Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Preserving the Open Internet	)	GN Docket No. 09-191
	)	
Broadband Industry Practices	)	WC Docket No. 07-52

To: The Commission

COMMENTS OF COX COMMUNICATIONS, INC.

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I. INTRODUCTION AND SUMMARY

In business for more than a century, Cox Enterprises has a long and successful track-record of investment and innovation in communications technologies.[1] Its largest division, Cox Communications, Inc. ("Cox"), is an industry leader in the provision of high-quality wireline video, telephone, and broadband services, and is currently deploying new wireless capabilities that will add mobility to its other service offerings. Cox can attest to the private sector's significant contributions that have helped make the Internet a vibrant and thriving ecosystem – without the binding regulatory framework contemplated in this proceeding.[2]

Within a service footprint that passes roughly ten million homes, Cox operates a sophisticated broadband network.[3] Keeping the network state-of-art has required constant

[1] Cox Enterprises began with a single newspaper – *The Dayton Daily News* – in 1898. By embracing new communications technologies at every turn, the company today has approximately 66,000 employees and operates, among other things, a wide range of media properties throughout the country, including cable systems, newspapers, television and radio stations, Internet web sites, and media advertising services.

[2] *Preserving the Open Internet, Broadband Industry Practices,* Notice of Proposed Rulemaking, 24 FCC Rcd 13064, 13065 ¶3 (2009) ("*NPRM*").

[3] Cox's broadband network passes 98 percent of the households in its footprint. As part of its ongoing capital investments, the company recently upgraded 86,000 out of 107,000 miles of network plant to 1 GHz, and plans to reach another 8,000 miles in 2010. This effort will give systems an additional 140 to 250 MHz of bandwidth, or

innovation and investment. Indeed, over the past 15 years, Cox has invested over $16 billion to transform its one-way cable systems into high-quality, two-way broadband networks. This investment has paid off for both Cox and our customers. Cox now provides residential and commercial high-speed Internet access, multichannel video service, and digital telephone to millions of customers[4] and enjoys favorable customer satisfaction for all services.[5]

Cox has been able to achieve these results due to a regulatory environment that has fostered growth and flexibility. Through the Telecommunications Act of 1996, Congress, the States, and the FCC together created the regulatory framework that Cox and others needed to bring local phone competition to American consumers. With a stable (even stagnant) monopoly marketplace for local phone service and a widely-understood, well-tested public switched telephone network, policymakers were able to adopt rules that removed barriers to entry and that implemented critical interconnection protections, thus enabling facilities-based competitors not simply to enter the marketplace but to flourish.

Those same policymakers had the wisdom to take a different approach towards the emerging marketplace for high-speed Internet access services. Rather than imposing rules in what was and continues to be a very fluid, competitive, and innovative environment, Congress

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enough room for the equivalent of at least 46 additional high-definition TV channels, if this were the only use of the bandwidth.

[4] Every day, four petabytes of Internet traffic flows across the Cox backbone. Every month, Cox delivers 1.7 billion telephone calls across its network.

[5] Cox is the nation's only cable company to earn Top Customer Satisfaction honors from JD Power across all its product lines – cable TV, high-speed Internet, and telephone – and for both residential and commercial, a clear indication of the collective value customers place on the whole of our services. Cox has received several top honors from PC Magazine for its High-Speed Internet service and seven consecutive J.D. Power awards for telephone service. *See* Cox Communications, Inc., Awards, *available at* http://ww2.cox.com/aboutus/our-story/awards.cox (last visited Jan. 12, 2010). Most recently, Cox received the 2009 North American Broadband Customer Value Leadership Award by the international research firm Frost & Sullivan, which recognized Cox for providing the most economical and secure packages for high-speed Internet service. *See* Press Release, Frost and Sullivan, Frost & Sullivan Recognizes Excellence in Best Practices (Sept. 23, 2009), *available at* http://www.frost.com/prod/servlet/press-release.pag?docid=180782487.

and the Commission each chose instead to monitor developments closely and to issue guidance to help ensure that the new broadband marketplace evolved in a consumer-friendly way.[6] In its 2005 *Policy Statement,*[7] for example, the Commission focused on consumer expectations and experience to craft four principles that have served the Internet world well.[8] In the environment created by the *Policy Statement,* occasional aberrant behavior has been identified and rectified while, importantly, all sectors of the Internet ecosystem have continued to innovate and invest.

Cox accordingly is concerned about the Commission's proposal to codify and expand upon the principles set forth in the *Policy Statement.* Unlike the monopoly telephone world that existed when Congress enacted the Telecommunications Act of 1996, the competitive broadband marketplace is still evolving and is highly dynamic and complex. Switching direction now to create a set of static rules dictating Internet access provider conduct would be a troublesome step backwards. The proposed rules are singularly focused on only one link in the chain of the Internet experience and have only a tenuous bearing on the overall consumer experience. While proponents of more regulation claim that such safeguards are necessary to protect the next generation of innovators, they fail to recognize that innovation does not occur only on the "edge" but also within the "core" of the network.

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[6] *See, e.g.,* 47 U.S.C. § 230(b) (it is the policy of the United States "to preserve the vibrant and competitive free market that presently exists for the Internet" and "to promote the continued development of the Internet.").

[7] *See Appropriate Framework for Broadband Access to the Internet over Wireline Facilities; Review of Regulatory Requirements for Incumbent LEC Broadband Telecommunications Services; Computer III Further Remand Proceedings: Bell Operating Company Provision of Enhanced Services; 1998 Biennial Regulatory Review – Review of Computer III and ONA Safeguards and Requirements; 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*, Policy Statement, 20 FCC Rcd 14986 (2005) ("*Policy Statement*").

[8] *Id.,* 20 FCC Rcd at 14988 ("*To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet*, consumers are entitled to access the lawful Internet content of their choice.") (underline added).

Nonetheless, to the extent the Commission decides to adopt additional principles or requirements, Cox urges it to focus on improving transparency throughout the Internet ecosystem. Cox has a long history of engaging and informing its customers about its broadband activities. To be most beneficial to broadband consumers, any disclosure principle adopted by the Commission should focus on educating the public, should not require the disclosure of sensitive information, and should apply across the marketplace – including to application developers.

In addition, any new principles or rules must recognize that a customer's broadband experience depends on the quality, reliability, and security of the underlying network.[9] To ensure the robustness of that experience, broadband Internet access providers must have the flexibility to manage their networks to address the evolving demands and needs of their broadband customers. As the Commission is aware, Cox recently trialed a new approach for managing congestion on its broadband network. The results of the trial, which are described below, highlight the benefits of service provider flexibility in managing complex broadband infrastructure to the benefit of end-user customers. The trial also underscores the need for the Commission not only to permit, but to affirmatively encourage, reasonable experimentation with new network management techniques.

