A SEMINAR REPORT

On

WEB 3.0

Submitted in partial fulfillment of the requirements for the award of degree of

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CERTIFICATE

This is to certify that the Seminar report on the topic entitled **"WEB 3.0"** has been successfully carried out by **Umesh Devpal (21BCA……)** in partial fulfillment for the award of Bachelor's In Computer Application of the **Jai Narain Vyas University , Jodhpur , Rajasthan** during the academic year 2022-2023. He/She has carried out the work under my supervision.

Signature

DECLARATION

I, Umesh Devpal**,** student of BCA in Computer Section, Faculty of Science, Jodhpur, Rajasthan hereby declare that the Seminar entitled **"Web 3.0"** has been carried out under the supervision of Prof**. Rachna Varma,** Computer Section, Faculty of Science, Jai Narain Vyas University, Jodhpur and submitted in partial fulfillment of the requirements for the award of degree in **Bachelor's In Computer Application (BCA) In Jai Narain Vyas University**, Jodhpur, Rajasthan during academic year **2022– 2023**.

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1. INTRODUCTION

Web 3.0 (web 3) is the third generation of the internet that interconnects data in a decentralized way to delivery a faster and more personalized user experience. It is built using AI (Artificial Intelligence), machine learning and uses the blockchain security system to keep your information safe and secure.

A decentralized autonomous organizations (DAOs) is an automated computer network organization model controlled by its community members rather than a single establishment like the government or a financial institution, and whose transaction records are maintained on a blockchain.

The idea behind using the semantic web is that it understands and interprets the context and concept of the data. Therefore, when a user searches for an answer, web 3.0 delivers the most accurate and relevant result to the end-user.

Google , Facebook and Microsoft are some of the few companies currently making an enormous profit from user data. But in the web 3.0 users will be able to sell their own data to advertisers while still retaining ownership and data privacy. In addition, web 3 will enable websites and applications to use data more meaningfully and tailor the information to each user.

Hence , this third evolution of the web is an internet where you will enjoy personalized interactions with machines and websites in the same manner as when you communicate with any other human.

2. HISTORY

2.1) Web 1.0 (1989-2005) – Web 1.0 started in 1989 and remained active until 2005. Sir Tim Berners-Lee invented the World Wide Web in 1989 while working at CERN (Conseil Européen pour la Recherche Nucléaire, or European Organization for Nuclear Research).

The primary technologies that comprised web 1.0 were :

- HTML (HyperText Markup Language)
- HTTP (HyperText Transfer Protocol)
- URL (Uniform Resource Locator)

The primary purpose of web 1.0 was to find information. Significantly, web users could not interact freely because it was "read-only," so any discussion was done offline.

Furthermore, because there were no search engines available during this iteration, navigating the World Wide Web (WWW) was not nearly as simple as it is now. You needed to know the website address (URL) for any site you wanted to visit. As one tech writer recalls, to "browse" the Internet back in the day, "we had to go through FTP file directories screen by screen and hope that the file we wanted was in there somewhere."

However, by the mid-1990s, Netscape Navigator emerged as the first (or at least first successful) web browser, and pioneered several browser features we still use today :

- Displaying a web page as it loads
- Using Javascript to create forms and interactive content
- Using cookies to keep session information

Alas, Netscape was annihilated by Microsoft during what was known as the browser wars.

2.2) Web 2.0 (1999 – 2012) – Darcy DiNucci first coined the term "web 2.0" in 1999 in her article "Fragmented Future". However, it was later popularized by Tim O'Reilly and Dale Dougherty in late 2004.

This is the stage of the web that most of us are familiar with. By 1999, people were starting to be able to engage with each other on the Internet via social media platforms, content blogs, and other services. Eventually, smartphones were created and mobile computing was launched. People began interacting online in discussion forums and creating content that other Internet users could access

and like, comment on or share. This was/is the era of Instagram Influencers and Yelp reviewers and social proof. The read-only mode became outdated, and web 2.0 was now promoted as a platform for interaction.

Web 2.0, as defined by O'Reilly and others between 1999 and 2004, shifted the world away from static desktop web pages created for information usage via expensive servers and toward interactive encounters and user-created content. Companies such as Uber, Airbnb, Facebook, and other social media platforms arose during the web 2.0 reign.

Web 2.0 Core Layers of Innovation

The emergence of web 2.0 was driven mainly by three core layers of innovation :

- **Mobile –** The iPhone's introduction in 2007 spread mobile connectivity to the Internet, allowing users to be online at all times. On the other hand, web 2.0 serves another purpose other than simply receiving the information we add to the web: It also collects data from us all by itself to analyze and add to the web. It can track our whereabouts, purchasing habits, financial activities, and so forth.

- **Social –** Until the arrival of Friendster, MySpace and later Facebook in 2004, the Internet was primarily dark and anonymous. These social networks enticed users to engage in specific actions and content creation, including recommendations and referrals – from convincing us to share photos online with particular friend groups to entrusting our homes to unknown travelers on Airbnb and even getting into a stranger's car with Uber.
- **Cloud –** The cloud commoditized the creation and upkeep of Internet sites and applications. New cloud providers consolidated and refined mass-produced individual computer hardware within several massive data centers located all over the world.

  Companies were able to transition from purchasing and maintaining their own costly and specialized infrastructure upfront to renting warehouses, computation power and management tools on the go. Millions of entrepreneurs enjoyed low-cost resources that multiplied as their firms grew. It facilitated increased collaboration by introducing new ways of organizing and connecting with others. However, it also created new chances for online stalking, cyberbullying, doxing, distributing false information, identity theft, and other forms of online harassment.

