Before the
Federal Communications Commission
Washington, D.C. 20554

	)	
In the Matter of:	)	Docket No. 04-36
	)	
IP-Enabled Services	)	RM-10865
	)	
	)	
	)	

COMMENTS OF EDUCAUSE
And the following higher education associations:
AMERICAN COUNCIL OF EDUCATION
INTERNET2

EDUCAUSE
1150 18TH St. NW
Suite 1010
Washington, D.C. 20036
(202) 872-4200

Staff Contact: Wendy Wigen
(202) 331-5372
wwigen@educause.edu

Table of Contents

Summary

EDUCAUSE submits these comments to the FCC in the matter of IP-enabled services, WC Docket No. 04-36, to encourage the Commission to treat IP-enabled services as a unique technology that should remain distinct from the legacy telephony regulatory system. Within its purview, the Commission is charged by Congress to protect the public interest, but also to avoid unnecessary regulation and promote innovation. With this in mind, the higher education information technology community that EDUCAUSE represents recommends that:

- Regulation of the Internet should be based on an IP-based model. This model would allow for the separate treatment of the services (applications layer) and the physical infrastructure (transport layer)
  - The applications layer (which includes voice over internet protocol or VoIP) should remain as regulation-free as possible, but
  - The transport layer may require some regulation to ensure affordable and ubiquitous broadband access;
- The Universal Service Fund (USF) needs to be updated and refocused on the goal of achieving universal broadband access; and,
- Public services such as 9-1-1 and access for the disabled are currently available and can be greatly enhanced in the IP world, however new revenue models to support them are necessary.

EDUCAUSE feels that the public's acceptance and migration to IP-enabled services provides an opportunity for the Commission to break from the burdensome rules of the legacy telephony world and provide for a rapid yet thoughtful and judicious transition to an IP-enabled environment.

	)	
In the Matter of:	)	Docket No. 04-36
	)	
IP-Enabled Services	)	RM-10865
	)	
	)	
	)	

COMMENTS OF EDUCAUSE
And the following higher education associations:
AMERICAN COUNCIL ON EDUCATION
INTERNET2

EDUCAUSE and the above named higher education associations submit these comments to the FCC in the matter of IP-enabled services, WC Docket No. 04-36, to encourage the Commission to treat IP-enabled services as a unique technology that should remain distinct from the legacy telephony regulatory system and to consider our recommendations in this matter.

II.   Introduction:

The length and breadth of the current NPRM on IP-enabled services is indicative of the fact that convergence, anticipated for years in the telecommunications and computer industries, has turned out to be a very complex issue. On one hand we are pursuing convergence because a rich and efficient environment will evolve when IP-enabled voice, data, and video services are on a single infrastructure. On the other hand a revenue structure that supports valuable public services and is based on a legacy telecommunications model is being rendered ineffective. Additionally, the rate of

transition is dependent on affordable access to high-quality broadband. Like a three-legged stool, all three factors are interdependent and their ability to enhance rather than hinder each other will largely depend on how well the social, political and legal challenges are met. EDUCAUSE is convinced that the consequences of these decisions will be far-reaching and will impact our campuses as well as our local, regional and global economies for years to come. Dewayne Hendricks, a member of the FCC Technology Advisory Committee, recently commented, "We have more technologies ready to be deployed then we know what to do with. The primary obstacles are not related to any intrinsic economic barriers, but the political and regulatory challenges that they present."[1]

Historically, the government passed laws to provide for the public good only when the private market failed to do so. In the preamble to the Telecommunications Act of 1996, the following goals are also stated: "To promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications consumers and encourage the rapid deployment of new telecommunications technologies."[2] VoIP, as a specific IP-enabled service, is of particular interest. The heavily regulated telephone companies appear ready to meet the challenge of transitioning to this new technology and are incorporating it into their business plans. Likewise, the Commission appears poised to approach IP-enabled services with a forward-looking vision that will allow the shedding of an outdated and cumbersome regulatory structure. This is to be applauded.