II. THE BROADBAND INTERNET MARKETPLACE HAS FLOURISHED THANKS TO REGULATORY RESTRAINT

The Commission's regulatory approach to date has provided a stable environment for investment and innovation in the broadband marketplace – even though the marketplace, and broadband networks themselves, continue to change rapidly. In adopting the *Policy Statement*,

[9] *See, e.g.,* Letter from Patrick Esser, President, Cox Communications, Inc., to Michael J. Copps, Chairman, Federal Communications Commission, GN Docket No. 09-51 (filed June 8, 2009) ("*Esser Broadband Letter*"); *Improving the U.S. Broadband Experience: How to Give More Americans Faster, Better and Safer Broadband by 2012*, Cox Communications, Inc., GN Docket No. 09-51 (filed June 8, 2009) ("*Cox Broadband White Paper*").

the Commission announced its goal of ensuring that "broadband networks are widely deployed, open, affordable, and accessible to all consumers."[10] Without a doubt, the restrained approach reflected in the *Policy Statement* has been a success. Today, broadband Internet access is widely available, open, affordable, and accessible, and there is very little evidence of consumer harm occurring without corrective action. The *Policy Statement* rightly reflects the understanding that the broadband marketplace is comprised of "good actors," and that flexible policies best protect the dynamics of the Internet ecosystem and still allow for appropriate government oversight.[11] The market has responded with unprecedented innovation and investment.

For example, in 2000, only 46 percent of households had access to high-speed Internet provided by a cable operator. Ten years later, and after the adoption of the *Policy Statement*, that figure has doubled as cable operators now offer high-speed Internet service to more than 92 percent of American households.[12] Similarly, capital expenditures by the cable industry have grown on an annual basis from $10.6 billion in 2005, when the *Policy Statement* was adopted, to $14.6 billion in 2008.[13] Indeed, the Commission itself has reported a tripling of high-speed Internet lines in just three years from June 2005 (42,517,810) to June 2008 (132,813,984).[14]

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[10] *Policy Statement*, 20 FCC Rcd at 14988.

[11] The Federal Trade Commission ("FTC"), in 2007, came to a similar conclusion that the residential broadband market was well served by a clearly articulated framework rather than static rules. FTC, STAFF REPORT, BROADBAND CONNECTIVITY COMPETITION POLICY (June 2007). After an extensive review of the broadband market, the FTC concluded that it was "well-equipped to analyze potential conduct and business arrangements involving broadband Internet access" as well as deceptive marketing practices. *Id*. at 120. Moreover, the threat of antitrust action disciplines the behavior of the private sector, not merely in terms of potential economic damages but also the less quantifiable but equally damaging political fallout caused by a public enforcement proceeding.

[12] *See* Comments of the National Cable and Telecommunications Association, GN Docket No. 09-51, at ii (filed June 8, 2009).

[13] *See* National Cable and Telecommunications Association, Industry Data, Cable Industry Capital Expenditures 1996 – 2008, *available at* http://www.ncta.com/Stats/InfrastructureExpense.aspx (last visited Jan. 7, 2010).

[14] *See* Federal Communications Commission, Industry Analysis and Technology Division, Wireline Competition Bureau, HIGH-SPEED SERVICES FOR INTERNET ACCESS: STATUS AS OF JUNE 30, 2008, at Table 1 (July 2009).

Moreover, in the *NPRM*, the Commission has been able to identify only two instances of network provider actions resulting in specific enforcement proceedings:[15] Madison River's blocking of Vonage calls[16] and alleged misconduct by Comcast (about which the FCC's decision remains pending before the U.S. Court of Appeals for the D.C. Circuit).[17] More recently, other questions of network access have been publicly discussed and swiftly addressed by the Commission.[18] In today's marketplace, competitors, and consumers alike are quick to alert regulators to potentially anti-competitive or otherwise questionable conduct, and to shine a bright light on possible violations. The Commission should not underestimate the effectiveness of competition and the government's and public's vigilance in deterring anti-competitive conduct in the residential broadband retail market.

In light of the tremendously successful track record of a restrained approach by government and the significant dearth of misconduct, it is short-sighted for the Commission to

[15] *NPRM*, 24 FCC Rcd at 13109 ¶123. Notably, only one of these cases came after the adoption of the *Policy Statement*.

[16] *Madison River Communications, LLC and affiliated companies*, Order, 20 FCC Rcd 4295 (EB 2005) ("*Madison River Order*").

[17] *Formal Complaint of Free Press and Public Knowledge Against Comcast Corporation for Secretly Degrading Peer-to-Peer Applications; Broadband Industry Practices, Petition of Free Press et al. for Declaratory Ruling that Degrading an Internet Application Violates the FCC's Internet Policy Statement and Does Not Meet an Exception for "Reasonable Network Management,"* Memorandum Opinion and Order, 23 FCC Rcd 13028 (2008) ("*Comcast Order*"); *Comcast Corp. v. FCC*, No. 08-1291 (D.C. Cir. filed Sept. 4, 2008).

[18] *See, e.g.*, Letter from James Schlichting, Acting Chief, Wireless Telecommunications Bureau, Federal Communications Commission, to James W. Cicconi, Senior Executive Vice President, AT&T Services, Inc., (July 31, 2009); Letter from Robert W. Quinn, Jr., Senior Vice President, Federal Regulatory, AT&T, to Ruth Milkman, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, RM-11361, at 1 (filed Oct. 6, 2009) (stating that AT&T consents to Apple enabling third-party VoIP applications for the iPhone that use AT&T's wireless network, including its 2G and 3G capabilities). S*ee also* Letter from Sharon E. Gillette, Chief, Wireline Competition Bureau, Federal Communications Commission, to Richard S. Whitt, Washington Telecom and Media Counsel, Google, Inc. (Oct. 9, 2009); Letter from Richard S. Whitt, Washington Telecom and Media Counsel, Google, Inc. to Sharon E. Gillett, Chief, Wireline Competition Bureau, Federal Communications Commission (Oct. 28, 2009) (letters between Google and the Chief of the FCC's Wireline Competition Bureau regarding reports of calling restrictions on the Google Voice service).

now adopt a view that seems to assume a marketplace of potential "bad actors."[19] Instead, all evidence points to a broadband marketplace that is working well and is self-correcting.[20] Nonetheless, if the Commission perceives a short-coming in the current *Policy Statement*, Cox recommends that the Commission focus on increasing transparency throughout the broadband ecosystem to improve consumer understanding and to strengthen the already successful monitoring mechanisms in the marketplace.

