REVOLUTIONISING THE VIDEO VALUE CHAIN - BLOCKCHAIN TECHNOLOGY

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ABSTRACT

Blockchain is a technology that is generating significant interest within the video industry. This paper outlines the steps being made in applying this technology to the video value chain. It starts with an introduction to the basics of Blockchain and then discusses two potential revolutionary use cases for Blockchain in the video industry.

The most radical application could be in significantly redrawing the distribution part of the video value chain, but a more imminent application is in addressing many of the key problems associated with video rights licensing.

While Blockchain-based solutions are already being developed for video rights, the most utility will be gained from major industry players working together and coalescing around one global rights Blockchain, which will benefit the industry as a whole (and individual media companies) to a far higher extent than any collection of point Blockchain rights solutions ever could.

INTRODUCTION

For the general public, Blockchain is associated primarily with Bitcoin and the wild frontiers of cryptocurrencies, but there are numerous articles and academic papers that tip Blockchain technology to profoundly disrupt many industries over the next decade. Some go further - Heltzel (1) argues that in the next two years Blockchain will “become the disruptive standard in modern commerce”, while Krause (2) cites a Gartner estimate that Blockchain delivered $4bn in business value-add or technology innovation in 2017, with that number forecast to grow to $21bn by 2020 and $3.1 trillion by 2030.

Blockchain is also starting to generate significant interest within the video industry, and this paper outlines the steps being made in applying the technology to the video value chain. It starts with an introduction to the basics of Blockchain and then talks about two potential revolutionary use cases for the technology in the video industry.

THE BASICS OF BLOCKCHAIN

At its core, a Blockchain is a way to arrange data or records. Essentially, it’s a decentralised, distributed database (or to use another term, a ledger) of records/data. But while a book or ledger has pages that record words or figures, a Blockchain is filled with information in what are called blocks.

These blocks don't have page numbers, but instead they have timestamps, which – like page numbers for books – are the prime way in which readers/users sort information. When new information is added to the database (through a new block), it gets an up-to-date timestamp, and slots into the database immediately after the block with the most recent timestamp. As new blocks (each with new information and new timestamps) are added, a chain of blocks is formed chronologically - and hence the term "Blockchain".

To be clear, when information in the Blockchain needs to be updated (e.g. when an existing database record must be updated with a change), this only occurs when an updated record is put into a new block with a new timestamp and added to the existing Blockchain. To use technical language, the adding of a new block means that the "state" of the Blockchain is updated.

In practical terms, you can't change history in a Blockchain - that is, modify or corrupt an existing record or block - but you can update information through adding a new block.

So, how do participants in a Blockchain check the current state of the database, to see if new blocks have been added (i.e. to see the latest version of records)? And – most importantly – how do they know that records have been updated legitimately?

P2P networking

The key mechanism for this is peer-to-peer networking and synchronised distribution of a decentralised database among multiple participants (computers or, in technical terms, "nodes") in the chain.

These nodes collaborate and communicate through a peer-to-peer relationship to make sure the current state of the Blockchain is stored on each and every node. When a new block is legitimately added to the chain, it is copied to every node in the network.

If any single node is compromised or switched off for any reason, the Blockchain is not lost or compromised, as the current state is stored on all the other computers in the network. The only way the Blockchain can be lost is if all the nodes in the network are attacked and lost at the same time – which is highly unlikely.

Crucial to this peer-to-peer networking of the Blockchain is cryptography and a consensus mechanism (i.e. set of rules) that enables valid blocks to be added, and for any disagreement as to whether a block is valid or not to be resolved. Only when a new block meets these consensus rules will the block be accepted and copied to all nodes, so that the state of the Blockchain - the so-called "single version of the truth" - is updated.

The consensus mechanisms used in Blockchains are agreed by the participants in advance of the Blockchain being set up. There are various mechanisms available, such as "proof-of-work" (which is used in Bitcoin), but the most relevant to the subsequent video use cases this paper will discuss is called "proof-of-stake" (POS), where participants stake something for a chance to add the next block.

There is a misconception that Blockchains are open to everyone, but that's not necessarily so. A video rights Blockchain, for example, would be open only to legitimate participants according to rules that are set out in advance (i.e. "legitimate" video rightsholders, however that is defined).