2.3) Web 3.0 (2006 – ongoing) – In 2006, the term web 3.0 was coined by John Markoff **.** In many ways, web 3.0 is a return to Berners-Lee's original Semantic Web concept, in which no central authority approval is required, and no central controlling node exists.

Layers of Web 3.0 – Whereas web 2.0 was primarily driven by the introduction of mobile, social and cloud technologies, web 3.0 is powered by three new layers of technological innovation :

- **edge computing –** While currently commoditized personal computer technology was modified in data centers in web 2.0, the shift to web 3.0 is moving the data center out to the edge (i.e. edge computing) and sometimes straight into our hands. Data centers are complemented by an array of advanced computing resources distributed among phones, laptops, appliances, sensors and cars, which will produce and consume 160 times more data in 2025 than in 2010.

- **Decentralization –** Decentralized data networks enable various data generators to sell or trade their data without losing ownership, risking privacy or relying on intermediaries. As a result, decentralized data networks will have a long list of data providers in the growing 'data economy.' However, in web 3.0, data is decentralized which means that users will own their data. Decentralized data networks enable various data generators to sell or trade their data without losing ownership, risking privacy or relying on intermediaries. It enables you to log in securely over the Internet without getting tracked by using Internet Identity.

- **Artificial intelligence & machine learning –** Artificial intelligence and machine learning algorithms have advanced to make valuable, and sometimes life-saving, predictions and acts. When built on top of emerging decentralized data structures that provide access to a plethora of data that today's tech titans desire, the possible applications extend far beyond targeted advertising into areas such as :

- Precision materials
- Medication creation
- Climate modeling

- **Blockchain –** In simple terms, blockchain is one more layer of technology behind web 3.0. More specifically, it is the foundation of web3, as it redefines the data structures in the backend of the semantic web. Blockchain is a decentralized state machine that deploys intelligent contracts. These smart contracts define the logic of an application for web 3.0. So anyone who wishes to build a blockchain application needs to deploy their application code on the shared state machine.

3. HOW DOES WEB 3.0 WORK ?

The idea behind web 3.0 is to make searches on the Internet much faster, easier and more efficient to process even complex search sentences in no time.
In a web 2.0 application, a user has to interact with its frontend, which communicates to its backend, which further communicates with its database. The entire code is hosted on centralized servers, which are sent to users through an Internet browser.
Web 3.0 has neither centralized databases that store the application state nor a centralized web server where the backend logic resides. Instead, there is a blockchain to build apps on a decentralized state machine and maintained by anonymous nodes on the web.
The logic of your applications is defined in **smart contracts**, written by the developers, which are deployed onto the decentralized state machine :

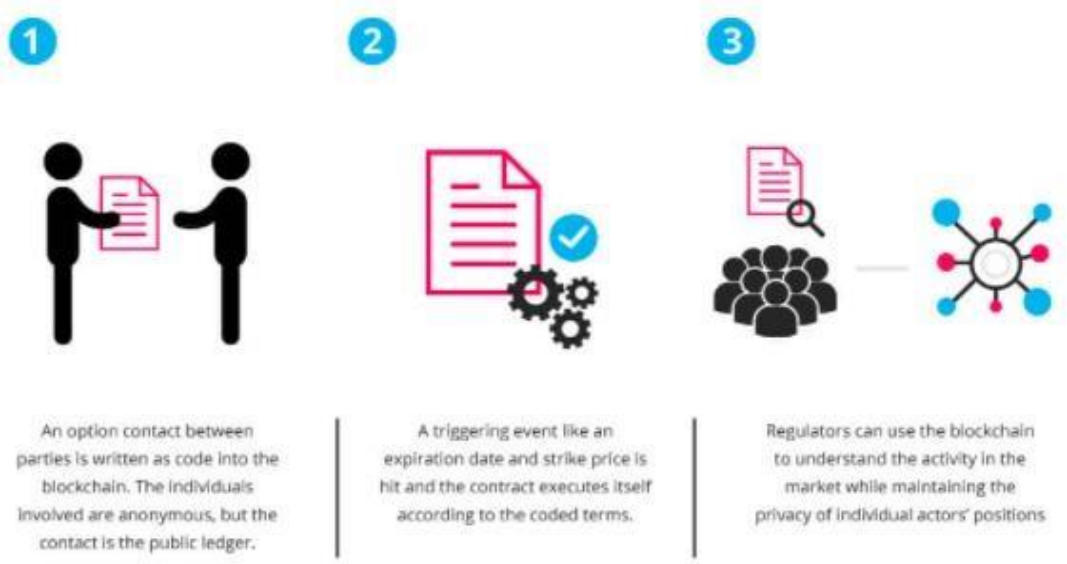

Figure 3.1 - Smart Contract

Anyone willing to build a blockchain application deploys their code on this shared state machine.

The front end remains almost the same as in web 2.0.

Here is a figure depicting the working of a **web 3.0 application** :

