Distance Learning Technology based on NetOp Virtual Classrooms

Veaceslav Sidorenco

Technical University of Moldova and RENAM

Preface

Public Association RENAM is a non-governmental, non-commercial and non-profit organization, established in the form of the public institution, carrying out its activities in conformity with the Constitution of the Republic of Moldova, with legislation of the Republic of Moldova, with international norms and conventions and with the its Statute.

Principal purpose of RENAM is a contiguous development of communication and information infrastructure of the scientific and educational community of the Republic of Moldova, creation of appropriate conditions for permanent network development for science and education by means of collaborated efforts of scientific and educational institutions; providing access to the national and foreign databases and distance learning facilities.

Networking infrastructure for science and education in Moldova development passed several stages. Initially many scientific and educational organizations in Moldova developed their internal networking segments separately, as independent sub-networks, but soon the real needs of scientific-educational society have required uniting these efforts. An organization of collaborated activity can be subdivided in some stages and the first practical results were obtained in 1996, when the Moldovan Department of Soros Foundation together with the Academy of Sciences of Moldova and the leading Universities proposed an initiative of creation of scientific-educational network "Moldnet".

RENAM directly follows goals and structures built during previous project of creation and development of AMNET (Academic Moldavian Network) infrastructure . AMNET had the aim to join more than 25 research institutes of the Academy of Sciences of Moldova (ASM), Universities and other non-governmental organizations of Moldova in 3 main stages:

- Stage I (1997): Creation of a satellite channel and central communication node of AMNET. Connecting remote buildings of ASM and universities campuses.
- Stage II (1998): Academic WWW server and IDC setting up and organizing AMNET users training. Creation of applied databases on multi-user SUN Microsystems servers.
- Stage III (1999): Linking other scientific and education establishments and alone users. Network topology optimization.

1 RENAM Project

Building of global networked information society opens large perspectives for integration of nation-wide research and education resources as well as for creation of modern dis-

tance learning and collaborative work infrastructures. Moldova as New Independent State from Eastern Europe is on the phase of establishing integrated physical connectivity structures, capable to provide Internet access points for higher and medium education schools, scientific and research laboratories.

A pioneer step on above-mentioned road was made in August 1999, when RENAM: a new joint Research and Education Networked Association of Moldova, was created www.renam.md. First stage of RENAM project has the goal to interconnect physically next organizations placed in Chisinau, the Capital City of Moldova [1]:

- **ASM**: Academy of Sciences of Moldova (http://www.asm.md)
- **TUM**: Technical University of Moldova (http://www.utm.md)
- **AEK**: Academy of Economic Knowledge (http://www.asem.md)

Second stage has the goal to additionally join resources of State University of Moldova (**SUM**: http://www.usm.md), of Pedagogical University from Balti City, of University from Cahul City and of 11 colleges from Polytechnic Community of Moldova. Strategic scope of RENAM can be emphasized by next list of aims:

- Creation and development of basic network nodes and highways of RENAM, providing a stable mutual access to national and foreign information resources;
- Elaboration of new information technologies in order to achieve a high level of investigations and close interaction with European and world's scientific and educational community;
- Development of communication media for distance education systems deployment.

Figure 1: European NREN's

RENAM was recognized internationally as having status of NREN - National Research and Education Network organization due to its structure and content of development pro-

grams. Moldova becomes one of the last European countries that is joining European community of NRENs (fig. 1).

Main purpose of first stage of RENAM project is focused to solve next important tasks:

- to integrate distributed campus networks of Research and Higher Education Institutes of Moldova into single networked organism,
- to add new and to optimally share existing external Internet connections and
- to build Common Information Infrastructures necessary to support ordinary computerized teaching, distance learning courses and postgraduate studies.

Physical Intranet WAN connectivity for RENAM is provided using Moldtelecom's intracity E1 (2048 kbps) cooper and optical lines, HDSL modems according to logical diagram, presented on fig. 2.
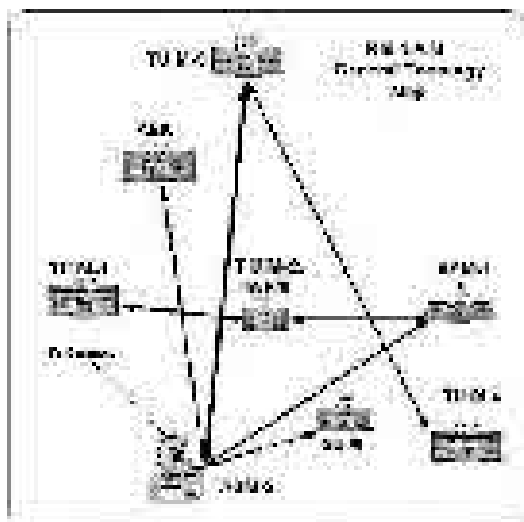

Figure 2: Campus-level connectivity map.

