

Regulators should not interfere with the “coming exoflood.”

Net Neutrality: A Radical Form of Non-Discrimination

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Despite the fact that the current net neutrality debate has drawn the attention of many academics and consultants, it is hard to find a precise definition in the literature of what “net neutrality” means. In layman’s terms, net neutrality is about the politics of envy: if a website cannot afford certain bells and whistles, then its rivals should not be allowed to acquire such enhancements. In economic terms, net neutrality represents the prohibition of any contracting for enhanced service or guaranteed quality of service (QoS) between a broadband service provider and an Internet content provider.

Such a prohibition would unwind existing contracts for QoS between broadband service providers and content providers. The anticompetitive harms that would be allegedly spared from such a prohibition pale in comparison to the efficiencies made possible by such contracting. Accordingly, net neutrality legislation should be rejected.

CURRENT FORMS OF TIERED QOS

There are two types of customers who are already purchasing enhanced QoS offerings from broadband service providers: end-users (primarily enterprise customers) and content providers. Not all content providers demand enhanced QoS. This option is demanded only by those content providers that supply QoS-needy content. Real-time applications represent an important type of QoS-needy content. Real-time video, Voice over Internet Protocol, and online video game traffic cannot be experienced properly by the end-user if it is subjected to jitter (unevenness in the rate of data packet delivery). Accordingly, real-time content providers demand enhanced QoS. The QoS offerings aimed at

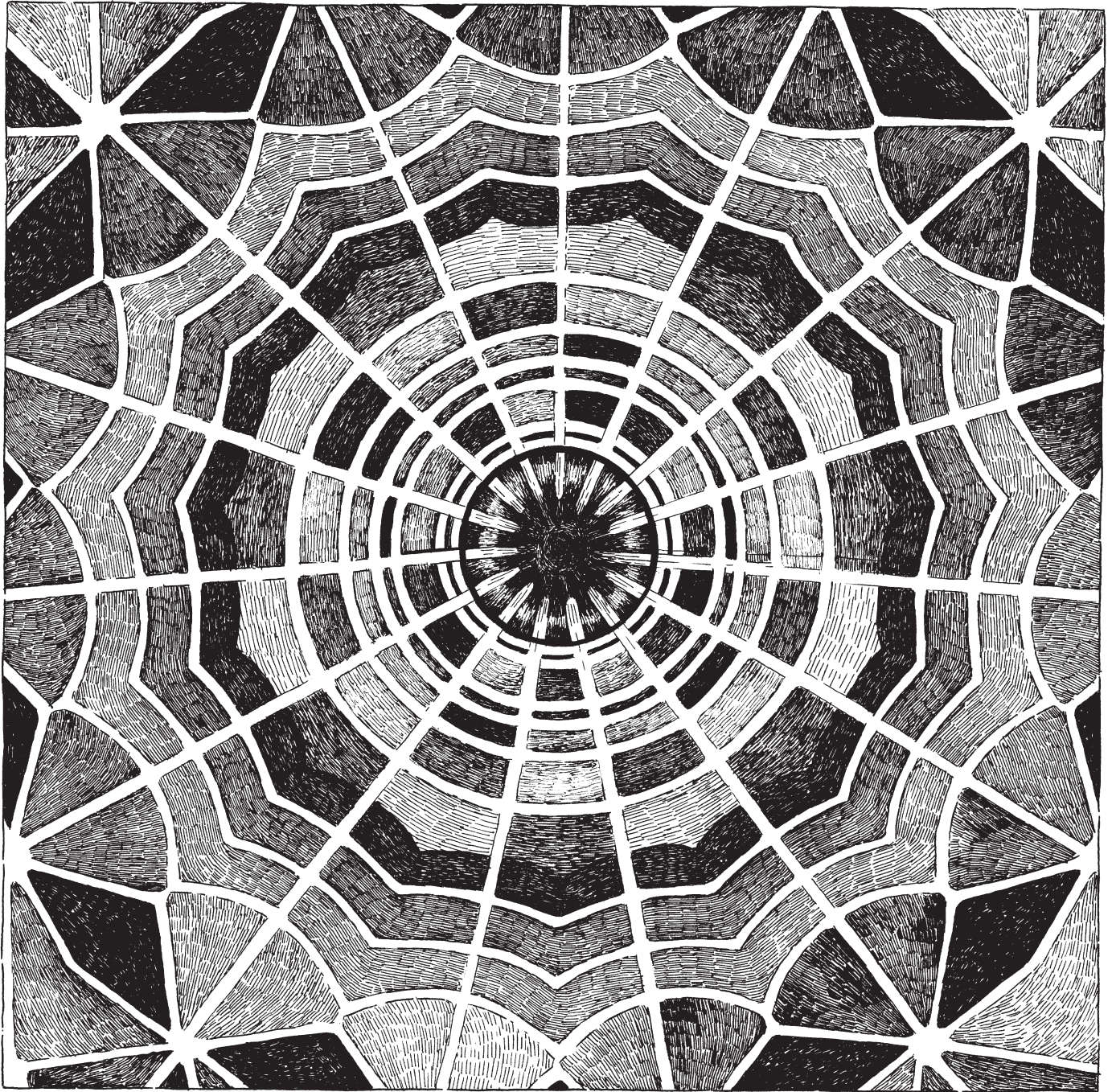
content providers are the target of net neutrality proponents.