III. COX SUPPORTS GREATER TRANSPARENCY IN THE INTERNET ECOSYSTEM

Cox has long placed a high value on its relationship with its customers and their satisfaction with Cox's services.[21] From its tag line "your friend in the digital age" to its newly refurbished web site,[22] Cox always aims to put the customer first and to provide its subscribers with as much information as appropriate regarding the Cox services they receive. For these reasons, Cox supports the Commission's efforts to promote greater transparency that "enable[s] broadband subscribers to understand and take advantage of the technical capabilities and limitations of the services they purchase."[23] Cox agrees that the public is well-served with clear and transparent information about what is and is not supported by any given Internet service or

[19] "[B]roadband Internet access service providers may have both the incentive and the means to discriminate in favor of or against certain Internet traffic and to alter the operation of their networks in ways that negatively affect consumers, as well as innovators trying to develop Internet-based content, applications, and services. Such practices have the potential to change the Internet from an open platform that enables widespread innovation and entrepreneurship to an increasingly closed system with higher barriers to participation and reduced user choice and competition." *NPRM*, 24 FCC Rcd at 13067 ¶8.

[20] Indeed, when Cox announced its congestion management trial in January 2009, the details of the trial were closely reviewed and freely discussed by interested observers and the "blogosphere." *See, e.g.,* Broadband DSLReports, Forums, Cox HSI; KS & AR: Any Congestion Management Trial Feedback, *available at* http://www.dslreports.com/forum/r21893947-KS-AR-Any-Congestion-Management-Trial-Feedback (last visited Jan. 7, 2010).

[21] *See*, *e.g.,* Press Release, J.D. Power and Associates, Overall Customer Satisfaction with Residential Telephone Service Increases Considerably (Sept. 16, 2009), *available at* http://www.jdpower.com/corporate/news/releases/pressrelease.aspx?ID=2009199 (detailing Cox as the highest rated residential telephone service provider in the East and West regions and noting Cox's particularly strength in the area of customer service).

[22] *See* Cox Communications, Inc., at http://ww2.cox.com/.

[23] *NPRM*, 24 FCC Rcd at 13108 ¶119.

application. If the Commission decides to codify this goal in a transparency principle, however, Cox urges it to extend the principle, with appropriate limits, to all participants in the Internet value chain, including application developers.

A. Cox Has Long Embraced Transparency as an Integral Part of its Business

As a trusted provider of broadband Internet access service that works diligently to communicate openly with its customers and policymakers, Cox has long supported the concept of greater transparency around broadband services and networks. For example, in its Acceptable Use Policy, Cox clearly discloses that it reserves the right to manage its network "for the greatest benefit of the greatest number of subscribers."[24] Moreover, for many years, Cox has been forthright that its network management options include the use of traffic prioritization and protocol filtering, along with rate limiting, anti-virus mechanisms, and the rejection or removal of "spam" and other unsolicited bulk email.[25] And, for those customers who desire a greater level of detail about the features of their broadband service, Cox also provides a listing of Features and Limits of Service.[26]

A recent example of Cox's commitment to transparency involves its trial last year of a new congestion management approach.[27] Before it launched the trial in its Kansas/Arkansas system, Cox embarked on a significant outreach effort to customers, policymakers, and other interested parties. Cox notified all Cox High Speed Internet customers in Kansas and Arkansas by letter or email. It also created a Congestion Management webpage devoted to the trial, and provided in plain and simple language an explanation of the trial, how the congestion tool

[24] Cox Communications, Inc., Policies, Acceptable Use Policy, *available at* http://ww2.cox.com/aboutus/policies.cox#acu (last visited Jan. 8, 2010) ("*Cox Acceptable Use Policy*").

[25] *See Cox Acceptable Use Policy*.

[26] *See* Cox Communications, Inc., Limitations of Service, Features and Limits of Service, *available at* http://ww2.cox.com/aboutus/policies/limitations.cox (last visited Jan. 12, 2010).

[27] The trial is described in detail in Section V below.

worked, and which applications and services were most likely to be affected during times of congestion.[28] Throughout the trial, consumers who had comments or questions about the trial were invited to respond to a specific email box (coxmessage@cox.com) included on the Congestion Management webpage. All responses were reviewed by Cox personnel. Through this review and outreach to others, Cox was able to gauge whether the information in the Congestion Management webpage was clear and adequate, and made updates to its FAQs (frequently asked questions) as appropriate. Cox firmly believes that this type of communication with its customers is a key factor to its success and the many awards it has received for all of its services.

Indeed, Cox has a keen business interest in ensuring its customers are satisfied with the level of disclosure they receive with respect to all of the products and services to which they subscribe. Cox devotes a significant amount of resources to staffing its call centers and to training its customer care employees to respond to customer questions and complaints. It is axiomatic that the more customers understand their service – what they pay for, what they receive, and how it operates – the less likely they are to contact the company, raise concerns, or to switch service. Thus, Cox, like other broadband providers, has a strong incentive to cultivate positive relationships with its customers throughout their subscription period to maintain an informed and satisfied customer base.

B. Any Transparency Principle Should Be Flexible, Limited to Non-Sensitive Information, and Extended to All Members of the Broadband Ecosystem

Should the Commission decide to add a transparency principle to the current *Policy Statement,* Cox believes such a principle will be most effective if it gives providers the flexibility

[28] *See* Cox Communications, Inc., About Us, Congestion Management FAQs, *available at* http://www.cox.com/policy/congestionmanagement/default.asp (last visited Jan. 10, 2010).

to determine how to make information available to their customers. Flexibility is necessary because different situations will call for different levels of disclosure. For example, Cox was able to select a disclosure approach for its Kansas/Arkansas congestion management trial – involving letters, emails, a unique website, and other disclosure efforts – that Cox determined was the best way to educate and inform its customers about a significant event impacting their broadband service. However, a situation involving a minor change in wording of a network management section of a consumer user agreement may not call for the same approach. In addition, Cox notes that, while posting information on its website in advance of a change in its network management practices is certainly preferable, it may not always be practical. Broadband service providers operate complex networks in a rapidly changing, real-time environment. There may be times when changes must be implemented first and notice provided within a reasonable amount of time thereafter.

Cox believes strongly that the Commission should refrain from imposing a "standard labeling format" or adopting a specific requirement to "disclose any changes to [] network management practices before or within a certain period of time after implementing those changes."[29] It is more constructive for the Commission to generally encourage transparency and disclosure – such as how a service or application potentially impacts the ability of subscribers to use broadband services, or any other particular feature, application, or device – than it is to focus on specific notification requirements or formats.[30]

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[29] *NPRM*, 24 FCC Rcd at 13111 ¶129.

