

**Testimony of
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**Before the
United States Senate
Committee on the Judiciary
"Reconsidering Our Communications Laws:
Ensuring Competition and Innovation"
June 14, 2006**

Mr. Chairman, Members of the Committee:

My name is Jeff Kuhns. I am the Senior Director of the Information Technology Services at the Pennsylvania State University. I am directly involved in managing the telecommunications and Internet needs of the university. I am testifying today on behalf of EDUCAUSE and the Internet2, the organizations that jointly represent the interests of higher education and universities in telecommunications policy. Thank you for the opportunity to testify today.

Summary: I would like to focus my remarks on the importance of keeping the Internet open to all -- the issue of "net neutrality." Universities are extremely large producers and users of Internet content. Penn State, for instance, depends upon the Internet to provide distance learning educational services -- allowing us to bring our enormous educational resources to the benefit of off-campus students throughout Pennsylvania, and even throughout the world. Furthermore, universities use the Internet to provide vital telemedicine services that provide essential medical monitoring and treatment via low-cost broadband connections. We are constantly developing new Internet-based applications and services that we hope to share with the American public.

All of these activities, however, depend upon the availability of an open Internet. The government's decision to eliminate this policy of openness last year throws all of our valuable services and research into doubt. Our distance learning, our telemedicine applications, and our research activities could be wiped out if the owners of the broadband networks are allowed to close down the Internet, or give preferential treatment to their own services. We urge Congress to restore the net neutrality policy that governed the Internet since its inception. The future of American education, innovation and competitiveness is at stake.

Penn State: Penn State is a multi-location university with 24 campuses located throughout the Commonwealth. As a land-grant University, we also have county extension offices in each of the State's 67 counties. We have over 80,000 students, with approximately one-half at the University Park Campus in State College.

Broadband Internet services are fundamentally important to our university in many ways. While each of our resident hall rooms are wired for high-speed networking, about 80% of our students live off-campus. Increasingly the off-campus students use cable modem service or DSL to reach University resources, and increasingly the University expects that these broadband services are available to our students as we develop course materials.

Through our Penn State On-line program we offer more than 50 degree and certification programs on all 7 continents, including masters programs in business administration, project management, and education. We have students who have never taken a college course before, who have attended college but need credits to complete their degree, who are taking additional credits in addition to traditional classes, and who are maintaining their professional education. These on-line programs are especially valuable to persons with disabilities. Furthermore, we offer an extensive selection of online and mixed media courses to members of the military so, no matter where they are stationed, they can start or continue their studies with Penn State.

We also use networking services to interconnect our campuses and our county offices. We use networking services to allow our researchers to collaborate with colleagues across the country and world, and to allow our students to access resources, correspond with friends and experiment with new network applications. We use networking services to provide information to prospective students, to provide information to parents and alumni, and to provide information to the public at large.

In sum, the availability of low-cost, high-speed, nondiscriminatory Internet services is absolutely essential for our university to meet our educational goals in the 21st Century.

EDUCAUSE and Internet2: Penn State is also an active member of both EDUCAUSE and Internet2. EDUCAUSE is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology. The current membership comprises more than 2,000 colleges, universities, and educational organizations, including 200 corporations, with 15,000 active members.

Internet2 is a not-for-profit partnership of 208 universities, 70 companies, and 51 affiliated organizations, including some federal agencies and laboratories. Its mission is to advance the state of the Internet, and it does that primarily by operating for its members a very advanced, private, ultra-high-speed research and education network called Abilene that enables millions of researchers, faculty, students and staff to “live in the future” of advanced broadband. By providing very high speed pipes – 10,000 times faster than home broadband, in the backbone – it enables its members to try new uses of the network, develop new applications, and experiment with new forms of communications. In short, the members of Internet2 are experiencing today what we hope the rest of America will be able to have and use in just a few years.

Because of the ground-breaking research undertaken by laboratories at Penn State and at other universities within the Internet2 coalition, our students can take advantage of many

new technologies and applications that were only dreamed of just a few years ago. Today, our students are able to take master music classes with world-renowned musicians via DVD-quality video conferencing technology. Recently, students at Wichita State were able to play and take lessons from the New World Symphony in Miami using Internet2's network. The fidelity of the audio and video is so fine-tuned, it is as if the teacher and the student are in the same room, able to discuss details about playing technique and musical phrasing. Famed oceanographer Bob Ballard is able to take elementary school children on undersea expeditions using Internet2's network. They can have a 2-way video conversation with an underwater diver in real time from any connected school in the country – imagine the lasting impression this must have – especially for those who may never have experienced the ocean firsthand.

