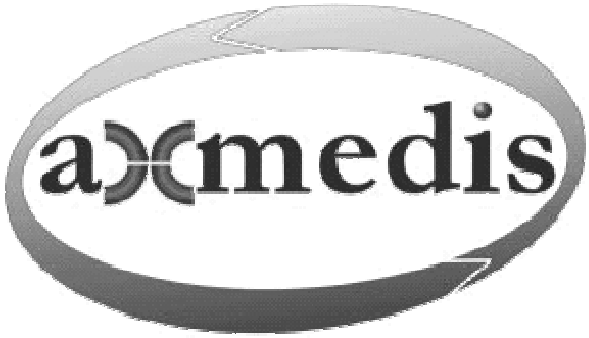


Automating Production of Cross Media Content for Multi-channel Distribution

www.AXMEDIS.org

DE2.1.1a

User Requirements and use cases

Version: 1.0-public
Date: 24/12/2004
Responsible: DSI

Project Number: IST-2001-37168
Project Title: Automating Production of Cross Media Content for Multi-channel Distribution
Deliverable Type: public version
Visible to User Groups: Yes
Visible to Affiliated: Yes
Visible to the Public: Yes.

Deliverable Number: DE2.1.1
Contractual Date of Delivery: M3
Actual Date of Delivery: 05-01-2005
Title of Deliverable: User Requirements and use cases
Work-Package contributing to the Deliverable: WP2
Task contributing to the Deliverable: all that of WP2
Nature of the Deliverable: report
Author(s): all

Abstract:
This document reports the requirements collected for the realization of the AXMEDIS Framework and AXMEDIS tools in general for the automated production, protection and cross channel distribution of digital content.
Keyword List: Requirements, Multimedia, cross media, Cross channel distribution, content production, protection.

Table of Content

1 Executive Summary and Report Scope

Market and end-users are pressing content industry to reduce prices. This is presently the only solution to setup viable and sustainable business activities with e-content. Production costs have to be drastically reduced while maintaining product quality. Content providers, aggregators and distributors need innovative instruments to increase efficiency. A solution is automating, accelerating and restructuring the production process to make it faster and cheaper. The goals will be reached by: (i) accelerating and reducing costs for content production with artificial intelligence algorithms for content composition, formatting and workflow, (ii) reducing distribution and aggregation costs, increasing accessibility, with a P2P platform at B2B level integrating content management systems and workflows, (iii) providing algorithms and tools for innovative and flexible Digital Rights Management, exploiting MPEG-21 and overcoming its limits, supporting several business and transactions models. AXMEDIS consortium (producers, aggregators, distributors and researcher) will create the AXMEDIS framework with innovative methods and tools to speed up and optimise content production and distribution, for *production-on-demand*. The content model and manipulation will exploit and expand MPEG-4, MPEG-7 and MPEG-21 and others real and de-facto standards. AXMEDIS will realize demonstrators, validated by means of real activities with end-user by leading distributor partners: (i) tools for content production and B2B distribution; (ii) content production and distribution for i-TV-PC, PC, kiosks, mobiles, PDAs. The most relevant result will be to transform the demonstrators into sustainable business models for products and services during the last project year. Additional demonstrators will be 2-3 associated projects launched as take up actions. The project will be supported by activities of training, management, assessment and evaluation, dissemination and demonstration at conference and fairs.

This deliverable is related to all the deliverables of WP2 which is devoted to the continuous collection and analysis of user requirements. This activity is performed by setting up a user group of experts and by considering the content production models, educational paradigms, entertainment models, distribution paradigms and protection innovative aspects of the project. The WP presents early requirements analysis with related tasks and a successive WP2.4 for its updating during the whole project when additional, or revised, detailed requirements will appear. The work includes the adoption of interviews and the identification of use cases, description of the test cases, (while the corresponding collection of reference content for stressing key problems and for the eventual verification and validation of corresponding solutions is performed in WP8), collection of current practices (best practices) in using media technologies and solutions (processes, tools, methodologies, equipment, etc), identification of distribution processes and models.

Main deliverables are:

- DE2.1.1 -- User Requirements and use cases (M3) – this deliverable contains the description of the user requirements and the corresponding use cases in UML, coming from WP2.1 and WP2.2;
- DE2.2.1 – Test cases and content description (M4) – this deliverable contain the description of the test cases for research functionalities and AXMEDIS tool validation, coming from WP2.2;
- DE2.4.1 – Requirements update (M18);
- DE2.3.1 – User Group Set up and analysis (M4). The analysis will be done on the basis of the curricula and the needs of the AXMEDIS project, to verify that all the aspects and user profiles and roles will be covered by the user group;
- DE2.3.2 – User Group Maintenance (M13).

The main activities that have supported the production of this deliverable are related to:

WP2.1 -- Early Requirements Analysis -- responsibility DSI -- collection of user requirements by using the expert user groups. The focus will mainly be on: content workflow, content management, content production, content searching, content rights management (licensing, formalising usage rules), content formatting in the various contexts (PC, mobile, i-TV, kiosk, PDA), user profiling, content composition, fingerprint, watermark, indexing, querying, transaction models, push and pull balancing, etc. In addition, a more detailed analysis of the functionalities that could be useful in the above contexts will be done: query on technical aspects, content

composition, content formatting, distribution, content exchanging, certification, supervision, etc. The use cases have to be collected by considering the points of view of content designers, multimedia producers, TISCALI, OD2, ANSC, AFI, ILABS, XIM, SEJER. In addition, EUTELSAT, HP, DSI, DIPITA, CPR, CRS4, IRC, UNIVLEEDS, EPFL, COMVERSE, ACIT, etc., will also collect this information from their experts by using specific interview based on guidelines produced by the consortium. A part of this information will be collected by reviewing the results of several past projects. In the analysis of requirements also those of the AXMEDIS partners and potential customers and SMEs in the respect of the WWW pages for getting general AXMEDIS services will be considered.

WP2.2 -- Use cases and test cases description -- responsibility FUPF -- this WP is devoted to the organisation of the requirements in terms of use cases and the corresponding identification and description of test cases. The test cases will be used for validating the functionalities identified by research and development WPs and during the activities of integration and optimisation, and in those of demonstration which is temporally allocated after the M30. The Content for the test cases will be collected and/or produced in WP8. The description about how the test cases will be selected and about which content will be suitable for that goal is reported in WP8. The use cases will be structured according to the UML model, including: name, ID, description, context assumptions (equipment, paradigm, location), actors (skill, age, instrument, paradigm), steps, variation, non functional aspects, content, interaction protocol, issues, etc. The test cases will be structured according to structure of the AXMEDIS framework and tools that will be developed in these 18 months of work. The model will be UML including: name, ID, description, functionality to be tested, context, partners involved, validator skill, data set needed, steps, expected results, variations, issues, additional activities to be considered, metrics to be used, etc. In this subWP, the targeted quality of use of the tools that will be developed during the project will be also defined in terms of metrics for usability. To this end users including the general public will be modelled based on the definition of the user requirements. The usability metrics will be focussed on extracting relevant drivers in the real environment of the application. Use cases and test cases for describing the interaction with the AXMEDIS services provided by the AXMEDIS portal will be separately described.

WP2.3 -- Set up and management of a AXMEDIS User Group -- responsibility UNIVLEEDS -- a user group of experts will be set up. The members of the user group will receive updated information about the project evolution and will constitute a source for testing and validating the produced results. The user group has to present experts representing the different users of AXMEDIS tools at business and consumer levels. These are content producers, content integrators, content designers, usability experts, content distributors, content aggregators, publishers, etc. A separate deliverable has been produced reporting all the activities regarding the User Group.

Requirements reported in this document have been classified in MANDATORY (default value), DESIRABLE and OPTIONAL. AXMEDIS consortium has decided to start working and defining the architecture focussing on the MANDATORY requirements for the first 18 months, but avoiding to define an architecture that could preclude any of the requirements including those that are OPTIONAL.

For the terms and the definitions reported in this document please refer to the Specification Document Part J.

This document is comprised of two parts:

A) on requirements
B) on use cases

Test cases are reported in a different deliverable.

2 Introduction to AXMEDIS

Market and end-users press content industry to reduce prices. This is presently the only solution to setup viable and sustainable business activities with e-content. Production costs have to be drastically reduced while maintaining product quality. Content providers, aggregators and distributors need innovative instruments to increase efficiency. A solution is automating, accelerating and restructuring the production process to make it faster and cheaper. AXMEDIS will start from the state of the art, taking the industry of content production and integration beyond, reducing the costs of content production and creating an environment in which content providers, producers, integrators and distributors will have access to a huge amount of content at lower cost by exploiting P2P solutions at B2B level.

The ***main*** project objectives of AXMEDIS project are:

- Reducing the costs of cross media **production** by accelerating the production process with artificial intelligence algorithms for: content composition and formatting, integration and aggregation, and workflow; identification and trial of solutions for accelerating content production and packaging; supporting the standardization process and contributing to MPEG; allowing the reduction of production costs (in the order of 30%) using automatic production of content and production on-demand. The adoption of the AXMEDIS solution and basic technologies in the next 5-8 years by major publishers and distributors and in several of the minor ones;
- Reducing the costs of cross media **distribution** among content producers, aggregators and distributors with a P2P platform at B2B level integrating Content Management Systems and workflows, including digital rights management (DRM) and active protection models supporting different business and transaction models; realization of the AXMEDIS Peer to Peer (P2P) infrastructure and tools for cooperative work on content production;
- Providing algorithms and tools for innovative and flexible **Digital Rights Management**, exploiting MPEG-21 and overcoming its limits, supporting several business and transactions models. Solving difficulties in creating and distributing cross media content generated by using content components coming from different content providers (supporting different Content Management Systems) with the support of a suitable interoperable DRM system. Contributing to these aspects to the MPEG-21 standard. (the project does not fix limitation to the content format and DRM);
- Realization of the AXMEDIS framework including research results, algorithms and tools for content production and distribution to stimulate and support the adoption of the new technologies by SMEs and large companies. The framework will be available for the European Industries and research groups. The new technologies will be open and interoperable to be integrated to present technologies and solutions of the production and distribution chains;
- Developing new knowledge at scientific and technological levels by means of research activities and use these innovative results to reinforce the leadership of Europe in the field of cross media production and distribution, acting in several points of the value chain.

2.1 State of the Art

The state of the art of digital content production is quite complex. The whole value chain ranges from content owners, producers, aggregators, integrators, distributors, publishers, designer, etc. In these large value chains the different distribution channels are also in many cases distinguished for the delivery channel (i-TV-PC; PC, Internet, PDA, Mobiles, i-TV-STB), or the theme of content (educational, games, software, cultural, etc.), or type of content (MPEG-4, MPEG-2, mp3, audio files, movies, documents, etc.), or modalities of transmission (streaming, downloading, etc.), or business models (subscription, pay per play, etc.), etc.

The state of the art of content management and distribution is mainly owned by the partners of the project especially for the content management and distribution.

- OD2 is a worldwide leader in B2B distribution of music. OD2 has in its portfolio all the content of the majors (BMG, Sony, WARNER, EMI, UNIVERSAL, etc.). They have their WAN platform for content management.
- SEJER is the leader of content market as an EDITIS company focussed on educational aspects.
- EUTELSAT is the most relevant carrier of satellite data broadcast for i-TV. They distribute OPENSKY.
- HP is one of the leaders of the consumer electronics market and of the high performance and content management systems with their Right Media Environment.

- TISCALI is using its Content Management System, XAURA, for managing and distributing content via 12 Portals in Europe and more recently for distributing content at mobiles such as images, messages, audio and videos.
- COMVERSE is a technology provider that creates large distribution systems and content management systems for distributors. Most of the large Content Providers are their clients: ZOMBA, etc.
- ILABS is producing content and managing it via proprietary and HP solutions.
- XIM is a content integrator in the area of videos. XIM presents an efficient workflow for integrating different content types integrated with the Content Management system.

The state of the art of CMS is quite complex. It can be difficult to compare performance and data models since a CMS is usually tuned for the specific needs of each user company. Publishers, distributors, aggregators, etc., have different needs in terms of metadata and files manipulated.
Most mid- to large-size content providers and distributors have their specific content management system, and larger companies have multiple systems in place. Implementations are usually focused on either Web content, documents, digital assets, or XML data.

The consortium partner **HP** provides MAB (Media Application Bus) a set of software tools and APIs that make the integration of different systems independent from the device manufacturer, programming language and underlying middleware platform. The Media Application Bus is a set of standard interfaces and protocols for applications working together in an integrated environment. The architecture is based on open standards. On the MAB, HP can build the whole value chain inserting the best of breed products for ingestion, indexing, editing, asset management, Digital Rights Management, storage and production. CMS must provide classification systems capable of organizing key metadata value and attribute pairs to aid in site analysis, personalization, content targeting and search results.
Generic repository systems help you maintain and manage large amounts of diverse content. By storing content as XML, vendors claim improvements in content re-use and re-purposing. XML also allows authors to search content repositories easily to find what they want. XML-based systems also include transformation services and content validation for structural compliance against a Document Type Definition (DTD). The primary advantage of XML-based systems, according to the vendors, is that XML permits you to separate content, format, and business logic.
The use of XML in the content management is rapidly evolving and the most interesting benefit is the single source publishing, even supported by a WYSIWYG document editor. Effective problems in storage and interoperability are still the lack of standards. A structured content is the key for a real XML-based benefit.
Automation is a feature to gain as much as possible from an XML-based content management; to eliminate manual steps wherever possible like conversions or manual formatting and to specialize the modelling and the creation parts are very recommended. What it can be gained is a full flexibility of the information. A typical solution is to create in proprietary formats and to export to the XML, this choice allows using a familiar environment but fails in a lack of the specialization capability of the model itself.

Some frameworks, like **XAURA** (used by the partner **TISCALI**), take full advantage of open standards. Using JSP technology, XAURA enables web developers to create fully dynamic pages without having to learn how to write Java code on the basis of Tag libraries. XAURA Tag Libraries can be mixed with the standard JSTL or third-party open source tag libraries (Jakarta Project) allowing the insertion of servlets by the Java programmers. JSP pages use tag libraries to retrieve and display content stored into XAURA. By design XAURA is not tied to a specific template technology or to a particular database implementation. As a CMS, XAURA has been designed for editors in order to enable very fast and easy management and publishing of relational data structures, even the most complex. It provides features for data categorization, scheduling, feed importation and user management. XAURA permits to manage any type of content, including video, multimedia objects etc. It is programmed in Java on an underlying Open Source architecture (JSP, Jakarta Tomcat, Apache, MySQL). Thus is possible to improve and adapt when project requirements imply the development of new features (personal java servlets to enhance content management functionalities). The XAURA concept of content is based on entities like Content type (abstract objects which describe the form of content in the system) and Content Item (instance of a Content type). In XAURA content must always be categorized and categories may be used to manage the widest variety of content properties. As an example, for a web site, categorization

will be generally used to specify that a specific Content Item belongs to a specific channel in a web site. XAURA supports automated data management procedures (workflow improvement). This is particularly important with external feed management. Incoming feeds may be thus imported, parsed, categorized, related and even published through completely automated procedures. As an example, if the feed is an XML file, procedures can be managed by writing a coherent XLS (EXCEL) file that will automatically import data into the system.

In most cases, the problems of all the content manipulators, delivering channel for content theme or types are similar. Currently, producers must plan content to work within the limitations of each target platform, making later repurposing for unforeseen delivery channels difficulties. Producers must also work to tight budgets and lead times, making it uneconomical to try and anticipate future requirements of content. Designers and aggregators work with a disparate array of proprietary tools and media, and are required to reinvent (or at best, repurpose) content for each target platform, often requiring massive parallel or overlapping duplicated effort.

The state of the art of content modelling, composition, formatting, protection and management is grounded on the content formats. Presently there is a large number of content formats that ranges from the simple files: documents, video, images, audio, authoring, etc., to integrated content models such MPEG-21 and WEDELMUSIC. The Project is going to move this state of the arts beyond the limitation of these models in:

- modelling of aggregated audio visual content, authoring MPEG-4, SCORM, etc. EPFL, ILABS, DSI, EXITECH are at the state of the art as demonstrated by the publications on WEDELMUSIC, CARROUSO, etc.
- managing at level of an integrated Content Management System among several leader companies in the sector. Allowing the sharing of content and the automatic accounting of its usage. In this area no P2P applications for integrating Content Management Systems have been proposed for B2B applications. This is a totally new action that also includes technical queries integrating content, legal, DRM, and technical aspects.
- formatting aggregated content to produce in short time complete and integrated content according to formatting style description. This is the first step for the realisation of *production on demand.* See the work of DSI in SAMOPROS; the language MILLA in WEDELMUSIC, the synchronisation models of EPFL, UNIVLEEDS, DSI, etc.
- combining, transcoding and formatting, for accelerating and automating as much as possible the production process protecting complete objects and components with the usage of DRM rules and licensing information. This will allow to process right automatically on the basis of the contracts. Protection models will take into account encryption, fingerprint and watermarking technologies: FHGIGD, DSI are working on this sector;
- studying and realising tools for content production in MPEG-21. EPFL, FUPF, DSI, EXITECH are working in MPEG.

DRM has to provide support for defining and implementing any business and transaction models. The Project will not address the study of new business models since they are different for each distribution channel and in most cases very well established and working. Where they are less defined, they are typically changed frequently with the aim of identifying more profitable solutions. The DRM is typically supported by AXMEDIS Certifier and Supervisor tool that is described in WP5.

Digital Rights Management (DRM) is a key issue for the real deployment of multimedia content distribution and e-commerce on the Internet. One valid approach to achieve this deployment is to develop standards allowing interoperability of solutions. MPEG is one of the international standardisation initiatives that are trying to take this path. MPEG international standards are produced by ISO/IEC JTC1 SC29/WG11 and published by ISO/IEC. In particular, MPEG-21 standardises a Rights Expression Language (REL) and a Rights Data Dictionary (RDD), helping to improve systems and applications interoperability. The REL specifies, based on XML technology, ways for applications to express rights and conditions applied to users and content. On the other hand, the RDD describes the semantics and relationships of rights, relating to the REL. Although currently several solutions for content distributions are available (Microsoft DRM, Media Commerce Suite of Real Network, EMMS of IBM, Liquid Audio, DMD Secure, Soudwrap, Sealed Media, Intertrust, DMOD, etc.), they do not seem to be accepted by the general public.

The general aim for MPEG-21 is to define a multimedia framework to enable transparent and augmented use of multimedia resources across a wide range of networks and devices used by different communities. The result will be an open framework for multimedia delivery and consumption.

MPEG is not the only effort for interoperability. There are many other consortia working in the topic, in most cases oriented towards a particular application area or market sector. Examples are OeBF, DVB, Open Mobile Alliance (OMA), OASIS, IEEE/LOM, CEN/ISSS, etc., to mention a few. It is worth noting the initiatives in the area of rights expression languages, such as XrML (eXtensible Rights Mark up Language) – the basis for MPEG-21 REL –, ODRL (Open Digital Rights Language) or LicenseScript. The MUSICNETWORK and MUSICAL projects are doing a good analysis of these standards.
The first generation of DRM systems was focussed on security aspects as a mean to solve the problems, in combination with the enforcement into existing architectures. A second generation will provide additional features to support end-to-end supply chain services. Current systems include languages for describing the terms and conditions, tracking asset usages by enforcing controlled environments or encoded asset manifestations, and closed architectures for the management of rights.

This will be performed by using technical open solution and tools that will be integrated in the production process of any content provider, aggregator or distributors. They will continue to use their technical solutions for low level content delivering while the AXMEDIS will be a kind of Super Content Management System, providing facilities for accelerating and facilitating the content production and B2B distribution integration respecting their ownerships on content and technology. AMEXID solution will overcome the problems of the integrated solutions that try to manage the multi-channel distribution by centralising the content formatting or by constraining the content distributors to strongly change their distribution chains.

The project is focussed on **reducing the production costs by 30% and increasing the integration** of the production process of cross media content, independently of the modalities of transmission, business models, theme of content, while AXMEDIS is going to take into account the aspects of content production, protection and distribution solving problems and producing new technologies:

- for content aggregation, transcoding and formatting to allowing the delivering on demand, content production on demand, contributing to MPEG-4, MPEG-7 and to MPEG-21;
- for content protection via DRM, contributing to MPEG-21, and by using fingerprint technologies for monitoring, defining interoperability rules from DRM and licensing aspects, and from standard of the market and MPEG-21 such as Windows Media and Real;
- for content sharing among business partners: producers, aggregators, integrators, distributors, publishers, designer, etc.;
- for content distribution towards automating/accelerating formatting on demand for distributors of some different distribution channels;
- integrating different Content Management Systems in a P2P network capable of sharing content among partners, tracking rights, clearance licensing, accounting, monitoring, etc., interoperability for content management system;
- for content selection via simple queries for the end user and complete technical queries at the Business level in the P2P, considering, DRM, licensing, content indexing, metadata, technical details, etc.

2.2 Potential Impact

The AXMEDIS project will have a strong impact on the social objectives of the EC.
The main points are the possibility of exploiting the huge amount of cross media which is present in the hands of the publishers in a secure manner and at low cost and thus at a low price for the final user. This will be performed by taking into account the needs of several relevant actors of the value chain.

The high costs of content production for multiple channels, combined with a lack of a secure model for distributing multimedia objects has limited the production and distribution of a huge amount of content and related investments due to a lack of a sound business case. This has led to a limitation in the creation of new services for the citizens. In addition,

today's high production costs create a significant entry barrier for new content creators and owners whose content does not have a high commercial potential, including much work of artistic, educational and cultural importance along with not-for-profit services.

The AXMEDIS has the critical mass to contribute to maintain the leadership in the area of content of European companies and research centres, creating the real environment and standard for attracting in it all other SMEs involved in this sector. The industrial partners will use the AXMEDIS solutions for improving their production and distribution processes. This means that the AXMEDIS demonstrators will be substantially a trial of the innovation that they will introduce in short time in their business process.

For these reasons AXMEDIS project will be very effective in:

- reducing costs of cross media production and distribution;
- increasing safety and reliability of protection models bringing them at an absolute level of confidence for the content producers and distributors;
- accelerating the publication of cross media content thus reducing their costs and allowing the production of content on demand;
- making possible the sharing of content components in the production process under the regulation of DRM. With AXMEDIS results, it will be possible to distribute the European content in the world without the risk of copyright infringement. This will increase the profits for distributors, publishers, authors, etc., and will reduce the price for the final users. Most of the publishers and content producers are typically SMEs. This trend has been already identified as the only possible way to solve the present problems;
- Producing new forms of leisure and entertainment. It will be possible to exploit the AXMEDIS framework and production process and distribution to implement new services such as: implementation of distance learning by sending cross media didactical material, sharing content among content producers, providers, archives, and distribution of multimedia towards final users with any type of cross media content;
- Opening the path for new services and functionalities for the citizens and for the intermediate users such as multimedia libraries, schools, cinema, etc. With AXMEDIS results, it will be possible to have full access to the information content, thus new functionalities for searching, comparing, composing cross media components, etc. This will be available at different levels for those who use cross media:
  - Content or components for business: creating added value digital objects in its production process: digital video broadcasters, digital audio broadcast, e-learning society, multimedia publishers, professional studios, etc.
  - Final cross media objects for entertainment or leisure such as simple consumers/end-users, multimedia archives, libraries, schools, theatres, etc.
- Allowing publication and production for all. With AXMEDIS solution, a P2P solution is realised for producing and sharing protected content among Consumers and small producers;
- Reducing the cost of service for delivering cross media towards the citizens for the availability of more efficient and smart business models. For example, one will buy cross media content that could be played at home on the computer, downloaded from the satellite data broadcast or simple internet or via mobile connection, and used on the i-TV, copied by a PC on physical support (for instance a CD, DVD, memory card) for the cars, etc., under the control of AXMEDIS DRM that guarantees the respect of the copy right rules;
- Increasing the number of employers, since new functionalities and roles will be possible in the multimedia SMEs for integrating available content and creating new products, and also by exploiting the smart engines of AXMEDIS for accelerating the production process.

The added-value in carrying out the work at a European level.

Most of the results that will be produced by the project will have a strong value even for non European countries and especially for the USA. This is due to the fact that the state of the art in Europe is advanced in comparison to that of the other countries, and with the AXMEDIS the advantage will be maintained and increased. In general, new products, new solutions, and new services could be built on the basis of the results of AXMEDIS project and these will be ideal for their exportation outside Europe.

The project has to be performed at European level to:

(i) reach the critical mass in terms of skill, human and financial resources.

(ii) Reach the critical mass in terms of skill since in this area is impossible to find competent partners in a single nation. In fact, the project involves several partners belonging to about 9 different states f the EU and from outside. Several partners of the AXMEDIS project are leaders in their sector and the complementary of their skill make the AXMEDIS consortium an unique occasion to solve common problem together and go on the world wide market with innovative European Solutions: EUTELSAT, SEJER, TISCALI, OD2, ILABS, HP, etc.

(iii) put together competencies coming from different strongly skilled research centres, companies and end-users from Europe and thus integrating their skills to reach a unique goal, to solve a set of common problems. This integration of knowledge is impossible to establish at any national level.

(iv) establish consensus for the setting of an effective standard for producing, protecting and sharing cross media content and preparing them for multichannel distribution.

(v) establish consensus for interoperability among different large industries and SMEs in different European states that work on the same cross media production and distribution area.

(vi) Helping the actors involved in the e-content business and SMEs in particular to increase their cooperation with technologies and to foster the acceptability and adoption of the technology in practice.

(vii) Stimulating the European content market towards a better organisation, creating the framework for an European-wide, and subsequently global, digital market were the production audio-visual contents will be stimulated, the rights holders protected and the consumers will have the opportunity to access to a wider offer of high quality contents.

The main results that can be exportable outside Europe are the content composition, transaction model, interoperability and protection aspects. The work performed in the project will address EC policies related to industrial exploitation of cross media content, valorisation of cultural heritage and digitisation, e-commerce (transaction model and protection), multimedia protection, Digital Rights Management, standardisation of multimedia objects, protecting European produced content and companies that work on content production and distribution.

Short Term and Long Term Impact

The market of cross media content production and distribution is very large. In AXMEDIS, the market segment taken into account addresses the production of content for delivering is on PC, I-TV (satellite data broadcast, which is satellite distribution toward PC), Mobiles, PDA, and kiosks. AXMEDIS will create a set of tools for shortening the production of content and thus for reducing the production and distribution costs at level of B2B. The analysis has been done with the support of the most important European industries. The integration of their activity with the support of major European companies and Research Institutions will create the real mass to make the difference strongly improving the state of the art.

The intention of the Consortium is to keep high the innovation of AXMEDIS solutions along the project according to the needs and the evolutions of content production, aggregation and distribution solutions over the duration of the project. This activity will be performed by using the knowledge that the partners have of the market in which they are actors and by using direct relationships and reporting of market assessing institutions. At the conclusion of the project, several sustainable activities are foreseen for all the partners. The intention of all partners is to participate in the successful exploitation of the project results. The most important streams of revenues that will keep the AXMEDIS a sustainable activity will be *a mix of services and products:*

- Services for maintaining and updating the AXMEDIS framework.
  - SMEs and Institutions that will produce the demonstrators and the take up are strongly interested in maintaining on the market their applications based on AXMEDIS framework;
  - Other companies and institutions will be strongly interested in becoming AXMEDIS compliant according to the high diffusion that it will have according to the dissemination and demonstration performed;
  - Maintenance of the installed demonstrators around Europe;

    - Design support for restructuring on the basis of the AXMEDIS technology content production and aggregation industries;
    - Registration to the AXMEDIS services and news.
- Products for the AXMEDIS:
    - AXMEDIS tools, initially will be delivered for free. In a second phase, commercial versions can be priced when coining proprietary components;
    - AXMEDIS protection model integrated on different architectures and platforms.
- Products based on AXMEDIS framework and services
    - Those produced from the demonstrators;
    - Those produced from the take up actions, etc.;
- Services that can be based on the exploitation of AXMEDIS compliant products
    - as those listed above.

Most of the above streams of revenues will request very small amount of money for each transaction; while, their global marketing is significant. The real market is not for AXMEDIS as a European stable consortium but it is in the impact that the AXMEDIS will have in the European Market of content and in the general quality and innovation that will be reached and thus in the products that the major industries involved in the project are going to produce with the demonstrators and in the AXMEDIS framework. The real benefits will be for the whole sector in Europe.
On this view, the partners are quite confident that the project results will produce relevant results and products that will gain a sustainable position on the market. The most important activity to reduce the risk is to organise a set of actions and measures, to make the project results strongly visible, accessible and profitable for all in terms of revenues, thus transferring the results into sustainable activities.
To this end, the following activities will be performed to widening the market:

- Exploiting and giving visibility to the Demonstrators via free services for an initial period;
- Exploiting and giving visibility to the take up Actions;
- Acquiring political and social consensus:
    - Contacting local, national and European governments. Partners such as: DSI, CPR, DIPITA, FHGIGD, FUPF, CRS4, SEJER, ANSC, UNIVLEEDS, EPFL, IRC, etc. have direct involvement in the administration bodies of their local and national Governments. European authorities and institutions will be reached by means of them;
    - Contacting industrial and European groups of interest. Partners such as: TISCALI, HP, ILABS, COMVERSE, EUTELSAT, OD2, EXITECH, CPR, etc. have direct involvement in industrial associations and European groups of interest;
    - Contacting local, national and European banks. Partners such as: CPR, etc., have direct involvement in their local and national banks;
    - Exploiting contacts with related companies. They have already confirmed their interest in the project with EOIs.
- Direct contacts:
    - Exploiting the visibility of ANSC, OD2, SEJER, TISCALI, etc. and of the major companies such as HP, COMVERSE, EUTELSAT, etc., for promoting AXMEDIS;
    - Exploiting the received Expression of Interests for stimulating them to become AXMEDIS compliant;
    - Exploiting the major associations and institutions for the dissemination of project results, see the list in the proposal;
    - Distribution of AXMEDIS framework for free to SMEs;
    - Distribution of AXMEDIS demonstration CDs.

2.3 Contributions to standards

International standards are considered as the basis in the AXMEDIS development for both models and tools. The results in this area will be contributions to the standardisation and extension of the presently available standards. AXMEDIS will use and improve the current standards in the field of multimedia content and content protection and distribution. The main contributions to standards will be into MPEG-4, MPEG-7 and MPEG-21. The AXMEDIS consortium can

guarantee a continuous presence in the MPEG committee, where some of the partners are active (EPFL, FUPF, DSI, etc.).

MPEG-21

In order to properly deal with the intellectual property of multimedia content, it is necessary to use Digital Rights Management (DRM) systems. The current ones have interoperability problems that International Standards may solve. Furthermore, newly developed tools would be better deployed if relevant standards exist. AXMEDIS plans to contribute to this standardisation work in two ways. First, by trying to align existing efforts, in collaboration with international bodies, such as the European CEN/ISSS. Second, and more important, by contributing to the most promising initiatives, such as those led by MPEG, that include, in MPEG-21, the specification of a Rights Expression Language (REL) and a Rights Data Dictionary (RDD), whose main objective is to facilitate interoperability between systems. Our project would verify the feasibility of those standards, close to their finalisation by proposing, if necessary, modifications or extensions to the standard and by developing the needed Reference Software, and overall test platforms and terminals. It must be taken into account that members of the Consortium are already active members of the groups already dealing with these issues. Finally, it is worth mentioning that, although mainly focussing on MPEG, other similar initiatives, such as those of IEEE/LOM, OMA or W3C will be followed and, if considered adequate, contributed to. The contributions planned for the specification of the MPEG-21 standard are mainly focussed on the DRM and its integration and application on the several media. These contributions are in the related deliverables. Additional contributions to MPEG-21 are envisaged more in general on overall aspects of the MPEG-21 terminal (such as DIA, DID, DIP etc.) like described in WP 4.1. Contributions in this case will be focused on the analysis of the requirements of AXMEDIS media and the functionality of MPEG-21 terminal, providing consistent feedback in terms of test, validation and amendments. These contributions will be in the deliverables related to WP4.1.

The consortium will produce a solution quite close to the idea of MPEG-21 (DRM and terminal in general) according to the past experience and the workplan. The decisions that will be taken will depend on the reasons for which the MPEG-21 will not materialize: delay, stop at the work, abandon in favour of a de facto standard, etc. In the case of DRM, AXMEDIS will produce a solution that will be interoperable with different models and solutions according to the requirements of interoperability that we have defined since the beginning. This will give us the possibility to better tune the model to become compliant with other DRM systems if the MPEG-21 fails. The idea to contribute on the MPEG 21 is mainly based on the fact, that we can still affect the structure of the MPEG-21 to cope with our needs, and in addition, MPEG-21 is more general with respect to the Windows Media and OMA or others. Thus it results in more flexibility and a perfect platform to be more interoperable among other DRMs. Nevertheless, project partners are also working on alternative specifications in the area of DRM, such as ODRL. The other sources are also Content Reference Forum, and the Digital Media Manifesto. EPFL is one of the founders of the DMP and DSI has participated to its definition.

MPEG-4, MPEG-7, W3C

AXMEDIS will go beyond multimedia coding and scene composition specified in MPEG-4, but in any case it will make wide use of MPEG-4 codecs and tools, from audio and video codecs to synthetic content modelling and multimedia scene description and delivery. In this sense, and given the current advanced status of MPEG-4, the contribution of AXMEDIS will nevertheless be based on two main aspects. The implementation of a complex and ambitious framework like the AXMEDIS one will for sure contribute to integrate and test different tools at the Systems level that have never been tested together at advanced prototype stage and this could highlight some difficulties or corrigenda to be done; moreover a fundamental contribution will be provided in terms of refinement for the conformance test procedures, especially at the Systems layer and for what concerns Profiles definitions and setup of appropriate complexity Levels.
AXMEDIS will also consider extremely advanced forms of, among others, music distribution, including coding and delivery of multimedia content including music notation and music descriptions. Concerning these aspects, AXMEDIS will take care to follow and contribute to efforts aiming at the integration of music notation format into MPEG-4, in coordination with the MUSICNETWORK NoE and with other leading companies in the music distribution domain.

For MPEG-7, AXMEDIS will contribute with the description of technical content for supporting complex query including DRM, technical features, licensing aspects, etc. These descriptors will be associated with AXMEDIS content

in the P2P platform for content sharing. Other contributions will be in the synchronisation, adaptation of musical objects in terms of descriptors and Middleware (MPEG-21 DIA, MPEG-21 Multimedia Middleware or M3W, etc.).

In addition to the contribution to MPEG, the World Wide Web Consortium (W3C) will be addressed, particularly for what concerns potential extensions to SMIL and SVG for media synchronisation and graphics, other than the new effort on synchronised text. Of particular interest is considered the recent effort for convergence between MPEG-4 XMT, SMIL, SVG and X3D (Web3D consortium). A precise strategy will be conceived at the beginning of AXMEDIS in order to maximise the contribution in this effort for convergence among extensible XML-based formats.

Distribution and transactions (ISO, XML, MARC, MAG, SBNC)
Distributed systems for search and retrieval of information are only feasible in case where the communication lines between clients and servers are well defined. Therefore AXMEDIS will closely adhere to already existing standards in the library sector (ANSI/ISO Z39.50 and a potential successor ZING) and emerging technological standards in the area of web services. The Universal Description, Discovery and Integration (UDDI) for look up of collections and Simple Object Access Protocol (SOAP) to connect to them are important. The Web Services Description Language (WSDL) provides descriptions to the offered web services used in conjunction with SOAP. The transported metadata can be provided in a range of different representations depending on the protocols used for communication and the availability of connected sites (MARC formats in the library area or where applicable XML schema). When distributing content standardised security mechanisms for the transfer are necessary. This can be achieved by using Secured Socket Layer (SSL) applications. Not only the particular communication steps have to be secured but also whole transactions. Secure Electronic Transactions (SET) may be envisaged for that purpose. There will be no active contribution to the aforementioned standards. The standards SBNC and MAG for cataloguing content will be considered.

Others standards considered
Contributions to other standards are foreseen. The de facto standards such as RealMedia, Windows Media and Adobe Content management will be taken into account for the area of content production and distribution. The interoperability of AXMEDIS with these standards will be studied and realised. These activities are possible as it has been done in WEDELMUSIC for including Adobe content including their DRM and protection model. The formats and the related standards for modelling images will be considered with particular attention to: TIFF, JPEG, JPEG2000, PNG, GIF, BMP, etc.
OD2 partner has a standardised format already supported by EMI, Warner, Sony for the distribution of music. SEJER belong to the French AFNOR CN36 organisation for standard. Sharing with US publisher on existing specifications.
The OMA (http://www.openmobilealliance.org/) is focused on the specification of service enablers and services layer and therefore is relevant for project AXMEDIS
OMA Download + DRM Subworking group: The goal of the OMA and Download sub working group is to specify application level protocols and behaviours that provide transactional and lifecycle management of content and applications and mobile devices.
AXMEDIS will make use of and may contribute to the OMA Download and DRM working group.
The OMA DRM work at this stage is more “messaging applications” oriented. AXMEDIS will define its specific and more enhanced application DRM requirements and will contribute to the OMA DRM protocols by enhancing it to support these requirements. AXMEDIS can enhance the current OMA STI work to include the support for AXMEDIS media types. There is also an open question on how to properly transcode a DRM encrypted media. AXMEDIS can contribute to define a standard way to do that.

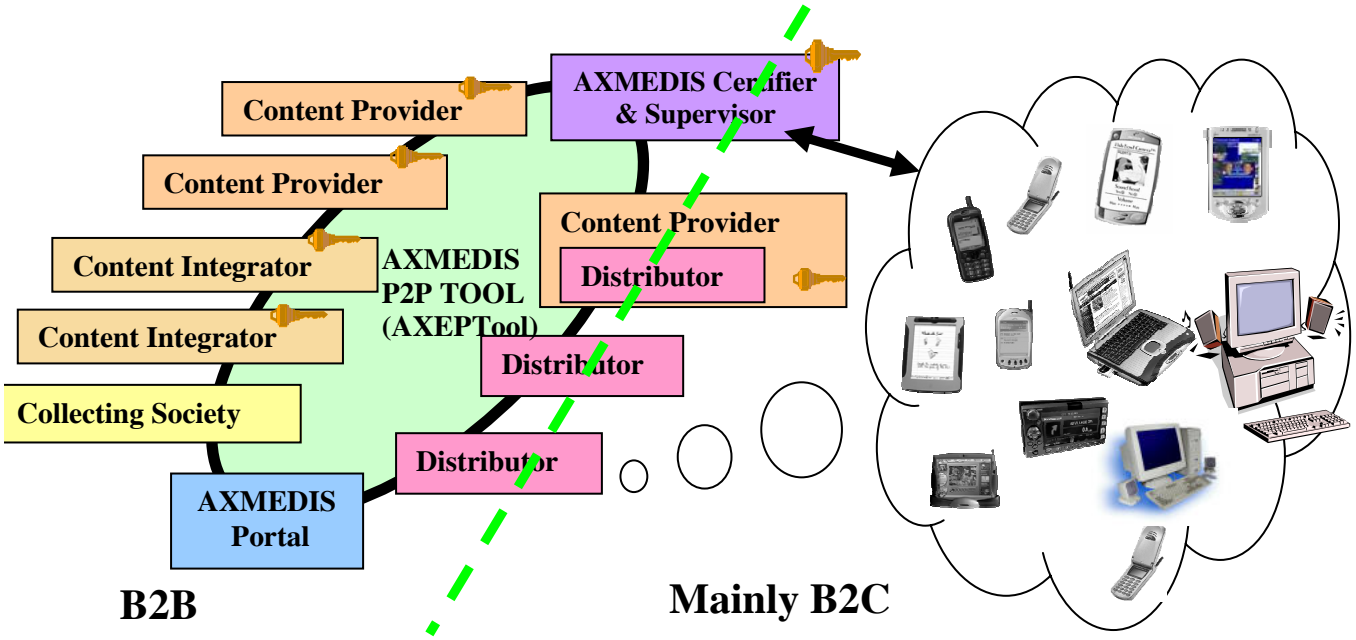
3 AXMEDIS main tools

The AXMEDIS digital content and content components (in the following, AXMEDIS content in general) will have a specific format capable of integration inside any kind of cross media format (video, images, animations, document, audio, etc.), adding metadata, identification, classification, categorization, indexing, descriptors, annotation, relationships and play activities and protection aspects. The format will permit the combination of content components, their secure distribution, etc., in the respect of the copyright laws, supporting a large variety of DRM rules and models according to concepts of interoperability among DRMs (mainly, but not only, based on MPEG-21, with both binary and

XML low level formats). Within the AXMEDIS content any type of cross media content can be included from simple multimedia files to games, software components, for leisure and entertainment, infotainment, etc.

The General Architecture of AXMEDIS is represented in the next figure, which highlights both:

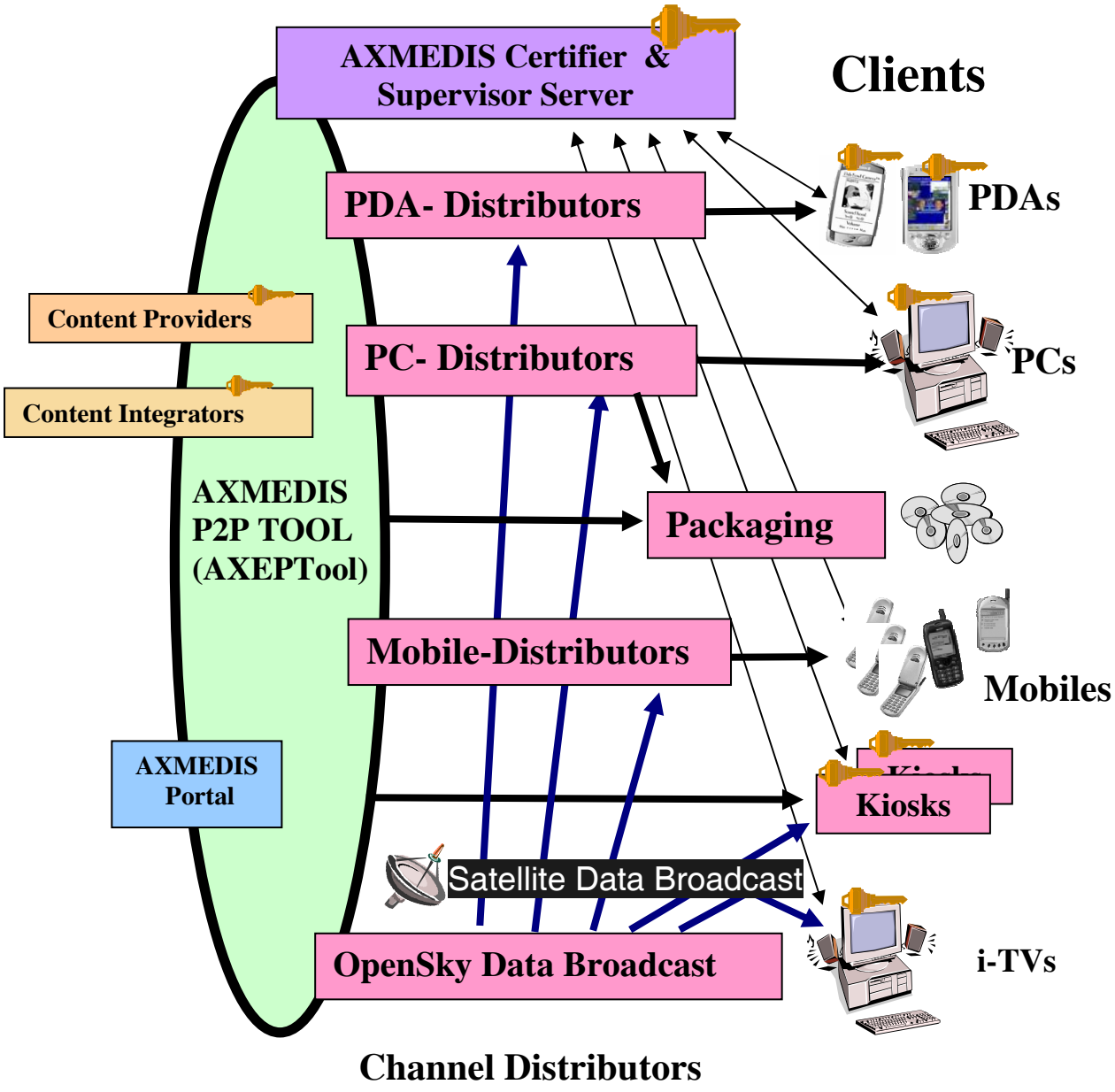
- **production** of AXMEDIS digital content and content components in connection with the AXMEDIS P2P tool (AXEPTool) that follows business mechanisms of B2B and support DRM with a certification authority (AXMEDIS Certifier and Supervisor). This can be connected to the Collection Societies as well as to each Content Provider and to Distributors if needed;
- **distribution** of AXMEDIS digital content towards clients via specific distributors that realize the last level of the distribution chain. This last level can also support a B2B transaction if the distribution is targeted at institutions. Also at this level the sharing via mechanisms of P2P is allowed and stimulated. This will not invalidate the protection model of AXMEDIS DRM.



AXMEDIS General Architecture, mainly B2B side

The standard distribution channel is today a single distribution path for each type of content, and often, multiple proprietary systems of representation for the same content. The definition of distribution channel editorial formats would provide one way, unified and rock-solid content format for multipurpose applications. Alternative solutions support multichannel distribution by using an XML model of content into the Content management systems of the content provider that also include multiple transcoding engines for transforming the XML model of content into the format suitable for the channel. This approach is not flexible enough since the transcoding of content at the source strictly limits the management of Digital Rights. In fact, in models such as CONTESSA the DRM can be applied only to the content in its final version. This creates key problems for the content providers since the content distributors are entitled to receive unprotected content. This is almost unacceptable in most cases.

In AXMEDIS, the channel distributors may maintain their distribution process. They can continue to use the same format for reaching the final users. In AXMEDIS, the content is distributed by using the P2P tool, namely AXEPTool, by using an evolution of the MPEG-21 format, with the AXMEDIS contribution. This content will easily contain and deliver MPEG-4, MPEG formats, PDF, HTML, SVG, images, documents, videos, audio file, etc. (in open standard format for continuation, without the use of proprietary technologies) on demand and for all platforms according to the final format produced by the Distributor. The received content will be formatted by using AXMEDIS tools on the basis of specific editorial formats.



AXMEDIS General Architecture, mainly B2C

The possible Channel Distributors have a large variety of capabilities, they are both of pull and push, and may include off-line and on-line connection from the client to the distributor.

Channel Distributors are interested in:

- Getting AXMEDIS content and components from the Content Providers and using them for distributing content via their channels for redistribution for both B2B and B2C transactions.
- Collecting AXMEDIS contents in a local database for preparing the production content Programme that is the agenda/menu proposed to the customers and final users.
- Using AXMEDIS content for creating attractive content for their customers. For this reason, they need to have the possibility of inspecting content in their internal LAN on a client PC.
- Receiving and satisfying requests from their customers for delivering to them the proposed content

- Receiving and satisfying queries performed by their customers that are looking for specific content. This activity is one of the most interesting added value of the AXMEDIS architecture.
- Getting updated information about the possible content that can be recovered from all Content Providers. This activity is performed via a service of the AXMEDIS portal. The updating of the database of the available content is performed in push via satellite data broadcast with specific policies.
- Accessing statistics produced by the AXMEDIS Certifier and Supervisor about the content usage.

Satellite Data Broadcast It is a content distribution mechanism that permits the distribution of the AXMEDIS content in a very efficient manner. This improves the quality of service of the data delivery process (dependent on broadband availability in client location), and Distributors and also PC users can also rely on Satellite Broadcast. This technology, provided by EUTELSAT's Opensky platform, allows large quantities of data to be pushed via satellite directly on the user's PC without congesting local networks. The use of this technology is completely transparent with regard to the AXMEDIS process and only acts as a cost effective and efficient transport mechanism. The same technology also allows the content providers to bring live multimedia streaming content directly to the user's PC either for free to air content (mainly for marketing purposes) or paying on-demand channels. The pushing mechanism can be used to renovate the catalogue of the Distributors periodically at low cost.
This platform appears to be ideally suited for distributing AXMEDIS content and components. It represents an excellent opportunity for content providers for new business and for accelerating the distribution decreasing their costs.

The satellite distribution channel can be used for several activities of content distribution for both B2B and B2C business models:

- The push of content
  - updating the AXMEDIS content and components in the databases of the Distributors and of the Providers;
  - updating the general indexing databases of the Distributors with updated information regarding the available AXMEDIS content and components of the Providers;
  - updating the AXMEDIS content on Kiosks;
  - delivering AXMEDIS content on demand directly to the consumers connected to the satellite i-TV according to their interactive requests;
  - delivering AXMEDIS content to the consumers connected to the satellite i-TV-PC according to their selection performed from the programmed content of the day and week.
- The streaming of AXMEDIS content on MPEG-4 on one or more channels for:
  - promoting Content Providers' content;
  - promoting Distributors' services, for example stimulating the acquisition of content in push with a business model based on subscription or pay per view;
  - Creating specific B2B channel with large institutions and consumers.

3.1 AXMEDIS content

The AXMEDIS Content is:

Prepared/Produced by Content Providers. The content can be created with traditional tools and can be packed, protected and enforced with DRM rules to be distributed and reused as components or complete objects automatically by AXMEDIS tools. This can be done by AXMEDIS tools directly interfacing the AXEPTool with the Content Management System of the content provider, integrator or distributor. Components can be reused for creating other content objects adding more detailed DRM rules, etc. These will take into account the production and distribution phases and the different usages for which the content can be built. Contributions to the improvement of MPEG-21 on these aspects will be performed by the AXMEDIS consortium for the project and to the MPEG forum.

Compounded and formatted in an almost automatic way by using specific tools that will be created in AXMEDIS by research and industrial activities. Composition is the simple action of putting together content component on the basis of rules, while formatting is the process to exploit the contained components in some integrated

visualisation/(editorial)format for their distribution and usage from the end user. A simple compounded object comprised of several parts (e.g., an audio, a video and a document), can be formatted using one of several methods according to different formatting styles (graphic layout, temporal scheduling of the content, speech generation from text, etc.) producing final content for i-TV, mobile, PC usage, etc. These activities will be based on content features, generic user profile and needs, specific user profile (in the case of composition on demand), formatting style, optimisation parameters, end-user device profile, interactivity level and paradigms, content type and features, metadata, categorization, business information (price, localization, etc.), temporal evolution, DRM rules, delivering time, etc. The production will be performed by using:

- artificial intelligence algorithms: logic engine interpretation and execution such as TILCO temporal logic (see DSI work);
- optimisation algorithms and tools such as those used for solving knapsack problems in the spatial domain, and scheduling optimisation algorithms in temporal domain: DSI has developed considerable skill in optimising processes on both these domains such as performed in SAMOPROS, OPTAMS, WEDELMUSIC, projects and solutions, etc., by using taboo search, genetic algorithms, knapsack and multi knapsack solutions, several scheduling solutions, MILLA formatting language, etc.;
- synchronisation algorithms and tools. DSI, DIPITA, EPFL and UNIVLEEDS have considerable skill on these aspects used in CARROUSO, WEDELMUSIC, projects and solutions, etc.;
- translation algorithms and tools: leading technology on translating text into several languages, and technology in vocal synthesis form text.

This approach will overcome the problems of simple layout optimisation algorithms that do not take into account contextual aspects and time evolution of content. This will reduce the costs of the production process avoiding trivial repetitive operations. Tools for creating formatting styles and profiles will be produced.

Protected by AXMEDIS tools to be distributed and shared in the AXMEDIS P2P Tool for Collaborative Content Production and Control (AXEPTool). The protection is ensured by using MPEG-21 model for DRM with the support of AXMEDIS Certifier and Supervisors Server and supporting interoperability with other DRMs. The protection technologies will be based on encryption and fingerprint technologies. Fingerprint solutions will be used for controlling and supervising any content on the P2P network controlling the usage of protected and non protected content and content components. The Encryption technology will be used as an active model of protection. DSI, FUPF, and FHGIGD have highly developed skills in this area on several models of passive and active protection.

Distributed and shared at B2B level among Content Providers, designer, integrators and Distributors. Content Providers provide the digital content and/or content components to be used by other Content Providers for further elaboration and processing and/or by Distributors for reaching the end-users. The business to business model among providers and distributors will be based on a P2P (peer to peer) tool for content sharing and cooperative work for production. This tool is called the AXMEDIS P2P Tool for Collaborative Content Production and Control (AXEPTool). Providers and Distributors can be connected to the Internet in any manner. In addition, the AXEPTool keeps track of the available content providers and distributors and of the published/available content for the distribution in the P2P network. The content will be in large part visible (catalogued) from the AXMEDIS portal via a satellite data broadcast. The AXEPTool for P2P activities of content production will also provide a specific user interface for technical queries including business aspects (costs, DRM rules, etc.). DSI, FUPF, AFI and ACIT are highly skilled on these topics.

Certified and supervised by the AXMEDIS Certifier and Supervisors Server, which is the certification authority for DRM. It certifies and verifies (i) the integrity and authenticity of the AXMEDIS content when it is produced, distributed and used (providing keys, etc.), (ii) the transactions performed providing authorizations, etc.; (iii) the integrity and the security of the distributors and clients, and of all devices that are involved in the manipulation and/or usage of the protected AXMEDIS content (preventing the usage on the AXEPTtool of non authorised content, the authorisation can be simply obtained by any producers via a registered and certified version of an AXEPTtool). The AXMEDIS Certifier and Supervisor keeps trace of the activities performed on each part of the content and components and reports these aspects to the authorized Providers, Distributors and Collecting societies in a sanitized form. This will permit the tracking of the revenues due for each distributed object. Specific statistics and related analyses will be also produced.

The AXMEDIS Model will support a large set of different transaction models such as: renting, pay per play, subscription, etc., and the content will have different behaviours according to the DRM rules and user profile.

Distributed toward consumers via the Content Distributors. These distribute AXMEDIS content to their clients via their specific distribution channels (without changing radically their distribution model and tools). Several Distributors can be present in the architecture for distributing content covering different or similar channels. They can cover thematic or territorial areas or groups of clients with specific needs, to also coping with different languages and cultural diversity. For instance impaired people, authors, performers, classic music, jazz music, educational content, cartoons, etc. Each Content Distributor may collect and redistribute content provided by all the Content Providers. The Distributors can distribute content according to the authorization/rules associated with the content itself and may add its specific rules constraining them and changing prices. The protection model will support the distribution via P2P network or via traditional B2C transaction models. The distribution is to:

- PC clients:
  - local/internal clients on PCs connected to the Distributor via a LAN (for covering needs of archives, libraries, production process of distributors, schools, etc.);
  - internet clients on PCs connected to Distributor via Internet (traditional or satellite connection);
- Mobile clients (PDAs or Cellular phones):
  - Remotely connected to a Content Distributor via UMTS, GPRS, etc.;
  - Locally connected to a Content Distributor via Wireless LAN (e.g., WiFi, Bluetooth);
- i-TV clients connected via
  - Satellite Data Broadcast (DVBS) with a PC, mainly receiving content in Push on a specific channel;
  - Open Sky distribution on their Set top Box (STB) or other device mainly receiving content in streaming;
  - Terrestrial Data Broadcast (DVBT) with a PC or a STB receiving content in push or streaming respectively;
- In all cases, the content can be also received off-line by the clients via
  - CDs, DVDs produced by some Distributor or friends;
  - Simple files from other consumers with other communication mechanisms, IRDA, LAN, etc.

Listed and Managed in terms of metadata and content evolution, business and technical information by the AXMEDIS Portal service in conjunction to the AXEPTool. This also collects the description and metadata of all the AXMEDIS content and content components that are published on the P2P architecture and network. A satellite data broadcast will be available for distributing information and content rapidly among Providers and Distributors connected with the AXEPTool. This will reduce the time and costs for downloading. It could work as a proxy for the whole information in the B2B network. The AXEPTool in conjunction with AXMEDIS Certifier and Supervisor will be capable of tracing about the evolution of each single digital object, this allows the workflow monitoring of content production, tracking versioning and digital rights exploitation. The AXMEDIS Portal is also a way to provide a large number of other services for the community and supporting the AXMEDIS Framework construction and management.

Searched into the distributed database managed by AXEPTool allowing the specification of technical/professional query including metadata, technical information, business and licensing aspects, content based, DRM rules, etc. In the demonstrators a more specific query engine will be developed to simplify the access to content for PDAs and Mobiles phones on the B2C side. In those cases, the information needed to identify the single object into a database is more related to the content description and metadata rather than to technical details.

Used and consumed by AXMEDIS clients. They can be of several different natures and according to that delivered in different formats plus encrypted parts (HTML, WAP, SCORM, LMO, MPEG-4, etc.). In some cases, they have to be certified/registered by the AXMEDIS Certifier and Supervisor Server, if they intend to manipulate protected content. In other cases, they are already identified by their internal card, for example in the case of cellular phones. The client tools can be implemented as Viewers that can be integrated in classical browsers with a plug in, Java Applet or ActiveX

compliant with the AXMEDIS directives or with specific tools. Standards viewers, provided by the consortium via the portal, can be customized at level of user interface, language and skin for specific purposes.

4 AXMEDIS Tools and Requirement Areas

The whole AXMEDIS system and architecture can be decomposed in a set of functional areas of work for collecting the requirements and Use Cases. These areas of work are:

- AXMEDIS General Requirements
  - AXMEDIS Object Model
  - Licence Model, Right Expressions
  - Business Models
  - Security Details and Aspects
  - General Requirements for AXMEDIS Tools
  - General Requirements for Distribution Tools
- AXMEDIS Object Authoring
  - AXMEDIS Editors, as authoring tools
  - AXMEDIS Viewers
- AXMEDIS Object Production
  - Compositional and formatting tools
  - AXMEDIS tools for using/producing AXMEDIS Objects in other Content tools
- AXMEDIS Workflow
  - Controlling and supervising local AXMEDIS tools
  - Controlling and Supervising AXMEDIS Object life in AXMEDIS compliant factories
- AXMEDIS Object Acquisition from CMS
  - Crawling content
  - Automatic gathering of Content
- AXMEDIS Database
  - Managing a Database of AXMEDIS Objects
  - Making queries inside Databases of AXMEDIS objects and inside the objects
  - Queries from clients
  - Queries for Distribution Channels
- AXMEDIS AXEPTools for P2P distribution on B2B
  - Distribution and sharing of AXMEDIS objects
- Publication of AXMEDIS Objects to distribution channels
- AXMEDIS Protection Tools
  - Protection
  - DRM
  - Fingerprinting
  - Monitoring
- AXMEDIS Player
  - Player for PC/TabletPC
  - Player for PDA
  - Player for Mobiles
- AXMEDIS Tools for satellite data broadcast on B2B
- AXMEDIS for Distribution via Internet
- AXMEDIS for Distribution towards Mobiles
- AXMEDIS for Distribution towards i-TV
- AXMEDIS for Distribution to PDA via Kiosks

Requirements have been classified as:

- MANDATORY (default value), meaning that the requirement have to be supported
- DESIRED, meaning that it should be supported
- OPTIONAL, meaning that it may be supported

5 AXMEDIS General Requirements

This section contains all the general requirements regarding the object model, licensing, business model and security aspects.

5.1 AXMEDIS Object Model

Main requirements:

5.1.1) All the AXMEDIS objects have to be MPEG-21 compliant digital objects. Any kind of digital resource can be included in an AXMEDIS object from simple documents, audio, video, text, games, software tools, animations, images, multimedia objects, etc.

5.1.2) Not all the MPEG21 compliant digital objects are AXMEDIS objects but they can be converted into AXMEDIS objects if you have the rights to do that.

AXMEDIS Data model schema has to:

5.1.3) be compliant to MPEG21 DID schema, including the fact that and AXMEDIS object has to include a description of the Protection Tool needed to process the content.

5.1.4) define tags to include AXInfo to represent information related to the AXMEDIS object or to an AXMEDIS Component.

5.1.5) support flexibility so as to add or import tags for particular industries. The usage of each tag should be tightly defined so that there is no ambiguity as to its purpose or content

An AXMEDIS object has to:

5.1.6) support a defined structure

5.1.7) provide general information (AXInfo) about itself

5.1.8) provide information AXInfo for each component of it

5.1.9) provide protection for the whole object or only the components where it is needed, or to the external resources

5.1.10) allow hosting the license inside the object or not. Objects that contain the license are called Governed AXMEDIS Object.

5.1.11) provide methods to certify existent metadata; This means that if one read the metadata in an object and they refer to a given resource, there is the guarantee that the metadata are those enforced by the Object Creator and they have not been changed. This is needed to avoid the distribution of object that could be acquired by final users on the basis of their description and this is not aligned with the real content.

5.1.12) support the composition of different components of any possible types (formats)

5.1.13) include digital resources or reference to them, content meta-data, DRM aspects (potential rights user could use), protection processor aspects, content distribution rules, content usage rules

5.1.14) support sharing of any component or resource between AXMEDIS Objects

5.1.15) include relevant Metadata identifying the characteristics of Content

5.1.16) allow using different metadata for different resources

5.1.17) include Descriptors such as MPEG7 or other metadata formats

5.1.18) include minimal metadata information (OID, creator, …), in such a case an external service may be used to fill in the metadata (DESIRED)

AXInfo included into AXMEDIS objects has to:

5.1.19) be accessible even when the object is protected.

Example: when the digital objects are distributed on the P2P, even if the object is protected AXInfo has to be accessible for the indexing of the objects into the distributed database without the need of opening the object by getting a license and the secret information (e.g. keys).

5.1.20) include information about:

- History of the object (during B2B lifecycle), version, changes performed, etc.
- Creator of the object (AXCID), Distributor of the Object (AXDID)
- Creator of the component (AXCID) in case the AXInfo is associated to an AXMEDIS component
- Specific metadata for the AXMEDIS community and B2B, B2C, etc.

- Information regarding workflow: work to be done, who has to do, where has to be done, deadline, etc.
- Fingerprint
- Technical information regarding the format: resolution, duration, type, related processing tool, sample rate, etc.
- AXInfo of components (a copy or a summary)
- A number of fixed metadata (e.g Dublin core)
- A number of Identification codes over the simple AXOID and AXWID (Work ID) already supported by industries ISRC code, bar code, number of catalogue, mechanical licence,

5.1.21) contain Potential Available Rights, while the really available rights are stored in the licence that is obtained separately from the object. Potential Available Rights are mainly used for querying. Potential Available Rights are all the rights that some user can acquire with a corresponding licence. provide information about how to use the whole content or a single or a group of component (i.e what is possible to do with and object: play, print, embed in another object, modify, adapt…) the usage could be different in B2B and B2C circuits (Possible Available Rigths)

5.1.22) be certified

5.1.23) maintain a state with respect to production and consumption life cycle (published, promotion, original master, label copy …)

5.1.24) contain information about where a licence can be acquired (i.e. Service, URL)

5.1.2 AXMEDIS Object structure

An AXMEDIS Object has to:

5.1.25) organize and associate any Digital Content and to include Digital Resources, Metadata, Rights Expressions, technical Information, Descriptors and Licenses, etc.

5.1.26) support hierarchical structure of content in order to allow different grouping and semantic associations. Thus supporting association of Composite AXMEDIS Objects

5.1.27) support references to other AXMEDIS objects inside its structure. A given Digital resource can be referenced by a multiplicity of Composing Content without duplication. AXMEDIS Component references can point to local/remote objects.

5.1.28) associate persistent information to Digital Resources. They can be general information, watermark, fingerprint info, etc.

5.1.29) be able to include protected (e.g. encrypted, watermarked, scrambled, …) and unprotected data.

5.1.30) support different grouping of components of the object itself in sub-collections

Example: **'Album vs Single':** Some content will have files batched together as a collection. It must be possible to make certain sub-collections of content within one bundle available separately by following approach defined below:

Approach 1: Separate license rights for sub-collections:

Example:

AXObj		Availability			
Description	File Type	Collection	Sub-collection 1	Sub-collection 2	Sub-collection 3
Sleeve Image	.JPG	✓	✓	✓	✓
Sleeve Notes	.PDF	✓	✓	✓	✓
Audio Track 1	.WMA	✓	✓		
Audio Track 2	.WMA	✓		✓	
Audio Track 3	.WMA	✓			✓

So looking at the table above there is one bundle of content available in four ways. It is available either as a whole, or as three separate tracks sharing a sleeve image and sleeve notes.

5.1.31) be able to organize and associate (i.e. multiplex) Metadata and Content for carriage in broadcast and streaming

5.1.32) support resources as preview of other resources contained in the object.

5.1.3 AXMEDIS Object Identification

AXMEDIS Object Model has to:

5.1.33) provide unambiguous identification of a piece of AXMEDIS Object and Component and internal Digital Resource
5.1.34) support working in conjunction with multiple, existing industry schemes for Digital Content identification (ISBN, ISMN, …) .
5.1.35) be able to extend the total number of identifiers that can be assigned in such a manner that previously assigned identifiers do not become obsolete.
5.1.36) support unambiguous identification of a Work and its parts that are AXMEDIS Objects or AXMEDIS Components

5.1.37) Some organisation has to assign an ID to AXMEDIS Works, Objects, Components and Resources
5.1.38) A new ID for AXMEDIS Object or Component may be requested only by a certified AXMEDIS Object Creator (see definition, it can be integrator, publisher, etc..).

5.1.4 AXMEDIS Object Classification

AXMEDIS Object Model has to:
5.1.39) be able to support and collect in the same AXMEDIS Object or Component several types of information that can be used for classifying AXMEDIS Objects or Components in different contexts. They can support different standards such as MPEG7, Dublin Core, UNIMARC, DIGIMARK, etc. The compatibility with those standards has to be supported by means of plug-in tools implemented by third parties.
5.1.40) include the following **mandatory** fields in at least one language:
- Author,
- Title,
- Genre of Authorship,
- Date of Creation of Work,
- Date of distribution (marketing/protection),
- Creator/Publishers name, ID and web location(s),
- Distributor name, ID and its web location(s),
- etc…

5.1.41) report the Classification language (e.g. using xml:lang)
5.1.42) support the Classification in multiple languages
5.1.43) facilitate search and find of content: AXMEDIS Works, Objects, Components, Resources or even pieces of Content
5.1.44) be able to include any kind of Descriptors that facilitate cataloguing Content for B2B distribution or for verification in terms of Fingerprint. See AXMEDIS Object Technical Features
5.1.45) support efficient communication of Metadata. . An End-User should not have to wait for a long time before using Metadata

5.1.5 AXMEDIS Object Technical Features

5.1.46) Relevant parameters in a content format have to be present in the object AXInfo to verify on the basis of the device profile if the Object is suitable or not, and to verify if any Adaptation is possible or thanks to the presence of the suitable tools and algorithms. These parameters should include:
- Compression algorithm used
- Bitrate used for encoding
- If it is an image: Video resolution, Size of the image
- If it is a sound: Audio sampling frequency, Number of channels
- Duration,
- Mime type as for the MPEG21 resources
- …

5.1.47) To associate unambiguously descriptive information like Fingerprint to a Resource, to an AXMEDIS Component, or an AXMEDIS Object

5.2 Licence Model, Rights Expression

5.2.1) An AXMEDIS Licence has to be unambiguously identified, AXMEDIS License ID

5.2.2) AXMEDIS objects have to be related to at least one AXMEDIS Licence (stored inside the object or not).

5.2.3) AXMEDIS Licence has to take into account exceptions to rights according to applicable law (e.g. Unpaired people, Educational Institute, etc…),

5.2.4) An AXMEDIS Object or Component (content piece inside an AXMEDIS Object) can be used only for the specific rights for which the license has been produced.

Example: Licences for consumption, broadcasting, archival, educational, promotional, demonstration for PDA, for mobile, for PC, for integration, for internal purpose, for Business level only, etc.

5.2.5) It must be possible to express an AXMEDIS Licence with an open specification rights expression language

5.2.6) An AXMEDIS Licence must be able to map all the possible rights usage conditions (already present in the contracts)

5.2.7) An AXMEDIS Licence must be able to work in conjunction with existing industry schemes to grant and deliver specific Licensed uses.

5.2.8) An AXMEDIS License must be able to specify whether a right has to be used only in a given Context

Example Distributor ID, nationality of the distributor, nationality of the user, location of the device, region for DVD etc., religion or political parameters, commercial, promotional, demonstration, preview, impaired people, public performance or private, adult only, over a given age, etc.

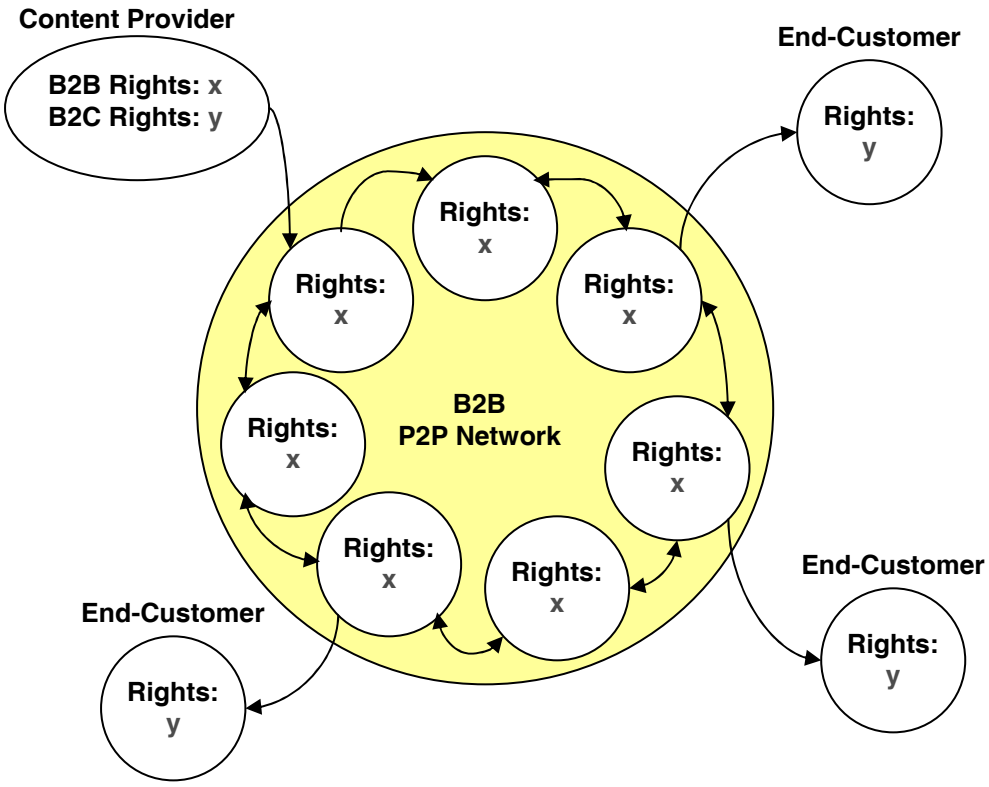
5.2.9) The possibility of adapting the Right Expression to different modes and languages.

5.2.10) In the case of Governed AXMEDIS Object, the rights described in the PAR of the AXInfo have to be aligned to the License included into the Governed AXMEDIS Object (OPTIONAL)

An AXMEDIS Licence has to:

5.2.11) support the expression of different subsets of Rights, both for delivering (B2C) and production (B2B) sides

5.2.12) be able to express onward rights for downstream partners. Usage rights must be specified at both a B2B and B2C level, with B2B distribution rights inheriting the B2C rights for onward distribution, supporting definition of new Rights when the need occurs



In the diagram above, the content provider defines two sets of rights. Firstly the B2C rights define the license granted to an end consumer. Secondly, the B2B rights define the license granted to other distributors. The B2C rights are inherited by the distributors for onward grant to end customers.

Example 1:

Party	Content	B2B Rights	B2C Rights
Photographer	Image	Use in publications Use in library archives	View of image Copy of image for personal use only
Publisher	Newspaper containing image	Use in library archives	View of newspaper for personal use only View of image Copy of image for personal use only
Library	Digital newspaper archive		View of archive for personal use only View of newspaper for personal use only View of image Copy of image for personal use only

Example 2: In the music industry, a session musician may record a piece of music, which is licensed for use by a particular party (the artist) in an assembled recording and free distribution by that artist. The artist may combine the original piece with other material to produce a finished master. This may, in turn, be distributed to a number of remixers, who may then re-distribute their interpretation of the recording to the artist. The artist may subsequently approve some of the interpretations and distribute this to his record label, who may combine one or more recordings with artwork and metadata and license a completed product for distribution onto retailers. The final product as purchased by an end-user combines all the rights of the individual elements. If one element does not carry the rights for onward distribution to a customer that is required (such as a sample from another recorded work), then these rights would have to be negotiated with the rights holder. This matches the physical process that may occur in the distribution chain of an audio release.

A content provider may place content into the AXMEDIS P2P network for an aggregator to collect, re-work and replace on the P2P network for the use of B2C distributors. Experience shows that the content provider will

want to retain control not only over which aggregators have access to their content, but which B2C distributors then have the onward rights to exploit the content. An aggregator will not have the right to choose their onward distribution channels. AXInfo may need to be flexible enough to contain information on these approved, downstream, distribution models. In fact, these distribution models may have even more tiers than just Content Provider, Aggregator, Distributor. So an 'n' tier model should be adopted to specify the onward rights.

Example: XYZ Records grants OD2 rights to aggregate and distribute digital catalogue through AXMEDIS to only 5 retailers for B2C exploitation.

This restriction (which will change over time – usually adding more and more approved retailers) must be recorded somewhere against the object or license and be easily and rapidly updated for very large sections of catalogue.

Example: At the end of the contracted period, XYZ Records is happy with the business generated through OD2 and 4 of the approved retailers and wishes to approve the catalogue for distribution through a further 5 retailers. However, one of the retailers has failed to settle their financial liability and XYZ records would like to cease distribution through that retailer. So 5 retailers become 9 retailers. Each of XYZ's catalogue of 300,000 audio tracks needs to be updated with the new information.

Note that this kind of activity can happen daily. OD2 have found that trying to keep this information updated at object level can be very resource inefficient. We would welcome a proposal for solving this problem. This could be along the lines of maintaining a set of rights 'contracts' between B2B parties which are referenced each time a query on the AXEPTool is run. Updates such as in the example above could be made only at the contract level.

5.2.13) unambiguously identify:

- who is granting the Right (licence issuer, licensor)
- who is obtaining the whole licence (licensee)
- for each right expressed in the license
  - the user (or the user group) to whom is granted
  - on which Device or Domains it can be used (more than one)
  - the AXMEDIS Object, Component, piece of resource to which the Rights Expression refers
  - in which context it can be used

5.2.14) state that a Right is granted in such a way that there is no ambiguity in the semantics of the Rights Expression

5.2.15) support the reference to a signed contract, where some information which characterized the AXMEDIS license itself are described (in natural language):

- **Purpose of the contract**
  Example: acquisition of rights with a view to incorporating an extract of an audio content into a CD-ROM on the history of jazz.
- **Assignment or user licence**
  The contract will stipulate whether an assignment or a user license is sought. It should be noted that the owner of the rights cannot transfer more rights than he owns. The owner may be free to refuse permission.
- **Scope of the assignment or the user licence**
  The user of the audio content lists the rights he wishes to have included in the assignment or the user licence - for example, the right to reproduce and adapt an extract of audio with a view to incorporating it in an interactive CD-ROM, communicating it to the public by telecommunication, distributing it and making derivative products.
- **Territory and term**
  The user should specify the territory where the incorporated work will be exploited - for example, the world, North America, Europe, etc. The term of the assignment or the user licence should be stated, as well as the renewal conditions, as the case may be.
- **Financial considerations**
  Since the cost of using the work in a new multimedia context is not, in many cases, set in advance by any generally applicable convention or rate, it will have to be negotiated case by case. Things to be taken into account are the nature of the use, the size of the extract in relation to the original work and in

relation to the other works incorporated into the New media product, the territory, the potential revenue to be gained from the exploitation, etc.
Some right owners or collecting society have established set prices for the use of their work Generally the financial consideration are paid in a lump sum . Note: in case of B2C distribution case by case negotiation is not needed.

