



LABORATÓRIO NACIONAL
DE ENGENHARIA CIVIL

HYDRALAB IV – Remote Access to Experimental Facilities

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RADE – Sixth Experience on Remote Access

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The participation of the Eng. Francisco from Azores harbour in the 6th experience of this project, through their collaboration in testing the remote access as end-users of the system, is acknowledged.



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RADE – Sixth Experience on Remote Access

1 INTRODUCTION

The present report describes two laboratory experiences on remote access to physical experiment tests for a 3D model, tested at the TOI2 tank on the 6th of March 2013. This is the 6th experience taken at the maritime hydraulic installations of the Harbour and Maritime Structure Division, of the Hydraulic and Environmental Department of the National Laboratory of Civil Engineering. Previous tests were performed on the 27th of January, 27th April, 6th of June and 26th of September 2012.

This work is made on the framework of the project RADE, a Joint Research Activity of HYDRALAB IV – More than Water. RADE (Remote Access to Data and Experiments) will develop a robust set of information systems to improve access to experiments and data through the innovative use of modern data management, curation and communication technologies.

The main objective of this laboratory experiences was to test the procedures previously presented in Capitão *et al.*, 2012, Fortes *et al.*, 2012, and Lemos *et al.*, 2012, aiming to remotely access a laboratory experience on a tank where a 3D model resides.

After the objectives (Section 2), Section 3 of the present report describes the experiences made at TOI2 tank (for a 3D model). In Section 4, final comments and future work are presented.

2 OBJECTIVES

The objective of the 6th experience described in the present report was to test and report the efficiency of the procedures previously presented in Capitão *et al.*, 2012, in Fortes *et al.*, 2012 and in Lemos *et al.*, 2012 . This experience took place at the TOI2 tank, located at LNEC's premises. During the test, a technician from the consultant company PORTOS DOS

AÇORES, of Faial Island - Azores (Portugal), was invited to remotely access the experience and to produce comments on the usability of that experience.

As described in previous reports, the methodology is based on the use of a fairly simple scheme composed of a video camera apparatus, installed at the flume, which is connected to a PC computer where the software “Microsoft Expression Encoder” capture video resides and where video and images are decoded and sent to a web server for storage and sharing with selected guests. This server will then enable real-time streaming over the internet, enabling a direct, quasi-real-time, access to the video from web users.

3 DESCRIPTION OF THE REMOTE ACCESS EXPERIENCES

3.1 Maritime hydraulic experimental facilities of the Harbour and Maritime Structures Division

A testing hall for hydraulic tests with an area of 6,500 square meters was used. This hall is mostly occupied with testing flumes and basins for hydraulic model studies. Basins are used for three-dimensional studies of structure stability and wave penetration. Flumes are used for stability and overtopping tests of maritime structures. In the next sections we briefly describe the TOI2 tank, used in the present remote access experience.

TOI2 is a wave tank used for studying directional irregular waves over a variable bed and their interaction with a 3D maritime structure. As in the case of the flumes, it is possible to construct all kinds of 3D foreshore bathymetries in this tank, both fixed bed and mobile bed foreshores, to ensure the wave behaviour in the model will be accurately reproduced according to the prototype. Mobile, 6.0 m long, irregular wave generators for use in the wave basins are available and may produce either regular (periodic) and irregular (random) waves. Passive absorption of wave reflections is provided. An overview of this tank is shown in Figure 1.

