RICHARD C. ROISTACHER
Research Associate
Bureau of Social Science Research
Washington, D.C.

The Virtual Journal: Reaching the Reader

In 1978 I described an organization for on-line scholarly journals.[1] Such journals can be maintained in information systems much like those used for bibliographic data and which are equipped with extensive indexing and retrieving facilities. In addition to the usual paraphernalia of information retrieval, virtual journals would also have editorial boards and referees. Since the virtual journal is exempt from page limits, everything submitted can be published.

However, it was suggested that one of the search terms for each article be a quality score given by the referees. Such a system would allow for all of the present diversity in point of view and quality. An author could publish in any journal desired, but might have to accept a poor referee score from a "better" journal.

An additional feature of a virtual journal would be the inclusion of a system of readership counts and scores of articles. This system would allow authors a chance at the beatific vision of vindication in the form of high readership counts and high reader ratings following publication of an article with low referee ratings.

The major problems inhibiting establishment of a virtual journal are not computing capacity, information retrieval technology or storage costs, but rather the cost and speed of data communication. My earlier paper used cost figures for communication taken from 1977, when it cost approximately $7.33 to store the average-sized article on-line for a year. It was estimated that transmission costs over Telenet for the average-sized article would have been about $2.40. Since that time, storage costs have fallen to $5.29, but actual experience with Telenet has shown transmission costs to be about $3.55 (without adjusting for inflation).

Experiences with Teleconferencing

Since writing the 1978 article, I have become heavily involved in teleconferencing, using Robert Parnes's CONFER program on the Michigan Terminal System (MTS). CONFER is a powerful, easy-to-use teleconferencing system which has gained a high degree of acceptance among its users. MTS offers many inducements for use, including a large variety of text processing, graphics, statistical, scientific and information retrieval software.

A Failure

My colleague, Albert Biderman, has used CONFER to organize a consortium of people engaged in writing a joint grant proposal. Each participant wrote a part of the proposal at his or her own institution, using CONFER only for coordination.

During the course of the conference, the University of Michigan stopped operating MTS for a week in order to replace the computer with a larger one. The week prior to the replacement was marked by extremely high computer usage as people rushed to complete tasks before losing computing services. Consequently, it was often difficult for conference participants to gain access to one of the seven Telenet ports. The result of the experience was that the participants soured on computer conferencing, and abandoned the project. (It is no excuse to say that computers are not replaced very often. There is always something happening which does not happen very often.)

A Mixed Case

I have been utilizing CONFER as a discussion and consulting medium for users in state statistical agencies who are doing substantive data analysis on MTS. One of these agencies decided to transfer all of its operational data from its local machine to our Amdahl V470 in Ann Arbor. The agency has been an active user of our system for almost a year, despite the many vagaries of telecommunication. Other agencies, which did not transfer their data to our computer, found that they had nothing to discuss with each other, and that it was not worth the trouble to look for messages.

A Success

A group of people without prior computing experience used CONFER to plan an annual professional meeting. Since the organization concerned was in acute danger of disintegrating for lack of a meeting, the participants were highly motivated to learn to use the system.

The Lesson for Virtual Journals

I believe that our mixed record of success and failure in these endeavors is indicative of what must be done to ensure for virtual journals a significant level of readership. Our failures have involved people possessing all degrees of computer skill who did not feel it worthwhile to fight their way onto the system in order to compute or exchange information. The factors influencing our teleconferencing successes and failures were (1) availability of a communication line, (2) experience of the user, (3) the degree to which the user desired to do substantive work on our computers, and (4) the need for several users to work cooperatively.

Our major difficulty has not been in teaching people to use our computing system or our teleconferencing program, but rather in providing them with terminals and reliable connections to the machines. Our two Amdahl 470s can handle about 500 simultaneous on-line users. However, these computers are connected to the Telenet common carrier network through a total of seven low-speed connections. Since the machines have a national clientele, it is often quite difficult for a remote user to obtain a connection.

The Communications Environment

Our teleconferencing trials and tribulations lead me to conclude that while we have achieved the necessary sophistication in central facilities for a virtual journal, we have not yet achieved a satisfactory telecommunications or local user environment. I think that technology is rapidly making available the tools for telecommunications and a local environment, but we must know which tools to use. I regret that this discussion must delve into some of the grittier details of data communications.

Communications Line Capacity

Our present remote client uses a 30-characters-per-second (CPS) upper-/lower-case terminal connected by an acoustic coupler to the local port of a data communications network. This setup allows the client to receive a 60-character line in two seconds and a page of text in a nominal two minutes. In fact, the buffering delays in Telenet mean that a page takes somewhat more than two minutes to print. The user must have a computer terminal, be familiar with Telenet and the remote host, and be willing to sit and wait while the text is printed out at a leisurely pace.

While 30 CPS is the most common speed for remote data terminals, there are other line speeds in use. At 30 CPS, the printing of text lags somewhat behind a slow human reader. At 120 CPS, the next increment in line speed, a screen of 60 lines fills in 30 seconds, which is about as fast as a

fast reader can scan it. At 480 CPS, the next increment of speed, a 60-line screen will fill in 7½ seconds, which is faster than anyone can read. At 960 CPS, a page-size screen fills with text in a flash, and the reader is free to go from page to page at will.