- **Guarantees**
  The new multimedia producer will also have to offer guarantees respecting the legitimate use of the work to be exploited.

5.2.16) include or refer to information about how to produce new licences for exploiting a new produced content

Example: summarising the consequences of music use for synchronisation and in multimedia content are:

Multiplicity of rights

Multimedia products are composed of multiple protected works. Multimedia exploitation involves a number of restrictive acts. There are a lot of rights to clear.

Multiplicity of right owners

Copyrights and related rights are rarely owned by a single entity. In practice, rights are divided along vertical and horizontal lines, for different models of exploitation and different territories. Some rights are managed directly by collecting societies. The multimedia producer has a lot of right owners to search for.

Overlapping rights

Individual content incorporated in multimedia products are subjected to overlapping rights: copyrights, neighbouring rights, rights of publicity, etc. Even if copyrights have expired, multimedia producers must reckon with surviving rights.

Lack of established licensing practices - Multiplicity of contacts

Copyright owners are inclined to apply royalty schemes developed for traditional media.. In practice, multimedia producers are confronted with a bewildering variety of licensing schemes. Each "family of rights" has its own licensing tradition.

An AXMEDIS Licence has to:

5.2.17) support the expression of these rights (functions):

- copy, personal copy management
- move on other devices,
- move/copy within authorised domain
- move/copy within Footprint (e.g. applications may be required to determine the geographic region in which the device running the application is found, particularly when on-line)
- signal no copy/move outside Footprint
- export/import, transfer from/to an external device/tool
  Example: the media can be transferred to other devices (e.g. an MP3 player), which devices are acceptable (including SDMI standards) and how many times this is allowed in a given, or any period.
- export
- export to a movable media
- backup/restore
- optionally store received content into a CMS by using an agreed exchange format
- burn in CD/DVD (red book..)
  Example: Physical Copy Protection (allow the user to burn over CD (protected content, content on a copy protection CD no longer supported by AXMEDIS protection, content on a red-book CD or other physical media)
  Whether a hard copy can be made of the media (e.g. a Recordable CD in red-book format) and how many times this is allowed in a given, or any period.
- edit, change the digital information of the object
- modify
- associate (audio and video)

- including into other new objects
- insert/associate, insert as an additional element in another cross media object
- embed
- compose, use as components
  Example: the use of a music pieces with images and video (CD-ROM, film, documentaries, publicity and TV spots, etc.) includes a contract of synchronisation with the following rights owners: the original publisher of the music (compulsory in any case) and the phonographic producer of the sound recording (if the user intend to use the sound recording)
- synchronise, use in a synchronised manner with other content
  Example: Use of Digital Audio for synchronisation of music with images like in movies, CD-ROM, multimedia contents, interactive games, on tv program, under web pages, etc. To use music in a film, video, or multimedia product, or in any audio-visual production, users will always need to get permission. The type of permission you will require, and the procedures you will need to follow, will depend on where the music owners are. In each case, you must acquire the rights to the musical work. The user needs to get permission (a "licence") if they want to reproduce the whole or any "substantial part" of material in which someone else owns copyright. In copyright law, any part of a work that is important, distinctive, essential or recognizable is likely to be "substantial". A few bars of music may be "substantial" in this sense, and the use of even short excerpts of music in a soundtrack or multimedia product will generally require permission.
- ungroup
- extract
- unprotect
- streaming
- downloading
- uploading
- adapt, change technical features, change of coding, change of resolution, format, etc
- print
- encrypt clear text content
- play
- resell (redistributing)
- second hand resell
- evaluate metadata
- edit metadata
- show metadata
- export Right Expressions or PAR in a human readable manner (e.g. clear text or HTML)
- free preview

Example: play for X minutes, or listed for the first 30 sec, or print for the first 2 pages, or view for the first 10 minutes, etc.

- low-quality play (the same content is played at different qualities depending on the license...)support definition of rights to use digital content in the analogical market
- public communication.

Example: The transmission of sound to the public by any medium. Within this category the music industry includes the transmission and immediate playback of media (audio and/or video) even for a limited time and not saved for later listening or viewing. Usually called Streaming (by music industry)

5.2.18) support the reference to these resources:

- give a right to one or many AXMEDIS Objects
- give a right to one or many Components
- give many rights each referring to a different Component of a AXMEDIS Object
- give different rights for sub-collections:

Example:

AXObj		Availability			
Description	**File Type**	**Collection**	**Sub-collection 1**	**Sub-collection 2**	**Sub-collection 3**
Sleeve Image	.JPG	✓	✓	✓	✓
Sleeve Notes	.PDF	✓	✓	✓	✓
Audio Track 1	.WMA	✓	✓		
Audio Track 2	.WMA	✓		✓	
Audio Track 3	.WMA	✓			✓

5.2.19) support the expression of these conditions:

- user identity-based
- in a private/public use device
- in a commercial content
- after the payment of a specific amount
  Example: include or refer costs for the usage of the rights as a function of the location, content type, Tool Type, context of fruition (education, impaired, public, integration, redistribution, etc.). These costs can be expressed in several currencies, specifying the vat and the net cost. The same effect can be obtained by producing a complex complete license or several licenses for the OID/WID, specifically for UID, TID, DID, etc.
- after the payment of a specific amount
- end-user territory availability (the countries in which the media is distributed and can be accessed).Note: this will be at country level and have to be considered that countries appear and disappear. The ISO standard list of countries is a good base reference. (ISO 3166)
- distribution date range (when the media files can physically be distributed B2B)
- usage date range (when the media files can physically be accessed and used B2C) (same thing)
- period of time (e.g. play as long as the play time is less than a specified period) and based on time/date
- time-shifted use has to be supported
- for a period of time after initial license / access
- expiration of rights after X days/hours from licence delivery
- expiration of rights after X days/hours from first play
- expiration of rights at a fixed date
- until a specified end date
- only between two specified dates dd/mm/yyyy hh:mm:ss – dd/mm/yyyy hh:mm:ss
- count based (play up to the specified number of times)
- counted number of plays/print/ executions, etc. (N=1 only once)
- n times in total
- n times in period of x days.
- unlimited times
- unlimited play/print/execute, etc. forever
- unlimited play/print/execute, etc. per period (for instance per month, etc.)
- on a specified device
- on a group of devices
- conditional expiry (e.g., loses rights to sheet music if stored in the device for longer than determined period without use)

5.2.20) support license templates to facilitate license production. Business level Licenses can be produced and provided in terms of templates matching the contracts

5.2.21) Efficient communication of a Licence. An End-User should not have to wait for a long time before Using Content

5.2.22) Licence check while consuming the object should not take a long time before answering

5.2.23) An AXMEDIS License can be generated by using the information stored in metadata referring to Potential Available Rights (or other IPR rights) (OPTIONAL)

5.2.24) An AXMEDIS License can define if its related keys to unprotect the object can be cached in the device to work offline

5.2.25) AXMEDIS Tools should provide functionality for two types of negotiation process: manual and automatic. The manual process would be predominantly B2B and would happen on the P2P network. It would follow the publishing of available works by a content or rights owner, and would follow the placing of works in an active list selection by a content or rights aggregator or distributor. The process of generating a licence from a list that has been selected could often require negotiation of price, details of terms and conditions of use, etc, and that these would need to be an iterative negotiation between the owners and the aggregator/distributor. Since there are no standard contracts at this level, and everything is negotiated. So some sort of mediation process could be provided by AXMEDIS that either allow manual negotiation, or that presents common or previously negotiated licences as a basis for further negotiation to both parties.
The automatic process would be predominantly B2C and would happen across the distribution network. Since frequently in B2C boilerplate licences are used, and not individual ones to each end user.

5.2.26) AXMEDIS should support Dynamic Licensing emulating in a digital form (and across a network) the existing business processes. Licences should be prepared automatically according to business process rules rather than being negotiated manually by people. Examples of this type of interaction could include:

- preset-boilerplate licences are made available for frequently requested pieces of content (or types of content)
- media that can have several different sets of content depending on the user's usage can be negotiated for at the moment of usage.
  For example, a 'Spiderman 2' movie application might enable a user to explore additional material like the soundtrack, but the rights to the soundtrack would only need to be acquired if the user requests them as part of the exploration. And if the user then requests the score for part of the soundtrack, then the rights for that would then need to be acquired too. The majority of users will not require these additional rights, and the owners will not want to negotiate each user licence individually, which means that an automatic electronic licensing technique would be very useful. It would also mean that the acquisition of rights would be easy (and transparent) which would remove one of the main justifications for casual piracy.
- media that is made up of a number of discrete items with separate licences can be 'unbundled' in licensing terms, so that if part of it becomes unavailable, then the rights can be altered to reflect this, without needing to revisit the entire bundle. One example might be in TV, where individual actors might have 'repeat fees' if a programme is shown again as a repeat but where some actors do not have this clause in their contract. A user might then be able to view those parts of the TV programme which contain the 'repeats are ok' actors, but not view those parts with the 'repeats are not ok' embargo. An electronic clearing house for this type of dynamism would be a powerful advantage for AXMEDIS, and would reflect trends within media for increasing atomisation of content (driven by DVD 'extras' and PVR functionality.)

5.2.2 Action Log

Action Log has to:

5.2.27) list and store any right usage attempt on an AXMEDIS object (even if it not succeeds)

5.2.28) list and store any succeeded right usage on an AXMEDIS object

5.2.29) be related to a single AXOID

5.2.30) be unambiguously identified

5.2.31) describe the action (when, what, where, how, etc.), and all the related ID: content, creator, tool, distributor, user, domain, device, etc.

5.2.32) detail also other parameters about content, creator, tool, distributor, user, domain, device, etc.
Example: the Device is used for public transmission, the Domain is an educational institute

5.2.33) be protected against unauthorised access, modification, etc. Thus everybody in the distribution chain can get a view of exploitation of only their content.

5.2.34) allow the reporting of right uses to provide information of interest to accounting reports
5.2.35) consider law constraints about Privacy…

For tools which manipulate Action Log

5.2.36) support the generation of human readable reports in a format which add clarification of the contextual information and object information
5.2.37) support the making of queries on the list of Action Log
5.2.38) The ability of making statistics on the database of Action Log
5.2.39) Protocols that allow to negotiate the way Action Log can be utilised/acquired
5.2.40) be managed to guarantee user privacy according to the applicable laws
5.2.41) Action logs should not slow down in any way the usage of content by the final user or B2B customer

5.2.3 The Domains

A Domain is a set of Devices.
Examples of Domains are: the X company, the tools related to the Domain of Mario Rossi House, etc.
5.2.42) A Domain has to be unambiguously identified.
5.2.43) Each device which request to enter in a Domain has to be certified
5.2.44) Each device which request to enter in a Domain has to be authorised
5.2.45) The set of Devices which belong to a Domain could change during the time
5.2.46) A Domain has to maintain a list of the Devices which belongs to it in any time
5.2.47) A Device can have access to more than one Domain, but can join only one Domain at time.
5.2.48) A Device which belongs to a Domain can use AXMEDIS objects licensed for that Domain according to license conditions
Example: people belonging to a family that obtained a License for home domain can consume AXMEDIS objects inside their home Domain with every device registered on that Domain
5.2.49) An AXMEDIS Object or Component related to a Domain License can be used only in the Domain for which the license has been produced.
5.2.50) Each device can register into a Domain in a simple manner
5.2.51) The license can be acquired to use the content for more than one Domain
5.2.52) A Device which belongs to a Domain can request to leave the Domain and it will be unregistered
5.2.53) A Device which moves outside the Domain will be unregistered
5.2.54) A Device which belongs to a Domain can be excluded
5.2.55) Users with an authorised entitlement shall be able to fully control Domain membership and Content distribution.
5.2.56) Users without an authorised entitlement shall not be able to obtain confidential information related to the Domain
5.2.57) Hierarchy of Domains should be supported (OPTIONAL)
5.2.58) A Domain should be configurable to permit a variety of distribution options between Devices belonging to the Domain, e.g. super-distribution of Content and Composite Content to Devices belonging to a sub-Domain within the Domain (e.g., specialized interest groups). (OPTIONAL)
5.2.59) A Device should be informed of all the accessible Domains present at certain time

5.3 Business Models

5.3.1) AXMEDIS has to exploit the following Business Models of content charge:

- free preview of content, or limited time/size free access
  - 30 second audio / video clips
  - Single use
  - Thumbnail image etc. etc. etc.

  Note that free previews must have some kind of restriction to prevent the use by a non-identified B2B party. For example if a content owner provides access to 30 second clips of its entire catalogue. This can be abused placing hyperlinks to these clips leading to millions of streams at great expense and of no promotional value to the content owner.
- pay per view

- pay per download (the customer downloads the content and can use it as long as he wants)
- pay per subscription (the customer pays a recurring charge (monthly, yearly, weekly) and can download as much as he wants (the subset of content available for download has to be considered) (download, streaming)
- unlimited access offers to some AXMEDIS objects (all you can consume in a predefined time slot)(flat based). Unlimited offers may not be supported by service providers (such as ISPs) – AXMEDIS should have terms and conditions of use that indemnify it from such constraints affecting user access. 'unlimited' access means for an individual user. It should not allow onward distribution (i.e. to friends, extended family, anybody else)
  Example: It must be possible to grant access over a range of content on an unlimited basis. In other words a customer may be granted access to the entire content belonging to a distributor.
- pay per minute
- pay per kB downloaded
- pay per day: the customer is charge offered (user has always accessible the content data on the device but pays for every day he accesses it)
- discount credits: user purchases a set of credits in advance which can be spend to operate all the above business models. Credits would be offered at volume discounts
- pre-viewing/using AXMEDIS objects
- pay for a fixed number of copies allowed
- pay for obtaining a right on AXMEDIS Objects that will belong to some other user (gift)

5.3.2) AXMEDIS has to exploit the following Business Models of content delivery to the user:

- allow a single User to use a content on a unique Device
  Example: It must be possible to provide content to the end-user with no authorisation of usage beyond the target platform. In other words there must be no further export of the media in a usable form (licensed or unencrypted) to any portable player, external storage device (including CD-R) etc; a user downloading a recording to a PC in this type of model could be granted unlimited use of it on that PC, but no rights for the transfer to a portable MP3 player or a recordable CD.
- allow a single User to use a content on multiple Devices,
- allow multiple Users use content by sharing a single Device,
- allow the use of a confidential identity
- allow to deliver content to the user that is suitable for the target user Device (device profiling).
- allow to pre-deliver to the user a big amount of AXMEDIS object , and provide a subscription license on the basis of the user profile (e.g. Cartoons, Sport Archives)
- allow re-download if the User has some problems with his Device

5.3.3) AXMEDIS has to support both streaming and download of AXMEDIS Objects

- **Example**: There is strong evidence to suggest up-sell from streams to downloads. In other words streams are used as a 'try before you buy' option before committing to a download

5.3.4) AXMEDIS has to exploit the following Business Models of licence delivery to the user:

- allow offline licensing (pre-delivery of the license)
- allow production of licenses even if the user is not interacting (automatic licensing)
- allow re-download if the User has some problems with his Device

5.3.5) AXMEDIS has to exploit the following Business Models of price definition:

- different price for different channels (web sites where the content is distributed)
- discounts on bulk purchases,
- discounts applied on the customer profile: the distributor can define cluster of customers considered more valuable

- discounts based on the customer payment system chosen (i.e. premium numbers has a cost higher than credit card, in order to push more profitable payment system discounts can be useful)
- discounts on content paid with recurring payments (i.e. first 3 months subscription is for free)
- consideration about VAT and territorial limitation (OPTIONAL)
  Example: AXMEDIS has to manage issues regarding different VAT applicable in different countries and the limitation of the distribution of content in the different countries

5.3.6) AXMEDIS has to interact with common distributor payment system:

- International (e.g. Visa, AMEX)
- National (Carte Bleue, Carta Si, ELV, Switch)
- Billing relationships (ISP, Telecomms, Digital TV)
- Mobile / Telephony-based systems (Premium SMS, IVR)
- eWallets (PayPal, Firstgate, BT click&buy)
- Credit notes, gift vouchers, discount vouchers, loyalty schemes, pre-paid cards
- Future-proof

Example: The payment system applicable depends on the distribution policy using the distributor payment gateway. What is required to AXMEDIS is to evaluate the opportunity to introduce gift certificates system (where the customer buy a credit on a web site and gift it to a friends who can use the credits to buy contents on the same web site) and wallet (deposit made by the customer who can be used to buy contents to the affiliate distributors).

5.3.7) AXMEDIS has to interact with existing payment methods and mechanisms, automated models of payment.

Example: The methods of payment which are popular vary wildly across Europe. Credit cards which are popular in the UK are much less widespread in France, Germany, Italy. We should include the ability to support ALL payment methods. This can be achieved if necessary with a secure API for self-integration.

Specific payment methods could be specified as the initial target:

International Credit Cards: Visa / Mastercard / American Express / Diners / JCB
National Debit Cards: Carte Bleue (France) / Carta Si (Italy) / Aurore (France, Spain, Italy) / Switch (UK) / Solo (UK) / Maestro (Various) / Laser (Ireland)
Direct Debit: ELV (Germany) / Rabobank (Netherlands)
e-Wallet Payments: PayPal / Firstgate / BT click&buy
Telephone billing: IVR, Premium SMS

Possibilities should be there for use of existing billing relationships (ISPs, TelCos, etc.)
Also, pre-paid cards, vouchers etc.

5.3.8) AXMEDIS has to interact with existing industry schemes to administer customer/device-specific uses.

AXMEDIS B2B Distribution has to:

5.3.9) support of the commercial relations between distributor and content provider models:

- Royalty: where the distributor can set autonomously the price but has to pay to the content provider a fixed fee.
- Revenue Share: where the distributor pays to the content provider a % of the revenues. With this model should be also considered an eventual minimum cost that the content provider can require.
- To Pure Carrier: where the Content Provider (really sure of his content attractiveness) wants to sell directly to a community of users. He pays for the Satellite Channel capacity and the access to the community.

5.3.10) support partner approval. An owner of digital rights (usually a content producer or provider) must be able to approve and deny individual partners in the B2B distribution model. This does not prevent content being made available openly if the producer or provider wishes, however major content producers (such as record labels)

WILL NOT allow their content to be loaded into the AXMEDIS network unless they are able to retain total control of who is and who is not allowed to exploit it.

Example: record label 'A' has an existing business partnership with retailer 'X'. If retailer 'X' wishes to launch a digital distribution service and take digital content (directly or indirectly) from record label 'A'. Record label 'A' may wish to deny access to this content if there are unpaid debts relating to the existing business partnership. This kind of occurrence happens at both a major and minor organisational level and must be provided for.

5.3.11) support exclusivity for individual product. An owner of digital rights (usually a content producer or provider) must be able to load content into the AXMEDIS network that is destined, either permanently or temporarily, for a limited number of partners to exploit. 'An exclusive'.

Example: a new release by a popular artist may be awarded to a particular retail network for an initial period of time.

5.3.12) support exclusions for Individual Product. It must be possible for a rights owner to load content that is openly available except for a given partner or partners. 'An exclusion'. Just as with exclusives, exclusions can be either temporary or permanent.

Example: An example of where exclusion might be used is alongside an exclusive. A rights owner may wish to provide a special enhanced version of a product to a certain retail network as an exclusive. A normal, non-enhanced version of the product might be made openly available to other partners for exploitation, but the retail network that are entitled to the exclusive, enhanced version are excluded from the normal, non-enhanced version.

5.3.13) support update and publishing of elements. It must be possible to update any one of the elements listed below independently of each other, including but not necessarily, from independent sources.

- Media (Audio-visual content)
- Meta Data (Description of content)
- Distribution Rules (B2B)
- Usage Rules (B2C)

Once a product has been updated with any of these elements, it must not be necessary to re-publish the entire product/bundle to the distribution network in order for the changes to be accepted by all distributors.

Example: it should not be necessary to publish an entire product/bundle in the case of the usage rights changing or meta data relating to one file being corrected.

5.3.14) scheduling dates for the exploitation of AXMEDIS content on B2B and B2C. Distribution schedules can be set both globally and within each territory. This might be best achieved with a system of overrides.

Example:

Territory	Promotion Date	Release Date	Delete Date
Global	**01/01/2004**	**01/02/2004**	**31/12/2027**
United Kingdom	01/03/2004	01/04/2004	[never]
France	[never]	[never]	[never]

Promotion Date can be defined as the date upon which distributors/retailers can be informed of the existence of content. This might allow advance warning and preparation of a promotional campaign for content (such as a hot new release from a top artist). Promotional material relating to this content (such as 30 second clips) would be made available from this date.

Release Date is the date upon which content is available for distribution to the end customer.

Delete Date is the date from which the content is no longer available for distribution to the end customer.

In the table above, the content is available worldwide between 1st February 2004 and the end of 2027. Retailers and distributors can be informed about the existence of content from 1st January 2004. In the United Kingdom however, an over-ride schedule exists, so that the content is available for a different period. In fact in the UK the retailers/distributors are not to be informed of the existence of the content until 1st March 2004 and cannot begin to sell the content until 1st April 2004. In the UK, the content is available beyond 2027; in fact no end date is set on the availability. The content is not available in France, and never will be.

Note that it may be necessary to provide different filters of available content for each territory in the case of distribution partners based in multiple territories. Thus a multi-national music retailer would need to maintain a separate list of active and available content for each territory in which they operate a service.

5.3.15) AXMEDIS has to support License revocation and reactivation

AXMEDIS has to:
5.3.16) support identification of rights and rights owners (could be more than one for each right).
5.3.17) support updating of right owner data
5.3.18) store the needed information to grant the return of the due revenues to right owner (a predefined percentage of royalties produced by a specific content)
5.3.19) support monitoring and maintenance of content use data by Collecting Societies via AXCS;
5.3.20) support all existing rights/royalties relations:

- Producers to artists - royalty
- Producers to any other person involved in the production process whose contract foresee royalties: following the number of copies of the recordings sold to the customers
- Authors Collecting Society to Authors and Publishers: following the mechanical licence as number of copies sold; following the mechanical licence made by a sub licensor in another country based on reciprocal agreement the Authors Collecting Society i.e Country X Society and sub licensor mechanical licence, Country X Society reports and statements to the Society of Country Y (country of the original publisher), Society of Country Y royalty to Authors and Publishers; following the diffusion of the recording as public use/performances, radio, tv, web, mobile etc
- Producers Rights Collecting Society to Producer: following the use of the sound recording: public use/performances, radio, tv, web, mobile etc
- Performers Rights Collecting Society to Performer following the use of the recording: public use, radio, tv, web, mobile etc.

5.3.21) support Rights Collecting Societies in

- collecting fees received on behalf of its members from usage of contents (i.e. broadcasting industries)
- licensing of public use of content
- retrieving information to distribute rights revenues to its member on the basis of content utilization

5.4 Security details and aspects

AXMEDIS Security has to:
5.4.1) allow the usage of an AXMEDIS Object only by the User that owns the corresponding License which grants such usage.
5.4.2) enforce the proper utilisation of AXMEDIS objects and Component, which is ruled by the existing AXMEDIS licenses
5.4.3) prevent use of content in public context without the corresponding rights stated in an acquired license
5.4.4) verify that a Tool in a Device is Trusted/Certified (it can process AXMEDIS Object in a safe manner)
5.4.5) verify if a Domain is trusted
5.4.6) verify the User identity (e.g. username and password)
5.4.7) grant that AXMEDIS Object is used by the intended User: secure procedure for the authentication of Users
5.4.8) certify the AXMEDIS Object Information including description, classification, identification, other metadata, fingerprint. This has to allow the verification if the received information for a remote object will effectively lead to download the described object.
5.4.9) certify the content resources in AXMEDIS Objects or Components with respect to associated metadata.
Example: This can be done with fingerprint.
5.4.10) be able to block/revoke right usage to content by blocking:

- Users
- Licenses

- Objects
- Devices and/or Device Types
- Domains
- Distributors (revoke license of distributing, more than one license could be revoked, automatic management of end-user licences)
- Creators (not capable and registering new object getting a certified ID)
- AXEPTools

5.4.11) be able to detect corruption or loss of part of an AXMEDIS Object
5.4.12) be able to detect that there is corruption or loss of part of an Action Log
5.4.13) be compatible with data protection and privacy aspects (e.g. to limit the compilation of user profiles by third parties)

AXMEDIS Security has to:
5.4.14) protect AXMEDIS objects during their entire life-time.

Example: Fingerprint or any secure means should follow the audio content during its life-time
Procedures for rights owners to save their audio content should allow saving it as a completely original work and also saving it when is used to make a new multimedia content
This will allow:

- To identify the original rights owners whenever and whatever the use of the content is
- To prevent copyright infringement (i.e. legally downloaded audio content should be prevented from making unauthorized copies of the content both in the digital and analogical environment)
- To control the correct use of the "private copy" exception given to consumers: to prevent that a single lawful copy of a phonogram is replicated.

5.4.15) be able to trace AXMEDIS objects during their entire life-time.

Example: In addition the traceability of the ownership could lay the basis to provide an additional "AXMEDIS service" to the right owners through the monitoring and control of the correct use of the contractual and licensing rules of the digital content and to inform rights holders on any infringement.

5.4.2 Content Protection Technology (Technical Protection Measures)

5.4.16) The Security level achieved by the Content Protection Technology must be state-of-the-art (subject to constant scrutiny and evaluation by the worldwide security community)
5.4.17) The Content Protection Technology has to be suitably flexible for a wide variety of Content Data
5.4.18) The Content Protection Technology has to be Efficiently implementable on a wide range of Devices
5.4.19) The Content Protection Technology has to be scalable depending on the commercial value of the content and this decision can be taken by the Content Creator, when it protects and publishes the content.
5.4.20) The Content Protection Technology has to be compliant with the appropriate considerations of export restrictions (e.g. protection algorithm such encryption outside the Europe).
5.4.21) Content Protection algorithm has to provide multiple phases of encryption/scrambling operations.

Example: in addition to the encryption, the content can be also scrambled by using several different algorithms.

5.4.22) Protection of content has to be achieved by using encryption and/or scrambling techniques. This prevents an unauthorized user from accessing Content Data.

Example: the scrambling of lines in images or video, the scrambling of audio samples, etc.

5.4.23) At no point must a media file exist in its entirety in an unencrypted state, unless on a device from which it is not possible to extract it. Such devices must meet an approved, or at least measurable standard such as SDMI, and therefore be controllable.

Example: if an MP3 player requires an unencrypted copy of an audio file in order to be able to play it, the device must conform to some recognised security standard such that it can be allowed or disallowed from receiving the media by DRM settings within the license. Thus, if such a device is compromised so that access

is subsequently made available to the unencrypted media, the DRM settings for products can be changed to exclude devices of the same type in future.

Note that it must be possible for distributors to extract open, unencrypted files if they are granted rights to change the files in any way (for example embedding additional meta data).

5.4.24) In the event of the Content Protection Technology used for some AXMEDIS Objects has been compromised or cracked, it must be possible to rapidly deploy a change to the encryption keys, licenses, end-user plug-ins or whatever is necessary to recover the situation.

Example: Player individualisation in Microsoft's Windows Media DRM version 7. In the event of a compromise of the DRM, new encryption keys are issued to distributors and all media players are required (by use of an 'individualisation version number check') to contact Microsoft in order to update the public decryption keys.

5.4.25) AXMEDIS has to take into account the so called "analogical hole" and provide methods to detect copyright infringement. (OPTIONAL)

Note: At the present moment all DRM solutions could virtually protect digital content only as long as that content remains in digital form. If the content is converted to analogical form, any protection that has been applied to that content is usually lost. The loss of content protection that this conversion entails means that such devices might facilitate piracy. I can legally purchase a digital sound recording to make a CD compilation. But how could this prevent to make illegal copies or illegal use of that sound recording in the analogical environment?

Achieving a balanced approach to the analogical hole has no easy solution. Millions of consumers already own at least one, and often many, digital devices with analogical inputs and outputs, and tens of thousands more of these devices are being sold every day around the world.

Virtually any existing device can be used to create unprotected analogical or digital copies of content.

Note: measures to protect the analogue copy can have an adverse effect on the quality of the original digital source. This must be avoided.

5.4.3 User Identification

A User in AXMEDIS has to:

5.4.26) be unambiguously identified

5.4.27) be approximately located with respect to its geographic position

Note: It is accepted that the location of a customer cannot always be identified when using certain distribution channels (e.g. Internet) however best endeavours must be made to establish that content is not accessed where it is not cleared for use. Examples of technologies that can be used here are:

- Network IP address
  Tables of IP addresses and their allocation can be purchased. These are not highly reliable, though some companies claim to be 95% accurate or more.
- Credit Card BIN Lists
  these can identify the location of the issuing bank of a payment card. If an end user is using a credit card from Spain, it is likely (though not certain) that he is domiciled there.
- End-User registration
  Simply asking the end-user where they live can be an effective way of ascertaining their location. This is obviously open to abuse, but can be useful when combined with other methods.
- Regional Distribution
  More control can be implemented in the B2B environment. Thus, if content cleared for France only is distributed only to French distribution partners, then it is less likely that it will end up on offer in (e.g.) German stores.

5.4.4 Device and Tool Identification and management

A Device in AXMEDIS has to:

5.4.28) be unambiguously identified

Note: This has to be applicable to any type of device, from PC to mobiles. On the mobiles it can be used the IMEI. While for the PC and other devices it would be better to do not use the IP address or MAC address since they can change frequently (the MAC less than IP), .

5.4.29) be certified by an AXMEDIS Certification Authority

A Tool in AXMEDIS has to:

5.4.30) be unambiguously identified

5.4.31) be certified by an AXMEDIS Certification Authority

AXMEDIS Security has to:

5.4.32) verify the trustiness/integrity of a Device (at any time) even at each Action on the AXMEDIS Object

5.4.33) detect eventual corruption of trusted Devices

5.4.34) verify the trustiness/integrity of a Tool (at any time) even at each Action on the AXMEDIS Object

5.4.35) detect eventual corruption of trusted Tools

5.4.36) allow reliable administration of Device/Tool-based Uses.

5.4.37) support succession strategies in cases where a Device is destroyed or otherwise replaced, or else used only for a period of time after which a different Device will be used.

5.4.38) support succession strategies in cases where a Tool is destroyed or otherwise replaced, or else used only for a period of time after which a different Tool will be used.

5.4.39) identify Device capabilities with respect to Tool minimum requirements, e.g., capability to process (e.g. Render) certain Resource types; capability to process certain Content formats; capability to process certain Rights Expressions; etc.

5.4.40) identify Device capabilities with respect to Content properties.

5.4.41) To identify Device capabilities with respect to License Processing (DRM interoperability) Device's Rights Expression interpretation capabilities

5.4.42) identify Device capabilities with respect to AXMEDIS Object uses (actual or potential) (print, audio play…)

5.4.43) suggest to the user to substitute a Device or Tool when this is corrupted or obsolete

5.4.44) provide sufficient flexibility to respect Users' wishes for anonymous use and confidentiality of information not necessary for the purpose of discovery of Device capabilities.

A Device in AXMEDIS has to

5.4.45) be able to identify another Device before distributing (or refusing to distribute) Content or Rights Expressions to that Device, however configurations for anonymity and/or confidentiality should be optional

5.4.46) be able to request and receive information identifying relevant capabilities of another Device before distributing (or refusing to distribute) requested Content or its associated Rights Expression to that Device

5.4.47) be able to request and receive information identifying characteristics of an AXMEDIS Object before receiving it

5.4.48) If a Device has received Content, the Device shall be able to determine whether it is able to process the Content before requesting the Rights Expression associated with it; the same shall apply if a Device has received the Rights Expression but has not received the Content

5.4.5 Protection Keys and their management

Protection Keys Management for AXMEDIS has to

5.4.49) generate new keys

5.4.50) associate keys to Users, Devices, AXMEDIS Objects

5.4.51) protect keys outside of a trusted environment

5.4.52) distributed keys to AXMEDIS tools

5.4.53) install keys

5.4.54) track keys usage

5.4.55) validate keys

5.4.56) update keys

5.4.57) revoke keys

5.4.58) destroy keys

5.4.59) store
5.4.60) backup keys
5.4.61) restore keys
5.4.62) enable Users, Device, Tools to employ a wide variety of key management systems in an interoperable fashion.
5.4.63) support different key exchange protocols without loss of interoperability in the following key distribution:
- One key to one or to many piece(s) of AXMEDIS Object
- One key to one or to many Users
- One key to one or to many Devices

5.4.64) support identification of authorised Protection Key Management systems
5.4.65) lend itself easily to key management implementations that do not interfere with an enjoyable User experience.
5.4.66) be robust again a single failure and as soon as it has been detected, has to begin adequate recovery plans in place to restore key management security.

5.4.67) An AXMEDIS Protection Key can be use to protect an AXMEDIS Object or a Component inside the object
5.4.68) Any Component inside an AXMEDIS Object can be protected with a Protection Key different from the one used to protect the container Object
5.4.69) A protocol and a mechanism to certify the creator of an object. Those that put the AXCID into the object and can protect the object itself.
5.4.70) To support the association of the Action Log with a Device and a Tool
5.4.71) The ability to support super-distribution of Governed Content when each instance of such Governed Content is encrypted with a different key (the new instances must register with new AXOIDs). This requires that the user who receives the super-distributed content to buy a license for it

5.5 General Requirements for AXMEDIS tools

For AXMEDIS certified tools it has to be possible to:
5.5.1) verify Conformance of the engine interpreting the Rights Expressions. Conformance shall be assessed and regulated according to industrial compliance regime.
5.5.2) verify Conformance of the engine executing the Rights Expressions. Conformance shall be assessed and regulated according to industrial compliance regime.
5.5.3) verify the robustness of a Device to attacks. Device producers are asked to provide their views on this issue.
5.5.4) verify the robustness of a Tool to attacks. Tool producers are asked to provide their views on this issue.

In AXMEDIS tools:
5.5.5) Changes to the AXMEDIS Object Model should be possible and all the tools should continue to work properly. Changes that should be considered:
- Changes of tag names without change of meaning;
- New attributes/properties in the description tags;
- …

5.5.6) Ability should exist to support the lack of some referred Component into the AXMEDIS Objects without putting in trouble the player or the editors
5.5.7) multiple languages should be supported in user interfaces (English, Italian, French, Spanish, …) (OPTIONAL)

5.5.8) AXMEDIS has to support automatic refill and completion of metadata using specific plug-in for AXMEDIS Editor/crawler to automatically integrate other metadata coming from external resources (e.g. databases)

AXMEDIS Content Production has to:
5.5.9) address the most relevant requests and issues of content production
5.5.10) take into account the usual workflow and procedures
5.5.11) support different platforms (from AVID, to Mac…) and working tools (e.g. Maya, Aftereffects, Photoshop, Quark Express, Illustrator, Freehand…)

5.5.12) support the production of promotional material, which has to be distributed in the B2B network; this content has to be tracked, even if gathering the related licence were for free

5.5.13) support the enforcing of in-house workflow production like

- revision of content at different production stages (artistic direction)
- association with in-house production information (audio cd → ISRC code, label copy, cue sheets, bar code)
- content composition (integrating booklet/label in an audio CD)
- clearance of pending rights (dealing with Authors and Publishers Collecting Societies to get mechanical licence rights on any image used in the booklet)

5.5.14) support the production of new content starting from other content (derivative work)

5.5.15) preserve the protection on the objects during their whole life-cycle

5.5.16) enforce AXMEDIS DRM inside external tools allowing to operate directly on the content in a safe manner

5.5.17) support clearing of the various rights of existing content before incorporating it into a new multimedia product

Example: to include audio content involves the following stages:

1. *Identification of the right owners:*

- Identify the category or categories of rights in question. A single product can incorporate rights from several categories.
- In the case of the reproduction of an extract from a work, determine whether the extract constitutes a substantial part of the reproduced work within the meaning of the law. If it is a substantial part, continue the procedure.
- To learn whether the content is still protected, check whether the owner of the rights and the date of publication of the content or any other relevant information indicated on it.
- Starting with that information, establish whether the term of protection has expired with respect to all its components.

  N.B. Authors/composers copyright. The term of protection of copyright in a joint work is to be calculated based on the death of the last surviving co-author

  Some examples of different terms of copyright expiration:

Germany, France, Italy, UK and USA	70 years
Japan	50 years
Cote d' Ivoir	99 years
Colombia	80 years
Mexico	75 years
India	60 years

  Under the WIPO Treaty, the European term of protection to be granted to producers of phonograms last, until the end of a period of 50 years computed from the end of the year in which the phonogram was published, or failing such publication within 50 years from fixation of the phonogram, 50 years from the end of the year in which the fixation was made.

- Depending on the type of content, on the use intended to make and on different rules of each country, the authorization and rights clearance should be asked to the entitled collecting societies or directly to the rights owners .
- If no Collecting management on that rights, but the owner has been identified, contact him directly.

2. *Elements to be negotiated during licensing process and copyright clearance*

- After locating the owner of the rights or the collecting society that represents the owner, and after establishing that the content is still protected, apply for authorization to incorporate the content into the new multimedia product giving the owner of the rights the following information:
  - a description of the work or the extract from the content that you wish to incorporate into the new multimedia product

- a description of the new multimedia product into which the work is to be incorporated (e.g. educational game, interactive encyclopaedia, e-business Internet site for the sale of goods, bank transactions, etc.)
- a description of the purpose (for example, to include music on an educational CD ROM on the Rock history, to enhance the visual aspect of a site, to create a fictional character for a game, etc.).
- ways of exploitation and terms.

It should be remembered that the owners of rights may refuse or agree to permit the use of their work. Clearance therefore implies that the owner believes that using his work in the new multimedia product is in his interest.

5.5.18) provide professional results by automating (or computer aiding) significant post-processing activities; **Example:** when dealing with video in order to grant proper transition and uniformity in style and appeal. The need for subtitles to manage the multi-language issue avoiding dubbing (and additional costs and rights related) may impose difficult technical problems to solve as the various technical solutions available have different impact (the length of text may significantly vary from one language to the other and so will the required superposition space on-screen; font readability depends on background image; the author of the video might refuse permission for certain kind of subtitling and require dubbing or vice versa)

AXMEDIS Licence Generation has to:

5.5.19) support rapid, high volume change of rights and conditions to both B2B and B2C. It must be possible for rights over a large portion of the available catalogue to be changed on a regular basis.
Example: Digital rights are not represented in all historical artist contracts. Most major record labels are currently going through an exercise of revisiting all contracts to make provision for new, digital formats. Often changes to distribution rights are made as the legal position is clarified over an artist contract. This may result in content needing to be removed from clearance ('taken down') with immediate effect. Typically a 24 hour deadline is placed upon this activity.
Other examples:
- A major rights holder may wish to adjust rights for end-users (such as the number of CD burns of an audio track) across their entire catalogue.
- A distributor may sign a deal with a major rights holder for a new territory, so the new territory may need to be added to the B2B distribution rights across the whole catalogue.
- A recording artist may negotiate ownership of his/her digital rights and the label may be operating on an 'assumed' ownership. Distributors may need to take down content from that artist with immediate effect and disease from selling it to end users

5.5.20) support fast track / priority updates. With a great deal of changes to distribution and usage rights happening, it is expected that there will be a backlog of updates at any given time. As such there needs to be a process for marking certain changes (usually those with a legal or strong commercial implication) as priority so that they 'jump the queue' and are processed ahead of others.

5.5.21) be open to negotiable options among right owners and user

5.5.22) allow verifying inconsistencies among the licenses of the several digital resource against the intention of the producer or integrator for the (re)distribution of the object under licensing.

5.5.23) allow black list of undesired users (each content owners should be free to exclude a user for personnel reasons)

5.6 General Requirements for distribution tools

5.6.1) The function of searching and selecting Content of interest to an End-User. To let the End-User make the best choice of Content

5.6.2) Access to certified AXInfo

5.6.3) When publishing an AXMEDIS object on the B2B/B2C distribution channel some metadata (e.g. Workflow metadata, …) has to be removed.

AXMEDIS Content Distribution has to:

5.6.4) support voting feedback on AXMEDIS Objects from consumers. This voting feedback has to be accessible to all AXMEDIS B2B actors involved in the creation, aggregation and distribution of the object. The voting feedback management has to take care of privacy policies. (DESIRED)
5.6.5) support audio and video streaming
5.6.6) be implementable on different platforms with the lowest possible effort, i.e. it must be based on a portable design.
5.6.7) support low footprint (memory/CPU) clients
5.6.8) support short and text-encodable authorization requests/messages during the licensing phase (and only few steps) (maybe licensing could be transported over SMS)
5.6.9) support integration with Customer Care Systems. Exporting strings generated for each transaction to SIEBEL (most common Customer Relationships Management (CRM) software used by telecom operator) is required. With this functionality the customer care agent is able to provide information about the transaction and the content sold.
5.6.10) support reduced registration procedures. AXMEDIS has to reduce the registration procedure the customer has to do facilitating the transmission of the personal information needed between the different partners instead of requiring double registration to the customer. This purpose has to be achieved in respect of the privacy. We suggest a system based on the email authentication instead of generating new accounts or personal code.

5.6.11) No specific software application should be required to end users in order to exploit media distributed through the AXMEDIS framework. Media should be available for use in common operating systems and applications on each of the target platforms. There should be no cost to the consumer for application plug-in and/or codec if required, and the installation procedure should be very simple, requiring the minimum intervention from the user (DESIRED).
5.6.12) Features for the exploitation of media files in existing media applications should be supported.
Example: The following functions in Windows Media Player should be supported for audio files:

- Cross fading
- Auto volume setting
- Play list integration
- Burn to CD
- Transfer to / synchronise with a portable device

AXMEDIS Distribution on mobile devices has to:
5.6.13) unambiguously identify the device
5.6.14) enforce content protection and avoid copyright infringement
5.6.15) take into account present technologies about mobile device identification (i.e. UMTS/GPRS → IMEI and WiFi → MAC)
5.6.16) provide anytime anyplace services
5.6.17) take into account mobility aspects such as not stable connections and provide robust or recoverable services
Example: A user travelling by train requests the viewing of a pay-per-use movie clip on his mobile device. Before he is able to watch this clip the train enters a tunnel and hence the mobile looses the network connection. By the time the train is in tunnel the server returns the requested clip and charges him for the required amount. As the train is in tunnel the network may not know where to deliver the clip and hence may discard it after few trails. When the train exists the tunnel, the user's mobile device reconnects to the network expecting the clip. In this case the user will either be charged twice or will not receive any requested clip.

6 AXMEDIS Object Authoring

6.1 AXMEDIS Editors, as authoring tools

AXMEDIS Editor, also called Authoring tool will support MPEG-21 with AXMEDIS addition with related composition and the nesting of levels; it will support the navigation in AXMEDIS objects, mainly derived from MPEG-21.

AXMEDIS Editor must meet the following requirements:

Model and Load/save

6.1.1) Supporting MPEG21 standard plus additions for AXMEDIS
6.1.2) Supporting downloading and streaming, modular or segmented downloading
6.1.3) Supporting modularization to be reused in the viewers, editors, plug-ins, etc.
6.1.4) Loading and saving AXMEDIS objects on file and into the database
6.1.5) Load and save in XML and in binary encoded/encrypted mode
6.1.6) Export, save and load of AXMEDIS components, protected or not.
6.1.7) Export and import of MPEG21 digital item and parts thereof
6.1.8) Loading and saving content that can be processed with some algorithm and tool. Similarly to what happen to IPMP of MPEG21.

Navigation/editing

6.1.9) Navigating into AXMEDIS objects
6.1.10) Adding and extracting AXMEDIS components with traditional and drag and drop modalities
6.1.11) Creating of AXMEDIS objects
6.1.12) Creation of some temporary AXMEDIS Object ID
6.1.13) Adding, managing and modifying plain resources. At least, AXMEDIS Editor shall support, in its basic implementation, the most common formats of: text document (doc, pdf, rtf), image (jpg, gif, bmp), audio (wav, mp3), video (mpeg2, avi), animation (mpeg4), etc…
6.1.14) Support multi-document, i.e. "simultaneous" management of different AXMEDIS objects shall be possible (e.g. MS Office® application, etc…). In such a way, various operations such as comparison (or cut and paste among different documents) will be implement able;
6.1.15) Extract from an AXMEDIS object a "template" or rules to generate other similar objects for composition/formatting.
6.1.16) Presenting the AXMEDIS objects by means of a set of different views: highlighting the hierarchy, the point of view of the final users, the relationships among elements, DRM aspects, etc…
6.1.17) The AXMEDIS Object Viewer is of major importance to allow the user, who is working with the AXMEDIS Editor, to visualize/play/execute the AXMEDIS object as it will be shown to the end-user
6.1.18) Activating external editors/viewers for modifying/executing digital objects included via ActiveX. In such way, AXMEDIS Editor (and then AXMEDIS Object Viewer) guarantees to be capable to face new content types and new actions (applicable both on new and old content types)
6.1.19) Configuring the editors/viewers to be activated, and other parameters, providing them with AXMEDIS plug ins to guarantee the protection level and the content object access.
6.1.20) Using/activating of internal players/editor to allow simple changing and visualization of the most used non-proprietary media formats
6.1.21) Exploiting functionalities developed in external AXMEDIS plug ins for digital resources adaptation

Protection

6.1.22) Protecting AXMEDIS objects Creating protected objects by using encryption and scrambling tools. This can be performed by exploiting the features of the PMS.
6.1.23) Enforcing DRM rules, verifying the consistency of the Possible Available Right of the whole object with those of the resources and AXMEDIS components included. This verification allows to see if the PAR of the whole object is in conflict with the PAR of the single resources. For example the whole PAR can be estimated on the

basis of the PAR of the single resources, while some of them can have the rights to use the object in Italy and other only in Germany. Thus the user has to be supported in verifying which are the problems if he like for example to deliver the object in Italy. The results have to be the list of possible conflicts on the basis of the PAR and a potential License or a simple statement of the user.

6.1.24) Navigating and understanding by simulation DRM rules

6.1.25) Verifying the protection of the loaded object

6.1.26) Respecting protection rules of AXMEDIS objects and components

6.1.27) Managing the registration of the user access, authentication, user id and password

6.1.28) Estimating and enforcing fingerprint inside the objects

6.1.29) Connection with AXMEDIS certification and Supervisor for the Action Log by means of the Protection Manager Support

Configuration and general support

6.1.30) Conforming to AXMEDIS Editor Configuration Manager requirements. Moreover, each configurable AXMEDIS Editor module shall have access to a set of default settings in order to continue working also in case of AXMEDIS Editor Configuration Manager missing or erroneous;

6.1.31) Providing support for printing information related to the structure of the AXMEDIS object, visual diagrams, textual information, relationships, etc…

6.1.32) Accepting third party plug-ins for AXMEDIS object data processing via a specific interface respecting DRM rules, etc., for example it is a way to

a) accept workflow commands and controls or messages
b) accept special views for metadata, including those of the Workflow for instance
c) accept specific viewers/players for AXMEDIS objects, for example for navigating on DRM, composing DRM visually, testing DRM aspects.
d) accept algorithms for digital content processing

6.1.33) Providing mechanisms for the AXMEDIS Editor Workflow Plug-in to interact with the AXMEDIS Workflow Manager. In particular it shall:

- permit to receive settings from external entities (e.g. a supervisor);
- log user operations;
- submit logs to a centralized collector (e.g. it should be the same supervisor above);
- allow to receive commands from the AXMEDIS Workflow Manager

6.1.34) Managing user profiles. A profile will be a container of user preferences, AXMEDIS Editor settings, saved query, composite object templates, etc…;

6.1.35) Providing a multilingual support (OPTIONAL)

6.1.36) Providing an interactive help. AXMEDIS Editor shall include a help which, at least, contains AXMEDIS Editor function explanations and user interface description. Such help should also contains some use case descriptions in order to better explain AXMEDIS Editor usage (DESIRED);

6.1.37) Providing trace of the most recent opened AXMEDIS files (DESIRED)

6.1.2 AXMEDIS Editor and View Modules

View modules are those parts of AXMEDIS Editor GUI which show some aspects of the actual AXMEDIS object and parts thereof. In the following sub-sections the most important aspects (and the corresponding views) thought about till this moment will be analyzed, i.e.:

- Hierarchy;
- DRM;
- Spatial;
- Functional/Behavioural;
- Descriptions and comments;
- Metadata;

6.1.2.1 AXMEDIS Hierarchy Editor and Viewer

Hierarchy View should show hierarchical relationship among elements of an object. Because of linearity of MPEG-21/AXMEDIS relationship among elements (i.e. each element has one, and only one, parent element), tree-like view (similar to the one of explorer) is the most suitable solution. Such view should permit cut and paste operation and, moreover, it should permit specific operations (through contextual-menu usage) on showed elements.

Hierarchy view shall

6.1.38) be an explorer-like view. For example, the view may contain two different panes: one pane showing a tree which represents element relationships, and the other pane showing the list (or something equivalent) of the sub-elements of the element currently selected in the first pane.

6.1.39) allow copy, cut and paste actions on structure of AXMEDIS object, i.e. not on piece of content contained in an object but on the structural elements of the object.

6.1.40) allow copy, cut and paste operation among different kind of views and different AXMEDIS objects (in different views) if, and only if, that action is semantically valid

6.1.41) enable the most common usage of add, cut and paste operations (e.g. by keyboard, mouse, etc…)

6.1.42) allow use of mouse right-click on showed elements to permit contextual menu usage.

6.1.43) represent each element by a specific icon. Icons of resources (i.e. the assets contained within the object) shall be obtained by OS file association, while the others shall be chosen .in some other ways

6.1.44) allow double-click on showed elements to permit execution of default actions

6.1.45) be fully configurable, e.g. visualization granularity, visualization style, context-menu operations, default operations, etc…

6.1.2.2 AXMEDIS DRM Editor and Viewer

DRM view shall

6.1.46) permit to browse and manage all DRM-related aspects.

6.1.47) permit to add new rules, remove and change existing rules on the whole object or parts thereof;

6.1.48) graphically show DRM relationship among the AXMEDIS object, components, others object and licences. Relationships should be represented with a graph structure, in which arrows and links will have given meaning/semantic;

6.1.49) be able to test an AXMEDIS object and components usage, in a given context. Such context could be a set of fake licenses and a set of constraints (place of consumption, time instant or interval, etc…). DRM View shall answer in two ways: true or false. In latter case, DRM View shall give a set of clauses that explain why not, e.g. a specific license is needed or a specific time interval is partially covered by the set of licenses owned by the user;

6.1.50) be able to show the dictionary of all those grants/actions feasible for a given resource, component or element, and, for example, to insert one of those grant in a license

6.1.51) be able to show the list of all grant conditions implemented by the AXMEDIS framework, and, for example, to insert one of those condition in a license possibly giving a reference service for those conditions which need external information to be evaluated

6.1.2.3 AXMEDIS Visual Editor and Viewer

Spatial View shall show object placement in a 2-D (or possibly 3-D) environment. Moreover, Spatial View shall permit managing (i.e. moving, deleting, adding, etc…) object subparts which have spatial properties or constraints.

6.1.52) Spatial View shall be able to proportionally represent components in all significant spatial directions;

6.1.53) Spatial View shall permit to modify spatial properties and constraints by means of graphical actions such as drag-and-drop, contextual menu, etc…

6.1.54) Component spatial properties should be relative to the comprising container or to other items. Otherwise, those properties should be absolute respects to the entire object;

6.1.55) Relations between visual entities could represent:

- Rights relationships
- Execution relationships (e.g. sequence of tracks to be played or tracks to be simultaneously played)

- Dependencies (e.g. HTML and linked resources)
- …

6.1.2.4 AXMEDIS Behaviour and Functional Editor and Viewer

Behaviour and Functional View is intended first as a View where the main modalities and layers of the Editor can be activated. The AXMEDIS Object can be a heterogeneous, multi-layer piece of information for which different modalities of exploration/manipulation are possible and for which different layers may be accessible according to preferences. In this sense the Functional View displays the available possibilities and allows selecting a text view, other than composited media view (scene layer) or a media-by-media view. The functional view may also allow displaying available modes of operation, like the selection between file / broadcast (save later, transmit immediately) and related configuration.

Behaviour and Functional View may also be an interfacing view to external editors affecting synchronization and timing among different media objects. An AXMEDIS object may include multimedia and cross-media scenes like those that can be produced by MPEG-4 BIFS, SMIL, etc. Through suitable plug-ins and interfaces the AXMEDIS Editor may allow inserting and taking out portions or elements of these composited elements. Direct internal editing through internal functions and menus could be limited to a minimum of simple straightforward cases. Overall, the Behaviour and Functional View should:

6.1.56) Allow the production and modification of behavioural and functional parts of the AXMEDIS Objects. These parts are the functional parts of the MPEG-21 object. They are used to describe the behaviour of the object when it is open, played, etc. It is possible in this way to describe the execution sequence and the buttons to activate them, etc. See Digital Item Processing, Digital Item Methods.

6.1.57) Allow switching by one touch tabs among different views such as text view (XML text view), composite media scene view, single media view (video, audio, hyperlinks, animations, etc.), media delivery view (embedded elements, streaming elements, etc.).

6.1.58) For aggregated composited objects, allow activating different windows with different view modalities for different subparts of the object.

6.1.59) Support plug-ins to show and manage specific composite media types that are to be reasonably expected for these elements, given the complex nature that these elements may have. At least a few of the major formats and tools for multimedia synchronization and timing (BIFS, SMIL), including maybe also QT, avi (divx) and the like.

6.1.60) Permit the visualization of simple time diagrams and/or spatial layouts from AXMEDIS objects to permit selection of some parts (on the base of annotations, etc.) to activate related editing tools for the supported functionality and formats (e.g. editing a single frame in an animated sequence) (OPTIONAL)

6.1.61) Be configurable, i.e. user should be able to select, for each kind of components, which view to activate by default.

6.1.2.5 AXMEDIS Annotations Editor and Viewer

Annotations View will permit to display information including annotations and comments within AXMEDIS objects or parts of them. Annotations and Comments will be logically included as elements in AXMEDIS objects without actually modifying their contents. Such View will be user customizable, i.e. users will be able to select which types of media have to be made accessible for each component. Annotations and Comments View should:

6.1.62) Permit to add/edit/delete annotations and comments by means of graphical actions such as drag-and-drop, contextual menus, etc

6.1.63) Be configurable, i.e. user should be able to select, for each kind of components, which annotations and comments types (textual, audio, alternatives, etc…) have to be made accessible;

6.1.64) Support plug-ins to show and manage specific media types that are to be reasonably expected for these elements, given the different nature that annotations and comments may have. Other than normal text support, at least audio annotations/comments and possibly text-to-speech should be included; still pictures should also be available in at least one common format.

6.1.65) Support for printing and visualising the metadata in a human readable format.

6.1.66) save annotations on a file.
6.1.67) load and apply annotations on an object.

6.1.2.6 AXMEDIS Metadata Editor and Viewer

Metadata Editor and Viewer will permit to adequately display/edit information contained within metadata associated with AXMEDIS object or parts thereof. Metadata will be contained within description and statement MPEG-21 elements. Such elements could contain user-defined XML code which will be correctly displayed by Metadata View. Such view will be user customizable, i.e. user will be capable to select which fields have to be displayed for each components. Metadata View shall:

6.1.68) provide a default visualization model which shall be able to adapt itself (e.g. by analyzing the data-related XML schema) automatically to the metadata structure;
6.1.69) be fully configurable, i.e. user shall be able to select, for each set of metadata (e.g. by schema identification or namespace) and for each kind of components (e.g. by mime type value), which metadata have to be displayed;
6.1.70) because of metadata versatility (MPEG-7, user custom, etc…), Metadata View shall support plug-ins to show and manage specific sets of metadata in a "user" definable manner, e.g. by schema identification or namespace. Specific set of valuable metadata, such as MPEG-7 metadata, should be included into AXMEDIS Editor basic release;
6.1.71) Support plug-ins for metadata automatic production, e.g. a plug-in for music genre estimation, summary generation, etc…
6.1.72) support for printing and visualising the metadata in a human readable format.
6.1.73) export in machine readable format.
6.1.74) allow editing of metadata.
6.1.75) allow choosing default metadata set values based on vocabularies/taxonomies (see IEEE LOM)

6.1.2.7 AXMEDIS Workflow Editor and Viewer

Workflow Editor and Viewer will permit to adequately display/edit information related to workflow management.
Workflow Editor & Viewer shall:

6.1.76) visualize the current status of the object/component (e.g. status, what have to be done, who have to do it, …);
6.1.77) allow the user to change some information
6.1.78) support for printing and visualising the workflow information in a human readable format.

6.1.3 AXMEDIS Editor Configuration

AXMEDIS Editor Configuration Manager will be the unique access point to AXMEDIS Editor modules configurations. Each configurable AXMEDIS Editor modules (and sub-modules) will respect AXMEDIS Editor Configuration Manager requirements. AXMEDIS Editor Configuration Manager will be flexible enough to manage the widest range of settings possible. That should be possible by means of plug-in support. Further, AXMEDIS Editor Configuration Manager will manage and provide AXMEDIS Editor general configurations, such as multi-language. AXMEDIS Editor Configuration Manager shall:

6.1.79) Be the unique configuration access point
6.1.80) Permit to group settings by some kind of identification
6.1.81) Support the most common parameter type, e.g. integer, float, colour, etc…
6.1.82) Support XML as parameter type to allow developers to define their own
6.1.83) Provide an user interface to allow configuration access and modification
6.1.84) Show configurations grouped by categories and by software modules
6.1.85) Include a default setting visualization module which shall be configurable. In such a way, every AXMEDIS Editor module shall specify it's own settings and AXMEDIS Editor Configuration Manager will be capable to correctly display it;
6.1.86) Provide an interface to allow development of plug-ins for customized visualization of specific settings, e.g. a developer, who develops a plug-in, should give also a custom user interface to set the plug-in parameter;
6.1.87) Managing configuration for the main modules and the additional viewers according to a mechanism of VARIABLE NAME = VALUE (string).

6.1.4 AXMEDIS Editor Plug-in Manager

AXMEDIS Editor has been thought to be as versatile and flexible as possible. In order to achieve this goal, various AXMEDIS Editor modules need to support plug-in technology. Hence, a AXMEDIS Editor Plug-in Manager is needed, such manager will be able to support installation/registration of plug-ins, to load such plug-ins for AXMEDIS Editor modules which request it and to maintain/manage relationship among plug-ins and related entities or actions, e.g. AXMEDIS Editor Plug-in Manager shall maintain relation among a specific set of metadata and the corresponding production or visualization plug-ins.

AXMEDIS Editor Plug-in Manager shall

6.1.88) manage the following kind of plug-ins:

- Data-manipulation plug-ins shall be able to modify AXMEDIS object structure, i.e. plug-ins which shall be able to delete or move existing components, insert new components, etc…
- Metadata show/manage plug-ins shall be used by Metadata View to adequately display and modify user-defined sets of metadata;
- Metadata production shall be able, through AXMEDIS object (and parts thereof) analysis, to produce metadata to be included into the object;
- Configuration plug-ins shall be used by AXMEDIS Editor Configuration Manager to manage and display specific configuration information;

6.1.89) provide standard interface definition for the above mentioned plug-ins family; The standard interface has to provide service for:

- dynamically attach plug ins,
- managing confirmation of plug ins,
- supporting the security and certification of the plug ins,
- allowing the plug in to insert menu items in the general menu and in the contextual menu of the objects according to the views.

6.1.90) Avoid the direct interaction among plug in or to change the behaviour imposed by other plug ins.

6.1.91) Provide support for mapping the basic functionalities of Composition and formatting and making them available for the composition and formatting engines

6.1.92) provide an interface to allow related AXMEDIS Editor modules to access to the associated plug-ins.

6.1.93) store all those information required to classify and sort plug-ins, such as:

- Kinds of component or actions associated;
- Mime type association;
- Etc…

6.2 AXMEDIS Internal Editors/Viewers

Internal AXMEDIS Resource Editors/Viewers are internal tools that supply the AXMEDIS Editor with a range of basic functionality involving the digital resource management.

Such Internal Editors and Viewer shall

6.2.1) be invoked by the AXMEDIS Editor;

6.2.2) allow managing the digital resource by respecting the DRM and protection mechanism associated with the resource;

6.2.3) allow visualising the digital resource if it is a document or an image;

6.2.4) allow playing/execute the digital resource if it is a video, or an audio or animation, or a multimedia resource, etc…;

6.2.5) allow manipulating the digital resource by means of basic editing functions. For example zooming in or out the image resource, excerpt extraction, etc..

6.3 AXMEDIS tools for using/producing AXMEDIS Objects in other Content tools

The possibility to interface the AXMEDIS Editor with external applications for content production (such as Adobe Photoshop®, Adobe Premier®, etc…) will allow the user working on digital resources by continuing to use own tools.

At the same time this solution will provide the opportunity to manage a wide range of digital contents and formats such as:

- Multimedia: MPEG-4, HTML, ……
- Animations: FLASH, etc….
- Audio: WAV, MP3, AIFF, ….
- Video: MPEG, AVI, H264/AVC….
- Document: DOC, PDF, PS, etc..
- Images and Graphics: TIFF, JPG, PNG, PIC, SVG, etc.
- others: music scores, excel sheets, power point presentations, games, etc.

To obtain that:

6.3.1) The AXMEDIS Editor shall activate external applications for Digital Content manipulation (editors/viewers for editing/viewing such as Adobe tools, Microsoft tools, etc.).

6.3.2) The AXMEDIS Editor shall provide interfacing mechanisms for communicating with external applications.

6.3.3) In case of external application supporting ActiveX/COM technology, the AXMEDIS Editor shall host an ActiveX/COM Manager and the relative ActiveX application shall be equipped with an External Editor/View AXMEDIS Plug-in.

6.3.4) In case of external application not supporting ActiveX/COM technology, the AXMEDIS Editor shall host an External View/Editor Activation Manager (via console) and the relative external application shall be equipped with an AXMEDIS Object Handler as Plug-in and provide a communication via socket or other inter process communication technologies.

6.3.5) Both plug-in technologies shall provide mechanisms for:

- Accessing AXMEDIS objects;
- Navigating into AXMEDIS objects;
- Creating AXMEDIS objects;
- Modifying and manipulating AXMEDIS objects according to DRM rules;
- Protecting and respecting the protection of AXMEDIS objects, by means of the Protection Support module.

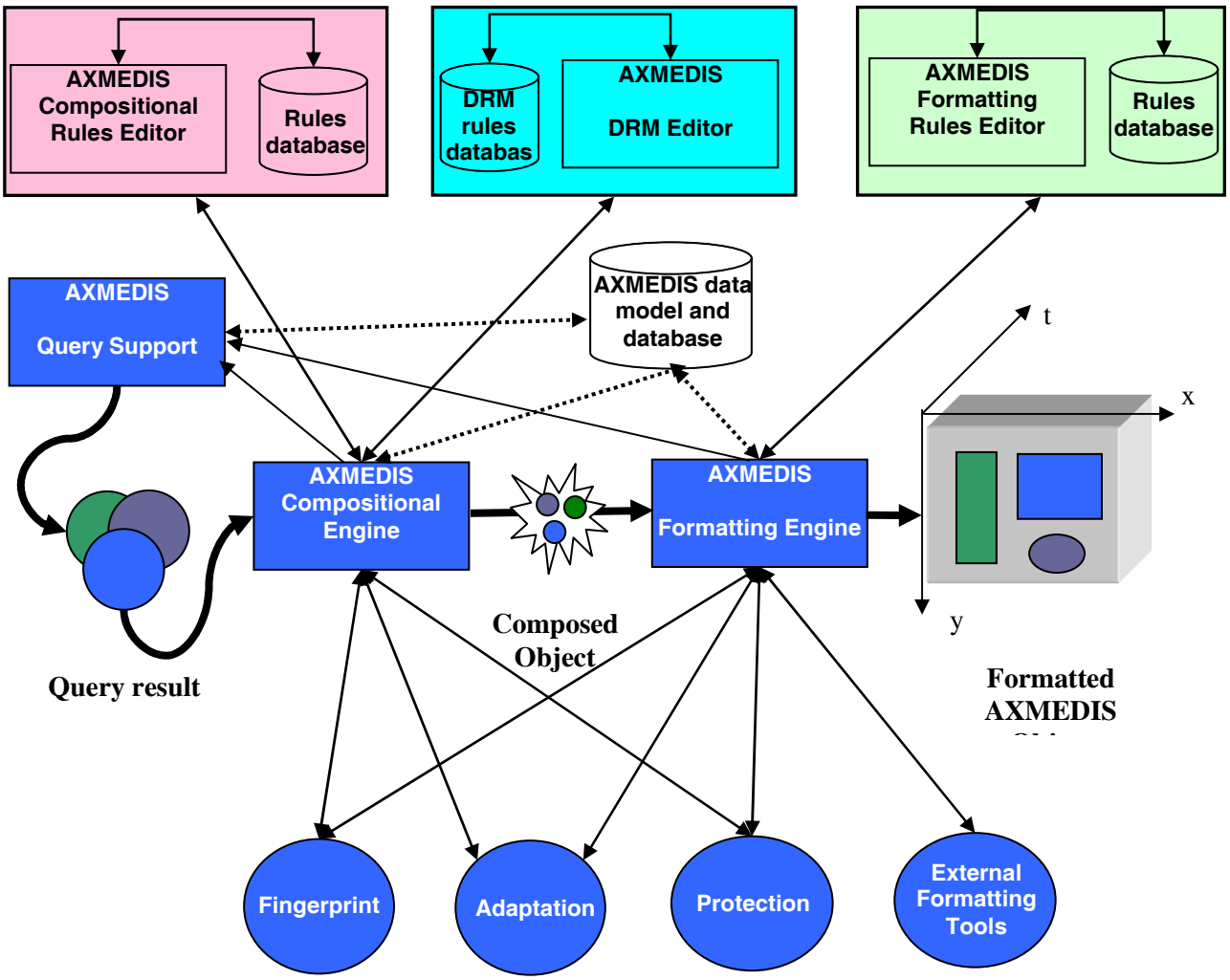
7 AXMEDIS Object Production

7.1 Compositional and formatting tools

The compositional and formatting tools belong to the set of digital content production tools. They have to aid the content designer to:

- efficiently collect the components needed, using advanced query options
- find/produce alternatives for the components that present potential distribution problems (files too big).
- structure the components, highlighting the semantic relations between them.
- bind the structure content to some presentation styles.
- the same broadcast/broadband-quality content must also be formatted for delivery to a variety of channels, necessitating repurposing and even re-authoring.
- different delivering channels according to different formatting styles and constrains about the profile of the final user device.

The problems of automatic content production is decomposed in two separate phases: composition and formatting. Such phases will be respectively performed by the **Compositional Engine** and **Formatting Engine**. Both engines can use services provided by some tools involved in the AXMEDIS object production. The relationships among tools are depicted in the following architecture:



AXMEDIS Query Support – It performs AXMEDIS objects searching by means of queries into AXMEDIS database and others database.
AXMEDIS Compositional Engine – It performs the composition process and generate new composite AXMEDIS objects. Such objects are stored in the AXMEDIS database.
AXMEDIS Formatting Engine – It performs the formatting process and generate new formatted AXMEDIS object. Such objects are stored in the AXMEDIS database or delivered via distribution channels.
Protection – It performs the protection of the AXMEDIS object via Protection Support
Fingerprint – It performs the Fingerprint estimation of a new AXMEDIS object. The fingerprint could be based on component's fingerprint or could be a new one.
Adaptation – It performs the Content adaptation for different distribution channels and format paradigm.
External Formatting tools - Tools for using external formatting functionalities
AXMEDIS Compositional Rules Editor – It is an editor for writing composition rules. It is supported by a Rules database where rules are stored
AXMEDIS Formatting Rules Editor – It is an editor for writing formatting rules. It is supported by a Rules database where rules are stored
AXMEDIS DRM Rules Editor – It is an editor for writing DRM rules. It is supported by a Rules database where rules are stored

7.1.1 Composition

The composition is the action of putting together content component to create a new digital item in an almost automatic manner. The final result is a new composite AXMEDIS object. The compositional activity should allow composing different kinds of raw assets such as Text, Images, Audio, Video (actual shot), Animation (synthetic), etc… coming from the AXMEDIS database. The composition could generate:

Basic Combined assets, for example:

- Texts + Image
- Texts + Audio
- Texts + Image + Audio
- Audio + Texts
- Animation + Texts
- Video + Texts
- Video compilations
- Audio compilations
- Image compilations
- All other different combinations of raw assets

Advanced Combined assets, for example:

- Multimedia presentation embedding sets of raw assets such as MPEG4, etc.
- Multimedia presentations composed of basic combined objects, **such as HTML,**

The composition could produce homogenous (where all digital resources are the same type) or heterogeneous (different kinds of digital resources) composite AXMEDIS objects.

Example:

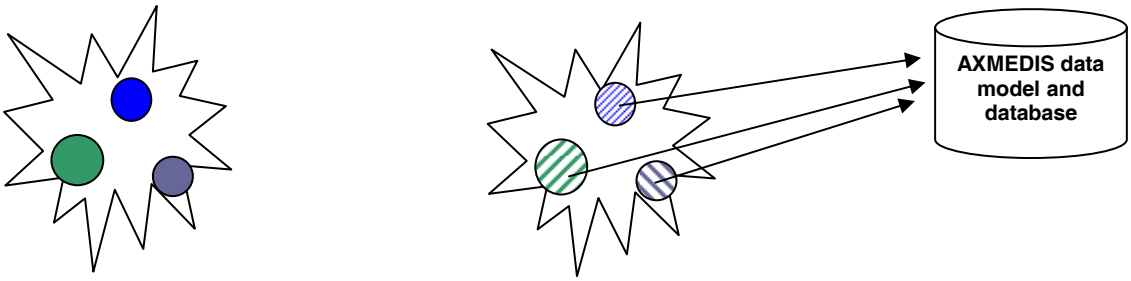
Let suppose to get a Selection of digital documents from a large database of content. The Selection can be a the identification of a AXMEDIS components (digital objects) Italian singer Eros Ramazzotti, that is:

- 100 Audio, 50 Documents, 30 Images

Some solutions for different compositions could be:

- Any composition of 2 audio, 2 images and 4 documents
- Collection year by year with audio, documents and images of the same year
- Any two audio ordered by time, take these images and the doc number 45 which is the biography
- Any combination of 2 over the 100, plus put in any new object a specific document (for instance a given version of the bio plus its image, that could be the cover).

All solutions listed in the example generate composite AXMEDIS objects that embed digital resources (audio, texts, images, etc…). A double mechanism for embedding digital resources should be available: (i) composition by references and (ii) physical composition. In the former case, digital resources are embedded in the composite object by using their reference (i.e. the ID of the single digital resource, the URL of the database where the resource is stored, etc…), whereas in the latter case digital resources are embedded physically in the new composite object. The first solution allows avoiding digital resource duplication and excessive wastage for disk storage space.



Physical Composition

Composition by References

The entire process should be based on rules, called Composition Rules, to allow an automatic and customizable composition process. A composition rule has to:

- describe what kind of information (metadata and licensing) to use in AXMEDIS objects retrieval. Such information defines selection mechanism based on queries built on metadata and licensing information for extracting digital resources from the AXMEDIS database;
- describe how to combine different objects (i.e. how many objects, what kind of objects, organising them by type, embedding them by reference or physically, etc…);
- describe how to manage and combine DRM rules for the new composite item;
- describe operations or actions that have to be performed during the composition process: (i) Fingerprint estimation and application for the new composite item and (ii) Object ID assignment for the new composite item.

For example, a compositional rule could be described as a function in the following way:

$$C = f(S1,S2,..,Sn,P1,\ldots,Pm)$$

Where:

- S_i – It defines a selection. It is a set of queries and/or a set of identified objects created by the user by using the AXMEDIS Query Support and that can be sent to the AXMEDIS Query Support to provide the list of AXMEDIS objects references into the database. This feature is needed only if the query is symbolic and not actualised with the name/references of the objects;
- P_i – It is a parameter (basic type as integer, string, Boolean);
- f is the identifier of rule (name of rule or other);
- C is the resultant of rule application. It is the new composite AXMEIDS object.

Considering the role of the composition engine in the AXMEDIS object creation and distribution, the engine could be controlled by AXMEDIS Workflow Manager. In this scenario, a composition rule could be used by the AXMEDIS Workflow Manager to realise a composition schedule to be sent to the Composition Engine. Such as schedule could contain information regarding:

- *Object ID* – It is the name of the new AXMEDIS object
- *Activation* – When the composition engine has to activate the rule (scheduling of the composition rule activation): time and date or period (from-to, weekly, monthly, synchronised with the reception of a signal from the WORKFLOW etc…)
- *Message* – A specific message coming from external tools.
- *Active Rule* ID or Name – It defines the identifier of the rule to be used
- *Selections Applied* – A set of one or more Sequences to be used with the composition rule
- *Parameter* – Parameters to be used with the composition rule. Each parameter is described by the name, the type and the value.

The *Activation* and the *Message* could be two mutual exclusive conditions for rule activation. A composition schedule could be described and structured in the following way (using an XML description):

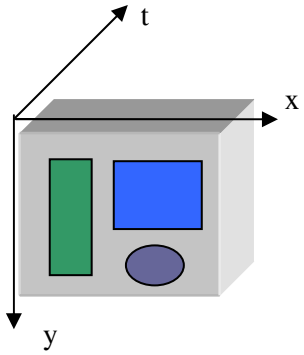
```
<Composition_Schedule>
        <Object_Name> The best of AXMEDIS <\Object_Name>
        <Scheduling_options>
                <Activation> 12:00 pm 25/12/2004 <\Activation>
                < Message> Message <Message>
        <\Scheduling_options>
        <Composition_Rule status=”active”>
                <Active_Rule> Identifier of rule <\Active_Rule>
                <Arguments>
                        <Selection>
                                One…..
                                <query> …… <\query>
                                ….
                                <query> …… <\query>
                                Object 1435325, Object 24243, Object 45670743
                        <\Selection>
                        ……
                        <Selection> …… <\Selection>
                        <Parameter name=”count” type = “integer” > 20 <\ Parameter >
                        ……
                        <Parameter>  ……<\ Parameter >
                <\ Arguments>
                <Rule>
                   …
                <\Rule>
        <\Composition_Rule>
<\ Composition_Schedule>
```

7.1.2 Formatting

Formatting is the process to exploit the digital resources in a combined AXMEDIS object in some integrated visualisation (editorial) format for their distribution and usage by the end user. A simple compounded object comprised of several parts (e.g., an audio, a video and a document) could be formatted in several different ways according to different formatting styles (graphic layout, spatial constrains, temporal scheduling of the content, speech generation from text, synchronisation between audio and images, etc.) and adapted for producing the final content (Digital Item Adaptation) to be distribute in different channels such as i-TV, mobile, PC usage, etc…

Generally, a formatted multimedia object could be considered as an unique object characterised mainly by:

- *Spatial relationships* – They are defined in the spatial domain and describe how visible resources are organised in the visible space (layout, margins, etc…)
- *Time relationships* – They are defined in the time domain and describe not only the basic orchestration (i.e. specification of when media items appear on and disappear from the screen), but also which synchronization relations need to be maintained (e.g. for audio streams that need to play lip sync with a video stream) and for controlling the speed and other basic behaviour of animated content (Temporal domain).



