Online Video and Audio Streaming Service Based on Decentralized Architecture

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Abstract

Today, in this rapidly changing world, media consumption is not a luxury anymore, it is a necessity. People view millions of videos every minute through various websites such as YouTube, Dailymotion and Twitch. It is thus, important that the user is provided with the desired content in a fast and timely fashion, with limited packet loss. Thus, we are trying to implement blockchain in video and audio streaming services which overcomes the drawbacks of traditional services.

Blockchain aims at decentralizing the web in order to remove the middlemen (the servers) to provide peer to peer connectivity between users. It is considered as the future of internet. We hope to develop such a system that is able to deliver media content such as video or audio without delay or traffic issue.

We aim to use modern technologies such as Blockchain, Proof of Stake and merging them with older technologies such as Peer to Peer networks/Adhoc systems, to develop a robust, fast and secure service platform.

Introduction

A. Lack of Robustness

Servers can be easily taken down using attacks such as Distributed Denial of Service (DDoS) attack, which is the most commonly used method. Such attacks exploit the fact that legitimate users can be denied access to the server/service by flooding the server with multiple requests. Such attacks would turn out to be useless against Web 3.0. Since, the data is never stored at one location/machine, the attack can be made only on a single system, which can be detected and necessary actions can be taken, without affecting the network.

B. Security

The decentralized nature of data also makes the network much more secure. This is due to the fact that current exploits would be rendered useless, due to the group of technologies constituting Web 3.0. Thus, manipulating data, or illegal access of data would be impossible, making the system secure, and free of plagiarized content.

C. Concurrent Content Delivery

It is often observed that servers go down due to the fact that multiple users try to access a given data stream. Upgradation of server is an expensive solution to the above stated problem. In our proposed system, the number of users will only strengthen the network, instead of degrading it.

Video and audio streaming service using decentralized architecture which is based

on technologies such as Peer to Peer networks, Merkle DAGs, and, Blockchain, would reduce the cost of service since there would be no need of renting, upgrading or maintaining servers. It would provide media content faster to end user. The inherent security of the network would also render conventional exploits useless, adding to the robustness of the system. Thus, providing a fast, secure and robust decentralized app (dapp) for users.

Objective and Scope of Project

The first and foremost goal of our proposed system will be to deliver media content requested by an user in a fast and timely manner, limiting the packet losses using a decentralized app (dapp). The user should be able to sign up/sign in to the network using a secure authentication system. The user should also have the ability to like or dislike a video/audio. The user should be able to upload his/her own content to the dapp system. Using the liked content of the user, we will have a simple recommendation algorithm to keep the user engaged in the network. The more the users are engaged in the system, stronger the network becomes. Thus, the recommendation system will be an integral part of the dapp. Future scope will include developing Android and if possible iOS clients for the service. On the Android and iOS clients, the users should be able to download the content.

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Literature Survey

Advantages of Web 3.0

1. Web 3.0 constituting technologies provides integrating to any service. Since the file must match a hash value, thus, one can not manipulate files easily.
2. Since, there is no need for servers, the hosting of services is much cheaper.
3. It is much better for scaling. The P2P paradigm only strengthens the network with increasing users.
4. It does not require censorship from the service, i.e., it has the ability to self-censor content
5. One can attract new users by providing incentivized hosting using FileCoin.
6. It provides access to files even in low connectivity.

Disadvantages of Web 3.0

1. Web 3.0 is still in its infancy i.e. it is not fully developed and work is still being done to make it widely available and popular.
2. It will require major backend overhaul for existing services.
3. It will make Web 1.0 websites more obsolete.
4. Lastly, it won’t work on less advanced laptops. The minimum requirement has been specified in the Hardware Requirements section

Feasibility Study

The underlying technology or tools used to develop the system will of open source nature mostly open web stack i.e HTML, CSS, JavaScript thus eliminating the cost of buying proprietary software.

The main advantage of node.js is that it is lightweight and efficient in the face of data-intensive real-time applications that run across distributed devices. Thus minimizing the load on the underlying system.

The underlying storage API, Inter Planetary File System (IPFS), has been used to create multiple DApps, and the Ethereum Blockchain is one of the most popular Blockchain applications, and is an easy to use framework.

The recommendation system can be developed using a simple ML algorithm or a feed forward neural network, and can be easily integrated into the system using node.js libraries.

Methodology and Work Plan

The project will be completed in 6 steps:

1. Determining Scope and Problem Definition
2. Performing Analysis and Determining Software Requirements
3. Design
4. Development and Implementation
5. Testing
6. Report Preparation

Sr.No.	Activity Planned	Start Date	End Date
1.	Determining Scope and Problem Definition	3rd July 2018	4th July 2018
2.	Performing Analysis and	3rd July 2018	4th July 2018

Sr.No.	Activity Planned	Start Date	End Date
	Determining Software Requiremennts		
3.	Design	5th July 2018	20th July 2018
4.	Development and Implementation	21st July 2018	21st September 2018
5.	Testing	22nd September 2018	7th October 2018
6.	Report Preparation	8th October 2018	23rd October 2018

We plan on acheiving the above targets using an iterative development cycle. An iterative cycle is much faster and delivers a better product in terms of quality. After development of each module, the module will be thoroughly tested. At the end of development, the complete project will be tested.

Software and Hardware Requirements

Operating System:
The service will work on all three major OS platforms i.e. Windows, Linux Distros and Mac OS. The OS must be modern enough to support the hardware requirements.

Minimum OS Requirements:

Windows: Windows 7, Windows 8, Windows 8.1, Windows 10.

Ubuntu: 14.04+
Mac OS: OS X 10.8+

Software:

It will mostly be built on JavaScript along with HTML5 and CSS3.
Bootstrap and other web frameworks will be used for the frontend development of the dapp.
The backend code would be done in JavaScript (node.js) and Solidity.

node.js modules used:

1. ethereumjs-testrpc
2. web3@0.20.1
3. solc

Note: Software requirements could increase with the progress of the project. The above are the minimum requirements.

Hardware:

System running one of the above OSes. The minimum specifications of the system must include:

1. 2 GB system memory
2. 2 GHz dual processor
3. 1 GB of free space
4. Internet Access

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