Higher Transmission Speeds

At present, speeds higher than 120 CPS require a direct connection between the terminal and the telephone line, something not commonly available to remote users. However, it is clear that new technology will find ways of bringing ever-higher transmission speeds to the individual user. Thus, my first design consideration for the local user environment for a virtual journal is that the line speed be as high as possible, preferably 480 CPS, but no less than 120 CPS. The 120-CPS connections are presently available from several data common carrier networks in large cities, and I expect that such connections will become standard over the next three to five years.

However, new technology will allow users access to much higher speeds. Recently Xerox Corporation introduced a communications system called XTEN which combines a laser communication channel between buildings with a sophisticated high-speed data network within buildings. XTEN is designed to be entirely independent of the telephone system and will furnish extremely high transmission speed.

While at some point such circuits will probably exist in every house and office, it may be that in the near future they will require special distribution points. One possibility would be to have libraries serve as the distribution points for these exotic, high-speed communication circuits. The retailing of communication facilities, however, is only part of the problem of providing a local environment.

The Local Environment

One of the paradoxes of successful remote computing is that it seldom looks like remote computing. The remote computer user is not likely to be alone at a terminal, but is usually one of a group of users in the same location. As a result, such users have access not only to on-line documentation, but to large stacks of paper manuals; and not only to on-line consultants, but to experts in the next office. If this is necessarily true for case-hardened computerniks, it will be all the more true for journal readers in general.

The natural agency for maintaining the local environment for virtual journals is the research library. The library should be responsible for consulting, and possibly for the retailing of communications. Research

libraries could invest in a subscription to a virtual journal or information retrieval system as well as a high-speed data line. The high-speed line could be shared among local users in any of several ways.

Multiplexing

The most common way of sharing a line is multiplexing, in which several users make concurrent use of the data line. A multiplexed line capable of 240 CPS may be split locally into eight 30-CPS lines. However, multiplexing is probably not an appropriate role for the library, as it competes directly with general providers of communications.

Staging

A better way libraries could use such an arrangement of high-speed, long-distance lines and lower-speed, local lines would be by staging. In staging, the library would retrieve information *en bloc* and then make that information available to the local users. For instance, if a user wished to retrieve an article from a virtual journal, he could ask to see the current table of contents for the journal. If the current files for the journal were available in the library's local computer, the user would be given immediate access to them. If, as would usually be the case, the local file was not current, the computer would retrieve an update from the journal's archive via the high-speed connection. The user's wait, however, would be only a few seconds.

Staging has advantages far beyond those of line-sharing. In particular, staging allows the local user to learn a single set of file manipulation and information retrieval commands. While there are many different command languages for computers and information systems, there are a relatively limited number of file designs for text information retrieval. The local computer could have available facilities which would allow supported files to be manipulated by its data base software. Thus, in most cases, the user could utilize a single command language for manipulating a wide variety of data files from diverse sources. Staging not only makes life easier for the local users, but is a logical extension of library services and library automation.

Terminals as Furniture

We have now given our local journal reader a reliable high-speed connection to the journal, as well as local consulting and a uniform command language. The reader can sit in an office or reading room looking at text on the screen just as if it were a friendly, local microfiche reader. Unfortunately, most people do not regard these readers as either friendly or local. Rather, they are a necessary tool for which one leaves

one's comfortable office or study for a drafty library reading room. How then are we to take the virtual journal the final steps to the readers?

Our experience with teleconferencing has shown that successful users have had either high rewards for using the system or high penalties for failing to use it. In both cases they have had to make investments in learning to use the system so that there were relatively few barriers for its continued use. The most successful users were those doing substantive work in graphics, statistical analysis or document processing. Since these people spent many hours at the terminal in the course of their work, the receiving and sending of messages and participation in conferences were not an isolated activity but were part of a routine. People who used the computer only for teleconferencing rapidly found that the rewards of participation did not exceed the problems of having to find a connection and of learning to use the command language.

It thus remains to make the virtual journal terminate in some object more friendly to the average scholar than a computer terminal. The answer is probably the communicating word processor. The present trend of sharp decreases in the price of hardware should continue to the point where the average office typewriter is nothing but a computer terminal minus communication facilities. Increasingly more office typewriters will include memory and intelligence, thus transforming them into word processors. Scholars will use such machines for the writing of papers either directly, or indirectly through secretaries. In this way, they will become familiar with the machine's operations and will regard its use for communications as a welcome extension of their capabilities, rather than as a foray into *terra incognita.*

Using word processors as terminals has the added advantage of making virtual journals accessible to those who cannot or will not type. The nontypist can ask a secretary to produce the latest table of contents of a virtual journal. After indicating either a choice of articles or a search strategy, the scholar can wait while the secretary produces the desired articles on the word processor to be read later at leisure. Thus, the journal reader is allowed to treat the word processor as either an on-line inactive system or a traditional, published journal.

Conclusions

The local environment for a virtual journal should be marked by three characteristics:

1. a data line capable of producing text at higher-than-demand speeds;
2. a single retrieval and command language independent of the particular journal or data base being accessed; and

3. a terminal which has uses deeply imbedded in the working life of readers.

We presently have available computing and information retrieval facilities necessary to a virtual journal. We are still evolving the communications and local terminal facilities necessary to ensure a wide readership.

REFERENCE

1. Roistacher, Richard C. "The Virtual Journal," *Computer Networks* 2:18-24, 1978.