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A Brief History of the Internet

From Web 1.0 to Web 3.0

April 2021

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Research and Insights

Macro Report

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Content

Executive Summary

Welcome to our "Web 3.0, Layer 1 and Layer 2" series. This article will guide you through the brief history of the internet.

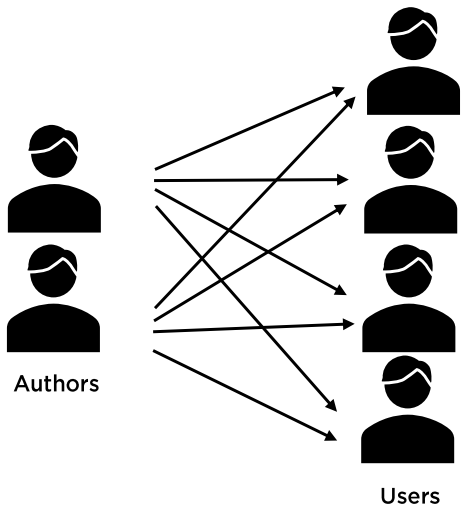
Key Takeaways

- Web 1.0 (1989-2005) is also called "static web", which is "read-only" and decentralized. Web 2.0 (2005-present) is interactive but centralized. Web 3.0 (future) will be more human-like and return to the decentralized structure, thus improving data privacy and security.
- Bitcoin provides a feasible direction to build web 3.0; Ethereum made a real example for dWeb: It allows users to write codes on the blockchain so that Dapps can be built upon. Blockchain shows the potential to decentralize the data structure of the current centralized system.
- Decentralized applications (Dapps) are digital applications or programs run on a blockchain or P2P network of computers instead of a single computer/a single organization. Compared to Apps, Dapps don't need centralized servers.
- Decentralized finance (DeFi) experienced dramatic growth in the second half of 2020 and dominates Dapp, especially in terms of transaction volume.
- Ethereum used to be the main platform for Dapps to build upon, with the most Dapps and a large ecosystem. However, its dominant position is challenged by a new competitor: Binance Smart Chain (BSC).

Introduction

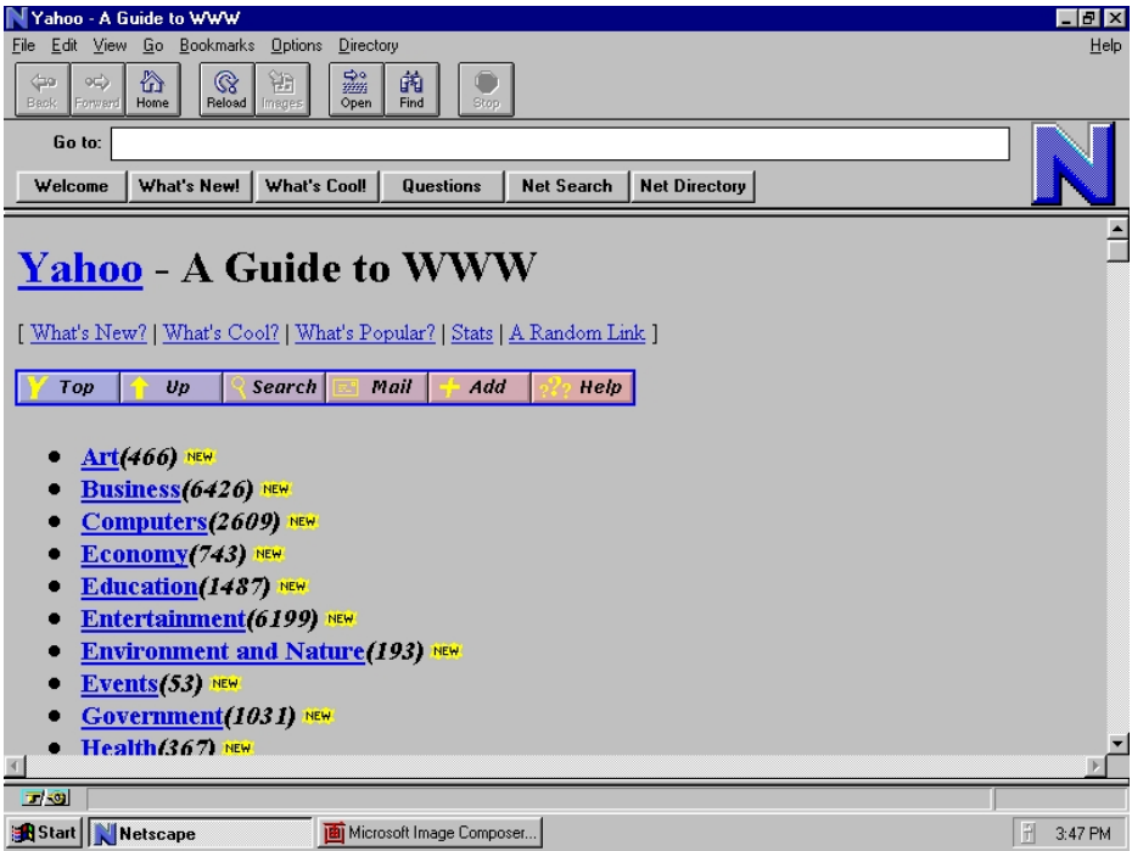
The internet has evolved dramatically from web 1.0 to web 2.0 so far. Even though web 2.0 has been advanced and easy-to-use, the innovation doesn't stop here: we are now on the way to explore another revolution: web 3.0. Now let's walk through web 1.0 to web 3.0.