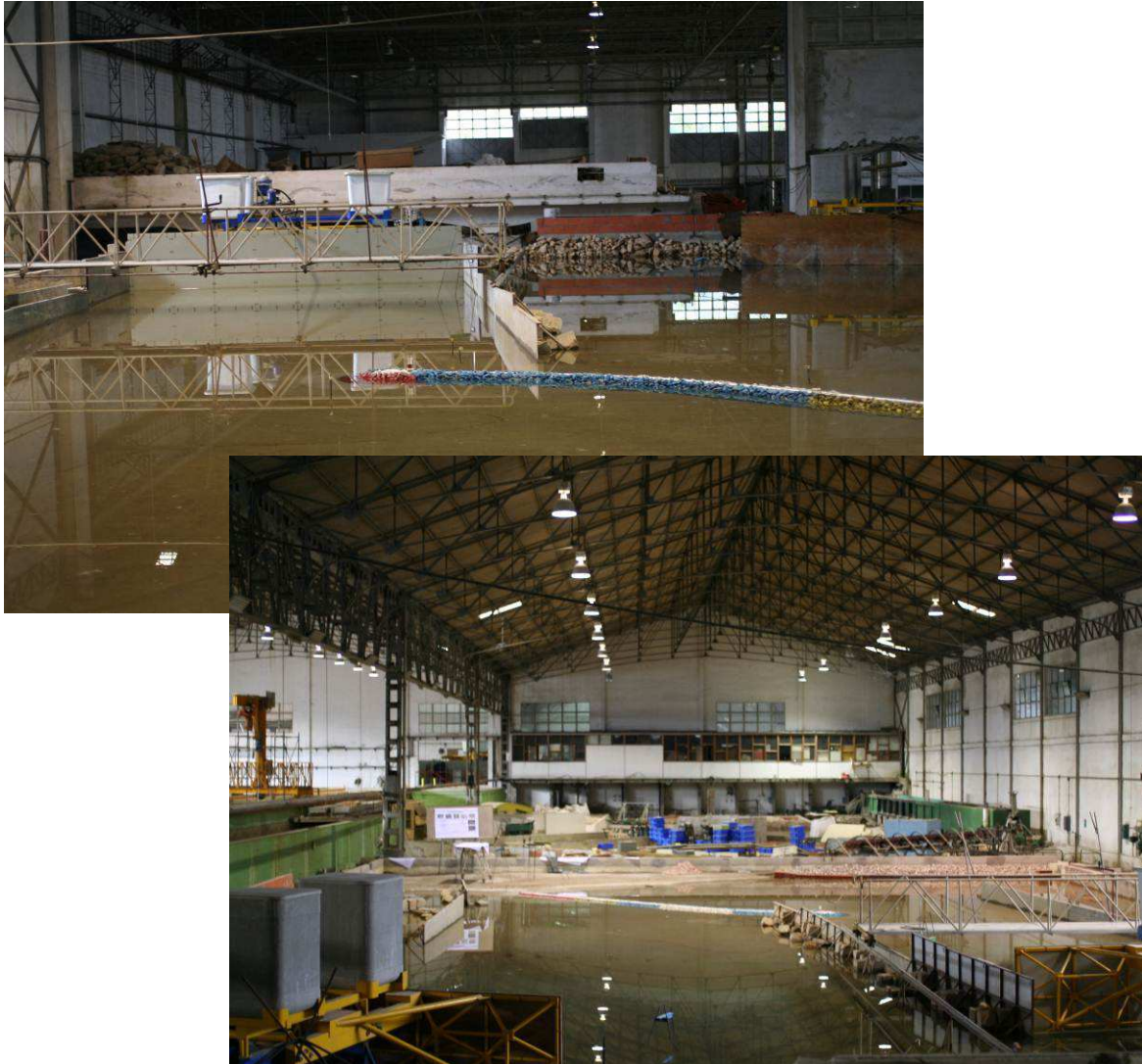


Figure 1 - Overview of the TOI2 tank.

In the testing hall there is a Control Room where a centralised control of the entire irregular wave flumes and basins is possible. This Control Room also receives all electric signals that convey information from models (resistive probes, force and movement sensors, video, intercoms). Also in the Control Room resides a computer software package, named SAM, which includes a set of methods for the characterization and numerical and physical simulation of sea waves (including wave groups) and processing wave data either from nature or from the wave flumes and tanks.

3.2 Physical equipment used in the remote access experience

The equipment used in both experiences was, Figure 2 to Figure 4:

- Camera with the following characteristics:
 - A Canon 600D digital camera with the following video capabilities: PAL 720p, 25 fps
 - Lens: Canon EF-S 18-55mm 1:3.5-5.6 IS
- A laptop PC computer with the following characteristics:
 - Dell Latitude E6500 - Intel Core 2 Duo Processor T9600 (2.8GHz, 1066MHz FSB, 3GB RAM)
- Video acquisition hardware
 - Conceptronic CHVIDEOCR A/D Converter DAQ board with provided cables
- Flexible tripod “Joby Gorillapod SLR Zoom”



Figure 2 - Laptop computer (Windows XP, 4 GB RAM) used to receive conveyed video signal from A/D Converter DAQ board. Also shown are the Canon camera and zoom lens, the Gorillapod, cables (with USB-composite video adapter) and the “USB Conceptronic A/D Converter DAQ board”.



