Stream-ripping:

Its role in the UK music piracy landscape three years on

September 2020

PRS for MUSIC

PRS for Music Foreword

Stream-ripping: its role in the UK music piracy landscape three years on builds on research we published with the Intellectual Property Office three years ago. The initial research, *Stream-ripping: How it works and its role in the UK music piracy landscape*, came at a time when little work had been done to understand the size of problem posed by stream-ripping.

The previous report allowed us to map the landscape of online music piracy and to gain insight into the functioning and the business model of stream-ripping services. We found evidence to support our assumption that stream-ripping was on course to become the dominant mode of online infringement.

This second wave of research shows that our expectation is now the reality: stream-ripping services account for more than 80% of the top 50 music specific piracy sites. We can see that the services are becoming more sophisticated, offering better quality downloads, evolving their revenue streams, and becoming more adept at operating beneath the radar, with many using the popular content delivery network Cloudflare to obfuscate the location of their servers. But what we can also see is that concerted efforts by the industry do work: a reduction of more than 50% of BitTorrent sites can be attributed to increased geo-blocking and enforcement efforts over the past three years.

Since this research was conducted, the world has changed beyond what anyone could have imagined. Amidst the massive societal changes, the almost global lockdown caused by the COVID-19 pandemic has also accelerated the acculturation of digital services. Online revenues have grown dramatically in recent years, but the digital world has always presented challenges alongside the opportunities, and online infringement remains a serious threat. Though the research underpinning this publication was conducted before the pandemic, its findings are nevertheless incredibly instructive. Looming longer-term economic uncertainty and the continued absence of income from live performance means that the revenues generated on legitimate digital platforms are more important than ever to the music industry. The use of illegitimate sites also carries wider risks for consumers: malware and potentially unwanted programs (PUPs) are often unwittingly installed by users during a confusing download process, leaving them vulnerable to scams.

While the report shows that our efforts are going in the right direction, it is equally clear that we must persist: we must continue working closely with government and industry to foster a secure environment for creators and consumers alike.

Andrea C. Martin
Chief Executive Officer

INCOPRO

Stream-ripping

Trends from 2016-2019

PRS for Music | December 2019*

***Updated September 2020**

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Project scope

This report was commissioned by PRS for Music to compare stream-ripping trends over a 3-year period, starting from October 2016 and ending October 2019, to the previous report delivered by Incopro in 2016.*

***This report was updated in September 2020 with amendments to the sample of piracy sites analysed, as highlighted in Appendix B.**

Stream-ripping is the process by which licensed content is copied from streaming services such as YouTube and Spotify and then stored for later use on the end user's computer. There are websites, software applications and mobile applications that are used to carry out this activity and this study looks at those methods in detail.

- **Part One** of the report provides a picture of the UK music piracy landscape, considering the most popular stream-ripping services being used in the country, and the overall proportion of music content infringement which these services are responsible for when compared to older methods of piracy.
- **Part Two** focuses on the technical composition of stream-ripping sites and services in terms of their technical infrastructure and functionality.
- **Part Three** investigates the user entry points to stream-ripping services, the licensed services being abused by these services, and finally the funding models of stream-ripping services.

Glossary

This glossary contains definitions of some of the terms and categories which are used throughout the report.

Stream-ripping services

Stream-ripping services are defined as any site, software program or app which provides users with the ability to download content without permission, and therefore illegally, from a third party internet stream which can be used offline. These services can be split into five further sub-categories, which have been considered throughout the report:

- **Stream-ripping download apps** source and download content from licensed services – delivering through an app.
- **Stream-ripping download sites** source and download content from licensed services – delivering through a website.
- **Stream-ripping sites** allow the user to download content from licensed services, via the input by the user of the URL/link for where the content is made available on the licensed service.
- **Stream-ripping plug-ins**, otherwise known as browser extensions, provide browser level functionality allowing for streamed content to be downloaded. The advantage of these services is that the ripping functionality can be turned on and off by the user in real-time without the need to switch between the streaming service and the stream-ripping service. Content can also therefore be downloaded in bulk, removing the need to download files one by one.
- **Stream-ripping software** is downloaded via developer websites, software or review sites, and allows for streamed content to be copied, or ripped, and stored as a downloadable file.

Established methods of piracy

- **BitTorrent sites** is a peer-to-peer (P2P) technology - a decentralised file-sharing system without the need to rely upon files being hosted by the site providing an index of torrent files. It is an efficient way to transfer large files across the Internet. Each part of a file downloaded by a user is then transferred to other users – there is no need for a user to have the entire file on their computer to share. Through P2P sharing and site rules, users are often not only downloading files for their personal use, but are also uploading their chosen file to aide others connected in the network, known as ”seeding”.
- **Cyberlocker host sites** work by allowing users to upload files to a cloud storage server. It is possible to access files on these sites through a link shared by the uploader.
- **Cyberlocker link sites** act as indexes or lists of links to content stored on cyberlocker host sites. Users can freely navigate content hosted on the site via the search functionality on the site or via search engines, meaning that files are easier to find for both would-be downloaders and copyright holders.
- **Proxy/other sites** have been categorised together in this report. The proxy sites considered in this report provide dedicated access to sites which have been blocked in the UK, allowing users to bypass this filtering to reach infringing content. “Other” has been used to group a variety of other methods of content piracy such as newsgroups (a forum for the discussion of a particular topic where files can also be posted for others to download) and other less popular file sharing methods such as eDonkey (an alternative to BitTorrent which allows users to share files in a decentralised network).

Other definitions used within this report

- **APIs** (Application Programming Interface) make it easier to develop a computer program or website by providing a way to speak to another computer system to request information or exchange data. For example, API calls to licensed services can be used by stream-ripping services to request content that they can then extract the audio from.

- **DDLs** (Direct Download Links) are links which direct users to the download of a file.

- **Malware** is a computer program software which is specifically designed to damage or gain access to the user's computer.

- **PUPs** (Potentially Unwanted Programs) are computer programs usually installed in conjunction with a program that the user wants. For example, a user may download a program for a specific purpose and be offered a browser extension or other tool as part of the software package. PUPs are not always benign and malicious examples include adware and spyware.

Key Findings

- In relation to the more established and historically popular categories of infringing sites, those categorised as **stream-ripping services** are found to account for a noticeable proportion of the overall music infringement activity in the UK. Usage of **stream-ripping services** accounted for 80.2% of the top 50 specifically music infringing sites;

- The **stream-ripping service** with the highest usage in the UK, by far, is the **stream-ripping site** *y2mate.com* - the recorded usage in October 2019 for this site amounted to 47% of the combined top 50 specifically music infringing site usage. **Stream-ripping sites** are the top used category in terms of overall usage from this sample.

- The legitimate service most abused through stream-ripping is YouTube, both in terms of the number of sites which provide **stream-ripping** capabilities for the service (80/100 of the sample surveyed) and the percentage of usage that takes place on YouTube specific infringing sites. Soundcloud is still offered, though always in conjunction with other licensed services. Infringement using Spotify has become more prevalent, with four of the sample being sourced there;

- The primary method of obtaining content via **stream-ripping services** is through the conversion of a link to a file using a **stream-ripping site**: a user pastes their chosen link into the website, which then converts the content into a file for the user to download. The predominant method of content delivery is through direct downloads, straight to the computer or device being used to access the service, rather than to a third party locker service such as Dropbox.

- The main user points of entry to **stream-ripping services** are found to be direct access to the services' domain and through search engines, with the exclusion of **stream-ripping software**. For **stream-ripping software** the source of traffic is almost the opposite, access is primarily achieved through organic search. **Stream-ripping download sites** are directly accessed 69% of the time; whereas the entry point for users is more evenly split for **stream-ripping sites,** with direct access at almost half, 49%, and access through search making up 46%.

- Web-based **stream-ripping services** rely predominately upon advertising for revenue. However, **stream-ripping apps**, **stream-ripping plug-ins**, and **stream-ripping software** also include payments as a source of funding. These services can charge for the initial download and installation and then for further enhancements brought about by upgrading to a premium licence. Another stream of revenue to these services is the bundled software; in most cases this results in users receiving some form of PUP (potentially unwanted program) through the installation process which may have unintended or malicious consequences. Facilities to accept the donation of cryptocurrency have been observed on three of the top **stream-ripping services**.

Part One

Stream-ripping in the context of the music piracy landscape

Stream-ripping can be defined as the process of obtaining a persistent copy of streamed content without permission, and therefore illegally, from third party streaming services. The user can create a downloadable file from content that is available to stream online. This process can be done using audio files or music videos but in both instances, audio copies of tracks can be permanently downloaded after a format conversion enabling the user to store them and listen offline.

The first part of the report considers the most popular music infringing websites to establish a top site list. With the top sites identified, the position of stream-ripping services in relation to overall music piracy, which has traditionally been dominated by more established methods of piracy, is explored in detail. Incopro tracks over 17,000 websites in its *Identify* database and categorises them by reference to the content that is accessible via them and the methods by which they make that content available. Metrics are gathered, such as visitor traffic and hosting location, which enables insight into the various aspects of the piracy landscape. To assess the proportion of **stream-ripping services** in the overall music piracy landscape, the top 50 most popular websites in the UK that make infringing music content available have been analysed.[1]

In this report, 'top x sites' refers to sites that are responsible for, or enable, the infringement of copyright in music content, as tracked by Incopro.

[1] For the purposes of this section, only those **stream-ripping services** which are provided via websites have been analysed, i.e. **stream-ripping download sites, stream-ripping sites,** and **stream-ripping software.**

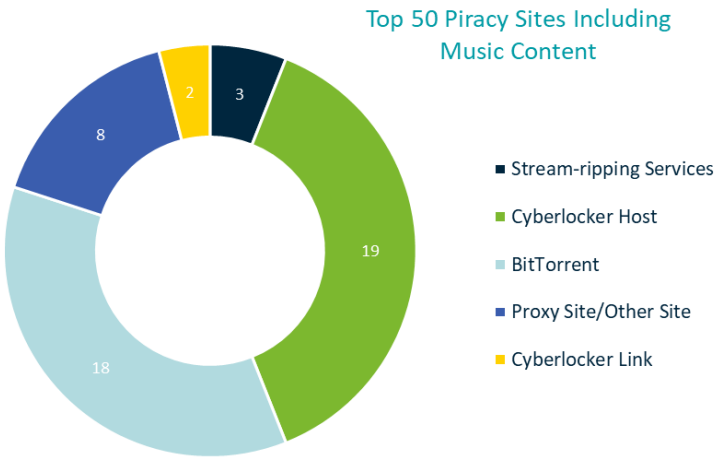
Most popular infringing sites which contain unauthorised music content

This section provides insight into the scale of **stream-ripping** in relation to overall content piracy in the UK. All infringing sites which contain music content (including those making music available alongside other types of content) have been ordered by their usage by UK users from the period between October 2016 to October 2019. The top 50 highest usage websites determined were then selected for further analysis.[2]

Stream-ripping services account for 3 of the top 50 piracy websites. This is an increase of 4% from the report completed in 2016. **BitTorrent** (18) and **Cyberlocker host** (19) are still the most common categories of sites which contain music content.

