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Virtual Audio Record – A New Phonorecord Format

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Abstract. The advent of modern streaming music services has served to distort modern copyright to the position to where a hostile environment now exists between streaming and downloadable music providers and the recording industry. This conflict has been evidence most clearly in the recent row which placed singer and songwriter Taylor Swift as an adversary to content providers Apple Music and Spotify. Ms. Swift was successful in her confrontation, but thousands of other singers, songwriters, and producers do not have the clout to enjoy. This paper offers a novel solution to provide a quality of music experience that has never before been available, restore and increase record sales, restore and increase consumer grade media hardware and provide a means to escape the copyright interpretation quagmire.

Introduction. In 2014, Taylor Swift made a blog post in which she shamed Apple for their denial of proper mechanical royalties during a special promotion. The focus of Ms. Swift's argument revolved around what she deemed a lack of respect for artists and proper payment for the work they created. The only route of resolution offered Ms. Swift by current US copyright law was the threat of a takedown of her works.[2] This issue highlighted very real problems with existing copyright legislation that technology has created, and as such an appropriate technological solution is required. The specific legislation revolves in the provisioning of digital phonorecord distribution as defined by the US Copyright Office.[3] A Virtual Audio Record (VAR) is a digital phonorecord which provides the experience of physical media through the application of modern cryptography and high resolution audio.

As the Virtual Audio Record provides the experience of physical media through its application of modern cryptographic functions to the logistical process of the manufacturing of physical media and provides a higher resolution experience via the MQA and MQ audio standards[4], the consumer purchase of a VAR may be considered a mechanical royalty and record sale. The adoption of the MQA standard for digital phonorecord delivery provides a new experience for the user, as well as opportunities for the development of new consumer hardware. This hardware supports the ecosystem which enables the provisioning of cryptographic proofs required to create the VAR for any given MQA master. The VAR standard has been created as an interpretation of the Guiding Principles defined in the US Copyright Office's 2015 report; Copyright and the Music Marketplace.[5] These principles are addressed by the VAR standard specifications and requirements. Implementation of this standard in the market with the proposed environment and ecosystem requires all of those interested with the market of or ownership of audio recordings (i.e. music).

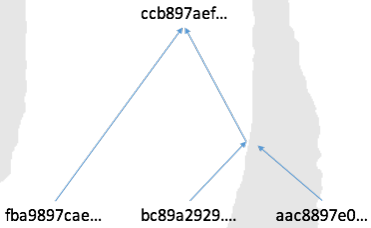
Each Virtual Audio Record manufactured is cryptographically provable as being an unaltered *original virtual phonorecord* or record of the *original process of creation*, therefore it is sufficiently permanent and stable for it to be reproduced for a period more than transitory duration. As we have seen in the verdict of the 'Blurred Lines' case, infringement was determined by the 'vibe' or 'process of creation', not on the final creation itself. Therefore, the traditional audio fingerprinting method of audio formats are insufficient for proper content identification and copyright protection within the exchange of the VAR format. The VAR presents finite evidence that the current music licensing and copyright system is not broken but rather should evolve to define "virtual" in definition and distinction to digital, what an "original reproduction" is in context to the recording of the "*original process of creation*", and how market trade and copyright law apply accordingly.

On-Demand Manufacturing of the Original Process of Creation within Virtual Audio Records

The recording moves from production to manufacturing in the supply chain and is not "copied", but processed within each step though a versioning process, which is cryptographically cataloged to preserve authenticity of the *original process of creation* recorded. The final version of that recording is then delivered to the end user in a format which is cryptographically provable as unique. Each VAR produced is verifiable as authentic and unique as the cryptographic identity assigned to the consumer is embedded into the VAR during the final manufacturing phase, making each instance unique to the consumer which purchased it. The proof-of-purchase is timestamped accordingly and fused with the identity of the owner; never to be removed or changed by anyone and secured by the *network of consumer hardware* (see below).

Virtual Audio Record as a method of Establishing Authenticity of the Process of Creation

The new RIAA and record industry initiative with the MQA standard covers lossless audio which provides a mixdown process unique to each master produced. This enables the application of SHA-3 preimages (process identifier) to the resulting MQA and other VSTs, automation interpretation to create a Master Quality Recording standards for each master produced. This hash used to form a forensic chain throughout the production process from the creation of the master to the printing of physical media.