Web 1.0 (1989-2005)



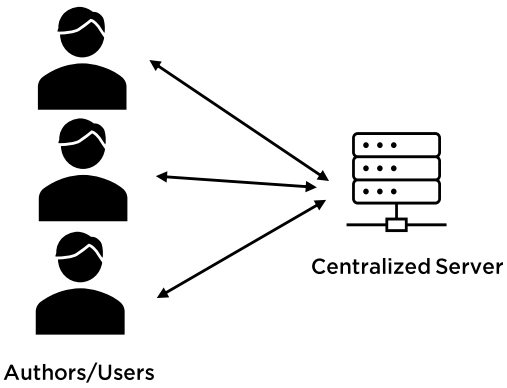
Source: Crypto.com Research

Web 1.0 has three features: **static**, **read-only**, and **decentralized**. Web 1.0 is also called "**static web**" because the contents are mostly text, which is very different from the web we are familiar with nowadays. What's more, most web pages are in a "**read-only**" mode: users can only read the contents on the web page written by a small group of authors, but cannot interact with the authors nor leave any comments. It features one-way information flow, and this experience is similar to reading books. Besides, web 1.0 is mostly **decentralized**. The internet services are based on open-sourced protocols controlled by communities, and individuals can express their opinions based on the given rules. During this period, Yahoo is the leading company. The following picture shows the web page of Yahoo in 1993.



Source: https://ebusinessharper.wordpress.com/2016/03/06/evolution-of-ebusiness-and-the-world-wide-web/

Web 2.0 (2005-present)

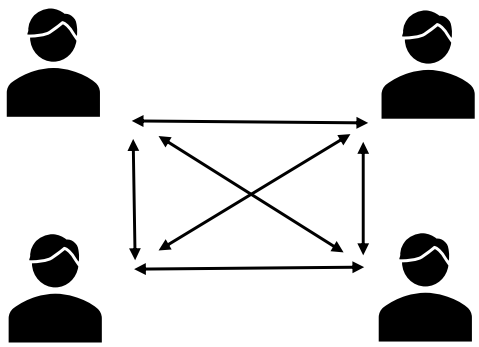


Source: Crypto.com Research

Web 2.0 is also called "**social web**", and it is the internet we are using now. There are two significant improvements of web 2.0 compared to web 1.0: **multiple content formats** and more **interactions**. As the internet speed becomes much faster, web 2.0 allows for various contents like images, videos, etc. Besides, web 2.0 is in a "**read-write**" mode, which means the user can be the author simultaneously, and it largely facilitates interactions between content authors and users. Because of this interaction, user-generated contents emerge. One typical example is Facebook.

However, as the content becomes rich, the original P2P network struggles to handle massive data processing. Thus tech giants provide **centralized servers** with huge capacities to process them and offer better services to users. As a result, web 2.0 features a **centralized structure**.

