

## Network Neutrality and Its Potential Impact on Next Generation Networks

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The Internet has speedily evolved from a collaborative project among governments and universities to a promising commercial medium operated primarily by private ventures.<sup>1</sup> The next generation<sup>2</sup> World Wide Web will not appear as a standard, “one size fits”<sup>3</sup> all medium primarily because consumers expect more and different features and service providers need to find ways to recoup frequent network upgrades to accommodate ever increasing throughput requirements. For example, Internet Service Providers (“ISPs”) offer on line game players, Voice over the Internet Protocol (“VoIP”)<sup>4</sup> and Internet Protocol Television (“IPTV”)<sup>5</sup> with “better than best efforts”<sup>6</sup> routing of bits to promote timely delivery with higher quality of service. Similarly content providers can use caching<sup>7</sup> and premium traffic routing and management service to secure more reliable service than that available from standard “best efforts” routing.

Service diversification can result in many reasonable and lawful types of discrimination between Internet users notwithstanding a heritage in the first two generations of nondiscrimination and best efforts routing of traffic. ISPs increasingly have the ability to examine individual traffic streams<sup>8</sup> and prioritize them creating a dichotomy between plain vanilla, best efforts routing and more expensive, superior traffic management services. However the potential exists for carriers operating the major networks used to switch and route bitstreams

to exploit network management capabilities to achieve anticompetitive and consumer harming outcomes.

Advocates for the principle of network neutrality<sup>9</sup> claim the potential exists for ISPs to engineer a fragmented and “balkanized” next generation Internet through unreasonable degradation of traffic even when congestion does not exist.<sup>10</sup> The worst case scenario envisioned by network neutrality advocates sees a reduction in innovation, efficiency, consumer benefits and national productivity occasioned by a divided Internet: one medium prone to congestion and declining reliability and one offering superior performance and potential competitive advantages to users able and willing to pay, or affiliated with the ISP operating the bitstream transmission network.<sup>11</sup> Opponents of network neutrality mandates scoff at the possibility of the worst case scenario, and view government intervention as anathema.<sup>12</sup>

This chapter will examine the network neutrality debate with an eye toward assessing how the Internet will evolve as a major platform for content access and distribution. The chapter accepts as necessary and proper many types of price and quality of service discrimination, but also identifies other types of potentially hidden and harmful discrimination. The chapter concludes with an identification of best practices in “good” discrimination that should satisfy most network neutrality goals without creating disincentives that might dissuade ISPs from building the infrastructure needed distribution of high bandwidth consuming content such as full motion video.

## **I. What is Net Neutrality?**

Network neutrality advocates seek to require ISPs to maintain the Internet as a “network of networks” seamlessly interconnecting facilities without favoring any category of content provider or consumer. Network neutrality in application would require ISPs to continue routing

traffic on a best efforts basis, ostensibly to foreclose the potential for the Internet to fragment and balkanize into various types of superior access arrangements, available at a premium, and a public Internet increasingly prone to real or induced congestion. Opponents to compulsory network neutrality seek to differentiate service, in terms of quality, price and features to accommodate increasingly diverse user requirements. For example, on line game players, IPTV viewers and VoIP subscribers may need prioritization of their traffic streams <sup>13</sup> so that their bits arrive on time, even if this outcome requires the ISPs to identify and favor these traffic streams.

ISPs want the flexibility to offer different options for consumer access to the Internet and how content providers reach consumers. Consumer tiering could differentiate service in terms of bitrate speeds, amount of permissible traffic carried per month and how an ISP would handle specific types traffic, including “mission critical” content that might require special treatment, particularly when network congestion likely may occur. While consumer tiering addresses quality of service and price discrimination at the first and last kilometer, access tiering could differentiate how ISPs handle content upstream into the Internet cloud <sup>14</sup> that links content providers and end users. Network neutrality advocates have expressed concern that the potential exists for ISPs to use diversifying service requirements as cover for a deliberate strategy to favor their own content and to extort additional payments from users and content providers threatened with intentionally degraded service.

Many network neutrality advocates speak and write in apocalyptic terms about the impact of price and service discrimination and how it will eviscerate the Internet and enable carriers to delay or shut out competitors and ventures unwilling or unable to pay surcharges. The head of a consumer group claims that incumbent telephone and cable companies’ can reshape the nation’s digital destiny by branding the Internet and foreclosing much of its societal and cultural

benefits.<sup>15</sup> On the other hand, opponents of network neutrality categorically reject as commercially infeasible any instance of unreasonable discrimination or service degradation. Network neutrality opponents also note that ISPs typically qualify for a regulatory “safe harbor”<sup>16</sup> that largely insulates them from regulation, because they operate as value added, information service providers<sup>17</sup> and not telecommunications service providers.<sup>18</sup> While the latter group incur traditional common carrier, public utility responsibilities, including the duty not to discriminate, the former group enjoys quite limited government oversight in most nations. Opponents of network neutrality see no actual or potential problems resulting from ISPs having freedom to discriminate and diversify service. Without such flexibility, opponents of network neutrality express concern whether ISPs will continue to risk investing the billions of dollars needed for construction of next generation network infrastructure.<sup>19</sup>

#### **A. Wireless Network Neutrality**

The network neutrality debate has focused almost exclusively on Internet access via wireline carriers. Recently the issue of wireless Internet access has surfaced in light of the growing importance of wireless services and consumer frustration with carrier tactics that disable handset functions and block access to competing services.<sup>20</sup> While wireless handsets generally can access Internet services, most carriers attempt to favor content they provide or secure from third parties under what critics deem a “walled garden” strategy: deliberate efforts to lock consumers into accessing and paying for favored content and services.

Just about every nation in the world has established policies that mandate the right of consumers to own their own telephone and to use any device to access any carrier, service or function provided it does not cause technical harm to the telecommunications network.<sup>21</sup> Once regulators unbundled telecommunications service from devices that access network services, a

robustly competitive market evolved for both devices and services. Remarkably wireless carriers in many nations, including the United States, have managed to avoid having to comply with this open network concept. Even though consumers own their wireless handset, the carrier providing service will operate only with specific types of handsets programmed only to work with one carrier's network. Carriers justify this lock in and high fees for early termination of service, because the carriers sell wireless handsets at subsidized rates—sometimes “free”—based on a two year subscription term. Of course the value of a two year lock in period offsets the handset subsidy, particularly in light of next generation wireless networks that will offer many services in addition to voice communications. In the United States wireless carriers and their “big box” retail store partners sell more than 60% of all wireless handsets,<sup>22</sup> typically when a subscriber commences service or renews a subscription. No market for used handsets has evolved, because wireless carriers do not offer lower service rates for subscribers who do not need or want a subsidized handset.

Wireless network neutrality would require carriers to stop blocking the use of non-carrier affiliated handsets and locking handsets so that they work only on a single carrier network. More broadly wireless network neutrality would prevent wireless carriers from preventing subscribers from using their handsets to access the content, services, and software applications of ventures unaffiliated with the carrier. It also would require carriers to support an open interface so that handset manufacturers and content providers can develop equipment and services that do not have any potential for harming wireless carrier networks.

Opponents of wireless network neutrality consider the initiative unnecessary government intrusion in a robustly competitive marketplace. They claim that imposing such requirements would risk causing technical harm to wireless networks and such generate regulatory uncertainty

that the carriers might refrain from investing in next generation network enhancements.

Opponents claim that separating equipment from service constituted an appropriate remedy when a single wireline carrier dominated, but that such compulsory unbundling should not occur when consumers have a variety of carrier options.

## **II. The Provocation: Broadband Access and Upstream Carriers Have to Upgrade Their Networks Without Certain Profit**

Incumbent telephone companies own and operate many of the ISPs having the largest market share and operating several of the major long haul networks.<sup>23</sup> Internet access and data services have become increasingly significant revenue generators in light of the substantial decline in long distance voice telephony rates and lost market share for local exchange telephone service.<sup>24</sup> The availability of Voice over the Internet Protocol (“VoIP”) services offering flat-rated long distance telephone service on a monthly subscription rate, or per call rates for a few pennies a minute, show how software applications riding on top of a basic transmission link can devastate an existing business plan that anticipates ongoing, large profit margins for core services. VoIP and wireless services have adversely impacted wireline local exchange revenues as consumers migrate to a triple play<sup>25</sup> bundle of services from cable television companies offering local and long distance telephone service and Internet access coupled with their core video programming services.<sup>26</sup> To retain subscribers the incumbent telephone companies have created their own triple play bundles at prices that generate lower margins for the voice telephony portion of the package deal.