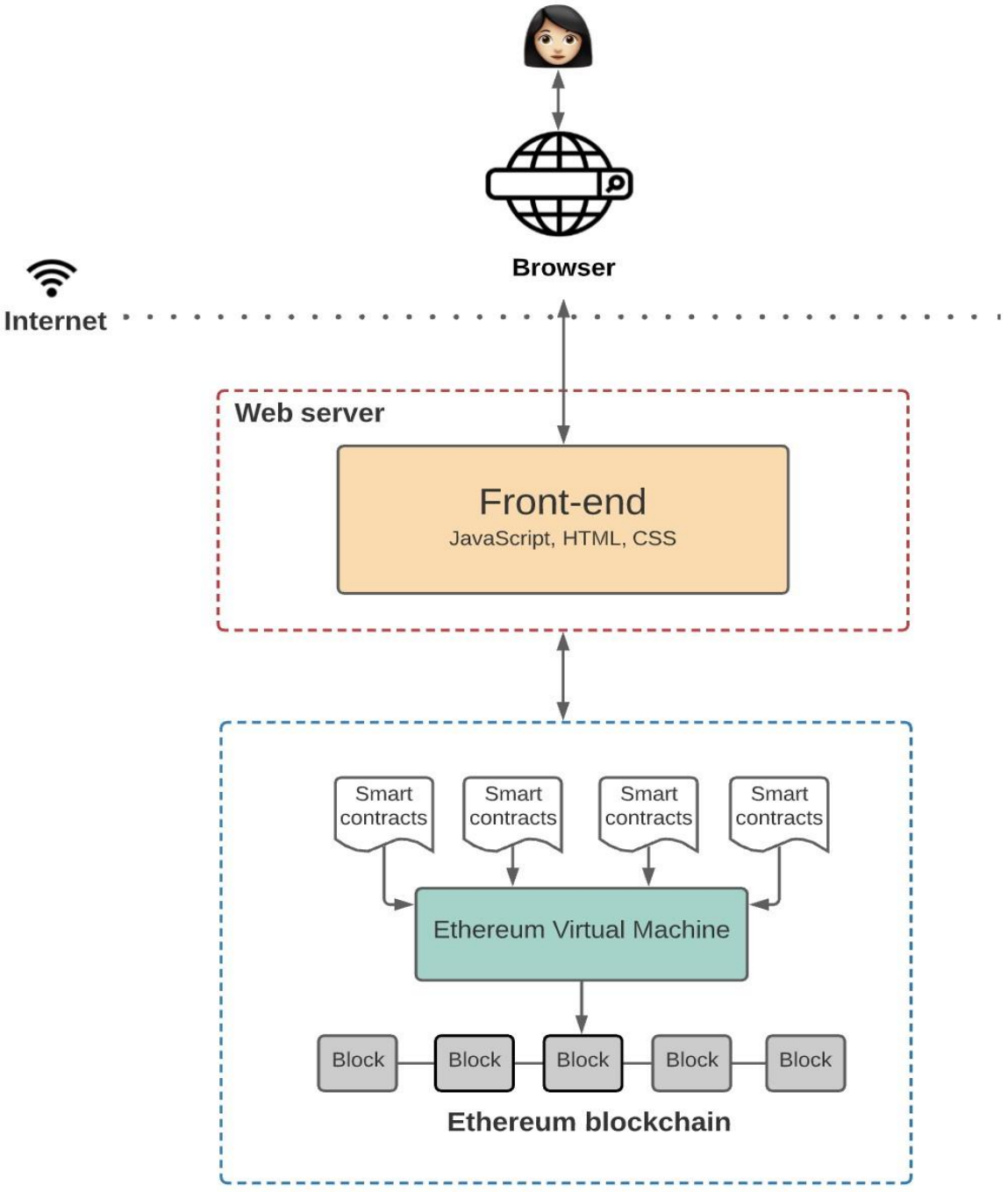

Figure 3.2 – Web 3 architecture

3.1) Web 3.0 Architecture – There are primarily four elements in the architecture that make up web 3.0 :

- **Ethereum Blockchain –** These are globally accessible state machines maintained by a peer-to-peer network of nodes. Anyone in the world can access the state machine and write to it. Essentially, it is not owned by any single entity but, rather, collectively by everyone in the network. Users can write to the Ethereum Blockchain, but they can never update existing data.
- **Smart Contracts –** These are programs run on the Ethereum Blockchain. These are written by the app developers in high-level languages, such as Solidity or Vyper, to define the logic behind the state changes. Because smart contract code is stored on the Ethereum blockchain, anyone can inspect the application logic of all smart contracts on the network.
- **EVM –** EVM stands for Ethereum Virtual Machine. The purpose of these machines is to execute the logic defined in the smart contracts. They process the state changes taking place on the state machine. The EVM doesn't understand high-level languages like Solidity and Vyper, which are used to write smart contracts. Instead, you have to compile the high-level language down into bytecode, which the EVM can then execute.
- **Front end –** Finally, we have the frontend. As we mentioned before, it defines the UI logic, but the frontend also communicates with the application logic defined in smart contracts. The communication between the frontend and smart contracts is a little more complicated than it appears in the diagram above.

How Does the Front-end Code Communicate with Smart Contracts on Ethereum?

We want our frontend to communicate with our smart contracts so that they can invoke functions, but recall that Ethereum is a decentralized network. Every node in the Ethereum network keeps a copy of all states on the Ethereum state machine, including the code and data associated with every smart contract.

When we want to interact with the data and code on a blockchain, we need to interact with one of these nodes. This is because any node can broadcast a request for a transaction to be executed on the EVM. A miner will then execute the transaction and propagate the resulting state change to the rest of the network.

There are two ways to broadcast a new transaction :

Set up your own node which runs the Ethereum blockchain software

Use nodes provided by third-party services like infura , alchemy etc .

If you use a third-party service, you don't have to deal with all the headaches of running a full node yourself.

Moving on, let's talk about providers. The nodes that you connect with when you need to interact with the blockchain (whether you set them up yourself or use existing ones from third-party services) are often called "providers."

Every Ethereum client (i.e. provider) implements a JSON-RPC specification. This ensures that there's a uniform set of methods when frontend applications want to interact with the blockchain. If you need a primer on JSON-RPC, it's a stateless, lightweight remote procedure call (RPC) protocol that defines several data structures and the rules for their processing. It's transportagnostic, so the concepts can be used within the same process, over sockets, over HTTP, or in many various message-passing environments. It uses JSON as a data format.

