



**SIXTH FRAMEWORK PROGRAMME
PRIORITY 2
“Information Society Technologies”**



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Standardization Activity Report
Final Version***

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EXECUTIVE SUMMARY

This report describes project activities related to Task 9.4 - Contacts with standard bodies, concerning SAPIR contributions to standardization, as part of WP9 - Dissemination and exploitation of the results.

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1 INTRODUCTION

In this deliverable we are presenting the *standards* used (or planned to use) within the SAPIR development.

1.1 TASK 9.4 FOCUS AND OBJECTIVES

The focus of the task 9.4 is to maintain the connection to the standardization bodies and to interact with them in order to exchange specifications resulting from the work done in the several work packages of the project.

1.2 DELIVERABLE OBJECTIVES AND OVERVIEW

The objective of the deliverable is to provide a clear report on the standards used in SAPIR pointing out the potential contributions that the project can provide to the standardization bodies.



2 SAPIR CONTRIBUTION AREAS FOR STANDARDIZATION

SAPIR project deals mainly with *multimedia items*. Coding and representations of digital items are the most important activities related to the adoption of standards, as well as the proposition of extensions and new functionalities that the project can provide.

We can view the project as made up of an architectural layer and an application layer.

2.1 ARCHITECTURAL LAYER

Concerning the architectural layer, described in work package 2, we are making use of commonly adopted standard for communicating within the network, as TCP/IP, HTTP and SOAP for Web Services, as well as the *Java RMI* (Remote Method Invocation) for distributing special functionalities. Unfortunately, even if there is some proposal for a Standard protocol to be used in a Peer-to-Peer (P2P) network as the early born *IETF P2PP* [P2PP], there is still no common adoption of a unique protocol for managing structured overlays as DHTs. We are monitoring the evolution of the proposals of standard protocols for managing SONs (Structured Overlay Networks) and if it will be possible we will try to use them in our architecture.

2.2 APPLICATION LAYER

Concerning the application layer, first of all we have to point out the development tools we had agreed to adopt. As we have decided to make use as much as possible of *Open Source Software* (OSS) and *Standard Frameworks* and implementations.

1. Code is mainly written in Java programming language and the Standard Edition JSE [JAVA]
2. Builds and packages are implemented with Maven [MAVEN] and Ant [ANT].
3. The reference integrated development environment is Eclipse [ECLIPSE]
4. The code versioning is realized with Subversion [SUBVERSION]
5. The web applications are published with Apache [APACHE] and Tomcat [TOMCAT]
6. The analysis of multimedia items as well as text are done making use of the Unstructured Information Management Architecture [UIMA]
7. Full text indexing is mainly managed making use of Lucene [LUCENE]
8. Logging of the applications makes use of Standard Logging with CLF format [LOG]
9. As test unit we are adopting JUnit [JUNIT], a standard Java test unit.
10. Structured data are represented in Extensible Markup Language [XML]
11. XML parsing is done with Standard packages released by Sun Microsystems as well as Standard libraries for SAX and DOM parsing as Xerces [XERCES] and XML transformation as Xalan [XALAN]
12. Application design and analysis makes use of UML2.0 [UML20] for creating artifacts and documents to be shared.

Concerning the metadata representation we are making use of the formats MPEG-1,2,3,4 as well as AVI and MOV for managing digital items and MPEG-7 for managing the metadata representation. We are making use of MPEG-21 for representing rights. Hence the most important standardization organization that we are dealing with is the MPEG consortium.



Another body is the *Digital Media Project* [DMP], because its aim is to provide the specifications of the *Interoperable Digital Right Management Platform*. These specifications are the building block of the MPEG-A [MPEG-A] standard.

MPEG-A [ISO23000] facilitates the swift development of innovative, standards-based multimedia applications and services. To this end, the MPEG-A introduces a set of standardized Multimedia Application Formats (MAFs), together with their related software implementation. The normative software demonstrates how MAFs are used and offers vendors a head start for developing multimedia products based on MAFs. MPEG's ultimate objective for MAFs is to stimulate the increased use of MPEG technology through additional interoperability of different media types at the application level.

Although in the past MPEG has specified profiles, subsets of technologies within specific parts of the standards, such as MPEG-2 Video, it has never recommended the use of specific combinations of profiles across different parts of a standard, such as MPEG-2 Audio and MPEG-2 Video, or across different standards, such as MPEG-4 and MPEG-7. It is this combination of technologies across MPEG standards which is the topic of MPEG-A [ISO23000].

