Web 3.0: Next Generation Architecture of Web

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Abstract - In the ongoing evolution of the Internet, web-based technologies opened up unimaginable opportunities and challenges. Traditional web, i.e., Web 1.0 was a Read-Only medium; the next version, Web 2.0, established itself as a Read/Write medium. In the current evolving version of web, viz., Web 3.0, users are able to read, write, and execute documents and machines will be able to perform some of the thinking previously only reserved for humans. In a short period of time, Web 2.0 and now Web 3.0 have created new tools and technologies to facilitate web-based task. In this paper, we will begin by discussing some definitions of Web 3.0, its evolution and characteristics. Next, we discussed the possible future technologies, trends, tools and services of Web 3.0 that will benefit every sector of industries and knowledge construction based on the Semantic Web.

1. Introduction

Web 3.0 (Web3) is the third generation of the evolution of web technologies. The web, also known as the World Wide Web, is the foundational layer for how the internet is used, providing website and application services. Web 3.0 is still evolving and being defined, and as such, there isn't a canonical, universally accepted definition. What is clear, though, is that Web 3.0 will have a strong emphasis on decentralized applications and make extensive use of blockchain-based technologies. Web 3.0 will also make use of machine learning and artificial intelligence (AI) to help empower more intelligent and adaptive applications. It took over 10 years to transition from the original web, Web 1.0, to Web 2.0, and it is expected to take just as long, if not longer, to fully implement and reshape the web with Web 3.0.

2. Definition

The term 'Web 3.0' was first coined by John Markoff of the New York Times in 2006, and first appeared significantly in early 2006 in a Blog article "Critical of Web 2.0 and associated technologies such as Ajax" written by Jeffrey Zeldman. Major IT experts and researchers support different approaches to the future Web. There is complete agreement among the experts about how Web 3.0 will evolve. Tim Berners-Lee, coined the term Semantic Web, and promotes the concept of conversion of Web into a big collection of databases. About Web 3.0, Tim Berner Lee says: "People keep asking what Web 3.0 is. I think maybe when you've got an overlay of scalable vector graphics - everything rippling and folding and looking misty-on Web 2.0 and access to a semantic Web integrated across a huge space of data, you'll have access to an unbelievable data resource."

Netflix founder, Reed Hastings thinks that Web 3.0 would be a full video Web as stated below: "Web 1.0 was dial-up, 50K average bandwidth; Web 2.0 is an average 1 megabit of bandwidth and Web 3.0 will be 10 megabits of bandwidth all the time, which will be the full video Web, and that will feel like Web 3.0".

Yahoo founder, Jerry Yang thinks that the new era of tools & techniques for creating programs, data, content and online applications will blur the distinction between professional, semi-professional and consumers. At the TechNet Summit in November 2006, Yang stated: "Web 2.0 is well documented and talked about. The power of the Net reached a critical mass, with capabilities that can be done on a network level. We are also seeing richer devices over last four years and richer ways of interacting with the network, not only in hardware like game consoles and mobile devices, but also in the software layer. You don't have to be a computer scientist to create a program. We are seeing that manifest in Web 2.0 and Web 3.0 will be a great extension of that, a true communal medium…the distinction between professional, semi-professional and consumers will get blurred, creating a network effect of business and applications."

Finally, we consider what Google's CEO, Eric Schmidt stated: "Web3.0 as a series of combined applications. The core software technology of Web3.0 is artificial intelligence, which can intelligently learn and understand semantics. Therefore, the application of Web3.0 technology enables the Internet to be more personalized, accurate and intelligent." These are some of views about Web 3.0 of the different experts of IT industry.

3. Three iterations of the World Wide Web

3.1 Web 1.0, commonly known as the World Wide Web, enables users to connect to websites and view or download the content. Web 1.0 is considered the genesis of the modern internet, spawned from university experiments and ARPANET to eventually create the internet.

3.2 Web 2.0 includes websites and applications that make use of user-generated content, made possible through rich web technologies. This era of the web first materialized in the late 1990s and gave rise to internet giants like Google and Facebook.

3.3 Web 3.0 is still being defined at the enterprise level, as the technologies it's based on continue to

evolve. Early marketing co-opting the term for consumer technology pushes peer-to-peer, decentralized technologies focused on digital ownership, such as cryptocurrency and nonfungible tokens (NFTS).

Table -1: Word Wide Web Differentiation

Web 1.0	Web 2.0	Web 3.0
Created in 1989 by Tim Berners-Lee	Term coined by Tim O'Reilly in 2004	Modern usage with blockchain defined by Gavin Wood, co-founder of Ethereum, in 2014
Static website content	Dynamic content and user input	Semantic content that can benefit from AI
Information delivery	Social networks	Metaverse worlds
Centralized infrastructure	Cloud utility infrastructure that is still largely centralized	Decentralized, edge computing and peer-to-peer
Relational database-driven content and application delivery		Blockchain-based distributed services

4. Layers of web 3.0

Here are the three new layers of 3.0

4.1 Edge Computing: While web 2.0 modifies presently commoditized personal computer technology in data centers, web 3.0 is pushing the data center out to the edge, that is edge computing, and perhaps right into our hands. Phones, computers, appliances, sensors, and automobiles will create and consume 160 times more data in 2025 than they did in 2010.

4.2 Decentralized Network: Decentralized data networks allow different data producers to sell or exchange their data without losing ownership, jeopardizing privacy, or relying on middlemen. As a result, in the emerging 'data economy,' decentralized data networks will have a large list of data providers.
In web 3.0, data is decentralized, which implies that consumers will control their data. Decentralized data networks allow different data producers to sell or exchange their data without losing ownership, jeopardizing privacy, or relying on middlemen. Using Internet Identity, you may log in securely over the Internet without being traced.