Once you connect to the blockchain through a provider, you can read the state stored on the blockchain. But if you want to write to the state, there's still one more thing you need to do before you can submit the transaction to the blockchain— "sign" the transaction using your private key.

However, when a user wants to publish a new post onto the chain, our DApp would ask the user to "sign" the transaction using their private key — only then would the DApp relay the transaction to the blockchain. Otherwise, the nodes wouldn't accept the transaction.This "signing" of transactions is where Metamask typically comes in.

Metamask is a tool that makes it easy for applications to handle key management and transaction signing. It's pretty simple: Metamask stores a user's private keys in the browser, and whenever the frontend needs the user to sign a transaction, it calls on Metamask.

Metamask also provides a connection to the blockchain (as a "provider") since it already has a connection to the nodes provided by Infura since it needs it to sign transactions. In this way, Metamask is both a provider and a signer.

3.2) Storage on the Blockchain – Of course, this architecture makes sense if you're building an app where all of the smart contracts and data live entirely on the Ethereum blockchain. But

anyone who has built apps on Ethereum knows that storing everything on the blockchain gets really expensive, really fast.

Keep in mind that, with Ethereum, the user pays every time they add new data to the blockchain.

That's because adding a state to the decentralized state machine increases the costs for nodes that are maintaining that state machine.

Asking users to pay extra for using your DApp every time their transaction requires adding a new state is not the best user experience. One way to combat this is to use a decentralized offchain storage solution, like IPFS or Swarm.

3.3) IPFS – IPFS stands for InterPlanetary File System. IPFS is a distributed system for storing and accessing files, websites, applications, and data. So, rather than storing data in a centralized database, the IPFS system distributes and stores the data in a peer-to-peer network. This makes it easy for you to retrieve it when you need to. IPFS also has an incentive layer known as "Filecoin." This layer incentivizes nodes around the world to store and retrieve this data.

Astute readers may also have noticed in the diagram below that the frontend code is not stored on the blockchain. We could host this code on AWS, as we normally would in Web 2.0, but that creates a centralization chokepoint for your DApp. That's why, if you want to build a truly decentralized app, you might choose to host your frontend on a decentralized storage solution, like IPFS or Swarm.

- **How IPFS works –** IPFS is a peer-to-peer (p2p) storage network. Content is accessible through peers located anywhere in the world, that might relay information, store it, or do both. IPFS knows how to find what you ask for using its content address rather than its location.

There are three fundamental principles to understanding IPFS :

- Unique identification via content addressing
- Content linking via directed acyclic graphs (DAGs)
- Content discovery via distributed hash tables (DHTs)

Content Addressing – IPFS uses *content addressing* to identify content by what's in it rather than by where it's located. Looking for an item by content is something you already do all the time. For example, when you look for a book in the library, you often ask for it by the title; that's content addressing because you're asking for *what* it is. If you were using location addressing to find that book, you'd ask for it by *where* it is: "I want the book that's on the second floor, first stack, third

shelf from the bottom, four books from the left." If someone moved that book, you'd be out of luck!

Every piece of content that uses the IPFS protocol has a content identifier, or CID, that is its *hash*. The hash is unique to the content that it came from, even though it may look short compared to the original content. If hashes are new to you, check out our guide to cryptographic hashing for an introduction.

Directed acyclic graph (DAGs) – IPFS and many other distributed systems take advantage of a data structure called directed acyclic graph or DAGs. Specifically, they use *Merkle DAGs*, where each node has a unique identifier that is a hash of the node's contents. IPFS uses a Merkle DAG that is optimized for representing directories and files, but you can structure a Merkle DAG in many different ways. For example, Git uses a Merkle DAG that has many versions of your repo inside of it.

To build a Merkle DAG representation of your content, IPFS often first splits it into *blocks*.

Splitting it into blocks means that different parts of the file can come from different sources and be authenticated quickly. (If you've ever used BitTorrent, you may have noticed that when you download a file, BitTorrent can fetch it from multiple peers at once; this is the same idea.)

Distributed hash tables (DHTs) – To find which peers are hosting the content you're after (*discovery*), IPFS uses a distributed hash table, or DHT. A hash table is a database of keys to values. A *distributed* hash table is one where the table is split across all the peers in a distributed network. To find content, you ask these peers. The libp2p project is the part of the IPFS ecosystem that provides the DHT and handles peers connecting and talking to each other.

- Difference between HTTP and IPFS :-

HTTP	IPFS
1. HTTP stands for HyperText Transfer Protocol.	1. IPFS stands for InterPlanetary File System.
2. It uses a centralised client server approach.	2. It uses a decentralised peer to peer approach.
3. Data cannot be accessed if the server is down or fails or any link gets broken.	3. Data is copied to multiple nodes, hence it can be accessed whenever needed.
4. The bandwidth provided is low, as multiple clients request from a single server at the same time.	4. Bandwidth is high, as data is requested from the closest peer who has the copy of that data.

