IJIBC 24-2-18

Web3.0 Video Streaming Platform from the Perspective of Technology, Tokenization & Decentralized Autonomous Organization

Song, Minzheong

Associate professor, Department of Media Communication & Advertising, Hansei University, Korea
mzsong@hansei.ac.kr

Abstract

 For examining Web3.0 video streaming (VS) platforms in terms of the decentralized technology, tokenization and decentralized autonomous organization (DAO), we look at four platforms like DLive, DTube, Livepeer, and Theta Network (Theta). As a result, DLive which firstly partnered with Medianova for CDN and with Theta for peer to peer (P2P) network and migrates to Tron blockchain (BC), receives no commission from what creators earn, gives rewards to viewers by measuring engagement, and incentivizes participation by allowing 20% of donation & fees for funding development, 5% to BitTorrent Token (BTT) stakeholders (among these 5%, 20% to partners, 80% to other BTT stakeholders). DTube on its own lower-layer BC, Avalon, offers InterPlanetary File System (IPFS), gives 90% of the created value to creators or curators, and try to empower the community. Livepeer on Ethereum BC offers decentralized CDN, P2P, gives Livepeer Token (LPT) as incentive for network participants, and delegators can stake their LPT to orchestrators doing good. Theta on its native BC pulls streams from peering caching nodes, creates P2P network, gives Theta utility token, TFUEL for caching or relay nodes contributors, and allows Theta governance token, THETA as staking token.

 We contribute to the categorization of Web3.0 VS platforms: DLive and DTube reduce the risk of platform censorship, promote the diverse content, and allow the community to lead to more user-friendly environments. On the other hand, Livepeer and Theta provide new methods to stream content, but they have some differences. Whereas Livepeer focuses on the transcoding layer, Theta concentrates both on the video application layer and content delivery layer. It means, Theta tries to deliver value to all participants by enhancing network quality, reducing CDN cost, and rewarding users in utility tokens for the storage and bandwidth they provide.

 Keywords: Web3.0, Video Streaming (VS) Platform, Technology, Tokenization, decentralized autonomous organization (DAO)

1. Introduction

 The Web3.0 streaming platform is one of the most popular Web3.0 business innovations in the digital world. Through Web3.0 music streaming platform, artists can connect directly with fans, receive payments without intermediaries, share royalties among themselves, and listeners can access a wide range of music

without intermediaries. Web3.0 video streaming (VS) platform also means that content creators can upload videos, set prices, share profits with viewers, and make more money from content without intermediaries. Viewers can access a wider range of content without intermediaries, meaning that they can watch their favorite videos without any restrictions. Over the top (OTT) platform which has broken down pay TV around the world, is also evolving into the Web3.0 platform as one of the VS platforms. The Web3.0 podcast streaming and Web3.0 live streaming platforms are also one of the video streaming platforms [1].

The decentralization meaning "without intermediaries" is a design task that spans three different interrelated elements: Technological, economic, and legal. Technological decentralization means that products and services can be deployed and operated without the need for a centralized intermediary to operate them, which is the basis for two other types of decentralization. The Web3.0's new technologies, programmable blockchains (BCs), composable smart contracts (SCs) have enabled decentralized systems to achieve unprecedented levels of orchestration and operational capabilities. Economic decentralization relates to the economies of Web3.0 systems. The programmable BCs like Ethereum and digital assets like cryptocurrency of Ethereum, ETH unlocked the ability of decentralized systems to have their own decentralized economies. On the other hand, there is no codified criterion of legal decentralization. In the U.S., the analysis of U.S. securities law, case law and Securities and Exchange Commission (SEC) guidelines can help establish practical criteria. The interaction between technology, economic and legal can help lead the system to legal decentralization by prioritizing distributed ownership among stakeholders, value building from distributed sources, and value distribution to decentralized stakeholders [2]. Therefore, this study does not consider the regulatory situation and is only interested in how the Web3.0 VS platform would be built in the business world.

2. Literature Review and Theoretical Background

2.1 Previous Literature Review

As shown in Table 1, with the keyword of 'Web3.0 VS' in Google Search, six academic papers have been during the period from 2022 to 2023. The first proposes a system providing video streaming using BC and token. User pays token by SC written on BC through application. IP camera streams the video to the user in real-time. To investigate the possibility of a BC camera streaming, a SC is uploaded on Ethereum BC and ERC20 tokens for the transaction are implemented. To overcome the slow trading speed and the disability of proper refunding, the off-chain transaction, one of the BC scaling techniques, is implemented [3].

The second deals with decentralized peer-to-peer (P2P) networks for video streaming (VS) with various monetization options. Firstly, the performance of decentralized VS platforms like NiftySubs is examined: With a 'pay-as-you-watch' subscription-based service, users can pay for the duration they watch the content on the Ethereum BC. Secondly, the use of protocols like Unlock for providing access to locked content on the BC is discussed: Superfluid Protocol money streams enable actual time finance and content storage on the content delivery network (CDN) like InterPlanetary File System (IPFS) [4].

