

ELSNET Video Conferencing

Niels Ole Bernsen, Hans Dybkjær and Laila Dybkjær

Centre for Cognitive Science, Roskilde University

PO Box 260, DK-4000 Roskilde, Denmark

emails: nob@cog.ruc.dk, dybkjaer@cog.ruc.dk, laila@cog.ruc.dk

Phone: +45 46 75 77 11 Fax: +45 46 75 45 02

In March 1996 someone at the Centre for Cognitive Science (CCS) at Roskilde University found an announcement for COMPULOG NET on the Web. The announcement said, among other things, that it is planned that all COMPULOG NET sites in the future should have desktop video-conferencing facilities to enable computer supported cooperative work between nodes. As a prelude, COMPULOG NET planned to install a few desktop video conferencing systems at selected nodes on a trial basis.

Having done analyses of several 'Media Space' experiments from around the world in the Amodeus-2 project, we found this an interesting and potentially useful way of cooperating among the nodes of a European Network, and proposed to Stewen Krauwer, the Coordinator of ELSNET, that ELSNET should take a similar initiative. We offered to take the next step if ELSNET found the proposal worthwhile. ELSNET might investigate the potential of computer supported and computer mediated cooperative work as a means of reducing the travel costs involved in European collaboration and increasing the interactivity between its nodes as well as between ELSNET and other Networks of Excellence (NoEs).

Steven found the proposed action well motivated and encouraged us to apply for an ELSNET grant for the purpose. The present report describes our experiences on video conferencing. Section 1 presents the proposal which was submitted to and approved by ELSNET. The proposal text shows the background of the work and the frame within which it was carried out. In Section 2 we discuss our choice of video-conferencing equipment. Section 3 presents the pilot work in terms of experiences from using video conferencing for everyday collaboration. Section 4 concludes the report. Section 5 provides definitions of some of the most frequently used terms related to video conferencing.

1. A proposal to explore video conferencing

We submitted a proposal to ELSNET that briefly described the proposed action, adding the following details:

Objectives:

- increase the interactivity between ELSNET nodes, in particular the sites not represented at ELSNET's Executive Board (EB);
- establish a concrete collaboration point in another NoE, viz. CompuLog;

- experiment with the potential of tele- and networking technology.

Rationale:

Face-to-face interactivity of ELSNET includes management and strategy meetings, scientific workshops, ELSNET conferences, industrial training activities, summer schools etc. Except for the management (EB) meetings, these activities are open to non-EB and even non-ELSNET sites. In between such meetings people communicate via email, phone and fax, and information is distributed via paper newsletters (Elsnews), electronic mailing lists and the World Wide Web (WWW). The WWW is continuously improving but is best suited for passive information presentation and reception of some kinds of user feedback. For more interactive explanation and negotiation, phone, email and fax are preferable, within their respective limitations.

Today, tools have been developed that support teleconferencing, collaborative writing, distance learning and other cooperative work. Key generic applications are video conferencing, whiteboards and application sharing. Commercial systems of these kinds have recently entered the market place at prices ranging from 1 to 35 (or more) Kecu per partner site. Their potential for improving distance cooperation and increasing productivity at reduced costs show great promise by, e.g., enabling people to simultaneously see and talk to each other, write and draw on the same electronic white-board, and even share the same standard applications while not having to spend time and money on travelling.

However, experience with large scale use of these tools and with the long-term effects on social and working conditions hardly exist at this point. On the other hand, many laboratories—among which CCS—have initiated or are planning to initiate experiments with collaborative networking, media spaces etc. Among NoEs, COMPULOG NET is planning that all sites should have desktop video conferencing facilities to enable computer supported cooperative work between its nodes.

Through introducing the use of video-conferencing and application sharing, ELSNET will be able to increase inter-node activity, accumulate experience with modern communication and cooperation methods and, by tying the activity to the COMPULOG NET initiative, increase collaboration with another NoE.

Work plan:

- We will set up the equipment at CCS and two other ELSNET sites, one non-EB academic and one industrial site. Experimentation will be partly through intra-ELSNET collaboration and partly through collaboration with COMPULOG NET sites. The plan to be realised is as follows:

- Initial phase:

- search the market place for suitable systems;
- locate the two other ELSNET sites to be included;
- coordinate activities with COMPULOG NET.

