Decentralized Internet: The Trustworthy, Democratic – Digital "Garden of Eden"

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Abstract

[The] days of usenet, irc, the web...even email (w PGP) ...were amazing,"
~ Jack Dorsey
[Owner, Former CEO Twitter]

The main purpose of this paper is to investigate the evolution of the internet over the decades. It aims to analyze the need to shift the current centralized network back to the decentralized network. The decentralized internet offers more benefits than the centralized ones but also require careful trade-offs. The original goal of the internet was not meant to be centralized. The US Department of Defense (US DoD) wanted to establish a secure communication that could withstand the catastrophic wars and unanticipated situations. The paper also throws light on the success of the current internet today mainly due to developments in protocols like TCP/IP, WWW & HTML, Browsers, Search Engines, and ISP's.

Keywords: Centralization, Decentralization, Modern Internet, Privacy, Search, Discovery, Abuse, Monetization, Peer to peer etc.

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Bullet: Today's Web – A puppet of "THE BIG FIVE"

If we time travel back in 1983, we would see that the internet was completely decentralized. Every single person had freedom to publish their contents on it without relying on any external service providers. The internet was not owned by anyone. Even today, no one owns the internet and its infrastructure. But the power distribution and its dominance are left in the hands of few.

Earlier when the web came into existence, we used to connect directly with our friends in our network through IRC, Emails that is through desktop computers that communicated with each other. We CONTROLLED OUR DATA. However, after 2000s as the commercialization of internet begin its reign, we started using the "new" web, communicated with our friends and shared information to them through centralized services provided by third parties like Google, Microsoft, Amazon, Apple, and Facebook. A computer today without these services is just a screen. The "biggies" have monopolized the market.

A Secret Weapon, ARPANET: The pendulum is now swinging drastically the other way

It was the evening of October 29, 1969, when a metal box of the size of refrigerator arrived at the doorsteps of Leonard Kleinrock, a professor at the UCLA. It was IMP (Interface Message Processor) or "Interfaith Message Processor" believing to start something new, something faithful that would revolutionize the world. That was the day, the infant internet uttered its first word, its first successful message which was sent from Kleinrock at UCLA to his friend at Stanford Research Institute (SRI).

The original goal of Advanced Research Projects Agency Network (ARPANET) was to establish secure and impenetrable communication network across geographical locations for

the US military. Later in 1980's it benefited the research institutes too as the universities like UCLA, Stanford adopted it via an initiative by the National Science Foundation (NSF). The real game started when the ARPANET, NSFNET and DARPA (The Defense Advanced Research Agency) eventually got decommissioned and it paved the way for the big tech giants as they grabbed the opportunity of commercializing the web seeing that the people heavily depended on the internet. This is how the internet shifted from decentralized to centralized.

Today everyone like the blog creators, content creators, gamers, social media influencers, you and me heavily rely on the internet, they "have" to. Our day doesn't start without the web. A mobile or laptop or any smart appliance is just a trash without internet. This clearly shows the impact and transformation of the modern internet on people lives.

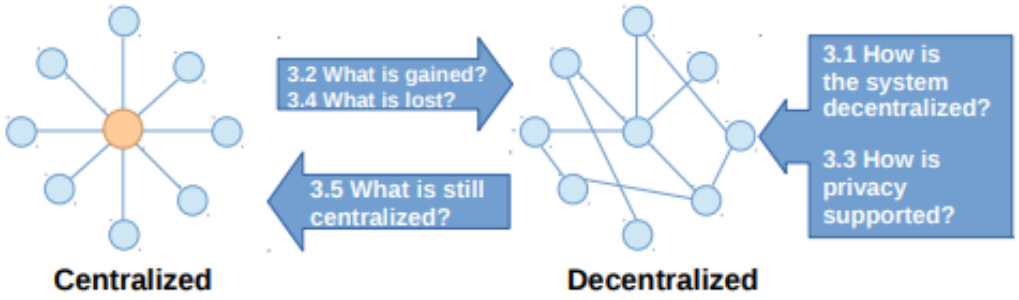

Fig. 1. From centralized to decentralized systems

The aspect of centralization that fetches our attention and which is something to be concerned about is the platform provided by the "biggies" determine the quantity of people using the internet. Millions and billions of users are forced to get a monolithic view of the internet designed by the impressively engineered distributed systems – "The Big 5". Single point of failure like outages, the very famous example is Cloudfare's 2020 failures created a global impact leading to unavailability of the internet and impacted many customers. To safeguard our data, we need to shift towards decentralized systems.

