

TV News Archives and IPTC's Video Metadata Hub

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1st March 2018

Today, there are many hurdles for video creators, publishers and archivists who wish to find, reuse and share relevant video clips in a way that respects the legal obligations to rights holders. The IPTC Video Metadata Hub is a comprehensive approach aimed at promoting and simplifying the use of standard metadata for video. It make the process of managing, searching and sharing video clips simpler, more accurate and more efficient.

1. The Role of Metadata in TV News Archives

The production of video, particularly for news, often involves stitching together many clips from multiple sources. Accurate and relevant metadata is crucial to finding clips, to determining whether a given clip is permitted to be reused in a particular context and whether any duties apply to that reuse. There are several different metadata schemas which have been developed to allow for the capture of video metadata. However, different sectors tend to use different metadata schemes - such as EBUCore for broadcasters and PBCore for public archives. Equally, camera manufacturers and edit system makers often create proprietary schemes, leading to the development of "walled gardens".

Inevitably, the different goals of the designers of the various metadata schemes have led to significant limitations in what can be conveyed. Many video standards have a quite narrow set of metadata fields, often focused on technical metadata, with sparse support for descriptive or rights-related properties. It is not unusual for a metadata schema to be strictly bound to a technical format. However, there is a proliferation of video encodings driven in part by the evolution of mobile devices, as well as the appetite for increasingly high resolution. Therefore, video archivists need to be able to manage metadata properties in a way that is independent of any particular format. Finally, some video metadata schema list the allowed properties, but do not provide sufficient guidance on how they should be used, which poses a problem for interpretation and interoperability. Therefore, competing and overlapping metadata standards make it hard to preserve and exchange accurate metadata amongst the different players in the video ecosystem.

Often the original reason that a piece of video was shot - such as to illustrate a particular news story - does not match the potential ways in which a given clip would be of interest now. Therefore, flexible and context-neutral descriptive metadata is crucial for making video more findable.

In many archives, rights for a particular video clip aren't cleared until the point of reuse. Many metadata schemes lack comprehensive ways to capture the details of intellectual property restrictions in a machine-readable way.

All of these metadata challenges mean that archive video deals below a certain size may not be economic to pursue. Therefore, reducing these frictions has the potential to significantly expand the size of the video production and reuse marketplace, as well as unlocking the potential for TV news to be rendered as structured data for research and analysis.

2. How Can the IPTC's Video Metadata Hub Help Address the Challenges of TV News Archives?

The IPTC¹ is a consortium of news agencies, publishers and system vendors, which develops and maintains technical standards for news and media, including NewsML-G2, News-in-JSON and Photo Metadata.

IPTC's Video Metadata Hub² defines how various video metadata properties can be expressed in different technical metadata standards. In other words, it solves the problem of shared metadata semantics, without requiring everyone to adopt the same metadata encoding format. This enables the use and exchange of metadata, without requiring the creation or adoption of new metadata schemes. It is designed to cover many use cases in a way that allows the exchange of metadata with existing standards for describing the visible and audible content, rights data, administrative details and technical characteristics of a video.

At its heart, the IPTC Video Metadata Hub (VMH) is a list of widely used metadata properties - each one with a name, definition and data type - together with a mapping for each property to a set of metadata standards. Currently³, there are two default mappings - ISO XMP (for embedded metadata) and EBUCore (allowing for the metadata to be saved as a standalone file). These mappings provide a comprehensive way to capture video metadata, for situations where you are not already dealing with a particular metadata scheme. It is also possible to use the the VMH to enrich the use of video metadata, even when one or more metadata schemas are already in use.

2.1 The IPC Video Metadata Hub Maps to Several Standards

The IPTC identified the key metadata standards in use for video today and has created mappings for each of them, as part of the VMH:

- **EBUCore** a metadata specification designed for broadcasters and used globally. Defined by the European Broadcasting Union, a membership organization for public service media.⁴
- **XMP** the Extensible Media Platform, originally defined by Adobe and now maintained by ISO. XMP is primarily used for embedding metadata in binary files - not only video, but also photo and audio.⁵
- **Quicktime** the metadata specification from Apple for its Quicktime (*.mov) format⁶

¹ <https://iptc.org/>

² <https://iptc.org/standards/video-metadata-hub/>

³ As of IPTC Video Metadata Hub Recommendation 1.1
<http://www.iptc.org/std/videometadatabus/recommendation/1.1>