Web 3.0 (future)



Authors/Users

Source: Crypto.com Research

You probably have heard of its name many times, so what is web 3.0? Two alias of web 3.0 can summarize the critical features: "dWeb" and "semantic web," and web 3.0 is the era when these features have become popular on the whole internet.

dWeb: The original design of the internet (in the web 1.0 era) is decentralized. However, the current internet (web 2.0) relies on centralized servers provided by tech giants, which caused severe privacy issues. A primary purpose of web 3.0 is to "re-decentralize" the web, so web 3.0 is also called "dWeb." Web 3.0 built applications and sites across a network of connected devices so that every device is a server. These Apps and sites follow a standard protocol and enable P2P interactions. This feature can make a significant difference by returning the

data ownership to the users from the centralized servers, which guarantees better privacy. What's more, because of eliminating a centralized server, single point attack cannot be successful, and the whole system's security is enhanced. Here is a list of dWeb sites, and we'll introduce dWeb applications (or Dapps) later.

Semantic Web: Semantic web is defined by Tim Berners-Lee, the inventor of the World Wide Web, which aims to make internet data more machine-readable. Compared to web 2.0, web 3.0 is expected to be even more human-like, and less human intervention is needed, thus providing highly-tailored content by leveraging advanced technologies like AI, big data analysis, NLP, and many more. For instance, web 3.0 is expected to understand contents like video and more complex associations between behaviors. In this perspective, web 3.0 can be viewed as an enhanced version of web 2.0.

More and more websites/Apps with features of web 3.0 have emerged in recent years. However, they are far from becoming mainstream, and most of our internet hasn't left the web 2.0 era. So web 3.0 hasn't come yet, but we expect it to make a huge difference in the near future.

Here we summarize the different characteristics from web 1.0 to web 3.0.

	Web 1.0	Web 2.0	Web 3.0
Content	Text-only	Various forms	Various forms
Interaction	Read-only	Interactive	Interactive
Intelligence	Low	Middle	High
Centralization	Decentralized	Centralized	Decentralized

Web 3.0 and Blockchain

There's been a long time when we are used to HTTP protocol and centralized servers like Facebook. Then why do we need web 3.0 to re-decentralize the web?

Simply put, the centralized system faces issues like data breaches, surveillance, and censorship, which seriously erodes internet security and users' privacy.

For example, Facebook's server collects lots of user-generated information and becomes a huge target for hackers. In 2018, a significant data breach happened and 50 million accounts were hacked. This event largely harms Facebook's reputation and warns people of using centralized web systems. Even if Facebook has enhanced its security system, data leaks that happened before can continue to harm users' privacy: 500 million user information was recently posted on the hacking website.

To let people own their data and better protect their privacy, web 3.0 emerged, and the re-decentralization trend is gaining popularity. One of the earliest attempt is the BitTorrent protocol in 2001, which leverages the power of cryptography. It makes downloaders into uploaders so that when there are more downloaders, more broadbands are provided. BitTorrent allows high-speed downloading in its decentralized system and becomes a milestone in this decentralization revolution. However, its application is limited to file transfer. We need another technology breakthrough that has more various applications.

In 2008, bitcoin was created, which provides a feasible direction to build web 3.0: blockchain technology introduced a decentralized consensus mechanism, proof of work, which removes centralized server and ensures high-level security for the decentralized network. However, bitcoin network's function is limited to cryptocurrency transfer, and the potential to build decentralized sites and applications is limited.

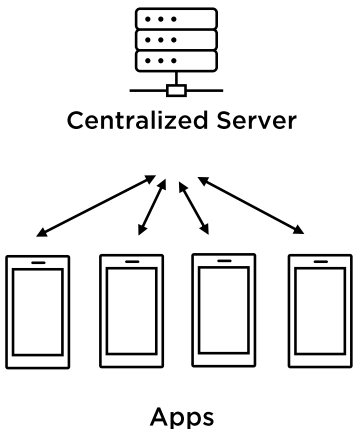
This situation changed in 2015 when Ethereum built a real example for dWeb: It allows users to write codes on the blockchain (or smart contract). This is great progress based on bitcoin as it can provide various forms of services on the decentralized system using programming. Because of networks like Ethereum, decentralized applications (Dapps) can be built upon them and forms a complex ecosystem. So far, blockchain technology has taken this decentralized connection to a new level. It shows the potential to decentralize the data structure of our current centralized system.

