ELLS COMMUNICATION TECHNOLOGIES

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Introduction

This paper provides information about bandwidth needs and technical capacities as well as communication functions of the distribution and communication components of the E-language system. Part one, prepared by professors Xing Li and You Yue of China's Tsinghua University, addresses the issue of bandwidth needs of commonly available multimedia communication tools as well as the capacities of the Chinese Education and Research Network(CERNET). Part two, prepared by Chun Lai and Yong Zhao of US's Michigan State University, provides an overview of the functions of commonly available computer-mediated communication software.

Part One: Network Communication Technologies and Network Capacities in Network Communication Technologies

The E-language Project is likely to be widely used and adopted, in areas both with sophisticated and less sophisticated networks. This thinking is in accordance with the "No Child Left Behind" spirit.

The quality of all network communication services is dependent upon a combination of many factors, including the capacity of the client computer, local ISPs, and backbone ISPs. The major factor that influences end users' experiences is their connectivity to the network. Currently most users connect through the following means:

PSTN dial-up modem: 19.2Kbps, 28.8Kbps, 33.6Kbps, 56Kbps

ISDN: 64Kbps, 128Kbps

T1 leased line: 1.544Mbps

E1 leased line: 2.048Mbps

ADSL: uplink max: 640Kbps, downlink max: 8Mbps

Cable modem: shared 10Mbps or 30Mbps

LAN: shared 10Mbps or 100Mbps

While the above connection technologies can be used to support a variety of communication needs, PSTIN dial-up is slow and more appropriate for text, animated web pages, and voice communication. Dial-ups can be used in combination with local Cds.

Connections with speed higher than 64Kbps, esp. T1 and above, can be used for richer media communications.

As a reference, we list the connectivity requirement of two most commonly used network media players below:

Windows Media Player, Microsoft Corp.

MODEM 28.8Kbps, 33.6Kbps, 56Kbps

ISDN 64Kbps□128Kbps

DSL 256Kbps, 384Kbps, 768Kbps□

T1 1.544Mbps

LAN 10Mbps or higher

Real Player, RealNetworks, Inc.

MODEM 14.4Kbps, 19.2Kbps, 28.8Kbps, 33.6Kbps, 56Kbps

ISDN 128Kbps

DSL 256Kbps, 384Kbps, 512Kbps

T1 1.544Mbps

LAN 10Mbps

For informational purposes, we also describe the bandwidth requirement of MPEG as a format for video communication.

MPEG-1: 1.5Mbps and below for motion pictures and sound, mainly used on CD-ROMs(including Video CDs and CD-I) for color motion pictures at the 30 frames per second, with CD quality audio. MPEG-1 is also used as a standard for video communications on digital phone lines, e.g., ADSL, Video on Demand(VOD), and educational networks.

MPEG-2: A standard for motion pictures with 10Mbps bandwidth. MPEG-2 allows broader range of compression rate to accommodate different needs for image quality, storage, and bandwidth.

MPEG-3: Currently only MP3, i.e. MPEG Layer-3, which is a standard for audio compression.

MPEG-4: Throughput at 4.8Kbps-64Kbps, resolution at 176_144 for digital TV, motion pictures, Internet, multimedia monitoring, movable multimedia communication, video broadcasting and games on the Internet/Intranet, and interactive multimedia on DVDs.

Network Infrastructure

Basic Information

CERNET, a network sponsored by the Chinese Ministry of Education, will be the primary carrier of the ELLS in China. CERNET is the largest education network in the world and the second larges network in China. CERNET currently has 28 international

and regional channels connected to the US, Canada, UK, Japan, and Hong Kong Special Administration Region. Its bandwidth totals 250Mbps.

Around 900 higher education institutions, K-12 schools, and educational research institutions are connected through CERNET (among which over 800 are higher ed institutions). About 1.2 million computers are connected to CERNET, with over 8 million individual users.

CERNET's backbone has been upgraded to 2.5Gpbs. Thirty five major cities in China are connected to CERNET at 155Mpbs. CERNET's 38 local centers are located in 38 universities in 36 major cities in all China's provinces or their equivalent administrative units except for Taiwan. Thus CERNET has the capacity to reach almost all higher education institutions in China. Over 100 universities and colleges are already connected to CERNET at the speed of 100-1000Mbps. **Therefore, the bandwidth provided by CERNET and regional networks in most parts of China can support the communication needs of the E-language system.**

Video conferencing services

In 2002, CERNET offered H.323 and multicast video conferencing services for the international conferences of CANS2002, APAN, annual meeting of CERNET, distance education, and other international and domestic academic exchanges.

Starting 2002, CERNET offers multicast services, which are exchanged with multicast services on Interent2. CERNET is the only backbone network in China that supports multicast at the moment and supports multicast video conferencing. Many campus web services of CERNET's clients already or are considering to provide network multicast functions and can thus provide service support. Multicast service enables

multiple users to access the broadcast information simultaneously, thus supporting more learners with limited bandwidth. With effective management, CERNET's multicast capability is expected to play a major role for the ELLS project.

