

2004



Advanced Engineering Taskforce Report

**ILLINOIS
CENTURY
NETWORK**

Central Management Services

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Illinois Century Network

Advanced Engineering Taskforce Report

July 2004

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Message from Gary E. Wenger, Chair, Advanced Engineering Taskforce

Preface

The ICN is a telecommunications backbone providing high-speed access to data, video, and audio communications in schools and libraries, at colleges and universities, to public libraries and museums, and for local government and state agencies. The network serves the needs of Illinoisans for education, training, and information technologies.

The network builds on previous investments in technology, including the Illinois Higher Education Video Network, the Illinois State Board of Education's Internet initiative, the Illinois State Library's work to connect libraries with learners, and efforts of the Department of Central Management Services to provide statewide telecommunications links. The Illinois Century Network replaces outdated technology with state-of-the-art technology to improve the quality, reliability, usability and access to a truly high-speed information artery providing direct links to institutions, particularly those in rural areas.

From expanding educational opportunity to strengthening economic development, the Illinois Century Network is able to:

- Provide a full range of educational opportunities anytime, anywhere.
- Provide access to Internet2 for Illinois education, libraries and museums.
- Facilitate the critical connection between K-12 schools and higher education
- Provide learning enhancement in existing classrooms through increased student-to-student and student-to-instructor interaction.
- Provide libraries and museums with the opportunity to share unique content.
- Provide services and educational programming to municipal government.
- Smooth the path between school and college and between school and work to encourage life-long learning at home and in the workplace.
- Increase the number of high school students taking college course work online and thus reduce the time and cost of a college education.
- Provide access to college admissions requirements and financial aid information to high school guidance counselors and students throughout the state making it possible for students to apply on-line to Illinois colleges and universities.
- Enable Illinois to sustain its competitive advantage in academic computing and networking.
- Deliver state-of-the-art education and training for business and industry.
- Allow Illinois to compete with other states by creating an attractive environment for rapidly growing network and information related businesses.

The Illinois Century Network provides the backbone network, the point of presence equipment (central equipment necessary to connect to the network), and a predetermined baseline amount of Internet access at no cost to eligible constituents (education, museums, libraries). Participants are responsible for the customer premise equipment (CPE) and access circuits. The institution makes the determination of the bandwidth necessary to carry current traffic; the ICN will assist in this determination if the assistance is requested. A constituent of ICN may request additional bandwidth at any time under the current cost recovery model.

The ICN backbone provides multiple diverse routes to the Internet in different parts of the state to ensure reliability and redundancy. The backbone is built on an OC12 ring that extends from Chicago-Peoria-Springfield-Champaign with OC3 and DS3 rings extending to other areas of the state. Internet egress is procured through five unique providers with routes leaving the network at three diverse locations. The ICN also provides connectivity to Internet2 through an OC12 to StarTap/MREN.

Support

The ICN has established nine Regional Technology Centers staffed with certified network specialists strategically located throughout the state to provide regional service as needed. There is also a Network Operations Center in Springfield to handle after hours calls.

The ICN is monitored 24 hours a day, 7 days a week, 365 days a year. Contact numbers are provided to ICN constituents at the time of connection and assistance is available in the event of network outages. These numbers are also available on the web site at www.illinois.net in the support section.

Governance

The Illinois Century Network is governed by a Policy Committee with seven standing members representing the Board of Higher Education, the Community College Board, the State Board of Education, the State Museum, the State Library, the Department of Central Management Services, and the Governor's office. Recently passed legislation allows for the expansion of Policy Committee representation to include private K-12 and higher education, and other participant constituents who are not already represented.

In order to plan for the long-term scalability and sustainability of the ICN, the management team established the Advanced Engineering Taskforce (AET). The members of the AET are drawn from a wide group of professionals representing the diversity of the ICN constituents and the advanced technological projects in the state. The ICN staff also works closely with the Illinois Online Leadership Council to ensure the network will be able to support the educational applications being developed in the Illinois elearning community.

Beginning July 1, 2003 (Fiscal Year 2004), the ICN budget became a part of the Illinois Department of Central Management Services with the Board of Higher Education remaining the fiscal agent in the interim. The transfer of the ICN to CMS has been seamless. The users of the ICN continue to see quality service and support.

Challenges

The future presents four major challenges for the ICN to provide the level of service required to support a mission critical environment. They include:

- *to continue maintaining a reliable and upgraded network*
- *to meet the expanding needs of the user communities*
- *to continue using a constituent driven model for planning and management*
- *to maintain an appropriate funding model*

Most organizations connected to the ICN depend on the network to deliver essential services. For example, at the College of DuPage, we depend on the network to deliver services to our students, faculty, staff, and the community. Our services consist of online and web-enhanced instruction, electronic communications between the faculty and students, and administrative processes such as student registration and grade reporting. We have grown to depend on the Internet for mission critical application services. The user community accesses the college web site on a continuous basis for information about the college and instructional material. Our resources need to be available seven days per week 24 hours per day. This example reflects the typical needs of other ICN clients. In order to maintain quality services, the existing infrastructures need to be replaced and upgraded on a regular basis. *The challenge to the ICN is to continue maintaining a reliable and upgraded network.*

Most organizations' utilization of the ICN will continue to grow. The Internet will continue to be used to deliver more and more services. The survey recently conducted by the ICN provides data that projects growth of Internet usage at 5-10 percent per year. Organizations will need to expand their Internet connectivity to deliver more services. There are certain applications using video and voice that will expand the use of the Internet. Content providers will continue to increase the traffic of the network. *The challenge to the ICN will be to meet the expanding needs of the user communities.*

It is important to understand the user perspective when managing a large organization. Over the years, the ICN has been very effective in utilizing constituent based input in developing plans and services. The user groups assist in setting future directions for services and support by communicating their issues and concerns. *The challenge to the ICN is to continue using a constituent driven model for planning and management.*

The funding model for the ICN state wide network and services must be competitive and add value to the member organizations. The model provides a fair and equitable solution in providing rates for all constituents. The educational constituents receive a baseline of bandwidth based on the full-time equivalent (FTE) enrollment and pay for services above that level. All other constituent rates are set based on ICN costs. The FTE model for primary constituents works reasonably well, but as stated above, does not encourage community sharing of bandwidth. Any erosion of service level, reliability or cost increase without increased service value will drive constituents away. The ICN needs to continue to hold or reduce the cost of service to all constituents. *The challenge to the ICN is to maintain an appropriate funding model.*

It has been a pleasure serving as Chair of the Advanced Engineering Taskforce for this past year and I am looking forward to another year.

-- Gary E. Wenger

Membership

Chair

Gary Wenger, Vice President of Information Technology, College of DuPage

Members

William K. Barnett, Ph. D. VP and Chief Information Officer, The Field Museum
Andrew Bullen, Information Technology Coordinator, Illinois State Library
Charles Campbell, Associate Director, Information Technology, SIU Carbondale
Tony Daniels, Chief Technology Officer, Central Management Services
Todd Cooper, Information Tech. Coordinator, IL Critical Access Hospital Network
Mike Dickson, Director of Information Technology, Center for the Application of Information Technology at Western Illinois University
James V. Dispensa, Special Assistant to the CEO - Technology & Telecommunications, Chicago Public Schools
Robert Einhorn, Director, Information Systems, College of Lake County
Sam Ferguson, Director of Information Technology, City of Schaumburg
Jim Flanagan, Director of Technology, Maine Township High School District #207
Dennis Gallo, Technology Coordinator, O'Fallon Community Consolidated School District 90
Charles Kline, Principal Research Programmer, University of Illinois at Urbana-Champaign
Abe Loveless, Network Specialist, Area 5 Learning Technology Center
T J Lusher, Assistant Dean of Libraries, Northern Illinois University
Joel Mambretti, Director of the International Center for Advanced Internet Research, Northwestern University
Keith Mann, Director, Media and Network Services, Township High School District 214
Alan Pfeifer, Director of Computing and Instructional Technology, Sauk Valley Community College
Steven J. Philbrick, First Deputy Chief Information Officer, City of Chicago/Business and Information Service
Richard Powell, Chief Financial Officer, John H. Stroger Jr. Hospital of Cook County
Erich Schroeder, Curator of Information Technology, Illinois State Museum
Ken Spelke, Associate Dean, College of ACES, University of Illinois at Urbana-Champaign
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Introduction

The 2004 Advanced Engineering Taskforce Report is the result of the group's deliberations during a time of change for the Illinois Century Network. Many of the discussions focused around the topic of the ICN transition to the Department of Central Management Services (CMS). Specific issues and concerns were posted to an online, continuous analysis of strengths, weaknesses, opportunities, and threats (S.W.O.T.). The information from this analysis provided a foundation for many of the meeting agendas and discussions. Inclusion of ICN staff and representatives from CMS brought all concerned parties to the table and many inquiries about the proposed consolidation were able to be addressed to the satisfaction of the AET members, allowing the consolidation issues to take a back seat to the overall work of the Taskforce.

