NIC Knack Paddy Whack Give That Information a Home: Campus Wide Information Systems and its Service Agent the Network Information Center (NIC)

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ABSTRACT

The global web of computer networks called the Internet is an open door to information for campus staff, faculty and students. While the potential is immense, the challenges faced by the information technology organizations and libraries is daunting. When planning for, implementing and managing this new catalyst for change; information professionals need to provide an infrastructure and support mechanism for this service in order for its use to be successful. The Network Information Center (NIC) and the Campus -Wide Information System (CWIS) will play a primary role in helping its users to master the language, culture, and tools of the next decade in education. Never before has an information technology infrastructure been such a strong catalyst for change, which will totally alter the educational process as we know it. In the wake of these changes this presentation will discuss:

• How to organizationally set up a NIC and CWIS:
• Getting the NIC and CWIS funded;
• Getting them started;
• Multiple uses of the Internet, CWIS and NIC;
• Ethics and security issues;
• Academic information delivery;
• Administrative information delivery;
• Library issues;
• Encouraging faculty, staff and student access;
• Navigating tools and services for the Internet, CWIS and NIC;
• Campus-wide issues.
Campus Wide Information System and Network Information Center as Catalysts for Change

The phenomenon of virtual communities on-line has deep roots in Campus Wide Information Systems (CWIS). Although CWISs and Network Information Centers (NIC) are sometimes hard to label, they're real, growing, and affecting your life whether you participate with them or not. In the last few years we have witnessed major advances in technology and public awareness of networking solutions.

Well, time has passed since personal computers started a minor revolution. Another revolution, argumentatively larger than the first even has the President's office mentioning the information infrastructure as a catalyst for change\(^1\). Since the Internet has become mainstream there has never been a better time for properly managing the CWIS and NIC to create a positive change that can truly transform the campus and its people.

CAUSE's statement about optimizing the infrastructure should be the creed of those who develop the next generation of CWISs and build its service agent, the NIC.

"As our need to be connected--to each other and the world--grows, networks proliferate and the clamor for new networking access grows. Tantalized with the possibilities for instantaneous communication and immediate access to vast sources of new information, staff, faculty, and students hold high expectations for the new order. However, while the potential held by the new infrastructure is immense, so are the challenges for those who plan for, implement, and manage it."\(^2\)

In the wake of these challenges, great opportunities lie where the NIC and the CWIS will play a primary role in helping "Infonauts" master the language, culture and tools for the next decade of world-wide education.

This paper's intent is to discuss the CWIS and its servicing agent the NIC and to enlighten the reader with relevant examples and experiences. Arizona State University makes no claims to be the model Campus-Wide Information System nor Network Information Center, but ASU does feel we have gained some important insights, hindsights and lessons learned on our journey to develop our new CWIS and NIC. Our method of developing these two entities on the cheap did initially hamper our efforts, but current senior management approval is providing the resources for new, more responsive, user centered systems. Practical application methods will discuss: how to organizationally set up a NIC and CWIS; getting the NIC and CWIS funded; getting them started; multiple uses of the Internet, CWIS and NIC; ethics and security issues; academic information delivery; administrative information delivery; library issues; encouraging

\(^1\)The National Information Infrastructure: Agenda for Action, Vision Statement of the Presidents Office for the NII by the National Telecommunication and Information Administration, September 1993.
faculty, staff and student access; navigating tools and services for the Internet, CWIS and NIC; and campus-wide issues.
What is a CWIS?

According to the Internet Glossary, "A CWIS makes information and services publicly available on campus via kiosks, and makes interactive computing available via kiosks, interactive computing systems and campus networks. Services routinely include directory information, calendars, bulletin boards, and databases." This definition is accurate, but quite limited. For example when Brown University first talked about the future of their CWIS, they mentioned it being a paperless society, marketing tool, menu system which integrates all campus services, latest course announcements, database applications, collection point for all campus policies, frequently asked questions, personal calendar/scheduler, and electronic forms. CWISs are virtual kiosks in the sky with online "anytime anywhere" access to a wealth of campus resources.

Campuses are not the only organizations running wide area information systems businesses, government agencies, and cities have grasped the concept and joined the Internet world to share their resources. Since many CWISs are letting users out the back door of the system to the vast resources of the Internet, the new generation of CWIS administrators like the term World-Wide Information System (WWIS). Not only are CWISs more available to other Internet resources, but the new generation of CWISs are more responsive and user centered for all users. In order for any information system to be successful, it must have support.

