University of Malta

Master of Science in Blockchain and Distributed Ledger Technologies

DLT5003: Introduction to Blockchain, DLTs and Cryptocurrencies

Assignment 1 - Part 1 (3. Technical Requirements)

Date Submitted: 17th February 2023
Student: Karsten Guenther 0295697M (ICT Stream)
Lecturer: Prof. Joshua Ellul

An understanding of YouSocial's decentralised platform architecture.

A decentralized platform architecture is a type of network infrastructure that operates in a distributed manner, without relying on a centralized authority or server. In this type of system, data is stored and processed by multiple nodes or devices, which communicate with each other to maintain consensus and ensure the integrity of the network. Decentralized platforms such a YouSocial's are typically designed to be highly secure, fault-tolerant, and resistant to censorship or single points of failure.

There are several key components making up the decentralized platform architecture, these include:

The most fundamental element of YouSocial's platform is its distributed ledger: This is the digital database that records all transactions and other data in a decentralized platform. A distributed ledger implemented using a dedicated blockchain network. Developing a dedicated blockchain for a social media platform entail identifying the features, functionality, and performance characteristics that the blockchain needs to support.

The dedicated blockchain must be able to handle a variety of smart contracts for the social platform to work: these include:

- ***Identity Management Smart Contracts:*** These smart contracts are used to create and manage user identities on the platform. They enable users to control and manage their personal information, including their profile data and activity on the platform.
- ***Content Sharing Smart Contracts:*** These smart contracts are used to enable users to share content on the platform, such as posts, photos, and videos. They include rules for sharing, attribution, and compensation for creators.
- ***Community Governance Smart Contracts:*** These smart contracts are used to facilitate community decision-making and governance on the platform. They enable users to vote on platform policies, propose new features, and resolve disputes.
- ***Reputation Management Smart Contracts:*** These smart contracts are used to track and manage user reputations on the platform. They include rules for rating and ranking users based on their behaviour and contributions to the community.
- ***Advertising Smart Contracts:*** These smart contracts are used to facilitate targeted advertising on the platform. They include rules for ad placement, targeting, and compensation for users who view or interact with ads.
- ***Tokenization Smart Contracts:*** These smart contracts are used to create and manage a native platform token and cryptocurrency. They include rules for token issuance, distribution, and usage on the platform.

The decentralised platform relies on consensus mechanisms to ensure that all nodes in the network agree on the state of the ledger and the validity of transactions. This is achieved using cryptographic algorithm Proof of Authority (PoA). PoA is a consensus mechanism that relies on a group of trusted validators to validate transactions on the blockchain. Validators are usually selected based on their reputation and expertise in the field. PoA can be faster and more energy-efficient than PoW or PoS.

The decentralised social media platform requires node software, each node in the decentralized network runs specialized software that allows it to communicate with other nodes and perform specific tasks such as verifying transactions or processing data and file sharing. Node software provides a wide range of features, such as smart contract deployment, transaction monitoring, and consensus management, that make it easier for developers to build and deploy dApps on the YouSocial network.

Peer-to-peer network is also a fundamental element of the decentralised social media platform. Nodes in a decentralized platform communicate with each other over a peer-to-peer (P2P) network, without relying on a centralized server or intermediary. This allows for greater security and resilience, as the failure of one or more nodes will not bring down the entire network. This ensures that user data and content remain secure and private, and that the platform is resilient to attacks it also provides scalability, enabling the platform to handle large volumes of users and data.

For our social media platform nodes are an essential part of the network, they are responsible for maintaining and validating the blockchain. There are different types of nodes that can be used on our network.

Full nodes are the most powerful and complete type of nodes. They maintain a complete copy of the blockchain and validate all transactions and smart contracts, full nodes are used to maintain the network's security, store and retrieve data, and help other nodes validate transactions. On YouSocial full nodes are responsible for storing user profiles, posts, and other content, and ensuring that this data remains accessible and up-to-date. They also facilitate transactions and enforce rules and regulations, such as those related to moderation, content policies, or user rights.