[30] Cox notes that the National Telecommunications and Information Administration ("NTIA") and the Rural Utilities Service ("RUS") developed network management disclosure obligations for the Broadband Technology Opportunities Program ("BTOP") and Broadband Initiatives Program ("BIP"). *See* Broadband Initiatives Program; Broadband Technology Opportunities Program, *Notice*, 74 Fed. Reg. 33104, 33110–11 (2009) ("*Broadband NOFA*"). The NTIA and RUS disclosure requirements appear to be more flexible than what the Commission is contemplating in that grant recipients are required to "display any network management policies in a prominent location on the service provider's web page and provide notice to customers of changes to these policies." *Id*.

The Commission also should be careful with the scope of any transparency principle, given its broad goal of "ensuring that *all* interested parties have access to *necessary* information about the traffic management practices of networks."[31] A transparency principle should not require broadband Internet access providers to unnecessarily disclose sensitive information that would enable hackers and others to circumvent security or management protections built into the service provider's network. Cox and other broadband providers find it necessary to utilize a number of network management techniques to counter the distribution of spam, viruses, malware, unauthorized copyrighted material, child pornography, and other similar abuse materials.[32] In essence, all network operators are participants in a constant game of "cat and mouse" with persons possessing nefarious motives. Operators thus employ a variety of proprietary techniques to deal with these constantly-changing threats and challenges. There simply is no subscriber benefit to having detailed information on these specific network management practices made public in light of the potential harm that could occur if these protective efforts were understood. Accordingly, although broadband providers should inform subscribers that they employ mechanisms to protect subscriber services and the underlying network, they should not be required to disclose details as to the specific nature of the actions.

Finally, if a transparency principle is adopted, Cox believes that it should apply equally to all participants in the Internet value chain, including application providers. In proposing the transparency principle, the Commission noted its interest in helping to "protect and empower consumers."[33] Yet, if the Commission truly wants to improve the consumer's broadband experience, it will impose a transparency principle across the Internet marketplace. Application

[31] *NPRM*, 24 FCC Rcd at 13108 ¶118 (emphasis added).

[32] Indeed, Cox estimates that roughly 92 percent of all emails sent require filtering because they are spam.

[33] *Id.*

developers, for example, should be required to disclose how an application potentially impacts a broadband customer's network connectivity, applications, services, software, personal computer, and other client devices or customer premises equipment.[34] Broadband subscribers can make informed decisions about using an application only if armed with appropriate knowledge of how the application works. Broadband service providers would also benefit by having access to information regarding the potential impact of applications to aid with network planning and management.

IV. THE COMMISSION MUST NOT HAMPER NETWORK INNOVATION AND INVESTMENT BY BROADBAND PROVIDERS

Preserving broadband service provider incentives to invest and innovate in the "core" of their networks is every bit as important as creating innovation incentives for entities at the "edge" of the Internet. Notwithstanding the Commission's suggestions that innovation is primarily limited to the network edge,[35] Cox's longstanding experience as a network operator demonstrates that the virtuous cycle of Internet investment and innovation is dependent on a highly dynamic and intelligent network. To put it simply, application, service, and content providers cannot innovate on their own; they need a dynamic network on which to operate and evolve. Thus, to enable the virtuous cycle and the continued enhancement of the customer's online broadband experience, the Commission must ensure that its efforts in this proceeding do not undercut the ongoing development of the broadband network. If this proceeding becomes

[34] *See, e.g.*, Comments of the Information Technology and Innovation Foundation, WC Docket. No. 07-52, at 2, 5-6 (filed Feb. 13, 2008) (describing how peer to peer networks increase network congestion.).

[35] "By allowing innovation to be easily implemented at the edge of the network, the end-to-end design of the Internet has lowered technical, financial, and administrative barriers to entry for entrepreneurs with technical skill and bright ideas." *NPRM*, 24 FCC Rcd at 13070 ¶19. "The Internet's accessibility has empowered individuals and companies at the edge of the network to develop and contribute an immense variety of content, applications, and services that have improved the lives of Americans. Such innovation has dramatically increased the value of the network, spurring—in a virtuous circle—investment by network operators, who have improved the Internet's reach and its performance in many areas." *Id.* at 13065-66 ¶4.

more of a discussion about guaranteeing that every application has a static existence on the Internet, the type of dynamic network innovation that has spurred tremendous application growth and development over the past decade will suffer.

Cox is a prime example of a company that keeps pace with continual changes in the public's appetite for communications services, made possible by new technologies through continued investment and innovation. As part of an enterprise with historical roots in the newspaper business, the Cox companies have eagerly embraced new technologies and expanded into new business ventures – from radio to television to cable to phone to broadband and now wireless.[36] Contrary to the persistent, but inaccurate, perception that innovation occurs only at the "edge" of the network, Cox's track record demonstrates that network providers can and do innovate on a large scale, taking considerable risks with significant operational challenges along the way. The Commission accordingly should avoid taking actions in this proceeding that would adversely impact Cox's continued investment in its network and the broadband services it provides to residences and commercial establishments throughout its markets.

A. Innovation and Investment in the Core Network Has Spurred Unprecedented Developments in the Broadband Ecosystem, with Cox Very Much at the Forefront

Unlike much innovation at the edge of a network, innovation at the core of the broadband network requires significant capital investments. Cox alone has invested over $16 billion since 1996 in its state-of-the-art broadband network, enabling the provision of advanced services like Cox Digital Phone and Cox High Speed Internet. As a result of this investment, Cox has made a number of recent network innovations:

[36] Cox's business model has necessarily evolved over time to match changing consumer demand. For example, while video programming services accounted for a substantial majority of Cox revenues at the beginning of this decade. Now, they account for less than half, with broadband Internet access accounting for a significant percentage.

- Between 2004 and 2006, Cox deployed Packet Cable Multimedia ("PCMM") infrastructure throughout its network. PCMM adds innovative quality of service features to the network in a wide variety of configurations, enabling such features as packet switched telephony and the ability for customers to preview faster speed tiers before purchase.

- Cox is reaching the end of a multi-year project investing more than a billion dollars to increase last-mile capacity to 1 GHz. This project, called Extendable Optical Network ("EON"), also provides improvements to Cox's national backbone and Video on Demand ("VOD") services, and has the effect of reducing the number of subscribers per node. The reduction in node size and the addition of bandwidth increase network capacity and enable faster data speeds.