Unlike telecommunications service providers, which can meter and price all network usage, ISPs typically interconnect networks using several different cost recovery mechanisms. The concept of the Internet as a “network of networks”<sup>27</sup> builds in an expectation among carriers that they will cooperate on interconnection arrangements with an eye toward promoting seamless

connectivity between disparate networks. When carriers first established interconnection agreements they refrained from exact route mapping and traffic metering. The Transmission Control Protocol used by ISPs determines routing “on the fly” based on current conditions as opposed to fixed routing used by telephone companies.<sup>28</sup> ISPs initially refrained from metering traffic based on the initial expectation that traffic volumes were roughly equivalent and the cost of metering was not worth the bother in light of the fact that third parties, such as government agencies, subsidized operations.

Even now the largest Tier-1 ISPs agree to make their networks and global network access available on a zero cost, sender keep all “peering”<sup>29</sup> basis for other Tier-1 ISPs.<sup>30</sup> Smaller ISPs now must pay for “transiting”<sup>31</sup> access to larger ISPs’ networks and the access these ISPs have secured to other ISPs’ networks. In addition to transiting payments from smaller ISPs, Tier-1 ISPs, affiliated with incumbent telephone companies, also receive payment from end users that they serve directly, e.g., through Digital Subscriber Link<sup>32</sup> monthly subscriptions and new fiber optic residential and business Internet access services.

However, the combined revenues from these two sources have not satisfied top management officers, for two reasons. First, proliferating ICE services, such as search engines, online gaming and real time delivery of video, trigger the need for carriers to upgrade broadband services, without a commensurate ability to raise rates, despite having enhanced the value accrued from a broadband access subscription. Second, the terms and conditions for Internet traffic peering and transit make it possible for sources of content to satisfy end user demand and have content delivered downstream to the end user without having to pay intermediary ISPs that have participated in the routing and bitstream delivery of the traffic. ISP bit transport services appear to have become a commodity business with lower margins than anticipated.

The apparent inability of ISPs to raise subscription rates and to receive payment from content providers has frustrated senior managers and motivated them to utter provocative claims that heavy users of their networks, such as Google, have become free riders:

Now what they would like to do is use my pipes free, but I ain't going to let them do that because we have spent this capital and we have to have a return on it. So there's going to have to be some mechanism for these people who use these pipes to pay for the portion they're using. Why should they be allowed to use my pipes? The Internet can't be free in that sense, because we and the cable companies have made an investment and for a Google or Yahoo! or Vonage or anybody to expect to use these pipes [for] free is nuts!<sup>33</sup>

**A. Incumbents Perceive Network Neutrality as Foreclosing Pricing Realignments and Reimposing Aspects of Telecommunications Common Carrier Regulation**

Incumbent carriers and like minded opponents to network neutrality have characterized their opposition to network neutrality in terms of standing firm against government intrusion,<sup>34</sup> the imposition of a remedy in search of a problem<sup>35</sup> and the need to remedy free ridership of ISP networks.<sup>36</sup> Additionally ISPs object to network neutrality, because it would foreclose pricing and service initiatives that if successful might generate higher revenues. ISPs also oppose Network Neutrality on grounds that it would trigger government constraints similar to common carrier regulation imposed on telecommunications service providers.

**1) Network Neutrality as a Constraint on Price Discrimination**

Network neutrality, whether imposed by law or regulation, can impose some restrictions on ISP pricing flexibility. However, even with such regulation ISPs should have the opportunity to provide “consumer tiering,”<sup>37</sup> e.g., differentiating end users’ Internet access by bit speed, monthly available throughput, and the ability to handle peak demand bursts as occurs in peer-to-peer networking, video gaming, and delivery of large files and real time streaming of video programming.

Similarly the concept of network neutrality does not foreclose attempts by incumbent carriers to reshape access pricing into a conventional two-sided market<sup>38</sup> where ISPs would demand and receive payments downstream and upstream regardless whether they serve end users. Under the current pricing arrangement a two sided market already exists for ISPs that can collect an Internet access subscription from end users for DSL and cable modem access<sup>39</sup> to the Internet cloud and also charge transit fees for small ISPs seeking access to portions of the Internet cloud these small ISPs cannot reach via their own networks.

ISP managers have objected to the one sided market scenario where the carrier receives subscription payments from end users, but no additional payments from content generators who “use” the ISP’s network without making direct payments to each participating carrier. Nothing about network neutrality forecloses an ISP from erecting a service so attractive to Google and other content providers as to entice them to opt for premium carriage of their traffic in lieu of the shared routes made available through the peering and transit arrangements secured by the ISPs directly serving these heavy users. For example, Akamai and other network management firms offer clients enhanced Internet traffic routing and content delivery by offloading traffic from best efforts routing options and onto “better than best efforts” options. Traffic can reach consumers with greater likelihood of on time delivery and reliability when ISPs and other Internet companies directly manage particular traffic streams with an eye toward reducing the number of routers the traffic has to traverse, avoiding circuitous routing and inserting traffic on the most reliable and least congested networks.

## **2) Reimposition of Common Carrier Responsibilities**

Opponents of network neutrality claim that it would impose common carrier regulatory burdens on ISPs that have avoided such burdens, or have been able to secure a reclassification of

services to avoid such responsibilities. In the United States Internet access, provided via DSL,<sup>40</sup> cable television plant,<sup>41</sup> power lines<sup>42</sup> and wireless networks,<sup>43</sup> constitute information services, largely exempt from regulation. Such re-regulation would impose cost, contain ISP flexibility and run counter to deregulatory initiatives.

Network neutrality advocates claim that requirements would not prove costly, because they would prohibit discriminatory actions rather than require costly, affirmative efforts to promote fairness. Opponents to network neutrality also imply that network neutrality requirements constitute a “confiscatory” and unlawful “taking” of their property.<sup>44</sup> Having invested in next generation infrastructure at significant expense both incumbent telephone and cable television operators expect to have nearly complete freedom from telecommunications service regulation. Additionally ISPs argue that Internet access has already become a robustly competitive market that can self-regulate.

### **B. Calibrating Carrier Rights and Responsibilities**

Common carriers historically incur both responsibilities and special opportunities, e.g., rights of way access to federal, state, municipal and private property for little if any payment.<sup>45</sup> So too have the telephone and cable television companies that now complain that regulation confiscates their property. It comes across as disingenuous for both telephone and cable television companies to rationalize the right to extend legacy privileges acquired during their regulated years, to convergent ICE services, many or all of which appear to qualify for the information service safe harbor.

Currently cable television operators and telephone companies can leverage preexisting rights or way or secure new rights of way based on their former, or existing, but possibly now temporary, regulated status. There appears to be no distinction in terms of the scope of rights of

way access available to carriers operating in their legacy, regulated mode and the very same carriers providing a larger array of services, some or all of which falling outside legacy regulators' jurisdiction.<sup>46</sup> For example, cable television operators regularly install equipment, including large above ground pedestals, without any payment to the property owner, so that the operators can offer triple play services regardless of whether the land owner wants these new services and without regard to the limited scope of services the carrier first offered as the basis for securing the rights of way initially. Similarly telephone companies continue to install new or replacement lines on private property without having to pay land owners, based on preexisting rights of way granted to the companies in their capacity as telecommunications service providers.

For so long as incumbent carriers continue to exploit the privileges conferred upon them in their capacity as regulated operators, these carriers should continue to accept limited quasi-common carrier responsibilities. For example, the broadcast television channel "must carry"<sup>47</sup> obligations of cable television operators do not evaporate simply because telephone companies may offer competing video program delivery services, or that cable television operators now can use existing copper, a blend of copper and fiber optics cables, or a completely fiber optic medium to provide both cable television video programming, IPTV, telephony, Internet access and other telecommunications or information services. Likewise, the responsibilities applied to incumbent telephone companies operating the only telecommunication wire into homes did not evaporate simply because a second wire became available, or the fact that the telephone company now can use existing or new media to provide telecommunications and information services.

## **II. The Response: Established Ground Rules Plus Enforcement**

Network neutrality advocates have both well placed apprehension and a misguided sense of what ISPs owe the public and their customers. ISPs do not operate in a transparent and fully competitive marketplace in light of nondisclosure agreements that shield interconnection agreements from scrutiny and still limited broadband competition at end user premises. Absent transparency and competition, network neutrality advocates have every reason to suspect large ISPs of leveraging their Tier-1 status to favor affiliates and preferred content suppliers, to punish unaffiliated content suppliers that have rejected premium service and to block, degrade or generate artificial congestion for non-premium routing services.<sup>48</sup> Users of ISP bitstream transmission and routing services cannot readily determine whether any particular ISP has acted on its incentives to tilt the competitive playing field and to play favorites, primarily because any complete end-to-end routing involves several ISPs and delays for any particular segment may result from a number of legitimate factors.

