Content Processing Media Grid, AXCP

ITALIA DEGLI INNOVATORI
Agenzia per la Diffusione delle Tecnologie per l'Innovazione
Presidenza del Consiglio dei Ministri

Technical Note
October 2013

Automate your business processes

Intelligent information management at low cost

Scalable and intelligent information processing.

Cloud computing, industrial scalable massive parallel processing platform.

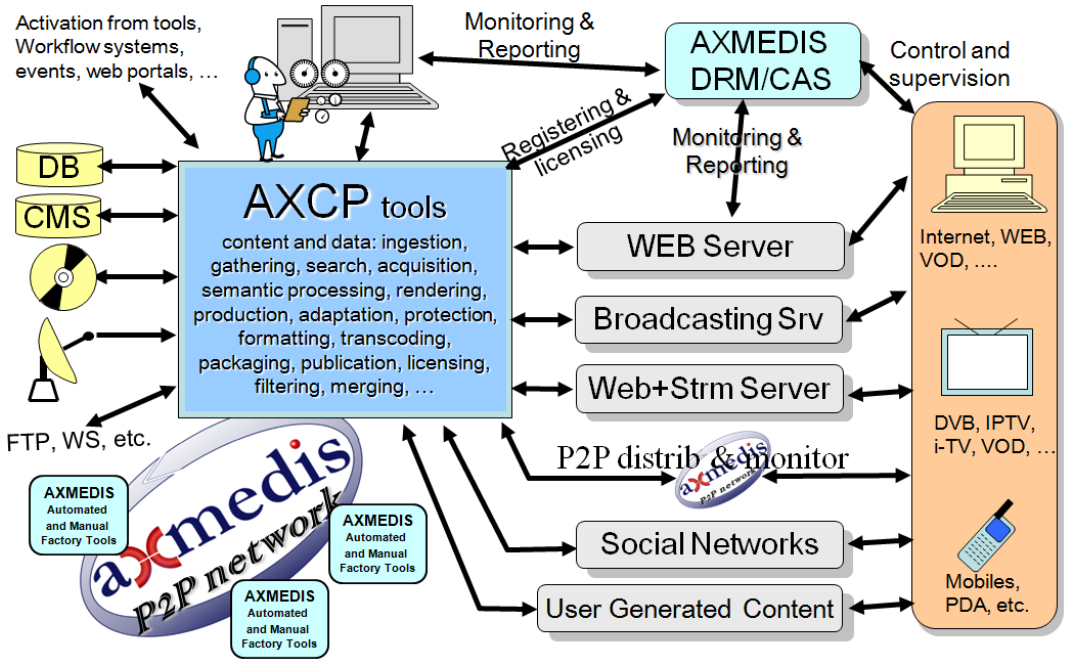
On-demand computing and processing.

Applications:
- data processing
- semantic computing
- knowledge management and reasoning
- media grid
- big data processing
- crawling process.
- data reconciliation and disambiguation
- distributed processing
- automated content management, adaptation
- parallel content repurposing
- parallel simulation
- computational intensive applications
- channel production and distribution: broadcasting, IP/Internet, WEB sites, P2P, mobile, tablet, IPTV, interactive TV and channels, VOD, etc.
- monitoring and control of: web, P2P, OAI-PMH, social networks, LOD
- similarity profile computing, management
- recommendations and advertising
- digital rights management and licensing

The AXCP Content Processing Media Grid is an open solution to set up architectures of media computing, for massive information management following business rules, growth and integration demands, big data management. It is a solution to set up scalable grid computing, at low costs, reliable and simple to install; to be used in conjunction with other applications, enforcing scalability, intelligence processing capabilities, batch processing, cloud computing, etc. (read IEEE Multimedia in April 2012. AXCP

- supports a large range of possible applications for massive and parallel processing integrated with databases, back office workflows, data crawling, collectors, Content and Data Management Systems, CMS/DMS, and web servers.
- reduces costs and increase efficiency by an automated information, media and content management.

