ePresence: An Open Source Interactive Webcasting and Archiving System for eLearning

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Abstract: ePresence is a system for interactive webcasts that are accessible in real-time by remote viewers and retrospectively by archive viewers who can browse and search for what they want to see. It is an open source system implemented using .NET technology that currently works with Windows and Linux servers and supports a wide variety of machines, operating systems, browsers, media engines, and bandwidths. We discuss current system features and projects for eLearning, eHealth, and corporate communications and training. Emphasis is placed on demonstrating the interface and capabilities, on presenting and explaining selected client work, and on discussing the advantages of open source for eLearning. Further details about the system architecture and implementation, and about research intended to develop new capabilities, appears in the companion paper "The ePresence Interactive Webcasting and Archiving System: Technology Overview and Current Research Issues" by Baecker, Wolf and Rankin.

The ePresence System

ePresence is an integrated hardware and software webcasting and event archiving system. To facilitate scaleable communications and knowledge sharing at a distance, we are engaged in research to make Internet visual communications:

• engaging, delivering rich media
• interactive
• accessible in real-time and via archives
• useful for knowledge building and sharing.

The result has been a viable and innovative webcasting infrastructure called ePresence (Baecker, 2002; Baecker, 2003; Baecker, et al., 2003). ePresence currently includes support for:

• video, audio, slide, and live desktop demos;
• slide review;
• moderated chat, private messages, and the submission of questions; and
• the automated creation of structured, navigable, searchable event archives.

ePresence also allows configurable live and archive interfaces through tailorable "skins". The media capturing and streaming engines run under Windows or Linux; client viewers exist for the IBM PC, the Macintosh, and Linux workstations. Media may be transmitted using Windows Media, Real Media, and MPEG4. The software is highly modular, and is soon to be released open source. More detail about the system architecture and implementation and current research directions may be found in the companion paper Baecker, Wolf, and Rankin (2004).

User Interface – Live Webcasts

ePresence allows remote viewers to watch live video streamed over the Internet, synchronized with presentation media or live demos**.** The current live webcast interface is illustrated in Figure 1. The video window and its controls are in the upper left; the slide window and its controls are on the right; the chat system is at the bottom. Slide controls allow a remote viewer to review slides previously presented by the speaker. The chat system supports public chat, private messages, and questions to the speaker. Requirements for remote viewers are kept to a minimum. Internet access can be at speed as lows as 56K, although higher-speed is preferable. Viewers may have a PC or a Macintosh; QuickTime, Real Media or Windows media players; and any browser. For first time users there is a registration and system check procedure to ensure technology compatibility in advance.
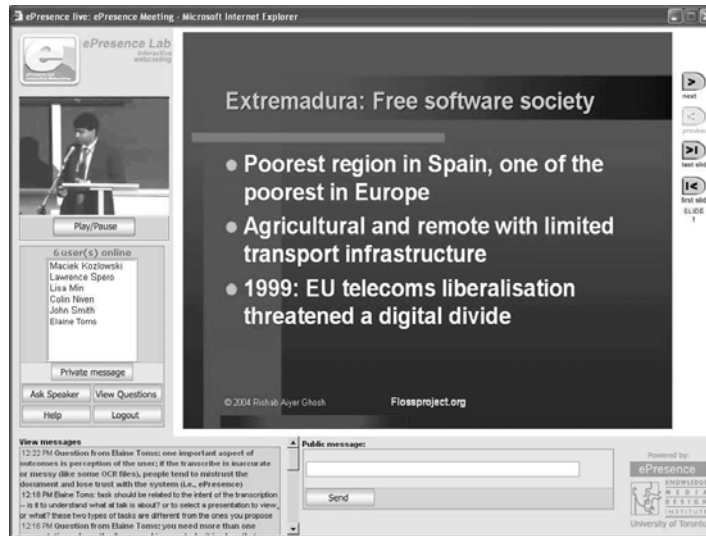
Figure 1. A screen shot from a live webcast