The MQA standard isn't necessary. The VAR process works with FLAC, AIFF, and other lossess formats, however we feature it because of its superior audio quality.

It could even house Virtual Reality content, video content, legal documents, or a combination of all of them!

The audio logistics sequencing process is not acoustic fingerprinting, but a cryptographic chain of authenticity that ends with the final version presented to the consumer. As such, the VAR standard does not conform to any known legislation regarding the definition of "digital audio copied recording" as it is demonstrable that every single VAR is a cryptographically guaranteed original.[6] Traditional acoustic

fingerprints take a sample of the average points and at several peaks and anchor points for those attributes.[7] Acoustic fingerprinting alone is not suitable to establish authenticity (i.e. a copy).[8]

At any time in the post-processing or physical media supply chain a process identifier can be deposited with the US Copyright Office. This transaction will contain a unique sequence layer which refers to the original sequence and all of its sequence layers timestamped when the transaction was initiated. All applicable deposit standards and requirements are legally complete and provably cryptographically accurate, as a stringent cross-reference is conducted to ensure that all of the sequenced audio is cryptographically unique through each step in the post-production and retail distribution processes.

Encrypted, Cloud Data Store Provided by Consumer Hardware

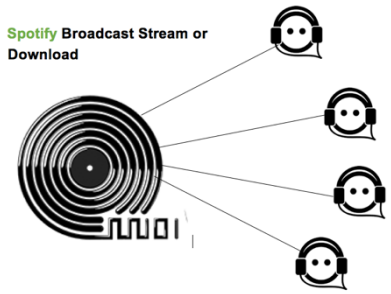
Virtual Audio Records are stored in an encrypted form in a distributed file store (DFS) data store, similar to BitTorrent.[9] The encrypted file also bears the cryptographic signature of the rights holder, allowing for metadata updates directly from the rights holder.[10] The DFS is maintained primarily through the implementation of the consumer hardware required to experience the MQA format at its full technical capabilities. The hardware components to create such a data store are able to be created from a design utilizing existing, market tested consumer grade technology.

Network storage capacity scales upon the adoption of consumer grade hardware purchased. The network is designed to scale at a rate twice the expected data storage requirements.

Assuming…	
11	**:1 compression ratio[11]**
72.72727273	**MB per VAR**
100,000	**MB capacity per device**
100,000,000	**VAR consumers**
100	**albums per lifetime of a consumer**
15%	**of consumers have VAR enabled hardware**
10,000,000,000	**total album purchases**
727,272,727,273	**MB total data**
1,500,000,000,000	**MB network storage capacity**

Utilizing and depending on a network or blockchain ran by individuals who all have different interests, increases the risk of the failed contribution of individuals needed to sustain the life and availability of the network. In Bitcoin, the network can fail if a majority of miners decide that they are unhappy with their profit and shut down their hardware. The hardware running the Bitcoin blockchain is built, managed, and purposed specifically by miners. For instance, utilizing the Bitcoin blockchain where the decentralized network is ran by miners incentivized by money and the use of Bitcoin, you face the network not agreeing on issues collectively to support the life and true purpose of the network. This is yet and still a centralized running network in essence.

Virtual Audio Record as a Digital Phonorecord Delivery (DPD) System

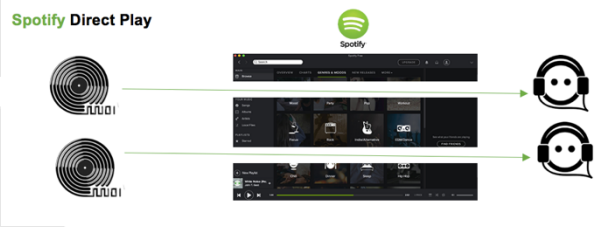


The VAR DP system has two components based upon two factors relating to the content provider:

1. A Broadcast Stream or Download is a copy of a VAR to which the mechanical revenue has been paid by the content provider, ending costly disputes over Title 17, Section 115, of the US Copyright Act.[11]
2. A VAR Direct Play originates from the VAR encrypted, cloud based data store.

Direct Play is based on a cryptographically provable direct license that the consumer has with the record label for that authentically unique content.

In this manner the VAR license inherits the terms the current direct license a consumer is afforded if they purchase a CD or Vinyl directly from a retail store.