This year's report reflects the shift in ICN focus from connectivity to network services that add value. In order to be able to reflect the current thinking of ICN constituents, the AET members played a key role in the development of the first constituent survey and used the results in the formation of the recommendations included in this report. In concert with this shift in focus, and the overall fiscal challenges facing the state of Illinois, the AET strongly sees the need for the ICN to engage in a strategic planning process that provides for continued world-class service in a tight fiscal climate.

Efficiency in networking continues to drive the recommendations of the AET. Migration to IP video allowing constituents to make more efficient use of their connection to the ICN; partnering with CMS as new applications, such as voice over IP, are rolled out to state agencies; continued investigation of wireless technologies to facilitate less expensive last mile connections; and the convergence of voice, video and data are representative of the issues considered by the AET during this past year.

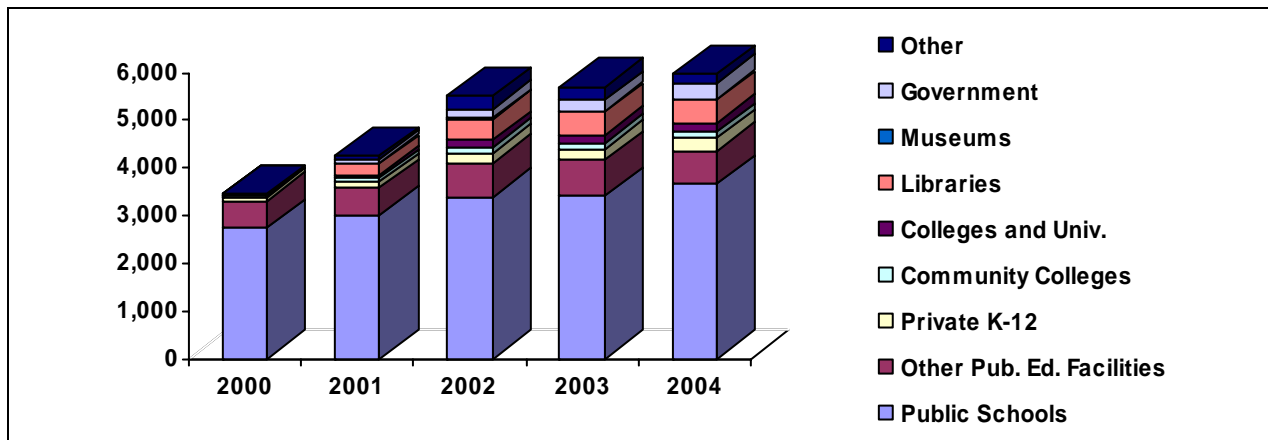
The recommendations also provide a foundation for the continued deliberations of the AET as the ICN solidifies its relationship with CMS and expands its network and service offerings to an expanded constituent base.

Utilization of the ICN

The number of connections to the ICN continues to grow, with primary constituents -- K-12, higher education, libraries, and museums -- representing the largest number of network participants. Growth in the number of state agencies, currently categorized as "government", is expected to increase dramatically as the ICN becomes more involved with CMS.

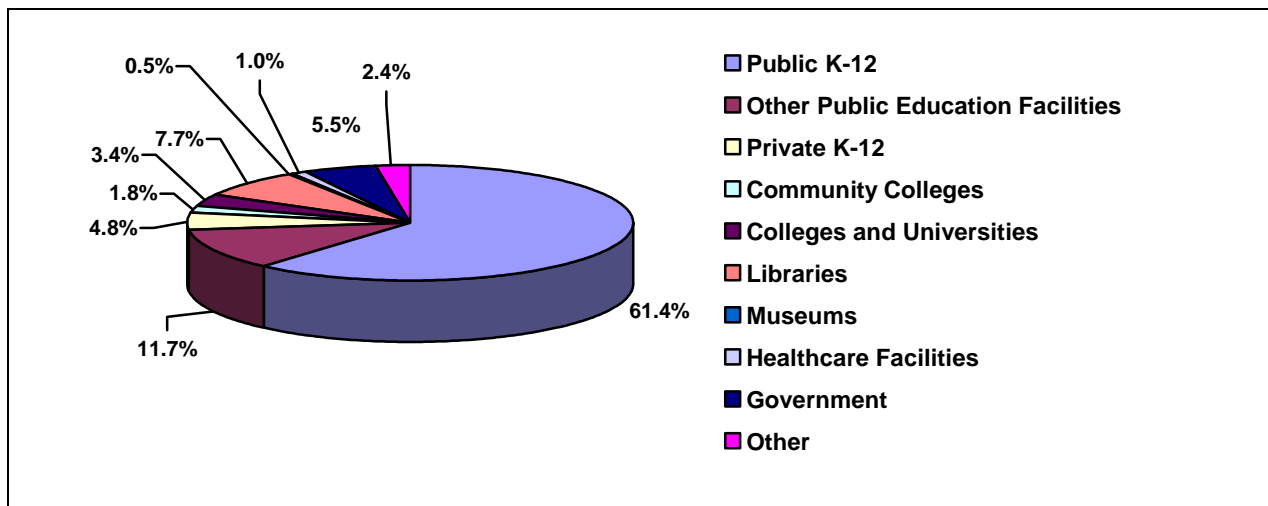
ICN Constituents by Category 2000 – 2004

Table 1



ICN Constituents May 2004

Table 2

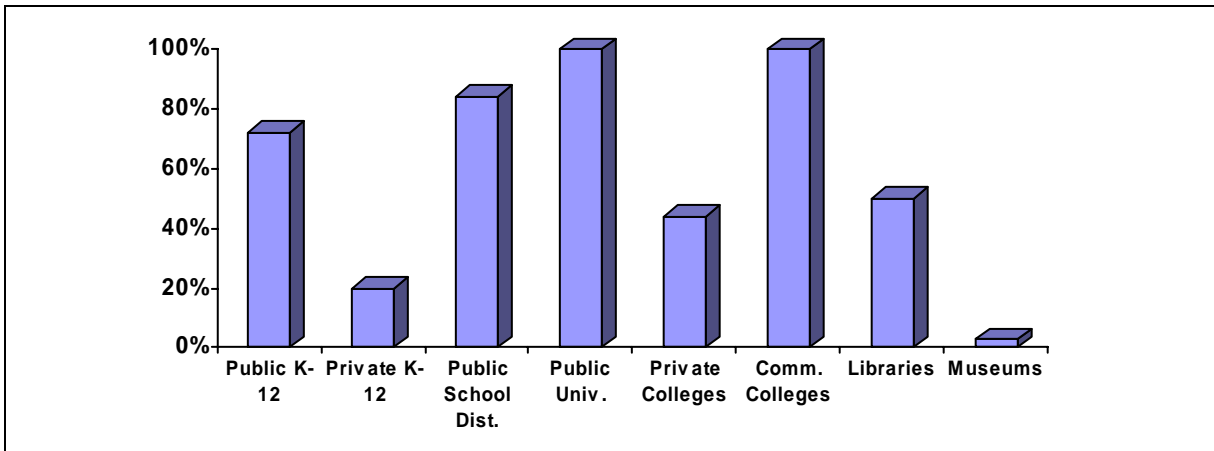


The legislation creating the ICN (20 ILCS 3921 Amended) called for the network to "be a service creating and maintaining high speed telecommunications networks that provide reliable communication links to and among Illinois schools, institutions of higher education, libraries,

museums, research institutions, State agencies, units of local government, and other local entities that provide services to Illinois citizens.” The current number of connected education institutions represents access to the ICN for just over 2,400,000 students attending K-12 and higher education, public and private schools in Illinois.

