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Decentralised social media

Roel Roscam Abbing *Malmö University*

Cade Diehm *The New Design Congress*

Shahed Warreth *Swansea University*

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Abstract: Social media platforms allow users to create digital identities, interact with other users, post and discover content. On mainstream social media platforms, aspects of the platform are centralised under the control of one umbrella. Decentralised social media are designed around the distribution of one or more aspects required to make social media function. Architecturally, these are data storage, content distribution, discovery, identity mechanisms and networking topology. Socially, these are their governance and revenue models. This article identifies and discusses three general types of decentralised social media grouped by architecture: federated, peer-to-peer, blockchain-based. Examples of each are discussed, along with a general description of their functioning and governance. Finally, the entry provides a general discussion of the drivers and issues around decentralised social media.

Definition

Decentralised social media can generally be categorised as federated, peer-to-peer (P2P) and blockchain-based. These platforms are designed around the distribution of one or more of the following: data storage, content distribution, discovery, identity mechanisms, governance and moderation, revenue models and network topology. Different drivers exist for decentralised social media, ranging from historical concerns over centralised power structures to more contemporary concerns about centralised platforms' content moderation policies.

Historically, there have been few formal definitions of what constitutes social media. In different academic fields, different nomenclature such as social network sites or online social networks have been used to talk about what is colloquially referred to as social media, with as many as six types proposed (Aichner & Jacob, 2015; McCay-Peet & Quan-Haase, 2017). Essential shared characteristics have been identified, as well as the need to distinguish between the different typologies of these platforms, such as microblogging or image sharing. While the typologies shift the type of content, the essential mechanisms are similar.

The core feature of social media is the social graph, which allows users to create profiles; establish connections to other users and interact with them; publish content; and receive feedback on this content (boyd & Ellison, 2007). Content publishing is the central social media activity, and is either made publicly available to all on the web or to specific groupings, such as users of the platform or accepted lists of followers. The content and the user's profile can be interacted with by following, commenting, reposting or leaving precoded reactions such as likes. On a technical level, social media platforms handle data storage; content discovery; identity establishment; addressing; and authentication. On a sociotechnical level, they also handle revenue models and content moderation (Gillespie, 2018).

Origins and evolution

Contemporarily and colloquially, decentralisation is closely tied to the discourse around blockchain technologies, but has functioned as a critique of centralised power structures since the advent of computer networking, operating as a cultural, normative and technical logic (Russell, 2014). Networks, and in particular the Internet, are imagined to flatten power hierarchies and be democratising agents (Bory, 2020; Baran, 1964).

With regard to web technology, on which the majority of platforms are built, the

dangers of centralising social functions has long been a concern, even prior to centralisation's emergence (Halpin, 2018). Consequently, the web engineering community has tried to decentralise key aspects of the social web through the creation of open standards, including identity provisioning (DNS, XDI, OpenID); authentication (OAuth); machine-readable web page metadata (RDF, XML, Microformats, Open Graph); and content transportation (RSS, ATOM, XMPP, ActivityPub). These efforts have had mixed results, partly because of internecine strife between different standards competing to solve similar issues (Halpin, 2018). Moreover, standards bodies such as the World Wide Web Consortium (W3C) and the Internet Engineering Task Force (IETF) have approached decentralisation technically and without considering economic, political and social issues.

While some standards have not been widely adopted, others have paradoxically helped cement the market dominance of mainstream, centralised platforms like Facebook and Google as they have co-authored and embraced key aspects of these standards. For instance, while the metadata standard RDF was not widely adopted, it inspired Facebook's Open Graph protocol (Halpin, 2018). By adding Facebook's 'Like' button, web pages are readable by social media platforms in a standardised way, and provide features like rich link previews, giving Facebook the ability to track users even when they are logged out. Similarly, OAuth was developed to securely identify users on one website using data from another. While this theoretically enabled a decentralisation of identity mechanisms, in practice it helped consolidate the position of Facebook and Google as the de facto identity providers through the 'Login with Facebook' and 'Login with Google' buttons (Halpin, 2018).

Nevertheless, the open protocols resulting from these standardisation processes also laid the technical foundations for decentralised social media. Besides academic experiments with decentralised social network architectures such as the Friend-of-a-Friend project, the first decentralised social media to get some degree of traction and publicity were partly or wholly based on these protocols. Subsequent decentralised social media projects all make use of these standards in one way or another.

Coexisting uses, meanings and types

Decentralisation has been characterised by the fuzziness of the term's usage and is thus in need of further characterisation and contextualisation (Bodó et al., 2021; Schneider, 2019; Troncoso et al., 2017). This section will provide avenues to characterise decentralisation in social media architecturally and culturally, and it introduces several examples of decentralised platforms, categorising them into the fol-

lowing: *federated, peer-to-peer* and *blockchain-based*.