⁴ <https://tech.ebu.ch/MetadataEbuCore>

⁵ <https://www.adobe.com/products/xmp.html>

- **MPEG-7** is the ISO 15938-5 specification for multimedia metadata ⁷
- **NewsML-G2** is IPTC's news exchange format for all media types - not just video, but also text, photo, graphics, audio and packages of content. It is widely used for the b2b exchange of news and media ⁸
- **PBCore** is a metadata scheme designed for audio and video. Originally developed by WGBH it widely used by public broadcasters within the United States, as well as by a number of film archives and other media organizations⁹
- **Schema.org** is a metadata specification for embedding metadata in web pages, using RDFa, Microdata and JSON-LD. It was founded by applications from Google, Microsoft, Yahoo and Yandex.¹⁰

2.1.1 Embedded or Standalone Metadata?

The metadata standards covered by IPTC's VMH are split roughly evenly between those which support embedded metadata and those who provide it standalone. Is it better to embed metadata within a video or to keep it as a standalone file, independent of the binary?

On the one hand, embedded metadata is less likely to be stripped by accident. On the other hand, it is much less convenient to version metadata embedded within a video, since it requires the reprocessing of the entire file - which can be a significant burden for large binaries. Standalone metadata simplifies creating custom views of the metadata - you may want a more comprehensive metadata set for internal use with a more custom or targeted set of values for external use. You may also want to vary the metadata you deliver to others, such as providing metadata values in different languages; standalone metadata makes that possible, without having to deliver a different binary.

It is possible to maintain both metadata embedded within a binary asset and to have a standalone copy. However, this introduces the problem of keeping the two copies synchronized.

2.2 Supporting Video Production and Archiving Workflows Involving Multiple Standards

It is not unusual for video to be produced from multiple source clips, which can differ in their technical formats. Equally, news video often needs to be transcoded from one format to another, in order to make it viewable on different platforms and devices. This could be because the target device does not support the original video's format. Or it could be that the original video uses an obsolete encoding, which needs to be converted to a modern, supported format.

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https://developer.apple.com/library/mac/documentation/QuickTime/QTFF/Metadata/Metadata.html#//apple_ref/doc/uid/TP40000939-CH1-SW1

⁷ <https://www.iso.org/standard/34232.html>

⁸ <https://iptc.org/standards/newsml-g2/>

⁹ <http://pbcore.org/>

¹⁰ <https://schema.org/>

2.2.1 Transferring Video Metadata, Along with Video Transcoding

Since, metadata schemas are often closely tied to technical formats, there needs to be a way to render the video metadata when an original format is transcoded into another, either for playback on a particular device or as part of a target archive format.

By defining mappings for properties between different video metadata schemas, the VMH simplifies the work involved in supporting different video encodings. It also helps to ensure that different implementations are compatible, simplifying the task of those who need to combine video clips made available by different providers.

2.2.2 Uniform metadata access for search across Different Video Formats

When a video archive consists of multiple different source formats and metadata schemas, there needs to be a uniform way to search across video stored with different metadata standards.

An archive can define a single search schema that will work across disparate video formats by using the metadata properties defined by the VMH. This reduces the burden of designing a schema, as well as the ingestion definitions to support it.

3. The Different Types and Uses of VMH Metadata

The VMH divides metadata properties into four categories:

1. Descriptive
2. Administrative
3. Technical
4. Rights

3.1 Descriptive Metadata

Descriptive metadata is useful for the discovery of a video, such as by search. Most descriptive metadata properties consist of text suitable for display to an end user (and therefore indexable by a full text search engine). Some descriptive metadata properties identify visual and audio characteristics of the video - what can be seen or heard. In general, descriptive metadata can be applied - either by hand or automatically - based on the moving images and the accompanying audio tracks.

The VMH 1.1 Recommendation¹¹ descriptive properties are:

- Title
- Headline
- Description
- Keywords
- Descriptive Terms drawn from a Controlled Vocabulary
- Dopesheet
- Transcript
- Data Displayed on Screen
- Language Version
- Location Shot
- Location Shown
- Depicted Event
- Person Shown
- Person Heard
- Featured Organization
- Object Shown
- Product Shown
- Genre
- Shot Type
- Visual Colour

¹¹ <https://www.iptc.org/std/videometadatahub/recommendation/1.1>

- Snapshot Link

3.2 Administrative Metadata

Administrative metadata provides information to help manage a video. In general, administrative metadata cannot be inferred from the video in isolation. Properties such as “storyline” - identifying which news event or story this video covers - requires more context than a single video can contain.

