RURAL DATAFICATION

A Multiple-network Collaboration to Extend the Internet to Underserved Communities

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I. Abstract

The Rural Datafication project brings together the efforts of a number of organizations to extend the reach of the Internet in states served by and bordering CICNet. It is a highly cooperative activity, one of the first and largest projects of this kind, involving ten state networks and a multi-state regional network. Although the phrase "rural datafication" has been used to describe this project succinctly, its purpose is to extend Internet access and services to underserved constituencies wherever they may be located, in rural, geographically remote, and urban areas. The project covers a two-year period and will add a substantial amount of network access in its region. Annual conferences on Rural Datafication help to disseminate information about the project and other solutions to rural networking challenges.

As late as 1935 ... decades after electric power had become a part of urban life, the wood range, the washtub, the sad iron and the dim kerosene lamp were still the way of life for almost 90 percent of the 30 million Americans who lived in the country-side. All across the United States, wrote a public-power advocate, "Every city 'white way' ends abruptly at the city limits. Beyond lies darkness." The lack of electric power, wrote the historian William E. Luechtenberg, had divided the United States into two nations: "the city dwellers and the country folks"; farmers, he wrote, "toiled in a nineteenth-century world; farm wives, who enviously eyed pictures in the Saturday Evening Post of city women with washing machines, refrigerators, and vacuum cleaners, performed their backbreaking chores like peasant women in a pre industrial age."

... from a description of the US before the Rural Electrification Act of 1936.[1]

1 Robert A. Caro. The Years of Lyndon Johnson: Path to Power (Vintage Books, 1981), p. 516.

II. Introduction

It is impossible to consider the problem of extending the Internet and Internet-based services on a truly ubiquitous scale without immediately thinking about the environment that preceded the creation of the United States Rural Electrification Act of 1936. The Act brought electrical power to millions of rural residents.

The problem exists well beyond the borders of the United States. To this point, within the US many of the institutions that have connected to the Internet are the nation's elite institutions of research and education: major research universities, laboratories, four-year universities and colleges, and early adopters within the private sector. Urban locations still predominate as hubs of connectivity. An analysis of the connections outside the United States yields a similar or more difficult situation—good connectivity in developed countries but with a profile similar to the US; a lower level of connectivity throughout much of the remainder of the globe. A challenge facing the Internet is to reach out to the rural areas and underserved communities, where expertise and money are often scarce, but enthusiasm and interest are not. The Rural Datafication Project is designed to meet that challenge.

The Rural Datafication Project is also designed to meet two other challenges: discovering how to create and conduct successful collaborative activities among multiple networking organizations, serving multiple geographic regions throughout a vast area of the United States; and determining how to create Internet- useful products and services within a single one of these organizations that can be applied for the benefit and use by all.

III. Organization and Scope of the Rural Datafication Project

The Project brings together the joint efforts of a number of organizations to extend the reach of the Internet in states served by and bordering CICNet. While CICNet will play the lead in the project,

infrastructure deployment and operation are under the auspices of the state networks. Participating state networks include: netILLINOIS, (IREN) Iowa Research and Education Network, INDnet (Indiana), MichNet (Michigan), MRNet (Minnesota), NYSERNET (New York), PREPNet (Pennsylvania), and WiscNet (Wisconsin). The North Central Regional Educational Laboratory (NCREL) will support work with the K-12 community.

Although the phrase "rural datafication" has been used to describe this project succinctly, the project's purpose is to extend Internet access and services to underserved constituencies wherever they may be located, in rural, geographically remote, and urban areas. The project focuses on three key areas: selecting and proving standard hardware and software for dial-up and dedicated, low-speed IP connections; high-quality documentation, training, and associated materials that will give new customers "out of the box" Internet connectivity; and expanding network connections and services to traditionally difficult-to-reach and difficult-to-serve user communities.

The Rural Datafication Project's key areas will not only provide NSFNET access to these organizations and individuals, but also promise great leverage on a long-observed "law" of network communications, that the amount of effort it takes to support a customer's network connection is inversely proportional to his connection speed. The effort spent once to develop standards and materials can be reused in each state network; using common infrastructure will reduce costs; and developing a regional approach to the rural datafication problem will strengthen the focus and scope of the NSFNET program throughout the Midwestern region of the United States.

IV. Support from the National Science Foundation

The National Science Foundation is providing significant funding for the project. Originally the National Science Foundation's network, NSFNET was conceived and developed as a means of access to super-computing centers established by the NSF in the mid-1980's. It has evolved into a national backbone network, interconnecting campus and mid-level networks into a nationwide data network of truly impressive scale. The information, educational, and research resources to which it now provides access are of immense and growing value to the users of this network and to many other organizations and individuals who currently have no access to it.

