AUTOMATED MULTI-CHANNEL CROSS-MEDIA PRODUCTION AND DISTRIBUTION

URL: http://www.axmedis.org

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Abstract:

This paper presents an EC IST FP6 supported project called AXMEDIS which aims to design and develop a framework for automated cross-media content production and multi-channel distribution. With a brief introduction on the current challenges of the market, we discuss the AXMEDIS technical objects and how the current market demand can be met by automating, accelerating and restructuring production and distribution processes. Besides discussing the general architecture and framework of AXMEDIS, this paper describes the AXMEDIS demonstrators to be organised by the leading distributor partners to achieve and realise a real-life distribution chain. Latest information, results and events of the AXMEDIS project are available online at http://www.axmedis.org

INTRODUCTION

AXMEDIS (Automating Production of Cross Media Content for Multi-channel Distribution) is an EC IST FP6 supported research and development project. It is an Integrated Project with a project consortium of 20 partners. The consortium is working together to design and develop the AXMEDIS framework which bring together innovative methods and tools to speed up and optimise content production and distribution, for leisure, entertainment and digital content valorisation and exploitation.

Digital-content market is urging better pricing and value-for-money for industry products and services. This is clearly evident in the recent price reductions by major

companies in the sector. The containment of sale prices is a vital key when setting up a viable and sustainable business venture in the digital cross media content. Possible solutions to this challenge could be found by automating, accelerating and restructuring production processes, and providing solution to the content protection. Such solutions will enable the production processes to be faster and cheaper, while at the same time providing new capabilities to support safer distribution.

The AXMEDIS project [1, 2] aims to meet the challenges of market demand by:

- reducing costs for content production and management by applying ~~Artificial Intelligence~~ innovative technologies~~iques~~ for content composition, representation (format) and workflow;
- reducing distribution and aggregation costs in order to increase accessibility with a Peer-to-Peer (P2P) platform at Business-to-Business (B2B) level, which can integrate content management systems and workflows;
- providing new methods and tools for innovative and flexible Digital Rights Management (DRM), including the exploitation of MPEG-21 [3] and overcoming its limitations, and supporting different business and transactions models.

The AXMEDIS format can include any other digital formats [4, 5], and it can exploit and enhance other formats such as MPEG-4, MPEG-7, MPEG-21, as well as other *de facto* standards.

AXMEDIS CONSORTIUM

The AXMEDIS Consortium consists of leading European digital content producers, integrators, aggregators, and distributors; as well as information technology companies and research groups. The partners of the AXMEDIS Consortium includes: Distributed Systems and Internet Technology Lab, Department of Systems and Informatics, University of Florence (Italy); Accademia Nazionale di Santa Cecilia Fondazione (Italy); ACit GmbH (Germany); Associazione dei Fonografici Italiani (Italy); Comverse Ltd (Israel); Consorzio Pisa Ricerche (Italy); Dipartimento di Italianistica, University of Florence (Italy); Ecole Polytechnique Federale de Lausanne (Switzerland); Eutelsat S.A. (France); Exitech S.r.L. (Italy); Fraunhofer Gesellschaft zur Foerderung der Angewandten Forschung E.V. (Germany); Fundació Universitat Pompeu Fabra (Spain); Giunti Interactive Labs S.r.L. (Italy); Hewlett Packard Italiana S.r.L. (Italy); On Demand Distribution Ltd (UK); Sejer Representing Bordas and Nathan (France); CRS4 – Centre for Advanced Studies, Research and Development in Sardinia (Italy); Tiscali S.p.A. (Italy); ICSRiM – University of Leeds (UK); University of Reading (UK); and Xim Ltd (UK).

AXMEDIS Objectives

AXMEDIS architecture and tools aim to meet the challenges of market demand by:

(i) reducing costs increasing efficiency for content production, protection, management and distribution;
(ii) supporting the whole value chain: digitisation, production, composition, integration, aggregation, synchronization, formatting, adaptation, indexing, integration in the same objects protected and non protected components, definition of relationships with other resources, metadata integration, protection, license production and verification, distribution along different channels such as: satellite data broadcast, Internet, cellular network, wireless, traditional supports as DVDs, DCs, etc.;
(iii) enforcing protection model in the whole value chain;
(iv) supporting different business and transaction models;
(v) Supporting the packaging of any other formats;
(vi) developing and providing new methods and tools for innovative and flexible Digital Rights Management (DRM), including the exploitation of MPEG-21 and overcoming its limitations;
(vii) Supporting different distribution channels (such as the Internet, mobiles, PDA, PC, i-TV, satellite, etc.) including P2P in both B2B and B2C levels;
(viii) integrating Content Management Systems, CMSs, with the distribution system by automating the communication of content and information between the two systems;
(ix) increasing accessibility with a Peer-to-Peer (P2P) platform at Business-to-Business (B2B) level, which can integrate content management systems and workflows;
(x) managing the workflow for the production and distribution of digital contents at level of the content factory and among different content factories sharing the same content production objectives;
(xi) automating the whole process to allow content production on demand.