Working with Different Connection Speeds

In areas with high speed connection to CERNET, multimedia content can be directly deployed through the network. However, in areas with less advanced networking capabilities, we should consider the network equivalent of dial-up connections in terms of communication speed, which generally is between 19.2Kbps and 64Kbps. CERNET provides dial-up services in all areas of China.

Schools that are currently not connected to CERNET can connect to CERNET through ChinaNet.

To take advantage of advanced network communication technologies, the pilot schools of the project should be located in schools and community centers in areas with more advanced connectivity.

International Communication

Due to its non-profit nature, CERNET has limited funds, and thus is cautious about upgrading its bandwidth for international connections. Because of the already busy international traffic on CERNET, ELLS should try to avoid duplicating communication content between the US and China.

Suggestions for Infrastructure

We suggest that severs in China be placed at the national center of CERNET inside Tsinghua University for the following reasons:

1. The national center can easily reach different regions and synchronize with local servers in different regions.
2. It is more convenient for the Ministry of Education to coordinate expenses incurred from international traffic and other management issues. These issues will be raised by CERNET's national center.
3. Administrators of major regional servers/systems can easily manage their accounts on the main server through the network.
4. In the further future, other regional servers can be placed in the regional centers of CERNET, which are close to targeted users.

Part Two: Communication Software

Introduction

In the past several decades, language teaching and learning theory has gotten rid of the heavy taint of the "individual-centered" behaviorist perspective to learning and embraced the "collaboration-centered, individual-concerned" sociocognitive perspective to learning, thus shifting from a single-minded focus on mechanistic pattern drilling and practice to an unreserved acknowledgement of the significant role of interaction with other humans, with the community, and with the world (Levy, 1997; Warschauer & Kern, 2000). Interaction is recognized as one important semiotic tool for knowledge co-construction and reconstruction (Vygotsky, 1981; 1987), and thus is crucial to language learning and, needless to say, second language acquisition (Lantolf, 2000; Long, 1996; Swain & Lapkin, 1995). Optimal second language learning environments call for affording abundant opportunity for meaningful interaction with authentic interlocutors in

authentic target language contexts (Egbert, Chao & Hanson-Smith, 1999), which necessitates the mediational role of computers in second language teaching and learning, especially in the case of limited in-hand access to target language resources. Human-computer interaction and computer-mediated communication, in particular, are the most powerful use of computers in response to this demand and demonstrate the great potential of computers in facilitating second language teaching and learning. Given the educational value of these two applications, it is meaningful and necessary to take an overview of the various types of software available within these two applications in order to best inform the effort to capitalize their language learning potential. Considering the fact that current software on human-computer interaction is still not intelligent enough to provide truly interactive communication (Kern & Warschauer, 2000), this overview will mainly focus on computer-mediated communication. This overview aims at describing the features and technical requirements of each type of software to help educators make the best informed and most appropriate decisions on the communicative component of their specific language teaching and learning systems for the given users and contexts.

Software Analysis

Synchronous CMC: Text-Based Conferencing System

Englishclub Chat --- Englishclub Chat is quite representative of most of the free text-based conferencing system. This type of system is usually many-to-many, with options for starting one-to-one conversation with the chosen member. It provides options for the adjustment of font, size, and color, as well as providing emoticons. Most text-based conferencing systems provide different chat rooms for users to choose and typically do not require downloading.

ICQ --- ICQ is a unique text-based conferencing system that basically provides one-to-one chat and Internet paging. It is free to download and requires users to manually add friends to their contact list, thus providing user control over contacs.

Audio-Video Conferencing Systems

1. Audio conferencing software

Netscape CoolTalk --- CoolTalk provides full-duplex audio conferencing, allowing both users to speak and be heard simultaneously. Its audio features include: 1) answering machine capability for recording, receiving, and playing back of messages; 2) watch-dog program which notifies users of missed calls; 3) full-duplex audio conferencing or auto-switching capability for half-duplex audio cards; 4) audio compression optimized for 14.4 kbps or 28.8 kbps connections depending on modem speed. Unlike audio-only Internet products, CoolTalk includes Chat Tool, which provides textual conferencing, and Shared Whiteboard with features of file importing, pointer, constrained, and free hand drawing, which enables graphical data conferencing. Included with Netscape Navigator 3.0, this software is a free one-to-one audio conferencing system.

StudyCom --- StudyCom provides many-to-many audio conferencing software. It also provides a textual conferencing function. Users can use these two functions simultaneously. This software is free to access, but it does not provide the function of building individual rooms. Thus users have little control restricting the interlocutor list.

2. Video Conferencing Systems

MSN Messenger / Yahoo Messenger -- These two conferencing software programs provide an integrated textual, graphical, and audio/video conferencing system. Although users can only engage in an audio/video conference with one person at a time, they can chat with several people simultaneously in writing. Thus it is one-to-many in textual conferencing and one-to-one in audio/video conferencing. The full-featured Whiteboard function also enables great graphical flexibility. This software is not only free but provides users absolute control over their contact list. The disadvantage is users have to manually add each contact onto their contact list, which is tedious work.

iVisit --- iVisit is a multi-party video, voice, and text conferencing system. It differs from most video conferencing software in that it allows many-to-many chat. In addition, it also offers the possibility for the users to create their individual rooms. It also allows for recording of audio and visual materials.

