



The growing number of implementations shows that *CD-ROM networking* has finally come of age. The particular benefits of providing access to CD-ROMs via a LAN are well-known (multi-user access to the same disc, easy access to various workstations, protection of discs and equipment, central management and updating of databases) and need not be discussed here in detail. The purpose of this article is to describe one of the largest CD-ROM networks in Europe, namely the one managed by the University of Vienna Library for the past three years. We will present information on the history of the project, some technical details, economic aspects, the user perspective, as well as other current issues and problems.

## **BACKGROUND**

The University of Vienna, founded in 1365, is one of the oldest and today one of the largest universities in Europe (about 80,000 students, 290 departments, 6,500 staff). Its University Library owns more than five million volumes, housed in the main

library and in 34 faculty and departmental libraries, and employs a staff of about 250 FTE.. The former medical faculty library was recently separated and established as a new inter-university institution, which operates its own CD-ROM network, mainly as a service for the medical faculty. It may be of interest that there are four other universities in Vienna (for agriculture, business administration and economics, technology, and veterinary science) as well as three tertiary art colleges. Each of the 12 Austrian universities run their own CD-ROM networks.

## **HISTORY OF THE PROJECT**

The first Austrian universities to implement CD-ROM networks were those in Graz and Innsbruck (both in 1992). Whereas in Innsbruck a Novell-based system (CD-Manager from the German company H+H) was used, Graz set up a solution designed by a local company (R+R Messtechnik) comprising a VAX file-server and a Logcraft CD-server system. Both CD-ROM networks made use of jukeboxes and traditional CD-ROM drives.

Shortly afterwards, R+R Messtechnik installed their newly developed system, *Ultra\*Net*, at the Vienna University of Agriculture, already applying their method of caching CD-ROMs to magnetic disk drives (*caching* means copying complete *disc images* of the CD-ROMs to large capacity magnetic disks).

Only in the autumn of 1992, the main library of the University of Vienna was equipped with ethernet wiring; until then only SNA wiring was available in the main university building where the library is located. The library had been planning a CD-ROM network during spring and summer, and, as soon as wiring was completed, set up a CD-ROM server. The new approach by R+R, which had proven successful at the agricultural university, was implemented here as well.

The first version of our CD-ROM network used NETBIOS as its networking protocol. Because of the university's general networking infrastructure this turned out to be a major problem. Being a metropolitan university without a typical campus, the University of Vienna is spread out over approximately one hundred different buildings, both in the city centre and in various other districts. Networking between all these different buildings requires "routeable" networking protocols such as TCP/IP or IPX/SPX. By definition, NETBIOS is not routeable. Therefore, in its first stage, the CD-ROM network could only be made available within the main library.

In 1993 R+R installed a new version of *Ultra\*Net*, based on the TCP/IP protocol and using Windows/NT as the operating system for the server. This

solved the above-mentioned problem and made our CD-ROM network accessible to the whole university.

## **PRESENT (TECHNICAL) STATUS**

At present, the following technical equipment and software are being used:

- 1 DEC Alpha 300 MHz server running under Windows/NT (version 3.51), with 64 MB of RAM, one 4-Gbyte internal hard disk drive, 1 internal CD-ROM drive
- 18 external 10-Gbyte hard disk drives (2 x 8 of these as a RAID system, 2 as standby devices)
- 7 external 6speed CD-ROM drives (used for caching purposes)
- *Ultra\*Net* server software, version 2.01 for 256 concurrent users, with multi-protocol support (TCP/IP, IPX/SPX, NETBIOS).

All networked databases are cached onto magnetic disks, which increases retrieval performance dramatically. In comparison with traditional CD-ROM drives or jukeboxes, the search speed of our network is generally very good.

Only IBM-compatible PCs can be used as client workstations, which is both an advantage and a disadvantage. On the one hand, this excludes users of Macintosh and Unix workstations; products such as *Omnimark* or other components which enable multi-platform access have not been implemented yet. On the other hand, limiting access to a single hardware platform guarantees full functionality of the various CD-ROM retrieval interfaces on all client workstations.

On the client side, registration of name and IP address with the system administrator and downloading of *Ultra\*Net's* client software (version 2.08) are required. The latter installs itself automatically on the PC, providing its own CD-ROM device driver which emulates a local CD-ROM drive. Each time the user connects to the system and selects a particular database, the respective CD-ROM retrieval software is transferred from the server to the local machine. After the end of the session it is removed from there automatically.