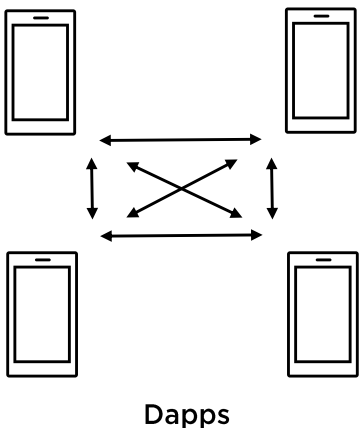
In summary, blockchain technology shows us a feasible direction for web 3.0 revolution. Formally speaking, the technology for building dWeb is called Distributed Ledger Technology (DLT), and blockchain is one type of it. DLT generalizes all similar systems that aim to solve consensus problems in a decentralized way. Others include DAG, Block Lattice, etc.

Decentralized Applications

We borrow the definition from Investopedia: Decentralized applications (Dapps) are digital applications or programs run on a blockchain or P2P network of computers instead of a single computer/a single organization. Like Apple Store, any developer can build Apps for Apple Store; developers can build Dapps on Ethereum system or other P2P networks and they are not owned by any entity. This guarantees some nice properties like self-governance, trustless, transparency, permissionless, etc. Besides, as Dapps always work autonomously using smart contracts, a sustainable Dapp always provide incentives to "keep developers building, users loyal, and miners maintaining a blockchain"[1]. So the economic design is also a critical difference between Dapps and Apps.

Here we make a simple comparison between Apps and Dapps. In the front end, these two are similar. All the structural differences we mentioned are reflected in the backend. Traditionally, centralized applications use API to link to a centralized server and the backend is controlled by a single organization. In contrast, Dapps removes the central server, and every device is a server. Thus it forms a P2P network for users to communicate. The following graphs show the structural difference between Apps and Dapps.





Source: Crypto.com Research

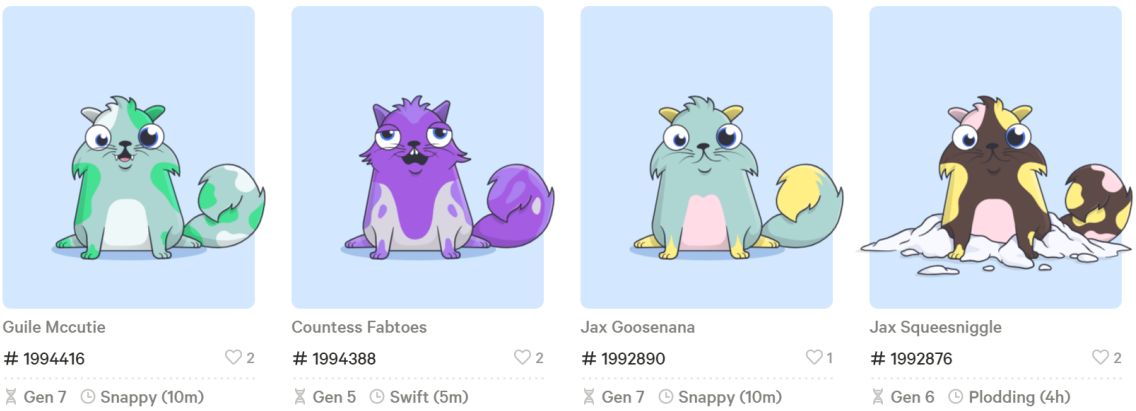
[1] https://www.oreilly.com/library/view/decentralized-applications/9781491924532/ch01.html

Different Categories of Dapps

The following table lists different categories of Dapps, example project for each category, and the 30 days transaction volume for that example project.

Categories		Examples	30d Volume
Game		CryptoKitties: collect and breed digital cats	$3.89M
DeFi	Token Swapper	Uniswap: decentralized exchange	$26.47B
	Lending	Venus: marketplace for lenders and borrowers	$1.11T
	Asset Management	yearn.finance: lending aggregation and yield generation on ETH	$51.11M
	Interoperability	RenVM: inter-blockchain liquidity for Dapps	$210.14M
	Payments	Flexa: digital payments	$6.47K
Collectibles		NBA TopShot: marketplace to trade officially-licensed NBA highlights	$218.93M
Gambling		Dice2.win: fair bets backed by open-sourced contract	$277.63M
Others	High Risk	BNBstake: BNB investment platform	$22.83M
	Social	Steemit: a community where users are rewarded for sharing	$900.41

Here we use CryptoKitties as an example as it's one of the most famous Dapps in history.