The **proxy/other sites** (8) category has slightly increased since the previous report, and consists of eight proxies, all of which lead back to **BitTorrent sites**.

Combined, **BitTorrent** and **Cyberlocker host** account for the majority of the most popular piracy categories (37/50). **Cyberlocker link sites** (two) have decreased slightly by 6%.



This top 50 approach provides a full picture of sites which may be being used to infringe music copyrights. One limitation, however, is that it is unclear exactly how much of the usage of these sites, which contain an array of content types, can be attributed to unauthorised music consumption and how much relates instead to the other kinds of content being accessed (e.g. film, TV, books).

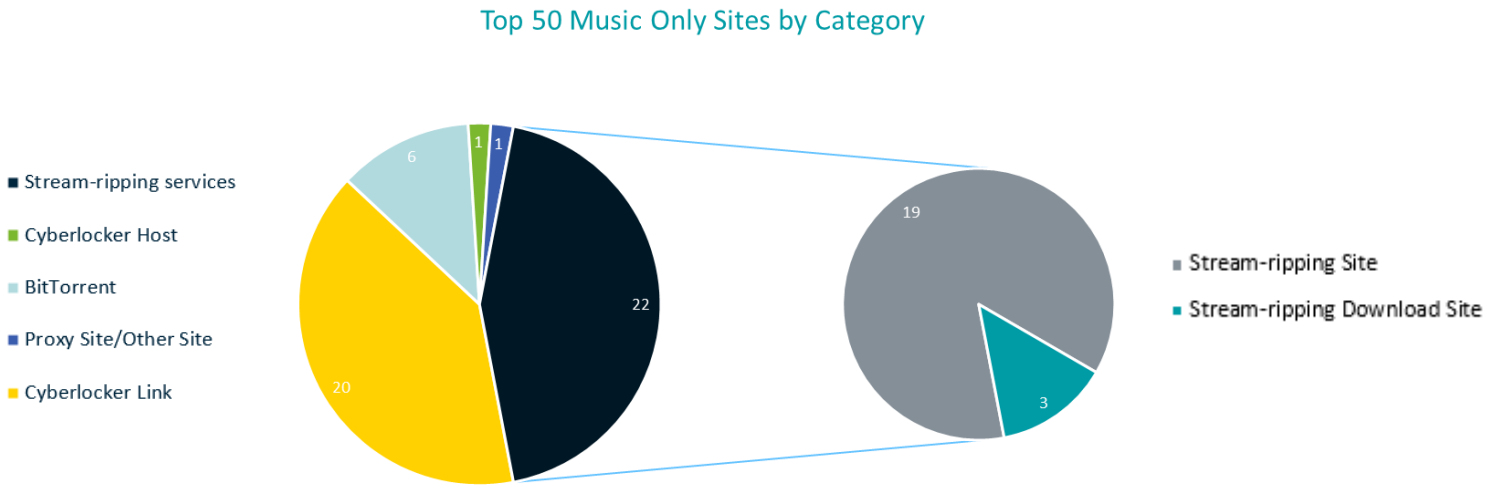
For these more generic content sites, where various types of content are made available, film and TV content has historically accounted for a considerable proportion of the usage of such sites. Only three of the top 50 sites which have been considered above are music-specific sites. This means that a significant proportion of the usage of the other 47 sites could pertain to other types of content. It should be noted that the usage considered in this report represents that of the whole site and may not relate specifically to music piracy.

[2] The methodology used to calculate site usage is contained in *Appendix A*.

To illustrate this possible bias, the top 10 most popular music and top 10 most popular video torrents on The Pirate Bay[3], a BitTorrent site, were analysed. There were 44,662 users actively sharing TV/film torrents and 3,422 users actively sharing music content. This represents almost a 13:1 ratio in users actively sharing TV/film content versus music. Although only indicative, it is helpful in understanding the context of music piracy on these websites.

Most popular sites providing unauthorised music content only

To provide a more music-centric landscape, the previous analysis was repeated focussing on websites offering music content only. This revealed an obvious change in the types of websites being used and especially in the prevalence of stream-ripping services.



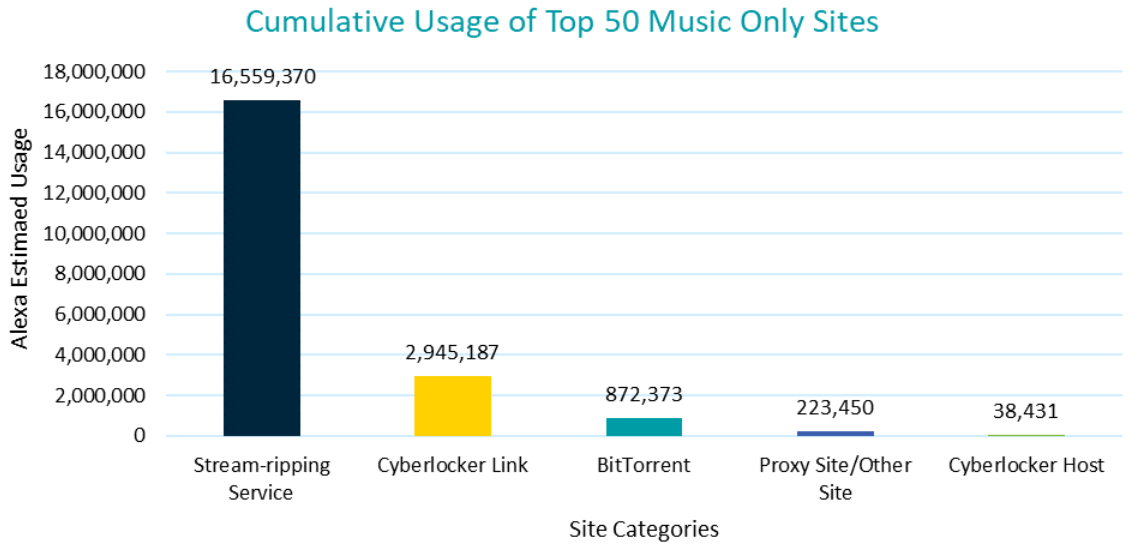
The proportion of **Cyberlocker link sites** being used for music specific content is considerably skewed in comparison to non-music specific sites. The reason for this is believed to be correlated to the ease of access with which users can search and directly download from large databases as the availability of reliable **BitTorrent** and **stream-ripping services** decline.

A large decrease in the proportion of **BitTorrent sites** can also be seen (from 14 to six), likely due to increased geo-blocking and enforcement efforts over the past three years.

The most noteworthy change brought about by specifically obtaining usage for music only sites is the introduction of 19 additional **stream-ripping services**. Breaking down the 22 **stream-ripping services** into their respective sub-categories reveals three **stream-ripping download sites**, followed by 19 **stream-ripping sites**.

[3] The proportion of audio and video activity analysed relates only to The Pirate Bay; this may change on some of the other popular platforms and has only been used to provide an indication of the balance in downloads of these two different types of content. Another point to take into consideration is that the active users in relation to torrents are worldwide, therefore there is the possibility that UK users do not follow the global trend of video content being more popular than music.

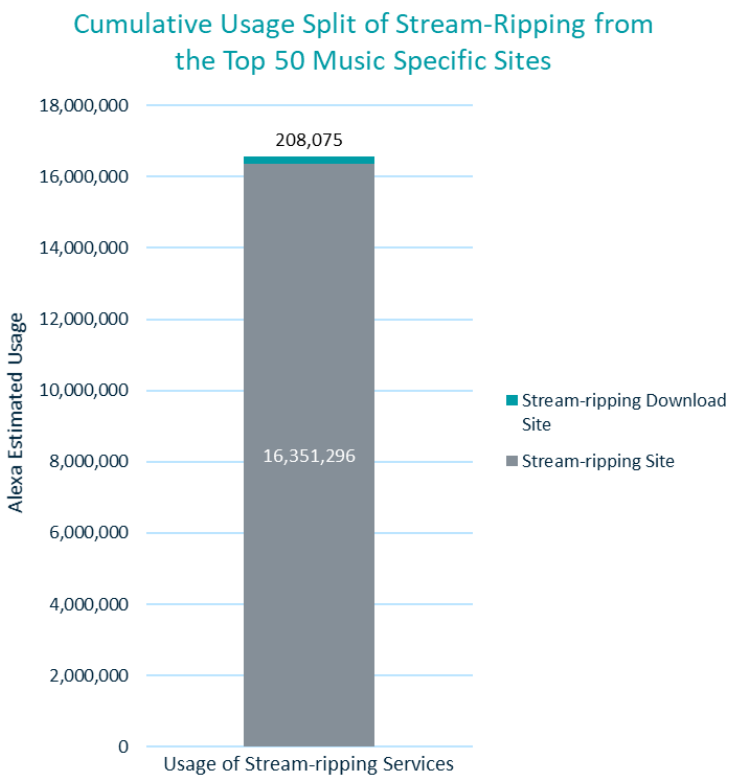
These sites have caused a shift in the overall breakdown of **stream-ripping services** as the October 2016 report reflected a slightly larger proportion of **stream-ripping download sites**.
The pie chart above shows 22 out of 50 websites related to **stream-ripping services**. The bar chart below reveals a slight increase in the usage of **stream-ripping services** in the top 50 music only sites. **Stream-ripping services** are responsible for the highest amount of use of the music specific infringing sites, ahead of **cyberlocker link sites**, accounting for 80.2% of the total top 50 usage, increasing by 12% since 2016.



A significant portion of **stream-ripping** usage relates to a single **stream-ripping site**: *y2mate.com*[4]. This site makes up 47% of the usage across the top 50 music specific infringing sites. The remaining sites in the top 50 account for less than 13% usage each.

[4] Y2mate.com is an active website offering stream-ripping capability

To analyse the **stream-ripping services** further, the cumulative usage data observed from October 2016 through October 2019 has been broken down into the sub-categories and is shown in the graph (right).

