Are Decentralised Applications the future of the Internet?

Introduction

The current internet is made up of centralised systems where the power is concentrated in one central server or group. These are government regulated but problems can arise in terms of dependability and security as well as economic cost. Decentralised apps are more stable and accessible compared to conventional centralised applications. They are based on a shared database that stores replicated data across all nodes. They are usually based on a p2p network of computers. The main vulnerability of a centralised system is that they have a single point of failure (CAI et al., 2016). This is in contrast to decentralised systems which are much more likely to survive outages with data being kept in multiple nodes. For this essay, I will analyse some more specific parts of decentralised and centralised systems.

P2P vs Client-Server Approach

Peer-to-peer is a decentralised network model that does not differentiate between client and server. Every node is both client and server, they can both request and respond. In peer to peer each node uses its own security but all the data is shared with every other node. Client server networks have a specific client and servers. A centralised server stores and manages the data (Leibnitz et al., 2007). To analyse these systems more closely I will discuss the advantages and disadvantages of HTTP and IPFS.

HTTP is an application layer protocol which is used for most of the data transfer on the web. It uses the client server approach. IPFS is a decentralised peer to peer system which means uploading content does not require a host server as all the data is hosted by each node. This means that using IPFS is a much more stable system. If a server goes down using HTTP then no data can be accessed but with IPFS the data is copied to multiple nodes so it can be accessed at any time.

In terms of scalability IPFS is adequate as it stands. It would be thought that the scalability of IPFS would not be good but as described in the experiments in (Wennergren et al., 2018) it actually tends to scale surprisingly well. With the lack of incentives for others to store things long term it is less likely that people will use it.

IPFS is not as secure as one might expect considering it is meant to be deployed over the internet. But there is less option for censorship which can be both a good and a bad thing. This means there is more opportunity for illegal activity which is very hard to regulate. It is also difficult to ensure that all copies of data are deleted which may be a problem when it comes to GDPR (Viet Doan et al., 2022).

HTTP is more costly than IPFS. Low traffic applications are often closed because they aren't cost effective to run. Current centralised apps such as Youtube and Netflix which are bandwidth heavy would thrive on an Internet using IPFS, it would greatly reduce cost and time serving content.

Cryptocurrency vs Digital Currency

Digital currency is currency that is recorded digitally. It has no physical counterpart. Cryptocurrency is a form of digital currency that is held as a record on a blockchain database. While cryptocurrency is defined informally as a currency, legally it isn't. The blockchain is essentially a ledger of all transactions. It is a distributed database of this information (Crosby et al., 2015). Almost all money is digital these days and for the purpose of this essay I will focus on the differences between cryptocurrency and regular online banking.

Bitcoin is one of the more popular examples that uses blockchain technology. Proof of work (PoW) is the basis for Bitcoin mining. It is a cryptographic proof that proves that a certain specific computational effort has been expended. This makes it easier for transactions to be processed peer to peer in a secure manner. It requires huge amounts of work which increases as more miners join. With this system there is no need for a trusted third party. It also issues bitcoins into circulation.

One of the main problems with cryptocurrency is that there is a limit on the number of transactions per second - usually around 3.3 to 7 transactions per second. This is due to the fact that one block is produced by mining every ten minutes. It is not quite as scalable as regular online transactions such as Visa who processes around 1700 transactions per second on average. Visa claims to be able to process around 24000 transactions per second (*Small Business Retail*, n.d.). As it stands, crypto transactions do not scale as well as normal online transactions.

In general the Bitcoin network consumes less than half of the energy that is consumed by the banking industry (Mackintosh, 2021). This is a significant number, the miners in a bitcoin network have the option to turn off their equipment at any time.

The dependability of bitcoin can vary as well. Banks are very reliable. But the value of bitcoin fluctuates quite a bit. It can increase very quickly as it did for the past few years. Current trends indicate that all cryptocurrencies are dropping in value at the moment. Criminals have a tendency to use bitcoin as its safety is questionable due to the frequency of its value fluctuating. There can be crimes such as stealing of investor coins, or even scams in crypto investing.

Specific Apps

DTube is the decentralised alternative to Youtube. It uses IPFS to host all of its video content. It exists on the blockchain and creators can be assured that their data is safe. Another benefit is that the data cannot be censored outside the DTube community. It is a

secure system as there is no central server with everyone's data. DTube uses the Steemit Cryptocurrency to reward its content creators

Openbazaar uses a peer-to-peer network for users to buy and sell products. It uses a client server software with an IPFS stack for each user. It also uses Bitcoin for payments. It is often used to sell illegal items which is a large problem in decentralised applications. At one point peer-to-peer with illegal content occupied over 50% of bandwidth on the internet.

Decentralised social networks are a blockchain based application. In these social media applications there is no censorship which has become a major talking point over the past few years. A select few companies own all the social media applications currently which means they have the ultimate control and authority over what is said on these platforms.

Decentralised Apps For Developers

One of the problems with decentralised applications from a developer perspective is that updating them is very difficult. To update a decentralised application there must be an update done on each and every node. Another problem with this is that at least some part of the application must be controlled by a single centralised entity such as an administrator. This is not decentralised as you would expect.

Each decentralised application should have a repository that the developers can connect to. Everyone in the network should be able to review pull requests and new updates. Then when it is deployed to the main node all the rest of the network will also download and implement these changes (*Maintaining Decentralized Apps and Applying Updates*, 2022).

It is difficult but not impossible to update these applications once they are employed as you can see. This means that for developers of decentralised applications there is an extra layer of ensuring that the application is working as expected. If there is a security issue in an old version then great care must be taken to ensure this doesn't happen again in the next update.

Conclusion - Answer the Question

In this essay I focused on analysing some more specific decentralised applications in comparison with the centralised equivalent. I think that the current system of centralised applications won't continue to be the only type of application on the internet. I think that elements of decentralisation will become more popular as time goes on. Some of the bigger companies such as Netflix are already looking into using decentralisation for their applications. Proof of work is an interesting concept that I think that will be used in the future as there will be no need for a trusted third party. The lack of regulation on decentralised apps at the moment will need to be improved if they are to be used more frequently. Decentralised apps are very resilient systems that can survive outages and there is no special position for a controlling party. Scaling these applications are difficult as well but there is room for improvement as in the study discussed earlier IPFS scales quite well.

Word Count : 1462

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