- In 2009, Cox introduced its DOCSIS 3.0-based Ultimate Internet Service, with speeds up to 50 Mbps downstream and 5 Mbps upstream. Cox expects to deploy this service to two-thirds of its footprint by the end of 2010. This significant network development will enable myriad applications developers and content providers to offer new and faster services to Cox's broadband customers.

As a result of this recent track record of investment and innovation, Cox High Speed Internet is now available to virtually all of the 9.4 million homes passed by its network, with many customers having access to downstream speeds of up to 50 Mbps.

Despite a difficult financial environment over the last 18 months, Cox has continued to invest and innovate in other ways to provide both residential and business customers with the services they demand. Specifically, Cox has taken steps towards launching a fourth service – wireless voice and data – over a new wireless network that will be integrated with its other service offerings.[37] The launch of a new competitive wireless service has required not only the procurement of spectrum rights in those markets, but also substantial capital investments. Incurring the costs of launching this new service, while continuing to upgrade its existing broadband network, has been a major undertaking for Cox. Nevertheless, even in the face of these challenges, Cox will soon begin offering wireless service in three markets – Hampton

[37] *See* Reply Comments of Cox Wireless, WT Docket. No. 09-66 (filed July 13, 2009).

Roads, Virginia; Orange County, California; and Omaha, Nebraska – with plans for deployment in other Cox markets over the next three to four years.

Similarly, Cox in recent years has dramatically expanded the reach of its business unit, Cox Business, which provides business-class voice, data, and video services to businesses of all types throughout its service footprints. Cox's broadband networks were originally designed to serve residential neighborhoods and manage residential data consumption rates. Expanding both the footprint and bandwidth of our network to provide businesses with the broadband connections they need compels costly, long-term capital investments. Cox has worked hard over the last several years to meet the burgeoning demand for Cox Business services through significant capital and other investments. Importantly, most of the new demand for Cox Business services has come from small- and medium-sized businesses eager to expand their reach into the online world – the same businesses that Chairman Genachowski described recently as a "driving force in our economy" and "a primary source of job creation" in the ongoing economic recovery.[38]

B. Robust Broadband Investment and Innovation Rely on Smart Oversight, Not Strict Regulation

Cox individually, and the broadband marketplace as a whole, benefit from insightful regulatory decisions that favor significant network investment in new consumer services. The broadband industry invests approximately $60 billion annually to expand network footprints, upgrade networks to provide faster and more reliable service, and develop new technologies to improve customers' experiences – all with no guaranteed return.[39] Sizable, long-term

[38] Julius Genachowski, Chairman, Federal Communications Commission, Prepared Remarks, Broadband Field Hearing on Small Business, Chicago, Illinois, at ¶3 (Dec. 21, 2009).

[39] Robert D. Atkinson, THE ECONOMIC IMPACTS OF DECLINING INVESTMENT IN BROADBAND, The Information Technology and Innovation Foundation (Oct. 2009) ("*Atkinson*").

investments by broadband providers will be necessary for the success of all players in the Internet world, since innovation at the core of the network helps support the ever-evolving consumer demand for new content and applications. Moreover, network investments spur additional infrastructure investments at the edge, since applications and services that appeal to growing audiences will eventually need to add capacity, servers, routers, and other equipment as well. Accordingly, although the Commission is concerned about maintaining the "low marginal cost" generally associated with the development of new content and applications that help make up the Internet experience,[40] it must not lose sight of the huge investment necessary to maintain and enhance the network itself.

If the Commission adopts rules that do not take business realities into consideration – by, for example, limiting the options of network operators to effectively manage their networks and to balance their customers' interest in accessing more bandwidth-hungry applications with the very real limits of network capacity – the regulations will cast a pall on network investment and service enhancements. At Cox, as is true for other service providers, product developers and product managers are constantly assessing and implementing new technologies to maximize the benefits for the largest numbers of consumers and to keep pace in the competitive marketplace. As part of deciding whether to invest in a new technology, Cox balances the increased consumer benefits of implementation with any potentially adverse impacts. The overarching goal is to retain consumers who are satisfied with the service they receive from Cox. Inappropriate regulation, or an unclear regulatory environment, discourages investments in new technologies, thereby hindering or even foreclosing new or enhanced consumer offerings.

[40] "These outsiders, many of whom may have limited resources but can innovate on today's Internet with very low marginal costs, could choose not to innovate if faced with fees from Internet access service providers for equal access to end users." *NPRM*, 24 FCC Rcd at 13089 ¶63.

The Commission should bear this dynamic in mind as it evaluates the potentially negative impact of new net neutrality rules. There is no such thing as a technology transition that does not disrupt some customers. If the Commission adopts rules that create uncertainty about whether a broadband service provider can implement a new service to serve the greatest good, the provider will almost certainly stop in its tracks. The same is true in the network management context. Companies facing uncertainty about how to run their networks will be forced to slow plans for network growth to digest any new rules and ensure that their existing networks comply with them. Further, such rules could result in both technological obsolescence and a freeze on innovation, as companies that have made multi-year, multi-billion dollar bets are discouraged from pursuing next generation technologies for the benefit of their customers.

C. Regulations That Curtail Broadband Investment and Innovation Would Threaten Skilled Jobs

A chill on broadband investment would not only slow spending on the network, but also would have real-world consequences for job creation. Broadband investments create jobs across the employment spectrum, providing opportunities for many people to find reliable employment. Regulations that negatively impact broadband investment risk slowing job growth at exactly the wrong time for our national economy.

As Cox has evolved from a one-way provider of video to a two-way provider of video, data, and telephony services (and soon to be a provider of wireless services as well), our commitment to deploying a better network has created employment opportunities across a wide range of skills. Our investments require engineers to design networks, contractors and field technicians to build physical facilities and install access to homes, salespeople to staff retail facilities, and managers and customer service personnel to assist consumers adopting new services. In fact, in the last two years alone, nearly 35 cents of every capital dollar spent on

improving our broadband networks has gone toward labor costs. Moreover, Cox has committed to offering countless development opportunities to its employees.