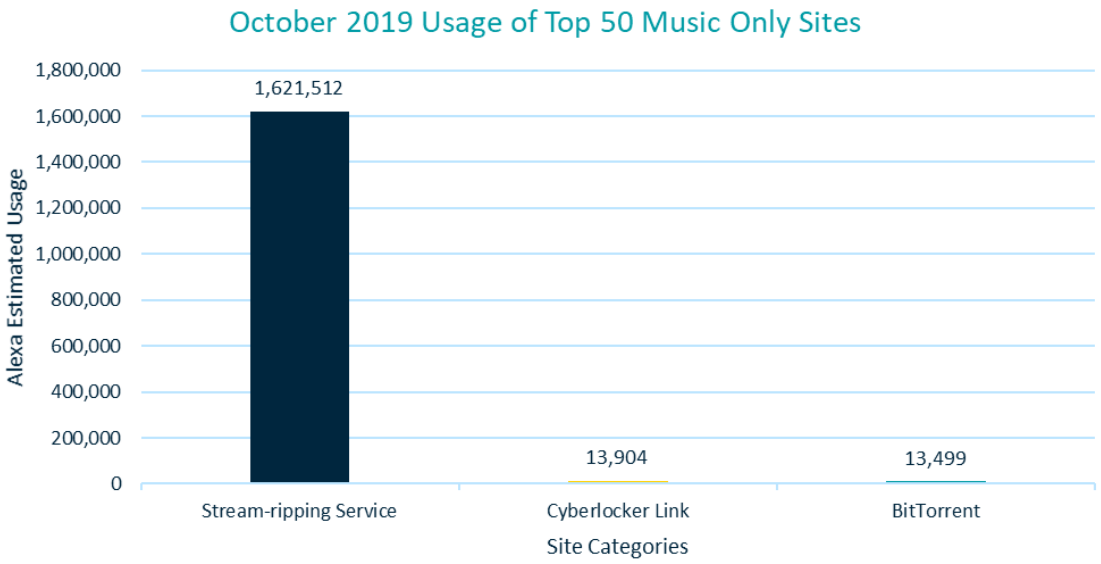


Viewing the data in this way demonstrates how **stream-ripping sites** dominate the percent of usage of **stream-ripping services**, at 98.7%.

Stream-ripping download sites are now responsible for a considerably lower percentage, 1.3%, a decrease of 10.5% since the previous report in 2016. The reason for this is likely to be due to targeted enforcement efforts on **stream-ripping download sites**.

Stream-ripping software[5] no longer appears in the top 50 based on usage, however they are still a prevalent issue. A breakdown of **stream-ripping software** available is provided later in the report.

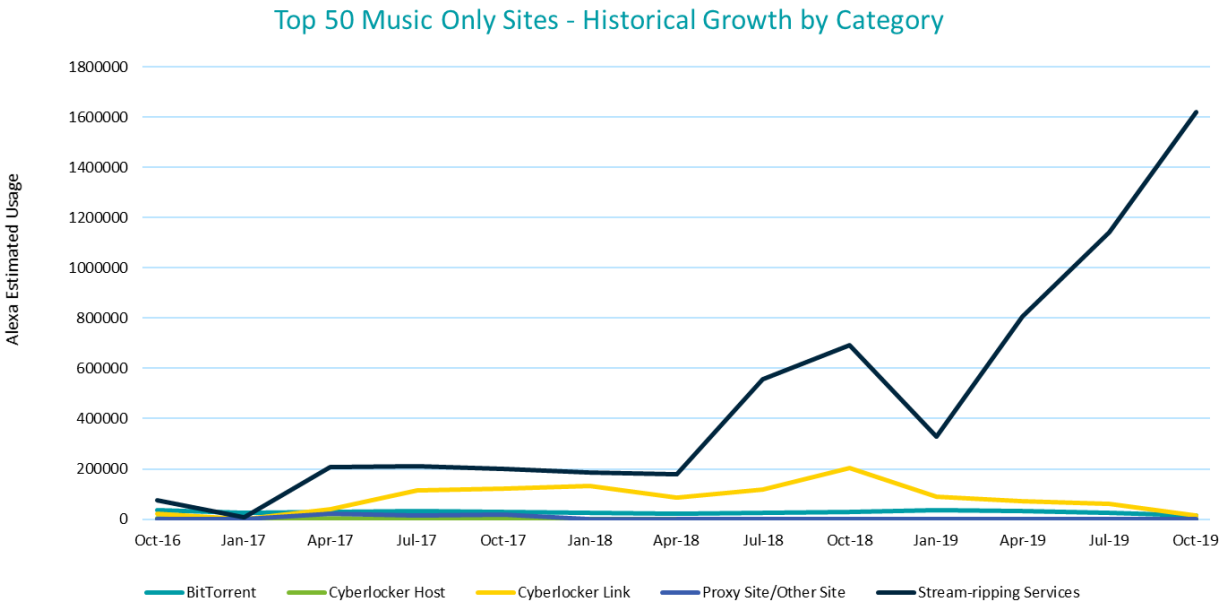
When looking at usage in October 2019 specifically, rather than cumulative usage, **stream-ripping services** actually account for 98.7% of the top 50 music only sites, whereas **cyberlocker link sites** and **proxy/other sites** have dropped out of the top 50 and are therefore no longer included.



[5] The **stream-ripping software** 2conv.com has also been included as a **stream-ripping site** due to the option to utilise an online converter, as well as the ability to download software for the purpose of **stream-ripping**.

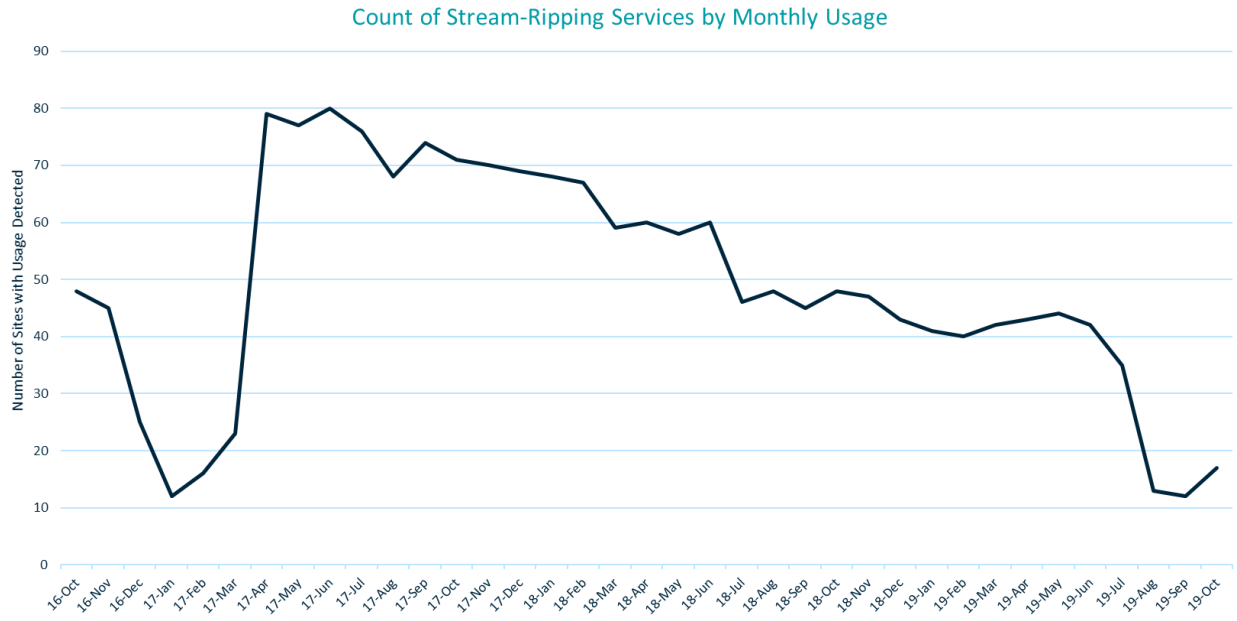
Changes in the music piracy landscape over time

To understand the evolution of **stream-ripping** over time, the following graph displays data for the top 50 sites, which contain music content only, for the period of October 2016 to October 2019 in the UK. Site usage has been combined by category to study the trends in usage over time.



The graph indicates that **stream-ripping services** have led in usage throughout the 3 year period ultimately increasing in overall usage by 1390% during this recorded period . There was a surge in the use of **stream-ripping services** in the first quarter of 2017, surpassing other categories. **Stream-ripping services** maintain a steady usage until mid-2018, at which point there is an upward trend. Later in 2019 we can see another surge, this is likely due to the emergence and popularity of the site *y2mate.com,* which has the highest usage of all sites. All other services remained fairly steady with usage under 200,000.

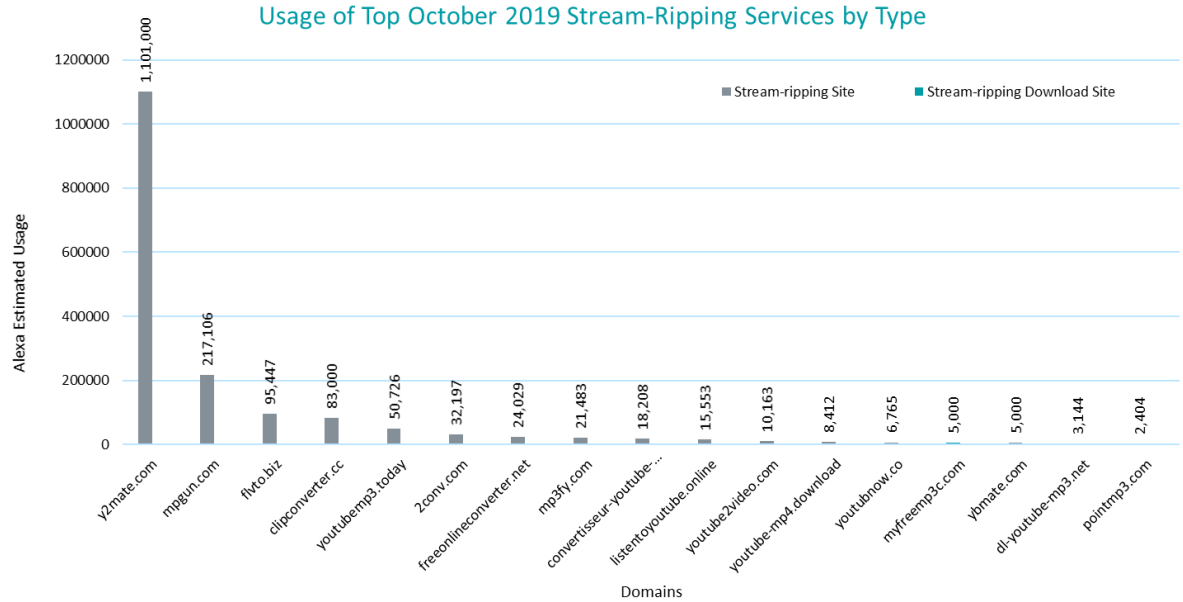
As an additional measure of the historical landscape for music only, the line graph below shows the amount of **stream-ripping service** sites for which usage was detected each month from October 2016 through October 2019. The decrease in usage seen in late 2016 is possibly due to the disruption efforts against these stream-ripping services, such as the geo-blocking of *youtube-mp3.org.* A surge can be seen in the first quarter of 2017, correlating with the jump seen on the Historical Growth graph above, and then there is continual decline leading into the last quarter of 2019, where only 17 **stream-ripping services** were recorded with usage.



