWS customers can easily provision Ethereum nodes in minutes and connect to the public Ethereum main network and test networks such as Rinkeby and Ropsten.

---

# Links, Resources

- Three main generations of blockchain technologies
    - <https://www.investopedia.com/tech/blockchain-technologys-three-generations/> -
  - But how does bitcoin actually work? ( youtube channel "3Blue1Brown" )
    - <https://www.youtube.com/watch?v=bBC-nXj3Ng4> -
  - Bitcoin Cash, Bitcoin SV
    - [https://en.wikipedia.org/wiki/Bitcoin\\_Cash](https://en.wikipedia.org/wiki/Bitcoin_Cash)
  - Roger Ver - [https://en.wikipedia.org/wiki/Roger\\_Ver](https://en.wikipedia.org/wiki/Roger_Ver)
  - Cayman Islands and taxes, Binance
    - <https://en.wikipedia.org/wiki/Binance> -
    - <https://decrypt.co/19204/top-7-crypto-companies-based-in-tax-havens> -
  - The CHEAPEST Way to Buy Crypto. Period.
    - <https://www.youtube.com/watch?v=D11waRlecrq> -
  - Cardano - public open-source decentralized blockchain platform, internal cryptocurrency called "Ada".  
founded in 2015 by Charles Hoskinson -  
[https://en.wikipedia.org/wiki/Cardano\\_\(blockchain\\_platform\)](https://en.wikipedia.org/wiki/Cardano_(blockchain_platform))
  - **Yield farming** = lending or staking cryptocurrency in exchange for interest and other rewards. Yield farmers measure their returns in terms of annual percentage yields (APY). While potentially profitable, yield farming is also incredibly risky.
  - **Crypto Mortgage** -  
<https://www.prnewswire.com/news-releases/milo-launches-first-us-crypto-mortgage-301462342.html>
  - ...
-

# More Links

- Melania Trump – NFT - <https://blockchain.news/news/former-us-presidents-wife-melania-trump-releases-the-first-nftpriced-at-1-sol>
  - Blockchain explorer - <https://www.blockchain.com/explorer>
  - Cryptopedia - <https://www.gemini.com/cryptopedia>
  - Book: "Platform Revolution: Blockchain Technology as the Operating System of the Digital Age" - <https://www.amazon.com/gp/product/1988025737/>
  - Fed Digital Currency Report - <https://time.com/nextadvisor/investing/cryptocurrency/expert-reaction-to-fed-digital-currency-report/amp/>
  - DeFi Decoded - Why fortunes are made in bear markets - 40min video - <https://youtu.be/joy4-QbG0Rw>
  - Wharton Accepts Cryptos as Tuition Fees for Blockchain Courses - <https://blockchain-news.cdn.ampproject.org/c/s/blockchain.news/postamp?id=wharton-accepts-cryptos-as-tuition-for-blockchain-courses>
  - 3 Ways NFT Gaming Is Building New Wealth Opportunities - [http://entm.ag/Q1CCQp?fbclid=IwAR0vyM7BHpG6gEk\\_3y0codMBIgtOB-C\\_YhJLXGtKLiPSkYJHoqlAE4gdcM](http://entm.ag/Q1CCQp?fbclid=IwAR0vyM7BHpG6gEk_3y0codMBIgtOB-C_YhJLXGtKLiPSkYJHoqlAE4gdcM)
  - India - tax on crypto in 2022 - <https://www.bloomberg.com/news/articles/2022-02-01/india-to-launch-central-bank-digital-currency-next-fiscal-year>
  - Laws for stablecoins - <https://www.americanbanker.com/news/democrats-circulate-bill-to-rein-in-stablecoins>
  - Stablecoin - [https://www.linkedin.com/posts/theblockchainforum\\_stablecoin-regulatory-update-feb-2022-activity-6895248259149893632-9Og3](https://www.linkedin.com/posts/theblockchainforum_stablecoin-regulatory-update-feb-2022-activity-6895248259149893632-9Og3)
  - Blockchain glossary for accountants - <https://jofacc.libsyn.com/a-blockchain-glossary-the-cpa-firm-of-the-future-and-excel-malware>
  - Feds & Digital Currency - <https://news.mit.edu/2022/digital-currency-fed-boston-0203>
  - KPMG is a global network of professional firms providing Audit, Tax and Advisory services - <https://www.marketwatch-com.cdn.ampproject.org/c/s/www.marketwatch.com/amp/story/crypto-is-volatile-but-kpmg-canada-just-added-bitcoin-and-ether-to-its-balance-sheet-heres-why-11644270913>
  - Cryptocurrency, Blockchain - IRS forms & how to file - <https://open.spotify.com/episode/4BA08KV2257tlygMglcgyq>
  - Google & Crypto - <https://sg.finance.yahoo.com/news/google-blockchain-crypto-ecosystem-sundar-pichai-nfts-000111560.html>
  - PayPal & Crypto - <https://blockchain-news.cdn.ampproject.org/c/s/blockchain.news/postamp?id=paypal-establishes-advisory-committeefocusing-on-crypto-affairs>
  - Apple and crypto payments - <https://finance.yahoo-com.cdn.ampproject.org/c/s/finance.yahoo.com/amphtml/news/apple-enable-crypto-payments-tap-150300322.html>
  - Coinbase - Earn crypto while learning about crypto - <https://www.coinbase.com/earn>
  - Coinbase - Get paid in crypto with zero fees, get your paycheck deposited into Coinbase - <https://www.coinbase.com/direct-deposit>
  - Ukraine Legalizes Bitcoin amid Intensified Tension with Russia - <https://blockchain-news.cdn.ampproject.org/c/s/blockchain.news/postamp?id=ukraine-legalizes-bitcoin-amid-intensified-tension-with-russia>
  - Fed Designs Digital Dollar That Handles 1.7 Million Transactions Per Second - <https://www-forbes-com.cdn.ampproject.org/c/s/www.forbes.com/sites/jasonbrett/2022/02/07/fed-designs-digital-dollar-that-handles-17-million-transactions-per-second/amp/>
  - BNB Chain - <https://www.binance.com/en/blog/ecosystem/introducing-bnb-chain-the-evolution-of-binance-smart-chain-421499824684903436>
  - Salesforce - NFT cloud service - <https://www-cnbc-com.cdn.ampproject.org/c/s/www.cnbc.com/amp/2022/02/09/salesforce-tells-employees-its-working-on-nft-cloud-service.html>
  - JPMorgan - Quantum Key Distribution (QKD) secure network - <https://www-pymnts-com.cdn.ampproject.org/c/s/www.pymnts.com/blockchain/2022/jpmorgan-announces-viable-quantum-secure-blockchain-network/amp/>
  - Paris Hilton on Tonight Show - NFTs - <https://www.youtube.com/watch?v=5zi12wrh5So>
  - Proof-of-Stake - Cardano, Solana, Algorand, Ethereum - <https://www.technologyreview.com/2022/02/23/1044960/proof-of-stake-cryptocurrency/>
  - What's on Tap? - Putin - and Crypto - <https://youtu.be/a0ryBK2UgTQ>
  - It's all about crypto and Blockchain - <https://www.inaa.org/accounting-industry-trends-for-2022/>
  - Good Glossary - <https://data-flair.training/blogs/distributed-ledger-technology/>
-