Light nodes are nodes that do not store a complete copy of the blockchain. They rely on other nodes to verify transactions and smart contracts. Light nodes are useful for devices with limited storage or processing power, such as mobile phones, tablets, traditional desktop computers and laptops to IoT devices. Light nodes can be used to for content creation and social interaction. This requires that the platform be designed to support a wide range of devices and form factors. Mobile devices, in particular, are becoming an increasingly important platform for social media, and any decentralized social media platform must be optimized to work well on mobile devices

Mining nodes play an important role particularly in the platform's consensus mechanism. By participating in the consensus mechanism of a blockchain, mining nodes help validate transactions and maintain the security of the network. The mining nodes are used to incentivise users to contribute to the platform and help maintain its security. YouSocial rewards users who participate in the consensus mechanism with utility tokens and limited edition NFTS. Additionally, mining nodes helps to distribute power and control across the network, rather than centralizing it in a few large nodes.

Masternodes are specialized nodes that provide additional services to the network. They offer features such as instant transactions, governance voting, or network monitoring. On our platform masternodes can be used to provide additional functionality and services to users. A masternode is responsible for managing a decentralized content delivery network that

ensures content is available and accessible to users at all times. They are also used to provide additional security features, such as multi-factor authentication or encryption. Masternodes can also play a role in governance, allowing users to participate in important decisions about the direction of the platform. In this way, masternodes can help provide a more robust and feature-rich experience for users, and can help differentiate a decentralized social media platform from its centralized counterparts.

Gateway nodes are nodes that provide a bridge between different blockchains or distributed ledgers. They enable interoperability and cross-chain transactions. In a decentralized social media platform, gateway nodes can be used to connect the platform with other networks and ecosystems, allowing users to access a wider range of features and services. Gateway nodes play a crucial role in connecting our decentralized social media platform to other blockchains and ecosystems. YouSocial uses gateway nodes to enable users to exchange tokens or other assets with other blockchain-based platforms and access decentralized finance (DeFi) services. Additionally, gateway nodes help ensure that the platform remains flexible and adaptable as new technologies and ecosystems emerge.

To build the decentralized social media platform, developers can Solidity as the programming language to develop smart contracts on the blockchain. Once the blockchain is developed, they must ensure it meets the performance and security requirements of the platform by conducting thorough testing. They must test for factors such as performance, scalability, security, and reliability to identify and mitigate potential vulnerabilities. They must also use load testing to simulate heavy user traffic and ensure the network can handle a high volume of transactions and requests. They also must address any issues that arise during testing. They can proceed to launch the blockchain once testing is complete and make it available to users on the social media platform, providing a secure and decentralized environment for social interactions and content sharing.

The Decentralised social media platform will need infrastructure to support the maintenance and support of the platform over time. This may include hardware and software components such as monitoring and management tools, as well as processes and procedures for addressing bugs and issues that may arise. It may also need infrastructure to support data analytics and reporting. This may include hardware and software components such as data warehouses, analytics platforms, and visualisation tools, as well as processes and procedures for collecting, storing, and analysing data.

The platform may need to integrate with external systems such as payment processors, advertising networks, and analytics platforms. This may require the use of APIs and other integration tools. It will need infrastructure to support customer support, including processes and tools for responding to user inquiries and resolving issues. This may include software components such as chat tools, as well as processes and protocols for managing customer interactions.

Centralised points of trust in the YouSocial platform:

In a fully decentralized social media platform, there ideally should not be any central points of trust, as the platform would be designed to operate in a trustless manner without relying on any centralized entities or intermediaries. However, in practice, there may be certain components or functions that require centralization or the use of trusted third parties. Here are the instances of such events:

Domain name system (DNS): The domain name system is used to translate human-readable domain names, such as YouSocial.com, into IP addresses, which are used to identify and locate servers on the internet. In a decentralized social media platform, there may be a need to register and manage domain names for various websites and services. This could involve using a centralized DNS system or a blockchain-based naming system.

Content moderation: A YouSocial may need to implement content moderation to prevent the spread of illegal or harmful content. However, moderating content in a decentralized platform can be challenging, as there is no central authority to enforce rules or guidelines. As a result, our platform may rely on trusted third parties, such as community moderators or content curators, to moderate content.