Percentage of Primary Constituents Connected to the ICN

Table 3

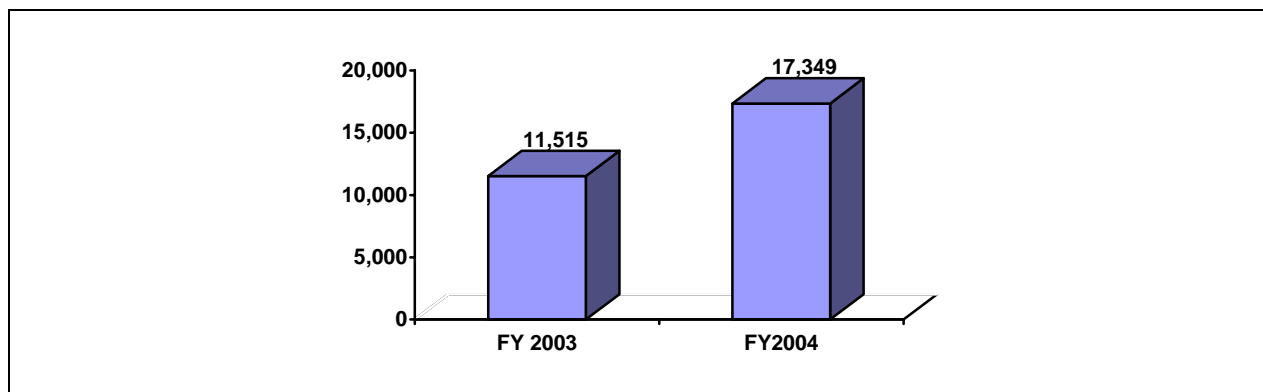


Content Filtering

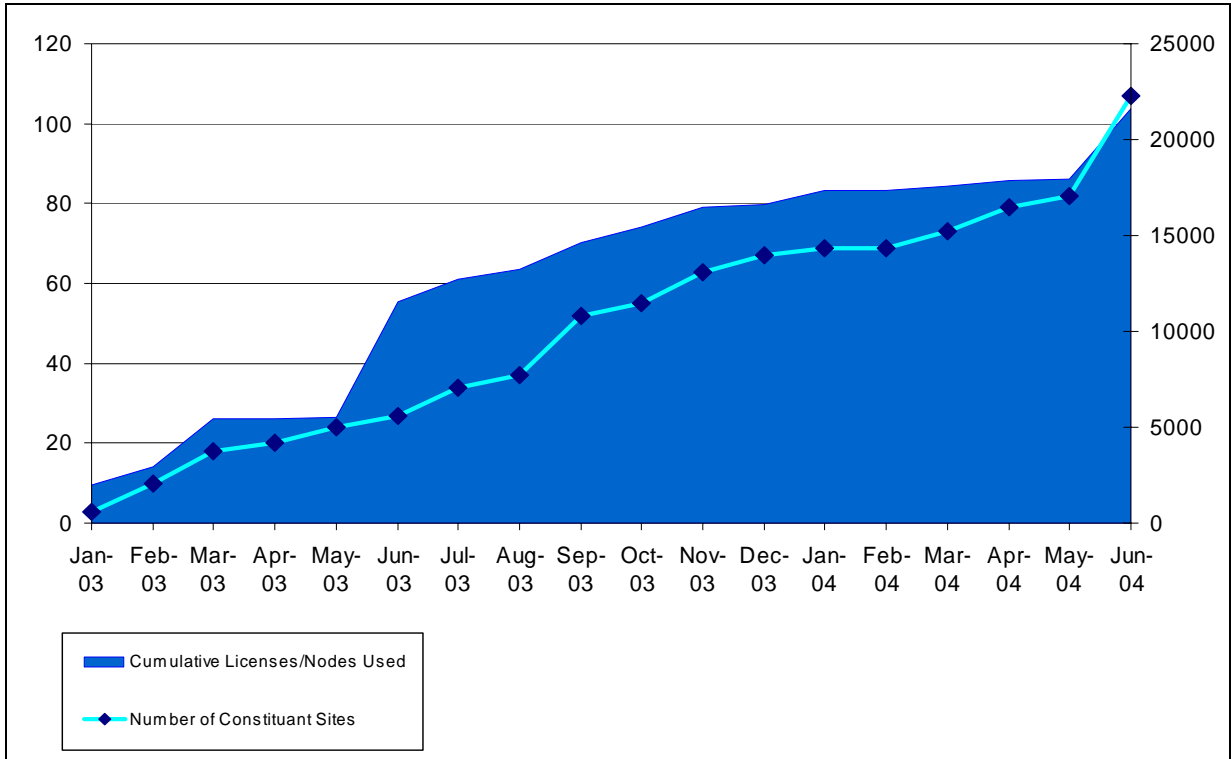
In January 2003 the ICN began offering a content filtering service to allow ICN constituents the opportunity to enable filtering on local networks without a great deal of expense or technical expertise to support the application. Content filtering is a mandatory requirement for K-12 schools and public libraries who wish to participate in the federal E-Rate program. The ICN files an E-Rate application on behalf of all eligible constituents, resulting in anywhere from two to four million dollars in additional funding to support the network. Content filtering is offered on a cost recovery basis, administered by the local institution, and is available to all ICN constituents.