As the *European Broadcasting Union* (EBU) is delivering standards for managing videos in distributed infrastructures, we are keeping in contact with them, especially with the projects that can related to ours, as the P/META [P/META, P/METATOOLS] and P/SCAIE [P/SCAIE], B/P2P [B/P2P].



3 STANDARD BODIES

In the Following we are giving a short description of the standardization bodies cited in this report, leaving the www references for more detailed information.

3.1 MPEG CONSORTIUM

MPEG [MPEG] which stands for Moving Picture Experts Group, is the name of a family of standards used for coding audio-visual information (e.g., movies, video, music) in a digital compressed format. The major advantage of MPEG compared to other video and audio coding formats is that MPEG files are much smaller for the same quality. This is because MPEG uses very sophisticated compression techniques. The MPEG working group of ISO/IEC is in charge of the development of standards for coded representation of digital audio and video. Established in 1988, the group has produced:

- MPEG-1, the standard which such products as Video CD and MP3 are based upon,
- MPEG-2, the standard on which such products as Digital Television set top boxes and DVD are based,
- MPEG-4, the standard for multimedia for the fixed and mobile web,
- MPEG-7, the standard for the description and search of audio and visual content,
- MPEG-21, the Multimedia Framework for the management of digital rights

In addition to those "consolidated" (but still evolving) standards, MPEG has started a number of new standard lines: MPEG-A "Multimedia Application Format" provides application-specific standards by integrating multiple MPEG technologies. MPEG-B, MPEG-C, MPEG-D provide Systems, Video and Audio specific standards, respectively; MPEG-E "MPEG Multimedia Middleware" or M3W provides support to download and execution of multimedia applications and ISO/IEC 29116 "Supplemental Media Technologies" collects other media-related standards required by MPEG-A standards.

In its 18 years of activity MPEG has developed an impressive portfolio of technologies that have created an industry worth several hundreds billion USD. In [MPEG] an overview of the achievements and current work by MPEG.

MPEG standards can be purchased directly from ISO, from their website <http://www.iso.org> or from a National Body. Some MPEG standards are publicly available (including the reference software of all MPEG standards [MPEG]).

In a world where information technology, consumer electronics and telecommunication products converge by incorporating increasingly sophisticated technologies and the need for timely available standards is as strong as ever, MPEG provides a proven mechanism to feed research results into standards that promote industry innovation to the benefit of all.

MPEG is a committee of ISO/IEC that is open to experts duly accredited by an appropriate National Standards Body. On average a meeting is attended by more than 300 experts representing more than 200 companies spanning all industry domains with a stake in digital audio, video and multimedia. On average more than 20 countries are represented at a meeting.

3.2 DIGITAL MEDIA PROJECT

A not-for-profit organization with the mission to "promote continuing successful development, deployment and use of Digital Media that respect the rights of creators and rights holders to exploit their works, the wish of end users to fully enjoy the benefits of Digital Media and the interests of various value-chain players to provide products and services". From the article 3 for the DMP statute we have: <<The DMP is a not-for-profit organization with the mission to promote continuing successful development, deployment and use of Digital Media that respect the rights of creators and rights holders to exploit their works, the wish of end users to fully



enjoy the benefits of Digital Media and the interests of various value-chain players to provide products and services, according to the principles laid down in the Digital Media Manifesto [DMP Manifesto].

Digital Media includes new emerging experiences made possible by Information and Communication Technologies along with mainstream media experiences such as Compact Disc, Digital Versatile Disc, Digital Audio Broadcasting and Digital Television.

DMP operates on the basis of open international collaboration of all interested parties: corporations and individual firms, partnerships, governmental bodies or international organizations, supporting the DMP mission and the means to achieve its goals. The terms are reasonable and applied uniformly and openly. DMP seeks the involvement of creators and end users of Digital Media through appropriate mechanisms.

The goals of DMP are realized through the development of Technical Specifications and Recommended Practices enabling businesses that support new or improved user experiences, and Recommended Actions to appropriate entities to act on removal of barriers holding up exploitation of Digital Media. Technical Specifications, Recommended Practices and Recommended Actions are collectively called "DMP Approved Documents". DMP contributes the results of its activities to appropriate formal standards bodies and other appropriate entities whenever this is instrumental to achieve the general DMP goals. The business of DMP shall not be conducted for the financial profits of its Members but for their mutual benefits. Discussions about sales levels, methods, channels of distribution, markets, customers, prices or profitability or any other topic which would restrict use of Digital Media are prohibited.