What is a NIC?

Sitler, Smith and Marine (1992, p. 4) state, "A Network Information Center is an organization whose goal is to provide informational, administrative, and procedural support, primarily to users of its network and, secondarily, to users of the greater Internet and to other service agencies." Just like CWISs, NICs can be anywhere in the Internet world. Because of the Internet's growth, users find it increasingly difficult to navigate through the maze of available resources, such as the hundreds of CWISs. NICs contain information of interest to the target user community (campus, community, state, world). Generally, a NIC lists information on what to do on the Internet, as well as specific local information, such as newsletters, guides, travel logues and popular navigation software.

A NIC has three main functions. The first is called information services or help desk functionality. This is the place where you call, email or fax to get help about network resources like a CWIS. The NIC is your first aid station for finding out how to get connected and where resources are on your CWIS or other CWISs and the Internet. InterNIC refers to this reference desk service as the "NIC of first and last resort." What InterNIC means by this is they will answer beginners questions and expert navigators.

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6Susan Calcari, "What is the InterNIC?, NIC fest '93, November 6, 1993.
questions. The information services also handles the training and educational material for the CWIS and networks.

The second function of a NIC is directory and database services. Sometimes referred to as the yellow pages and white pages of the networked world. This is where someone would ask questions like: How do I find curriculum resources on the CWIS?; and how can I put my information onto the CWIS and the Internet? The directory of directories is the road map to finding rich resources like library catalogs and data archives.

The third function of a NIC is registration services. Registration services for a CWIS sets up accounts for members of the community to be information providers and provides users with assistance on policy issues. This third essential function usually operates the accounts and access privileges of the CWIS and the corresponding Internet connections.7

The NIC is one stop shopping for information about the CWIS and the Internet. One important aspect of the NIC is its ability to coordinate services which are across many organizations and levels within the campus. Personnel from varied functions interact and exchange experiences to provide help for the end users. The NIC support can be as instrumental as establishing on-line help for the CWIS, to working off-line with faculty on using the CWIS and network tools effectively in the classroom. In order to support these varied tasks, collaboration is a key.

Think Globally, Act Locally

The strength of the Internet's current success is collaboration, cooperation, and communication. The Internet's success teaches us the key to ultimate success of implementing a CWIS and NIC is coordination and the collaborative culture of the Internet. Never before has there been a time when so many people can communicate so much information with so many people. There are many organizations that can help, co-develop, and pool resources to ensure the CWIS and NIC at the local level is satisfactorily serviced.

Most everyone believes information is power and knowing what is occurring with other organizations trying to solve the same problems that your organization may have is what the collaboratory nature of the Internet is all about. There are many organizations at the world, federal, state and local level that can assist your campus with administering the CWIS and servicing your end users with a NIC.

World Level

A world wide group, the Internet Engineering Task Force, is the protocol engineering, development and standardization arm of the Internet Architecture Board (IAB). It has grown to be a large open international community of network designers, operators, vendors and researchers concerned with the evolution of the Internet protocol

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7InterNIC Backgrounder, NIC fest '93, November 6, 1993.
architecture and the smooth operation of the Internet. A CWIS and NIC project team
does not need to reinvent the wheel, rather make adaptations and changes to other CWIS
and NIC software, documentation, policies and procedures from thousands of world wide
organization doing just what your organization is doing.

Federal Level

At the federal level funded, by the National Science Foundation, is InterNIC which
is a focal point between Network Information Centers and end users. The InterNIC
cooperates with regional, campus, governmental agencies and international NICs to stay
abreast of the current requirements of these organizations and their users. Another entity
at the Federal level is The Clearinghouse for Networked Information Discovery and
Retrieval (CNIDR). CNIDR is sort of a 'Consumer Reports' type group which works
closely with the developers of other network navigation tools to move them toward
providing compatibility and consistency. CWIS developers can get help from CNIDR
regarding which CWIS software to use at your campus. These two groups are only a few
of the very helpful federal level groups to cooperate with to run a successful CWIS and its
service agent the NIC.