Constituents for Content Filtering

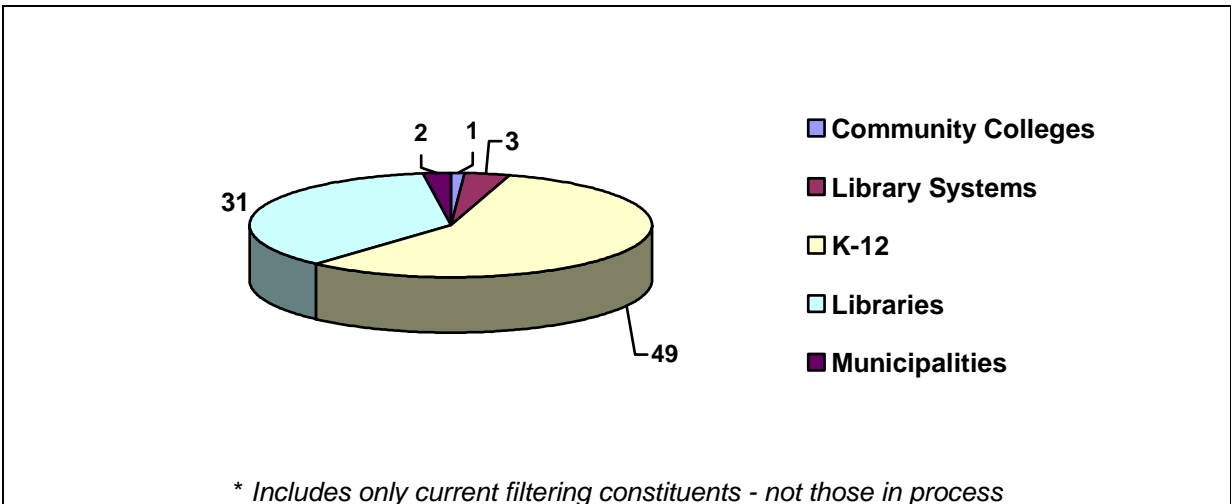
Table 4



Content Filtering Usage
Table 5



Content Filtering Constituents by Category
Table 6

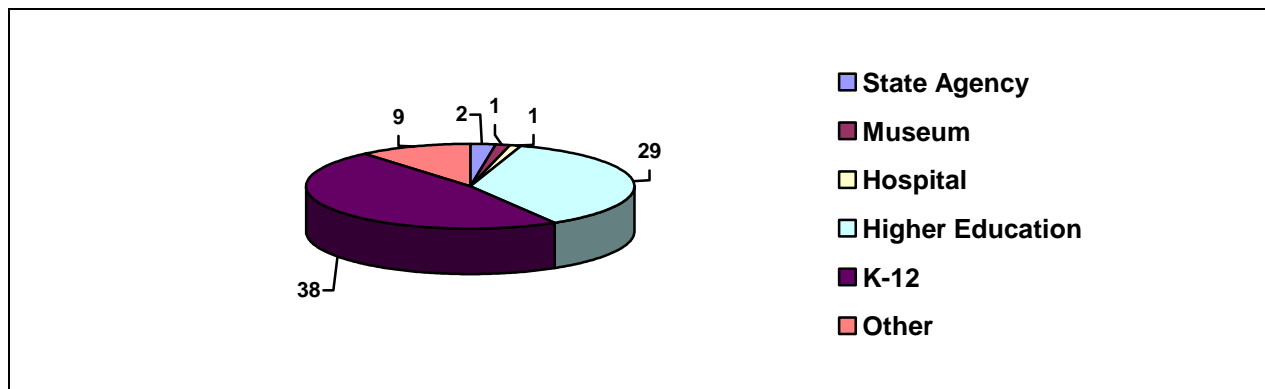


IP Video

Many of the ICN constituents are looking to implement H.323 video or migrate from H.320 to H.323 in order to be able to use their connection to the network for both data and video. The IP video offering allows constituent IP video endpoints to register with and utilize the services of a gatekeeper, access to an IP (H.323) to ISDN (H.320) gateway, and access to an H.323 multipoint control unit. During the first year of implementation, 80 video endpoints registered for the service. Institutions need to install IP video equipment at their site in order to take advantage of the service and growth in this area is contingent upon ICN constituents installing H.323 equipment. However, the migration of all state agency video sites to H.323 will contribute significantly to accelerated demand for this service over the next year.

IP Video Constituents by Category

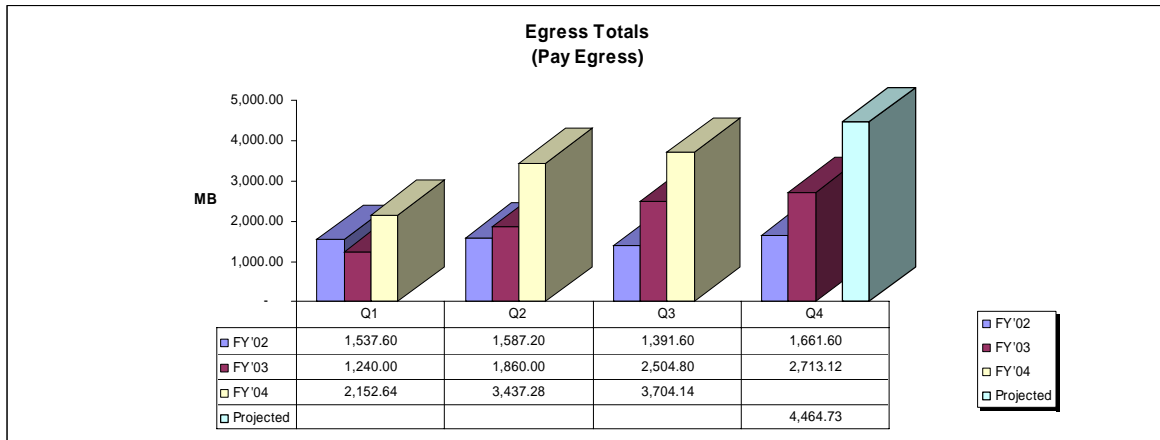
Table 7



Egress

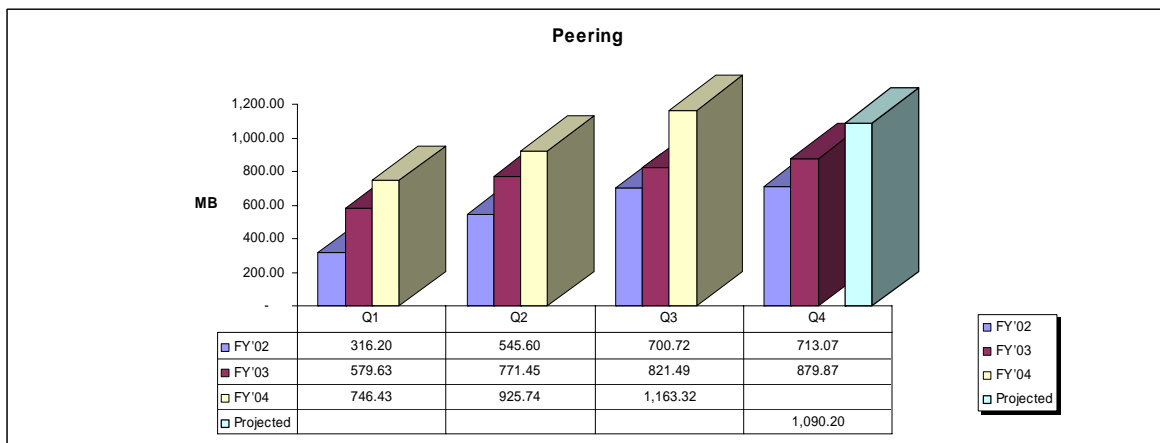
The ICN provides egress from Tier 1 network service providers, offering five levels of physical and network diversity to network constituents. As shown in Table 8, demand for direct Internet access services has grown substantially over the past three years. Historically, ICN direct Internet access has increased at a fairly level eight percent per month, or 100 percent per year. However, due to cost recovery and several bandwidth saving initiatives (i.e. Akami and ADNS peers), the annual increase has been reduced and is now approximately 75 percent per year. The ICN has renegotiated or is in the process of renegotiating all of the egress/direct Internet access contracts and expects to realize considerable savings while increasing bandwidth and moving to gigabit Ethernet connections to the providers.

Egress Totals (Pay Egress)
Table 8



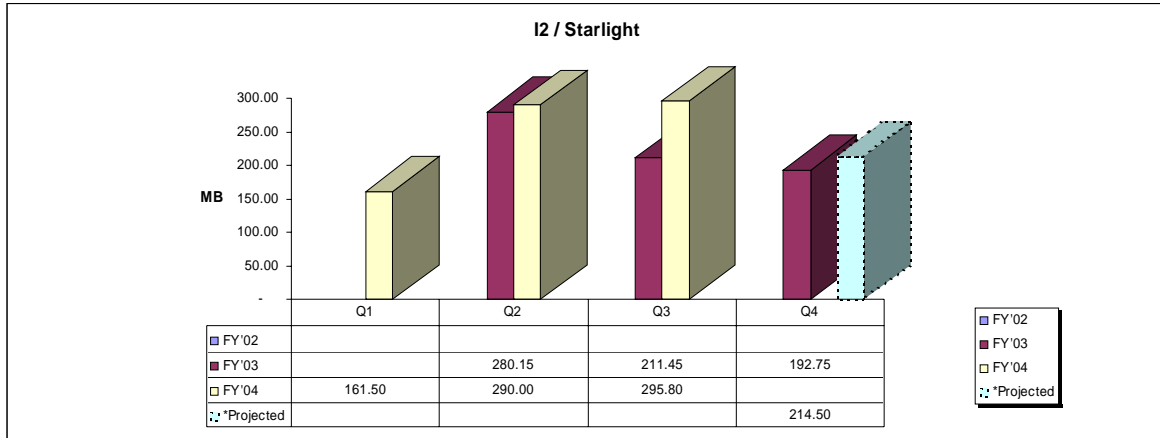
ICN peering connections (Table 9) provides ICN with access to other networks that are willing to share traffic at no cost. The circuit providing this connection is currently an OC12 to ADNS (Ameritech Data Network Services) and although fairly expensive, still provides the ICN with a cheaper egress alternative. Due to the trend of ADNS peers moving to other providers, the ICN is going to migrate from this connection to a private NAP connection where more peers are located. This will maintain the ICN's "free" bandwidth to peers while providing the ICN with higher bandwidth and a lower circuit cost.