User Interface – Archives

Archiving is an essential component of the ePresence system. It provides viewers with the opportunity to revisit an event previously attended, or view an event they may have missed. Viewers can watch an entire archive or just review a segment using the search and navigation features. The archive interface includes a structured table of contents of the event (Figure 2a, left side and close up Figure 2b). The table of contents is a navigable, two-level hierarchical list and includes slides, desktop demos and other media presented by the speaker. Archive viewers can also navigate by a timeline (Figure 2, bottom). The top level of the structure is represented as a "Chapter," and the second level is represented as a "Slide." In the table of contents "Chapters" appear as the darker coloured font and "Slides" appear as the lighter coloured font. The two colour hierarchical structure is also represented in the timeline. When you cursor over the timeline the Chapter and Slide titles appear automatically. The marks along the timeline indicate where each occurs during the presentation. Chapter titles can be input by a moderator during the talk or afterwards using ePresence Producer (Figure 6). Slide titles are generated automatically from Powerpoint in cases where it is used; they too can be input or edited using ePresence Producer. Archive viewers can search within a particular archive or across a repository of archives based on key words in the slides when Powerpoint is used. For particular archive searches the results appear as long vertical blue lines along the timeline (Figure 3). Results for a global search of an archive repository appear as a list, indicating all of the archives where the search word appears.
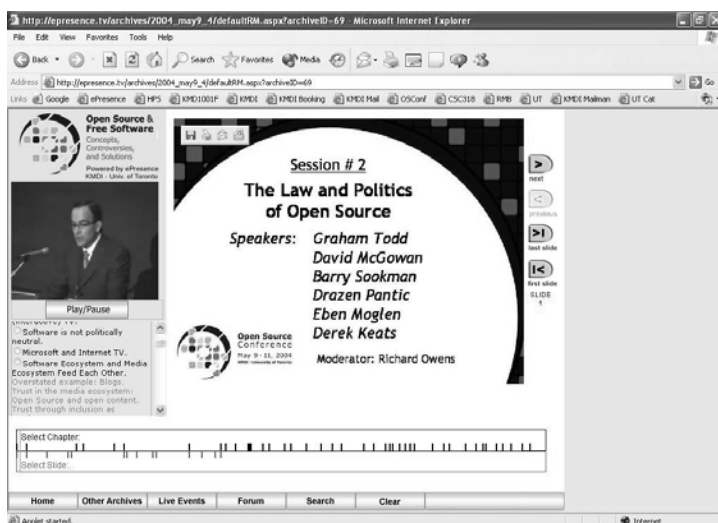

Figure 2a. A screen shot from the archive interface
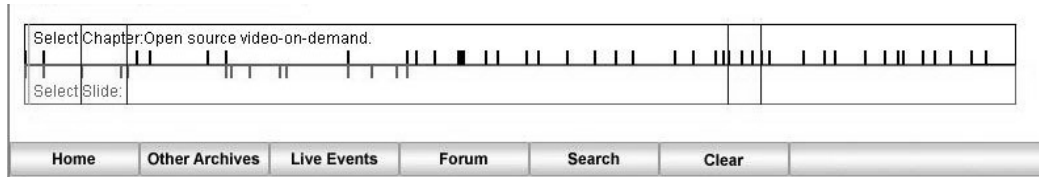
Figure 2b. Close-up of table of contents

Figure 3. A screen shot of search results as they appear on the timeline

Webcasting a Live Event

Equipment required to webcast a live event is standard off-the-shelf computer hardware and audio/visual equipment (Figure 4 shows the equipment for a medium-scale webcast, with the video camera not shown). Live events can range from small-scale single camera, single microphone, single stream productions to large-scale multi-camera, multi-microphone, multiple stream events. ePresence supports multiple encoders (Figure 4, bottom) enabling one or many real-time streams to run in parallel with a set of web services that collects event stream information and saves it as an XML file. The live event software has many other features. It not only allows for remote audience participation, but also supports remote speaker participation. The remote speaker can deliver a presentation from her location using a webcam, videoconference unit or a telephone. She controls her presentation for both local and remote audiences through the Remote Slide control software (Figure 5). Another feature of the Live Webcasting software is the Live Demo module. Designed to enhance corporate training and customer service capabilities, the Live Demo software allows speakers to deliver live software demonstrations or Web tours over the Internet. It requires the module to be installed onto the presentation laptop.
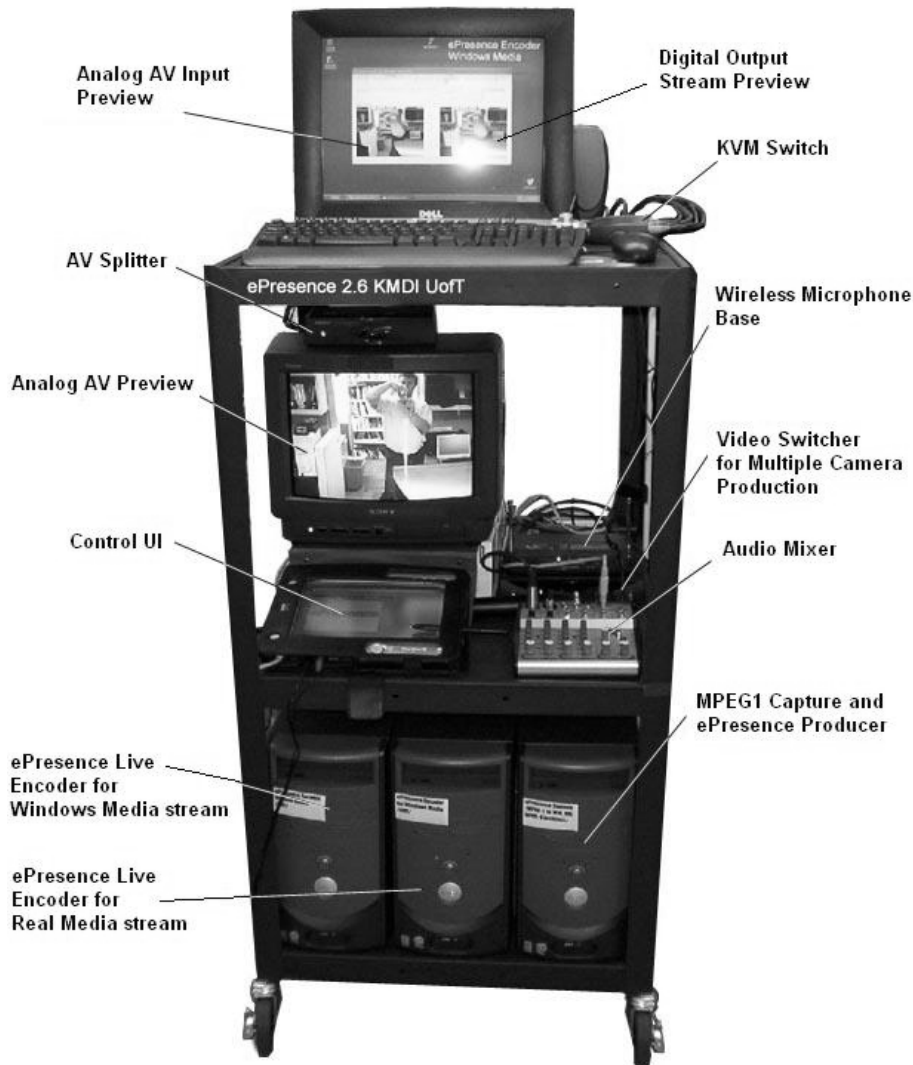