The third shows how Web3.0 is an important driver of high-quality economic development. By investigating the most relevant work of Web3.0 in artificial intelligence (AI), education, data management, finance, and Web3.0-based technologies, this paper summarizes technologies that can be applied to the four core components of the digital economy including digital industrialization, industry digitization, digital governance, and data valorization [5].

The fourth reviews the extant research on Web3.0 published between 2003 and 2022 by using a topic

modeling procedure latent Dirichlet allocation to uncover the research themes and the key phrases associated with each theme. Seven research themes are uncovered. This study highlights the interaction among research themes contributing to the understanding of solutions, applications, and use cases like metaverse and non-fungible tokens (NFTs). Building upon the pioneering research in the field of BC, decentralized networks, SCs and algorithms, this study proposes an exploratory agenda for future research from an ecosystem approach [6].

The fifth shows the timeliness of Web3.0. The cycles of technological trends and investment bubbles accelerate in such a way as to escape any attempt at observing them in motion before they crash, and then everybody moves on to the next thing. Web3.0 was not an anomaly in the technology sector, but it articulates patterns that existed in Web2.0. Therefore, this study focuses on understanding how the movement around Web3.0 formed through an interplay between normative concepts and contestations related to ideas of 'decentralization' and economic interests and operations related to the dynamics of fictitious capital. It shows how any potentially "expansive" forms of Web3.0 development struggle for success, recognition, and attention due to the wild excesses of hype and investment devoted to "extractive" forms of Web3.0 [7].

The last examines critically the experiences and imaginaries of creators working on two BC-based VS platforms, Theta.tv and Odysee. Based on interviews with early adopters of these, it investigates how creators experience these in terms of their processes of governance, community creation, and career development. Creators' career-building functions have not yet led to the distributed 'ownership' of these platforms [8].

Table 1. Summary of previous research results

Year	Authors	Key points
Feb. 2022	M. H. Jeong and S. K. Kim	- Off-chain transaction, one of the BC scaling techniques, is implemented for overcoming the slow trading speed and the disability of proper refunding.
June 2022	E. J. Lopes, S. Kataria, S. Keshav, S. T. Ikram, M. R. Ghalib, A. Shankar and M. Krichen	- Two kinds of solutions for video transcoding are introduced: 1) With a 'pay-as-you-watch' subscription-based service like NiftySubs, the users can pay for the duration they watch the content on Ethereum BC. 2) Superfluid Protocol money streams enable actual time finance and storage of content on the CDN such as IPFS.
Oct. 2022	C. Chen, L. Zhang, Y. Li, T. Liao, S. Zhao, Z. Zheng, H. Huang, and J. Wu	- Technologies applied to the four core components of the digital economy including digital industrialization, industry digitization, digital governance, and data valorization are summarized.
May 2023	C. Guan, D. Ding, J. Guo and Y. Teng	- The interaction among research themes contributing to the understanding of solutions, applications, and use cases like metaverse & NFTs is emphasized and an agenda for future research from an ecosystem approach in the field of BC, SCs and algorithms is proposed.
June 2023	J. Sadowski and K. Beegle	- It is shown how "expansive" forms of Web3.0 struggle for recognition due to the wild investment devoted to "extractive" forms of Web3.0.
Nov. 2023	M.Järvekülg, I. Ibrus, and U. Rohn	- Creators' career-building functions lead not yet to the distributed 'ownership' of both video sharing platforms, Theta.tv and Odysee.

2.2 Theoretical Background

While the video industry adopted Web2.0 VS platforms, technology and economics professionals can contribute more to grow the web technology and business models and support the Web3.0 business development of VS platforms. As shown in Figure 1, a holistic perspective of the decentralization comes from technical and economic views and there are new components of decentralized Web3.0 systems: BC network and composable SC protocol, digital assets, and decentralized governance [2].
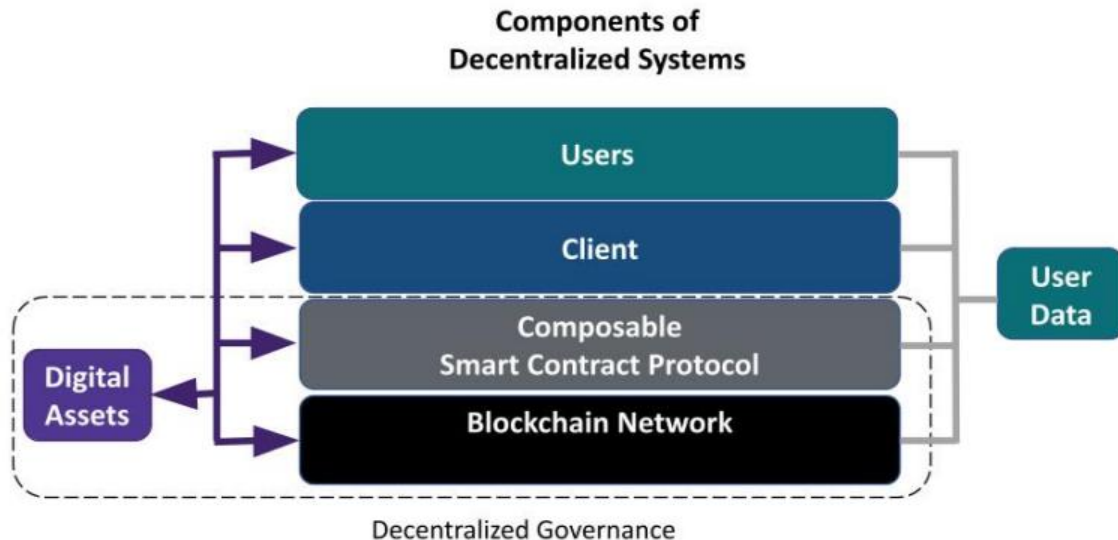
Figure 1. New components of Web3.0 system

