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INTRODUCTION

Mr. Chairman, and Members of the Committee, my name is Lawrence Lessig, and I am a professor of law at Stanford Law School. For the past decade I have been researching the relationship between technology and Internet policy, and in particular, the relationship between the architecture of the Internet and innovation. I am therefore happy to have the opportunity to address the question that this Committee is now considering — whether Congress should enact rules to protect network neutrality.

To answer that question, this Committee must keep in view a fundamental fact about the Internet: as scholars and network theorists have extensively documented, the innovation and explosive growth of the Internet is directly linked to its particular architectural design. It was in large part because the network respected what Saltzer, Clark and Reed called "the 'end-to-end' principle" that the explosive growth of the Internet happened. If this Committee wants to preserve that growth and innovation, it should take steps to protect this fundamental design.

In my view, the most important action that this government has taken to preserve the Internet's end-to-end design was the decision by Chairman Michael Powell to commit the FCC to enforce what he referred to as the Internet's four "Internet Freedoms." Building upon an idea first presented to this Committee by Microsoft's Craig

Mundie in 2002, these "Internet Freedoms" established for the first time a federal policy to assure that network owners don't deploy technologies that weaken the environment for innovation that the Internet initially created. Those principles were relied upon by the FCC when it stopped DSL provider Madison River Communications from blocking Voice-over-IP services. That enforcement action sent a clear message to network providers that the Internet that they could offer must continue to respect the innovation-promoting design of end-to-end.

It is my view that Congress should ratify Powell's "Internet Freedoms," making them a part of the FCC's basic law. However, in the time since Chairman Powell announced these principles, it has become clear that they are missing one important requirement. The now openly-stated intentions of AT&T and others to introduce access-tiering to the Internet threatens to undermine application competition on the Internet.[1] Congress should act to avoid that result.

Access-tiering[2] will create an obvious incentive among the effective duopoly that now provides broadband service to most Americans. By effectively auctioning off lanes of broadband service, this form of tiering will restrict the opportunity of many to compete in providing new Internet service. For example, there are many new user generated video services on the Internet, such as Google Video, YouAre.TV, and youTube.com. The incentives in a world of access-tiering would be to auction to the highest bidders the quality of service necessary to support video service, and leave to the rest insufficient bandwidth to compete. That may benefit established companies, but it will only burden new innovators.

To oppose access-tiering, however, is not to oppose all tiering. I believe, for example, that consumer-tiering should be encouraged. Network providers need incentives to build better broadband services. Consumer-tiering would provide those incentives.

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[1] See *Telcos Propose Web Tiers,* Red Herring (January 31, 2006).

[2] By "access-tiering," I mean any policy by network owners to condition content or service providers' right to provide content or service to the network upon the payment of some fee. These fees are independent of basic Internet access fees. No one questions the right of network owners to charge Google for the bandwidth it uses. Instead, "access-tiering" adds an additional tax on network innovators based upon the particular service being offered.

Consumer-tiering, however, should not discriminate among content or application providers. There's nothing wrong with network owners saying "we'll guarantee fast video service on your broadband account." There is something wrong with network owners saying "we'll guarantee fast video service from NBC on your broadband account." And there is something especially wrong with network owners telling content or service providers that they can't access a meaningful broadband network unless they pay an access-tax.

I don't mean "wrong" in the sense of immoral, or even unfair. My argument is not about the social justice of Internet access. I mean "wrong" in the sense that such a policy will inevitably weaken application competition on the Internet, and that in turn will weaken Internet growth.

The Internet's growth is a crucial part of the Nation's economic growth. In my view, Congress should take steps to assure that the current concentration in broadband access does not translate into reduced application competition on the Internet. A "network neutrality" policy that combined Chairman Powell's "Internet Freedoms" with a requirement that network providers secure a level of basic internet service with only consumer-tiering would, in my view, promote that growth.

I. The End-to-End Internet Inspired A Wide Range of Innovation

The Internet has inspired a wide range of innovation. Because of its particular architectural design, that innovation has come primarily from the "edge" or "end" of the network through application competition. As network architects Jerome Saltzer, David Clark, and David Reed describe,[3] the original Internet embraced an "end-to-end" design, meaning the network itself was to be as simple as possible, with intelligence for the network provided by applications that connected at the edge of the network.