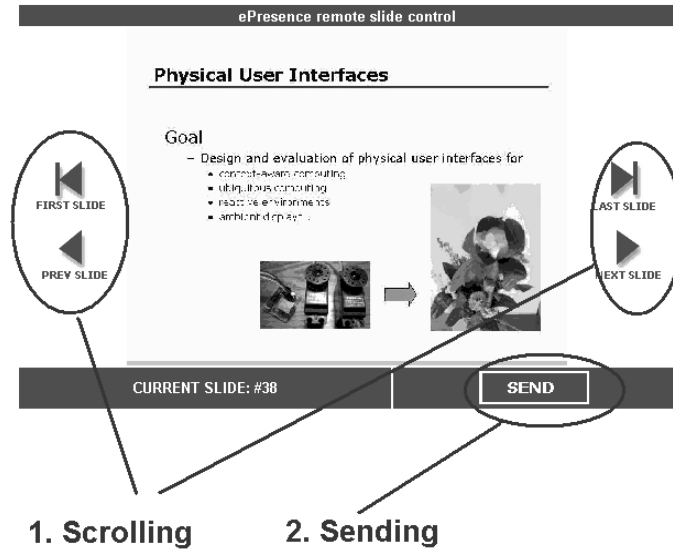Figure 4. The ePresence production cart for medium-scale webcasts

Figure 5. Screenshot of remote slide interface

Producing the Archives

After the event the XML file is used to produce the event archive using the innovative postproduction module, ePresence Producer (Figure 6). Designed to simplify postproduction, ePresence Producer allows you to:

- Reproduce your event, and all associated materials, such as video, audio, slides and live demos
- Resynchronize event slides
- Make corrections to chapter and slide titles in the table of contents
- Choose from a selection of archive templates
- Encode captured video into multiple streaming formats
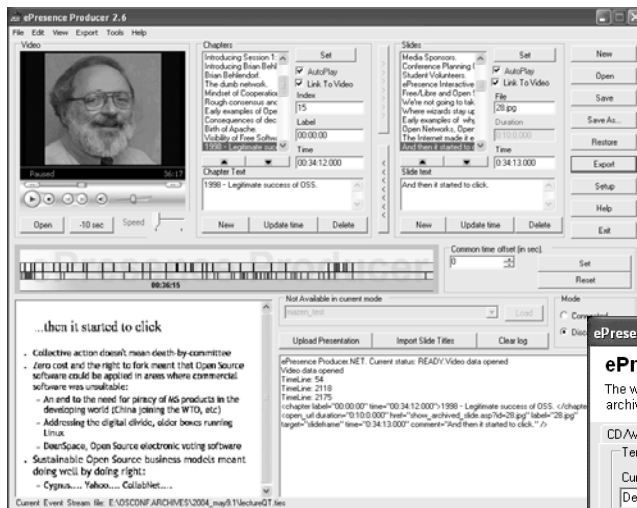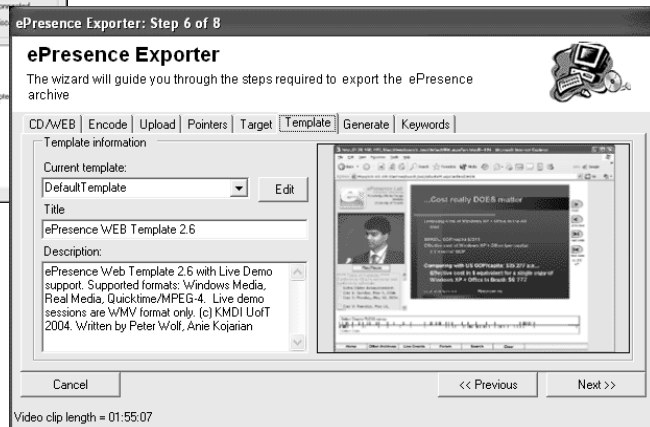- Export the archive to the web or to CD (Figure 7).

