Web 3.0 - Building Citizen Rights in Cyberspace

Mingyuan Zheng*[1,a], Yaming Liang[2,b], Yan Yang[2,c], Lei Zhang[1,d]

{[a]zmy_henu@henu.edu.cn, [b]252165996@qq.com , [c]13592190448@139.com, [d]zhanglei@henu.edu.cn}

School of Computer and Information Engineering, Henan University, Kaifeng, Henan, China[1]
Pingmei Shenma Construction Industry Group, Pingdingshan, Henan, China[2]

Abstract. As of 2024, the Internet has become an indispensable part of people's lives, and for some people, it is even considered akin to a social infrastructure. At the inception of the Internet, technologies and frameworks were constantly invented and applied to utilize data dispersed across various terminals, changing the way information is exchanged on the Internet from static posting in the web 1.0 to dynamic interaction in the web 2.0 . Looking ahead, engineers and experts proposed new requirements for the network, namely web 3.0. With the development of technologies such as blockchain and distributed storage, some Internet applications possessing web 3.0 characteristics have been born, optimizing the virtual world from economic, cultural, and technological perspectives. However, the seemingly mature web 3.0 technology ecosystem is advancing slowly, and even regressing, unlike the smooth transition from web 1.0 to web 2.0. Web 3.0 seems to lack some key dynamics, or has encountered some uncertain resistance. This paper first introduces the differences between web 1.0, web 2.0, and web 3.0, then discusses the problems and challenges encountered in the web 3.0 revolution, and raises questions and answers.

Keywords: Internet, Web evolution, Web 3.0

1 Introduction

In May 1991, the World Wide Web proposed by Tim Berners-Lee made its first appearance on the Internet. This is a distributed hypertext system, known as Web (or Web 1.0)[1] which is a linked information system based on graphics and linking organizations. A key feature of Web 1.0 applications is static pages, allowing visitors to perform some simple operations, such as reading and clicking. Although basic and monotonous, Web 1.0 applications continued to evolve into more practical and user-friendly formats.

The second generation of the web (called Web 2.0) [2]was proposed in the Brainstorming Forum. Compared to Web 1.0, users are no longer just reading or downloading content from static websites. They are able to write or upload various creations on the internet. This interaction is vital for the Web 2.0 architecture. Numerous novel technologies (for example, asynchronous JavaScript and css) provide users with a rich experience. So far, Web 2.0 has inspired the creativity of many young people and encouraged them to participate. Social media platforms (like Facebook, Twitter, and Tiktok), video and music websites (like YouTube), and e-commerce platforms (like Amazon, eBay) have changed our lives in the past decades.

With the development of personal terminals, the Internet has become a more powerful tool and has become extremely important in people's lives. In the foreseeable future, the Internet will

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inevitably become indispensable in modern social life. As it stands now, there are heavy internet users in the population who, while using the internet intensively, have also discovered the problems of the current internet. As users always flock towards better services, free and easy-to-use internet services have become people's first choice. But the price comes along with it. Platforms owning huge user data have become unshakeable in the Internet, they possess the data generated by users and can benefit from it while the producers of data have no solution[3]. The storage-sharing model that people use on the Internet is unhealthy, and due to this unhealthy internet environment and the restriction of imperfect technology, the rights that people have in real life cannot be realized in virtual space.

This article will discuss the interpretation of citizenship under virtual space and discuss the difference between web3.0 interpretation, the driving force of web3.0 technology, and the path to building web3.0.

2 Citizenship in the internet environment

Web 1.0 primarily serves as a content delivery network, providing users with the ability to passively consume information on websites. The characteristic iteration of Web 2.0 is an increase in user interaction, promoting the production of user-generated content and enhancing user interactivity and usability. Web 3.0 has not yet arrived, and what exists currently are descriptions of its shape. We often hear it being described as "readable, writable, possessable," and many scholars or technical experts have given their interpretations, resulting in different versions of the Web 3.0 vision, such as Web3, Web3+, etc. In general, however, the era of Web 3.0 will be a time when property rights, voting rights, judicial rights, and freedom of speech are realized on the Internet, i.e., the construction of citizenship.

In the context of Web 3.0, these terms can be defined as follows:

Property rights refer to Internet entities having property rights over the data they produce, being able to control data access and initial transfer.

