

A Robot Economy for Music Without Any Middleman

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by

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Preface

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1

Introduction

Most audio streaming services are run by companies, incentivized to make money. They take large cuts of the subscription money from its users. As a result, the artists receive a low compensation. The distributors Spotify, iTunes and Google Play take on average a 25% cut for signed records and 40% cut for unsigned records. This thesis investigates the feasibility and usability of an audio streaming service without a central distributor.

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This thesis proposes a solution in the form of a decentralized system which uses a decentralized autonomous organization (DAO) to operate. Listeners, artists and robots form this DAO. The DAO has a shared responsibility for distributing content. In this system, its users (artists and listeners) share audio files and metadata without any middleman. Additionally, users can give donations to artists while the system does not take a cut of these donations. The user can use this system to discover, search and play audio files, targeted at music and podcasts.

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Section X describes the design of the system, section Y its implementation and Z its testing results.

XYZ



Figure 1.1: Artist compensation inconsistency

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Problem description

The most widely used music streaming services, with the largest music catalogs, run centralized, proprietary and closed-source software. The companies owning these services have a large amount of power in the music streaming industry because of their scale. The top 5 streaming services have a combined market share of 81%, so this can be regarded as an oligarchy. Because of their power, they can ask high commission fees or lock artists to one platform. As a result, artists receive low compensation. Furthermore, in closed-source software, the processing and storing of user data is nontransparent. The recommendation and playlist generation algorithms are also a black box for the user. As companies make money from selling data to third parties, their data-gathering methods are expected to become more disruptive for user privacy. At the time of writing, there exists no alternative decentralized and transparent music streaming system without intermediaries.

In central question, focus on power and economic incentive for artists

How can we design and implement a music streaming service that distributes the power from one authority to its users?

2.0.1. Platformization and gatekeeping

The infrastructure of current internet applications are increasingly moving towards 'platformization'. In essence, platforms are taking control of "the surface on which the market exchange take place" (Andersson Schwarz, 2016) with digital distribution and network effects enabling an increasing centralization of power. This phenomenon is related to IT gatekeeping: tying access of content to a specific internet service. An example of this is the release of the album *The Life of Pablo* in 2016, which was contracted to only be played on one platform, Tidal. In addition, the big music platforms are able to create a digital enclosure of content. This facilitates rent-based monetization of user data, described by (Harvey, 2002) as 'monopoly rent'. Namely, advertisers can lease a virtual space, relying on the predictive power of user networking and interaction data. The latest movement in platform accumulation is the monopolization of data. Large scale of data about user interactions with the platform forms a 'monopoly of knowledge' (Innis, 2007). The power of platform companies are raising because platforms, in general, tend towards monopoly (Srnicek, 2017).

In relation to gatekeeping, platforms are now given the task to perform moral judgements on content, for example whether to censor a certain artist. Recent examples exist such as the disappearance of Li Zhi¹, who published songs about democracy and social issues in China. All of China's main streaming sites removed his songs. In 2019, Apple Music also removed content from their platform by singer Jacky Cheung, who referenced the tragedies of Tiananmen Square in his songs².

2.0.2. Intermediaries take a large share

Artists publishing their content on a music streaming service such as Google Music, Spotify and Apple Music receive low compensation, because the intermediaries take a large share. According to Midia Research, the top 5 streaming services control 81% market share (Mulligan, 2020), which can be regarded as an oligarchy.

¹<https://www.independent.co.uk/news/world/asia/tiananmen-square-china-li-zhi-singer-disappears-anniversary-protests-a8940641.html>

²<https://hongkongfp.com/2019/04/09/apple-music-china-removes-jacky-cheung-song-reference-tiananmen-massacre/>

Together these streaming services have the power to ask high subscription fees. After multiple consecutive years of growth, 2019 became the first year in which digital streaming is the single biggest source of revenue for the music industry globally (IFPI, 2020). The global music market also gained a 33.5% growth in paid streaming subscribers during this year (IFPI, 2020). This trend is shifting power from decentralized music stores to centralized streaming services. At the same time, streaming services take a large cut in revenue, and artists are having a harder time making money from music. According to investigations by aCooke (2018) and ReCode (2015), the revenue cut of Apple Music and Spotify is between 25% and 30%. An additional problem is opacity: streaming deals on these platforms remain behind closed doors. For these reasons, massive audiences are needed to generate sustaining profits. An investigation by Bloomberg³ shows that a whopping 152,094 Spotify subscriber streams generate \$100 on average for artists. Consequently, only 0.733% of all acts generate enough revenue for an artist to make a living (Ingham, 2018). The International Federation of the Phonographic Industry states that as of 2018 there exists a "value gap" in digital music streaming, meaning a "mismatch between the value that some digital platforms [...] extract from music and the revenue returned to the music community—those who are creating and investing in music" (IFPI, 2018).