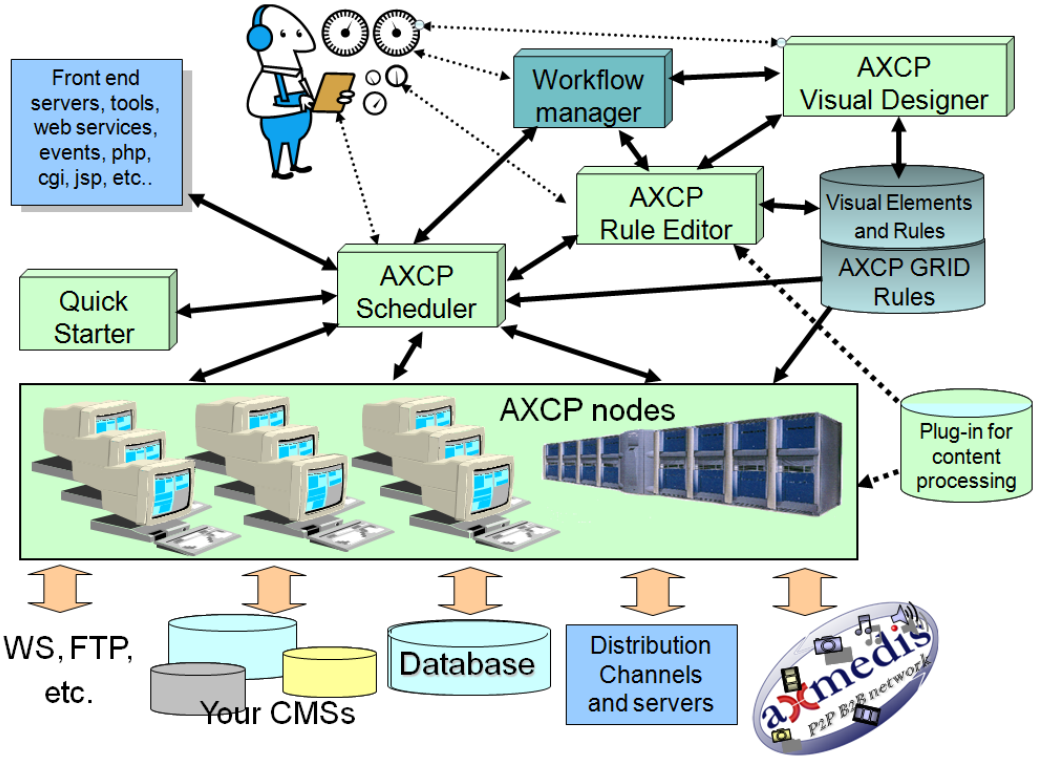
http://www.computer.org/cms/Computer.org/ComputingNow/homepage/2012/0812/W_MU_MicroGrids.pdf).



AXCP allows setting up scalable architectures to automate and organize:
- computational intensive parallel processing;
- intelligent information management with semantic processing;
- services for content production and/or distribution on demands;
- events collection, data management, sensors, internet of things, RFIDs, ..;
- social network back office management, content processing, user and content profile processing, recommendations;
- user generated content processing, adaptation and formatting;
- connection with dbpedia, geonames, Europeana, ECLAP, Vimeo, etc.
- monitoring events and status of: WEB/internet sites, P2P networks, databases, ftp sites, …;
- content management for production and distribution channels: VOD, IPTV, WEBTV, DVB-T, web, P2P, FTP, HTTP, OAI-PMH, WebServices, etc.;
- interoperable trust and security rule processing, CAS and/or DRM (digital rights management) MPEG-21 and OMA;
- processing business models, single and multiple distribution channels: pay per play, subscription, counting, renting, billing, etc., for B2B and B2C;
- content management system: DMS, CMS, and/or archives;
- data fingerprint and watermark extraction and insertion;
- Import and export data with Europeana;
- Connections with Social Networks: linkedin., facebook, etc.

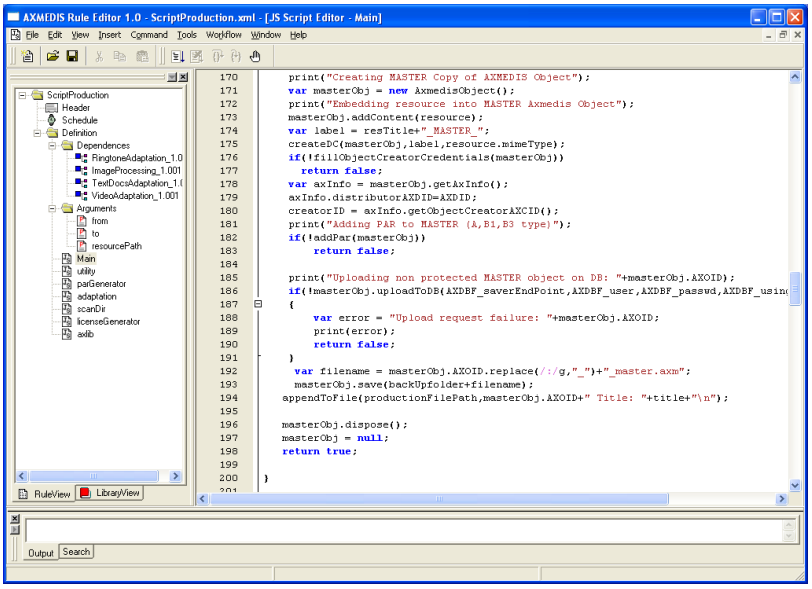
AXCP Architecture

The following figure reports an AXCP Scheduler that put in execution processes on AXCP Nodes which can be industrial or desktop computers connected with the AXCP Scheduler via one or more networks.



The AXCP solution is grounded on the concept of Rule. AXCP Rules formalize activities of processing on grid nodes and may activate other Rules on other nodes in the cloud computing architecture on physical machines. AXCP Rules are written in Extended JavaScript language to formalize jobs, logic, deadlines, periodicity, parameters, communication, storage, time, capabilities, etc. The AXCP is endowed of an integrated development environment and debug. Moreover, any executable program in the Operating System can be put in execution by an AXCP Node and thus controlled by the AXCP Scheduler. A summary of the functionalities accessible by the AXCP Rules are reported at the end of this document, they can be recovered in the manual and in the help provided with the AXCP IDE tools. The AXCP Scheduler can be controlled by other tool via API, Web Services.