Table no. 3.1 – difference between http & ipfs

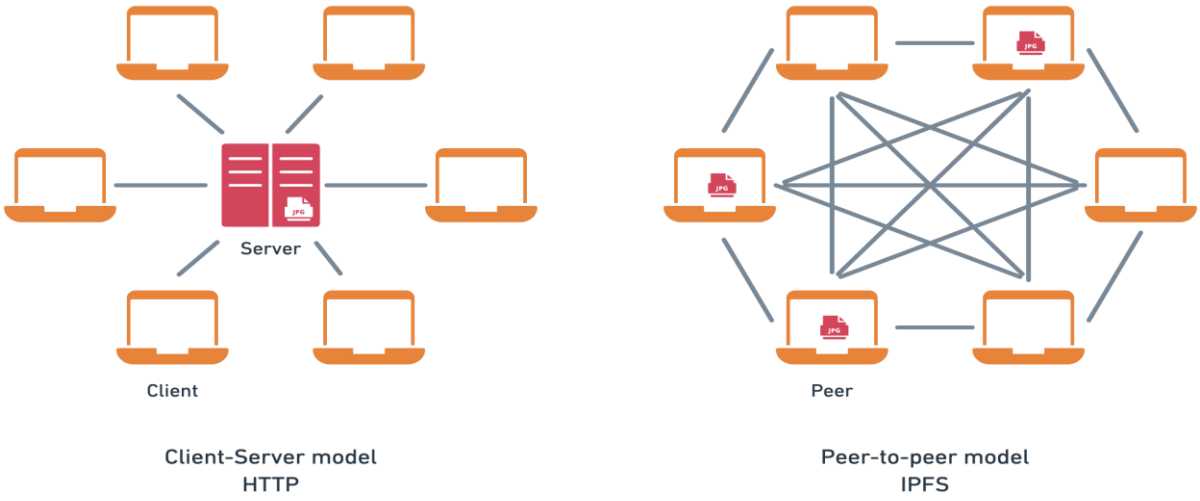

Figure 3.3 – HTTP vs IPFS

3.4) DAO – A decentralized autonomous organization (DAO) is an emerging form of legal structure that has no central governing body and whose members share a common goal to act in the best interest of the entity. Popularized through cryptocurrency enthusiasts and blockchain technology, DAOs are used to make decisions in a bottom-up management approach.

A decentralized autonomous organization is an entity structure in which tokenholders participate in the management and decision-making of an entity.
There is no central authority of a DAO. instead, power is distributed across tokenholders who collectively cast votes.
All votes and activity through the DAO are posted on a blockchain, making all actions of users publicly viewable.
One of the first DAOs named The DAO was an organization created by developers to automate decisions and facilitate cryptocurrency transactions.
A DAO must ensure security is prioritized, as exploits can leave a DAO drained of millions of dollars of its treasury savings.

- **Understanding DAOs –** One of the major features of digital currencies is that they are decentralized. This means they are not controlled by a single institution like a government or central bank, but instead are divided among a variety of computers, networks, and nodes. In many cases, virtual currencies make use of this decentralized status to attain levels of privacy and security that are typically unavailable to standard currencies and their transactions.

Inspired by the decentralization of cryptocurrencies, a group of developers came up with the idea for a decentralized autonomous organization, or DAO, in 2016. The concept of a DAO is to promote oversight and management of an entity similar to a corporation. However, the key to a DAO is the lack of central authority; the collective group of leaders and participants act as the governing body.

- **How DAOs Work –** DAOs rely heavily on smart contracts. These logically coded agreements dictate decision-making based on underlying activity on a blockchain. For example, based on the outcome of a decision, certain code may be implemented to increase the circulating supply, burn of a select amount of reserve tokens, or issue select rewards to existing tokenholders. The voting process for DAOs is posted on a blockchain. Users must often select between mutually-exclusive options. Voting power is often distributed across users based on the number of tokens they hold. For example, one user that owns 100 tokens of the DAO will have twice the weight of voting power over a user that owns 50 tokens. The theory behind this practice is users who are more monetarily invested in the DAO are incentivized to act in good faith. Imagine a user who owns 25% overall voting power. This user can participate in bad acts; however, by doing so, the user will jeopardize the value of their 25% holding.

  DAOs often have treasuries that house tokens that can be issued in exchange for fiat. Members of the DAO can vote on how to use those funds. for example, some DAOs with the intention of acquiring rare NFTs can vote on whether to relinquish treasury funds in exchange.