Net neutrality proponents speak of “access tiering” — that is, offering tiered levels of QoS at different prices — as if it is some hypothetical strategy that will be employed at some future date to foreclose unaffiliated content providers. In reality, tiered QoS offerings are already here at different layers of a broadband service provider’s network, and for legitimate technical and economic reasons. Content providers are voluntarily entering into contracts with broadband service providers presumably because content providers (and their customers) value the service enhancements more than the prices for the enhancements.

Enhanced QoS is not forced upon content providers as part of some bundle of services that the providers otherwise do not want, or because the broadband service provider has monopoly power over the supply of one of the products in the bundle. Furthermore, broadband service providers offer enhanced QoS at a surcharge to content providers, not because they are trying to foreclose potential rivals in an upstream market or to degrade the quality for content providers that decline the QoS option, but because it is costly to offer such enhancements and because a managed network ultimately generates benefits for Internet users.

Broadband service providers currently may offer enhanced QoS to content providers in the form of managed hosting, local caching of content in nearby data centers, and prioritization of traffic at the IP packet layer. By purchasing hosting services from a broadband service provider, a content provider can gain immediate access to the provider’s network. A content provider can also take advantage of the provider’s service level agreements (SLAs), under which the broadband service provider is required to provide proof of a promised level of service. Each SLA contains a technical component, which

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offers several classes of service. A content provider can request that a broadband service provider offer a fully managed hosting solution or it can manage its own applications hosted in an Internet Data Center (IDC) owned by a broadband service provider. For example, Qwest offers the following commitment to customers that outsource their Web presence: "You receive industry-leading SLAs. Many data centers are built with high degrees of redundancy in critical systems such as power, HVAC, fire detection and suppression and security."

Online video game providers may purchase enhanced QoS as an option with hosting services from broadband service providers. For example, Sony produces *EverQuest*, a three-dimensional, fantasy, massive multiplayer online role-playing game (MMORPG) that requires users to pay a recurring monthly fee. For a time, *EverQuest* was the most popular MMORPG in the

industry. Blizzard Entertainment produces *World of Warcraft*, another MMORPG set in a fantasy environment. As of September 2006, *World of Warcraft* had almost 7 million active subscriptions worldwide. In both games, online subscribers control a character avatar "exploring the landscape, fighting monsters and performing quests on behalf of computer controlled characters." In addition to cash incentives for good performance, a player is rewarded with experience that allows her character to improve in skill and power. MMORPG games have hundreds of thousands of users playing simultaneously. To achieve the best possible fantasy environment for their online gaming websites, Sony and Blizzard place their servers in IDCs owned by broadband service providers around the world. They simply cannot afford for the players of their games to experience jitter.

AT&T hosts many of the largest online games. AT&T's host-

ing service spans 30 IDCs across four continents, including locations in Paris, Shanghai, California, and Singapore. A content provider that purchases managed hosting service can obtain SLAs relating to network response time, application response time, and application performance.