Public BCs and SC protocols support decentralization by enabling transparency, being open source, enabling data portability and being composable. The decentralized economies of Web3.0 systems are driven by a combination of their intrinsic incentives triggering a third-party's desire to participate in such system based on its characteristics like user base, network effects, technology, etc. and extrinsic incentives like digital asset distributions, revenue sharing, etc. Digital assets are the most critical tool that Web3.0 systems must facilitate the formation of their decentralized economies. Decentralized governance makes Web3.0 systems more secure by distributing technical control over the systems to decentralized groups, thereby limiting the ability of any single party to take control of the governance. It can support legal decentralization by reducing stakeholder reliance on the managerial efforts of any individual, thereby reducing the high risk of information asymmetries. SC utilizes DAOs utilizing token-based voting. The DAO models are borrowed from Decentralized finance (DeFi). DAOs empower sub-DAOs with tailored authority regarding action categories like legal, finance, development, etc. DAOs incentivize participation including the compensation of delegates. For protecting against malicious attacks, DAOs use progressive decentralization, where greater control is handed from the developer company to the community as the safety of the protocol increases [2].

In terms of the technical components for BC- and SC-based video streaming businesses, there are three basic technical roles: Decentralized transcoding solutions, CDN, and network of relay nodes. To transcode a video along with encryption and packaging, VS platforms can use decentralized transcoding solutions where various entities act as "transcoding" nodes to perform these tasks in return for payment for each task using digital currencies like Bitcoin, Ether, etc. There are centralized CDNs like Akamai and decentralized CDNs

like VideoCoin, or a combination of both. They also choose to use a current distributed or decentralized network of relay nodes helping reduce network latency. Like transcoding nodes, the relay nodes get paid for the tasks performed using digital currencies in Web3.0 [9].

3. Research Design

BC technology is expected to reinvent VS with SCs, decentralized content distribution models, accessibility, targeted marketing, micropayments, decentralized CDN, effective, monetization and so on. As shown in the left side of Figure 2, as of the first half of 2023, there are three sources to introduce Web3.0 VS platforms with ranking [10-12] and one source to introduce decentralized YouTube alternatives [13]. Of these four sources, four VS platforms are chosen three times: DLive, DTube, Livepeer, and Theta.
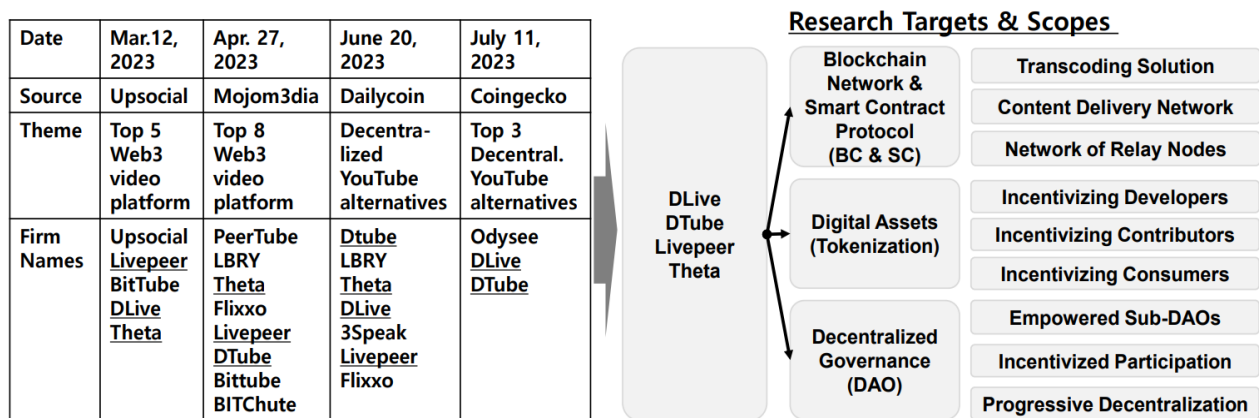
Date	Mar.12, 2023	Apr. 27, 2023	June 20, 2023	July 11, 2023
Source	Upsocial	Mojom3dia	Dailycoin	Coingecko
Theme	Top 5 Web3 video platform	Top 8 Web3 video platform	Decentralized YouTube alternatives	Top 3 Decentral. YouTube alternatives
Firm Names	Upsocial Livepeer BitTube DLive Theta	PeerTube LBRY Theta Flixxo Livepeer DTube Bittube BITChute	Dtube LBRY Theta DLive 3Speak Livepeer Flixxo	Odysee DLive DTube