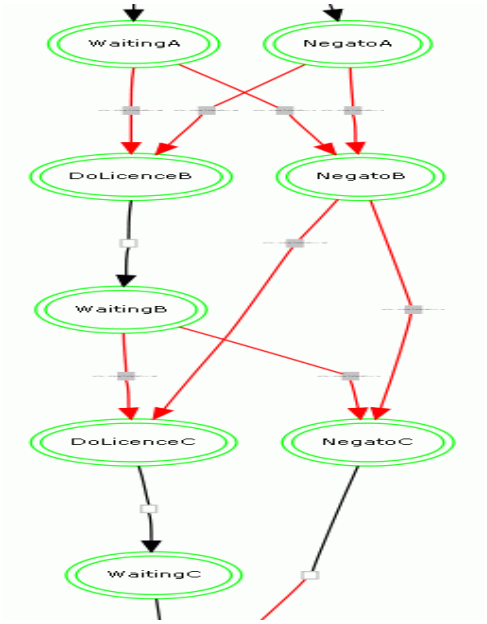
The **AXCP Rules** can be produced by the AXCP Rule Editor (java script editing and debug, see on the figure on the right side) or by the AXCP Visual Designer (visual design, editing and verification). Once produced, a AXCP Rule can be put in the pool of Rules of the AXCP Scheduler (data base of AXCP GRID Rules) for their execution on the AXCP Nodes. AXCP Rules can be activated (put in execution) in several manners. The Rules uses may integrate any combination of functionalities included into the Extended Java Script language and provided by the Plug ins (see in the following). They include access to databases, information and data processing, communication, storage, security, semantic processing, security, etc.



AXCP Rule Editor is used to produce, debug, test, activate and validate AXCP Rules to execute them on AXCP Nodes via AXCP Scheduler. The Rule Editor assists the developers with debug, monitoring and intelligence (word completion, suggestion, user and java script function list, etc.). The AXCP Rule editor can access to the database or Rules of a Scheduler and change them without stopping the AXCP Scheduler and thus the computing. Thus the AXCP tools support the hot plug replacements of AXCP Rules.

The AXCP can be customized by:

- creating/customizing AXCP Rules to be executed on AXCP Nodes;
- creating hierarchies/meshes/networks of cloud computing in which a Scheduler control a number of nodes/peers, and those nodes may activate other Schedulers as well via web services and direct communications;
- setting up fail over and fault tolerant solutions, creating chains of Schedulers/Nodes in fail over, redundant nodes, etc.
- customizing, realizing and installing additional plug-ins to add new formats, encoders, decoders, adapters and converters, etc. The AXCP Plug-in technology is well documented and supported by a development tool kit, and open sources;
- organizing AXCP Nodes in a hierarchical/net manner. An AXCP Node may control one or more AXCP Schedulers which in turn may control other AXCP Nodes, etc.;
- dynamically creating rules with other processes, and activating them on the Scheduler;
- executing operating system processes, passing them parameters/files and getting eventual errors;
- reporting and managing errors, setting ups recovery by error policies, rules.

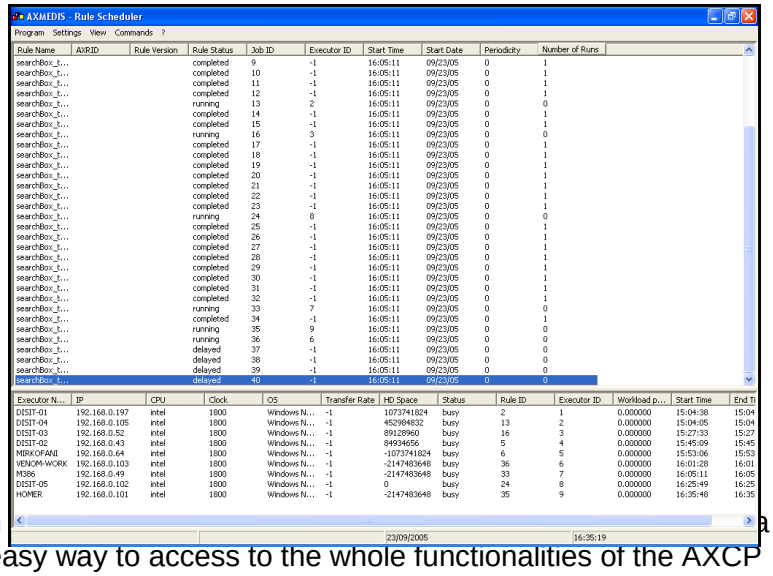


The AXCP solution is based on a Service Oriented Architecture (SOA); fully documented APIs for all the functionalities, and WEB Services for accessing and controlling tools, and for distributing produced content towards your front-end distribution servers. This means that a range of tools from acquisition, metadata ingestion, data base and distribution servers and solutions may very easily integrated with the AXCP tools.