Finally, mention must be made of what are called “smart contracts” – an automated way to track, process and legitimise transactions made on the Blockchain. To use the example of a video rights database yet again, a smart contract could be templated to allow someone licensing a video right on the Blockchain to contract with the entity that has deposited that right onto the database. Of course, only the legitimate owner could sign off a transaction for that right (and therefore has no obligation to sell a right – as is the case in the non-Blockchain world), so a smart contract only executes once both parties in the transaction agree, with verified digital signatures from both.

If two blocks add two separate, identical transactions at the same time (e.g. a rightsholder who exclusively licenses a specific video in a specific territory to two separate purchasers, to double revenue illegally) there are consensus protocols that spot this and resolve the problem.

A full, technical explanation of Blockchain is not possible here, but in summary a Blockchain is a permanent, verified, record of information that operates on a secure, decentralised peer-to-peer network with consensus mechanism that govern its operation.

Blockchain discussions at media trade shows have largely been about digital advertising and the potential to reduce expenditure that is “lost” to middlemen in the advertising value chain, but this paper will now look at two other areas that will provide equally revolutionary applications within the video industry.

A VIDEO RIGHTS DATABASE

The problem of tracking media rights and linking licensees and licensors has long existed within the global music industry, and it’s no surprise that Blockchain is being used to address these issues in that value chain – see Gheorghe et al (3).

The same basic approach can be applied to the video value chain.

Imagine a single database listing all video content globally that is available for licensing by territory/platform/format etc. Where rightsholders continually update the database with all new content they make available to license, and where potential licensees (from legitimate companies) can search that ledger to see what rights are available and where, by platform/period etc - and then license that content, subject to agreement from the selling counterparty and suitable commercial terms.

That’s the essential idea of a Blockchain-enabled video rights database, and it can potentially solve the following key problems that the video industry faces today:

Current problems:	**Blockchain solution offers:**
Large quantity of video rights databases – 1,000s of rights databases (1+ at each rightsholder, plus multiple attempts at aggregated databases, each of which is limited in scope/participants)	**One unified video rights database -** (a single “version of the truth”) enabling a “one-stop” deposit of rights available to search and license
Multiple taxonomies – multiple taxonomies for rights data, with different, complex data sets listing availability/licensing terms etc.	**One taxonomy** – agreed by all participants

Static databases - differing standards in updating largely static databases, often with little provenance or quality	**Single standard for new entries and agreed process to update database –** i.e. a consensus mechanism
Contractual content licensing is inefficient - time consuming and resource intensive	**Smart contracts** - better (i.e. quicker and cheaper) process for licensing content
Rights payments can be slow	**Real-time rights usage, tracking and payment processing**

Table 1 – Current problems in the video rights value chain and potential Blockchain solutions

A single database

The advantages of a single, global video rights database over the current multiplicity of rights databases (estimates range from 1,000s to 50,000+ globally) are clear, though a unified ledger (enabled by Blockchain) does not come without concerns by some rightsholders.

Arqiva has talked through the concept of a single rights database with members of its Customer Council, and there are two potential issues – first, about who would have access to the rights database, and second, once parties have access, which data would they have access to view on that ledger.

On the first point, a key principle is that the rights ledger is a B2B tool and that only "qualified" parties can participate in the Blockchain. What entities qualify is simply a rules-based decision process, and those qualifying rules will be agreed by the companies that set up the Blockchain-enabled rights database in the first place. This is likely to be relatively straightforward to do – participants would likely be legal entities that currently exploit or want to exploit video rights.

The second point could be more contentious. It is entirely up to each participating entity which rights they put onto the database, but what happens if they want to shield information about those rights? For example, "multichannel A" may not want to let multichannel B know that certain rights are available in a territory (or not available in certain territories since that content has already been licensed there).

There are two types of solution. Either:

a) all participants accept the rule that once information is uploaded on the Blockchain (e.g. of rights that are available to licence in certain territories), that *all* valid participants have the right to view that information - or -

b) qualified parties have the complete right to define what is available to whom. In this case, multichannel A could block multichannel B from seeing some or all of its rights information on the Blockchain.

There are clearly pros and cons for each approach, and the participants who set up the Blockchain are free to debate and agree which principle they wish to adopt. And that's a key point of a Blockchain – the "rules" are not set by one individual company or entity, but by all the participants in the Blockchain. As Maney (4) points out, "Blockchain holds the

promise of building economies that are more like cooperatives-- owned by all who participate or invest - not by one company."