3.3 EUROPEAN BROADCASTING UNION

The European Broadcasting Union [EBU] is the largest association of national broadcasters in the world, with the aim of promoting cooperation among broadcasters and facilitating the exchange of audiovisual contents. The EBU works to ensure that the crucial role of public service broadcasters is recognized and taken into consideration by decision-makers. EBU is consulted by the European Institutions on a regular basis on all issues of concern to the audiovisual sector. We also work closely with the UN, UNESCO and our colleagues in the World Broadcasting Unions (WBU) to ensure that our voice is heard in the global debate on media policy.



4 STANDARDIZATION ACTIVITIES

4.1 MPEG-A

The Digital Media Project is providing the reference software implementation of the ISO IEC 23000-5, called *Chillout* [CHILLOUT] and members of SAPIR (from EURIX) joined Chillout development in July 2007. Hence a first contribution to standards provided by SAPIR is the implementation of the reference software for ISO IEC 23000-5, *Media Streaming Application Format*.

Actually SAPIR will include Chillout in the application layer in order to fulfill the rights management in the P2P network. Also, we are monitoring the approval process of the other standards related to MPEG-A (23000-x) in order to provide/test the reference software. Chillout is the name given to the reference software implementation of the Digital Media Project (DMP). DMP is a no profit organization that has recently approved a version 3.0 of its specification, called Interoperable DRM Platform (IDP-3.0). In July 2006 a group of DMP members submitted a proposal to MPEG to standardize a Media Streaming Multimedia Application Format (MS MAF) based on DMP IDP specification, which has reached in October 2007 the stage of Final Draft International Standard. For this reason, Chillout is also the reference implementation of ISO/IEC 23000-5 Media Streaming Application Format [23000-5], targeting the distribution of governed content over streaming channels.

Chillout is released as Open Source Software (OSS) under the Mozilla Public Licence v.1.1 and it's composed by several layers: a Core Layer, a normative library providing the functionalities to generate and parse (a) the XML structure defined by IDP, (b) files and streams for transport across devices, (c) messages exchanged by two devices performing DMP protocols; an Auxiliary Layer and an Application Layer that provide a number of applications to create, distribute and access content and associated information.

Chillout can virtually handle any type of audio-visual resource, and allows creating contents with inline or referenced resources and metadata describing them. Specific profiles of TV-Anytime [TVANYTIME] and MPEG-7 [MPEG-7] are the native choices of metadata schemes for describing some characteristics of the content. Moreover, MPEG-21 REL is the technology of choice for representing the IPR information related to content and parts thereof. Chillout can handle both content only governed by a license (a Creative Commons-like approach) and at the same time content governed by a license and also protected by encryption techniques, thus enabling a broad variety of application scenarios and business models.

The following is a list of technologies implemented by Chillout:

1. A data structure capable of hosting diverse data types accompanying a "resource" audio, video, image, text etc. (Digital Item Declaration or DID [DID])
2. An identification system of content (Digital Identification or DII [DII])
3. A set of technologies usable to protect content (Intellectual Property Management and Protection or IPMP [IPMP])
4. A language to express rights associated to a resource (Rights Expression Language or REL [21000-4][21000-5-1][21000-5-2])
5. A file format for storing Digital Items and resources (File Format [21000-5-3])
6. A technology to transmit Digital Items in streaming mode (Digital Item Streaming or DIS [21000-9])



4.2 MPEG-7

We can divide our contributions to MPEG-7 into two different contexts: the MPEG-7 representation and the MPEG-7 Query Format.

4.2.1 MPEG-7 Metadata Representation

Concerning the representation, in D3.1 we defined an annotation format for expressing the results of metadata and feature extraction. Some of the extensions are specific to particular indexing and retrieval methods that are being developed in the scope of the SAPIR project, and would not be appropriate to propose as standards. The following extensions could be of more general interest, and will be proposed to the MPEG-7 committee:

- The description schemes *MelodyDescription* and *RhythmDescription*, which describe melody and rhythm in a different way from the standard MPEG-7 description schemes. These representations are required for the music retrieval methods we are investigating in SAPIR.
- Annotations for mentions of named entities (persons, places, etc.) in text and speech. We will propose extensions implementing this functionality, although the details of the proposals will differ from those described in D3.1 due to ongoing work since D3.1 was completed.

4.2.2 MPEG-7 Query Format

Concerning the MPEG-7 QF we have joined the board responsible for it, proposing a Query-By-Example syntax based on XML Fragments [XML Fragments] extended with a new `<Mpeg7Query>` operator for querying MPEG-7 features. A detailed description of the possible contribution to the MPEG-7 QF to exploit it in SAPIR analysis is provided in Deliverable D5.1, *Query Language for complex queries over multi-media data*.