The term decentralisation evokes its binary opposite, centralisation. However, in practice, centralised and decentralised systems are better understood as existing on a spectrum (Graber, 2021). With regards to social media, centralisation is used to discuss architectures where all aspects of a social media system are under one umbrella, including content moderation. This is the case in the aforementioned centralised platforms where all users are provided with identity, authentication, data storage, addressing and governance from the same provider. On the other end of the spectrum, one can find peer-to-peer (P2P) architectures, where all users of the system connect directly to each other and are their own sources for addressing, data storage, identity and governance. Each topological configuration has distinct advantages and drawbacks when it comes to aspects such as privacy, scalability, usability and persistence (Troncoso et al., 2017).

Limiting the assessment of centralisation and decentralisation to network topology is an oversight. Moreover, decentralisation also operates as a rhetorical and cultural logic with multiple drivers. Schneider (2019, p. 2) argues that decentralisation, while discussed technically, is used to refer to a social order. Specifically, he identifies ‘three interlocking legacies’ for decentralisation discourse: early computer networks, political theory and the blockchain. Similarly, Bodó et al. (2021), outline drivers ranging from information security concerns to concerns over power asymmetries and desires for political and economic disintermediation. In recent years, the content moderation policies of social media platforms have also been a driver for decentralisation. This is addressed in the governance and content moderation section.

Federated

Federated systems include the earliest attempts to create decentralised social media such as *identi.ca*, GNU Social and *Diaspora*, as well as recent projects such as *Mastodon* and *PeerTube*. Federated systems all rely on open web standards and are open source, and decentralise through online federation. Hosting providers (‘instances’) interoperate with other instances, allowing interaction between different instances. Different federated platforms are also interoperable with one another to varying degrees, similar to email, leading users to refer to them as the *Fediverse* (federated universe) (La Cava et al., 2021; Fediverse Network, 2020; Mansoux & Roscam Abbing, 2020). None of the federated projects follow a for-profit model, and are thus heavily reliant on donations, sponsorship, grants and volunteer labour.

The experience of the network is dependent on the instance you are part of as each instance takes care of data storage, content discovery, identity establishment, addressing and authentication. Since there is no global state for all messages and users, content discovery is contingent on the connections that an instance has established, which in turn depends on user-to-user connections. Therefore, what one can view also depends on what instance one is on, creating a pressure to establish connections with as many instances as possible. Moreover, if an instance disappears, the data of all users on that instance also disappears. Some projects such as Mastodon (2020) and Hubzilla (n.d.) allow users to migrate from one instance to another. For security and privacy, users are thus reliant on the administrative team behind each instance, as is the case with centralised social media.

Peer-to-peer

While peer-to-peer (P2P) systems have received significant attention in academic literature in the past (see Masinde & Graffi, 2020 for an extensive discussion), few have developed past the prototype stage and seen much adoption. Secure Scuttlebutt (SSB) and Briar are two examples with an active userbase.

SSB is based on the so-called gossip protocol, wherein users receive an identity and corresponding set of encryption keys which are tied to their device. Users establish contact with other users' devices, and receive and forward data in the network to users they know directly (Kermarrec et al., 2020; Tarr et al., 2019). However, one's data is propagated into the network only when they are followed. This means all users are potentially part of the infrastructure required to propagate data through the network, and that users collectively take care of data storage, content discovery and identity establishment. While in theory the network can be solely based on direct user-to-user interactions, in practice it is heavily reliant on so-called 'pubs', wherein the servers are also part of the peer network and always online, thereby providing better speed, consistency and reliability (Troncoso et al., 2017, p. 311). SSB's underlying mechanism is replicated append-only logs, meaning deletion of information is not possible as all changes must be propagated through the network (Tschudin, 2019). Histories of changes such as following someone, subscribing to a topic or changing display names are also permanent. SSB's funding is mostly derived from sponsorship and grants, but in some cases there is venture capital investment.

Similarly, Briar allows for private and group messaging in addition to the creation and subscription to blogs and message boards. Unlike SSB, Briar relies explicitly on direct interaction between users outside of the app. Data storage, content dis-

covery and identity establishment are therefore based on device-to-device interactions, while their authoring and publication interfaces mirror those of other platforms. At their core, P2P platforms such as Briar are examples in which the underlying social graph is fully disconnected from a centralised source, and publication or other functionality rely entirely on alternative methods for discovery, mirroring, content display and other core functionality.

Blockchain-based

Blockchain-based technologies are ‘a distributed network of computers, ideally organised in a decentralised way, mutually agreeing on a common state while tolerating failures (incl. malicious behaviour) to some extent’ (Valiente & Tschorsch, 2021). Blockchain-based social media feature cryptocurrencies which are usually created specifically for the platform and are derivatives of, for example, the Ethereum blockchain. Some are pegged to fiat currencies, usually the US dollar. Blockchain is an anonymised public ledger of all transactions, meaning anyone can look up the details of any transaction if they have the associated address or transaction hash. No transaction can be deleted or removed.