- Equipment:

- buy and install at each site a video-conferencing and application sharing system.

- Experimentation:

The three ELSNET sites will collaborate with each other and, whenever relevant, with COMPULOG NET sites.

- Reporting:

After 5 months CCS will submit a written report to the ELSNET EB on the experiences gained. Attached to the report will be a proposal for ELSNET 2 activities in the area.

2. Choice of video conferencing equipment

In April 1996 we received a grant from ELSNET and a contract was set up on the basis of the above description. In the following period we had close contact to David Pearce who coordinates COMPULOG NET. This allowed us to follow the decision process of COMPULOG NET concerning which equipment to buy, and why. We also went to the Danish distributor of the video conferencing system ShareVision to have a demonstration.

Broadly speaking, three different types of video conferencing equipment are on the market. These three types are based on external hardware, such as Eris, internal board-based equipment, such as ShareVision, and Internet-based software, such as CU-SeeMe, respectively. The two first-mentioned types are commercial whereas some Internet-based video conferencing software can be downloaded for free. Board-based equipment is not as easy as external hardware-based equipment to move from one computer to another.

Most equipment runs on only one of the platforms PC, Mac and Unix, which of course reduces the possibility of people using the same equipment across companies and research institutes. Moreover, several protocol standards exist. Protocol standards specify how to transfer video signals, audio signals and signals from external devices such as mouse and keyboard. In order to allow full application sharing it is required that all participants can transfer and receive these signals. Only if different brands of equipment conform to the same standards are they able to communicate with each other.

The COMPULOG NET group, being ahead of the ELSNET investigation, decided to purchase a video conferencing system called Eris from RSI Systems Incorporated. We decided to purchase Eris as well for at least the following reasons:

1. It runs on two different platforms (PC and Mac) already and is being planned to run under Unix.
2. In several public tests of video conferencing equipment Eris received strongly positive evaluation.
3. Eris is based on external hardware connected to the computer via an SCSI cable. This means that Eris can be easily moved from one computer to another.
4. Eris is telephone-based and requires an ISDN connection. ISDN is fairly expensive but provides a faster and more stable connection than the ordinary telephone line. This means that Eris has better video quality.
5. The COMPULOG NETWORK had decided to buy Eris. If we did the same we would have a chance to test video conferencing across Networks.
6. An inquiry among ELSNET nodes did not show convergence on any particular alternative video conferencing platform.

7. RSI has a declared commitment to follow international video conference standards. This means that they will conform to protocol standards concerning and promote the possibility of communication with other video conferencing systems.

The drawbacks of Eris are:

1. It does not allow full application sharing as provided by, e.g., ShareVision. Eris only allows the conference participants to view the same window but not to (jointly) write into it.
2. Multipoint, which is the possibility of having more than two participating sites in a video conference, is only indirectly supported since a server is required. RSI recommends the MCU from VideoServer in Boston. We understand that use of a multipoint server can be quite expensive but do not have exact figures.
3. Eris is fairly expensive. We paid about 4 Kecu per unit.

Originally, we intended to offer equipment to the nodes involved in the Dialogue Annotation (DA) work funded through another ELSNET grant. Two problems prevented this, however. First, there were more DA nodes than we could afford to offer equipment. Actually, we could only offer to cover part of the expenses of one or two sites given the price of the Eris equipment. Secondly, it turned out that Stuttgart, who was our main DA collaborator, already had Internet-based video conferencing equipment and therefore was less interested in Eris.

We also wanted to test the equipment ourselves before recommending it to other ELSNET nodes. Unfortunately, we had difficult and prolonged problems in making Eris work at all. As there is not yet a Danish Eris provider, we had to solve these problems ourselves through endless experimentation with the software and a long series of lengthy communications with the US producer of Eris, the British provider, and the Danish Telecom which delivered the ISDN equipment. None of them would admit to having caused the problems. On one particular day we had three people from Danish Telecom searching the university's wiring system for two hours with sophisticated equipment until they finally found what they were looking for behind the wall at the loo! As it eventually turned out after about three months of effort, the problems were mainly caused by an error in the ISDN equipment. Someone working somewhere else in Danish Telecom knew that there was a problem with the type of Siemens Euro-ISDN box that was installed at CCS but since the problem had not shown up so far, none of their people in the field had been told about it. However, this appears to have been a very special problem. Eris itself is extremely simple to connect to the computer via an SCSI cable. The Eris software is very simple to install and normally it works at once without any problems. Still, if there is no Eris provider in your country, you should better prepare for everything.