Figure 3 – CO13 flume. A side view from the installed setup.

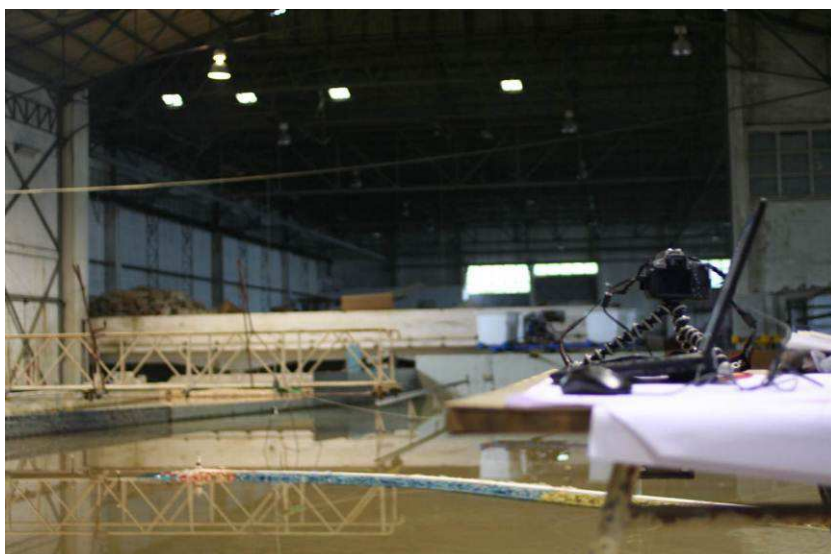


Figure 4 - TOI2 tank. A side view from the installed setup.

3.3 Software Equipment

The software used in the video decoding and streaming was, again, the Microsoft's Expression Encoder 4 (free version). Encoding was established with the following video and audio characteristics:

- Video 25 fps, 1000 Kb/s
- Audio 128 Kb/s (2-channel 16-bit 48 kHz)

This is a commercial software program to encode a wide array of video file formats, stream live from webcams and camcorders or screen capture from PC's. It also enables making simple edits to video files and enhancing available media with overlays and advertising. A free version of this software was used in all experiences (Figure 5).

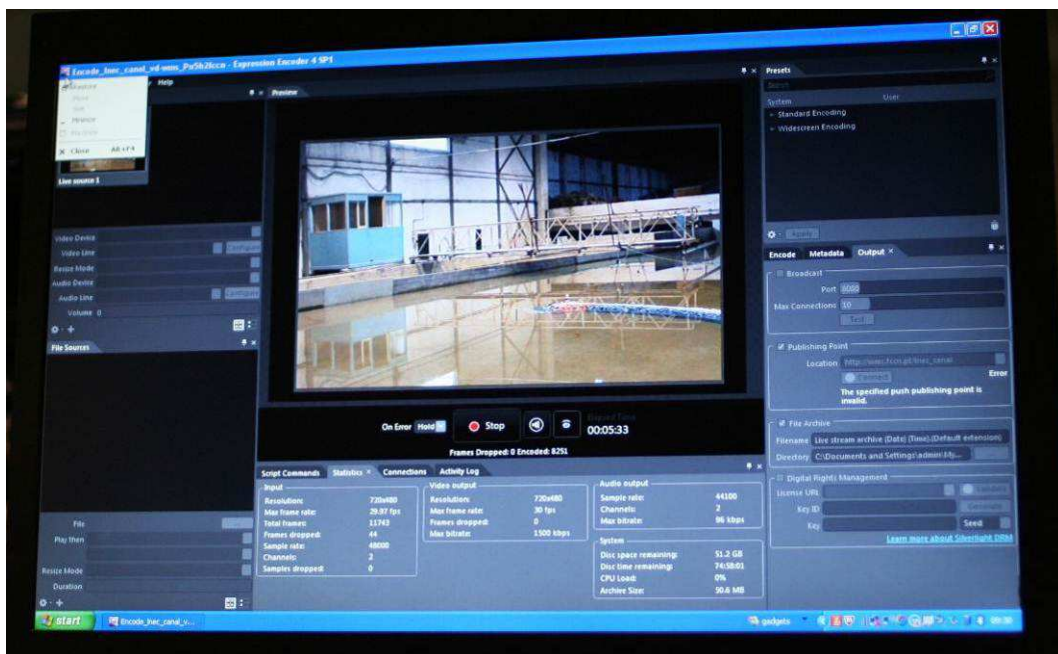


Figure 5 - Software equipment.