The identifier for a video and whether versioning is supported is a complex topic. Does updating the metadata for a video trigger a new version of the entire video asset? Is an updated video binary a new version of the video or should it be marked with an entirely new identifier, perhaps linked to an earlier video via a storyline identifier? Should different technical renditions of a video get different identifiers? How should different edits of a video be linked together? The VMH enables a range of different identification and versioning policies through the identifier, version and rendition properties, along with other supporting metadata.

The VMH 1.1 Recommendation administrative properties are:

- Video Identifier + Video Version +Video Rendition
- Date Created and Modified (with support for imprecise dates)
- Date Released
- Series / Season / Episode
- Temporal Coverage
- Rating (supports different sources)
- Registry Entry
- Feed Identifier
- Storyline Identifier
- Publication data
- External Metadata URL

3.3 Technical Metadata

Technical metadata describes the technical characteristics of a video, generally at the rendition level. Often, technical metadata values can be automatically captured by software. Technical metadata properties can be useful for filtering a set of clips by desirable characteristics, such as encoding quality or duration.

The VMH 1.1 Recommendation technical properties are:

- Stream-ready
- Orientation
- Media Type
- File Format

- File Duration
- Editorial Duration Start
- Editorial Duration End
- Editorial Duration
- Frame Size
- Signal Format
- Signal Aspect Ratio
- Display Aspect Ratio
- Video Stream Count
- Video Coding
- Video Profile
- Video Frame Rate
- Video Bitrate Type
- Video Bitrate
- Audio Coding
- Audio channels
- Audio channel layout
- Audio Sample Rate
- Audio Bitrate Type
- Audio Bitrate
- File Bitrate

3.4 Rights Metadata

Rights metadata captures the intellectual property characteristics of a video, along with permitted uses or restrictions. Rights metadata properties are important for determining whether a given clip can be reused for a particular purpose. Indexing rights metadata values can be useful for filtering a set of otherwise similar clips, in order to restrict search results to just ones which can be reused.

The VMH 1.1 Recommendation rights properties are:

- Creator
- Contributor
- Supplier
- Licensor
- Rights Owner
- Copyright Notice
- Copyright Year
- Credit Line
- Rights and Licensing Terms - either as human-readable or machine-readable, or both
- Model Release Status
- Model Release Document
- Property Release Status

- Property Release Document
- Source

3.5 Video Metadata for Parts of a Video

Many news video stories consist of multiple video and audio tracks which have been stitched together. The VMH supports metadata both for an entire video and for the component parts.

Essentially, all of the VMH metadata properties may be applied to a part of a video, as well as to the whole. There is no requirement for the “entire video” metadata values to be a simple listing of the component part values. In order for the VMH properties to be expressed at the clip level, the underlying metadata scheme must support it.

3.5.1 EBUCore and <part> elements

An EBUcore XML document can include the metadata of the video as a whole, as well as of its parts.¹²

The properties of the `ebuCoreMain/coreMetadata` element apply to the video as a whole. The properties of an `ebuCoreMain/coreMetadata/part` element stand for a specific part of the video. The `partStartTime` and the `partDuration` elements define which part of the video is covered by a `part` element.

3.5.2 XMP and <Pantry> elements

The XMP packet of a video asset can include the metadata of the video as a whole, as well as of its parts.¹³

The top level of the logic structure of the XMP packet applies to the video as a whole. The `xmpMM:Pantry` element is an array of metadata packets of media assets which are a part of the video. Each packet must include an `xmpMM:DocumentID`. The `xmpMM:Ingredients` element defines the included parts either by its `xmpMM:DocumentID` or by the delimited frame counts of this part inside the video as a whole.

4. The Future of IPTC’s Video Metadata Hub

The IPTC’s Video Metadata Hub is under active development. The current recommendations are ready to use now. But the IPTC is continues to extend the coverage of the VMH to additional areas.