AXCP GRID solution main elements:

- **Rules can be:**
  - executed on any AXCP Node, single computer, virtual machine;
  - parameterized for automating management activities;
  - activated according to different policies: periodic, sporadic or on demand;
  - activated in synchronous and asynchronous manner and by other AXCP Rules;
  - activated to return back any kind of results and error codes;
  - activated by other AXCP Rules, third parties external tools, web services, …;
  - dynamically produced, sent to the AXCP Scheduler and thus activated;
  - set up to detect changes in the file system, local database, in the P2P, etc.;
  - activated by Workflow Management Systems (Open Flow and BizTalk), PHP, JSP, JAVA, Web Service clients, etc.;
  - used to schedule other AXCP Rules and AXCP Schedulers;
- **Nodes** are controlled by the AXCP Scheduler, and can be
  - industrial computers or desktop computers in your offices delegating at the AXCP a part of their CPU power detailing the CPU percentage left to AXCP for each single hour of the week, 24/7;
  - executed alone (with the AXCP standalone node) for executing sporadic AXCP Rules for ad-hoc processing and activation without demanding their allocation to the AXCP Scheduler;
- **Standalone Node** allows putting in execution a single AXCP Rule from your applications and servers via a simple shell command, it is an AXCP Rule which can be used without the AXCP Scheduler. It is an easy way to access to the whole functionalities of the AXCP language for executing an asynchronous processes without calling the Web Service AXCP Scheduler.

- **Scheduler allocates and manages AXCP Rules on GRID Nodes:**
  - scheduling and balancing jobs/processes on AXCP Nodes according to the Rule processing needs in terms of plug-ins, time and resources: balancing nodes workloads, Deadline Monotonic, starting time, optimization;
  - activating jobs as sporadic and periodic tasks, controlled by other tools and/or web services;
  - monitoring progress of production processes and their status, via logs and in real time, etc.;
- **Quick Start** permits to activate AXCP Rules in a very simple manner by passing them parameters; for examples a collection of objects, a path, a database, a query, a list of files, etc., or just a click;
- **Standalone Node** allows putting in execution a simple shell command. This solution is an easy way to access to the whole functionalities of the AXCP for executing an asynchronous process without calling the Web Service AXCP Scheduler.



AXCP for Cross Media, Rich Media and Multimedia Content Processing

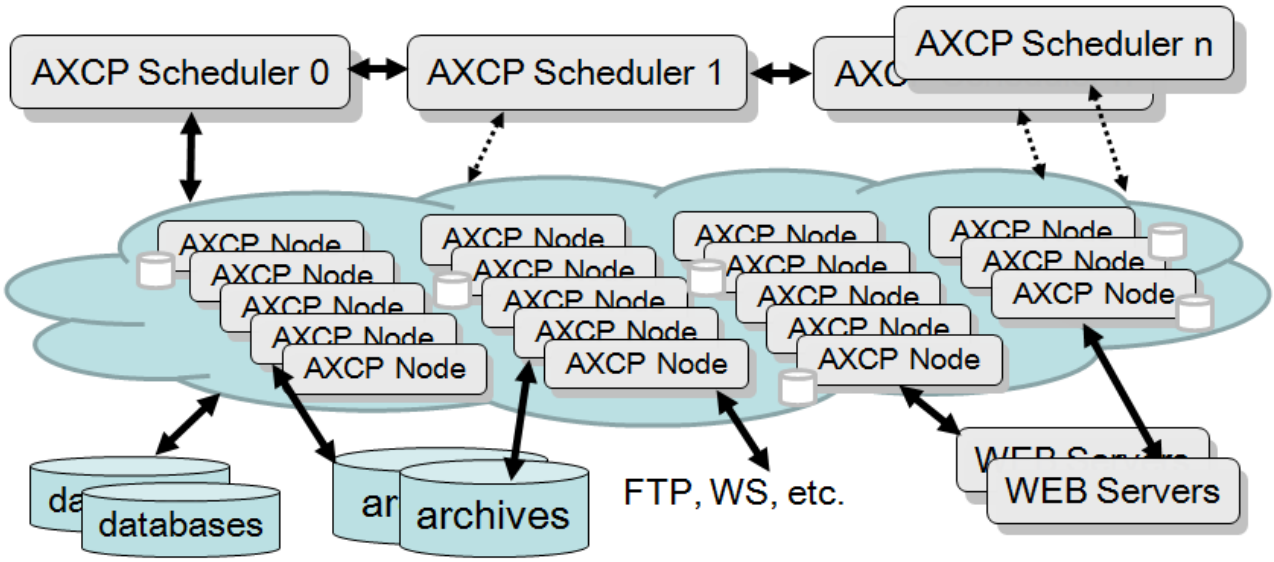
The AXCP is suitable for automating intelligent and integrated management of content taking into account formats, devices, business models, services, etc. AXCP can be used for the automated management, of data and content processing, pre-/post-production and for distribution of a large range of content formats, for automatically producing, crawling, metadata ingestion and processing, processing, packaging, adapting, transcoding, formatting, and/or repurposing content, files, user registrations, profiles, licensing, etc., of content and data of any kind. AXCP reduces the costs of content management, supports the whole value chain and makes real the convergence of media, and the interoperability of content enabling multi-channel distribution (e.g., mobile, web, satellite, kiosk, iTV, P2P, interactivity, etc), and provides a flexible and interoperable DRM, for both B2B and B2C across traditional and P2P distribution platforms.