State Level

The Arizona State Public Information Network (ASPIN), with funding from the
National Science Foundation, is developing a Network Information Center for the State of
Arizona. The Governor's Strategic Plan for Economic Development is writing legislation
to fund the State NIC and is planning on giving additional funds to the ASPIN to help
expand the state network to the rural areas. Some of the rural area expansion dollars are
to start CWISs in the rural community colleges. Arizona State University is helping to
coordinate all of the new Internet connections in the rural community colleges and to form
a cooperative NIC of NICs to help support end users and develop CWISs. Arizona's
Freenet organization called Arizona Community Computing (AzTeC) is looking to join
forces collectively with community level CWISs and NICs to provide seamless support for
all communities, equal access and support for state internetworking

Local Level

ASU's NIC

Organizationally, the ASU Network Information Center consists of a help desk
with four part-time phone consultants, a NIC-Q@ASU.EDU email list for questions, a
populated on-line consulting system, and a virtual NIC, which is a Gopher directory
containing items that help users find information about the Internet, NSFNET,
WESTNET, ASPIN, and ASU networks and navigational software. The NIC is especially
intended as a reference point for new CWIS and Internet customers to use in obtaining
general information about the ASU Gopher CWIS and the Internet, especially how to
connect, usage policies, and user guides. A pointer to the InterNIC (Network Information
Center) of first and last resort, InterNIC, is included here. Other useful NIC Gopher
Servers, general purpose Internet guides, information, newsletters, phone books, and Internet navigation information are also included. 

The Network Operations Center menu provides up-to-date information about Internet outages that are scheduled or have just occurred which can be used to help one plan one's use of the Internet. By checking here, a user may discover that the site they are trying to reach is down, and not a result of their own software/hardware configuration. Any user can also see various statistics for usage on the Internet/NSFNET as well as ASU’s Gopher Server usage statistics.

ASU Information Technology also provides an on-line consulting service for Internet related questions as a part of ASPIN (the Arizona State Public Information Network). Questions and requests for information can be sent in an e-mail note to NIC-Q@ASU.EDU or you may call the ASPIN NIC consulting line at 965-7000.

**ASU's CWIS**

At the campus level, the Arizona State University Gopher is our Campus-Wide Information System, which provides a central delivery vehicle for information about Arizona State University. It is easy to use, and finding information is facilitated through a simple searching mechanism or browsing a hierarchy of menus. As an added benefit, the interface has the same "look and feel" of a variety of platforms, so computer users familiar with Gopher on one system can easily adapt to Gopher on the other systems. Finding information on the ASU Gopher is as simple as selecting a cheeseburger from a menu. The ASU CWIS gives computer users at ASU access to similar systems throughout the world and those at other universities access to information about ASU.

The "ASU Campus-Wide Information" directory contains information from various departments and organizations at Arizona State University. Some of this information is located on various college or department gopher servers, however, some is located on the ASU CWIS Gopher Server. In any case, the information providers are responsible for the contents of their own particular "branch" of the ASU CWIS Gopher system. ASU Information Technology makes no claims for the accuracy, currency, or reliability of the information contained in these sub-menus.

ASU departments and organizations, and soon off campus organizations, that would like to contribute their own sub-menu should read the item "How to Contribute to the Arizona State University Gopher" in the same directory and as seen below.

**Figure 1 How to Contribute to the Arizona State University Gopher**

| How to Contribute to the Arizona State University Gopher (11/18/93) |

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8 Baldwin, Doug. About the Network Information Center, Gopher CWIS ASU, November 18, 1993.
9 Baldwin, Doug. About the Network Information Center, Gopher CWIS ASU, November 18, 1993.
As you are probably well aware, the potential for Gopher as a tool for distributing information of all kinds, from all sorts of places, is great. It takes creative ideas from all kinds of people to make a truly useful Gopher. The very nature of Gopher lends itself well to bringing information from a wide range of providers into one integrated structure.

At ASU, we are attempting to make it easy for departments and organizations to become information providers for the ASU Gopher Server. ASU Information Technology (IT) is providing the "conduit" and support for these contributions. Individual organizations and departments are responsible for their own "branch" of "gopher-space". All an "Information Provider" needs is their own Gopher server or authorization to use a new facility called "Gopher-Lunch" to "feed" the main ASU Gopher Server maintained by ASU IT. Access to ASU department/organization Gopher Servers/sub-menus will be through the "ASU Campus-Wide Information" item from the main ASU Gopher menu. An "Information Provider" has the following options available for contributing:

1) Run your own Gopher server on a Unix workstation.
   + The Unix Gopher Server software is the most robust and reliable.
     + WAIS full-text indexing is available for database searching.
     - Unix workstations tend to be more expensive to buy/administer.