### **A. Justified Apprehension**

Network neutrality advocates primarily have only anecdotal information of intentional efforts to delay, block and drop packets.<sup>49</sup> In the United States, the FCC has intervened in only one instance involving a telephone company's refusal to terminate VoIP traffic.<sup>50</sup> The Commission secured an agreement by Madison River Communications to resume the proper delivery of such traffic, in light of the company's status as a telecommunications service provider legally obligated to perform traditional common carrier duties. Had Madison River Communications operated as an ISP providing Internet access, the FCC might not have responded in a timely manner, if at all, based on the view that the Commission lacked jurisdiction to compel ISPs to interconnect with anyone.

ISPs' incentive and apparent desire to differentiate service, the costly and widespread opposition to network neutrality and the provocative assertions of incumbent carrier senior managers point to a keen interest in pursuing network access tiering. The often cited Madison River case may offer little evidence that Internet content and service providers regularly risk unfair price and quality of service discrimination, or worst yet absolute blockage. However it does support apprehension that an enforcement mechanism does not exist when an ISP, and not a telephone company common carrier, engages in unreasonable discrimination, or absolute blockage. The FCC could threaten an investigation with the prospect of enforcement sanction only because the offending traffic blocker had an affirmative duty to accept traffic and deliver it to the final destination.

Until such time as the first and last kilometer of broadband access becomes robustly competitive customers will have as few as one or two carriers available for broadband access to content.<sup>51</sup> Under these conditions a decision by DSL and cable modem service providers to block certain types of traffic, or to degrade the traffic of unaffiliated or non-preferred content providers would have an immediate, identifiable and adverse impact on the public interest. Under such circumstances regulatory oversight remains necessary, because the level of marketplace competition may not prevent bottleneck abuse and price squeezing behavior by ISPs.

### **B. Unjustified Apprehension**

Network neutrality advocates fear that the next generation Internet will contain so much bias and preferential treatment as to jeopardize the fundamental end-to-end connectivity that has contributed to success. This "curtains for the Internet" perspective overstates the potential harm from access tiering, by unlawful, anticompetitive practices, for several reasons. ISPs may want

to squeeze out additional revenues and may resort to heavy handed, extortionate tactics, but surely they would stop when such strategies are publicly disclosed by the news media possibly triggering closer scrutiny of such tactics by legislative, regulatory and judicial authorities. Absent collusion or consciously parallel conduct among DSL and cable modem carriers, customers could migrate to the less biased carrier. Put another way if AT&T deliberately dropped or delayed delivery of Google packets, some customers might migrate to the faster delivery options paid for by MSN or Yahoo, but other customers might abandon AT&T in light of its shoddy performance.

While it may be difficult to detect and prove the “smoking gun” of deliberate packet dropping and other anticompetitive tactics, after the fact forensic examination may provide the basis for remedies as was the case when employees of Enron, a large electric generator, created artificial congestion in the delivery grid to run up prices.<sup>52</sup> Similarly deep pocketed content providers recoiling from what they consider extortionate rate increases might pursue the option of constructing alternative broadband access options for consumers such as Google’s support for urban Wi-Fi networks<sup>53</sup> and its possibly introduction of a wireless handset.

But even if network neutrality becomes codified into law or regulation, network neutrality advocates have to accept that the next generation Internet will contain more bias, delivery options and service diversification than previously available. Advocates for network neutrality need to accept that customer and access tiering constitutes a predictable, and not always lamentable, product of a maturing marketplace.

As networks evolve and the technologies used become more diverse and mature, network operators have available the resources to recalibrate their pricing structure and to diversify services. ISPs have far greater ability to meter and examine Internet traffic. They want to exploit

technological opportunities to “sniff” traffic packets<sup>54</sup> and to prioritize them<sup>55</sup> based on payments received, but they do not want to relinquish their exemption from regulation and liability for carrying harmful content.<sup>56</sup>

In light of the marketing tactics used to entice initial subscriptions most Internet users expect access to a lot of free content, on an “all you can eat,” unmetered basis,<sup>57</sup> at a low fixed price with delivery speeds progressively increasing without a higher charge. The Internet’s value proposition has increased over the years as consumers tap into increasingly diverse sites, now offering material that requires a network capable of delivering a broadband bitstream in real time. The power users of the Internet, spammers, gamers, peer-to-peer file sharers and full motion video watchers have become quasi-free riders in light of their ability to pay the same price as lower volume users, while forcing ISPs at both the end user link and farther upstream, to upgrade their networks while maintaining the same subscription rate.

### **III. The Resolution**

Legislation could solve the network neutrality debate by providing principles for which regulatory agencies would have express legal authority to enforce. Additionally legislation could expressly authorize traffic reporting requirements on ISPs and the power of the National Regulatory Authorities (“NRAs”) to investigate and remedy instances where dropped bits did not result from actual congestion. In light of the controversy surrounding this issue, the lack of consensus and well funded policy expressions, legislatures may not remedy the problem in a timely manner.<sup>58</sup> Absent legislation the stakeholders will have to take affirmative steps on their own toward resolution.

One example of dispute resolution among stakeholders occurred when AT&T unilaterally made some network neutrality commitments, albeit to secure approval of its merger with

BellSouth.<sup>59</sup> AT&T has provided a document that, reluctantly perhaps, acknowledges that network neutrality is a concept that parties can convert into actual practices and service commitments.

The AT&T network neutrality commitments contain a time limited agreement to comply with a previous FCC statement of principles that articulate a baseline code of conduct for ISPs.

In a non-binding, non-compulsory Policy Statement the FCC articulated four “principles”:

- (1) consumers are entitled to access the lawful Internet content of their choice;
- (2) consumers are entitled to run applications and services of their choice, subject to the needs of law enforcement;
- (3) consumers are entitled to connect their choice of legal devices that do not harm the network; and
- (4) consumers are entitled to competition among network providers, application and service providers, and content providers.<sup>60</sup>

Until AT&T’s 30 month commitment to adopt the FCC’s four “Network Freedoms,” the Commission had issued a document having no enforceability.

AT&T also committed to maintain the same number and types of existing peering agreements and for two years from the closing date of the merger, or the effective date of any legislation enacted by Congress subsequent to the merger closing, “to maintain a neutral network and neutral routing in its wireline broadband Internet access service . . . from the network side of the customer premise equipment up to and including the Internet Exchange Point closest to the customer’s premise.”<sup>61</sup> AT&T expressly reserved the right to tier service upstream and exempted its enterprise managed IP services and IPTV services from any network neutrality commitment, two loopholes that will grow in significance as AT&T migrates from copper-based transitional DSL broadband service to fiber optic networks ostensibly installed primarily to provide IPTV.

Beyond AT&T's conditional, time limited and ambiguous commitment, incumbent ISPs should commit to transparency and full disclosure of network access and customer tiering activities. This means that Tier-1 ISPs, including those networks owned and operated by major incumbent telephone and cable companies, should publicly disclose their peering and transiting policies, as well as offers and acceptances of Service Level Agreements that deviate from best efforts routing. A voluntary agreement to disclose might foreclose regulatory intervention by NRAs and it would not prevent better than best efforts service arrangements. Such arrangements could include variable bandwidth and throughput services to end users, peers and transiting customers, bandwidth partitioning and service metering.

Additionally any ISP that serves both end users, whether by resale or facilities it owns and operates, should commit to a "best practices" collection of service commitments including the following:

- an affirmative obligation not to drop packets and create congestion when actual traffic conditions do not necessitate such action;

- no retaliation through targeted degradation in service quality for any network user that has refused to pay for premium services;

- no port blocking and other refusals to deliver traffic onward to another ISP or the intended recipient except when such action would violate laws or cause harm to the ISP's or other ISPs' networks;

- a commitment to make available any better than best efforts to any similarly situated customer;

- an agreement not to override firewalls, filters and other traffic management technologies or services made available to customers or installed by customers, except when such action would violate laws or cause harm to the ISP's or other ISPs' networks; and

- no intentional failures to comply with existing Service Level Agreements executed with end users, peers and transiting customers.

Lastly NRAs should impose reporting requirements on ISPs to assess the consequences of a bifurcated best efforts/better than best efforts Internet. Traffic data compiled and disclosed by ISPs can provide regulators with a better sense of how often network congestion occurs and what circumstances trigger poor service. With such empirical data, NRAs should have a better capability for determining when an ISP has artificially created congestion as a ruse for degrading service to non-premium paying content providers and retail customers. Likewise such data could corroborate an ISP's assertion that it did nothing to degrade overall service, or target specific bitstreams for inferior service.