When our equipment finally worked, most of the DA work had already been carried out. For this and the other two reasons mentioned above we looked for another ELSNET node with which we had ongoing collaboration. Edinburgh was asked to join in because we have ongoing collaboration with them on how to build Web facilities. Edinburgh accepted and in the following we describe our experiences from our joint video conferences.

3. Description of the pilot work done

We have had an estimated 6 video conferences with Edinburgh over the last two months. The conferences were mostly concerned with the Edinburgh Glossa Web facility work and its future

planning, including work to be done in ELSNET-2 and collaboration between this ELSNET activity and planned work in i3net. We also had a video conference with David Pearce from COMPULOG NET on their experiences with the use of video conferencing. The following three sub-sections highlight three points which stand out on the basis of our own experiences from the collaboration with Edinburgh. Sub-section 3.4 presents Edinburgh's experiences. Sub-section 3.5 summarises our video conference with COMPULOG NET.

3.1 Usability

In our experience, the Eris system is usable for ELSNET collaboration. When using the system, one may choose different window sizes for viewing the collaborator at the other end of the line. There are three standard window sizes but otherwise the size may be varied at will. When using the smallest standard window size, there actually is synchrony between the collaborator's lip movements and his/her speech. This synchrony disappears with larger window sizes, which severely damages usability. Eris apparently requires a fast graphics board to function smoothly with a large window size. However, when using the smallest standard window size, and after getting used to the system, the impression is one of being together in the same room. The effect is one of having a much more relaxed conversation than is possible on the phone. This is supported by the fact that Eris, using ISDN technology, provides constant-quality image and sound throughout the interaction. The net result is that video conferencing is much more conducive to getting complex collaborative work done than when only the telephone is being used. We therefore want to use the equipment as much as possible in the future.

3.2 Economy

The Eris system is rather expensive. We are trying to obtain estimates of future price reductions from the provider. However, even now, it seems clear that the investment can be returned given a modest amount of collaboration between different sites. The investment corresponds to about 10 stays abroad at economy fare. If one argues that these 10 stays are, say, 2.5 times as effective as one 1-hour video conference, 25 videoconferences are needed to recuperate the investment. Given, say, four close collaborators across Europe and 6 to 7 videoconferences with each of them during one year, the investment will have been recuperated during the first year. Note that the trade-off just computed does not take into account one factor which is at least as important as the travel cost, namely people's time. It takes virtually no time to set up a video conference, the only effort involved being one of agreeing in advance, for instance by email, when to have the conference.

This is not all. We have ongoing collaborations with people in Edinburgh on a variety of topics: Ewan Klein and others concerning the Glossa system, Ewan Klein concerning ELSNET research and research planning, Jean Carletta concerning corpora and speech acts, John Lee concerning multimodality, Marc Moens and Jean Carletta concerning our joint HCM project on dialogue etc. Several of these colleagues were also present during the conferences. Ewan Klein sometimes had fellow Glossa workers present during the video conferences. The same amount of conversation with several people could of course have been accomplished had we gone to Edinburgh by plane. However, we have constantly been several people present on our side during the conferences as well. This means that each video conference, in effect, replaces several people travelling. And this, again, means that recuperation of investment (and saving of time) is faster than was calculated above. During a video conference, one can have all the relevant expertise on each site represented

in front of the screen, which is actually preferable to sending one person over from one site to another. On the same point, if some relevant piece of material has to be fetched from someone's office and brought into the video conferencing room, this is easily achieved on both sides, whereas it could only be achieved at the host site in the travel-over-by-plane scenario.

So, even if the Eris system is, at the moment, only able to easily and relatively inexpensively link up two sites, the number of relevant people it can link up is much higher in practice.