Judicial rights mean that all entities in Internet-based services have the same status. For example, during the Web 2.0 era, the agreement between users and platforms was not entirely equal. There was even threatening users' rights in some platform terms, such as Twitter and Tencent, etc. If user content is judged by the platform to harm the company's interest. The most extreme case is after the individual's death, the data generated during their lifetime can't be preserved or inherited.

Freedom of speech refers to the freedom to share user data. At present people use social software for transmission. The seemingly free sharing actually has a huge barrier. Firstly, there is isolation between platforms. Secondly, the data is transferred from the user's app to the platform's server. This series of actions are closed, and external information service platforms can't obtain the data.

Judicial rights mean that all IoT entities follow the same rules, and entities cannot conduct value judgement among each other. Voting rights and judicial rights are the premises for the protection of property rights of entities. These have a positive impact on the formation of network communities.

3 Challenges and issues

3.1 Power of change

Users will choose products for more convenient features and give up products because of the high cost. They have to make a trade-off between privacy data and product usability. On the other end of the service, Internet entities tend to lean towards profit. Technologies that help generate profit will be transformed into products, while those that help save costs will be converted into products. Based on this power, the web has completed the transition from Web1.0 to Web 2.0, as shown in Table 1.

The goal of Web 3.0 is clearly not in the interest of most top Internet companies. Therefore, the Web 3.0 reform cannot be achieved through technological updates in existing network services.

Table 1. Differences between different stages of the web.

stage	Architecture	products	Data	Authorization	Technology
Web1.0	centralized	Yahoo, Netscape	from platform	by platform	HTML 、 HTTP 、 URI
Web2.0	platform centralized	Google, Facebook, Amazon	from user	by platform	SOC、JavaScript
Web3.0	distributed	Ethereum[4] , Element	from user	by user	smart contract 、 storage service

3.2 Technical

3.2.1 Resource description framework

Resource Description Framework(RDF)[5] is a standard that provides a unified method for describing entities/resources. Simply put, it is a way of representing things. Formally, RDF is expressed as Subject-Predication-Object triples, sometimes also called a statement, and in the knowledge graph, we also refer to it as a piece of knowledge. However, it is not limited to RDF. Cross-platform data transmission needs a unified standard to deal with different rendering terminals to ensure data readability and usability.

3.2.2 Blockchain

Blockchain is a hot technology in web3.0[6]. Whether it's its decentralization features or power decentralization, trustlessness, autonomy, anonymity, immutability, and auditability, all these features make it the core technology of Web3.0 construction.[8]

(1) Decentralization: No need for third party intervention, realize peer-to-peer transactions, coordination, and collaboration. In the blockchain system, it is impossible to control global data, and the shutdown of any node will not affect the overall operation of the system. This decentralized network will greatly enhance data security.

(2) Immutability: Blockchain uses encryption technology to verify and store data, and uses distributed consensus algorithms to add and update data. The blockchain requires various nodes to participate in verifying transactions and producing blocks; modifying any data

requires changing all subsequent records, and it is extremely difficult to modify the data of a single node.

(3) Collective maintenance: The decentralized feature of blockchain determines its collective maintenance. Blockchains are collectively maintained by participants in a peer-to-peer manner, all parties have clear responsibilities, there is no need to cede rights to third-party institutions, thus realizing collaborative cooperation.

3.2.3 Cloud storage for private

Cloud storage is a model of online storage where data is stored on multiple virtual servers, usually hosted by third parties, rather than on dedicated servers. Hosting companies operate large data centers, and those in need of data storage hosting can meet their data storage needs by purchasing or leasing storage space from them. Data center operators prepare virtualized storage resources based on customer needs, and offer them as storage resource pools. Customers can then use this storage resource pool to store files or objects. In reality, these resources may be distributed across many server hosts. Cloud storage services are typically oriented towards companies, supporting various services. Under the web3.0 technology framework, cloud storage services should provide data hosting services combining identity authentication and RDF for personal storage[9].