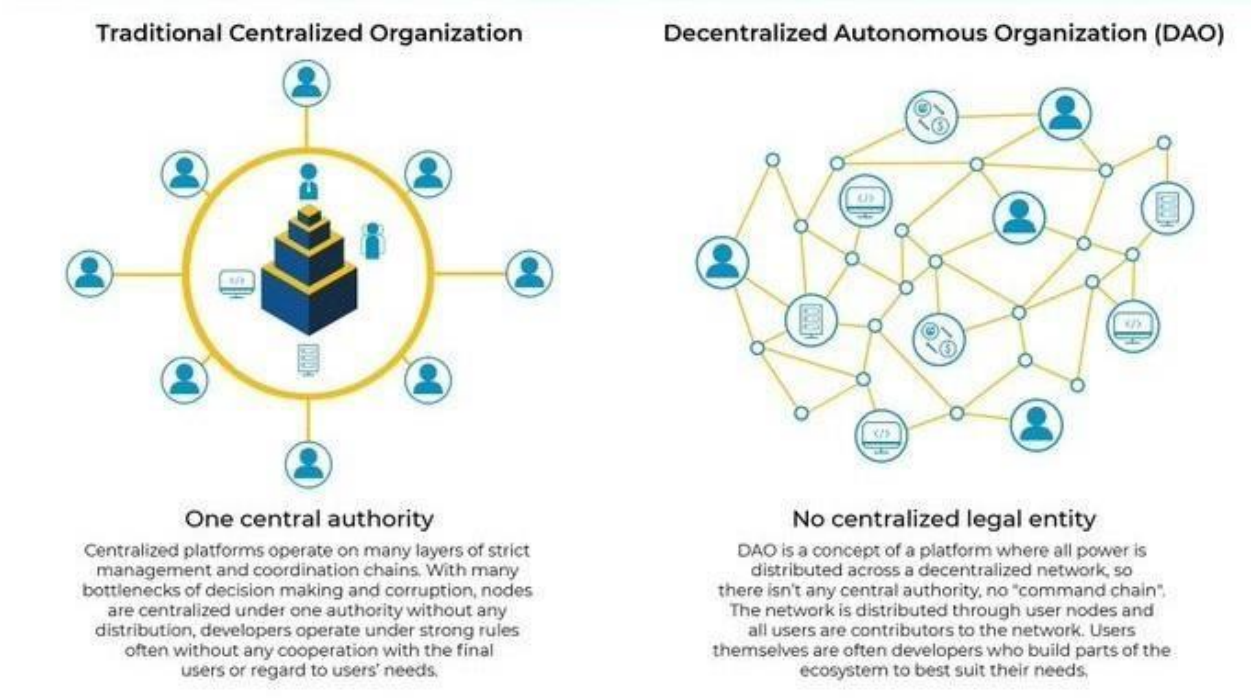

Figure 3.4 – TCO & DAO

4. KEY FEATURES OF WEB 3.0

Web 3.0 has many prominent differences in comparison to its predecessors, especially due to the fundamental structural changes. You can find many features such as semantic web, connectivity, artificial intelligence, 3D graphics, decentralization and ubiquity. However, the key features of web3 have singled it out as a formidable force in the future of the internet. Here are the five most notable traits of web3 which establish the significance of web3 itself.

4.1 Semantic web – Semantics is the study of the linkages between words. The semantic web would enable the computer to analyze data and decode the meaning and emotions that they are trying to convey. This will help in giving a better and more pleasing internet usage experience to the users. The semantic web, or "a web that understands humans," works on improving online technologies with additional functionalities. The extension of the World Wide Web that provides an efficient & easier way to share, find and combine data & information from distinct sources is called Semantic Web. Semantic web can allow users to create, share and link material through search and analysis. The search and analysis capabilities with web 3.0 would focus more on understanding the meaning of words and the context behind them. Semantic web is definitely a plausible improvement over the interpretation of data in terms of numbers or keywords. In the simplest terms, we can define Semantic Web as a relationship between things, described in a manner which makes people and machines able to understand. We may say, "Traditional World Wide Web = Web of Documents with Limited Interoperability", "Semantic Web = Web of Integrated, Linked meaningful Data".

4.2 Artificial intelligence – The list of answers to "What are the features of web3?" would also draw attention to artificial intelligence. One of the primary features of Web 3.0 will be its ability to decipher human emotions and thoughts. Artificial Intelligence or AI will be used extensively to filter data and content and to tailor the search results according to the user's preference. AI can help computers and devices understand information just like normal people, with faster and more productive results. The features of web 3.0 with AI would have considerable improvements over human-based corrupt practices such as manipulated data or biased product reviews. In addition, web3 would also leverage user feedback as a vital resource for encouraging the web to offer reliable data. The AI functionalities can enable the web to differentiate between fake and genuine information.

4.3 3D graphics – The next important trait among the key web 3.0 features would refer to spatial computing and 3D graphics. Web 3.0 will bring in the new graphics technology, making the three-dimensional virtual world a reality. The use of 3D graphics will make the internet user experience more immersive and will also be helpful in transforming a variety of sectors like health, e-commerce, real estate, etc. Many experts have hailed the web3 as the spatial web as it has the potential for reducing the barriers between physical and virtual worlds. Web3 could help in reimagining graphics technologies alongside ensuring easier interactions with three-dimensional virtual worlds or the metaverse. The three-dimensional design is a common highlight in web3 applications, services and websites. The 3D graphics help web3 in creating immersive worlds not just for gaming but also for other crucial applications in different sectors like healthcare, ecommerce and real estate.

4.4 Connectivity and ubiquity – The outline of important features in web 3.0 would also draw the limelight towards connectivity and ubiquity. Ubiquity means the power to be present everywhere at the same time, or in simpler words, ubiquity means omnipresence. Now Web 2.0 or the internet as we know it today is already quite omnipresent. So Web 3.0 will simply take it a step further by making the internet more widely accessible using the Internet of Things (IoT). Web 3.0 would ensure seamless connectivity among users and devices involved in the ecosystem while staying available all the time. The notion of "web3 never sleeps" is quite true. The features of web3 help in capitalizing on semantic metadata, which can help in ensuring new benchmarks for connectivity. At the same time, you must also notice the association of web3 with IoT sensors on a massive scale. Therefore, web3 can provide the assurance of availability of the internet to anyone, irrespective of the location and time. You can also access the internet without any restrictions regarding the type of device.

4.5 Blockchain and decentralization – Blockchain technologies are another notable entry among top web3 features with the ability of blockchain to introduce decentralization. As a result, web3 applications and systems could provide the assurance of cryptographic security for user data. Most important of all, the assurance of blockchain and

decentralization could help in encouraging communication between software and browser plugins. Web3 would also leverage blockchain technologies to ensure transparency in the ecosystem, thereby providing better scope for audits and security. Blockchain plays a crucial role in Web by providing a decentralized, secure and transparent platform for conducting transactions and exchanging data and information. It eliminates intermediaries, enabling peer-to-peer transactions, reduces the risk of data breaches, and enhances privacy and security. Web applications built on blockchain technology are designed to be more user-centric, decentralized, and democratic, fostering greater trust, collaboration, and innovation. Web applications using blockchain technology aim to empower individuals by giving them greater control over their data and digital identity. It enables a new decentralized digital economy where individuals can own, manage and monetize their data without relying on centralized intermediaries. Web also promises to bring about new business models, new ways of exchanging value, and new ways of collaborating and organizing communities. The decentralized nature of blockchain technology makes it ideal for supporting Web, as it enables a more equitable, open and transparent web for everyone.