Currently, 294 CD-ROM discs (which represent 162 different databases) are cached on hard disk drives; another 60 discs are only accessible from single workstations in the main library. The table at the bottom of the page shows the numbers of networked CD-ROMs by type of database:

## USE OF THE SYSTEM

By mid-June 1996 we had 918 registered users of the network - an increase of 42% since the end of last year. The whole target group (University of Vienna academic staff with PC equipment and network access) can be estimated to consist of between 3,000 and 4,000 users. Of the 918 registered users 10 are public workstations located in the main library and primarily used by students; however, these make up about one third of the total usage of the system. Public access to the CD-ROM network is also offered in several departmental libraries.

The service is available 24 hours a day and on 7 days a week, with the exception of a weekly downtime of seven hours which is needed for service purposes. During day hours, the average number of concurrent users is always between 20 and 30. In accordance with the experiences of other (Austrian) universities the most

	<i>databases</i>	
<b>discs GENERAL AND MULTIDISCIPLINARY</b>		
Bibliographies of serials/periodicals 27		14
Books-in-print databases	12	13
National bibliographies	10	14
Library catalogues	7	7
Bibliographies of dissertations/theses 6		3
Other general bibliographies 16		15
<b>SUB-TOTAL</b> <b>83</b>		<b>61</b>
<b>SUBJECT DATABASES</b>		
Sciences	23	107
Social sciences/economics 39		30
Humanities	30	38

popular databases are union catalogues (i.e. the Austrian periodicals database and the union book catalogue of Austrian academic libraries) as well as books-in-print-databases (*Global Books in Print* and *German Books in Print*), followed by *Dissertation Abstracts Ondisc*. Among the subject specific databases that are used most frequently are the *Austrian Historical Bibliography*, *MLA* (language studies and related disciplines), *WISO* (business administration) and *PsychLit* (psychology).

Although we do not have systematically recorded evidence of user reactions, our general impression is that the CD-ROM network has been accepted in a very favourable way. This is true both for the users of the public workstations in the main library and those in academic departments. Without having promoted the system extensively, registration numbers keep increasing and students are sometimes even queuing up at the public workstations. Another indicator of the popularity of the network is the fact that the requests for mediated online searches have decreased considerably.

### **ECONOMIC ASPECTS**

It is widely known that networking of CD-ROMs is a costly undertaking. In the case of the University of Vienna a model of cost-sharing was adopted between the University Library and the University Computing Centre. While the latter finances the hardware (including the intra-university network) and system software, the library pays for the purchase or lease of all CD-ROMs and the appropriate networking licences.

In 1995, the total expenditure for hardware (excluding network costs) was 467.000 Austrian Schillings (appr. £28.313 Sterling), whereas CD-ROM databases and licences made up a total cost of 4,061,000 Austrian Schillings (appr. £ 247,000).

In addition, the University Library has one full-time staff working exclusively to maintain the CD-ROM network (caching and updating of CDs, system management and user administration). Due to the amount of work another system librarian's assistance is frequently required.

### **CURRENT ISSUES AND PROBLEMS**

Generally speaking, our CD-ROM network runs smoothly and without many problems. Nevertheless, there are a few aspects which need improvement and/or further development:

- The system software on the server machine (Windows/NT and *Ultra\*Net*) still shows some instability, sometimes creating peaks of memory utilisation or failing to control the external hard disks, both without apparent reason.
- As already mentioned, on the client side the usability of Apple and Unix workstations would be desirable for a certain segment of users.
- The *Ultra\*Net* statistics module, which works perfectly well on Intel-based machines, does not yet run on our Alpha server.
- Also on the client side, the use of our system requires familiarity with MS-DOS memory management. At least 560 KB of conventional memory must be available on a client PC after loading all necessary

device drivers (network and CD-ROM drivers) and Microsoft's CD-ROM extension (MSCDEX). Often, end-users are not skilled enough to optimise their PCs themselves, but neither the library nor the computing centre has sufficient staff resources to support all workstations connected to the system.

- Still missing (but already being developed) are *Ultra\*Net* clients for Windows/NT and Windows 95.
- Also under development is client software which enables searching of Windows-based CD-ROMs over the network. This feature becomes increasingly desirable as a growing number of CDs (e.g. dictionaries, encyclopaedias, full-text and factual databases) are designed as multimedia applications.
- Finally, end-user information and training are still unsolved problems. Although the service is presented on the library's WWW-pages, it has not been "marketed" to the various segments of the potential user community. A first step would be the implementation of an improved help function to inform new or inexperienced users of the scope and contents of the available databases on the CD-ROM network.

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