A single taxonomy

Agreeing a single taxonomy is perhaps one of the greatest challenges for this use case. What information on rights should be listed, how they should be listed and what the parameters and limits are of each data category must all be agreed. It could take many hours (lasting weeks or months) of consultation and – frankly – negotiation to reach an agreement between participants. This will only happen if everyone is willing to compromise on the higher goal of an agreed taxonomy and no-one takes a zero-sum game approach.

A consensus mechanism

An agreed process to update the database (as detailed in the first part of this paper) is arguably the easiest issue to solve, as consensus mechanisms already exist for Blockchain applications in other industries. There may be specific challenges of the video rights application, but early indications are that POS is a promising mechanism for the rights Blockchain.

To elaborate on this, the POS mechanism would require qualified participants in the Blockchain to stake a sum of money each time they upload a new video right into the database – which would then be forfeit if that right was erroneously claimed.

How much would that stake be? Clearly it needs to be large enough to hurt an entity that deliberately uploads incorrect information/rights, though on the other hand large rightsholders may uploaded significant numbers of rights in any given time period – if a stake is too high, then theoretically a single entity could be staking very large sums.

One solution is to reduce the stake, or have one stake (or bond) per participating company, or to ensure the consensus mechanism is very fast, so that in effect stakes are the equivalent of "bridging loans" that last nanoseconds.

Smart contracts

Once a searching entity finds a right it would like to license, then automated "Smart contracts" with common legal terms and clauses could be used to license small, medium or even large deals.

At first sight, enabling a function that would make the work of hundreds if not 1,000s of media lawyers redundant is a very good thing (unless you're a media lawyer of course!), but obviously for this to happen any automated contracting system must be at least as good - if not better – than the very valuable service currently provided by human counterparts.

Much of the value from lawyers comes from their ability to deal with the variability of licensing deals – the "every deal is different" problem, with an associated issue that a counterparty lawyer (theoretically) must check the fine print of a new licensing deal each time, no matter how small the change from previous contracts may be.

Yet automated contracting is nothing new, and Arqiva – as well as many other companies no doubt – has been making efforts to simplify and standardise media contracts for some time.

As Pons (5) says, automated smart contracts on a video rights Blockchain will not be easy to implement. It depends significantly on simplification and standardisation, and reducing contractual risk of a standard contract to a suitably acceptable level.

It may be that smart contracts can't be part of an initial video rights Blockchain, or at least for larger deals, but smart contracts are not an essential part of this concept, which can operate without them and leaving contracting to "old school" methods if needed.

Real-time tracking

There is potential for a video rights Blockchain to incorporate real-time usage tracking and/or automated facilitation of payments for legitimate use of video between licensees and rightsholders. Realistically, this is a capability that would add significant complexity to the Blockchain platform and is not core to the main functionalities of a video rights solution, and for that reason is not elaborated on further in this paper.

One last observation on a video rights database is that several point solutions (i.e. Blockchain applications for single companies) are already in development. However, this paper argues strongly that the real value in this use case is through true pan-industry collaboration that powers a single database listing global rights across multiple rightsholders (multichannels, national broadcasters, studios, sports leagues etc.) – which is where the network effects of a single, searchable database will be attainable.

If history in our industry (and others) is anything to go by, multiple point solutions will - in time - consolidate into several competing video rights Blockchains, based on regions, or genres or whomever signs up for that specific Blockchain. The industry will save itself a great deal of time and resources if it coalesces quickly around one single global video rights Blockchain.

Arqiva is working with a London-based Blockchain company called Jaak on a pilot for a Blockchain-enabled video rights database, but as the saying goes, "other Blockchains may be available"!

Figure 1 shows the technology stack that Jaak is putting together for the video rights ledger, to give an idea of how the solution can be architected.

This stack comprises:

- Microservices and apps that provide easy access to the "outputs" of the Blockchain.
- Data/content, as provided by industry participants in the Blockchain