This document will present recommendations on how the Commission can balance these three goals as it considers how to regulate IP-enabled services: to provide essential communications services, maintain fair consumer prices, and encourage innovation. EDUCAUSE's college and university members, who plan, design, build-out, and manage

---

[1] For more information on Dewayne Hendricks go to: http://www.warpspeed.com/DLH_Bio.html
[2] Testimony of John McCain at a Full Senate Commerce Committee Hearing, "Telecommunications Policy Review: Lessons Learned from the Telecom Act of 1996," April 27, 2004. http://commerce.senate.gov/hearings/testimony.cfm?id=1164&wit_idk=2743

telecommunications systems on their campuses, work with both Internet technology and legacy telephone technology on a daily basis. Many of them administer VoIP systems. VoIP is used as the model in this discussion, but the ideas presented extend to all services that are delivered over the Internet. These comments are based on the premise that IP-enabled services are a unique technology and should remain distinct from the legacy telephony regulatory system.

III.   Background
A.   New IP-Centric Model for Rulemaking:

In March 2004, MCI's Senior Director of Global Policy and Planning, Rick Whitt, explained that "trying to impose the current outmoded legal system onto the Internet and all of its IP progeny is a flawed, damaging and ultimately doomed approach. Instead, policymakers should adopt a new public policy framework that regulates along horizontal network layers, rather than legacy vertical silos."[3] EDUCAUSE agrees with Mr. Whitt, his colleague at MCI, Vint Cerf and others who feel that starting with an IP-centric model for regulation is key to achieving an effective but minimal level of Internet regulation.

Explained in detail in Whitt's public policy paper[4], the advantages of converting to a layered model include:

(a) The model matches, rather than conflicts with, the reality of how services are implemented and delivered over the Internet.

(b) Anti-competitive behavior by dominant providers in any service layer is more easily identified and remedied.

(c) Innovation is promoted by affirming a federal commitment to apply minimal regulatory constraints. Using this model, regulations can be applied selectively to only those layers of the Internet where anti-competitive market behavior is apparent, or the public interest is not being served by the market.

---

[3] Taken from the introduction to MCI Policy and Presentations at http://global.mci.com/about/publicpolicy/presentations/
[4] Whitt, Richard S. "A Horizontal Leap Forward: Formulating a New Public Policy Framework based on the Network Layers Model," MCI, March 2004. http://global.mci.com/about/publicpolicy/presentations/horizontallayerswhitepaper.pdf

EDUCAUSE believes that the layered model is the essential foundation of an updated and forward-looking approach to promoting the move to IP-enabled services. The layered approach allows the flexibility to encourage innovation and competition with little or no regulation in some areas, while allowing a stronger hand to control anti-competitive behavior and protect the public interest in others. To achieve this customized approach, it is important to understand the distinction between the transport layer and the application layer.

B.   Distinction Between the Transport and Application Layers for Purposes of Rulemaking:

Within the IP-centric model, the physical infrastructure (transport) layer is separated from the services (applications) layer. While many of the problems that spawned regulations in the telephony world will remain in an IP-centric one, they can be resolved differently depending on whether they occur in the application or transport layer. (See section IVA and IVB below.) Issues specific to this NPRM that we will address are: how to maintain innovative momentum, control anti-competitive behavior, and ensure and fund related public services.

IV.   How to Generate Revenues for Public Policy Needs
A.   The Application Layer:

The NPRM asks: *Can separate IP-enabled applications be distinguished for regulation purposes?*

Although it is theoretically possible to distinguish IP-enabled services by analyzing the network protocol number of each packet, the realization of the theory is impractical. Such analysis would overload all known telemetry systems and network routers. Additionally, some phones (for example, Cisco) use random network ports, and, as seen in the "music on demand industry," users can easily spoof network port numbers.

Furthermore, an important consideration is whether this is the right question.

The Internet applications market enjoys a low barrier to entry, multiple competitors, and near immediate response to consumer demand. By all economic measures, the market is thriving. Anti-competitive behavior does not appear to be an immediate threat. However, mandates may still be necessary to insure the availability of public services such as access to 9-1-1/E9-1-1 and devices and services for the disabled. Businesses are prepared to provide these services; traditional funding methods are the obstacle.