Academy of Sciences of Moldova has two main campuses (ASM-1 and ASM-2) and a Biostation satellite campus whereas Technical University of Moldova has four main places (TUM-1...TUM-4) distributed at distances ranged from 1 to 6 km inside Chisinau City. External Internet connectivity is provided by new VSAT channel and equipment, that had been set up under NATO Grant and were connected to DFN: Educational and Research Network of Germany. It is also expected, that RENAM will represent Moldova in future in Trans-European Research and Education Network Association (http://www.terena.org).

Specialists from the Faculty of Radio-Electronics of Technical University of Moldova (FRE TUM) have positive experience in organizing distance learning courses for the specialists in telecommunications placed in every regional telecommunications center of

Moldova [2], [3]. During 1996-1999 an Intranet infrastructure inside Moldtelecom State Company was built by specialists from FRE TUM and small enterprise Systemcomputer Ltd. The corporate Intranet had been equipped with web-server, having HTML-published technical documentation and electronic books on the subjects of setting up and administer TCP/IP digital networks, Windows NT administrator's handbook, LAN and WAN topologies, Geographical Information Systems for telecommunications engineers and other subjects. There was presented also teaching programs and lists of test questions. The interaction with virtual students was made via corporate e-mail system, that was used for making individual contacts between teachers and students. In order to be admitted to local qualificative exams students had been imposed to answer via e-mail to a list of individual questions. During preparing to exams there were organized simple textual chat sessions. Later there were made fruitful experiments of Microsoft NetMeeting software and Tekram HOW-RU videoconferencing hardware using in order to perform audio, video and white-table chat sessions.

The experience obtained during building of above infrastructure is planned to be widely used inside RENAM joint distance learning project improved with facilites described in next section.

2   Virtual Classrooms

One of most basic concept for Distance Learning and Postgraduate Studies of RENAM project consists in creation Virtual Classrooms infrastructure, that will be based on a system of distributed network resources and facilities. Steering board of RENAM had proposed to create a set of Distance Learning Intranet servers installed at every organization-member of RENAM and to divide learned subjects into three basic categories:

– General and special problems of information technologies (beginner's level, medium-skilled level, advanced studies);
– Non-computer science problems (profiled on prepared specialties);
– Postgraduate studies problems.

Every server must have a package necessary for creation of virtual teacher workplace (fig. 3).

Administrative and static information must be handled on a base of dedicated web-server, having published information about:

– Lists of learned subjects, their general programs, requirements for students, recommended literature and hyperlinks,
– Lists of typical test questions;
– Electronic books (in HTML, PDF and/or DOC formats);
– Lists of FTP-accessible files, demo- programs, additional binary information, interactively accessible databases;
– Lists of multimedia files and streams;
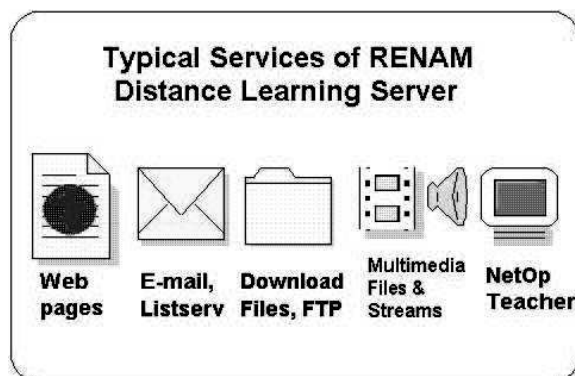– Schedules of on-line lessons;
– Results of tests and exams.

Figure 3 Distance learning services for teacher's place

Preliminary registration of students for joining Virtual Classrooms can be made using different interactive web pages creation methods like Dynamic HTML, Active Server Pages, CGI and other techniques or using e-mail/Listserv resources. Some laboratory works can be implemented using script languages (Java Script, VBScript) or object-oriented technologies, based on Java programming or Component Object Models (ActiveX).

The sessions of interactive lessons is planned to be organized using Danware's NetOp School software facilities, named "Teacher" and "Student" (www.danware.com).

NetOp School package works in the environment of wide range of OS: Windows (2000, NT, ME, 9x, 3.1x) or NetWare Windows Client and is capable to establish fast and transparent distance learning sessions over a wide range of physically implemented networks like: Internet, TCP/IP, IPX, ISDN, NetBIOS Intranets, direct modem connection segments.