Funding from the National Science Foundation totals more than $1,300,000 over a two-year period.

V. Project Design

Specific features of the project include approximately 20 new network points of presence spread across six states (Michigan, Indiana, Illinois, Wisconsin, Minnesota, and Iowa) and information servers for 8 states (the above states plus New York and Pennsylvania). Approximately 2 staff at CICNet will work in the areas of information services, technical design and implementation, and project coordination.

The project will include deploying network access in rural areas and building upon and extending existing network infrastructure. It will provide dial-up access and accommodate direct connections. CICNet will develop a set of standardized resources, such as documentation and training materials, which will be used by each of the state networks to support use of the network by community members. On-site training and support will be provided cooperatively by CICNet and the state networks.

Networked information servers will provide services for targeted user communities, such as K-12, public libraries, agriculture extension, and small businesses. CICNet will create the architecture and develop the servers. A goal of the project is to discover whether, how, and how effectively the servers will be used by user communities.

CICNet and the state networks will co-sponsor a second annual conference on rural datafication. As of this writing the conference is scheduled to be held in May of 1994.

V.A. Infrastructure and Software

Initial project activities are focused upon network access. One of the project planning team's first activities was to design specifications for the network points of presence (POP) and access software. Since one of the goals of the project is to demonstrate the strength of a standard approach across multiple networking organizations and a large geographic region, reaching agreement on a standard POP design was an important milestone. Each POP is currently designed to include a network router, terminal server, and high-speed modems. The POP will support 6 concurrent dial-up sessions and a small number of dedicated connections.

By building standard POPs, system integration efforts are kept to a minimum and any custom work that must be done can be used by all participants.

The POP design is intended to take advantage of the work underway in the IETF Network Access Server (NAS) Requirements Working Group. The NAS Requirements Working Group is studying solutions for distributed authentication and authorization.

Another important component of network access is the end-user software. Since the "low end" customer is of primary importance, support for dial-up access is a high priority. When considering dial-up access, both terminal emulation (VT100) and full TCP/IP (SLIP and PPP) access are being evaluated. In addition, it must be anticipated that end users will be accessing the network from Mac-, DOS-, and Windows-based platforms.

As of this writing there have been considerable differences of opinion as to the relative support each area should receive. Several participants in the deliberation process advocate a TCP/IP solution only. The thinking in this case is motivated by the idea that real Internet software will provide the best Internet services and that access by terminal emulation should be discouraged because it is becoming obsolete. Other participants, however, have acknowledged that without access by terminal emulation, a relatively large percentage of potential users will find that a very familiar solution no longer works. In the end, the planning team decided to include support for both types of access. In addition, it is anticipated that terminal access users will be brought into the system through a set of standard, front-end menus.

Also as of this writing, a significant challenge is to put together standard packages for Mac, DOS, Windows platforms. These packages will need to include a suite of TCP/IP services (telnet, ftp, Gopher, etc.), user documentation, and an easy installer. The necessary components for the Mac and DOS platforms are available in a variety of commercial and shareware versions. Windows applications are just now emerging. In addition, a number of integrated packages are also beginning to appear which include all the necessary applications under "one roof." CICNet staff, working in conjunction with state network staff, are currently reviewing the options and plan to have a suite of software and documentation for each platform in place by spring, 1994.

V.B. Information Services

Another major component of the project is information services for rural communities. As network technology has standardized and become more widely available, user communities are beginning to ask their network providers for more than simple access, a "dial tone." They want someone to talk to. The Rural Datafication project will extend an Internet "dial tone" to communities that are currently isolated from the network. A significant part of the project must be to provide that "someone to talk to"—that is, information and services that add real, usable value to an Internet connection.

Presently the plan is to target a set of specific constituencies, such as K-12, health care, and public libraries. Once user groups are identified in geographic areas, CICNet will bring groups together, initially over the network, perhaps later in person, to share experiences and resources among geographic communities. For example, one of the project's goals is to build and maintain a dialog among rural health care staff from 6 to 12 communities from across the region.

As these groups are established, they will play the role of primary advisors for building information and data-base services on the network servers supplied to each state by the project. Using the health care example, the project provides the resources for this group to either supply, or request from other sources, information resources that can be made available through the network servers. Using this model, the project will develop a set of information resources for several specific constituent groups. A unique feature of these information resources will be their focus on rural issues. These resources will be made available initially under Gopher and later in the project under WAIS and World Wide Web.

We have identified three requirements for information services provided as part of the Rural Datafication project: first, they must support the project's primary mission to bring the power of the Internet to traditionally underserved communities; second, they must build upon today's information infrastructure and capabilities (for example, Gopher and WAIS), yet incorporate evolving technologies (World Wide Web, WHOIS++); and third, they must involve experts in disciplines of interest to the project's constituents, rather than relying only on technical expertise.

