

The integration of Metadata from production to consumer

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The newly-formed MPEG-7 Ad-hoc Group on Integration is currently dedicating itself to the task of integrating metadata as approached by the SMPTE (for the professional TV Production domain) with the metadata approach chosen by the MPEG-7 community. The SMPTE approach is based on a dictionary and binary coding, and is intended specifically for machine control and fast real-time applications. The MPEG-7 approach is based on standard XML and is human readable.

For professional use during the more technical phases of production and post production, the SMPTE approach can be well suited while, in the domain of consumer set-top boxes, the most promising interface is XML-based.

Both approaches have value in their own right, each with distinct advantages at specific points in the content production and delivery processes. For this reason alone, it is worth the effort of trying to harmonize the two approaches. It would be of great benefit to broadcasters if production metadata and consumer services were to connect together seamlessly – without human intervention in the form of Metadata Editors in the transmission multiplex area.

Introduction

In many different groups, people are working on metadata and its standardization. Some of these groups have a special interest in the broadcasting world, in its widest sense. Others are interested only in the highly-specialized professional production environment.

As a result of the output from the EBU/SMPTE Task Force's work on *the harmonization of standards for the exchange of programme material as bitstreams (TFHS)* [1], standards development has proceeded within the SMPTE's Technical Committee, particularly

group W25, and also within other organization's committees such as the EBU P/Meta group [2]. While the SMPTE is working in the broad domain, including everything related to programme-making in a broadcast production environment, P/Meta is focusing on the area of Business-to-Business and System-to-System exchanges between Broadcasting or Production organizations, although they recently became involved also in the Broadcaster-to-Consumer domain.

In parallel with the start of this process, the MPEG community also realized that there was a pressing need for the development of a comprehensive MPEG metadata standard. This work started in July 1997 as MPEG-7. The work in MPEG-7 has, until recently, been largely driven by Academia and the Telco companies. Focus has very much been on web-based applications and annotation tools for audio and video material. The work has concentrated on the development of tools for describing concepts and content, although there also has been an interest in video editing.

However, MPEG-7 did not limit its scope to broadcasting, but extended into many other domains also; for example, medicine, physics and many other applications involving the description of audio-visual content. About one year ago, the broadcast community started to actively participate in this work and, of course, looked to the metadata work that was being done in the area of broadcast-related applications by a small group of specialists – largely the same group that was also participating extensively in the SMPTE metadata work. This group came to the conclusion that it was essential to harmonize at least the MPEG-7 and SMPTE standards, in view of the potential benefit and great opportunities opened up if these two work areas were to complement each other and could be made to map closely to each other – and the even greater benefits that would arise if related work, such as Dublin Core, the FIAT minimum data list and the work of the INDECS project, could also be incorporated. From that perspective, the MPEG-7 Integration Group was set up to formulate proposals for a framework that would allow the interoperability of metadata systems targeted at production, knowledge management, post production, archival repository, distribution, publication, and the exchange of audio-visual material both between businesses and between businesses and consumers.

This group quickly identified the need for a concise and consistent dictionary of terms and definitions within the various schemes, as well as the need for concise mappings between the MPEG-7 and SMPTE etc. work: indeed, a common dictionary would be an ideal outcome although this is likely to be extremely difficult to achieve. If MPEG-7 can be made to fit on top of, or act as an extension to library and broadcast production metadata, then there will be an opportunity, with little extra cost, to achieve intelligent navigation, multimedia handling and the exchange of descriptive data (metadata) between content providers (producers), professional and other users (e.g. broadcasters), and final users (consumers) – as well as unlocking the potential of effective knowledge management from data-rich libraries of stored material.

The MPEG-7 Integration Group has identified a validation process to enable the migration towards a common standardized metadata layer, underpinning all the business processes from the earliest conceptual stages of production, through the full range of multimedia production and post production processes, right into the home platform.

This process will enable the application of Information Science techniques to unlock the full potential of archival storage in such a way that existing content can be retrieved for a multitude of purposes.

As things stand, the professional production of multimedia content (including its metadata) is likely to be largely based on standards each written for a specific fragment of the end-to-end industry process. For instance, in the production and post production phases of standardization, it is likely to revolve around SMPTE standards such as the SMPTE Metadata Dictionary (SMPTE 335M and RP210), the Unique Material Identifier (UMID) (SMPTE 305M) and Key Length Value coding (SMPTE 336M). For librarianship purposes, the Dublin Core or the FIAT minimum data set is widely referenced while, in the conceptual and consumer domains, MPEG-7 is a very promising newcomer. However, it is essential that, as standards develop, applications based on any one of these standards should seamlessly integrate with applications further down the chain which are based on another standard. In particular, it is essential to ensure integration with consumer products using, for instance, XML so that metadata is passed transparently through the chain from the conception of an idea by the producer to consumption by a viewer or listener – without error or human intervention.

In the MPEG-7 Ad-hoc Group on Integration, the work has just been started to build the first version of an MPEG-7 dictionary. The group has recently taken the first steps in this process and, as a convenient starting point, will focus on filtering off Descriptors from the MPEG-7 Descriptor Schemes and, hence, produce a flat list of the Descriptors with their definitions and data-type. The next step will be to study if the MPEG-7 schema and SMPTE Dictionary world views can be reconciled and, currently, this work is in its very earliest stage. Once this preparation of the dictionary of terms and definitions has progressed to first draft stage, it will be possible to study the potential for the integration of the two. This must be done in such a way that precise definitions of metadata “elements” can be compared between the SMPTE and MPEG dictionaries, which makes the work painstaking and not a little challenging!

