

Presto – PrestoSpace – PrestoPRIME

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The "Presto" projects have, since 2000, launched a strong action towards preservation of audiovisual contents. PrestoSpace, which run from 2004 to 2008, proposed tools and strategies for an integrated approach to the whole audiovisual preservation process. The recently initiated PrestoPRIME, deals with strategies and solutions for keeping digital contents alive on the very long term, as well as initiating a Competence Centre dedicated to Digital preservation.

Presto – PrestoSpace

The context

There is an urgency concerning audiovisual archives; the problems are well known and understood however there is a certain lack of action when it comes to making decisions about preservation of analogue and digital contents. The decisions are difficult for any archive responsible and the solutions available often complex or uncertain; this is why there has been in the past a strong tendency to wait and see how technology evolves and what new solutions it may bring. In the meantime physical decay and technology obsolescence slowly make the contents unavailable or imply an enormous effort in order to save them. This is why we live in the rim of a crucial moment, where large chunks of our audiovisual past are at risk of being lost and where still not enough actions are undertaken in order to keep the contents alive.

At the end of the nineties, some large broadcast archives starting taking important initiatives in order to transfer analogue content to digital carriers, since they had started having problems with carrier degradation. Very quickly the complexity and the high cost of the transfer showed the necessity of launching ambitious preservation plans on the long term if contents wanted to be preserved. Broadcast archives represented a good place where to measure carrier and content degradation; the regular use or archived material for new programs or to fill broadcast spaces, implied a regular access to the archive and permitted to get a feedback on the state of the archive.

The necessity for quick action brought archives together in order to initiate a technological cooperation that would permit to accelerate and optimise the actions needed to attempt an audiovisual preservation of the audiovisual heritage. It was under great risk of loss, and with real problems witnessed day after day. Thus was born the Presto project which run from 2000 to 2002, followed by PrestoSpace, which run from 2004 to 2008 and is now being continued by PrestoPRIME, which started in January 2009 and will run until mid 2012.

A first attempt: the Presto project

While launching preservation plans and fighting for government funding, three large broadcast archives: BBC, Ina and RAI

(institutions which dispose of a research department), started working together in order to tackle the obsolescence of media and the high costs of transfer. They joined together in the EU funded IST FP5 Presto¹ project where they were the leading partners, with the objective of developing cost-effective technology and processes for audiovisual media.

Main partners of the project:

BBC Information and Archives, coordinator of the project, with Richard Wright as project manager

INA - Institut National de l'Audiovisuel, Bry Sur Marne, France

RAI - Radiotelevisione Italiana - Main Archive, Rome, Italy

Research and Technology Innovation Centre, Turin, Italy

Technical partners:

Advanced Computer Systems, Rome, Italy

e-vod, Levallois, Perret, France

Istituto Trentino di Cultura, Trento, Italy

JOANNEUM RESEARCH, Graz, Austria

NTEC Media GmbH, Potsdam, Germany

Snell and Wilcox Limited, Petersfield, UK

VectraCom, Montreuil, France

User Group:

NAA Netherlands Audiovisual Archive (afterwards named B&G)

NRK Norwegian Broadcast Archive

ORF Austrian Broadcast Archive

TRT Turkish Broadcast Archive

SVT Swedish TV Archive

SWR Suedwestrundfunk Broadcast Archive, German Television

YLE Finnish Broadcast Archive

The project produced a very important set of technical and industrial results², which permitted to optimise and accelerate the transfer process for audio, video and film. It also started a survey on broadcast holdings in order to evaluate the volume of European contents, with a first estimation of 5 million hours of material in the three domains for 10 archives, which permitted to extrapolate the amount of 100 million hours in Europe if all audiovisual archives were included. This survey gave a dimension of the amount of investment necessary and the fact that important cost reductions were to be applied in order to achieve that objective.

Furthermore, and probably one of the most important conclusions, an industrial processing approach, where manual object handling would be limited, where software quality control would be applied and where a global management of the process would be installed, could bring substantial economies to the whole process, ranging from 50% to 70% of economies in regards to current costs.