The AXCP offers functionalities to support and set up integrated activities of:

- content Ingestion and gathering, database management (traditional and RDF), crawling, indexing, archiving, gathering from OAI, etc.;
- query, download and publication on social networks: FaceBook, YouTube, Flickr, XMF, Cineca;
- content storage and retrieval, active querying: SQL and SPARQL;
- connection with Europeana and any OAI-PMH server;
- content processing, repurposing, adaptation, transmoding, transcoding for text, docs, images, audio, video, multimedia, XML, SMIL, HTML, styles, MXF, newsML, MPEG-4, MPEG-21, 3D, ebook, etc.;
- metadata repurposing, adaptation, transcoding, integration, enrichment, validation;
- content descriptors, extraction and comparison, fingerprint, MPEG-7, MPEG-21, etc.;
- content composition, formatting, layout, styling;
- communication with databases, FTP, HTTP, P2P and distribution servers via several protocols;
- content packaging: MPEG-21, MXF, OMA, newsML, ZIP, GameMaker, etc.;
- content protection via several algorithms;
- content DRM with MPEG-21 and OMA, with tracking and reporting rights exploitation;
- content licensing, licensing the production of licenses;
- content publication and distribution toward multiple channels;
- workflow management integration with BizTalk and OpenFlow;
- massive execution of parallel processes exploiting Rapid Miner, ImageMagik, FFmpeg, keyword cloud generation, DRM, etc.;
- user management: registration, licensing, profiling, advertising.

AXCP Solution Reliability and Redundancy

The AXCP solution is scalable in terms of number of AXCP Nodes and AXCP Schedulers. The AXCP solution is highly reliable, scalable and fault tolerant. It may be used to create redundant architectures in which multiple Schedulers and multiple Nodes are organized in clusters and fail over in chains. In this case, an AXCP Scheduler will take the role of master, and the others will be in the chain but ready to cover that role in the case of failure or for rotation policies. AXCP cloud/grid solutions may be used to set up highly reliable architectures in which each computer (scheduler or node) can be put off-line for maintenance without stopping the processes and at no risk for the running jobs.
AXCP can run multiple copies of the same rules on different AXCP Nodes making possible the setup of fault tolerant solutions. Moreover, AXCP Nodes automatically reconnect with the AXCP Scheduler after a lack of connection. The status conditions in terms of tasks to be processed and running activities of the AXCP scheduler is continuously saved on net HD, and allows disaster recovery. This information can be shared among the several AXCP Schedulers in the same chain to set up automated recovering. In the case of changing Scheduler (one abandoned or it has been rebooted for failure), the next one takes the control immediately. Thus, the AXCP Nodes are automatically reconnected to the new one. The replaced Scheduler can be reboot and posed in the chain. The correct implementation of the highly reliable solution implies the usage of multiple network cards, and reliable industrial computers. The solutions can be setup on different kind of operating systems such as Windows Servers, Windows 7, Vista and XP, home and professional, 32 and 64 bits versions. Virtual machines and appliance are provided as well.



AXCP solution may be set up on a single computer with all inside as well as on many industrial or desktop computers (that may put at disposal a part of their CPU power and file system). Each node may share file systems and access independently on the network and thus on databases. Thus, solutions with large numbers of distributed databases are possible; to realize data and/or computational GRID solutions with shared or partitioned databases and data sources.
The AXCP can be used to set up hierarchical solutions, in which multiple AXCP Schedulers with their nodes are activated by other nodes and Rules. This allows setting up hierarchical networks, meshes, cube and other parallel and distributed configurations for computing on physical and/or on the cloud.

Examples of solutions exploiting AXCP technology and tools

- **ECLAP:** European Collected Library of Performing art, http://www.eclap.eu, for an infrastructure and solution for Social Networking for performing art professionals and lovers, with the automated content ingestion, annotation, enrichment, multilingual additions, contextualization and posting information on Europeana EDM. ***AXCP is adopted in ECLAP*** portal as the back office engine for automating: gathering content, processing metadata, estimating similarities and recommendations, multilingual semantic indexing, crawling OAI-PMH, export to Europeana, multichannel content adaptation and repurposing,

watch dog of the cloud services, producing recommendations, semantic computing, production of similarities among users, estimation of audiovisual descriptors, etc.