4.3 Artificial Intelligence and Machine Learning:
Artificial intelligence and machine learning algorithms have progressed to the point that they can now make useful, and sometimes life-saving, predictions and actions. When constructed on top of new decentralized data structures that provide today's tech titans access to a multitude of data, the potential uses go far beyond targeted

advertising into sectors like precision materials, drug production, and climate prediction. Even though web 2.0 has comparable capabilities, it is still mostly human-based, allowing for corrupt behaviours such as biased product assessments, manipulated ratings, human blunders, and so on.

5. Features that define Web 3.0

Here are some features of web 3.0 that define web 3.0 in the real world.

5.1 Semantic Web: The semantic web enhances online technologies by allowing users to create, share, and link material via search and analysis based on the capacity to grasp the meaning of words rather than keywords or numbers.

Blockchain and cryptocurrencies are progressively being integrated into the current economic framework, and it is yet uncertain if they will be fully integrated or become the primary currency. Cryptocurrencies, on the other hand, are envisioned as a mechanism to compensate content creators in Web 3.0, who would get a token each time someone accessed their work.

Application sharing, transactions, and censorship-resistant peer-to-peer file storage will all be supported via smart contracts. It would necessitate a total change in corporate practices, as well as the empowerment of consumers and producers.

5.2 Artificial Intelligence:
By combining this power with natural language processing, computers in Web 3.0 will be able to discern information in the same way that people do, resulting in faster and more relevant results.

To meet the needs of users, they grow increasingly intelligent. Even though Web 2.0 has similar capabilities, it is still mostly human-based, allowing for corrupt practices such as biased product assessments, manipulated ratings, and so on.
Customers may offer comments on any product or service using online review platforms like Trustpilot.

Unfortunately, a company can easily engage a large number of people to write glowing reviews for its valuable products. As a result, for the internet to give reliable data, AI must learn how to distinguish between the genuine and the fake.

5.3 3-D Graphics or Metaverse: Some visionaries refer to Web 3.0 as the Spatial Web because it aims to blur the line between real and virtual worlds by rethinking graphics technology and putting three-dimensional (3D) virtual worlds or metaverse into sharp relief.

In Web 3.0, three-dimensional design is frequently employed in websites and services. Unlike their 2D predecessors, 3D graphics create a new level of immersion not just in futuristic gaming applications like Decentraland, but also in other areas like health, real estate, and e-commerce. 3D graphics are used in museum tours, computer games, e-commerce, geographical settings, and other applications.

5.4 Connectivity or Ubiquity: Web 3.0 will eventually eliminate many of the drawbacks of Web 2.0. Information is better linked with Web 3.0 owing to semantic metadata. As a result, the user experience progresses to a new level of connection that takes advantage of all accessible data.

Web 3.0 is highly based on IoT sensors and makes the Internet available to everyone, anywhere, at any time, without the need for a computer or smartphone. Ubiquity is defined as being or having the ability to be everywhere, especially at the same time. It can be summed up in one word: pervasive.

Web 3.0 simply goes one step further by making the internet accessible to anybody, anywhere, at any time. Internet-connected devices will no longer be limited to PCs and smartphones, as they were in Web 2.0 since IoT will bring forth a range of new types of smart gadgets. In the end, your identity, most of the items you own, all of your data, and every software capacity you have a right to use will all be connected and able to function together.

5.5 Software negotiating with software: The "browser and website" model is what we've been used to. We have browser plugins that help us with things like cutting web pages, filling in passwords, and ad blocking, among other things. Except for the web giants with the big budgets that can afford Big Data AI and hence software that responds to the user in real-time, websites have been pretty sluggish in communicating with their users.

Web 3.0 will have a different paradigm. Individual users will start to think of what we now refer to as a browser as a type of operating system that executes programs. What we presently refer to as plugins will become applications, and while they will still be able to display documents and videos, some will be considerably more sophisticated. In Web 3.0, users will be able to buy and configure bots that serve them directly, much as hackers and certain websites do now. After all, bots are merely apps.

6. Web 3.0 applications

6.1 **NFT.** Nonfungible tokens (NFTs) are tokens that are stored in a blockchain with a cryptographic hash, making the token unit unique.

6.2 **DeFi. Decentralized finance (DeFi)** is an emerging use case for Web 3.0 where decentralized blockchain is used as the basis for enabling financial services, outside of the confines of a traditional centralized banking infrastructure.

6.3 **Cryptocurrency.** Cryptocurrencies like Bitcoin are Web 3.0 applications that create a new world of currency that aims to be separate from the historical world of fiat currency.

6.4 **dApp. Decentralized applications (dApps)** are applications that are built on top of blockchain and make use of smart contracts to enable service delivery in a programmatic approach that is logged in an immutable ledger.

6.5 **Cross-chain bridges.** There are multiple blockchains in the Web 3.0 world, and enabling a degree of interoperability across them is the domain of cross-chain bridges.

6.6 **DAOs.** DAOs are set to potentially become the organizing entities for Web 3.0 services, providing some structure and governance in a decentralized approach.

7. Conclusion

Web 3.0 is more than a set of useful and new technologies and services. Web 3.0 technologies offer an array of services to make a true online universe a reality. Because of its very nature Web 3.0 services will be having positive impact on productivity. Web 3.0 technologies offer benefits of 3D-wikis, 3D Labs; Intelligent Agent based search engines, Virtual environments like Avatar and Semantic Digital Libraries etc. In our vision of the Web 3.0, we foresee a scenario where such ubiquitous technologies will create a convergence of real and virtual environments, where the user will seamlessly interact with humans and machines either through virtual means or in the real world. These benefits can be directly aligned to the existing best practices in online education, and make further authenticated and effective surrounding.

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