Presto was indeed the first step to evaluate, understand and define solutions for analogue to digital transfer of audiovisual

1. Presto: Preservation Technology for Broadcast Archives

2. For information about the results, visit:
<http://presto.joanneum.at/index.asp>

material while giving the dimension of the effort that would be needed at a European level in order to achieve effective preservation of the holdings.

PrestoSpace: an integrated approach towards audiovisual digitisation

Presto was a very important landmark for the participating archives; it gave them a long-term vision of what was there to be done and useful indications on the methods and processes needed in order to advance. It also gave them important information to plan the future actions and to seek for national funding in order to develop their ambitious preservation plans.

However the wide comprehension of the problems involved in digitisation and access to contents, established another fact: it would be very difficult, if not impossible, for small and medium archives to survive in the digital world unless strong actions were undertaken to assist, organise and provide technology and methodology to develop efficient preservation plans. It was also important to find business models and funding issues that would help small archives in what seemed an impossible quest.

The results of Presto, mainly concerning the industrial approach or "factory" approach and the situation of most archives in the audiovisual domain, were one of the strong incentives to launch a new project, more ambitious which would not only permit to develop this approach but would also take into account all the actions needed to transform an analogue content into a digital archive, restored, documented and publishable. It would promote the Factory approach in order to accelerate, diminish costs and improve the quality of the preservation process. Thus PrestoSpace was initiated, bringing together in an EU funded FP6 Integrated Project; Audiovisual archives, Industrials, Academics and Service Providers, in order to construct a strong network of resources and tools to accelerate audiovisual preservation.

The project worked on all the actions that intervene in the digitising process, in order to find in each domain new solutions or substantial improvements. The project was in consequence structured in 4 work areas, dealing with the main actions within the preservation and digitisation chain:

- **Preservation Work Area:** developing tools to improve media playback, assess the media state and organise the preservation process.
- **Restoration Work Area:** correction algorithms for real-time and disk-based restoration.
- **Storage and Archive Management Work Area:** planning, financial and management tasks for preservation process and storage technology aspects.
- **Metadata, Access, and Delivery Work Area:** tools for metadata extraction and structuring, ensuring proper delivery to the archives.

In parallel to these work areas, transversal Workpackages permitted to articulate the project internally and in regards to the outside world, they concerned: User Requirements, System Architecture & Specifications, Integration of results, Services, Exploitation & Tests.

User groups were organised to understand their problems and experiment with intermediate developments. The main user groups concerned Audiovisual archives, composed of 180

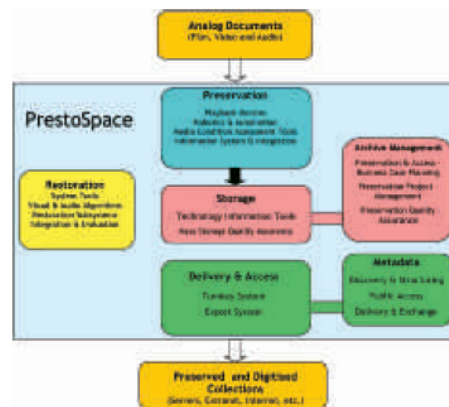


Fig 1. The structure of the project, with its different work areas.

members from 52 countries and the Service Provider Group, composed by 144 members in 26 countries. Continuous dissemination and training actions as well as tests were undertaken with these user-groups to verify and get strong feedback about the developments.

These transversal Workpackages operated at the project level, keeping a view on all the developments of the project. They had the major task of verifying that the results were interoperable and easily interconnected.

The Partners of PrestoSpace

Archives, Service providers, Industrials, Universities and applied research Institutes from 8 European countries and the US, participated to the project. The partners contributed to address directly the archiving problems, to implement the results of research and to build the tools and components for the preservation chain, for restoration innovations and for access solutions.

- **8 archive institutions and their R&D departments:** INA, BBC, B&G, ORF, RAI, Netherlands Film Museum, Österreichischer Mediatek and NOB.
- **3 applied R&D institutions:** Joanneum Research, CRCDG-CNRS, IT Innovation.
- **6 universities:** University of Sheffield, Gdansk University, Surrey University, Trinity College Dublin, Université de La Rochelle, University Roma Tor Vergata.
- **15 industrial partners,** all of them are SMEs: ACS, Indeep, Eurix, CubeTec, Hi-Stor, HS-Art digital, Centrimage, Sirma AI Ltd, Media-Matters (US), Snell&Wilcox, SSL, StreamUK, TI Partners, Studio Hamburg, Vectracom.