The Pros & Cons: Four Decade Long Journey of the Internet!

Nowadays, in midst of the hustle, trembled by the current economic downturn, and the turmoil of recession in which the US has been trapped, events happening in market like mass layoffs of the employees at giants like Facebook and Twitter, users are becoming more aware and gradually noticing the challenges of the centralized internet. These powerful giants have now become the gatekeepers of the information. We have to rely on them, trust them. The centralized internet does not guarantee privacy neither is safe from a breach. Any fake or misleading information could be circulated among the public, basically the modern internet has the power to manipulate its users' decisions. Recommender systems are like hidden spies. Wherever you

browse, you are being tracked and this information is used illegally to gain profit by understanding the user behavior and playing with their minds.

A centralized internet is prone to attack, vulnerable to failures if the main hub goes down or gets corrupted. However, if your network contains various nodes, it becomes difficult to paralyze the operations and hit their operating systems. Decentralized systems offer freedom, control, and better privacy/security.

The Web Before the Web: The demise of Gopher, the supplemental web Gemini, and the advent of HTTP

There was a time when the HTTP was not a standard. Back in those days people turn their heads to gopher. Gopher was the old school HTTP. Super Dimension Fortress (SDF) was the major host of gopher services. Gopher.floodgap.com Gopher provided a platform to host info, pdf, text, video, sound. The main emphasis of this stateless protocol was on context rather than presentation. However, it failed to support huge scripting. The interface of gopher was "boring".

Then came a fix for gopher, a decentralized protocol called "GEMINI". There were others too like Mercury, Gemini, Apollo. But Gemini was unique. It was intended to supplement the web. It could not load images but could play an audio via text. It proved to be a boon for satellite communication, visually impaired due to its accessibility feature, it did not allow tracking and overheads and supported international standards. The goal of this protocol was to promote Simplicity, privacy, generality, and accessibility.

Gemini was a fit in simpleness of gopher and completeness of http. Fast forward to 1990's, the HTTP became a web standard. This heavy weight protocol was generic, stateless, and agnostic. It used HTML tagged in symbol. So, if we look at HTTP, it was just like a bundle of

services whose actual goal was to specify the presentation of the information, how a data should be shown. The birth of http was responsible for the advent of centralized system whose effects, our generation is facing today.

Analysis of Decentralized Internet Systems: The future of humanity is not AI, it is Decentralization!!

Experts say that the next milestone in evolution of advanced networking is the metaverse and the Decentralized web (DWeb). Blockchain is an encrypted, secure technology. Bitcoin and ether are a virtual currency, a cryptocurrency that operates free, without the intervention of governments, central control or banks and runs on Blockchain. It provides a decentralized ledger of transactions to the public. How about using these systems instead of intermediaries?

We came across many protocols in the past like the TCP/IP, Email, IRC, Telnet, Usenet, IMAP, The DNS, HTTP, there's one such protocol that supports file sharing and is based on peer-to-peer design system, and which is fully decentralized. This is a BitTorrent protocol. Its network is so robust that it can transfer huge files from one server to every customer. It follows the mirroring concept. User is the master here. Since the protocol is fully decentralized, there are no chances of any bottlenecks, and the user can experience fast downloads. The host on the other hand, does not incur bandwidth charges. Don't you think BitTorrent gained popularity? Of course, it continuous to gain fame because the downloads don't get affected if power crash or system failure happens. You get every piece of data untouched!

IPFS is a Point-To-Point(P2P) decentralized file storage system. It is like torrent that we use to download files using the BitTorrent protocol. It makes use of Distributed Hash Table (DHT) to store data in various nodes across the network. Objects are not allowed to be altered, instead versioning can be used to alter .txt, .html file for a website.

Secure Scuttle Butt (SSB) is a distributed social network that could work offline without the intervention of the Internet Service Providers. Users can perform all the activities staying offline supported by their Git repo. Users can find each other on the local network. SSB hold the power to replace Facebook.

Privacy, Monetization, No Abuse: Let's grab the power

Attracting flies with honey: The internet today abuses users by playing with their trust. No matter what, our feed or any website that we open gets cluttered with unnecessary advertisements. Today, you browse any website, it pops the dialog box to "Accept All Cookies". Unwillingly the user has to bear with such interventions. Cyber criminals illegally steal our information and sell our data. Your location gets traced too. Hackers trace you and monetize their malware.