We have a very strong interest in the current telecommunications reform discussion that is unfolding here in the Congress: we have seen an Internet future that is possible for this country and we know that the rules and incentives that you are considering could have an enormous and lasting impact upon the kind of Internet we will actually achieve.

The Importance of Net Neutrality. Our experience working with advanced networks has taught us that the Internet works best if the user – not the network owner or operator – determines what information is transmitted over the network. Users should be able to decide how much bandwidth to buy from the network operators – a little or a lot. Once the user has paid for his or her bandwidth, the user should be able to go to any web page, use any lawful application, equipment or service, and send any lawful content.

Allowing the network owner to block or degrade content, equipment or applications fundamentally alters the Internet experience. Indeed, allowing a gatekeeper to monitor, screen, manipulate traffic would ruin the Internet as we know it. Instead of the open, free-wheeling, forum for discourse and commerce that we enjoy today, the Internet would become the private playground of a few network owners – which face little competition and thus have significant market power -- whose incentive will be to steer users to the products and services that they own.

The debate over net neutrality is sometimes distorted by those who oppose legislation. They maintain that everyone has a different definition of net neutrality, or that this is a solution in search of a problem. While these pithy phrases might be easy to toss around in casual conversation, they are dead wrong. This issue is not nearly as complicated as the opponents would have you believe. Let me state a few points very clearly.

First, now that the FCC has eliminated the net neutrality requirements for broadband providers, network owners can block traffic at will. A cable or phone company could block access to a Senator's web site or an on-line journal simply because they disagree with the viewpoint being expressed. The network owner could block or degrade a competitor's VOIP offering, simply because it competes with the telco's own VOIP service. There is absolutely no legal requirement to maintain an open network today. At a minimum, Congress must act to prohibit blocking or intentional degradation of Internet traffic.

Second, there is one central principle that underlies the entire net neutrality debate – nondiscrimination. Network owners should not be able to give preference to their own services over those of their competitors. Network operators should truly be “neutral”; their job should be to carry traffic on a nondiscriminatory basis. To be sure, there are lots of ways of writing this principle into statutory law, but the variety of language does not mean that there are a variety of meanings to net neutrality. All the advocates of net neutrality with which EDUCAUSE and Internet2 are aligned share this common goal of ensuring an open, nondiscriminatory, neutral Internet.

Third, the telephone and cable companies maintain that legislating on net neutrality would prevent them from managing their networks, but this is a misconception. Network management is not a barrier to net neutrality. As network managers ourselves, we understand the need to be concerned with security attacks, spam, and overall congestion – but these should not be used as excuses to discriminate. In short, network management and net neutrality are not in conflict, they are perfectly consistent. In fact, telephone companies today engage in network management of their narrowband networks under a net neutrality regime without difficulty.

Fourth, giving preferential treatment to certain Internet traffic (as the telephone and cable companies desire) is not only unfair, it inherently degrades the quality of service provided to others. If a network operator starts to give preference to packets from one source (that perhaps pays the operator for preference), what happens to all of the other, ordinary packets? We know that when an ambulance or fire truck comes down a congested highway, everybody else has to pull over and stop. For emergencies, and for public safety, that is accepted, but what if UPS trucks had the same preference? Giving a preference to the packets of some will degrade the transport for everyone else.

Fifth, allowing the network operators to charge users to deliver traffic on the Internet will inherently inhibit non-profit organizations from using the Internet for social good. If economic toll booths are allowed for content and applications to access the Internet, then soon only the richest content providers will be able to make their material available. What happens to the small college or university, the little guy, the start-up, the entrepreneur? If charging content providers to carry their bits to local customers had existed ten years ago, we would never have seen universities using the Internet for distance learning and telemedicine applications that are widely available today. Universities and colleges simply could not compete with the large on-line merchants for priority access to the network.

Just to cite some examples, MIT is pioneering a move to put all of its course content – written materials, multi-media, videos of lectures and more – onto the Internet for free distribution to the world. It is an experiment, but a bold one that could have transformative impact upon those who might never be able to see the inside of a college classroom. Stanford University is making the audio from class lectures available on the Web. The Library of Congress is working on projects to make rare materials available over the Internet. Should MIT or Stanford or the Library of Congress now have to pay

Verizon and AT&T, Comcast and Cox, and all of the other local network providers to allow Americans access to this material? Other nations are not putting up toll booths, why should we?