#### **IV. Conclusion**

The network neutrality debate highlights a particularly contentious time in ICE policy making. Stakeholders appear to have little inclination to find a middle ground, and decision makers appear to have even less. Policy making has become predominated by sponsored research, politics, campaign contributions and rhetoric. In light of an apparent disinterest for the facts, it comes as no surprise that the network neutrality debate highlights opposing perceptions about the impact from changes in the next generation Internet. Regrettably no unbiased fact finding appears readily available, because the issue has triggered intense lobbying and the use of hyperbole.

Network neutrality opponents have overstated the case that competition would remedy any and all instances of illegal network bias. A fully self-regulating Internet marketplace does not exist, nor can one confidently assert that the Internet marketplace would remedy all attempts at unreasonable network bias. On the other hand the Internet has not failed to function when network operators and content providers cut exclusive and preferential deals, or when network providers offer better than best efforts routing.

For better or worst the next generation Internet will adopt many of the biased networking characteristics of current vintage cable television and third generation cellular telephony. Cable television operators enjoy substantial freedom to cut special content delivery deals, but lawful “must carry” obligations impose affirmative carriage duties, notwithstanding cable operators’ non-common carrier status. Commercial mobile radio service providers retain the common carrier, telecommunications service provider status, yet they can use new broadband carriage capabilities to deliver a biased, walled garden access to video and Internet content.

Regulators should agree to examine allegations of network bias and evaluate the complaint from a public interest template that considers whether discrimination constitutes an unfair trade practice, or a reasonable attempt at diversifying and proliferating information services.

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## END NOTES

<sup>1</sup> For background on how the Internet evolved from a government underwritten project to a privatized and commercialized medium, *see* Rob Frieden, *Revenge of the Bellheads: How the Netheads Lost Control of the Internet*, 26 TELECOM. POL’Y, No. 6, 125-144 (Sep./Oct. 2002); *see also*, *See*, Barry M. Leiner, Vinton G. Cerf, David D. Clark, Robert E. Kahn, Leonard Kleinrock, Daniel C. Lynch, Jon Postel, Larry G. Roberts and Stephen Wolff, *A Brief History of the Internet*, Internet Society; available at: <http://www.isoc.org/internet/history/brief.shtml>.

<sup>2</sup> *See, e.g.*, International Telecommunication Union, What Rules for IP-enabled NGN?, Workshop (March 23-24 2006); web site materials available at: <http://www.itu.int/osg/spu/ngn/event-march-2006.phtml>.

<sup>3</sup> “TCP/IP routes packets anonymously on a ‘first come, first served’ and ‘best efforts’ basis. Thus, it is poorly suited to applications that are less tolerant of variations in throughput rates, such as streaming media and VoIP, and is biased against network-based security features

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that protect e-commerce and ward off viruses and spam.” Christopher S. Yoo, *Beyond Network Neutrality*, 19 HARV. J.L. & TECH. 1, 8 (Fall, 2005).

<sup>4</sup> Voice over the Internet Protocol (“VoIP”) refers to the use of the Internet to carry and deliver on a real time, immediate basis packets of data that correspond to a voice conversation. VoIP services range in quality, reliability and price and can link both computers and ordinary telephone handsets. For technical background on how VoIP works see Intel, White Paper, *IP Telephony Basics*, available at: [http://www.intel.com/network/csp/resources/white\\_papers/4070web.htm](http://www.intel.com/network/csp/resources/white_papers/4070web.htm); Susan Spradley and Alan Stoddard, Tutorial on Technical Challenges Associated with the Evolution to VoIP, Power Point Presentation, available at: [http://www.fcc.gov/oet/tutorial/9-22-03\\_voip-final\\_slides\\_only.ppt](http://www.fcc.gov/oet/tutorial/9-22-03_voip-final_slides_only.ppt). See also, Jerry Ellig and Alastair Walling, *Regulatory Status of VoIP in the Post-Brand X World*, 23 SANTA CLARA COMPUTER & HIGH TECH. L.J. 89 (No. 2006); Amy L. Leisinger, *If It Looks Like a Duck: The Need for Regulatory Parity in VoIP Telephony*, 45 WASHBURN L.J. 585 (Spring, 2006); Mark C. Del Bianco, *Voices Past: The Present and Future of VoIP Regulation*, 14 COMMLCON 365 (2006); R. Alex DuFour, *Voice Over Internet Protocol: Ending Uncertainty and Promoting Innovation Through a Regulatory Framework*, 13 COMMLCON 471 (2005); Stephen E. Blythe, *The Regulation of Voice-Over-Internet-Protocol in the United States, the European Union, and the United Kingdom*, 5 J. HIGH TECH. L. 161(2005).

<sup>5</sup> “Rather than ‘broadcasting’ a constant stream of all available programs, as cable does and Verizon plans to do, IPTV stores a potentially unlimited number of programs on a central server, which users then call up on demand. SBC will not replace the copper lines that currently run into customer premises. Instead, to make sure there is sufficient bandwidth between the neighborhood node where the optical fiber terminates and the household premise, it will upgrade the DSL equipment currently at those nodes and in households with VDSL technology. At the household, the viewer will use the IP technology to send a signal to the SBC end-office to send a particular channel or video on demand selection. That signal will be sent over the same bandwidth used for data and VoIP service. In SBC's system, a single customer line will have enough bandwidth to support up to four active television sets per household at a time, or up to two HDTV channels at a time.” Charles B. Goldfarb, *Telecommunications Act: Competition, Innovation, and Reform*, Congressional Research Service 37 (Jan. 13, 2006); available at: <http://www.educause.edu/ir/library/pdf/EPO0635.pdf>; See also Micah Schwalb, *IPTV: Public Interest Pitfalls*, 5 J. TELECOMM. & HIGH TECH. L. 305 (Fall, 2006).

<sup>6</sup> “The Internet is a vast network of individual computers and computer networks that communicate with each other using the same communications language, Transmission Control Protocol/Internet Protocol (TCP/IP). The Internet consists of approximately more than 100 million computers around the world using TCP/IP protocols. Along with the development of TCP/IP, the open network architecture of the Internet has the following characteristics or parameters: 1. Each distinct network stands on its own with its own specific environment and user requirements, notwithstanding the use of TCP/IP to connect to other parts of the Internet. Communications are not directed in a unilateral fashion. Rather, communications are routed

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throughout the Internet on a best efforts basis in which some packets of information may go through one series of computer networks and other packets of information go through a different permutation or combination of computer networks, with all of these information packets eventually arriving at their intended destination. 2. Black boxes, for lack of a better term, connect the various networks; these boxes are called ‘gateways’ and ‘routers.’ The gateways and routers do not retain information but merely provide access and flow for the packets being transmitted. 3. There is no global control of the Internet.” Konrad L. Trope, *Voice Over Internet Protocol: The Revolution in America’s Telecommunications Infrastructure*, 22 COMP. & INTERNET L. 1. No. 12, 1,4 (Dec. 2005).

<sup>7</sup> Caching refers to intermediate and temporary storage of data. “Google makes and analyzes a copy of each Web page that it finds, and stores the HTML code from those pages in a temporary repository called a cache.” *Field v. Google, Inc.*, 412 F.Supp.2d 1106 (D. Nev. 2006) (holding that the Digital Millennium Copyright Act (DMCA) provides a “safe harbor” exemption from liability for making cached copies of copyrighted works).

<sup>8</sup> “A packet sniffer (also known as a network analyzer or protocol analyzer or, for particular types of networks, an Ethernet sniffer or wireless sniffer) is computer software or computer hardware that can intercept and log traffic passing over a digital network or part of a network. As data streams travel back and forth over the network, the sniffer captures each packet and eventually decodes and analyzes its content according to the appropriate RFC or other specifications.” Wikipedia, Packet sniffer; available at: [http://en.wikipedia.org/wiki/Packet\\_sniffer](http://en.wikipedia.org/wiki/Packet_sniffer).