Most popular stream-ripping services

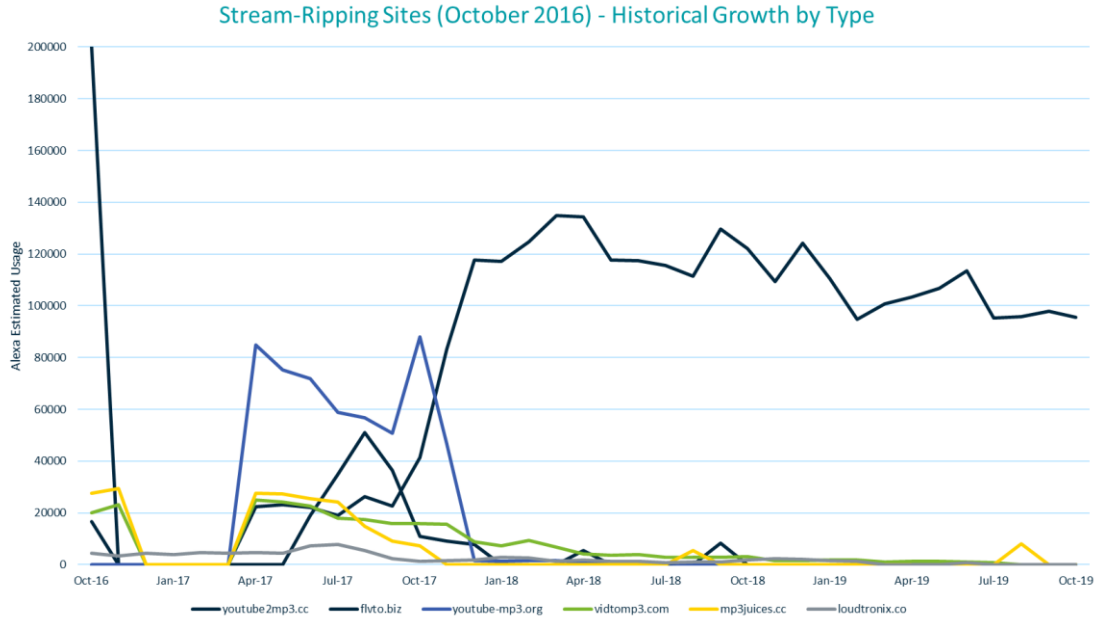
To understand the drivers for these statistics, the most popular **stream-ripping services**, identified from usage between 2016 and 2019, have been analysed to determine individual trends over time.

As of October 2019, the most popular stream-ripping service in the UK was *y2mate.com*, which dwarfed the usage of all other stream-ripping services. The significance of the dominance is clear in the bar graph below.



To put this usage gap into perspective, *mpgun.com*, which was the second highest usage site, recorded only 19.7% of the usage of the highest, *y2mate.com*, in October 2019. This site is unparalleled in popularity when considering the alternative **stream-ripping services** in the UK and is found to have been a leader in usage for several years, appearing first in late 2016. *Y2mate.com* has maintained an overall average monthly usage of approximately 648,184 over the three-year period observed since October 2016. This average usage is just under 300,000 more than the usage of the highest site in October 2016, *youtube-mp3.org.*

The 2016 report concluded the highest infringing **stream-ripping site** at the time was *youtube-mp3.org*. The graph below shows the lifespan of this site, and includes five additional sites from the 2016 top 20 music stream-ripping services list.[6]



It can be seen that even after *youtube-mp3.org* was geo-blocked for UK users, a small trickle of usage remained through May 2018, at which point it finally disappears. This proves the overall effectiveness of geo-blocking efforts.

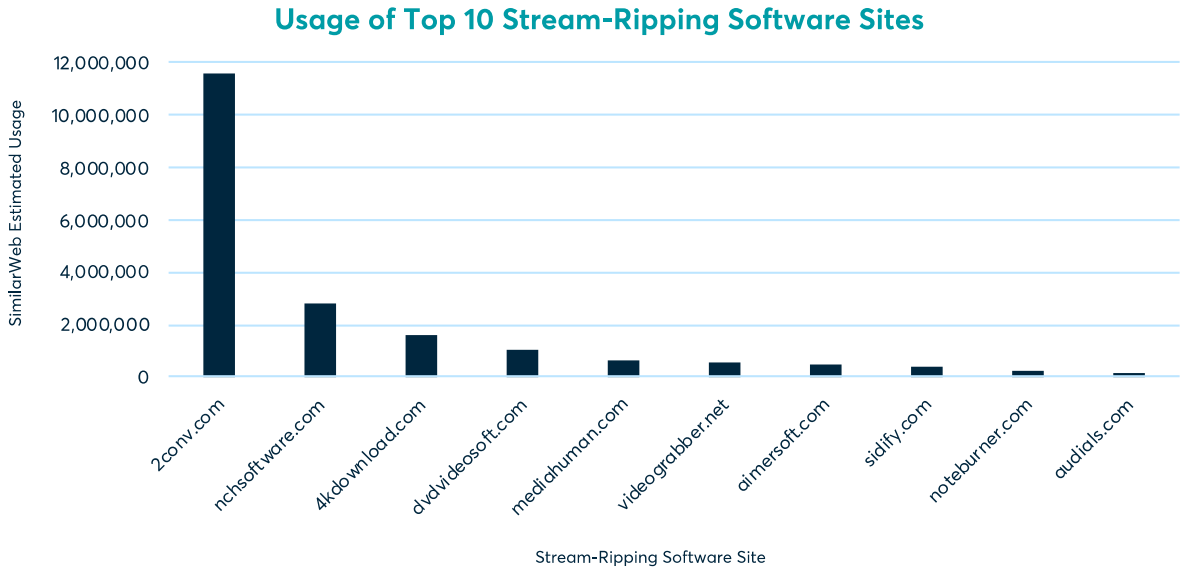
Most of the remaining sites which appear in the current top 50 list, excluding *youtube2mp3.cc*, maintain fairly low usage before dropping to 0 by October 2019. Although these **stream-ripping services** have enough usage to survive in the top 50 list, only one remains active in the top 20, *flvto.biz*. The life span of these tracked **stream-ripping services** further implies the inconsistency observed among those services while their decline reflects the enforcement efforts centred around music piracy.

Stream-ripping software

A breakdown of the top 10 **stream-ripping software sites** by estimated usage can be found in the chart below.[7]

[6] All 6 sites were selected due to their appearance in the current cumulative top 50 music only site list.

[7] Usage for the **stream-ripping software sites** is a cumulative amount provided by SimilarWeb and based on the entire site's usage. This number is assumed to be inflated, especially in cases where more than one type of software is offered within a domain.



Of the top 10, eight **stream-ripping software sites** offer at least two downloadable versions of **stream-ripping software** for installation. It appears that the most utilised **stream-ripping software** is from the site *2conv.com* which has also been included in the **stream-ripping site** category as they offer an online converter as well as software.[8]

Just one **stream-ripping software site** from the October 2016 report was identified as still active with usage data during the past three years: *Freemake.com*. However, usage has decreased significantly and it is not in the current top 50.

Users of the top **stream-ripping software** primarily have access to audio files with an average claimed quality of 256 kbps. This content is generally available for direct download only, however the software *noteburner.com* offers options to save to OneDrive and GoogleDrive.

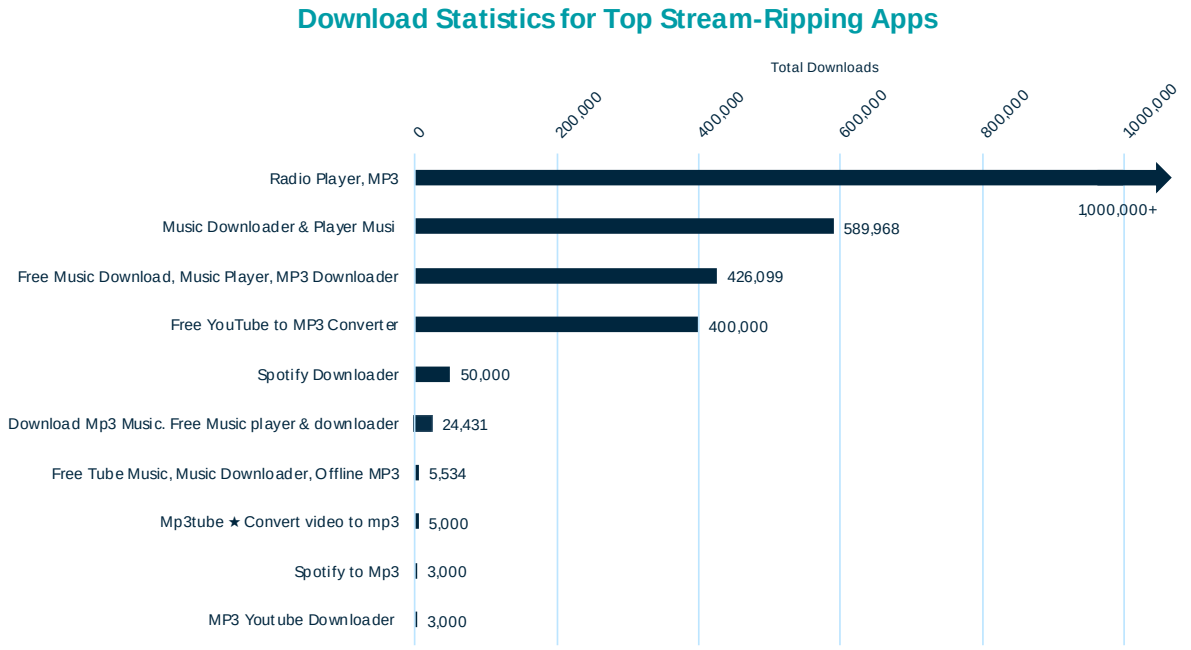
[8] Accurate Alexa usage was obtained for this site utilising methodology outlined in Appendix A; this can be compared with the usage in the 'Usage of Top 10 Stream-Ripping Software Sites' graph to further conclude the inflation of SimilarWeb statistics (899,328 Median Usage V.S. 11,600,000 SimilarWeb Estimated Usage).

Stream-ripping download apps and stream-ripping plug-ins

So far in this report, the data has been taken from those **stream-ripping services** that operate via websites. Two important subcategories that have yet to be analysed are **stream-ripping download apps** and **stream-ripping plug-ins**.

Turning first to **stream-ripping download apps**, a total of 10 popular apps were identified for analysis. Looking at the titles of these **stream-ripping download apps**, two out of the 10 explicitly mention YouTube, giving an indication of their primary source of content. Two others make potential references to YouTube, i.e. 'Free Tube' and 'Mp3tube'. Of the remainder, two specifically reference Spotify.