Peering Connections
Table 9



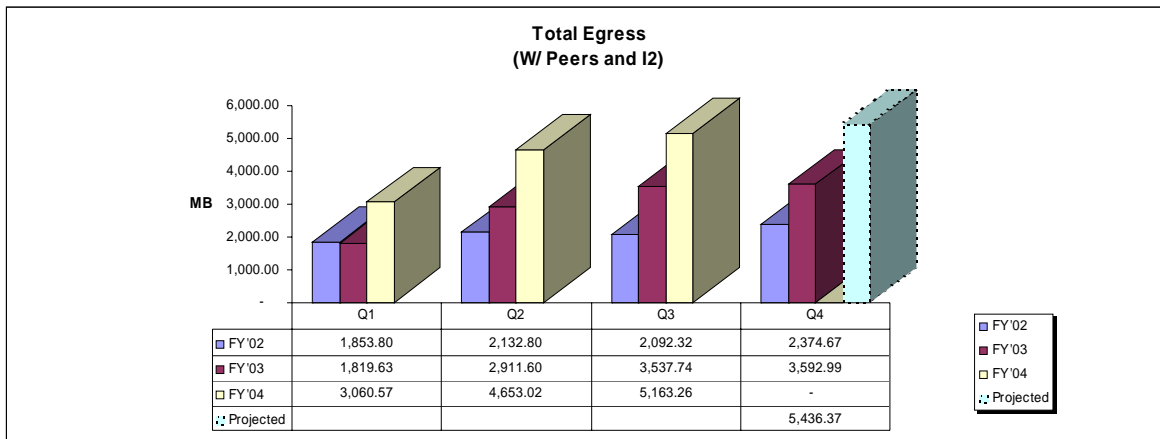
Internet2 access, via Starlight (Table 10) is a relatively new phenomenon for ICN. The ICN has been a sponsored education group participant (SEGP) with the I2/Abilene project since fiscal year 2003 and continues to see increased demand for this connectivity to other I2 participants. However, due to the burstiness of the traffic associated with Internet2 applications, along with some incomplete data from fiscal year 2004, during the migration between circuits, it is difficult to determine a formula based projection for future demand.

Internet 2 Access Table 10



The total egress (Table 11) available to the ICN is approximately five OC12s for direct Internet access, one gigabit for Internet2 and another OC12 for NAP peers, representing a total of 3.1 gigabits of direct Internet access and a 4.7 gigabit total.

Total Egress Table 11

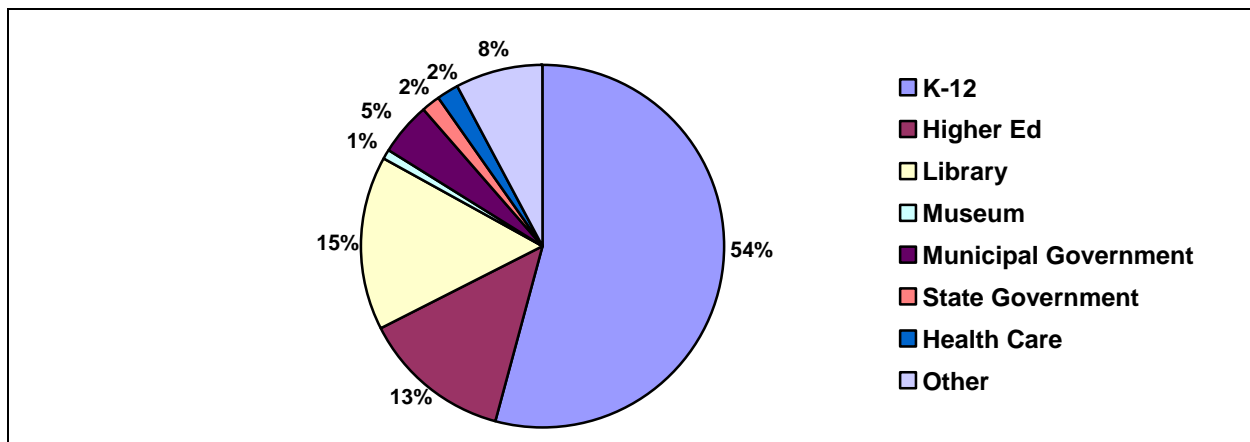


Constituent Survey

In April 2004, the Illinois Century network conducted an online survey of existing constituents to assess their level of satisfaction with the ICN; their need for and interest in network services and their anticipated need for additional bandwidth. The AET participated in the development of the survey in order to insure that appropriate questions were included. The responses provided the AET with a clearer understanding of constituent needs and allowed them to align their priorities with those of ICN constituents.

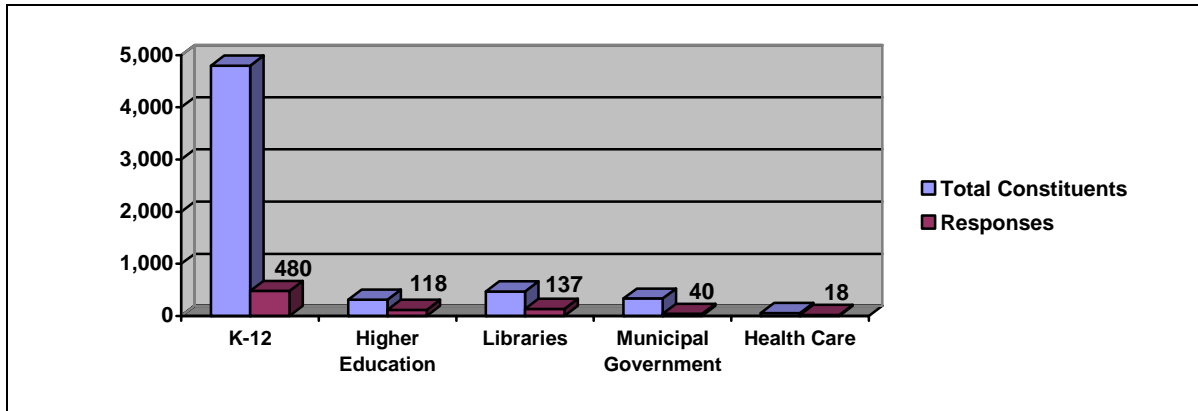
Completed surveys were returned by 924 constituents, representing 17 percent of the 5,544 constituents on the distribution list. While the majority of respondents (54 percent) were from the K-12 sector, the participation by sectors was more evenly spread when looking at the number of responses as a representation of the total sector population (Table 12).

Survey Respondents' Affiliation
Table 12



In the K-12 sector, 480 responses represent 10 percent of the connected K-12 constituents; 118 responses from higher education represent 37 percent of the higher education sector (includes community colleges); 137 responses from libraries represents 29 percent of this sector; 40 responses from municipal government represents 12 percent of the total connected municipalities; and 18 responses from the health care community represent 31 percent of this sector (Table 13).

Constituent Responses by Category
Table 13



Overall Satisfaction with the ICN

Satisfaction with the ICN was measured by a number of different criteria. Quality of support received from the Regional Technology Centers (RTC) was rated quite high, with 30 percent being satisfied and 56 percent being very satisfied. Most of this support involves the application process and the resolution of technical problems. The Cisco certified staff serving at each of the RTCs plays a key role in these positive ratings. The quality of support received from the 24/7 Network Operations Center also received favorable ratings – 31 percent satisfied and 45 percent very satisfied. ICN communications, technical problem resolution, and response time also received favorable ratings (Table 14).

When asked about constituent satisfaction with the quality of ICN filtering and IP video service, the majority of constituents replied “not applicable”. Combined with many written comments indicating that constituents were unaware of these service offerings, the low ratings in this area are indicative of a lack of marketing and promotion of these services.