Research Targets & Scopes

Blockchain Network & Smart Contract Protocol (BC & SC) — Transcoding Solution, Content Delivery Network, Network of Relay Nodes

Digital Assets (Tokenization) — Incentivizing Developers, Incentivizing Contributors, Incentivizing Consumers

Decentralized Governance (DAO) — Empowered Sub-DAOs, Incentivized Participation, Progressive Decentralization

DLive DTube Livepeer Theta

Figure 2. Research design: target & scope

Along Figure 2, the research questions are as follows:
1) What are the key business characteristics of DLive in terms of BC & SC, tokenization, and DAO?
2) What are the key business characteristics of DTube in terms of BC & SC, tokenization, and DAO?
3) What are the key business characteristics of Livepeer in terms of BC & SC, tokenization, and DAO?
4) What are the key business characteristics of Theta in terms of BC & SC, tokenization, and DAO?

Based on the above research design, this study searches the four candidates of Web3.0 video streaming platforms, DLive, DTube, Livepeer, and Theta by digging technical, financial, market data, company documents and press releases from their start year up to the end of 2023.

4. Results

4.1 Key business characteristics of DLive

DLive was firstly launched on Steem BC in December 2017 and moved to Lino BC in September 2018. Then, DLive formed a strategic partnership with BitTorrent serving as the file storage and finally migrated to Tron BC in December 2019. It is on process to merge DLive accounts with BitTorrent by utilizing BitTorrent File System (BTFS) [14].

In terms of the BC & SC, the contributions of stakeholders like infrastructure providers like storage, CDN, and transcoding solutions in Lino were rewarded through 'Infrastructure Rewards' and 'LINO Stake Voting

Rewards' [15]. After facing some challenges, DLive worked with a CDN company, Medianova and partnered with Theta for P2P in 2019 [16,   17]. After joining BitTorrent and Tron BC, BitTorrent serves as the file storage for DLive and the migration to the Tron BC has been completed in August 2023 [18].

In terms of the tokenization, DLive in Lino received no commission, utilized a reputation system to ensure that high-quality content is prioritized, and returned the streaming value to creators or viewers. DLive offered Lino token, LINO for transactions, donations, and paid subscriptions: Creators get 90.1% of donations and subscription revenues and 9.9% was deposited into a pool of "Locked LINO" to reward the engaged users [19]. After migrating to the Tron BC, DLive takes 0% on what creators earn. Based on the community growth, creators get more exposure to viewers. DLive creates a reward system where viewers are rewarded by engaging with the creators. By offering the viewer rewards, 'Treasure Chest' on the watch page, DLive's algorithm is constantly measuring the engagement from every viewer on the channel. As of July 2020, the majority of the DLive viewers come from the United States, Turkey, and Brazil and there have been over 7 million monthly active users (MAUs) and 150 active content creators creating live content on DLive [20].

In terms of the DAO, DLive on the Tron BC moves to BitTorrent token, BTT by launching 'BTT Staking' on the Tron BC for its users in April 2020. For strengthening the partnership, the 'BTT Staking' rewards are available only on DLive. Every BTT stakeholder can earn from the growth of the platform, and it is a unique feature of DLive. These rewards increased to 25% further encouraging and rewarding those who join DLive. This partnership can make the ecosystem more sustainable for a longer period and prevent fraud and abuse [18]. Every BTT stakeholder can earn from the platform growth. They are incentivized because the reward comes from 25% of all donations and subscription fees on DLive. It is like a company sharing all their revenue and paying out to shareholders as dividends [20]. To better support the future development of the platform, it was announced to change the distribution of 'BTT Staking' rewards being effective in January 2021. 20% of total donation and subscription fees go to DLive to fund future platform developments and 5% of total donation and subscription fees are distributed to all BTT stakeholders. Among the 5%, 20% goes to DLive Partners, 80% goes to all other BTT stakeholders [21]. However, on September 15th, 2022, BTT Staking system was deactivated on DLive after distributing over 4 billion BTT tokens (total average value of 1.4 million dollars) to BTT Stake holders. New features rewarding the entire community are expected to be launched [22].

4.2 Key business characteristics of DTube

DTube launched in August 2017, allows users to upload videos and make DTube cryptocurrency via 'likes' on their post. DTube does not rely on hidden algorithms for content promotion, but all service-related data is publicly available to ensure a transparent user experience (UX). Only the users can sensor it through the community power of their up-votes and down-votes. To deliver the best UX, it runs without any advertising. Instead, users can advertise product or service directly inside their own videos at their own risk of losing their subscribers [19].