Initial work has, significantly, already revealed that the discipline of this dictionary approach is in any case essential and of vital importance in keeping the MPEG-7 schemes compliant within themselves. It has also demonstrated its suitability as a basis for interoperability with other metadata systems.

Abbreviations

FIAT	<i>Fédération Internationale des Archives de Télévision</i> (IFTA in English)	SMPTE	Society of Motion Picture and Television Engineers (USA)
KLV	(SMPTE) Key Length Value	TVA	TV-Anytime
MPEG	Moving Picture Experts Group	UMID	(SMPTE) Unique Material Identifier
NOB	Dutch Broadcast Facilities Company N.V.	XML	Extensible markup language

Although the MPEG-7 schemes enable a very rich mix of conceptual descriptions, there is currently a lack of an MPEG-7 transport and coding mechanism and this issue is under consideration at the moment in the Binary Format ad hoc group. The SMPTE has recently standardized Key Length Value (KLV) coding for transporting metadata within professional production technical systems. This coding protocol is specifically intended for transporting metadata associated with multimedia files and can be very bit-efficient. The study group in MPEG considers this way of coding as one of the possibilities for a binary transport of MPEG-7 metadata. One of the essential tools to be developed is one that will translate KLV into XML and vice-versa. In order to do this in a reliable way requires a common understanding of the basic elements used to build the applications and schemes. In particular, the integration of web-based consumer and professional user applications, alongside other professional production and post production tools in a professional production environment, will require complete interoperability in applications such as the searching of professional databases.

The broader picture

From the viewpoint of end-users, integration is essential since the industry literally cannot afford the costs of living with competing and possibly incompatible schemas in different parts of the production-to-consumer chain. Integration will also enable the elimination of unnecessary differences between schemas, and the minimizing of translation processes at interfaces. While in theory, it may be possible to work with different standards in each domain (production, post production, content management and distribution) – provided there is sufficient compatibility to allow automatic translation at the interfaces – this is undesirable. Translation is inefficient and unreliable (or lossy) without intervention, and is likely to be expensive to resource.

Clearly, the better alternative is to have a common structure and compatible domain-specific vocabularies with a single or federated public registry of the vocabularies.

Hence, the next stage in the integration process will be to study the integration needs beyond those of the SMPTE and EBU or Dublin Core, and into areas such as NewsML.

Fig. 1 outlines the process for integration:

The process on the left side represents the MPEG-7 environment and that on the right, the “others”.

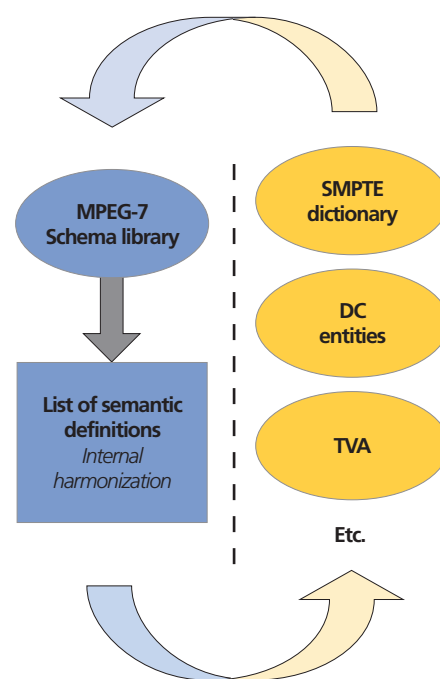


Figure 1
The process for meta-
data integration



Peter Mulder is currently a Consultant of Technology and Strategy development at NOB Department of Technical Services. He joined the company in February 1964 and later (from 1972 till 1989) worked at the Research and Development Department. From 1989 until 1994, he was Production Manager at NOB Design (graphics department). In 1994 he became involved in setting up of the then new business unit "NOB-Interactive", a unit that is still engaged in the development of new (multi)media and distribution possibilities and also with developing new technical infrastructures for performer-driven animation and for virtual studio systems.

Mr Mulder is active in many related international standards committees such as the SMPTE engineering committees, EBU/P-Meta, MPEG-7 and the TV-Anytime forum. During 1998, he was elected SMPTE Governor for the Europe, Middle East and Africa region and later re-elected for the 2000-2001 term. His main interest at the moment is in metadata and in both its use and exchange between the professional and consumer domains – "From shooting to the Personal Disk Recorder".

When a new MPEG-7 schema is proposed, it will be necessary to submit a contribution to the MPEG-7 MDS group and to agree the new application schema. This will be examined within the MPEG community and, if it fits in with the overall Standard structure, the scheme can be accepted.

Similarly, proposals in the other domains will be submitted in that domain.

Since the integration work has ensured reliable mappings between the standards, the mapping process for new submissions can then be completed without difficulty.

Closing remarks

In both the SMPTE and MPEG-7, the metadata groups are very small with only a few representatives from the broadcasting community. The issue is, however, vitally important to this community also: any interested broadcasters are invited to, indeed should, participate in this metadata work.

Bibliography

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