Source: CrytpoKitties

Founded in October 2017, it was a virtual game that allows players to breed, raise, and trade virtual cats with unique genomes that influence their appearance. To own these kitties, players need to pay ETH, which creates a good channel for beginners to interact with the blockchain. The whole game is written on five Ethereum smart contracts, and users interact with it via their own Ethereum address. It's highly automatic, and no need for human intervention.

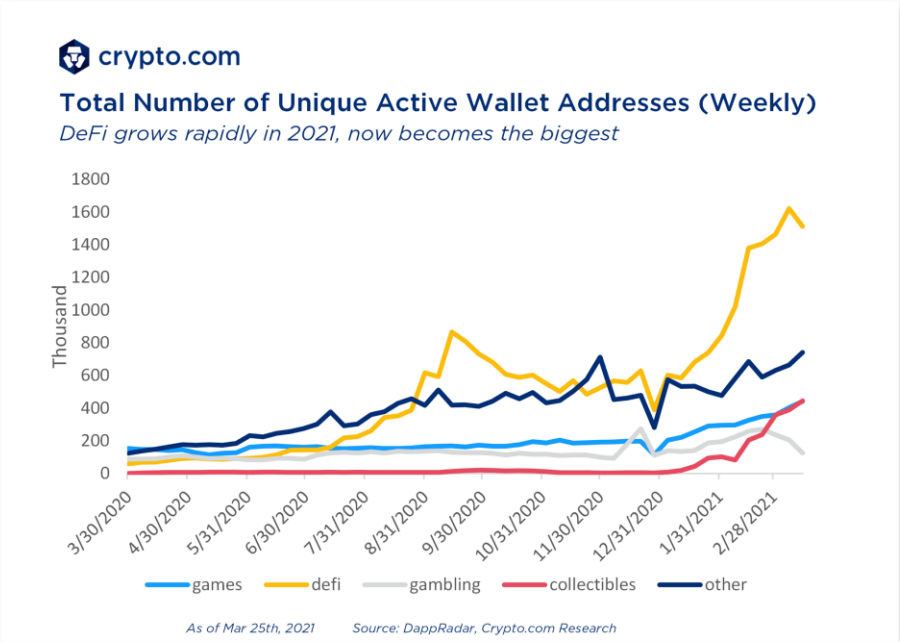
Because the kitties are in the blockchain, they are entirely owned by the players and will live forever on the chain. This unique feature makes it even more attractive compared to traditional collective games. It becomes so popular and even causes congestion on Ethereum in 2017.

In 2017, one CryptoKitty was sold for 600 ETH (US$172k at the time). The project made appearances on mainstream media everywhere, including CNN, CNBC, and the Financial Times.