3.3 Application sharing

Eris does not allow real application sharing at the moment. People from two sites cannot simultaneously *use* the same running program. What Eris does allow, is to put up something on the screen at one site and let the people at the other site view, point to and discuss what has been put up. We made use of this feature when discussing the Glossa Web pages and their architecture. Ewan would put up a Glossa Web page and it would be discussed among the two sites just as if both parties had been sitting in front of the same screen.

3.4 The video conferences from Edinburgh's point of view

Edinburgh CCS/HCRC welcomed the opportunity to test the Eris system; although we had some experience with video-conferencing systems in the past, it had been rather haphazard. The Eris system came well recommended, and we appreciated the effort that Roskilde CCS had invested in researching the issue.

An ISDN line had already been set up in CCS/HCRC for another video-conferencing system (which turned out to be unusable) and installation of the Eris hardware and software was pleasantly easy. Opening a connection to Roskilde was also quite straightforward.

Edinburgh employed the system to contact Roskilde on three separate occasions within a space of three weeks, and found it surprisingly useful. There really does seem to be added value in seeing who you are talking to (even at 4 to 8 frames per second), and we had some fruitful discussions about ELSNET strategy. Although the Eris system is primarily designed for one-on-one discussions, it is quite usable with two or three people at each end, as we discovered.

Since we are not yet in a position to install Eris boxes on individual's desks, holding a video-conference requires a certain amount of scheduling. Although this is an obstacle to spontaneity, it does mean that you set aside an adequate block of time for the discussion, and that needn't necessarily be a problem. But you therefore need to have something serious to talk about to make the extra effort. In general, I believe that much of the discussion required for carrying out ELSNET tasks could be effectively transacted via video-conference rather than having to fly out to your colleague's institute. Consequently, I would strongly support the greater use of this technology within ELSNET: it partly offsets travel costs, it is less stress than travelling, and the ecological effect is, I guess, quite benign compared to air travel.

3.5 COMPULOG NET

We recently had a video conference with David Pearce for mutual updating on the experiences of using Eris in the two networks. COMPULOG NET purchased six Eris units, four of which have been installed. One node is waiting for the Unix version and one unit was returned. Experiences in COMPULOG NET on the use of Eris are still limited. David Pearce reported that he had had positive experience when using Eris during the preparation of a workshop and for preparing a video film in collaboration with a company in the UK. The video conferencing equipment allowed

him to easily inspect and comment on early versions of the video film. Right now COMPULOG NET is waiting to see what RSI can offer. Communication with RSI has been a bit difficult for both of us since RSI closed their office in the UK in autumn of 1996. David Pearce was referred to a contact person in Germany whereas we were referred to the following address:

Greg Craven, Director of European Operations
RSI Europe
Postbus 59366
1040 KJ Amsterdam
Netherlands
+31 20 301 2235 Tel
+31 20 301 2202 Fax
100533, 2675@compuserve.com

4. Conclusion

We recommend to consider significantly increasing the use of video conferencing within ELSNET. Eris has demonstrated satisfactory usability even though its usability merely represents an acceptable minimum compared to ideal requirements; and it seems clear that costs in terms of travel and time can be saved for the sites that have Eris. Evidently, once multi-site connectivity and/or application sharing have become possible, video conferencing will be likely to save significant amounts of money and time for ELSNET, as well as enabling increased-intensity collaboration across the network.

A central question is which equipment ELSNET should decide on using. The Eris system lacks real application sharing and only allows Multipoint via an MCU server. However, the biggest problem, it seems to us, is that it is not possible to upgrade Eris. Recently, RSI introduced a new product called *Eris 1000 Computer-Free* which has stand-alone software built into the engine. This makes it possible to plug the device directly into a monitor and an ISDN line, and then have a video conference without using a computer. Another product, which represents the next RSI generation, is the *VideoFlyer 2000*. This product will transmit at 384 kb/sec. instead of Eris' 128 kb/sec. It will be T.120 compatible and will have a whiteboard. It comes as either computer-based or computer-free and can be used with 1, 2 or 3 ISDN lines as well as an analogue phone line. VideoFlyer should be available in Europe from around March 1997. The list price will be approximately 5 Kecu, i.e. about 1.6 Kecu more than the list price of Eris. However, this improved functionality can only be had by buying a brand new system even if one already has an Eris system. We will inquire with Eris if ELSNET can make a favourable deal and to what extent RSI plans to enable upgrading in future products. Upgradability is important. Without it, systems quickly become outdated. Only if RSI can promise more continuity in the future products can we recommend systems from this company.