A formatted AXEMDIS object: *X* and *Y* axes represent the spatial domain, *t* represents the time domain

All the formatting activity shall be based on content features, generic user profile and needs, specific user profile (in case of formatting on demand), formatting style, optimisation parameters, end-user device profile, interactivity level and paradigms, content type and features, metadata, categorization, business information (price, localization, etc.), temporal evolution, DRM rules, delivery time, etc…

The formatting should have to take into account also the specific problems of the distribution channel:

- Location of the content and time to delivering
- Business and transaction models, thus DRM of content
- Model of delivering: streaming, download, off-line distribution, etc.
- Format for delivering: MPEG-4, simple audio files, documents, video, etc.

For example an user, who is working on an a PDA or a mobile, wants to play a video clip, which requires a broad band to be played, the formatting process has to adapt this video clip so to satisfy transmission constraint and to provide to the user a service with an adequate quality.

To this end a wide set of formatting algorithms are needed. Each of such algorithms should be based on:

- AXMEDIS components with their description content type,
- Different content usage paradigms, which are the editorial formats.
    - page or formatting style/layout,
    - evolution of page style along the time,
    - Final format to be produced: MPEG-4, WAP, HTML, AXMEDIS integrated format, etc….
- Selected on the basis of formatting rules based on
    - User profiling, Programme or channel profile, User's request, interactivity level,
    - availability of the content components and their costs
    - final device on which the content has to be received and used
    - Duration and complexity of each content component combined for creating the page.
- Shaping details for each content type…..
    - Video: time, size, frame rate, compression
    - Audio: time, sample rate, compression
    - Image: size, complexity, size
    - Text: #words, size of text (proportionally scalable), language
    - Music: #measures, time, voices
    - Animation: size and time

The formatting process could be executed both in the AXMEDIS environment by using the set of formatting algorithms developed during the project life or out of the AXMEDIS environment by delegating the external tools. Such tools could be the same content formatting tools used by the content producer. In this scenario, the external formatting process has to be described by means of the set of formatting operations and functions (a kind of function mapping) that the external tool has to perform. At the end of the external formatting process, the external tool returns the new formatted object to apply protection or/and fingerprint on it or/and execute others operations. Anyway, the formatting process produces a new object which satisfies user needs and provides a mechanism by which is possible to have a platform/network independent cross-media distribution framework.

The entire process should be driven by rules, called Formatting Rules, to allow an automatic and customizable formatting process that responds to the distribution and end user needs.
A formatting rule has to:

- describe what resources are involved in the formatting process (i.e. extracting digital resources from the AXMEDIS database by means of queries built on metadata and licensing information or from a composite AXMEDIS object);
- describe distribution channel properties, user device features, user profile, etc…
- describe the final output using a specific integration format (MPEG-4, SMIL,…) or using DIP capabilities provided by MPEG-21 objects
- describe how to combine different digital resources and create relationships in terms of:
    - spatial relationships (for graphic layout, resource adaptation, …)
    - time relationships (for synchronisation, transitions effect, fitting (shrinking or stretching, cutting,)…);
- describe how to manage and combine DRM rules for the new formatted resource;
- describe operations or actions that have to be performed during the formatting process, for example:
    - which formatting algorithms have to be used (synchronisation, image scaling, resolution scaling, format conversion, etc…)
    - which external functionalities (by dynamic call to services provided by external tools) have to be used
    - Fingerprint estimation and application for the new composite item
    - Object ID assignment for the new composite item.

For example, a formatting rule could be described as a function in the following way:

$$R = f(S1,S2,..,Sn,P1,...,Pm)$$

Where:

- S_i – It defines a selection. It is a sequence of query to be sent to the Query Support for AXMEDIS objects retrieval or references to digital resource embedded into an composite AXEMDIS object;
- P_i – It is a parameter (basic type as integer, string, Boolean);
- *f* is the identifier of rule (name of rule or other);
- *R* is the resultant of rule application. It is the new formatted AXMEIDS object.

Considering the role of the formatting engine in the AXMEDIS object creation and distribution, the engine could be used by other tools as an on demand or time scheduled service. For example, the AXMEDIS Workflow Manager could ask to the Formatting Engine for the execution of a formatting rule on specific set of AXMEDIS objects. Moreover, the formatting could execute the specified rule at a specific date and time or periodically (weekly, monthly, etc…).
This formatting schedule could be described and structured in the following way (using an XML description):

```
<Formatting_Schedule>
        <Scheduling_options>
                <Activation>  12:00 25/12/2004 <\Activation>
                <Message> Message <Message>
        <\Scheduling_options>
        < Formatting_Rule status=”active”>
                <Active_Rule> Identifier of rule <\Active_Rule>
                <Arguments>
                        <Selection>
                                <query> …… <\query>
                                ……
                                <query> …… <\query>
                        <\Selection>
                        ……
                        <Selection> ……<\Selection>
                        <Parameter name=”dpi_resolution” type = “integer” > 150 <\ Parameter >
                        …
                        <Parameter> …… <\ Parameter >
                <\ Arguments>
                <Rule>
                   …
                   if(! Mpeg4Tool)
                       Standard.Animation (obj1, from …, to ….., “fast”, from left);
                   else
                       Mpeg4Tool.Animation (Obj1, from…, to….., “fast”, curve….);
                   …
                <\Rule>
        <\ Formatting _Rule>
<\ Formatting_Schedule>
```

Where:

- *Activation* – It indicates when the formatting has to be done (scheduling of the composition rule activation): time and date or period (from-to)
- *Message* – A specific message coming from external tools.
- *Active Rule* – It defines the identifier of the rule to be used
- *Selection*– Sequences of query to be used with the formatting rule
- *Parameter* – Parameters to be used with the formatting rule. Each parameter is described by the name, the type and the value.

The *Activation* and the *Message* could be two mutual exclusive conditions for rule activation.

To extended the capabilities of the formatting engine, solution based on **artificial intelligence** could be adopted to perform and solve:

- problem for graphic layout, spatial fitting (Knapsack problems, Taboo Search, etc.)
- text justification in the page,
- positioning of images on the pages
- selection, ordering and positioning of the images along the sliding show
- time fitting
- application of heuristic rules for the content composition and/or formatting
- Automatic synchronisation

- Etc…

Possible actions primitives:

- **Time fitting**
- **Stretching, shrinking**
- **Taking excerpt in space and time**
- **Resizing**
- **Reformatting**
- **Reshaping**
- **ROI application, region of interest**
- **Etc.**

Example of format (please contribute in extending and refining the existing list)

In this section some example of format paradigm are reported below, for each paradigm the set of digital resources and the main characteristics and formatting operations to perform (listed after the "→") are reported:

Karaoke

Audio and text → synchronization of words highlighting with the song

Slide shows

Images and audio → time scheduling and synchronisation of images showing and with audio, transitions effects

Images and texts → time scheduling and synchronisation of images showing with text displaying, layout definition between images and text, transitions effects in sequence change

Images, texts and audio → time scheduling and synchronisation of images showing with text displaying and audio, layout definition for images and text, transitions effects in sequence change, time fitting for audio, audio shrinking or stretching.

Video Subtitling

Video and text (dialogs in a specific language) → synchronisation of sentences while actors are speaking, overlapping of text on frames, adaptation of text font

Video Clip

Video sequences, audio, texts, image → scheduling of sequences, synchronisation with audio track, transitions effects in the sequence change, titling composition, titling layout and animation, logo position

Running text

Texts → scrolling of text (horizontal or vertical), different colours, fonts, etc.

Interactive TV

Videos, images, text, hyper text → definition of screen layout (video area, static text areas, images area), refresh conditions for static text area, resources adaptation according to the displaying area geometry. Definition of actions and links with video resources.

Bloomberg TV format

Video, texts, running texts, images → definition of screen layout (video area, static text areas, running text area, images area), time refresh for static text area, resources adaptation according to the displaying area geometry.

"Interactive hypertext" such as HTML
Texts, images, audios, animations, video → definition of screen layout, actions, hyper link

Animation
Images → sequence of images, rendering parameters, animation effects

Presentation
Texts, images, audios, video → definition of screen layout, actions, hyper link, transition effects, text and image animation, time fitting

The output of the above formatting process can be:

- In a digital format different from the original resource, in which the original digital resources are changed in coding, such as using a sliding show with audio file to produce a video.
- In a digital format keeping the original resources in their original format and organising them in space and time such as: power point presentation, HTML, WEDELMUSIC, etc…

7.2 Compositional Engine

The compositional engine should be a parser and an executor of rules; it should be supported by a composition rules repository and a set of artificial intelligence engines. Such engines should provide hints to the user (automatic syntax control of rule, simulation of the rule execution, rule feasibility, rule debugging, etc..). The final result provided by the Compositional Engine is the creation of a new composite AXMEDIS object.

Compositional Engine shall:
7.2.1) work in respect of AXMEDIS Data Model Schema;
7.2.2) activate compositional rules
7.2.3) have an internal clock for rule activation
7.2.4) schedule rules activation at specific time instants or periodically (weekly, monthly, daily, etc…)
7.2.5) receive activation messages from the AXMEDIS Workflow Manager and notify the end of composition
7.2.6) obtain AXMEDIS objects by querying the AXMEDIS Database (using AXMEDIS Query Support);
7.2.7) allow grouping AXMEDIS objects obtained from queries by type (i.e., video, audio, image, textual, document, combined objects, etc.);
7.2.8) retrieve AXMEDIS objects from AXMEDIS Database by means of their Object ID;
7.2.9) produce a new AXMEDIS object
7.2.10) assign to the composite object a new Object ID provided by AXMEDIS Object ID Generator;
7.2.11) store in the AXMEDIS Database the new AXMEDIS object;
7.2.12) accept a reference to a specific composition rule. Such reference is provided by the user or other modules (i.e. the AXMEDIS Workflow Manager) on the basis of the kind of composition (audio plus images, or audio collections, etc…)
7.2.13) check if the composition rule, chosen or created by user, is feasible;
7.2.14) parse a composition rule
7.2.15) execute a compositional rule
7.2.16) notify errors deriving from compositional rule application
7.2.17) simulate a compositional rule
7.2.18) use metadata to reduce the number of AXMEDIS objects involved in composition;
7.2.19) require the fingerprint estimation of the new AXMEDIS object produced by a composition rule. The fingerprint could be based on the fingerprint of components or a new one;
7.2.20) operate in respect of AXMEDIS DRM model;
7.2.21) be able to merge DRM rules of components into the new AXMEDIS object in such a way that all rights are respected;
7.2.22) permit the introduction of new DRM rules to the new AXMEDIS composite object;

7.2.23) be able to automatically choose the "better" composition rule among the set of all composition rules stored in the repository if any composition rule is not specified by the user;
7.2.24) provide a composition service, that means: Compositional Engine shall accept (i) a composition rule, (ii) a set of components to be composed together (also in AXMEDIS queries form), (iii) a set of parameters;
7.2.25) be able to merge/embed AXMEDIS objects to create a new AXMEDIS object;
7.2.26) permit to embed digital resources physically or by reference.

7.3 Composition Process Rule Language

The composition process should be described by means of a composition rule. It could be seen as a automatic composition procedure where it is specified what and how to combine digital resources. For example, in case of an audio collection creation may be necessary to group automatically a set of audio resources related to a singer in order to compose an audio compilation whose total duration is not greater than a specific value, to apply new specific DRM rules to the new AXMEDIS object and to request a fingerprint estimation and application. This example of composition requires metadata associated with each digital resource (i.e. the name of singer, year of composition of songs, duration), conditions (i.e number of digital audio resources to be used for the collection, total duration) and actions (applying or combining DRM rules, fingerprint estimation and application). More in general the composition rule should be described by means of a script language called Composition Process Rule Language. In this way, the user could specify the operations to be performed in the composition process by writing a new composition rule or modifying an existing one. The script language should be based on syntax rules and should provide the way for writing and describing: declarations, directives, comments, instructions (assignments), actions, selections, operators (logical, arithmetical), control and iterative structures, and so on. Such language could be based for example on ECMA script or JavaScript language and it should provide the way to write general and different composition procedures. The parsing and the execution of a composition procedure should be performed by artificial intelligence engines inside the Compositional Engine. The Composition Process Rule Language should be also supported by a representation format (e.g.TXT, XML, etc…) in this way a composition rule could be stored into a composition rules repository and it could be used when building other similar composition, at the same time it could also be shared with the other content designers of the P2P network.

Composition Process Rule Language shall:
7.3.1) provide the way to write general and different composition procedures.
7.3.2) be based on a script language
7.3.3) be supported by syntax rules.
7.3.4) be able to call base operations.
7.3.5) support strings, Boolean and numerical variables.
7.3.6) support flow control (e.g., loops, for, do-while) and conditionals (e.g., if-then-else, switch).
7.3.7) support the unique identification of a composition rule
7.3.8) support event and exception handling.
7.3.9) support operations on sets such as: union, intersection, combinations, etc.
7.3.10) have the ability to express concurrency.(low)
7.3.11) be lightweight in terms of footprint, memory consumption and CPU cycles. (DESIRED)
7.3.12) support safety checking and protection mechanisms.
7.3.13) support dynamic call to external services provided by other tools (e.g. Fingerprint, Adaptation, Protection)
7.3.14) be extensible by defining additional operations by means of external or added functions or procedures.
7.3.15) be marginally supported by some visual tool for the production of the script (DESIRED)
7.3.16) be marginally supported by some user interface for producing script by examples (OPTIONAL)
7.3.17) be specified by an XML Schema (In such a way, the syntax will be extendable and easily controllable);
7.3.18) be represented by a format (TXT, XML, etc…) in order to store a composition rule inside a Rules Repository.
7.3.19) provide mechanisms for automatic creation of selection and conditional mechanism among composite object components;
7.3.20) provide mechanisms for describing or referring or producing to a DRM rule.

7.3.21) provide mechanisms for describing and specifying the automatic creation of DRM rules within the new composite object (merging, combining, adding, etc…);
7.3.22) provide selection from metadata and values of metadata;
7.3.23) perform processing on text or metadata;
7.3.24) allow conditional expressions in the script language depending on:
- the values of information such as Metadata, Fingerprint, etc. in the AXInfo,
- the Object Structure,
- the viewer or distributor profile
- the configuration of the currently available tools for content production, adaptation, protection ,fingerprint estimation, etc. .

7.3.25) allow to specify actions that may include:
- Metadata processing and estimation (translations, etc.)
- Fingerprint estimation and processing
- DRM Possible Access Rights production and processing
- Protection, integration or not of License
- License production and processing, verification, etc.
- Etc.

7.4 Composition Rules Editor

Compositional Engine works on the basis of composition rules. Such rules could be written by using the Composition Rules Editor. This editor is an user interface or a tool that should permit to obtain well formed rules (i.e. rules that match a specified syntax) by the means of both graphic and scripting tools.

Composition Rules Editor shall:
7.4.1) be a graphic user interface (GUI) capable of using the most common GUI capabilities such as drag and drop, right click, etc… to support human user to create composition rules;
7.4.2) provide possibility to insert scripting code instead of using graphic interface;
7.4.3) control manually inserted scripts before accepting it to detect syntax errors;
7.4.4) support both Visual and Textual queries on content;
7.4.5) produce well formed rules in respect to the syntax of Composition Process Rule Language;
7.4.6) work in respect of AXMEDIS Data Model Schema;
7.4.7) define new composition rules visually or textually;
7.4.8) store composition rules for reuse;
7.4.9) allow query on the stored composition rules;
7.4.10) provide some procedure to impose structure to be applied on the new composite AXMEDIS object;
7.4.11) provide some procedure to choose a specific compositional rule from the repository;
7.4.12) provide some facilities to impose new DRM rules on the composite object or to give some directives on how to merge (if possible) components' DRM rules;
7.4.13) provide a way to debug/test compositional rules;
7.4.14) provide a way to activate/deactivate/remove compositional rules;
7.4.15) be activated by the AXMEDIS Workflow Manager
7.4.16) display messages from the AXMEDIS Workflow Manager

7.5 Formatting Engine

The Formatting Engine shall use a set of rules, a network/user profile and an AXMEDIS object to produce a new object (or directly a stream) which satisfy the profile. For example an user, who is working on an a PDA or a mobile, wants to play a video clip, which requires a broadband connection, then the Formatting Engine has to adapt this video clip in appropriate format and quality. The final result provided by the Formatting Engine is the creation of a new AXMEDIS object.

Formatting Engine shall:
7.5.1) work on the basis of rules which respect Formatting Process Rules Language.
7.5.2) execute formatting rules
7.5.3) access to a correct clock for rule activation
7.5.4) schedule rules execution at specific time instants or periodically (weekly, monthly, daily, etc…)
7.5.5) receive activation messages from the AXMEDIS Workflow Manager and AXMEDIS P&P;
7.5.6) send acknowledgement at the completion of the formatting process by returning the new object ID (in case of the P&P) or a confirmation message (in case of the AXMEDIS Workflow Manager)
7.5.7) notify errors deriving from formatting rule application
7.5.8) check if a formatting rule, activated by the user, is valid;
7.5.9) accept a reference to a specific formatting rule to be executed. Such reference is provided by the user or other modules (e.g. the AXMEDIS Workflow Manager) on the basis of formatting request (e.g. synchronisation between audio and images, subtitling a video with a specific text, etc…)
7.5.10) consider profiles (i.e. user and channel profile) for optimal format and quality;
7.5.11) use adaptation tools and algorithms:
(i) synchronize different media, for example: video with audio or video with text (subtitles);
(ii) synchronize different languages media (text and/or audio) with a same video;
(iii) image scaling;
(iv) transcoding;
(v) etc..
7.5.12) allow setting up the Adaptation tool plug-ins on the basis of the client (End User) capabilities: for example supported multimedia formats, screen dimension, resolution, etc.;
7.5.13) obtain AXMEDIS object from AXMEDIS Database Manager by Object ID.
7.5.14) put the new formatted AXMEDIS object into the AXMEDIS Database
7.5.15) assign a new temporary Object ID to the formatted object;
7.5.16) require the fingerprint estimation of the new AXMEDIS object produced by the formatting rule.
7.5.17) operate in respect of AXMEDIS DRM model;
7.5.18) be able to merge, combine and add DRM rules of components into the new AXMEDIS object in such a way that all the rights are respected;
7.5.19) permit the introduction of new specific DRM rules in the formatted object;
7.5.20) respect the AXMEDIS Data Model Schema;
7.5.21) use services provided Fingerprint tool, Adaptation tool, Protection tool, external formatting tools

7.6 Formatting Process Rule Language

The formatting process should be described by means of a formatting rule. It could be seen as a automatic formatting procedure where it is specified, what digital resources, and how to link them. The formatting rule should be described by means of a script language called the Formatting Process Rule Language. In this way, the user could specify the operations to be performed in the formatting process by writing a new composition rule or by modifying an existing one. The script language should be based on syntax rules and should provide the way for writing and describing: declarations, directives, comments, instructions (assignments), actions, selections, operators (logical, arithmetical), control and iterative structures, and so on. Such language could be based for example on ECMA script or JavaScript language and it should provide the way to write general and different formatting procedures. The parsing and the execution of a formatting procedure should be performed by using AI techniques within the Formatting Engine. The Formatting Process Rule Language should also be supported by a representation format (e.g. TXT, XML, etc…). In this way a formatting rule could be stored into a formatting rules repository and reused to build other similar object.

Formatting Process Rule Language shall:
7.6.1) provide a way to write general and different Formatting procedures.
7.6.2) be supported by syntax rules.
7.6.3) be based on a script language.

7.6.4) be able to call basic operations to support
- strings, Boolean and integer variables;
- flow control (e.g., loops, for, do-while) and conditionals (e.g., if-then-else, switch);
- the unique identification of a composition rule;
- event and exception handling;
- operations on sets such as: union, intersection, combinations, etc.

7.6.5) have the ability to handle distributed processing.(OPTIONAL)
7.6.6) optimise memory consumption and CPU cycles. (low)
7.6.7) support dynamic call to external services provided by other AXMEDIS tools (e.g. Fingerprint, Adaptation, Protection) and external formatting tools (for example the formatting tools used by the content producer).
7.6.8) provide mechanism for selecting and automatically invoking formatting algorithms (synchronisation algorithm, resource adaptation, resolution scaling, etc…)
7.6.9) be specified by an XML Schema (In such a way, the syntax will be extendable and easily controllable)
7.6.10) provide mechanism for describing or referring to a DRM rule.
7.6.11) provide mechanism for describing and specifying the automatic creation of DRM rules within the new composite object (merging, combining, adding, etc…);
7.6.12) provide a selection from the set of metadata with relative values;
7.6.13) allow definitions for animations, transitions among images and video, and their combinations in terms of spatial, temporal, and functional behaviour, etc.
7.6.14) allow conditional expressions in the script language depending on:
- the values of information such as Metadata, Fingerprint, etc. in the AXInfo,
- the Object Structure,
- the viewer or distributor profile
- the configuration of the currently available tools for content production, adaptation, protection ,fingerprint estimation, etc. .

7.6.15) allow a given number of standardised functionalities that can be recovered by several different tools for content adaptation, formatting, etc. This allow formatting script that can be ported and executed on different content factories even if the content factory does not contain the same additional tools:

```
If ! Mpeg4Tool Then
        Standard.Animation (obj1, from …, to ….., “fast”, from left);
Else
        Mpeg4Tool.Animation (Obj1, from…, to….., “fast”, curve….);
```

7.6.16) be extensible by defining additional operations using external or additional functions or procedures.
7.6.17) be marginally supported by some visual tool for the production of the script (low)
7.6.18) be marginally supported by some user interface for producing script by examples (low)

7.7 Formatting Rules Editor

Formatting Engine works on the basis of the Formatting Process Rule Language. This editor is an user interface that should permit to input rules (i.e. rules that match a specified syntax) by means of both graphic and scripting tools.
Formatting Rules Editor is also used to create profiles for distribution channel and devices. Profiles and Rules allow adaptation of the digital content automatically.
The presentation style (e.g. Bloomberg TV, classic style) can be created based on the content designed or adapted/modified using an existing presentation style. Variants have to be considered depending on the content play/usage/product scenario (e.g. PDA, I-TV, PC, phone). Some generic presentation styles can be provided (e.g. a sequence, a video with text, an image with text) which can be reused for other styles with different details. The presentation style may be described using a graphic rule based language to aid the novel user in the creation/customisation of a style.

Formatting Rules Editor shall:

7.7.1) be a graphic user interface (GUI) capable of using the most common GUI capabilities such as drag and drop, right click, etc… to support human user to create composition rules;
7.7.2) support scripts to define new formatting rules directly using the Formatting Process Rule Language;
7.7.3) provide possibility to insert scripting code instead of using graphic interface;
7.7.4) control manually inserted scripts before accepting it to detect syntax errors;
7.7.5) support both Visual and Textual queries on content;
7.7.6) define new formatting rules visually or textually;
7.7.7) support the representation of temporal constraints (i.e. in case of a synchronisation some images could have a definite temporal sequence, or an audio related to a specific video);
7.7.8) support the representation of spatial constraints (i.e., overlap of images as a background with some buttons);
7.7.9) store composition rules for reuse;
7.7.10) allow query on the stored formatting rules;
7.7.11) be able to describe scheduling rules to let the Formatting Engine to perform specified tasks at specific time (e.g. repeat a formatting task periodically);
7.7.12) provide a way to debug/test formatting rules for one or more objects;
7.7.13) provide a way to activate/deactivate/remove formatting rules;
7.7.14) provide some procedure to choose a specific formatting rule from the repository;
7.7.15) work in respect of AXMEDIS Data Model Schema;
7.7.16) be activated by the AXMEDIS Workflow Manager
7.7.17) display messages from the AXMEDIS Workflow Manager

8 AXMEDIS Workflow

8.1 Initial Requirements Analysis

The Workflow Management System (WfMS) is to support the coordination of resources and activities during the development of any product, particularly in production and distribution of electronic multimedia products for Axmedis.

In order to identify the initial user requirements based on the user's expectation of the Axmedis Workflow Management System (WfMS), a questionnaire was submitted to Axmedis Consortium content producers and distributors. This was followed up with an in-depth semi-structured interview with practitioners from within the Consortium membership. In the appendix to this document we have included the tabularised results of this requirements acquisition process which included at least one set of knowledge elicitation activities performed with practitioners from each of the three distinct business sectors within the domain namely music, advanced interactive-immersive e-media, and, e-book/educational multimedia. The questionnaire results as included in the Appendix also include costing data in respect of each of a set of typical activities such as:

- metadata integration
- composite object production
- protecting objects
- distributing objects to distributors
- acquiring objects from publishers
- finalizing the contract in the licences.
- production of the programme for publication.
- updating digital content
- updating metadata
- updating licences
- recovering history of the object production. tracking, administrative activities. rights clearance management. etc...

In appendix are reported brief descriptions of the following workflows:

- Music & Audio Production and Distribution Workflows
    - The Workflow for Music & Audio Production
    - The Workflow for Music & Audio Distribution (OD2)
    - Spontaneous speech repositories production workflow
    - Audio/Music/e-Content Distribution Workflow
- Advanced Interactive and Immersive e-Media Production and Distribution Workflow (XIM)
- Multimedia Edutainment/ e-book Production and Distribution Workflow (ILABS)

8.1.1 Questionnaire for Workflow Requirements to serve the AXMEDIS Platform

Your Name:
Company Name:

Please tick the right answer or write your comments below each question as appropriate

1) Which of the following multimedia business sectors is your company involved in?
- **a)** Music/Audio Production and/or Distribution
- **b)** Educational/e-book Content Production and Distribution
- **c)** Advanced Entertainment e-media Production and Distribution (e.g. films, videos, games, immersive-3D environments, interactive experience portals etc)

2) For each of the above sectors in which your company has an involvement, or for at least one of the above which you feel mainly characterises your business model, please specify which of the following stage(s) is included in your multimedia business
   - **a)** Producer (accessing, creating, authoring, editing, rendering etc)
   - **b)** Integrator (accessing, aggregating, editing, formatting, etc)
   - **c)** Distributor (editing, formatting, packaging, bundling and distribution, etc)
   - **d)** Retailer (selling, mainly B2C)
   - **e)** Other?

3) Do you have an established, "mature" process for any or all of the above? Yes/No
(by a mature process essentially we mean a business process that is specified formally, established and communicated to all staff and is routinely followed as a standardised process flow e.g. a flow chart /decision tree etc.)

4) Which tools do you normally use for integrated operations management of any of the above multimedia development and/or distribution processes as may be relevant to your business; as follows:
   - **a)** for the overall Workflow Management?
   - **b)** for the Production Phase?
   - **c)** for Integration/Ingestion Phase?
   - **d)** for the Distribution Phase?
   - **e)** for Retail Operations?

5) Which client platforms do you use which would require Workflow Management client software?

6) For the AXMEDIS Workflow Management System to serve the AXMEDIS Framework as an integrated tool, a provisional list of requirements specifications has been deduced after initial user consultations. Please tick any requirements aspects, listed below, which you think would be particularly helpful in supporting your own business operations.

Common requirements

The WfMS must to be able to:

i. Operate within the key Operating Systems (OS); for example the Windows, Linux, Mac Environments.
ii. Interact with the AXMEDIS Object Manager to access objects and track/update their status (i.e. allow workflow metadata visualisation, editing, automated updating and storage).
iii. Monitor how the progress of assigned process activities and be capable of managing more than one workflow process instance so as to provide workflow support for multi-agency co-design & co-production of multimedia content based on open source distributed products through LGL, BSD or similar licences.
iv. Provide time & status metadata updates that remain accessible to other Enterprise Project Management Applications, such as SAP for example (This requirement is optional)
v. Provide a Service Interface (API) to be used for developing the plug in for AXMEDIS Editors, Engines and Query Support:
vi. Provide a seamless interface to AXMEDIS-native tools (e.g. Content Production, Formatting, Packaging/Bundling and Distribution tools) for the range of operating systems selected above, i.e. provide interfaces for the following tools and engines:
    a) Editor,
    b) Rule Editor/Viewers for various tools,
    c) Composition & Formatting Engine,
    d) Programme and Publications Engine,
    e) Protection Tool Engine,
    f) P2P Active Selection Engine,
    g) Collector Engine,
    h) Publication/Loading Rules/Selections Editor,
    i) Publication Tool Engine of AXEPTool,
    j) Loading Tool Engine of AXEPTool,

k) Administrative Information Integrator
l) Administrative Information Manager
m) Accounting Manager and Reporting Tools
n) User Query Support

7) Any other requirements for the AXMEDIS Workflow Management that you feel should be included?

8) Any other comments regarding the above AXMEDIS WfMS requirements e.g. their ranking or other issues?

9) The Workflow interface for AXMEDIS has to interoperate with one or two Open Source Workflow Engines, as well as a commonly used proprietary WfMS as selected from the list of the leading workflow engines available and nominated by the User Community, Please state your preference as follows:

a) Workflow engines preferred by you for Windows PC (XP,2000,98) Environments:
   i) as Open Source WfMS
   ii) as Proprietary Licensed WfMS

WF engines preferred by you for the Mac Environment
   i) as Open Source WfMS
   ii) as Proprietary Licensed WfMS

b) WF engines preferred by you for the Linux Environment
   i) as Open Source WfMS
   ii) as Proprietary Licensed WfMS

10) Are any stages of your workflow currently automated? Yes/No
If yes, please describe which activities are currently controlled by a Workflow Management System:

11) Do you need to share workflow management with partner organisations in your value chain?
   i) How does this work now?
   ii) Who is involved?
   iii) Would you think these organisations would find the adoption of the AXMEDIS framework helpful for their operations?

12) On the whole, i.e. considering the entire scenario end-to-end what is the proportion of your production/distribution workflow that is currently automated?

13) For the following typical activities, please could you give your best evaluation of *their relative cost* in terms of resources used (staff time, tools etc) and thus the costs typically incurred in your processes (it may be helpful to refer to the attached map of activity hierarchies). For each of the common activities listed in the table below and/or those activities within your own multimedia value chain which you may wish to append to this table, it may be easier to consider the relative cost incurred as the percentage of the cost for the task under consideration relative to the overall cost incurred for the entire value chain end-to-end.

Typical activity	Time taken	Tools used	Cost Incurred (e.g. man-minutes + other resources)
metadata integration			
composite object production			
protecting objects			
distributing objects to distributors			
acquiring objects from the publisher			
finalising the contract in the licenses.			

production of the programme for publication			
updating digital content e.g.			
a) updating metadata			
b) updating licenses			
c) recovering history of the object production, tracking			
administrative activities, clearance of rights, etc...			
Any other activities, please enter in rows below			

14) Please examine the AXMEDIS Use-Cases being proposed as listed in the table below. Are you happy that the Use-Cases proposed typically cover all the aspects of your required workflow logic in respect of each of your relevant process streams? (a, b, c, d as above), Yes/No

15) If No, what aspects of which one of your process streams (a, b, c, d as above) are not fully accommodated by the Use-Cases listed below, please specify?

Feedback received from the partners for the above questionnaire along with the Costing is listed in Appendix

8.1.2 Comparative Analysis of State-of-the-Art Open Source Workflow Systems

The WFMS will be based upon an open source product distributed through LGL, BSD or other licences used in open source programs.

The selected WFMS server application will run on Microsoft Windows XP Operating System while clients from various platforms, including Microsoft Windows XP, Linux and Mac/OS operating systems, will be supported.

The WFMS shall be able to tie together all the AXMEDIS Client tools (authoring/formatting/rendering/ composing/packaging/bundling applications) and the Axmedis Server Engines and thus create an integrated platform which will be made accessible through standard industry interfaces.

On the Client side, the WFMS User Interface will be the home interface for all users and actors involved in the product development and distribution processes.

Through the WMFS User Interface the actor logs-in and sees all the work items in which he is involved or committed and, by accessing one of these work items, he can perform the actions required, launching the proper tools.

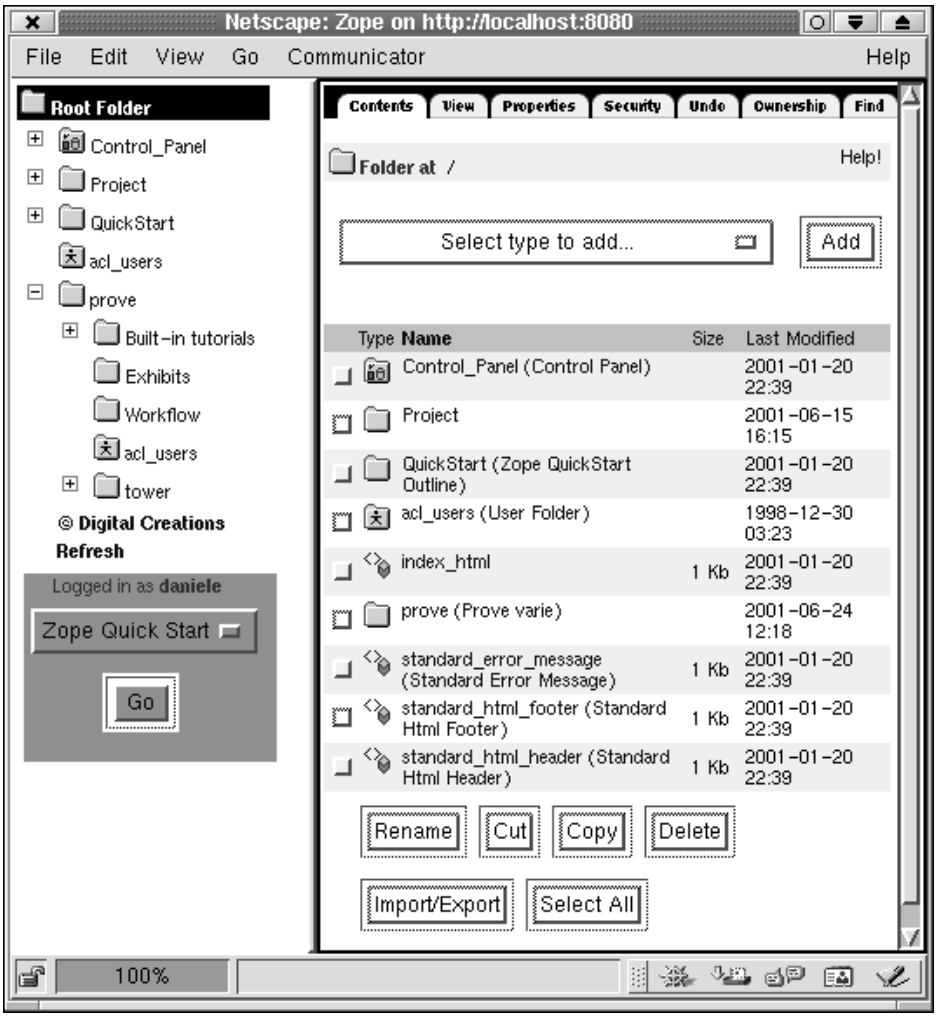
All actions performed by the actor/user are logged by the WMFS in the Axmedis Object repository, as well as the new revisions and status changes.

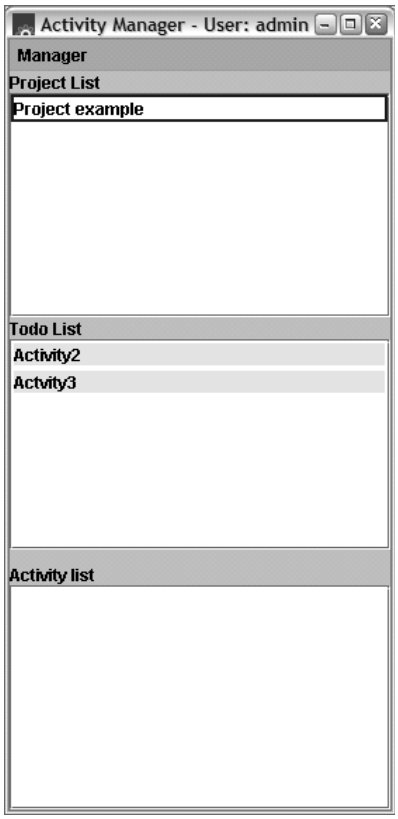
Through the WFMS User Interface it will be possible to create new or delete Axmedis Objects or Components (which in turn will create or delete (sub)process instances).

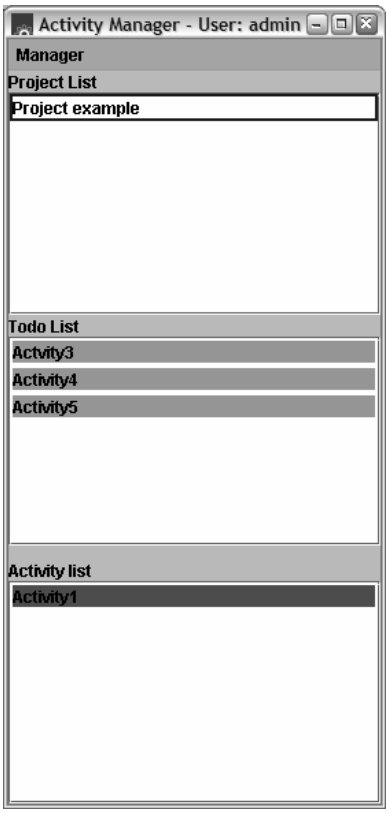
Through the WFMS User Interface it will be possible to edit Axmedis Objects or Components (in the user's work list), by locking it and downloading it to Client work area, where it will be processed by the proper tools ((authoring/formatting/rendering/composing/ packaging/bundling).

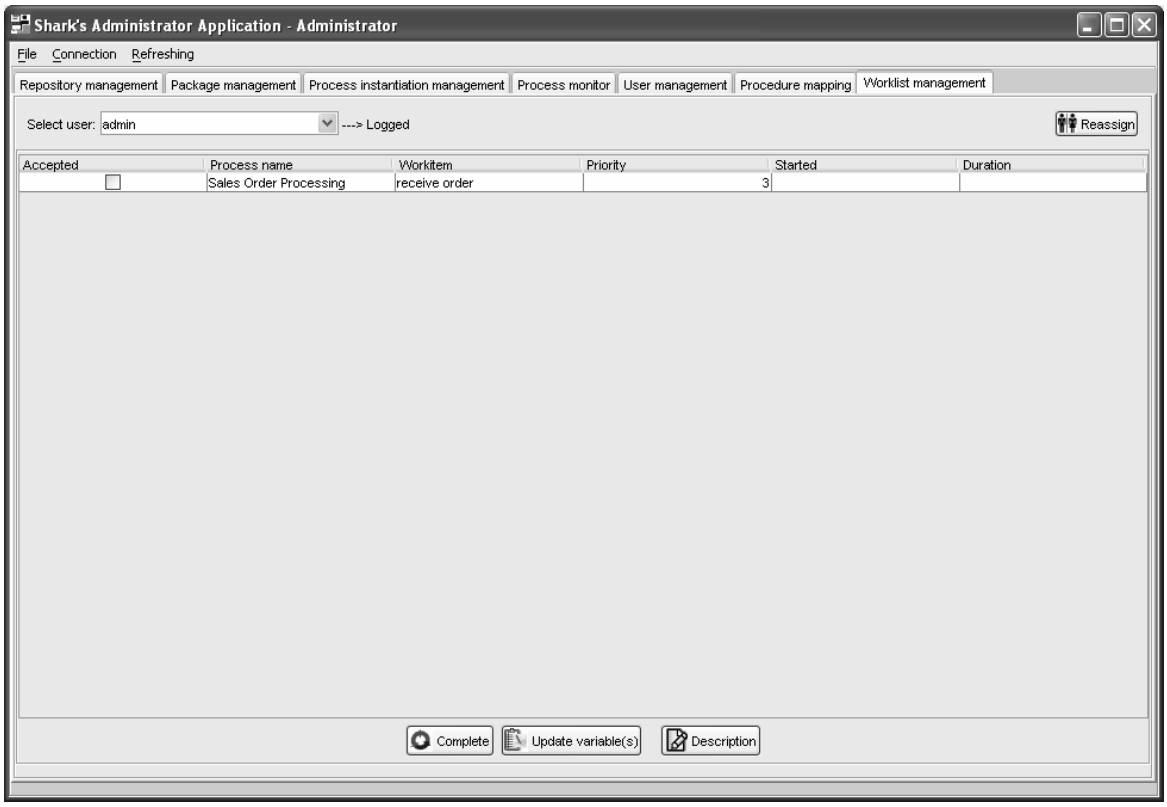
All the WFMS under investigation have Web based User Interfaces, based upon Web applications.

The appearance of the User Interfaces are quite different, ranging from a File Manager look & feel to a top-down menu with coloured status look & feel. See couple of examples below:




Activity Manager - User: admin
Manager
Project List
Project example
Todo List
Activity2
Actvity3
Activity list


Activity Manager - User: admin
Manager
Project List
Project example
Todo List
Actvity3
Activity4
Activity5
Activity list
Activity1


Shark's Administrator Application - Administrator
File
Connection
Refreshing
Repository management
Package management
Process instantiation management
Process monitor
User management
Procedure mapping
Worklist management
Select user:
admin
---> Logged
Reassign
Accepted
Process name
Workitem
Priority
Started
Duration
Sales Order Processing
receive order
3
Complete
Update variable(s)
Description

Once the actor/user has selected a work items to work with and an editing activity to be performed (like editing, composing, formatting, etc an Object/component), the WFMS will lock the Object/component in the Object repository and will copy it to a work area for exclusive access from the user. As an option to be considered in the Specification phase, an ActiveX can be executed in the Client to download the Object/component and launch the proper tool automatically. Otherwise download and proper tool execution will be under user's responsibility (we have to consider security issues related to the usage of ActiveX). A third option could be to develop specific plug-ins for the open command of the client tools; these plug-ins, before opening, will download (if not already performed) the Object/component from the exclusive access work area and will log the action.
Once the user/actor has terminated the activity by saving and closing the modified Object/component, he will copy it back to the exclusive access work area and issue "terminate" activity task in the WFMS User Interface. This will bring back the Object/Component in the Object repository, having performed:

- Logging of the performed activity in the Object tracking data
- Eventually changing the Object status
- Eventually changing Object revision

As an option, to be defined in the Specification phase, a plug-in can be executed at the termination of the editing tool, which will automatically issue the WFMS "terminate" activity, upload the Object/component to the exclusive access work area and finally bring back Object/component in the Object repository

The web services technology can be used to integrate the WFMS and server-based AXMEDIS applications (Axmedis Object Manager, Program and Publication Engine, Protection Tool Engine, Publication Tool Engine of AXEPTool etc.).

Using web services, XML technology can be exploited and can enable the integration of applications that can be published, located, and invoked over the Web. In this way the WFMS invokes web service methods over HTTP, enabling one to interface any server-side component, regardless of language or platform or location.

In order to use web services to interface the WFMS and the external engines, these applications are required to expose their APIs.
All the following listed WFMS have APIs that can be used for the Web Services interface. The web services needed to interface the WFMS which can be developed using, for example, the open source AXIS product with a Java application server (Apache Tomcat, JBoss) or, in Microsoft environment, can be developed using IIS web server and .net framework.

Description of expected interface types of WFMS

In summary four types of interfaces are expected to form the basis of WFMS interactions within the AXMEDIS framework. These types will depend on the characteristics of the different applications or tools the WFMS must exchange information with.
These interfaces are outlined below:

1. **WFMS-AXMEDIS native tools interface**: the AXMEDIS client tools form a crucial part of the AXMEDIS framework and will therefore present a closely knit form of interaction. These native tools which deal with aspects related to authoring, formatting, rendering, composing, packaging, and bundling applications all perform specific actions on an AXMEDIS object.
   A typical scenario is described:
   an authorized actor, utilizing the WMFS User Interface, selects a work item from her/his worklist. This results in a sequence of operations on the AXMEDIS object as specified by the work item and workflow rules. These typically will comprise of the following phases; locking the object in the repository to ensure object consistency, downloading it to the user's local work area, manipulation of object, uploading it to the repository and releasing of the lock. All events will be logged so that tracking the actions performed on a specific object by a user as well as the objects status change and revision histories will be known.
   In order to perform all these tasks, the WFMS-AXMEDIS native tools interface will be based on customized ActiveX components designed to perform specific tasks in the MS Windows environment, or in appropriate

libraries in the other platforms (Mac/OS, Linux…). Some tasks will be common to all tools and will thus share components, while others may require specific components to perform their related actions such as authoring, formatting, rendering, composing, packaging, and bundling.

2. **WFMS-CMS interface:** External CMS must be allowed for as users must not be impeded in their work. Interfaces toward such systems are necessarily less well integrated with respect to native AXMEDIS tools. An essential part of this type of interface will be the check-in and check-out operations of an AXMEDIS object by an authorized actor. The former operation performs tasks related to maintaining object consistency by locking it in the repository and authorizing its download exclusively to this actor. The latter operation releases this lock once the upload of the manipulated AXMEDIS object has been successfully completed and status / revision entries have been inserted in the WFMS.
3. **WFMS-AXMEDIS Server Engines interface:** The web services technology can be used to integrate the WFMS and server-based AXMEDIS applications such as the AXMEDIS Object Manager, Program and Publication Engine, Protection Tool Engine, Publication Tool Engine of AXEPTool among others. Using web services, the WFMS invokes the proper methods over HTTP(s), enabling one to interface any server-side component, regardless of language or platform or location and vice-versa.
4. **WFMS-Query support interface:** this type of interface is a particular case of the WFMS-AXMEDIS server engine interface which is based on the web services technology. In this case an authorized user may perform AXMEDIS related queries through the WFMS user interface. The user has the possibility of performing an advanced search on characteristics connected to AXMEDIS objects by invoking external search engines and thus retrieving the information being sought.

The Open Source Workflow tool will be selected on the basis of following criteria:

- Best coverage of the functions needed by Axmedis
- Openness of the interfaces
- Usability considerations
- Robustness, based on project references

From a first analysis of dominant open source Workflow engines, the following situation appears:

1) **Openflow -** OpenFlow is a workflow engine developed by Icube and released as free software under GNU GPL licence. It is based on an object oriented structure and it has a powerful exception handling system along with dynamic redesign support. These features make OpenFlow much more flexible than any other existing workflow engines. OpenFlow supports most of the open standards (XML/XML-RPC) and the web standards. It has also got a simple access to most of the relational database and thus it facilitates integration between heterogeneous systems.

   Through an integrated role assignment system, OpenFlow can assign tasks and activities to single users or workgroups and also to automatic applications. At every moment OpenFlow can trace the complete history of a certain situation: participants involved, activities and action executed and invoked. It is possible to do performance analysis, efficiency, and verify the correct implementation of the adopted model.

   OpenFlow is activity-based, web-based, WfMC inspired, built and integrated with the application server Zope. OpenFlow is capable of running on most operating systems including Linux, Windows 9x, NT/2000, XP, MacOS.

   OpenFlow is written in Python, which is an interpreted, interactive, object-oriented programming language. It is often compared to Tcl, Perl, Scheme or Java. Python combines remarkable power with very clear syntax. It has modules, classes, exceptions, very high level dynamic data types, and dynamic typing. There are interfaces to many system calls and libraries, as well as to various windowing systems (X11, Motif, Tk, Mac, MFC). New built-in modules are easily written in C or C++.

   OpenFlow is strongly web oriented and offers complete support for developing and executing workflows via browser. The interaction with OpenFlow uses simple HTTP requests like process modelling, assignment of users to

activities, definition of the interaction with the applications. Every user receives his task which interacts with appropriate applications through the network.

2) **JBoss jBpm** - The jBpm open source workflow engine has now been joined with JBoss, to become a critical piece of the JBoss Enterprise Middleware Platform. With the resources and commercial reach of JBoss behind it, JBoss jBPM can now capitalize on its technical strengths and popularity to become the de facto standard in BPM market.

   jBpm is a flexible, extensible workflow management system written in Java. Its process definitions are based on UML activity diagrams, which establish a clear and effective communication between process developers and managers.

   jBpm includes a web-based interface that enable its users to execute their tasks in their browser. Business processes, expressed in the proprietary language JPDL and packaged in process archives, serve as input for the jBpm runtime server. jBpm combines the development of workflow-applications with enterprise application integration (EAI) capabilities. JPDL language was designed from the ground up with the ability to support any standard or specification that exists today or may emerge, including BPEL, BPELJ, BPML, BPSS, ebXML, WSCI and XPDL.

   JBoss jBPM is a standalone product. It can be deployed on its own or with any J2EE application server. JBoss jBPM is distributed under the LGPL license. Unfortunately developer tools for the workflow engine are quite limited today, which may increase the complexity of development.

3) **ObjectWeb Bonita –** ObjectWeb Bonita is a flexible cooperative workflow system downloadable in LGPL Licence form, compliant to WfMC specifications, which is written in Java.

   It provides a comprehensive set of integrated graphical tools for performing the process conception and definition, the instantiation and control of this process, and the interaction with the users and other applications. It also presents a browser-based environment with Web Services integration that uses SOAP and XML Data binding technologies in order to encapsulate existing workflow business methods and publish them as J2EE-based web services.

   ObjectWeb Bonita is a third Generation Worflow engine based in the activity anticipation model. This flexibility allows a considerable increase of speed in the design and development phases of cooperative applications.

   Bonita Workflow is integrated with the application server JonAS. It supports role assignement to distribute tasks and activities to the different actors. It is multiplatform and can run on different OS including Windows 9x, Linux, Solaris, AIX, HP-UX.

4) **Enhydra Shark –** Enhydra Shark is an extendable workflow engine framework including a standard implementation completely based on WfMC specifications using XPDL as its native workflow process definition format and the WfMC "ToolAgents" API for server-side execution of system activities. Enhydra Shark is released under the GNU LGPL. It is totally platform independent and it is written in Java.

   The open source Enhydra JaWE graphical XPDL editor can be used to produce XPDL process definitions for Enhydra Shark. Based on different communication technologies "Tool Agents" can handle the application control and information exchange. Sample ToolAgents will be available for JavaScript, JDBC access, EJB access, pure Java classes, Corba calls, EMail, Webservice calls, etc. These Tool Agents start up and stop applications, pass workflow and application relevant information to and from the application and control the applications run level status. Shark defines Tool Agent interface as its internal interface and thus the clients know nothing about it. In addition, every single component (persistence layer, transaction manager, scripting engines, process repository, etc) can be used with its standard implementation or extended/replaced by project specific modules. This way Enhydra Shark can be used as a simple "Java library" in servlet or swing applications or running in a J2EE container (supporting a session beans API and maybe using EJBs for persistence), Corba ORB or accessed as a web service.

5) **OpenWFE -** Open source WorkFlow Engine is implemented in Java and is available under a revised BSD licence. OpenWFE not only features a workflow engine, but also a Business Process Management Suite.
As released, it features a Worklist component for storing work items (tasks) for participants and a Reactor component, for automatic participants. It also features Droflo, a web based flow designer. OpenWFE does not require any Application Server, just a 1.4.x Java Development Kit. OpenWFE-dotnet is a C# written library for people developing on the .NET platform. It allows them to access an OpenWFE Worklist to participate or a launch a flow. OpenWFE-pyya is the equivalent written in Python. Workflow definitions are expressed in a proprietary language, which is extensible. An XPDL filter is under work: it will allow OpenWFE to interpret and use XPDL defined business processes.

The following table compares the main functionalities provided from each considered WFMS

Functionality	OpenFlow	Enhydra Shark	JBpm	ObjectWeb Bonita	Open WFE
Process editor	The open source designer GraphViz is suggested	Integrated with JaWE (Java Workflow Editor), a graphical java workflow process editor compliant to WfMC specifications supporting XPDL as its native file format.	A graphical workflow designer is not present. Process definition is made in jPdl.	integrated with graphical tools (Worklist and Graph Editor) that can be used for the process definition and process control	Integrated with Droflo, a web based flow designer
Web interface	Exploits Zope's integrated web interface	Supperted	Supported	Supported	Supported
Roles and users management	Roles and users are managed though some Zope functionalities	Supported	Supported	Supported	Supported
XML	Supported	Supported	Supported	Supported	Supported
Platforms	Windows NT, Windows2000, Linux/Unix	Multiplatform	Multiplatform	Multiplatform: the application server runs on (Windows*, Linux, Solaris, AIX, HP-UX, ...)	Multiplatform
Process monitoring	Log files are provided. and can be used for monitoring purposes	A graphical monitoring tool is provided	Not provided	Real-time monitoring of activities is provided	Not provided
Subprocesses and parallel processes use	Supported	Supported	Supported	Supported	Supported
Reporting	Not provided. The process execution is logged in a file. Extracting this information, reports can be created	Provided	Not provided	Not provided. The integrated Jonas application server provides some reporting and monitoring tools	Not provided
API	Provided	Provided	Provided	Provided	Provided

Based on the above table, all these Open Source products have:

- A Web Application based User Interface
- An API which can be easily used for developing the WebServices interface towards the various Axmedis engines and modules

Other Workflow Management Systems not considered in this evaluation are reported in appendix.

8.1.3 Workflow Applications deployed at CPR

The Multimedia and Telematics Division of CPR use Plone and Zope as CMS, and a Sourceforge project called "Collective" does exist aiming at the development of WF "modules" to be integrated with the above mentioned products. Since Plone/Zope are de facto industry standard CMSs, it would be of interest for Axmedis to keep this product under consideration. Moreover, and above all, Plone/Zope are Open Source, and there compatible versions of Plone/Zope for

(practically) ALL existing platforms (Windows, Linux, Mac, Solaris, BSD....) and they can interoperate with the majority of existing DBMSs (the commercial & the OS ones).

JBPM joined the JBoss Consortium in early October 2004. JBPM is a Java workflow engine released as Open Source. This is another product to be considered, given that JBoss products are used worldwide (more than 5 millions downloads...).

Another example is Openwfe, an Open Source Java based WF Engine

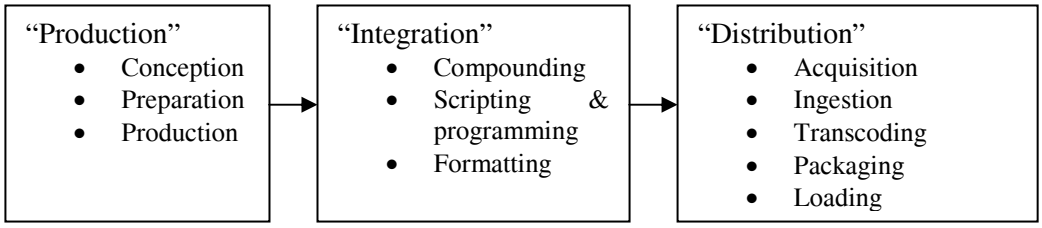
As far as the commercial side is concerned, the widely shared view borne out by Google is :-) Reactor 5, J2EE, platform independent suite seems to be a good choice. The problem, here, is the cost (something near $10K for a single CPU, probably much more for the source...).

8.2 General workflow requirements

A key objective of AXMEDIS is to reduce the cost of content production, formatting and distribution by automating and streamlining workflow. This section looks at four aspects of the AXMEDIS users' requirements for workflow:

- The contrasting requirements of the existing workflows of the AXMEDIS content creators, integrators and distributors (presented as scenarios)
- The functional workflow requirements required by the partners
- The integration requirements between AMXEDIS tools and a third party Workflow Management System (WFMS)
- The metadata requirements for workflow from the AXMEDIS Object model.

It is important to distinguish between the high-level, B2B workflow that operates inter-organisationally, and the micro-workflow occurring within each organisation that forms part of the AXMEDIS value chain. The high-level workflow follows the first stages of the AXMEDIS object lifecycle:



This high level workflow can be *nested* where the object is intended to be used as a building block (for example a stock photograph to be used for publications, or some library music to be incorporated in video productions) for another more complex hybrid object. In these cases, the distribution stage is a B2B distribution rather than a B2C distribution as in the final delivery to the consumer.

Below this high-level workflow are the more detailed and media-specific workflows associated with production, integration and distribution. The nature of these workflows is contingent upon the following parameters:

8.2.1 Stage(s) of the lifecycle covered by the organisation

For example, GUINTI is involved in both production and distribution, while XIM is involved in production, and OD2 is involved in distribution. In practice, most organisations also exhibit a certain amount of overlap so that the boundaries between these lifecycle stages are not clear-cut.

8.2.2 Degree of customisation of the content

At one extreme, XIM creates complex multimedia content that is intended to promote a movie and is therefore sold as a single item to a film distributor. At the other extreme, OD2 is adapting, packaging and distributing digital music to generate millions of unit sales

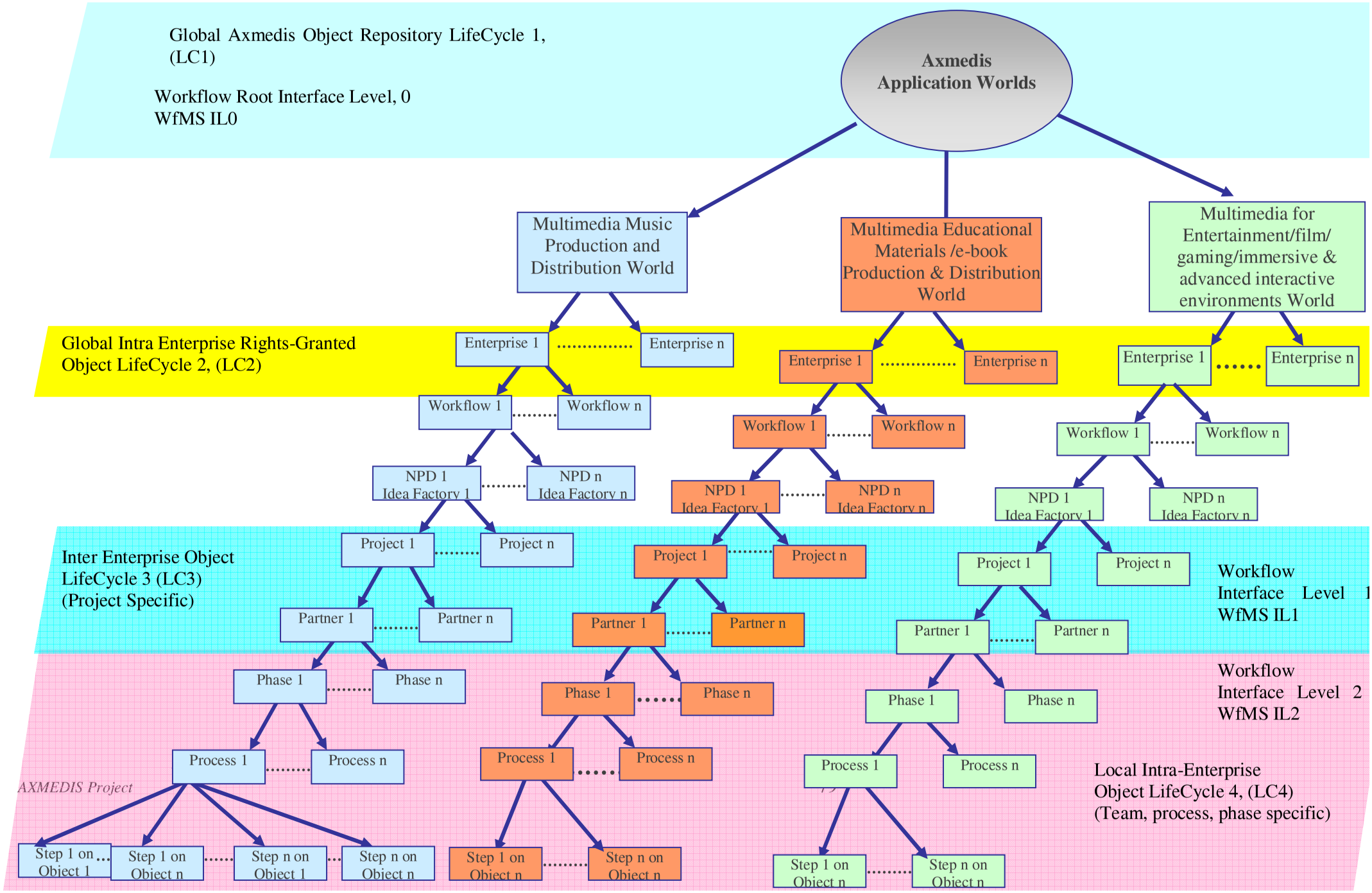
8.2.3 On-demand versus produced for stock

As in manufacturing, the content creation workflow can include stocks at any stage of the value chain, from raw materials (sheet music, scripts…) through components (audio clips, news articles), through sub-assemblies (bundles of news articles plus associated photos, bundle of video clips comprising an unedited video production…) to stocks of final products (audio album including DRM rules and artwork, physical stock of CDROMS…). As with modern "Just-in-time" manufacturing, where stock levels are minimised to allow maximum flexibility and efficiency, on-demand content creation is possible at most stages of the value chain. It is important to recognise that some forms of content will still require long lead times for production, such as a new audio album, or a feature film, so these will always require stock levels at some stage of the value chain. More dynamic content, such as live broadcasts, news stories and interactive events can be created and distributed in near real time, subject to DRM rules and production planning having been previously established.

8.2.4 Complexity of the media object

Single medium content such as an image or a piece of music generally does not require an integration stage. However, both can have complex DRM rules, be used as components in multiple hybrid objects and therefore be distributed P2P within the B2B domain, and both could also be distributed directly to the consumer.

On the other hand, any form of multimedia requires some form of integration stage, and if the product is to be a game or interactive application, will require a programming and/or scripting workflow to run in parallel with the media production workflows.


Global Axmedis Object Repository LifeCycle 1, (LC1)
Workflow Root Interface Level, 0
WfMS IL0
Axmedis Application Worlds
Multimedia Music Production and Distribution World
Multimedia Educational Materials /e-book Production & Distribution World
Multimedia for Entertainment/film/ gaming/immersive & advanced interactive environments World
Global Intra Enterprise Rights-Granted Object LifeCycle 2, (LC2)
Enterprise 1
Enterprise n
Workflow 1
Workflow n
NPD 1 Idea Factory 1
NPD n Idea Factory n
Inter Enterprise Object LifeCycle 3 (LC3) (Project Specific)
Project 1
Project n
Partner 1
Partner n
Workflow Interface Level 1 WfMS IL1
Phase 1
Phase n
Process 1
Process n
Workflow Interface Level 2 WfMS IL2
Step 1 on Object 1
Step 1 on Object n
Step n on Object 1
Step n on Object n
Local Intra-Enterprise Object LifeCycle 4, (LC4) (Team, process, phase specific)
AXMEDIS Project

8.2.5 Possible Workflow Interaction Environments

We distinguish 3 distinct Interaction Environments (IE) for the workflow control of the Axmedis multimedia project processes and Axmedis object life development as follows:

1) **The Global WfMS-AXOM Interaction Environment WfMS IE0**: This is the highest level control involving the WfMS interacting with the Axmedis Object Database., which is the generic level of global tracking and audit of development of object and versions of object lives.
2) **The Project Manager Level WfMS Interaction Environment WfMS IE1**: This is the next level down from WfMS-IE0 interface. This is dedicated to the interaction environment between project workers and the workflow management system, whereby line managers from a particular partner or the overall project coordinator can be interacting with the workflow to enquire about the overall progress of the project including the various states of progression of development of groups or individual Axmedis object lives, e.g. the states of all embedded sounds, videos, etc.
3) **The Base User Operations Level WfMS Interaction Environment WfMS IE2**: This is the lowest level of Interaction environment. This is dedicated to serve the individual project team member/user interactions with the workflow in controlling and progressing their own individual work load.

8.2.6 Global Epistemology of Axmedis Object Life to help with Meta-data Requirements Specifications

In this section we present an approach to analysis that starts from the consideration of each of the 5 distinct categories of envisionable Axmedis Object Life. We consider the set of allowable prototypical object states, actors, actions and scenarios for each of the 5 distinct life spaces of Axmedis Objects which we have set out below. We will attempt to derive the knowledge representation requirements in terms of the semantic roots that must be embedded in the meta-data as triggers to permit intelligent context-aware local and global control (aided by dynamic inheritances), as well as evolution and tracking of the local and global states of each object in a way that is universally consistent, protected, inter-operable and efficient but above all has semantic integrity and continuity with seamless control of the object states and operations across all the 5 possible categories of lifecycles and project spaces.

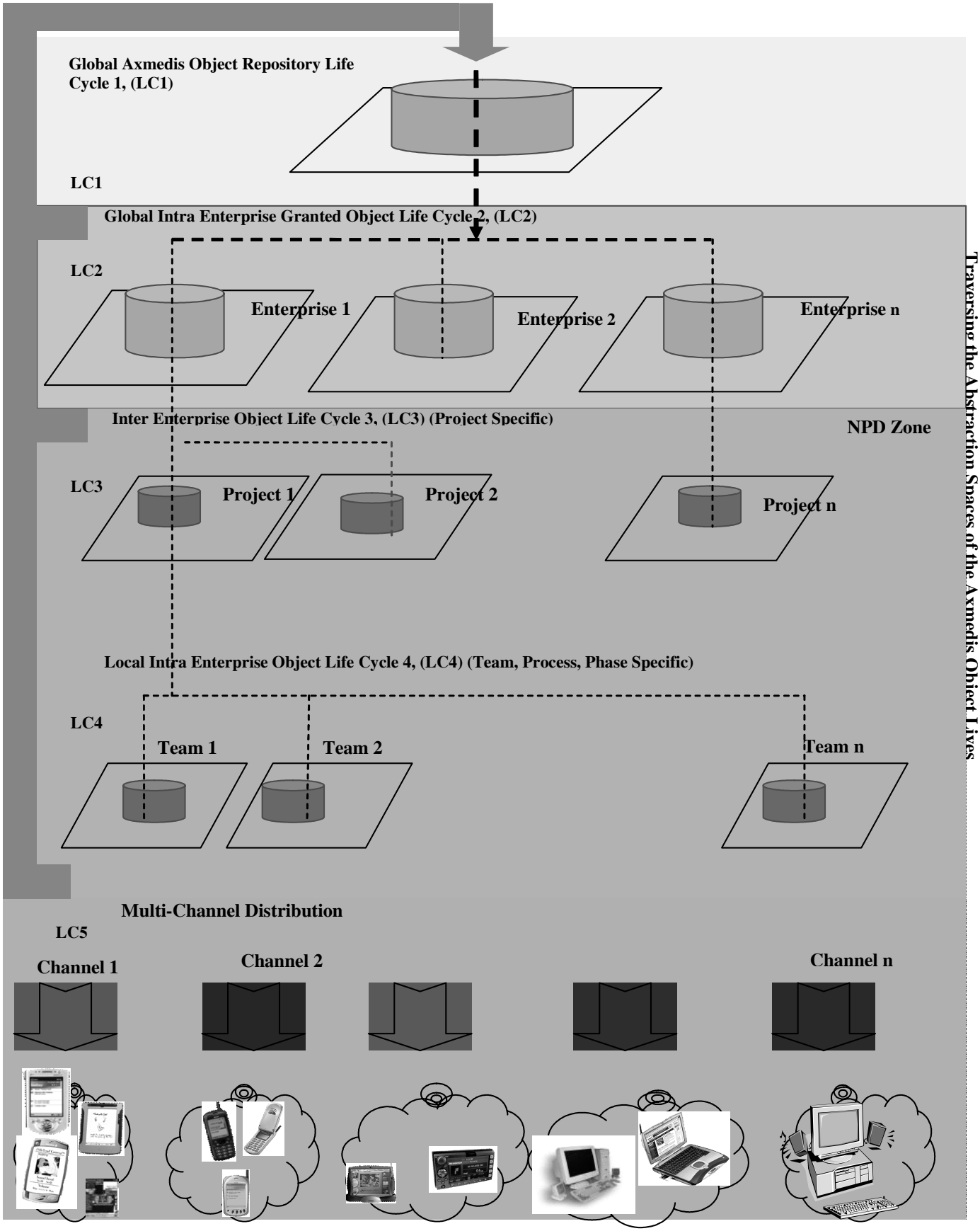
We are working towards establishing the initial spaces of semantic types as candidates from which to refine and eventually conclude the set of trigger states that have to be represented to accommodate the respective contexts. This we hope to do as we will elicit more knowledge, ongoing with Guinti, XIM and OD2, in our attempt to achieve a consensus re these issues in the light of discussion and feedback with the help of all our colleagues within the consortium. Thus we welcome your feedback.

It should be noted here that the relevant semantic systems engineering and therefore metadata and standards design and efficiency issues that will be the focus of this Requirements Analysis and Design exercise will need to be further discussed by the consortium in the context of the Axmedis intention to subscribe, as well as contribute, to the emerging standard such MPEG 21 and their future enhanced versions.

So at this stage we envisage the following 5 distinct categories of Axmedis Object Lifecycle Spaces. Some of these may run in a *concurrent*, *recursive* or *re-entrant* fashion within parallel or hierarchical universes, for at least some periods of time (delimited by project lifecycles, partnership or granted-rights lifecycles, or other constraints).

These lifecycles are illustrated in the following diagram :

Traversing the Abstraction Spaces of the Axmedis Object Lives.


Global Axmedis Object Repository Life Cycle 1, (LC1)
LC1
Global Intra Enterprise Granted Object Life Cycle 2, (LC2)
LC2
Enterprise 1
Enterprise 2
Enterprise n
Inter Enterprise Object Life Cycle 3, (LC3) (Project Specific)
NPD Zone
LC3
Project 1
Project 2
Project n
Local Intra Enterprise Object Life Cycle 4, (LC4) (Team, Process, Phase Specific)
LC4
Team 1
Team 2
Team n
Multi-Channel Distribution
LC5
Channel 1
Channel 2
Channel n
Traversing the Abstraction Spaces of the Axmedis Object Lives

LifeCycle 1, (LC1): Global Reference Axmedis Repository Object LifeCycle
This is that object life known to the Axmedis Object Manager which is to act as the universal custodian of such global reference versions of Axmedis Objects.

The object birth here starts when the object is first registered and deposited as an Axmedis Compliant Object known to, and indexable by, the Axmedis Object Manager.

In principle this should be a perpetual life extending into the future with object death being triggered only in the unlikely event of a full-rights object owner or an Axmedis Authority deciding to withdraw the object and all its versions from Axmedis Compliance.

LifeCycle 2, (LC2): Intra-Enterprise Axmedis Object Global LifeCycle
This is that object lifecycle which exists within the internal Enterprise Objects Reference Repository as maintained to ensure Enterprise Compliance Management with respect to the granted-rights restrictions to be adhered to by the Enterprise. This is typically a central server, perhaps available through the internal web pages of the Enterprise-wide portal. This is the local custodian of usable reference versions of digital assets that are legally available to the Enterprise staff to use for projects. This local custodian service can also help trigger processes for Axmedis Object Rights Renewal/Requests/Purchases etc.

The Axmedis Objects in its custody can be of two types:

a) Axmedis Objects that are Enterprise-native i.e. are fully rights-owned internally by the Enterprise (E). This type of object lifecycle starts with the birth of an object as a newly created object within the enterprise and extends into the future for ever or until the object is discarded/withdrawn for some reason and thus the object ceases to be available for use in the development projects of the Enterprises concerned. However the enterprise may decide to simultaneously de-register their fully rights-owned object globally as well i.e. withdraw its availability also as an Axmedis Compliant Object. This means that the termination of LC2 for this category of objects may also trigger their LC1 but the reverse need not necessarily follow.

b) Those externally owned Axmedis Objects acquired for use by the Enterprise subsequent to rights licence requests being granted by the owning authorities. Such lifecycles start with the acquisition of rights and end with the expiry of such rights. However such life instances can be re-newed contingent upon re-purchase of some rights (re-entrant) from the respective licensing authority.

Lifecycle 3, (LC3): Inter-Enterprise Axmedis Object Global Development LifeCycle
The following two lifecycles, i.e. LC3 (global) & LC4 (local) are born in and exist within the distributed (collaborative inter/intra-factory) New Product Development (NPD) Zone. Both LC3 and LC4 should be represented such as to allow tracking of the object lifecycles end-to-end at any time and locating their full coordinates in any stage of their development. This can use a set of 10 canonical Situation Assessment (SA) primitives, the 10P-SA; i.e. place, project, phase, process, partner, person, period, purpose, progress(-to-date), projected(-work-remaining), (using the "10P-stamped" project workflow objects, Ref Use Case Document, table 1).

Thus LC3 is the overarching lifecycle which tracks the global evolutionary development path of an object as it is worked on, as the object is passed back and forth across Enterprise Boundaries in the course of its development within a project. This extends from inception to completion of a product as happens in net-economy virtual value chain constellations, for collaborative New Product Development or multi-agent contract fulfilment projects.

The tracking of such a lifecycle enables the locating of the development of an object within the macro-perspective of the entire collaborative project path in terms of its current progress state within the broad stages of the project milestones and trajectory. Nested levels of inheritance should allow seamless

referencing to the finer grain information, if need be, to locate exactly where the object is currently being worked on (in which Manufacturing Cell/Working Group and in which Enterprise) in its ongoing development path.

There can be many such LC3s running as parallel lifecycles, with arbitrary degrees of overlap, for the same object as there can be several ongoing collaborative projects running in parallel in which such an object is being incorporated and worked on.

Therefore such LC3s are project-dependent and recursive down to several levels of nested sub-LC3s/LC4s. Typically, in the case of pre-existing objects, a new LC3 starts for an object each time that object is sourced for a new project. This commences at the point that the object is requested from the Global Intra-Enterprise Axmedis Object Repository and acquired by the Project Leader *for a certain new project*. Alternatively for objects that are to be newly created in the normal course of NPD processes, the relevant LC3 starts at the point of management commitment to build the new object either in the context of an ongoing project or when a new dedicated project is started to create such a new object (at the "Digitised Sketch Appraisal" Phase, ref UseCase Diagram 1 above). All such Axmedis Object LC3s end at the completion of each project for which they are sourced or during which they are "invented" as newly created objects.

Lifecycle 4, (LC4): Intra-Work-Group Axmedis Object Repository (P2P level), LC4
Many lifecycle 4s can exist in parallel as the active LC4 instances of an object life that may be currently worked on (or not) within various cooperating manufacturing cells engaged on the same project (i.e. within various partner or personal spaces). Thus LC4 tracks the evolutionary path of an Axmedis object whilst it is being worked on in any of the distributed project cells by each single Manufacturing Cell/ Work Group/Unit/Team/Person. Some enterprises are organised horizontally, vertically or on a fluid cross-functional project-dependent basis. So this lifecycle type itself can be both recursive and re-entrant depending upon the size, complexity and structuring of the project development path and/or the way the Enterprise Work Group/Cells may be distributed. Therefore such lifecycles are both project-dependent and enterprise process logic dependent, and typically start with the hand-over of the worked object to the Work Group and end at the completion of the project or with the hand-over of the worked object to the next Work Group for further development towards completion.

Initial Set of Semantic Types Emerging as candidates based on analysis so far:

Here we simply list the initial, the indicative but not yet the actual, form of the semantic types emerging as being relevant at this stage of our domain knowledge analysis for each context of the Axmedis Object Lifcycles.

In practice Generalisation Ontologies can be deployed to allow the hierarchical decomposition and horizontal partitioning of the full domain ontology to (sub)ontologies. In this way, for any given context, the semantic integration and reasoning required for the workflow tracking of an Axmedis Object will remain adequately expressive, efficient, effective and above computationally manageable.

LifeCycle 1, LC1 Semantic Types: These are candidate semantic types, including triggers, for global tracking and control of Object States at the interaction space of the Axmedis Workflow with the Axmedis Object Manager:

new-usage-instance-needed, new action, full-rights, relative-rights, rights-updated, rights-granted, rights-denied, protection-status/(un)protected, modified/rendered, new-view-created, metadata-updated, , metadata-viewed, metadata missing/incomplete, ready, not-ready, interrupted-process-n, barred/stopped, history, formatted, packaged-n, edit-started, edit-completed, protection-tool-started, protection-tool-ended, license-manager-started, license-manager-ended, wanted, deposited, owned, viewed-n, taken-n, requested-n, time-done, phase-done, process-done, waiting-on/for-process-n, awaited-by-process-n, suspended, internal, external, authorised/signed-off

LifeCycle 2, LC2 Semantic Types: These are candidate semantic types, including triggers, for global tracking and control of Object Usage Instances and Rights Compliance within an Enterprise (similar to internal policing of software licences processing and compliance).

version-type, view-type, usage-instances-in-credit, license-manager-request-pending, rights-last-re-newed, full-rights, relative-rights, right-last-updated, rights-granted, rights-denied, protection-status, (un)protected, metadata-updated, not-available, stopped, X-bar, Stuck-at-Y, license-suspended/rejected, wanted, owned, viewed-n, taken-n, requested-n, internal, external, authorised/signed-off, internal/external-copyrighted, DRM-needed, DRM-added, DRM-ok, binned/discarded, running, first-pass-sealed, packaged-n, bundled-n.