3.4 Description of the remote access experience

During the experience, the following steps were taken:

- Laptop PC Computer – near the flume;
- Installation of the equipment (Figure 6 and Figure 7):

1. Setup of the camera. Turn the camera on. On the top right dial, change operation mode to “Movie”. Frame the subject and press shoot button halfway to autofocus the subject. Then change the AF/M lens button from autofocus to manual focus.



Figure 6 – Setup of camera in the final position and video mode operation selection.

2. Connect camera to the computer. The connection between computer USB port and camera is made through use of a Conceptronic A/D Converter DAQ board.

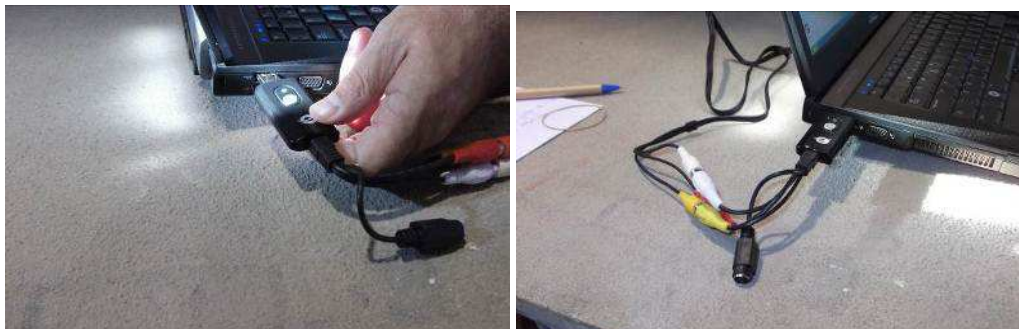


Figure 7 - Cable connections between camera and computer.

- Use of the free version of Microsoft's® Expression Encoder 4 software (http://www.microsoft.com/expression/products/EncoderPro_Overview.aspx);
 - At desktop, click the shortcut for Microsoft's® Expression Encoder 4. The encoder program will start (Figure 8);
 - Open file "Encode_LNEC_canal" to start job "LNEC_canal". (Figure 9);
 - A small window showing the active job (the video scene), will appear at the screen left upper corner (Figure 12).