The employment benefits of broadband are not limited to jobs with network providers, moreover. Like most infrastructure industries, broadband investment carries a multiplier effect, indirectly creating jobs related to the production process and inducing even more job creation as broadband employees spend their paychecks in their local communities.[41] Put another way, each percentage point increase in broadband penetration in a state is projected to increase statewide employment by 0.2 to 0.3 percent per year, with the strongest positive impact coming in the manufacturing and services sectors.[42] Even more importantly to our economic recovery, however, broadband also carries what some economists call a "network effect"; by introducing new or substantially improved technology to a community, broadband promotes innovations by business owners and consumers alike, leading to new economic activity that would not have otherwise occurred.[43]

Regulations that chill network investment would unduly jeopardize the jobs associated with that investment. Two recent studies found that even a two percent reduction in total broadband investment could reduce employment by as many as 31,000 jobs, and a five percent reduction could remove up to 78,000 jobs from the economy.[44] Although we are beginning to see signs of some economic recovery, employment figures remain dour; now is precisely the

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[41] The Bureau of Labor Statistics estimates that the communications industry has a multiplier effect of 2.52; for the manufacturing industry responsible for creating our equipment, the multiplier is even higher, 2.91. *See* Josh Bivens, Economic Policy Institute, Working Paper No. 268, UPDATED EMPLOYMENT MULTIPLIERS FOR THE U.S. ECONOMY (Aug. 1, 2003), *available at* http://www.epi.org/page/-/old/workingpapers/epi_wp_268.pdf.

[42] Robert Crandall, William Lehr, and Robert Litan, THE EFFECTS OF BROADBAND DEPLOYMENT ON OUTPUT AND EMPLOYMENT: A CROSS-SECTIONAL ANALYSIS OF U.S. DATA, Issues in Economic Policy, Number 6 (July 2007).

[43] The network effect is estimated to add an additional employment multiplier of 1.17 to broadband employment effects. *See* Robert Crandall, Charles Jackson, and Hal Singer, THE EFFECTS OF UBIQUITOUS BROADBAND ADOPTION ON INVESTMENT, JOBS, AND THE U.S. ECONOMY, Criterion Economics, Washington, DC (Sept. 2003).

[44] *See Atkinson* at 2; *see also* Internet Innovation Alliance, INVESTMENT IN BROADBAND CRITICAL TO JOB CREATION (Oct. 21, 2009).

wrong time to enact broadband regulations that could have such a substantially negative impact on jobs.

V. FLEXIBLE COMMISSION POLICIES SHOULD CONTINUE TO ALLOW NETWORK OPERATORS TO EXPLORE NEW AND INNOVATIVE APPROACHES TO MANAGING BROADBAND NETWORK CONGESTION

Cox continuously strives to provide its customers with the most reliable, secure, and highest quality broadband experience possible. As outlined above, Cox has devoted significant investment and company resources to deploying a state-of-the-art broadband network that meets the evolving needs of the company's more than four million Internet subscribers. The current proliferation of applications and devices spurred by recently expanded network capacity has only led to a greater increase in traffic growth and demand,[45] which continues to affect the Cox network in unpredictable ways.[46] These trends require Cox engineers to engage in around-the-clock network management to ensure that our customers enjoy a safe, dependable, and robust user experience at all times. At times, this network management also requires the use of congestion mitigation techniques. Notwithstanding Cox's efforts to deploy the fastest network possible, customer demand always will outpace supply, and Cox must have tools in place to ensure that its customers have a full broadband experience no matter the situation.

Below, we discuss the details of an important network congestion trial that Cox conducted in 2009. The results of the trial have been invaluable for Cox to better understand its network and how best to provide an optimal online experience to its customers. But, equally as important to Cox, the trial itself underscores the value of a regulatory environment that

[45] For example, Americans viewed over 30 billion videos in the month of November 2009, up from 14.3 billion videos viewed online in the month of December 2008, more than doubling in less than a year. *See* Press Release, comScore, November Sees Number of U.S. Videos Viewed Online Surpass 30 Billion for First Time on Record (Jan. 5, 2010), *available at* http://www.comscore.com/Press_Events/Press_Releases/2010/1/November_Sees_Number_of_U.S._Videos_Viewed_Online_Surpass_30_Billion_for_First_Time_on_Record.

[46] For example, in a major Cox broadband market, traffic has increased at a cumulative annualized growth rate of 43 percent over the past three and a half years.

encourages, rather than discourages, network operator experiments aimed at improving the broadband services they provide to consumers. The *ability* to test and experiment (with appropriate disclosure) new and innovative ways for managing its broadband network to address significant customer service issues such as safety and traffic congestion is critical to Cox's provision of a dynamic and robust customer broadband experience. Any action by the Commission that has the effect, even if unintended, of freezing current network management practices will only serve to negatively affect the very consumers that the Commission aims to protect.

A. Cox's Recent Technology Trial Highlights the Need for Service Provider Experimentation and Flexibility in Network Management

Cox is always looking for new ways to empower the customer and to improve its broadband service. Since it first rolled out high-speed Internet access more than a decade ago, Cox has anticipated and addressed network developments that could adversely impact its customers' experience. For example, in 2004, Cox was one of the first broadband service providers to make a complete suite of security software available for free to its broadband subscribers.[47] Cox also employs multiple layers of protection against spam, and continually adds new tools to its spam-fighting arsenal to preempt the relentless schemes generated by spammers. In addition, Cox was an early leader in handling identity theft and protecting customer data.

In more recent years, the rapid growth of peer-to-peer ("P2P") and other Internet traffic has presented Cox with another significant engineering challenge.[48] Like many other multi-

[47] *See* BNET, Business Library, Cox Communications Rolls out Authentium Integrated Security Suite (Oct. 10, 2004), *available at* http://findarticles.com/p/articles/mi_m0EIN/is_2004_Oct_10/ai_n6229252/?tag=content;col1 (last visited Jan. 13, 2010).

[48] Since the emergence of P2P networking in the late 1990s, P2P applications have multiplied, evolved, and established themselves as the "leading growth app" of Internet traffic. As part of their evolution, however, P2P applications have made traffic more difficult to track. In contrast to first-generation P2P networks which used well-defined port numbers, current P2P applications have the ability to disguise their existence through the use of

service communications networks, Cox's cable networks are asymmetric – that is, they have far more downstream capacity than they have upstream capacity.[49] But although they are a limited resource, the upstream channels on Cox's network are used for a variety of important purposes, including enabling broadband customers to communicate with websites and send email and other digital communications; carrying messaging for Cox's circuit- and packet-switched telephony services; and carrying set-top box instructions, such as channel changes, parental control settings, and recording requests, back to the video headend.

Congestion on any of Cox's upstream channels presents problems. But, at times when traffic on the upstream channels dedicated to broadband becomes congested – as occurs with significant usage of P2P applications and large file uploads – the experience of Cox's broadband customers can suffer. In particular, congestion increases latency, dropped packets, and jitter – which manifest as degraded voice and video quality, slow uploads and downloads, and slow reactions within online games for Cox customers.