In terms of the BC and SC, after running on Steem BC and IPFS, DTube launched its own lower-layer BC, Avalon for improving the scalability and introducing new utilities in 2019. DTube is running on its own BC, Avalon with a delegated proof of stake (PoS) consensus protocol. To immunize videos to censorship, the video files are stored still in IPFS and if one peer node fails, the file flows to the next node [23]. The IPFS serving as a CDN has a BitTorrent-based bandwidth distribution system. This is available worldwide by adding files to the local file system [24, 25].

In terms of the tokenization on Avalon BC, DTube Coin (DTC) is a fully liquid and transferable crypto asset

and voting power (VP) is the resource used to play the curation game which means that users can spend their VP to post, vote and tag content to earn DTCs and to influence content's ranking. VP is not a tradable asset and has no value outside the DTube platform. As shown in figure 3, DTube coin distribution works in three steps: First, DTube chain distributes VP to every DTuber at a rate of +1 per DTC per hour. Second, DTubers spend their VP each time they post, vote, comment or tag a content. Last, in real time, the BC algorithm generates and distributes new DTCs to the users to reward them according to content popularity [26].

Figure 3. DTube coin distribution

On DTube, 90% of the revenue goes to community, content creators and curators, with 10% going to the DTube commission for running and developing the BC. On DTube, there are no advertisements, but a small percentage of the revenue from each video goes to the developers and community leaders [23].

In terms of the DAO, the Avalon BC uses a delegated PoS (DPoS) consensus algorithm and democratic governance with elected 'leaders' who validate and mine the BC and implement future changes based on the community's votes. DTube's BC, Avalon allows for effective on-chain governance to implement community-specific changes. DTube firstly aims to create "trust" between the platform and its community, giving members the power to moderate content, and fairly distributes earnings to members without censorship of free speech, the invasion of individual privacy, or bombarding viewers with intrusive advertisements [23]. Secondly, the utility token, VP bears a utilitarian value by generating VP and bandwidth to its holder with time. It protects Avalon from the 'Sybil' attacks creating multi-accounts to cheat the vote numbers. Bandwidth is used to write transactions and each byte from the transaction is deducted from the bandwidth balance. DTubers can't transact if they don't have enough bytes. The content popularity (Upvotes), moderation (Downvotes), and classification (Tags) are determined by the "community power" without algorithmic alteration [19]. This community activity is a progressive decentralization because greater control is moving from the platform to the community.

4.3 Key business characteristics of Livepeer

Livepeer founded in 2017, launched its main network on the Ethereum in May 2018. It is a decentralized VS transcoding network providing decentralized CDN, P2P, censorship-resistant VS infrastructure, and VS dapp allowing anyone to launch their video services at a reasonable cost. It enables developers to build their own VS dapps without relying on Web2.0 platforms.

In terms of the BC and SC, it offers broadcaster nodes for streaming content and transcoder nodes for transcoding live video feeds. It provides a scalable and cost-effective infrastructure solution and improves VS reliability and reduces the expenses by up to 50 times [27]. The Livepeer network is designed to be easily scalable and support many users. It helps reduce the SV costs by allowing anyone to contribute their computer resources like central processing unit (CPU), graphic processing unit (GPU) and Internet bandwidth for

transcoding. If it lets some users pay to broadcast video and other users get paid to provide the resources, Ethereum is what lets it embed rules dictating who gets paid, how much they get paid, and what they do to prove that they didn't cheat and provide the valuable work to the system. There is a two-layer consensus mechanism: Layer 1 where transactions are made, is based on Ethereum, and layer 2 is based on the delegated proof of stake (DPoS) system. There are three types of Livepeer network users: Developers using it to power their video functionality, users using the dapps, and broadcasters using it to reduce infrastructure cost. All of them are part of Livepeer infrastructure and owners [19].

In terms of the tokenization, Livepeer is powered by Livepeer Token, LPT incentivizing users to run nodes on the network to help power it. LPT is staked to reward users who contribute their computing resources to power and secure the network. There are two contributors: Orchestrators and delegators. Orchestrators run nodes on the network to transcode and distribute video streams and choose to concurrently mine for ETH while performing transcoding. Delegators stake tokens on orchestrators to help secure the network. Orchestrators receive rewards in newly minted LPT and ETH fees from the network. A share of the LPT rewards and ETH fees are paid to delegators who have staked LPTs on the orchestrators. As of September 2023, 4,035 delegators and 100 orchestrators have been on the Livepeer network [28, 29].

In terms of the DAO, everyone who holds LPT can have an opportunity to participate in Livepeer network. So, competition to earn the LPT generated from the network and from broadcaster fees allows anyone to try and maximize their profit by running the most efficient hardware or software and using the cheapest electricity and bandwidth to serve the network [19]. Delegators are LPT holders contributing to the network by staking their LPT tokens to orchestrators who are doing a good performance. When they stake, their tokens are temporarily locked and can be staked to another orchestrator. Accordingly, the network's security can be increased. LPT holders can participate in key decision-making of the protocol [27, 29].