5. WEB 3.0 MAIN APPLICATIONS

While some of this technology is still under development, it is also important to know that Web 3.0 applications have already materialised.

- **Machine learning –** In recent years, Artificial Intelligence has gained a great deal of prominence. Both are linked to the Web 3.0 concept, a significant example being assistants such as Siri. Thanks to automatic natural language processing, the intelligent assistant can analyse, speak and interact with users. Machine learning is also used alongside other technological tools such as the Internet of Things (IoT) and Big Data to process large amounts of data. *Blockchain:* Web 3.0 has helped develop the most secure mathematical structure for users, the Blockchain. This technology is designed to store data in such a way that it is almost impossible to falsify it. It is a public electronic ledger that can be freely shared among diverse users and creates an immutable record of their transactions. The Blockchain provides an ultra-secure network, as data is transmitted in encrypted form. Blockchains are efficient, fast and drive the development of smart contracts.
- **Non Fungible Tokens (NFTs) –** The NTFs are a form of cryptography, and each NFT is unique and non-transferable. In addition, they are linked to digital or physical assets, and therefore have ownership and property. Their growth is currently very important in areas such as art or fashion, however, they are not currently regulated by any authority or legal institution.
- **Metaverse –** The metaverse is another application that will interface with this semantic web, as it is an overview of what the Web 3.0 interface will look like. Primarily, it will rely heavily on Virtual Reality, VR, and Augmented Reality, AR, to create an immersive experience, blending digital elements with the natural world.
- **Cryptocurrencies –** The supply of cryptocurrencies is another well-known application and are known as Web 3.0 tokens. Its main objective is to give users greater control over their digital content with the help of a centralised infrastructure. Currently, digital currencies are not controlled by any government, except in El Salvador, central authority or banking institution. Cryptocurrencies use blockchain technology to record the number of coins in existence and who holds how many.

- **DeFi –** DeFi stands for decentralized finance. It 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.
- **DApp –** DApp stands for decentralized applications. 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.
- **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.
- **DAOs –** DAOs are set to potentially become the organizing entities for Web 3.0 services, providing some structure and governance in a decentralized approach.

6. EXAMPLES OF WEB 3.0 APPLICATIONS

Here are some popular examples of web 3.0 applications that explain the scope of its adoption :

- **Quintura –** Quintura is a new search engine based on relational search. Through a cloud of tags and collected terms, it facilitates navigation to other concepts of interest.
- **Apple's Siri –** Siri is a perfect example of voice recognition software as a key component of web 3.0. Using this technology, Siri and other personal assistants communicate, share information (through linked blocks), and provide users with more helpful search results for every meaningful query, including how to, why, and what. Previously, Siri could accomplish only simple tasks, like reminders and directions to the local grocery store, by using pre-programmed algorithms.
- **Wolfram Alpha –** Wolfram Alpha is a computational intelligence platform that now uses web3. The platform can compute answers of users from different fields like mathematics, nutrition and science. It quickly connects with other apps to gather information from their databases and streamlines the information for end-users. As a result, it is now faster and provides more accurate results than it used to be with web 2.0. Siri is a frequent user of Wolfram Alpha.
- **Sola –** Another example of a web 3.0 social network website is Sola. It is a decentralized social platform powered by distributed nodes, IPFS, and the Ethereum blockchain.
- **e-Chat –** e-Chat is a web 3.0 app that is powered by a decentralized blockchain. Essentially, it is a secure messenger, but it is also known as the fastest-growing social network. Users get the benefit of sharing any data without fearing its theft. Therefore, it is widely used to send cryptocurrency. App Store and Play Market have an e-Chat app for their users.
- **Storj –** Decentralized storage is one of the primary features of web3, and Storj utilizes this feature wisely. It is one of the oldest and leading decentralized storage solutions, powered by blockchain technology that allows users to rent their free disk space. Storj has a native token that is used as a payment method on the network. Users can earn based on the shared disk space paid for by the renters on the platform. The transaction is made on this platform through blockchain technology.

- **LBRY –** LBRY is a web 3.0 video and music website with a library of different forms of content, such as books, music and videos. The decentralized digital library uses blockchain technology to publish material and monetize it with its integrated payment system.
- **Ethlance –** Ethlance is a web 3.0 remote job platform. The decentralized app works on top of the Ethereum blockchain, where anyone can hire and start working in exchange for Ether cryptocurrency, which was never possible with older technology.

7. CHARACTERISTICS OF WEB 3.0

1. **Decentralized:** relying on blockchain technology and peer-to-peer networks instead of centralized servers.
2. **Personalized:** using artificial intelligence and machine learning to deliver individualized experiences.
3. **Interoperable:** allowing seamless exchange of data and value across different platforms and applications.
4. **Secure:** utilizing cryptographic algorithms to protect user data and privacy.
5. **Semantic:** using metadata and ontologies to enhance search, discovery, and analysis of information.
6. **User-centric:** giving users more control over their data, identity, and online reputation.
7. **Trustworthy:** establishing a secure and transparent ecosystem that builds trust among all participants.
8. **Open and accessible:** promoting open standards and protocols to ensure open access and innovation.
9. **Transparent:** enabling greater transparency and accountability in transactions and interactions.
10. **Efficient:** optimizing resources and reducing waste through the use of advanced technologies.
11. **Immutable:** providing a tamper-proof and permanent record of transactions and interactions.
12. **Programmable:** enabling developers to create new applications and services that leverage the decentralized infrastructure.
13. **Collaborative:** fostering collaboration and sharing of resources and knowledge across communities.