As part of an enterprise hosting service, a content provider can place its content on the broadband service provider's servers to reach end-users faster and more reliably than from the content provider's servers alone. For example, Verizon markets a service called "Application Acceleration" on its website, which offers content providers "a high-performance web application delivery platform so [their] distant end-users get the same level of performance [their] local users enjoy." AT&T markets a similar service under the name "Intelligent Content Distribution Service." It bears emphasis that this form of QoS (along with other forms) may be supplied by third parties in addition to broadband service providers. For example, Akamai Technologies provides a similar content-acceleration service by caching content closer to the end-user for over 2,000 customers. One measure of the size of the market for acceleration services is Akamai's revenues, which reached \$100 million in the second quarter of 2006. The fact that Akamai offers enhanced QoS at a surcharge to content providers suggests that the same conduct by a broadband service provider is based on justifiable business practices that could be found in what net neutrality proponents believe are otherwise competitive markets.

NET NEUTRALITY LEGISLATION

The current legislative proposals, if adopted, would impose all sorts of "duties" on broadband providers. One duty of a broadband service provider would be a non-discrimination requirement to offer the same quality of service to all content providers. Effectively, a broadband service provider would be able to offer enhanced QoS to a given content provider, but if it did so, it would have to offer the same level of quality to all content providers free of charge. The apparent motivation for such a restriction is to stymie efforts by any content provider to secure enhanced QoS from broadband providers, and instead to force all contracting for QoS to occur between broadband providers and end-users. (To appreciate the potential administrative costs associated with such contracting, imagine the nightmare that credit card companies would face if the fees were negotiated individually with millions of diners rather than with thousands of restaurants!) These bills generally do not distinguish between broadband services offered by broadband service providers versus those offered by backbone networks, and they would presumably impose their net neutrality restrictions on both types of networks.

What do these duties mean in practical terms? Suppose that AT&T enters into a contract with Sony (which it has at certain levels of its network) in which Sony pays AT&T a fee to guarantee that Sony's online gaming customers can enjoy their online games in real time without any disruptions. Now suppose that Congress passes this version of net neutrality. AT&T must offer the same level of quality to all of Sony's online gaming rivals free of charge. At that moment, Sony would insist that its contract with AT&T be nullified. Why should Sony have to pay for something that all its online gaming rivals get for free?

BORROWING FROM CABLE In the words of Professor Jon Peha of Carnegie Mellon, a more "balanced" non-discrimination provision would allow a broadband service provider to enter into a contract with a content provider for enhanced QoS at some surcharge, but that broadband service provider would then be forced to offer that same contract to all content providers. Assuming such regulation is necessary (and that is a critical assumption), this is much closer to the idea of non-discrimination that is embodied in the program carriage rules in the Cable Act. In particular, the Cable Act seeks to protect unaffiliated video programmers or content providers by prohibiting a cable operator from

- discriminating against video programmers on the basis of affiliation in the selection, terms, or conditions for carriage of video,
- conditioning carriage on equity, and
- conditioning carriage on exclusivity.

The Cable Act's non-discrimination template should not be applied to the Internet for several reasons. First, those non-discrimination provisions and the program access rules were crafted when, for most households, cable television was the only provider of multi-channel video programming, and slightly more than half of all cable programming services were vertically integrated with cable operators. This does not accurately characterize the current state of competition in the broadband market. According to the Federal Communications Commission, as of June 2006, 95.6 percent of U.S. ZIP codes were served by two or more broadband service providers (including satellite broadband), and 87.4 percent of U.S. ZIP codes were served by three or more broadband service providers (including satellite broadband). The second statistic implies that residents living in 87.4 percent of U.S. ZIP codes have a choice between a cable modem provider and a DSL provider.

Second, the unique relationship between an unaffiliated Internet content provider and a broadband service provider is not conducive to foreclosure strategies. With a few exceptions, Internet content is not acquired by broadband service providers at a certain cost per subscriber per month, as is the case with traditional video programming. Setting aside the seldom-used leased access rules, unaffiliated video content providers cannot reach a video distributor's customers unless the distributor has acquired the content from the provider. By contrast, unaffiliated Internet content providers do not need to reach an agreement with a broadband service provider to reach that provider's broadband customers. Hence, broadband service providers and unaffiliated content providers are not likely to get into a carriage dispute arising over price or affiliation. Although such disputes are common in the video programming industry and Congress has given the FCC powers to prevent discriminatory practices, because Internet content providers do not depend on broadband service providers to reach end-users in the same way that video programmers depend on cable or Direct Broadcast Satellite (DBS) providers, video programming is the wrong framework for analyzing discriminatory strategies in Internet content markets.