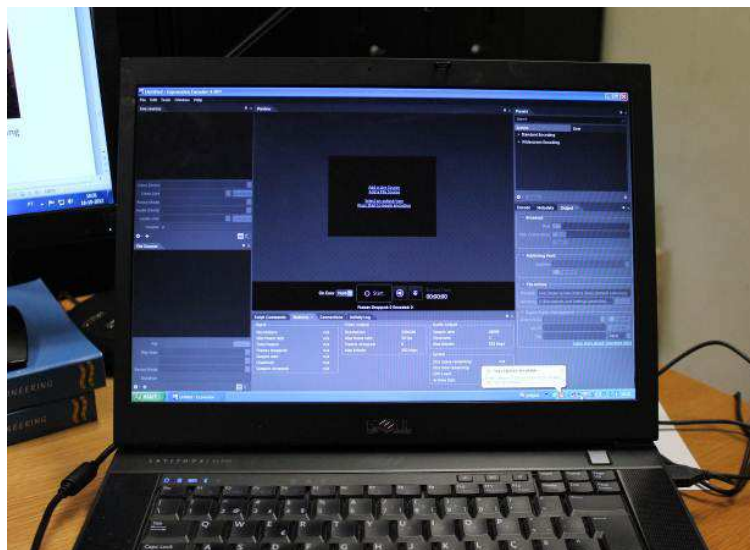
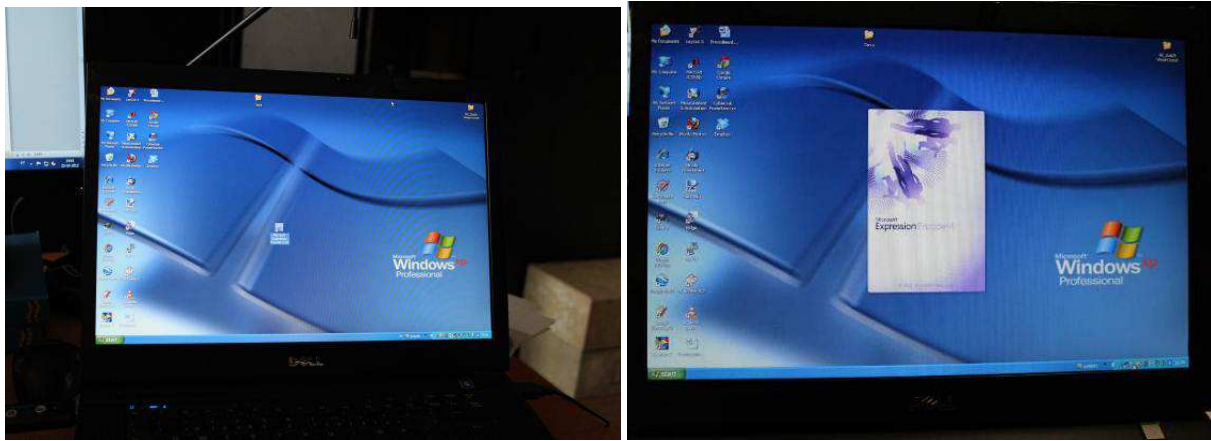


Figure 8 – Starting Microsoft's® Expression Encoder 4 software.

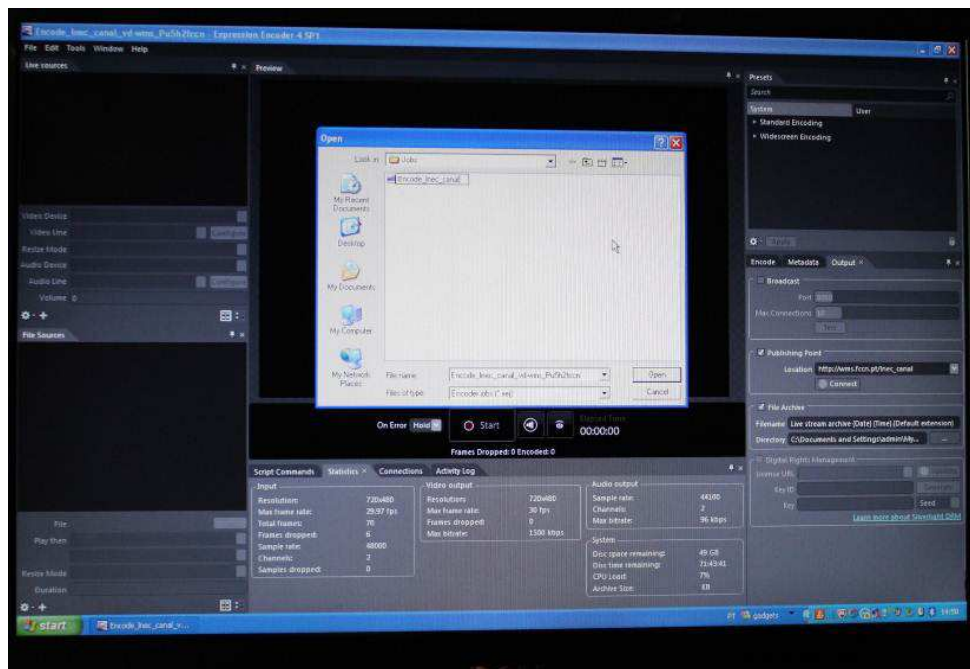
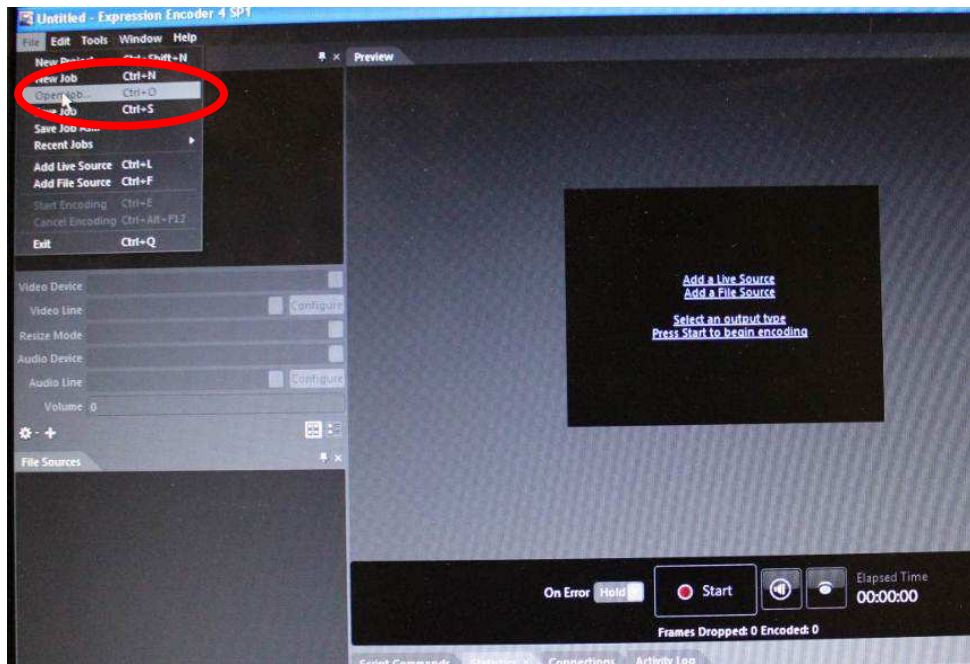