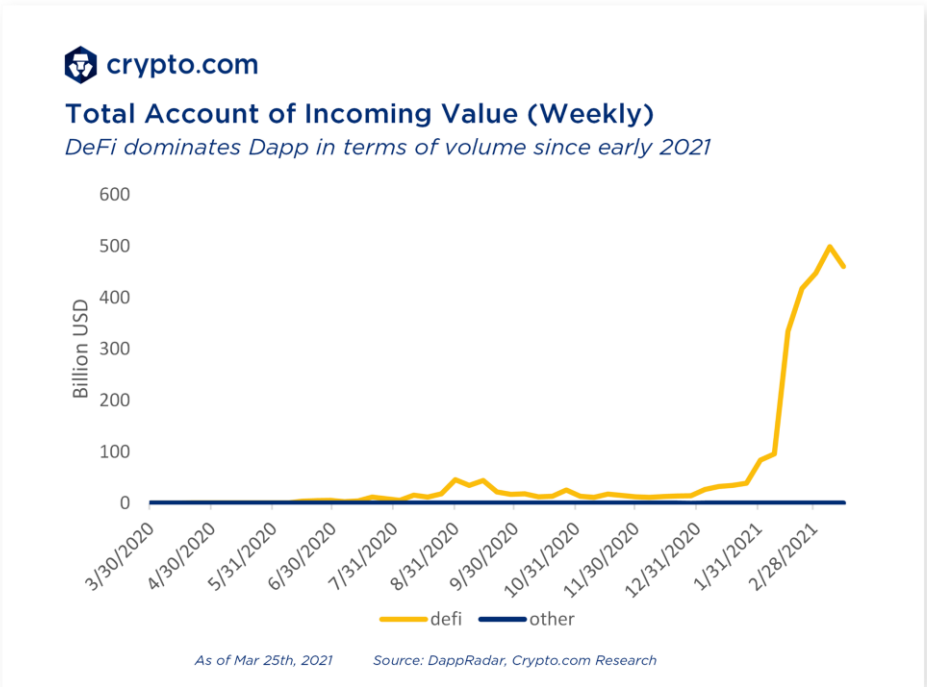
Dapps Overview

Comparison by Categories

DeFi is the most popular DApp category as it dominates both the user bases and transaction volume. According to the data from DappRadar, over 1 million users interacted with DeFi, and more than $270 billion was transactedso far in 2021. The data also suggests that the gap between DeFi and other categories became larger after 2020.



DeFi's dominating position is even more apparent if we look at the transaction volume as DeFi is the main area to perform transactions. The gap between DeFi and other categories is still huge. For example, in February 2021, the total transaction volume for DeFi is more than $900B, while the number is less than $2B for non-DeFi Dapps.



Comparison by Chain

For a long time, Ethereum is the main platform for Dapps to build upon, with other competitors like TRON, Flow, EOS, ThunderCore, WAX, VeChain, IOTA, Stellar, etc. However, recently, Ethereum's dominant position in DApps was challenged by a newly-emerged strong competitor: Binance Smart Chain (BSC).

BSC was founded by Binance and was launched in May 2020. It is a blockchain that runs in parallel to the Binance Chain and can run independently. Unlike Binance Chain, BSC is compatible with the Ethereum Virtual Machine (EVM) to port Ethereum apps and users easily. As the gas fees in Ethereum went ridiculously high recently because of ETH price increase and network congestion, many Dapps moves to BSC. BSC is more efficient than ETH in the sacrifice of decentralization. For instance, the block time is reduced from 13s in ETH to 3s in BSC, allowing for faster transaction throughput and faster confirmation time. What's more, the gas price is much lower in BSC. For instance, in early April, the average gas price is around 15 Gwei in BSC, while the number is around 150 Gwei in ETH. However, unlike ETH, which is highly decentralized, BSC is "partially decentralized." It's supported by centralized Binance Exchange and has more centralized elements to fasten its transaction speed and lower its cost. Specifically, BSC uses a Proof-of-staked-authority consensus algorithm, and it is centered upon 21 validators.

Besides, Binance is actively expanding its ecosystem. For example, Binance Labs leads a $2.4M investment round for Plasm Network, a multi-virtual machine scalable contract platform on Polkadot. This investment can bridge the Binance and Polkadot communities. And Plasm Network is the first investment under Binance Labs' $10M Fund to support innovative projects in Polkadot.

According to DappRadar, there are more than 2,200 Dapps on Ethereum, while the number is only 255 for BSC. Although Ethereum is a much larger ecosystem with more Dapps built upon it, the following charts show that Ethereum's number of users and transaction volume have already been surpassed by this partially decentralized platform: BSC.

The outstanding transaction volume on BSC is primarily attributed to some big projects like Venus, Belt Finance, and Autofarm. The monthly transaction volume is $1.1T, $578.0B, and $355.3B respectively. On Ethereum, the largest transaction volume project is Uniswap, with a monthly volume of $26.2B only. Variation in transaction volume is high for different Dapps on BSC, and it may not be that easy for this challenger to sustain the No.1 position.

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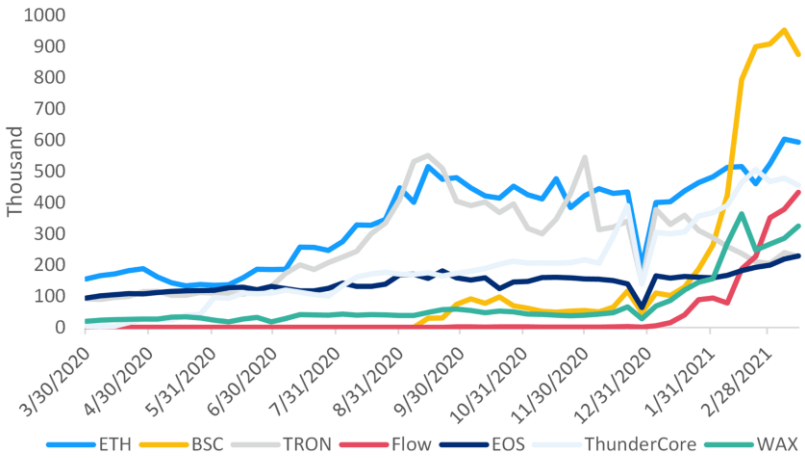
Total Number of Unique Active Wallet Addresses (Weekly)