2) Run your own Gopher server on a Macintosh computer.
   + The Macintosh Gopher Server software is extremely easy to install and use, making this a good solution for new providers.
   + Macintosh computers tend to be less expensive than Unix workstations.
   + If most of your information is in Mac format, there will be less file conversion/transfer involved.
     - Depending on the processing ability of the Mac, this may not be a good solution if traffic to your information gets very heavy.
     - WAIS full-text indexing is not available for database searching.
     - Disk storage space tends to be an issue.

3) Run your own Gopher server on a PC computer running Unix.
   + PC compatible computers tend to be less expensive (and used ones more available) than Unix workstations.
   + There is public domain Unix software available for PC's
     + WAIS full-text indexing is available for database searching.
     + If most of your information is in DOS format, there will be less file conversion/transfer involved.
     - Depending on the processing ability of the PC, this may not be a good solution if traffic to your information gets very heavy.
     - Disk storage space tends to be an issue.

4) Submit information to IT's ASU Gopher Server with "Gopher-Lunch".
   + The easiest way to get information into the ASU Gopher.
   + Gopher-Lunch works through a Gopher Client or through simple E-mail.
   + You do not have to administer the server's platform/operating system.
     - You may be limited to a certain amount of disk space.
     - You will have to transfer files to the system.

In all cases, you will have to coordinate with ASU Information Technology to have your submenu added to the "ASU Campus-Wide Information" menu.

For easy access, pointers to the Gopher Server software described above are included in the same directory as this file is in. The Gopher-Lunch command menu is also included here so once you get authorized as an Information Provider, then you can begin adding items.
To get authorized for Gopher-Lunch, or to have the ASU Gopher Server point to your own Gopher Server, send an e-mail note to "gopher-help@info.asu.edu". Or, easier yet, if you're running a Gopher+ Client that supports ASK blocks, select the "Request to become an Information Provider to the ASU Gopher" item in this directory, which will let you fill out and submit a request form to "gopher-help" automatically.

NOTE: Supported Gopher+ clients are: Macintosh TurboGopher (version 1.0.7 or greater), PC Gopher III (version 1.1.2 or greater), HGopher for Windows, or Unix Gopher (version 2.0 or greater). The Gopher Clients on the ASU Academic IBM VM/CMS and Academic VAX currently do not support ASK blocks and will not work). Once your request has been approved or denied, you will be contacted with more information on setting up your part of "gopher-space". Thanks for your interest!

--The ASU Gopher Team

At ASU we are moving to a production Gopher CWIS server, which will be automated with the software product mentioned above called Gopher Lunch. Gopher Lunch will help ASU finish migrating off our old mainframe CWIS system. The Gopher Lunch software will allow ASU to automate and coordinate the CWIS to help lay persons to be information providers at ASU.

What Gopher Lunch Is

Gopher Lunch is a system for submitting and maintaining "gopher data" on a Gopher Server, via Gopher+ clients, electronic mail, and anonymous ftp. As it is often unpopular to generously assign remote login accounts on Gopher Server systems, and as the methodologies and learning curve for updating and maintaining "gopher data" is equally unpopular, Gopher Lunch was developed as a more secure and intuitive distributed system of maintaining "gopher data."

There are two interfaces for administering all of the Gopher Lunch commands. The first is through the Gopher+ client ASK blocks. ASK blocks are simple on-line forms that providers fill out and submit. An example of a Gopher Lunch ASK block is in Figure 2. The other interface to Gopher Lunch is Internet electronic mail. Most mail clients with gateways to the Internet work fine for Gopher Lunch. Coupled with anonymous file transfer protocol (for binary and large files) both interfaces allow a validated provider to maintain his/her own files, create searchable indexes to those files, and perform various accounting functions---all from the provider's native platform. Creation, deletion, and maintenance of the CWIS accounts can be done through the same interface(s) by a "CWIS maintainer."

Figure 2. Example of a Gopher Lunch Ask Block for Adding a File

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10The ASU Gopher Team, How to Contribute to the Arizona State University Gopher, Gopher CWIS ASU, November 18, 1993.
Figure 2. The Gopher Lunch ASK block requires the Information providers identification and password for his/her CWIS account. The \texttt{[<path>/]<filename>} is the location of where the file should be placed in the CWIS. The "Name for the file" section is where the Information provider gives the new information a descriptive name for the file everyone will see. The "Numb for the file (optional)" field is for the order of directory occurrence the Information provider wants the information to be in. The "Text for the file" section is where the information provider types or pastes in the actual text.
Getting a CWIS or NIC Funded and Started