<sup>9</sup> See, e.g., Brett M. Frischmann and Barbara van Schewick, *Network Neutrality and the Economics of an Information Superhighway: A Reply to Professor Yoo*, 47 JURIMETRICS (Summer, 2007)(publication forthcoming); Rob Frieden, *Internet 3.0: Identifying Problems and Solutions to the Network Neutrality Debate*, 1 INTERNATIONAL JOURNAL OF COMMUNICATIONS, 461-492 (2007); available at: <http://ijoc.org/ojs/index.php/ijoc/article/view/160/86>; *Network Neutrality or Bias?-- Handicapping the Odds for a Tiered and Branded Internet*, 29 HASTINGS COMMUNICATIONS AND ENTERTAINMENT LAW JOURNAL, No. 2, 171-216 (2007); Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, 95 GEO. L.J. 1947 (2006); *Beyond Network Neutrality*, 19 HARV. J.L.& TECH. 1 (2005); Bill D. Herman, *Opening Bottlenecks: On Behalf Of Mandated Network Neutrality*, 59 FED. COMM. L.J. 103, 109-110 (Dec., 2006); Tim Wu, *Network Neutrality, Broadband Discrimination*, 2 Journal of Telecommunications and High Technology Law, 141 (2005); available at: <http://ssrn.com/abstract=388863>; Barbara van Schewick, *Towards and Economic Framework for Economic Neutrality*, paper presented at the 33d annual Telecommunications Policy Research Conference, Arlington, Va. (2005); available at: <http://web.si.umich.edu/tprc/papers/2005/483/van%20Schewick%20Network%20Neutrality%20TPRC%202005.pdf>; Mark A. Lemley and Lawrence Lessig, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era*, 48 UCLA L. Rev. 925 (2001).

For links to a representative sample of advocacy papers and analyses of network neutrality see National Regulatory Research Institute, *Diverse papers on net neutrality*; available at: <http://www.nrri.ohio-state.edu/Telecom/hot-topics-links/net-neutrality/papers/>.

<sup>10</sup> See, e.g., Brett Frischmann & Barbara van Schewick, *Yoo's Frame and What It Ignores: Network Neutrality and the Economics of an Information Superhighway*, 47 JURIMETRICS J. (forthcoming 2007); Barbara van Schewick, *Towards an Economic Framework for Network Neutrality Regulation*, 5 J. ON TELECOMM. & HIGH TECH. L. (forthcoming 2007); Barbara A. Cherry, *Misusing Network Neutrality to Eliminate Common Carriage Threatens Free Speech and the Postal System*, 33 N. KY. L. REV. 483 (2006); Tim Wu, *Network Neutrality, Broadband Discrimination*, 2 J. TELECOM & HIGH TECH L. 141 (2005); available at: <http://ssrn.com/abstract=388863>; Mark A. Lemley and Lawrence Lessig, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era*, 48 UCLA L. Rev. 925 (2001).

<sup>11</sup> See Jeff Chester, *The End of the Internet?*, THE NATION (posted Feb. 1, 2006); available at: [www.thenation.com/doc/20060213/chester](http://www.thenation.com/doc/20060213/chester); Tim Wu, *Why You Should Care About Network Neutrality, The Future of the Internet Depends on it!*, Slate (May 1, 2006); available at: <http://www.slate.com/id/2140850/>; Trevor R. Roycroft, *Economic Analysis and Network Neutrality: Separating Empirical Facts From Theoretical Fiction* (June 2006); available at: [http://www.freepress.net/docs/roycroft\\_study.pdf](http://www.freepress.net/docs/roycroft_study.pdf); Save the Internet; available at: <http://www.savetheinternet.com/>; freepress, *Net Freedom Now!*; available at: <http://www.freepress.net/deadend/=neutrality>; Common Cause, *Net Neutrality*; available at: <http://www.commoncause.org/site/pp.asp?c=dkLNK1MQIwG&b=1421497>; Andrew Raff, *Net Neutrality Reading List*, at IPTA Blog (Feb. 28, 2006); available at: [http://www.iptablog.org/2006/02/28/net\\_neutrality\\_reading\\_list.html](http://www.iptablog.org/2006/02/28/net_neutrality_reading_list.html).

<sup>12</sup> See J. Gregory Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet*, 2 J. COMP. L. & ECON. No. 3, 349 (2006); Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, 94 GEO. L.J. 1847 (June, 2006); Thomas W. Hazlett, *Neutering the net*, FINANCIAL TIMES, FT.com Online, posted March 20, 2006; available at: <http://news.ft.com/cms/s/392ad708-b837-11da-bfc5-0000779e2340.html>; Testimony of J. Gregory Sidak, United States Senate, Committee on Commerce, Science and Transportation (Feb. 7, 2006); available at <http://commerce.senate.gov/pdf/sidak-020706.pdf>; U.S. Internet Industry Assn. *Network Neutrality: Phantom Problem, Unintended Consequences* (March 14, 2006); available at: <http://www.usiia.org/pubs/NNPrimer.doc>; Thomas M. Lenard and, Randolph J. May (Eds.), *Net Neutrality or Net Neutering: Should Broadband Internet Services Be Regulated* (2006); <http://www.springer.com/west/home/economics/r+&+d?SGWID=4-40548-22-166923618-0>; Raymond L. Gifford, *The Internet Left Gets a Case of the Vapors*, The Progress & Freedom Foundation, Progress Snapshot, Rel. 2.15 (June 2006); available at: [http://www.pff.org/issues-pubs/ps/2006/ps\\_2.15\\_intenet\\_left.pdf](http://www.pff.org/issues-pubs/ps/2006/ps_2.15_intenet_left.pdf); Adam Thierer, *Are 'Dumb Pipe' Mandates Smart Public Policy? Vertical Integration, Net Neutrality, and the Network Layers Model*, 3 J. Telecomm. & High Tech. L. 275 (2005); Christopher S. Yoo, *Beyond Network Neutrality*, 19 HARVARD J. L.

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& TECH. (Fall 2005); Christopher S. Yoo, *Would Mandating Broadband Network Neutrality Help or Hurt Competition? A Comment on the End-to-End Debate*, 3 J. ON TELECOMM. & HIGH TECH. L. 23 (2004).

<sup>13</sup> “The Internet is a vast network of individual computers and computer networks that communicate with each other using the same communications language, Transmission Control Protocol/Internet Protocol (TCP/IP). The Internet consists of approximately more than 100 million computers around the world using TCP/IP protocols. Along with the development of TCP/IP, the open network architecture of the Internet has the following characteristics or parameters: 1. Each distinct network stands on its own with its own specific environment and user requirements, notwithstanding the use of TCP/IP to connect to other parts of the Internet. Communications are not directed in a unilateral fashion. Rather, communications are routed throughout the Internet on a best efforts basis in which some packets of information may go through one series of computer networks and other packets of information go through a different permutation or combination of computer networks, with all of these information packets eventually arriving at their intended destination. 2. Black boxes, for lack of a better term, connect the various networks; these boxes are called ‘gateways’ and ‘routers.’ The gateways and routers do not retain information but merely provide access and flow for the packets being transmitted. 3. There is no global control of the Internet.” Konrad L. Trope, *Voice Over Internet Protocol: The Revolution in America’s Telecommunications Infrastructure*, 22 COMP. & INTERNET L. 1. No. 12, 1,4 (Dec. 2005).

<sup>14</sup> The Internet cloud refers to the vast array of interconnected networks that make up the Internet and provider users with seamless connectivity to these networks and the content available via these networks.

<sup>15</sup> See Jeff Chester, *The End of the Internet?*, THE NATION (posted Feb. 1, 2006); available at: [www.thenation.com/doc/20060213/chester](http://www.thenation.com/doc/20060213/chester).

<sup>16</sup> A safe harbor constitutes “[a]n area or means of protection [or a] provision (as in a statute or regulation) that affords protection from liability or penalty.” BLACK’S LAW DICTIONARY (8th ed. 2004).

<sup>17</sup> In the United States, information service providers generate “the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications, and includes electronic publishing, but does not include any use of any such capability for the management, control, or operation of a telecommunications system or the management of a telecommunications service.” 47 U.S.C. § 153(20). ISPs fit within the information service provider classification thereby exempting them from telecommunications service provider regulation. The FCC considers the two classifications mutually exclusive. “[T]he language and legislative history of [the Communications Act of 1996] indicate that the drafters . . . regarded telecommunications services and information services as mutually exclusive categories.” Federal-State Joint Board on Universal Service,

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Report to Congress, 13 FCC Rcd. 11501, 11522 (1998); *see also* Vonage Holdings Corp., 290 F. Supp.2d at 994, 1000 (applying the FCC's dichotomy).

<sup>18</sup> In the United States common carriers, including providers of basic telecommunications services, must offer service on a nondiscriminatory basis, subject to numerous entry regulations, tariffing, and operating requirements.

<sup>19</sup> See, e.g., J. Gregory Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet*, 2 J. COMPETITION L. & ECON. 349, 460 (Sep. 2006); Thomas W. Hazlett, *Neutering the net*, FINANCIAL TIMES, FT.com Online, posted March 20, 2006; available at: <http://news.ft.com/cms/s/392ad708-b837-11da-bfc5-0000779e2340.html>; Testimony of J. Gregory Sidak, United States Senate, Committee on Commerce, Science and Transportation (Feb. 7, 2006); available at <http://commerce.senate.gov/pdf/sidak-020706.pdf>.