- **APRE Toscana:** *http://www.apretoscana.org* a best practice network, collaborative work portal and blog for stimulating access at the European Commission funding and accessing to related information and events. ***AXCP is adopted*** as the back office engine for automating: gathering content, processing metadata, estimating similarities, multilingual semantic indexing, multichannel content adaptation and repurposing, producing recommendations, semantic computing, recommendations, production of newsletters.
- **Mobile Medicine:** *http://mobmed.axmedis.org* multichannel social network for medical personnel, portal to support mobile content production and distribution, medical procedures, production of mini-applications for dosage estimation and decision taking support, applications in the areas of: emergency, educational, critical conditions, etc. ***AXCP is adopted*** for automated production of intelligent content for pc and mobile, iPhone (see Mobile Medicine on Apple Store), iPad, semantic computing, estimation of recommendations, symbolic similarity, multilingual indexing and fuzzy search;
- **OAI-PMH Monitoring & Crawling facility** at DISIT: ***AXCP is adopted*** for automated ingestion of worldwide Open Access archives via OAI PMH, assessment of quality of metadata, archives and services, semantic reasoning, automated metadata reconciliation and mapping, automated repurposing and distribution;
- **Monitoring P2P Bittorrent** networks. ***AXCP is adopted*** for accessing at sanitized information regarding P2P workload and activities, assessment of quality of metadata, archives and services, semantic reasoning, automated reconciliation, production of reports.

ITALIA DEGLI INNOVATORI
Agenzia per la Diffusione delle Tecnologie per l'Innovazione
Presidenza del Consiglio dei Ministri

AXCP is an innovative solution and technology selected in the 2011 by the Italian National Agency for the Diffusion of Innovative Technologies, at the Premiership of the Italian Ministry Council. They are defined as “Innovations selected by the Italian Innovators”, namely "***Innovazioni selezionate dall’Italia degli Innovatori***" in Italian language. Get last version of the tools:
AXCP TOOL free DEMO version 4.0:
http://www.axmedis.org/documenti/view_documenti.php?doc_id=4398
The industrial version can be recovered from Effective Knowledge http://www.effective-knowledge.com/

AXCP: see the linked page at the Ministry portal, or see the link at DISIT DSI University of Florence; This innovation has been initially developed within the AXMEDIS Project, while it has been strongly improved during last years, thus adding innovative functionalities and robustness. In general terms, the innovative solution consists in a language for programming multimedia grid for semantic computing and processing. The solution has been identified as one the most innovative solution for media processing, by other Research and Innovation agencies and it is also described in IEEE Multimedia, IEEE Computer Soc Press, April 2012, and in other papers.

The AXCP innovative tool can be used for a very large range of media computing applications ranging from DRM to P2P monitoring, from adaption to distribution and Content Delivery Network, semantic computing, etc. In ECLAP, the AXCP is used for automating:

- adaptation of content during ingestion, so as to produce the content for PC and mobiles and manage cross media content;
- calculation of semantic distances among users and objects and among objects and objects, with clustering technologies;
- social network management.

AXCP Rules Functionalities

In the AXCP JavaScript language, the following functionalities area accessible as native operators and/or plug ins. The addition of new functionalities is possible by adding new plug ins, or by creating Javascript functionalities. Most of the following capabilities are available on the light version of the AXCP tools.
The following features are ONLY examples of the full set of functionalities of the AXCP.

Firing and control activities

- Activation via AXCP scheduler web service
- Activation via AXCP Quick Start tool
- Activation via Workflow tools
- Activation via your Applications, Java, C++, PHP, JSP, CGI, etc.
- Activation via detection of files changing, changing in databases, etc.
- Cross activation of a rule via another rule, usage of multiple schedulers and nodes
- Time periodic and/or sporadic activations
- Dynamic production, allocation and activation or rules
- Dynamic update of the grid node executable and libraries.
- Integration with Nutch, Hadoop, NoSQLdb,

Content and metadata access, ingestion and gathering from

- CMSs and databases:
  - RDF/RDFS/OWL databases: SESAME, OWLIM
  - ODBC, MySQL, non-SQL database
  - XML databases, Tamino, eXact
  - Lobster®, MSSQL, HP DMP, ..
- OAI PMH, Open Archive based accesses;
- Main communication protocols:
  - SQL, Web Services, FTP, HTTP,
  - SFTP, HTTPS
  - WebDAV, SMB, Gopher, NNTP
- Linked Open Data
- Linked Open Media
- operating systems files:
  - MS Windows, Windows Servers, etc.
- Rich media formats:
  - MXF, NewsML, IMS SCORM, MPEG-21, HTML, SMIL, etc.
- A range of Crawling and data mining tools

Content and metadata management and retrieval

- Content production for iPhone, iPad, Android, Windows Phone (audio video, images, epub, etc.)
- Content production for Content Organizer player for smart phone and tablets (iPhone, iPad, Android, Windows Phone): http://www.eclap.eu/94220
- from multi-archive content crawling, extraction and aggregation with metadata
- from any databases via HTTP and/or ODBC, etc.
- from AXMEDIS database (MPEG-21 database) or from others
- actualizing the queries into the scripts, definition of active/dynamic queries
- from P2P AXMEDIS network
- indexing of metadata and full text with Lucene and/or Solar
- integration with HP DMP, Digital Media Platform
- Integration with other solutions for content distribution see http://WWW.AXMEDIS.ORG