14. **Inclusive:** promoting equal access and participation for all, regardless of geography or social status.
15. **Sustainable:** utilizing environmentally sustainable technologies and practices to minimize the impact on the planet.
16. **Dynamic:** allowing for real-time updates and changes to the underlying infrastructure and applications.
17. **Scalable:** capable of handling large amounts of data and users without sacrificing performance.
18. **Flexible:** adaptable to changing user needs and evolving technology trends.
19. **User-friendly:** designed with a focus on user experience, making it easy and accessible for non-technical users.
20. **Future-proof:** incorporating emerging technologies and standards to ensure long-term viability and relevance.

8. ADVANTAGES AND DISADVANTAGES

- **Advantages of Web 3 –** Web 3.0 will make the web more intelligent, secure and transparent, resulting in more efficient browsing and effective machine-human interaction.

Here are the top advantages of the web 3.0 :

1. **Data privacy and control –** The end-users will get the most significant advantage of data encryption to protect their information from disclosure.
2. **Seamless Services –** Decentralized data storage will ensure that the data is accessible to users in any circumstance. Users will get multiple backups, which benefits them even in the event of server failures.
3. **Transparency –** Regardless of which blockchain platform end-users use, they will track their data and inspect the code behind the platform. Nonprofits develop the majority of blockchain platforms, which means they provide an open-source blockchain platform that allows open design and development processes. This will help eliminate the dependency of users on the organization that develops the platform.
4. **Open accessibility to data –** The data will be accessible from anywhere and from any device. The idea is to increase data collection and its accessibility to users worldwide by allowing smartphones and other connected devices to access data on the computer if synced.
5. **Restrictionless platform –** Since the blockchain network is accessible to all, users can create their own addresses or interact with the network. Users cannot be restricted on this network based on their gender, income, geographical location or sociological factors. This feature will make it easier for users to transfer their assets or wealth anywhere across the world in no time.
6. **Single profile creation –** With web 3.0, users do not need to create individual personal profiles for different platforms. A single profile will work on any platform,

and the user will have complete ownership of any given information. Without users' permission, no corporation can access their data or verify its accuracy. However, users have the choice to share their profiles and sell their data to advertisers or brands.

7. **Enhanced data processing –** Web 3.0 is beneficial for problem-solving and intensive knowledge creation tasks. It utilizes artificial intelligence to filter out valuable information from a huge quantity of data. Users will also benefit from its ability to conduct client demand forecasting and personalized customer service, necessary for flourishing businesses.

- **Disadvantages of Web 3.0 –** There are also several challenges associated with the implementation of web 3.0. Personal data management and reputation management issues will become more critical than ever.

  Here are the top challenges associated with the implementation and usage of web3 :

1. **Requires advanced devices –** Less advanced computers won't have the ability to provide the benefits of web 3.0. The devices' features and characteristics will need to be extended to make the technology reachable to more people globally. Considering the present scenario, only a limited number of people will be able to access web 3.0.
2. **Web 1.0 websites will become obsolete –** If web 3.0 becomes full-fledged on the Internet, any websites based on web 1.0 technology will become obsolete. The old technology is incapable of updating its features to match the new ones. This means those sites will be substantially more outdated and consequently lose a competitive edge over new sites.
3. **Not ready for widespread adoption –** Web3 technology is more intelligent, efficient and accessible. Yet, the technology is not entirely ready for widespread adoption. Much work is needed on technology advancement, privacy laws, and data use to satisfy the user's needs.

4. **Demand for reputation management will increase –** With the easy availability of a user's information and less anonymity through web 3.0, reputation

management will become a matter of concern more than ever. In other words, brands and companies will need to maintain their name, reputation and image online. Companies will need to help customers acquire critical market intelligence, valuable business insights, compelling content and cutting edge internet marketing to stay ahead of competitors. Hence, reputation management will turn out to be more critical than ever.

9. WHY WEB 3.0 IS IMPORTANT FOR THE FUTURE ?

Web 3.0 is a system for users, designed by users in the form of creator-driven platforms. Here are the top reasons why web3 will become important in the coming years :

- **Less reliance on centralized repositories –** Web 3.0 will attempt to make the Internet a diverse source so that hackers, leaks and reliance on centralized repositories are avoided. Using verifiable data scarcity and tokenized digital assets, there will be the possibility of users owning their own data and digital footprints. No platform will be held accountable for data usage.
- **More personalized interactions –** Web 3.0 will become increasingly important in 2023, as most users continue to prioritize customized and individualized browsing encounters on the web.
- **Better search assistance powered by AI –** There will be an increasing demand for humanized digital search assistants that are far more intelligent, pervasive and powered by semantics, blockchain and AI.
- **Reduced dependency on intermediaries –** It will help disintermediate businesses, remove rent-seeking intermediaries, and give this value directly to the customers and providers in a network. Network users will work together to address previously hard-to-control problems by mutual ownership and governance of these new decentralized intelligence structures.
- **Rise in peer-to-peer connectivity –** Through new Internet inventions, the connection between members and organizations will remain innately robust to keep in line with more adaptive peer-peer interaction and governance. With peer-topeer connectivity, humans, businesses and machines will be able to share more data while maintaining greater privacy and security.
- **Enhanced trust –** With the knowledge of the next Internet generation, we can reduce dependency on individual platforms to future-proof entrepreneurial and investment activity.

10. CONCLUSION

We are heading towards an Internet where people will have complete control over their data and privacy, and permit companies to use their data (or not). All this will be powered by blockchain.

Therefore, web 3.0 will accelerate the honest and transparent use of user data, from personalized search results to cross-platform development tools and the use of 3D graphics. The web will become more immersive and interactive.

The new Internet will be here soon! Let’s embrace web 3.0 with open arms.

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