Third, the program carriage and access rules were adopted to address an actual proven pattern of historic discrimi-

nation by cable operators. Given the limited record here, the program access template is really the opposite of what net neutrality advocates want — namely, protections against possible abuses that have yet to materialize.

Fourth, there are technological issues relating to some services, such as high-definition television (HDTV), that could constrain a broadband service provider's ability to offer enhanced QoS on the same terms to a second or third content provider. In particular, the current bandwidth of today's broadband networks may not be capable of accommodating multiple HDTV signals.

With these four caveats in mind, even a sensible non-discrimination rule of the kind advocated by Professor Peha may not be needed and may not be feasible.

It seems that net neutrality advocates like the idea of using the cable non-discrimination rules as a template for net neutrality. In a November 16, 2006 blog post, Art Brodsky of Public Knowledge wrote: "In the past, we have said that a model for

first place — would read something like this: "A broadband access provider cannot condition the price of enhanced QoS on the affiliation of the content provider. Nor can it condition the price of enhanced QoS on exclusivity or equity."

Given the lack of monopoly power in all but a handful of local access markets, the lack of leverage a broadband service provider wields over a content provider, the lack of a proven record of discrimination, and given certain technological constraints relating to HDTV, it is unlikely that the major broadband service providers would be willing to embrace the non-discrimination conditions from the Cable Act. They simply want compensation for providing a service (enhanced QoS) that has a positive marginal cost. In addition, they want to avoid having to use only expanded physical infrastructure to meet what Bret Swanson in the *Wall Street Journal* recently called the "coming exaflood" of bandwidth-intensive applications, including video sharing, medical imaging, and digital surveillance. Because of this dilemma, broadband service

Broadband service providers are genuinely worried about avoiding a traffic jam on the Internet that threatens to undermine everyone's Internet service.

Net Neutrality regulation could be the program-access rules, which guarantee access to most of the content on cable systems." Unfortunately, Mr. Brodsky focused on the protections for rival video distributors like DBS providers, while the net neutrality debate focuses on trying to find protections for unaffiliated content providers. That is, a DBS provider is a downstream rival of a cable television provider, while an Internet content provider is an upstream supplier for a broadband service provider. But his intentions were pure. Thus, notwithstanding the four caveats listed above, the non-discrimination protections for upstream suppliers — carriage conditions cannot be based on affiliation, and carriage cannot be conditioned on equity or exclusivity — are more relevant to the net neutrality debate.

How would the program carriage rules from the Cable Act be rewritten for the Internet? The first challenge is that broadband service providers, unlike cable television providers in the early 1990s, are not trying to withhold "carriage" or access to their customers from content providers — instead, they want compensation for offering enhanced QoS to a select group of content providers (namely, those who offer real-time applications). Access to the broadband service provider's customers is already granted. Note that the protections for unaffiliated programmers in the Cable Act would not prevent a cable operator and a video programmer from striking a carriage deal at a positive price. Rather, they prevent a cable provider from demanding exclusivity or equity as a condition of carriage, or conditioning carriage on the basis of affiliation. Applied to Internet content, the non-discrimination provisions — if necessary in the

providers, and the analysts who cover them, are genuinely worried about avoiding a traffic jam on the Internet that threatens to undermine everyone's Internet experience.

As Richard Clarke, the director of economic analysis at AT&T, has demonstrated, meeting that demand with a fully neutral network would be simply unaffordable to customers. In particular, he estimates that to provide sufficient capacity to accommodate the current typical Internet usage pattern in an unmanaged network, the cost per customer could reach \$47 per month. To provide sufficient capacity to accommodate expected growth in traditional Internet data services as well as use of Internet connections for bandwidth-intensive applications equivalent to just two simultaneous standard definition television channels per home, Clarke estimates that the cost per customer of an unmanaged network could reach \$140 per month for Internet service only (not including the cost for video content). Finally, if customers use the equivalent of viewing two simultaneous HDTV channels, Clarke estimates that the cost per customer of an unmanaged network could reach \$466 per month.

What can be said is that the net neutrality proposals, if amended along the lines described here, would not be rejected out of hand by economists from every corner of the political spectrum. There are several papers in the economic literature that examine the conditions under which a firm should be compelled to treat unaffiliated upstream providers the same as they treat their affiliated upstream providers. However, there does not appear to be one economic paper that examines the conditions under which two parties should be prevented from

voluntarily contracting for a service at a positive price.