The 35 partners of the project were outstanding actors of the Audiovisual domain and contributed strongly to the success of the project bringing together the critical mass necessary to solve major preservation problems. The cost of the project was of 15M€ where 8M€ were brought by the European Commission.

The results of the project³

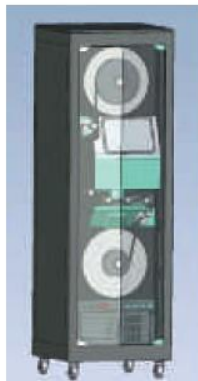
Each work area or domain of the project produced important results a majority of which have become or will become industrial

3. All the results can be found at: www.prestospace.eu

products. Parallel to the technological developments the strong exchange with the Archive and Service Provider community permitted to understand the underlying organisational and funding problems and to propose a new concept institution for providing guidance to Audiovisual Archives: the Competence Centre.

Preservation

A fast, affordable Datacine, a Contact-less Playback Tool for audio disks, an Audio-tape magnet-optical playback tool, an Automated Video Preservation tool, a Manual tape condition assessment tool and an Information System for Preservation Management.



A fast affordable Datacine: specific Datacine for archive films, sprocket-less, very gentle to film (even damaged), robust to archive film impairments (shrinkage, aged tape splices, curling, damaged sprocket holes). It will be commercialised by P+S TECKNIK, Munich in October 2009.

Fig 2: PrestoSpace Datacine prototype.

A Contact-less Playback Tool for audio disks: reading audio disks without touching them, simple setup and no risk for the disk. Reduced crackle : reduced cleaning requirements, robustness to scratches and lacquer cracks. Developed by Ina and commercialised by Indeep.



Fig 3. Prototype of the system to be commercialised by Indeep in October 2009.



An Audio-tape magneto-optical playback tool: efficient to all tape speeds, stereo/dual channel tapes, 1 to 4 tracks, reverse tracks, tracks position, automatic head azimuth adjusting, detection and correction of drop-outs.

Fig 4. Prototype of the audio-tape playback system developed by Reply and Hi-Stor.

An Automated Video Preservation tool: uses **robotics** and **customised** software and hardware to **migrate large quantities** of cassette contents, lower cost, higher speed, higher quality, automated migration done on-site, robotic tape handling, robotics/signal/video/audio monitoring, proprietary tape cleaning correction technologies, proprietary time-base correction, migrates to :

- Digital Media files - Mpeg2, Mpeg4, Windows Media, MJPEG2000 (World's first hardware-based MJPEG2K encoding system);
- + traditional videotape (if desired) at the same time.



Fig 5. Robot and control system developed by Media Matters and commercialised under the name of Samma System.

A Manual tape condition assessment tool and An Information System for Preservation Management: these two developments are essential blocks for determining the state of the audiovisual collections in function of the brand of the tapes and the year of fabrication, and the Information System, called Precactis, permits to follow all the linked processes within a preservation chain and verify the correct preservation status and the location of the physical and digital objects.

Restoration

Based on existing restoration environments, the project developed a large set of restoration tools, improving the state of art regarding defects that couldn't be dealt with up to know and improving the quality of restoration.

Restoration management tool: this generic tool can follow job execution & progress monitoring. It is interfaced to Prefactis and permits content handling. It can manage restoration sub-systems like Brava, Diamant, M.I.R., Artifis, AudioCube, Dobbin, it permits restoration plan creation.

Defect analysis and description infrastructure: in order to correct defects, they have to be detected, a series of detectors for dust/dirt, grain/noise, blocking, visual activity, (frozen frame) were developed. The associated tools were a defect and quality summary viewer on a timeline, with synchronous play and navigation, standardised defect and quality information and description schemes, MPET-7 based.