The approved standard from Oct 2007, [MPQF] defines a syntax for input query format and for output query format. In the Input query format they define three main elements; Representation (what to return), QueryCondition (conditions on the input including on MPEG-7 features) and SortBy (how to sort the results).

For the SAPIR scenarios we mainly focus on the QueryCondition part from [MPQF]. Still we think that the QueryCondition in [MPEG-7QF] lacks some functionality like defining a similarity over a combination of several MPEG-7 descriptors, hierarchies of descriptors with weights and their combinations by a user defined aggregate function as defined in Deliverable D5.1.

We proposed SAPIR contribution to be included in a future version and the board was positively impressed by our suggestion.

In the coming months we will monitor the progress of the standard and try to extend it with our defined functionality. Once it is approved we will consider transforming our language to the QueryCondition part of [MPQF].

4.3 MPEG-21 (QUERY FORMAT)

The contribution to MPEG-21 is the proposal of a Query Format for Rights, that is missing so far. When the MPEG-21 was born, there was no need for a specific query format, as most of



protected items were not published / exchanged on the worldwide web. Nowadays, the growing of sharing systems of digital items as Flickr [FLICKR] and YouTube [YOUTUBE] implies the need of querying not only the items itself but also the associated license and we think that it is the time for having a standard way for doing this. Most of the sharing systems are creating their own proprietary protocol for accessing the rights information. Our suggestion is to propose an MPEG-21 QF to the MPEG consortium in the next meetings. Actually we are planning to provide a “call for MPEG-21 Query Format” to the consortium.

Actually the MPEG consortium will probably decide to include the MPEG-21 QF in a more general MPEG Query Format (MPQF), by creating a unique bundle, along with the MPEG-7 QF.

4.4 IDRМ

Concerning the Interoperable Digital Right Management, we have joined the DMP, providing an extensions of specification related to the iDRM in a P2P environment. We have provided the 1052 [IDRM1052], 1053 [IDRM1053] specification documents related to the P2P iDRM. These specifications are not yet included in a standard, but they are accepted by DMP and they are open and everybody can adopt and implement them in a completely open way.

4.5 EBU P/SCAIE

We have declared our interest in the P/SCAIE [P/SCAIE] project and EBU will take our solution for extracting features in their *study of content analysis-based automatic information extraction in production*. In our architecture, each peer is potentially able to extract enough features for automatically classifying the digital items that it owns. In addition, for extracting features we are making use of fully open source software and standards packages as UIMA [UIMA] chains, SOAP communication and Java programming language. Hence EBU could be very interested in this kind of solution.



5 PLANS FOR STANDARDIZATION ACTIVITIES

The contribution areas described in the previous Sections will involve SAPIR members in the next months. SAPIR concrete plans for contributions to standards can be outlined as in the following:

- development of Chillout, the reference software for ISO IEC 23000-5, *Media Streaming Application Format* (see Section 4.1)
- possible extension of MPEG-7 metadata representation to include appropriate description schemes for music, text and speech (see Section 4.2.1)
- propose a contribution to the QueryCondition part of MPEG-7 QF to express queries by a weighted combination of MPEG-7 descriptors for the similarity (see Section 4.2.2)
- possible proposal of a call for an MPEG-21 QF (which is still missing) to MPEG consortium
- contribution to the definition of the MPEG-21 QF (or the the MPEG-21 part of the unique MPEG QF), in order to express queries including digital rights metadata (see Section 4.3)

The possible contributions listed above will require the participation of SAPIR members to the activities of standardization bodies mentioned in this document. Therefore we do not exclude the addition of further contributions suggested by the development of SAPIR research activity itself or by the collaboration with members of standardization bodies.

6 SUMMARY

In this report we have presented an exhaustive list of the standards adopted by the project partners in the application implementations as well as in the metadata representations.

Moreover the planned contributions to the standardization bodies are presented and we can conclude that SAPIR aims to make use as much as possible of the currently available standard technologies and formats and whenever a specific technology is not covered SAPIR will try to propose its implementation to the related organization, in order to improve our software quality and to give a candidate solutions to the other researchers in the future.



