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1 Executive Summary

This document provides an overview of Audio/Video infrastructures and services within RCTS, the Science Technology & Society Network, which is the Portuguese national research & education network, managed by FCCN as a unit of FCT.I.P..

The main goal of this document is to provide an updated picture of RCTS’ existing A/V infrastructures and services, which were built over the years with the community’s cooperation. This document was also created to raise local awareness about what is deployed and also to the benefit of other R&E communities that may be building the same type of services. This work is essentially a status document, similar to the one published in April 2015 about the VoIP Network Status in the Portuguese R&E [1].

The portfolio of Audio/Video services is diversified, covering content production, collaboration tools and high-end videoconferencing. A peek into the future of Web-based Audio/Video services is also included in this document, in the chapter on WebRTC.
2 Infrastructures

FCT-FCCN has built some high-end infrastructure to serve the Portuguese research & education community. A TV studio built right next to the network’s main hub (Lisbon) is a real crown jewel. This chapter also describes the two immersive videoconference rooms, which were built with exactly the same specifications, at RCTS’ main node in Lisbon (sharing its location with the TV studio, but in a different building), and at the University of Porto’s Rectory, in the city of Oporto, 300 kilometres North of the Portuguese capital.

2.1 TV Studio

Goal: Recording audio-visual content in high definition.

High definition video production:
- Video production and post-production;
- E-learning content;
- Interviews;
- Roundtables;
- Presentations;
- Demos: products, services, equipment;
- Institutional video creation.

Audio Capture:
- Voice over video;
- Translation;
- Audio to video post-production;
- Musical recording up to 16 simultaneous channels;
- Radio and podcasts production.

Over the years, a diverse range of work was produced at the studio, namely:

- Instituto Gulbenkian Ciência: IGC building’s graffiti’s Making-of, as part of IGC’s 50th anniversary (2012);
- Universidade Aberta: Advanced collaborative services and knowledge sharing (2012).
• Instituto Gulbenkian Ciência: Intravital Imaging of the Mouse Thymus using 2-Photon Microscopy (2011).
• Fibre optics fusion. Voice over recorded at the studio (2011).
• Me and my body. Animation by Diana Silva (IGC). Audio recording and sound performed at the studio (2011).
• Showcase: Tejo and Douro HD rooms (2009).
• Chess – Basic rules (2009).
• Reading Fernando Pessoa - Pedro Veiga. Fully recorded at the studio (2009).
• Web Storks. Voice over recorded at the studio (2009).

2.2 **Immersive Videoconference Rooms**

The advanced videoconference infrastructure available in the Tejo and Douro HD rooms is aimed at meetings, work discussion and holding academic examinations (allowing some jury members to be remote). The service is available to the community served by organisations connected to RCTS, namely teachers and researchers. Each of the two rooms is equipped with six seats.

**Characteristics**

- Infrastructure based on high-definition video standards and technology;
- Ability to hold sessions with any other compatible equipment on the Internet;
- Three 65-inch high-definition (1080p) screens;
- High-fidelity surround sound;
- Equipment control through touch-screen with an intuitive graphical environment;
- Allows multipoint videoconference, session recording and mobile video calls (3G Video).
3 Services

Video On-Demand/Webcast, Educast and Colibri services are described in this section.

3.1 Video On-Demand and Webcast

Previously recorded video streaming of educational/scientific/cultural/artistic content over the Internet.

Video On-Demand and Webcast are services that allow the transmission of audio and video sources to the Internet from a specific location. The services include encoding and (for the On-Demand version) storage on an audio and video fileserver to be accessed later from the Internet.

Its usage includes:

- Classes
- E-learning
- Internal TV channels
- Non-live and live broadcast events

Real-time broadcasting is based on a central broadcaster server, located at RCTS’ central node in Lisbon. This service is the operational base for the “Nature on the Web” project, where storks, griffin vultures and bats can be remotely observed at different locations in their own environments. This project is run together with the Público newspaper (www.publico.pt), IPTelecom (www.iptelecom.pt), RenTelecom (www.rentelecom.pt) and Ciência Viva Centres (www.cienciaviva.pt). Live feeds are available at:

The above picture shows a frame captured during 2009, which also demonstrates this project’s longevity.