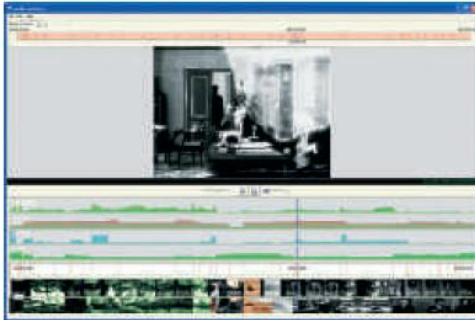


Fig 6. Interface for Defect and Quality control.

High-level restoration algorithms: within the audio restoration, specific developments were done concerning Cube-Tec products Audio-Cube and Dobbin. General tools for coordination of audio restoration and integration within the restoration workflow. A central editor form which the operator can start either manual or automatic restoration. Restoration algorithms plugged-in via VST interface.

Disk-to-disk real-time restoration tool: a disk to disk visual restoration environment integrating 3 restoration tools: Brava – Artifis and Scratchbox was developed, interfaced to RMT. Some of the characteristics are: smart navigation (go to next cut, click in timeline...), interactive restoration of dirty splices, blotch detection and removal, improved motion estimation.

For the DIAMANT V2.2 system new and improved tools were developed like: Re-timing, ReGrain, Pixelmotion, Image interpolator, DFlicker. Specifically for Video support: DInterlace, DropOut, Dshake, FieldSplit, restoration reports.

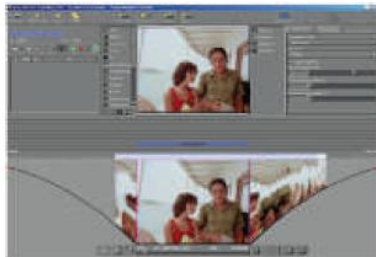


Fig 7. View of the DIAMANT system with integrated restoration algorithms.

Film restoration software tool: specific developments were done in the film domain in order to correct strong defects. In the audio domain: removal of wow/flutter, sprocket hum and noise. In the visual domain: motion estimation, blotch and dirt detection, large blotch removal, scratch removal, flicker removal, re-grain.

Storage and Archive Management

The storage and archive management work-area was indeed one of the most popular within the project. Working on a constant relation with users, it provided an important background for understanding and explaining the problems dealt within the project.

Among the main developments, can be found: a Web-Guide and Software tool for storage planning for audiovisual preser-

vation, Guide and Software tool for business-case planning for audiovisual preservation and organisation. Logistics and Quality Insurance System for Audiovisual Preservation.

The results of the studies, enquiries as well as the tools were made available through an online Audiovisual Archive Digitisation and Storage Guide, which gave all the necessary information an archive needs to know to understand and undertake preservation actions⁴. Tools for cost calculation or preservation planning could be found here so to estimate cost and effort for any audiovisual collections. A Wiki on preservation was also installed to answer the questions and give the theoretical approach to preservation⁵.

It also provided highly useful information about storage and storage evolution on the long-term, in order to orient and inform about the evolution of costs and storage.



Fig 8. Image of the Storage management page in the PrestoSpace website.

Metadata, Delivery and Access

It is essential within an archive process to have documentation and publishing tools. An environment was built within the project in order to permit the integration of existing documentation and the possibility to apply specific metadata extraction algorithms and to be able to hand improve the documentation.

In order to achieve these objectives, several tasks were realised, the first of them was to establish an XML document format schema in order to include existing metadata and to enlarge the extracted ones. A specific format based on P-Meta, MPET-7 profile nodes and ad-hoc structures was then conceived as a framework for documentation.

The specific platforms, one for documentation and one for publishing contents were constructed, integrated within a delivery environment called the Turnkey system.

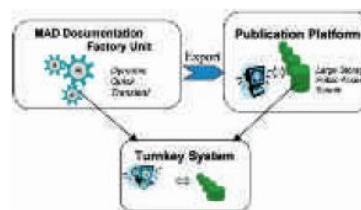


Fig 9. The structure of the documentation, publication and export system.

4. <http://prestospace-sam.ssl.co.uk/>
 5. <http://wiki.prestospace.org/>

A series of specific GAMP's (Generic Activity MAD Processors) were developed by the rich panel of academic research institutions. These processors can be applied to document in order to extract information to enrich the documentation. These processes can be done in Italian or English. Among them we find: shots finder, video segmenter, speech to text, stripe images, semantic analysis, camera motion, text segmenter, web aligner.