Level of Satisfaction with ICN Service
Table 14

	N/A	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
Quality of support from RTC	6% 51	1% 6	0% 4	7% 65	30% 266	56% 497
Quality of Support from 24/7 NOC	13% 112	1% 10	1% 6	10% 85	31% 270	45% 400
ICN Communications	6% 55	0% 4	1% 12	11% 98	37% 323	44% 384
Connectivity Problem Resolution	5% 47	1% 9	1% 7	7% 62	32% 279	54% 476
Services Problem Resolution	27% 233	1% 6	1% 11	14% 124	24% 204	33% 284
Response time from ICN	9% 75	1% 7	1% 8	10% 83	35% 302	46% 397
Quality of ICN Filtering Service	47% 390	1% 9	2% 14	19% 161	15% 122	16% 130
Quality of ICN IP Video Service	56% 449	1% 5	1% 8	19% 152	10% 82	13% 107

Services

In response to interest level and types of services, constituents were asked to rate potential services by priority level – top priority, priority for next year, future interest, and no interest. Three services – SPAM filtering (27 percent), security scanning (26 percent), and antivirus (25 percent) – were rated almost equally as the top priority issues facing constituents (Table 15). These priorities echo many of the comments received by constituents through informal conversations with ICN staff. A series of detailed questions regarding products currently in use; products under consideration; and price-point for an ICN offering of the various services was asked in the survey. Response results can be found at www.illinois.net/survey.

Top Priorities of Constituents
Table 15

	Number Listing Top Priority	Percentage of Category Total
SPAM Filtering	235	27%
Security Scanning	224	26%
Antivirus	215	25%
E-mail/Web hosting	84	10%
Off-Site Storage	83	10%
WAN Management	63	8%
School to Home	63	8%
Other	25	6%
Colocation	36	4%

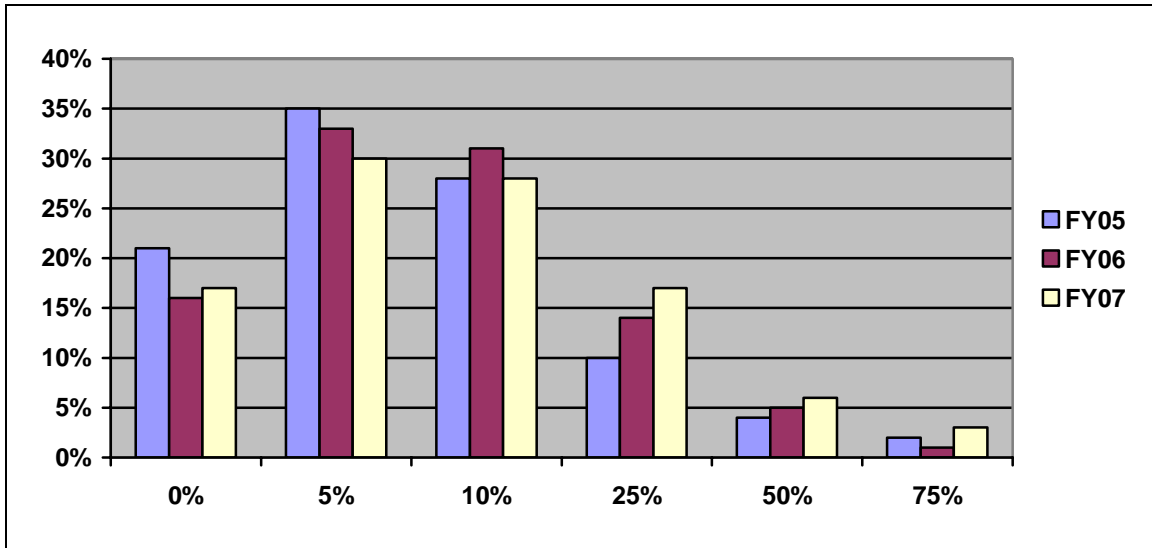
When asked about services not traditionally provided by the ICN, such as e-mail and web-hosting, there was little interest. Comments included with the survey results indicated that constituents feel that the ICN should stick to its core mission of providing reliable connectivity throughout the state and not offer services that constituents either take care of themselves or acquire from other sources at reasonable cost. While the question on whether or not the ICN should pursue volume discount pricing for paid subscription services, e.g. Britannica, EBSCO, was more closely divided, 43 percent interested, and 57 percent not interested. Comments again suggest that constituents have access to these resources through other means and that the ICN should not duplicate these efforts.

Bandwidth Utilization

Information on bandwidth utilization and anticipated future needs for additional bandwidth was collected in large part to feed into the deliberations of the Advanced Engineering Taskforce and help the ICN Network Design and Engineering Staff plan for network enhancements and upgrades. In brief, 81 percent of those responding indicated that they had adequate bandwidth to meet their needs, 19 percent felt their site did not have adequate bandwidth. The majority of requests for additional bandwidth fell into the 1.5 Mb (28 percent) and the 3 – 9 Mb (39 percent) categories. This supports the preliminary suggestion of the Advanced Engineering Taskforce that the cost recovery model look at adding incremental pricing for quantities below the 10 Mb price point.

Respondents were asked to estimate their percentage growth for Internet access, projecting three years out. The results show that growth will continue to occur each year, with the largest increases in FY06 and FY07 (Table 16). For the immediate future, these estimates support the response that 81 percent of the respondents have bandwidth adequate to meet their needs.

Bandwidth Growth (Estimate)
Table 16



Summary

This was the first time the ICN attempted to do a formal survey of connected constituents and overall, staff felt that it provided useful information. Coupled with the feedback received at the regional information sessions, the ICN will continue to utilize this information for network and services planning. The scope of all ICN work will be expanded as the ICN moves forward in collaboration with CMS. The complete survey results can be found at www.illinois.net/survey.

Environmental Scan

Throughout the year, the AET members were encouraged to contribute to an on-going posting of strengths, weaknesses, opportunities, and threats (S.W.O.T.) facing the ICN. The strengths of the ICN are many, including: the technical reliability of the network; the knowledge and skill base of the staff; lower pricing and increased performance; and the planning, testing, and implementation of leading-edge technologies designed to enhance the operation of the network. One of the strengths of the ICN which was mentioned several times was the diversity of its participating institutions. The representation on the AET reflects this diversity, ensuring that the input provided to the ICN reflects the needs of all eligible constituents.

Initially, the AET members were concerned about the impact that the consolidation with CMS might have on ICN network services and customer support. There was also concern that funding would be redirected and that staffing levels may fall short, making it difficult for the ICN to continue providing the level of service and reliability that constituents have come to expect. As the network expands, serving constituents with needs divergent from those of the educational community, the very diversity that is currently seen as an ICN strength threatens to become a weakness as the ICN is potentially stretched to meet these needs and perhaps establish new priorities. Over the course of the year, the inclusion of CMS staff in the AET deliberations went a long way towards mitigating these concerns. Many of the AET members indicated in the S.W.O.T. analysis that although they had been concerned early on, they became encouraged by what they had encountered at the meetings and in conversations with CMS representatives.

As technology changes and the ICN begins its new relationship with CMS, the AET members believe there are many opportunities that should be explored on behalf of current and future ICN constituents. Identified areas of opportunity include VoIP; H.323 video; continually decreasing costs for Internet access; wireless technologies and other methodologies designed to bring service to the underserved; and the opportunity to develop new markets for services. The ability of the ICN to play a critical role in the economic growth of the state was also identified as a key opportunity. Many of the opportunities identified in the S.W.O.T. exercise have reemerged as recommendations imbedded in this year's AET report.

Every state is facing critical fiscal issues that impact technology deployment, education, and other state services. Illinois is no exception and the single biggest threat facing the ICN is the impact that reduced and redirected funding could have on the network and the services provided to constituents. All of the issues identified as threats by the AET are related to funding, either in the form of reduced funding or the inability to bring pressure to bear on the vendors to keep costs down. If costs are not low enough, key constituents with significant purchasing power may leave the ICN, resulting in higher costs for the remaining ICN constituents. The ICN and CMS need to work together to maintain the integrity of the network and sustain the excellent reputation that the ICN has worked hard to build, avoiding any bureaucratic impediments that might hinder progress and innovation.