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arbitrary ports and encryption. As a result, reliable estimates of P2P traffic require examination of packet payload. *See* Thomas Karagiannis, Andre Broido, Michalis Faloutsos, K.C. Claffy, Transport Layer Identification of P2P Traffic, *IMC '04*, at 121-134 (2004).

The most recent studies, for the most part, indicate that P2P traffic continues to grow, generating approximately two exabytes of data per month globally (500 million DVD equivalents), per Cisco's 2008 study, or six hundred petabytes more than reported in the 2007 study. However, as a percentage of consumer traffic, P2P is on the decline. Cisco notes that it may have dropped from 60 to 51 percent between 2006 and 2007, and to an estimated 44 percent of all consumer traffic by the end of 2008. The decline in P2P's proportionate traffic share is due primarily to the increasing share of downstream video traffic, as well as a trend toward web-based file sharing in place of P2P file sharing. *See* Cisco, Approaching the Zettabyte Era (2008), *available at* http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481374.pdf. *See also* Hendrik Schulze, Klaus Mochalski, iPoque, Internet Study 2008/2009 (2009), *available at* https://portal.ipoque.com/downloads/index/get/id/265/; Craig Labovitz, Arbor Networks Blog, The Internet After Dark (Part 1) (Aug. 24, 2009), *available at* http://asert.arbornetworks.com/2009/08/the-internet-after-dark/ (last visited Jan. 14, 2010) and The Internet After Dark (Part 12 (Aug. 30, 2009) *available at* http://asert.arbornetworks.com/2009/08/the-internet-after-dark-part-ii/ (last visited Jan. 14, 2010); C. Labovitz, S. Iekel-Johnson, D. McPherson, J. Oberheide, F. Jahanian, M. Karir, ATLAS INTERNET OBSERVATORY, 2009 ANNUAL REPORT (2009), *available at* http://www.nanog.org/meetings/nanog47/presentations/Monday/Labovitz_ObserveReport_N47_Mon.pdf; Nate Anderson, Ars Technica, *P2P Traffic Drops As Streaming Video Grows In Popularity* (Sept. 2, 2008), *available at* http://arstechnica.com/old/content/2008/09/p2p-traffic-drops-as-streaming-video-grows-in-popularity.ars (last visited Jan. 14, 2010).

[49] Cable systems were originally designed as point-to-point multipoint services, providing little more than extended broadcast video service. Although cable networks have evolved to offer rich, two-way voice and data services, video programming continues to take up the vast majority of spectrum on the cable pipe.

Over the years, Cox has discovered that upstream congestion in its high-speed Internet service cannot be completely addressed via increased capacity. As noted earlier, Cox has always invested heavily in its network, with many of its cable systems now having state-of-the-art capacity of 1 GHz.[50] But congestion can occur on any high-capacity network for a number of reasons: extensive viewing of major news events online; attacks on the network or physical damage to the network plant requiring traffic rerouting; or even severe weather conditions forcing many people to work from home. Cox therefore must be prepared for both the expected and unexpected "surges" in broadband traffic to keep information flowing as efficiently as possible.[51]

It was in this context that Cox engineers, who have continually explored how best to manage network congestion throughout the Cox network, decided to trial a new congestion management technique on the broadband upstream in 2009. The new technique was guided by a simple concept: Cox customers should be able to enjoy the same high-quality broadband experience during periods of congestion on the broadband upstream that they enjoy when congestion is non-existent. To accomplish this goal, Cox focused on the end-user customer experience: how could the network be managed so that customers' use of various broadband applications would be seamless even in the face of traffic congestion? The engineering answer to this question was grounded in the widely-recognized fact that network congestion undermines the user experience more with certain types of applications than with others. More particularly, applications that demand a continual and uninterrupted stream of packets (*i.e.*, "time-sensitive"

[50] *See supra* n.3 and the discussion of EON at p.13.

[51] In Cox's view, congestion management technology is not a substitute for necessary increases in network capacity. The nature and causes of congestion vary, however. For example, congestion can reflect intermittent and/or cyclical user activity; it can also reflect sustained growth. A congestion management solution thus is a tactical tool that protects the customer experience while Cox evaluates the nature of the congestion at issue and assesses how best to address it (including, potentially, by adding network capacity). While congestion due to sustained growth may lead to network upgrades, intermittent, short-term congestion may instead require tactical traffic management tools.

applications) are more adversely impacted than applications that can tolerate latency without any perceptible effect on the user's interaction with those applications (*i.e.*, "non-time-sensitive" applications). As described in more detail below, Cox engineers set out to develop a technology solution that would enable them, during times of significant congestion, to protect the customer's experience with time-sensitive applications, while at the same time not undermining his or her experience with non-time-sensitive applications. Whether this objective could be met would be tested using sophisticated "traffic shaping" techniques.[52]

The trial – which took place during a number of months in 2009 in Cox's Kansas/Arkansas system – demonstrated that the new approach did work as intended and produced some interesting findings that will be useful in managing the Cox network going forward.[53] One noteworthy finding was the discovery that congestion actually occurred on the downstream at a much higher rate than the upstream, reflecting changes in customer usage patterns that are beginning to emerge in other Cox markets. In the wake of the significance of this and other discoveries, the trial also reinforced Cox's view that regulators should not just allow but should actively encourage broadband network operators, with appropriate disclosure, to continue to experiment with new network management techniques in order to provide the optimal experience for their customers in a constantly-changing broadband environment. As discussed below, a presumption of reasonableness for broadband providers implementing network management technologies with appropriate transparency would go a long way to advancing that view.

[52] Traffic shaping is the practice of slowing some or all of the packets in a network traffic stream in order to keep traffic moving smoothly through the network.

[53] As further evidence of the evolving nature of technology and the need for flexibility in managing a broadband network, Cox actually switched vendors during the middle of the trial because it needed to get a better understanding of network traffic and what actions could best improve the customer experience.

The following sections and attached Appendix explain the factors involved in establishing the parameters and business requirements of the trial; provide a description of the technology tested and the trial itself; and then analyze the results of the trial.

1. Cox Undertook the Trial to Analyze, in the Field, Whether an Innovative Approach to Managing Congestion on Its Broadband Network Would Realize Measurable Consumer Benefits

The primary goal of the trial was to test a method for managing congestion that would provide measurable consumer benefits, specifically as a "surge protector" before congestion becomes a major problem. In initiating the trial, Cox assumed the following: (1) the variable nature of Internet usage creates surges of temporary congestion, even in robust, well-built networks; (2) broadband applications – whether web browsing, email, or videoconferencing – have inherently different network requirements for achieving the optimal customer experience; and (3) traffic shaping technology could be used during periods of temporary congestion to distinguish between different categories of broadband applications while ensuring a smooth overall customer experience.

