UNet– A Decentralised User-Centred Social Media Platform Without Bias

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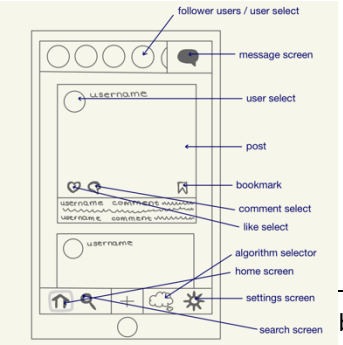
Abstract

The world is becoming increasingly driven by data. Through social media, users can interact with each other and share content globally. However, the traditional centralised infrastructure of these services calls into question the inherent trust we put in these organisations and whether with the lack of transparency and the absolute control they have over both the content we see and our personal data means a better solution is needed. To solve this, we present UNet, a transparent, modular and secure social media platform harnessing the potential of the Tezos blockchain to allow for a decentralised content distribution network users can trust. UNet ensures its users' safety from manipulation from external parties or "ownership bias" due to its decentralised infrastructure and promises a "user-first" initiative allowing for complete anonymity and lack of censorship or data collection. Additionally, users can be confident in trusting the platform's security due to the blockchain consensus mechanism and are able to control how and what content they see through UNet's custom front-end interpreter.

(I) Background

Social media by nature promises free speech and freedom of opinion. However, with a small group of people within corporate entities setting the rules, this core component of social media becomes somewhat corrupted. Due to the corporate nature of these platforms, it becomes unclear what the true cost and consequence of using them are: a fact that's becoming increasingly clear with the recent Facebook[1] and Instagram[2] data scandals. The manipulation of social media platforms for social engineering, where users are dehumanised and catalogued as assets and their rights and safety not being the main priority, has led to degradation not only in central parts of society such as democracy in politics[3] but also, the lack of concern could severely damage users' mental health; Estimates suggest more than 210 million people worldwide suffer from addiction to social media. Furthermore, the internet[4] with symptoms of depression are twice as likely to appear in people who spend 5-7 hours on screens[5] and are 71% more likely to have one risk factor for suicide[6]. A safe environment where users not only have choice over the algorithms they are immersed in but could also develop their own algorithms to become a part of the platform's ecosystem has the potential to address this. Social media such as Twitter and Instagram have an immense botting issue where phishing, harmful content and dangerous social engineering attacks are propagated through. This is due to their free ad-based model which doesn't penalise the creation of many alternate accounts, nor hard limit the rate of messages.

(II) Proposed Solution



Example Front-end Layout

We propose a decentralised social media platform using the Tezos blockchain to both secure data and remove corporate-motivated bias giving users a safe environment to express their opinion and share with others where they are placed at the heart of the design. The platform will be able to be used in both an open and completely anonymous mode as detailed in Section II-D. The social media platform will be modelled off current popular platforms such as Instagram and Reddit, where users can post content, view, comment, like others' content, search for specific content and be recommended content from an algorithm of their choice and message other users. The lack of

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book scandal: Who is selling your personal data?",
echnology-44793247

26/11/2022, 20:27, Dailymail "Instagram is hit with $500BILLION class action lawsuit accusing the Facebook-owned platform of illegally harvesting up to 100 million users' biometric data"
https://www.dailymail.co.uk/news/article-8620989/Lawsuit-accuses-Instagram-illegally-harvesting-biometric-data.html

[3] 26/11/2022, 21:02, Maryville University "Social Media's Influence on Elections",
https://online.maryville.edu/blog/social-media-influence-on-elections/

[4] 26/11.2022, 19:50, ScienceDirect: "Life satisfaction: A key to managing internet & social media addiction"
https://www.sciencedirect.com/science/article/abs/pii/S0160791X16301634

[5] 26/11/2022, 19:57, Time: "There's worrying new research about kids' screen time and their mental health",
https://time.com/5437607/smartphones-teens-mental-health/