Figure 9 – Using Microsoft’s® Expression Encoder 4 software: Open file “Encode_LNEC_canal”.

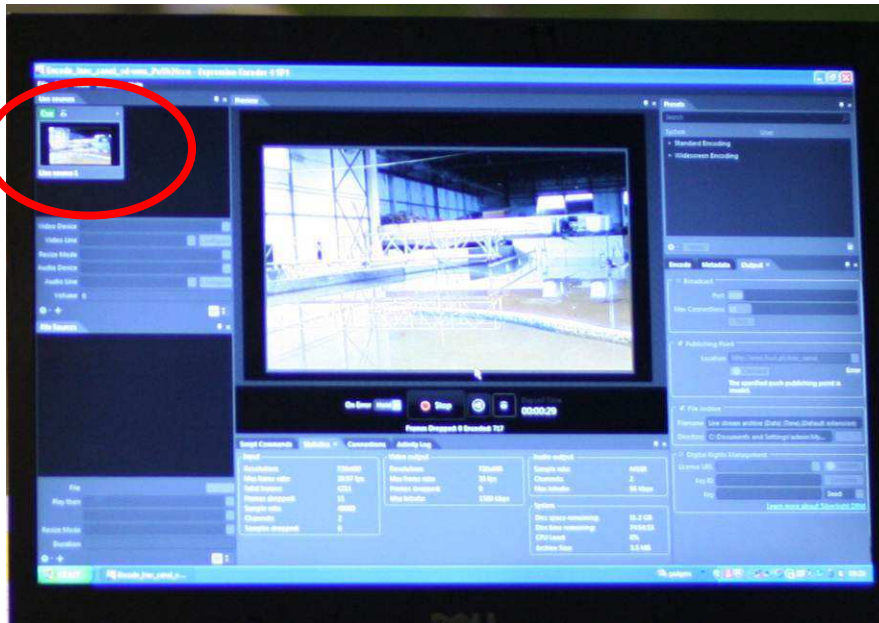


Figure 10 – Using Microsoft’s® Expression Encoder 4 software: View of the active job “Encode_LNEC_canal”.

- Activation of the wave generator at the wave basin to generate waves (Figure 13)



Figure 11 - TO12 tank. General view of test operation.