One consequence of this design is that early network providers couldn't easily control the application innovation that happened

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3 [29]See J. H. Saltzer, David Clark, and David Reed, "End-to-End Arguments in System Design," available at <http://web.mit.edu/Saltzer/www/publications/endtoend/endtoend.pdf>; David P. Reed et al., "Active Networking in End-to-End Arguments," available at <http://Web.mit.edu/Saltzer/www/publications/endtoend/ANe2ecomment.html>.

upon their networks. That in turn meant that innovation for these network could come from many who had no real connection to the owners of the physical network itself. Indeed, if you consider some of the most important innovations in this history of the Internet — from the development of the World Wide Web by a Swiss researcher at CERN, to the first peer-to-peer instant messaging chat service, ICQ, developed by a young Israeli, to the first web based (or HTML-based) email, HoTMaiL, developed by an Indian immigrant — these are all innovations by kids or non-Americans: outsiders to the network owners.

This diversity of innovators is no accident. By minimizing the control by the network itself, the "end-to-end" design maximizes the range of competitors who can innovate for the network. Rather than concentrating the right to innovate in a few network owners, the right to innovate is open to anyone, anywhere. That architecture, in turn, has created an astonishing range of important and economically valuable innovation. Here, as in many other contexts, competition has produced growth. And that competition was assured by the network's design.[4]

II. Concentrations in Broadband Access Threaten That End-to-End Neutrality

It was the assumption of many (including me[5]) that competition in broadband access would prevent any compromise in end-to-end neutrality. That was the premise of the "open access" requirement imposed upon telecom providers. The assumption was that in a competitive market, no individual ISP would have the market power to successfully restrict the range of Internet applications. "Open

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[4] The best work describing this interaction is Barbara van Schewick, *Architecture and Innovation: The Role of the End-to-End Arguments in the Original Internet*, PhD dissertation, Technical University, Berlin (2005), and Tim Wu, *Network Neutrality, Broadband Discrimination*, 2 J. Telecom. & High Tech 141 (2003). I have also addressed this question in *The Future of Ideas* (2001).

[5] See, e.g., Mark Lemley & Lawrence Lessig, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era,* 48 UCLA Law Review 925 (2001).

access" thus sought to establish a competitive ISP market, which in turn was thought would protect network neutrality. [6]

This assumption about competition protecting end-to-end neutrality has been drawn into doubt by recent scholarship.[7] But given the increasing concentration in broadband provision, the question whether ISP competition could protect end-to-end neutrality is now effectively moot. Whether or not competition among ISPs is enough, America no longer has sufficient broadband ISP competition. In most markets, an effective duopoly controls access to high speed Internet.[8]

This concentration has now led network owners to openly advocate changes in network policy designed to vest new control in the network owner over the applications and content that flow over their network. In the United States, there have been isolated incidents, for example, of DSL providers blocking Voice-Over-IP (VOIP) services.[9] That policy has become the rule in a number of foreign jurisdictions. And as recently reported, network owners in the United States and Canada are now discussing adding access-tiering to their networks.[10]

These changes, if allowed, would fundamentally alter the environment for innovation on the Internet. With a network that embeds the principle of end-to-end, there is no danger that an innovator's application or content will be blocked by the network owner. Consumers might not like the innovation. That risk is unavoidable. But an end-to-end network removes the risk that the network owner will interfere with an innovation, either because it competes with the network owners own business (e.g., VOIP), or

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[6] As the Wall Street Journal recently reported, France has vigorously enforced "unbundling" requirements for network providers. See Jesse Drucker, *For U.S. Consumers, Broadband Service is Slow and Expensive,* Wall Street Journal, November 16, 2005. Japan has followed a similar policy. See Nobuo Ikeda, *The Unbundling of Network Elements Japan's Experience*, available at < http://www.rieti.go.jp/jp/publications/summary/03110001.html>.

[7] See van Schewick, *supra*, §9.3

[8] FCC, "High-Speed Services for Internet Access," as of 12/31/04, available at <http://www.fcc.gov/wcb/iatd/comp.html>.

[9] See *infra* note 12.

[10] See *supra* note 1.

because the owner wants to extract payment from the innovator. This threat-free environment induces more application innovation.

If the principle of end-to-end is abandoned, however, then innovators must now include in their calculation of risk the threat that the network owner might either block or tax a particular application. That increased risk will reduce application investment.