Constituencies the Rural Datafication project has targeted include communities whose needs current networked information resource providers have tended to ignore, or are just beginning to address. These constituencies include:

1. K-12 teachers, students, administrators, parents, and communities;
2. higher education faculty, students, and administrative staff;
3. public, university, and K-12 libraries;
4. state and local government;

5. business;
6. health care providers;
7. agricultural extension agencies.

The project's information services architecture must include providing and maintaining services that enable both novices and experienced network users in these communities to make effective use of Internet resources. These services will include:

1. information servers (Gopher and WAIS initially; WWW eventually);
2. information on Internet navigation tools and procedures;
3. training materials;
4. documentation (installation, quick-start, quick-reference, reference, help desk, FAQ lists);
5. server-information entry and maintenance tools;
6. feedback (suggestions, complaints, questions) mechanisms.

Finally, specific information resources the project will provide should be based on the project constituents' needs and desires. The project's information services architecture, however, should both provide information resources and encourage the use of the Internet as a way to build communities among groups that traditionally have had little contact with one another. As the project participants explore new resources that become available, the list of delivered resources will probably change; however, an initial offering could include information and community-building resources such as:

1. National Public Telecomputing Network (NPTN) "cybercasting" services, which include:
- Academy One, which includes simulations, science projects, foreign language projects, on-line adventures, civic involvement projects, educator support and training, cultural awareness projects, and on-line information resources such as the Big Sky curricular database, the Congressional Memory Project, and Project Gutenberg;
- medical information services, including the H.O.P.E. Foundation Cancer Center, the Pediatrics Center, and the HIV/AIDS Information Center;
- news services such as USA Today, Highlights for Children, Washington Post, London Times, and Moscow News;
5. Usenet news;
6. the ERIC education databases;
7. Fedix and other federal information databases;
8. LEXIS/NEXIS/DIALOG and other for-fee databases;
9. the North Central Regional Educational Laboratory (NCREL), the U.S. Department of Education Office of Educational Research and Improvement (OERI), and other education-specific gophers;
10. bibliographies of Internet-related books and periodicals;
11. guides to Internet resources;
12. existing FYI/RFC/FAQ documents;
13. a "familynet" (a way for geographically dispersed families to exchange e-mail);
14. on-line conferences, using existing conferencing technologies such as CAUCUS, PICOSpan, or Usenet news, or a MUSE (multi-user simulated environment);
15. local Internet/fax gateways;
16. on-line "poster" sessions to provide forums for learning how others use the Internet;
17. a glossary of networking terms and acronyms (for example, the Hacker's Dictionary);
18. public library on-line catalogs, as they become available.

VI. Rural Datafication Conferences

Important aspects of the project involve receiving advice and counsel from those most directly affected by the project, discovering related activities that evolve as the project continues, and disseminating the results of the project within meaningful and useful time periods. One way that this is accomplished is through a (now annual) conference on Rural Datafication.

In May 1993, CICNet and its partners in the Rural Datafication project jointly co-sponsored the first rural datafication conference in Chicago, Illinois. The conference focused on two primary concerns. The first was on ways to effectively respond to user communities which desire Internet services but which are currently unable to obtain Internet access. The second was on ways to best enhance existing services to those populations that make use of non- dedicated connections; i.e., users whose access to the Internet is through dial-up modem rather than high-speed dedicated lines. The focus included users who use SLIP and PPP to get direct connections to the Internet, and those who use Internet facilities through dial-up terminal emulation.

The conference was targeted for three key communities. The first was the providers of networked information, whether they be network organizations or not, who might be interested in assisting in the development of a rural datafication strategy. The second was the users of networked information: teachers, researchers, librarians, scientists, lawyers, bankers—in short, those who are interested in contributing to and gaining from the growing electronically connected community.

The conference planning committee sought particularly to attract users interested in the rural datafication idea. Finally, the conference was intended for potential users of networked information who wished either to learn about the network or to advise those involved in the project on how best to construct a truly pervasive and ubiquitous data network.

The conference was developed along six tracks: K-12 education, agriculture, post-secondary education, libraries, heath care and health education, and community and government education. More than 200 people participated, with representatives from throughout the North American continent. The selected conference program information is clear evidence of the unique nature of the Rural Datafication problem and its need for unique solutions. It is to the participants in communities such as those represented below that the solutions contemplated by a rural datafication strategy should be directed.