Figure 6. A screen shot of the ePresence Producer interface

Figure 7. A screen shot of the ePresence Exporter interface

ePresence Client Projects

ePresence has already been used for a wide variety of events, for example, the Knowledge Media Design Institute's 3-day international conference entitled "Open Source and Free Software: Concepts, Controversies, and Solutions," (see: http://opensourcelive.net) press conferences, political forums, continuing and distance education, and eHealth. However, it is in the latter two areas where we see ePresence having the greatest impact.

The Telehomecare Project
During the Fall of 2003 we were contracted by Centennial College to help produce multimedia training modules for their East York Telehomecare Project. The overall goal of the project was to use new technologies to assist with remote and in-home patient visits. Implementing telehomecare required both patients and nurses to learn new skills as they adopted these new technologies. One such example is the training module created for homecare nurses entitled, "The Patient Station" (see: http://thc.kmdi.utoronto.ca/). This module demonstrates the patient station to the nurses, explains how it works, and how and where to install the unit in the patient's home. In addition to training modules like this one, the Telehomecare project also has in its archive repository multimedia records of meetings and seminars. Most of our work on this project was accomplished using ePresence Producer. However, when Centennial College and its partners were ready to launch the project to the public, ePresence delivered the press conference live over the Internet (see: "The East York Telehomecare Showcase" http://thc.kmdi.utoronto.ca/).

The Educational Computing Division of the Faculty of Medicine, UofT
Instead of contracting us to produce events and archives, the Faculty of Medicine decided to adopt an ePresence system of their own. After some initial support with the software installation and live production the Faculty of Medicine began using their system independently for the continuing education of healthcare professionals such as psychologists and physicians involved with geriatric care. The Faculty also produces live webcasts of publicity events (see: "June 16, 2003 Senator M. Kirby`s talk and awards ceremony" http://epresence.med.utoronto.ca/).

The University of Trento, Italy
The University of Trento was among the first organizations to adopt an ePresence system. Trento has successfully used ePresence to webcast a variety of courses, including C++ Programming, Software Engineering and Distributed Systems, for 2 years (see: http://ortles.dit.unitn.it/). Students enrolled in these courses can view lectures live or use the archives as a resource when completing assignments or when studying for exams.

Current and Planned Research
There remain many research challenges and opportunities. Some examples of current and planned research include: the implementation of a portable ePresence archive viewer on a Pocket PC; the use of voice over IP with spatial audio (Kilgore, et al., 2003) for discussions among remote viewers and ultimately also questions to the speaker; further studies of how viewers use structured, navigable, searchable archives (Dufour, et al., 2004); and the automatic recognition of speech and especially of the keywords on the audio track. More details for planned research may be found in Baecker, Wolf, and Rankin (2004).

Open Source Projects in eLearning

As of the writing of this paper (15 Sept. 2004), plans are well underway to release ePresence under a dual license open source framework by December 2004 or January 2005.

Our primary reason for pursuing the open source approach is to give ePresence adopters maximum flexibility in tailoring the system to their needs. This is particularly important in eLearning, where appropriate technology must fit the organizational culture and philosophy of an educational institution. Feedback from early adopters suggests that this will be an important source of differentiation from an already crowded marketplace of proprietary software vendors. It also seems to be the best strategy to allow the technology to be adopted by individuals and small groups who want to participate in eLearning but lack the infrastructure and means to adopt a proprietary solution.

Another advantage of the open source model is the enhanced opportunity for testing and improving the technology. We are motivated to form a strong community of institutions and individuals who will collaborate on future research and development. This is in keeping with the mandate of many institutes of higher education. For examples of some anticipated open source projects likely to be of interest to the community, see Baecker, Wolf, and Rankin (2004).

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- Caseware International, and
- Informedia s.r.l.

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