4.4 Key business characteristics of Theta

Theta Network (Theta) was founded by Theta Labs in January 2018 and its business goal is to contribute to the Theta ecosystem including block explorer, edge nodes, wallet, and guardian nodes. Theta developers chose to host the platform on Ethereum in 2018. Then, Theta has built its native Theta BC in March 2019. Users share their unused bandwidth and resources like unused memory and computing power of their computers. Theta BC encourages bandwidth sharing across the network. Users get the opportunity to contribute excess bandwidth and computing resources in exchange for token rewards.

In terms of the BC and SC, Theta is an ERC20-compliant decentralized video delivery network. As such, Theta users can leverage Ethereum. Theta BC is secured by the PoS consensus mechanism based on the Multi-level Byzantine Fault Tolerance (Multi-level BFT) algorithm. This consensus is much faster than traditional Proof-of-Work (PoW) systems. Theta BC as the end-to-end infrastructure for decentralized VS and delivery permits maximum functionality, and the system can pull streams from peering caching nodes. There are three components run by this system: Data encoding, storage, and delivery. For performing each of these, users can earn Theta fuel token, TFUEL as a reward, incentivizing them to support and grow the Theta. This network supports the creation of vertical dapps which live on top of Theta platform and leverage its powerful technical toolset. Theta allows multiple specialized dapps to be built by any video platforms or content providers. The first dapp launching on this was SLIVER.tv. The one of Theta's benefits is its expandability and interoperability. Theta.tv is Theta's own streaming service where users can view and post their videos [19, 30].

In terms of the tokenization, ERC-20 tokens enjoy a massive variety of wallets, decentralized exchanges

(DEXs), and games. Theta serves as an Ethereum Virtual Machine (EVM) compatible SCs-based platform for launching dapps and rewards users with native tokens for SVs to the community. Theta hosts dual tokens: a non-inflationary Theta Network token, THETA as the governance token and an inflationary TFUEL as the utility token. THETA providing users with a host of functionalities, is used for staking as a validator node or guardian node, for producing blocks and participating in the protocol's governance. Validators are Samsung, Google, BC Ventures, Sony and so on. These nodes produce new blocks in the BC. Guardian nodes are run by the Theta community checking on the active functioning of the validator nodes. There are 1,000,000,000 THETAs in circulation as of September 2023. It is the total amount of governance tokens the Theta platform intends to issue. But TFUEL serves multiple purposes within the network. It incentivizes and encourages individual users to share their redundant computing and bandwidth resources as caching or relay nodes for video streams. Viewers earn TFUELs. Theta enables direct transactions between viewers, creators, and advertisers. It provides high-quality video content at a lower cost and its users earn TFUELs by sharing their resources, creating a mutually beneficial ecosystem [30, 31].

In terms of the DAO, THETA is the native governance token issued in 2018 as ERC-20 token allowing users to participate in the network's security and decision making. Validators and community holders need to stake THETAs to verify the transaction on the BC [30, 32].

At the end of 2023, Theta is secured by 29 validator nodes which produce new blocks and validate transactions on Theta BC. It also relies on guardian nodes and edge nodes run by community. Guardian nodes stake THETA tokens and finalize blocks created by validator nodes, ensuring the network's security and edge nodes share their bandwidth, storage, and computing power to deliver video streams and perform edge computing tasks. Theta uses a multi-chain architecture consisting of a main chain for the network's governance and multiple subchains handling the scalability and customization of use cases. Subchains can also issue their own tokens that are compatible with Theta token standard (TNT-20). THETA as the native token of Theta serves as the governance and staking token of the network. THETA holders can stake their tokens to run guardian nodes and secure the network, as well as vote on protocol upgrades and network parameters [33].

5. Conclusion

The results of this study are summarized in Table 2. DLive which firstly partnering with Medianova for CDN and with Theta for P2P network and migrating to Tron BC, receives no commission from what creators earn, gives rewards to viewers by measuring engagement, and incentivizes participation by allowing 20% of donation & fees for funding development, 5% to BTT stakeholders. Among these 5%, 20% goes to partners and 80% goes to other BTT stakeholders.

DTube migrating from Steem to its own lower-layer BC, Avalon, offers BitTorrent based IPFS due to its caching friendly function and P2P network, gives 90% of the created value to creators or curators, and try to empower the community.

Livepeer as a video transcoding provider on Ethereum BC offers decentralized CDN, P2P, gives LPT as incentive for network participants. The transcoding process is costly for broadcasters. So, Livepeer provides transcoding services by utilizing idle CPU and GPU owners worldwide to become operator nodes. The two main actors on the network are orchestrators and delegators. Delegators can stake their LPT to orchestrators doing good job.

Theta on its native BC pulls streams from peering caching nodes, creates P2P network. Theta consists of two

native tokens: TFIEL is the utility token that powers the video delivery and edge computing services like transcoding, caching, and computing. THETA is the governance token that allows users to participate in the network's security and decision making.