3.3 Elite or popularist

"Web3" as we know it today was introduced in 2014 by Gavin Wood, one of the co-creators of Ethereum, a concept put forth by Tim Berners-Lee. The concept of "web3.0" was initially proposed by the creator of the World Wide Web, Tim Berners-Lee, in 2006, as an anticipation for the next generation of the Internet after web2.0. He believed that the "Semantic Web" would be the core of the future Internet. However, due to the widespread adoption of various interconnect technologies and personal devices, the Internet is no longer the same as it was in 2006. Nowadays, some people believe that the next generation of the network will be based on blockchain and smart contracts. This is represented by the concept of "Web3" proposed by Gavin Wood, a supporter of Ethereum, in 2014. Ethereum and Binance, web applications fully supported by users, definitely have the advantages of blockchain technology[7], such as decentralization and immutability, when they have real-world value. However, things like election penetration or hard forking of virtual currencies can also happen. The situation mentioned may not be obvious at this stage, but the individual constructed by the Internet is ultimately a person, and the culture and nationality possessed by humans. This unstable tendency will eventually tear apart such web applications. If such blockchain-based applications are the basic services of web3.0 internet, even if they only split for a few weeks, it will be very costly to restore them due to the characteristics of blockchain technology. Therefore, this article believes that blockchain-based web3.0 services will inevitably be replaceable, not the cornerstone of building web3.0 Internet. Complete decentralization is too ideal and unreliable.

Just as the name suggests, Web2.0 can be considered as an upgrade or enhanced version of Web1.0. Technically, this is the case. However, with the emergence of Web3.0, there is a perception that Web1.0 is more akin to the Web3.0 era than Web2.0. The internet linkages of computer information advocated by the founder of the web, viewed from the current situation,

have indeed interconnected many terminal computers, but unfortunately, are they really linked? Technically or physically speaking, yes, everyone is linked on the Internet, but the data is not. Most of people's data exchanges are completed through the hosting of a third party other than the network service provider. The Matthew effect in the Internet is thus manifested, and the reinforcing cycle increases the amount of data owned by the platform. Rather than saying that web3.0 is an upgrade of web2.0, it might be better to say it is a repair of it as the power of Internet technology has slipped to its current state. If so, change the perspective, that is, break the Matthew effect of data enrichment in the Internet. To this end, I propose the following points:

1.Lack of identity verification services and key management services for individuals.

2.Lack of web personal storage services combined with RDF.

3.The basic internet bandwidth is not sufficient to support more cheap personal service terminals.

3.4 A Secure and decentralized approach

Based on the above, we can easily imagine that an individual's data and information are stored on personal servers. Sharing behavior is completed through list visit addresses, access control, storage in a universal format, and transmission using new channels. The list can be implemented using blockchain technology and some distributed publishing technology. Access control can be implemented by standalone authentication service providers, through the use of the Resource Description Framework. Due to the differences in network transmission between multiple service providers, it is insufficient to support high-traffic applications supported by individuals. The solution exists in the combination of RDF-based web personal storage services. Due to the existence of RDF and ABE authentication, it ensures that users have actual control over the data and data migration.

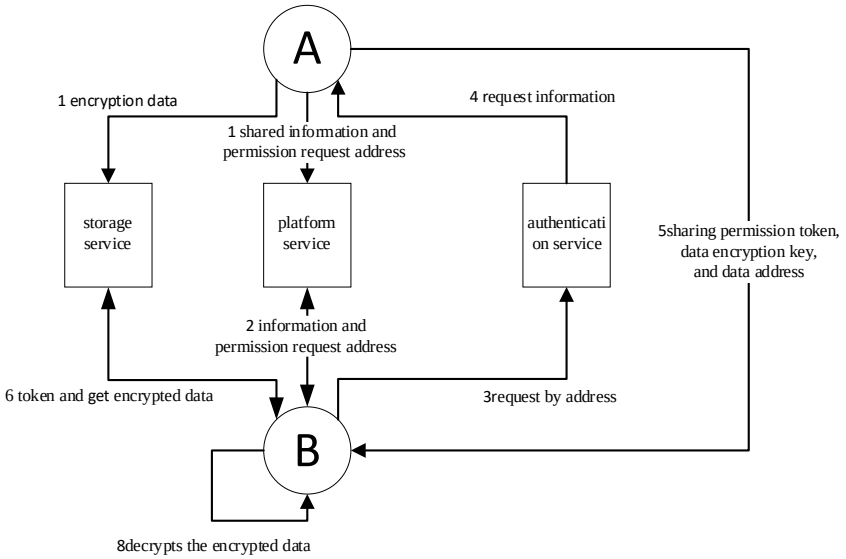

Figure 1. The main process of a secure and decentralized approach.