LifeCycle 3 & LifeCycle 4: LC3 & LC4 Semantic Types: These are candidate semantic types, including triggers, for Project–specific local and global tracking and control of object development trajectories (Situation Assessment) in distributed New Product Development Zones.

early, late, ready, not-ready, stuck-at-Z, pending-Y, terminated-at-N, binned/discarded, running, earliest-started, latest-finished, CPA-slack-(non)-critical, first-pass-sealed, re-drafted-n, re-sealed-n, (re)composed-n, (re)formatted-n, (re)packaged-n, (re)bundled-n, distributed, within-phase-n, starting-phase-n, at-end-of-phase-n, within-process-n, starting-process-n, at-end-of-process-n, project-part-n, time-done, phase-done, place-done, partner-done, person-done, process-n-awaited, process-n-awaiting, suspended, contingent, authorised/signed-off, handed-over-sealed, internal-copyrighted, external-copyrighted, DRM-needed, DRM-added, DRM-ok.

LifeCycle 5 Semantic Types: These are candidate semantic types, including triggers, for global tracking and control of Axmedis Object for multi-channel, multi-agent distribution spaces.

price, (re)sealed-date, rights-restrictions, project-number-ref , (co)produced by, ordered by, trailer- only, (dis)continued, suspended, sequelled, time-done, (un)protected, protection-status, X-bar, usage-instances-in-credit, license-suspended/restricted, license-manager-request-pending,
authorised/signed-off, DRM-needed, DRM-added, DRM-ok, full-rights, relative-rights, rights-updated, rights-granted, rights-denied, metadata-updated, metadata-viewed, metadata-missing, barred/stopped, owned, viewed-n, taken-n, requested-n, (re)composed-,(re)formatted-, (re)packaged-, (re)bundled-, modified/rendered, distributed, handed-over-, waiting-on/for-process n, awaited-by-process-n, ready, not-ready, internal, external, not-available, early, late, ,

The following list of entities/states/triggers refer to the scenarios described and illustrated above. The Actor's names are only meant to be indicative of the roles that are normally discharged and it may be that in any given enterprise some of the Actors specified here may have a different nominal designation or overlapping responsibilities.

8.2.7 Digital Object Workflow initial semantic types:

a) Triggers early, late, ready, not-ready, internal-copyrighted, external-copyrighted, DRM-needed, DRM-added, DRM-ok, binned/discarded, stopped, running, first-pass-sealed, re-drafted, re-sealed, composed, formatted, packaged, bundled, distributed, within-phase-n, starting-phase-n, at-end-of-phase-n, within-process-n, starting-process-n, at-end-of-process-n, earliest-started, latest-finished, CPA-slack-(non)-critical, project-part, time-done, phase-done, place-done, partner-done, person-done, process-n-awaited, process-n-awaiting, pending, suspended, contingent, authorised/signed-off.

b) Actors: Sector Director, Creative Director, Lead Editor, Concept Initiator, Text Editor, Graphics Editor, Audio/Music Editor, Rights Clearance Expert, Rights Seeker, Rights Owner, Marketing Expert, Distribution Expert, Production Team Leader, Partner, Authorising Responsible

c) Groups: Production Team, Technical Team, Editorial Team

d) Editorial Board: Creative Director + Concept Initiator + Production Team

e) Evaluation Board: Editorial Board + Marketing Expert + Distribution Expert + Rights Clearance Expert/Seeker

f) Actors' States: initiating, approving, rejecting, requesting modifications/re-work, available, unavailable, technical expert, legal expert, external, internal , waiting, ready, not-ready, early, late, overloaded, underloaded,

g) Objects: Idea, Sketch, Digitised Sketch, Digitised Asset, Distribution Channel, Package/bundle, milestone, slack, CPA

h) Processes: Concept Initiation, Sketch Appraisal, Digitised Mock–up Appraisal,
Initial Project Appraisal, Production–to-Draft, Continuous Evaluation, Distribution, formatting, composition, packaging, bundling, revenue-collection, sealed, resealed, draft, redraft, over-ride.

8.3 Generic Workflow Use Cases for Digital Object Production and Distribution

Based on the above scenarios, the following generic use cases have been developed.

No.	Use Case Name	Role
1	Search	This is a generic use case that can search for anything. A special case can be inherited to search for eligible components to be worked on.
2	Create NPD Workspace	This use case when run should create a fresh NPD workspace folder with the required configuration files in it etc i.e. a suitable workspace desktop suited to the role of the participant(s) in the value chain segment to which they are contributing towards the NPD as a whole
3	Add	This use case is responsible for adding components to the NPD. Typically it can be inherited to add projects, people, roles, processes, phases, partners, components, activities, Rights, DRM, etc
4	Edit	This use case is responsible for editing various aspects of the NPD. It can be used to edit the current DRM rules or can be used to edit a component based on the selected process and updates versions if required.
5	Remove	This is a generic use case responsible for removing anything from the NPD. e.g. partners, people, processes, components, etc.
6	Group	This use case is responsible for bundling components, people, processes, partners, projects, teams, packets, digital assets products, etc into one entity which may be further referred to.
7	Show	This use case is responsible for showing information related to various components, their copyrights, DRM, History (metadata, timestamp, version), Template (house styles, business rules), global state of any projects, etc.
8	Discard NPD	This destroys the NPD workspace, when the decision of No-Go is taken. This removes all the information regarding the NPD.
9	Track Component	This tracks down the history of the selected component. The result comprises of all the actions performed on the component along with all the future activities including "wait actions" re "suspended" objects awaiting pending operations which may themselves be contingent on Critical Path Action(s) (CPA) trigger(s).
10	Track CPA	This use case identifies the Critical Path Activities (CPA) and produces all the information regarding those activities e.g. people involved, components being worked on, processes needing attention, etc.
11	Timestamp Generator	This use case is responsible for generating the timestamp for each of the activities that are performed on an object by an actor or process at anytime, anywhere any place by any partner – in any phase of the production and distribution end-to-end. This can be represented within the metadata and will be used by "Track Component" to locate the evolution status of any object within nested spiral development lifecycles across distributed teams from different units/partners. This will allow global tracking including accommodating re-entrant and re-cursive states of processing of the objects across partner project spaces (projects, phases, processes, progress-to-date, projected-work-remaining, persons, partners, places, periods, purpose, – 10P STAMP, (Badii 2004)
12	Generate Version	This generates hierarchical versions for all the digital and hard copy artefacts for the NPD development

13	List Work	This use case is responsible for generating a hierarchical list of the sequence of all the work to be done in a particular sectorial workflow scenario, e.g. phases, processes to be invoked on certain objects by certain people with specific globally traceable coordinates as unique and easily retrievable instances (i.e. 10P Stamped Workflow Objects).
14	Select a Work Item	This use case is responsible for selecting a work item from the work list
15	Complete a Task	Users can invoke this functionality to signal to the workflow system their wish to have an activity terminated. Accordingly the workflow system will proceed to the next step in the workflow process instance (It is important to note that this functionality enables an over-ride control action on the part of the human operator if required)
16	Distribute Work	This use case is responsible for distributing the work amongst the people assigned to the NPD. The work can be at component level or at NPD level. Some of the assigned work may be pipelined or suspended in a wait/pending stack, awaiting appropriate triggers for handover
17	Change State	This use case is responsible for changing states of objects/actors or phases of a project including triggering and the upload of a new workspace for a new phase in the project. e.g. the object may become available after copy right clearance or a person/partner may become (un)available.
18	Notification	This use case is responsible for sending out notifications to the responsible actors for the start and/or ends of the activities/work; e.g. request for information or components, etc.
19	Global Viewer	This use case is to collect all the information for the current NPD and present a global view for managerial decisions and for Production accounting information feed made accessible any Enterprise MIS platforms such as SAP (along with the 10P Object Stamps)
20	UI	This is a generic use case for the user interface, which delivers all the functionalities provided by the user interface of the selected workflow tool. This use case is just a place holder to for the User Interface requirement and hence there are no steps involved. The specific behaviour of this use-case will depend on the selected workflow tool.
21	XUI	This is a generic use case for inter-organisational workflow interaction and the interaction between WfMS and other Axmedis native tool. This use case is just the place holder for the interfaces of WfMS and other Axmedis tools, which are described in DE3-1-2 framework and tool specification document.
22	Check-In	This use case is responsible for editing manually various aspects of the NPD. It can be used to edit the current DRM rules or can be used to edit a component based on the selected process and updates versions if required.
23	Check-Out	This use case is responsible for copying the object from the actor exclusive access area (when he previously uploaded it) to the Axmedis DB

8.4 The Workflow Management System Functionalities

Based on the scenarios described above, this section presents the initial functional requirements for the design of the Integrated Workflow Engine and its interfaces to the other sub-systems.

8.4.1 Status and triggers

The Work Flow Management System (WFMS) will need to update status of, or trigger certain actions based on status of a AXMEDIS Object regarding the following:

- Who will need to act on any AXMEDIS Object next
- What will anyone need to do on any AXMEDIS Object at any time
- Where will any action need to be done on any given AXMEDIS Object at any time
- When will any action need to be done on any AXMEDIS Object

The WFMS has to be able to do this at any time in the lifecycle of a digital artefact end-to-end i.e. from the creation/access of any AXMEDIS OBJECT through all stages to the final viewing of the AXMEDIS OBJECT (embedded or on its own) by the end user. This can include any combination of rendering, editing, formatting, packaging and distribution or repeated sequences of such steps on the AXMEDIS OBJECT within one team/organisation or collaboratively across all organisations involved in the value chain end-to-end. Any AXMEDIS OBJECT as part of any of a number of projects must be locatable and traceable in terms of its current status and history of work already done on it and yet to be done on it by whosoever from

anywhere in the partnership of the distributed project teams at any time, place and space within the nested evolutionary spiral development lifecycle of a project.

8.4.2 Common requirements

Thus the WFMS must to be able to:

8.4.1) Operate within the key Operating Systems (OS); for example the Windows, Linux, Mac Environments

8.4.2) Interact with the AXMEDIS Object Manager to access objects and track/update their status (ie allow workflow metadata visualisation, editing, automated updating and storage) (MANDATORY)

8.4.3) Monitor how the progress of assigned process activities and be capable of managing more than one workflow process instance so as to provide workflow support for multi-agency co-design & co-production of multimedia content based on open source distributed products through LGL, BSD or similar licences.

8.4.4) Provide time & status metadata updates that remain accessible to other Enterprise Project Management Applications, such as SAP for example (OPTIONAL)

8.4.5) Provide a Service Interface (API) to be used for developing the plug in for AXMEDIS Editors, Engines and Query Support

8.4.6) Provide a seamless interface to AXMEDIS-native tools (e.g. Content Production, Formatting, Packaging/Bundling and Distribution tools) for the range of operating systems selected above, i.e. provide interfaces for the following tools and engines

a. Plug in for **AXMEDIS Editor**
b. Plug in for **Composition Tool Engine**
c. Plug in for **Formatting Tool Engine**
d. **Program and Publication Engine**
e. **Protection Tool Engine**
f. **Publication Tool Engine of AXEPTool**
g. **Loading Tool Engine of AXEPTool**
h. **AXEPTool P2P Active Selection Engine**
i. Plug in for **Accounting Manager** and **Reporting Tools**
j. Plug in for **Administrative Information Integrator**
k. **Publication/Loading Rules/Selections editor**
l. **Programme and Publication Rule Editor**
m. **Protection Tool User Interface and Rule Editor**
n. Collector Engine (OPTIONAL)
o. **Core Accounting Manager and Reporting Tool** (OPTIONAL)
p. **Administrative Information Manager** (OPTIONAL)

8.4.7) Control and manage the process activities, for example by re-assigning, delegating, to the single activities

8.4.8) Either a process editor user interface or a standard process definition language (XPDL, jPDL) will be used for defining and customizing the workflow processes for production, integration and distribution

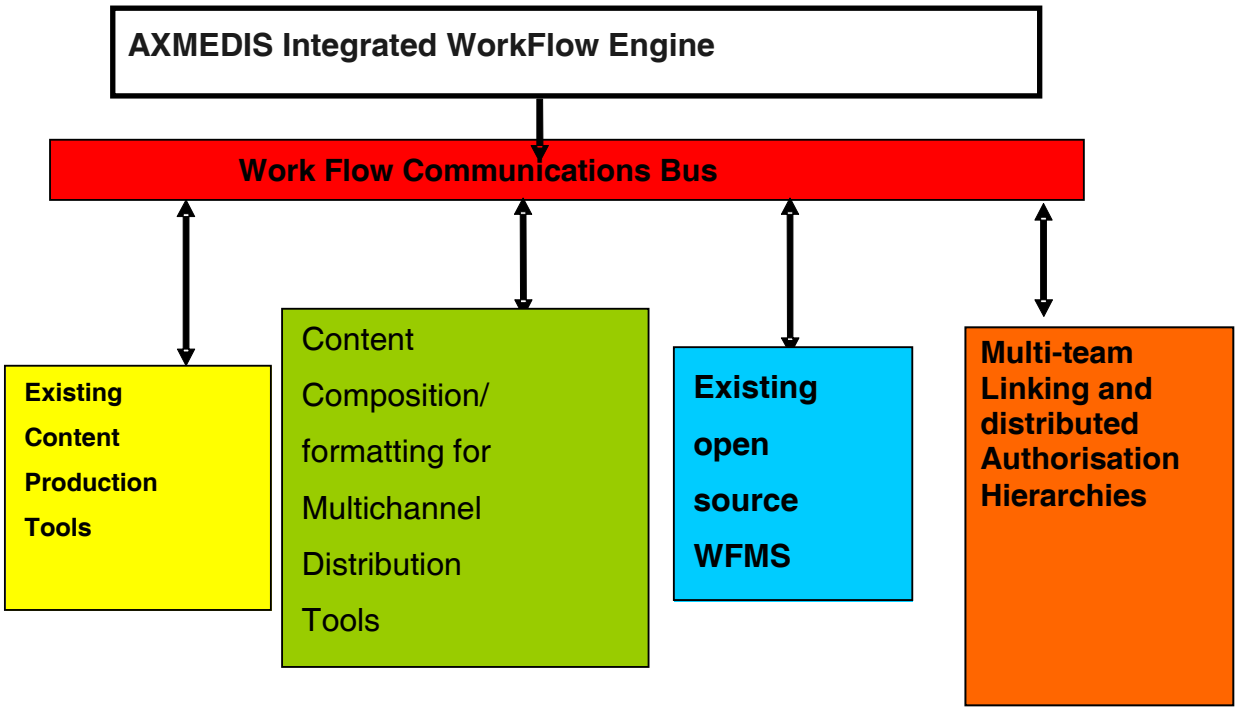
8.4.3 Inter-organisational workflow functional requirements

Additionally, the following requirements are necessary for inter-organisational teams of multimedia content producers and their customers:

8.4.9) Provide support for incremental sign-off over the course of bespoke multimedia content production

8.4.10) Provide workflow with multi-lingual and cross-lingual support (OPTIONAL)

This is illustrated by means of the following schematic of the Workflow Engine and its interfaces:



8.4.4 Workflow actors and their proxy agents:

i) Content Owners and Content Providers

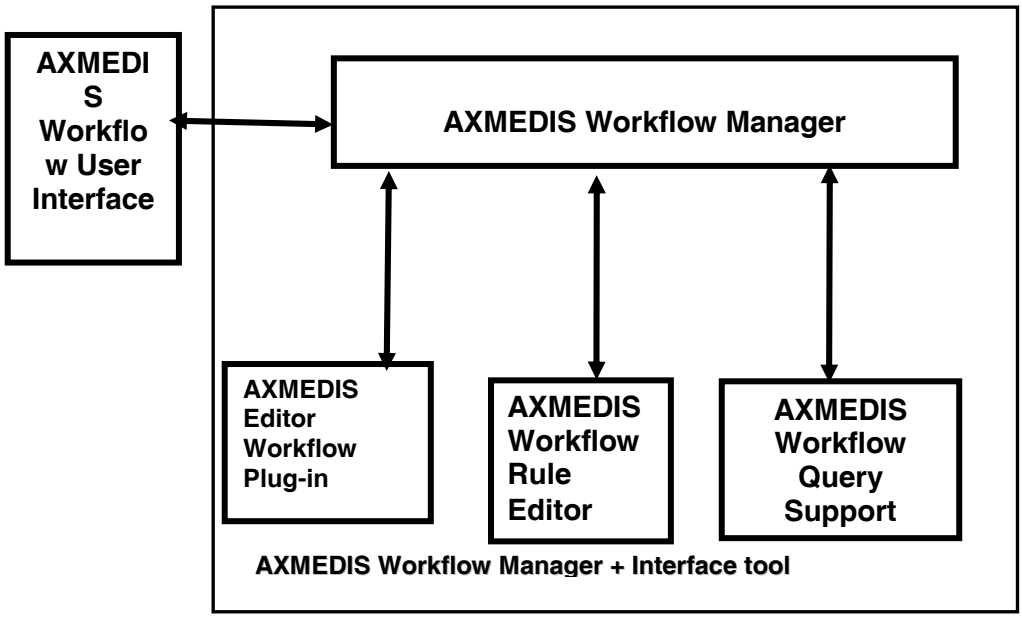
ii) Content Producers/ Distributors (Prosumers – professional consumers)

iii) Authorisation/Moderation Processes or authorities for:

- **a)** DRM copyright and usage clearance
- **b)** Editorial moderation/clearance/over-rides,
- **c)** Sign-off to support intermediate validation/hand-over in multi-agency co-design, co-production, co-distribution of multimedia content and on-the-fly multi-channel sub-contracting/outsourcing of multimedia elements production/distribution in B2B/B2C networked markets (also with non-repudiation support).

8.4.5 Integration between WFMS and AXMEDIS

The integrated AXMEDIS workflow engine will need to include an intranet-accessible application as in a web application. The schematic below is to illustrates this:



In the above diagram, the Workflow Management Server will be a third party WFMS, which will be interfaced with the AXMEDIS object manager via a custom AXMEDIS Workflow Object Manager Interface. This will also provide the interfaces required for the client application.

8.4.6 WF Environment Requirements Specification

Workflow Environment Tools & Actors to be served:

Tools:

I. Axmedis Object Manager (Tracking every operation performed on the objects in the Axmedis Objects Manager)
II. Application Programs for Content Production, Formatting, Packaging/Bundling & Distribution
III. Possibly other ERP/MIS application such as SAP (although this may also be realised; this is not within strictly a requirement)

Actors or their proxy agents:

A. Content Owner/Providers
B. Content Producers/ Distributors (Prosumers)
C. Authorisation/Moderation Processes or authorities:
   a) DRM copyright and usage clearance
   b) Editorial moderation/clearance/over-rides,
   c) Sign-off to support intermediate validation/hand-over in multi-agency co-design, co-production, co-distribution of multimedia content and on-the-fly multi-channel sub-contracting/outsourcing of multimedia elements production/distribution in B2B/B2C networked markets (also with non-repudiation support).

Axmedis WFMS interoperability

The WFMS must be compatible with all the open source standards like LGL, BSD or similar/

8.4.7 Axmedis Workflow Typical Scenarios

Some possible WF usage scenario examples:

- An editor creates a new object and buildS the basic structure and contents and releases the object to other editor roles
- Other editors modify the object, in following steps of the process
- An editor director checks the object and asks for new activities by the editor roles
- Editors modify again the object through a sequence of steps
- An editor director gives ok for object “publication”
- One package is created by a distributor editor
- Other distributor roles compound the package
- A director checks the package and gives authorization to distribute

9 AXMEDIS Object Acquisition from CMS

9.1 Crawler Collector Indexer

The Crawler Collector Indexer has to:

9.1.1) crawl into the CMSs and the databases of the content providers, integrators, and distributors to access content and indexing it. All the crawled content has to be stored in the Crawled Results Integrated Database to be used by the Collector Engine for automatic production/update of AXMEDIS objects inside the AXMEDIS Database.

9.1.2) use plug-in technology to access the CMS/database for extensibility.

9.1.3) collect and index different media sources.

9.1.4) collect all the information related to all pieces of content present in the CMS like metadata, technical details, DRM aspects, licensing aspects, possible products that use the content, multilingual information, etc.

9.1.5) notify to the Collector Engine when a new or updated AXMEDIS object is put in the Integrated Database.

9.1.6) store new objects in the Integrated Database by means of abstract XML documents (with no semantic meaning)

9.1.7) crawl the following databases:

- MySQL
- Oracle
- MS-SQL
- IBM-DB2
- PostgresSQL
- Tamino
- Extraway

9.2 Plug-ins of Crawler Collector Indexer

Plug-ins of Crawler Collector Indexer have to:

9.2.1) access the specific CMSs database information. For each piece of content it produces an abstract XML document to be indexed (i.e. a set of feature/value pairs).

9.2.2) preserve links among content (i.e. if two pieces of content are related in the CMS the associated abstract documents have to be related as well).

9.2.3) Special consideration has to be given to the information needed for administrative activities (i.e. accounting).

9.3 Automatic gathering of Content, Collector Engine

Collector/Transcoder Engine will migrate the content from the Crawled Results Integrated Database (created by the Crawler Collector Indexer) to the AXMEDIS format and database. These tools will be capable of processing data automatically updating the content into the AXMEDIS database when these are updated into the CMSs.

The Collector Engine has to:

9.3.1) be notified when a new or updated object is introduced in the Crawler Results Integrated Database;

9.3.2) decide on the basis of user defined rules if an abstract XML document from the Crawled Results Integrated Database has to be imported or not into the AXMEDIS Database.

9.3.3) build an AXMEDIS object from the abstract XML document produced by the Crawler plug-in. The building process should be controlled by the end-user who specify rules in order to produce the AXMEDIS object.

9.3.4) use plug-ins for estimation of fingerprints on content to complete the indexing.

9.3.5) be controlled trough a user friendly interface to specify the rules to decide if an object has to be imported or not, and the rules to map the abstract document to an AXMEDIS Object and to state when to activate the fingerprint plug-ins.

9.3.6) provide support for queries in the Crawler Result Integrated Database received from the Query Support.

9.3.7) The query results should not report objects already available in the AXMEDIS Database.

9.4 Fingerprint Extractor as a collection of Collector Engine Plug-ins for extracting features

These plug-ins for the CMS involve research to extract meta data (content descriptors) directly from the content. Two different types of metadata can be distinguished:

- content descriptors, which provide information about content characteristics, and
- fingerprints, which identify or verify content.

The plug-ins produce content descriptors (including fingerprints) on objects newly added to the AXMEDIS database. Thus two classes of requirements can be identified:

- First, feature extraction and processing depend on the applications. Generally, different applications can be identified: Content Based Retrieval (CBR) using different types of content descriptors, Fingerprinting (FP) for identification of content, or FP for verification of content. e.g. these requirements include requirements from the algorithms about the input.
- Second, results of the feature extraction and processing also depend on the application: the resulting descriptors and their characteristics e.g. calculated content descriptors are not mandatory understandable for humans. More subtle content descriptor characteristics also influence their usage. For example, the size of the fingerprint (number of bits) affects the number of AXMEDIS digital resource that can be identified.

Within this document we address the specific requirements on fingerprinting algorithms within section 9.12. Here, the requirements on the content descriptors and related algorithms are described. Content descriptors support users in searching and identifying content.

Main requirements:

9.4.1) A unified interface, which allows the integration of different technologies, has to be defined.

9.4.2) Different types of content that have to be processed: images, videos, audio, and documents.

9.4.3) Specification of the applications of CBR and FP within AXMEDIS and the derived specifications of requirement on the feature extraction and processing as well as on the content descriptors.

9.4.4) Algorithm design has to consider the complexity of the content description calculation. This influences the performance of the content migration. (Scalability only relevant for retrieval. Thus it is not considered during the extraction). (DESIRED)

9.4.5) The descriptors have to be designed considering:

- Content Descriptor (e.g. size, or granularity of the input data for calculation of the content descriptors)
- Influence of processing operations (with a focus on typical processing operations like DIA rather than attacks) (DESIRED)

9.4.6) The encoding of a large number of fingerprints and their report for different point along the temporal evolution of the digital resource. For example, estimation of the rhythm every 30 seconds, estimation of some content descriptors for the Genre detection or coding every 2 minutes, estimation of the average number of character per word every page, etc. (DESIRED)

9.4.7) MPEG-7 encoded Metadata may be supported (OPTIONAL)

9.4.8) Content Descriptors has to include technical details such as:

Text: number of chars, number of words
Video: time duration, resolution, coding format, dominant colour (in the time)
Audio: rhythm, tonality, time duration, coding format, sample rate, number of channels
Multimedia: size, number of components
Animation: size, frame rate
Images: size, format, bit depth
General: size in terms of bytes

9.4.9) Requirements for feature extraction and music description of audio files (DESIRED)

- Automatic detection of music genre and type of sound source (male/female voice or musical instrument, which instrument or musical ensemble, etc.).

- Recognition of one or two main "voices" in noisy environment (i.e. the other voices or instruments).
- Estimation of the main tonality, rhythm of music.
- Generation of short audio excerpts summarizing the main themes of a more complex music song or instrumental composition (based on rhythmic and/or harmonic patterns).

Requirements for feature extraction and description of audio files containing speech (OPTIONAL):
9.4.10) The process of feature extraction must allow:

- The retrieval of the length of speech (both in speech only files and in mixed music-voice files)
- The identification of Dialogue structure (i.e. Monologue- dialogue)

Requirements for feature extraction and description of textual file:
9.4.11) the feature extraction must be able to:

- identify the File type among the accepted ones (editable text, printable version, marked-up text, Adobe PDF, Microsoft Office Documents, Postscript, etc...)
- retrieve Text infos:
  - Standard encoding used in the text format, if any
  - Language(s) of the doc
  - Text length in periods
  - Text length in paragraph
  - Text length in lines (if applicable)
  - Text length in pages (if applicable)
- produce a Text summarization (OPTIONAL)
- extract Keywords
- determine the Text topic (OPTIONAL)
- determine the Text type (comics, poetry, tale, novel, script, diary, essay, article, subtitling, etc.) (OPTIONAL)
- determine the Text genre (OPTIONAL)

10 AXMEDIS Database

10.1 Managing a Database of AXMEDIS Objects

The database has to store AXMEDIS objects; AXMEDIS objects could be structured collections of components as well as single components to be integrated inside other AXMEDIS objects.

AXMEDIS Database has to:

10.1.1) be scalable in order to fit the needs of the small end user and of the big corporate end user;

10.1.2) be adaptable to free and commercial database and should be implemented in PostgresSQL (Free under BSD licence) or the commercial databases such as Oracle, DB2 and so on;

10.1.3) not be too specialized in order to deal with requirements 10.1.1) and 10.1.2) and therefore should be a relational database instead of an object oriented or XML database (suggestion);

10.1.4) be independent from changes to the AXMEDIS Model structure schema .

10.1.5) manage AXMEDIS objects both in binary and xml formats.

10.1.6) store protected and unprotected AXMEDIS objects.

10.1.7) provide access to the structure of stored AXMEDIS objects, giving the ability to locate, extract and search: components, items & collections etc. inside the objects (when not encrypted).

10.1.8) support versioning of AXMEDIS objects.

10.1.9) store administrative information like the transactions performed on the clients as well as the accounting information like licences, contracts etc.

10.1.10) store the licences sold to the customers.

10.1.11) Information contained in the licence database will be accessible for browsing & query.

10.1.12) support queries on administrative information like: all transactions performed in a period, all transaction of a customer, etc. for reporting purposes.

10.1.13) support the following operations:

- add/update (new version) an AXMEDIS object given in binary or xml format;
- completely remove an AXMEDIS object giving the id;
- remove the last version of an AXMEDIS object giving the id.
- search for objects or components (see queries);
- extract a whole object or only a part of it (in binary or text format) for the last version or for a specific version.

10.1.14) Guarantee consistency of AXMEDIS object ID.

10.1.15) support user management, to set what the user can do in the DB (possibly using capabilities of OS or optionally developing a provisioning system)

10.1.16) support groups of users

10.1.17) support user grants to:

- read objects produced by the user or other users of a specific group
- read any object
- add objects
- remove objects produced by the user or other users of a specific group
- remove any object
- manage users profiles
- …

10.1.18) users of the DB should be kept synchronized with the users of the AXMEDIS Workflow Manager

10.1.19) monitor access to the DB from users and keep a log of operations performed on the DB.

10.1.20) be used for IN/OUT AXEPTool DBs (OPTIONAL)

10.1.21) when a new version of an AXMEDIS Object is uploaded an event should be sent to AXEPTool

10.1.22) able to lock AXMEDIS objects. When an AXObj is read from the DB it could be possible to lock the object until it is uploaded (from the same user). When a locked file is read from another user a message has to say that it is read only and giving the name of the user locking the file.

10.1.23) allow Administration Tool to remove a lock.

Technical requirements:

10.1.24) Parts of AXMEDIS objects, like resources, may be stored on the file system.
10.1.25) The database has to provide efficient ways of searching inside the stored objects.
10.1.26) To avoid duplications as much as possible, inside the database AXMEDIS components/resources with the same id may be stored once (i.e. the same video used in many objects).
10.1.27) The AXMEDIS Database has to index all the metadata associated to AXMEDIS objects/components for fast retrieval
10.1.28) Support different indexing (full text, cross indexing,..) for mandatory and complementary metadata fields.
10.1.29) AXMEDIS Database could manage more efficiently metadata stored in the AXInfo part of the Object/Component (AXInfo structure will be fixed) and less efficiently non-standard metadata.
10.1.30) AXMEDIS Database metadata management should be configurable, in the sense that metadata for fast retrieval has to be configured.
10.1.31) AXMEDIS Database should run on MSWindows and Unix-like Platforms

AXMEDIS Database Administration Tools has to allow to:
10.1.32) search in the DB (using Query Support)
10.1.33) browse the DB by Author, Genre, Publisher, …
10.1.34) open last version or a specific version of an object using the AXMEDIS Editor
10.1.35) remove the last version of an object
10.1.36) remove completely an object
10.1.37) add/remove/modify users that can access to the DB
10.1.38) modify the grants of the user

10.2 Making queries inside Databases of AXMEDIS objects and inside the objects

Selections are collections of symbolic queries and AXMEDIS Objects IDs. Selections are then a set comprised of symbolic queries not expanded or actualized such as S1= {Q1, Q2} or a selection of AXMEDIS Object IDs with some symbolic queries such as S2={Q3, AXOB1, AXOB444, AXOB3412}. Selection can be expanded or actualized so that S1 at time t1 can be S1@t1= {AXO1-1, AXO1-2, AXO1-3, AXO2-1, AXO2-2, AXO2-3, AXO2-4, AXO2-5, AXO2-6, AXO2-7, AXO2-8, AXO2-9}, while the same query at time t2 can be S1@t2= { AXO1-3, AXO2-1, AXO2-2, AXO2-3, AXO2-4, AXO2-5, AXO2-6, AXO2-8, AXO2-9, AXO3-1, AXO3-2}
Active Selections are selections that are stored in the user profile and marked as active. These selection can be expanded or actualized automatically by the system when an object is inserted in the system, removed from the system or modified in a way in which it is no more respondent to the selection.

10.2.1) AXMEDIS Tools shall reach objects into AXMEDIS Database by three different ways:
- By querying/searching using information filled in the form by the user;
- By browsing AXMEDIS Database categories, viz., showing AXMEDIS objects (stored into the database) grouped by significant metadata, such as browse all MS Word® ClipArts; MP3s and so on;
- By identifying, i.e., AXMEDIS Editor should obtain an AXMEDIS object from the database by some kind of unique identification (such as urn, path, unique database id, etc…);

10.2.2) AXMEDIS Tools (with user interface) shall show a technical query interface so that user shall be able to search content all over AXMEDIS network, AXMEDIS Database and within an object. Such interface should be as friendly as possible and it should show all possible technical and legal/DRM-related features which will be exploited within AXMEDIS. Moreover, the interface shall permit to save the query into the user profile. In such a way, users could reuse complex queries without time-loss to re-insert previously inserted query;
10.2.3) **AXMEDIS Query Support** serves several AXMEDIS tools such as:
- AXMEDIS Editor/Authoring tools;
- AXMEDIS Internal editors/viewer;
- AXMEDIS Workflow Manager;
- AXMEDIS Rule/Selection Editors (such as P&P, publication tools, loading tools, …)
- AXMEDIS Engines (such as Composition, Formatting, Publication Engines, …);

- AXMEDIS Other tools and plug-ins for AXMEDIS interaction with Selection of objects.

10.2.4) **AXMEDIS Query Support** is suitable for making technical query support, including aspects of DRM and aspects related to statistics on Action-Log. For example, you can select all Ramazzotti songs that have been played more than 1000 times in Europe;

10.2.5) **AXMEDIS Query Support** must provide support for the different activities that a user needs to work with; the most important activities are summarized in the following:

- provide support for making queries, mainly technical queries (activity mainly developed at the user interface level);
- store queries and their recovering for future reuse, that is an user interface with memory of the previous requests and a back end with caching capability;
- manage a personal repository of queries (realized at the user interface level);
- provide an user interface capable of adapting to the evolution of the AXMEDIS data format with a backend capable of translating "old queries" in the current format;
- user interface has to visualize results with some preview representation: this preview should be considered as a streaming activity from the point of view of right clearance
- user interface must be capable of presenting results sorted by different parameters such as: by license type and costs, by name, by match score or relevance when the information is present, by author, by location/provider, by size, by duration and in general it should be possible to order by the different fields present in the query;
- user interface shall have the capability of directly preview the multimedia contents for all the media for which a plug-in is provided or shall ask to the user to select the most appropriate viewer for the content under inspection;

10.2.6) **AXMEDIS Query Support** must be capable of making query both at level of simple AXMEDIS object and at the level of complex AXMEDIS objects. When complex objects are considered, query support must propagate the query to the components of a complex AXMEDIS object. In a more general sense query support must be capable of querying different sources of information and must be also open to other sources that the project must support if they appear:

- **AXMEDIS Database** (WP4.2.3: EXITECH, WP4.2.4: EXITECH): query support must be capable of querying the simple objects directly stored in the AXMEDIS database;
- Components of AXMEDIS objects (WP4.2.3: EXITECH, WP4.2.4: EXITECH): query support must be capable of recursively applies the query at the level of the objects embedded inside a complex or composite AXMEDIS object;
- **AXEPTool** distributed query in the P2P environment and database, interfacing the internal query with that of the P2P environment and reporting results (WP4.4.2: CRS4): the user interface of the query object must be capable of distributing the query to the distributed P2P B2B database and to collect the results;
- **Collector Engine**, query from AXMEDIS environment passing in deep into the **Crawler Results Integrated Database** the user interface of the query object must be capable of distributing the query to the Collector Engine and to collect the results; the results of the query will be not available outside the AXMEDIS Factory that hosts the Collector Engine;

10.2.7) **AXMEDIS Query Support** must be capable of receiving queries from Distribution channels, that are queries of the end users passing from the distribution channel and reaching the general AXMEDIS Database the backend of the query support must be simply interrogated by other application according to a standard predefined protocol;

10.2.8) An user can ask for a notification when new objects satisfy one of his/her query in order to identify if some new elements responding to the criteria appears in the repositories of AXMEDIS objects by means of Active Selections.

10.2.9) The results will be notified on the basis by a multi-channel distribution mechanism capable of managing email, SMS, and other media. The notification is performed with a predefined frequency on a predefined period of time (OPTIONAL);

10.2.10) **AXMEDIS Query support** will be capable of managing Selections;

10.2.11) Query Support has to allow querying on predefined fields (title, author, PAR,...) as well as full text search inside metadata fields.

10.2.12) Query Support User Interface has to allow the user to customize the order of fields in the list of possible fields for query.
10.2.13) Query Support has to support the following operators to build a query: and, or, not, like, contains...

10.3 Query support for clients

Actors (end users using an AXMEDIS compliant Client Viewer) can query one ore more AXMEDIS object. For this the Query Support is used, which is integrated in the Client Viewer.

The steps identified are:

1. Creating the query (different search characteristics)
2. Displaying the received results (including preview if possible)

The requirements for the query support are:
10.3.1) The identification of relevant queries (with different) search parameters for the relevant content types to support flexible query interfaces with the users.
10.3.2) The identification of suitable interface for creation of the queries with a focus on usability. (DESIRED)
10.3.3) The definition of a common interface with the Query Support to support different queries.
10.3.4) The identification of suitable user interface for presenting, navigating in, and selection of the query results with a focus on usability. (DESIRED)

10.4 Query Support for Distribution Channels

The only way for the distribution channel to interact with the AXMEDIS Query Support is via the Query Support Web service interface.

Therefore the interface has to be defined:

10.4.1) Definition of the interface with the Query Support for Clients including the communication protocol and the standard definition language for the service interface.

11 AXMEDIS AXEPTools for P2P distribution on B2B

11.1 AXEPTool for P2P on B2B

The AXEPTool is the application that allows business users to share a common environment in which AXMEDIS Objects can be published and loaded without the need of a centralized infrastructure which would be costly to maintain and a potential bottleneck in the whole production chain.

The AXEPTool for P2P on B2B must meet requirements divided into the following categories: **general requirements, discovery and connection to the AXMEDIS community, query to search AXMEDIS objects, loading remote AXMEDIS objects, publishing local AXMEDIS objects.**

11.1.1 General Requirements

11.1.1) AXMEDIS Objects should be published and loaded without the need of a centralized infrastructure which would be costly to maintain and a potential bottleneck in the whole production chain. Some functionalities of the network could be centralized wherever the centralisation allows better performance, security, and dramatic traffic reduction.

11.1.2) The messages exchanged between hosts in the P2P network should be transported in a way that the presence of firewalls and NATs do not compromise the network itself. Thus, HTTP tunnelling and other appropriated solutions will be designed and deployed whenever necessary.

11.1.3) The P2P network should be able to scale to a number of participants as large as 10^4 – 10^5

11.1.4) When a new object is published or an old object is updated into the AXEPTool Out database all the AXMEDIS peers that are the AXEPTools have to be informed.

11.1.5) When an AXEPTools realize that a new version of an object or that a new object satisfy a P2P Active Selection it has to be downloaded and pushed into the Input Database.

11.1.2 Discovery and Connection to the AXMEDIS Community

11.1.6) When the user launches the AXEPTool , it starts a discovery protocol to find on the network one or more participants in the AXMEDIS P2P network. Once the discovery protocol provide results the AXEPTool tries to establish one or more connections. When the connections are established the AXEPTool is ready to exchange messages with the other participants in the community.

11.1.7) The discovery/connection mechanism should be completely automated and assisted by the user only in case of unrecoverable failure.

11.1.8) Identities of local and remote host must be verified by means of digital signatures. That implies the involvement of a external certification/supervisor authority. Hosts without a certified identity ARE NOT allowed to join the AXMEDIS community.

11.1.3 Query to search AXMEDIS Objects

11.1.9) The AXEPTool must provide a GUI to produce technical queries. The fields in the query can be as complex as the metadata model used to describe AXMEDIS Objects. Thus depending on metadata, the GUI can change the fields presented to the user. Technical queries have to include:

i. details related to the description of components.
ii. costs and DRM rules, for each action a price, play, excerpts, redistribution, resizing, distribution on a different area, validity of the DRM rule and copyright coverage, etc.
iii. available languages if there is speaker speech or text.
iv. range of age suggested.
v. business model suggested.
vi. time of delivering delivery and availability in terms of first delivering, if not ready.
vii. type of delivery: on-line, offline, etc.…
viii. if on-line time of downloads or acquisition.
ix. cultural level.
x. subject, description of content with simple metadata.
xi. Textual description of subject and evolution.

11.1.10) A query produced by the user should be processed by participants in the P2P network. The AXEPTool will receive all query-hits relevant to a query. A query-hit is a datum containing all the information related to a remote AXMEDIS Object (a remote AXMEDIS Object is an AXMEDIS

Object stored in another organization and shared in the P2P AXMEDIS Community). Among the others, the query-hit should provide :

i. size of the content
ii. version where applicable
iii. identification of the owner
iv. identification of the source (in cases of download from multiple sources it is likely to have only one owner but more sources from which one can load the content). The identification of a source is mainly a way to establish a connection to the remote AXMEDIS Object and can be in form of URI (protocol://sourceaddress/resource)
v. verification of certified metadata, presently assigned to the AXEPTool Monitor as a duty

11.1.11) A query produced by the user can either provide immediate results or no results at all. In any case, the user should be keep informed about one or more of the followings events:

i. When a content already downloaded is modified and a new version is released
ii. When a content relevant to a previous search is published by someone in the P2P network
iii. When a content that potentially may be of interest for the user is published

11.1.12) Related to previous "user requirement" a query can be saved into a "**Active Query Pool**". An Active Query is periodically resent by the AXEPTool with a given period.

11.1.4 Loading remote AXMEDIS Objects from the P2P Network

11.1.13) Once a query is processed by the AXMEDIS P2P network, the user receives a list of query-hits. The user should be able to select one or more objects from the list and start the download.

11.1.14) An object should be downloaded simultaneously from more than one source if multiple sources are sharing the object.

11.1.15) The user should be able to start, suspend, cancel and resume the download of an object. Download are thus organized in sessions.

11.1.16) For any complete downloading session, an Active Query MAY be created and saved in order to be notified when a new release of the same object becomes available. If a new release is available, the download session for that object is resumed from the beginning and a new copy of the object is downloaded from the P2P sources.

11.1.17) Objects are loaded from the P2P network in the **AXEPTool In AXMEDIS Database** and they can be moved to the **AXMEDIS Database** manually by the user or automatically by the **Loading Tool Engine of AXEPTool.**

11.1.18) An object moved into the **AXMEDIS Database** becomes part of the business operations and digital rights of the object owner must be enforced.

11.1.19) The user should be able to configure the amount of bandwidth allocated to downloads.

11.1.5 Publishing Local AXMEDIS Objects

11.1.20) The user can make a selection of objects stored in the AXMEDIS Database to be published in the P2P network. Selected objects are moved to the **AXEPTool Out Database** and from that moment on they are available to other participants in the P2P network.

11.1.21) When the local AXEPTool receives a query from the AXMEDIS P2P network, it verifies whether or not objects stored in **AXEPTool Out AXMEDIS Database** match the query. In case of successful matching, the AXEPTool sends to the network a message containing one or more query hits. The implementation of such a functionality should rely on the **AXMEDIS Query Support Component.**

11.1.22) The local AXEPTool can be asked from another participant in the P2P network to upload an AXMEDIS object or a block of an AXMEDIS object stored in the **AXEPTool Out AXMEDIS Database**.

11.1.23) The user should be able to configure the amount of bandwidth allocated to uploads.

11.2 Publication and loading AXMEDIS Objects of AXEPTool

11.2.1) AXMEDIS objects loaded from other AXMEDIS participants in the P2P network can be played/viewed by the user by means of appropriate players/editors. AXMEDIS objects considered relevant to the internal business are moved into the private **AXMEDIS Database.**

a. The **Loading Tool Engine of AXEPTool** perform this task autonomously selecting content identified in the P2P tool and loading it in the AXMEDIS Database (WP4.4.4: CRS4, WP5.5.2: CRS4)
b. The **Loading Tool Engine of AXEPTool** performs according a set of rules which can be:
    i. directly edited by the user
    ii. inferred by user behaviours.

11.2.2) AXMEDIS objects stored in the private **AXMEDIS Database** could be published and share in the P2P network.

a. The **Publication Tool Engine of AXEPTool** publishes AXMEDIS objects moving them to the **AXEPTool Out Database** where they are available to all P2P network participants.
b. The **Publication Tool Engine of AXEPTool** performs this task autonomously according a set of rules that can be either:
    i. Directly edited by the user
    ii. Inferred by user behaviours.
c. AXMEDIS objects that are non-protected must be protected before their publication invoking the services of the **Protection Tool Engine**.

11.2.3) Workflow in the AXEPTool. AXMEDIS objects may be part of a higher level work flow. Thus, some operations on the object could be required in order to achieve a goal in a workflow system. Information about workflow can be coupled/associated/embedded in the AXMEDIS objects. Depending on these workflow information the AXEPTool can:

a. Search and download an object in the P2P network
b. Load an object from the **AXEPTool In AXMEDIS Database** into the **AXMEDIS Database**
c. Publish an object to the **AXEPTool Out AXMEDIS Database** making it available to the other P2P participants

12 Programme and Publication Engine Tools

The actor (in this case a Programme Producer/manager) can use the GUI of the P&P to interact with the Query Support, and to make selections from the results of the AXMEDIS Query Support to schedule some programmes (e.g. day, week, month, year) with the following rules:

- WHAT: the AXMEDIS object of interest
- WHERE: destination channel, where to publish e.g. iTV or kiosk or other, and "where" profile
- WHEN: date, time, slot, duration
- HOW: direct transfer, reference or require formatting engine

The representation of the above rules could be represented using XML.

The draft programme can be saved and reloaded from a P&P repository. Programme can be activated, once it is ready, by the actor using the GUI.

The active engine is continuous running module accessing the system clock to process a list of "activated" programmes, which consists of "rules" to make available AXMEDIS objects to the specified destination channels at the correct time, taking into account the transfer time.

In short, there are three modes of operation in this area:

- Create/change: the actor uses a GUI to create some programmes using the AXMEDIS Query Support to browse the AXMEDIS database, to select, to schedule, and to return with a list of relevant objects
- Activate: the actor activates a set of programmes from the above created and saved programmes
- Execute: The active engine looks at the given tasks and distribute the programme and relevant objects using the Distribution Server.

"On Demand" formatting process is to be performed by the Active P&P Engine before the actual AXMEDIS object is to be delivered to the distribution server. A check has to be carried out to verify if the object in question is "compatible" with the destination profile. If the profile of the AXMEDIS object is incompatible with the destination profile, the P&P Engine interfaces with the Formatting Engine to provide the appropriate processing on the object. For example, the AXMEDIS object in the database could be for HDTV and the actor has requested it to be used on a PDA. The Programme and Publication Engine provides the Formatting engine information on WHAT (reference to the AXMEDIS object) and the destination profile.

The Formatting engine is expected to

- Take a copy of the AXMEDIS object
- Process/convert the object so that it is compatible to the destination profile
- Create a new AXMEDIS object and return its ID to the P&P Engine

P&P Editor requires

12.1.1.1) A GUI interface

12.1.1.2) to work in respect of the AXMEDIS Data Model Schema;

12.1.1.3) connection with Query Support to use the services provided in order to send query and to receive results

- Expect information on DRM results for eligibility into the programme schedule
- Not to include results in selection from the black list of AXCS

12.1.1.4) Definition of the Programme (in XML to contain a list of selected AXMEDIS objects)

12.1.1.5) Connection to the P&P Repository to save and retrieve programme (including drafts). The rules collection is a log file with all the past rules that can be reused with or without modification for future usage

12.1.1.6) Recovering of a programme

12.1.1.7) Interface with AXMEDIS Workflow Manager by using the appropriate workflow Plug In

12.1.1.8) Connection to P&P Engine [OPTIONAL]

P&P Editor requires its GUI interface to allow

12.1.1.9) the actor to select object from the results of the Query Support

12.1.1.10) the actor to create, save, remove and edit/schedule some programe with the following rules:

- WHAT: the AXMEDIS object of interest
- WHERE: destination channel, where to publish e.g. iTV or kiosk or other, and "where" profile
- WHEN: date, time, slot, duration
- HOW: direct transfer, reference or require formatting engine

12.1.1.11) the actor to "activate" one or more program

12.1.1.12) the actor to do a trail pre-activation of a program, to simulate, test and be prepared

12.1.1.13) the actor can remove an active program if the active program has not been delivered to the distribution server.

Program and Publication Engine tools for enabling content on demand

P&P Engine requires

12.1.1.14) Access to a correct system clock

12.1.1.15) Connection to the Distribution Engine to distribute the programme and all related objects in time for the programme consumption

12.1.1.16) Direct interface with the Active Publication Rules

12.1.1.17) Direct interface with Database Manager to obtain the object

12.1.1.18) Channel and distributor profile: Access to the profile of the Distribution Engine (for estimated delivery time)

12.1.1.19) Update content daily or weekly according to the schedule and to update content incrementally to reduce the effort and workload (Not sure if this is relevant for this section but it should be more relevant for Publication of the AXEPTool) [OPTIONAL]

12.1.1.20) P&P Engine requires connection to the formatting engine and the Formatting engine is expected to

- Take a copy of the AXMEDIS object;
- Process/convert the object so that it is compatible to the destination profile
- Return the new ID reference of the formatted object

12.1.1.21) Interface with AXMEDIS Workflow Manager by using the appropriate workflow Plug In

13 AXMEDIS Protection Tools

13.1 AXMEDIS Object ID Generator

AXMEDIS Object ID Generator has to:

13.1.1) produce AXMEDIS Object ID with the following features:

- every Object ID is associated to one and only one AXMEDIS Object (unique ID in the whole system)
- every AXMEDIS Object is referred by one and only one AXMEDIS Object ID
- an ID is associated to a specific Object during its whole life-cycle and this association remains active even if the Object is updated or removed
- the Object ID should be produced on the basis of the Content submitted by a Content Creator

Example: an Audio Producer has to insert in the AXMEDIS system a new audio content recorded in his studio; he submits as Content Creator this resource to obtain a valid Object ID in order to create a new AXMEDIS Object for his audio content. The Object ID generator should use the audio content (audio features i.e. tempo, energy distribution) to produce the new ID

13.1.2) allow the generation of Object ID on the basis of a request performed by a Content Creator

13.1.3) support the retrieving of a list which reports Certified Object Creators

13.1.4) support the retrieving of a list which reports all the object IDs with the associated Content Creators

13.1.5) be able to produce new IDs on-demand within an acceptable period of time

13.2 AXMEDIS Certifier and Supervisor

AXMEDIS Certifier and Supervisor is the AXMEDIS certification authority that provides services for Content Providers and Distributors and verify the correctness of the Clients (as "Clients" are intended also software agents, not only physics or legal people).

AXMEDIS Certifier and Supervisor database structure should be designed considering the distribution of services provided with the aim of scalable architecture capable of supporting a huge amount of transactions per second. These transactions can be of various kinds:

- requests of key
- requests of verification (tool, device, identity, etc)
- requests of log reports
- registrations

The architecture of AXMEDIS Certifier and Supervisor should be flexible enough to support centralised Certification and Supervision as well as distributed. In the centralised version only one AXMEDIS Certifier and Supervisor is set up for the whole network, in the other case each distributor and P2P network may have a distinct Certifier and Supervisor. They could be hierarchically organised or stand alone, limiting in this case the navigation of content.

The architecture of the AXMEDIS Certifier and Supervisor should be scalable and the internal services should be well separable to cope with large traffic for the certification and supervision and to allow the decentralisation of some of the services in an easy and reconfigurable manner.

13.2.1 General requirements

13.2.1) All AXMEDIS users must be registered by AXCS (author, clearing house, collective management society, content provider, end-user, marketer, mediation service provider, metadata service provider, performer, producer, publisher, reseller, resolution service provider, retailer, etc);

13.2.2) Multiple registration in the AXMEDIS database of the same user should be avoided unless the user provide enough information to differentiate his role in AXMEDIS

Example: John Smith should be registered twice if it accesses AXMEDIS inside his company (as Content author or integrator) and at home as an end-user (consuming content on his own devices).

13.2.3) All AXMEDIS tools must be registered: editor, composition engine, formatting engine, protection tool engine, etc. This activity is generally referred as "Off-line registration". This information has to be included in the AXCS database.

Example: A software producer builds a player for AXMEDIS Objects. If he wants his player to become an AXMEDIS player, he has to register it in the AXMEDIS system. Only after "Off-line registration" the player can be used in AXMEDIS system to play AXMEDIS Objects.

13.2.4) All AXMEDIS tool must be certified by AXCS. Certification activity is needed to avoid tool corruption. It involve the specified tool (the single installation of the tool) and it must be performed the first time that tool is used.
Example: A consumer wants to use an AXMEDIS player to play AXMEDIS Objects. He has to get it from the software producer and then, after its installation, the player has to be "Certified" in AXMEDIS.

The AXCS has to
13.2.5) "verify the certification of a tool". This verification occurs every time an action over an AXMEDIS Object is performed. Only certified tools can use AXMEDIS Objects.
13.2.6) "Authenticate" every AXMEDIS tool. In this phase the AXCS verifies the tool certification in order to avoid tool corruption. The "Authentication" can occur at a fixed time (for example every n minutes) or in any convenient way for the specific context (type of device, type of connection etc).
13.2.7) be accessible by users, devices, tools, only via PMS (except for the registration process which is accessible by distributors)
13.2.8) manage and supervise the registration process (according to the other subject involved)
13.2.9) support every communication over secure channels (confidentiality, authentication, integrity) apart from reporting activities of anonymous information (statistical analysis of actions);
13.2.10) manage protection keys associated to AXMEDIS objects (needed for unprotection of the content)
13.2.11) is/are the only protection keys holders. The protection keys are held only by AXCS that distribute them (via PMS servers) to all other subjects, which should have the rights to get them.
13.2.12) manage lists of OID with their protection information (key and others aspects)
13.2.13) record in an Action-Log all the actions (uses) performed on an AXMEDIS Object.
13.2.14) support collection of Action-Logs in both on-line and off-line operation of the AXMEDIS tools; Each time a tool connects and some off-line actions have been performed must be re-synchronised in order to check consistency of the tool and to register the off-line Action-Logs.
13.2.15) support the consultation to Action-Log performed by Distributor, Creator and Collecting Society
13.2.16) support the generation of Marketing reports with anonymous statistics.
Examples:
- Number of video viewed in a country;
- Number of hard-rock songs played in country;
- Mean length of video downloaded in a country or region;
- Mean size of video downloaded in a country or region;

13.2.17) support the generation of Administrative reports for accounting systems requested by Distributor, Creator and Collecting Society regarding only their respective objects (i.e. the objects under their management)
Example: A Distributor can access all the Action-Logs concerning his distributed AXMEDIS Object, but not the Action-Logs concerning other Objects. He can also collect on his own CMS/accounting system all the data related to the Action-Log that involve AXMEDIS objects in his catalogue
13.2.18) grant that only the authorized entities can access Action-Logs
13.2.19) produce different kinds of IDs such as AXCID, AXDID, AXUID, AXTID; in general it produces all the ID used to identify an object, a subject, a tool or anything else univocally in the whole system
13.2.20) be capable of blocking the access to the system for a single tool, device or a category of tools, if their security has been compromised
13.2.21) be capable of blocking the access to the system for a user in order to stop allowing him/her to use the AXMEDIS objects: this does not involve the tool or device used by the blocked user
Example: In a mediateque a user that uses a PC on the mediateque LAN try to perform a copyrights violation: that user must be blocked accessing the system but the PC can be used by all other mediateque users.
13.2.22) be capable of revoking a set of AXMEDIS Licenses
13.2.23) be designed to be manageable by a Distributor
Example: a Distributor can have (and use) his own AXCS to control his content over a specific distribution channel; a Collecting Society can access to AXCS services managed by a third party (a service provider).

13.2.24) support hierarchical connection to a Super AXCS that collect general information from all AXCS
13.2.25) support query and response about collected information to other ACXSs

13.3 Protection Tool Engine

Protection Tool Engine involves research in the following fields:

- Innovative methods to apply protection on authored/compounded AXMEDIS objects, allowing customisable DRM information.
- Analysis of the best technologies to avoid illegitimate usage of the produced content like cryptography for authentication and secure transmission.
- Secure communication framework between content producer/consumer in a unified trusted domain.
- Safe architecture for the authentication of clients to the AXMEDIS Certifier and Supervisor in order to allow content consumption reports and to be robust against terminals, which aim to violate DRM rules.
- Allow protection data to be encapsulated in the AXMEDIS object together with other information about DRM and licensing.

On the basis of these innovative results Protection Tool Engine will be a service for:
13.3.1) protecting content, single as well as set of objects (selections, collection, etc.),
13.3.2) maintaining trace of established collections and actions to perform them again automatically when needed,
13.3.3) accepting protection commands from other tools,
13.3.4) working and managing the information contained in the Accounting Log and public log,
13.3.5) interacting with the Accounting Managing and Reporting tool.
13.3.6) encryption of content,
13.3.7) converting AXMEDIS non protected objects in AXMEDIS protected objects,
13.3.8) requesting the key to the AXMEDIS Certifier and Supervisor notifying at the same time that a new object is published in its protected mode with related administrative information: content type, owner, identification, etc...,
13.3.9) Writing protection rules, possibly visually
13.3.10) Printing protection rules in a suitable manner
13.3.11) Definition of rules for protection selected set of objects
13.3.12) Integration of DRM rules models into the database of DRM-licenses. Once a new license or license model is created by the Protection Tool Editor it has to be saved into the AXMEDIS Database (see specific section for storing this information)
13.3.13) Exploitation of the **DRM Support**

The MPEG-IPMP part into the MPEG21 standard will be considered and analysed in deep. During the project the innovative methods and architecture will contribute on the development of the standard itself
Protection tool engine should make use of some of the tools described in section 13.6, DRM support

13.4 Accounting Manager and Reporting Tools

Accounting managing and reporting tool should collect information from AXMEDIS Certifier and Supervisor and Administrative Information Integrator and log these data in Account/public log database.

13.4.1) DRM modelling, modelling licensing. Study Rights information models
13.4.2) Modelling database for licensing and transaction tracking
13.4.3) Communicating with the AXMEDIS Certifier and Supervisor to get specific information related to the transactions performed on the objects of a given content provider or aggregator.
13.4.4) Storing into the AXMEDIS database the transactions, matching who has done the action on what;
13.4.5) Listing clients of the provider, with the history of their transactions, etc.
13.4.6) Listing objects for which the user has authorization
13.4.7) Listing all clients
13.4.8) Listing all distributors and higher level
13.4.9) Generate any kind of report among those for which data are present and accessible to the user who requested the report.

13.4.10) Report and statistic analysis data generation
13.4.11) Statistic analysis of the content usage, very useful for tuning the service and the structure of the ready to use proposed objects.
13.4.12) Compute statistics about the access, utilisation, distribution etc. of the AXMEDIS objects based on the event reports previously generated

13.5 Administrative Information Integrator

This is a set of tools for making available the administrative information received from the AXMEDIS certifier and supervisor and collected into the AXMEDIS database (managed by the Accounting Managing and Reporting tool) into the database of the Content Providers in their administrative form. For example, to bring administrative information into XAURA, HP CMS, OD2 CMS, etc. For this purpose, in WP 9.1 several Administrative Information Integrators will be realised. The idea is to find a common basis among them and to customise the application according to the needs and protocols to interact with the different CMSs.

The Administrative Information Integrator shall:
13.5.1) interface with different CMS technology;
13.5.2) store administrative information into the Content Provider database.
13.5.3) communicate with the AXDB to get administrative information related to a specific Content Provider.
13.5.4) guarantee privacy of sensitive data via protection mechanisms.

13.6 Protection Manager Support/Server

The Protection Manager Support (PMS) shall
13.6.1) be able to recover the information needed to properly manage a protected object
13.6.2) be invoked by the AXMEDIS Object Manager should allows only the granted actions performed by a specific user on a given resource (in a proper context)
13.6.3) not be responsible to perform the granted action on the object model, while it shall communicate on a safe channel the secret information to access to the protected content
13.6.4) work in "user session": as soon as the user has logged himself and his identity has been validated the PMS can support protected manipulation of the object by such user (i.e. gather user licences, checking for some basic rights)
13.6.5) operate on a specific AXMEDIS object and shall examine every requested action in order to control if the needed rights are acquired in some of the licenses
13.6.6) perform a query on its license server which is responsible to match results in the licenses set
13.6.7) get the secret information (1 ore more decryption keys) from the AXMEDIS Certifier and Supervisor service, which are delivered on a safe channel
13.6.8) get the status information of a specific AXMEDIS Object from a trusted entity in order to fulfill the conditions, which can be output of a right query. For example a user can perform an action a limited number of times, the counter of the actually performed actions stored in a separated trusted entity also to consider same action performed on different devices
13.6.9) be capable of renew its own protection method in order to produce new secure object after a succeeded attack to a protection method
13.6.10) be capable of detect a succeeded attack in order to persecute the attacker (or to be excluded from the distribution) and to operate the renewal
13.6.11) be referred by different AXMEDIX Object Manager instance placed in editor, players, plug-ins and must be recoverable as a service
13.6.12) be divided in two communicating part in order to build the secure communication between who prepare queries for the rights and the part which answer to such queries
13.6.13) be interoperable and portable
13.6.14) run as service especially when it is required by low capacity devices (i.e. PDA) and its client shall be able to execute such devices
13.6.15) provide the functionality to include protection related information (IPMP) into AXMEDIS objects
13.6.16) Add the protection information and/or license to governed parts of an AXMEDIS object shall not affect the ungoverned parts of this object.

13.6.17) be able to recognize IPMP information inserted into an AXMEDIS object
13.6.18) be possible to associate licenses with the target of their governance
13.6.19) be specified the means to indicate in an AXMEDIS object:
13.6.20) present the location from which the applicable license may be retrieved
13.6.21) provide a method or process for acquiring the applicable license
13.6.22) support Protection Information (such as the IPMP Info) expressions shall support some of the below information:

- Expression of the capabilities of a Peer
- Expression of different protection mechanism applying to the AXMEDIS Object: Fingerprinting, watermarking, digital seal, digital seal.

13.6.23) support operations in connected and unconnected environments.

13.6.2 DRM Support

DRM support involves research in the following fields:

- Analysis of existing standards for the representation of rights expressions, such as MPEG-21 REL and ODRL. The analysis will be used for representing rights and for license creation for new content and/or cross-media content. In the last case the rights of the cross-media content should be derived from the source content rights. Once the licenses are created, they can be validated and associated/extracted to/from content.
  On the other hand, users may be authorised according to licenses. To do so, we can use license interpretation or MPEG-21 authorisation model. For the authorisation model it is needed to create its different components, authorisation requested, authorisation story and authoriser. User authorisation also involves the integration with the Rights Data Dictionary (RDD).
  Other desired functionalities related to licenses are the content license migration between user domain devices and the integration of rights into a license database.
- DRM Interoperability, which involves the analysis of the problems arising in the content distribution via Internet including DRM control and support, interoperability between different systems, for instance windows media and MPEG 21, security protocols and quality of service, access devices, etc. A Rights Expression Translator will be developed. This tool would allow us to translate a subset of validated licenses (a profile) from a REL into another (for instance, from MPEG-21 REL to ODRL), providing interoperability.
- DRM for mobile, which involves the study of specificities of REL for mobile environments, that could lead to an implementation of a mobile profile for REL.
- Modelling DRM rules.

The research above involves the development of the corresponding tools that provide the functionalities detailed below:
13.6.24) License Server:

1. License Creation
2. License Validation
3. License Storage and retrieval from the license database
4. Navigation of licensing information

13.6.25) Authorization Server:

1. License extraction from the content
2. License retrieval from the license database.

User authorization based on rights expressions and constraints (time, etc.) using RDD term genealogy. The authorization server will answer in two ways: true (i.e. user is authorized) or false. In the latter case, the authorization server will explain the reasons why the user is not authorized.
13.6.28) Rights expression translator: translates rights among different rights expression languages providing interoperability. This translation is done under certain conditions, as, in general, it is not possible to translate any rights expression expressed in one rights language to an equivalent rights expression expressed in other rights language.
The research to be done also involves:
13.6.29) Formal model of contracts and relationships with DRM model, including storage

13.6.30) DRM modelling, modelling licensing. Study Rights information models

13.7 Encryption/Decryption Support

The encryption/decryption support should allow the encryption and decryption of the AXMEDIS objects for permitting their use by the AXMEDIS tools (mainly AXMEDIS editor and AXMEDIS viewer).

When AXMEDIS editor creates an AXMEDIS object, the user that creates it may want the object to be encrypted. In this case, a symmetric key should be generated in order to encrypt/decrypt AXMEDIS object. Then, the information regarding encryption of the new AXMEDIS object has to be stored: Encryption algorithm used to encrypt the content and the symmetric key for encrypting/decrypting the object (protected with asymmetric ciphering techniques).

When an AXMEDIS user wants to make use of an encrypted AXMEDIS object, he must have permission to do it. This permission will be controlled by means of the DRM support described on section 9.9. In case the user has permission, the user receives the key for decrypting the object in a secure way (for instance, the key could be ciphered with the public key of the user) and inserted into the license giving permissions to use the object.

The encryption /decryption support could be summarised in the following requirements:
13.7.1) Encryption of AXMEDIS object with a symmetric key
13.7.2) Decryption of AXMEDIS object with a symmetric key
13.7.3) Storage of encryption/decryption information (cryptographic algorithm, keys, etc)
13.7.4) Encryption of symmetric key of AXMEDIS object using public key techniques
13.7.5) Decryption of symmetric key of AXMEDIS object using public key techniques

13.8 Fingerprint Extractor Plug-ins for extracting features

As described in section 9.4 two different types of descriptors can be distinguished (fingerprints and content descriptors). Content descriptors and related extraction algorithms are addressed in section 9.4. This section is focused on fingerprinting issues. Within the AXMEDIS framework fingerprinting technologies are important to ensure content usage according to the licensing condition. As data within AXMEDIS is distributed via a P2P-network, the fingerprinting technology observes upload/download on the P2P networks

Thus, it is very important to identify various processing operation, which are relevant according to the applications. These processing operations must not influence the calculated fingerprint or the related identification process.

Main requirements:
13.8.1) Definition of an unique interface, which allows the integration of different technologies.
13.8.2) Different types of content have to be processed, including images, videos, audio, and documents.
13.8.3) Specification of the applications of FP within AXMEDIS and the derived specifications of requirement on the feature extraction and processing as well as on the content descriptors. Additionally, relevant operations have to be identified and classified according to their potential influence on the FP.
13.8.4) Algorithm design has to consider complexity. (Also here, scalability is not a requirement for the calculation of the fingerprint.) (DESIRED)
13.8.5) The fingerprints have to be designed considering (DESIRED):
- The maximum number of content that can be identified, which affects the fingerprint size.
- The minimum segment size necessary for calculation of the identifier (granularity).
- Error rates (RR, FP, FN) should to be chosen according to the application.
- Different processing operations (including unintentional and malicious attacks) and their influence on the identification and verification/authentication.

13.8.6) Requirements on the robustness of fingerprinting have to consider typical processing operations like (DESIRED)
- lossy compression,

- change of sample and resolution and other technical parameters within AXMEDIS (digital item adaptation),
- malicious attacks based, e.g.typical video or audio processing.

13.8.7) Forensic survival for legal purposes should be analysed.(OPTIONAL)

Requirements for text fingerprinting

13.8.8) Fingerprint must be independent from the file format

13.8.9) Fingerprint depends only on textual information (sequences of characters, words, punctuation) and it is independent from text formatting (bold, italics, tabs, font, size etc.)

13.8.10) Identification of original text, same fingerprint for identical documents.

13.8.11) Fingerprint allows to determine a degree of possible plagiarism between two texts in terms of similarity (OPTIONAL)

Requirements for spoken/vocal audio fingerprinting

13.8.12) Fingerprint must be independent from the file format

13.8.13) Identification of original digital resource by mean of fingerprinting

13.8.14) Identification of modified audio by means of:

- estimation of compatible fingerprint values on compressed/resampled digital resources.
- detection of audio files that include portions of the original

14 AXMEDIS Player

Although AXMEDIS focuses on content production, a reduced number of players (and MPEG-21 terminals) will be implemented in order to provide to the AXMEDIS Framework tools to be downloaded by end users to play back AXMEDIS Objects in cases when the target user is a consumer and especially when target platforms are such kind of devices that an Editor or other kind of sophisticated tools is not supported or envisaged due to either computational, or functional or display capabilities: such kind of tools may include PDAs, Mobiles, devices with embedded Multimedia DSP processors, etc. In the following requirements for PC and similar platforms are reported (first phase) and then requirements for a few mobile or lightweight devices which may be selected for the second phase (WP 4.1.4).

14.1 General requirements

As a subset in functionality of an Editor, a Player must comply with some general requirements which are inherited from the Editor. These requirements are:

14.1.1) Supporting MPEG-21 standard plus additions for AXMEDIS
14.1.2) Loading AXMEDIS objects from file and from the database
14.1.3) Loading in XML and in binary encoded/encrypted mode
14.1.4) Supporting license policies, business models, distribution channels etc. available from the AXMEDIS framework for a given platform
14.1.5) Respecting protection rules of AXMEDIS objects and components
14.1.6) Managing the registration of the user access, authentication, user id and password

Additional general requirements for any Player are:

14.1.7) (DESIRED) Managing user profiles. A profile will be a container of user preferences, AXMEDIS Player settings, appearances, etc…;
14.1.8) (DESIRED) Providing trace of the most recent opened AXMEDIS Objects
14.1.9) (DESIRED) Providing access management in form of fast-forward playback and track jump

14.2 AXMEDIS Player on PC, Tablet PC

14.2.1 Tablet PC vs. PC

Tablet PC are mostly like PC with the following specific features:

- Tablet PC have about twice times less computing power than PC (smaller processors)
- Tablet PC have limited screen size; consider a maximum of 1024x768; this has impact on GUI design;
- Tablet PC uses a Pen as pointing device instead of a mouse; this has impact on GUI design
- Tablet PC are “handwriting enabled”; this provides extra possibilities compared to a PC and does not imply constraints on the player design; the possible use of such feature would make the player more platform dependant which is not desirable;

Thus, the requirements on the player on PC and the requirements on the player on Tablet PC are mostly the same. Where it is not the case, it is clearly indicated.
In the following parts, we simply use the term “player” to speak about both Player on PC and Player on Tablet PC.

14.2.2 Platforms

The widely used OS on Tablet PC is Windows XP for Tablet PC, which is the same as XP *plus* some functionalities dedicated to the Pen device management, handwriting management etc.
Therefore we can consider that an AXMEDIS player running under Windows XP is good for running on most Tablet PCs.
Then requirements on platforms are:

14.2.1) The AXMEDIS Player must run at least on Windows XP Platforms
14.2.2) (DESIRED) The AXMEDIS Player should run on other Windows Platforms
14.2.3) The AXMEDIS Player must be written with portability to Linux and Mac OS in mind

14.2.4) (DESIRED) The AXMEDIS Player should be easy to install by the end user; care should be taken in avoiding the use of libraries or external software requiring (due to their licenses) a specific installation procedure. Dependencies to external libraries/software should be minimized

14.2.3 GUI

14.2.5) The AXMEDIS Player must follow usual GUI design guidelines in order to be user-friendly and easy to use

14.2.6) AXMEDIS Player must provide GUI for the most important AXMEDIS generic features, e.g. the AXMEDIS Player must provide appropriate dialogs to allow the user to log-in into the AXMEDIS system

14.2.7) (DESIRED) The AXMEDIS Player GUI should reflect Rights and Functions available on the displayed AXMEDIS Objects. For example, if copy/paste is not allowed on the AXMEDIS player, corresponding GUI controls should reflect that fact.

14.2.8) (DESIRED) The Player's GUI should adapt to the TYPE of displayed content and functionalities available on such content. E.g. a video require a different set of button than an HTML document.

14.2.9) (OPTIONAL) GUI should be designed to be usable at different screen definitions, including 1024x768

14.2.10) (OPTIONAL) GUI should avoid small controls (buttons etc.) in order to be more usable on a Tablet PC

14.2.11) (OPTIONAL) GUI should conform to the look and feel that has been adopted for other potential AXMEDIS software available to the End User;

14.2.12) The Player's GUI must support Internationalization. At least English language must be supported in its first versions.

14.2.4 Functionality

14.2.13) Player must be able to use protected content

14.2.14) Player must be able to display/playback a representative subset of content formats provided by the partners for the demonstrators, trough plugin/external modules/external libraries

14.2.15) The Player should have a playback function allowing blind access to stored "titles". Thus the user cannot access directly to the digital content (OPTIONAL)

14.2.16) Player must allow external viewers to be used for content playback/view. External viewers should use AXMEDIS plug-ins to guarantee the protection level and the content object access.

14.2.17) Player must allow using/activating of internal viewers/players to allow simple changing and visualization of the most used non-proprietary media formats

14.2.18) The Player should have the possibility to start more playback instances of a viewer/player allowing local adaptation if necessary for resources overload (OPTIONAL).

Internal Viewers shall

14.2.19) be invoked by the AXMEDIS Player;

14.2.20) allow managing the digital resource by respecting the DRM and protection mechanism associated with the resource;

14.2.21) allow viewing the digital resource if it is a document or an image;

14.2.22) allow playing the digital resource if it is a video, an audio or an animation, or a multimedia resource, etc.;

14.2.23) allow manipulating the digital resource by means of very basic manipulation functions. For example zooming in or out the image resource, stop/play/pause, etc.

14.2.24) (DESIRED) Player should be able to log a representative set of user action to the AXMEDIS Log service

14.2.25) The Player must understand and be able to render a representative set of presentation rules contained in a Composite AXMEDIS Object

14.2.26) The Player must provide a minimal, representative set of functions available from AXMEDIS Objects

Example:

- an AXMEDIS Object may embed multiple AXMEDIS objects and provide information on the way to display some of these objects relative to the others: AXMEDIS player should be able to use

these information and play content accordingly. Otherwise said: the AXOM provides APIs, a representative set of this APIs should be exploited by the player, and reflected by its GUI;

14.2.27) (OPTIONAL) Annotation. The end user is able to add personal annotations to content by using the Player. The annotations can be text, graphics, recorded voice etc. that refer to content. The annotations do not modify the original content. The annotations are stored locally and separated from the content. The Player has the capacity to associate the annotations with the content so that the user knows to which content the annotations belong. The user can play the content and take the notes at the same time. When the content is a moving picture or a song the Player can add time stamps to the annotations. The Player can also handle the use of spatial stamps to accompany the user annotations. A spatial stamp could be used to associate an annotation to a certain position of a still picture

In addition, a Player for PC/Tablet PC may:

14.2.28) Permit to add annotations and comments by means of graphical actions such as drag-and-drop, contextual menus, etc (OPTIONAL)

14.2.29) Support plug-ins to show and manage specific media types that are to be reasonably expected for these elements, given the different nature that annotations and comments may have. (OPTIONAL)

14.2.30) Allow saving annotations to a file. (OPTIONAL)

14.2.5 Other requirements

14.2.31) Player must be able to display composite content like if they were a unique resource; e.g. an AXMEDIS Object composed by two object of type HTML and flash must be displayed as one object, in a single window

14.2.32) (DESIRED) Player should be able to perform correctly on low end computers or on Tablet PC

14.2.33) (OPTIONAL) Player should implement some APIs allowing it to be integrated into a host application (e.g. Netscape plug-in API, ActiveX API etc.)

14.2.34) (OPTIONAL) **Resources playback management**: The Player should be able to smartly manage the resources playbacks, in the case where the user plays multiple resources at the same time. It should be able to, for example, stop the playback of hidden resources.

14.2.6 AXMEDIS Player as MPEG-21 Terminal

MPEG-21 Terminal Requirements are detailed in following sections. AXMEDIS encapsulate some parts of MPEG-21, making them available through AXMEDIS APIs.