2.0.3. Monopsony power

Monopsony power means that a dominant buyer has the power to push prices down with suppliers. In the context of music, this means that artists have little choice over which platform to publish their music on, because of the dominance of one platform. A few major players in the music industry together form an oligopolistic market. Monopsony power in this area can lead to squeezing the producer side. An example of monopsony power is an event that happened in 2014, between Amazon and Hachette. Amazon, having a large market share on e-books, used its commercial muscle to demand a larger cut of the price of Hachette books it sells. This included for all Hachette books "preventing customers from being able to pre-order titles, reducing the discounts it offered on books and delaying shipment" (Ellis-Petersen, 2014). Along the same lines, the music streaming oligarchs can use their commercial muscle to demand low pays to artists. Spotify founder and CEO Daniel Ek declared to its investors that the increase in interactions with its in-house curated playlists "puts Spotify in control of the demand curve"⁴.

2.0.4. Recommendations and curatorial power

The Big Tech music companies recommend content that best fits their business model, which may be contrary to what is most useful to their customer. The companies can promote or dis-promote content by their choosing. This shows "curatorial power": the ability to advance own interests by organizing and prioritizing content (Prey, 2020). Musicians and record labels are increasingly more dependent on landing on Spotify-curated playlists. For example, a study done by the European Commission shows that, for a track to land on the Spotify-curated playlist "Today's Top Hits", it will see an increase of \$163,000 in revenue (Aguiar & Waldfogel, 2018). 99 of the top 100 playlists are curated by the company. So its recommendation algorithms and playlist curation systems are highly influential. As the top music streaming services run closed-source software, the inner workings of the recommendation algorithms are opaque to the user. These algorithms, fed by user interaction data, are in some extent also a black box to the company, as they are built using machine learning technologies. However, as noted by (Gillespie, 2014), the impression that algorithms are objective is a "carefully crafted fiction". Namely, they are altered based on company strategies. Companies are not obliged to explain their algorithms. In the context of recommendations, this leads to a "threat of invisibility": the problem of content regularly disappearing (Bucher, 2018), a phenomenon which is out of the hands of the artist, because of an asymmetry in knowledge over the algorithm workings. Frustrating for artists and labels is also the opaqueness of getting playlisted: it is unclear why "[...] a particular track was placed, or replaced, on a playlist" (Prey, 2020).

³<https://www.bloomberg.com/opinion/articles/2017-09-25/the-music-business-is-more-unfair-than-ever>

⁴<https://investors.spotify.com/financials/press-release-details/2019/Spotify-Technology-SA-Announces-Financial-Results-for-Fourth-Quarter-2018/default.aspx>

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Related work

3.0.1. Decentralized audio streaming services

Multiple decentralized audio streaming services exist. Examples are Audius¹, Resonate² and eMusic². All of these systems have in common that they save metadata and identifiers of audio files on a blockchain, and save the audio files in an off-chain database. All these off-chain databases are structured like IPFS³ with a company-run centralized interface between the user interface and the database. For a system to be fully decentralized, this layer should be removed. These solutions are closed source. Moreover, they use their own cryptocurrency to pay their artists which is an unstable income.

3.0.2. Decentralized content delivery networks

Decentralized content delivery networks are being investigated by multiple systems such as VideoCoin⁴ and DCDN⁵. Most of these start-ups use blockchain technology and their own-released cryptocurrency as a token to pay nodes that serve the content. This means that the incentive for running a node depends on the value of those cryptocurrencies, so this is an unstable situation for workers.

A fully decentralized audio streaming service requires sharing and streaming audio files over a network of nodes in which any participant can start and run a node. An example of such network is BitTorrent. The challenge with BitTorrent acting as a streaming service is that the requirement from the user perspective is to have low latency for streaming and buffering media files. For each file, the peer discovery algorithm is run, which is a slow-start algorithm. It also relies on having enough seeders per file available.

Torrent files contain a list of chunks, which represent the different parts of the related file. These chunks are called torrent pieces. Flawless streaming of media files over BitTorrent requires a smart algorithm to predict what file is requested next, and what torrent pieces should be loaded. BitTorrent relies on trackers to perform peer discovery. However, trackers are a central point of failure. To make the system more decentralized, a solution using independent trackers and a gossip protocol² can be used.

3.0.3. Incentives for file spreading

In a DAO, the party responsible for hosting and spreading of files is not well-defined. To tackle the tragedy of the commons, entities should be incentivised just enough for the system to be sustainable and usable, but no more. An example incentive system is bandwidth tokens².

¹<https://audius.co>

²<https://eMusic.com>

³<https://ipfs.io/>

⁴www.videocoin.io

⁵<https://www.dcdn.com/>

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Implementation

5

Conclusion

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