The NPRM asks: *Should IP-enabled services be distinguished for taxation purposes?* To consider distinguishing between IP-enabled services for revenue generation immediately raises the specter of obsolete rules. As Senator John Sununu said, "There exists no sound basis for discriminating among different types of data."[5] The Internet2 community's work on session initiation protocol (SIP) and presence is a current example. Do we tax a PDA because its owner wandered into a SIP-aware network someplace, and her child on the other side of the world can now have a voice, video, or instant messaging (IM) "interaction" with her? Does she get to decide whether the interaction is voice, video, or IM based on the amount of the tax? Even simply singling out voice services would be difficult. For example, VoIP is now available through various paid (Vonage, for example) and non-paid versions (IM, for example). Furthermore, organization-specific VoIP services can travel over both intranets and the Internet, but generally would not be noticed as voice traffic because the organization can deploy an IM server that provides VoIP as well.

Imagine that the user above is currently in a tax-exempt location and is helping her child with math homework. A whiteboard is added to the mix, and the parent begins moving from the current location, intending to go back to the office. Outside, the PDA seamlessly switches to the cellular infrastructure. Along the way a transition is made to an 802.20 service, and then to an 802.16 service in the parking lot outside the office. Then the call is completed in a Wi-Fi environment inside a taxable corporation. Potentially dozens of distinct service/transport combinations are involved on just one end

---

[5] Sununu, John, "Commentary: VOIP of the People." The Wall Street Journal, February 24, 2004. http://online.wsj.com/article_print/0,,SB107758511740337301,00.html

of this particular call. If the parent decides to have the PDA transition the call to a laptop then the possible combinations double. Next year there likely will be another alternative, and the potential number of services will double again. This example is for just one end of one conversation, using very few services, devices, and bandwidth alternatives.

The problem is further compounded when considering an international context. To what extent will it be possible to simply "highjack" any service adversely impacted by regulation and move it offshore, away from any country with an unfavorable regulatory environment? With 40% of the Internet connections in the United States now DSL or cable modems, a figure that presumably continues to grow, it would seem that only draconian measures could prohibit connection to any service worldwide, thereby making the existence of onshore rules moot.

For reasons of practicality and proven market success, EDUCAUSE believes that the application layer, including VoIP, should remain as free of regulation as possible. The only exception would be to ensure the availability of 9-1-1 services and access for the disabled where the programs are funded from non-service-specific sources.

B.   **The Transport Layer:**
The economics of transporting data across copper, fiber or the airwaves differ considerably from designing and implementing an application. Barriers to entry are huge, in the billions of dollars. Incumbent providers are well established and few in number; any student of economics would recognize the opportunity for anti-competitive behavior. History has shown that oversight and regulation are required to maintain competition and affordable consumer prices. The desirability of taxing the transport layer to support social programs is not so obvious. While transport layer taxation is technologically sound, this approach is in conflict with other policy imperatives, such as the president's goal of universal broadband access by 2007. Even when broadband is available, price remains the key inhibitor to migration from dial-up. Funding models that increase the price of broadband creates disincentives to broadband deployment.

A transport layer taxation scheme must not be allowed to become a proxy for applications layer taxation. For example, using bandwidth or price-per-megabit as the cost basis relates directly to the type of applications run. Messaging can be accomplished at dial-up modem speeds; videoconferencing requires 128Kbps for marginal services and, today, 1Mbps for standard services.

Transport layer taxation is also subject to the rapid rate of change in both the cost of bandwidth and its efficient use. This would make revenue difficult to predict. The trends predicted by Moore's Law [6] are as applicable in the case of bandwidth deployment and use as they are in chip technology.

C.   Alternative Funding Models:

The NPRM asks: *What alternatives exist to infrastructure and services as foundations for generating revenues for public policy purposes?*

Few who understand the current taxation scheme are satisfied with it. Why extend a broken system to the IP-centric model when the transition to IP-enabled services provides the perfect opportunity to develop new funding strategies? The following alternative funding strategies, shift the focus from the existing system of delivery to the three stated priorities outlined in the NPRM: deployment of 9-1-1 services, compliance with the Americans with Disabilities Act (ADA) and support for the USF. Instead, we can look to other precedents, models, and Congress for answers.

EDUCAUSE would like to start the discussion of alternatives by suggesting a set of goals. Consideration should be limited to programs that:

- Would provide a uniform national approach to avoid disjointed efforts of individual states.

---

[6] The observation made in 1965 by Gordon Moore, co-founder of Intel, that the number of transistors per square inch on integrated circuits had doubled every year since the integrated circuit was invented. Moore predicted that this trend would continue for the foreseeable future. In subsequent years, the pace slowed down a bit, but data density has doubled approximately every 18 months, and this is the current definition of Moore's Law, which Moore himself has blessed. Most experts, including Moore himself, expect Moore's Law to hold for at least another two decades.