This direct license bridges the rights of use on, as defined in the US Copyright Act, the VAR and the definition of "phonorecord", as the resulting sound recording and data is transmitted directly from the community of VAR consumer hardware devices containing the cryptographic manufactured originals purchased from retail. A VAR is not a copy, as defined in the US Copyright Act, as so a "copy" of the "sound recording or music work" is not "streamed" nor "downloaded" or "distributed", as defined under existing legislation, to a consumer under blanket or shared licensee rights inherited by a parent license allowing sharing of owned copyrighted VAR (embodying all exclusive rights as legislation sets) with others within the same network possessing the same direct license for the same original VAR.. VAR is a digitally provisioned, cryptographically "fixed" phonorecord in virtual form not simply digital. To quote the legislation specifically:

> "Mechanical reproduction rights of writers and publishers would apply when phonorecords were delivered to consumers by way of digital transmissions. The mechanical royalty rates would vary depending on whether or not it was possible to identify the particular work being copied. The two categories of works were "trackable," i.e., identifiable deliveries, for which information would be available as to which works were being copied, and "non-trackable" deliveries, those deliveries for which copying can reasonably be expected but identification of the works copied would be impossible or difficult. The Consensus Agreement rates for identifiable deliveries would be the mechanical compulsory license rate. The rates for non-trackable deliveries, where the making of phonorecords was facilitated without making an effort to determine which works were being copied, were to be set by voluntary negotiations. If negotiations were

unsuccessful, rates would be subject to the binding determination of copyright arbitration royalty panels, convened by the Librarian of Congress."[13]

Licensing

Currently, copyright information is documented in several disparate places.[14] This causes deficiencies in account and integrity of the copyright information. Often, there are several parties which have rights to one recording. This information is able to be cryptographically itemized through licensing rules that are optionally applied by the primary copyright owner.[15] This ensures that the audio sequence is never separated from the licensing and copyright information, allowing for the transfer, issuance, or enforcement of licenses between entities in an automated fashion. A VAR license is enabled through two distinct properties:

- A cryptographically signed proof of purchase via online or physical retailer.
- The unique VAR ID for the content to be provisioned, which establishes the consumer end-point for the cryptographic chain of trust.

Change management of licenses is established through the application of cryptographic signatures of all or specific copyright holders or other parties in the logistical supply chain. Flexible rules can be applied per the VAR custody chain. The copyright owner is therefore able to establish mathematically enforced rules to protect the resulting content. As such, publishing and distribution parameters can easily be provisioned on the VAR stemming from the burn-to-disc and burn-to-track process.

License Execution and Rights Transfer

Today, many of the license and rights executions that take place relating to content (intellectual property) are not logged in an open-server to provide for automation of enforcement. The established cryptographic regime for license enforcement enables the ability to properly audit the transfer of VAR licenses in a public manner, without identifying any specific party involved in the transfer and still requiring direct approval of the authorized rights holder.

VAR Global Media Metadata with No Central Database

In 2014, the industry initiative to build a decentralized publishing and copyright works database, the Global Repertoire Database (GRD), was discontinued as not to the inability for the industry to get it built successfully but the inability of one or more participating entities not agreeing on the ongoing maintenance and support costs to keep the database updated and running.

This is one of the biggest challenges around centralization of global data besides the fact that it adds on complexity of ensuring the physical and digital music supply chain can guarantee the integrity of the originally published and authentic metadata as it changes throughout the lifetime of a copyright.[16]

A VAR does not generate nor incur any transaction charges when metadata is queried, communicated or changed. We eliminate all costs of metadata infrastructure and maintenance. There is no central point of

failure or need to build datacenters for the ever expanding catalogs of the creative economy. The VAR was designed on principals of grounded exchange and affording benefits of all entities involved. As record sales increase so does the amount of data infrastructure available. As your VAR compatible consumer hardware sales increase, so does the amount consumers all contribute computing power to provide the bandwidth for the network of VAR's global media metadata.

The metadata is not encoded or embedded into the MQA standard itself but linked to it through cryptography, which therefore does not require the existing MQA recordings distributed to be updated or audited for accuracy. This eliminates a centralized data store fixed to the phonorecord and disparately managed such as the compact disc data base (CDDB) is managed by Gracenote where CD record metadata must be registered and commonly used by commoditized CD rippers and media players in order for Gracenote's consumer hardware and software will feed matched metadata to a physical CD.