<sup>20</sup> See Tim Wu, *Wireless Net Neutrality: Cellular Carterfone and Consumer Choice in Mobile Broadband*, New America Foundation, Wireless Future Program, Working Paper No. 17 (Feb. 2007); available at: [http://www.newamerica.net/publications/policy/wireless\\_net\\_neutrality](http://www.newamerica.net/publications/policy/wireless_net_neutrality); Robert W. Hahn, Robert E. Litan and Hal J. Singer, *The Economics of "Wireless Net Neutrality"*, AEI-Brookings Joint Center for Regulatory Studies, Related Publication 07-10 (April, 2007); available at: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=983111](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=983111); and <http://jcle.oxfordjournals.org/cgi/reprint/nhm015v1.pdf>. See also, Rob Frieden, *The Costs and Benefits of Separating Wireless Telephone Service From Handset Sales and Imposing Network Neutrality Obligations* (Oct., 2007); available at: [http://papers.ssrn.com/sol3/cf\\_dev/AbsByAuth.cfm?per\\_id=102928](http://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=102928).

<sup>21</sup> See, e.g., *Use of the Carterfone Device in Message Toll Telephone Service*; *Thomas F. Carter and Carter Electronics Corp., Dallas, Tex. (Complainants), v. American Telephone And Telegraph Co., Associated Bell System Companies, Southwestern Bell Telephone Co., And General Telephone Co. Of The Southwest (Defendants)*, Decision, 13 F.C.C.2d 420 (1968), *recon. denied*, 14 FCC 2d 571 (1968); *Telerent Leasing Corp. et al.*, 45 FCC 2d 204 (1974), *aff'd sub nom.* *North Carolina Utilities Commission v. FCC*, 537 F.2d 787 (4th Cir. 1976), *cert. denied*, 429 U.S. 1027 (1976); *Mebane Home Telephone Co.*, 53 FCC 2d 473 (1975), *aff'd sub nom.* *Mebane Home Telephone Co. v. FCC*, 535 F.2d 1324 (D.C. Cir. 1976). See also, *Public Utility Comm'n of Texas v. FCC*, 886 F. 2d 1325 (D.C. Cir. 1989) (noting long established FCC policy that carriers and non-carriers alike have a federal right to interconnect to the public telephone network in ways that are privately beneficial if they are not publicly detrimental).

Previous FCC opposition to this principle failed to pass muster with a reviewing court that interpreted the Communications Act as mandating the right of consumers to attach equipment to the network in ways that were privately beneficial but not publicly harmful. *Hush-A-Phone Corp. v. U.S.*, 238 F. 2d 266 (D.C. Cir. 1956).

<sup>22</sup> "The carrier retail channel still accounts for the large majority of wireless sales;

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however, the distribution support provided by indirect channel partners keeps getting stronger . . . Verizon Wireless has been shifting focus to its own retail outlets that account for 65% of new sales.” A. Greengart and B. Akyuz, Current Analysis, Consumer Handsets, Mobile Devices-U.S., 2-3 (2006); available at: <http://www.currentanalysis.com/k/files/CurrentAnalysis-MA569.pdf>.

<sup>23</sup> Mark Winther, *Tier-1 ISPs: What They Are and Why They Are Important*, IDC White Paper (May, 2006); available at: <http://www.ntt.net/english/library/pdf/IDCTier1-Whitepaper.pdf>.

<sup>24</sup> See International Telecommunication Union, *The Future of Voice: Consumer Issues*, Briefing Paper (Jan. 2007); available at: <http://www.itu.int/osg/spu/ni/voice/papers/FoV-Ewan-Sutherland-Final.pdf>; see also, International Telecommunication Union, The Future of Voice Workshop web site; available at: <http://www.itu.int/osg/spu/ni/voice/meeting.phtml>.

<sup>25</sup> [‘T]riple play’ [refers to a combination] of voice, high-speed Internet access, and video services over their respective networks.” Exclusive Service Contracts for Provision of Video Services in Multiple Dwelling Units and Other Real Estate Developments, Notice of Proposed Rule Making, 22 FCC Rcd. 5935, 5938 (2007). The quadruple play refers to the combination of “video, broadband Internet access, VoIP and wireless service . . .” AT&T Inc. and Bellsouth Corporation, Application for Transfer of Control, Memorandum Opinion and Order, 22 FCC Rcd. 5662, 5735 (2007).

<sup>26</sup> “Few doubt that the future of telecommunications will rely mostly on broadband and wireless technologies. Wireless and broadband technologies are transforming the telecommunications market, offering users ubiquitous access to voice, data, and internet services. The number of mobile subscribers has already surpassed that of end-user switched access lines served by local exchange carriers.” National Regulatory Research Institute, *Methods for Analyzing the Effects of Broadband and Wireless Services on Competition in Local Telephony*, Project Announcement; available at: <http://www.nrri.ohio-state.edu/current-projects/telecommunications/methods-for-analyzing-the-impact-of-broadband-and-wireless-services-on/>.

<sup>27</sup> “The idea of a computer network intended to allow general communication between users of various computers has developed through a large number of stages. The melting pot of developments brought together the network of networks that we know as the Internet.” Wikipedia, *History of the Internet*; available at: [http://en.wikipedia.org/wiki/History\\_of\\_the\\_Internet](http://en.wikipedia.org/wiki/History_of_the_Internet).

<sup>28</sup> “TCP/IP routes packets anonymously on a ‘first come, first served’ and ‘best efforts’ basis. Thus, it is poorly suited to applications that are less tolerant of variations in throughput rates, such as streaming media and VoIP, and is biased against network-based security features that protect e-commerce and ward off viruses and spam.” Christopher S. Yoo, *Beyond Network Neutrality*, 19 HARV. J.L. & TECH. 1, 8 (Fall, 2005).

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<sup>29</sup> Internet peering refers to a reciprocal traffic routing arrangement whereby one ISP agrees to accept traffic for onward routing in exchange for a similar routing commitment by another ISP. Peering typically involves no settlement or payment of funds as ISPs agree to peer only if they generate and receive roughly the same volume of traffic. See also, Wikipedia, <http://en.wikipedia.org/wiki/Peering>. For helpful background on how peering developed see Scott Marcus, Global Traffic Exchange among Internet Service Providers, OECD Briefing (2001); available at: <http://www.oecd.org/dataoecd/45/9/1894955.pdf>; Geoff Huston, *Interconnection Peering and Settlements*, INET'99 presentation; available at: [http://www.isoc.org/inet99/proceedings/1e/1e\\_1.htm](http://www.isoc.org/inet99/proceedings/1e/1e_1.htm); William B. Norton, *Interconnection Strategies for ISPs*, Document v.2.0; available at: <http://pharos.equinix.com/pdf/whitepapers/ISPInterconnectionStrategies2.pdf>; *The Evolution of the U.S. Internet Peering Ecosystem*, Draft 1.1; available at: <http://pharos.equinix.com/pdf/whitepapers/PeeringEcosystem.pdf>; *A Business Case for ISP Peering*, Draft 1.3; available at: [http://pharos.equinix.com/pdf/whitepapers/Business\\_case.pdf](http://pharos.equinix.com/pdf/whitepapers/Business_case.pdf); Bill Woodcock, *White Paper on Transactions and Valuation Associated with Inter-Carrier Routing of Internet Protocol Traffic or BGP for Bankers*, Version 0.2; available at: <http://www.pch.net/resources/papers/bgp-for-bankers/BGP-for-Bankers-v02.doc>; Daniel C.H. Mah, *Explaining Internet Connectivity: Voluntary Interconnection Among Commercial Internet Service Providers* (March 26, 2003); available at: [http://tprc.org/papers/2003/181/Explaining\\_Internet\\_Connectivity\\_Mar26-03.DOC.pdf](http://tprc.org/papers/2003/181/Explaining_Internet_Connectivity_Mar26-03.DOC.pdf); Steve Gibbard, *Economics of Peering* (Oct. 2004); available at: <http://www.pch.net/resources/papers/Gibbard-peering-economics.pdf>; see also, Network Startup Resource Network, Routing, BGP and IXP Resources; available at: <http://www.nsrc.org/route-bgp-ixp.html>; The North American Network Operators' Group, Peering Links; available at: <http://www.nanog.org/subjects.html#P>.