Metadata models and processing

- metadata models and extensions:
  - Dublin Core full set
  - complex metadata such as: EAD, DC
  - ECLAP metadata
  - multiple Unique IDs and descriptors: UUID, ISBN, ISRC, ISAN, ISMN, etc., your IDs
  - business metadata such as: AXInfo
  - Potentially Available Rights, PAR, Licensing information in MPEG-21 REL
  - any custom metadata
  - Workflow information
  - Protection information
  - Content descriptors as Metadata
  - MPEG-7 descriptors
  - Content fingerprint for recognition and monitoring distribution channels
  - Europeana metadata
- metadata manipulation and processing:
  - mapping conversion via XSLT
  - processing via XSLT

Content Processing for audio videos, document, images, and any files:

- digital resources adaptation and transcoding
- extraction of descriptors and/or fingerprints
- watermarking
- indexing, classification
- summarization
- filtering
- repurposing
- recognition
- search and retrieval
- production of simple and animated thumbnails, icons
- MIME type description and access of files

Semantic Processing, intelligence reasoning

- Data Clustering
- Integration with semantic database: SESAME and OWLIM inference engine
- Integration with CoSKOSAM of OSIM, for Ontology production and NLP, http://openmind.axmedis.org
- Production of recommendations: user and content
- Processing of ontologies
- Distances of profiles: users and media
- Processing of Taxonomies
- TILCO temporal logic engine

Text/Document processing, adaptation and transcoding:

- Natural Language Processing:
  - Integration with ANNIE, GATE, JAPE
  - Crawler, tokenizer, Tagger, PosTagger, etc. in Italian and English
- text processing with regular expressions and other techniques
- text language detection
- text language translation with external tools
- text transcoding by format:
  - PDF-TXT, HTML, PS, RTF,
  - MS-Word, Plain text, ….
- text keywords Multilanguage:
  - Extraction from comparison (corpus based)
  - Extraction from semantic analysis
- text fingerprint:

  - Extraction, Plagiarism detection
- Full text indexing with Lucene and/or Solr.
- Keywords and keyphrases extractors in Italian, English, German, France, etc.

Audio Processing, adaptation and transcoding:
- Audio transcoding and processing of:
  - WAV, WMA, MPEG, VORBIS, AC3, DV,
  - MACE, ADPCM, AAC, real audio, AIFF,
  - PARIS, NIST, SVX, IRCAM, W64, SD2, MP3,
  - etc.
- Audio descriptors extraction and recognition:
  - Low level descriptors extractor: waveform, spectrum, centroid, MFE, MFCC, ZCR, Spectral Flatness, onset and offsets, etc.
  - High level descriptors extractor: audio segmentation, music genre, rhythm, silence detection, spoken/music content, noise
  - Polyphonic audio transcoding
- Audio fingerprint estimation and recognition:
  - M2Any fingerprint algorithm and recognition
  - Philips fingerprint algorithms
  - AudioID fingerprint algorithm
  - extractors and comparison of fingerprints
  - detection of plagiarism
- RingTones:
  - Operations of: resample, clip, etc.

Video Processing, adaptation and transcoding:
- Video transcoding and processing of
  - FFMPEG and other libraries
  - MPEG-1, MPEG-2, MPEG-4, VC1, H.261,
  - RealVideo 1.0, RealVideo 2.0, MJPEG,
  - RAW, lossless MJPEG, FLV,
  - H.263, WMV, ASF, ASUS, DV, YUV, ASV1,
  - ASV2, SVQ1, SVQ2, AVI, FLAC, DAUD, AVS,
  - H.264, VP3, FFW, Flash, VCR1, VCR2,
  - CLJR, Apple, DXA, THP, AASC, DVD, 3GPP,
  - etc.
- Video descriptors MPEG-7
  - GoF/GoP, and dominant color
  - Homogeneous Texture
  - Color Structure
  - Contextual descriptors
  - production of simple and animated thumbnails, icons
- Video fingerprint:
  - extractors and comparison of fingerprints
  - detection of plagiarism

Image Processing, adaptation and transcoding:
- Image conversions of more than 150 different formats:
  - JPG, GIF, PNG, BMP, TIF, SVG, PS, PDF, MPEG, PCX, PGH, PICT, PIX, RGB, TGA, TXT,
  - WMF, XPM, YUV, YCbCr, YcbCrA, etc.
- text to image conversion, PDF to image, PS to image
- thumbnails production from img, video,pdf, etc.
- Image processing algorithms:
  - Contrast, edge, blur, media, mirror, equalize,
  - magnify, resize, roll, scale, shade,
  - negate, noise, filtering, rotate, past, spread,
  - extract, overlap, replace, shear,
  - production of thumbnails, icons, ….