The AXMEDIS digital content and content components (in the following, AXMEDIS content in general) have a specific format capable of integration inside any kind of cross media format (video, images, animations, document, audio, etc.), adding metadata, identification, classification, categorisation, indexing, descriptors, annotation, relationships and play activities and protection aspects. The AXMEDIS format permits 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 DRM models (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, and others.

General Architecture of AXMEDIS

Figure 1 illustrates the general architecture of AXMEDIS with highlights on both the production and distribution aspects. The *production* of AXMEDIS objects and content components is in connection with the AXMEDIS P2P tool (AXEPTool) for B2B distribution that supports DRM with a certification authority (AXMEDIS Certifier and Supervisor). This can be connected to the Collection Societies as well as to each Content Providers and Distributors providing reporting and statistics. The *distribution* of AXMEDIS objects towards the clients via specific distributors realise the last level of the distribution chain. This final level can also support a B2B transaction if the distribution is targeted at institutions. At this level, sharing via P2P mechanisms is also allowed and stimulated, without invalidate the protection model of AXMEDIS. All distributors connected to the AXEPTool may access to a large collection of AXMEDIS objects coming from providers, integrators, publishers, etc. connected to the AXEPTool.

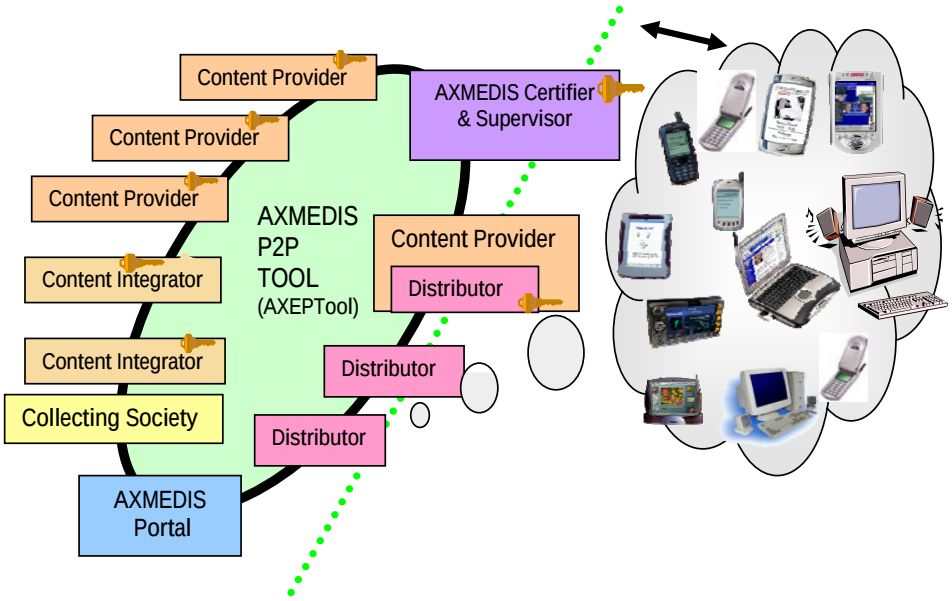

Figure1: Architecture of the AXMEDIS (mainly on B2B)

The distribution channel may present 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 robust content format for multipurpose applications. Alternative solutions support the multi-channel 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 many models and solutions, the protection and 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 generally unacceptable in most cases.

In AXMEDIS, the channel distributors can continue to use the same mechanisms for reaching the final users. In AXMEDIS, the content is distributed at B2B level by using the P2P tool, namely AXEPTool. Each AXMEDIS object may contain a single or a collection of digital resources to be delivered or shared, such as MPEG-4, MPEG formats, PDF, HTML, SVG, images, documents, videos, audio file, etc., (any standard format for continuation, without the use of proprietary technologies). This content can be adapted by using AXMEDIS compliant tools to reach some specific editorial formats and to satisfy the needs of the final user device and channel.