III. Powell's "Internet Freedoms" Are A Critical, Though Incomplete, Defense of Network Neutrality

This concern about the costs to innovation caused by network owners is not new. Since the 1996 Telecom Act, the FCC had been struggling to formulate policy that balanced both the need for new broadband investment against the risk that broadband operators would exercise too much control over network innovation. Former FCC Chairman Michael Powell finally resolved that policy struggle in February, 2004. In a speech given in Boulder, he outlined four principles that he promised would guide FCC policy. As Chairman Powell described, these "Internet Freedoms" were:

> (1) Freedom to Access Content. First, consumers should have access to their choice of legal content.
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> Consumers have come to expect to be able to go where they want on high-speed connections, and those who have migrated from dial-up would presumably object to paying a premium for broadband if certain content were blocked. Thus, I challenge all facets of the industry to commit to allowing consumers to reach the content of their choice. I recognize that network operators have a legitimate need to manage their networks and ensure a quality experience, thus reasonable limits sometimes must be placed in service contracts. Such restraints, however, should be clearly spelled out and should be as minimal as necessary.
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> (2) Freedom to Use Applications. [C]onsumers should be able to run applications of their choice.
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> As with access to content, consumers have come to expect that they can generally run whatever applications they want. Again, such applications are critical to continuing the digital broadband migration because they can drive the demand that fuels deployment. Applications developers must remain confident that their products will continue to work without interference from other companies. No one can know for sure which "killer" applications will emerge to drive deployment of the next generation high-speed technologies. Thus, I challenge all facets of the industry

> to let the market work and allow consumers to run applications unless they exceed service plan limitations or harm the provider's network.
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> (3) Freedom to Attach Personal Devices. [C]onsumers should be permitted to attach any devices they choose to the connection in their homes.
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> Because devices give consumers more choice, value and personalization with respect to how they use their high-speed connections, they are critical to the future of broadband. Thus, I challenge all facets of the industry to permit consumers to attach any devices they choose to their broadband connection, so long as the devices operate within service plan limitations and do not harm the provider's network or enable theft of service.
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> (4) Freedom to Obtain Service Plan Information. [C]onsumers should receive meaningful information regarding their service plans.
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> Simply put, such information is necessary to ensure that the market is working. Providers have every right to offer a variety of service tiers with varying bandwidth and feature options. Consumers need to know about these choices as well as whether and how their service plans protect them against spam, spyware and other potential invasions of privacy.[11]

Powell's speech was an indication about enforcement strategy. In March, 2005, that strategy was demonstrated. In an extraordinarily swift manner, the FCC succeeded in securing a settlement with a DSL provider, Madison River Communications. That company had allegedly blocked VOIP on their DSL lines. In the settlement, Madison River agreed it would not use its power over the network to block legal applications on the network.[12]

Powell's strategy, in my view, was a perfect mix of carrot and stick. His aim was to signal to network providers the kind of network service they could provide without fear of FCC intervention. But the Madison River case demonstrated that Powell's FCC would not hesitate to intervene when these basic

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[11] "Preserving Internet Freedom: Guiding Principles for the Industry," February 8, 2004, <http://www.fcc.gov/commissioners/previous/powell/speeches.html>.

[12] "Madison River Communications, LLC Order and Consent Decree," March 3, 2005, <http://www.fcc.gov/voip/>.

principles were violated. Network providers thus knew the kind of business model that would steer clear of the FCC. That had an important effect upon investment incentives — both of network providers, and of application developers.

There is, however, one important hole in the "Internet Freedoms" that Powell articulated. And that risk is revealed in the recently revealed intentions of major network providers to begin to implement access-tiering for content and service providers on the Internet.

The motivation behind this sort of tiering is perfectly understandable. Network providers now have significant market power in the broadband market. They aim to leverage that power to maximize revenue. No doubt, some of that revenue will support new network provisioning. That provisioning will of course benefit everyone to the extent it increases the spread of broadband service.

But this form of tiering will also have consequences for the market for application and content innovation. That danger can be seen in a simple hypothetical.

Imagine a network owner with the ability to provision a network that is providing 6 Mbps to its customers. Initially, that capacity is the effective space for broadband application competition. Imagine then that the network begins to offer "speed lanes" to particular video providers. These channels effectively reduce the capacity for broadband application competition. In this context, video providers have the incentive both to secure for themselves sufficient bandwidth to guarantee quality service, and the incentive to guarantee that no one else, or at least, no one not paying the access fee, be able to provide that network service. Thus, working with the network provider, large video companies could secure sufficient provisioning to enable their content to be served while leaving insufficient bandwidth to other competitors.

Thus, for example, there are many new user-generated video sites appearing on the Internet. Google has one such site — Google Video — but others are being created by traditional Internet startups. Thus, youTube.com and YouAre.tv are two competitors to Google that are developing similar services to the Google Video service.

In a world with access-tiering, companies like Google in this context would have an incentive to secure sufficient bandwidth to

enable its services while leaving competitors without enough bandwidth for their own. Access-tiering would thus become another barrier to entry for competitors, reducing application or content competition on the Internet.