UNINTENDED CONSEQUENCES In an article in the *Journal on Telecommunications and High Technology Law* that I co-authored with Robert Litan of the Brookings Institution, I examined several possible outcomes that can emerge given this draconian “non-discrimination” provision embodied in the current net neutrality legislation. Two of the most likely outcomes are:

- no contracting for QoS will occur at the regulated price of zero, or
- broadband service providers would offer a blended quality of service offering that is “too high” for some applications and “too low” for others.

Concerning the first outcome, the classic shut-down decision in economics is to withdraw from supplying a service if the price is less than the average variable cost of supplying that service. As explained above, the average variable cost of providing QoS is the opportunity cost of carrying a given traffic stream and thus exceeds zero. Hence, it is reasonable to assume that a broadband service provider would withdraw its QoS offering from the market entirely to comply with the non-discrimination provision. In the other scenario, gamers and other users who need very high QoS might not have the QoS necessary to make paying for a gaming site worthwhile. This in turn could cause content providers to reduce their investment in new QoS-needy content. In addition, content providers who do not require higher QoS, which is the majority of sites out there right now, would then be forced to pay the increased price for blended quality of service.

To make this point concrete, consider a content provider that currently purchases hosting service from a broadband service provider for \$100 per month but declines the QoS option, which is priced at an additional \$50 per month. Assume that 10 percent of the broadband service provider’s customers chose the bundled hosting offering (hosting plus QoS) for \$150 before the imposition of net neutrality. The average price per customer is thus \$105. Under a net neutrality regime, the price of the QoS option would be set to zero (by law) and the price of hosting service would increase to \$105 if the broadband service provider sought to preserve the average revenue per customer. Hence, the content provider that originally opted against QoS now incurs an additional charge of \$5 per month for blended QoS. Faced with this higher incremental cost, the content provider would likely try to pass on a portion of this cost increase to its customers. These outcomes would be harmful to Internet users, as they would force everyone to pay a price that does not correspond with the value he attaches to the services, which will reduce output and reduce surplus overall.

THE ANTICOMPETITIVE ARGUMENTS

The merits of the anticompetitive arguments advanced by proponents of net neutrality go something like this: If a broadband service provider is allowed to charge a fee to Sony or Blizzard for providing enhanced QoS, then upstart gaming providers who lack the resources of Sony would not be able to compete effectively in the market for online gaming. Con-

sumers would be worse off given the barriers to entry created by the surcharge. This argument appears to fall under the “Covet Thy Neighbor” ethic (which likely explains the vast majority of regulatory proposals in Washington) – my rival should be prohibited from investing \$2 billion in developing a major product innovation because I cannot do likewise.

DEFINING THE MARKET While that example may not evoke much sympathy, try this one, which is admittedly harder: Suppose that Comcast creates its own gaming website. If Comcast is allowed to charge a fee for enhanced QoS to unaffiliated gamers, then Comcast will set that fee excessively high so as to prevent rival gamers from competing with its own gaming website. Could such a strategy “foreclose” the upstart content provider – that is, could it cause the upstart content provider to lose out on some economies of scale or, in the worst case, exit the industry entirely? To answer that question, one must first define what antitrust economics calls the “relevant geographic market.”

Vertical foreclosure theories depend critically on the relevant geographic market. A local downstream broadband service provider – whether it is a cable television operator or a cable modem provider – lacks the ability to foreclose an upstream content provider that generates content with nationwide appeal. Proponents of net neutrality like to cite the combined share of all DSL and cable modem providers nationwide (98 percent) to suggest incorrectly that the market share is extremely high – that is, to suggest that upstart content providers are somehow beholden to DSL and cable modem providers. But this statistic has no meaning in this context. A content provider is not vying for the eyeballs in one particular locality that is served by both a cable model provider and a DSL provider (whose shares sum to 98 percent). Thus, summing their shares is nonsensical.