Although the CWIS and NIC are entirely different organizations they have many areas which are mutually inclusive and co-dependent on each other. One common element they share is their haphazard beginnings and practically no budget start. ASU, for example, slated that the NIC be a zero dollar budget start up, but coordinate services that are already being done and not called NIC functions were costing a considerable amount of money. Even at these early stages there was an acknowledgment for the need of future funding sources. On the other hand, the CWIS became an after hours project over two years ago, when ASU was looking to support its' distributed computing consultants with an on-line consulting system. When the consulting systems engine was designated to be a Gopher server, management desire to replace the mainframe CWIS emerged. Through the hard work of the ASU Gopher Team and their ability to educate others about navigating the Internet, progress was made and Information Technology dollars followed the progress and action. The ASU CWIS Gopher server was born by riding the coat tails of another project (on-line consulting). Presently, ASU has a test CWIS, a production ASU CWIS Gopher server, and a production server for Netnews and other future CWIS engines.

At the same time CWIS project was having its' eager beginnings the State Network Information Center became funded by an NSF grant (ASPIN) intended to network the rural areas of the state. In the grant was funding for starting a NIC of NICs for Arizona (de facto ASU for now) and geographically distributed NICs for the rural community colleges and their new Internet connections. The awareness and excitement generated by the promise of the "data superhighway" prompted a Governor's level group to request funds from the state to help enlarge the NIC development efforts and separately fund Internet applications like CWISs around the state.

There are many different strategies to getting NICs and CWISs started. Some methods include just renaming old services, organizing the elements of both that already exist, adding CWIS and NIC functionality to projects already under development, and adding another phone number to the phone consulting line or departmental gopher. The ideal method of establishing a model NIC or CWIS is not to just throw things on a server and dish out ad hoc help, but to form a steering committee including faculty, staff, administration, and students to direct the structure of the CWIS and functionality of the NIC. ASU may not have had ideal starts for both of these projects, but with a "just do it" mentality the initial success developed into a clear vision, which has now been articulated by the Vice Provost. ASU's Gopher CWIS Server and the NIC are new emerging services reborn with strong commitment and new leadership.

Multiple Uses of the Internet, CWIS and NIC

The CWIS administrator and the NIC support staff person are expected to be Internet gurus. This is just not possible with the size of the network, the number of applications, and the speed of network development. The information served up by many CWISs is not just ASCII text anymore. There are many new forms of information like audio (Internet Talk Radio), video (mpeg), and multicasting (mbone) that not only require
lots of bandwidth, but a technical savvy administrators and knowledgeable NIC staff people. With all of the multiple uses of the Internet a successful CWIS administrator needs to encourage others to serve up information they require, so as to not force the central IT unit to hold everyone's hand in becoming an information provider. The key to making information providers self-sufficient is a "training-free" and consistent graphical user interface. Along those same lines the NIC staff needs to have one skill greater than any other, and that is not to have all of the information needed for all types of uses, rather knowing where that information is. Bucking and referring to the appropriate location for help is the only way for ASU IT to support multiple uses of the CWIS and NIC.

**Ethics and Security Issues**

Ethics and security go way beyond netiquette. The NSFNET acceptable use policy used as the networking administrator's crutch is currently not enforced and therefore has no teeth. There are also trade offs that occur between ease of use and the building of fire walls for security. The most appropriate way to address security is to discuss it from the first day of the CWIS project. For example one security issue at ASU is having public dial up access to a secure Gopher CWIS server and not allowing anyone connecting to it to create links to off campus. This is so ASU does not give out entire Internet access to the general public.

Ethics and world wide cooperation is essential because anyone can easily become an information provider to the world. Educom's "Bill of Rights and Responsibilities for Electronic Learners" is an excellent document that every NIC should have and organizations like the Electronic Frontier Foundation should be consulted when dealing with responsible citizenship in the electronic community. The best way to be prepared for ethical and security issues is to have policies in place and study security case studies from other campuses.

**Academic and Administrative Information Delivery**

A successful CWIS can create a culture change of moving from a paper-based process to an on-line browser or search and query database process. The information resources on the CWIS get interwoven in the academic discipline and the NIC staff people are regularly helping faculty teach navigation skills to the classes. Faculty are feeling empowered at the office ethernet jack. Due to the marketing work of the NIC, academics are using the CWIS for many different things from publishing electronic journals to displaying CD photo images of the Mars probe.