[6] 26/11/2022, 19:54, NPR "The Risk Of Teen Depression And Suicide Is Linked To Smartphone Use, Study Says",
https://www.npr.org/2017/12/17/571443683/the-call-in-teens-and-depression

central ownership means users are assured that data is not collected about them. Instead, they contribute to the platform through Tezos gas fees and computation to support the platform, both clear costs without hidden agendas. Users are able to dictate their own experience on the platform by either choosing the platforms recommendation algorithms or designing their own which become incorporated within the platform's ecosystem. The inherent impenetrability of the Tezos blockchain ensures the platform secures user data well as it removes a central authority for hackers to target as well as providing the consensus mechanism making changing any individual block virtually impossible. Section II-A details the explanation behind choosing a blockchain as the heart of our infrastructure and Section II-B explains why specifically the Tezos platform. Section II-C details the Interplanetary File System (IPFS) and how this underlines our storage system mechanism. Section III speaks to the feasibility of our platform by using proof of concept examples.

(II-A) Blockchain

The decentralised nature that comes from using a blockchain helps tackle the problems outlined in (I) Background as it creates an environment not run by any one central authority but instead allows the users to dictate their own platform while hosting the platform on a virtually impenetrable foundation. Our design allows messages and posts to be modelled via transactions to a smart contract database using the user's cryptocurrency wallet. This allows for a unique online identity while also complete anonymity as there are no inherent links between a cryptowallet address and any personal information as well as providing no possibility of impersonation which is a widespread issue online unless the crypto wallet itself is compromised. The verification of user through logging in with their crypto-wallet also helps prevent cybercrime such as public deformation which feeds into cancel culture having the potential to both vastly encourage confidence in the platform while also helping prevent the destruction of users' mental health due to insecurity of their social media platform. It could also potentially save activists executing their freedom of speech from governments by providing them with the shield of anonymity necessary. Creation of messages and posts act through our custom-built smart contract on the Tezos blockchain. A small gas fee is incurred of about 0.001 tez which is a tenth of a penny at the current conversion rate, which we believe is a small trade-off for the usage of a decentralised system. This will also help to combat spammers and botting which are prominent issues in current social media which spread phishing attacks and harmful content and incur a penalty on those who seek to abuse the system by having a hard resource limit of Tezos to block malicious intents.

(II-B) Tezos Blockchain

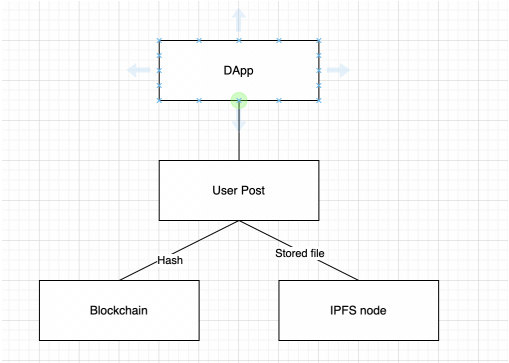
The Tezos blockchain forms the foundation of our solution; an ideal social media platform should be futureproof and with updates built on user-centred-design. Tezos' aggressive self-amendment protocol allows future innovations suggested by users to be seamlessly implemented into the blockchain. This not only allows users to have their own input into the platform at the core of our infrastructure but also guarantees future security of the platform as it constantly updates itself to combat any potential threats and also futureproofs the technology which we host on. The automation of this feature is key to our platform's success as ideally after initially setting it up (see Section IV-A), we would allow the platform to grow with as little developer intervention as possible to allow for a completely user-run platform. Additionally, Tezos has quicker block creation rates in comparison to other common blockchains such as Bitcoin[7], being about 10x faster from 10 minutes per block (Bitcoin) compared to <1 min per block (Tezos), as well as being more environmentally friendly due to higher efficiency in its the proof by stake mechanism. As our platform runs off a blockchain, the block creation rate of the blockchain is crucial to ensuring the speed of our platform for a fluid user experience during conversations and discussions.

(II-C) Big Map Record Storage

We use a big map datatype to store records of timestamps of messages and the corresponding crypto wallet addresses who sent out the message. As big maps are able to adapt to extremely large storage sizes without disrupting the rest of the blockchain due to their lazy serialised nature, we find this to work great as it allows scalability to beyond millions of messages on the blockchain. We overcome the inability to iterate through the big map with search algorithms by working off the blockchain on the IPFS system and performing the search algorithms there. Using the big map with unique time stamp and crypto wallet address, we can confirm through the blockchain that the entry in the IPFS system is accurate regarding author and message.