On blockchain-based platforms, cryptocurrencies are used for the monetisation of content and site governance, and are central to both the identity and revenue models of these platforms. Blockchain-based social media projects, like Minds (Ottman et al., 2018) and Steemit (Steem, 2017) are centralised in a single organisation which takes care of functions such as content discovery, identity establishment, addressing and authentication. Blockchain-based platforms have become synonymous with decentralisation in mainstream discourse due to their lenient terms of service and content moderation (Warreth, 2020). The scope of prohibited content is narrower as many of these platforms are a response to centralised platforms’ content moderation policies. As such, content is stored on the blockchain or through a distributed storage system. Notably, Web3, which is built on the Ethereum blockchain, seeks to build a new internet on blockchains, including social media, gaming and more (Roose, 2022). Examples of blockchain-based platforms include Minds (Ottman et al., 2018) and Steemit (Steem, 2017). However, Web3 has been deemed responsible for the ‘the hyperfinancialization of all human existence’ (Diehl, 2021).

Issues associated with the term

Governance and content moderation

Many decentralised social media platforms arose in response to the centralisation and therefore the power asymmetry of mainstream social media (Diehm, 2020), particularly with regards to content moderation. As platforms' content guidelines and the regulations governing them have changed, the (in)ability of communities to define what is acceptable has been a major driver for decentralised social media. As a result, users have migrated to other platforms or started new ones, though most have proven to be temporary or unsuccessful (Bodó et al., 2021; Edwards & Boellstorff, 2021; Warreth, 2020).

The perceived deplatforming of right-wing content from centralised platforms has led to increased interest in decentralised social media (Van Dijck et al., 2021; Barrett & Sims, 2021; Bevensee, 2020). One example is Gab, a platform based on Mastodon, with the ability to define one's own content moderation policy. Additionally, using federated software such as Mastodon allows for the use of the Fediverse's third-party mobile apps, which forms part of an explicit strategy to avoid deplatforming through the removal of branded apps (Van Dijck et al., 2021, p. 11). Similarly, Minds has attracted a notable extreme right user base, while supporters of the Islamic State and Al Qaeda have also promoted it (Popper, 2021; Rajendra-Nicolucci & Zuckerman, 2021, p. 31; Europol, 2021). Minds has stated that it allows extremist content in order to 'de-radicalize' users (Makuch & Pearson, 2019).

There are some examples of collective governance and moderation, including the Fediverse mobilising to collectively block Gab when it joined (Caelin, 2022). In the case of SSB, the use of codes of conduct and aesthetic signalling through imagery and language by developers, early adopters and advocates specifically aims to deter adoption by the extreme right (Bevensee, 2020, pp. 15-16). However, users are responsible for making their own decisions about blocking others. The act of one account blocking another is propagated through the network, which can indicate to others to also block the account (Kermarrec et al., 2020; Tarr et al., 2019). It is important to note that while such platforms bring greater transparency, their immutable nature means even truly objectionable content, such as child sexual abuse material, cannot be removed (Diehl, 2021).

Multi-stakeholder open standards model

Abbate (2000, p. 179) states that 'protocols are politics by other means', meaning parties working on technical standards use those standards to further their agenda

(see also DeNardis, 2009, p. 10). Meanwhile, ten Oever (2021) demonstrates that much of internet standardisation is voluntary, and adherence is therefore based on strongly embodied norms and principles which can be easily undone. Halpin (2018) outlines the paradox of the multistakeholder open standards model, where work aimed towards the decentralisation of the web further enabled its centralisation. However, the same processes and technologies also enabled larger decentralised social networks to emerge. As such, this work is critical but vulnerable to corporate capture. This can happen not only through “Embrace, Extend, Extinguish” (Simcoe & Watson, 2019, p. 6) but also through the accumulation of a majority stake of a tokenised governance model, a form of Sybil attack which blockchains are uniquely vulnerable to. One such example of this is documented in the case of Steem (Rajendra-Nicolucci & Zuckerman, 2021, pp. 33-35).

As corporate initiatives to standardise decentralised social media emerge, it is worth questioning whether it is realistic to expect this model to yield different results than it has historically. A further question arises about whether a new or unified standard built from scratch and driven by a single party is favourable over building on existing protocols and established multi-stakeholder forums. Finally, it is worth noting that such technologies are often built in the West, and exported elsewhere with ‘the belief that every social problem has a technological solution’, akin to a white saviour. Cryptocurrencies in particular have been touted as revolutionising poorer countries, in a mindset dubbed crypto-colonialism, echoing history (Ottenhof, 2021).

Conclusion

Several types of social media exist, with centrally controlled platforms being the most widely known. Centralised and decentralised platforms exist on a spectrum, and are designed around the following: data storage, content distribution, discovery, identity mechanisms, governance and moderation, revenue models and network topology. While there have been several attempts to create open standards to ensure a decentralised internet, the importance of several providers has nonetheless solidified, thereby reinforcing centralised systems.

Nevertheless, several decentralised platforms have shown promise, but have not yet gained widespread adoption. One particular driver for their adoption is the content moderation policies of centralised platforms. Decentralised social media are seen as an alternative to the power asymmetry of centralised platforms, offering users autonomy and greater control over the content they see. Regardless, these technologies bring their own concerns, most notably with respect to their

immutability and the monetisation of socialising. Moreover, the multi-stakeholder open standards model risks creating further centralised systems, despite their stated objectives.

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