To be able to fully use the Webcast service, an organization will need an encoder with specific hardware and software, audio/video devices duly integrated with the encoder and local connectivity where the session will take place. Last but not least, a service request to FCT-FCCN is required in order to guarantee that the central broadcaster server is available and duly configured.

An installation and configuration cookbook (in the Portuguese language) for a windows media encoder is available at: https://www.fccn.pt/file_manager/?id=352.

This service is aimed at the RCTS community and service can be requested through servico-videodifusao@fccn.pt.

### 3.2 Educast

Educast is a federated service and is available at: https://educast.fccn.pt

How it works:
- Recording – Video, audio and slides are locally recorded using the Educast Recorder.
- Upload – Optionally, videos can be transferred from a collection to a channel.
- Editing – Videos can be organized and processed using a web editing tool.
- Publishing – Videos become available on the Internet automatically.

The Educast service is the result of a partnership between FCT-FCCN, its Swiss federation counterpart SWITCH and the University of Porto. Educast comes after four years of development at SWITCH to create a complete solution focused on recording classes and cultural events. This solution consists of a central storage repository, video processing, online content edition and recording software (Switchcast recorder). The University of Porto guarantees initial training and technical support service for local (Portuguese) educast teams.

Goals:
- Producing video content that is educational, cultural, informative or recreational;
- Simultaneous capturing of a speaker’s video and PowerPoint presentations;
- Content editing control by the teacher;
- Adapting to structure and technical reality at Higher Education Organizations;
- Final publishing in three different formats to Web and mobile devices: Flash, QuickTime, iPod;
- Integration with e-learning systems (Moodle), portals and Higher Education Organizations’ websites;
- Restricted access to content.

Educast is aimed at the community composed by organizations connected to RCTS, as well as its teachers and researchers. Content that is produced remains accessible, through controlled access, to students. This service is available to organizations that are part of RCTSaaí and own audio/video sets compatible with the Educast platform.

Technical Requirements

Hardware
- Compatible with Apple Mac computers, with Intel processor and FireWire connections (MacMini, MacBook Pro, Mac Pro, iMac) with a minimum of 1 GB of RAM;
- Apple computers will need to have a Firewire port, because only Firewire cameras are supported (no USB);
- Microphone usage or another audio source, i.e., output signal line from equipment located in auditoriums or classrooms;
- For PowerPoint presentations, an Epiphan device is also needed in order to capture slides from another computer, possibly the presenter's computer.
- One of the following devices is recommended: VGA2USB LR, HR VGA2USB, VGA2USB Pro or DVI2USB.

Software
- Mac OS X 10.5.8 (or higher) or Mac OS X 10.6.3 (or higher);
- QuickTime Player 7.6 (or higher);
- Safari 3.x or Safari 4.0.2 (or higher);
- Educast Recorder 2.2 (or higher);
- Epiphan driver (in the case Epiphan frame grabber is used)

Joining Process

Organisation
- Create a workgroup that will act as a point of contact for the initiative;
- Sort out all the necessary technical conditions;
- Get in touch with FCT-FCCN using the suporte-educast@fccn.pt address.

Teacher / Researcher
- Get in touch with the local Educast team from your own organisation.

Produced Videos (content in Portuguese):
- Introduction to Law – 1st Class
- Cardiology Interns Training – Information sources
- The Future of Water Public Services – Opening
- Portugal Conference- Future Challenges
- Alcohol and Young Citizens
- e-Roots Networks
- Virtualization and Filesystem Clusters – Master of Computer Science Engineering, Seminar
- Technologies and Learning at the Higher Education System - V Pedagogy Forum - FMDUP
Below are some of the most important references regarding this project:

«Falar Global» Interview at SIC Noticias TV channel [2]
«Seed Science 2012» winner prize, on the communication category.