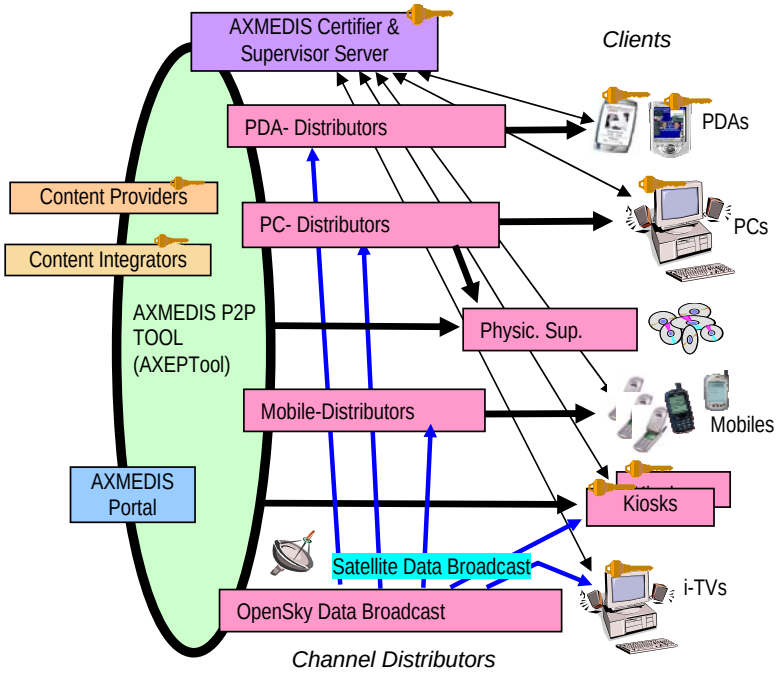

Figure 2: AXMEDIS Architecture (mainly B2C)

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. The AXMEDIS consortium planned to build demonstrators for difference distributions channel, with satellite-data-broadcast for B2B and B2C and i-TV, Internet to reach Personal Computers, cellular network to reach mobiles, and local distribution Kiosks to reach PDAs and mobiles. The model includes P2P in both B2B and B2C levels. ~~Channel Distributors are involved 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 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.~~

~~The Satellite Data Broadcast 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. This platform is suitable for distributing AXMEDIS content and components, an excellent opportunity for content providers for new business and for accelerating the distribution decreasing their costs.~~

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AXMEDIS Framework

In Figure 3, the structure of the AXMEDIS Framework [7] is reported. It contains all the necessary tools to manage the content workflow from the content production to the distribution over different channels.

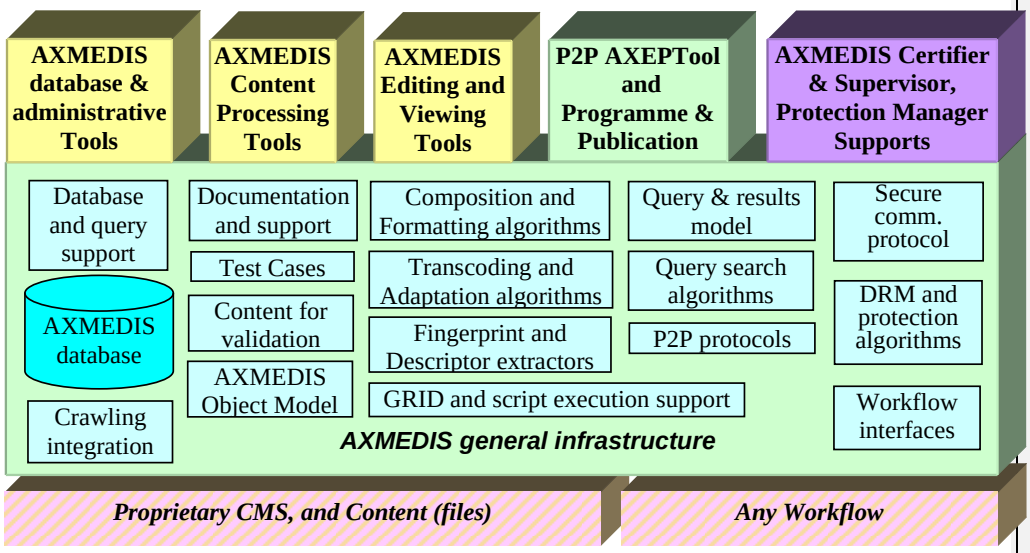

Figure 3: AXMEDIS Framework

The general infrastructure gives a common ground on the base of which other AXMEDIS compliant applications can be built. The most relevant parts of the AXMEDIS Framework include:

- **AXMEDIS Object Model, AXOM,** is a common model for content representation which allows that the information about the content can be exchanged between the different tools for the manipulation/fruition, AXMEDIS is a flexible specialization of MPEG-21 format;
- **Database model and tools** are used to access the AXMEDIS database and to make queries to the search algorithms. The access is performed by beans of web-service;
- **Additional information:** test cases, uses cases, requirements [8], content for validations, general documentation of AXMEDIS tools and supports, CVS tree for sources, guidelines for source code production, guidelines on content production and distribution, tutorials on content protection, tutorial on AXMEDIS tools, etc.;
- **P2P protocols** for creating GRIDs and P2P tools such as the AXMEDIS Content Processing Engine and Scheduler, the AXEPTools, and the AXMEDIA peers;
- **Algorithms** for compositions and formatting, for transcoding and adaptation, for for extraction of fingerprint and descriptors, content processing, license manipulation and verification, license adaptation, etc., for many different formats of digital resources and for any categories of them: audio, video, document,

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multimedia, images, animations, text, metadata, etc. These can be attached to other tools by means of the AXMEDIS Plug-in Manager and Model.

- **Integration with proprietary CMSs** by means of Crawler and Accounting Manager tools to bring back the administrative information;
- **Protection tools:** DRM/Protection solutions, DRM engines, guidelines for licensing and contract definition, protection tools, monitoring tools, secure communication protocol;
- **AXMEDIS Players** to the production of customised players on the basis of specific needs and the above support tools;
- **AXMEDIS Content Processing tools:** engine for executing Spider Monkey script accessing to all the above mentioned supports and data-types;

AXMEDIS Activities

AXMEDIS is to organise and realise a set of demonstrators to function as real components in activities such as production, protection and distribution organised by the leading distributor partners. This is to achieve and realise a real-life distribution chain validated by the activities of end-users. The demonstrators are to focus upon tools for:

- content production, protection and B2B sharing, production and distribution;
- content production and distribution to end-users via different channels including interactive TV (i-TV), personal computer (PC), kiosk, mobile, PDA and others.

AXMEDIS will offer assistance and technical support to companies interested in using the platform and adopting the AXMEDIS solutions. This support action will be provided through activities such as training, management, assessment and evaluation, dissemination and demonstration at conference and fairs. Furthermore, the AXMEDIS consortium will grant the sum of 1 million Euro to companies and research institutes interested in developing real solutions by exploiting AXMEDIS technologies (this is referred to as take up actions).

It is easy and beneficial for all to gain access to the AXMEDIS technologies. Some didactic events will be organised to provide better understanding of the AXMEDIS technologies with further information about the potentialities of AXMEDIS. Business delegates could attend these events so as to take part in the project and bring AXMEDIS technologies to their company. Special training sessions and courses will be held for managers, content managers, content producers and integrators, and digital content distributors. Workshops and courses will be organised in several venues in Europe. To provide better understanding of the new solutions, AXMEDIS is providing a forum for discussion, with technologists and experts who are ready to assist with any AXMEDIS related problems and concerns.

Conclusions

This paper discussed the AXMEDIS framework designed to address a verity of current challenges of the digital domain, particularly in the cross-media market. The AXMEDIS framework is capable of supporting data collection and translation from accessible Content Management Systems (CMS), and automatically transforms legacy digital content into AXMEDIS objects. The framework consists of a wide range of processing modules for the production of the cross-media contents with the functionalities to preserve the security level along the whole value chain. We believe that the framework offers an effective environment for content production, protection and distribution at both B2B and B2C levels.

The AXMEDIS technologies and tools will be accessible for the adoption by companies and SMEs. The AXMEDIS platform will be available soon for industrial groups and research institutions. AXMEDIS technologies will be easily accessible offering a higher level of integrative capability with other industrial and standard allowing their exploitation in different production and distribution chains.

The AXMEDIS solution is mainly based on MPEG-21 model. It aims to stimulate the applications and exploitations of the new features by creating many AXMEDIS compliant tools and solutions and to allow these core aspects and solutions accessible in the form of an integrated AXMEDIS Framework. Latest developments and information about the AXMEDIS project, including upcoming events and activities, can be found online at the project website at http://www.axmedis.org

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