- Would be similar to the Rural Electrification Project of the 1930's. This highly successful program was funded through low-or no-interest federal loans and administered through local cooperatives, many still in existence today.

- Would shift the sources of funding for USF, 9-1-1, and disabled access programs from taxes on the legacy voice systems to other sources in order to ease the transition to IP-based systems that can provide even more capability.

V. Universal Service Fund Reform

EDUCAUSE appreciates the challenge before the Commission to ensure all Americans continue to have affordable access to essential communication and information services. What is considered "essential" is rapidly evolving as more Americans depend on advanced data services to conduct business, continue their education and live their daily lives.

Higher education institutions increasingly rely on advanced broadband networks to provide education and research services both on campus and in their surrounding communities. Despite the fact that they do not receive direct support from the USF, institutions located in high-cost, rural areas have a vested interest in maintaining this program. The USF helps keep these schools' telecommunication costs at levels that enable them to provide services similar to institutions located in densely populated urban areas.

EDUCAUSE advocates a new and streamlined regulatory universal service structure based on sound economic and social concepts, recognition of the advantages inherent in new network technology, and a willingness to undertake the difficult transition away from current obsolete telecommunications facilities. With this theme in mind, we ask the Commission to consider the following concepts as it deliberates the recommendations from the Federal-State Joint Board on Universal Service[7]:

---

[7] The Federal-State Joint Board on Universal Service was established in March 1996, to make recommendations to implement the universal service provisions of the Telecommunications Act. This Joint Board is comprised of FCC Commissioners, State Utility Commissioners, and a consumer advocate representative.

- Move away from legacy, narrowband, and obsolete voice services to funding advanced, broadband networks that can provide data, voice, and video applications.
- Streamline the collection and distribution of universal service funding and make it technology neutral.
- Require all transport layer services to contribute to the USF.
- Use incentives and interim regulations to expedite the transition from legacy networks and associated funding models.

EDUCAUSE supports adoption of a funding model that will encourage transport providers to expedite the transition from legacy telephony systems to providing digital, broadband access. We recognize that essential services may be quite different for a single family home compared to a large institution, therefore the fees should remain focused on the underlying transport layer, whether that be copper, fiber, or wireless.

Maintaining these services through the USF will be difficult using the existing funding model. It would require all eligible transport layer service providers to contribute their equal share. Unfortunately, the Commission is hindered by the definitions used to determine which carriers should contribute and which should be eligible for USF support. Following our suggestion in Section 1 to use an IP-based model for rulemaking, the USF revenue could be sourced at the transport layer eliminating many of the definitional issues. Those companies that own the "pipes" are also the direct recipients of USF funds to extend the local loop. By subsidizing the build-out and maintenance of this infrastructure, USF funds benefit all transport providers by extending their reach into underserved areas.

The USF's ultimate goal should be to ensure a robust infrastructure that enables affordable, ubiquitous connectivity to high-speed networks. Keeping this in mind, EDUCAUSE realizes the transition period may require interim regulations to help encourage the rapid migration to IP-enabled services and to help ease the inevitable

turmoil in the market. This is not unprecedented as the recent digital TV rulings demonstrate.

VI.   Other Areas of Interest:

A.   Access to Emergency 9-1-1:

The existing 9-1-1 system for seeking emergency assistance via telephones has evolved over a span of 30 years to provide reliable, accurate and ubiquitous access for traditional wireline phones. According to the National Emergency Number Association (NENA), 99% of the population of the country is now served by "*at least*" basic 9-1-1 services. EDUCAUSE understands the criticality and importance of reliable and accurate 9-1-1 service.

Today, EDUCAUSE members are working with various technical, regulatory and standards bodies to further define the issues, and to help develop solutions that once implemented, will resolve the final hurdles associated with 9-1-1 service in IP-enabled environments and provide enhanced service offerings from the 9-1-1 community.

1. The Issues

There are three major issues that have surfaced over the past few years pertaining to 9-1-1 access on an IP-Enabled network:

- Ensuring that the proper public safety answering point (PSAP) is reached by an IP-enabled device that has moved from its "home" to a remote location;
- Ensuring that accurate location, identification and call-back information is received by the PSAP when called from an IP-enabled device whether it is local or remote; and
- Implementation of affordable, scalable and reliable location deterministic solutions which are able to accurately and dynamically track IP-enabled phone locations.