(II-D) Peer-to-Peer Network Storage Solution for Posts and Messaging

[7] 26/11/2022, 21:34, WalletInvestor "Tezos - (XTZ) vs Bitcoin - (BTC) Comparison – 1 day" https://walletinvestor.com/compare/tezos-vs-bitcoin



IPFS allows computers all over the globe to store and serve files as part of a giant peer-to-peer network[8]. When a user makes a post, this post is given a Content Identifier (CID)- a unique address derived from a SHA-3 hash of the post's contents. SHA-3 is the latest secure hashing algorithm[9] with a high collision resistance of $2^{n/2}$ making it unlikely to encounter any collisions in the near future. By mapping the CIDs to people with the content addressed by that CID, a Distributed Hash Table (DHT) is created with each node storing a subset of the hash table and information about the addresses of nodes storing other relevant sections. When a user views another's post, they download the CID in the DHT to find the poster's IP address and download data directly from them. By comparing the selected post's hash in the blockchain to the hash of the actual data stored in IPFS, the data can be verified to be the correct selected data. This system offers an alternative solution to storing data directly on the Tezos blockchain which would be computationally expensive and significantly reduce the inclusivity of our platform due to economic constraints. The speed and reliability of this system stems from the number of users on our platform as downloads are spread between all of them. See Section IV for further details. To protect users' privacy, anonymity and hence helping to stop censorship, we consider several ways to implement anonymity into IPFS. Changing from its usual TCP/IP protocol, it could be powered using an I2P protocol providing invisibility to users. Another approach is to adopt the usage of Tor, which may be adjusted to give a non-anonymised solution for users who do not prioritise anonymity as much, but also a slower but anonymised solution for users who do need it at the same time by using more route bounces. The mixing of the two types of users traffics helps stop overkill anonymity for the average user but also increase the effectiveness of Tor identity masking.

(II-E) Custom Front-end Interpreter

Our solution is modular as it is at its core a decentralised ledger of message-content ownership on our database within our smart contract and IPFS storage system. The smart contract is immutable after upload as well as the IPFS upload, protecting against censorship. We do this by providing no way of removing entries from the database when uploading the smart contract, as well as to the IPFS framework which is able to show tampering and reject censorship from any changes to the hash (as the post contents would've changed and IPFS uses SHA-3 of its contents for the CID). This means that users can choose to interact with this database in any app or program as long as it has the ability to read the blockchain and IPFS. For example, common apps such as Reddit, YouTube or Instagram could be repurposed to pull content off of the dual database instead. This would ultimately allow the user to choose a custom front end interpreter of the database, so they can choose a solution with what they like. They would be able to change recommendation algorithms, search algorithms and viewing UI, limited only to the creativity of developers of the interpreter. As creator bias is removed, there is no incentive apart from the user's own which decides their experience. As the front-end interpreter can be any app (as long it has read capabilities), extensions to limit screen-time, filter out and block out inappropriate, racist and hurtful comments can be built and shared across the internet between users and independent developers. Everything about the front-end experience which defines a great deal of the user's experience can now be decided by the user completely.

(II-F) Search Algorithm Mechanism

IPFS: For searching, we will have the address and an array of the file. This will mean we won't have to search the whole blockchain but find the address of the blocks on which that specific array of info is, so we just get access those blocks.

Blockchain: search performed on the IPFS database, ledger access using timestamp to verify ownership of messages.

(III) Proof of Concept

The feasibility of our platform is clear; though to the best of our knowledge we have not found an executed project the same as ours, projects with similar components exist proving our platform is completely possible.

(III-A) IPFS Database

[8] 26/11/2022, 22:31, Cloudfare "Interplanetary file System (IPFS)", https://developers.cloudflare.com/web3/ipfs-gateway/concepts/ipfs/

[9] 26/11/2022, 23:09, "SHA-3", https://www.sha-3.com/

IPFS is able to host large scale collections such as Library Genesis, which is a collection of scholarly resources totalling over 33 terabytes of data. This should be more than enough as extremely large social media forums such as Reddit only total to around 1.5 terabytes in size.