¹² <https://tech.ebu.ch/docs/tech/tech3293.pdf>

¹³ <http://www.images.adobe.com/content/dam/acom/en/products/xmp/Pdfs/XMPAssetRelationships.pdf>

4.1 More Metadata Mappings

As outlined in section 2.1 above, the VMH currently provides mappings to EBUCore, XMP, Quicktime, MPEG-7, NewsML-G2, PBCore and Schema.org. At the time of writing, the IPTC is looking at mapping to additional formats and standards, including SMPTE's MXF¹⁴ and camera-specific metadata, including Sony, Panasonic and Canon. A challenge here is that MXF properties are not always publicly available, so does it make sense to provide a public mapping in VMH? We will likely provide targeted mappings, based on specific requests, rather than attempt something more comprehensive.

In addition, the IPTC Video Metadata Working Group keeps an eye on the existing mappings, to keep them up-to-date - such as incorporating incremental updates to schema.org, where appropriate.

4.2 More Types of Video

The IPTC Video Working Group is starting to look beyond “traditional” forms of video and moving images. In the last few years, 360 degree video and photography have moved from being novelties to being taken seriously for the production of journalistic content¹⁵. Augmented Reality and Virtual Reality technologies are starting to be used as “practical tools” for news video¹⁶. Manufacturers are offering devices - such as Nokia's Ozo¹⁷ and Sphericam¹⁸ - to enable both professional and consumer “immersive” experiences.

However, the expression of metadata for 360 degree media is not yet standardized, so this is not a question of mapping between standards. One possibility is that IPTC itself creates standards in this area, as it has done for photography¹⁹. At present, we are working with the JPEG group as they seek to agree on 360 degree metadata²⁰.

4.3 Partnering with Others

The IPTC is starting to work with camera manufacturers and software companies to ensure that they agree that the Video Metadata Hub recommendations are accurate. The goal is also to promote awareness of this work - and perhaps to gather insights into where else standardization might be helpful.

¹⁴ <https://www.smpte.org/standards/find>

¹⁵ <https://insights.ap.org/industry-trends/report-how-virtual-reality-will-impact-journalism>

¹⁶ <http://www.tvnewscheck.com/article/109560/vr-and-ar-becoming-standard-news-tools>

¹⁷ <https://ozo.nokia.com/>

¹⁸ <http://www.sphericam.com/>

¹⁹ <https://iptc.org/standards/photo-metadata/>

²⁰ https://jpeg.org/items/20180212_cfp_jpeg360.html

4.4 Getting Involved with the Video Metadata Hub

IPTC is a membership organization consisting of more than 50 companies, associations and individuals²¹. All of the standards and other intellectual property created by the IPTC is produced under open source licenses. This means that anyone can freely use the IPTC Video Metadata Hub recommendations. However, if you wish to participate in the development and maintenance of the standard - or of any of the other IPTC standards - you need to become a member²².

You don't need to be a news organization to work with the IPTC. For example, within Photo Metadata, we have worked with cultural heritage organizations²³. And many of our standards are quite applicable to a broad range of media.

About half of the active participants of the IPTC's Video Metadata Working Group are from news or broadcast TV organizations. Many others are from cinema or stock footage archives. Most of the work happens in teleconferences and via a Yahoo! Group²⁴. We also have face-to-face meetings²⁵. Generally two "full" conferences, in which a broad range of topics are discussed and one Photo Metadata Conference (in concert with CEPIC) which has increasingly covered video-related topics in recent years²⁶.

If you have questions about the IPTC Video Metadata Hub, a good resource is the IPTC's Public Photo Metadata Yahoo Group²⁷. This is an active community with an interest in all kinds of image metadata - both moving and still. We're also considering offering certification in IPTC standards, perhaps starting with the VMH. Is that something that would be useful? Let us know! And if you're interested in any aspect of the IPTC, feel free to contact myself (chair@iptc.org) or the Managing Director (mdirector@iptc.org).

²¹ <https://iptc.org/participate/membership/current-members/>

²² <https://iptc.org/about-iptc/membership-enquiry/>

²³ <https://iptc.org/news/culturalheritagepanel/>

²⁴ <http://groups.yahoo.com/group/iptc-videometadata-dev>

²⁵ <https://iptc.org/about-iptc/events/>

²⁶ <https://iptc.org/events/photo-metadata-conference-2017/>

²⁷ <https://groups.yahoo.com/neo/groups/iptc-photometadata/info>