With the flexibility of a cryptographic chain-of-custody for usage rights, such a system may then be extended to the metadata itself, and copyright holders are then provided the ability to exclusively allow partners to access a VAR's granularly controlled information for use in their own consumer hardware and software products.

This approach unifies metadata (which includes publishing and copyright information) dissemination while at the same time returning control to the copyright holder, and does so without interrupting or conflicting with a provider's hardware or web infrastructure, market product leverage, and functionality.

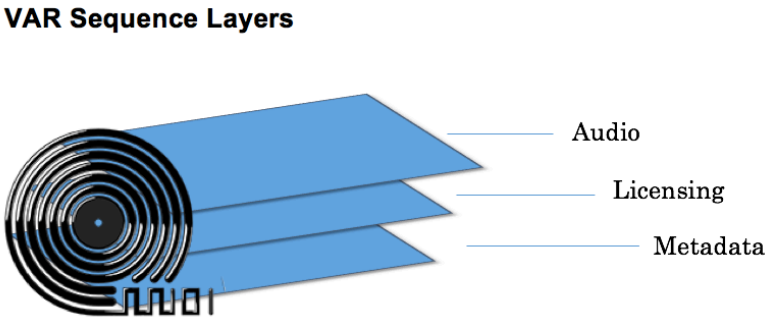
A decentralized implementation may then seed metadata to every related VAR on a 1:1 basis, and does sow without a central point of failure or control. This methodology retains the integrity and the availability of the data in perpetuity, remaining true to the original design purpose of the GRD project.

Supporting 'Opt-in' without Safe Harbors

The MQA format is derived from a digital studio master and the specific cryptographic signature of that master is retained throughout the production process as VAR-specific metadata so audio cannot be provisioned to the DHT data store without appropriate authentication, authorization, and third party quality standards programmed in digital audio interfaces. Furthermore, any content which matches the acoustic signature of the resulting performance but does not contain the appropriate cryptographically signed MQA metadata can be considered *prima fascia* counterfeit.

Furthermore, the cryptographic signatures required to provision the VAR content for transmission to the consumer prevent content from being delivered to any non-authenticated platform in this format, nor can the VAR be simultaneously transmitted to multiple devices.

The desire to monitor and enforce limitation of the unauthorized performance of an audio recording is satisfied by modifying consumer behavior in the manner that lower audio quality, portability across platforms, a retail integrated experience, and instant ease of access online and offline makes other approaches to content delivery less desirable and worth your asking value of an album.



Modern Release Techniques

Currently, creators and publishers which are responsible for designing and telling the complete story to the audience do not have the ability to release exclusive or windowed content due to the preferred alternative of a consumer being able to get in on the "black market" much easier and faster. Without the ability to incorporate these types of techniques distributors have decreased the amount of magic within the experience for consumers; ultimately decreasing their perceptive value of it.[17]

With VAR distributors are now able to enforce windowing without incurring additional supply chain and infrastructure costs. At present the music supply chain model does not support efficient protection and handling of content and their related metadata. Ingestion can sometimes take weeks into some platforms just as well as updates.[18] Special attentions are given to major artists to support these release techniques but is not afforded to all, which would be remedied by the implantation of a VAR as a DPD.

Conclusion

A new virtual phonorecord format as the Virtual Audio Record would give the benefits of harmonizing mechanical royalties with the performances of a record through an implementation of the latest developments in sound reproduction and cryptographic technology. As its underlying delivery protocol is not broadcasted in a stream or transmitted as any type of download it is not subject to the laws applicable to digital broadcast transmission, whether interactive or non-interactive, on the Internet.

This gives new light to the direct or blanket licensing gloom in industries as the music industry in respect to streaming platforms. As there is a direct purchase license between the consumer and the copyright owner; exclusive performing rights are given to the consumer, not the platform. Whether the platform respects these rights or not is up to the platform's ethical outlook of the supply chain, however this may come as a cost in the opinion of the consumer.

This methodology also sheds room for new licensing flexibility and the potential for secondary after-markets. A VAR provides a copyright owner the ability to both provide a direct license to the consumer to play the audio only on participating platforms, pay-per-play, or any number of licensing and royalty implementations.

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