14.2.35) (OPTIONAL) AXMEDIS Player should implement MPEG-21 engines corresponding to the subsets of DIA, DIM etc. available from AXMEDIS Objects

14.2.7 Mozilla based AXMEDIS Player for PC and Tablet PC

When speaking about *Mozilla*, we are in fact speaking about the *Mozilla Framework* which is a set of tools, languages an APIs allowing the development of cross-platform GUI, document oriented applications. Here is not the place to enter in details into the Mozilla technologies, however a quick summary is needed before introducing requirements implied by using these technologies to develop an AXMEDIS viewer.

Several components are constituting the Framework :

- XUL, XBL are XML languages used to describe application GUIs
- CSS is used to manage the GUI look & feel and aspect
- Javascript is the language used as a glue, to provide the logic of the application, and to connect GUI to the application core
- XPCOM is a C++ Cross-Platform Component Model, much like Microsoft's COM. Mozilla's rendering engine and most of the APIs provided by the Framework are in fact XPCOM components. Adding capacities to the Mozilla Framework can be done by developing new XPCOM components, either in C++, or in Javascript.
- The old Netscape Plug-in API, still in use in all Web Browsers, is available to Mozilla to allow it to render content trough other rendering tools, and to basically interact with these rendering tool. A new Plug-in API is being designed by the Mozilla team, but its status is not yet stable. This new API is aimed at increasing the possible interactions between the plugin and its host, thus increasing the integration between content rendered by the plugin and content natively rendered.

By default, the Framework provides APIs to manage internet connections, to manipulate XML through DOM, transform XML with XSLT, work with the File System, unzip files, manipulate RDF data models etc. It can natively render the following contents: HTML, XHTML, XUL, XML, most image formats (GIF, JPEG, PNG etc.), SVG is quite correctly supported, MathML, WAV sounds, plain text etc. Some well know rendering plug-ins are: Macromedia Flash; Adobe PDF Viewer; most Video & Audio Players etc.

Being able to develop a Mozilla based AXMEDIS viewer requires that:

14.2.36) AXOM APIs must be available through one or more Mozilla XPCOM component(s)

14.2.37) (DESIRED) A specific Mozilla distribution should be constructed for the AXMEDIS player, to avoid unexpected interaction between AXMEDIS Player and user's default Mozilla Browser.

14.2.38) (DESIRED) The choice of accepted content for the demonstrators should take the existence or inexistence of corresponding plug-in into account

14.2.39) A Mozilla version with an odd second digit must be used as the base version for the player development. Such versions do benefit of security corrections during their lifetime.

14.3 AXMEDIS Player on PDA

14.3.1) The AXMEDIS Player shall run on at least one of the most widespread PDA device with well supported OS and platform.

14.3.2) (DESIRED) The AXMEDIS Player user interface should work almost exclusively through touch devices limiting to the minimum interaction via keys or other interfaces.

14.3.3) The AXMEDIS Player shall allow Digital Content playback for several audiovisual formats (e.g. AAC, MP3, MPEG-1/4, AVC, AVI, etc…) at the most convenient profiles and levels, including scalable codecs and as far as possible computational graceful degradation for complex bitstreams

14.3.4) (DESIRED) Plug-ins may be used for media decoding such as video, audio, interaction. Such plug-ins could be integrated to AXMEDIS Object Manager directly. Indeed in these platforms use of Activex/COM or similar and implementation of object handlers in media decoders may not be possible.

14.3.5) AXMEDIS Player should be easy to download and to install in the PDA device

14.3.6) AXMEDIS Player should communicate with a PMS client installed on PDA

14.4 AXMEDIS Player on Mobiles

The AXMEDIS player for Mobiles will be used to enjoy AXMEDIS Objects directly on mobile phones. However have to be noted that this player is not used in the distribution to mobiles demonstrator (see section 17) which will deliver to the mobile phones the content stored into AXMEDIS Objects (e.g. a logo, a ring tone), possibly adapted for the device, and will not deliver the whole AXMEDIS Object.

The following are requirements for an AXMEDIS Player for mobiles:

14.4.1) AXMEDIS model and architecture has to support the possibility of realizing an AXMEDIS player for mobiles to allow the execution and play of protected AXMEDIS objects on mobiles.

14.4.2) The AXMEDIS Player shall run on at least one of the most widespread Mobile devices with well supported hardware and software platform.

14.4.3) (DESIRED) The AXMEDIS Player user interface should work almost exclusively through a limited number of keys and/or interaction devices (pointing devices, joystick-like devices, etc.).

14.4.4) The AXMEDIS Player shall allow Digital Content playback for several audiovisual formats (e.g. AAC, MP3, MPEG-1/4, AVC, AVI, etc…) at the most convenient profiles and levels, including scalable codecs and as far as possible computational graceful degradation for complex bitstreams

14.4.5) (DESIRED) Plug-ins may be used for media decoding such as video, audio, interaction. Such plug-ins could be integrated to AXMEDIS Object Manager directly. Indeed in these platforms use of Activex/COM or similar and implementation of object handlers in media decoders may not be possible.

15 AXMEDIS tools for Satellite Data Broadcast on B2B

15.1 Satellite Data Broadcast for B2B

The pushing mechanism can be used to renovate the catalogue of the Distributors periodically at low cost.
Referring to the B2B side of AXMEDIS, the satellite infrastructure will be used by AXEPTool to distribute contents to a large number of distributors using a single transmission.
When a new content is available the Content Producer makes it visible to the Distributors. In case one of the distributors requests the content a transmission is performed over satellite using multicast IP traffic technologies. This means that all Distributors (and any other user of the AXEPTool system) will receive the content at the same time and store it locally or not, according to a predefined set of filters. Bidirectional satellite communications will be used for this task, using DVB-RCS (Digital Video Broadcasting – Return Channel via Satellite) technologies and a customized proxy solution that will permit to optimise the usage of resources (bandwidth, time for serving the requests and mainly costs).
The satellite distribution channel can be used for several activities of content distribution for both B2B business models:
The push of content

- updating the AXMEDIS content and components in the databases of the Distributors and of the Providers;
- updating the general indexing databases of the Distributors with updated information regarding the available AXMEDIS content and components of the Providers;
- updating the AXMEDIS content on Kiosks;

The streaming of AXMEDIS content on MPEG-4 on one or more channels for

- creating specific B2B channel with large institutions and consumers.

15.2 Server for B2B Satellite Data Broadcast

15.2.1) The B2B Satellite Data Broadcast shall treat both AXMEDIS Object and Regular Object..
Examples of Regular Objects are:

- Archives of database update
- File for indexing database
- Normal Archives
- 'Service' Files ;

15.2.2) An AXMEDIS B2B distributor or an automatic tool shall start the sending process of an AXMEDIS Object for a B2B distribution;
15.2.3) The B2B distribution shall provide a system of transport level encryption(DESIRED);
15.2.4) The B2B distribution shall provide a system of forced push of the content (the B2B user/AXMEDIS Distributor does not need to manually choose the content from a guide; it shall be received automatically in his local cache);
15.2.5) The AXEPTool P2P Client Application Interface shall accept special requests of a AXMEDIS Distributor asking for the content delivery by satellite(OPTIONAL);
15.2.6) The AXEPTool P2P Server shall upload in a specific server (internal to the OPENSKY Platform) the requested AXMEDIS Object (with related metadata)(OPTIONAL);
15.2.7) The B2B distribution storage server shall be authorized to access to the P2P network(OPTIONAL);
15.2.8) All AXMEDIS Objects shall have their associated part called AXMEDIS Info (metadata) ;
15.2.9) An AXMEDIS Objects shall be associated to an OPENSKY Package. All information contained in the AXMEDIS Info will be useful to retrieve complementary data for the creation of an OPENSKY Package. The last has the following main describing fields:

- Name
- Description
- Target Public (all, children, adult,…);

15.2.10) An AXMEDIS Object / OPENSKY Package shall be associated to an active Program to be transmitted in multicast to authorized users;

15.2.11) Error Correction or retransmission shall be used to ensure that the content is correctly received(DESIRED);

15.2.12) An AXMEDIS Object / OPENSKY Package, after finishing his transmission session, shall stay still available for future retransmissions via Push and/or Pull (example of Pull transmission is the reparation of lost packets during the Push transmission)(DESIRED).

15.3 Client for B2B Satellite Data Broadcast

15.3.1) The AXMEDIS B2B Client shall have a return channel to interact with the Server Side (repairing some lost packets, etc.) (DESIRED);

15.3.2) The AXMEDIS B2B Client shall have a specific hardware/software configuration expressly defined and validated by broadcaster

Hardware:

- Processor
- RAM
- Mother Board
- DVB-S card
- Size of the Dish
- Platform (UNIX, Windows)

Software:

- Version and/or Distribution of the Operating System
- Service Packs and/or Additional Modules of the Operating System
- Version of drivers for all relevant adapters
- Version of the AXMEDIS B2B Client;

15.3.3) The AXMEDIS Object shall be accessed/manipulated at the end of the push transmission (a flag-file will be created to indicate the end of successful reception). The AXMEDIS B2B client can:

- move the AXMEDIS Object into a different location of the file-system;
- delivery the AXMEDIS Object to the application charged of apply some specified actions (updating database catalogue, moving the object into a web server, etc) associated with the AXMEDIS Object;

15.3.4) Each AXMEDIS Object shall be stocked in a distinct folder identified by the name of the OPENSKY package .

16 AXMEDIS for Distribution via Internet

The main goal of this section is to analyse the architecture of PC distributors devoted to handling multimedia premium content, into stable, documented and fully featured solutions open to integration with all the components of the AXMEDIS project so to enable a complete and easy to use environment for the publication and up-selling of content over the Internet. This can be traditional of broadband, for movies, documents, multimedia content, music, coursewares, etc.

In this section we will generally focus on any type of media (audio, video, images, text etc.). nevertheless the primary interest is related to the distribution of premium video content.

Broadband penetration is growing very fast in Europe. In 2003 broadband will reach over a quarter of all European Internet connections. In 2004 estimates pose Europe with a larger penetration than other important markets such as the USA. Nevertheless, especially in the entertainment arena in Europe, broadband content offerings are still in their infancy if compared to the North American market.

The European delay is not only due to the lack of technological solutions capable of addressing all the risks and issues arising in the value chain of content distribution over the Internet, but especially because the European market does not have the same linguistic scale of the North American market. Narrowing this gap and breaking the linguistic barriers is one of the core components of TISCALI's strategies.

TISCALI is a European ISP present in 14 European countries (Italy, France, UK, Germany, Spain, Belgium, The Netherlands, Denmark, Norway, Sweden, Finland, Switzerland and Austria) and in South Africa. As a matter of fact TISCALI is a unique Internet reality capable of offering a pan-European offering of Internet service. Among other services, mainly focused on Internet access and applications such as email, messaging, Voip etc, as a general strategy TISCALI has devotes strong efforts in the development of a global European infrastructure capable of delivering content to the numerous portals operative in all of its countries. This effort has consolidated in the development a number of applications that pose the grounding blocks of such infrastructure.

At the centre is XAURA, an open, java based Content Management System, that enables to rapidly prototype content applications for the web. XAURA is rapidly being deployed to migrate all the current web properties of TISCALI into a unique global content infrastructure. XAURA can be adapted to fit most different content schemes. Among specific implementations, a considerable effort has been dedicated to the development of multimedia based services, especially when based on premium content. All these have been recently unified in a common framework, called the "MediaClub". The MediaClub is the main entry point for all audio-video content. It integrates the commercial DRM systems present in the company as well as TISCALI's billing gateway and deliver infrastructure enabling to provide pay per view, subscription based content packages and other models. Currently the system is working as an experimental service in Italy providing feature movies to TISCALI's ADSL subscribers.

16.1 Business Requirements

16.1.1) Business model required

Content can be charged:

- pay per view
- pay per download (the customer downloads the content and can use it as long as he wants)
- subscription: the customer pays a recurring charge (monthly, yearly, weekly) and can download as much he wants (the subset of content available for download has to be considered)
- pay per minute
- pay per kb downloaded
- pay per day: the customer is charge offered (user has always accessible the content data on the device but pays for every day he accesses it)

- discount credits: user purchases a set of credits in advance which can be spend to operate all the above business models. Credits would be offered at volume discounts

Licence has to consider the number of copies allowed

16.1.2) Commercial policy required

For successful distribution we need flexibility in the price definition supporting:
Different price for different channels (web site where the content is distributed)
Special price applicable:

- discounts on bulk purchases,
- discounts applied on the customer profile: the distributor can define cluster of customers considered more valuable
- discounts based on the customer payment system chosen (i.e. premium numbers has a cost higher than credit card, in order to push more profitable payment system discounts can be useful)
- discounts on content paid with recurring payments (i.e. first 3 months subscription is for free)

16.1.3) Commercial relations between distributor and content provider

AXMEDIS has to provide support in the relationship between distributor and content providers.
The model foreseen are:

- **Royalty:** where the distributor can set autonomously the price but has to pay to the content provider a fixed fee.
- **Revenue Share:** where the distributor pays to the content provider a % of the revenues. With this model should be also considered an eventual minimum cost that the content provider can require.

16.1.4) VAT and territorial limitation

AXMEDIS has to manage issues regarding different VAT applicable in different countries and the limitation of the distribution of content in the different countries

16.1.5) Payment System

The payment system applicable depends on the distribution policy using the distributor payment gateway.
What is required to AXMEDIS is to evaluate the opportunity to introduce **gift certificates** system (where the customer buy a credit on a web site and gift it to a friends who can use the credits to buy contents on the same web site) and **wallet** (deposit made by the customer who can be used to buy contents to the affiliate distributors).

16.1.6) Integration with Customer Care Systems

We require the application develops a tool to export the strings generated for each transaction to SIEBEL (most common Customer Relationships Management (CRM) software used by telecom operator). With this functionalities the customer care agent is able to provide information about the transaction and the content sold.

16.1.7) Registration procedures

AXMEDIS has to reduce the registration procedure the customer has to do facilitating the transmission of the personal information needed between the different partners instead of requiring double registration to the customer. This purpose has to be achieved in respect of the privacy.
We suggest a system based on the email authentication instead of generating new accounts or personal code.

16.2 Server for content distribution on PC

In addition to the delivery features requested by other partners, delivery to PC will have to be managed also via web server (eg. apache web server) http delivery in unicast and multicat. As per multicast, client-server operations will have to implement transmission control in order to prevent and, if required, provide real time retransmission of data.

16.3 Client for content distribution on PC, Analyzing and Supporting P2P on B2C

P2P services are a completely un-presided market that provides huge opportunities for Internet operators. What's most important, there is a growing need, among users, for P2P services that are capable of guaranteeing the quality of service and solving the most common and annoying issues with P2P illegal file sharing. As a matter of fact, there are up to **5 common issues** commonly experienced by users, each of which pose an opportunity and a challenge to content owners and broadband ISPs. Best explained with an example.

Suppose I were Searching for "The Matrix" on Kazaa. After retrieving tens of entries I chose a peer which appears to have high bandwidth (T3) and start downloading a 1GB file. Here is what I may experience (an most of the times I actually do):

Issue 1. Download Speed: I carefully selected a host with T3 connection but I receive data at a 36kb/s modem speed. After 36 hours and several attempts I finally manage to download the whole file. Now if everything went fine and the file is not corrupted, here what else may still happen (and normally it does):
Issue 2. Identity: Is it really what I was looking for? I double click on the file I just downloaded. It's name is "the_matrix.avi" but when I open it I discover it's a porn movie: I am storing a 1GB porno movie on my hard drive! It may even be worse. It may even be a porn DRMized file prompting me to purchase a license each time I try to open it.
Issue 3. Quality: who did the encoding? The movie's playback flickers and I can't distinguish a word from the sound track, not to mention Dolby Surround 5.1, Digital Dolby AC3 and all that makes a movie sound nice.
Issue 4. Security: is my PC going to blow up because of some virus? No, an AVI file can not carry a virus but does an average user know? And what if the file is in WMD format? In this case it may even have a virus.
Issue 5. Legality: Is anybody spying me?

The success of Internet media on demand lays in the emergence of distributors who will take care of Certification. P2P is the most amazing and effective mean to distribute content to the final users but somebody is needed out there to make users feel more comfortable. In other words, content owners will defeat piracy the moment they realize they can become competitive to what's available on the net. No one would pay 30 euros to download a movie from a p2p service. But what if it the movie cost 3 euros? Wouldn't be much better and save us a lot of worries.

What's important here is that broadband operators can play a major role in this game as they have trusted brands over the Internet (especially for their subscribers). Above all, they can guarantee quality of services, i.e. provide:

- Caching server sitting on their networks that are capable of providing all the data throughput available to their users. On a 256kb/s it takes about 4 times the duration of a movie to download the same full high quality DivX encoded movie. At 1mb/s you can start streaming it.
- DRM infrastructure that by enabling encryption, content license issuing and, notably, digital signing of content stands at the center of all content certification

Summarizing, the main actions that AXMEDIS must undertake in the development of the DRM for securing the content value are:

1. **Fit the 5 golden rules of media certification**:
    - Identity: provide a reliable certification method
    - Quality: state of the art encoding
    - Download speed: top class network infrastructure
    - Security: virus, worm and spam free
    - Legality: clear usage policies
2. **Pricing:** develop competitive pricing
   Downloading a movie should cost less than renting a DVD in the rental shop

This vision must be actively pursued and posed as basic requirement in the development of a PC based AXMEDIS client. Basic requirements to be provided in order to fulfil this business vision are:

16.3.1) The AXMEDIS User shall be able to access the distribution of AXMEDIS objects, using a Windows-based PC with an installed Microsoft Windows media Player;

16.3.2) Each AXMEDIS Object shall be delivered either via unicast or multicast IP transport;
16.3.3) Each AXMEDIS Object may be accessed either via client-server connection or via P2P exchange with other AXMEDIS USERS;
16.3.4) The AXMEDIS Client Application shall be a set of plug-in and possibly a viewer for AXMEDIS Objects: It will have to be an executable embedded via Microsoft Windows Media Player, and enable:
- interact with the Server Side in order to provide data transmission control including for the repairing of lost packets, sending profiling preferences, etc.
- manage transactions on AXMEDIS Objects (e.g. acquiring licenses from the AXMEDIS Certifier and Supervisor)
- provide delivery and playback statistics

16.3.5) The AXMEDIS Object shall be accessed/manipulated via the AXMEDIS Client. Users will be able to easily individuate, access and move the AXMEDIS Object into different locations of the file-system;
16.3.6) Each AXMEDIS Object shall be stocked in a distinct folder clearly identified by the user;
16.3.7) The AXMEDIS User shall be able to view all relevant properties of the content

16.4 Integration and customization of a CMS to AXMEDIS Framework and content

The main goal is to transform XAURA and the MediaClub integrated with AXMEDIS tools, XAURA's main instance devoted to handling multimedia premium content, into stable, documented and fully featured solutions open to integration with all the components of the AXMEDIS project so to enable a complete and easy to use environment for the publication and up-selling of content over the Internet accessing to the content available on the AXMEDIS P2P network AXEPTool.

In order to meet the AXMEDIS requirement, TISCALI will put in place a new implementation of its XAURA CMS, which will be named XAURA 2.

The specific goals of the new CMS will be to:
- Provide XAURA 2 with Content Management modules required to integrate advanced and business sensible applications of AXMEDIS such as content staging, reporting, usage tracking, personalization, scheduling, workflow management, advertising etc.
- Extend XAURA 2 to support of all main standard and commercial content formats, repositories and applications that are supported by the AXMEDIS Project or by its partners systems
- Extend XAURA 2 java classes to natively support all components of the AXMEDIS project, in particular the P2P services
- Extend XAURA 2 features to provide the appropriate framework for the fulfilment of goals set in the development of the MediaClub

The activities planned are:
- Integrate XAURA java classes to natively support all components of the AXMEDIS project, in particular the P2P services with AXEPTool
- Final version of the XAURA enforced with AXMEDIS capabilities
- Optimization and fine tuning of the application, Integration of the solutions and evaluating and optimising them.
- implementation of additional features and integration in the experimental channel

GUI Features that will have to be implemented include:
- Multiple Website instance management (enables syndication of content to multiple distribution channels)
- Deployment management
- Publishing engine management
- High performance module based static publishing

- Personalization module real time assembly

Backend features:

- Workflow
- Project Messaging
- Advanced media object management, including:
  - Read all available content
  - Create new content
  - Categorize content
  - Associate content items
  - Set and modify the permissions to manage content
  - Edit/delete existing content
  - Review and publish content
- WebServices based search engine
- Import/Export service
- Content Editor based on (XSD?) schema and client side logic implementation
- Application Reporting: DRM, transaction, content supliers, users

As far as the MediaClub is concerned, the main goal is to transform the current implementation of the MediaClub into an end-to-end solution for creating, importing, publishing, up selling and delivering broadband content available on the AXMEDIS network and other foreign repositories. The system will be shipped directly with XAURA 2 and a customizable broadband player. System will be designed to support all main business models for content: free-to-air, subscription and pay per view content.

Operations as encoding and license creation (DRMization of content) may be performed by Tiscali employing it's own AXMEDIS production tool implementation. Nevertheless the system will be primarily used to distribute already encoded content and will be designed to easily integrate remote DRM repositories of content.

The MediaClub system will be designed in order to develop portal instances (we call them the "media portals") that may be capable of performing all operations associated with selling media. The MediaClub will natively come shipped with tools for content, metadata and user management.

The MediaClub system will ship with a number of JAVA GUI components and JAVA based interfaces that will enable to rapidly build all main functionalities of a media portal and integrate with remote systems as payment gateways, license servers and delivery infrastructure.

The MediaClub system will also include a tool for reporting all end user content purchases and use. The reporting tool will be designed to provide "views" to all content partners enabling these to monitor in real time their content performance.

Summarizing the MediaClub will be based on a four layer structure:

- User Certifier System. Manages user accounts, credits and matches user purchases to DRM business rules
- Catalogue Management System. Enables efficient management and publishing of catalogues of DRM encrypted content
- DRM layer. Enables to manage multiple DRM instances
- Payment Gateway Interface. Requires correct matching of DRM business rules with payment methods: Credit card payments, SMS payments, Drop Dialler, DSL/LAN dialler used for ADSL time online payments, Monthly billing on Access bills

GUI Features that will have to be implemented include:

- Media Catalogue management and publishing, including following publishing modules:
  - catalogue
  - registration
  - user page
  - preview
  - editorial
  - extra
  - play media
  - top downloads
  - customer care
  - DRM and media test

- Delivery management. All content in the MediaClub will be encrypted by employing DRM technologies. The MediaClub will require users to purchase a **license** in order to be able to unlock any media content. Though primarily devoted to content download, users will have several ways of accessing content and viewing it:
  - **Streaming.** Similar to a broadcast experience, user acquires license and subsequently starts streaming content. Recommended only for higher bandwidth (450kb/s or above).
  - **Download.** After acquiring a license, the user can download the media (up to 10Mb/s encoding). Media can be viewd from the user's computer after the downloading process (can take 1-8 hours according to user access)
  - **Pre-Download**. User can first download content and then is prompted to purchase license.

- User management. All purchase models in the MediaClub require users to subscribe. Subscription will be integrated into the Tiscali user DB using Tiscali Single Sign-On system. Tiscali Single Sign-On will be used to build specific marketing offers to Tiscali users. The offer will be open also to non-Tiscali customers that will be managed in an external database (at least until every country has a short portal registration). Geographical limitations will also have to be applied if the contents are available only for certain territories.

- Business rules management. The MediaClub will be designed to support four different payment models that may allow users to:

  - Pay-per-View (PPV): User pays to view a single media in streaming or download mode before he can watch it. After having acquired a license for a media download, this license remains valid for only a limited time before it expires. This is set usually to 1 month. After having rented a media in streaming or download mode, the user will be able to see it as often as we likes within a certain period. This period is usually set to 72 hours (3 days) as it is common for home videos as well
  - Prepaid Credits: User can purchase in advance (prepaid) credits. Every time he rents or buys a media, a certain number of credits will be deducted from his account. Prepaying a higher number of credits results in a volume discount for the user. Experience with music prepaid credits show that the model is very adapted to Internet use.
  - Subscription: Based on a recurrent fee. User purchases either full access to a set of contents that can be viewed throughout the period he pays for. Or he gets a defined number of credits every month for that the subscription is valid.
  - Bundle. Content is accessible either for free or with a discount to specific Tiscali customers that purchase also an access product. This can also be achieved by charging a certain number of credits per month to the users account.
  - Sell-through. User acquires a permanent license and owns the media after the download, just as a purchased DVD (including the right to watch it without limitations and to burn it). Equivalent to a content offer of the shelf (CD, DVD, book etc.)

- Credits management. As a matter of fact, the MediaClub will use credits as the same underlying concept for all payment modes: PPV, prepaid credits, subscriptions and bundles. Credits are managed in a very

similar way as currently done on Tiscali Music Club. All contents are associated to a set of credits which are translated into currency in the case of PPV, or are visualized as mere credits for prepaid users. example implementation could ser an equivalence of **100 credits = 1 euro.** Technically speaking the users always purchases a set of credits. This enables to provide ease of communication for all offers with users able to easily asses the value of their purchase. Credits provide also and easy mean of negotiation with content owners.

The MediaClub will be designed in order to enable very fast and easy management and publishing of media content. The underlying architecture of Xaura 2 will provide all tools to manage relational data structures and basically any type of content, including media and multimedia objects. Backend features will include:

- Media Catalogne Import/Export
- Reporting: DRM, transaction, content supliers, users information, includine:
  - Transaction outcome
  - Content title
  - User
  - Purchase date
  - Content owner
  - Payment method
  - Distribution channel
- Media catalogue based search engine
- Content Management (in addition to what inherited from Xaura 2):
  - Edit media content data (title, abstract, main text, links, pictures, thumbnails etc.)
  - Specify right clearance properties of content (availability period, license properties etc.)
  - Specify publishing and distribution procedures (publishing meta-data)
  - Edit source format data (transmission standards, physical supports etc.)
  - Edit streaming and downloading format data (display size, frame rate etc.)
  - Edit credit packages and prizing
  - Review and edit customer data
  - Review and edit transaction data

16.4.1) A specific implementation of the Media Catalogue Import/Export will have to integrate the AXEPTool for accessing the AXMEDIS P2P network.
16.4.2) Such implementation shall be capable of executing queries on the AXMEDIS Database for the retrieval of new AXMEDIS Objects;
16.4.3) All AXMEDIS Object shall have their associated part called AXMEDIS Info (metadata);
16.4.4) AXMEDIS Objects shall be imported as MediaClub Media Catalogue objects.

The AXMEDIS Object will have to be designed in order to enable via the MediaClub back-office. In other words, the MediaClub will enable to create content packages that may be distributed in all models specified. This is possible thanks to the integration of business rule management procedures (which in turn integrate DRM functions available).

Importation of AXMEDIS Object will need to be optimized for the handling of large files (up to 5-10GB files) as required for High Definition (HD) feature movies.

16.4.1 Integration TISCALI content sources to AXMEDIS model and tools

Content provided by Tiscali will be natively hosted on the incoming MediaClub environment. Besides data hosted in XML format and other SQL based DB data, media files will be available in Microsoft Windows Media Video and as uncompressed AVI files.

AXMEDIS crawler to be provided so as to manage all Tiscali data and media types.

16.4.2 Analyzing and Supporting certification, etc

AXMEDIS Certification of clients has to:

16.4.5) generate an almost unique identification code for the device (PC, PDA, …) AXMEDIS tool are installed on. **Note**: the identification code has to be produced using ids of hardware components that hardly change (e.g. CPU, HD, network card, …)

16.4.6) generate a fingerprint of the installation of the tools on the device to be used to check tools integrity.

16.4.7) periodically communicate verification information to AXMEDIS Certifier and Supervisor to guarantee device and tools integrity

16.5 Adaptation of Clients and Servers to AXMEDIS: aspects of DRM

In addition to requirements expressed by other distributor partners:

DRM RULES:

16.5.1) activation of rights at a fixed date

16.5.2) counted number of plays (N variable)

16.5.3) burn option on removable device (CD, DVD etc)

16.5.4) counted number of devices

DRM FEATURES:

16.5.5) support for high volume video files (5-5GB)

16.5.6) support high volume video streaming (up to 10Mb/s)

16.5.7) license server unavailability URL to be hard coded in DRM file

16.6 PC Client Optimisation

In addition to the optimization as already requested by other distributor partners, optimization will have to be strongly focused on the delivery and playback of large volume video files such as HD feature movies.

16.7 PC Distribution

Accessing requires the use of "a client" which is currently a modified web browser in charge of the rights policy enforcement. Basically, there is no store of content. It provides links to the content of each content provider. Each content provider is then in charge of making available its content through Internet, to the End User. For the AXMEDIS objects to be distributable, and AXMEDIS infrastructure to be integrated in the distribution chain, we consider that :

- client integrates somehow an AXMEDIS player for the content playback
- distribution portal is upgraded to be AXMEDIS compliant
- uses AXMEDIS authentication through the client/AXMEDIS player
- the content providers will NOT necessarily become AXMEDIS compliant

For AXMEDIS, it is required that :

Licenses Policies

The distributor must be able to enforce *at least* the following license policies :

16.7.1) Content is usable by one User for one Year

16.7.2) Content is usable without limit within a given school or group of schools, and only in this one.

Commercial policy and relation with distributor :

The Distributor must be able to provide *at least* two kind of offers:

16.7.3) Revenue share, where the distributor pays the Content Provider a percentage of the revenue for each sold resource

16.7.4) Bundle, where the distributor pays a negotiated amount of money to each distributor for unlimited use of their content within a given domain

Accounting

16.7.5) (DESIRED) Content Provider should be able to account the usage of its content and identify which distribution channel has been used to access it, in order to check the fees given back by the distributor

16.7.6) The distributor must be able to account the usage of the content he is distributing, in order to be able to pay back corresponding fees to the Content Provider

16.7.7) Distributor must have the ability to define packages of resources (in collaboration with different content providers). The price is agreed between the distributor and the Content Providers, along with the way fees are redistributed to the Content Providers belonging to the package.

16.7.8) (DESIRED) Content provider distributing their resources through a Package on a specific Distribution channel should be able to account the sales of this package in order to check the fees given back buy the distributor.

Registration and authentication

16.7.9) The distributor has to be able to use an already existing Database Of Registered Users. Schools may provides their own authentication mechanism and in these cases it is necessary to avoid adding a second one. This means that the AXMEDIS client has to provide a mechanism to allow the automatic opening of a session (login) by another application

16.7.10) The AXCS of this channel have to, in some ways, be able to interact with another authentication system's database (batch update, dynamic connection ?)

16.7.11) These requirements must not reduce the security level of the whole system. If the satisfaction of these requirements requires rules, better provide the rules than reduce the security level.

Additional services to the Content Providers

The distributor should be able to provide the following services to the affiliated Content Providers:

16.7.12) **Protection**. The Content provider may not be AXMEDIS compliant. Therefore, the Distributor must have tools to transform raw content into AXMEDIS Protected Objects, according to the licence agreement discussed with the distributor, AUTOMATICALLY.

16.7.13) (DESIRED) **Aggregation**. Construction of packaged offer may require that the distributor has to construct an AXMEDIS Object representing in some ways such package. The AXMEDIS Framework should provide tools to AUTOMATICALLY construct such package.

16.7.14) (DESIRED) **Editorial services**. The Distributor portal provides ways for the Content Providers to speak about their content (announcement etc.). For AXMEDIS Compliant Content Providers, the AXMEDIS Framework should provide tools to set up AUTOMATIC construction. Example : AXMEDIS tools should be available to automatically detect new version of the distributed product and to construct an "announcement" section on the portal with information from the Content Provider, such like Version information, List of changes etc.

Portal construction

The distribution portal is accessed through an AXMEDIS compliant client. Once the user logged in, the list of available resource for its profile and its rights is displayed. The content distributed but not accessible is hidden to the user. The same way, on the selling portal, it is desirable to adapt the pages according the user who is consulting them.

16.7.15) AXMEDIS must provide Tools and APIs to allow the Distributor to construct the consultation portal pages on the fly, according to which is requesting them. Mainly: get the list of objects available to the user and extract relevant information from the object to present the list.

16.7.16) (DESIRED) AXMEDIS should provide Tools and APIS to allow the Distributor to construct the selling portal pages on the fly, e.g. using the PARs and other metadata.

Other requirements

16.7.17) (DESIRED) The distributor should not have to set up a local CMS for the distributed content. It may store its affiliated Provider's content on its platform temporarily, for technical purposes, but not permanently.

16.7.18) (DESIRED) The consultation portal may provide previews of some of the available resources. These previews should be dynamically gathered from the Content Provider, therefore through the AXMEDIS Framework, without the need to store the preview or the whole object locally.

17 AXMEDIS - Distribution for Mobiles

17.1 Premises

Today's telecommunication market is extremely interested in content-oriented services as sources for potential revenues. The AXMEDIS platform provides a comprehensive business perspective for both content providers and telecom service providers. A large variety of technologies and protocols are presently in use throughout the world, many of which are proprietary and do not adhere to any standard. Consequently, telecom operators encounter major challenges when attempting to deliver content-based value-added services. The AXMEDIS platform effectively address these challenges, by providing content owners with user-friendly tools in a familiar environment, and enables them to offer their content to a large number of users while ensuring content protection.
By increasing the volume and types of content, the AXMEDIS platform can assist operators and content providers in realizing the following goals: increasing end user satisfaction; increasing content offering to all types of customers with any type of device (by streamlining content delivery to mobile handsets despite the large variety of devices available on the market); and opening new business opportunities to content providers and telecom operators.

WP4.7 is related to content distribution research for mobile devices. Within this work package the involved partners should perform the following research:

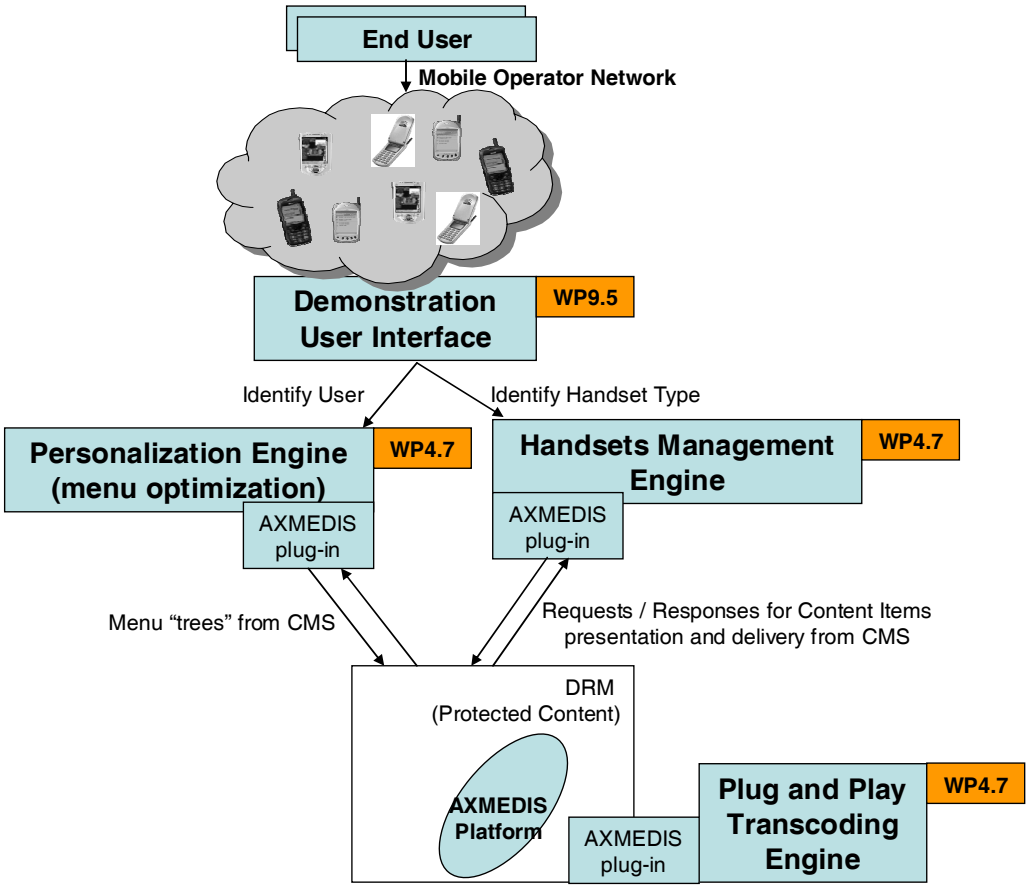
- Analysis of the distribution for mobile devices
- Plug and play transcoding support
- DRM support for mobile devices and interoperability

WP9.5 is related to the production of the demonstrator for AXMEDIS object distribution towards mobile devices.

17.2 General Description

Content distribution for mobile devices is performed using a "**content push**" method upon end user request (referred to as the "subscriber"). In order to reach the desired content, the subscriber navigates through a set of menus (referred to as "menu trees"). To make such navigation more effective, user-friendly, and easy to use, the **personalization engine (WP4.7)** should be designed and developed. The content items should be delivered to the end user in the exact format required by the user's device. In order to determine the final delivery format, the **handsets management engine (WP4.7)** should be designed and developed. It will be responsible for determining which formats are compatible with the specified device. All formats supported by the AXMEDIS platform are stored in the AXMEDIS, and supplied upon request. In order to have files available in all supported formats **the offline transcoding plug-and-play engine (WP4.7)** should be designed and developed. The most relevant and usable encodings will be identified and supplied within the AXMEDIS platform. The platform will be capable of accepting any custom codecs and automatically supporting newly added formats. To ensure content protection the DRM should be used to define the type of protection and licensing methods.

17.3 Architecture



17.4 Plug-and-Play Transcoding Support

In order to complete the subscriber's request and deliver the requested content to the mobile device the requested files should be available in the CMS. To have all files ready for the deliveries, either they would all be uploaded to the CMS or the CMS would generate them automatically from one (or more) source files. The Plug-and-Play Transcoding Server is the tool that supports file conversion from one format to another.

The following scenario illustrates typical Transcoding requirements. One WAV file has been uploaded into the system with the content item. Web users would require conversion of this file to WMA format. To play this file as a sample it should be clipped (to 30 seconds, for example) and converted to the low-quality WMA. To sell this file it should be converted to the high-quality WMA. In order to be played by the telephony system it should be converted into either a-law PCM or u-law PCM (to be exact - Dialogic a- or µ-law 8 kHz (64 kbps, mono)). And similar to the WMA, for sample playing it should be clipped (to 10 seconds, for example), or supplied in full length, depending on the subscriber request.
In this scenario, we see that even simple interfaces will require at least seven different file instances. In order to service additional interfaces and devices, the count of required files quickly multiplies. These files cannot be generated manually by the content manger or content administrator, but the system can easily produce all of them using only the source files and the appropriate codecs for the conversion processes.
The following is a list of requirements for supporting plug-and-play Transcoding:
17.4.1) Define the development platform and the set of built-in components to be used:

a. Microsoft Windows 2000 Server.
b. The Transcoding server should be designed as Windows Service.
c. The Transcoding server should be equipped with the AXMEDIS plug-in to be capable of communicating with the AXMEDIS platform.

d. Identify the set of additional components to be installed with the operating system to support different codecs (such as Windows Media, Microsoft Format SDK, etc.).

17.4.2) Define the development language(s):

a. The primary development language is C/C++ (for all public components).
b. Visual C++ compiler and linker (version 6 or 7-.NET).
c. Identify other development languages to be used for all private components, for example demonstration tools, or any of the internal developments. These will not be shared with the others that are using languages such as Visual Basic, Visual Basic.NET, ASP, ASP.NET, Java, JSP, etc..

17.4.3) Define the way of transcoding support:

a. Support offline transcoding only (generate files in offline and store all of them on the content server, available for subscriber requests).
b. Custom codecs should be easily integrated into the platform in order to add support for the new formats.

17.4.4) Define interoperable interface for plug-in codecs:

a. Support all types of files (such as audio, video, ringtone, image, etc.).
b. Support a dynamic set of properties (all of the listed file types have different set properties, so the interface should be as universal as possible in order to support all of them).

17.5 DRM support for mobile devices and interoperability

This subject requires scope definition and determination of relevant requirements.
The following should be taken into account for the scope definition:

17.5.1) Support of offline transcoding only.
17.5.2) Define an appropriate set of rules for mobile content protection.
17.5.3) Define the user interface for DRM for mobiles
17.5.4) Have open architecture for supporting DRM in future standards, which can be implemented on mobile devices (this should not be AXMEDIS primary focus for mobile devices).
17.5.5) Define the licensing model(s) that are acceptable by all parties – content providers, content owners and mobile service providers (such as Comverse, or other companies in the same field) or by mobile operators.
17.5.6) This activity could be expanded into an AXMEDIS consortium to propose to the EU (or even worldwide) the creation of the non-business (non-profit) organization for license management, in which representatives from all interested parties can participate (content owners, providers, service providers and operators).

17.6 Handsets Management Engine

One of the most widespread problems in the modern world of mobile devices is the issue of compatibility, support of various formats, and interoperability between different cellular phones. This problem is prevalent for almost all types of cellular devices irrespective of phone manufacturer; (one manufacturer may even produce two incompatible phones; and the problem just multiplies itself when considering multiple manufacturers).
Take, for example, the popular Nokia 3510i cellular phone, the first phone introduced that supports polyphonic ring tones. The announced polyphonic format used for this group of devices is SP-MIDI (Scalable Polyphony MIDI), which is based on the standard MIDI format but with reduced functionality. It was been co-developed by the Nokia Corporation and Beatnik Inc. The initial basic format is termed MIDI-4. A lot of content was developed for this standard and it has become relatively popular. We can compare this to the more advanced Nokia 7650 cellular phone, which also supports polyphonic ring tones with the improved MIDI-24 standard. The same file, when uploaded to both devices, is played in completely different methods (in some cases even the volume of the tracks is decoded and played differently).

The platform must have the resulting files in all formats, such that the Handset Management Engine can provide “application compatibility” and an opportunity to supply reasonable content quality to the end user

To further illustrate the disparity in handset specifications, consider the following additional details:

Polyphonic ringing tone level 4. Handsets compatible with polyphonic level 4 phones can playback 4 simultaneous notes. The Nokia 3510, 3510i, 5100, 6100, 6610, 6800, 7210 and 7250 support playback of polyphony 4 level ring tones. These phones include 29 melodic and 14 percussion instruments. The Nokia 6220 supports polyphony level 16.
Polyphonic ringing tone level 24. The Nokia 3650, 6600, 7650, 3300 and 6650 support polyphony level 24 MIDI content. The instrument bank of these handsets includes 128 melodic and 47 percussion instruments. To get even better polyphonic ring tone sounds, some mobile phones have built-in synthesizers, for example: Panasonic GD87 and Samsung SGH-T100.

A polyphonic ring tone is downloaded to a mobile phone over MMS or WAP, unlike the traditional monophonic ring tone which is downloaded to the phone as an SMS message. Polyphonic tones cannot be sent to other mobile phones. In Europe and the UK subscribers are usually charged for polyphonic tone download via the mobile phone bill. In the United States, polyphonic ring tones are usually paid for with a credit card; some ringtones Web sites also accept payment by Pay Pal. The payment options depend on the service, the operator and the agreement with the subscriber.

The following is list of requirements for implementing a Handsets Management Engine:
17.6.1) Define the development platform and set of built-in components to be used:

a. Microsoft Windows 2000 Server.
b. Comverse Fun Dial platform.
c. The Handsets Management Engine should be implemented as a built-in part of Comverse Fun Dial platform.
d. The Handsets Management Engine should be equipped with an AXMEDIS plug-in capable of communicating with the AXMEDIS platform.
e. Identify a set of additional components to be installed with the operating system.

17.6.2) Define the development language(s):

a. Primary development language is C/C++ (for all public components).
b. Visual C++ compiler and linker (version 6 or 7-.NET).
c. Identify other development languages to be used for all private components, for example demonstration tools, or any of the internal developments. These will not be shared with the others that use languages such as Visual Basic, Visual Basic.NET, ASP, ASP.NET, Java, JSP, etc.

17.6.3) Define the data storage:

a. The Handsets Management Engine will use the Fun Dial data storage to manage information relevant to supported handsets (for the selected telecom network); and map information regarding supported content formats. This will enable the CMS to request only the appropriate formats for the specific user.

17.6.4) Define the User Interface:

b. A simple UI is required to have self-configuration capabilities.

17.7 Personalization Engine

Most telephone users encounter IVR (interactive voice response) telephony applications on a regular basis, often without even being aware of it. There are many responses to IVR applications, but very few users are really satisfied. This stems from one basic factor: users want to complete the call as quickly as possible to reduce billing charges, and get off the line. When callers find that they are not understood by an operator, they simply reiterate their requirement until they have made themselves clear. If a caller doesn't find an appropriate IVR option, it is more than likely that he/she will hang up. Companies have woken up to this reality, and are investing in major efforts to improve IVR-based systems - to reduce airtime and to increase customer satisfaction. In parallel, the Personalization Engine should be as dynamic as possible from its inception to provide the most effective service possible. The Personalization Engine must address the issue of optimizing menus and methods of accessing the desired content.

Imagine a scenario in which a caller wants to download a polyphonic ring tone to his/her device. He/she calls the IVR system and listens to the top level menu. He/she selects a service: Dedications, Fun Greetings, Icons, Pictures, Ringtones, Polyphonic Ringtones, etc… and then a content catalog. Most systems present a

hierarchy of content, starting, for example, with: popular music, folk music, classical music, ethnic music, etc. The user then selects a top-level category and may have to access a lower level or two, until he/she can finally select the actual content. Then he/she must specify the mobile device to which he is uploading or sending the content.. If the operator's network supports more than one type of device (as is usually the case), then either the system must determine the type of device, or ask the user to select the device from a list. Without this vital piece of information or with incorrect information, all the effort of navigating through the menus is pointless. At best, the user is notified by SMS about the failure of delivery, in which case the user has to start all over again.

The AXMEDIS platform can revolutionize this process by storing personalized information in the database, which can be automatically retrieved. The information could include history of the user, his preferences, and interest groups, and many other properties. This information is used to modify the menu flow in order to ensure that the user's navigation is more effective. The platform can promote content to the users and/or suggest a narrow cross-section of content to speed up and enhance navigation - based on the users' history and other users from the same interest groups.
The following is list of requirements for implementing a Personalization Engine:
17.7.1) Define the development platform and the set of built-in components to be used:

a. Microsoft Windows 2000 Server.
b. Fun Dial platform.
c. The Personalization Engine should be implemented as a built-in part of Fun Dial platform.
d. The Personalization Engine should be equipped with an AXMEDIS plug-in capable of communicating with the AXMEDIS platform.
e. Identify a set of additional components to be installed with the operating system.

17.7.2) Define the development language(s):

a. The primary development language is C/C++ (for all public components).
b. Visual C++ compiler and linker (version 6 or 7-.NET).
c. Identify other development languages to be used for all private components, for example demonstration tools, or any of the internal developments. These will not be shared with the others that use languages such as Visual Basic, Visual Basic.NET, ASP, ASP.NET, Java, JSP, etc.

17.7.3) Define the data storage:

a. The Personalization Engine will use the Fun Dial data storage to manage information regarding user preferences, history and groups of interests (for the selected telecom network).

17.7.4) Define the User Interface:

a. A simple UI is required to have self-configuration capabilities.

17.8 Integration of Content Sources to the AXMEDIS Model

17.8.1 The Content Model Presentation

In order to serve the user interface applications, the AXMEDIS platform should be able to supply the required content information to the application layer.

The CMS has a generic content model, which is based on the OnRadio EU FP5 project. This content model is complex and has been optimized for the needs. The AXMEDIS platform should be able to give compatible abilities in a simpler way.
We need to introduce only two basic objects from the CMS, in order to have a suitable level of requirements: Menu and Items.

17.8.1.1 Menu Definition

The Menu definition is performed using the Category Objects of the CMS. These are the primary objects that build UI menus. All items are related to the last level of the menu. Items can be related to more than one category.

Request example:

Request

XSD Name: get_categories_request.xsd

```
<RQST name='GET_CATEGORIES'>
  <ROOT  title='[Root Category Name or Full Path]'
         lang='[Language Enumerator]'/>
</RQST>
```

The response should bring the full category tree:

Response

XSD Name: get_categories_response.xsd

```
<RPLY  name='GET_CATEGORIES'>
    <ERROR> [Error ID or 0] </ERROR>
    <ERROR_DESC> [Error Description if present] </ERROR_DESC>
    <CATEGORIES>
      <CATEGORY   id='[Category ID]'
                  type='[Category Type]'
                  owner='[Category Content Owner Name]'
                  title='[Category Title]'
                  full_path='[Category Full Path]'
                  description='[Category Description]'>
          <FILES>
            <FILE  title='[File Title of File Field]
                   encoding_type='[Encoding Type Enumerator]'
                   path='[File Path or URL]'/>
            <FILE … />
          </FILES>
          <META_INFO>
            <INFO  title='[Title of Meta Info Text Field]'
                   data='[Meta Info Data]'/>
            <INFO … />
          </META_INFO>
      <CATEGORY … />
    </CATEGORY>
  </CATEGORIES>
</RPLY>
```

17.8.1.2 Menu Mandatory Fields

The **<CATEGORY>** section properties are:

Category ID – the AXMEDIS Object ID for the UI references. This field is used to simplify navigation.
Content Language – the AXMEDIS Object language.
Full Path – the Category path in the tree (e.g. Project\ Polyphonic Ringtones\ Popular Music).
Title – the Category title.

The **<FILES>** section should contain a list of all required files in order to represent the category in the user interface (for example a prompt file is required in order to hear a category in an IVR; a video clip file is required to show a category as a video in a mobile device, etc…).
The **<META_INFO>** section enables additional information to be associated with a content item, without modifying the object. This information is typically requested by the user interfaces.

17.8.2 Items Definition

Items are the primary objects to be introduced to the subscriber and then to be delivered to the mobile devices in one of the required formats. Items have at least one or more physical instances – files.
The CMS uses Multimedia Items Objects to represent Items.

The following Request example shows only part of the filtering parameters available in the system:

Request

XSD Name: get_content_items_request.xsd

```
<RQST name='GET_CONTENT_ITEMS'>
   <SUBID> [Subscriber ID] </SUBID>
<ITEMS content_id='[Content Item ID]'
         content external id='[Content Item External ID]'
         content_type='[Content Type Enumerator]'
         content_lang='[Language Enumerator]'
         content_title='[Content Title]'
         content_artist='[Content Artist]'
         category_id='[Last Level Category ID]'
         category_full_path='[Last Level Category Full Path]'
         mo_id='[Mobile Originator ID or nothing]'
         order_by='[Order By Enumerator]'
         BEGIN_RECORD='[Begin Record Number]'
         END_RECORD='[End Record Number]' />
</RQST>
```

This response should bring all the items that respond to the filtering parameters in the request.

Response

XSD Name: get_content_items_response.xsd

```
<RPLY  name='GET_CONTENT_ITEMS'>
     <ERROR> [Error ID or 0] </ERROR>
     <ERROR_DESC> [Error Description if present] </ERROR_DESC>
     <ITEMS total='[Total Count of Items]'>
       <ITEM  content_id='[Content Item ID]'
              content_external_id='[Content Item External ID]'
              content_type='[Content Item Type]'
              content_lang='[Content Item Language]'
              content_owner='[Content Owner Name]'
              content_title='[Content Item Title]'
              content_artist='[Content Item Artist]'
              length='[Content Item Length in Seconds]'
              billing_category='[Billing Category Enumerator]'
              billing_desc='[Billing Category Description]'
              mo_id='[Mobile Originator]'
              expiration= '[Content Item Expiration (value in days)]'
              in_mylist='[MYLIST Indicator Enumerator]'>
         <FILES>
           <FILE  title='[File Title of File Field]
                  encoding_type='[Encoding Type Enumerator]'
                  path='[File Path or URL]'/>
           <FILE … />
         </FILES>
         <META_INFO>
                <INFO title='[Title of Meta Info Text Field]'
                    data= '[Meta Info Data]'/>
                <INFO … />
                <INFO … />
         </META_INFO>
         <IN_CATEGORIES>
           <CATEGORY id='[Category ID]'
                     title='[Category Title]'/>
           <CATEGORY .../>
         </IN_CATEGORIES>
       </ITEM>
       <ITEM … />
     </ITEMS>
</RPLY>
```

An alternative way is to request all of content tree including items from the AXMEDIS platform.

Request example:

Request

XSD Name: get_full_content_request.xsd

```
<RQST name='GET_FULL_CONTENT'>
   <ROOT  title='[Root Category Name or Full Path]'
          lang='[Language Enumerator defaulted to DFL]'/>
</RQST>
```

This response should bring all the categories and the items inside them.

Response

XSD Name: get_full_content_response.xsd

NOTE: This example breaks across pages.

```
<RPLY name='GET_FULL_CONTENT'>
  <ERROR> [Error ID or 0] </ERROR>
  <ERROR_DESC> [Error Description if present] </ERROR_DESC>
  <CATEGORIES>
    <CATEGORY  id='[Category ID]'
            type='[Category Type]'
            owner='[Category Content Owner Name]'
            title='[Category Title]'
            full_path='[Category Full Path]'
            description='[Category Description]'>
      <FILES>
        <FILE title='[File Title of File Field]
              encoding type='[Encoding Type Enumerator]'
              path='[File Path or URL]'/>
        <FILE … />
      </FILES>
      <META_INFO>
         <INFO  title='[Title of Meta Info Text Field]'
                data='[Meta Info Data]'/>
         <INFO … />
      </META_INFO
      <CATEGORY id='[Category ID]'
            type='[Category Type]'
            owner='[Category Content Owner Name]'
            title='[Category Title]'
            full_path='[Category Full Path]'
            description='[Category Description]'>
        <FILES>
          <FILE title='[File Title of File Field]
                encoding_type='[Encoding Type Enumerator]'
                path='[File Path or URL]'/>
          <FILE … />
        </FILES>
        <ITEMS total='[Total Count of Items]'>
```

```
          <ITEM content_id='[Content Item ID]'
              content_type='[Content Item Type]'
              content_lang='[Content Item Language]'
              content_owner='[Content Owner Name]'
              content_title='[Content Item Title]'
              content_artist='[Content Item Artist]'
              length='[Content Item Length in Seconds]'
              billing_category='[Billing Category Enumerator]'
              billing_desc='[Billing Category Description]'
              mo_id='[Mobile Originator]'
              expiration='[Content Item Expiration (value in days)]'>
            <FILES>
              <FILE title='[File Title of File Field]'
                  encoding_type='[Encoding Type Enumerator]'
                  path='[File Path or URL]'/>
              <FILE … />
            </FILES>
            <META_INFO>
              <INFO title='[Title of Meta Info Text Field]'
              data= '[Meta Info Data]'/>
              <INFO … />
              <INFO … />
            </META_INFO>
          </ITEM>
          <ITEM … />
        </ITEMS>
      </CATEGORY>
      <CATEGORY …>
        <ITEMS>
          <ITEM …/>
          <ITEM …/>
        </ITEMS>
      </CATEGORY>
    </CATEGORY>
  </CATEGORIES>
</RPLY
```

17.8.2.1 Items Mandatory Fields

The **<ITEM>** section has the following mandatory fields:
Content ID – the AXMEDIS Object ID for the UI references. This field is used to simplify navigation.
Content Type – the AXMEDIS Object type (such as SONG, RINGTONE, POLYPHONIC RINGTONE, FUN GREETING, etc.).
Content Language – the AXMEDIS Object language.
Content Title – the item title.
Content Artist – the list of the item's participants.

The **<FILES>** section should contain list of all required files in order to represent the item in the user interface (for example – a prompt file is required in order to hear a category in an IVR; a video clip file is required to show a category as a video in a mobile device, etc.
The **<META_INFO>** enables additional information to be associated with a content item, without modifying the object. This information is typically requested by the user interfaces.

17.8.3 Integration Considerations

17.8.3.1 Business Data

The Content Management System data model defines the business objects and the relations between them in order to describe and serve the customer business model.

17.8.3.2 Accessibility and Redundancy

The system requires 24/7 accessibility to the business data and content files. The data is stored on Telco-grade infrastructure (high performance hardware and software), with redundancy, providing all systems, including the CMS, with the required accessibility and redundancy.

17.8.3.3 Performance

The storage (database and file servers) is designed for online availability. CMS systems benefit from these performance parameters and typically don't suffer any time delays when fetching business data and files.

In order to successfully integrate with the existing CMS, the AXMEDIS platform must conform with the xxxx-compatible CMS content model, and the accessibility, redundancy and performance standards, as specified in this section.

18 AXMEDIS for Distribution towards i-TV

18.1 Introduction

EUTELSAT is the most relevant carrier of satellite data broadcast for i-TV. EUTELSAT implements the Satellite Data Broadcast in the OPENSKY service.

Satellite Data Broadcast is a content distribution mechanism that permits the distribution of the AXMEDIS content in a very efficient manner.
This technology allows large quantities of data to be pushed via satellite directly on the user's PC without congesting local networks. The same technology also allows the content providers to bring live multimedia streaming content directly to the user's PC either for free to air content (mainly for marketing purposes) or paying on-demand channels.
The use of this type of data delivery is completely transparent with regard to the AXMEDIS process and only acts as a cost effective and efficient transport mechanism.
The satellite distribution channel can be used for several activities of content distribution for B2C business models:
The push of content

- delivering AXMEDIS content on demand directly to the consumers connected to the satellite i-TV according to their interactive requests;
- delivering AXMEDIS content to the consumers connected to the satellite i-TV-PC according to their selection performed from the programmed content of the day and week;

18.2 General Description

WP4.8 is related to the content distribution, based on satellite data broadcast, towards I-TV[1] client applications. The satellite data broadcast provides a very fast distribution channel[2] that can be very suitable to deliver highly demanded content to a very large audience of users. Moreover, the continuous falling of the prices of hard disks[3] provides the possibility to proactively store a huge amount of content on the client platform, opening up totally new distribution and fruition scenarios based on push content delivery.
In order to effectively exploit the considerable potentials of the satellite distribution, the AXMEDIS framework provides the possibility to adopt this technology both in a B2B and in a B2C scenario. The requirements for the B2C scenario, covering client-side and server-side applications, are provided in the present section.
The satellite distribution enables different delivery paradigms, either in streaming or in download. The following table gives a summary about the main delivery paradigms that do not require streaming or client-side caching.

delivery paradigm	description	back channel	protocol	choice of content	waiting time	notes
Pure push	A predefined carousel of content is built on the server and distributed in broadcast. Users can choose from a list of incoming content the items that shall be downloaded from the carousel at the time they will be actually delivered.	not required	multicast	restricted to the most popular content items	variable (generally several hours)	No feedback from users to optimise the carousel.

[1] Although the term "i-TV" usually identifies a paradigm for distributing applications through the digital TV broadcast, so that they can be downloaded and executed on specifically designed platforms (interactive set-top boxes), in the context of AXMEDIS the term "i-TV" is used to identify a distribution of multimedia content to PCs using a "push" delivery model.

[2] one transponder DVB-S may carry up to 38 Mb/s

[3] today storing 1GB costs less than 1 EUR, in the next 2 years this cost will drop to less than 0,1 EUR

Optimised push	Same as above, but optimised to meet the general preferences of the users. Users profiles are periodically provided by users and are built either automatically or according to explicit votes.	yes (required to send back profiles)	multicast	restricted to the most popular content items	variable (generally several hours)	Improvement of the pure push delivery.
Multicast pull	Users can request any kind of content; however the server will postpone the delivery so that it is possible to satisfy many requests of the same content item with a single delivery, using multicast protocol.	yes (required to send back the wish list and/or votes)	multicast	the whole catalogue	variable (generally several hours)	Provides some kind of near-on-demand service.
Pure pull	Same paradigm as the http download. Data are delivered to clients using either by satellite or by terrestrial connection.	required	Unicast	the whole catalogue	very low	

Possible non-streaming delivery paradigms using satellite distribution

More delivery paradigms are possible when a cache is available on the client platform. More precisely, the client-side cache (and, in general, any client-side content filtering engine) has the effect of disjoining the access paradigm from the distribution paradigm. For instance, a content that is distributed in push can be selectively stored in the cache and consumed later on using an access paradigm that is virtually on-demand.
Moreover, a client-side composition agent could build a totally new content just aggregating some components retrieved from the cache, enabling the possibility to build personalised TV/radio programs or slideshows.
However, the AXMEDIS framework will support only a subset of the many possible delivery and access paradigms that may come out from the above considerations. For instance, no streaming support will be available in the AXMEDIS demonstrators[4].
The following table summarises the application models that will be analysed in order to choose the features supported by AXMEDIS demonstrators.

application	delivery paradigm	description	main research topics	notes
STANDARD T4.8.1	PURE PUSH	At any moment, the AXMEDIS user can access the lists of the AXMEDIS objects available in the carousels and choose to receive any of them (no request and no connection are necessary)	▪ push optimisation ▪ push-pull balancing	

[4] the lack of streaming support in the demonstrators is not due to the inability to support streaming in AXMEDIS

(no cache required)	MULTICAST PULL	The AXMEDIS user votes an AXMEDIS object from the catalogue of latest releases. A high priority carousel is periodically updated to include the most voted objects (e.g. every week the top ten most voted items are put in the carousel). If the voted item is actually in the carousel, it will be automatically downloaded to the user's Hard Disk as soon as it is broadcasted. The AXMEDIS user may also request an AXMEDIS object from a "full catalogue" in order to receive it in multicast, without urgency, through a "low priority" carousel. Requests will be served with a FIFO strategy. The same service can also be used to get lost packages	▪ user profiling ▪ server queue management	
	PURE PULL (Internet)	If the AXMEDIS user requesting an AXMEDIS object from the "full catalogue" does not want to wait, the object can be delivered through Internet.		
CACHED-BASED DISTRIBUTION ON I-TV T4.8.2 (cache required)	OPTIMISED PUSH	Provides a near-on-demand media access from a cache that is periodically updated from a push carousel. The carousel is optimised according to a general user profile. The objects received from the carousel are filtered on the client platform according to the specific user profile. The user can access the cached objects using an on-demand-like paradigm, to play them or to save them to the hard disk.	▪ push optimisation ▪ filtering strategies ▪ caching strategies ▪ user profiling	This service is particularly suitable for not very expert users and for busy people. An additional HD dedicated to the CACHE is suggested
CACHED-BASED PERSONALISED CONTENT DISTRIBUTION T4.8.3 (cache required)	OPTIMISED PUSH	It is based on a client side content aggregation using the object which are already available in the cache (it is an enhancement of the previous application). Provides the possibility to create personalised content directly on the client platform, using as ingredients the AXMEDIS objects that are in the cache.	▪ push optimisation ▪ filtering strategies ▪ caching strategies ▪ user profiling ▪ aggregation strategies	No manipulation of AXMEDIS objects will be done in the client platform. The aggregation will be performed on the fly at the time the object is presented.

Application models supported by AXMEDIS demonstrators

As far as the standard application is concerned, the "catalogue of the latest releases" is a list of the new AXMEDIS objects from the AXEPTool which periodically is available to be voted by the AXMEDIS users. The most voted objects are broadcasted by a "high priority carousel" which occupies most of the available bandwidth. The rest of the bandwidth is dedicated to the broadcasting of a "low priority carousel" containing AXMEDIS objects that had been requested to be delivery not urgently.
The catalogues also include the schedule and, possibly, a free sample of the available AXMEDIS objects.

From a technical point of view, the three application models described in the previous table may be easily integrated in a unique framework. However, commercial opportunities may suggest implementing in the final platform only some of them. Moreover, the AXMEDIS user can choose to activate any configurations, also for a short period of time. For example, a user who usually prefers voting or explicitly requesting AXMEDIS objects, for some time and for some reasons may choose to have some content automatically delivered in the cache, according to his/her profile. This option would be probably preferred by not skilful or by busy people. The same reason may make some users choose the automatic content composition which is the functionality that requires the minor effort at all.

The push optimisation is related to the management of the bandwidth to be used by the "high priority" carousel and the bandwidth which remains for the "low priority" carousel. In order to consider many different situations of the service, dynamic adaptations of the bandwidth will be also analysed.
When an AXMEDIS user subscribes to the service he/she has also to provide some information about his/her preferences. This explicit user profile shall be dynamically and implicitly updated after the actual behaviour

of the user with any of the functionalities summarised in the table. The AXMEDIS broadcast server periodically updates the database of all the AXMEDIS user profiles.

18.3 Server for content distribution on i-TV

18.3.1) A web server shall be available where AXMEDIS users can express their preferences inside a list of proposed AXMEDIS Objects;

18.3.2) Another AXMEDIS partner (i.e. TISCALI,OD2), having highly clicked website, could provide its own top-list, then another Push Carousel, including this AXMEDIS top content, could be defined(OPTIONAL);

18.3.3) AXMEDIS Objects in the top list, resulting from the users voting session, shall be sent in push to several users ;

18.3.4) AXMEDIS Info of an Object (Metadata) shall contain some pre-distribution information about Potential Market, Users etc. and not only statistical information ;

18.3.5) An AXMEDIS actor shall play the role of the OPENSKY Publisher ;

18.3.6) An internal server has to be installed in the OPENSKY Platform to join the AXEPTool (P2P network). The AXEPTool has to be compatible with Linux ;

18.3.7) An entity shall produce a query on the AXMEDIS Database for the retrieval of new AXMEDIS Objects ;

18.3.8) An AXMEDIS Object shall be associated to an OPENSKY Package. All information contained in the AXMEDIS Info will be useful to retrieve complementary data for the creation of an OPENSKY Package. The last has the following main describing fields :

- Name
- Description
- Target Public (all, children, adult…)

18.3.9) An AXMEDIS Object / OPENSKY Package shall be associated to an active Program to be transmitted (depending on the result of the voting session for this Package) in multicast to authorized users ;

18.3.10) An AXMEDIS Object / OPENSKY Package, after finishing his transmission session, shall stay still available for future retransmissions via Push and/or Pull (example of Pull transmission is the reparation of lost packets during the Push transmission) (DESIRED).

18.3.11) The lost packets during the transmission of AXMEDIS objects that have been explicitly requested by a user shall be notified to the server; the server shall decide the most effective recovery technique, either based on the retransmission of packets in unicast (via Internet) or redelivering the packets in the subsequent data carousel (OPTIONAL)

18.3.12) The push/pull balancing shall be analysed in order to reduce the average response time. The size of the bandwidth dedicated to the main carousel (broadcasting the top ten AXMEDIS objects of the week) and the remaining bandwidth to be used for the “low priority” carousel (objects explicitly required) shall consider many aspects (the loading situation of the server, the number of AXMEDIS users, the number of requests in the server queue, etc.). Another important factor is related to the percentage of lost packets; for example, if an OPENSKY package has lost 50% of total packets amount and the same situation is present in 80% of the authorized receiving stations then the OPENSKY package will be re-transmitted in Push for all authorized users. If an OPENSKY package has lost 5% of packets amount and the same situation is present in 10% of the authorized receiving stations then each station will ask for re-transmission of packets lost in Pull, individually (DESIRED)

18.4 Client for content distribution on i-TV

18.4.1) The AXMEDIS User shall be able to access the push distribution of AXMEDIS objects, using a Windows-based PC ;

18.4.2) The AXMEDIS Client Application shall have a return channel (e.g. via Internet) in order to:

- Interact with the Server Side for repairing lost packets (DESIRED),
- Sending profiling preferences, etc (DESIRED).

- Manage transactions on AXMEDIS Objects (e.g. acquiring licenses from the AXMEDIS Certifier and Supervisor)
- Provide a feedback to the Push Distributor useful to manage the data carousel (OPTIONAL);

18.4.3) The AXMEDIS Client Application shall have a DVB-S card connected to a satellite dish correctly pointed to the satellite providing OPENSKY Services ;

18.4.4) The AXMEDIS Client Application shall have a DVB-S card correctly installed and configured to:

- Listen on the transponders of OPENSKY
- Filter the right PIDS (Program Identifiers) where AXMEDIS Object are in transmission ;

18.4.5) The AXMEDIS Client Application shall provide an API level to guarantee a full interaction with the OPENSKY application. This integration will allow the OPENSKY users community to access AXMEDIS Objects (DESIRED);

18.4.6) The AXMEDIS Client Application shall be a set of plug-in and possibly a viewer for AXMEDIS Objects: both of this additional elements will be added into a OPENSKY Setup AXMEDIS compatible (DESIRED);

18.4.7) The AXMEDIS Object shall be accessed/manipulated at the end of the push transmission . The AXMEDIS Client Application can move the AXMEDIS Object into a different location of the file-system (DESIRED);

18.4.8) Each AXMEDIS Object shall be stocked in a distinct folder identified by the name of the OPENSKY Package ;

18.4.9) The AXMEDIS User shall be able to view the list of the AXMEDIS objects that are going to be distributed in broadcast in the incoming carousels .

18.4.10) The user shall be able to explicitly request (ask for downloading) some AXMEDIS Objects. These Objects will be available on the user's file system at the time they will be actually delivered by the data carousel. The List shall contain some information (estimated) about the incoming transmission :

- Start Time
- Duration
- Guaranteed bit rate (Speed)
- Size
- Target (User that can play the Content)
- Name
- Short Description
- Publisher Details;

18.4.11) The AXMEDIS User, who has voted for scheduling the AXMEDIS Object, shall receive it automatically without any other manual action (OPTIONAL);

18.4.12) The AXMEDIS User shall be able to open all correctly received AXMEDIS Objects .

18.5 Integration and customization EUTELSAT framework to AXMEDIS content

18.5.1) The AXMEDIS Certifier Supervisor shall give complete visibility to the AXMEDIS Distributor concerning transactions made by their users .

18.6 Integration EUTELSAT content sources to AXMEDIS model and tools

18.6.1) All AXMEDIS Object shall have their associated part called AXMEDIS Info (metadata) ;

18.6.2) An AXMEDIS Object shall contain a part of clear content:

18.6.3) User can evaluate his interest to the pushed content

18.7 Adaptation of Clients and Servers to AXMEDIS: aspects of DRM

DRM RULES:

18.7.1) distinction by country

18.7.2) expiration of rights after X days/hours from licence delivery

18.7.3) expiration of rights after X days/hours from first play

18.7.4) expiration of rights at a fixed date

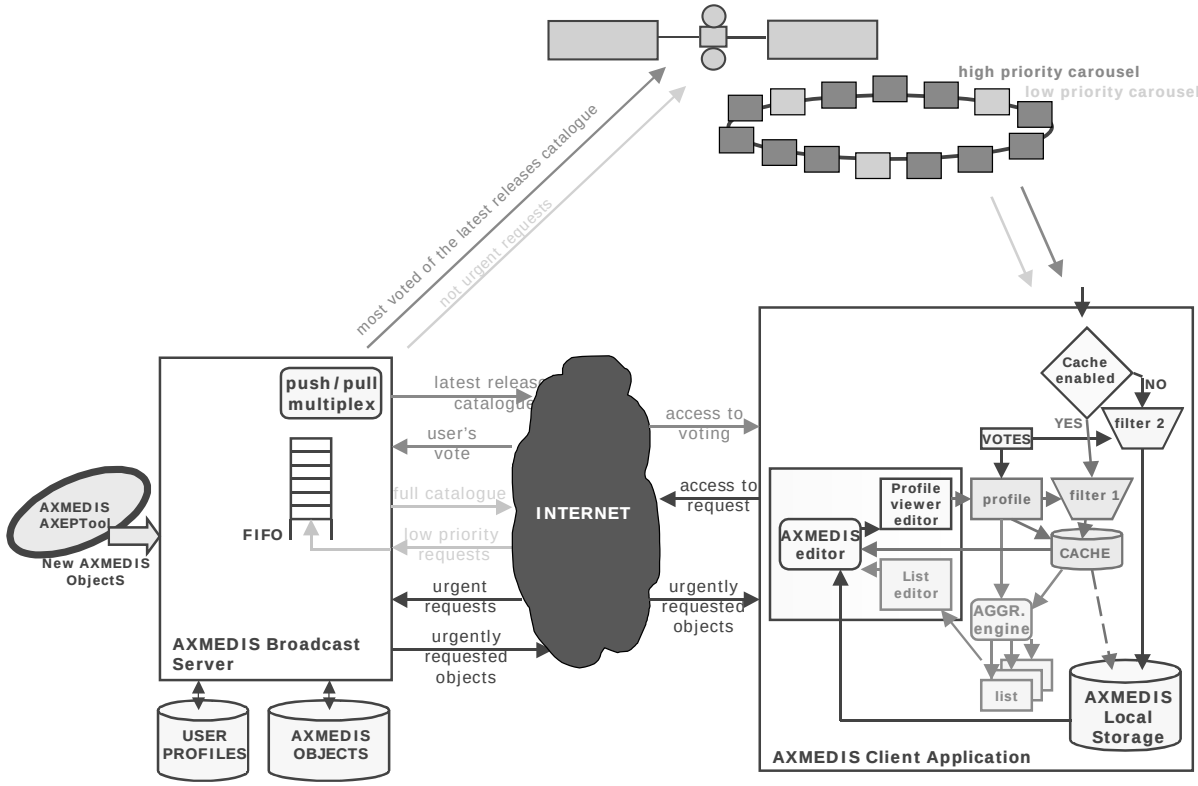
18.7.5) counted number of plays (N=1 only once)

18.7.6) unlimited play

18.7.7) free preview for X minutes
18.7.8) low-quality play (it means that the same content is played at different qualities depending on the license...)

DRM FEATURES:
18.7.9) support for audio and video files
18.7.10) support for audio and video streaming
18.7.11) licensing information separate from encoded file (i.e., no re-encoding necessary for new business rules/licenses)
18.7.12) implemented on different platforms
18.7.13) low footprint (memory/CPU)
18.7.14) short and text-encoded authorization requests/messages during the licensing phase (and only few steps) (maybe licensing could be transported over SMS) (DESIRED)
18.7.15) offline licensing (pre-delivery)
18.7.16) non-interactive licensing (simply a message from the server to the client, not an interactive protocol)

18.8 Delivery Management and cache strategies



General Scenario

SERVER APPLICATION REQUIREMENTS:
User profiling
18.8.1) The server shall provide an optimised push behaviour as described in T4.8.1 ;
18.8.2) The push optimisation shall be driven by a collective user profile that resides on the server ;

18.8.3) At the beginning of the service, the collective user profile shall be initialised at default status in order to drive the delivery management process ;
18.8.4) The collective user profile shall be periodically updated depending on the user profiles that are provided by the clients ;
18.8.5) The server application shall keep a record of individual user profiles and of the actual user choices ;
18.8.6) The AXMEDIS user profiles in the AXMEDIS Broadcast Server shall be periodically updated according to the history of AXMEDIS user choices and to the user profiles provided by the AXMEDIS Client Applications (DESIRED);

CLIENT APPLICATION REQUIREMENTS:
18.8.7) The application shall provide a local cache that shall be able to receive all the contents that are proactively filtered from the pushed broadcast carousel ;
18.8.8) The application shall provide a set up environment where the user shall be able to set the dimension of the cache ;
18.8.9) The set up environment shall provide the possibility to define a basic user profile (DESIRED);
18.8.10) No explicit control of the cache content shall be possible for the user ;
18.8.11) A cache clean up function may be made available to the user (DESIRED);
18.8.12) The AXMEDIS User profile shall be automatically and locally updated according to the history of the actual choices of the user (DESIRED);
18.8.13) The client platform shall provide a filtering agent that will selectively download AXMEDIS object from the carousel to the cache, according to a given filtering algorithm ;
18.8.14) The filtering algorithm shall be based on the following parameters: user profile, AXMEDIS objects meta data, cache size, cache daily updating rate (DESIRED);
18.8.15) A cache management algorithm shall be able to remove from the cache AXMEDIS objects ;
18.8.16) The cache management algorithm shall remove AXMEDIS objects from the cache according to several factors: the metadata of AXMEDIS object, the user profile, the caching latency, the history of the user accesses, etc. (DESIRED);

18.8.17) The AXMEDIS User shall be able to view the list of AXMEDIS objects that are available in cache ;
18.8.18) The AXMEDIS User, depending on the license, shall be able to open and play any cached objects and/or to move them to the file system ;
18.8.19) An Internet connection shall be available in order to grant access permission to the AXMEDIS object which was chosen from the cache, according to the DRM rules ;
18.8.20) A local search engine shall be provided to retrieve objects from the cache ;
18.8.21) During the transmission of an AXMEDIS object the server shall be notified about damaged or lost packets; the server will decide the most effective recovery technique (see 9.3.25) ;
18.8.22) The client application shall periodically send the local user profile to the AXMEDIS server (DESIRED);
18.8.23) The privacy of the users shall be protected, i.e. the user shall be aware of the profiling information that is sent back to the server and may decide, in the set up environment, to avoid the disclosure of personal information (DESIRED);
18.8.24) The user may decide to let the client application to include in the user profile the actual history of the his/her choices of the objects that are present in the cache (DESIRED);
18.8.25) A single client platform application may be used, at different times, by different users. In this case the set up environment shall replicate the user set up features for every user and an authentication shall be required at the start up of the user session (DESIRED).