Location determination of an IP-enabled device is at the heart of all three issues. While these issues are technically complex, and ubiquitous enterprise class solutions to these issues remain elusive, we believe the issues will be resolved. The cell-phone industry resolved similar issues during the 1990s when the rise in cell-phone use brought the manufacturers, carriers, public safety community and regulatory agencies together to develop 9-1-1 routing solutions. EDUCAUSE believes a similar but much improved process is well underway within the IP-enabled marketplace. Learning from the difficult and lengthy process the cellular industry experienced, the location determination solution in the IP-world promises to be faster and less expensive. Based on open standards, the emerging model is designed to promote competition and be international in nature.

As the FCC considers extending 9-1-1 requirements to IP-enabled services, we recommend it do so in a way that ensures that the solutions to the outstanding location determination issues are well defined and understood, and that a timeline for implementation of these solutions takes account of the complex nature of the enterprise architecture and not unduly delay deployment.

2. Improved 9-1-1 Services
EDUCAUSE believes that IP-enabled networks will go well beyond the current 9-1-1 capabilities considered above and lead to dramatically enhanced services. Three major changes can be predicted:
a. PSAP's will become more reliable and redundant and will be able to provide improved services as they migrate to an all-IP infrastructure. This change to packet-switched technology represents the first real opportunity in a generation to modernize the 9-1-1 infrastructure. Emergency calls can be answered anywhere packets can be routed. For example, a PSAP call-taker could easily take calls at home, over a cable modem or DSL broadband connection without any loss of functionality. Similarly, any PSAP could take over the role of another PSAP, in case the original PSAP for a specific region became overloaded or lost connectivity due to technical failure or natural disaster.

Likewise, because of the service-transport separation, a PSAP could readily acquire network connectivity from any of multiple ISPs, so that failures in one network would be less likely to disconnect the PSAP. Since pending calls, including calls on hold, do not consume network resources, it would be less likely that calls would be blocked due to trunk overload.

b. IP-enabled instruments will be able to deliver enhanced information to the PSAP regarding the emergency being reported. An all-IP infrastructure makes it possible for end users to move beyond voice to support media types such as text (for example, for hearing- and speech-impaired users), instant messaging, and video (for sign language and situational awareness). Other possibilities exist as well: an individual calling 9-1-1 from a laptop or cell phone equipped with a digital camera could send a photograph of an accident scene to the call-taker. An emergency center could respond with video of how to perform an emergency medical procedure such as CPR, give emergency driving directions to the hospital, notify the hospital, and even contact family members..

c. Critical databases used by the PSAP's, such as the Master Street Address Guide (MSAG) and the Automatic Location Information (ALI) database will become more accurate. This will enable first responders to quickly and more easily locate distressed callers within multitenant buildings or at large campuses such as colleges and universities. Today, the updates to these databases are managed almost entirely by the telephone carriers. In an IP-enabled system, enterprises will provide updates directly to the MSAG and ALI databases, bypassing the telephony carriers. For example: a university has 72 different buildings and 23 public streets on a 4 square mile campus. The school will be able to update the ALI and MSAG databases routinely with specific address, floor and room of an intra-campus building and the IP-enabled (and legacy) devices.

An all-IP emergency calling infrastructure in the future is critical, and must be able to support analog and digital wireline phones, cellular wireless, and VoIP callers.

EDUCAUSE realizes that because upgrades to all 6,100 Public Safety Answering Points (PSAPs) in the United States will require time; therefore, the Commission should plan for a period of transition.

B.   Access for the Disabled:

In a recent FCC IP-Enabled Solutions Summit, "Focus on Disability Access Issues", a major issue for the disabled was identified by Brenda Battat[8] that also captured the general tone of the Summit. Her concern was not that the hearing disabled would be left behind by VoIP, but that the transition to IP-enabled services wouldn't be fast enough. This reconfirms the need for the Commission to avoid regulations that would delay the deployment of IP-enabled services.