(III-B) Messaging Service

Numerous messaging services on the blockchain have already been created such as Dust, Cryptviser and Echo to name a few.

(III-C) Custom Front-end Interpreter

Any program with ability to read from the blockchain and IPFS will work – our system can be simplified to a database of content and there exist many solutions which currently pull content from a database. This is shown lots of popular online services such as YouTube or Instagram which all pull content from a database to display to the user. Smart contract and wallet interactions have been proven extensively such as with Tezos, and IPFS uploading products are widely available online and have been shown to work extensively too.

(IV) Further Improvements and Feasibility

(IV-A) Initial Proposed Business Model and Weaknesses

As mentioned in Section (II-C), the speed and reliability of our current proposed system relies on the online users of the platform to spread downloads between all of them. IPFS dependency means the quality of nodes hosting (in terms of what percentage of the total content they hold) the files must improve or else they may be compromised, and data could eventually be lost as there would not be enough copies shared through the IPFS system for obscure and less frequently accessed content. IPFS holds the CID but the actual files are hosted on a node's hard-drive. With a rising popularity and demand, we will see the rise of enough large size storage nodes that IPFS's unreliability will be negligible. It may therefore be necessary to initially plant "users'' to initially carry out these downloads as the platform gains popularity. After the platform has developed a community, this would be unnecessary.

(IV-B) Scotsman Qualification

Upon conducting a Scotsman Examination (SE), we have concluded that the idea is profitable with a high score therefore concluding that our idea is marketable and profitable. Through our initial market research as detailed Section I, there is a clear market pull for a decentralised social media platform tackling addiction, the current damage to users' mental health and lack of user control while also offering a platform user's can trust in securing their data, not having other potentially damaging motives and having a completely transparent cost. We can therefore conclude to the best of our knowledge that we easily surpass the criteria for the 1st and 8th sections. Upon reviewing competitors, we've concluded that while some platforms may attempt to address specific concerns, there is a lack of a platform which brings these ideas together into a single solution for the user which is needed to achieve all the benefits therefore achieving the criteria detailed in sections 2 and 3 in the SE. The criteria in sections 4-6 are relatively ambiguous in comparison to the previous sections however with the mass scalability of social media alongside the ability to quickly popularise our social media platform due to its inclusivity in both hardware and economic considerations, we believe we would fulfil these criteria. We have yet to however conduct a feasibility examination on the initial proposed business model with the potential £5,000 budget so further research would be needed into this temporarily decreasing our score. The ability to communicate directly with not only potential clients but also experts in the Tezos ecosphere has allowed us to both quantitatively estimate the popularity of this platform to a certain extent while also ensuring we talk to the given authority our platform will run on. As a result, we have concluded our platform will have at the least a 7/8 score on the Scotsman Qualification and is therefore more than feasible.

(IV-C) Blockchain Creation Rate

With our current model, the speed of our platform is limited by the blockchain creation rate of the Tezos blockchain. While this is not an immediate issue as the platform should still run quickly, when running in anonymous mode, with our current solution with Tor this would be noticeably slower than the average social media platform as the platform grows in popularity, we hope to either find an alternative solution to this. However, this is not a particular area of concern, as

through leveraging Tezos' self-governing and faster upgrades whilst not requiring applications to be remade after each one means it could be solved in the future when Tezos scales in users.

(V) Conclusion

The corporation of social media has led to users' needs becoming less vital to its design as they are treated to assets. This has led to many devastating effects from the obscurity of the true cost of using the platform, sacrificing the mental wellbeing of users for profit and due to its centralised nature, vulnerability of data stored in these platforms. To resolve these issues, UNet's infrastructure based off the Tezos blockchain ensures both the security of its users and longevity of the platform. Furthermore, by allowing for customisable front-end interpreters, UNet allows users to decide how they want to view their content and how the algorithm searches for recommended content helping drastically reduce the damage to mental health normally associated with social media. While this paper outlines a few possibilities for the platform, due to the customisable nature of its front-end interpreter, there are many more possibilities for extra features such as screen time managers or child-safe searches (by restricting certain words or by ML/AI inspired approached) which allow our platform to evolve with the user's experience.