BSC has surpassed ETH in 2021 and is around 1.5 times of ETH currently



As of Mar 25th, 2021 *Source: DappRadar, Crypto.com Research*

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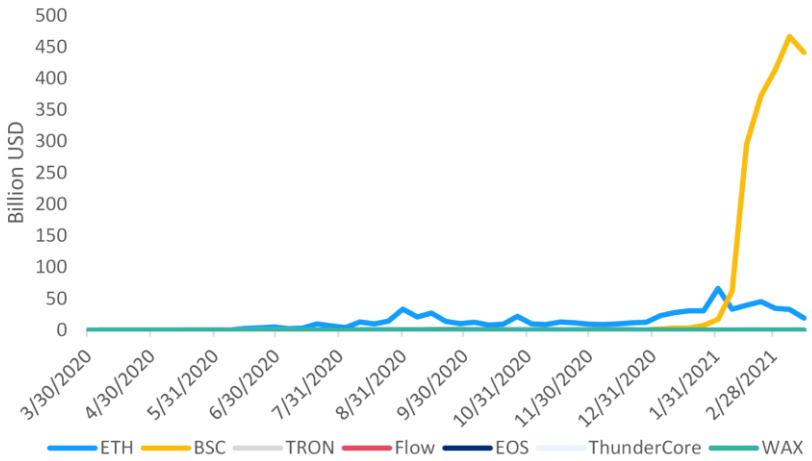
Total Account of Incoming Value (Weekly)

BSC has surpassed ETH in 2021 and is more than 20 times of ETH currently



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Limitations and Solutions

As we have mentioned, the Ethereum gas fee surged sharply recently, revealing a pain point of blockchain: scalability. What is scalability? We have examined scalability deeply in this research article. Simply put, the inefficiency rises from the fact that each transaction will be broadcast to the whole huge network. This means every single transaction will be recorded on hundreds of thousands of computers. This mechanism enhances security but makes it inefficient when nodes and transactions increase. Scalability is measured by throughput and confirmation time.

Throughput measures the capacity, say, how many transactions can be processed per second (tps). For instance, bitcoin can process 7 tps, while Visa can process 24,000 tps. Confirmation time is influenced by many factors. Some examples are: throughput and average first block waiting time. As Dapps, transactions, and users increase sharply in Ethereum, network becomes congested. This congestion increases average first block waiting time, thus deteriorate confirmation time.

In 2017, cryptocurrencies experienced an unprecedented bull round. The surging demand worsen the congestion problem and make the scaling issue even more severe. The same happens during the recent bull run. Then how does scalability cause gas prices to surge? When confirmation time is relatively long, people will bid higher gas prices to have their transactions processed earlier. Thus we see an unbelievably high gas fee nowadays.

There are many possible solutions to mitigate this problem: (1) Layer 1 (on-chain) solutions (e.g. BCH: increase the block size); (2) Layer 2 (off-chain) solutions (e.g. Lightning Network: second layer off-chain payment channel).

In August 2017, the famous bitcoin cash hard fork emerged and bitcoin was from that time split into bitcoin classic (BTC) and bitcoin cash (BCH). This hard fork is an application of increasing the block size to improve the scalability of the network, so that more transactions can be settled when mining one block. In March 2018, Lightning Network launched. It moves some transactions into off-chain channels so that they can be settled much faster. Only after finishing, will they be broadcast to the whole on-chain network.

Summary

Key Takeaways

- Web 1.0 (1989-2005) is also called “static web”, which is “read-only” and decentralized. Web 2.0 (2005-present) is interactive but centralized. Web 3.0 (future) will be more human-like and return to the decentralized structure, thus improving data privacy and security.
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