To measure the popularity of these **stream-ripping download apps**, data on global downloads of apps was obtained. These download figures relate to downloads of the apps themselves which are considered in this report and not content downloaded through them. This data revealed 2,504,032 downloads in total as of November 2019, just over double the amount from the 2016 report. A breakdown of this data by **stream-ripping download app** is shown below.

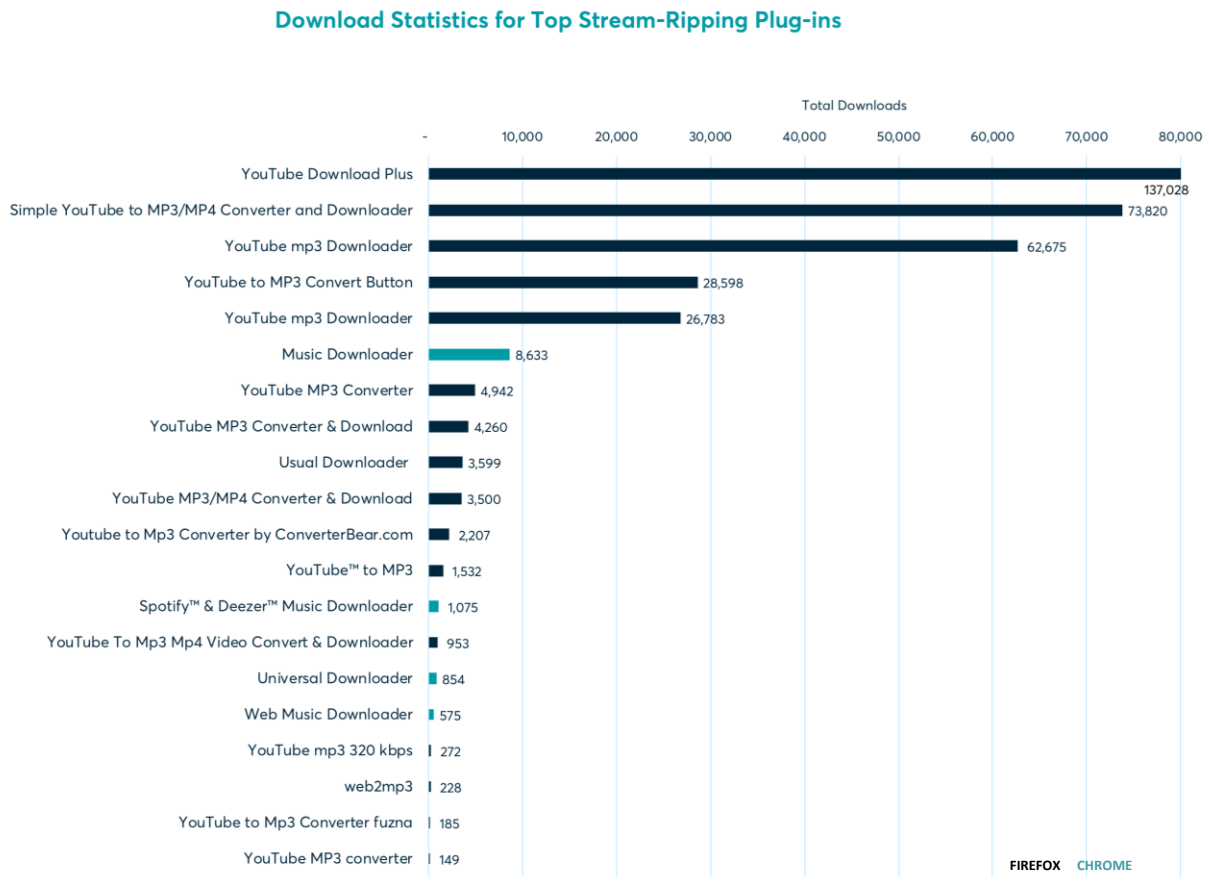


There are a couple of important caveats to these figures; firstly, the data is global and not focussed solely on UK users. Secondly, there is a wide array of app stores online which offer **stream-ripping download apps** for download[9]; many of these stores are less known, and not all app stores display download statistics. Stores which do share download numbers often inflate figures by providing ranges (500-3,000) or round up by thousands with an addition symbol (+).[10] It should also be noted that these figures are assumed to be accrued over the lifespan of the app as no date range is specified. For these reasons, the figures should be considered approximate.

[9] This sample is comprised of apps from GooglePlay, AppleStore, Aptoid, and *uptodown.com*.

[10] No record could be found on how these download figures are tracked.

Considering next the subcategory of **stream-ripping plug-ins**, a total of 20 were identified based on their popularity:



As the graph above shows, 14 of the **stream-ripping plug-ins** specifically reference YouTube as the content source in their titles. The remaining plug-ins are a mix of implied music downloaders (three), downloaders which do not specify the source in the title (two), and a single plug-in referencing Spotify and Deezer. All of the **stream-ripping plug-ins** listed here specifically mention being used to convert or download music in their descriptions.

While determining the most relevant **stream-ripping plug-ins** a noteworthy trend was discovered about entry points for potential piracy sites. Many plug-ins reviewed were indicated by user reviews to re-route the user to another piracy site rather than assist in converting and downloading music.[11]

The data for **stream-ripping plug-ins** has two key limitations: firstly, like **stream-ripping download apps**, the data is global and therefore UK downloads cannot be determined; and secondly, figures obtained are cumulative. As with **stream-ripping download apps**, the data should therefore be taken as indicative to give an idea of the scale of the issue.

[11] These **stream-ripping plug-ins** are not included in the displayed sample due to their absence of popularity, seemingly due to their lack of fulfilling their purpose as functioning plug-ins.

Part Two

Technical composition of stream-ripping services

This section of the report provides a technical analysis of the top 10 currently active **stream-ripping services** in the UK as identified in Part One. The **stream-ripping services** are examined to determine their technical infrastructure and functionality.

The following table lists the **stream-ripping services** considered and the key points from the analysis are discussed below.

Domain	Category	Obtain Content	File Type	Quality (kbps)	Content Delivery
y2mate.com	Stream-ripping site	URL + Search	Both	128+	DDL
mpgun.com	Stream-ripping site	URL + Search	Both	120	DDL
flvto.biz	Stream-ripping site	URL	Both	192+	DDL/Email/Dropbox
clipconverter.cc	Stream-ripping site	URL	Both	256	DDL
youtubemp3.today	Stream-ripping site	URL + Search	Both	130+	DDL
2conv.com	Stream-ripping site/ Stream-ripping software	URL	Both	128	DDL
freeonlineconverter.net	Stream-ripping site	URL	Both	192+	DDL
mp3fy.com	Stream-ripping site	URL + Search	Both	256-320	DDL
convertisseur-youtube-mp3.net	Stream-ripping site	URL + Search	Both	192+	DDL
listentoyoutube.online	Stream-ripping site	URL + Search	Both	256	DDL

When looking at the current top 10 **stream-ripping services** in comparison to those from October 2016, it can be seen **stream-ripping sites** have increased in popularity, from 5/10 to 10/10 sites offering online stream-ripping conversion. All of these sites contained a URL pasting functionality associated with **stream-ripping sites**.

Clearly, the current primary method of obtaining content via **stream-ripping services** is through the conversion of a link to a file using a **stream-ripping site**; a user pastes their chosen link into the website, which then converts the content into a file for the user to download. This is an easy and certain way for users to obtain the content they want, as they have preselected the video or stream in advance on a site like YouTube and copied the link to it. Six of the **stream-ripping sites** in the top 10 also included a search function, allowing users to search for the track, album or artist names that they wished to download, with the source of the files coming from YouTube or similar. One of these sites additionally grants users access to browse previously downloaded content, functioning similarly to **stream-ripping download sites**.[12]

The file types available via these **stream-ripping services** are often offered in both audio and video formats; all 10 sites provided audio and video **stream-ripping** capability. All sites offered download in .mp3 format for audio and .mp4 for video. A selection of sites also offer other format types including .mp4a, .wav, and .aac for audio; .avi for video. Although, there could be some interest for users to download video content for offline viewing, based on the functionality supplied by these services, it is demonstrably less common than those wishing to rip audio.

[12] The **stream-ripping download site** *youtubemp3.today.*

Audio quality delivered by **stream-ripping services** varied depending both upon the source used and the compression technique employed. The quality of an audio file can be measured in kilobits per second (kbps); an MP3 file at 192kbps is near CD quality audio. The lower the quality, the lower the kbps value. Six of the **stream-ripping services** in this sample provide audio files at a quality of 192kbps or above, which is a slight improvement in overall quality available from 8/10 at a minimum standard of 128kbps in October 2016. This may imply a reason of interest for users, however, it still remains that the source stream is expected to suffer degradation during the process of converting to a downloadable audio file, and streaming content is not always in high quality to begin with, so the user may find they have lower quality audio than they expected.

Due to the source content on streaming sites having been compressed during the uploading process, 320 kbps files (or higher) are unlikely to be obtainable through **stream-ripping**. Therefore, where sites offer 320 kbps quality (for example, *mp3fy.com*) the file is likely to have been subject to upscaling. This makes the file a larger size but it does not improve the audio quality - it is actually detrimental to the clarity of the bitrate of the ripped files.

The predominant method of content delivery on **stream-ripping services** is through direct download links (DDLs), straight to the computer or device being used to access the service. This option is available on all of the analysed services and is expected to account for the clear majority of content being ripped. Although the report completed in 2016 indicated there may be an increase in the use of Dropbox as an additional file saving option, this capability does not appear to have made a notable impact. Taking a look at the top 10, just one music only **stream-ripping service** offers download to Dropbox.[13]

Finally, the previous analysis also found several **stream-ripping services** using the same API to facilitate downloads. It was originally found that the **stream-ripping site**, *youtube2mp3.cc*, provides an API which powers the functionality on its website. This API was found used on a handful of the top 50 sites from 2016. None of the top 10 sites analysed in this cumulative report listed an API. Upon review of the current top 50 music only **stream-ripping services**, only two mention using an API, both claim to be utilising the API *ytmp3*.[14]

It should be noted, one **stream-ripping download site** did appear in the **stream-ripping services** list when looking at the usage for October 2019, however, none appeared in the top 10. These sites have content sourced by licensed services, such as Youtube and Spotify. Users then browse the available converted content or search for the track, album or artist names they wish to download.

[13] The **stream-ripping site** *flvto.biz*.

[14] The **stream-ripping download site** *myfreemp3c.com* and **stream-ripping site** *freemp3.cc*.