This would represent a fundamental change in the environment for innovation on the Internet. For the first time, network owners would have a strategic capability, as well as incentive, to create barriers to entry for new innovators. We should remember that the current leaders in Internet innovation all began with essentially nothing. Google, eBay, Yahoo! and Amazon all started as simple websites providing limited, but fantastic, services. They had to pay no special access-tax to be on the Internet; there was no special channeling by Internet providers that disadvantage these competitors relative to any others. They succeeded because the product they offered was better than others. Competition on the merits thus drove this market.

That competition would be threatened by access-tiering. Existing content providers have an incentive to block competitors; access-tiering would be a means to effect that competitive advantage. And while these actions might not rise to the level of an antitrust violation, it is perfectly appropriate for Congress to select a network policy that it believes would maximize innovation and growth for the Nation. Adding toll booths to the Internet may well benefit those who own the roads; but it won't benefit application and content competition on the Internet, both of which drive economic growth.

To oppose access-tiering, however, is not to oppose all tiering. It is certainly valuable for network providers to offer consumers different tiers of service. Such differentiation will create incentives for network providers to improve network performance. The currently abysmal record of broadband provision in the United States demonstrates that they certainly need more incentives.[13] Consumer-tiering could well provide more incentives.

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[13] Comparative broadband infrastructure statistics rank broadband in America somewhere between the 13th and 19th industrialized nation in broadband penetration. See, e.g., <http://www.clickz.com/stats/sectors/geographics /article.php/3563966> (15th). As the Wall Street Journal reported last fall, it is not countries such as Japan or Korea that have outflanked the United States. European countries too now offer their citizens vastly superior broadband options. French households, for example, can secure 20 Mbps service at about

But consumer-tiering would not create any of the anticompetitive effects that access-tiering would. So long as network owners offered neutral tiering — for example, offering high speed for video content, or simply higher speed for large file transfers — that "discrimination" would not harm application competition. The diversity of consumer wants would produce a general demand for faster, cheaper Internet service. That general demand would benefit application competition generally.

IV. Congress Should Ratify Powell's "Internet Freedoms" Along With A Restriction On Access-Tiering

In light of this emerging threat to application and content innovation, it is my view that Congress should enact legislation that clearly establishes the competitive baseline for broadband service in America. That legislation should first ratify Chairman Powell's "Internet Freedoms." These principles are an essential element to any "network neutrality" policy.

But in addition to these "Internet Freedoms," Congress should act to avoid the competitive costs that access-tiering could produce. There are two ways in which Congress could respond to this threat.

At a minimum, Congress could simply restrict access-tiering by network providers. That would leave network providers free to offer consumer-tiered service. But such tiering should not be allowed to turn upon the particular provider of network content. Instead, such tiering should be limited to either bandwidth guarantees (e.g., guaranteeing at least 10 Mbps) or service guarantees (e.g., guaranteeing fast 'video service' without specifying a particular provider).

A more ambitious regulation would require network providers to provide a "basic internet service" to all broadband customers. The FCC would define what "basic internet service" was. And the FCC's definition would turn upon a judgment about the capacity necessary to assure sufficient competition among application and service providers. In the current context, that could mean sufficient bandwidth to provide reasonable video services. But as the uses of the Internet develop, the scope of this "basic internet service" could change.

$1.80/Mbps. The equivalent Verizon entry-level service plan costs almost 11 times that price. See *supra* note 6.

CONCLUSION

The Internet was the great economic surprise of the 20th century. No one who funded or initially developed the network imagined it would have the economic and social consequences that it has had.

But though the success of the network was a surprise, we have learned a great deal about why it was a success. Built into its basic design was a guarantee of maximum competition. A free market in applications was coded into its architecture. The growth of that network followed from this basic design. The world economy benefited dramatically from this growth.

The threat facing the Internet today is that network owners will convince regulators to go back on that original design. Through regulatory policies that permit broadband providers to act however their private interests dictate, these regulatory policies would threaten the economic potential of the network generally. New innovation always comes from outsiders. If insiders are given both technical and legal control over innovation on the Internet, innovation will be stifled.

Unlike many other industrialized nations, we in the United States have failed to preserve the extraordinary competition among ISPs that characterized early Internet growth. But despite that loss in access competition, the end-to-end principle, supported in part by the FCC, still provided significant opportunity for application and content competition. The changes now being spoken of by the effective duopoly of broadband providers will weaken that application and content competition.

It is my view that any policy that weakens competition is a policy that will weaken the prospects for Internet and economic growth. I therefore urge this Committee to secure and supplement the work of Chairman Powell, by enacting legislation that protects the environment for Internet innovation and competition that the original Internet produced.