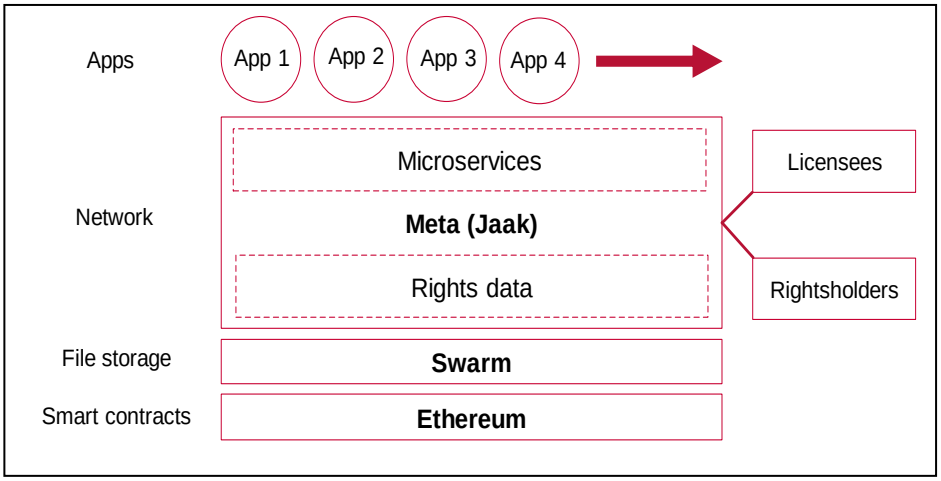

Figure 1 – A Blockchain tech stack for the video value chain

- Meta - a network protocol that provides a set of rules for connecting data across multiple sources, creating a decentralised, shared network.
- Swarm - a distributed data storage and content distribution platform
- Ethereum - an open-source, distributed platform/operating system that includes smart contract capability

PEER-TO-PEER CONTENT DISTRIBUTION

The second use case is to use Blockchain technology to enable ultra-local peer-to-peer distribution of content, analogous to Napster peer-to-peer music file sharing but for video – all on a legal, trackable basis powered/monitored by a Blockchain layer

Of course, peer-to-peer video distribution is not a new concept. Companies such as Octoshape and Steamroot have been or are offering some kind of P2P ability - but Blockchain could potentially enable P2P distribution in a much more radical way.

Unlike Napster in the music space, Blockchain could empower a legitimate business model of content delivery from millions of local “servers” globally to end consumer devices, with appropriate control/monitoring and processing of payments to hosting devices. While this seems far-fetched at present, if feasible this could overturn the distribution part of the value chain, disintermediating several of the current steps/players today and enabling much more efficient and cheaper distribution of content over the top.

How it could work:

- A Pareto-like selection of most viewed content is identified, tagged, and stored ultra-locally on user devices across the globe. File sizes mean that any individual device might only hold a small selection of content, but the Pareto-based selection of top content would exist within a defined ultra-local network.
- These videos are served up to any viewer on-demand through being delivered from one server/PCs/laptop to a user just a few streets away – either delivered as time-limited download or even streamed ultra-locally.
- Blockchain technology allows authorisation, enabling and tracking of legal provision of this P2P video distribution, together with a tracking and payment process for those (who could number millions) who allow their devices to be used for such services

At best, the video distribution value chain could be fundamentally redrawn by a successful application of Blockchain technology in this way, and there is a strong argument that this would be entirely welcome if it improved the speed and quality of video delivery to viewers, and reduced the cost of doing so at the same time.

Clearly there are immense challenges. The Blockchain technology stack and protocols that are being put together now for the video rights ledger application would need to be significantly enhanced and speeded up to enable authorisation, enabling and tracking of legal provision of P2P video distribution, together with (presumably) a tracking and payment process for those (which could number many hundreds of thousands) that allow their servers/PCs/laptops or even smartphones to be used for such as service. It is doubtful that workable technologies exist today for such a solution – but they may well do in the future.

Plus, of course, video files are vastly larger than music files; rightsholders would need to radically rethink their strategies; and IP networks would have to be able to cope with (and allow) a vast increase of “local” traffic. And it’s not too hard to think of at least another half-a-dozen major hurdles that would need to be overcome.

But, for the moment, the key point to remember is the potential of the prize on offer – a significant reduction of the vast amounts that media companies currently spend on distribution via CDNs.

CONCLUSIONS

The first steps are being taken today in developing practical applications of Blockchain technology to the video value chain.

Interest from many media companies in potential use cases is high, and that’s because Blockchain technology could potentially solve significant industry problems.

The most radical application could be in significantly redrawing the distribution part of the video value chain, but a more imminent application is in addressing many of the key problems associated with video rights licensing.

Blockchain-based solutions are already being developed for video rights, but the most utility will be gained from major industry players working together and coalescing around one global rights Blockchain, which will benefit the industry as a whole (and individual media companies) to a far higher extent than any collection of point Blockchain rights solutions ever could.

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