Identity verification: In order to prevent fake or fraudulent accounts, the platform may need to implement an identity verification system. This could involve using a trusted third party, such as a government-issued ID or a social media account, to verify a user's identity.

Decentralized storage networks: The data on our platform may be stored on a decentralized storage network as our decentralized storage networks relies on trusted nodes or gateways to provide access to the network.

User interfaces and client software: While the data on the platform may be stored and transmitted in a decentralised manner, users still need a way to interact with the platform. This could involve using a centralised user interface, such as a mobile app or web-based client, which may rely on centralised servers or services to function.

Smart contract deployment: Our platform use smart contracts to enable various functions, such as token rewards for content creation and curation. However, deploying and managing smart contracts may require the use of a centralised entity, such as a development team or a smart contract auditor.

Token distribution and management: YouSocial uses tokens to incentivize user participation and reward content creators and curators. However, managing and distributing tokens may require the use of a centralised entity, such as a token issuer or a centralised exchange.

Governance and decision-making: On YouSocial, decision-making is distributed among users through a governance mechanism. However, the governance mechanism itself may require centralisation, such as a centralised voting platform or a centralised dispute resolution process.

Onboarding and user adoption: In order to attract and onboard new users to the platform, YouSocial may need to rely on centralised marketing and outreach efforts, such as advertising campaigns or partnerships with centralised entities.

Integration with other platforms and services: Our decentralised social media platform may need to integrate with other platforms and services, such as payment gateways or analytics tools. These integrations may require the use of centralised APIs (application programming interfaces) or service providers.

Network infrastructure: While the data on the decentralised social media platform may be stored and transmitted in a decentralised manner, the underlying network infrastructure may still rely on centralised entities, such as ISPs (internet service providers) or cloud computing providers.

Legal compliance and regulatory oversight: In order to operate within existing legal and regulatory frameworks, a decentralised social media platform may need to comply with certain laws and regulations. This may require the use of centralised legal and compliance services or the involvement of centralised regulatory bodies.

Decentralised aspects in YouSocial's decentralised social media platform:

Here are some decentralised aspects in YouSocial's decentralised social media platform:

Decentralised content distribution: In addition to decentralised data storage, YouSocial uses a decentralised content distribution network (CDN) to distribute content. YouSocial uses a peer-to-peer network, where users help to relay and distribute content to other users.

Decentralised identity: YouSocial uses a blockchain-based identity protocol, to enable users to maintain control over their personal information and identity.

Decentralised incentives: In YouSocial's decentralised social media platform, users may be incentivised to contribute to the platform using a decentralised rewards system. This could involve using a blockchain-based token, such as a cryptocurrency, to reward users for creating and curating content.

Decentralised moderation: YouSocial's decentralised social media platform may use a decentralised moderation system that enables users to flag and report inappropriate content, without relying on a centralised authority or team to review and moderate the content. This could involve using a reputation system or a decentralised dispute resolution mechanism to handle disputes.

Decentralised APIs: YouSocial's decentralised social media platform may offer decentralised APIs that enable developers to build applications and services on top of the platform. These APIs could be decentralised by leveraging a blockchain or other decentralised technology to enable developers to access and use the platform's data and functionality in a decentralised manner.

Decentralised advertising: YouSocial's decentralised social media platform may use a decentralised advertising system that allows users to control their data and earn rewards for viewing or interacting with advertisements. This could involve using a blockchain-based advertising network that allows advertisers to target users directly, without relying on a centralised advertising platform.

Decentralised search: YouSocial's decentralised social media platform may use a decentralised search system that enables users to search for content across the platform in a decentralised manner. This could involve using a distributed search engine that leverages a peer-to-peer network to index and search content without relying on a centralised search provider.

Decentralised development: YouSocial's decentralised social media platform may use a decentralised development model that enables developers to contribute to the platform in a decentralised manner. This could involve using a decentralised code repository, like GitHub or GitLab, to enable developers to collaborate on the platform's codebase in a decentralised manner.

These are just a few examples of how YouSoical's development team can leverage decentralised and centralised technologies which can be interchangeably used to offer increased transparency, security, and user control. By building a truly decentralised social media platform, users can enjoy a greater degree of privacy, autonomy, and freedom of expression, while reducing the risk of censorship and manipulation.