The quality of Eris is good compared to other phone-line-based and Internet-based video conferencing equipment. The quality, of course, cannot match high-bandwidth equipment but this would be too expensive to consider for ELSNET anyway.

Alternatively, one might argue that ELSNET should not decide on any specific product at first but rather on whether equipment should be based on the telephone line or on the Internet and which standards to conform to. The precise brand of equipment does not matter so much from an overall

communications view point as does the protocol used by the equipment. Systems using the same protocol can communicate. Voice and video quality, on the other hand, depend on equipment and mode of connection.

So what we propose is the following:

1. We will raise the issues noted above with RSI.
2. i3net is in the process of finalising a survey of Internet-based communications software including video conferencing systems. The survey will be available at <http://www.i3net.org>. We will benchmark promising systems against Eris. If, as we suspect, Eris comes out on top because of its ISDN technology which appears to be the only low-cost technology that can currently deliver a minimum of usability, then ELSNET should seriously consider purchasing a number of *VideoFlyer 2000* systems.

5. Definitions

Video conferencing:

Video conferencing offers as a minimum the possibility that people at different sites can simultaneously talk together and see each other. In many cases video conferencing also offers application sharing.

Video conferencing systems:

Are systems which enable video conferencing. We shall disregard advanced LAN and other systems which require Megabit connections and concentrate on currently affordable systems. Some of these systems use the telephone line (POTS or ISDN) while others use the Internet. The former systems are either board-based or use an external hardware unit. Platforms may be Mac, PC or Unix but typically a system only runs on one or at most two of these platforms. Examples:

The Eris system from RSI is ISDN-based and uses an external hardware unit. It runs on PCs and Macs. A Unix version is planned. Price: approx. 4 Kecu.

ShareVision from CreativeLabs is board-based and communicates via an ordinary telephone line. It runs on a windows PC. Price: approx. 1.5 Kecu.

CU-SeeMe is Internet-based. It runs on Mac and PC. Price: can be down-loaded for free from the Cornell web site: <http://www.indstate.edu/msattler/sci-tech/comp/CU-SeeMe/index.html>.

Multipoint:

Multipoint means that the video conferencing system allows more than two sites to be connected and participate in the same video conference. Point-to-point systems allow only two participants at a time, but may mimic multi-point communication via calls to a multi-point server.

Application sharing:

Application sharing allows as a minimum a video conferencing participant to share a selected document with the other participants in the sense that they can all see the document and all participants can see if somebody points to the document. Full application sharing requires that any participant can write into a shared document while the others can see what happens.

Whiteboard:

The video conferencing system may have a built-in facility for writing and drawing in a shared window. With full application sharing the whiteboard functionality may be achieved via, e.g., an external drawing program.

Video conferencing standards:

The most important standards are the following three:

H.243: This standard covers Multipoint Control Units and defines the MCU protocol standard.

H.320: The dominant video conferencing standard developed by the ITU-T (International Telecommunications Union - Telecommunications Standards Section). It is a standard for describing video conferencing terminals but the term H.320 has come to represent a whole suite of specifications for enabling compliant video conferencing sessions. It was originally adopted for room-based video conferencing and for digital lines such as ISDN.

T.120: standardises the electronic management of encryption standard in development. It will cover document sharing protocols. Once T.120 is adopted, compliant whiteboard applications will be able to talk to one another. One usually associates desktop video conferencing with talking heads and smiling faces. The T.120 suite of standards is emerging as the main mechanism that will enable users to work together on documents such as text files, spreadsheets and graphic images. T.120 comprises the components:

T.123 - network protocols defined in T.123 allow communication over a wide variety of standard networks, including LANs, ISDN and POTS;

T.122 and T.125 - Multipoint Communication Services which provide a connection-oriented service that is independent of the T.123 transport stacks operating below it;

T.124 - Generic Conference Control provides conferencing capabilities by outlining services for setting up and managing a Multipoint meeting, and addresses conference security (passcode protection, provides general conference administration;

T.126 - allows users to view and annotate images and share applications;

T.127 - gives users the ability to initiate simultaneous Multipoint file transfer.