Descartes Medias

Paris Descartes university has launched in 2008 a Podcast project with a several hundreds of thousands euros budget and cofunding from the French Ministry of Education and Research (SDTICE) and City of Paris. The Apple *Podcast Producer* application ought to meet the needs of Paris Descartes but also to be shared within the Université Numérique en Région (UNR : State Digital University) Paris Ile-de-France.

The technical architecture is built from several features:

- capture infrastructure composed by fifty Mac Mini within thirty auditoriums and classrooms equipped with audiovisual devices
- server infrastructure: 12 *XServe* (16 cores) with 24 GB RAM,
- buffering on a dedicated SAN storage with 16 disks of 750 GB (7 TB total storage).

Tuning of *Podcast Producer* was very difficult. Industrialization in the context of a shared service offering has caused many problems :

- unreliability of the capture agents with unpredictable breaks in the recordings,
- complex architecture of capture in a multi-source configuration
- performance problems on the Xgrid encoding revealed by an internal review
- too complex implementation to integrate the service into the information system of the institution (system architecture too highly coupled with Mac OS and its updates).

These problems have resulted in 2010 in the end of *Podcast Producer* as a solution in favor of a Web-based application, internally developed, while keeping and optimizing the original hardware architecture.

Descartes Media Suite (DMS) was born. All courses at the University Paris Descartes are captured and intensively broadcast through this suite, beginning September 2010 for the First Year in Health Studies (PAES).

DMS is a concept built on four activities:

- **capturing** which massively and automatically produces multimedia contents,
- **broadcasting** which transmits live or VoD media intended for a wide audience,
- **encoding** which optimizes format from capture to broadcast for visualisaton on various devices (Smartphone, Tablet, PC, TV set, ...)
- **publishing** for multimedia data storing, classifying, organizing, indexing, managing their access rights, and submiting them for broadcast.

DMS is a software suite consisting of four applications modules, each separately developed, either on inhouse resources (Descartes Capture & Media2Descartes) or through integration and operation of commercial third party solutions (Descartes Broadcast and Descartes Engine). Each module is self-contained, modular and mutualisable. Capture Descartes might well be, for example replaced by another capture device.

This suite forms a production chain and a mass media broadcast, consistent, scalable and mutualisable. It can be deployed in SaaS mode on a private academic Cloud.
These four applications are:

Descartes Capture

Descartes Capture is the keystone of DMS. This application is the frontend which controls the recording and dissemination of recordings by IP streaming on the campus network or Internet.
From an account on the *Digital Workspace* (ENT) of Paris Descartes, it creates a reservation on one or more capture locations, managing access to the capture agents and resources (camrecorders, VGA input, broadcast stream reception) . This application can manage different configurations: one to three people in the audiovisual office can control timetable conflicts.

The capture software is based on the *Wirecast* commercial software from Telestream on an Apple *Mac Mini*. This software operates audio-visual resources of the amphitheater and is controlled by a centralized system that was locally developed on a J2EE client / server architecture deployed on Tomcat servers.

The management of the capture devices can be independently performed by local technical people. A Web interface and a tactile version (iPAD) can easily trigger a capture and a broadcast.
Thus, under the Health first year Studies in the first 2010 semester, 1000 hours of lectures have been recorded and broadcast in six lecture halls, every day from 8 AM to 9 PM.

Descartes Capture automatically pushes contents into **Media^{2}Descartes** for technical validation by the resources administrator. Then **Media^{2}Descartes** checks the copyright before allowing online publication of the resource.

Descartes Broadcast

This application module provides live streaming broadcast of courses between a lecture hall and the Internet. It also allows the delayed replay of lectures. The 2008 - 2011 architecture is based on a Gigabit network and two *QTSS* streaming servers: one is dedicated to the broadcast and the other to the webcast.

As an evolution of DMS, the architecture evolves to 10 Gigabit network with four streaming servers in redundant load balancing to broadcast information with a very high availability. The chosen solution is based on *Wowza* software and coordination with *EVO* (*SeeVogh*) is studied.
Beyond education (PAES Health first :), from the community: RENATER -Days. year Studieseveryday since September 2010 on 11 amphitheaters in parallel**Descartes Broadcast** is also used for broadcasting of events Education / Research Digital Days (JNUM) of Paris Descartes, TutoJRES or ESUP

Descartes Engine

The captured information from **Descartes Capture** is very large and is weekly measured in tens of Gigabytes of raw data. The capture agents generate source files in a raw format which needs to be encoded in order to restore the information on different viewing devices. The H264 format has been particularly favored for publication since 2009 on *iTunesU*. A grid with parallelization of treatments is necessary to industrialize the contents production and put them online as soon as possible.

Problems have occured using the Xgrid encoding system that led us to deploy an alternative solution based on *Episode Engine* software from Telestream. In the DMS context, **Descartes Capture** submits records to the grid and the new encoding solution reuses Xgrid nodes. In the context of UNR encoding shared resources, a control interface will be developed by integrating the *Shibboleth* identity federation (end 2011).

Media ^{2} Descartes

This is the publishing platform for multimedia resources at Paris Descartes.
It allows each member to publish his productions: filmed courses, tutorials, conferences, seminars, digital resources, scientific images...