Specifically, we propose a way of organizing personal blogs in the context of web3.0. As shown in Figure 1, A encrypts and uploads personal shared data to storage services. The storage service manages access requests through authentication. At the same time, the introduction of shared information and the shared permission request address are uploaded to the platform service for release. B obtains the introduction of A's shared information through the platform service and wishes to obtain the details of this information. Therefore, a sharing permission token, data encryption key, and data address are requested either through the authentication service's proxy or directly from A's sharing permission request address. With the token and address, encrypted data are requested from the data storage service, B then decrypts the encrypted data on their machine using the data encryption key, to achieve the service status expected by web3.0. Here, the platform service can use blockchain technology and be completed through smart contracts, realizing completely decentralized and unalterable authentication services. Also, because the storage service uses RDF, its service can be provided by other Internet entities, or users can support it technologically themselves. This allows everyone to manage their data while having choices. Finally, the authentication service can effectively control and proxy the sending and responding of shared data requests.

3.5 Approach practice and analysis

To verify the feasibility of the above approach in the future, we conducted a series of experiments in laboratory environments. The specific approach is to use four computers in the same network to play the roles of user entity A and user entity B, as well as the network third-party entity C providing storage services and the network third-party entity D providing storage platform services. A complete process of user data sharing in the experiment is shown in Figure 2.

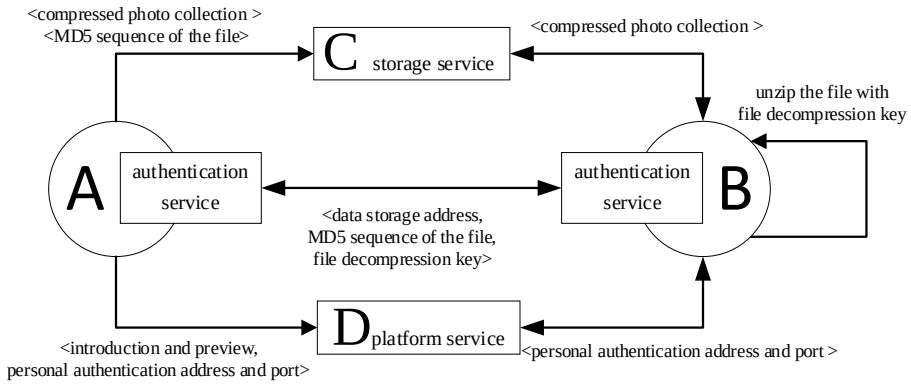

Figure 2. A complete user data sharing process.

For Figure 2, the user data sharing process primarily comprises three steps:

1) User entity A compresses and encrypts the photo collection and uses the <MD5 sequence of the file> as the address to hang <compressed photo collection > as a static file on the third-party entity C. Then, <brief introduction and preview of the photo collection, personal

authentication address and port> are submitted to the platform services provided by the third-party entity D.

2) User entity B obtains a brief introduction and preview of the photo collection in the platform services and makes an authentication request based on the authentication address and port left by A; User Entity A can respond to B's request and choose to deliver the <data storage address, MD5 sequence of the file, file decompression key> to B.

3) User entity B, based on the <data storage address, MD5 sequence of the file>, downloads the compressed photo collection from the corresponding static resource address of third-party entity C, and then unzip the file with the decompression key to obtain the data shared by user entity A.

From the work we have completed, there are a few issues:

1.In 2), User entity A is making a manual return request after receiving a request from B, which is extremely inconvenient. However, if A's authentication system automatically handles requests, it cannot ensure that the requesting user is an Internet entity allowed to share by the data owner A. Hence, before the arrival of Web 3.0, more construction is needed for Internet entity authentication technology.

2.The practice we carry out is based on static File Downloading, but the demand for Streaming Media cannot be ignored. Implementing the aforementioned system in the current networking and hardware environment is challenging.

3.The authentication encryption services in the aforementioned system all use the OpenSSL tool. However, not all Internet users are familiar with encryption certification. More user-friendly authentication services and more convenient third-party authentication methods need to be explored.

4 Conclusion

Implementing the web3.0 ecosystem with existing technology is not a distant thing. Whether thinking about how to build from the perspective of establishing citizenship in the Internet, the power of technological change, or the debate over the diverse definitions of Web 3.0, all these express people's expectations for the arrival of web3.0. Unfortunately, the evolution of web space is linear like history, needing a gradual process, and how to bridge the gap between the highly developed web2.0 today and the fascinating web3.0 is very worth discussing. The development of the web now seems to have entered a low-lying area and cannot continue to advance, but constantly developing new technologies and new ecologies seem to be our ropes to break away from here.

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