EUNIS Award [3]
The Educast@fccn project, of which the University of Porto is a strategic partner (through its GATIUP unit – New Technologies in Education), received the 2012 Honourable Mention from the Elite Award for Excellence in implementing Information Systems for Higher Education from EUNIS (European University Information Systems Organization).

3.3 Colibri

Colibri is a distance collaboration service aimed at the Portuguese scientific and academic community, with the purpose of enabling meetings, workgroups, classes and tutorials. The service is available at http://colibri.fccn.pt, and the main page allows a choice between two versions, as depicted in the following image:

Version 1: To schedule sessions using traditional videoconference systems. This version is based on Scopia Desktop and its main characteristic is H.323 compatibility. The main page shows options that allow a user to create a new session or join an already existing session.
Version 2: Rich sharing environment and collaboration multiplatform. This version is based on AdobeConnect.

Either versions are already federated and both versions allow the scheduling of meetings. Recording is also supported.
WebRTC

Web Real Time Communication (WebRTC) is an API designed within the World Wide Web Consortium (W3C) allowing the creation of applications in a browser-to-browser fashion, which can include audio/video calls and direct file sharing, without resorting to plugins.

WebRTC is a new standard that is being finalized at IETF and W3C. It aims to allow any development team to easily create real time communication tools, integrating audio, video and data. Despite the fact that its standardization process is still to be concluded, this technology seems to be highly disruptive when compared to technologies available on the market today (SIP, H.323, etc...). Its pioneer adoption by Google and integration on its browser (Chrome) provided tools and libraries based on this technology that facilitates the creation of new applications, where users communicate in real time through the browser using audio and video.

Currently, this technology is already part of other browsers and is available in libraries, which allow new services and native applications, making it increasingly ubiquitous.

There is a mini demonstrator of WebRTC technology, built at FCT-FCCN and available at: https://webconf-colibri.fccn.pt/webrtc/

The French Research and Education network (RENATER), has already deployed the Rendez-Vouz service, powered by Jitsi.org. This service can be used by anyone, but creating rooms is only possible for edugain federation users (http://services.geant.net/edugain). The service is available at: https://rendez-vous.renater.fr

Beyond the European NREN community, there is already a free application allowing any user to transfer files. The URL is available at: https://www.sharefest.me/upload
5 References

http://services.geant.net/cbp/Knowledge_Base/Real-time_Communications/Documents/CBP-22_VoIP-network-status-in-Portuguese_RE.pdf

[2] «Falar Global» Interview at SIC Noticias TV channel 
https://www.youtube.com/watch?v=ytg46U2ZQUk

[3] EUNIS Award, 
http://sigarra.up.pt/up/noticias_geral.ver_noticia?P_NR=13181&P_amo_id=1213
List of Acronyms

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<th>Acronym</th>
<th>Description</th>
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<tr>
<td>API</td>
<td>Application Program Interface</td>
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<tr>
<td>EDUGAIN</td>
<td>Identity Federation service, developed by GÉANT</td>
</tr>
<tr>
<td>FCT-FCCN</td>
<td>Fundação para a Ciência e a Tecnologia, I.P. – Unidade FCCN</td>
</tr>
<tr>
<td>H.323</td>
<td>ITU-T recommendation, defining protocols to provide audio-visual communication</td>
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<tr>
<td>IETF</td>
<td>Internet Engineering Task Force</td>
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<tr>
<td>ITU-T</td>
<td>International Telecommunication Union – Telecommunication Standardization Sector</td>
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<tr>
<td>NREN</td>
<td>National Research &amp; Education Network</td>
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<tr>
<td>R&amp;E</td>
<td>Research &amp; Education</td>
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<tr>
<td>RCTS</td>
<td>Rede Ciência Tecnologia e Sociedade</td>
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<tr>
<td>RCTSaai</td>
<td>RCTS Authentication &amp; Authorization Infrastructure</td>
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<td>RENATER</td>
<td>French Research &amp; Education Network</td>
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<tr>
<td>SIP</td>
<td>Session Initiation Protocol</td>
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<td>SWITCH</td>
<td>Swiss Federation Research &amp; Education Network</td>
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<tr>
<td>VoIP</td>
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