Administrative users have been excited about not having to reinvent the wheel when creating policy by viewing other universities policies and procedures through the CWIS and the Internet. Many administrators after receiving training from the NIC at ASU, point up to their bookshelves and state, "We do not need all of these out-of-date paper manuals when the information is at our fingertips on the CWIS." Many of the administrative offices are interested in becoming information providers, especially those in areas such as admissions, registration and student affairs. The new CWIS has raised the eyebrows of many budget minded administrators who envision cost savings and increased
administrative productivity. ASU's NIC is trying to ensure that none of the administrative or academic users will fall through the cracks.

**Library Issues**

The CWIS and NIC should not ask for help from the library, but include them. The library community has many valuable contributions to offer the users of the CWIS and the Internet. Libraries have been exposed to the paperless society; the library without walls; the move from collections to access; and the shift in emphasis from quantity to quality. Libraries have experience in training patrons to glean information resources and have a large part to play in the full circle development of the ASU NIC and CWIS. For example, librarians at ASU have partnered with the NIC to teach navigation of the CWIS and the Internet. The librarians handle the resource questions and the techies handle the tools questions. Until both librarians and information technology professionals work together the CWISs and NICs will not reach their full potential.

**Encouraging Faculty, Staff and Student Access**

ASU's NIC staff, through the faculty development department, started teaching introduction to the CWIS tools and Internet navigation. Classes were booked solid for weeks. The NIC staff was quick to notice the only way to keep the faculty interest was to "hook them" by setting up discipline specific training sessions for each subject area. The NIC trainers even trained from the department sites. The most important teaching motto for the NIC staff was just teach them one thing they will use everyday. About five hundred of the faculty trained also challenged the CWIS and NIC teams to make tools user friendly and classes very short. The faculty interest was in the resources first, the tools second, and running a server in a close third.

Having 42,000 students puts an ASU CWIS Gopher Team of under ten staff members and a NIC staff of under ten members at quite a disadvantage. However, due to the faculty excitement and efforts, many classes on campus were going on Internet hunts and frequently meeting in computer labs to get aquatinted with the Gopher client for student survival training in the 1990s. Every campus computer lab had CWIS and Internet access and it did not take long for student Internet Users Groups to form and for a few student organizations to become information providers for the campus and the world. The students are used to training themselves at ASU and take full advantage of the on-line consulting database and tutorials.

The administrative training was much different than faculty and student training. The administrators wanted demonstrations first, then maybe hands on classes. The administration at ASU was more interested in the new CWIS conceptually, then as a personal productivity tool. Generally, the administrators wanted the NIC team to train their trainers first, and then have their trainers teach each of them. This train the trainers concept worked fine unless one of their trainers just could not grasp the material.

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Training administrators to be information providers involved lots of piloting first, show and tell second, then development. The administrators’ culture change happened most drastically with many of them trying to think of innovative applications such as preparing for campus imaging and electronic work flow.

**Navigating Tools and Services for the Internet, CWIS and NIC**

The speed of development of new client/server tools is exciting, but very problematic for NIC support when a new version of a tool comes out every week and the ASU CWIS server software changes every two weeks. The policy project team screams for stability on the server side so the CWIS can be called "production," but can something that changes this much and is experimental so often, be called production? The arguments will go on for months, but the CWIS will keep functioning with over 7,000 visitors and approximately 3,000 searches a day. This CWIS traffic is increasing geometrically each month. The funding of the ASPIN state network increases the CWIS potential users to over 500,000.

The challenges of so many new CWIS users for the NIC makes the task daunting, but the research and development team is finding new tools and automated services to give end users a better interface and more advanced searching capabilities. Due to the small size of the CWIS and NIC staff ASU draws on the experiences of others and collaborates interstate and world-wide for internetworking solutions. Many of the new tools like Mosaic and WWW servers are being experimented with to see if they meet our needs. The future of the ASU CWIS does not lie within the next new navigational tool, but with the strategies for serving the campus and state with the NIC.

**Campus-wide Issues**

There are so many issues concerning these two entities. Most of the issues are not problematic, but opportunistic. Outreach efforts for the campus are improved immensely by effective information dissemination and strengthen linkages to others at geographic distances because of the CWIS. The ability for everyone on the campus to become an information provider and the ability to listen to audio and see video brings up an old issue of capacity. ASU has not had capacity problems yet, because many CWIS providers are willing to run their own servers. The other issues that ASU will wrestle with for some time to come is:

- Responsibility of information;
- Wide accessibility;
- Funding;
- Governance/ Policy-making;
- Network management;
• Intellectual property rights/copyright;
• Privacy/data security;
• Technical standards and;
• User training and support.