<sup>30</sup> “Tier 1 networks typically seek to protect their relatively rare status by preventing new networks from becoming Tier 1's and thus potentially competing. The networks often accomplish this by setting "peering requirements" which are intended to be too high for new networks to meet. Some experts in the field of Internet interconnections have compared the collective behaviors and motivations of Tier 1 networks to those of a cartel, in that they attempt to reduce competition in Internet bandwidth pricing through tacit collusion, and attempt to restrict the admission of new members. When one Tier 1 is perceived to be "cheating" the cartel by selling transit for too low a price, or by "dumping" too much outbound heavy bandwidth (which is significantly easier to deliver for the sending network than the receiving network), other members may move to de-peer that network.” Wikipedia, Tier1 network, Politics; available at: [http://en.wikipedia.org/wiki/Tier\\_1\\_carrier](http://en.wikipedia.org/wiki/Tier_1_carrier).

<sup>31</sup> Internet transiting refers to a traffic routing arrangement whereby one ISP agrees to accept traffic for onward routing for compensation. Transiting involves a settlement and payment of funds because one ISP requires access to the links, subscribers and content available via another ISP's network and its peering arrangements. “Transit is the business relationship whereby one ISP provides (usually sells) access to all destinations in its routing table.” William

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B. Norton, *Internet Service Providers and Peering*, Draft 2.5 (undated) available at: <http://www.equinix.com/pdf/whitepapers/PeeringWP.2.pdf>.

<sup>32</sup> Digital Subscriber Links provide Internet access via the copper wires initially used solely to provide narrowband telephone service. Telephone companies retrofit the wires to provide medium speed broadband services by expanding the available bandwidth by about 1500 kiloHertz. The FCC provides the following definition: “Digital Subscriber Line is a technology for bringing high-speed and high-bandwidth, which is directly proportional to the amount of data transmitted or received per unit time, information to homes and small businesses over ordinary copper telephone lines already installed in hundreds of millions of homes and businesses worldwide. With DSL, consumers and businesses take advantage of having a dedicated, always-on connection to the Internet.” Federal Communications Commission, FCC Consumer Facts, Broadband Access for Consumers, available at: <http://www.fcc.gov/cgb/consumerfacts/dsl2.html>.

<sup>33</sup> At SBC, It’s All About “Scale and Scope,” BUSINESSWEEK, ONLINE EXTRA (November 7, 2005); available at: [http://www.businessweek.com/@@n34h\\*IUQu7KtOwgA/magazine/content/05\\_45/b3958092.htm](http://www.businessweek.com/@@n34h*IUQu7KtOwgA/magazine/content/05_45/b3958092.htm).

<sup>34</sup> See, e.g., Hands Off the Internet, World Wide Web Site; available at: <http://handsoff.org/blog/>. “Hands Off The Internet is a nationwide coalition of Internet users united together in the belief that the Net’s phenomenal growth over the past decade stems from the ability of entrepreneurs to expand consumer choices and opportunities without worrying about government regulation.” [http://handsoff.org/hoti\\_docs/aboutus/](http://handsoff.org/hoti_docs/aboutus/).

<sup>35</sup> “Currently there are no principles of network neutrality encoded into law. So ISPs are already free to block or favor content as they please. It’s telling that none of them has. In fact, no proponent of network neutrality can cite an existing problem to which network neutrality is a solution.” Arpan Sura, *The Problem With Network Neutrality*, FreedomWorks World Wide Web Site, (May 2, 2006); available at: [http://www.freedomworks.org/informed/issues\\_template.php?issue\\_id=2571](http://www.freedomworks.org/informed/issues_template.php?issue_id=2571); Other web-based organizations hotly dispute this view: “The constant refrain of the Astroturf groups like McCurry’s ‘Hands Off the Internet’ is that Network Neutrality is a solution in search of a problem. They cite the absence of numerous examples of blocking or degradation to back this argument. This is a red herring. There are multiple real-world instances of blocking and impairment.” Save the Internet.com, Big Lie of the Week: No. 3, undated; available at: <http://www.savetheinternet.com/=lie3>.

<sup>36</sup> “The network builders are spending a fortune constructing and maintaining the networks that Google intends to ride on with nothing but cheap servers,” Arshad Mohammed, Verizon Executive Calls for End to Google’s ‘Free Lunch,’ Washington Post, D1 (February 7, 2006); available at: <http://www.washingtonpost.com/wp-dyn/content/article/2006/02/06/AR2006020601624.html>.

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<sup>37</sup> Net Neutrality: Hearing Before the S. Comm. on Commerce, Science & Transportation, 109th Cong. 5 (2006) (statement of Prof. Lawrence Lessig) [hereinafter Lessig Testimony], available at <http://commerce.senate.gov/pdf/lessig-020706.pdf>.

<sup>38</sup> “Two-sided (or more generally multi-sided<sup>1</sup>) markets are roughly defined as markets in which one or several platforms enable interactions between end-users, and try to get the two (or multiple) sides “on board” by appropriately charging each side. That is, platforms court each side while attempting to make, or at least not lose, money overall.” Jean-Charles Rochet and Jean Tirole, *Two-Sided Markets: An Overview* (March 12, 2004); available at: [http://faculty.haas.berkeley.edu/hermalin/rochet\\_tirole.pdf](http://faculty.haas.berkeley.edu/hermalin/rochet_tirole.pdf).

<sup>39</sup> Cable modems provide Internet access using a small portion of the bandwidth available from cable television networks. “Cable operators have invested in major improvements or system upgrades to provide cable modem service. The typical upgrade employs a hybrid fiber-coaxial (HFC) architecture. Most HFC systems utilize fiber between the cable operators’ offices (the headend) and the neighborhood “nodes.” Between the nodes and the individual end-user homes, signals travel over traditional coaxial cable infrastructure. Part of the cable system, typically a 6 MHz channel, is dedicated to cable modem service. At each subscriber's home or office, a splitter and a high-speed cable modem are installed. The splitter separates signals and sends them to different cables going to the subscriber's television and computer. The cable that goes to the computer connects with a high-speed cable modem and an Ethernet card that are attached to the computer. This modem and card enable the cable system to communicate with the subscriber's computer, and vice versa.” Inquiry Concerning The Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, 17 FCC Rcd. 2844, 2915 (2002).

<sup>40</sup> Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, 20 FCC Rcd. 14853 (2005)(reclassifying DSL from a telecommunications service to an information service), *affirmed sub nom.*, Time Warner Telecom, Inc. V. Federal Communications Commisison, \_\_\_ F.3d. \_\_\_, Nos. 05-4769, 05-5153, 06-1466, 06-1467 (3<sup>rd</sup> Cir. Oct. 16, 2007); available at: <http://www.ca3.uscourts.gov/opinarch/054769p.pdf>.

<sup>41</sup> Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities, Internet Over Cable Declaratory Ruling, Appropriate Regulatory Treatment for Broadband Access to the Internet Over Cable Facilities, GN Docket No. 00-185 & CS Docket No. 02-52, Declaratory Ruling and Notice of Proposed Rulemaking, 17 FCC Rcd 4798 (2002), *affirmed sub nom.* National Cable & Telecommunications Association v. Brand X Internet Services, 125 S. Ct. 2688 (2005).

<sup>42</sup> United Power Line Council’s Petition for Declaratory Ruling Regarding the Classification of Broadband over Power Line Internet Access Service as an Information Service, WC Docket No. 06-10, Memorandum Opinion and Order, WC Docket No. 06-10, 21 FCC Rcd

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13281 (2006) (2006); available at: [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-06-165A1.doc](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-165A1.doc).

<sup>43</sup> Appropriate Regulatory Treatment for Broadband Access to the Internet Over Wireless Networks, Declaratory Ruling, WT 07-53, 22 FCC Rcd. 5901 (2007); available at: [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-07-30A1.doc](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-30A1.doc).

<sup>44</sup> While reviewing courts have questioned the nature, type and rates of the FCC mandated common carrier interconnection and facilities-leasing requirements, the judiciary has not deemed the requirements confiscatory: “There is no evidence that the decision to adopt TELRIC [i.e., compulsory pricing of local exchange service elements on the basis of quite low Total Element Long Run Incremental Cost] was arbitrary, opportunistic, or undertaken with a confiscatory purpose. Indeed, the indications in the record are very much to the contrary.” Verizon Communications, Inc. v. F.C.C., 535 U.S. 467, 472, 122 S.Ct. 1646, 1652 (2002). F.C.C. v. Florida Power Corp., 480 U.S. 245, 107 S.Ct. 1107 (1987) (rate set by the FCC was not confiscatory and thus did not amount to an unconstitutional taking).

<sup>45</sup> For example, the Telecommunications Act of 1996, as amended, specified the right of wireless telecommunications service providers to secure rights of way and tower siting access to federally owned property. Telecommunications Act of 1996, P.L. 104-104, 110 Stat. 56 (1996), Sec. 734(c) (2006), *codified at* 47 U.S.C. §332(c)(7). Generally a telecommunications service provider can secure nondiscriminatory access to the poles, ducts, conduits, and rights-of-way owned or controlled by another telecommunications service provider. 47 U.S.C. §224.