One "Teacher" module gives the possibility to create a number of Virtual Classrooms, every of which can be simultaneously connected to up to 50 distant "Student" modules. Student's computers can be placed anywhere in the common network. The only requirement for student's PC is to be equipped with necessary networked operating system and "Student" module.

Teacher can handle multiple classrooms and switch between them. One of the most important capabilities of "Teacher" module is the ability to "Give a Distant Demo" making teacher's screen broadcast (fig. 4).

It is possible to send a teacher's screen demo in full screen mode to students for a fully controlled demo or to choose to provide the demo in a window, enabling the students to perform step-by-step instructions and interactive learning. By displaying a presentation or an application on classroom PC's, teachers reduce the need for expensive overhead video-projection systems and are better able to keep a student focused on a lesson.

Another important capability consists in the possibility to capture and broadcast the screen of selected student, demonstrating it as good (or bad) example of work done (fig. 5).
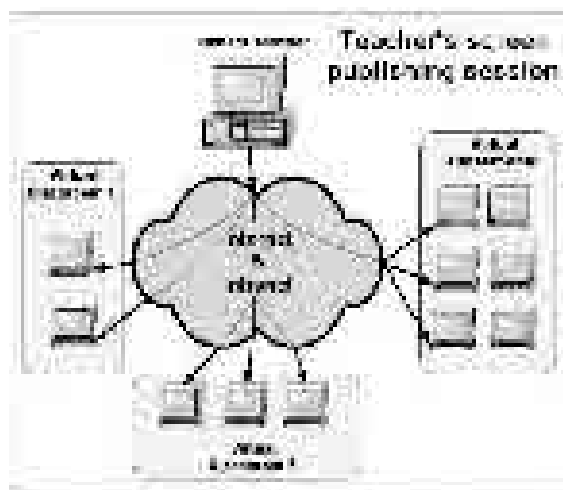
Figure 4 "Give a Demo": Teacher's screen broadcast

In order to keep a student's attention the teacher can lock out students from being capable to use their keyboard or mouse. The teacher can accomplish this during a broadcast session or the teacher can use "Attention" button that enables a teacher to send a text or graphic message to students while also locking out their keyboard.

NetOp School allows a student to request help from the instructor without interrupting the rest of the class or becoming embarrassed. This way can be established chat sessions for online conference with individual student or entire classroom.

It is also possible to monitor individual student and to take remote control over it's PC for one-on-one instruction. During remote control session it is possible to launch student's applications or to enter in file transfer regime in order to quickly prepare student's workplace or to get files with student's results.

During next 3 years it is expected to prepare for distance learning using Virtual Classrooms next curricula:

  – Programming languages basics (C++, Object Pascal, Java);
  – Databases Management systems;
  – Web publishing (HTML, JavaScript, VBScript);
  – Microsoft Office components studies;
  – Operating Systems Basics (Windows ME, Windows 2000);

During 1999-2000 an Intranet infrastructure inside Romtelecom Department of Hunedoara County (Romania) was built and trest by specialists from FRE TUM and small enterprise Systemcomputer Ltd. using NetOp School prototype of corporate Distamce Learning infrastructure. A combination of web publishing resources with e-mail, FTP, Multimedia streaming and NetOp School resources of RENAM project is planned to be used for creation of modern and efficient Distance Learning infrastructure, based on the concept of
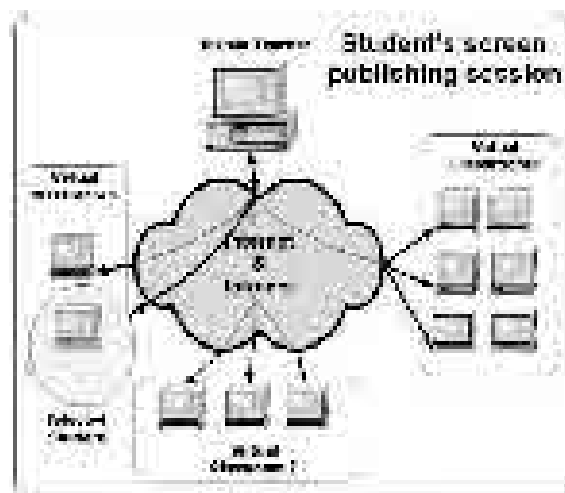
Figure 5 "Show student's screen": Given student's screen broadcast

Virtual Classrooms. It is expected to radically improve the quality and efficiency of networked learning capabilities of Research and Higher Education community of Moldova at the beginning of new millennium.

References

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