Digital File Fingerprint and recognition
- Estimation of fingerprint of digital files:
  - MD5, SHA-1, base64, ascii-bin, etc.
- Recognition of fingerprint by similarity

Content Composition Presentation and Interactive models
- creation of cross media and multimedia content combining raw assets such as text, images, audio, video, animation, metadata, descriptors, licenses, and other
- multimedia objects in formats
  - MPEG-4, HTML, SMIL
  - MPEG-21 (supported by AXMEDIS Editor and players for MPEG-21)
  - NewsML (load), MXF (load and save)

Multimedia and cross media adaptation/processing
- Create MPEG-4
- Create MPEG-4 SMR (Symbolic Music representation)
- Audio visual processing:
  - concatenation, delay, extract
- MPEG-4 remove tracks
- conversions:
  - MPEG-4 to 3gp
  - MPEG-4 to AVI
  - MPEG-4 to ISMA
  - SMIL to HTML

General Information Processing of:
- Load/import, production and saving of XML files for commands and/or metadata
  - based on E4X model
- Load/save any file from/to the operating system, server, FTP etc.
- Production of custom, template and/or behavior-based, HTML pages
- Production of custom, template and/or behavior-based, SMIL scenes
- Processing XSLT with XALAN

Distribution and control of P2P network
- Monitoring of P2P nodes and network status
- Automatic publication of content into the P2P network
- Automatic download of content from the P2P network
- Control the seeding capabilities
- Accessing to reporting and statistics
- Remote control of P2P network
- Removing obsolete content from P2P network

Integration with Social Networks and sources
- YouTube: query, download and upload, processing
- Flickr: query, download and upload, processing
- Facebook, Twitter
- LOD and LOM sources, DBpedia
- XMF social networks (ECLAP, APRETOSCANA, IUF, etc.) tool to make your social network: query, download and upload, processing,
- Posting of news on social networks with social icons, connection with OpenAuth.

Communication Capabilities:
- Massive Content ingestion and processing, User Generated content ingestion, massive content ingestion as in ECLAP social network.
- Access via a large range of databases
- Access via Web Services; dynamic client generator based on WSDL
- Access via FTP/SFTP sites, GET/PUT, etc.

- Access via operating system, activating shells, etc.
- Sending commands HTTP, HTTPS
- Sending Mails, with attachments and/or HTML, SMS
- Creating reports and newsletters in:
  - TXT, CSV, HTML/CSS, XML, XHTML, …

Workflow management Production Process

- integration of the AXCP tools with OpenFlow and BizTalk Workflow Management systems
  - receive commands
  - activate scripts passing parameters
  - returning values and results
- definition of full customized solution for workflow management
- WEB based interfaces for creating GUI to control AXCP GRID processing
- WEB based interface for monitoring AXCP reports and results
- Collaborative Workflow solutions

Content Packages, Media Containers and DRM

- MPEG-21 file read and production, with any digital resource inside, from other MPEG-21 to HTML, SMIL, groups of files and related resources
- MPEG-21 to keep joined your metadata and digital resources as well as to package and delivering them as unique chunks of information with DRM
- OMA files production
- IMS SCORM ingestion
- ZIP ingestion and production
- production of MPEG-2 TS streams
- RSS ingestion and production
- ATOM ingestion and production (in progress)
- MXF ingestion and production
- newsML ingestion and production

WEBtv, IPTV

- ingestion and processing of EPG, XML EPG for DVB-T, DVB-S, ..
- Integration from Sky EPG server

Content Formatting

- structuring and styling content elements by means of SMIL based templates
- applying style-sheets to define the usage interface (format, layout) of the whole collection of content elements and the interested content usage paradigms
- Genetic Algorithms for best time fitting, etc.

Profiling and their management

- Reading and manipulating:
  - user profiles
  - network profiles
  - context profiles
  - device profiles
- Recommendations, favorites, voting, etc. based on static and dynamic profiles and similarities
- Statistical and empirical algorithms
- Reasoning based on Clustering: k-medoids, K-Means and other algorithms
- Reasoning based on profile distances.

Content Adaptation Process

- Based on profiling and rule based
- Digital Item Adaptation based on MPEG-21 DIA
- Decision taking engine for DIA based on the above mentioned profiles.
  - Rule based
  - Ontology and inferential engine based
- Scripting capabilities for expanding DIA and decision taking engine

Content Protection and DRM

- Content registration (unique IDs) and verification
- Content and digital files signature
- Content fingerprints and watermarks
- Protection of digital resources and objects with MPEG-21 IPMP, OMA
- protection/encryption:
  - AES, DES, 3-DES, blowfish, Cipher, CAST
- Tracking exploited rights and reporting actions performed to the content owner, distributors, collecting societies, etc.
- Manipulating MPEG-21 protected objects according to AXCP Node license
- Open to integrate other DRM solutions

Content Licensing and DRM

- generating license from license model and additional information, storing licenses, and posting to license server automatically
- supporting transcoding/translating licenses (MPEG-21 REL, OMA ODLR);
- posting licenses on license server
- verification of licenses
- resolving nationality from IPs

Content Publication and Distribution

- supporting distribution towards multiple channels, for one or more: Internet, satellite, mobile, P2P distributions
- producing, monitoring and editing programmes and schedules
- controlling P2P AXMEDIS network in downloading and publishing reducing the seeding time to zero
- connecting other AXMEDIS Factories of content integrators, producers, and distributors
- posting content on the EUTELSAT Carousel for broadcasting.

Take this document

Contact:

Paolo Nesi
DISIT Lab, University of Florence
Tel: +39-055-4796523
Fax:+39-055-4796469/363
Paolo.nesi@unifi.it
http://www.disit.dinfo.unifi.it