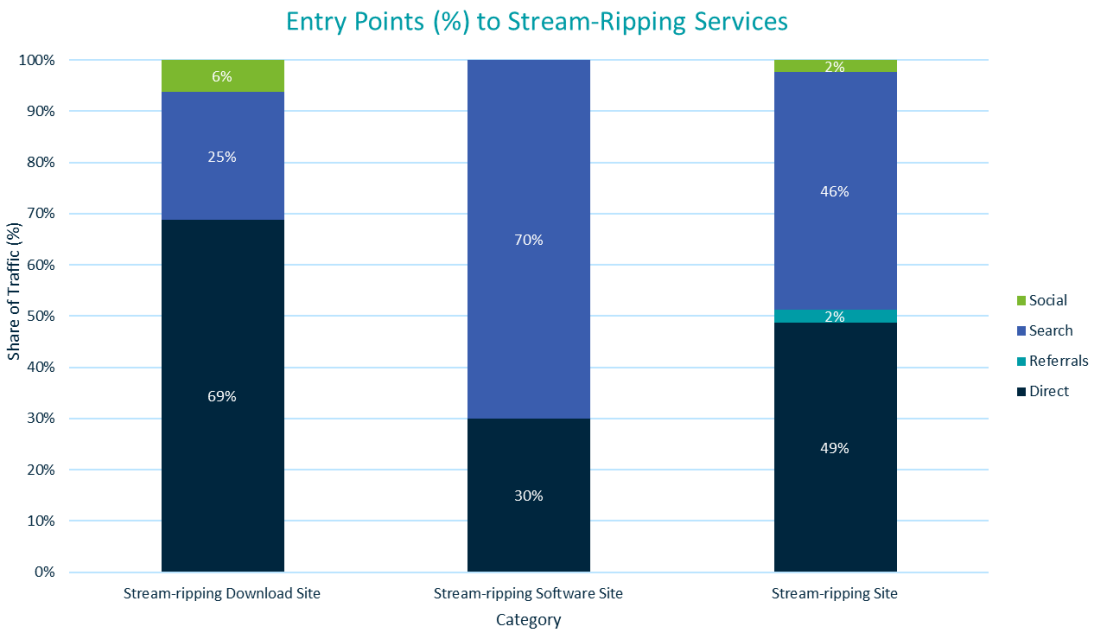
Part Three

In-depth look at the most popular stream-ripping services

Part Three of the report focuses on how users find these **stream-ripping services**; the funding models of these services; the licensed services being abused by these **stream-ripping services**; and finally where these **stream-ripping services** are located.[15] The full list of 100 **stream-ripping services** used for the analysis in this part of the report has been provided in *Appendix C*: Top **stream-ripping services** by subcategory.

User Entry Points

A key question is how users find out about **stream-ripping services** initially. Incopro used SimilarWeb[16] traffic source data to provide insight into how users find these services. The following graph displays the origin of traffic to a sample of the most popular **stream-ripping services**, categorising the sources of traffic as originating from direct access, referrals, social networks and search engines.



The stacked bars show that overall there are two main points of entry to the most popular **stream-ripping services** in the UK: direct access and search engine.

Stream-ripping download sites now receive the majority of traffic from direct access. If users are already familiar with sites they are able to navigate directly to them. Direct traffic was expected to increase over time as users remember the site name, use bookmarks or rely on the auto-complete function in their browser to

[15] Historical data from http://web.archive.org/ was utilised for sites where usage was calculated between 2016 and 2019 which are no longer active.

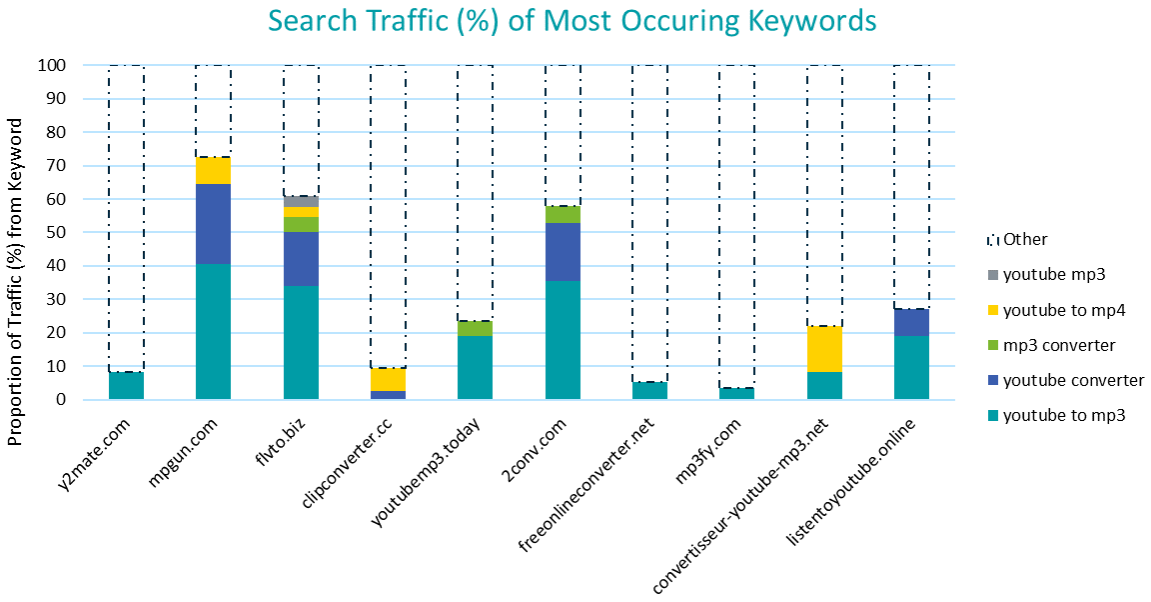
[16] For more information about SimilarWeb, please see: https://www.similarweb.com/corp/about

find the site again from their browsing history; this appears to be the case for **stream-ripping download sites** and approximately half of **stream-ripping sites**.

Stream-ripping software sites receive the majority of their traffic from search engines. This may be due to the use of generic keywords such as “downloader” and “converter” when users are searching for software. If the sites remain active long enough for users to familiarise with these sites, traffic from direct access may increase over time as was the case for **stream-ripping download sites**.

Search Keywords

As search is a key driver of traffic, further analysis of the top keywords used to reach each type of site was performed. The top five keywords available for each of the top 10 **stream-ripping services** were collated, yielding 50 total search terms. Nine of these 50 search terms were found to appear more than once, with the most popular of these being “youtube to mp3”.



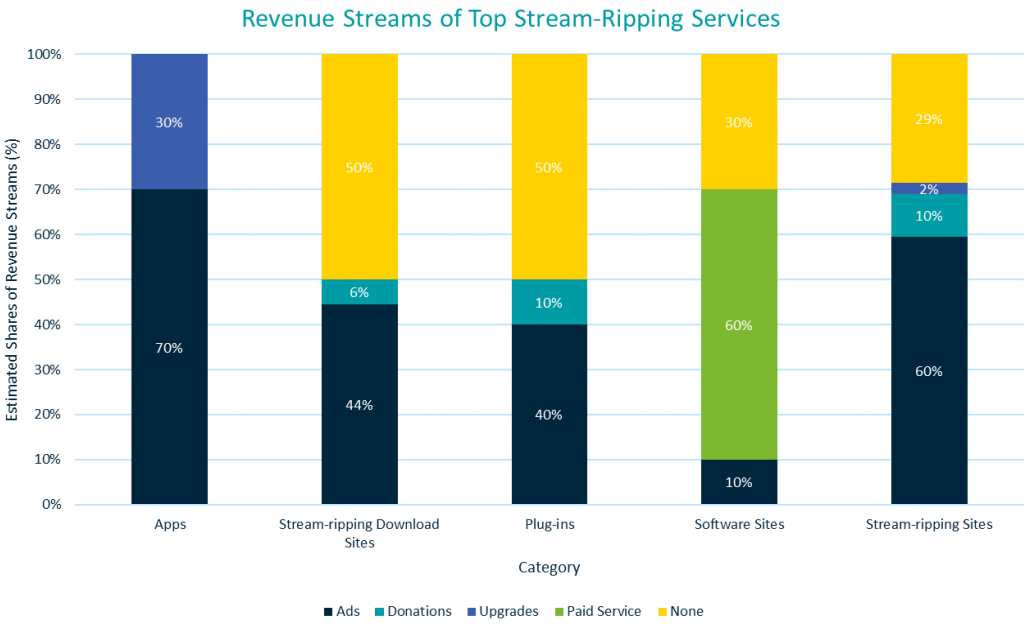
The above graph displays the five most frequently searched keywords of the top 10 **stream-ripping services**, and the amount of search traffic for which they are responsible. The keywords listed were utilised to search for all of the top 10 **stream-ripping services**.

The graph shows the most popular search terms to be relatively generic **stream-ripping** keywords, with the main themes being “youtube to mp3” and “youtube converter”.

The most popular keyword from October 2016, “youtube to mp3”, is still listed in the top five keywords for 2019. It was previously speculated that this keyword and its variations were used as a form of navigation access to the previously more popular sites, *youtube-mp3.org* and *youtube2mp3.cc*.Despite the fact that those sites are no longer listed among the top usage sites, it has been found that “youtube to mp3”, and similar keyword variations, remain the main search terms for **stream-ripping services**, as users are more likely to search for their preferred conversion format, rather than for a specific domain. There has been a significant increase in the variety of *Other* keywords across all sites since the 2016 report.

Funding Models

The funding models of piracy sites can typically be categorised as advertising or payments made directly to the site in the form of payment for services or donations. The following graph shows an analysis of 100 **stream-ripping services**.



This analysis reveals that advertising still accounts for the majority of income associated with these services, with the exception of **software sites**. 49 of the 100 services appear to receive revenue through advertisements. Compared to the 2016 report, a larger number of services appear to be unpaid and ad-free, showing no source of revenue.

Stream-ripping software sites are the main **stream-ripping service** which obtain revenue from paid only services. **Stream-ripping download apps** are the primary service gaining revenue from upgrade options, specifically in-app purchases. A limited number of **stream-ripping sites** also have optional paid memberships.[17] These memberships are designed to enhance functionality, such as the removal of advertising or multiple download capabilities, encouraging users to move to a premium version of the service.

Although only seven services account for revenue from donations, it should be noted that one of those services is receiving donations in the form of cryptocurrency, **stream-ripping site** *mp3bear1.mobi*. Additionally, through the review of **stream-ripping download apps**, two apps[18], offered on Aptoid, a third party Android App Store, were discovered to be accepting donations in cryptocurrency.

The funding model of **stream-ripping download apps** and **stream-ripping plug-ins** tend to rely almost entirely upon bundled software (including malware, adware and spyware being installed – unwittingly – by users) in the installation process rather than adverts, though these are still present in some apps. Most of these **stream-ripping services** therefore subsist through the inclusion of potentially unwanted programs (PUPs) which can only be avoided by opting out during a confusing installation process.