Best Practices in bad business: Identity fraud is now a multi-faceted business. The online payment that you do after ordering stuff from sites, you voluntarily provide your credit/debit card details along with CVV, this user information is sold in bulks to the brokers making it almost impossible for the law enforcement to trace.

In the last couple of decades such crimes have increased tremendously, and the advent of centralized internet is to be blamed. But is it still possible to prevent such abuse by staying on centralized network? What preventive measures should one take? The answer lies in decentralization which is clearly explained by Jack Dorsey, the owner, and former CEO of Twitter. Below are the excerpts from his twitter page.

https://twitter.com/jack/status/1204766078468911106

jack @jack · 11 Dec 2019

Replying to @jack

twitter was so open early on that many saw its potential to be a decentralized internet standard, like SMTP (email protocol). For a variety of reasons, all reasonable at the time, we took a different path and increasingly centralized Twitter. But a lot's changed over the years...

71 707 4,180

jack @jack · 11 Dec 2019

First, we're facing entirely new challenges centralized solutions are struggling to meet. For instance, centralized enforcement of global policy to address abuse and misleading information is unlikely to scale over the long-term without placing far too much burden on people.

65 525 3,423

jack @jack · 11 Dec 2019

Second, the value of social media is shifting away from content hosting and removal, and towards recommendation algorithms directing one's attention. Unfortunately, these algorithms are typically proprietary, and one can't choose or build alternatives. Yet.

61 641 3,898

jack @jack · 11 Dec 2019

Third, existing social media incentives frequently lead to attention being focused on content and conversation that sparks controversy and outrage, rather than conversation which informs and promotes health.

81 923 5,319

jack @jack · 11 Dec 2019

Finally, new technologies have emerged to make a decentralized approach more viable. Blockchain points to a series of decentralized solutions for open and durable hosting, governance, and even monetization. Much work to be done, but the fundamentals are there.

78 778 3,581

Reinventing the Internet: Through the lens of a daily user

If we now fully migrate to decentralized systems possibility, is it will be better. You will directly pay for your stuff. For e.g.: micropayments based on cryptocurrency. You will secure your identity; passwords would disappear or only a single unique unrecoverable password that works everywhere could be established. Isn't it interesting? If you want to hear a song, just drop a coin in the crypto box, get a decryption key and listen.

Centralization hidden in Decentralization

Focus on a decentralized internet is much more than security. It tries to focus on requiring less responsibilities to address the latency related problems. People's desires and awareness is increasing due to the ongoing privacy scandals by the "biggies", going back to decentralization won't be as easy as we think. People are now used to working upon centralized internet, it would be difficult to turn our heads to decentralized networks. People's desire for transparency is increasing, but are they willing to adopt the past?

There is an increase in inclination among users to break up with the tech giants that promotes their own monolithic view of the internet and anti-competitive behavior. This could inspire people to move towards a decentralized internet. We came across the numerous benefits that a decentralized internet provides but user today don't want to step in and bear the responsibility. The P2P may not favor those who already are addicted and attached to the third-party platforms. A worldwide implementation of the internet and shift to decentralization may not emerge as friendly union.

Richard Stallman clarifies this with a daily life example. "Imagine that you purchase a new apartment, and the basement is locked, and the builder had the key. If you want to make any

changes like repair, or decorate it, you must go to him. What if for some reason, he is out of town or tells you to get lost? You would be stuck". This is exactly the internet today.

Conclusion

"Decentralization is a continuum, not a binary choice."

In this paper, we saw the benefits and ease one gets by using decentralized internet. It has the potential to solve many problems that the current internet is facing. It shows the resiliency against cyberattacks by eliminating single points of failure. We can achieve the prevention of Data breaches by declining to store information in data stores. Users will get control and ownership of their data. In short, the user will become the King and chooses or change the services at his/her will. But how can decentralization at such level be achieved? This remains the main challenge. As we know practice makes man perfect, the techies, tech-savvies will understand the complexities and intricacies involved. What about the ordinary man? The ordinary man won't easily get used to decentralized internet. There is still this void that needs to be filled. There is a possibility that they may connect with intermediaries for the help. This network architecture has immense potential to serve humanity with trust and freedom granted solely to the user. We can only hope that a day comes in future when the decentralized network is accepted by all, at a global level.

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