7 REFERENCES

- [JAVA] - <http://java.sun.com/javase/>
- [MAVEN] - <http://maven.apache.org/>
- [ANT] - <http://ant.apache.org/>
- [ECLIPSE] - <http://www.eclipse.org/>
- [SUBVERSION] - <http://subversion.tigris.org/>
- [APACHE] - <http://httpd.apache.org/>
- [TOMCAT] - <http://tomcat.apache.org/>
- [UIMA] - <http://incubator.apache.org/uima/>
- [LUCENE] - <http://lucene.apache.org/>
- [LOG] - <http://logging.apache.org/>
- [JUNIT] - <http://junit.sourceforge.net/>
- [XALAN] - <http://xalan.apache.org/>
- [XERCES] - <http://xerces.apache.org/>
- [XML] - <http://www.w3.org/XML/>
- [UML20] <http://www.uml.org/>
- [EBU] <http://www.ebu.ch/en/about/index.php/>
- [MPEG] <http://www.chiariglione.org/mpeg/>
- [P2PP] <http://tools.ietf.org/wg/p2psip/draft-baset-p2psip-p2pp-01.txt>
- [P/SCAIE] Study of Content Analysis-based Automatic Information Extraction in Production - <http://www.ebu.ch/>
- [B/P2P] <http://wiki.ebu.ch/p2p>
- [P/META] Metadata Exchange Project - <http://www2.sub.uni-goettingen.de/cgi-bin/ssgfi/anzeige.pl?db=meta&nr=000613&ew=SSGFI>
- [P/METATOOLS] PMetaTools - <http://www.crit.rai.it/attivita/pmetatools/index.html>
- [DMP] <http://www.dmpf.org/>
- [DMP Manifesto] <http://www.chiariglione.org/manifesto/dmm.htm>
- [ISO23000]
http://www.iso.org/iso/iso_catalogue/catalogue_ics/catalogue_detail_ics.htm?csnumber=42010&ICS1=35&ICS2=40
- [MPEG-A] MPEG-A – ISO IEC 23000 - Multimedia Application Format - <http://www.chiariglione.org/mpeg/standards/mpeg-a/mpeg-a.htm>
- [IDRM1052] <http://www.dmpf.org/open/dmp1052.zip>
- [IDRM1053] <http://www.dmpf.org/open/dmp1053.zip>
- [UIMA] <http://incubator.apache.org/uima/>
- [FLICKR] - <http://www.flickr.com/>



[YOUTUBE] - <http://www.youtube.com/>

[23000-5] ISO/IEC 23000-5 Information technology — Multimedia application format (MPEG-A) — Part 5: Media streaming application format

[TVANYTIME] ETSI TS 102 822-3-2 V1.1.1 (2006-01); Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime"); Part 3: Metadata; Sub-part 2: System aspects in a uni-directional environment

[MPEG-7] MPEG-7 ISO/IEC 15938 Information technology Multimedia content description interfaces. <http://www.chiariglione.org/mpeg/standards/mpeg-7/mpeg-7.htm>

[DID]ISO/IEC 14496-13:2004 Information technology — Coding of audio-visual objects — Part 13: Intellectual Property Management and Protection (IPMP) extensions

[DII]ISO/IEC 21000-2:2005 Information technology -- Multimedia framework (MPEG-21) -- Part 2: Digital Item Declaration

[IPMP]ISO/IEC 21000-3:2003 Information technology -- Multimedia framework (MPEG-21) -- Part 3: Digital Item Identification

[21000-4] ISO/IEC 21000-4:2006 Information technology -- Multimedia framework (MPEG-21) -- Part 4: Intellectual Property Management and Protection Components

[21000-5-1] ISO/IEC 21000-5 AMD 1 – Rights Expression Language: the MAM (Mobile And optical Media) Profile

[21000-5-2] ISO/IEC 21000-5 AMD 2 – Rights Expression Language: the DAC (Dissemination And Capture) Profile

[21000-5-3] ISO/IEC 21000-5 AMD 3: – Rights Expression Language: the ORC (Open Release Content) Profile

[21000-9] ISO/IEC 21000-9:2005 Information technology -- Multimedia framework (MPEG-21) -- Part 9: File Format

[CHILLOUT] <http://chillout.dmpf.org/wordpress/index.php>

[MPEG7QF] Mario Döller and Kerstin Renner and Ingo Wolf and Matthias Gruhne and Harald Kosch, Introduction of an MPEG-7 Query Language, *In Proceedings of the Second International Conference on Digital Information Management (ICDIM 2007)*, October 2007, Lyon, France,

[MPQF] Kyoungro Yoon, Mario Doeller, Matthias Gruhne, Ruben Tous, Masanori Sano, Miran Choi, Tae-Beom Lim, Jongseol James Lee, Hee-Cheol Seo, Ingo Wolf, ISO/IEC FCD 15938-12 Query Format, Oct 2007