18.9 iTV Client Optimisation and onsite Content Integration

The aim of this activity is to study, explore and define new delivery and consumer models based on client-side content composition. More specifically, the research study aims to define and verify algorithms and methods able to produce personalized audiovisual programs and media on demand services by aggregating content, from different sources, directly on the AXMEDIS Client Application. This task requires the Automatic Cache feature because it works with the AXMEDIS objects which are already in the cache.
This application model may be particularly suitable to people that are used to push delivery paradigms like television.

The term "AXMEDIS channel" is used hereafter with the following meaning: "an aggregation of AXMEDIS objects, either temporal or spatial, performed on the client platform directly at presentation time". AXMEDIS channels are accessed in sequence, like normal TV or Radio programs.
This configuration necessarily implies a different business model from the previous applications. In fact, in this case the end user shall pay a subscription (weekly, monthly or yearly) for the AXMEDIS channels and not for each AXMEDIS object included in them.

SERVER APPLICATION REQUIREMENTS:

These requirements are the same as section 18.8

CLIENT APPLICATION REQUIREMENTS:

18.9.1) The application shall provide a local cache that shall be able to receive all the contents that are proactively filtered from the pushed broadcast carousel ;
18.9.2) The application shall provide a set up environment where the user shall be able to set the dimension of the cache ;
18.9.3) The set up environment shall provide the possibility to define a basic user profile (DESIRED);
18.9.4) No explicit control of the cache content shall be possible for the user ;
18.9.5) A cache preloading shall be performed by the system at the beginning and after every cache cleaning operation (see the next req.) ;
18.9.6) A cache clean up function may be made available to the user (DESIRED);
18.9.7) The AXMEDIS User profile shall be automatically and locally updated according to the history of the actual choices of the user (DESIRED);
18.9.8) The client platform shall provide a filtering agent that will selectively download AXMEDIS object from the carousel to the cache, according to a given filtering algorithm ;
18.9.9) The filtering algorithm shall be based on the following parameters: user profile, AXMEDIS objects meta data, cache size, cache daily updating rate (DESIRED);
18.9.10) A cache management algorithm shall remove from the cache AXMEDIS objects ;
18.9.11) The cache management algorithm shall remove AXMEDIS objects from the cache, according to several factors: the metadata of AXMEDIS object, the user profile, the caching latency, the history of the user accesses, etc. (DESIRED);
18.9.12) The client application shall provide an aggregation engine that shall automatically build a set of predefined AXMEDIS channels using the AXMEDIS objects that are available in the cache ;
18.9.13) The aggregation engine shall continuously monitor the actual cache content in order to build the best possible AXMEDIS channel (DESIRED);
18.9.14) Three kind of AXMEDIS channels shall be available:

- Radio channel, composed by a temporal sequence of audio objects
- TV channel, composed by a temporal sequence of audiovisual objects
- TV-portal channel, composed by the spatial aggregation of a TV with some real-time textual/graphics content (DESIRED);

18.9.15) A certain number of default AXMEDIS channels shall be available (e.g., 3 radio channels, 3 TV channels, and 1 TV-portal channel) according to a default user profile ;
18.9.16) The set up environment shall allow the AXMEDIS user to personalize the AXMEDIS channels (DESIRED);
18.9.17) The AXMEDIS channels shall provide the typical VCR functionalities (e.i, playback, rewind, fast-forward, pause) (DESIRED);
18.9.18) The rewind functionality shall be granted only for a limited period of time (e.g. 1 hour) (DESIRED); after this time the AXMEDIS object could not be in the cache any more;
18.9.19) The AXMEDIS user shall be able to record some events in the hard disk (for example, a film), according to the DRM rules (DESIRED);
18.9.20) The AXMEDIS User shall be able to view a list of the available AXMEDIS channels ;
18.9.21) During the transmission of an AXMEDIS object the server shall be notified about damaged or lost packets; the server will decide the most effective recovery technique
18.9.22) The client application shall periodically send the local user profile to the AXMEDIS server ;

18.9.23) The privacy of the users shall be protected, i.e. the user shall be aware of the profiling information that is sent back to the server and may decide, in the set up environment, to avoid the disclosure of personal information (DESIRED);

18.9.24) The user may decide to let the client application to include in the user profile the actual history of the his/her choices among the available channels (DESIRED);

18.9.25) A single client platform application may be used, at different times, by different users. In this case the set up environment shall replicate the user set up features for every user and an authentication shall be required at the start up of the user session (DESIRED).

19 AXMEDIS for Distribution to PDA via Kiosks

In this section are presented the basic requirements for the described scenario. Some of these requirements are in strict dependency with requirements described before when describing other platform components (more specifically editing, formatting, composing and securing).

19.1 Server for content distribution on PDA

19.1.1) High power computation ability to manage
   i. Content description
   ii. Content adaptation
19.1.2) Storage of catalogue with object preview has to be available
19.1.3) Storage for object selected in the chart has to be available
19.1.4) A maximum size for downloadable object has to be defined in relation to each target device to ensure download feasibility
19.1.5) A maximum number for locally stored AXMEDIS Object per category has to be defined to ensure reasonable update time
19.1.6) The max number of locally available stored AXMEDIS Object has to be adaptive and dependent on object average dimension
19.1.7) The server has to be capable to handle in parallel system update and customer service
19.1.8) The server needs a secure connection for economic transaction
19.1.9) Catalogue upgrade/ change should be synchronised with kiosk operation to avoid problems during purchase transactions
19.1.10) The server has to be remotely controlled (optional)
19.1.11) The server has to receive AXMEDIS software components (including updates) and AXMEDIS rules via the AXMEDIS framework.
19.1.12) Storage consumption has to be remotely manageable and statistics should be kept for maintenance
19.1.13) System services and functionalities have to be remotely controlled at least in terms of availability
19.1.14) Content delivery should always happen in secure mode
19.1.15) Fruition on delivery platform should be conditioned by availability of proper decoding tools (to be distributed with content if absent on target platform)
19.1.16) Catalogue and content customisation (in terms of delivery format, quality, chunking, protection…) has to be managed on the server side or eventually at the source while preparing specialised content
19.1.17) The server is equipped with a Web Server (for example IIS 5.0) and a framework for the software execution (for example .NET framework)
19.1.18) The server has to be equipped with an AXMEDIS License generator tool to create license for user devices
19.1.19) The client device cannot access internet except for aspects related to interaction with PMS and AXCS via the server or to specified URL in tunnelling mode.
19.1.20) The server has a Multilanguage application
19.1.21) The server needs a local repository to store information related to Kiosk application
19.1.22) The server has a Windows 2000 or XP operating system
19.1.23) The server has to install the satellite AXMEDIS tool to receive in push the catalogue on a scheduled basis

19.2 Integration & customisation of ILABS platform for content management with AXMEDIS content

In order to ensure the more profitable integration of AXMEDIS content into ILABS CMS is necessary to take into account that ILABS CMS is natively based on XML and LO-LOM objects. This implies that there should be defined a proper mapping procedure and processing guidelines for the usage of ILABS Massive publisher to proper populate ILABS CMS with AXMEDIS content. To achieve the reverse process it could be possible to adopt the reverse process. In the rest of this section are pointed out the most relevant point to tackle to ensure feasibility of the proposed approach

19.2.1) AXMEDIS content should be described and structured in XML according to IEEE-LO/LOM, IMS, AICC and SCORM standards.

19.2.2) When an object to be imported embeds objects, low level constraints have to be apparent at the outer level (AMEDIS Object Metadata) so to avoid acquisition / import of objects that may turn out to be unusable during the aggregation or processing step to be carried out inside the company that has acquired the object. Examples of this low level constraints are:

- A photography course embedding images ruled by exclusive resale agreement in specific market,
- A history of art course embedding a nude may be restricted in certain countries,
- A history of rock embedding info on the Kiss cannot be sold in Germany with their original logo.

19.2.3) Samples data structures and management methods should be provided for all kind of basic and combined assets as specified in the following section related to content sources.

19.2.4) the following operations will be applied for management of the local system:

i. Insert
ii. Extract
iii. Preview
iv. Save
v. Protect
vi. De-protect
vii. Group
viii. Ungroup
ix. Search
x. Export
xi. Import

Definitely they will be possible if the DRM allows it but at the same time is necessary that they are performed onto the object by company tools therefore proper plug-ins are necessary in order to maintain and respect present interoperability with platforms like WebCt, Blackboard… and keep compliancy with IEEE-LO/LOM, IMS, AICC and SCORM standards.

19.3 Integration of ILABS content sources and formats with AXMEDIS models & tools

19.3.1) AXMEDIS content related models, structures, classes, methods and hierarchies should be exposed

19.3.2) Proper API provided with samples for primary content category should be provided

19.3.3) The following kind of objects (both raw and combined) should be available:

i. Raw assets
   - Text
   - Images
   - Audio
   - Video (actual shot)
   - Animation (synthetic)

ii. Combined assets (basic)
   - Text + Images (image & caption eventually in multi language)
   - Text + Audio (audio & subtitles eventually in multi language)
   - Text + Images + Audio (image & caption + narrator voice and subtitles)
   - Audio + Text (audio & subtitles in multi language)
   - Animation + Text (animation + subtitles in multi language)
   - Video + Text (video + subtitles in multi language)
   - Generic LO (HTML based)
   - Generic LO (Flash based)

iii. Combined objects (advanced)
   - Multimedia presentation embedding sets of raw assets
   - Multimedia presentations composed of basic combined objects
   - Generic course (HTML based and composed of generic LO)
   - Generic course (Flash based and composed of generic LO)

Note: this is the list of object that our system can handle. Each of them has metadata associated and their usage is usually regulated via specific acquisition contracts. In the LOM standard © and IPR related issues are dealt with only via basic info as owner and contributor. There is no room for DRM that has to be external and, therefore should be merged at time of conversion into AXMEDIS format. If such operation is done at single asset level then when aggregating back structured content constraints should be exposed. Take also into account that IMS, AICC and SCORM standard are implemented differently into different platforms therefore to grant content reusability into several platforms like WebCt and Blackboard the LO/course has to be strictly respecting the standard and DRM metadata will be lost if embedded as not part of the standard itself.

19.3.4) The following set of formats should be supported:

Audio	**Video**	**Image**	**Text**	**Animation**
WAV	AVI	JPEG	DOC	Flash
MP3	MPEG	GIF	TXT	
AIF	Real	PNG	RTF	
PCM	Qick Time	TIF		
		TGA		

19.3.5) The following set of tools should be supported:

Audio	**Video**	**Image**	**Text**	**Animation**	**3D modeling**	**HTML layout**
Sound Forge	AVID	Photoshop	Word	Flash MX	Maya	Learn eXact Packager
Audacity	Final Cut Pro	Adobe Illustrator	Open Office		3D Studio Max	Dreamweaver MX
	After Effects	Adobe InDesign				

19.4 *Adaptation of ILABS pay per use clients & servers to AXMEDIS aspects of DRM

19.4.1) For each item should be possible to describe the following data

i. © Declaration / Disclaimer
ii. © Owner
iii. IPR owner
iv. Other special rights
v. Price policy
vi. Usage policy
vii. Special needs

19.4.2) For price policy should be possible to define:

i. Market of usage
ii. County of usage
iii. Type of usage
iv. Base price
v. Discount policy
vi.

19.4.3) For Usage policy should be possible to define:

i. Sale to end user
ii. Sale to retailer
iii. Sale to publisher
iv. County of usage
v. Type of usage

19.4.4) At least the set of objects specified in the section related to content sources should be manageable individually.
19.4.5) AXMEDIS content related DRM structures, classes, methods and hierarchies should be exposed. This means that when an object to be imported embeds objects low level constraints have to apparent at the outer level so to avoid acquisition / import of objects that may turn out to be unusable during the aggregation or processing step to be carried out inside the company that has acquired the object. Take into account that a course can be composed of tens of LOs, a.LO can be in turn composed of tens of components. They can have multiple organisations and each component (down to raw asset) may have metadata. Moreover if the LO is SCORM it can be traceable that means that there are a set of API embedded into the object that interact with the fruition system to report and collect data on the operations performed by the user in terms of fruition. In terms of DRM this may imply the possibility to change LO delivery format from SCORM to IMS or AICC (here delivery is a specific term of the mentioned standards related to LCMS and means how the user will be managing the fruition on the content and not the standard meaning of AXMEDIS.
19.4.6) Proper API towards the DRM engine should be provided with samples for both raw and combined object

19.5 Optimization of content distribution (push and pull balance)

User profile should reflect a simple set of definition and usage rules that will simplify the overall process and minimise the impact of privacy related issues. User identification should be dome via indirect media to avoid issues related to privacy and sensible data management.

19.5.1) Personal data should be limited and stored in a safe manner
19.5.2) Connection to a third trusted party to manage customer identification
19.5.3) Connection to a clearing house to handle economic transactions
19.5.4) Presence / absence of fruition tools on delivery platform should be verified
19.5.5) User profile info should be used to promote to customer newly available content
19.5.6) Promotion message should be soft
19.5.7) User should be able to stop at any time push information services
19.5.8) No content can be delivered but just pre-view
19.5.9) Content should be delivered with no pull information inside
19.5.10) Content should be delivered in secure mode
19.5.11) Content visualisation tools should be delivered to customer if not already available
19.5.12) Device identification should be unique and un-ambiguous

20 AXMEDIS WWW Portal Requirements

20.1 General description

As stated in the Annex I, the AXMEDIS portal is the general service front end to users, playing a fundamental role in the technical infrastructure and in the implementation of synergies among distribution channels for classical music digital content.
The web portal will be the main front end for the customers (those that can be interested to join the AXMEDIS framework). It will be designed and organized to attract potential users through an appealing and efficient user interface. The usability characteristics of the web portal will be well studied so that the visual aspect of the web pages can be easy to use and efficient. During the development of web pages, the different market segments and user profiles will be taken under consideration so that the appearance of the web portal is interesting for frequent web users and easy and attractive for people who are less familiar with this media. This is very important since the project, which is mainly based on editorial production and distribution, must take care about the brand and the image on the market. So logo, icons, colours, shapes and sound have to be appealing and unique in such a way that they can be a strong element in the marketing and dissemination phase.

The **main roles of the AXMEDIS portal** are the following:

- Providing technical information to contractors, affiliated partners, user group members etc.: software components, test cases, discussion lists, documents, guidelines, etc.;
- Providing information and access point to who is interested to join the AXMEDIS initiative
- Providing administrative information for the contractors;
- Providing support for research institutions interested to join AXMEDIS and to contribute to its development;.
- Disseminating the information of AXMEDIS and providing some demonstrator;
- Providing support to companies and institutions that will be involved in the take up actions;

The Annex I note that: "the AXMEDIS Portal is NOT a super database of the contents. The content is stored into the databases of the Content Providers and distributors".

The AXMEDIS web site will be implemented using PHP modules and MySql database on an Apache server. The web site will be compatible with any other web server and should be moved on a Microsoft IIS web server as well. The style sheet technology was used to guarantee an uniform model and style of the site layout. The entire code will be projected, implemented, and tested by Exitech. The main reason for doing so is that we like to have a very high level of site personalization. Anyway if one or more commercial or third party tool will be found guaranteeing all the web site requirements in a better manner it may substitute our code.

The web site or at least some selected parts should be validated respecting of the W3C standards (HTML 4.0, CSS and accessibility) by using W3C validation tools or equivalents.

The AXMEDIS web site will be divided in four main areas:

- (i) public area,
- (ii) user group area, (private)
- (iii) affiliated area, (private)
- (iv) contractors. (private)

Each area has to provide specific content and services as described in the following. The private sections should have the same modalities we are already familiar with or similar to the MUSICNETWORK portal, while being more structured and functional.
The web page access will be free for the public area and controlled for the other. Members will have access to the hole web site including the contractors area. The affiliated area member cannot access the contractors area and the UG area members cannot access the other private areas.

The web site will manage several type of access:

- Anonymous
- User Group member
- Affiliated
- Contractor
- Public area administrator
- User group area administrator
- Affiliated area administrator
- Contractors area administrator
- Contractors activity administrator
- Webmaster

The following services were identified for the web site:

- Information on AXMEDIS (multilingual – 6 languages)
- Information on UG activity
- Information on Affiliated activity
- Information on Contractors activity
- Mailing list for discussion of problems
- Upload and download of documents
- Contractors and affiliated web pages
- Event and fairs announcements and registration
- Test cases database
- Trial applications and tests results
- Identification of major sources of information
- WEB site search engine (html, .pdf, .ps, .doc file format and database content)
- WAI accessibility for some selected parts of the web site
- W3C standard compliance for some selected parts of the web site
- Newsletter service and newsletter archive browsing
- News service, top ten news, top ten downloaded documents, etc.
- Web site statistics, documents, logs, etc.
- Collaborative area
- CVS availability
- Opening and closing operation for activities,

20.2 Private side for the CONTRACTORS, (private access):

The contractors area will be accessible only to the contractors. In order to become a contractors area member the user has to contact the webmaster and after the project coordinator confirms the access will be activated. The main characteristics of the contractors area are:

- A structure divided in ACTIVITIES with news and documents for each activity. New activities can be added dynamically by one contractors area administrator.

Each of them has to provide

- documents upload for that task, automatically will be accessible for all the CONTRACTORS in the global list. For each upload a message is automatically added and displayed into the activity news and posted on the mailing list indicated by the responsible, see below.
- download of document of the ACTIVITY
- specific blobs posted
- a responsible that has to administrate the documents cataloguing, has to maintain the main HTML page of the activity and to state which mailing list(s) has to receive an email for each news or document posted.
- A main html activity page with
  - last posted public documents
  - most requested public documents

- Possible activities could be: CA, WP1, Dissemination, events, etc.

- On the Left Menu and at the general level for all Contractor
  - Messages to be posted on the internal NEWS/BLOGS
  - Access to the AXMEDIS CVS
    - For cooperative work on sources of the AXMEDIS framework
  - Access to the Contractors web pages, only internally accessible, but granting the possibility to perform autonomous changes by each individual contractor
    - One home page for each contractor for names, emails, fax, of people involved, roles, link to their web pages and activities, any links to relevant document into the AXMEDIS database, see below, etc.
  - Access to add new events in the list
  - Change of profile, non (?) change of mailing list subscription
  - Access to send a email to the mailing list: CONTRACTOR, AFFILIATED, PARTICIPANTS, USER GROUPS
  - List of the available documents by alphabetic or date ordering with the evidence in which ACTIVITY has been posted
  - Search in the database of documents and html pages
  - Access to the list of ACTIVITIES Archive
  - Access to the list of Running ACTIVITIES

- For the contractors area administrators more services will be available:
  - Creation of a new ACTIVITY and related framework
  - Close an Activity (pass it from running Activities to the Activities Archive)
  - Control for polishing lists and the above services
  - Monitoring access and producing statistics
  - Change the access to document granting the access of a document to CONTRACTORS, AFFILIATED, USER GROUP or PUBLIC. In those cases the related list of document is updated.
  - See the list of registered people at the several levels
  - Allow to a Contractors area member to administrate an activity (create a Contractors activity administrator

- The Contractors activity administrator will access the tool for the activity administration. It will be possible to:
  - Manage the activity documents (organise, delete or move documents)
  - Maintain the activity html pages
  - View the activity statistics (web page access, activity mailing lists)
  - Close an Activity (pass it from running Activities to the Activities Archive)

- The Contractors area will have several mailing lists or reflectors
  - AXMEDIS, generic, for all the contractors
  - AX-TEC: for research and technical aspects,
  - AX-ADM: for administrative aspects
  - Other mailing lists can be activated if needed (dissemination, management, assessment)
  - Any kind of communication among partners for the AXMEDIS framework have to go through these mailing lists.
  - The mailing list subscription will be managed by the contractors area administrator. Any request for adding or removing people from the mailing lists has to be sent to her/him.
  - Only the contractors subscribed to a mailing list can send a mail to the other subscriber. If a message arrives from an unknown email address it will be ignored.

- Area for cooperative work on documents, (like BSCW or NUXEO)
  - It has to be integrated with the ACTIVITIES support above

20.3 AFFILIATED Area (private)

The access to the affiliated area will be grant to the affiliated area members and to the contractors area member.

For the affiliated area the following services will be provided:

- the information will be a selection of what stated above,
    - Messages to be posted on the internal Affiliated NEWS
    - Access to part of AXMEDIS CVS
    - Access to the Affiliated web pages, only internally accessible, but granting the possibility to perform autonomous changes by each individual affiliated
        - One home page for each affiliated for names, emails, fax, of people involved, roles, link to their web pages and activities, any links to relevant document into the AXMEDIS database, see below, etc.
    - Change of profile, non change of mailing list subscription
    - Affiliated mailing list
    - Documents upload/download
    - Search in the database of documents and html pages (not into the contractors area)
    - Area for cooperative work on documents

- For the affiliated area administrators more services will be available:
    - Control for polishing lists and the above services
    - Monitoring access and producing statistics
    - Change the access to document granting the access of a document to CONTRACTORS, AFFILIATED, USER GROUP or PUBLIC. In those cases the related list of document is updated.
    - See the list of registered people at the several levels

20.4 Private side for the USERGROUP:

- the information will be a selection of what stated above

The need to have:

- a specific mailing lists
- Upload and download of documents into the affiliated area
- The access to the contractors and affiliated documents will be as decided during upload by the Contractors or Affiliated
- Area for cooperative work on documents
- a list of questionnaires to give some answers
- search on all documents, but access to only those marked as USERGROUP or PUBLIC

- As usual for the UG area administrators more services have to be available:
    - Control for polishing lists and the above services
    - Monitoring access and producing statistics
    - Change the access to document granting the access of a document to CONTRACTORS, AFFILIATED, USER GROUP or PUBLIC. In those cases the related list of document is updated.
    - See the list of registered people at the several levels

20.5 Public side accessible to PUBLIC:

- Menu on the left
    - Description
        - general information of the project
    - AXMEDIS Framework
        - Architecture, Purposes, etc
    - Dissemination

        - download of the press release, a sort of draft flyer
    - Demonstrations
        - Some download possible, etc.. connection to demos
    - Downloads
        - Of document and tools
    - Events and conferences
    - Contacts
        - contacts and main people list
    - Partners
        - list of the Contractors with their logos
        - please start to provide the logo collection
    - Affiliated partners (those that have signed during the registration to be visible)
    - Registration rules
        - How to become affiliated, real access to the AXMEDIS information
        - How to become participants, simple registration on the newsletter
    - Links
    - Statistics
    - Private area info

- Services visible on the first page
    - Immediate description in several languages
    - news
    - last posted public documents
    - most requested public documents
    - registration to the mailing list
    - mailing lists for all the affiliated
    - request of information, send an email to me
    - Search in PUBLIC documents and web pages

20.6 Main service characteristics

20.6.1 Documents Download

For downloading a documents the user has to use the download item into the services menu. Both the four areas documents and the activities documents index will be displayed. It is possible to browse into the structure and view/download any document.

20.6.2 Documents Upload

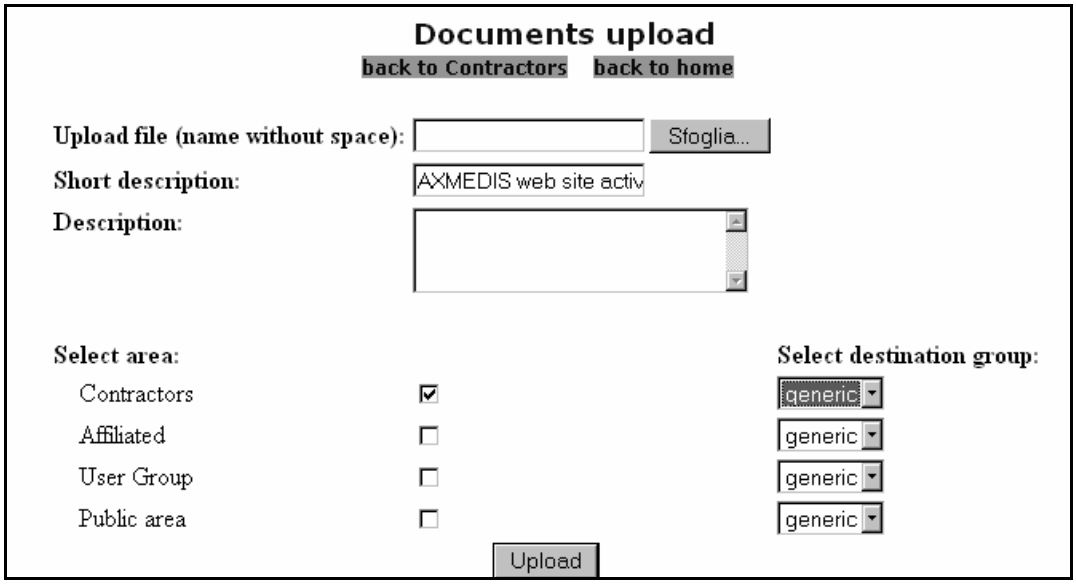
Any user who has an account on the AXMEDIS web site may upload a document in his own area or into the other areas like shown into the next table:

User is Member of:	Upload available into the
Contractors	Contractors area, activities, Affiliated area, User group area, Public area
Affiliated	Affiliated area, User group area, Public area
UG	User group area, Public area

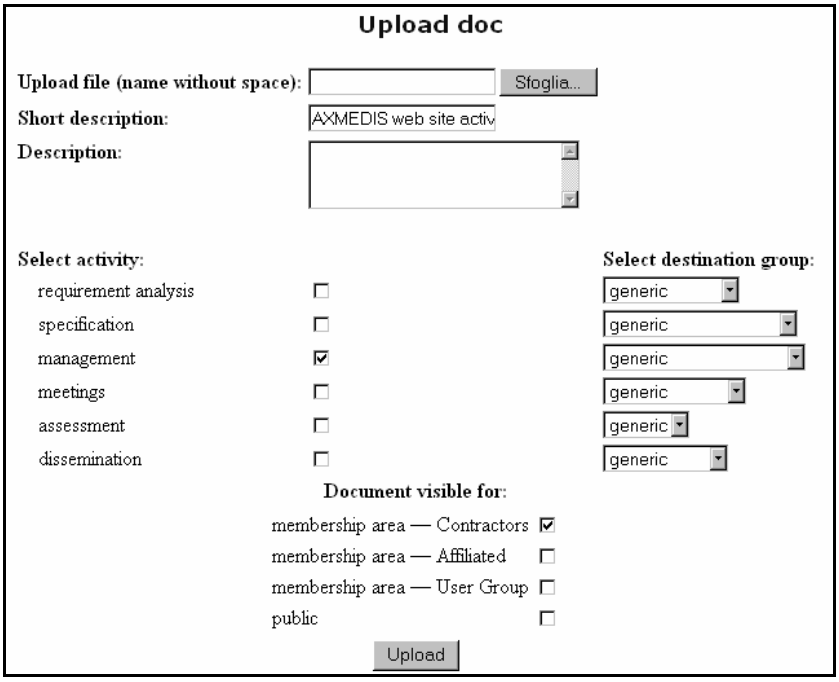
The anonymous user cannot upload documents.

For accessing to the uploading service the user has to access the web site, perform the login and choose the upload doc into the Services menu.

Into the next window browse for the file to be uploaded (name without space), insert the document short description (to be shown into the top ten or other short lists), then the complete description. Choose the areas where the document has to be viewed and the relative destination group. The same document may be uploaded into all the four areas (no copies will be created but only the several accesses will be created).



The activities documents can be uploaded by accessing any activity into the Contractors Area. Use the upload document link for having the next window:



The same steps have to be followed paying attention to select the activities and the correct destination group.

20.6.3 Web search engine

A service offered by the AXMEDIS web site is the search engine. The engine will be chosen in order to fulfil requirements like the capability to perform database search and to allow some protection on the result (in case the user is not registered), possibility of personalization, etc.
Search engine requirements:

- Perform search into the html file
- Perform search into the txt file
- No search into the php code
- Allows to eliminate some directory from the search path

- Allows search into a part of the database (messages)

20.6.4 Mailing lists

Several mailing lists have to be set up at different levels. Any web site area will have one or more mailing lists. The members of contractors area, according to the CA, will be automatically added to one or more mailing lists. The members of the other areas will accept an agreement when the subscription will be done.
The mailing lists have to respect the following requirements:

- Only subscribers can send emails to the mailing list
- Some antivirus scan will be perform on the messages
- Some controls will be performed to eliminate vacancy message propagation
- The email addresses for members of contractor area mailing lists will be loaded from the database so the user can change at any time his/her address by accessing the edit profile service

20.6.5 User Profile

The user profile allows the web site registered users to update the personal information.
The only field that cannot be changed by the user is the account. It can be changed only by the webmaster.
The profile will collect several information like:

- First name
- Second name
- Country
- Email
- Website
- Title
- Affiliation
- Type of affiliation
- Type of role
- Area of role
- Contact information (phone, fax, ecc.)

20.6.6 Contractors and Affiliated web pages

The members of the contractors area and the members of the affiliated area will have the possibility to fill a web page on the AXMEDIS web site.
The web pages are generated one for each affiliation (company). Any company has to define a person who will administer the web page.
Information like company contacts, overview on the activity, description of products can be inserted into these pages.
The pages could be activated on request.

20.6.7 CVS

A CVS have to be set up in order to allow the work on the same source code. The CVS system will be choose after the evaluation of:

- Reliability capabilities
- Transfer security
- Binary file management
- Rule definition capability
- Access rights managements capability
- Costs (several freeware are available)

20.6.8 Cooperative work environment

The AXMEDIS users need to use a collaborative environment in order to perform the cooperative documents editing. In order to do it the tool have to fulfil a set of requirements like:

- Reliability capabilities

- Transfer security
- Office file management (doc, xls, ppt)
- Access rights managements capability
- Workflow capability
- Costs
-

21 MPEG-21 Requirements

MPEG-21 General Requirements (MPEG document W6492)
Requirements for Digital Item Declaration (MPEG document W3756)
Requirements for Digital Item Adaptation (MPEG document W4684)
Requirements for IPMP (MPEG document 6389)

22 Appendix

22.1 Content Management Systems used by the partners

AXMEDIS – CMSs -V1-2				
CMS	**DBMS**	**Content stored in**	**Notes**	**CMS Platform**
X				Windows XP
X				Windows 2000 Professional, GNU/Linux Mandrake 10 + GNU/Linux Slackware 10.
in-house developed CMS written in PHP	MySQL		Development in progress	Windows XP
XML CMS based on Extraway engine	Extraway (XML DBMS)		Development in progress	Windows 2000 prof. XP for new Pc's 2 Macs with Mac OS 9.2 (planning MAC OS X)
Content Management System	Oracle 8.1.7	File System only		Windows 2000 Server
X				Windows XP
Multicast Toolkit (EMT)	Postgresql v. 7.4.5	File System		Linux RedHat 7.3 and upper
X				Windows 2000, Solaris and Linux (SuSE 9).
LEX - learn eXact(c)	Tamino	File System	Plan to change to a relational DBMS	Win32 based platforms
HP proprietary CMS, which is part of the HP DMP	MSSQL or ORACLE	FILE SYSTEM		
own CMS called RMS (Royalty Management System).	SQL2000	File System		Windows 2000 / Windows XP
XAURA	MySQL or ORACLE	DBMS (some images) File System for multimedia (mainly Network Appliance Net Filer technology)	now migrating to new version XAURA 2	primarily Linux (also SUN Solaris & Windows Server 2000)
X				
in-house developed CMS written in PHP	MySQL	File system	considering migrating to ZOPE	Red Hat Linux (7+)
X				
X				Windows 2000
proprietary CMS for XML repository, another one for media content	Oracle 9i for XML repository, SQL2000 for media (images, video,	XML in DBMS media in FILE SYSTEM		Windows 2000 and should run under Windows Server 2003

	flash, director)			
No CMS		File System	In future Zope	Windows XP. * 2x 3TB NAS Win. Server2003 * linux boxes with Fedora Core 2 kernel 2.6.x * a Mac OSX
X				Windows XP
docPile (doc. management) PhProjekt (groupware + cms) TUTOS (the same as PhProjekt).	MySQL, Postgres			Linux (Debian e Slackware) W2003 server with SQLserver
WEDELMUSIC	MySQL, 4thDimension	File System	To be completed	Windows XP

22.2 Composition & Formatting Tools used by the partners

AXMEDIS – Information from Contractors -V1-1

multimedia content formatting tools	multimedia content automatic production tools	multimedia content protection / DMR	multimedia content format	specific hardware	platform operating system	notes
Audio file	**Produce** PEAK DECK PRO-TOOLS ITUNESo **Video post production** FINAL CUT	Any audio track produced should include the ISRC code which allow to identify main info on that track (country of production, original producer, year of the issue, identification number)	**Audio** MP3 MP4 AIFF WAV **Video** MPEG **Image** JPG	MAC for production and post production MAC and WINDOWS for the net	MAC OS X 10.3.5	
Audio file Image file	None automatic Wave Lab for audio		**Audio** MP3 AIFF WAV **Video** MPEG WMV **Image** TIFF JPG	MAC (MAC OS 9.2) PC (Windows 2000 and XP)	Windows 2000 pro Windows XP Mac OS 9.2 (in future MAC OS X)	
Content Management System	Content Management System and 3rd-party studios supplies content in the required formats	no preference	**Audio** WAV a/u-law PCM Microsoft WMA **Video** no preference		Windows 2000 Server	
Multicast Toolkit (EMT) with internal modules: Secure Data Broadcast (SDT), Corporate TV (CTV), Private Live Broadcast (PLB).	Windows Media Encoder Niagara (preferred)	Windows Media Technology DRM We want to find, in the AXMEDIS context, something of more OPEN and STANDARD and NOT OWNERSHIP of a single company	Windows Media Technology WMV WMA Real QuickTime.		Linux RedHat 7.3 and upper Linux Fedora Core 2 Windows Media Encoder/Server, Windows Media DRM Encoder/Licenser	
Image Photoshop, Adobe Illustrator, Adobe InDesign **HTML layout** Learn eXact Packager **Web animation**	Adobe Premiere Learn eXact Packager	None DMR Verisign Certificates will be adopted for usage with SDK Learn eXact & Tamino internal tools	**Audio** WAV MP3 **Video** AVI MPEG Flash	P3/P4 adequately equipped MM-PC	Windows 2000 Windows XP	

Flash MX **3D modeling** Maya 3D Studio Max			**Image** JPEG GIF PNG TIF			
HP DMP (Distributed Media Platform) hasn't embedded tools for editing and formatting contents	HP DMP hasn't an embedded multimedia content production tool		Any content type is manipulated by HP DMP			
Audio WindowsMedia Encoder (v8, 9) **Image** Photoshop Fireworks	Our own content production applications	WindowsMedia DRM	**Audio** WMA **Image** JPG	Dell servers with Quad Xeon processors	Windows 2000 Windows XP	**Tools in-house** OD2 Ripper OD2 Transcoder OD2 Packager / Packaging on Demand (PoD)
HTML layout general purpose text editors Macromedia Dreamweaver MX Homesite Microsoft Front Page Flash MX **Encoding** Windows Media Encoder Helix Producer	mainly internally developed tools devoted to video capture (based on Adobe Premiere) and multi-encoding (based on Windows Media SDK and Helix Producer)	Microsoft Windows Media Rights Manager	**Audio** Windows Media Audio **Video** AVI Windows Media Video Real Media Video **Image** Jpeg Gif Tiff psd	Dell Optiplex workstations and Dell Power Edge servers. HP EVO notebooks In addition, for video encoding we also have a wide range of input and switch devices including DV, BetaSP, DVD, Digi-Beta, S-VHS, VHS players from main manufacturers (Sony, Panasonic, Philips and others).	Windows 2000 Windows XP	
Image Photoshop Illustrator **HTML layout** Dreamweaver MX **Web animation** Flash MX **Video editing** Final Cut Pro **Video compositing and effects** After Effects **3D modelling and rendering** Maya **Audio** Digital Performer 4 (with various plugins) PEAK	**Production** iMovie iPhoto iDVD **batch video format conversion** Apple Compressor / Discreet Cleaner	none	**Audio** Authoring AIFF/SD2 Publishing MP3 AAC Real Audio MP3 embedded in Flash SWF **Video** Authoring QuickTime Publishing MPEG4 WindowsMedia RealMedia Flash FLV **Image** Authoring TIFF/PSD/AI Publishing JPG GIF SWF	Apple Macs (dual G5s, powerbook G4s), all OS X 10.3. Windows XP/98 machines for web content testing **Audio** MOTU audio interfaces **Video** firewire DV in-house **Format conversions** BetaSP DigiBeta	Mac OS X 10.3	

Adobe Photoshop Adobe Acrobat Corel Draw Dreamweaver MX	None	none	**Audio** MP3 WAV **Video** Realmedia MPEG **Image** JPEG GIF		Windows 2000 Windows XP	
Compression Sorenson Squeeze **Uncompressed** AVI / WAV High res. Mpeg / mp3	Cygwin GNU tools (zip, sed, perl, GNU Make,) MS Tools	Proprietary file/stream forma based one luefish(protection) and zip(compression) libraries We have developed our own encoder and our own mozilla client decoder (Protocol Handler)	**Audio** SWF MP3 **Video** SWF MPEG **Image** basic JPEG **Document** XHTML (MML, SVG, HTML, javascript) **Mozilla framework** XUL RDF	Simple PC's	Windows 2000 Windows XP Unix platform to use Cygwin Mac OS X (external partners)	
Image Photoshop **HTML layout** Dreamweaver MX **Web animation** Flash MX; **3D modelling** Maya	Windows Movie Maker	none	**Video** QuickTime in MPEG4 WindowsMedia Flash FLV **Images** Photoshop in GIF, JPEG, etc	Dell Optiplex Machines GX280 and other Dell Workstations running Windows XP/98, Sony VIAs as mobile workstations & HP Palm top for location-sensitive mobile content services request & delivery testing etc..	Windows 2000 Windows XP	
Wedelmusic MS Tools Adobe Tools	Wedelmusic MS Tools	Wedelmusic	Wedelmusic **Audio** WAV MP3 **Video** AVI MPEG Fl **Image** JPEG GIF PNG TIF	Windows XP / 2000 or Linux on PC		

22.3 Workflow Scenarios for Production Processes of Digital Multimedia Objects and Costings

The AXMEDIS Workflow Management System (WFMS) is to identify and coordinate the deployment of actors, tools, AXMEDIS Objects and resources in order to enhance the efficiency of multimedia Production and Distribution processes. These activities can be then directed to a worker (user) to complete the assigned activities or if the activities require no human intervention, then they are done automatically by invoking the required tools through the WFMS.

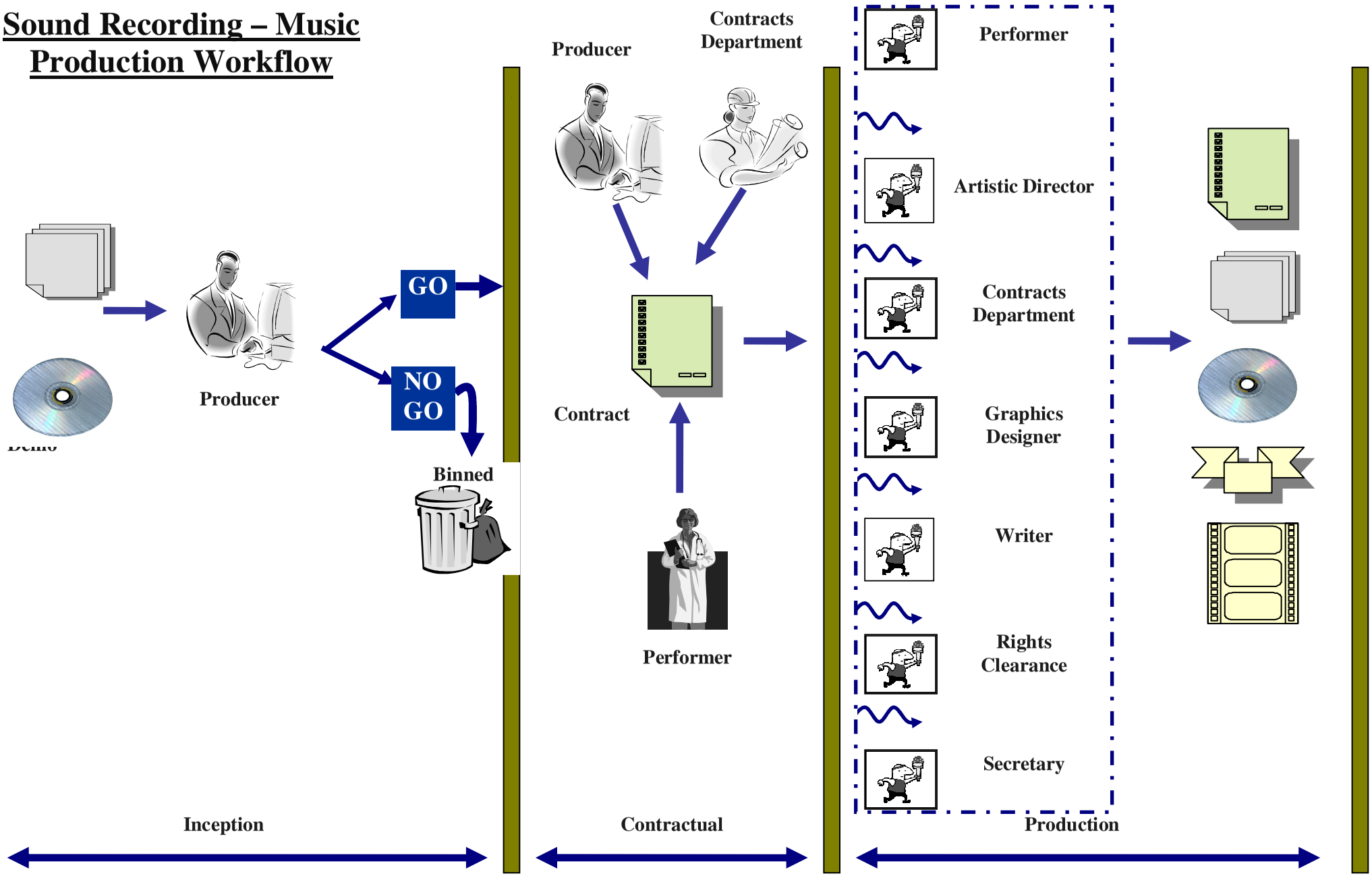
In the following , the typical sequences of workflow processes for the production and distribution of multimedia objects in the three distinct sectors namely music, interactive e-media and e-books are described.

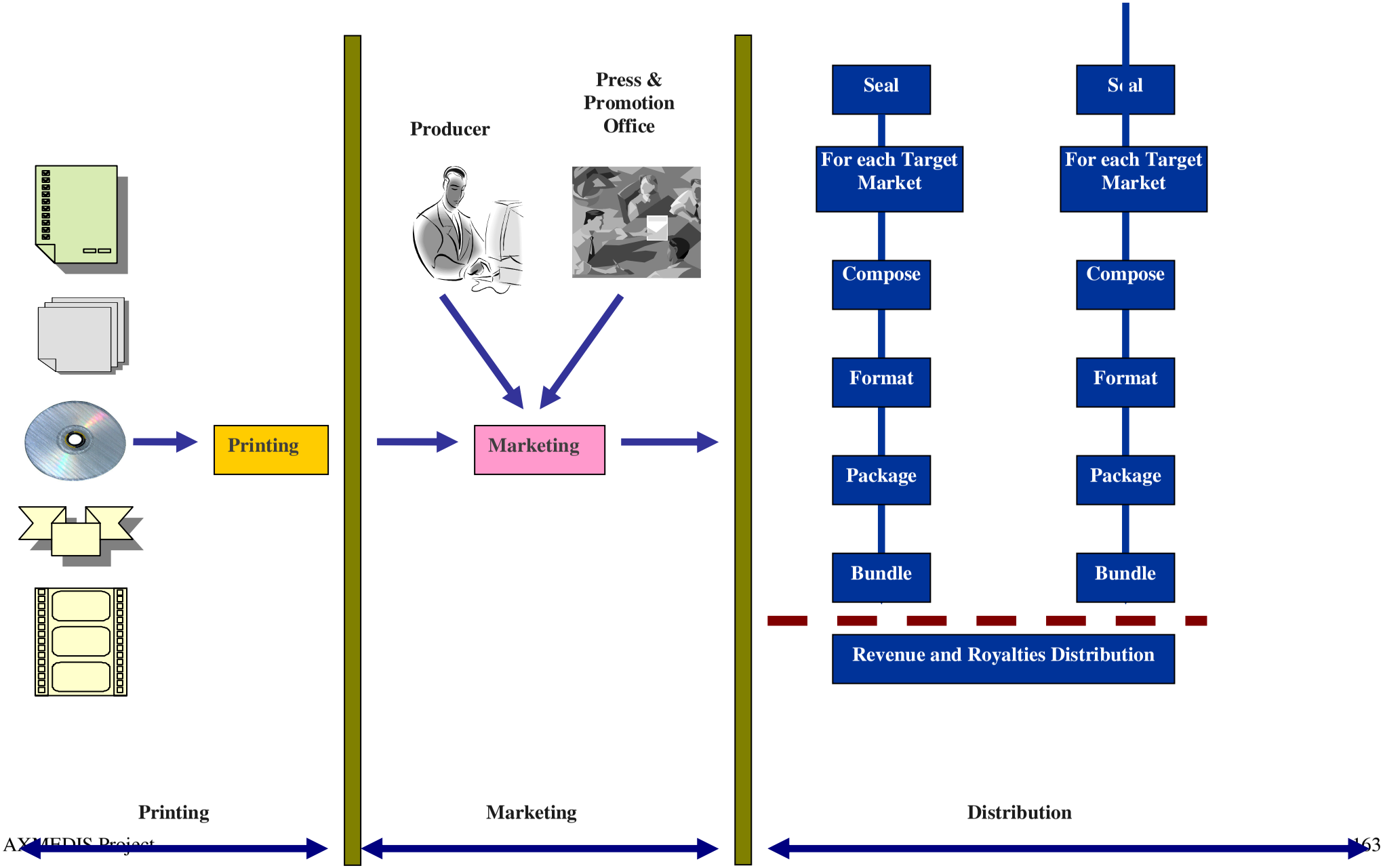
22.3.1 Music & Audio Production and Distribution Workflows

22.3.1.1 The Workflow for Music & Audio Production

SOUND RECORDING- MUSIC PRODUCTION

1) A producer receives a demo (simple and generally home made) of the proposed song from the publisher or the author.
2) The producer decides to record it (or not).
3) Producer/performer agreements general situation: contract already exists (exclusivity)
4) Start of the production process involving:
    a. Artistic director : in charge to overview the production step by step (in house)
    b. Contracts department (in house) : contracts with recording studio, musicians, sound engineer, musical assistant, etc
    c. Graphic designer for the booklet/label: freelance (contract) or in house
    d. Writer for the booklet notes: freelance (contract)
    e. Rights' clearance (in house) : deals with Authors and Publishers Collecting societies to get mechanical licence (fees depend on terms of copyright duration on the songs, on number of recording, on number of recording "free of charge" for promotional use etc); clearance of the rights on any image used in the booklet;
    f. Secretary (in house): ISRC code, label copy, cue sheets (metadata), bar code etc
5) The material is given for the print: original master, label copy (number of catalogue, titles, subtitles, publishers, musicians etc) ISRC code, bar code, mechanical licence, graphics releases
6) Distributor: general situation contract already exist.
7) Before distribution the producer starts with marketing and promotion including press communication. Press and promotional offices (in house) Promotion might include the distribution of content extracts.
8) (Commercial) distribution generally intended as selling of recording. Distribution can be done via multiple channels not limited to retailers, websites, music shops, direct sells etc. The distributed content can be delivered in various formats and on various media types.


Sound Recording – Music Production Workflow
Producer
GO
NO GO
Binned
Producer
Contracts Department
Contract
Performer
Performer
Artistic Director
Contracts Department
Graphics Designer
Writer
Rights Clearance
Secretary
Inception
Contractual
Production


Producer
Press & Promotion Office
Printing
Marketing
Seal
For each Target Market
Compose
Format
Package
Bundle
Seal
For each Target Market
Compose
Format
Package
Bundle
Revenue and Royalties Distribution
Printing
Marketing
Distribution

8.2.1.1.1 Actors involved in the sound recordings process since the beginning

1. ***Publisher***
   Activity: an organization/company that makes music works public and share the author rights. The copyrights must be assigned to the music publisher by the authors/composer in written contract, in return for a percentage of royalties produced by the song.
   Actors that connect with Publishers in the content value chain:
   - **Authors/composers**
   - **Authors and Publishers Collecting Societies:** Co-register works with Authors or Publishers, provide work information, publisher and author information, use terms and conditions and publisher agreements.
   - **Publishers:** Co-publishing and/or sub-publishing agreements (a foreign agent retained by the original music publisher of a song to exploit the song in the foreign agent's geographic territory)
2. ***Phonographic Producer***
   Activity: an organization/company that undertakes the technical and economical responsibility necessary for the making of sounds recordings.
   Actors that connect with Producers in the content value chain:
   - **Producers:** Co-production contract and production licenses terms and conditions (i.e. sub licensing agreement with a foreign producers authorizing him to duplicate and sell copies of existing masters, in exchange for paying to original producer a royalty for each record sold.
   - **Performers:** Obtain licence terms and conditions for performing rights
   - **Authors and Publishers Collecting Societies:** Obtain license terms and conditions for first fixation, work ID, product ID - so called Compulsory Mechanical licence
   - **Phonographic Producers rights Collecting Society:** collect and distribute the neighbouring rights (public exploitation of sound recording)
   - **Distributors/Aggregators:** commercial contract agreements
   - **Clearing Houses:** Multiple work use clearing/ distribution terms and conditions production .
3. ***Performer***
   Activity: realize the works of the authors within productions process.

   Actors that connect with Performers in the content value chain:
   - **Producers:** Performance, first fixation and reproduction licence terms and conditions
   - **Performers Rights Collecting Society:** collect and distribute the neighbouring rights (public exploitation of sound recording)
4. ***Collective Management Society***
   Activity: an organization that provides collective representation to their constituents such as authors/creators, phonographic producers or performers.
   Authors and Publishers Collecting Society
   The Authors and Publishers collecting societies collect and distribute royalties from the multitude of users of copyright material in their home territory and, through reciprocal arrangements with societies in other countries, extend their reach to the international sphere. They are involved in standardizing:
   - Certified metadata for work identification
   - Licences for the different concepts under which the works are exploited (mechanical reproduction, public performance, public communication).
   - Maintaining work use data
   - Distribute rights revenue to authors and publishers

Producers Rights collecting Societies/ Performers Rights Collecting Societies
A society/organization that collects and distributes fees received on behalf of its members from users of sound recordings and music videos mainly the broadcasting industry.

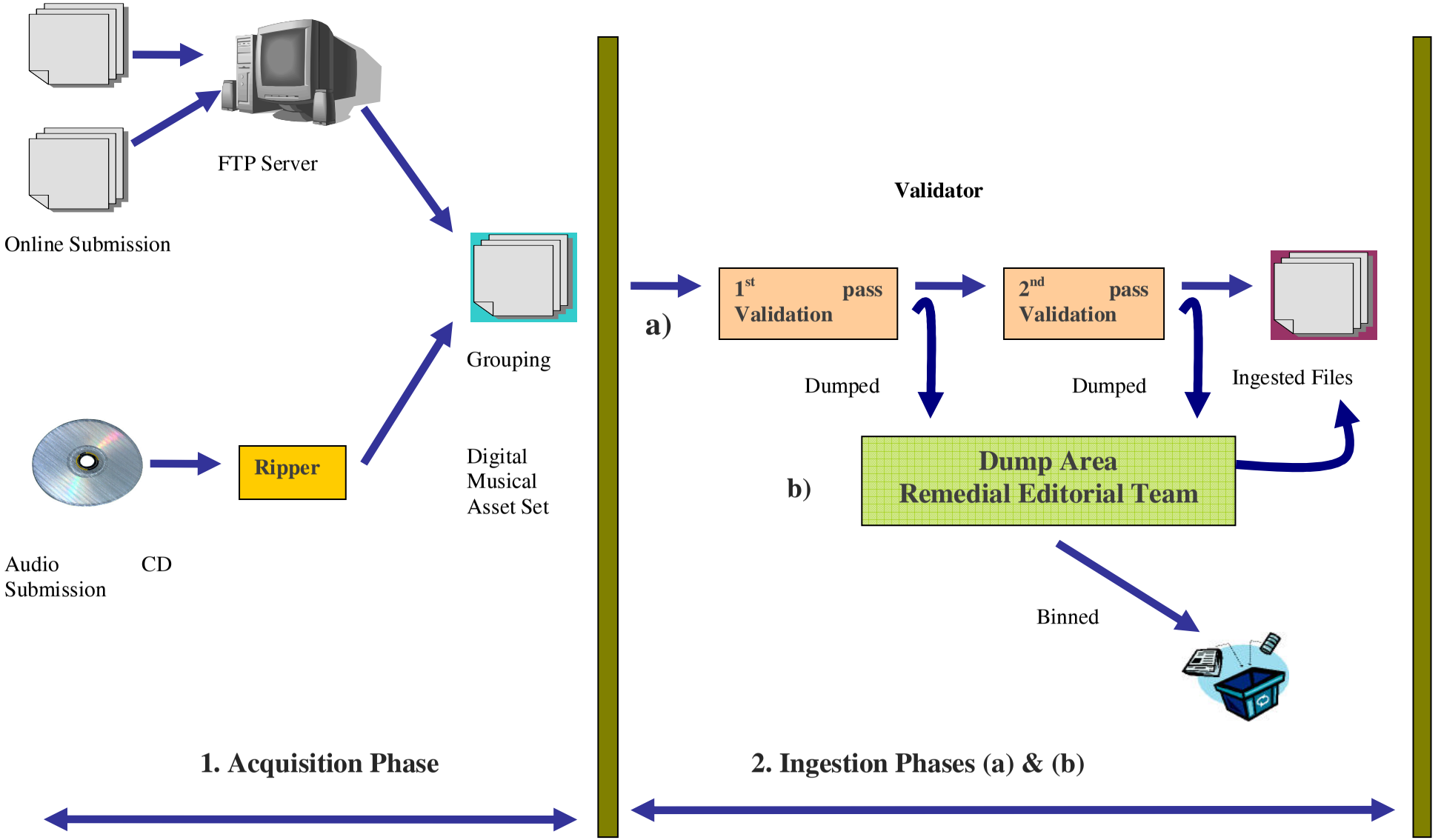
- Certified metadata for work identification
- Licenses for public use of sound recording
- Maintaining work use data
- Distribute rights revenue to producers/performers

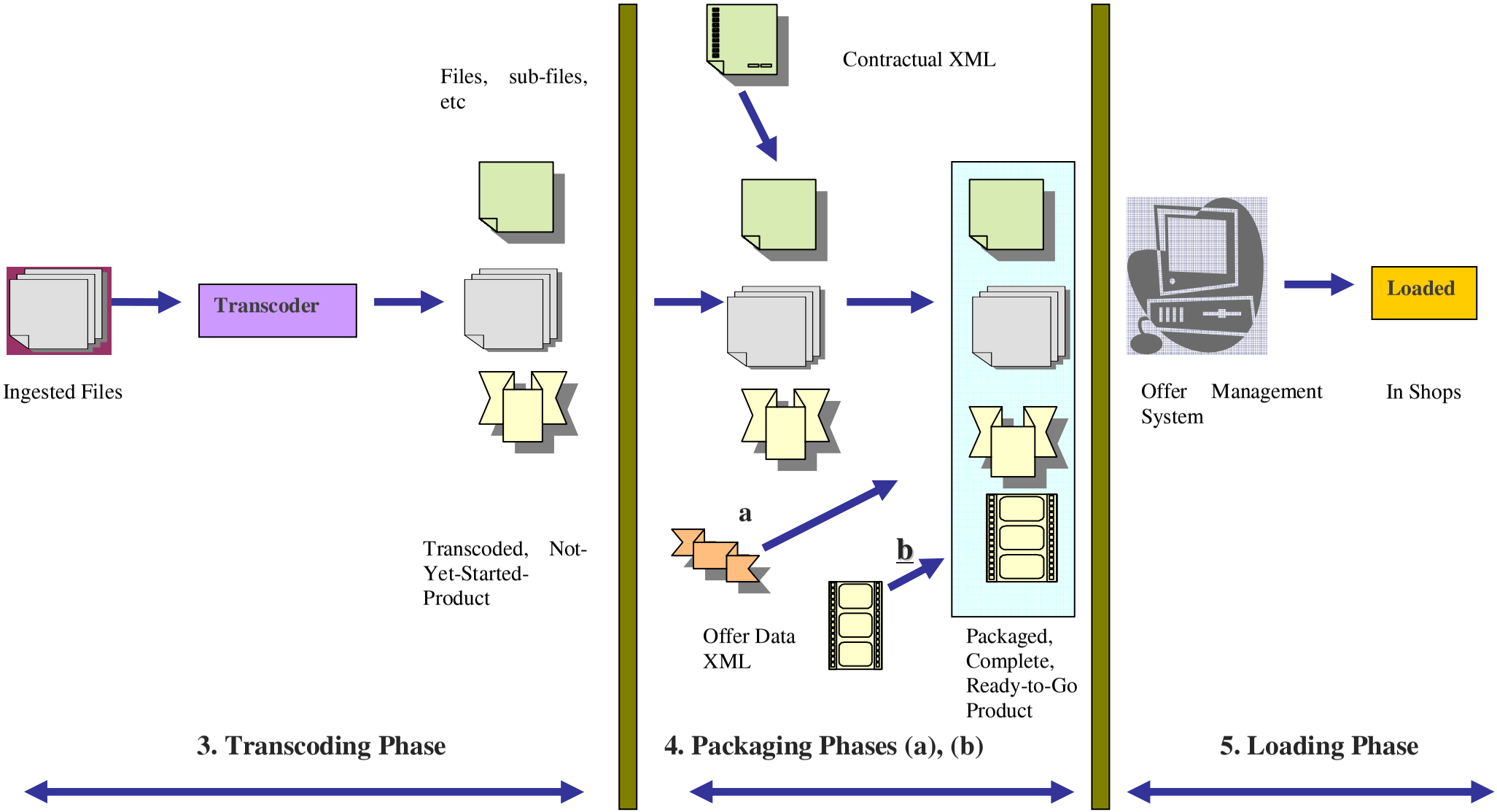
22.3.1.2 The Workflow for Music & Audio Distribution

On-Demand Distribution [OD2] is one of the AXMEDIS partner involved in the distribution of digital multimedia contents. This section will now describe the workflow activities involved in distribution of musical contents.

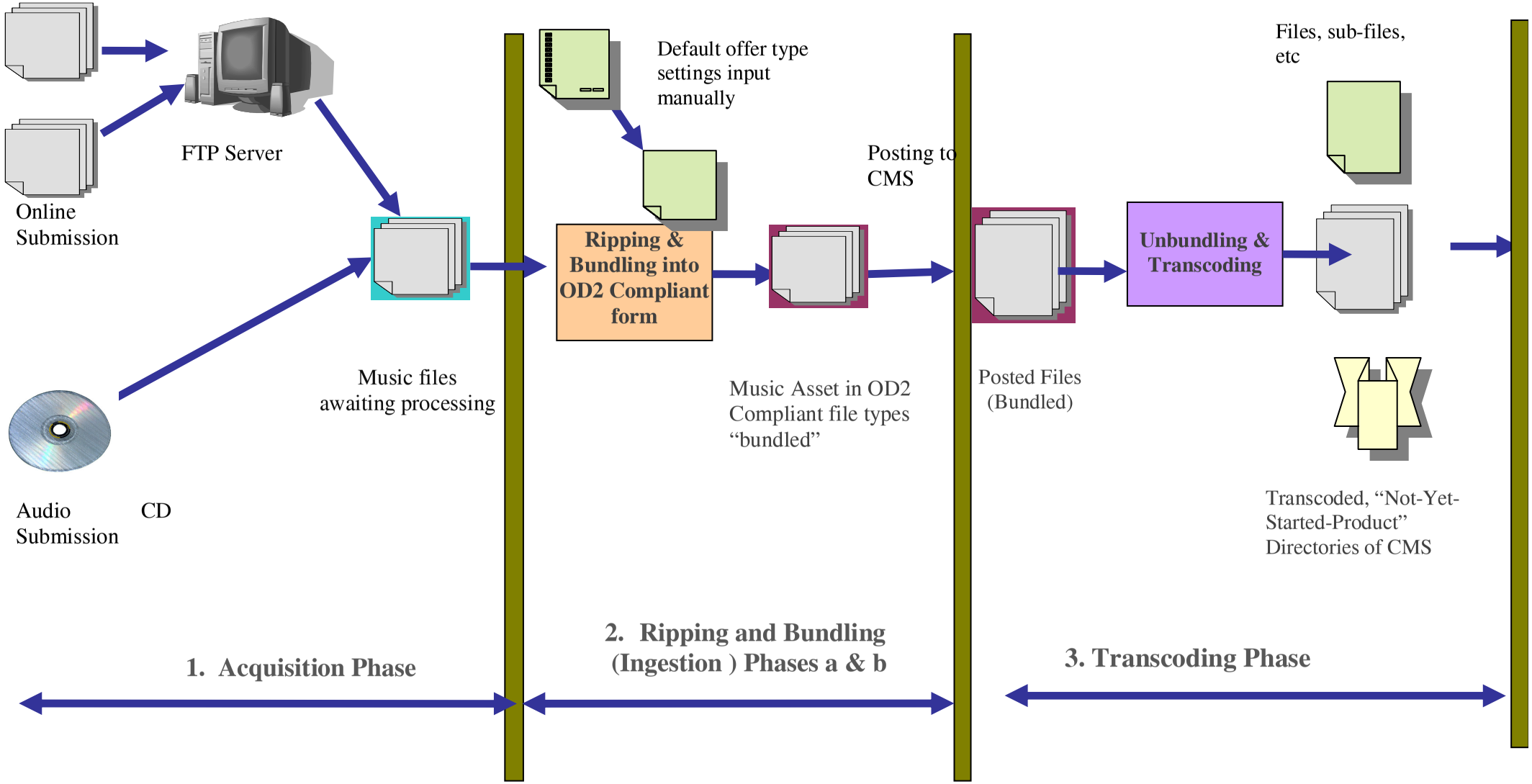
In this section, the current and the proposed (forthcoming) workflow processes at OD2 are illustrated by two sets of diagrams below which show the broadly similar nature of both workflows both of which essentially comprise a similar processing scenario spread over 6 phases, as follows:

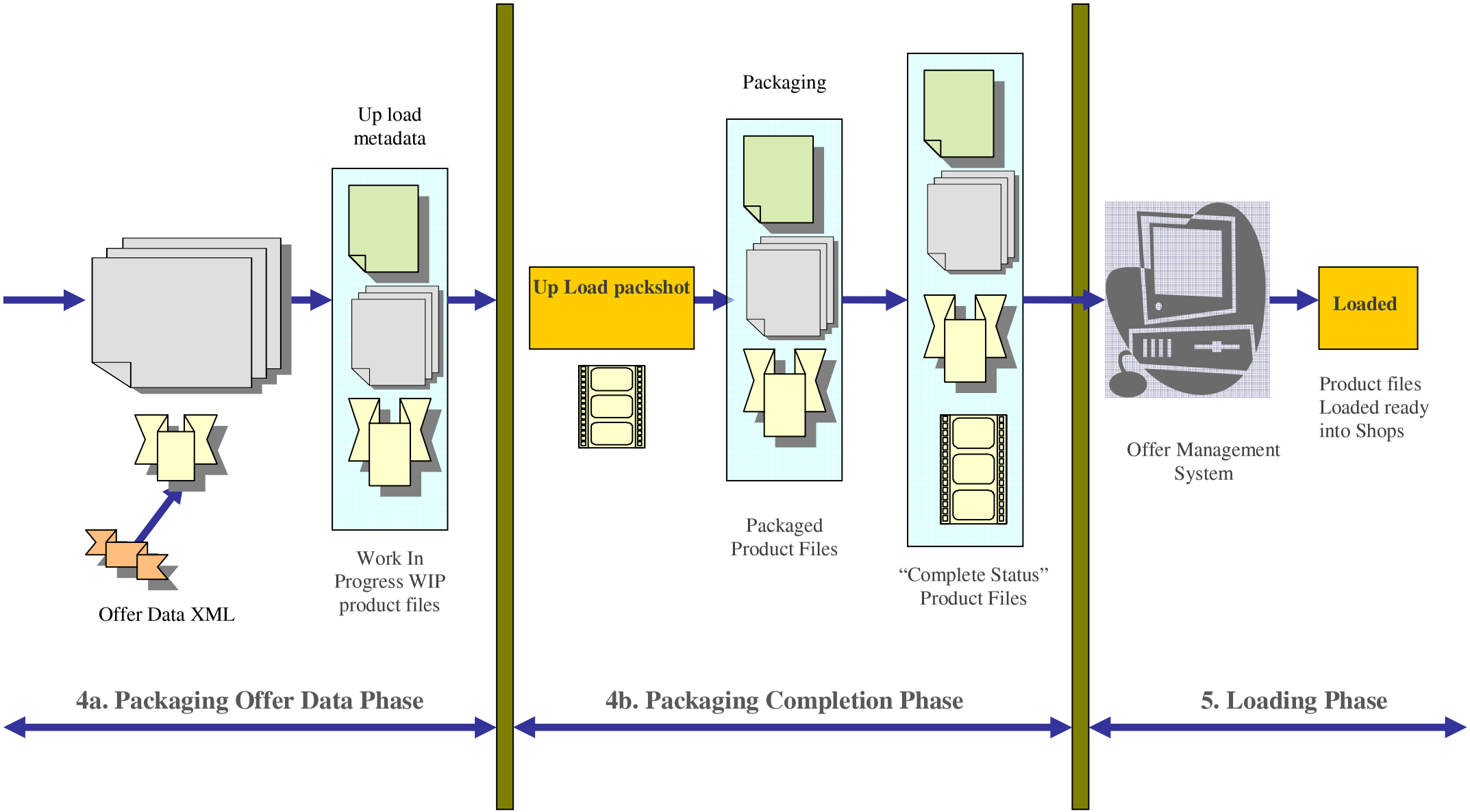
Proposed Workflow for Music Distribution




Files, sub-files, etc
Contractual XML
Transcoder
Ingested Files
Transcoded, Not-Yet-Started-Product
a
b
Offer Data XML
Packaged, Complete, Ready-to-Go Product
Offer Management System
Loaded
In Shops
3. Transcoding Phase
4. Packaging Phases (a), (b)
5. Loading Phase

Current OD2 Workflow for Music Distribution




Up load metadata
Packaging
Up Load packshot
Loaded
Offer Data XML
Work In Progress WIP product files
Packaged Product Files
"Complete Status" Product Files
Offer Management System
Product files Loaded ready into Shops
4a. Packaging Offer Data Phase
4b. Packaging Completion Phase
5. Loading Phase

Knowledge elicitation sessions

8.2.1.2.1 Typical Scenario for music distribution

Any task comprises of three stages namely the preparatory task enablement, followed by the task core processes, and concluded with the task closure stage. In a sense the Media Distribution On-Demand Processes to be described below can be viewed equally as production closure or distribution enablement processes followed by core distribution activities. It is important to note that the closure processes of distribution namely the download-on-demand of appropriate offers to be made available at a particular online shop or region normally occurs at download run-time and therefore the final real-time bundling and delivery phase of the Distribution is a feature of the dynamic web transaction environment and is not included here as coming within the provenance of the Distribution Workflow Control although it takes place under interactive control of the customer and the Offer Loader during music download-on-demand

The overall Distribution scenario is divided into six phases, starting from the acquisition of the digital media to its final delivery.

1) Acquisition Phase

Stock acquisition occurs mainly through FTP music download from the respective producer's server or sometimes the stock arrives by post on an Audio CD. Due to the high volume of music stock that various music producers (referred to as labels) supply for distribution on demand through online shops linked, currently it is better to prioritise the processing of new releases. They treat new releases as "urgent" files to be fast-tracked through the required internal processes and loaded into online shops within around 10 days.

AAA maintain a rigorous Quality Audit (QA) process on all stocks submitted to them by music publishers. A considerable number of the music files/CDs that arrive to be distributed online, have missing metadata fields etc (e.g. genre type) that have to be completed within the internal make-ready process before such stock can be loaded into the shops. The music files that arrive for processing generally have files formatted as (128-WMA) along with an XML document containing the metadata. The arrivals-server stores such files in a folder specific to each music producer i.e. according to each label. Upon the arrival of each new file, a script is invoked to check the file for its release date and if this falls into the category of new releases, the relevant file name is tagged "urgent" thus giving it a high priority for processing by being moved to the urgent area of the database.

Alternatively, those music files that are received in the form of Audio CD need to be checked and classified for processing as "urgent" or "non-urgent". Such Audio CDs are "ripped" into individual track files using in-house ripping software that converts the files into 128-WMA file format, re-named using the compliant files naming convention, before they are stored into the appropriate area of the database. The ripper program takes three passes i.e. runs three times using the data on the CD to generate 3 versions of the ripped files. These 3-versions are checked against each other and if they are not identical, they are discarded and the source CD is put in a special queue for further consideration and quality checks before being either rejected or accepted after further processing. Otherwise, if all the three ripped versions are the same, the CD is accepted with one copy of the file being stored to go through the make-ready pipelined process before being loaded into the shops.

An XML document containing the metadata for the CD is also generated and stored along with the music files. The files received from FTP servers can also be in different file formats and hence they too are converted into 128-WMA file format (if necessary) and re-named using the compliant file naming convention before being stored in the database. It is also possible that the original XML document that accompanied each music file upon arrival is found to be incomplete and may have several data fields missing. In such cases the XML document is created manually with the missing information filled. At this stage, the acquisition phase for these files is considered to be complete and they are ready for further processing. All such files are given compliant names as alphanumeric file names that are also the codes for identification of various parameters, e.g. supplier code, bit-rate, etc. This process is also known as "Bundling" and the files are referred to as "Bundled".

Due to the lack of full adherence to formatting and metadata standards on the part of the music producer companies who are the suppliers, all the above processes can not be fully automated under workflow control but

currently need continuous human intervention; hence the considerable workload involved during the oD2 make-ready process.

2a. Ingestion Phase (a)

Once the files are in the acquisitions database, an "Ingestion Program" is started. This program polls the database continuously for new acquisitions waiting for further processing. If it finds a new "urgent" file to be processed as higher priority stock, it picks it up and processes it through the ingestion. Otherwise the next available "non-urgent" file will be picked up to be processed by this ingestion program.

If there is any file in the "urgent" area of the database, the ingestion program invokes a validating program for its first pass validation. This program checks the WMA file along with the XML metadata file and makes a high level surface check to ensure that the metadata values are all present and correct. Typically this is a syntactical check for validating the structural integrity of the metadata i.e. to see if all of the required values are present. If any missing values are detected in the metadata at this stage, then such values will have to be supplied by references to the contractual rules in force with the respective supplier and will thus be extracted and inserted accordingly.; e.g. missing genre, UPC[1], ISRC[2], etc. If any files are found to be faulty in a way that can not be readily rectified by the above data extraction and insertion process then the whole bundle will be "dumped" into a specially designated "Dump Area" of the database to be processed further through a remedial procedure (described below in phase 2b).

After the above first pass validation, the validator makes a second Quality Audit pass to check other parameters within the XML document and the music content itself, e.g. the encoding used, the bit-rate used, compression, sound quality, etc. If this QA check were to report faulty or problematic items, then the whole bundle will again be dumped into the Dump Area of the database to be processed further through a remedial procedure (discussed later). If the files are found non-faulty they are moved to a different area, the CMS[3] Area of the database, using predetermined rules. These valid files are now called "Ingested" and ready to be stored in the relational database area which uses the XML data to store the various files related to each other in appropriate tables.

2 (b): Ingestion Phase (b) via Remedial Editorial

Whenever any file is "dumped" in the Dump Area of the Acquisitions Database, by the validator, a Remedial Editorial team reviews the dumped file to find out the reasons for the dump action, e.g. missing UPC, ISRC number, formatting problems, content problems etc. They take appropriate action based on these reasons for the earlier dump action so that the files concerned can pass both the above validation stages e.g. the missing values are inserted, the media files may have to be re-generated in appropriate format, etc. If the remedial action required can not be performed by the Dump Area staff (e.g. ISRC values cannot be obtained), then the files are binned i.e. will not be processed further and the suppliers are informed accordingly unless such data can be obtained and inserted accordingly.

The product code (UPC) and the International Standard Recording Code (ISRC) should be included in the metadata to allow traceable royalty payments to be effected for each sale. It should be noted that new regulations will require that if an ISRC number is not available for a product then that product cannot be included in the download charts.

3. Transcoding Phase

This is the process of taking the root product and creating various derivative media from it. The transcoder keeps running in the background all the time to see whether there are any newly ingested musical assets that have not been transcoded. When it finds one it takes the available files and uses a set of transcoding rules derived from contract XML to generate the required sub-files from the root product as permitted according to the contract with a particular label (according to their stipulated preferences and default sets for distribution in various territories). The transcoder stores the related files together in the location allocated to that product set plus adds DRM onto the product.

Essentially in this phase, the "Ingested" bundles (i.e. file sets each belonging to a particular music product e.g. a CD) are transcoded to generate different types of files based on the distribution requirements. This is done by unbundling the files and using them as needed to produce derived versions e.g. to generate 30 sec clips.

Additional file versions as may be required for different formats etc for various distribution channels etc. These files are called sub-files or the child files of the original parent file. The full set of files that then become available for each product as the output of the transcoding process i.e. all the related files and sub-files as a full set as required for each music product is re-bundled and stored along with their location information in the CMS database. These files are now known as "Transcoded" files and that partition of the database where they are kept is known as the "Products" Area.

At the end of this stage, the resulting files are referred to by their status as "Not-Started" products. This is to signify the fact that they have been transcoded ready as a product but they are still not ready to be loaded into the server areas dedicated to various online shops as further packaging phases are still needed in order to pack the Pack shots (Artists Photo, etc) and the offer-terms metadata (i.e. metadata specifying terms of availability re various download package offers as agreed with the suppliers to be targeted for different market regions (online shops for different countries etc) plus other applicable Offer Data as recommended by the Recommendation System as will be described in the subsequent phases.