The Internet2 Experience. We are aware that some providers argue against net neutrality by saying that they must give priority to certain kinds of Internet bits, such as video, in order to assure a high quality experience for their customer. Others argue that they want to use such discrimination among bits as a basis for a business model. Let me respond to these arguments by telling you about the experience at Internet2.

When Internet2 first began to deploy its Abilene network, the engineers started with the assumption that they should find technical ways of prioritizing certain kinds of bits, such as streaming video, or video conferencing, in order to assure that they arrive without delay. For a number of years, Internet2 seriously explored various “quality of service” schemes, including having our engineers convene a Quality of Service Working Group. As it developed, though, all of the research and practical experience supported the conclusion that it was far more cost effective to simply provide more bandwidth. With enough bandwidth in the network, there is no congestion and video bits do not need preferential treatment. All of the bits arrive fast enough, even if intermingled. Today the Internet2 Abilene network does not give preferential treatment to anyone’s bits, but its users routinely experiment with streaming HDTV, hold thousands of high quality two-way video conferences simultaneously, and transfer huge files of scientific data around the globe without loss of packets.

We would argue that, rather than introduce additional complexity into the network fabric, and additional costs to implement these prioritizing techniques, the telecom providers should focus on providing Americans with an abundance of bandwidth – and the quality problems will take care of themselves. For example, if a provider simply brought a gigabit Ethernet connection to your home, you could connect that to your home computer with only a \$15 card. If the provider insists on dividing up that bandwidth into various separate pipes for telephone and video and Internet, the resulting set top box might cost as much as \$150. Simple is cheaper. Complex is costly.

A simple design is not only less expensive: it enables and encourages innovation.

The design of the Internet. Universities also have a deep concern about the future of the Internet because universities helped to design the Internet from its inception. The original Internet was designed to have an agnostic, neutral “core” whose job was to pass packets back and forth – and not to discriminate or examine the packets themselves. This allowed the network to be very cost efficient and economical. It also allowed all of the “intelligence” in the network to be at the “edge,” that is, in the hands of the user.

This was very important to the evolution of the Internet. The network provider did not have control, the user did. As long as the user utilized the standardized protocols, he or she could expect to send and receive packets to anyone else on the network in a completely understandable, predictable manner. That allowed the user to experiment with

new programs, new applications, slightly tweaked applications, and even new devices – and the user would know that the network would treat the packets all exactly alike. Innovation was possible and could happen very quickly at “the edge” because you did not have to re-architect or re-build the entire network in order to make a tweak or improvement in an end-user technology (such as improving a web search engine or developing a new video encoding program).

As a result of this remarkable design, sometimes called “end-to-end architecture,” an explosion of new Internet technologies emerged over the past decade, many of them on university campuses or by recent graduates. The World Wide Web, the Web browser, the search engine, instant messaging, and many other technologies were innovations by users of the network. Not one of these innovations was developed by telephone or cable companies.

The future of the Internet. The faculty and staff and students at Penn State and other Internet2 universities are experimenting with the next generation of the Internet today. We believe that Americans are going to need, and want, significant increases in broadband speeds over the next two decades (just as they have experienced increased computer processing speeds and ever-expanding computer memory). Internet2 universities routinely provide 100 megabits per second to the desktop, and many schools offer 1,000 megabits (1 gigabit) per second connections to their faculty and students. We have done so using commercially available, open-standards technology and our traffic flows on the very same fiber used by today’s Internet service providers. Today’s typical home broadband connection – which admittedly is a big step up from dial-up – is only about 1 megabit. So the goal of broadband legislation should be to encourage ever-increasing bandwidth. Reinstating the net neutrality rule that was eliminated last year could unleash another wave of new uses, new applications, money-saving innovations, and economy-driving benefits. This continued drive toward improving productivity and new applications will give an added push to network providers to deploy broadband to meet this burgeoning demand.

We at Penn State and other colleges in the EDUCAUSE/Internet2 community have a vital stake in this legislative debate. The openness of the Internet has allowed universities to develop important services and applications that are benefiting students, faculty, patients and doctors, users and producers of information. Keeping broadband networks open, inexpensive, and simple is better than costly, complex, and closed. Reinstating the net neutrality rule that was in effect for decades will spawn another amazing wave of innovation and growth. We know, because we have seen part of that future.

Thank you for your consideration.