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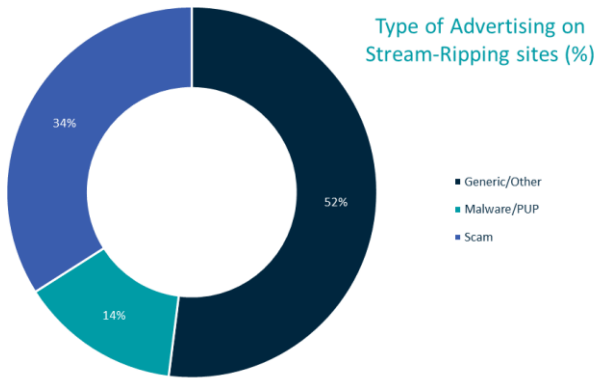
[17] The **stream-ripping download site** *dirpy.com.*

[18] Youtube Cacher and NewPipe.

Although most **stream-ripping services** rely on advertising as the primary source of revenue, it is difficult to estimate the level of funding attributable to direct payments; this could potentially represent more incoming revenue than that received by sites using only advertising as the sums involved are likely to be higher, though lower in volume.

Type of advertising on stream-ripping services

The pie chart displays the types of advertising served when accessing a sample of the most **popular stream-ripping services** in the UK. To quantify the links and adverts present on stream-ripping services, all advertising has been assigned to one of the following four categories: malware/PUPs, scams, gambling links and generic/other advertisements.



Generic/other ad links were found to be the most prominent type of advertising served in the sample used, accounting for 52% of advertising delivered. These advertisements are typically presented as product offers or are of a pornographic nature. It is likely that the companies discovered to be advertising on such sites (some of which were well known brands) are unaware that they are being associated with pirated content alongside other potentially harmful advertisements.

The second most common type was scam advertisements which are found to be responsible for 34% of advertising.

Malware/PUP advertisements appear to have declined by 38.2% since the previous report in 2016. Those identified were based on complaints provided in user feedback.[19] No gambling links were found throughout the review of all **stream-ripping services**.

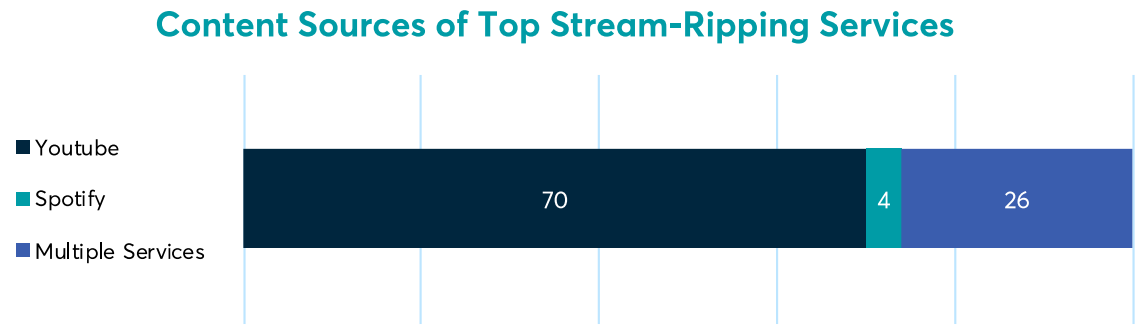
Licensed services abused through stream-ripping services

YouTube remains the most abused licensed service by sites making up the **stream-ripping** landscape since the report from 2016. This may be unsurprising given that YouTube is still within the five most popular sites in the world, with billions of visitors globally every month.

Abuse of this service means that the video stream is typically converted into an audio file and downloaded onto the user's device. As noted in Part One of this report, *y2mate.com*, the most popular **stream-ripping service** in the UK over the three-year period observed, is a **stream-ripping site** specifically designed to rip content from YouTube. The majority of **stream-ripping download apps** and **stream-ripping plug-ins** described above had YouTube as their primary source of content.

The following graph displays the services used as a content source for 100 of the most popular **stream-ripping services**.

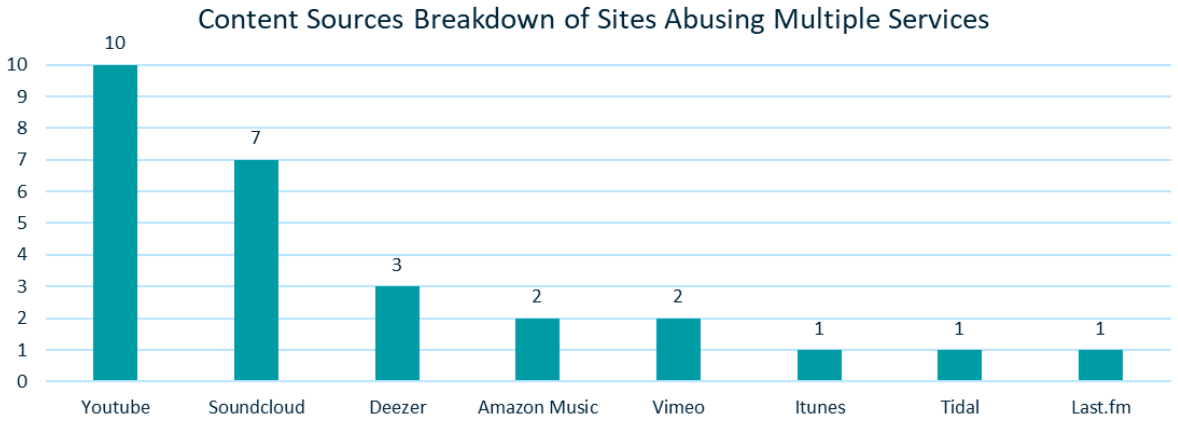
[19] This data did not reveal any specific malware/PUP programs and is to be considered indicative.



Exclusive YouTube ripping is available on at least 70 of the 100 services surveyed. Spotify is now the second most affected licensed service, replacing Soundcloud from October 2016. However, only four of the total services included in this sample used Spotify as their exclusive content source.[20]

Of these services, 26 claim to be sourced from multiple licensed services, seven of which include Soundcloud. No services in this sample were identified as being sourced exclusively from Soundcloud.

The breakdown of sites abusing multiple sources can be seen in the graph below.



It is important to mention that whilst not as popular as YouTube, there are options for those seeking to rip content from other licensed services. **Stream-ripping** of the music streaming services Tidal, Deezer, and Amazon Music all have been observed. Similar **stream-ripping services** can also be found for content found on social media platforms.

[20] The 4 Spotify exclusive services are comprised of 2 **stream-ripping apps** and 2 **stream-ripping software.**

Server locations and hosting providers of stream-ripping services

Over half of the sites surveyed (32/60) were found to have their server(s) located in the USA. The location of servers is misleading in this case however, as 25 of these 32 sites use the popular content delivery network (CDN) CloudFlare. Another 11 of the sites were found to be using another popular CDN, OVH, bringing the total sites using either of these providers to an even more significant 36/60.

A variety of other more obscure internet service provider/hosting providers were identified, such as Servers.com Inc, who advertises maintaining seven servers worldwide. However, each of these lesser known providers host less than four sites, with the majority hosting only one each of the sampled 60.

Content delivery network (CDN) services continue to rise in popularity over recent years. The most important aspects of CDNs is that they work to distribute load across several hosts, rather than one centralised server. There is a myriad of benefits which arise from this capability, including lower hosting costs, increased security against malicious attacks and increased performance and reliability.

However, due to the way in which CDNs work, the technology has brought with it concerns of protecting illegal websites by masking their true hosting company's location. This makes it difficult to pinpoint any identification details for who is running the sites and where they are situated.

The obfuscation of a site's real hosting location has the potential to increase the difficulty of copyright infringement notifications and any other complaints from copyright holders reaching a site's real host.

CloudFlare is still one of the most popular CDN providers in use, allegedly providing domain name services to 12 million plus websites with approximately 20,000 new customers daily.[21] Their historical growth and evasive stance on action against piracy only further imply their continued connection with piracy activity and **stream-ripping services**.

[21] According to https://en.wikipedia.org/wiki/Cloudflare.

Conclusions

Data considered in this report shows that **stream-ripping** has continued to be a popular route to music content in the UK and the overall usage of **stream-ripping services** is still rising. The comparison in usage of multi-media content site lists and music specific content top site lists demonstrates that stream-ripping has been a predominant issue affecting the music industry, and has maintained a fairly dominant position within the music piracy landscape, even with the uprising in **cyberlocker link sites**. Based upon the usage figures explored in this report, **stream-ripping sites** are held responsible for a significant proportion of overall music piracy levels occurring in the UK now and likely the foreseeable future.

Furthermore, it is recommended that the revenue streams of **stream-ripping services** be observed closely, to watch for the evolution of free or ad-funded services into paid-for services, potentially offering users higher quality conversions or other implied features. Limited **stream-ripping services** are starting to utilise cryptocurrency; as this form of revenue continues to expand, it would be beneficial to continue to examine sites for increased cryptocurrency activity, as this is an unregulated revenue corridor aiding infringers in offering illegitimate services.

Another continued issue is the use of content delivery networks (CDN) by **stream-ripping services** to avoid identification of the services' managing entities. These services are less likely to be removed with a single copyright infringement notice and will require deeper investigations in order to reveal infringers.

It will be important to continually monitor the evolution of **stream-ripping services** and the way in which they are used, especially as sites continue to increase their ease of navigation, conversion options, as well as quality and storage alternatives. It appears the enforcement against **stream-ripping download sites**, through disruption strategies such as notice and take down, have decreased their popularity; **stream-ripping sites** now lead as the main source for abused licensed services. A persistent and targeted approach in the enforcement of all **stream-ripping services** is necessary to combat their evolution.

Appendix A

Methodology

Selection of stream-ripping services

Incopro tracks over 17,000 sites, with many of the popular **stream-ripping services** already included in its Identify database before data collection for the report began. To provide the most complete picture of **stream-ripping** possible however, open source research was used to find and add additional **stream-ripping services** to the database. All sites and services were categorised as belonging to one of the following five major categories: **stream-ripping services**, **BitTorrent**, **cyberlocker host site**, **cyberlocker link site** and **proxy/other**. A further five sub-categories relating to **stream-ripping services** were identified and considered as follows: **stream-ripping download app**, **stream-ripping download site**, **stream-ripping site**, **stream-ripping plug-in** and **stream-ripping software**.

To produce a list of the most popular 'top sites', all sites were ordered by their Alexa estimated UK usage. Alexa estimated usage (full Alexa estimated usage metric methodology below) was used in this report to analyse any potential shifts and trends in the usage of music piracy sites in the UK over time. The starting point for Alexa usage considered in this report is October 2016, with the end data point being October 2019. All sites being tracked by Incopro are categorised in several ways according to how content is made available on them and the type of content being made available. This report focuses upon the piracy of music content, therefore only sites which include music content were used in the dataset.