4 (a). Packaging Phase (a)

These "Transcoded" Product files are then packaged in two phases; firstly to add the offer data to the metadata and secondly to add the pack shots. In the first of the following two packaging phases, the Contract XML data are accessed from the Proprietary Offer Management System (i.e. terms of product download availability as agreed with the label; i.e. with the supplier). Such Offer Data are added to the product metadata along with other applicable Offer Data from the Recommendation System. The resulting bundle is referred to as a WIP Product i.e. a Work-In-Progress product that has the status "packaged" and is moved to the Work-In-Progress area of the CMS database.

4(b). Packaging Phase (b)

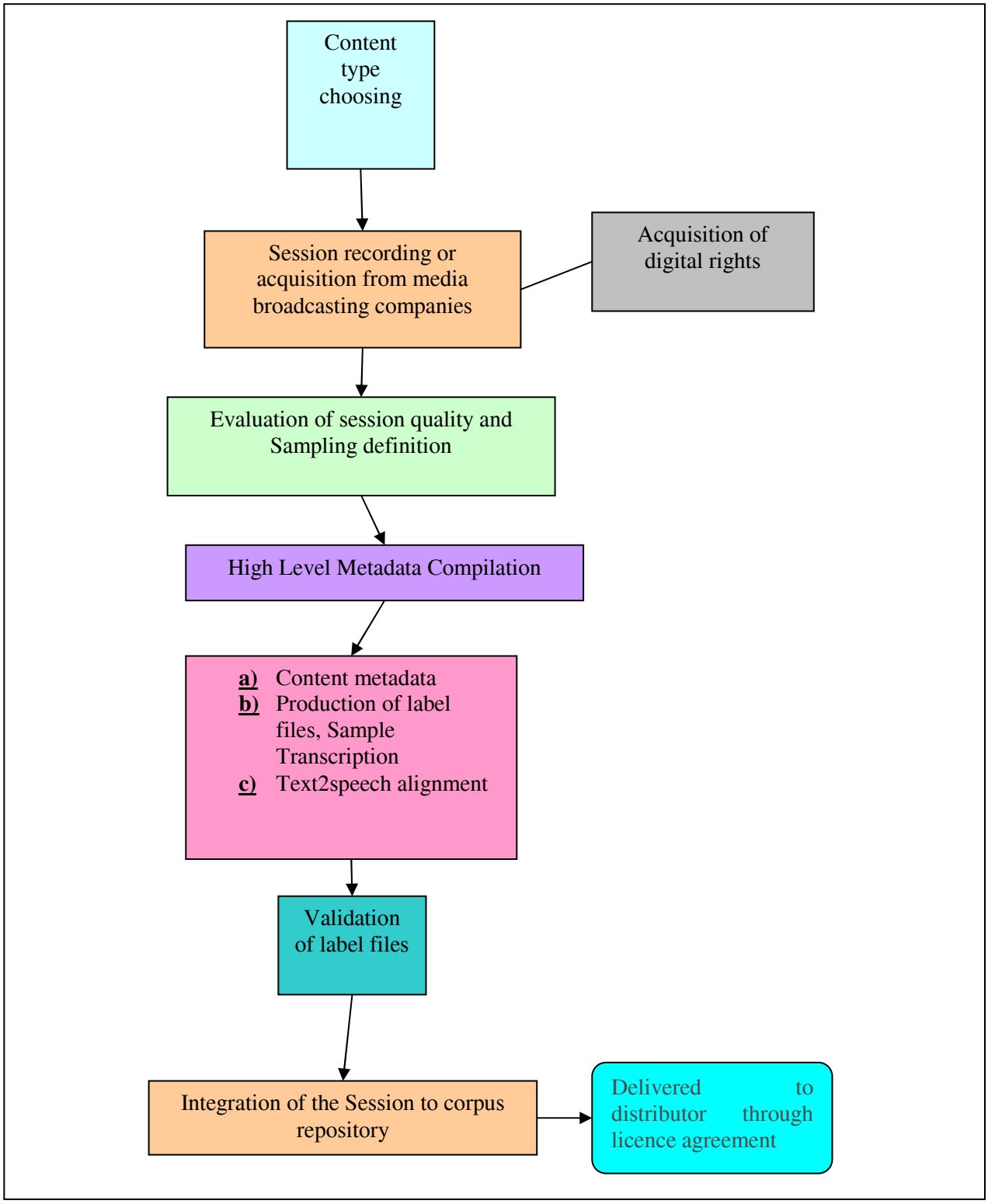
In this final packaging completion phase, the "Pack shots" are added to the Packaged WIP so as to completely package together all the files, i.e. the media file itself with DRM, and, all the sub-files including clips, pack shots, metadata (including Offer Data) which are then packaged with the status "complete" and becomes ready-to-go for loading into the regional online shops as in the next phase described below.

Phase 5: Loading

The "complete" packaged product resulting from the packaging completion phase is then input to the Offer Management System which loads such "complete" files into the database of shops based on the pre-agreed time and terms of release for each region. These files will then be called "Loaded" files and will be available for the end users according to the offer terms as agreed with the respective labels. If the files are loaded early then only the 30 sec clips will be available for download, until their release time, for the region concerned - as stipulated in the contract by the respective label. The full product will be available from the date of release onwards.

At some points the online download availability of certain media may cease if the contractual terms stipulated that the media were to be made available online only for a limited period of time. So such products are simply unloaded and thus become unavailable

22.3.1.3 Spontaneous speech repositories production workflow



22.3.1.4 Audio/Music/e-Content Distribtion Workflow

Diagram 1 Audio/Music/e-Content Distribution

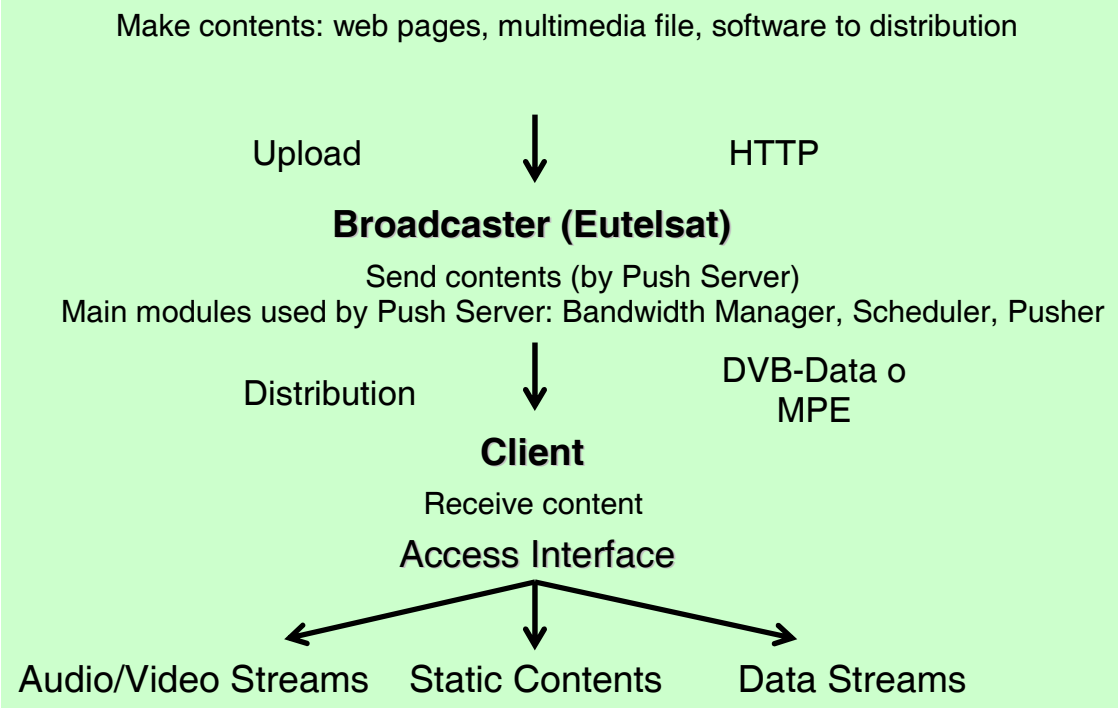
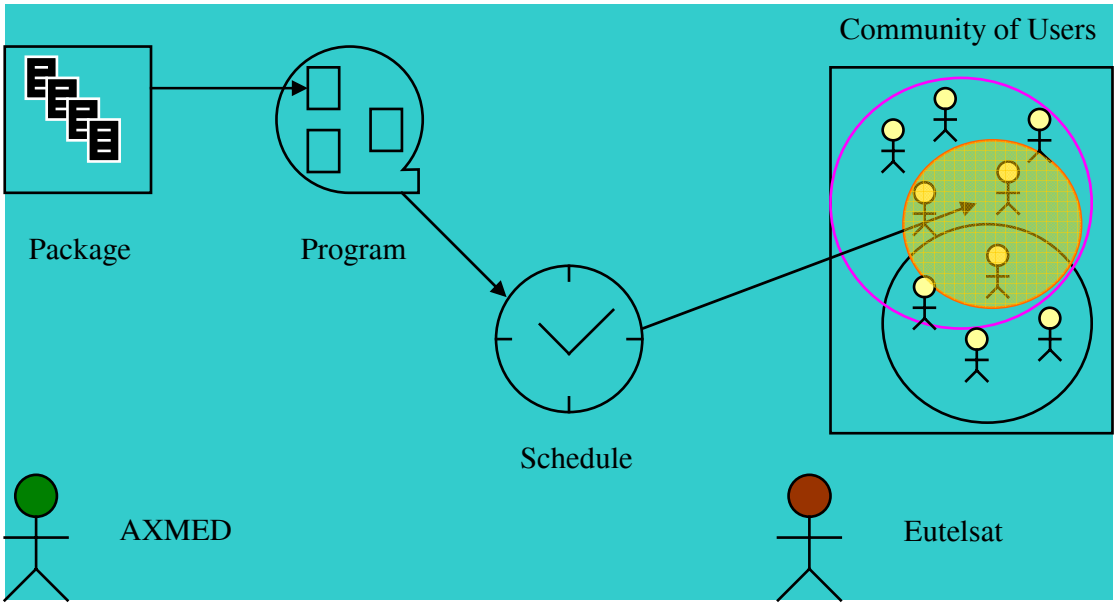
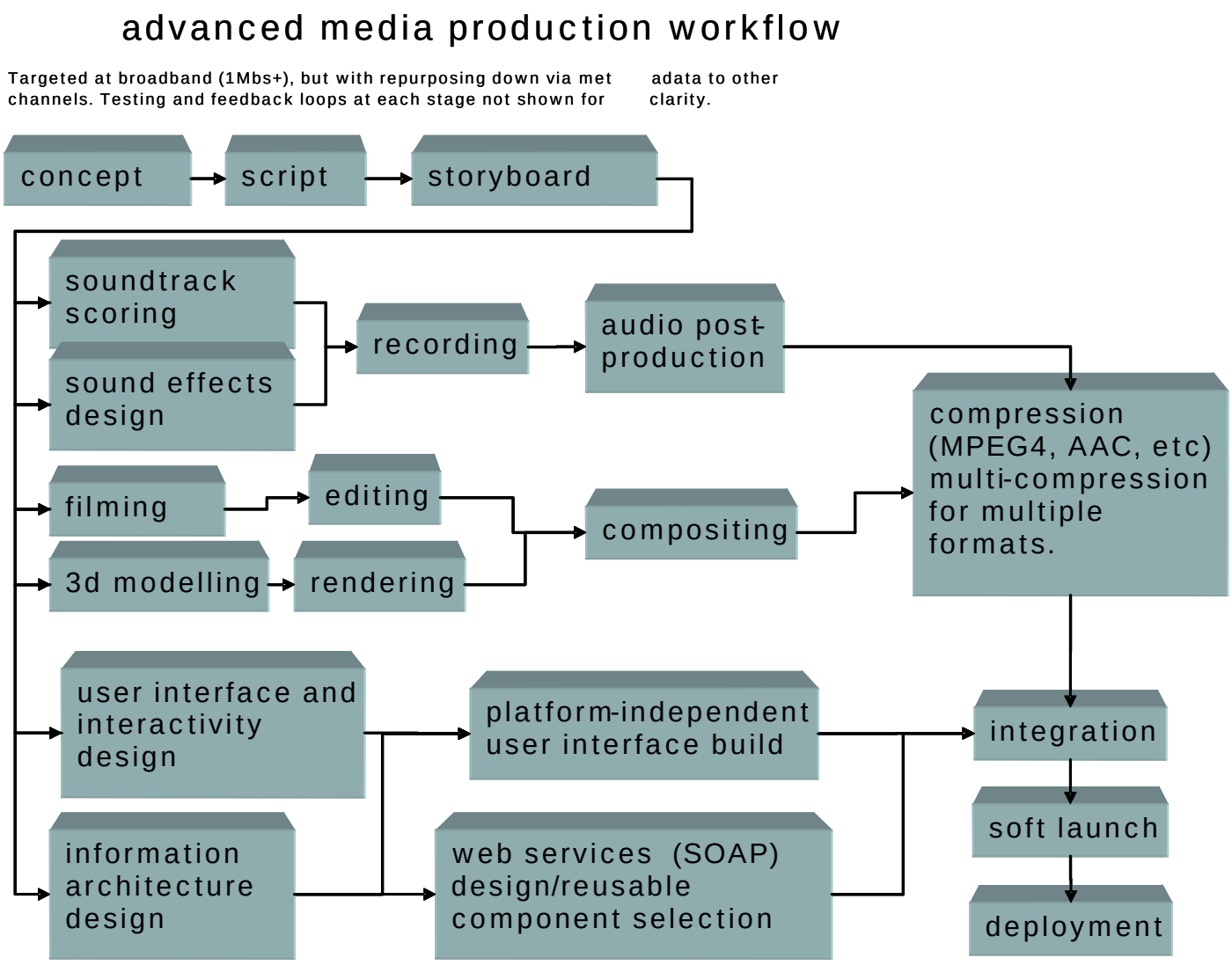


Diagram 2



22.3.2 Advanced Interactive and Immersive e-Media Production and Distribution Workflow



Advanced media workflow

- **Conceptualisation** - A producer starts with a concept for a production, which is scripted and storyboarded as a non-linear storyline, meaning that multiple, contingent versions of the same storyline are developed. A sound track is scored and recorded.
- **Sound** - Sound effects are designed and recorded into a library for the project, but not edited yet. Clearance for usage is sought from 3rd party sound sources.
- **Filming** - Location and or sets are prepared, filming takes place, including all possible routes through the content in line with the storyboard.
- **Rendering** - 3D models are developed and rendered out ready for compositing (integrating).
- **Post production** - All audio-video content is then composed and edited into suitable slices for interactive playout.
- **Clearance** - Once a working mock-up or prototype is developed, this is distributed to the relevant sources for usage clearance for any 3rd party media.
- **Transcoding** - All AV content is compressed with suitable codecs for the target platforms.
- **Information architecture** - Information architecture is designed by the software engineers.
- **Copy writing** - Text-based content sourced or written (again, a clearance loop may be necessary).

- **Localisation** - Localisation is applied to written and spoken content for the target languages.

- **UI development** - The User interface is designed (using UML use cases) and tested for usability and accessibility requirements.
- **Coding** - Software engineers design and build the web services and program logic. This may include web-based database, interfaces with a custom CMS, SOAP or .NET web services, and the actual embedded scripting which will be client-based, which is at present is usually coded in Flash and deployed as an SWF.
- **Multimedia integration** - All elements are integrated using authoring tools suitable for the target platforms.
- **Testing** - Final testing is carried out (each previous step includes iterative testing in addition).
- **Soft launch** - The service is 'soft launched' meaning essentially beta testing.
- **Go live / launch** - Final deployment takes place once feedback from testing has been elicited and incorporated.
- **Review process** - Once fully operational, the service or game is reviewed, monitored and refined as necessary.

22.3.3 Multimedia Edutainment/ e-book Production and Distribution Workflow

This section will now describe the workflow for various AXMEDIS partners involved in production and distribution of Multimedia Education/Entertainment/e-books.

22.3.3.1 Typical Scenario for Digital Object Production and Distribution

I. **Sketch Phase**: Concept initiator creates sketch of New Product Development (NPD) and gives this to the Director. Director can make a decision of No-Go or Go. If the decision is No-Go the sketch is binned and the NPD concept is discarded otherwise the NPD concept will progress to Phase 2.

II. **Sketch Digitisation Phase**: Technical Team in consultation with the legal copyright experts develop a digitised mock-up of the sketch.

III. **Digitised Mock-up Appraisal Phase**: The digital mock-up is given to the Director for appraisal. The Director can make a decision of No-Go or Go. If the decision is No-Go the sketch is binned and the NPD concept is discarded otherwise the NPD concept will progress to Phase 4.

IV. **Initial Project Appraisal Phase**: An Editorial Board is convened to consider the Go-stamped digital mock-up and decides whether a project can be feasible and launched at this time. If the decision is No-Go the project launch will not take place or may be postponed. If the decision is Go, a new project is started and the new product development concept progresses to Phase 5. Team leaders are assigned and the production is initiated using a content production technical team and a Rights Clearance Seeking legal team.

V. **Production-to-Draft Phase**: The technical team comprising text, graphics and audio editors work to produce the digital drafts and in parallel the clearance seeking team work to secure the required copyright clearance agreements from external copyright owners. The Draft when ready, is presented to an Evaluation Board by the production team.

VI. **Continuing Evaluation Phase**: The Evaluation Board comprising the production team, distribution team, marketing and legal experts will evaluate the Draft and if the Draft is not-ready, it will be either discarded or sent back to Phase 5 for re-Drafting. Whenever a Draft is evaluated as "ready", then the Draft of the new product will be (re)-Sealed and the new product will progress to the final phase 7.

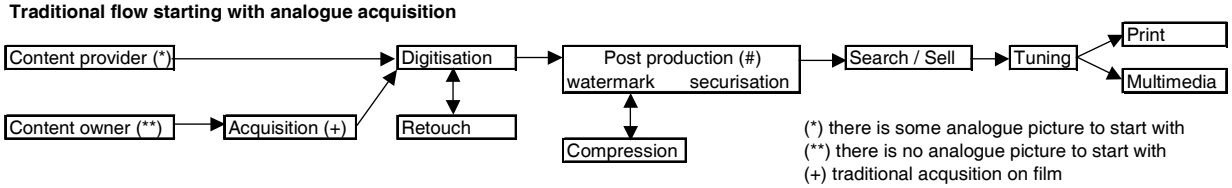
VII. **Distribution Phase**: In this phase, target distribution channels are selected and for each channel the (re)-Sealed Draft product goes through a linear sequence of composition, formatting, packaging, bundling, and distribution to users (B2B or B2C).

LOOP

Depending on any reworking that may prove necessary during phase 7, due to rights/marketing issues (e.g. specific geo-politic or cultural sensitivities requiring substitution or re-working of certain part of a re-Sealed product for distribution to specific markets through particular channels, or, due to unexpected rights clearance difficulties having

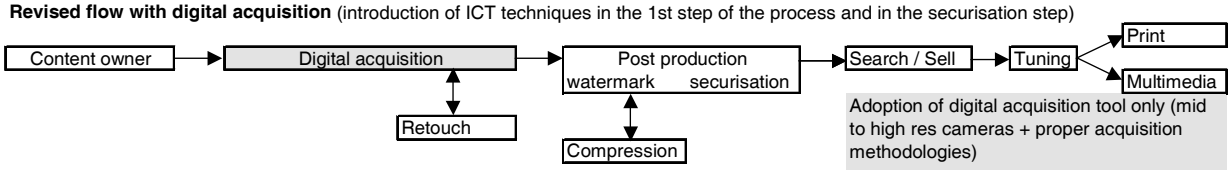
arisen) the new re-sealed product may need to be referred to phase 5, for re-Drafting. Introduction of ICT in content production process for publishing (some comparisons)

Traditional flow starting with analogue acquisition



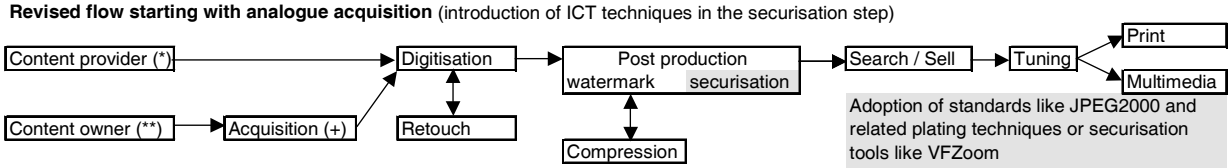
(*) there is some analogue picture to start with
(**) there is no analogue picture to start with
(+) traditional acqusition on film
(#) the securisation process is only partially adopted

Revised flow with digital acquisition (introduction of ICT techniques in the 1st step of the process and in the securisation step)



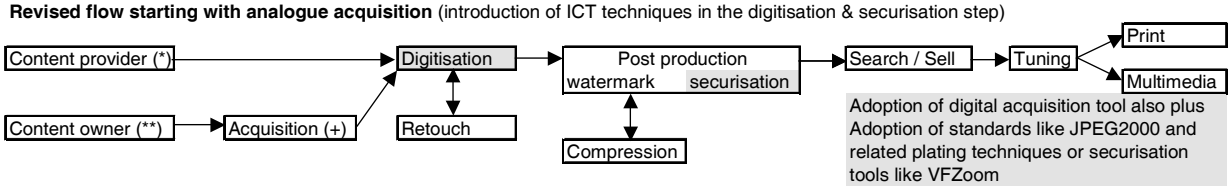
Adoption of digital acquisition tool only (mid to high res cameras + proper acquisition methodologies)

Revised flow starting with analogue acquisition (introduction of ICT techniques in the securisation step)



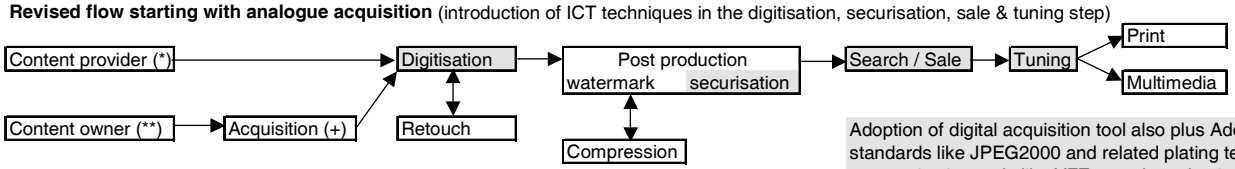
Adoption of standards like JPEG2000 and related plating techniques or securisation tools like VFZoom

Revised flow starting with analogue acquisition (introduction of ICT techniques in the digitisation & securisation step)



Adoption of digital acquisition tool also plus Adoption of standards like JPEG2000 and related plating techniques or securisation tools like VFZoom

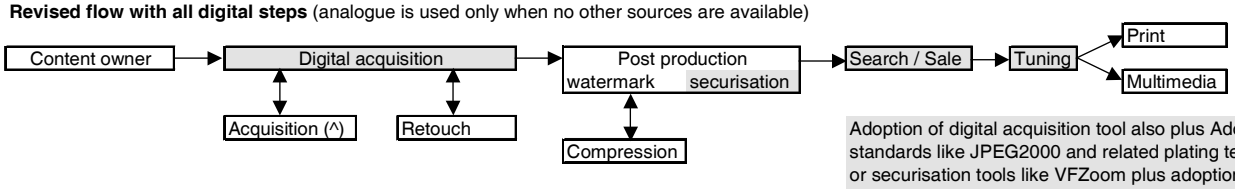
Revised flow starting with analogue acquisition (introduction of ICT techniques in the digitisation, securisation, sale & tuning step)



(*) there is some analogue picture to start with
(**) there is no analogue picture to start with
(+) traditional acqusition on film
(#) the securisation process is only partially adopted

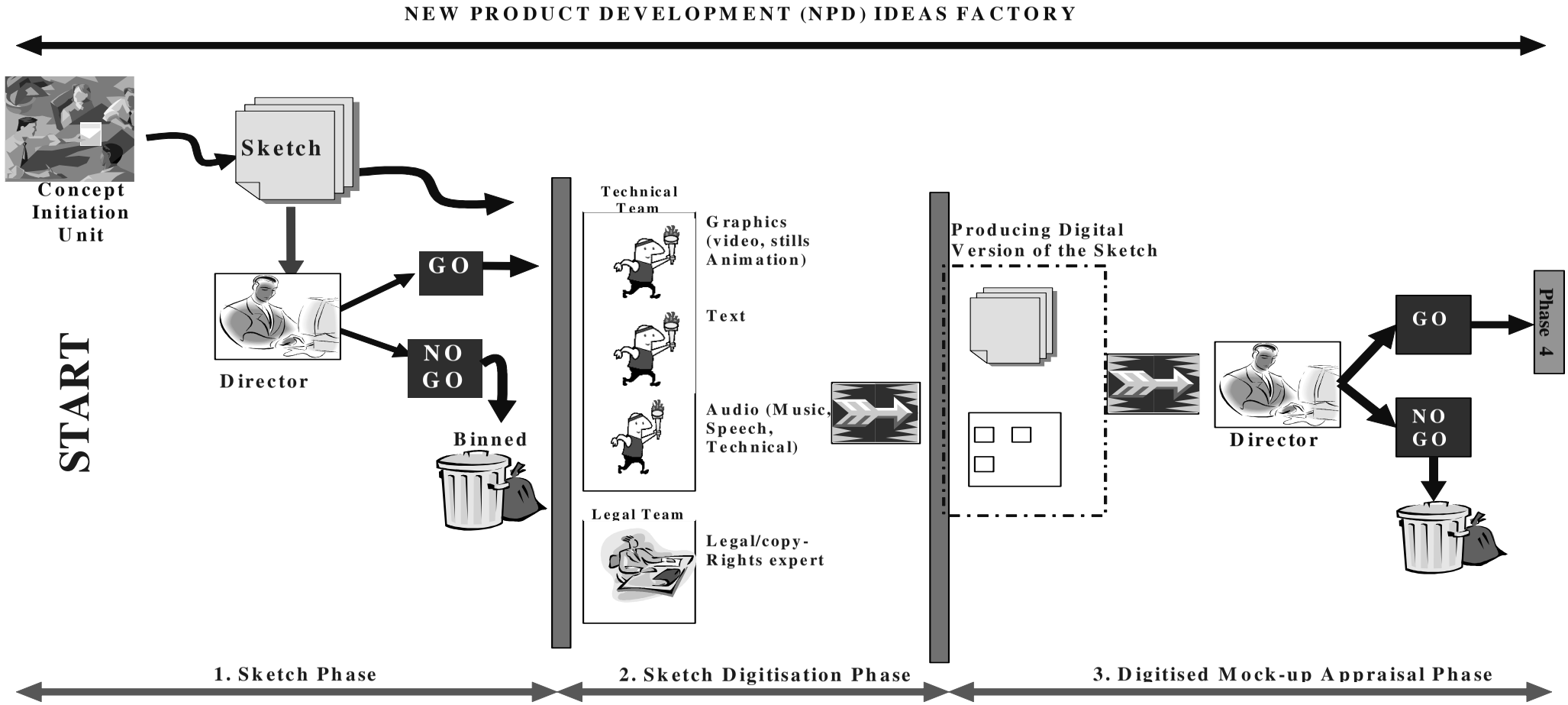
Adoption of digital acquisition tool also plus Adoption of standards like JPEG2000 and related plating techniques or securisation tools like VFZoom plus adoption of e-commerce tools and work flow solution to help manage the clearence process during invoicing and delivery. Introduction of colour calibration in the Digitisation and tuning step (note that different standard apply to colour space in the two phase nominally RGB and CMYK / Esacromy)

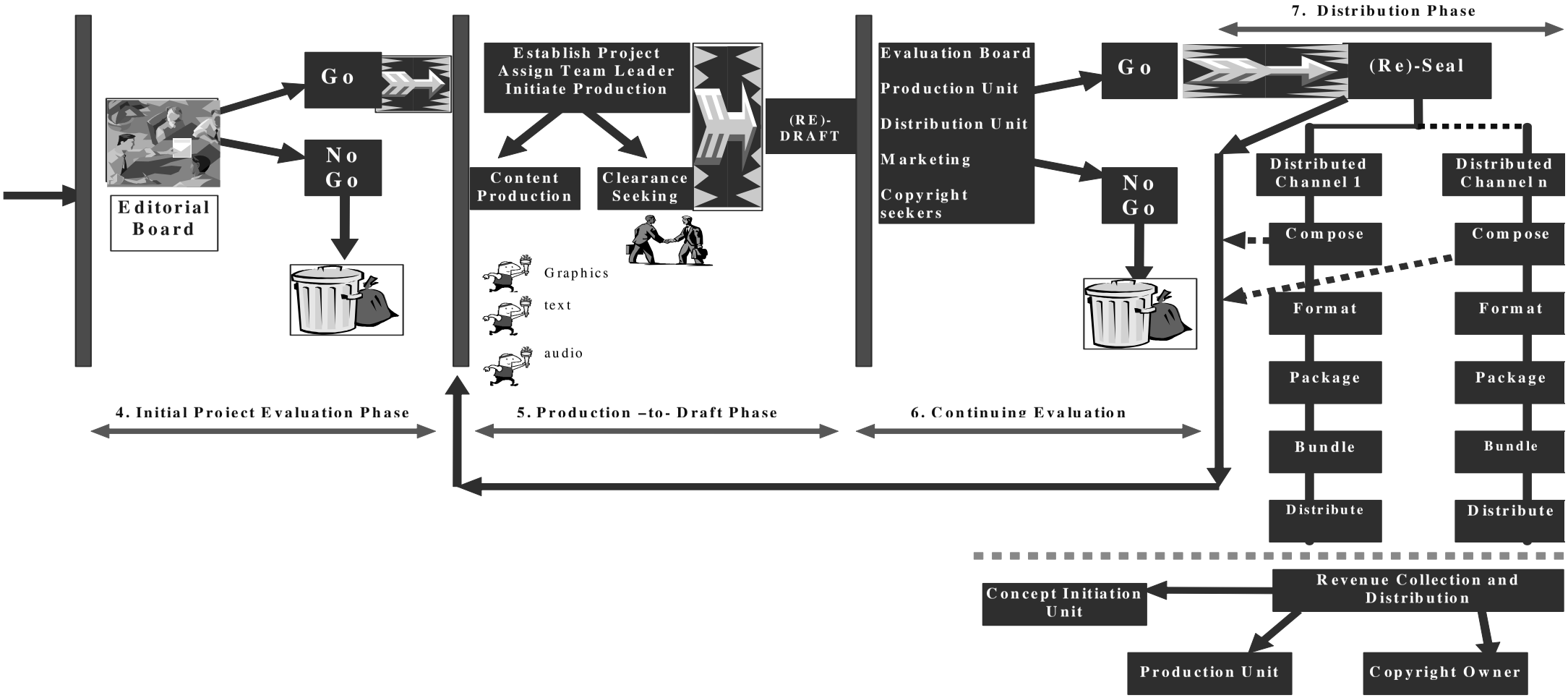
Revised flow with all digital steps (analogue is used only when no other sources are available)



(*) there is some analogue picture to start with
(**) there is no analogue picture to start with
(#) the securisation process is only partially adopted
(^) aquisition from analogue sources as the only one available

Adoption of digital acquisition tool also plus Adoption of standards like JPEG2000 and related plating techniques or securisation tools like VFZoom plus adoption of e-commerce tools and work flow solution to help manage the clearence process during invoicing and delivery. Introduction of colour calibration in the Digitisation and tuning step (note that different standard apply to colour space in the two phase nominally RGB and CMYK / Hexachrome)


NEW PRODUCT DEVELOPMENT (NPD) IDEAS FACTORY
Concept Initiation Unit
Sketch
START
Director
GO
NO GO
Binned
Technical Team
Graphics (video, stills Animation)
Text
Audio (Music, Speech, Technical)
Legal Team
Legal/copy-Rights expert
Producing Digital Version of the Sketch
Director
GO
NO GO
Phase 4
1. Sketch Phase
2. Sketch Digitisation Phase
3. Digitised Mock-up Appraisal Phase


7. Distribution Phase
Go
No Go
Editorial Board
Establish Project
Assign Team Leader
Initiate Production
Content Production
Clearance Seeking
(RE)-DRAFT
Graphics
text
audio
Evaluation Board
Production Unit
Distribution Unit
Marketing
Copyright seekers
Go
No Go
(Re)-Seal
Distributed Channel 1
Distributed Channel n
Compose
Compose
Format
Format
Package
Package
Bundle
Bundle
Distribute
Distribute
4. Initial Project Evaluation Phase
5. Production –to- Draft Phase
6. Continuing Evaluation
Concept Initiation Unit
Revenue Collection and Distribution
Production Unit
Copyright Owner

8.2.3.1.1 Production Process

The production chain follows well-codified and standardised process that can be described as follows:

Activity	Task		Involved roles
Idea (1)			*Management* *Authors* *Chief Editor* *Press Office*
Market survey (2)			
Title design (3)			
Go / No Go decision [5] *(4)*			*Management*
Research of (5)	*Sources (6)* *References (7)* *Contacts (8)* …	*IPR/© clearance*	*Management* *Authors* *Editorial board* *Editorial staff* *Press Office* *Legal Department*
Draft acceptance [6] *(if positive the next step starts if not the previous is reiterated)*			*Management* *Authors* *Editorial board* *Legal Department*
Editing of (11)	*Texts (12)* *Notes (13)* *Indexes (14)* … *Multimedia (15)* *Captions (16)*		*Authors* *Chief Editor* *Editorial board* *Editorial staff* *Press Office* *Legal Department*
Product final acceptance *(if positive the next step starts if not the previous is reiterated)*			*Authors* *Chief Editor* *Legal Department*
Finalisation of (17)	*Texts (18)* *Notes (19)* *Indexes (20)* … *Multimedia (21)* *Captions (22)*		*Chief Editor* *Editorial board* *Editorial staff* *Production department* *Press Office* *Legal Department*
Formal authorisation to start production *(if positive the next step starts if not the previous is reiterated. In this case IPR/© clearance should have been completed if not process may be suspended / stopped / cancelled)*			*Management* *Chief Editor* *Editorial board* *Legal Department*
Production	*Depends on the kind of publication (CD, WEB, TV, book, magazine …)* ***See the pre press section too***		*Production department* *Press Office*

Most of the relevant differences between the various kinds of production lay in the characteristics of the used multimedia item (an image suited for print out requires at least 600dpi while the same image for the web could be tuned on a 72dpi basis).

The IPR and © management is usually managed in a parallel stream, main interactions occur whenever some asset cannot be cleared and therefore has to be replaced. Such event may therefore occur at any step and the impact may be marginal or relevant depending on a set of possible combinations of factors:

- The relevance for the publishing project of the object that could not be cleared;
- The reason for lack of clearance;
- The stage of the publishing process:
- The availability of a replacement / equivalent object…

In line of principle a similar approach applies (with major or minor changes) to the editorial process of whatsoever product. We will primarily focus on traditional, desktop and multimedia publishing as they present the highest number of contact points and overlaps. Digital TV, serials, movies and in general products requiring video production are somehow different as the design and planning phase is much longer and has several by-products (storyboards, drawings, scripts, books… even buildings) that in certain case will have their own existence and production cycle. Therefore we will just give a very brief sketch of this process without entering in details.

Activity	Involved roles

[5] Such a decision is based on market data and production cost analysis to ensure the expected return on investment (ROI)

[6] At this step starts a parallel process for managing © and IPR clearance performed in an asynchronous parallel fashion.

<table>
<tr><td>Idea</td><td colspan="3">Storyboard drafting</td><td>Author
Writer
Script editor
Art director
Director
Producer
Production accountant</td></tr>
<tr><td colspan="4">Cost estimation</td><td>Producer
Production accountant</td></tr>
<tr><td colspan="4">Go/No Go decision</td><td>Producer</td></tr>
<tr><td>Title design</td><td>Storyboard finalising
Scripting drafting
Casting preparation</td><td rowspan="2">Cost estimation refinement</td><td rowspan="6">IPR/© Contracts management</td><td>Author
Script editor
Producer
Director
Casting director
Art director</td></tr>
<tr><td>Design & preparation</td><td>Casting
Scripting
Lighting drafting
Shooting plan drafting
Effects drafting
Costumes drafting
Sound track drafting
Contracts finalising</td><td rowspan="4">Costume designer
Makeup designer
Composer
Audio Engineer
Graphic designer
Special effect designer
Fight arranger
Lighting cameramen
Production assistant
Location manager
Art director
Director
Casting director
Producer
Production lawyer
Production accountant</td></tr>
<tr><td>Development & shooting</td><td>Storyboard adapting
Lighting management
Shooting plan adapting
Effects management</td><td rowspan="3">Cost control</td></tr>
<tr><td>Post Production</td><td>Mounting
Sound addition
Effects addition
Packaging</td></tr>
<tr><td colspan="2">Marketing</td><td>Marketing manager</td></tr>
<tr><td colspan="2">Distribution & rights selling</td><td>Revenue management</td><td>Marketing manager
Production accountant</td></tr>
</table>

Following what has just been stated we will detail the publishing process and for each role, the overall set of activities macro requirements and related tools. For each set of macro requirements and related tools we have also tried to point out basic requirements in terms of functionalities taking for granted that all other minor or non-crucial requirements should be implicitly solved by adopted tools. In the schema communication tools like e-mail, ftp … are taken as granted. As the print medium is still a very important market and cost production is relevant (paper consumption for start-up and close down of print process, ink consumption, quality assurance with optical on-line check of print process, printing equipment maintenance…) we will also provide a sketch of the pre-press service where in the recent years ICT has been increasingly adopted helping reducing production costs and times while retaining or even increasing result quality.

Details will be initially provided for the editorial process (expanding what was previously just sketched in terms of actions and needs) then actors will be described in more detail. Only after this all the pre print activity will be tackled.

8.2.3.1.2 Process, involved roles and related macro requirements

An overview on the macro requirements is provided I on the macro requirements and /or need tools related to each activity, task and sub-task according to involved roles in the following schema.

Activity	Task	Involved roles	Description	Macro Requirements / Needed tools
Idea (1)		*All*	*Product basic concept sketch*	*There are no special requirement*
Market survey (2)		*Management*	*This is the basic activity carried out in order to define new products. As each publishing activity should be based on sell forecast. This phase ensures that all analysis efforts have been carried out to give a sound basis to the evaluation process of a new publishing idea. Usually there is also a major effort to locate new ideas into a publishing plan.*	*Market studies, forecasts & Press survey are used to keep under control market evolution and are a starting point on which the management intuition relies for soundness* *Scorecards indicators & Company management tools are used to keep under control all major company indicators (balance, sell, cash flow …)*
		Press Office	*Provide information and starts preparing product early announcement*	*There are no real requirements for this actor category in this phase.*

Activity	Task	Involved roles	Description	Macro Requirements / Needed tools
		Authors	*Usually there is no direct involvement in the survey at least in an operational manner. The author is generally meant to provide ideas based on the market survey results.*	*There are no real requirements for this actor category in this phase.*
		Chief Editor	*The role of the chief editor in this phase is to mediate results of the survey, managements expectations and authors ideas with present and scheduled publishing activities in order to state if there is room for a new product, when and where.*	*Publishing planning system in order to ensure that if a new title has to be started there is enough man / machine power and time to adjust the new development*
Title design (3)		*Management*	*The main contribution in this phase is related to the strategy. Care is taken to harmonise each new operation with the existing publishing plan, or else in defining new plans.*	*Scorecards indicators & Company management tools are used to keep under control all major company indicators (balance, sell, cash flow …)*
		Press Office	*Prepares the product early announcement*	*There are no real requirements for this actor category in this phase.*
		Authors	*There is a direct involvement in this phase. Each author will contribute with his own original piece of content (text, image, video, music, design …) at least in terms of samples and sketches in order to better clarify its idea and proposal.*	*Text editors to manage pieces of text describing ideas and content* *Image processing tools to show sample of pictures* *Audio managing tools could be required when examining digital or analogical samples non played live.*
		Chief Editor	*Defines the guidelines of the project in a storyboard according to company adopted standards and procedures. Guides the single or group of authors to integrate into the editorial working group and gives general rules for checking the production process. He also states the relevant milestones and deadlines in the overall process. Provides the accounting department will all required data to set up the related items in the company planning and accounting system.*	*Text editors to manage pieces of text describing ideas and content* *Image processing tools to show sample of pictures*[3] *Audio managing tools could be required when examining digital or analogical samples non played live.* *Publishing planning system in order to ensure that if a new title has to be started there is enough man / machine power and time to adjust the new development*
Go / No Go decision (4)		*Management*	*Based on the result of the market survey, the analysis of the proposed ideas and the production availability and costs a go / no go decision is taken. Many publishing project are stopped at this stage regardless of the content or idea quality but due to excessive cost or lack of real market.*	*Scorecards indicators are used to keep under control all major company indicators (balance, sell, cash flow …)* *Publishing planning system in order to ensure that if a new title has to be started there is enough man / machine power and time to adjust the new development*
Research of (5)	*Sources (6)* *References (7)* *Multimedia (9)* *Similar titles (10)*	*Authors* *Editorial board* *Editorial staff*	*Available information sources are sought and book-marked. Highlighted sources are classified and stored into a DB or files for future reference. Each source is ranked in terms of relevance, quality and richness.* *Copyright issues related to the source are noted..*	*Information services (Reuters, ANSA …), BBS, Archives, Books & libraries, Internet are used as common information sources were to seek data.* *Databases are used both for seeking and storing found data. Therefore it is necessary to have a database management system and related tools*
		Press Office	*Provide information and sources*	*There are no real requirements*
	Contacts (8)	*Management* *Editorial board*	*Possible partners for publishing are sought both on a local and an international basis according to the marketing strategy that was established in the design phase*	*Personal knowledge and relation are mainly used in this phase and therefore the only real requirement is a good "relational capability" for all the involved team.*
Editing of (11)	*Texts (12)* *Notes (13)* *Indexes (14)* *Captions (16)*	*Author* *Chief Editor* *Editorial board*	*Acts as a supervisor checking for quality assurance and publishing plan (schedule, cost …) respect. Has the full responsibility of the phase development.*	*Publishing planning system in order to track man / machine power used* *Reporting tools for production cost update toward the accounting department*
		Authors *Editorial staff*	*Writes, produces, acquires and stores contents and assets to be used in the production phase. During this process various tools and procedures are used.*	*Text editors to manage text. Both in creation phase as well as in the revision one.* *Databases for seeking and storing data (reference and processed data)*
		Press Office	*Prepares the announcement*	*There are no real requirements*
	Multimedia (15) *[Images* *Audio* *Video]*	*Chief Editor* *Editorial board*	*Acts as a supervisor checking for quality assurance and publishing plan (schedule, cost …) respect. Has the full responsibility of the phase development.*	*Image processing tools,* *Video managing tools,* *Audio managing tools: to check acquired content … and operate a proper selection based on quality criteria.* *Databases for seeking and storing data*

Activity	Task	Involved roles	Description	Macro Requirements / Needed tools
		Authors	*Creates, processes and archives items to be used in the production process.*	*Image processing tools, Video managing tools, Audio managing tools: to acquire content and turn it into basic assets to be used in the production process Databases for seeking and storing data*
		Editorial staff	*Acquires, classifies and stores items to be used in the production process.*	*Image processing tools, Video managing tools, Audio managing tools: to check acquired content, classify and store it. Databases for seeking and storing data*
Finalisation of (17)	*Texts Captions Notes Indexes*	*Authors Chief Editor Editorial board*	*Acts as a supervisor checking for quality assurance and publishing plan (schedule, cost …) respect. Has the full responsibility of the phase development.*	*Publishing planning system in order to track man / machine power used Reporting tools for production cost update toward the accounting department Publishing tools: to check produced content in terms of layout and aspect. Databases for seeking and storing data*
		Editorial staff	*Processes and stores contents and assets taking care of layout and aspects related issues (text correctness, proper linking between captions and images …)*	*Publishing tools to manage textual content. Both in term of layout as well as in aspect. Databases for seeking and storing data*
		Production department	*Prepares the proper layout of each text portion according to the expected product Finalises and optimises content in order to fit the designed layout Produces the eventual product cross index*	*Publishing tools to manage content. Both in term of layout as well as in aspect. Programming tools to manage product development (multimedia, web and TV only) Databases for seeking and storing data*
		Press Office	*Finalises the announcement and starts promoting the product*	*There are no real requirements*
	Images Audio Video	*Authors Chief Editor Editorial board*	*Acts as a supervisor checking for quality assurance and publishing plan (schedule, cost …) respect. Has the full responsibility of the phase development.*	*Image processing tools, Video managing tools, Audio managing tools: to check acquired content … and operate a proper selection based on quality criteria. Databases for seeking and storing data*
		Editorial staff	*Processes and stores contents and assets taking care of layout and aspects related issues (resolution, layout, colours …)*	*Image processing tools, Video managing tools, Audio managing tools: to check acquired content, classify and store it. Databases for seeking and storing data*
		Production department	*Prepares the proper layout of each multimedia portion according to the expected product Finalises and optimises content in order to fit the designed layout Produces the eventual product cross reference*	*Image processing tools, Video managing tools, Audio managing tools: to manage content. Both in term of format as well as in aspect. Programming tools to manage product development (multimedia, web and TV only) Databases for seeking and storing data*

At this point the process ends that can be described in general terms with no specific reference to the actual production cycle. In terms of productions there are peculiarities that are strictly dependent on the specific product that is being produced. For our project aims, production details of a specific product are not as crucial as the process described so far. This is mainly due to the fact that at this point the producer will use the object in its own production environment respecting rules and constraints deriving form DRM.

It is taken as granted at this stage that an operation like storing content on a specific location of the file system in an unprotected mode will be possible only if the DRM rules and data provided with the managed object allow this to happen. Therefore we believe it is more crucial at this stage to point out the process steps and what is used to achieve it in general rather than to specify in details steps that may greatly vary from actor to actor. Nevertheless basic indication of related macro requirements or needed tools are provided

Activity	Task	Involved roles	Description	Macro Requirements / Needed tools
Production	*Books & Magazines*	*Production department*	*Prepare the final layout (which depends on several factors including co-editions …) according to optimisation methods for paper saving (back and front printing, page cutting …). Uses the proper printing procedures and equipment according to copies expected number. Checks the correctness of the attained result*	*Publishing & printing tools to manage content. In term of layout, aspect … Image processing tools: to manage content. Both in term of format as well as in aspect. Databases for seeking and storing data*

Activity	Task	Involved roles	Description	Macro Requirements / Needed tools
	CD/ROM DVD		*Finalises the title and implements the run-time environment (including multi-language aspects…)* *Mounts all product components in the final version,* *Checks the correctness of the attained result* *Prepares the gold disk for mass production* *Prepare the final packaging*	*Publishing tools to manage content. Both in term of layout as well as in aspect.* *Image processing tools,* *Video managing tools,* *Audio managing tools: to manage content. Both in term of format as well as in aspect.* *Programming tools to manage product development* *Databases for seeking and storing data*
	Web		*Finalises the site (including multi-language aspects…)* *Mounts all site components in the final version,* *Checks the correctness of the attained result* *Puts on line the final version or provides the ASP[7] with the due files and file system structure*	*Image processing tools,* *Video managing tools,* *Audio managing tools: to manage content. Both in term of format as well as in aspect.* *Programming tools to manage product development* *Databases for seeking and storing data*
	TV, iTV, PDA mobile and other new media		*Finalises the title and implements the run-time environment (including multi-language aspects…)* *Finalises the production (according to delivery platform)* *Checks the correctness of the attained result* *Deliver the final version*	*Publishing tools to manage content. Both in term of layout as well as in aspect.* *Image processing tools,* *Video managing tools,* *Audio managing tools: to manage content. Both in term of format as well as in aspect.* *Programming tools to manage product development* *Databases for seeking and storing data*

Management

Description	Macro Requirements / Needed tools
After having an idea the first step is generally a market survey. This is the basic activity carried out in order to define new products. As each publishing activity should be based on sell forecast. This phase ensures that all analysis efforts have been carried out to give a sound basis to the evaluation process of a new publishing idea. Usually there is also a major effort to locate new ideas into a publishing plan. *Once some preliminary result from the market survey is available (in case of positive ones) a design phase is started. The main contribution in this phase is related to the strategy. Care is taken to harmonise each new operation with the existing publishing plan, or else in defining new plans.* *Based on the result of the market survey, the analysis of the proposed ideas and the production availability and costs a go / no go decision is taken. Many publishing project are stopped at this stage regardless of the content or idea quality but due to excessive cost or lack of real market.* *Possible partners for publishing are seek both on a local and an international basis according to the marketing strategy that was established in the design phase*	*Market studies, forecasts & Press survey are used to keep under control market evolution and are a starting point on which the management intuition relies for soundness* *Scorecards indicators & Company management tools are used to keep under control all major company indicators (balance, sell, cash flow …)* *Publishing planning system in order to ensure that if a new title has to be started there is enough man / machine power and time to adjust the new development* *As far as partner search is concerned personal knowledge and relation are mainly used in this phase and therefore the only real requirement is a good "relational capability" for all the involved team.*

Authors

Description	Macro Requirements / Needed tools
Usually, even if there is a direct involvement in the "idea" generation, there is no direct involvement in the survey at lest in an operational manner. The author is generally meant to provide ideas based on the market survey results. *Each author will contribute to the design phase with his own original piece of content (text, image, video, music, design …) at least in terms of samples and sketches in order to better clarify its idea and proposal.* *Available information sources are seek and book-marked. Highlighted sources are classified and stored into a DB or files for future reference. Each source is ranked in terms of relevance, quality and richness.* *Copyright issues related to the source are noted.* *They write, produce, acquire and store contents and assets to be used in the production phase. During this process various tools and procedures are used.* *They create, process and archive items to be used in the production process.* *They do also act as a supervisors, checking for quality assurance and publishing plan (schedule, cost …) respect.*	*Text editors to manage pieces of text describing ideas and content in the design phase, in creation phase as well as in the revision one.* *Image processing tools,* *Video managing tools,* *Audio managing tools: to examine content in the design phase, to acquire content and turn them into basic assets to be used in the production process, to check acquired content … and operate a proper selection based on quality criteria in the finalisation phase.* *Information services (Reuters, ANSA …), BBS, Archives, Books & libraries, Internet are used as common information sources were to seek data.* *Databases for seeking and storing data (both reference and processed data) Therefore it is necessary to have a database management system and related tools* *Publishing planning system in order to track man / machine power used in the editing phase* *Publishing tools: to check produced content in terms of layout and aspect.* *Reporting tools for production cost update toward the accounting department*

Press Office

[7] Here ASP stands for Access Service Provider

Description	Macro Requirements / Needed tools
It acts throughout the whole process mainly with a promotional role. It performs all actions related to product advertising and promotion tuning the delivered news to the product development stage. Early announcement: *this is done in order to start attracting potential customer and public audience attention toward the newly concept idea* Announcement: *once the product is almost finished starts the announcement activity once again focused to attract attention and prepare the ground for the subsequent promotion and marketing actions.* Promotion*: this is the last phase of the process and is usually aimed to support the sell activity of the product. Aside from standard advertisement activities there may be special events, press conferences …*	*Text editors to manage pieces of text describing ideas and content in the design phase, in creation phase as well as in the revision one.* *Image processing tools,* *Video managing tools,* *Audio managing tools: to examine content in the design phase, to acquire content and turn them into basic assets to be used in the production process, to check acquired content … and operate a proper selection based on quality criteria in the finalisation phase.* *Here personal knowledge and relation are essential and therefore the only real requirement is a good "relational capability" for all the involved team.*

Chief Editor

Description	Macro Requirements / Needed tools
The role of the chief editor in this phase is to mediate results of the survey, managements expectations and authors ideas with present and scheduled publishing activities in order to state if there is room for a new product, when and where. *Defines the guidelines of the project in a storyboard according to company adopted standards and procedures. Guides the single or group of authors to integrate into the editorial working group and gives general rules for checking the production process. He also states the relevant milestones and deadlines in the overall process. Provides the accounting department will all required data to set up the related items in the company planning and accounting system.* *Acts as a supervisor checking for quality assurance and publishing plan (schedule, cost …) respect. Has the full responsibility of the phase development.*	*Text editors to manage pieces of text describing ideas and content* *Image processing tools,* *Video managing tools,* *Audio managing tools: to examine available and searched raw material, to check acquired content … and operate a proper selection based on quality criteria.* *Publishing planning system in order to ensure that if a new title has to be started there is enough man / machine power and time to adjust the new development and also to track man / machine power used* *Reporting tools for production cost update toward the accounting department* *Publishing tools: to check produced content in terms of layout and aspect.* *Databases for seeking and storing data*

Editorial board

Description	Macro Requirements / Needed tools
Available information sources are seek and book-marked. Highlighted sources are classified and stored into a DB or files for future reference. Each source is ranked in terms of relevance, quality and richness. *Copyright issues related to the source are noted.* *Possible partners for publishing are seek both on a local and an international basis according to the marketing strategy that was established in the design phase* *Acts as a supervisor checking for quality assurance and publishing plan (schedule, cost …) respect. Has the full responsibility of the phase development.*	*Information services (Reuters, ANSA …), BBS, Archives, Books & libraries, Internet are used as common information sources were to seek data.* *Personal knowledge and relation are mainly used in this phase and therefore the only real requirement is a good "relational capability" for all the involved team.* *Publishing planning system in order to track man / machine power used* *Reporting tools for production cost update toward the accounting department* *Publishing tools: to check produced content in terms of layout and aspect.* *Image processing tools,* *Video managing tools,* *Audio managing tools: to check acquired content … and operate a proper selection based on quality criteria.* *Databases for seeking and storing data*

Editorial staff

Description	Macro Requirements / Needed tools
Available information sources are seek and book-marked. Highlighted sources are classified and stored into a DB or files for future reference. Each source is ranked in terms of relevance, quality and richness. *Copyright issues related to the source are noted.* *They acquire, classify and store items to be used in the production process (sources raw materials).* *They write, produce, acquire and store contents and assets to be used in the production phase. During this process various tools and procedures are used.* *They process and store contents and assets taking care of layout and aspects related issues (text correctness, proper linking between captions and images … resolution, layout, colors …)*	*Information services (Reuters, ANSA …), BBS, Archives, Books & libraries, Internet are used as common information sources were to seek data.* *Text editors to manage text. Both in creation phase as well as in the revision one.* *Databases for seeking and storing data (reference and processed data)* *Publishing tools to manage textual content. Both in term of layout as well as in aspect.* *Databases for seeking and storing data* *Image processing tools,* *Video managing tools,* *Audio managing tools: to check acquired content, classify and store it.*

Company Management tools

Directly used but not affected by the production flow as they are valid in a general way and context. They represent the management framework and therefore support the whole process.

Macro Requirements / Needed tools Description
Scorecards indicators & Company management tools *used to keep under control all major company indicators (balance, sell, cash flow …)*
Reporting tools *for production cost update toward the accounting department*
Production planning system *both in order to ensure that if a new title has to be started there is enough man / machine power and time to adjust the new development and to track man / machine power used in the editing phase*

Generic tools

Directly used and somehow affected by the production flow, mainly in terms of accessibility and indexing. They do provide sources of information and therefore they do represent part of the content that will be directly affected by the production process.

Macro Requirements / Needed tools Description	Requirements / Needed tools
Information services (Reuters, ANSA …), BBS, Archives, Books & libraries, Internet *used as common information sources were to seek data. Data collected here will be then used throughout the production process.*	*Granted access* *Digitising facilities* *Archiving facilities* *Indexing facilities* *Seek engines tools* *Categorization tools* *Crawling engines tools*
Market studies, forecasts & Press survey *used to keep under control market evolution and are a starting point on which the management intuition relies for soundness*	*Granted access* *Digitising facilities* *Archiving facilities* *Indexing facilities*

Specific tools

Directly used and affected by the production flow. Most requirements should already be covered by available commercial products. Certainly integration issues may rise when taking into account the variety of used tools. Such a problem can be solved by adopting a criterion of compatibility for formats used in the various suite of tools. In the following schema are therefore reported only the basic and essential requirements while all details have been skipped.

Macro Requirements / Needed tools Description	Requirements / Needed tools
Publishing tools & Text editors *to manage pieces of text describing ideas and content in the design phase, in creation phase as well as in the revision one.* *to check and manage textual content. Both in term of layout as well as in aspect.*	*Easiness of use* *Wide content format acceptance (Word ©, WordPerfect ©, Lotus Notes ©, AmiPro ©, StarOffice ©, Aldus Pagemaker ©, FreeHand ©, Illustrator ©, Quark Express ©, Director ©, Flash ©, Maya ©, AferEffects ©, …)* *Easy to integrate and recall from working environment* *Multi platform* *Powerful export / Import filters* *Support connection with major DB (through ODBC, OLE …)*
Image processing tools, *Video managing tools,* *Audio managing tools:* *to examine content in the design phase,* *to acquire content and turn them into basic assets to be used in the production process,* *to check acquired content, classify and store it … and operate a proper selection based on quality criteria in the finalisation phase.*	*Easiness of use* *Wide content format acceptance* *Easy to integrate and recall from working environment* *Multi platform* *Powerful export / Import filters* *Editing tools (cut, paste, join, fade, …)* *Image filtering & palette management* *Support also professional features (gamma correction, filtering …)*
Databases *for seeking and storing data (both reference and processed data) Therefore it is necessary to have a database management system and related tools*	*Easiness of use* *Wide range of storable objects (video, pictures, audio, text …)* *Relational capabilities* *Fast access* *Wide capacity* *Easy retrieve* *Powerful indexing* *Multi key management* *Multi language management*

The pre-print service

Due to the fact that the Pre Print Activity could be considered either as an internal part of the production process of a Publishing house or as a service provided to a generic customer by a specialised entity, this part of the publishing workflow has been detailed here. Of course also the pre print service has its own well codified and standardised process that can be described as follows:

Activity	Task	Involved roles
Contract (1)	*Initial contact* *Offer (Pricing & Schedule)* *Contract*	*Customer* *PPS – Marketing* *PPS – Production manager*
Material provision (2a) (2b)	*Material provision (raw, formatted, to format …)*	*Customer*
Print proof provision (3)	*(Eventual formatting)* *page proof preparation* *Validation iteration* *Delivery to: Customer or to next step*	*Customer* *PPS – Production manager* *PPS – Technician* *PPS – Graphic expert*
High quality image insertion (4) (5)	*High quality picture insertion* *Colour page proof* *Validation iteration* *Delivery to: Customer or to next step*	*PPS – Graphic Expert* *PPS- Production manager* *Customer*
Blue print (6) (7)	*Blue print* *Validation iteration* *Delivery to: Customer or to next step*	*PPS – Graphic Expert* *PPS- Production manager* *Customer*
Film production (8) (9) (10)	*Film* *Validation iteration* *Delivery to: Customer or actual print out*	*PPS – Graphic Expert* *PPS- Production manager*

If comparing this schema with the one presented at the very beginning it is quite apparent that here we've placed in evidence and stressed the case of a service (initial point (1)) rather than the case of actual production. In such an instance the entry point should be regarded as block (1a) dashed as well as its connection to the rest of the flow.

In case of a service then the customer will contact the Pre Print Service (PPS) in order to check PPS availability, related costs and schedule and also to establish the data exchange policy (in terms of formats…). Then the customer will provide the PPS either with a closed document (generally a PDF or EPS file) or with an open one along with high resolution pictures and a print out foul proof. Only rarely it happens that the customer requires the PPS to do also the assembly and the paging.

As far as the production process is concerned, and once there is an established layout and grid, usually it is required to replace low quality pictures with the high quality one provided. Once this step has been accomplished a colour press proof is ready. From the colour press proof it is possible to derive a blueprint and from this one a film. Once the film has been produced the pre-print process is ended and is possible to go for actual printing. The customer will have several intervention cycles especially as far as approval is concerned. It is also possible that a customer may require only a subset of the overall process steps as the PPS could be used as an outsourcing facilities covering the process and therefore also the kind of delivered work will depend on customer needs and adopted policies

22.3.3.2 Process, involved roles and related macro requirements

In the following schema is provided an overview on the macro requirements and /or need tools related to each activity, task and sub-task according to involved roles. It is also necessary to take into account that needs and requirements affecting the customer imply compatibility and interoperability issues which can be considered as additional requirement for the system.

Activity	Task	Involved roles	Description	Macro Requirements / Needed tools
Contract (1)		*Customer*	Presents to the PPS his needs in terms of work, results, budget and schedule (kind of paper, print paper format, additional services …)	*Text editors to manage pieces of text describing ideas and content* *Image processing tools to show samples* *Mailing & FTP tools to manage data exchange with the PPS*
		Marketing	Provides the customer information, keeps track of customer requests and acts as an interface with the Production manager & department	*Text editors to manage pieces of text describing ideas and content* *Image processing tools to show samples* *Mailing & FTP tools to manage data exchange with the Customer*

Activity	Task	Involved roles	Description	Macro Requirements / Needed tools
		Prod. manager	Supports the Marketing department by data provision on schedule, costs and needs (formats for the raw material, resolution, work procedure …)	*Publishing planning system in order to estimate and plan man / machine power used* *Reporting tools for production cost estimates*
Material provision (2)	*Open document provision (2a)*	*Customer*	Provides the PPS production with an open document along with high resolution pictures (accepted supports are CD, DVD, ZIP, JAZ or mail).	*Digital storage management tools to store the raw data (CD/DVD burner, data compressors …)* *Mailing & FTP tools to manage data exchange with the PPS*
	Closed document provision (2b)	*Customer*	Provides the PPS production with a closed document (generally a PDF or EPS file) along with high resolution pictures (accepted supports are CD, DVD, ZIP, JAZ or mail).	*Digital storage management tools to store the raw data (CD/DVD burner, data compressors …)* *Mailing & FTP tools to manage data exchange with the PPS*
Print proof provision (3)	*Layout preparation*	*Prod. manager*	With graphic experts examines the proof of concept / content provided by the customer along with raw data and plans activities, work load and all subsequent steps.	*Text editors* *Image processing tools: to manage customer content and check pictures* *Publishing planning system to manage man / machine power* *Mailing & FTP tools to manage data exchange with the Customer*
		Graphic expert	Prepares the page grid and layout, takes care of fonts, pictures (low or mid resolution), text and all other page characteristics according to customer requests	*Publishing & printing tools to manage customer content.* *Image processing tools to handle images to be used (low, mid & high resolution)* *Mailing & FTP tools to manage data exchange with the Customer*
		Customer	It may happen, even if rarely, that the customer requires the PPS to act as a full service covering all steps from assembly, design and layout to paging of the overall work. In case this happens the customer will provide the PPS with a proof of concept and detailed descriptions on expected results.	*Publishing & printing tools* *Image processing tools: to manage content. Both in term of layout, aspect format…* *Databases for seeking and storing data* *Mailing & FTP tools to manage data exchange with the PPS*

Activity	Task	Involved roles	Description	Macro Requirements / Needed tools
Print proof provision (3) Cont.	*Print proof*	*Graphic expert*	Prepares the actual print proof and hands it over to the Customer for a iterative validation process aimed to get to a foul proof accepted by the customer	*Publishing & printing tools* *Image processing tools: to manage content. Both in term of layout, aspect format…* *Databases for seeking and storing data* *Mailing & FTP tools to manage data exchange with the Customer*
		Prod. manager	Supervises the whole process	*Publishing planning system in order to track man / machine power used* *Reporting tools for production cost update toward the accounting department* *Mailing & FTP tools to manage data exchange with the Customer*
		Customer	Validates the results reached so far in the process and gives approval for passing to the next step	*Publishing & printing tools* *Image processing tools: to manage content. Both in term of layout, aspect format…* *Databases for seeking and storing data* *Mailing & FTP tools to manage data exchange with the PPS*
High quality image insertion	*Image substitution (4)*	*Prod. manager*	Supervises the whole process	*Publishing & printing tools* *Image processing tools* *Publishing & printing tools: to check results*
		Graphic expert	Starting from the result of the previous step (when needed) or from the material received from the customer takes care to replace low quality pictures with the high quality one provided.	*Publishing & printing tools* *Image processing tools: to manage and package content* *Databases for seeking and storing achieved work* *Mailing & FTP tools to manage data exchange with the Customer*
	Validation (5)	*Graphic expert*	Sends to the customer the set of files produced at the previous step (4). The shipping is usually done providing an electronic support (CD, DVD …) holding the resulting work (Quark-X Press … format) along with closed files (PDF, EPS …). At this point an iterative validation process is initiated between the PPS and the customer to get to a colour press proof accepted by the customer.	*Digital storage management tools to store the result of the packaging (CD/DVD burner, data compressors …)* *Databases for seeking and storing data* *Mailing & FTP tools to manage data exchange with the Customer*
		Customer	Validates the results reached so far in the process and gives approval for passing to the next step	*Digital storage management tools to access received packaged data (data de-compressors …)* *Mailing & FTP tools to manage data exchange with the PPS*

Activity	Task	Involved roles	Description	Macro Requirements / Needed tools
Blue print	*Preparation (6)*	*Graphic expert*	Produces a blueprint starting from the colour press proof to be sent to the customer for approval. Once again here starts an iterative process that ends with the formal approval by the customer.	*Publishing & printing tools* *Image processing tools: to manage and package content and to calibrate colours* *Databases for seeking and storing achieved work* *Mailing & FTP tools to manage data exchange with the Customer*
	Validation (7)	*Graphic expert*	Sends to the customer the set of files produced at previous steps (4 & 6). The shipping is usually done providing an electronic support (CD, DVD …) holding the resulting work (Quark-X Press … format) along with closed files (PDF, EPS …).	*Digital storage management tools to store the result of the packaging (CD/DVD burner, data compressors …)* *Databases for seeking and storing data* *Mailing & FTP tools to manage data exchange with the Customer*
		Customer	Validates the results reached so far in the process and gives approval for passing to the next step	*Digital storage management tools to access received packaged data (data de-compressors …)* *Mailing & FTP tools to manage data exchange with the PPS*
Film production (8) (9) (10)		*Graphic expert*	Starting from all that has been produced in steps (4) and (6) a final film is produced. What attained here could be either sent to print (10) or to the customer (9).	*Printing tools: to manage calibrated content* *Databases for seeking and storing achieved work* *Mailing & FTP tools to manage data exchange with the Customer*

Customer

Description	Macro Requirements / Needed tools
Presents to the PPS his needs in terms of work, results, budget and schedule (kind of paper, print paper format, additional services …) *Provides the PPS production either with an open document along with high resolution pictures (accepted supports are CD, DVD, ZIP, JAZ or mail).* *Provides the PPS production either with a closed document (generally a PDF or EPS file) along with high resolution pictures (accepted supports are CD, DVD, ZIP, JAZ or mail).* *Only rarely it happens that the customer requires the PPS to do also the assembly and the paging of the overall work. In case this happens the customer will provide the PPS also with a proof of concept and detailed descriptions on expected results.* *Takes part to the validation process.*	*Text editors to manage pieces of text describing customer ideas, content, requirements and expectations* *Image processing tools: to examine available raw material, to check acquired content..* *Publishing tools: to check produced content in terms of layout and aspect.* *Databases for seeking and storing data* *Mailing system to keep in touch with marketing / production people and manage daily work*

Production Management

Description	Macro Requirements / Needed tools
Acts mainly as a supervisor and a decision maker. *Supports the Marketing department by data provision on schedule, costs and needs (formats for the raw material, resolution, work procedure …)* *With the graphic expert examines the proof of concept given by the customer and plans activities* *Supervises the whole process*	*Publishing planning system in order to ensure that if a new work has to be started there is enough man / machine power and time to adjust the new development* *Text editors to manage pieces of text describing ideas and content* *Reporting tools for production cost update toward the accounting department* *Publishing tools: to check produced content in terms of layout and aspect.* *Mailing system to keep in touch with marketing / production people, customers and manage daily work*

Marketing

Description	Macro Requirements / Needed tools
Contacts potential customers and presents range of provided services, related quality, cost and benefits. *Provides the customer specific information on a certain work.* *Keeps track of customer requests, feedbacks, remarks …* *Acts as an interface with the Production manager & department*	*Market studies, forecasts & Press survey are used to keep under control market evolution* *Mailing system to keep in touch with customers ? production management and manage daily work* *Reporting tools for checking sell rate, customer satisfaction …* *Databases for managing contacts, orders, complaints …*

Graphic Experts

Description	Macro Requirements / Needed tools

Prepares the page grid and layout, takes care of fonts, pictures (low or mid resolution), text and all other page characteristics according to customer requests *Prepares the actual print proof and hands it over to the Customer for a iterative validation process aimed to get to a foul proof accepted by the customer* *Starting from the result of the previous step (when needed) or from the material received from the customer takes care to replace low quality pictures with the high quality one provided.* *Sends to the customer the set of files produced at the previous step (4). The shipping is usually done providing an electronic support (CD, DVD …) holding the resulting work (Quark-X Press … format) along with closed files (PDF, EPS …). At this point an iterative validation process is initiated between the PPS and the customer to get to a colour press proof accepted by the customer.* *Produces a blueprint starting from the colour press proof to be sent to the customer for approval. Once again here starts an iterative process that ends with the formal approval by the customer.* *Sends to the customer the set of files produced at previous steps (4 & 6). The shipping is usually done providing an electronic support (CD, DVD …) holding the resulting work (Quark-X Press … format) along with closed files (PDF, EPS …).* *Starting from all that has been produced in steps (4) and (6) a final film is produced. What attained here could be either sent to print (10) or to the customer (9).*	*Publishing planning system in order to track man / machine power used* *Text editors to manage pieces of text describing customer ideas, content, requirements and expectations* *Image processing tools: to examine available raw material, to check acquired content..* *Publishing tools: to check produced content in terms of layout and aspect.* *Databases for seeking and storing data* *Mailing system to keep in touch with marketing / production people, customers and manage daily work*

Company Management tools

Directly used but not affected by the production flow as they are valid in a general way and context. They represent the management framework and therefore support the whole process.

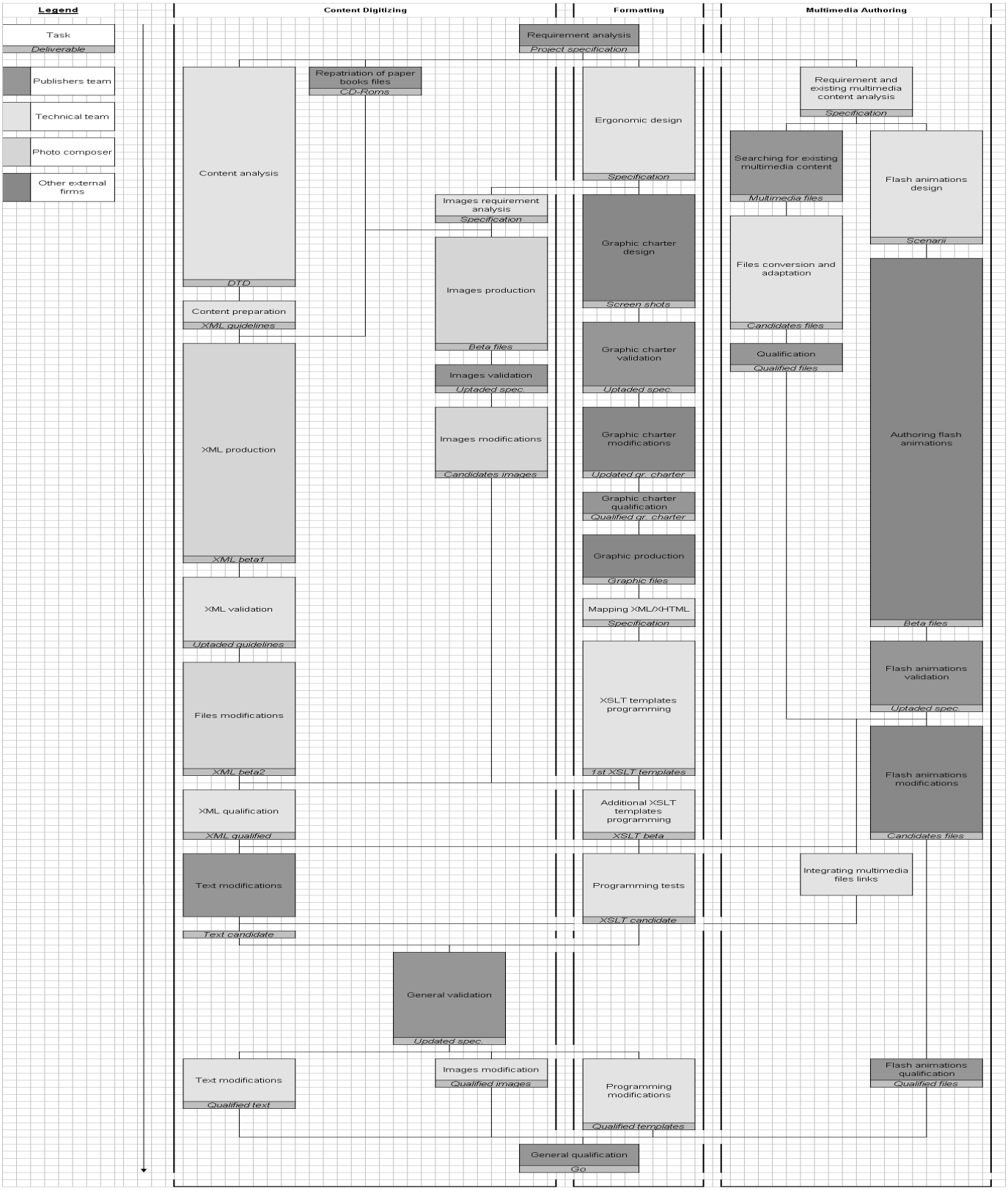
Macro Requirements / Needed tools Description
Reporting tools *for production cost update toward the accounting department*
Production planning system *both in order to ensure that if a new title has to be started there is enough man / machine power and time to adjust the new development and to track man / machine power used in the editing phase*

Specific tools

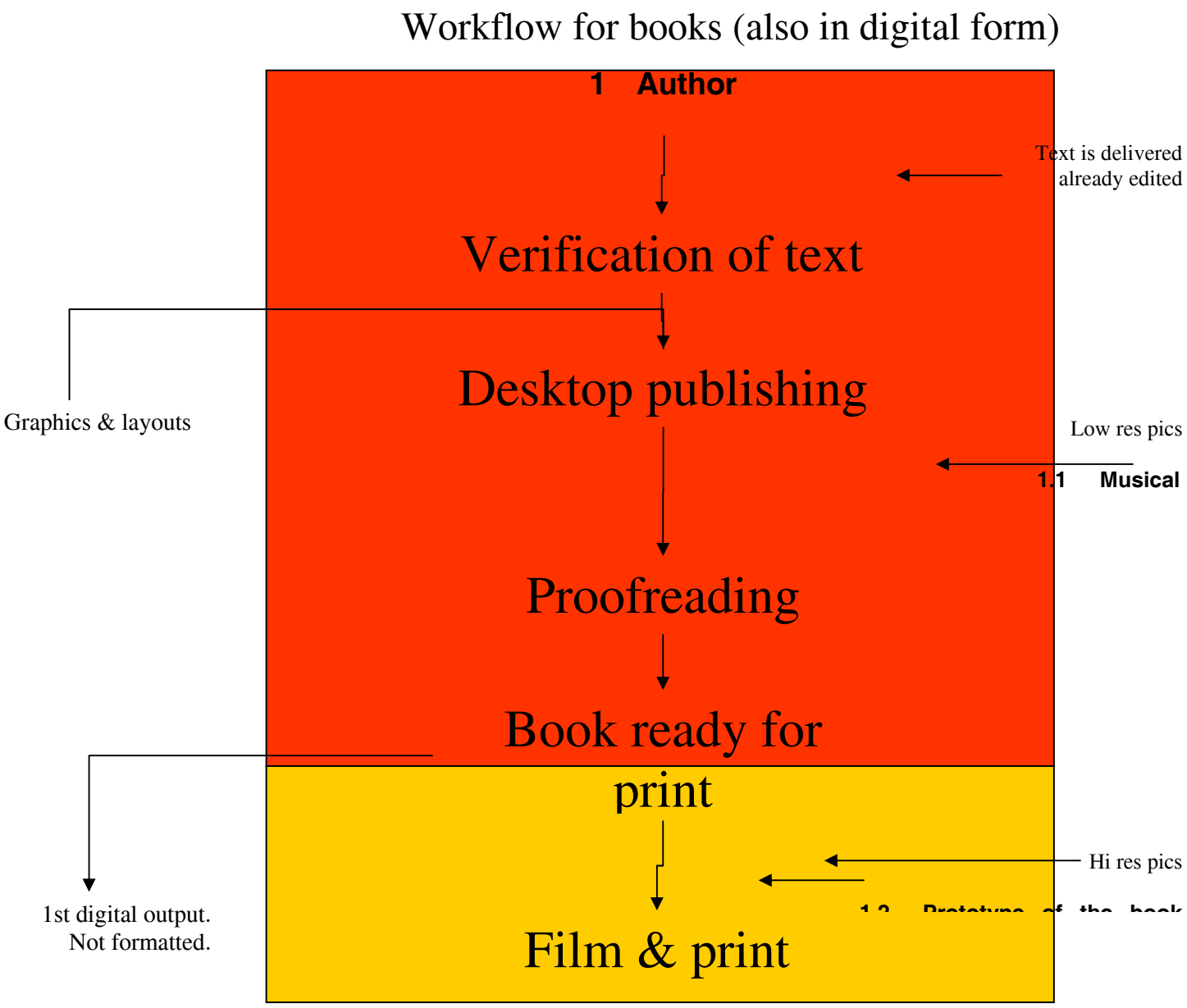
Directly used and affected by the production flow. Most requirements should already be covered by available commercial products. Certainly integration issues may rise when taking into account the variety of used tools. Such a problem can be solved by adopting a criterion of compatibility for formats used in the various suite of tools. In the following schema are therefore reported only the basic and essential requirements while all details have been skipped.