Virtual Reality (Graphic-Enhanced) Conferencing System

ThePalace --- ThePalace is a many-to-many textual conferencing system, using graphical avatars and providing still two-dimension graphics in the chatting background. Several palaces are provided and each palace consists of a several of rooms. Users choose their own avatars and enter any room to join the conversation. It is possible for users to create their own palace server or create their own rooms in a given palace, and thus users

have some control over their conferences. Furthermore, the software provides a log file that traces users' movement and chats around the palace.

Active Worlds --- Active Worlds is a real-time many-to-many interactive 3-D virtual reality conferencing system. Only textual chat is available and is free. Users can move about, play online games, shop, and make friends with people from all over the planet, and they can even stake claim to a piece of virtual land and build their own virtual home, mansion, estate, or castle! Annual fees are charged on the institutions who want to build, manage, and control their own 3-D active worlds.

Asynchronous CMC:

Mail (E-mail, Voice Mail, Listserv)

HandyBits VoiceMail --- HandyBits VoiceMail enables the possibility of sending voice messages and compensates for the typing nuisance of e-mail. It has a multi-language support program and is compatible with virtually any e-mail client and thus can be played on any computer equipped with a sound card. It also provides a GSM compression feature, which makes voice messages transfer on the Net ten times faster. This software is free to download for personal use, but charges are imposed for commercial use and site licensing.

L-Soft LISTSERV --- LISTSERV is web-interface based e-mail list management software, supporting both HTML and text format and can be customized to seamlessly

blend with any existing Web site. It offers submission of messages to a number of people who are on the list at the same time. It also integrates an anti-virus system that scans every message and attachment for viruses and rejects infected messages automatically. It also has a reporting and database feature. It works on Windows, Open VMS, VM, and ten brands of UNIX and can be licensed for a fee. However, the anti-virus and database feature is only available for LISTSERV Classic and can not be run on Windows 95/98/ME.

Threaded Messages (Bulletin Board/Web Forum, Yahoo! Groups)

Discus --- Discus represents a series of commercial bulletin board software programs. Licenses for this kind of software can be purchased. The system requirement is quite basic and can be met by most web host servers. Discus works in conjunction with a My SQL database running on one's server to provide reliable, robust, and speedy data storage.

WebCT / Blackboard --- These two software packages stand for a group of more integrated systems. This kind of software incorporates both synchronous and asynchronous CMC. They often provide textual chat rooms as well as threaded bulletin boards. Licenses can be purchased to run on one's own server.

Yahoo! Group --- Yahoo! Groups (http://group.yahoo.com) is similar to the integrated system mentioned above. It integrates both textual chats and threaded bulletin

boards and is free to use. Anyone can start a group. A group can be configured so that every message is sent simultaneously to all group members' e-mail accounts.

Table 1: Comparison of Functions

SOFTWARE	ANONYMITY	MODALITY	FORMAT	CONTROL	TEMPORALITY
Englishclub Chat	HIGH	WRITTEN	MANY-TO-MANY/ One-to-one	NO	Synchronous
ICQ	HIGH	WRITTEN	ONE-TO-ONE	YES	
CoolTalk	MEDIUM	WRITTEN/AUDIO	ONE-TO-ONE	YES	
StudyCom	MEDIUM	WRITTEN/AUDIO	MANY-TO-MANY	NO	
MSN Messenger	MEDIUM/HIGH	WRITTEN/AUDIO/ VISUAL	ONE-TO-ONE/ One-to-many	YES	
iVisit	LOW	WRITTEN/AUDIO/ VISUAL	ONE-TO-ONE/ Many-to-many	YES	
The Palace	HIGH	WRITTEN/VISUAL	MANY-TO-MANY	YES	
Active Worlds	HIGH	WRITTEN/VISUAL	MANY-TO-MANY	YES	
E-MAIL	MEDIUM	WRITTEN	ONE-TO-ONE/ One-to-many	YES	Asynchronous
VOICE MAIL	MEDIUM	AUDIO	ONE-TO-ONE/ One-to-many	YES	
LISTSERV	MEDIUM/HIGH	WRITTEN	MANY-TO-MANY	YES	
DISCUS	MEDIUM/HIGH	WRITTEN	MANY-TO-MANY	YES	
WEBCT	MEDIUM/HIGH	WRITTEN	MANY-TO-MANY	YES	

Human-Computer Interaction

A.L.I.C.E --- A.L.I.C.E is human-computer interaction software. It can converse with users in a fast and skillful manner. It avoids a lot of questions and seldom asks questions. So to some extent, the conversation with it makes users feel as if having a one-side conversation. Nevertheless, it can serve as a conversation partner, providing authentic target language instruction. It relies totally on text.