Recommendations

AET Roles and Responsibilities

In light of the many changes facing the ICN with the transition to CMS, the further expansion of the constituent base, and the shift in focus from connectivity to network services, the AET considered making changes to the original charge to reflect the current environment. The Advanced Engineering Taskforce was created in 2000 with the charge to advise the management of ICN regarding advanced technology issues, reflecting on both the needs of the client community and the changes in technology likely to affect the market and education applications.

AET members suggested that the new charge encompass the concept of advocacy in that the membership represents the constituent groups connected to the network. The sharing of resources, beyond simple connectivity, and reference to the consideration of network services were also concepts that the AET felt needed to be included in a revised charge. The language for the proposed charge is as follows:

The ICN Policy Committee established the Advanced Engineering Taskforce in order to advance relationships with K-12 schools, community colleges, four year colleges, universities, libraries, museums, hospitals, local, county, and state governments, and other communities to better meet common objectives in advancing the use of technology and networking in the state of Illinois. In summary the AET will:

- Provide advice and recommendations to ICN staff and the ICN Policy Committee on matters related to ICN policies, planning and services;
- Serve as a two-way conduit to the appropriate constituency group for ICN related business;
- Promote, through education and collaboration, the development of applications and services that meet the needs of constituencies served by the ICN;
- Facilitate opportunities to offer continuing education programs of interest to the ICN membership;
- Investigate advanced technologies that may be of benefit to the ICN constituents that reflects on both the needs of the constituent community and impacts the market and educational applications.

Recommendation: *The AET recommends adoption of the revised charge to the committee as stated above.*

Constituent Representation and Participation

Constituent group participation is critical to the success of the AET. Representation should be determined by constituent group in order to provide adequate input to meet the needs of all clients. Appointees should be individuals that are interested in providing feedback and representing their constituency group. It is important for members to attend meetings on a regular basis.

The transition of the ICN to CMS naturally requires more cooperation and collaboration between the ICN and state agencies and greater attention to the state's need for network services. Currently the ICN technical staff is working with CMS on several beta projects. Included in this list is the connection of state agencies to the ICN; VoIP for state agencies; video migration from H.320 to H.323; and VSAT technology as a wireless option for data transfer. As these projects move from beta to production, staffing levels within the ICN will need to be addressed to ensure that the quality of each service offering, as well as the network in general, does not suffer.

The AET is encouraged by the collaborative efforts made between the ICN and CMS. Many state agencies who are involved with educational entities will be able to further these partnerships when connected to the ICN. The ICN currently has as its primary constituents: K12, higher education, community colleges, libraries and museums. As the ICN network expands with the addition of the CMS network, education must remain its top priority. Appropriate caution should be exercised prior to the introduction of additional protocols or technologies so as to avoid any adverse impact on the educational constituents.

The following table identifies each member of the AET with his or her updated term length noted in parentheses after their name.

Advanced Engineering Taskforce (Member Terms)
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Advanced Engineering Taskforce (Member Terms)						
K-12 Schools	Jim Dispensa, CPS (2005)	Jim Flanagan, Maine Township Schools (2006)	Dennis Gallo, O'Fallon CCSD 90 (2007)	Abe Loveless, LTC (2005)		
Community Colleges	Diann Jabusch Spoon River College (2007)	Alan Pfeifer, Sauk Valley Community College (2005)	Gary Wenger, COD (2006)			
Universities	Charlie Campbell, SIU (2006)	Mike Dickson, WIU (2007)	Charles Kline, UIUC (2005)	Joel Mambretti, Northwestern University (2006)	Ken Spelke, UIUC (2007)	Bret Sutton, Aurora University (2005)
Libraries	Andrew Bullen, Illinois State Library (2007)	TJ Lusher, NIU Founders Library (2006)				
Museums	William Barnett, The Field Museum (2006)	Erich Schroeder, Illinois State Museum (2005)				
Other Institutions	Linda Winkler, Argonne / I-Wire (2005)	Todd Cooper, IL Critical Access Hospital Network (2005)				
Units of Local Government	Sam Ferguson, City of Schaumburg (2007)	Steven J. Philbrick, City of Chicago (2006)				
State Agencies	State Agency rep					

***Recommendation:** Representation on the AET should be expanded to include members from state agencies, in addition to those representing CMS, ensuring that the AET continues to be the technical advisory group on behalf of all ICN constituents. In an effort to further strengthen participation and ensure constituent representation, the AET recommends that each task force member must agree to attend a minimum of two meetings per year and that replacements will be recommended by the AET and approved by the Policy Committee.*

Strategic Planning

The technology issues facing organizations are not unique to higher education, K-12, hospitals, local, county, state government, or large and small business organizations. The problem stems from a simple fact - technology has become an essential element in the way people work and communicate. For organizations to remain competitive and provide quality programs, old technologies must be replaced, existing and emerging technologies must have on-going support, and investments must be made in solutions for tomorrow. Understanding and planning for the future direction in the use of technology is critical to the success of an organization.

Planning should be an essential activity of every organization and a core element of strategic and operational processes. Planning is a future-oriented process that enables an organization to anticipate changes in internal and external environments and position itself to respond to changes as they occur. It should be a process that every organization follows. It is a dynamic and reflective process that ensures that goals are clarified, priorities are established, stakeholders are organized, and an evaluation system is implemented before critical decisions are made.

The Illinois Century Network should develop a formal strategic planning process to determine written goals, objectives, and action plans. A goal is a broad statement of outcomes that an organization hopes to achieve. An objective is a measurable statement defining what is accomplished and an action plan is what projects are needed to accomplish the objective. The strategic plan for the organizational unit usually provides a three to five year forecast of the opportunities, needs, and budget required to accomplish the objectives. The plan is reviewed and updated annually allowing for changes in both needs and budget.

***Recommendation:** The AET recommends the ICN develop a formal strategic plan to define goals, objectives, action plans, and measure the organization's effectiveness.*

Equipment Replacement Strategies

The ICN in its initial form was turned up in 1999. As the network expanded and matured, core and distribution routing and switching equipment was upgraded or replaced. Support for advanced features, backbone bandwidth upgrades, requirements for higher speed backplane requirements, manufacturer end of life and end of support notices were factors included in near and long term roadmaps for migration. These plans continue today with the intent of supporting backbone bandwidth increases, MPLS, QoS, multimedia, etc.

Equipment purchased by the constituents has not been maintained using a similar replacement strategy. Much of the equipment purchased by constituents and deployed locally has not been

replaced and could affect the overall performance and operation of the network. Much of the equipment exceeds the normal life cycle for such equipment.

Recommendation: The AET recommends the development of a technology replacement plan for edge routers that is disseminated to constituents who can then include this information as part of a comprehensive plan for keeping their local networks current.

Network Security

Network security has become a critical issue facing those involved in the support of information technology systems. The list of issues includes: e-mail – spam, open relay; host – virus / worms; and service impacting – DOS attack, hackers. For the most part, these concerns can be mitigated with the use of a firewall and patched systems with up to date antivirus software installed. The ICN security team has initiated a “Best Practices” section of the ICN website (www.illinois.net/support) to provide constituents with helpful hints for staying on top of and preventing security breaches.

The ICN technical staff is investigating the feasibility of offering additional services in the security arena. Potential ICN service offerings could include:

- Antivirus software master contract
- Firewall service – exclusively limits access to a local area network
- Custom router configurations – access lists to deter hackers
- Consulting service – securing the windows environment
- E-mail services – anti-spam software to minimize unwanted e-mail

Recommendation: The AET supports these efforts and recommends that the ICN staff continue to expand the “Best Practices” web site.

Content Providers

The ICN staff continues to look for ways to make content more accessible to constituents. Currently the emphasis is on the sharing of educational content, such as those resources provided by the state library and the museums. Colocation of content servers on the network is one of the means to facilitate access to content, yet the constituent survey indicated little interest in this potential service at this time. Increased bandwidth, at low or no cost, e.g. bandwidth “grants,” to content providers is another avenue that should be investigated in the ongoing effort to encourage the sharing of content via the network. As the number and types of constituents continues to grow, additional opportunities for sharing content will be presented. The healthcare community has already identified several areas in which they could benefit by sharing content and in all likelihood state agencies will do the same.