In Part One of this report several data sets were created in this way: the top 50 piracy sites which include music content, the top 50 piracy sites which contain only music content, the top 250 piracy sites which include music content and the top 20 **stream-ripping services**. The technical composition in Part Two focuses on the top 20 **stream-ripping services** looking at the 10 most popular based upon Alexa estimated UK usage. Where site usage was not indicative of popularity, such as for **stream-ripping download apps** and **stream-ripping plug-ins**, download figures were used to distinguish the most popular **stream-ripping services** in Part One.

The dataset used in Part Three of the report is a selection of the most popular services from each of the five **stream-ripping** subcategories. The top services were chosen upon validation of a **stream-ripping** functionality targeted at legitimate streams and owing to their popularity or usage. Alexa estimated usage was used to identify the most popular sites, and where usage was not relevant (i.e. for **stream-ripping download apps** and **plug-ins**) download figures were considered. The top 42 were used for **stream-ripping sites**; top 18 were used for **stream-ripping download sites**; top 20 for **stream-ripping plug-ins**. Where it was not possible to provide at least a top 20, a top 10 was used for **stream-ripping software** and **stream-ripping download apps**. This selection of the most popular **stream-ripping services** amounts to a sample of 100 services.

Metric collection and analysis

Research into the technical composition of the top 10 most popular **stream-ripping services** (based upon their UK Alexa estimated usage) in Part Two was conducted through accessing each service and investigating several technical infrastructure and functionality elements. This included how each service obtained content, the file types which were made available, the audio quality available, how content was delivered to users and whether an API or any type of facilitator was being used by the service. All services were manually reviewed for content; for sites identified no longer maintaining an active online status, historical archive data was utilised from Internet Archive (aka the "WaybackMachine").

Traffic source data made available by SimilarWeb was used in the analysis of the entry points to **stream-ripping services**. Data was available for **stream-ripping sites** (42), **stream-ripping download sites** (18), **stream-ripping software** (10) - but not for **stream-ripping download apps** or **stream-ripping plug-ins**. The 'origin of traffic' data provides statistics for the proportion of traffic to sites coming from direct access, mail, referrals, social networks and search engines. This was analysed to comment on how traffic is being driven to **stream-ripping services** by their sub-categories. SimilarWeb also provides keyword data, this was considered for the top 10 highest usage **stream-ripping services** (based upon UK Alexa estimated usage). The top five keywords for each site was provided from SimilarWeb, amounting to a total of 50 keywords which were analysed.

Research into the funding models of top **stream-ripping services** considered (42) **stream-ripping sites**, (18) **stream-ripping download sites**, (20) **stream-ripping plug-ins**, (10) **stream-ripping download apps** and (10) **stream-ripping software.** Funding for each site was categorised as one of the following four revenue stream options: upgrades, donations, paid services, ads, or no revenue stream where none was found. Where advertising was found on a site (on **stream-ripping download sites** and **stream-ripping sites**) the type of advertising was recorded as being malware/PUP, scam, or gambling, with all other advertising categorised as generic/other ads.

The section covering the licensed services abused through **stream-ripping** grouped **stream-ripping services** in terms of their content source: YouTube, Spotify, or multiple services. A total of 100 services were surveyed in this way (42 **stream-ripping sites**, 18 **stream-ripping download sites**, 20 **stream-ripping plug-ins**, 10 **stream-ripping download apps** and 10 **stream-ripping software**). Analysis into the server locations of stream-ripping services and their hosting providers looked at 60 services, comprised of 42 **stream-ripping sites** and 18 **stream-ripping download sites**.

Alexa estimated usage methodology

Incopro chose Alexa as its first provider of traffic metrics and is working to integrate other data sources in the future. Many people have misconceptions regarding the data provided by Alexa, possibly due to several changes in methodology throughout their history and being slightly opaque about the detail of their data collection.

Prior to 2008, Alexa traffic estimates were based solely on their browser toolbar, which users had to manually install on their computer. In 2008 Alexa announced that they were no longer relying solely on the toolbar data, and instead pulled in data from a variety of sources, including buying data from ISPs. Alexa's methodology has changed again over the past few years, which appears to coincide with Alexa launching their direct site measurement program (Alexa Certified Metrics). Alexa has removed all text from their information pages regarding buying data from ISPs/collecting from a variety of sources, and now state the following (paraphrased):

- Traffic estimates are based on data from their global traffic panel, a sample of all internet users. The panel consists of millions of users using toolbars created by over 25,000 different publishers, including Alexa and Amazon.
- Some sites are directly measured by Alexa – site operators can sign up to Alexa's certified metrics program.
- Traffic Rank is a measurement of traffic to a website, relative to all other sites on the web over the past three months (a rolling three month period updated daily) and calculated using a combination of the estimated average daily unique visitors to the site and estimated number of page views over the past three months.
- Alexa corrects for biases in the demographic distribution of site visitors, they correct for potential biases in data collected from the various browser extensions, to better represent the type of visitors who might not be in their measurement panel. That being said, biases still exist.

- Due to the concentration of visitors being on the most popular sites, it is difficult to accurately determine the rank of sites with fewer than 1000 monthly visitors. Therefore, traffic rankings of 100,000 and above should be considered rough estimates. The closer a site gets to number one, the more accurate its traffic ranking becomes.

Alexa's collection methods and traffic data were presented and explained in court in 2015 by Incopro's Director of Technology, Bret Boivin. This evidence was accepted by the judge and formed an important part of the successful case against the defendant.

As there are several data providers that offer usage numbers for sites, and each provider applies a different methodology and draws data from different sources, Incopro has chosen to refer to the usage metric as an overall 'Alexa usage estimate'. This is to avoid inconsistencies with other data sources, and because the focus of this report is concerned with the impact of enforcement as opposed to the number of users for particular sites.

To determine this usage metric, we translate the Alexa reach, which is expressed as number of users per million, for each site and user percentages into estimates of the estimated usage of a website. To do this, the global internet population has been obtained from the latest ITU Facts and Figures. Alexa reach data is tracked automatically by our system, along with several other key metrics. For this calculation, the three month reach data is used with the ITU figure to produce the usage metric.

Alexa also makes data available for territories individually where the website has enough traffic data in that country. This is expressed as a percentage of all users visiting the site. This percentage figure is used in conjunction with the above reach calculation to get the Alexa estimated usage metric for the site in each territory. We take the above calculations on a day-by-day basis and then calculate the median value for the month for each site, for both the global and country calculations. Given the fluctuations in numbers that can occur as a site decreases in popularity, this is the best way to remove any dramatic increases or decreases.

This Alexa usage estimate is used to show trends in relation to specific sites. Sites relevant to all aspects of the piracy landscape, from legitimate services to proxies used to circumvent ISP blocking measures are dynamically tracked by Incopro. We can also confidently assess the impact on other sites that are in the same type of 'piracy market' and that might be expected to benefit from blocking applied to other sites. Our confidence on this stems from the fact that the Incopro system has tracked blocked sites and the key other piracy sites for a substantial period and has also tracked all known proxies for such sites. This tracking has had to be meticulous because the tracking is then used to notify ISPs of site and proxy domains to be blocked. More data sources are being identified and included in Incopro's Identify database in the coming months, which will increase the data points available for comparison.

As of November 2015, Incopro has been able to track all live domains relating to a specific website, rather than just the main site. As a result, the usage for any alternate domains being used have been included within the total usage data for this month.

Appendix B

Top 50 music content sites

Sites Containing Music	Music Only Sites
pirateproxy.app	y2mate.com
y2mate.com	flvto.biz
rutracker.org	2conv.com
openload.co	poiskm.co
mega.nz	youtube-mp3.org
mediafire.com	mpgun.com
zippyshare.com	zaycev.net
pirateproxy.cc	ipleer.fm
proxybay.app	clipconverter.cc
thepiratebay.org	dimeadozen.org
rutor.info	vidtomp3.com
rarbg.to	mp3.naij.com
flvto.biz	tekstowo.pl
thevideo.me	mp3juices.cc
rapidgator.net	youtubemp3.today
proxybay.bz	ytmp3.cc
1337x.to	k2nblog.com
imagetwist.com	funkysouls.com
k2s.cc	convertmp3.io
filebase.ws	musicpleer.audio
filelist.ro	usd.bravo-dog.com
uploaded.net	myfreemp3c.com
torrents.me	forum.audionews.org
turbobit.net	myzuka.club
dfiles.eu	soundpark-club.com
magnetdl.com	best-muzon.cc
rlsbb.ru	xmusik.me
2conv.com	loudtronix.co
unblocked.gdn	freemp3.cc
ukbay.pro	vubey.yt
nitroflare.com	newalbumreleases.net
torrentleech.org	listentoyoutube.online
sendspace.com	u2torrents.com
userscloud.com	lalamus.cc
unblocked.vet	naitimp3.ru
pirateproxy.vip	primemusic.me
uptobox.com	mp3fy.com
torrentday.com	flv2mp3.by
filejoker.net	mzmuz.ru
fboom.me	psychocydd.co.uk
linkomanija.net	listenvid.com
filefactory.com	myfreemp3.click
1fichier.com	hulkshare.com
4shared.com	mp3red.me
iptorrents.com	israbox.one
extratorrent.cc	musicmp3spb.org
chomikuj.pl	livemixtapes.com
torrentsmd.com	muzofon.com
limetorrents.info	pleer.net
glodls.to	ytmp3.com

Appendix C

Top stream-ripping services by sub-category

SR Category	Domain
Stream-ripping site	y2mate.com
Stream-ripping site	flvto.biz
Stream-ripping site	2conv.com
Stream-ripping site	youtube-mp3.org
Stream-ripping site	mpgun.com
Stream-ripping site	clipconverter.cc
Stream-ripping site	vidtomp3.com
Stream-ripping site	mp3juices.cc
Stream-ripping site	youtubemp3.today
Stream-ripping site	ytmp3.cc
Stream-ripping site	convertmp3.io
Stream-ripping site	loudtronix.co
Stream-ripping site	freemp3.cc
Stream-ripping site	vubey.yt
Stream-ripping site	listentoyoutube.online
Stream-ripping site	mp3fy.com
Stream-ripping site	flv2mp3.by
Stream-ripping site	listenvid.com
Stream-ripping site	ytmp3.com
Stream-ripping site	teledyski.info
Stream-ripping site	mp3bear1.mobi
Stream-ripping site	freeonlineconverter.net
Stream-ripping site	convertisseur-youtube-mp3.net
Stream-ripping site	grabfrom.com
Stream-ripping site	clip.dj
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Stream-ripping plug-in	Spotify™ & Deezer™ Music Downloader
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Stream-ripping plug-in	Web Music Downloader
Stream-ripping plug-in	YouTube mp3 320 kbps
Stream-ripping plug-in	web2mp3
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