Teletypewriter (TTY) technology was a major breakthrough for the hearing impaired when it was introduced in 1964, but there had been little advancement until Internet text messaging became available. Ten percent of the market for text messaging technology, such as the BlackBerry[9] or Sidekick[10], is in the hearing-disabled community. What Cisco refers to as "total conversation" technology, available through VoIP, comes closer to the desired "equivalent access" standard than anything previously available. Total conversation refers to the ability to provide simultaneous voice, video, and text. This means screen readers or products like "AOL by phone" can read email and convert text to voice for the blind. Voice can be converted to text for the hearing impaired at a speed and with the mobility that far surpasses traditional TTY devices. Videoconferencing allows for sign language and lip-reading for the deaf. Video Relay Services can also be used that allow a person to use their own language, transfer it through an interpreter, and have it delivered in the recipient's language whether in text, sign, or voice format. And perhaps most important, it can be done for less cost and in more user-friendly ways than ever before.

---

[8] Brenda Battat M.S. from the Association for Self Help for Hard of Hearing People in her presentation, "FCC VoIP Solutions Summit." May 7, 2004.
[9] http://www.blackberry.com/products/handhelds/index.shtml
[10] http://www.t-mobile.com/products/overview.asp?phoneid=195184

Although IP technology promises to ease the lives of the disabled, there are still barriers to access that the FCC can address:

- All of these technologies require access to broadband. Lower prices and increased availability are needed.
- Historically, assistive technologies have been a small niche market, considered unprofitable by mainstream developers. A government requirement could provide the incentive and competition needed to make these features available, drive innovation, and keep costs low.
- Creating and enforcing international standards for interoperability is critical.
- Incentives for a rapid transition from legacy devices to IP-enabled devices should be provided by the FCC whenever possible. During the transition period, "gateways" that enable new devices to communicate with the existing TTY and PSAP systems must be available.

VII.   Conclusion:

EDUCAUSE submits these comments and urges the Commission to take a fresh and forward-looking approach to the regulating of IP-enabled services. Although issues of anticompetitive behavior and the public interest that required regulation in the legacy telephony world will undoubtably emerge in the Internet world, a new approach based on an IP-centric model is critical to ensure this new technology remains vital and innovative. The integration of telephone and computer technology that VoIP represents can tremendously enhance public services such as 9-1-1 and equitable phone access for the disabled. However, the funding models of the legacy world need revision. What VoIP provides is the opportunity to develop new funding strategies for public services based on the public good they provide, rather than on a per-service charge. For example, the highly-successful USF, should be restructured to promote our nations most recent telecommunications goal - ubiquitous broadband access by 2007.[11]

---

[11] "A New Generation of American Innovation", The White House, April 2004
http://www.whitehouse.gov/infocus/technology/economic_policy200404/innovation.pdf

Three critical dimensions - continuous innovation; provision and funding of public services; and affordable access to broadband - must be kept in balance if the IP world is to move forward expeditiously: EDUCAUSE feels this NPRM provides an opportunity for the Commission to break from the burdensome rules of the legacy telephone world and provide for a rapid, yet thoughtful and judicious transition to IP-enabled services.

Appendix A

Association Descriptions

EDUCAUSE:

EDUCAUSE is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology. Membership is open to institutions of higher education, corporations serving the higher education information technology market, and other related associations and organizations. EDUCAUSE programs include professional development activities, print and electronic publications, strategic policy initiatives, research, awards for leadership and exemplary practices, and a wealth of online information services. The current membership comprises nearly 1,900 colleges, universities, and education organizations, including more than 180 corporations, and more than 13,000 active member representatives. EDUCAUSE has offices in Boulder, Colorado, and Washington, D.C.

ACE: American Council on Education

ACE, the major coordinating body for all the nation's higher education institutions, seeks to provide leadership and a unifying voice on key higher education issues and to influence public policy through advocacy, research, and program initiatives.
Its members include approximately 1,800 accredited, degree-granting colleges and universities and higher education-related associations, organizations, and corporations. Founded in 1918, ACE fosters greater collaboration and new partnerships within and outside the higher education community to help colleges and universities anticipate and address the challenges of the 21st century and contribute to a stronger nation and a better world.

INTERNET2:

INTERNET2 is a consortium being led by 206 universities working in partnership with industry and government to develop and deploy advanced network applications and technologies, accelerating the creation of tomorrow's Internet. Internet2 is recreating the partnership among academia, industry and government that fostered today's Internet in its infancy.