<sup>46</sup> The Supreme Court has endorsed this leveraging of access rights. In *National Cable & Telecommunications Association, Inc., v. Gulf Power Co.*, 534 U.S. 327, 122 S.Ct. 782 (2002) the Supreme ruled that cable television companies have the same legal right to access and attach wires to poles owned and operated by other utilities regardless of which such pole attachments are used to provide regulated video or unregulated broadband services.

<sup>47</sup> See Rob Frieden, *Analog and Digital Must-Carry Obligations of Cable and Satellite Television Operators in the United States*, in European Audiovisual Observatory, IRIS SPECIAL, TO HAVE OR NOT TO HAVE—MUST CARRY RULES, 21-28 (2005); 15 MEDIA LAW & POLICY, No. 2, 230-246 (2005-06).

<sup>48</sup> See, e.g., Associated Press, Comcast Admits Delaying Some Traffic (Oct. 23, 2007), available at: [http://www.nytimes.com/aponline/technology/AP-Comcast-Data-Discrimination.html?\\_r=1&oref=slogin](http://www.nytimes.com/aponline/technology/AP-Comcast-Data-Discrimination.html?_r=1&oref=slogin) (a major cable television and Internet access provider admitted to degrading peer-to-peer network traffic ostensibly to better “shape” and manage traffic).

<sup>49</sup> See, e.g., SavetheInternet.com, How does this threat to Internet freedom affect you? available at: <http://www.savetheinternet.com/=threat> (claiming blocked access by Canadian incumbent telephone company to a Web site sympathetic to the Telecommunications Workers Union during a contentious labor dispute; intentional degradation of competing VoIP service

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by Shaw, a major Canadian cable, internet, and telephone service company and blocked emails that mentioned [www.dearaol.com](http://www.dearaol.com) -- an advocacy campaign opposing an attempt by AOL-Time Warner's to secure payment from e-mail senders).

<sup>50</sup> Madison River Communications, LLC, Order, DA 05-543, 20 FCC Rcd 4295 (2005), available at: [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DA-05-543A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-543A1.pdf).

<sup>51</sup> In the United States incumbent telephone and cable television companies provide over 96 percent of all broadband Internet access connections. "Of the 64.6 million total high-speed lines, 44.1% were cable modem, 34.9% were ADSL, 1.5% were symmetric DSL (SDSL) or traditional wireline, 1.1% were fiber to the end user premises, and 18.4% used other technologies." Federal Communications Commission, *High-Speed Services for Internet Access: Status as of June 30, 2006*, 2 (2006); available at: [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-270128A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-270128A1.pdf).

"Of the 50.4 million lines which were faster than 200 kbps in *both* directions, 55.9% were cable modem, 36.3% were ADSL, 1.9% were SDSL or traditional wireline, 1.4% were fiber to the end user premises, and 4.5% used other technologies." *Id.* at 3. Of the 45.9 million lines serving residential subscribers, "cable modem represented 59.9% while 35.8% were ADSL, 0.2% were SDSL or traditional wireline, 1.0% were fiber to the end user premises, and 3.2% used other technologies." *Id.* at 3.

The FCC's most recent compilation shows significant market penetration by satellite delivered options, although the Commission makes no distinction between the slow speed available via satellite and the comparatively high cost. *See* Federal Communications Commission, *High-Speed Services for Internet Access: Status as of December 31, 2006*, 2 (2007); available at: [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-277784A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-277784A1.pdf). (calculating the market share of telephone and cable companies to have declined to 72.2%).

<sup>52</sup> "[I]n Load Shift, Enron traders submitted false energy schedules and bids to the California market to create the appearance of congestion on a transmission line. This would trigger payments attached to easing congestion and let Enron profit from its own lies when it used its transmission rights to ease the sham congestion." Mary Flood and Tom Fowler, *The Fall of Enron: Ex-Trader Pleads Guilty To Schemes; Prison, Fines Likely In California Deals*, *The Houston Chronicle, Business*, p.1 (Feb. 5, 2003).

<sup>53</sup> Laurie J. Flynn, *Some Worries as San Francisco Goes Wireless*, *New York Times, Technology* (April 10, 2006); available at: <http://www.nytimes.com/2006/04/10/technology/10wifi.html?ex=1302321600&en=93da4b89b4623e07&ei=5088&partner=rssnyt&emc=rss>.

<sup>54</sup> "A packet sniffer (also known as a network analyzer or protocol analyzer or, for particular types of networks, an Ethernet sniffer or wireless sniffer) is computer software or computer hardware that can intercept and log traffic passing over a digital network or part of a network. As data streams travel back and forth over the network, the sniffer captures each packet and eventually decodes and analyzes its content according to the appropriate RFC or other

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specifications.” Wikipedia, Packet sniffer; available at: [http://en.wikipedia.org/wiki/Packet\\_sniffer](http://en.wikipedia.org/wiki/Packet_sniffer).

55

“Cisco® Service Control technology offers service providers the ability to classify application traffic and identify subscribers while prioritizing and optimizing network resources. Using stateful deep packet inspection, operators can optimize traffic on their networks, thereby increasing efficient use of network resources, reducing costs, and maximizing capital investment. State-of-the-art bandwidth management can be applied to network traffic on a global, subscriber, or individual flow-level hierarchy, helping ensure that operators can better manage network resource distribution.” Cisco, Optimizing Application Traffic With Cisco Service Control Technology, Solution Overview; available at: [http://www.cisco.com/en/US/products/ps6150/prod\\_brochure0900aecd80241955.html](http://www.cisco.com/en/US/products/ps6150/prod_brochure0900aecd80241955.html).

56

In the United States Section 509(c)(1) of the Communications Decency Act, *codified at*, 47 U.S.C. § 230(c)(1), states that “No provider or user of an interactive computer service shall be treated as the publisher or speaker of any information provided by another information content provider.” *See* Rob Frieden, Internet Packet Sniffing and Its Impact on the Network Neutrality Debate and the Balance of Power Between Intellectual Property Creators and Consumers, FORDHAM INTELLECTUAL PROPERTY, MEDIA & ENTERTAINMENT LAW JOURNAL (publication pending).

57

“What the ISPs don't tell the public is that there are no free-riders among the content companies. They pay handsomely for their bandwidth. In fact, they are the true bread and butter for the major telecoms and ISPs. The reason that this "Network Neutrality" controversy exists today is that ISPs don't want to admit that their whole business model is flawed. They don't want to admit to their home customers that they need to pay for metered bandwidth just like they pay for metered water and electricity.” Code Monkey Ramblings Blog, Network Neutrality, posted May 20, 2006; available at: [http://www.codemonkeyramblings.com/2006/05/network\\_neutrality.php](http://www.codemonkeyramblings.com/2006/05/network_neutrality.php).

58

Both the United States Senate and House of Representatives have considered network neutrality bills without enacting any into law. Wallace Koehler, Network Neutrality Under Challenge (May 1, 2006); available at: <http://www.infotoday.com/newsbreaks/nb060501-1.shtml>; Anne Broache, Net neutrality field in Congress gets crowded, cnetnews.com (May 19, 2006); available at: [http://news.com.com/Net+neutrality+field+in+Congress+gets+crowded/2100-1028\\_3-6074564.html](http://news.com.com/Net+neutrality+field+in+Congress+gets+crowded/2100-1028_3-6074564.html); Net neutrality showdown, cnetnews.com; available at: [http://news.com.com/Net+neutrality+showdown/2009-1028\\_3-6055133.html](http://news.com.com/Net+neutrality+showdown/2009-1028_3-6055133.html).

59

*See* Letter from Robert W. Quinn, Jr., Sr. Vice President Federal Regulatory AT&T to Ms. Marlene H. Dortch, FCC Secretary (Dec. 28, 2006); *attached to* Federal Communications New Release, FCC Approves Merger Of AT&T Inc. and BellSouth Corporation--Significant Public Interest Benefits Likely to Result (rel. Dec. 29, 2006); available at:

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[http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-269275A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-269275A1.pdf)[hereinafter cited as AT&T Concessions Letter].

<sup>60</sup> Federal Communications Commission, Public Notice, FCC Adopts Policy Statement (Aug. 5, 2005); available at: [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-260435A1.doc](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-260435A1.doc). The FCC has proposed to reassess its role in supporting non-discriminatory Internet access. *See* Federal Communications Commission, Public Notice, FCC Launches Inquiry Into Broadband Market Practices (rel. March 22, 2007); available at: [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-271687A1.doc](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-271687A1.doc).

<sup>61</sup> AT&T Concessions Letter at 9.