Table 2. Summary of results

Firm	Roles	Key Characteristics
1. DLive (2017~)	①BC/SC	- Transcoding Solutions: Migrating from Steem, Lino to Tron BC & SC - CDN: Partnering with Medianova in 2019, then migrating to Tron ecosystem - Network of Relay Nodes: Partnering with Theta (2019) moving to Tron ecosystem
	②Tokenization	- Reward to Developers: 0% platform cuts on what content creators earn - Reward to Consumers: Viewer rewards, 'Treasure Chest' by measuring engagement
	③DAO	- Incentivizing participation: 20% of donation & fees for funding development, 5% to BTT stakeholders (Among 5%, 20% to DLive partners, 80% to other BTT stakeholders)
2. DTube (2017~)	①BC/SC	- Transcoding Solutions: Migrating from Steem to its own lower-layer BC, Avalon - CDN: BitTorrent based IPFS due to its caching friendly function - Network of Relay Nodes: BitTorrent based IPFS as P2P network
	②Tokenization	- Reward to Contributors: 90% of the created value going to creators or curators
	③DAO	- Progressive Decentralizing: Trust focused and community powered
3. Livepeer (2017~)	①BC/SC	- Transcoding Solutions: Transcoding video into all formats and bitrates - CDN: Distributing video to end user on Ethereum BC - Network of Relay Nodes: Building P2P infrastructure
	②Tokenization	- Reward to Contributors: LPT as incentive token for network participants
	③DAO	- Incentivizing Participation: Delegators' LPT staking to orchestrators doing good job
4. Theta (2018~)	①BC/SC	- Transcoding Solutions: Native BC, Theta based OTT streaming as open source - CDN: Pulling streams from peering caching nodes allowing users to share. - Network of Relay Nodes: Creating a P2P native BC which users can share.
	②Tokenization	- Reward to Contributor: Theta Fuel (TFUEL) for caching or relay nodes contributors
	③DAO	- Progressive Decentralizing: THETA serves as the governance and staking token.

In conclusion, we contribute to categorize Web3.0 VS platforms. DLive and DTube are YouTube alternatives. They can reduce the risk of censorship, promote a more diverse range of content, offer alternative monetization strategies involving cryptocurrencies, and allow the community to lead to more user-friendly environments.

Livepeer and Theta have similar business objectives in that they both provide new methods to stream content utilizing decentralized BC technology, but there are some differences. Livepeer focuses on the transcoding layer and there is a developer offering that lets any developer construct a live VS dapp. On the other hand, Theta concentrates on the video application layer and the content delivery layer. It means, Theta delivers value to all market participants by enhancing network quality, reducing CDN cost, and rewarding users in utility tokens for the storage and bandwidth they provide.

References

[1] Medium, "Building the Future of Streaming: Exploring Web3 Streaming Platform Development," https://medium.com/javarevisited/web3-streaming-platform-development-cc604d88ec5d, April 23, 2023.

[2] Miles Jennings of Andreessen Horowitz (General Counsel of a16zcrypto), "Decentralization for Web3 Builders: Principles, Models, How," https://a16zcrypto.com/decentralizationforbuilders. PDF paper, April 2022.

[3] M. H. Jeong and S. K. Kim, "Video Streaming Based on Blockchain State Channel with IoT Camera," *Journal of*

Web Engineering, Vol. 21, Iss 3, pp. 661-676, February 14, 2022. DOI: https://doi.org/10.13052/jwe1540-9589.2134.

[4] Lopes, E. J., et al., "Live video streaming service with pay-as-you-use model on Ethereum Blockchain and InterPlanetary file system," *Wireless Network,* Vol. 28, pp.3111‑3125, June 2022. DOI: https://doi.org/10.1007/s11276-022-03009-6.

[5] C. Chen et al., "When Digital Economy Meets Web3.0: Applications and Challenges," *IEEE Open Journal of the Computer Society,* Vol. 3, pp. 233-245, October 2022. DOI: https://doi.org/10.1109/OJCS.2022.3217565.

[6] C. Guan, D. Ding, J. Guo and Y. Teng, "An ecosystem approach to Web3.0: a systematic review and research agenda," *Journal of Electronic Business & Digital Economics,* Vol. 2 No. 1, pp. 139-156, May 2023. DOI: https://doi.org/10.1108/JEBDE-10-2022-0039.

[7] J. Sadowski and K. Beegle, "Expansive and extractive networks of Web3," *Big Data & Society,* Vol.10, No. 1, January-June 2023. DOI: https://doi.org/10.1177/20539517231159629.

[8] M. Järvekülg, I. Ibrus, and U. Rohn, "Shifting from Web2 to Web3: The adaptive creator experiences on blockchain-based video-sharing and streaming platforms," *Convergence: The International Journal of Research into New Media Technologies,* first published online, November 9, 2023. DOI: https://doi.org/10.1177/13548565231214184.

[9] N. Barman, G. C. Deepak, and M. G. Martini, "Blockchain for Video Streaming: Opportunities, Challenges, and Open Issues," *Computer,* Vol.53, pp.45-56, July 2020. DOI: https://doi.org/10.1109/MC.2020.2989051.