The oft-repeated 98 percent figure assumes incorrectly that the relevant geographic market to assess the alleged anticompetitive effects from an access tiering is the local market – that is, it assumes that a content provider is offering content that is particular to a given locality and therefore requires access to a broadband service provider’s subscribers in a given locality. But Internet content is not local. At a minimum, it is national, and more likely it is international. The vast majority of Internet content appeals to all U.S. residents, not just the residents of a particular locality. There is next to nothing on *YouTube.com* or *Google.com* or *ESPN.com* that is specific to a particular U.S. city. That is precisely why anticompetitive refusals to deal are possible in video markets, where some content such as local broadcast television news and regional sports are in fact local (and those content providers depend on a single cable provider), but impossible in Internet markets.

Will the unaffiliated gamer be prevented from getting its legs underneath it as a result of Comcast’s demand for a QoS surcharge? Stated differently, does Comcast have the ability to foreclose upstart gamers? The answer is an unequivocal no. First, the gamer will still have access to Comcast’s subscribers, albeit without enhanced QoS. Second, the gamer still can strike deals for enhanced QoS with other broadband service providers. Because Comcast, the largest broadband service

Table 1

The Broadband Market

2006 year-end broadband subscriber numbers and nationwide market share

Provider	Subscribers (millions)	Market Share
Comcast Cable	10.954	22%
Verizon	7.000	14%
AT&T	6.900	14%
Time Warner Cable	6.312	13%
Cox Cable	3.357	7%
Charter Cable	2.530	5%
Cablevision	2.064	4%
Qwest	2.000	4%
Insight Cable	0.613	1%
Others	8.718	NA
Total	50.448	

SOURCES: FCC, "High-Speed Services for Internet Access Status as of June 30, 2006" at tbl2 (2007); company websites.

provider in the United States, controls access to only about 23 percent of all broadband subscribers, it lacks the ability to induce the upstart gamer from exiting the industry or even operating at an inefficient scale. As Table 1 shows, the next largest providers are AT&T and Verizon, each with roughly 14 percent of the U.S. market.

Even if Comcast refuses to sell its enhanced QoS, the upstart gamer is free to enter into contracts for enhanced QoS with other broadband service providers that collectively control access to the remaining 77 percent of all U.S. broadband subscribers. To the extent that the Internet content market is international, Comcast's foreclosure share (assuming hypothetically that Comcast decided to prevent access to the content provider entirely) is even smaller.

In a recent *Journal of Telecommunications and High Technology* article, Barbara van Schewick cites my 2001 *Journal of Industrial Economics* article with Dan Rubinfeld in support for her call to prohibit access tiering. But this application of the theory of vertical foreclosure assumes incorrectly that a content provider is offering content that is particular to a given locality and there-

fore requires access to a single broadband provider's subscribers. As I explained above, the vast majority of Internet content appeals to all U.S. residents, not just the residents of a particular locality. This is precisely why anticompetitive refusals to deal are possible in video markets, where some content (e.g., local broadcast television news, regional sports) is local, but are unlikely in Internet markets.

Finally, most vertical foreclosure theories require the existence of economies of scale. Without economies of scale, the rival cannot be harmed as a result of its being foreclosed from a certain segment of the market. The minimum efficient scale of an Internet content provider is likely very low, and whatever foreclosure there is would not be enough to prevent the content provider from reaching its minimum efficient scale. Thus, the anticompetitive arguments in support of net neutrality do not have merit.

CONCLUSION

Net neutrality in its current form will jeopardize very large consumer benefits made possible by contracting for enhanced QoS, but it will spare us no anticompetitive harm. For that reason, net neutrality regulation should be rejected. Assuming one could demonstrate monopoly power in the access market, a more sensible nondiscrimination rule would be to require that carriers charge different content providers the same rate for any given enhancement of QoS, not to prevent any charges for enhanced QoS whatsoever. But it is not clear that even a reasonable nondiscrimination rule is required for Internet services, given the fact that broadband service providers acting unilaterally lack the ability to foreclose content providers.

With the advent of streaming video and other bandwidth-intensive applications, the demand for bandwidth is projected to overtake the existing supply quickly. Regulators and legislators should not interfere with a broadband service provider's ability to manage this "coming exaflood" with intelligent networks. At best, the price of Internet service will skyrocket if broadband service providers can meet the coming traffic using only expanded infrastructure. At worst, the Internet experience for all users will deteriorate. Given the tremendous uncertainty over the future of the Internet and the need to encourage innovation and investment, it seems dangerous to interfere with heavy-handed regulation at this juncture. **R**

Readings

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