For a discussion of alternative approaches to rural datafication, the following organizations and speakers participated:

1. FreeNET British Columbia, Roger Hart, President, Pacific Regional Association for Telematics and Senior Associate, Teleconsult Limited;
2. SENDIT—A Computer Telecommunications Network for K-12, North Dakota, Dan Pullen, SENDIT Education Coordinator;
3. Big Sky Telegraph, Montana, Frank Odasz, Director;
4. Pennsylvania Extension Network, G. A. Hussey, Assistant Director, Computer Services, College of Agricultural Sciences, Penn State;
5. From Bench to Bedside—National Network of Medical Libraries, Pacific Northwest, Sherrilynne Fuller, Director;
6. Sustainable Development Information Network, Massachusetts, Miles R. Fidelman, Technical Director, and Executive Director, The Center for Civic Networking.

From the list of speakers and topics, discussing the nature of the problem and the needs for alternative solutions:

1. “Packets, Schooners and Million Multipliers” E. Michael Staman, President, CICNet;
2. “When Worlds Collaborate, I,” Ross Stapleton, Adjunct Professor, Georgetown University;
3. “Proselytizing the Net,” Simona Nass, President, Society for Electronic Access;
4. “When Worlds Collaborate, II,” Anthony Riddle, Executive Director, Minneapolis Television Network;
5. “Networking the Nations: Information Policy and Internet Access for American Indian and Alaskan Natives” George Baldwin, Chair, American Indian Telecommunications and, Chair, Sociology, Henderson State University, Arkansas;
6. “Tripping the Net Fantastic: Play and Exploration in Cyberspace” Rick Gates, UC Santa Barbara and creator of the Internet Hunt.

Future conferences on Rural Datafication have been expanded to include workshops, pre-conference activities, and space for informal meetings. An Advisory Board of representatives from the community has been formed to help plan the pace and intellectual content of the conferences.

VII. Where Do We Go from Here?

Over the next two years, the Rural Datafication project will produce the following services:

1. client and server software with documentation;
2. training materials for new users;
3. new user start-up kit and site guide;
4. troubleshooting guide for state networks;
5. one UNIX server per state to support a variety of information services;
6. evaluation reports from the project partners, including reports from users;
7. a model for extending infrastructure in other regions;
8. a model for extending support structures in other regions.

These services will be available to the national networking community (although cost recovery may be required on some items).

VIII. Conclusion

This article provides a broad overview of a set of activities related to network access for rural communities in the upper Midwest. CICNet, along with eight state networks and a regional education laboratory, has launched a two-year series of initiatives focused on extending the Internet to difficult-to-reach and traditionally underserved communities of users. An annual conference series will discuss problems and progress in rural datafication.

For more information about these activities, including the annual conference on rural datafication, contact Rhana Jacot, Information Services Coordinator (rjacot@cic.net or 313.998.6521). For information about CICNet, contact Kimberly Shaffer, Marketing Coordinator (shaffer@cic.net or 313.998.6104).

Author Information

E. Michael Staman is currently President of CICNet, Inc., and a founder and Interim President of CoREN, Inc. His background includes more than 26 years in technologies in both the higher education and private sectors; consulting, research, publications, and professional service in a variety of societies; and creator of several important Internet concepts such as Rural Datafication$_{sm}$ and Wide Area Information Resources Management (WAIRM). Dr. Staman has served on numerous boards, including the Federation of American Research Networks (FARNET).

John Hankins has been involved in the development, operation, and administration of computer systems and networks in academic organizations for the past 15 years. From 1984 through 1988 he held a number of management positions at the University of Michigan including Assistant Director of the Computing Center and Director of the Advanced Workstation Laboratory. He was appointed Assistant Director of CICNet in 1990 and was promoted to Deputy Director in 1993. CICNet is an NSF-funded network which provides NSFNET access for the Big Ten universities and more than 200 other academic, nonprofit, and business organizations in the Great Lakes region. At CICNet he has responsibility for financial management and the development of network-based information services. This latter activity has led to CICNet's active role in supporting a number of region-wide information system initiatives.

J. Paul Holbrook has been Technical Services Manager for CICNet since joining the network in 1990. He received a Bachelor's degree in Computer Science at the University of California-Irvine in 1982. His background includes eight years at Xerox Corporation working on Star, a predecessor to the Apple Macintosh, and eighteen months with CERT at Carnegie Mellon University. He co-edited Internet RFC 1244 (Site Security Handbook) and is the Rural Datafication Project Manager.

Rhana Jacot joined CICNet in August 1993, where she coordinates information services. She received a Bachelor's Degree in English Language and Literature at the University of Michigan in 1991. After working as a computer consultant at the University for three years, she became Associate Editor of and a regular contributor to the University's information technology newsletter. She currently serves as Editor and lead writer for CICNet's Rural Datafication project.