[10] Upsocial, "Top 5 Web3 Video Platforms for 2023," https://upsocial.com/web3-video-platforms/, March 12, 2023.

[11] Mojom3dia.io, "8 Disruptive Web3.0 Video Platforms You Need to Know About," https://www.mojom3dia.io/blog-posts/revolutionizing-video-streaming-8-disruptive-web-3-0-video-platforms-you-need-to-know-about, April 27, 2023.

[12] CoinGecko, "Top Decentralized Social Media in 2023," https://www.coingecko.com/research/publications/top-decentralized-social-media, July 11, 2023.

[13] Dailycoin, "Decentralized YouTube Alternatives: Video Streaming Sites You Need to Know," https://dailycoin.com/decentralized-video-streaming-platforms-best-alternatives-to-youtube/, June 20, 2023.

[14] Coinspeaker, "DLive and Lino Network Join BitTorrent and Tron Ecosystem," https://www.coinspeaker.com/dlive-lino-bittorrent-tron/, December 31, 2019.

[15] Lino, "Lino Blockchain Overview," 2019.

[16] Medianova, "Medianova: Empowering OTT Platforms with Private CDN solutions," marketing presentation, https://x-dream-group.com/x-dream-group-wAssets/docs/Products/IPTV-OTT/Medianova-Private-CDN-Presentation.pdf, 2019.

[17] Blockchainnews, "DLive Introduces Decentralized Video Streaming to Increase Customer Base By Over 50 Million Monthly Users," https://blockchain.news/news/dlive-introducing-decentralized-video-streaming-to-increase-customer-base-over-50-million-monthly-users, October 14, 2019.

[18] Crypto-economy, DLive Migration to Tron blockchain nears completion, removing Lino blockchain from the platform, https://crypto-economy.com/dlive-migration-to-tron-blockchain-nears-completion-removing-lino-blockchain-from-the-platform/, August 30, 2023.

[19] Medium, "Video Streaming and Blockchain: A Tale of Two Paradigm Shifts," https://medium.com/the-capital/video-streaming-and-blockchain-a-tale-of-two-paradigm-shifts-75a8bcfe6d3f, November 1, 2019.

[20] Medium, "TRON 4.0 Online Conference: Charles Wayn — CEO of DLive: Integration of DLive and TRON 4.0, " https://trondao.medium.com/tron-4-0-online-conference-charles-wayn-ceo-of-dlive-integration-of-dlive-and-tron-4-0-4f474a93ab4f, July 8, 2020.

[21] Dlive community, "Change in BTT Staking Rewards Distribution," https://community.dlive.tv/2023/03/07/change-in-btt-staking-rewards-distribution/, December 15, 2020.

[22] Dlive community, "BTT Staking to end on September 15, 2022," https://community.dlive.tv/2023/03/07/btt-staking-to-end-on-september-15th-2022/, September 4, 2022.

[23] Blockchainnews, "What is DTube?" https://blockchain.news/wiki/what-is-dtube, September 19, 2020.

[24] T.V. Doan, T.D. Pham, M. Oberprieler, and V. Bajpai "Measuring Decentralized Video Streaming: A Case Study of DTube," working paper of Technical University of Munich, Germany, 2020.

[25] Next-Blockchain, "Blockchain Theory: IPFS (Inter-Planetary File System)," https://next-

block.tistory.com/entry/IPFSInterPlanetary-File-System, January 20, 2023.

[26] Medium, "The social blockchain: a new model for social media," https://dtube.medium.com/the-social-blockchain-a-new-model-for-social-media-45dd4729d39b, August 20, 2019.

[27] A.A. Nair, et al., "dStream - Decentralized Streaming Platform using Livepeer Network and CDN," working paper, School of Computer Science and Engineering, REVA University, 2022.

[28] Pintu, "Livepeer (LPT): Pioneering Decentralized Video Streaming," https://pintu.co.id/en/academy/post/what-is-livepeer-lpt, September 11, 2023.

[29] Bybitlearn, "What Is Livepeer Token (LPT): Making Video Services Decentralized," https://learn.bybit.com/web3/livepeer-token-lpt-crypto/, September 13, 2023.

[30] Securities.io, "Investing in Theta Network (THETA) - Everything You Need to Know," https://www.securities.io/investing-in-theta/, Sep. 6, 2023.

[31] Medium, "Theta Network: Fundamentals, technicals, tokenomics and future outlook discussed," https://medium.com/@abhinav.bheema/theta-network-fundamentals-technicals-tokenomics-and-future-outlook-discussed-a45ac672900b, December 21, 2021.

[32] Thenewscrypto, "Theta Network (THETA) Price Prediction 2023 - Will THETA Hit $2 Soon?" https://thenewscrypto.com/theta-network-theta-price-prediction/, January 3, 2023.

[33] Medium, "THETA NETWORK (THETA): A Web3 Blockchain Infrastructure for Video, AI and Entertainment," https://medium.com/coinmonks/theta-network-theta-a-web3-blockchain-infrastructure-for-video-ai-and-entertainment-20a23561b9b6, December 12, 2023.