- Click start button at Microsoft’s® Expression Encoder 4 (Figure 14a). After a while, an authentication window appears where server’s username and password should be provided (Figure 14b).
- This will begin the video streaming at the <http://wms.fccn.pt/lneccanal> server (publishing point), Figure 13.

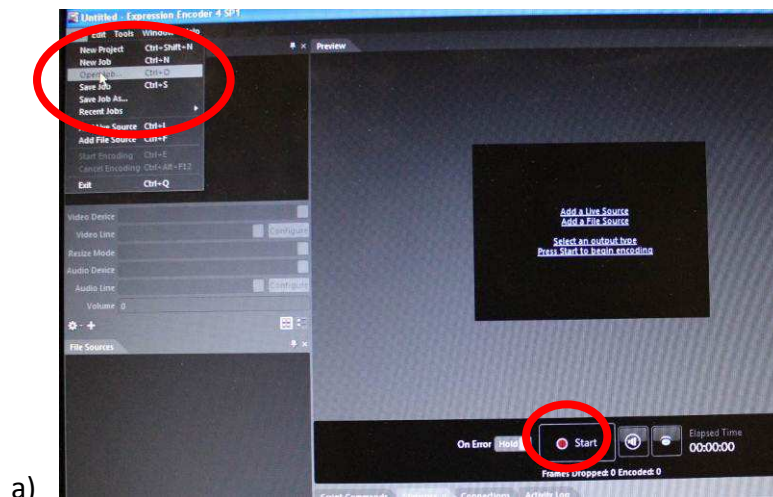


Figure 12 - Using Microsoft's® Expression Encoder 4 software: a) Click start button
b) Authentication window.



Figure 13 - Video streaming on Microsoft's® Expression Encoder 4 software.

Broadband internet access is recommended to guarantee high quality transmission. In the present experiences LNEC's Ulisses wi-fi network was used. During the video

stream a video file is stored in the publishing point, as well as in the computer disk (Figure 14).

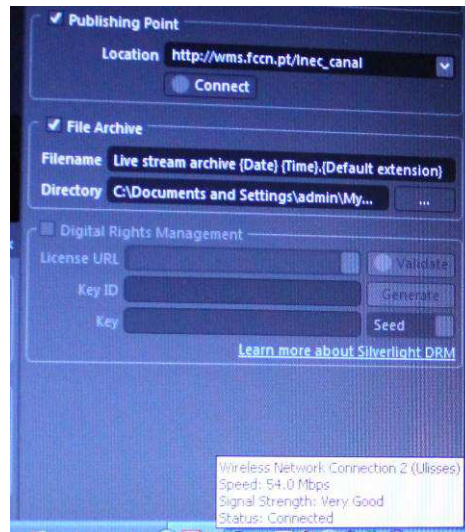


Figure 14 – Internet access using local 54 Mbps wi-fi network.

Access to the web address: <http://wms.fccn.pt/lneccanal> (Figure 18). During the 6th experience, a computer, outside LNEC's network was used by using Windows media player (WMP) through Internet Explorer (IE), in a PC system.

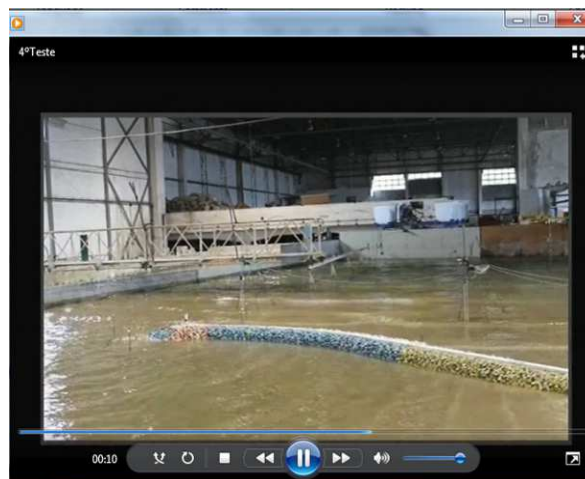


Figure 15 - 6th experience. Windows Media Player playing video at 1600 Kbps at a user's terminal.

3.5 Results

The experiences produced video files of the whole experiences. From these results one may:

- Evaluate the performance of the video transmission.

- Identify the main problems.