- Publications moderation
- Signature of author's contract of online contents and images for the Paris Descartes members
- Access administration: public or restricted to a group within the directory of the university
- Statistics tools
- Chapters display for filmed courses
- Resources index
- Podcast
- RSS streams
- Research engine
- Integration features to display media on other sites
- Video display in different sizes depending on the playback screen
- Localization: French, English and Russian.

Descartes Medias. **Author:** *François Cadé*

The LMS platforms like *Moodle* and *Dokeos* at Paris Descartes are linked to this data warehouse to natively display resources in their contents. The LMS use the integration features in **Media²Descartes** or RSS streams. Using this RSS streams technology has allowed us to be the first French university to publish the content of our media resources directly on the *iTunesU* public platform.

The development environment of this data warehouse is based on Java and WebObjects on a multi-tier architecture. It uses a Java *WebObjects* application server with a Web browser (Firefox, Chrome, Safari, Internet Explorer, etc.) or iTunes. Hosting files: SMB, NFS ... shared by *WebObjects* and *Apache* servers. The server access authentication uses *CAS* for both authentication and group management.

The objectives of this suite:
- Have a unique and **shared** workspace throughout the university, production
- Valuing educational, scientific, events contents
- Enhance supports and teaching methods through the web
- Legally manage and validate online documents and images copyrights
- Standards formats adapted to different viewing devices: iPod, iPad, laptops, smartphones…
- Provide technical follow up to the publication and to the help of teachers,
- Develop access to resources through the ENT (Digital Workspace).
- Ease the LMS platforms of the management of very large multimedia contents

Users:
- Teachers, researchers or staff people are the known authors in the directory of the Paris Descartes University
- 38,000 Students of Paris Descartes, 32 amphitheaters a total capacity of over 6,000 seats equipped with podcast
- Teachers, educational services, ICT for Education (TICE), administrative staff and researchers

The publishing workflow: filing of a document
- The notion of contributor: 3 possible cases: the author himself, a contributor, the automatic captation system
- The access rights to the document: depending of the target audience, you can restrict access with the use of a password, or open access to everyone. The publication tree takes into account groups from the tree of the scholarship system *Apogee*
- Indexing: title, abstract, keywords, author, co-author ... allows automatic indexing lusing SupLOMfr standard.
- The publication is limited to **Media²Descartes** by default, but the program can also automatically create links to: *iTunesU* and *Canal-U*.

An important work with a law firm has been performed to permit validation of digital image and document copyright by differentiating occasional publications from achievements through a semester course.

Description of an extension: the virtual slides project or digital microscopy : a new teaching tool in health education

This project aims to renovate the learning of different health specialties currently based on the reading by the student to the standard microscope slides. It consists in digital images database acquired from real blades called "virtual slides" to view all or part of a smear or a cup. After indexing, these images will be integrated into the **Media^{2}Descartes** and made available for the LMS. This innovative technology will allow the student to remotely view these images and the teacher to provide learning cases.

This pilot project inter-faculty (Medicine, Pharmacy and Odontology) fits perfectly in first year of Health studies. The training involved: Pathology Medical and ondotology, Hematology and Histology organic. 250 digital blades are used in various practical sessions.

Some advantages of Descartes Media Suite:
- For teachers: the automatization of courses recording, the access protection of this course, indexing, ease of use in multiple LMS platforms
- For students: a course very easily visible and lectured
- For the computer: an ease of the learning platforms, only one link is sufficient to get the recording, a single repository of courses and multiple internal or external uses, and thus the sharing of educational resources among teachers.
- All is of course protected by single authentication architecture.

For the teacher **Media^{2}Descartes** can be divided into four configurable modules:
1. Global management :
   - access rights based on the information system of the institution
   - the creation and organization of topics,
   - the withdrawal of publication media
   - management of users
   - publications moderation
   - statistics tools.

2. Content management :
   - multimedia files deposit
   - online signing contracts for documents and images copyrights
   - indexing media
   - monitoring of contributions by mail and dashboard

3. Legal management :
   - administrators can validate the contracts manually signed
   - contracts dematerialized signing with one or more authors for a publication or globally for one semester
   - List of signed contracts
   - Monitoring of publication for authors

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4. Access management :

- chapters for filmed courses
- varied and optimized display formats
- indexing of resources
- podcast
- subscription via RSS
- search engine
- exports to view the media on other sites
- media sharing with others

Interconnection was performed with other tools at Paris Descartes such as the LMS *Moodle* and *Dokeos*, the search engine *SINEQUA* or the local social network **Carnets²Descartes**.

Statistics as of May 5, 2011

Number of media published since 2006: 6,044 Including:

- 3,921 courses
- 45 seminars
- 1,087 conferences and symposia
- 79 tutorials
- 588 virtual slides
- 324 other publications.

- Number of authors:
  Since its creation: 3,084
  2010: 1,093

- Number of students who consult different media:
  2010-11: 9,880 students

- Number of students who viewed the media since its creation: 19,951
- Number of diplomas concerned: 36

- Media published by colleges:
  Biomedical: 5
  Odontology: 20
  Law: 32
  Management Technology: 313
  Mathematics / Computer science: 301
  Medical school: 2,309
  Pharmacy: 713
  Psychology: 81
  Human and Social Sciences: 82
  Sports: 17
  Health first year Studies: 325.

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