Recommendation: The AET suggests that the ICN staff continue to pursue colocation, developing a service that can be marketed to constituents.

Digital Divide

Although the availability of affordable telecommunication services increases annually, there remain some constituents who have only very limited and high priced means by which to connect to the ICN. The AET recognizes the benefit in exploring alternative means of connectivity that will spur competition; lowering access costs overall. These alternatives include Wireless, Cable/MSO (Multiple Systems Operators), Satellite, and Powerline technologies.

The wireless provider industry has suffered setbacks with the rest of the technology sector but initial providers have reemerged and new providers have arrived as part of a general revival in the industry. Enhanced technologies in both the licensed and unlicensed space have spurred this revival. Cable or MSO company mergers and acquisitions have resulted in larger and ever expanding coverage areas for individual companies, spurring investment and new service offerings throughout Illinois. Both coaxial cable (Cable Modem) and fiber based (Metro-Ethernet) services have the potential to be viable options for constituent connections to the ICN. Plans for cable/MSO access to ICN POPs to enable network interconnection should be developed and pursued.

The satellite industry suffered setbacks similar to those of the wireless industry, delaying high throughput ka-band deployments. As these deployments resume they will offer another viable alternative for connectivity to the ICN. Powerline broadband technologies have made substantial progress in development and remain nascent as far as service offerings. The ICN should continue to follow development of commercial powerline services

Recommendation: The AET recommends the pursuit of alternative means of connectivity that utilize Wireless, Cable/MSO (Multiple Systems Operators), Satellite and Powerline technologies and renewing or establishing relationships with these providers to develop plans for utilizing their services for last mile connectivity.

Recommendation: The AET recommends the ICN seek out and participate in efforts such as the Governor's Broadband Task Force which will promote investment in telecommunication infrastructure in underserved areas.

Community Networking - Private Fiber Networks

In many locations in the state, ICN constituents are able to work together and collectively create what have come to be called 'community networks' or private fiber networks. Private fiber networks are beginning to pop up throughout the state and the ability for ICN constituents to take advantage of the infrastructure and connect with a single higher bandwidth connection to the ICN can provide a huge benefit both to ICN and to their constituents.

Constituents benefit from higher bandwidth availability to other constituents within the private fiber network, because of the averaging effect that multiple users have on the same bandwidth; constituents connected in this manner will also experience overall higher bandwidth availability to ICN. This approach also tends to be less expensive for the constituents, since the private fiber networks in many cases are already available, or can be built using existing infrastructure in local cable, municipal, electrical or other local or regional organizations.

The ICN benefits by purchasing and monitoring fewer ports and having a single point of contact for the connection instead of multiple contacts, allowing the ICN technical staff to focus on design and upgrade issues associated with the connection.

One of the drawbacks to this scenario is the current impact that the ICN cost recovery has on community networks. Currently, a district that has four schools of two hundred students each qualifies for four T1 connections, one per building. If these schools were to convert to a community network, the baseline bandwidth they receive would be reduced to the equivalent of a single T1. This is not necessarily by design, but the impact is there nonetheless. Schools that could work together and provide better access to their students and teachers in many cases do not do so because they would lose bandwidth. ICN staff has indicated a commitment to evaluate this deterrent in the next cost-recovery model.

Another drawback to this scenario is the administrative cost. If the constituent were to manage (or purchase) the private fiber network, ICN's administrative cost would be lower. In reality however, it appears that ICN staff have had to pick up the ball in many occasions causing more administrative issues than if ICN were to handle it separately from the beginning. The AET recognizes the desire that the existence of constituent networks reduces the administrative load, rather than increase it.

The last concern that ICN staff mentioned concerning 'community networks' is the community network management entity. This entity is acting as an agent of ICN whether ICN realizes it or not. There have been several instances in the past that caused constituents to complain about ICN service when in reality the issue resided in the community network, where the ICN really has no jurisdiction to remedy technical problems. This can be a customer service issue if the ICN appears to take months to solve problems that it really cannot possibly resolve.

Recommendation: The AET recommends that the ICN seek to modify the FY06 cost recovery model to mitigate the deterrent for community sharing of bandwidth.

Cost Recovery Model

The current cost recovery model provides an effective solution for the ICN to cover costs during the fiscal year. The model provides a fair and equitable solution in providing rates for all constituents. The educational constituents receive a base line of service based on the full-time equivalent (FTE) enrollment and pay for services above that level. All other constituent rates are set based on ICN costs. The FTE model for primary constituents works reasonably well, but as stated above, does not encourage community sharing of bandwidth. In addition, the ICN needs to consider any increases in the cost recovery model very carefully. To cost justify the ICN service, the cost has to be at or below market rates. The ICN needs to continue to define its value added service. Any erosion of service level, reliability or cost increase without increased service value will drive constituents away. The ICN needs to continue to hold or reduce the cost of service to all constituents.

Recommendation: The AET recommends that the ICN continue to provide high quality service and support while maintaining the existing cost recovery model.

Wireless Technologies

The AET continues to investigate the role that wireless technologies will play in providing lower cost, last mile connectivity to constituents who have limited access to such services. One of the technologies under investigation is VSAT (very small aperture terminal). VSAT technology is two-way satellite data transmission. The typical setup includes a small satellite dish which can be installed in a variety of ways including non-penetrating roof mounts, canopy mounts, and wall mounts. The VSAT router, which connects the dish to the local area network, includes industry-standard Ethernet ports.

Working in conjunction with the ICN to evaluate VSAT service, CMS has published a request for proposal for VSAT satellite data transport. This new service offering will provide low-cost broadband connectivity options to remote, and in some cases, rural sites. The Network Design and Engineering group of the ICN participated in the evaluation and testing of the VSAT technology and found that overall the test results, which included video conferencing as well as data transmission, were quite favorable. The CMS timeline to begin offering this service is late summer of 2004.

K-12 and higher education institutions throughout the country are increasingly embracing wireless technologies such as WiFi to provide increased mobility for users on their campuses. The rapid proliferation of wireless local-area networks is having a dramatic impact on network availability and education itself.

A new technology called WiMax promises to do for the metropolitan-area network what WiFi has done for the local-area network. While it is certainly true that the reality doesn't always live up to the hype, WiMax has great potential, especially in sparsely populated areas in need of low cost alternatives to T1 service. Because WiMax is standards based and will be supported by major manufacturers like Intel, cost and performance are expected to reach levels unachievable by proprietary solutions. Interoperability and healthy competition among vendors should result in increased functionality at reduced prices. WiMax has the potential to provide constituents with a low cost fixed wireless solution for connecting constituents within a community as well as last mile connectivity to the ICN.

Recommendation: The AET recommends continued investigation of wireless technologies to add value and reduce cost over landline solutions for all constituents.

Communication Technologies Converge – Voice, Video & Data

Since its inception, the AET has watched the development of technologies that support the convergence of voice, video, and data over a common medium. The migration to H.323 video will allow ICN constituents to use a single connection to the network for both data and video. In efforts to further maximize their utilization of the ICN and reduce telecommunication charges, many of the ICN constituents have started investigating Voice over Internet Protocol (VoIP) as an option for voice traffic. VoIP uses the technology employed to send typical data applications over IP networks, to send voice traffic.

The ICN will certainly be involved as the means of transport for traffic generated by constituent VoIP implementations and should plan for and implement the Quality of Services mechanisms required to support this and other Real Time Protocol (RTP) based (time sensitive) traffic. The

migration of State Agencies to the ICN will most likely be the initial source of VoIP traffic and the ICN should consider leveraging any centralized VoIP services contemplated for agency support to serve the traditional constituent base. Currently the state is doing a beta test for VoIP within an agency.

Recommendation: The AET recommends that the state develop a system whereby all ICN constituents could take advantage of converging technologies.