Macro Requirements / Needed tools Description	Requirements / Needed tools
Publishing tools & Text editors *to manage content in all phases (eventually design, creation as well as in the revision in case of full servicing).* *to check and manage textual content. Both in term of layout as well as in aspect.*	*Easiness of use* *Wide content format acceptance (Word ©, WordPerfect ©, Lotus Notes ©, AmiPro ©, StarOffice ©, Aldus Pagemaker ©, FreeHand ©, Illustrator ©, Quark Express ©, Director ©, Flash ©, Maya ©, AferEffects ©, …)* *Easy to integrate and recall from working environment* *Multi platform* *Powerful export / Import filters* *Support connection with major DB (through ODBC, OLE …)*
Image processing tools: *to examine content,* *to manipulate content: crop, resize, resample, filter, alter (via special effects) retouch and / or calibrate,* *to prepare content, on the basis of quality criteria, for the finalisation phase.*	*Easiness of use* *Wide content format acceptance* *Easy to integrate and recall from working environment* *Multi platform* *Powerful export / Import filters* *Editing tools (cut, paste, join, fade, crop, resize, resample, filter, alter (via special effects) retouch and / or calibrate, … gamma correction, palette management)*
Databases *for seeking and storing data. Therefore it is necessary to have a database management system and related tools*	*Easiness of use* *Relational capabilities* *Fast access* *Wide capacity* *Easy retrieve* *Powerful indexing* *Multi key management*

22.3.3.3 e-Books Production Process Workflow



22.3.3.4 Books/e-Books Production Process Workflow



22.4 Workflow State-of the Art

22.4.1 Introduction

Part of the reason for the growing popularity of the workflow management systems is the spread of collaborative working among companies, who need information management technology to help them integrate operations with their partners and customers. Workflow has evolved steadily and surely over the last 10 years or so. It has been 'repackaged' a number of times – frequently in attempts to enhance it by adding more up-to-date features; more often trying to make the potential customer believe it solves than it really can. Workflow management is not a miracle solution! It is a technology which brings people and automation together, delivering control and management to a business process, and enabling improvements and change to be accommodated without the need to throw away earlier investment in systems development and implementation.

22.4.2 Development

Starting as a simple way of controlling the flow of work around a department or organisation, often through diagrams, it provided a mechanism for linking people with the process. The timely delivery of work to those who could complete it along with the information to support it meant less wasted time, less waiting for information and faster end-to-end completion of the job in hand. The first development was to add the ability to build in controls so that the process could be guaranteed as being compliant to defined standards and procedures – internal or external – and nothing was forgotten. The overall level of service was improved; missed deadlines could be avoided. Greater gains in efficiency could be achieved by endeavouring to automate the process as far as possible, resulting in less manual involvement. Over time, workflow moved towards enabling work to go 'straight through' the process, only needing manual intervention when something out of the ordinary was encountered. And because online data feeds already contained all the information necessary to complete many of these transactions, it meant that with suitable integration into legacy and support systems, little or no user involvement was necessary, at least in theory, as in practice that would be highly dependent on the quality of the work process description and modelling plus its actual implementation in the supporting tool. Such systems have had a particular impact in the financial world – and many companies took the opportunity provided by straight through processing.

More recently, with the massive rise in online customer, supplier and partner interaction, workflow was thrown headlong into the world of the Internet. How was the data as entered by a customer to be later linked into a web form directly into the back-end office systems? Workflow was chosen as the best fit tool that could provide an answer as it would act as the glue that eliminated the need to re-type data. Orders submitted online could be posted straight into a sales order processing and stock control system. And so to business process management: it seems as if workflow, in all its guises, has come full circle. BPM, however, is really the embodiment of all that has gone before into an enterprise-wide solution that includes the full range of techniques only touched upon here. It is about delivering a single solution, using tighter integration into legacy and third-party systems, with substantial automation and the ability to keep users (staff, customers, suppliers) involved. However, full enterprise-wide solutions need more than just workflow. The key thing is that the more integrated workflow becomes within the organisation, and the more people it affects, the greater the level of return that can be expected. At the same time this implies a higher barrier (in terms of acceptance) from the people directly involved especially when the traditional way of work is only partially automated as is the case of content production where despite the high usage of computer based systems to support people at work there is a huge amount of human creativity involved.

Nowadays, the concern for smaller workgroups and individual users is increasing, and is creating an emerging market. The market for small scale workflow products, however, goes well beyond web design groups. Personal Workflow Solutions could turn out to be one of the fastest growing market segments in the next few years, as professional users and small teams become increasingly used to the concept. This will depend on a number of factors: the most important is of course user awareness. Market research shows that small to mid-size workgroups are aware of the issues involved and of the need to manage projects more effectively. This is mainly due to the rise in new roles and work methods allowing parties to operate remotely via ICT support.

22.4.3 What next?

Apart from the technology developments, a number of standards' bodies have been involved in trying to ensure that everybody is kept on the same track and that workflow products deliver to the same – or at least similar – goals. The Workflow Management Coalition (WfMC) has been a leader in this area and its vision of interoperability between workflow systems has to be applauded. Unfortunately, there are very few who have embraced these standards

completely, and current trends in this area are moving towards the Business Process Management Initiative (BPMI) and the development of the Business Process Modelling Language (BPML). BPML is an XML-based meta-language and is intended to be a high-level language which enables an organisation to describe its business processes in a common way. How likely BPML is to become a reality is, at this point, largely unknown.

22.4.4 Workflow products

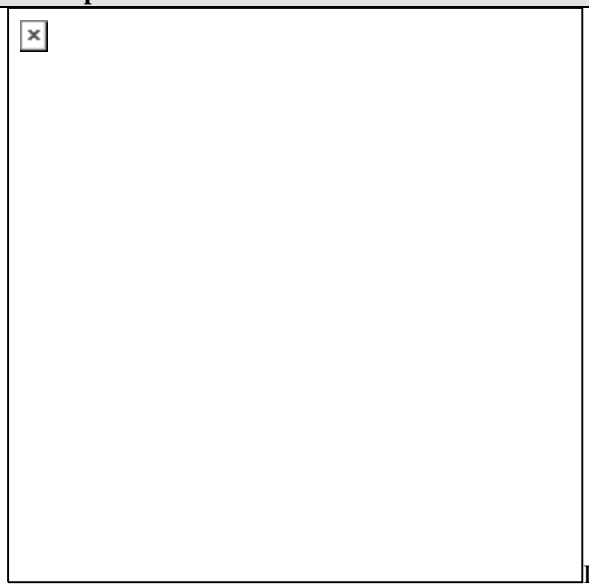
Even if definitely not exhaustive, the following products list presents not only the most relevant products in this area, but also, to a certain extent, the evolution from their origin. Most products were not created with workflow functionalities but they have added utilities to their image systems, document management systems, or a kind of ERP system with some document aspects.

The list of tackled products is: Eastman Software Enterprise Workflow, InTempo, Lexign Flow, COSA Workflow, LiveLink, Lotus Workflow, MQ/Series Workflow, NIKU, OnBase Workflow, K-SPRINT, Staffware Process Suite, TeamWARE Flow, Visual and Panagon Workflo.

All of them have a graphics tool to design the process and an engine to control the steps of the workflow. But the power of those utilities vary from one product to another. Also they differ in the added features they have in addition to the workflow itself.

Name:	**Eastman Software Enterprise Workflow**	
Company:	*Name*	EiStream Technologies
	URL	www.eastmansoftware.com www2.eistream.com
	Contact	carolyn.prono@eistream.com
Nationality:	USA	
Language:	English	
Description:	**E**astman Software Enterprise Workflow, is a highly scalable workflow solution for imaging. It offers a form-based development environment with integration tools for transaction processing, imaging, and OCR/ICR. It reveals linear scalability up to dozens of servers per domain, and supports multi-domain operation.	
Technology:	System requirements: • Server: Microsoft Windows NT/Microsoft SQL/ Oracle/ Sybase • Client: Microsoft Windows 95/98/2000/NT	
Features:	Eastman Software Enterprise Work Manager Series includes **workflow**, **imaging**, **Enterprise Report Management**, and **storage management components**. With **Imaging** and Workflow, organizations can manage the routing of electronic information within the automation and improvement of critical business processes. Integration of images, faxes, documents and other forms of information into the process is seamless Other features: • A **graphical scripting tool** enables activities development at low cost. • The **Route Builder** provides a graphical, drag-and-drop environment for building complex workflow routes and defining business processes. • The **FormBuilder** facilitates the development of custom forms, including forms for maintaining coded data, indexing data, retrieving indexed work items, and routing documents and folders. • Large number of participants, distributed, some working at home • Easy activity implementation and application integration	

Name:	**InTempo**	
Company:	*Name*	Adobe
	URL	www.accelio.com
	Contact	http://www.adobe.com/misc/comments.html
Nationality:	USA	
Language:	English	

Name:	**InTempo**
Description:	 InTempo workflow is based on Mail/Web-based activity delivery with no client/server permanent relationship resulting into easy enterprise wide deployment. With a very easy to use and deploy engine, InTempo offers flexible dispatching rules, calendar based time computation, at minimum total cost of ownership.
Technology:	▪ Microsoft Windows NT/2000 ▪ Integrated HTML/XLM electronic forms
Features:	The **Accelio Integrate Enterprise Application Integration (EAI)** Tools, used in the Accelio Integrate InTempo ® Business Process Management platform, allow organizations to extend and accelerate complex cross-functional business processes that leverage existing data sources and corporate applications. With the **Accelio Integrate Designer ™** , you design customized, role-based processes that support your distinct business rules and meet the diverse business requirements. • Easy-to-use graphical process designer • Web-based user interface for work management • Deadlines and reminders to ensure timely processing • Object Library API —COM interface for easy customization • Document envelope —enabling attachments to work items • Flexible e-mail and Web-based routing • Large number of potential participants • Very low development/deployment costs

Name:	**Lexign Flow**	
Company:	*Name*	Lexign
	URL	www.lexign.com www.keyfile.com
	Contact	info@lexign.com
Nationality:	USA	
Language:	English	
Description:	Lexign Flow software is a comprehensive business tool that streamlines and automates an organization's mission-critical business processes, regardless of complexity. It can be deployed in a single department, across an enterprise, or in business-to-business environments to speed decisions, increase productivity, and maximize efficiency without compromising flexibility.	
Technology:	Windows 2000/ Microsoft Exchange Server	

Name:	**Lexign Flow**
Features:	▪ Provides an easy-to-use **Workflow Designer** that uses a visual design interface for modifying, defining, and implementing simple or complex business processes throughout and beyond the enterprise. ▪ Utilizes an **Intelligent Workflow Server** to evaluate business rules and data-driven logic and determine which action(s) to take. ▪ Allows forms, documents, and links to be included securely with a workflow, enabling participants to input and view data or to review and edit documents associated with the workflow. ▪ Allows participants of a workflow to be a specific individual or determined by defining a custom role, such as Budget Manager. ▪ Supports dynamic changes to running work processes and allows users to delegate tasks or consult with other users. ▪ Provides built-in forms capability (**Lexign ProForms**) that enables replication of current paper-based forms in electronic format. The Lexign provides two document management products to complement the workflow solution: ▪ **Lexign Keyfile**: Provides a standalone solution for document tracking, content management, and version control. Supports a wide range of documents, including paper, fax, e-mail, word processor files, scanned photos, voice, and video. ▪ **Lexign Store**: Captures and converts transaction content and documents into data elements that can be accessed electronically within the enterprise or globally via the Internet.

Name:	**COSA Workflow**	
Company:	*Name*	COSA Solutions
	URL	www.cosa.nl
	Contact	info@cosa.nl
Nationality:	Netherlands	
Language:	Dutch, English, French, German	
Description:	COSA Workflow joins a powerful organization model featuring multiple group hierarchies to describe the procedure. A distributed engine handles case migration. COSA offers an HTML worklist handler and Lotus Notes integration. Activities can be scripted or programmed through a comprehensive API. COSA Workflow was selected by Baan in 1999 as the standard workflow product integrated into its ERP product.	
Technology:	• Integration with applications through e.g. COM, DCOM, OLE, Java, etc • Platforms: Mainframe – S/390, PC – Win 3.x, PC – Win95/98/ME, PC – Win NT/2000/XP, Unix – AIX, Unix – HP-UX, Unix – Linux, Unix – Solaris, Web Browser. • Based on a multi-server architecture	

Name:	**COSA Workflow**
Features:	Cosa Workflow has been developed to automate and control administrative business processes. Moreover, the company offers two extra tools to complement the workflow solution: ▪ **Cosa Archive** forms a complete Document Management system that controls all paper flows through the organisation. Documents are scanned and electronically archived. ▪ **Cosa Flowmodeller** consists of three separate modules: – With the aid of the **User Editor**, you can chart the entire organisation. – The **Network Editor** can then be used to model all the processes in your organisation. – The **Simulator** monitors the process by means of precise mathematical PetriNet models. Moreover, it enables you to predict the effects of developments and changes, by calculating different growth scenarios. Other features: • Complex organization with Units, Groups, Projects, and many roles • Complex or very complex procedures with many parallel paths • Flexible and financially attractive • Solution E-commerce or e-business platform

Name:	**LiveLink**	
Company:	*Name*	Open Text Corporation.
	URL	www.opentext.com
	Contact	info@opentext.com
Nationality:	Canada	
Language:	English	
Description:	Livelink's workflow services provide powerful workflow facilities, enabling you to ease the creation, deployment, modification, and management of business processes with no programming needed whatsoever.	
Technology:	▪ Livelink's supported standards include SQL, LDAP, TCP/IP, HTTP, HTTPS, HTML, SMTP, ODMA, PDF, Java and ActiveX ▪ The Livelink Application Programming Interfaces (API) allows integrations to be developed using C, C++, Visual Basic, and Java. ▪ Using standards such as XML and CORBA	
Features:	▪ The graphical Java-based **WorkflowDesigner** enables you to: drag-and-drop steps and participants, attach documents or other objects and create sub-workflows. Livelink provides document and knowledge management functionality for organizing knowledge. ▪ Developing a **Content Management System** to manage your corporate knowledge assets allows you to easily find, use and reuse content. ▪ The Livelink's **knowledge management software** provide a secure central knowledge repository and all of the tools required to access, share, discuss and work with this information.	

Name:	**Lotus Workflow**	
Company:	*Name*	Lotus Development Corporation (an IBM Company)
	URL	www.lotus.com
	Contact	www.ibm.com/contact/us
Nationality:	USA	
Language:	English, German, Spanish, Danish, Portuguese, Brazilian, Swedish, Norwegian, Dutch, Finnish, French, Italian, Chinese, Japanese, Korean and Thai.	
Description:	Lotus Workflow extends the workflow capabilities to the Domino product. Mission-critical workflow applications can now be supported and maintained, rolled out across the enterprise, and quickly modified as processes evolve. By providing point-and-click tools and reusable object libraries for routing rules, role assignment, deadline handling, and task automation, even complex processes can be automated with little or no programming.	
Technology:	System Requirements: ▪ Server: Windows NT and Lotus Domino ▪ Client: Windows 95/98/2000/NT or Windows 2000 and Lotus Notes Multiple platform support on IBM, Linux, Solaris, and Windows.	
Features:	Lotus Workflow mirrors this structure: Workflow Viewer, Workflow Architect, and Workflow Engine ▪ The **Engine** allows developers to save and reuse process logic and components, reducing the time needed to create new Workflow applications. The Engine utilizes Notes ™and Domino services and design tools, including Domino Designer ▪ The **Architect** enables Workflow designers to specify workflow process logic, process participants and rules	

Name:	**Lotus Workflow**
	governing participation-without programming. The Architect and the Engine are linked, so that processes designed with the Architect are executed by the Engine. ▪ The **Viewer** enables workflow participants to view the context and status of work for each job initiated or assigned to them. Other features: ▪ Web protocols makes workflow applications instantly Web-ready. ▪ **Integrate Workflow and Document Management functions.** Organizations can store and manage documents throughout their life cycle within Domino.Doc, while using Lotus Workflow applications to route documents and other work across the enterprise. ▪ **Visual Workflow development tools.** An intuitive graphical interface lets you specify business logic, participants and their roles, and relevant data-all without extensive programming.

Name:	**MQ/Series Workflow**	
Company:	*Name*	IBM
	URL	www.ibm.com
	Contact	www.ibm.com/contact/us
Nationality:	USA	
Language:	English	
Description:	MQ/Series Workflow with a true object-oriented design, offers a high level of re-usability. MQ Series Workflow concentrates on procedure management and powerful organization modelling while leaving activity implementation to the programmer. It is tightly integrated with Lotus Notes.	
Technology:	System requirements: ▪ Server: Microsoft Windows 2000/NT, IBM, HP, SUN ▪ Client: Microsoft Windows 95/98/2000/NT, IBM	
Features:	▪ Defining your business processes. MQSeries Workflow provides a **graphical editor** to help you design your business processes. ▪ It generates **Flow Definition Language** (FDL) which is translated for execution by the runtime server. ▪ At execution time the runtime server distributes the activities to the clients of the designated persons or groups. The server provides information about the applications to be invoked and about relevant operational data. ▪ **Workflow engine** can directly co-operate with applications and other workflow engines through XML encoded MQSeries messages. Other features • Robust, complex production workflow with applications integration. • Procedure independence relative to organization changes • Large number of different procedures and activities with re-usability • Activities are complex and must be programmed to fit requirements	

Name:	**NIKU**	
Company:	*Name*	Niku Corporation
	URL	www.niku.com
	Contact	info@niku.com

Name:	**NIKU**
Nationality:	USA
Language:	English
Description:	Niku 6 is designed to give large organizations real-time entrepreneurial agility, providing integrated, enterprise-wide collaboration and work delivery, instantaneous visibility into operations at all levels, and time-to-value capabilities superior to that of smaller competitors. the software incorporates state-of-the-art **knowledge, portfolio, resource, project and financial management**, sophisticated roll-up dashboard reporting, a silo-eliminating database, and multi-level security, into a single enterprise-wide corporate portal.
Technology:	Niku 6 is written entirely in Web-standard code: J2EE, XML/XSL, HTTP
Features:	The Niku 6 work delivery engine combines proven best-of-class functionalities: • Automating the services they provide. • Ensuring the timeliness and accuracy of their data. • Enabling them to collaborate seamlessly over the Internet. • Simplifying their use of corporate best practices and workflows. • Giving them personalized work spaces available on any Web device. • Providing access to structured and unstructured knowledge they need. • Giving them the capability to monitor and adjust their work in real time. Niku workflow templates include: **Production workflow, Ad hoc workflow,** and **Administrative workflow**

Name:	**OnBase Workflow**	
Company:	*Name*	OnBase
	URL	www.onbase.com
	Contact	hyland@onbase.com
Nationality:	USA	
Language:	English, Spanish, Portuguese	
Description:	OnBase Workflow is an electronic document routing system that enables users to process work more efficiently, faster, and more accurately than with traditional paper processing. OnBase Workflow is beneficial whenever successive points of input or action are required in order to complete a task, process, or procedure. From processing applications to approving expense reports to managing remittance processing, workflow streamlines collaboration and accelerates the completion of critical business tasks. Additionally, OnBase Workflow can easily integrate with and provide the backbone to e-commerce solutions as well as be tied to organizations' core ERP and CRM systems	
Technology:	Integrates easily to other legacy systems utilizing VB scripting and robust API calls.	
Features:	▪ OnBase is enterprise software that combines the technologies of **document imaging, COLD/ERM, document management, and workflow** into a single web-enabled application ▪ Point-and-click configuration enables customization of both the routing and the user interface without programming. ▪ Workflow configuration consists of two central windows: the Tree Configuration window and the GUI Configuration window. ▪ Ensures that documents are routed in a standard, controlled, and prompt manner. ▪ Accommodates exceptions to the configured model by assigning specific users with rights to add or exempt stages on an ad-hoc basis. ▪ Forwards documents without delay to each successive phase. ▪ Monitors and measures the time it takes to complete a process. ▪ Supports Internet access for users outside of the immediate office environment.	

Name:	**K-SPRINT**	
Company:	*Name*	ROBOTIKER
	URL	www.robotiker.com
	Contact	martinez@robotiker.es
Nationality:	Spain	
Language:	Spanish	
Description:	K-SPRINT is an integral system for managing workflows in an organisation. It is an application based on Lotus Notes which allow for simple modelling of the sequence of *tasks* in the work procedures within an organisation. These tasks, linked together through the sequence defining the workflow, involve *people* in the organisation who consult, modify and create *documents.* This is a software which links together the TASKS-PEOPLE-DOCUMENTS triangle of every organisation enabling key tasks to be automated and carefully controlled. At the same time it makes sure all of the information generated is stored in a clear and structured manner. Information search and query is very agile.	
Technology:	System requirements: • *Server*: Windows NT, Lotus Domino Application. • *Client*: Windows 95, Lotus Notes Application.	
Features:	• K-SPRINT is a knowledge and Workflow management system based on LOTUS NOTES (client) and DOMINO (server), which takes maximum advantage of the possibilities of this environment: user management, access privileges, e-mail notification, record management, publication of Internet/Intranet information, etc. etc. • The SPRINT system is made up of three integrated modules: - Workflows graphics module: users define the stages or tasks associated with a workflow, the sequence in they are to be carried out and their interdependencies. K-SPRINT lets you set up flexible control structures to model business processes: Sequential or parallel execution of tasks. Conditional jumps (manual or automatic decision making). Repeated task cycles. Task grouping. - **Advanced document management module** offers the functions of the advanced record management system. Storage, organisation and structuring of information and support for all types of documents and version management. Particularly appropriate for managing *organisational knowledge* (cultural aspects, organisational memory, procedures, methodology, products and services, and the result of the work, etc.), yellow pages classified by topics, persons, department, etc. *external* knowledge: about customers, vendors, providers, market analysis, etc.	

Name:	**K-SPRINT**
	- **Workflow management and monitoring module** is in charge of launching the workflows previously defined in the Edition Module. K-SPRINT provides a flexible workflow managing system by means of control of privileges: access, viewing, assigning tasks to users, delay notification in carrying out tasks and statistical analysis of workflows, graphical monitoring of workflows, specific workflow trays for management tasks, etc.

Name:	**Staffware Process Suite**	
Company:	*Name*	Staffware
	URL	www.staffware.com
	Contact	info@staffware.com
Nationality:	UK	
Language:	English	
Description:	Staffware offers a good balance between production and administrative workflow requirements while delivering very high production throughput. Activity implementation uses form definition and a scripting language that can be deployed on Windows, and JAVA clients. Staffware provides an interface to major EAI middleware suites.	
Technology:	System requirements: ▪ Server: - Windows NT / 2000 with SQL Server and Oracle - UNIX– Sun Solaris, IBM AIX, HP-UX and Linux with Oracle ▪ Client: Windows 9x/NT/2000 It supports Lotus Notes and Microsoft Exchange	
Features:	The Staffware Process Suite is a multi-component suite of application modules: ▪ The **Staffware iProcess Engine (iPE)** is a core component of the new Staffware Process Suite for automated or straight-through-processes that need transactional integrity and reliability. ▪ Modelling the Process. The **Staffware Process Definer** allows IT staff and business specialists to map all business processes and to build the integrated enterprise the way in which the stakeholder community sees the organization. ▪ Managing the Process**.** ▪ IT infrastructure view . The **Staffware Process Administrator** provides the IT department with a robust tool for overseeing the implementation and deployment of automated processes. ▪ Business operations view . The **Staffware Process Monitor** is a management tool for monitoring the effectiveness and efficiencies of the entire business processes to enable ongoing process improvement. ▪ Integrating people, processes and applications. **Staffware Process Objects** delivers significant enhancements to the previous Object model, while the **Staffware Process Integrator** brings a radically new approach to enterprise integration. ▪ Connecting the end users. The **Staffware Relationship Management** tool is a unique process-centric relationship management solution. ▪ Pre defined end user applications. The **Staffware Process SuiteTM** provides out-of-the-box, customizable end user applications such as loans processing or claims management.	

Name:	**TeamWARE Flow**	
Company:	*Name*	Teamware
	URL	www.teamware.com
	Contact	info@teamware.com
Nationality:	Europe (3i) and Japan (Fujitsu)	
Language:	English	
Description:	TeamWARE Flow offers outstanding dynamic capabilities with procedures implemented on the spot that can start running while still incomplete. The procedure definition can be completed and modified while the process is in progress. It uses facilities of the TeamWARE groupware environment as well as Lotus Notes and Microsoft Exchange for electronic mail, document management, and user identification. Its companion entry product Teamware Dolphin is the perfect example of an ad-hoc workflow proposing instant define and run workflow capabilities directly to end-users.	
Technology:	System requirements ▪ Server: Windows NT/ 2000 Server or Professional ▪ Clients: Windows 95/98/2000/NT Databases supported: MS SQL Server/ Oracle/ Sybase Adaptive Server/ Microsoft Jet Integration with: Teamware software. Office/Lotus Notes/ MS Exchange Client-server and web-based	

Name:	**TeamWARE Flow**
Features:	▪ The **Planner** is a graphical modelling tool for drawing up, initiating, and following up process plans. They can include roles, forms, sub-plans, triggers, scripts, parallel and sequential activities and conditional activities. ▪ The **Viewer** enables process participants to view worklists, manage attachments and follow process histories. ▪ **Web client** for access over intranets or the internet ▪ **Form Builder** is a user and programmer's tool for creating electronic forms. The form includes data fields that are linked to a database and optional scripts that can, for instance, invoke external applications. ▪ **Document Storage and Directories.** Forms, process plan templates and documents (attached to processes) are stored in the system. User information is stored in a directory system and a range of directory systems is supported. ▪ Application Development. **Flow Objects** provides an Automation interface to the workflow services. This enables you to develop solutions that use Flow Objects by means of any development environment that provides Automation Controller support. Other features: • A product of choice when dynamic changes are important • A good engine for collaborative applications with very low development costs • Throughput and development tools for medium load production applications • Easy deployment via the Internet, Lotus Notes, and Exchange • Integrated forms definition tools, and ActiveX for customized applications.

Name:	**Visual and Panagon Workflo**	
Company:	*Name*	FileNet
	URL	www.filenet.com
	Contact	www.filenet.com/English/Contact_Us/
Nationality:	USA	
Language:	English	
Description:	Visual and Panagon Workflo are a production workflow with an API to build tailored worklist handlers and activities. The process definition process is object-oriented. It provides class hierarchies with inheritance, facilitating the definition of process variations with simpler diagrams. **Visual Workflo**'s strengths are its object-oriented process definition, the scalability of its distributed server and the power of its programming and development tools. Java-enabled development of Internet applications that are server and/or browser hosted. On top of that **engine**, a completely new set of features were built to be integrated with Panagon **document management system** and replace the previous ad-hoc Filenet product Ensemble. This provides a subset of the Visual Workflo capabilities with a completely ready to use WEB based user interface, and a new end user oriented process definition tools.	
Technology:	System requirements: • Client: Microsoft Windows 95/98/NT • Server: NT, HP-UX, IBM AIX • Web Servers: Apache, Microsoft , Netscape, Sun Java	
Features:	▪ Visual interface and graphical tools ▪ Services to easily track, manage, and monitor work ▪ Real-time modification of work ▪ Configurable management statistics and flexible logging options for improved visibility and workload balancing ***Visual Workflo*** • High throughput and scalability for production workflow applications • Powerful object-oriented procedure definition tool for complex procedures • Activities are complex and must be programmed (with RAD tools) to fit requirements • A product for large projects with a development expertise ***Panagon Workflo*** • Ad-hoc workflow applications defined by end users • Integration of Panagon document management • All Web-based from process definition to administration • Automatic generation of web based interfaces.	

22.4.5 Conclusion

Most Workflow document and records management solutions contain what might be viewed as "office automation" level document distribution and check in/check out functionality. Production workflow engines (capable of codifying

business rules, being accessed via API and integrated into business applications, etc.) however have, in the main, not been successfully integrated with document and records management solutions. A key trend in the workflow market has been the incorporation of workflow functionality in core business applications or ERPs. In our opinion, the workflow as a separate technology set has a limited life span.

22.5 Answers to the Workflow Questionnaire

Q No.	Workflow Questions		X1	X2	X3	X4	X5	X6
1.	Which of the following stage(s) does your multimedia business include?	a) Producer (accessing/ creating/ authoring, editoring, rendering etc)		Yes We produce our own content	Yes	Yes	In our B2B scenario we are Carrier (responsible for the content delivery)	Yes
		b) Integrator (accessing, editing, aggregating, formatting, etc.	Yes	Yes We aggregate content from other producers	-	Yes	In our B2C scenario we have some agreement with Producer to distribute their content to our users and sharing revenues. In this case we are Integrator and Distributor	Yes
		a) Distributor (editing, formatting, packaging, bundling and distribution)	Yes	Yes We distribute books & e-content (from us and other publishers too)	-	Yes – but we deliver the final product only.		
		b) Retailer (selling mainly B2C)	Yes	Yes We have started selling e-content this year.	-	Yes	In our B2C scenario, we don't sell directly to final users, but we sell to our partners and they keep the contact with the final user	
2.	Do you have an established "mature[1]" process for any or all of the above?	a) Yes b) No	Yes	No	No	Yes – for distributing items for mobiles	Yes we started each scenario three years ago	No
3.	What tools do you normally require to integrate with the Workflow Management for each of the above categories as relevant? In each category If Yes, then could you please make it available for the purpose of this WFMS Requirement Specification exercise	a) For Production? Yes/No	No	Yes	No			Yes
				All Validator build tool (proprietary & make font)				Authoring tools (Photoshop, Maya, Flash)
		b) For Integration? Yes/No	Yes	Yes	No			Yes
				Validator build tool (proprietary & make font)			A simple packaging procedure to pass form AXMEDIS world to the OPENSKY one. Ex: a tool that calls it for getting the AXObj and assign it into an OPENSKY package. Our tools are either the web interface where publishers package their content or they can do that by using some API to use the technology in a "silent" mode.	Flash, Dreamweaver
		c) For Distribution?	Yes		No	Yes		No
						We need to get finally rendered reformatted, resized and converted object for delivery	Who should decide the transmission details? In our architecture there is a Publisher. After packaging an AXObj in our Push Technology who	

							will associate it to a Program? Who will schedule the Program? Who will decide the target for the Program? See next slide with a general scenario Also in this case our workflow management takes into account two possible scenarios: transmission details are defined either using web-based interface for Publishers or sending formatted (XML) commands to our server passing through the API level.	
		d) For Retail?	No		No			No
		If Yes, then could you please make it available for the purpose of this WFMS Requirement Specification exercise.					Our Partners (User Providers) assign/buy contracts for their users either from an appropriate web-based User Administration Interface or by sending some formatted (SML) requests to our API level. Partners buy in advance, some credits from us. Credits will allow to Partners of buying contract for their users. Final users will pay to our partners the price for the contract.	
4.	**Are you happy that the AXMEDIS Use Cases being proposed prototypically cover all the aspects of your core workflow logic in respect of each of your relevant process streams**		Yes	Yes will help us to set up a Workflow?	Yes	No, for my opinion it may be constantly defined for different types of distribution channels.	Yes but it will be difficult to find a common interface for all distribution channels	Yes
5.	**If No, what aspects of which one of your process streams (a,b,c,d as above) are not fully accommodated, please specify?**		Will cover minor points in interview	-	-			-
6.	**What client platforms do you use which would require Workflow management client software?**		Proprietary Content Management/ Ingestion programs	MS Windows, Mac OS	Windows PC (OS= XP pro & Win Server 2003 Limited use - LINUX & OSX)	Actually our client is our application server application which distribute the final content item for mobile device. Windows 2000 Server is used for application server	Java Platform for developing our client application it runs on either Window or LINUX. The client application is charged of receiving the AXObj, of stocking it and of delivering it to the appropriate viewer/player For developing we have both windows and Linux workstations	Mac OS x Windows XP
7.	**Are there any relevant requirements aspects for the AXMEDIS WFMS as covered in the WFMS Requirements Discussion Document that in your opinion have been left out**		No		We are not using WFMS at the moment so we are not in a position to comment	Still an open issue, should be resolved later if any	WF engine could operate in Linux	No
8.	**The Workflow**	• **WF engines preferred by**	OD2 has little or		Mostly PC XP, 2000, 98	We have no special	Windows and Linux, Web-based	

	interface for AXMEDIS has to interoperate with one or two Open Source Workflow Engines selected from the list of the leading WF engines availableas shareware and nominated by members of the Consortium, Please state your preference as follows:	**• you for Windows PC (XP, 2000, 98) Environment** **• WF engines preferred by you for the Mac Environment** **• WF engines preferred by you for the Linux Environment**	no knowledge in this area.		A few MAC machines mainly to control digital camera back system A few Linux machines mainly web servers, ftp, ssh	preferences just windows platform should be supported	proposal (http://con-cern.org)	
9.	**Are any stages of your workflow currently announced**	**If yes please describe:**	Only by proprietary systems to be covered in interview	No	-			No
10.	**Do you need to share workflow management with partner organisations in your value chain?** **i) How does this work now?** **ii) Who is involved?** **iii) Would all of these organisations adopt AXMEDIS:** **Following the meeting, please provide a flowchart and brief description of your workflow**		No	We should share ideally WF with many partners i) We don't use any WFMS, Some. ii) authors, publishing houses, designers, software houses, schools, photo-composers, Mail/file exchange iii) Not sure all of them can adapt it (authors, schools,…) Definitely No	-	iii) Definitely no, we are the final distributor before delivering finalised content item for the mobile device	i) Publisher uploads the content ii) Publisher and Broadcaster iii) Yes if AXM editor produces a stable result in DRM Technology Broadcaster send content, owner of technology, responsible to transport level. Final user access the content	i) Approval processes at each stage ii) Client iii) No

Q No.	Workflow Questions		X7	X8	X9	X10	X11	X12
1.	Which of the following stage(s) does your multimedia business include?	a) Producer (accessing/creating/ authoring, editoring, rendering etc)	Yes	Yes	Offline Workflow	We produce our own content and also editing, management, distribution and fruition tools, platform and solutions. We also produce CD/DVD or books but only on specific customer order and commitment		
		b) Integrator (accessing, editing, aggregating, formatting, etc.		Yes	Offline Workflow	We acquire, adapt and aggregate content from other publishers when there is no in-house experience on the specific domain	YES, namely Pre-encoding, encoding, encrypting, (meta)data entry and content upload (in certain cases remote content import). We call them the "Content Acquisition Platform"	
		b) Distributor (editing, formatting, packaging, bundling and distribution)			Offline Workflow	We distribute mainly editing, management, distribution and fruition tools, platform and solutions but also e-content, CD/DVD and/or books (these latter only when agreed with committers)	YES	
		c) Retailer (selling mainly B2C)				We sell mainly editing, management, distribution and fruition tools, platform and solutions but also e-content, CD/DVD and/or books (these latter only when agreed with committers)	YES	
2.	Do you have an established "mature[1]" process for any or all of the above?	a) Yes b) No	Yes	Yes	Yes	We are ISO9000 certified and the process has been documented, procedures are in place, simple tools are used.	PARTIALLY	
3.	What tools do you normally require to integrate with the Workflow	a) For Production? Yes/No		No	Yes	Yes	N/A	
					Audio tools as Peak Bias(MAC), Deck Bias (MAC),	Visual SourceSafe – for CM management and control of developed code		

	Management for each of the above categories as relevant? **In each category If Yes, then could you please make it available for the purpose of this WFMS Requirement Specification exercise**				Protools(MAC) and multimedia developer as Macromedia Director. But also many more.	Learn eXact Suite – for content production (LO, LOM…) Bugzilla – for problem tracking MS-Word – for document production / MS-Excel – for process tracking and recording / forecasting MS-Project for planning		
		b) For Integration? Yes/No		Yes	Yes	Yes		
		If Yes, then could you please make it available for the purpose of this WFMS Requirement Specification exercise.		WinPitchPro (http://www.winpitch.com) – Speech analysis, Text2Speech Editing, Synchronization and Tagging software. IMDI Tools (http://www.mpi.nl/IMDI/) – Speech Metadata Management tools	As above in a)	Visual SourceSafe – for CM management and control of developed code Learn eXact Suite – for content production (LO, LOM…) Bugzilla – for problem tracking	Pre-encoding, encoding, encrypting, (meta)data entry and content upload are processed via internally developed tools + Xaura (WF is implicit in the tools – very simple few step process) For remote content import we do use software importation tools with implicit built in workflow	
		c) For Distribution?		No	Yes	No		
		If Yes, then could you please make it available for the purpose of this WFMS Requirement Specification exercise.			multimedia developer as Macromedia Director		For content upload we use common commercial FTP managing software For (audio video) content delivery deployment we use internally developed software routines for automatically transferring content from central content repository to edge cache servers	

		d) For Retail?		No		No		
		If Yes, then could you please make it available for the purpose of this WFMS Requirement Specification exercise.					Xaura enables to specify e-store business rules, pricing etc. License back-office tool for reporting and customer care operations (re-funding, re-issuing of licenses)	
4.	**Are you happy that the AXMEDIS Use Cases being proposed prototypically cover all the aspects of your core workflow logic in respect of each of your relevant process streams**			Yes	Yes	Yes	No	
5.	**If No, what aspects of which one of your process streams (a,b,c,d as above) are not fully accommodated, please specify?**						Content Acquisition Platform (audio video) content delivery deployment Synchronization between license creation and Xaura metadata management Notification between license issuing and License back-office metadata	
6.	**What client platforms do you use which would require Workflow management client software?**			Microsoft Windows 2000 & XP	Mac, Windows XP	Microsoft Windows	To be assessed during AXMEDIS specification process. Presumably the tools would be Xaura, License back-office and the Content Acquisition Platform.	
7.	**Are there any relevant requirements aspects for the AXMEDIS WFMS as covered in the WFMS Requirements Discussion Document that in your opinion have been left out**			No	No	Yes System Management		
8.	**The Workflow interface for AXMEDIS has to interoperate with one or two Open Source Workflow Engines selected from the list of**	• **WF engines preferred by you for Windows PC (XP, 2000, 98) Environment** • **WF engines preferred by you for the Mac Environment** • **WF engines preferred by you for the Linux**				No Preference		

	the leading WF engines availableas shareware and nominated by members of the Consortium, Please state your preference as follows:	**Environment**						
9.	**Are any stages of your workflow currently announced**	**If yes please describe:**	No	No	No	No	Multi-encoding, DRM license creation Remote content import Content Publishing (audio video) Content delivery deployment Xaura metadata synchronization License back-office metadata notification	
10.	**Do you need to share workflow management with partner organisations in your value chain?** **i) How does this work now?** **ii) Who is involved?** **iii) Would all of these organisations adopt AXMEDIS:** **Following the meeting, please provide a flowchart and brief description of your workflow**			No	i) Recording, Mastering, Sending master to CD printer and packaging, send back for distribution. ii) Artists, Sound Engineers, Producers, Designers (CD lay-out), CD printers. iii) Mainly the CD printer should be adopt AXMEDIS avoiding the terrestrial sending of Master Audio and master Graphics.	We do not need as we cover the whole value chain, but it would be beneficial i) we don't use any WFMS ii) authors, publishing house, servicing companies, distributors and retailers iii) not sure all of them can (authors) adopt it	YES i) Synchronization between partner license creation and Xaura metadata management Notification between partner license issuing and License back-office metadata ii) Content syndicator iii) Yes, several, including OD2	

22.6 Answers to the Content Process / Distribution Cost Questionnaire

Responses to supplementary Questions re Costing

0) Which of the following multimedia business sectors is your company involved in:
a) Music Production and/or Distribution
b) Educational/e-book Production and Distribution
c) Advanced Entertainment e-media Production and Distribution (e.g. films, videos, games, immersive-3D environments, interactive experience portals etc)
Music Production

1) On the whole, i.e. considering the entire scenario end-to-end what is the proportion of your production/distribution workflow that is automated and what proportion is manual?
Most of the producing process, with regard to music recording , are manual if by manual we intend the direct involvement of professionals. Partially automated are the contractual and licensing forms (based on standard forms) .

12) Please could you give your best evaluation of the time, tools used and cost typically incurred in your processes for the following typical activities (it may be helpful to refer to the attached map of activity hierarchies in order to remember to include all the steps involved for each typical activity below for each of the streams.
As far as the recording process lay its basis on many variants changing time by time, the costs and time spent for each recording process are not always the same. In the table below we illustrate the following case:

- *CD album (containing almost 12/14 songs)*
- *Artist/ singer (quite famous)*
- *Breakeven :30.000 copies*
- *Cost of each copy to the public € 20,00*
- *Some cost are expressed in percentage calculated on the amount of copies sold*
- *Costs of in house people such as artistic director, contract and rights clearance office, accountant, graphic aggregator and press agent are in connection with specific time spent.*

- *this refer to the case in which the producer is also publisher.*

8.2.1.1.5 Audio/Music Production Workflow & Costing

	Time taken HOURS	Tools used	Gross cost
ISSUING THE BUDGET LEGAL OFFICE	4 18/20	EXCEL WORD	€ 88.00 € 2,000.00
CONTRACT WITH ARTIST	2	WORD	€ 44.00
CONTRACT WITH RECORDING STUDIO	1	WORD	€ 22.00
CONTRACT WITH MUSICIANS OR BAND 5 people	1	WORD	€ 22.00
CONTRACT WITH ORCHESTRA	1	WORD	€ 22.00
CONTRACT WITH ARRANGER	2	WORD	€ 44.00
CONTRACT FOR COVER DESIGN	1	WORD	€ 22.00
CONTRACT WITH CD BOOKLET WRITER	1	WORD	€ 22.00
CONTRACT FOR COPIES OF MUSIC SCORES	0.3	WORD	€ 11.00
CONTRACT WITH DISTRIBUTOR CONTRACT WITH PROMOTER	3 2	WORD WORD	€ 66.00 € 44.00
CONTRACT WITH CD FACTORY CONTRACT FOR VIDEO PRODUCTION	1 project base	WORD	€ 22.00 € 44.00
*PUBLISHING CONTRACT	1	WORD	€ 44.00

*CUE SHEET FORM for Authors and Publishers Collecting Society	0.15	WORD	€ 5.50
MECHANICAL RIGHTS FORM for Coll. Soc.	0.3	WORD	€ 11.00
ISRC LISTING for all tracks	0.3	EXCEL	€ 11.00
ACCOUNTANCY DEP.	10	EXCEL	€ 220.00
CONTRACTS MANAGEMENT	3	WORD	€ 66.00
UPLOADING METADATA ON DATABASE	3		€ 45.00
UPLOADING LICENSING DATA ON DATABASE	3		€ 45.00
UPLOADING MP3 ON DATABASE	3		€ 45.00
GRAPHIC AGGREGATOR	24		€ 480.00
CD COVER AND BOOKLET LAYOUT	1	FOTO LAB.	€ 400.00
ARTISTIC DIRECTOR	80		€ 3,200.00
PRESS AGENT	project base		€ 5,000.00
MECHANICAL RIGHTS	30.000 copies		€ 18,000.00
CD PRINT/RELEASE	30.000 copies		€ 24,000.00
ARTIST ROYALTIES	5/10 %		€ 48,000.00
SPECIAL SAMPLES FOR B2B USERS	16 ORE	CD BURNING	€ 352.00
FLEXIBLE COSTS			
PROMOTION/ADVERTISING	project base	tv/radio/magazines etc	€ 220.00
MUSICIANS/BAND	project base		€ 15,000.00
ORCHESTRA	project base		€ 5,000.00
ARRANGER	project base		€ 15,000.00
MUSIC SCORES	project base		€ 2,000.00
RECORDING STUDIO	200	equiment	€ 20,000.00
GRAPHIC DESIGN	project base		€ 1,000.00
BOOKLET WRITER	project base	WORD	€ 500.00
DISTRIBUTION	15%		€ 90,000.00
PROMOTER	project base		€ 15,000.00
PROMOTION/ADVERTISING	project base	tv/radio/magazines/promo stage	€ 150,000.00
VIDEO CLIP	project base	VIDEO COMP.	€ 15,000.00

Xxxx response

0) Which of the following multimedia business sectors is your company involved in:

a) Music Production and/or Distribution

Distribution only

b) Educational/e-book Production and Distribution

N/A

c) Advanced Entertainment e-media Production and Distribution (e.g. films, videos, games, immersive-3D environments, interactive experience portals etc)

Distribution only

11) On the whole, i.e. considering the entire scenario end-to-end what is the proportion of your production/distribution workflow that is automated and what proportion is manual?

More or less 60% / 40% (where 60% automated and 40% manual work)

12) Please could you give your best evaluation of the time, tools used and cost typically incurred in your processes for the following typical activities (it may be helpful to refer to the attached map of activity hierarchies in order to remember to include all the steps involved for each typical activity below for each of the streams?

The answers are based on the Content Management System (referred on as CMS). Our comments are embedded in the table below, proposed by document originator.

Typical activity	**Time taken**	**Tools used**	**Cost Incurred (e.g. man-minutes + other resources)**
metadata integration	1 hour per 100 items	CMS	45 minutes per 100 items / man 15 min /system resources time (automated resource)
In terms of CMS this operation includes both manual and automatic work for new content uploading into system			
composite object production	5 hours per 1000 items	CMS	300 min / system resources (automated resource)
In terms of CMS this operation includes files upload and production to the system. The process is scheduled manually and performed fully automatically.			
protecting objects	N/A	N/A	N/A
There is no any objects protection available in CMS			
distributing objects to distributors	N/A	N/A	N/A
There are no subsidiaries which receive content from. Content is distributed only to the customer's sites.			
acquiring objects from the publisher	about 1 week per 100 items (depends on publisher responsiveness)		60-120 minutes for object requirements definition / man
In terms of content department this operation means to issue request to Content Owners and/or Content Provider to supply content for the specific customer(s).			
finalizing the contract in the licenses	N/A	N/A	N/A
There are global contract with Content Owners / Content Providers and there is no digital content protection available. In both terms such work is not present.			
production of the programme for publication	0.5 hour per 100 items	CMS	30 min / 100 items / man
In terms of CMS this operation means content publishing and integrity testing.			
updating digital content e.g.			
a) updating metadata	2 min per item	CMS	2 min per item / man
In terms of CMS this operation means update of content meta data in case of found errors, reported rejects or other problems… This work is manual.			
d) updating licenses	N/A	N/A	N/A
e) recovering history of the object production . tracking	N/A	N/A	N/A
administrative activities . clearance of rights . etc...	5 hours of work per Content Provider	Excel	300 min / man (see comments below) per Content Provider
Assuming all data came from 10 different customers per one Content Provider. This work is done manually.			
Any other activities, please enter here			

a) Uploading the data to the online system	about 3 hours / per 1000 items	CMS	30 min of man work + 2.5 hours of system work per 1000 items
In terms of system the whole content update process is divided between offline CMS and online system. Synchronization process between these two systems is also part of content preparation process and should be measured.			
b) Testing the content on the live platform	8 hours (see comments below)	CMS	about 4 hours of man work
The newly upload and updated content should be tested prior switching to be used in the online system. Above values include 2 cycles of rejects and updates.			

YYYY response to Costing Questionnaire

10) Which of the following multimedia business sectors is your company involved in:

a) Music Production and/or Distribution
b) Educational/e-book Production and Distribution
c) Advanced Entertainment e-media Production and Distribution (e.g. films, videos, games, immersive-3D environments, interactive experience portals etc)

C

11) On the whole, i.e. considering the entire scenario end-to-end what is the proportion of your production/distribution workflow that is automated and what proportion is manual?
XIM's production work is currently highly bespoke and hence 95% manual. Approximately 5% of effort is achieved via scripting of tools, for example, batch image preparation in photoshop, batch video compression into streamed formats, batch 3D rendering etc.

12) Please could you give your best evaluation of the time, tools used and cost typically incurred in your processes for the following typical activities (it may be helpful to refer to the attached map of activity hierarchies in order to remember to include all the steps involved for each typical activity below for each of the streams.
XIM's costs are highly variable depending on the scope and complexity of the project. However, I have estimated a basic range of current costs in the table below, which we can compare against once we are using AXMEIS tools to support our workflow.

As well as direct costs, it is also important to consider the production lead-time, which is often delayed by inefficient clearance and approval processes. There is great potential to reduce this by means of the AXMEDIS tools and framework.

Typical activity	Time taken (hours)	Tools used	Cost Incurred (e.g. man-minutes + other resources)
metadata integration	0	not applicable	0
composite object production	100-400 hours	Maya, Flash, Photoshop, After Effects	Labour, computer and software depreciation (€2.5k per production)
protecting objects	0	None at present but wish to in the future	IPR counsel (€?)
distributing objects to distributors	4-16 hours	standard tools for email, FTP, WebDAV, DVD-ROM burning	communications, consumables, couriers etc. (€10-€150)

acquiring objects from the publisher	5-20 hours depending on source	(small effort but can be large elapsed time (up to 2 weeks), impacting delivery lead time)	usage rights of third party components €250-€2000 depending on nature of the objects
finalizing the contract in the licenses .	4-16 hours	email, MsOffice	legal counsel may be required (€1-€3k)
production of the programme for publication	200 hours	Maya, Flash, Dreamweaver, Photoshop, Final Cut Pro, After Effects	Labour, computer and software depreciation (€2.5k per production)
updating digital content eg a) updating metadata b) updating licenses c) recovering history of the object production . tracking	50-200 hours	Maya, Flash, Dreamweaver, Photoshop, Final Cut Pro, After Effects	Labour, computer and software depreciation (€2.5k per production)
administrative activities . clearance of rights . etc...	5-20 hours for clearance, depending on source. Also included here is the approval process with key stakeholders.	email, MsOffice.	(small effort but can be large elapsed time (up to 2 weeks), impacting delivery lead time)
Any other activities, please enter here: programming, integration and testing	200-300 hours	Flash, Java, Dreamweaver, MEL, etc	Labour, computer and software depreciation (€2.5k per production)

ZZZZ response to Costing Questionnaire

Which of the following multimedia business sectors is your company involved in:

a) Music Production and/or Distribution

Distribution only

b) Educational/e-book Production and Distribution

N/A

c) Advanced Entertainment e-media Production and Distribution (e.g. films, videos, games, immersive-3D environments, interactive experience portals etc)

Pre-encoding, encoding, DRM-encrypting, (meta)data entry, file upload and Distribution only

11) On the whole, i.e. considering the entire scenario end-to-end what is the proportion of your production/distribution workflow that is automated and what proportion is manual?

Pre-encoding, encoding, DRM-encrypting, (meta)data entry, file upload:
50% manual / 50% automated if content is not imported
20% manual / 80% automated if content is imported
Distribution :
30% manual 70% automated

12) Please could you give your best evaluation of the time, tools used and cost typically incurred in your processes for the following typical activities (it may be helpful to refer to the attached map of activity hierarchies in order to remember to include all the steps involved for each typical activity below for each of the streams?

All considerations below are related to video files (Movies)

Typical activity	**Time taken**	**Tools used**	**Cost Incurred (e.g. man-minutes + other resources)**
Metadata integration		Xaura	60 minutes per movie / man 15 min /system resources time
this operation includes both manual and automatic work for new content uploaded into Xaura system			
composite object production	16 hours per 1 item	Xaura	Special sites: 960 min / man per item 15 min /system resources time
This operations is strictly confined to the development of multimedia web GUIs for special sites (entirely managed via Xaura)			
protecting objects	Movies: 4 hours	WM DRM	Movies: 30 min / Man per video 210 min /system resources time
objects protection is available via Microsoft Windows Media DRM			
distributing objects to distributors	Movies: 1 hour	FTP	Movies: 10 min / Man per video 50 min /system resources time
Distributor is to be meant any media server repository (Tiscali or third party)			
acquiring objects from the publisher	Off-line transfer: about 2 weeks per 10 movies (depends on publisher responsiveness) on-line transfer: aprox. 60 minutes per movie	Delivery courier	120 minutes for object requirements definition / man if data is not imported and provided with XML data sheet (in this case 20 min)
These durations are strongly variable depending on responsiveness			
finalizing the contract in the licenses	2 months – 1 year	Face to face negotiation	7 days per content deal (each deal aprox 100 movies)
This is the most time consuming and lasting operation. Strogly depeding on content owner			
production of the programme for publication	2 hour per movie	xaura	60 min / movie / man
For Tiscali this operation means content publishing and integrity testing			
updating digital content e.g.			
a) updating metadata	20 min per movie	xaura	20 min per movie/ man
This may happen in the case of translations, error handling or just data modification			
f) updating licenses	30 min	WM DRM	30 min / Man per video
g) recovering history of the object production . tracking	N/A	N/A	N/A
administrative activities . clearance of rights . etc...	4 hours of work per Content Provider	Excel	240 min / man per Content Provider
This work is done manually by merging Xaura reports			
Any other activities, please enter here			

c) Uploading the data to the online system	about 1 hour / per movie	FTP	Movies: 10 min / Man per video 50 min /system resources time
Via Xaura and simple FTP manager applications			
d) Testing the content on the live platform	1.5 hour per movie	CMS	90 min per video /man
Controlling playback integrity and metadata coherence			

EEEEE response to Costing Questionnaire

0) Which of the following multimedia business sectors is your company involved in:

a) Music Production and/or Distribution

b) Educational/e-book Production and Distribution

c) Advanced Entertainment e-media Production and Distribution (e.g. films, videos, games, immersive-3D environments, interactive experience portals etc)

11) On the whole, i.e. considering the entire scenario end-to-end what is the proportion of your production/distribution workflow that is automated and what proportion is manual?

30% automated, 70% manual (for current ingestion system)

12) Please could you give your best evaluation of the time, tools used and cost typically incurred in your processes for the following typical activities (it may be helpful to refer to the attached map of activity hierarchies in order to remember to include all the steps involved for each of the streams.

Typical activity	**Time taken**	**Tools used**	**Cost Incurred (e.g. man-minutes + other resources)**
metadata integration	1 hour per batch of 50 products	Xl proforma spreadsheet, ftp client, xml	1 man hour
composite object production	30 minutes per batch of 50 products	xml	10 man minutes
protecting objects	5 minutes per batch of 50	Content management database	5 man minutes
distributing objects to distributors	24 hrs	Dataloader, oms	3 man hours
acquiring objects from the publisher downloading files	3 hours per batch of 50 albums	ftp client	15 man minutes
finalizing the contract in the licenses .	3 weeks	email	3 man days
production of the programme for publication n/a	n/a	n/a	n/a
updating digital content e.g.			
a) updating metadata	1 hour per week	Content management	1 man hour
h) updating licenses	1 hour per week	Content Management	1 man hour
i) recovering history of the object production . tracking n/a	n/a	n/a	n/a

administrative activities . clearance of rights . etc...	1 hour per week	email	1 man hour
Any other activities, please enter here			

Costing Questionnaire (Expert H)

1) Which of the following multimedia business sectors is your company involved in?

a) Music/Audio Production and/or Distribution(yes)

b) Educational/e-book Content Production and Distribution(yes)

c) Advanced Entertainment e-media Production and Distribution (e.g. films, videos, games, immersive-3D environments, interactive experience portals etc) (yes)

2) For each of the above sectors in which your company has an involvement, or for at least one of the above which you feel mainly characterises your business model, please specify which of the following stage(s) is included in your multimedia business

a) Producer (accessing, creating, authoring, editing, rendering etc) (B2B)

b) Integrator (accessing, aggregating, editing, formatting, etc) (B2B)

c) Distributor (editing, formatting, packaging, bundling and distribution,etc) (B2B)

d) Retailer (selling, mainly B2C) (yes)

e) Other?

3) Do you have an established, "mature" process for any or all of the above? (yes)
(by a mature process essentially we mean a business process that is specified formally, established and communicated to all staff and is routinely followed as a standardised process flow e.g. a flow chart /decision tree etc.)

4) Which tools do you normally use for integrated operations management of any of the above multimedia development and/or distribution processes as may be relevant to your business; as follows:

a) for the overall Workflow Management?

b) for the Production Phase? (yes)

c) for the Integration/Ingestion Phase ? (yes)

5) Which client platforms do you use which would require Workflow Management client software? PC, MACOS, UNIX

7) Any other requirements for the AXMEDIS Workflow Management that you feel should be included?
C2C

10) Are any stages of your workflow currently automated? (yes)
If yes, please describe which activities are currently controlled by a Workflow Management System:

11) Do you need to share workflow management with partner organisations in your value chain?

i) How does this work now? MANUAL

ii) Who is involved? ALL PARTNERS nm2

iii) Would you think these organisations would find the adoption of the AXMEDIS framework helpful for their operations? MAYBE

12) Meta data are part of the trust third party responsibility. Metadata are interested tracing all history and project history, where for project we intent the evolution of the content production.

-- On the whole, i.e. considering the entire scenario end-to-end what is the proportion of your production/distribution workflow that is currently automated? FOR SOME WOOLS 100%

Costing Questionnaire (Expert C)

1) Which of the following multimedia business sectors is your company involved in?

c) Advanced Entertainment e-media Production and Distribution (e.g. films, videos, games, immersive-3D environments, interactive experience portals etc) (yes)

2) For each of the above sectors in which your company has an involvement, or for at least one of the above which you feel mainly characterises your business model, please specify which of the following stage(s) is included in your multimedia business

a) Producer (accessing, creating, authoring, editing, rendering etc) (yes)
b) Integrator (accessing, aggregating, editing, formatting, etc) (yes)
c) Distributor (editing, formatting, packaging, bundling and distribution,etc) (yes)

3) Do you have an established, "mature" process for any or all of the above? (yes)
(by a mature process essentially we mean a business process that is specified formally, established and communicated to all staff and is routinely followed as a standardised process flow e.g. a flow chart /decision tree etc.)

4) Which tools do you normally use for integrated operations management of any of the above multimedia development and/or distribution processes as may be relevant to your business; as follows:

b) for the Production Phase? (no)
c) for the Integration/Ingestion Phase ? ? (no)

5) Which client platforms do you use which would require Workflow Management client software?(none)

7) Any other requirements for the AXMEDIS Workflow Management that you feel should be included?
(No) Technical data of images and audio to track from acquisition through production to distribution vital to include compression details

10) Are any stages of your workflow currently automated? Yes/No
If yes, please describe which activities are currently controlled by a Workflow Management System:
Non linear off line to online conform

11) Do you need to share workflow management with partner organisations in your value chain?

i) How does this work now? PERSONAL CONTACT, DOCUMENTS
ii) Who is involved? Producer, director, designer, editor, commission editor
iii) Would you think these organisations would find the adoption of the AXMEDIS framework helpful for their operations? ONLY IF IT FITTED WITH EXISTING WORKFLOW

- Metadata:
- History, technical details (camera setting), compression details, re formatting details (from 16:9 to 4:3, etc.) copyright details, artistic details, author details, last recording, main contract elements SHOULD BE ACQUIRED at point of needs (during plannins, shooting, post production, etc.)

12) On the whole, i.e. considering the entire scenario end-to-end what is the proportion of your production/distribution workflow that is currently automated? 5% automated

13) For the following typical activities, please could you give your best evaluation of *their relative cost* in terms of resources used (staff time, tools etc) and thus the costs typically incurred in your processes (it may be helpful to refer to the attached map of activity hierarchies). For each of the common activities listed in the table below and/or those activities within your own multimedia value chain which you may wish to append to this table, it may be easier to consider the relative cost incurred as the percentage of the cost for the task under consideration relative to the overall cost incurred for the entire value chain end-to-end.

Typical activity	Time taken	Tools used	Cost Incurred (e.g. man-minutes + other resources)

metadata integration	0	0	0
composite object production	30%		> 30%
protecting objects	0	0	0
distributing objects to distributors	1%	Physical delivery	1%
acquiring objects from the publisher	5%	Physical	5%
finalising the contract in the licenses .	105	Personal contact, email	20K Pound per year
production of the programme for publication	40%		40% of the total cost
updating digital content e.g.	5%		
a) updating metadata	0	0	0
j) updating licenses	5%	Word	5%
k) recovering history of the object production, tracking	5%		5%
administrative activities, clearance of rights, etc...	15%	Pc	15%
Any other activities, please enter in rows below			

22.7 Answers to the Questionnaire to the User Group of Experts (November 2004)

In answers letters are used to identify experts.

22.7.1 General

1. See you any problems or limitations in the usage of P2P model for sharing and distributing content at B2B level ?
   a) NO provided that the content is protected
   c) IRP Limitations, existing business network may wish to limit access
   d) no
   e) I show problems regarding the quality and format needed for different content, example high quality of images and mobile phones
   f) not clear to me yet
   g) NO
   h) synchronisation of images across a distributed file store, simultaneous access of content by collocated users via hit contention problems

2. Are you interested in becoming connected to AXMEDIS AXPTool for publishing/ distributing/ integrating content ?
   a) yes, depending on outcomes and results
   b) SIAE is a collective management society, so it is not dealing with objects but with information and works on payments by commercial users
   c) yes
   d) yes
   e) yes
   f) yes

g) yes
h) yes as EC NM2 project, and potentially as that for commercial hosting media

3. Which is your methods for content distribution at B2B ?
   a) OFF line traditional market
   b) broadcast (terrestrial, cable, satellite) videostream (CHS, DVD, CD) Internet
   d) physical shipping tapes CDs
   e) broadband
   f) depending on the platform
   h) ATM, ETHERNET, FTP
   Area you moving content with hardware media (CD, DVD…) ?
   b) NO
   d) yes, CD, DVD
   e) I have digital tape just for archive
   f) also
   g) DVD, DV tape, CD, FLASH USB
   …….
   Which hardware media (CD, DVD, tapes, etc..) ?
   a) VHS mainly
   c) DVD, CD, VHS
   d) CD, DVD, BETACAM SP, DIGTAL BETACAM,
   f) all
   g) DVD, DV tape, CD, FLASH USB

4. How many Gigabytes are you moving per year or per months ?
   c) don't know
   d) images (50 Giga to 1 Tera per year), video 150 Hrs per year
   f) …..
   g) 1 Giga
   h) several peta bytes (commercial)
   How large is your catalogue in terms of number of digital objects ?
   c) programming more than 20
   d) images 25000we have users of over 50000 video tapes
   e) we have 200 hrs of pedagogical audiovisual musical content
   f) millions
   g) 200-300 objects
   h) millions (commercial)
   How large is your catalogue in terms of number of Gigabyte ?
   a) few
   d) entire catalogue is about 3 Tbyte
   h) several peta (commercial)

5. How many times per week/month/year do you refresh your catalogue? For which parts: entirely, partially?
   a) as association we don't know each Tv producer or their wisher. Mainly for major fairs
   d) one per month, add images, edit metadata, delete images
   e) 1 per month, partially
   f) daily
   g) monthly partially
   h) daily
   …….
6. Which type of content is dominant in your catalogue (for example, video, audio, documents, images, multimedia formats) ?

a) VIDEO
c) video and virtual reality
d) picture of users and video
e) audiovisual of great musical events
f) video
g) audio and documents
h) video

In which digital format ?
c) 625 regular, or HDTV (1080)
d) video digital betacam, images tiff/jpg
e) DV cam
f) high res MPEG
g) mpeg3 AND PDF
h) mpeg 1 and 2

7. Is your content protected during the B2B distribution and sharing ?
   a) no only the contract
   c) no only by legal rights
   d) no or very little protections
   e) yes
   h) yes

8. How much you spend in Adapting digital content during the year in terms of euros or man months ?
   d) about 20 MM per year
   e) just put video on broadband
   f) 10-15 MM per year
   h) several man year (commercial)

22.7.2 Content Management Systems

9. Which CMS are you using?
   b) SIAE has developed its own management tools some of them in cooperation with other collective societies
   c) none
   d) fotoware family of SW
   g) WEDELMUSIC
   ……

10. Which kind of DBMS is behind the CMS (i.e. MySQL, DB2, Oracle, ...)?
    b) SIAE copyright management system concerns data of content/works and not content itself.
    c) none
    d) FW is based on tagging and SQL
    e) ORACLE
    f) all

11. Content (images, video, ...) is stored in the DBMS or in the File System?
    c) none
    d) In the FS and it is indexed
    e) in DBMS
    f) all

12. Which is your favourite platform for CMS (i.e. Windows, Unix/Linux, Macintosh, etc.)?
    c) WINdows
    d) windows
    e) WINDOWS ……

f) windows

13. Which is your favourite operating system for CMS (i.e. Windows 2000, MAC OSX 10.3, etc.)?
    c) win 2000
    d) win 2000 professional
    e) Windows
    f) windows
    g) WINDOWS
    h) unix

14. On the basis of your experience do you have some comments/needs on content management systems?
    c) I would welcome a template in which we could enter a part of the information regarding rights to see created the license
    d) capability to connect together a CMS, capability to automatically translate metadata to other standards, capability to integrate content protection automatically or semi automatically

22.7.3 Composition & Formatting Tools

15. Which multimedia content formatting tools are you using?
    c) MAYA, AVID, 3DSMAX
    d) fotoware per images
    f) chellomistral
    g) WEDELMUSIC
    h) proprietary, + quick time pro, Virtual DUB, graphics Converter

16. Which multimedia content automatic production tools are you using (i.e. Windows Movie Maker, Digital Image, etc.)?
    c) none
    d) one of the above, transcribe/transcode with clearner
    f) chellomistral
    h) proprietary, + avid, premiere, final cut pro

17. Do you use some automatic procedure based on script language for automatic content production (i.e. Javascript)?
    c) none ……
    f) yes propeirary
    g) NO
    h) UNIX shell scripts, java scripts

18. Which multimedia content format are you using or prefer for:
    - video (i.e. mpeg, avi):
      c) Mpeg
      d) DVI, MPEG
      e) MPEG
      f) mpeg
      g) AVI MPEG
      h) MPEG, QT
    - audio (i.e. mp3, wav, wma):
      c) vaw
      d) MP3
      f) vaw
      G) MP3
      h) WAV, AIFF …….
    - image (ie. jpg, gif, tif, bmp, png…):

c) jpg
d) TIF, JPG
f) BMP
g) tiff
H) JPEG, TARGA, TIFF.

- document (i.e. word, txt, html, …):
  c) WORD
  d) DOC, PDF
  f) word
  g) TXT word PDF
  h) RTF, PDF
- animation (i.e. flash, …):
  D) QT
  f) some animation.
  h) flash
- other:
  c) various virtual reality formats
  d) interactive QT and java based players

19. Which specific hardware are you using for multimedia content production (i.e. video/audio digitalization devices …)?
    c) Snell and Wilcox Converters + formatter ALCHIMIST
    d) video DISCre + film flome, infernbo, Pinnacl, for images photoshop

20. Which is your target devices for your content production (i.e. PC, TV, mobile, PDA, …) ?
    c) TV mostly, and also PC and mobile
    d) VIDEO TV and picture web and magazine
    e) PC and cable tv
    f) TV and PC
    g) PC
    h) all the above plus STB and other media terminal

21. Do you use any specific tool for content adaptation (i.e. for video/audio adaptation,…)?
    c) only for reframing (Snell and WILCOX)
    d) yes, DISCRE + CLEANER software
    g) WEDELMUSIC
    h) Virtual DUB and Quick Time Pro

22. Which multimedia content protection / DMR tools are you using?
    c) none
    d) none
    f) multiple depending on the platform
    g) WEDELMUSIC

23. Which is your favourite platform for content composition & formatting tools (i.e. Windows, Unix/Linux, Macintosh, etc.)?
    c) Windows, but also some MAC
    d) IRIX and LINUX, also windows in part
    e) windows
    f) windows
    g) windows
    h) MAC

24. Which is your favourite operating system for content composition & formatting tools (i.e. Windows 2000, MAC OSX 10.3, etc.)?

c) Windows,
d) IRIX, LINUX RED HAT, WIN 2000
e) windows
f) windows
g) windows
h) mac os 9

25. Which is the schema or standard you use for digital contents cataloguing (i.e. Dublin Core, Unimark, ICCU schema, etc…)
b) the standard we use are agreed by CISAC and approved by ISO. They refer to CIS (Common Information tool for CISAC Society), information on standards and identifiers can be recovered from www.cisac.org
d) IPTC, Dublin Core or Photo, IPTC for VIDEO (very little)
e) our own system based on UNIMARC
f) ICCU, UNIMARC
h) all the above plus MPEG7 derivations

26. On the basis of your experience do you have some comments/needs on automatic content composition/formatting?
c) complex area in TV production, since so many factor are involved format (landscape 4:3 16:9 Versus Portrait) use of graphic overlay, transmissions etc..
d) I believe this is a very difficult issues and will need a lot of target users profiling and target device profiling
e) take a lot of time to take in account the different needs of each
h0 a growing market

27. Do you have an Integration team in your company?
D) yes
f)yes
g) YES
h) yes

22.7.4 Distribution via Satellite data Broadcast

28. See you any problems or limitations in the usage of Protected Satellite Data Broadcast for distributing content at B2B level (e.g., satellite dish installation, dvb-adapter, etc.)?
    a) Content rights owner protection main issue
    c) attenuation, no return patch except for the phone
    d) no experience
    f) NO
    g) NO
29. Do you need guaranteed bandwidth channels for your data transfer (e.g. live streaming) (inside the questions set number 4)?
c) YES
e) I need a very high quality in the dissemination effect
f) YES IN SOME CASEs
h) we have several QOS related problems

30. Do you have a broadband internet connection in your production location?
c) YES
d) YES, adsl
e) yes
f) yes

h) YES

22.7.5 Business Models

31. do you need additional DRM rules for B2B with respect those that you have hear ?

a) AXMEDIS tools have to include all the existing rules actually regulating the market and future exploitation
c) no
D) yes as discussed
e) I need a very easy way to refresh the content

32. do you need additional DRM rules for B2C with respect those that you have hear ?

a) Some and the issues of analogue mole protection against illegal use
b)
c) No
d) As discussed .
e)

22.7.6 Content protection and DRM

33. Do you see any problem or limitation in the usage of the DRM model proposed for creation and consumption of multimedia content?
a) I need more explanation
c) no
e) a problem is to predefine the way to disseminate the content
f) not clear yet
G) NO
h) negotiation of licenses seems to be manual, layered web for B2b is needed, simple boiler plate license for B2C is needed, preval of user plus data protection issues, fingerprint should be related with content hash or similar. …

34. Are you interested in using the protection model proposed in your own organisation?
a) it depends on how it works, sure we need to protect content
d) yes
e) I need to more detailed information about the system
f) ??
g) YES
h) may be

35. Which are for you the five most important requirements presented?
c) ability to preserve information across various media ad under compression plus attenuation
h) ALL
Would you add or delete any requirement?
h) NO
Do you think that the proposed requirements address the current problems on content protection aspects?
c) yes
d) to a great extend, yes
e) all the person participate In a musical lass
h) partially see the email on license negotiation

36. How many multimedia objects need protection in your organisation?
c) 20k

d) each one ……
f) x00.000
h) Millions

Which kind of protection? (Avoid unauthorised users access, avoid superdistribution, etc.)

d) avoid editing, alteration, redistribution
f) MULTIPLE
g) WEDELMUSIC
h) multiple

37. Which formats are you currently using for content distribution/protection?
    c) 625, 625 digital 601
    d) we do not digitally protect content
    g) WEDELMUSIC
    h) Multiple

38. Is your content currently protected during distribution and sharing? How?
    c) NO
    d) NO
    g) yes with WEDELMUSIC
    h) proprietary DRM

39. How much do you spend in content protection during the year in terms of euros or man months? For which amount of content?
    c) 0-40000 euro
    d) NO

22.7.7 Distribution via Internet

1. Ideally in the full end-to-end value chain between content supplier and Internet end user distributor who do you see as better suited for the collection of end users transaction revenue?
   c) internet end user distribution
   f) content aggregated for distribution
   h) ISP

2. How should be end user transaction revenue split from central point of revenue collection across the full value chain
   c) aired percentage to content supplier, then distributes accordings to percentage
   f) like clearing house ….
   h) flexibility, multiple profile

3. Are all players in the value chain expected to participate to the end-user revenue split or are there specific players who should be remunerated by other means?
   c) most players will export-dem,and payments in return for their contributions. This is necessary in UK tv
   f) the clearing house will probably receive a fixed amount for the transaction and the commercial company as well
   h) depends on the value add plus lost of the play /supply

4. Do you see any specific reason for keeping real time recording of end user content transactions in the end-to-end value chain between content supplier and final B2C distributor?
   c) usage number should be reliable + known. With transparency there will be non confidence from content creators (for instance, movie businss model with distributor as warner)
   f) yes, if they need to change the frequency of the offering of price
   h) logging for financial / regulation / CDM purposes

5. What system of payment do you see as mostly suited for fulfilling B2B transactions across the value chain?
   C) initially secure payments, once business partners know plus transaction each other other normal invoicing can be used
   f) invoicing based on info of clearing house or accounting reports
   h) micropayment modes ?

6. Could you list the key market drivers for the development of a viable business in the distribution of digital content over the Internet?
   c) dynamic content relation to or derived from will known entertainment branos, reliability of service plus billing good quality device with quality screens
   f) sex, sports, information
   h) trust, security, Dreadth of content plus suitability of viewing device

7. Which are the key typologies of content which should be part of a broad digital content offer over the Internet? What volumes of content per typology would be required? What update rates?
   c) music sames, sambling, stories derived from key entertainment branos, news plus sports, serial adult
   f) video, audio, graphics
   h) do you mean topology ?, if so cross media

8. Which are the primary content formats which you use or see as set to vest a major role in the near future? Could you also list their key advantages and limitations?
   c) cartoon (band dosing) type stories, games, 3D content, automatically generated video sequence, radiovision. CARTOON: simpleway telling stories of all kids, from from satire….. GAMES: full immersive, show play, RADIOVISION: simple successions, piching by audio….
   f) Video, poor data, interactive games, info to pda…
   h) PDF, Mpeg4, MPEG21, MPEG7, cross media, layered media (eg. Tv overlays with other channels), 3Dmedia, flash…

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- WIPO directive: http://www.wipo.int/

24 Terminology

see Part J of deliverable on AXMEDIS Framework Specification and its Part J.