A Competence Centre for audiovisual contents

The Competence Centre is one of the most important results of the project; it is conceived as tool to bring advice and guidance for Audiovisual actors as well as a technology integration point where the results of PrestoSpace as well as other projects can be made available to the community. Furthermore, it would provide a long-term integration point for future projects and remain as a continuous reference point for the audiovisual sector.

Initially the working concept for PrestoSpace was the "Preservation Factory" a unique place where all the actions were realised in the preservation chain. This concept is still applied within the project, however due to the diversity of actions needed, and the non-synchronisation of them, this becomes a task that has to be structured and organised through long periods of time. The preservation is done under factory conditions, where strong improvements were obtained with adequate organisation and monitoring of actions and quality. The Prefactis tool described earlier realises these actions and permits to transfer the preservation metadata to the other areas of work.

However the feedback obtained from users, concerns the necessity for precise orientation and expert analysis of problems in order to permit decision-making. The conclusion was that the best way to bring together all the results of the project was to bring them within an organisational instance that would provide a certain number of facilities to the actors of the domain. This implies:

- Bringing together the technological and methodological results of PrestoSpace in a centralised instance;
- Group in a centralised instance the actors of the domain: Archives, Service Providers, Industrials, Academics;
- Make expertises of audiovisual archives in order to orient them on preservation planning and eventually build a plan and monitor it;
- Establish links between Archives and Service Providers in order to find the most effective collaboration;
- Monitor their relationship;
- Include developments and technology of other projects, including PrestoPRIME;
- Become a European reference point for Audiovisual Preservation.

The Competence Centre was not built within the project, it was designed and it would be to the following project to launch it. The global ambitions were accepted by the European Commission, which sees in the Competence Centre a first attempt to structure activity, to be enlarged to other domains.

Living in the digital world: PrestoPRIME

A new project was launched in January 2009, under FP7, called PrestoPRIME⁶. This project brings together some of the for-

⁶ <http://prestoprime.org>

mer actors of PrestoSpace, with an overall objective of assuring the existence of digital data on a long-term perspective.

The purpose of PrestoPRIME is to research and develop practical solutions for the long-term preservation of digital media objects, programmes and collections, and to find ways to increase access by making media archives available within the framework of European on-line digital libraries. This will result in a range of tools and services made available through a networked Competence Centre. It is important to mention the European Digital Library Foundation as a partner, this Foundation, in charge of the Europeana Portal, brings new access possibilities to the domain.

The four principal objectives of the project

- To research and develop means of ensuring the permanence of digital audiovisual content in archives, libraries, museums and other collections.
- To research and develop means of ensuring the long-term future access to audiovisual content in dynamically changing contexts.
- To integrate, evaluate and demonstrate tools and processes for audiovisual digital permanence and access.
- To establish a European networked Competence Centre to gather the knowledge created by PrestoPRIME and use it to deliver advanced digital preservation advice and services in conjunction with the European Digital Library Foundation.

The partners

Institut National de l'Audiovisuel / British Broadcasting Corporation / Radiotelevisione Italiana / Joanneum Research Forschungs-gesellschaft mbH / Netherlands Institute for Sound and Vision - Beeld en Geluid / Oesterreichischer Rundfunk / Ex Libris / EURIX / Doremi Technologies / Technicolor / IT Innovation / University of Liverpool / Vrije Universiteit Amsterdam / Universitaet Innsbruck / European Digital Library Foundation

Total budget of the project: 12M€. Project starts on January 2009 and ends in June 2012.

Conclusion

The series of "Presto" projects have brought to Audiovisual archive community, an effective answer concerning the dangers and the roads that lead to the digital world. New answers are being searched today for long-term preservation of digital contents; it is not only a question of survival of data, it is also an important incentive for archives to get into the digital world and have the necessary assurance that their contents will not be in danger.

Important landmarks have been established, new technology is accessible, and an effective know-how is being transmitted to all archives. This is the result of the concerted actions of main actors of the audiovisual domain, with the indispensable funding and orientation brought by the European Community.