The main conclusions arising from the 6th experience were:

- An adequate image quality of the video images was attained at all times;
- No image freezing occurred. This could be a typical network problem but in this experience that was not the case. LNEC's internal network speed should theoretically guarantee 100 Mbps but in reality, on some conditions (high traffic levels and users) a much lower throughput was sometimes available. A solution to this problem is to update existing network cables (coaxial) to optical fibre;
- A delay of around 20 s was apparent.

User Francisco Silva's Internet and computer characteristics from the consultant company PORTOS DOS AÇORES, located at Faial Island - Azores (Portugal), were the following:

COMPUTER CHARACTERISTICS: Fujitsu laptop: Intel (R) Core (TM) i5-2450M CPU@2.50 GHz 2.50 GHz. RAM: 4 GB, 64 bit

INTERNET CHARACTERISTICS: Cabled proxy dependent ADSL 8MB.

4 Conclusions

This report describes the sixth experience on remote access made at the TOI2 wave tank on the 6th of March 2013. The experience took place on the maritime hydraulic installations of the Harbour and Maritime Structure Division of the Hydraulic and Environmental Department of the National Laboratory of Civil Engineering.

The methodology used is based on the use of a film camera installed at the flume or tank, which is connected to a PC computer where the software "Microsoft Expression" capture video resides and where video are images and decoded and sent to a server via HTTP. This server will then enable real-time streaming over the internet, enabling a direct, quasi-real-time access to the video from web users.

The main conclusions arisen from this set of tests were the following:

- Methodology is appropriate for 3D scale model tests;
- Methodology is very simple and easily portable;
- The end-user who collaborated in this test confirmed good image quality reception and almost no dropped frames or freezing images;
- LNEC's web page for RADE project can be accessed at

http://www.lnec.pt/organization/dha/npe/estudos_id/RADE/index_html/?searchterm=RADE

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- [1] Capitão, R.; Silva, C.; Fortes, J.; Lemos, R. (2012). “HYDRALAB IV – Remote Access to Experimental Facilities. RADE - First Results” - NPE, LNEC.
- [2] Capitão, R.; Fortes, J.; Lemos, R. (2012). “HYDRALAB IV – Remote Access to Experimental Facilities. RADE - Second and Third Experiences on Remote Access” - NPE, LNEC.
- [3] Lemos, R.; Fortes, J.; Capitão, R. (2012). “HYDRALAB IV – Remote Access to Experimental Facilities. RADE – Fourth and Fifth Experiences on Remote Access” - NPE, LNEC.

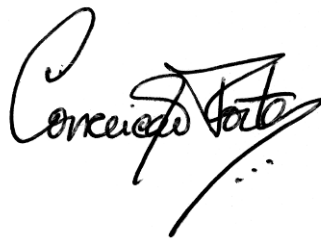
Lisbon, May 2013

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APPENDIX I

Comments on the 6th experience, from the collaborators



Date: Wed, 6 Mar 2013 15:46:09 +0000

From: Francisco José Melo Silva <fsilva@portosdosacores.pt>

To: Juana Fortes (jfortes@lnec.pt) <jfortes@lnec.pt>, Luís Gabriel Silva (lgsilva@lnec.pt) <lgsilva@lnec.pt>, Rute Lemos (rlemos@lnec.pt) <rlemos@lnec.pt>


Caro/as

Conforme solicitado, abaixo descrevo as características da rede interna da PA e do meu PC Fujitsu (portátil):

- Rede: ADSL 8MB com proxy (tem que ser desactivado para poder visualizar o vídeo)

- PC:

Sistema

Classificação:	 Índice de Desempenho Windows
Processador:	Intel(R) Core(TM) i5-2450M CPU @ 2.50GHz 2.50 GHz
Memória instalada (RAM):	4,00 GB (3,89 GB utilizável)
Tipo de sistema:	Sistema Operativo de 64 bits
Caneta e Toque:	Não está disponível Introdução por Caneta ou Toque para este Ecrã

Definições de Nome do Computador, Domínio e Grupo de Trabalho

Nome do computador:	HORPT7P04
Nome completo do computador:	HORPT7P04.portosdosacores.local
Descrição do computador:	
Domínio:	portosdosacores.local

Melhores cumprimentos e continuação de bons trabalhos.

Francisco Silva