When selecting a next-generation congestion management technology that could properly implement, test, and report on Cox's proposed traffic shaping approach, Cox identified at least two key primary business requirements. *First*, the network management tool needed to be able to distinguish and manage traffic on a granular level so as to affect the least number of packets or flows, and to minimize effects on end users. Having such advanced shaping capabilities minimizes the effects on end users by diminishing the impact of congestion across the network by briefly slowing or shaping certain applications, in order to allot increased bandwidth to other applications. *Second*, the technology needed to give Cox greater insight into how its broadband network functions. Sophisticated monitoring and reporting capabilities can help capture trends

in Internet traffic for network capacity planning, congestion management, and troubleshooting. Better network insight not only would permit Cox to identify congestion in a more targeted fashion, but it also would enable Cox to better understand traffic trends, plan capacity-building investments, and target traffic shaping.

Cox also had to determine how to implement traffic shaping to best protect the customer experience with various applications during times of upstream congestion.[54] Because different applications have varying levels of tolerance to delay caused by congestion,[55] Cox expected that allocating delays to the applications best capable of handling delay would minimize perceived disruption in broadband service for the average consumer. For example, gaming and VoIP calls are extremely sensitive to latency because they operate in real time. Likewise, video calls from videophone applications, such as those often used by the hearing-impaired community, are also particularly time-sensitive. Streaming video and web surfing are also sensitive to latency, but somewhat less so than gaming and VoIP calls. Network control traffic – those packets that are necessary to keep the network moving – is also time-sensitive. Cox's classification of particular

[54] It should be noted that Cox specifically tested a congestion tool that clearly fell within the guidance for reasonable network management as set forth in the *Comcast Order*. For example, the technology was limited to times of congestion and targeted to the affected Cable Modem Termination System ("CMTS"); thus the trial was furthering "a critically important interest" and "narrowly or carefully tailored to serve that interest." *See Comcast Order*, 23 FCC Rcd at 13055-56 ¶47-48. Similarly, Cox fully disclosed the trial to customers and provided its subscribers with detailed information on the technology solution and its potential affect on non-time sensitive traffic. *Id.* at 13058-59 ¶52. Finally, since use of the shaping tool in the trial was limited to times of congestion, the technology also would comply with the *NPRM*'s proposed definition of "reasonable network management." *NPRM*, 24 FCC Rcd at 13113 ¶137 ("we propose that a broadband Internet access service provider may take reasonable steps to reduce or mitigate the adverse effects of congestion on its network or to address quality-of-service concerns"). The congestion tool also does not implicate potentially problematic areas identified by the Commission such as degrading VoIP traffic or singling out particular content. *Id.*

[55] *See, e.g.,* International Telecommunication Union, Recommendation G.1010, END-USER MULTIMEDIA QOS CATEGORIES SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS QUALITY OF SERVICE AND PERFORMANCE (Nov. 2001). *See also* IETF Request for Comments: 4594, "Configuration Guidelines for DiffServ Service Classes," August 2006 (Section 2, Figure 2.3 displays a table with the types of traffic found on a network and their associated tolerance to loss, delay, and jitter).

applications as time-sensitive or non-time sensitive was based upon industry knowledge of how applications behave and customer expectations.

Existing applications accordingly were categorized as follows:

Time-Sensitive Applications

- Web (Web surfing, including web-based email and chat embedded in web pages)
- VoIP (Voice over IP, telephone calls made over the Internet)
- Games (Online interactive games)
- Streaming (Web-based audio and video programs)
- IM (Instant messages, including related voice and webcam traffic)
- Email[56]
- Tunneling and Remote Connectivity (VPN-type services for telecommuting)
- Other (Any service not already categorized)

The creation of an "Other" category was a conservative choice in recognition of the fact that new applications will be developed that do not clearly fall into one category or the other at the outset. Thus, until an application could be clearly analyzed and classified as non-time sensitive, it was by default placed into the time-sensitive category.

Non-Time Sensitive Applications

- File Access (Bulk transfers of data such as FTP)
- Network Storage (Bulk transfers of data for storage)
- P2P (Peer to peer protocols)
- Software Updates (Managed updates such as operating system updates)
- Usenet (Newsgroup related)

The rationale for the non-time sensitive classifications is fairly self-evident with selected applications not involving real-time communication.[57]

Cox installed the network management platform at the regional data center near its Kansas/Arkansas system, which had agreed to participate in the trial. When fully operational,

[56] From a purely engineering perspective email is non-time sensitive and can easily tolerate brief delays. Cox nonetheless placed email into the time-sensitive class because customers perceive email as time-sensitive.

[57] *See* note 55 *supra.*

the congestion management tool allowed the network to intelligently monitor traffic flow on a neighborhood-by-neighborhood basis. First, the tool identified upstream "time-sensitive" traffic from "non time-sensitive" traffic by examining the packets' application headers to the extent necessary for accurate classification of the packet. When the upstream traffic reached the pre-established congestion threshold, the congestion management tool began to shape traffic. The tool shaped the upstream non-time sensitive traffic by slightly slowing the pace of the traffic in the queue until the congestion abated. Once the period of congestion was over, shaping ceased. Cox engineers also placed a safeguard in the system by limiting the amount of upstream traffic that could be shaped, thus ensuring that upstream traffic was allotted sufficient bandwidth to continue to move without being blocked.[58]

2. The Trial Revealed Some Noteworthy Results that Will Be Useful in Managing the Cox Network Going Forward

Based on the results of the trial, Cox determined that the technology worked as expected. The trial also provided valuable insight into the cause and effects of congestion on the network. The trial revealed the following broad observations:

1. Congestion on the upstream, measured at the CMTS, was relatively light, materially affecting only a very small subset of subscribers.
2. The shaping mechanism worked as expected by mitigating the impact of congestion on time-sensitive applications.
3. Congestion on the downstream, measured at the CMTS, was greater than that on the upstream and will require further evaluation and a possible business remedy.

Upstream Congestion. Cox found that the congestion on the upstream, within the trial system during the trial period, was relatively light.[59] Indeed, only 8.5 percent of subscribers in

[58] While it is possible that if enough congestion occurs, packets of non-time sensitive applications could be dropped, that packet loss is due to the nature of TCP, not the technology itself. Indeed, without the congestion tool, packets could start dropping much sooner.

[59] It should be noted that the trial took place during a period of no aberrant strain on the network such as might be expected during a major news or video event, such as the presidential inauguration, or during a heavy user period,

the market overall experienced any upstream congestion, averaging around 7 minutes per day throughout the trial. Over two-thirds of these subscribers (5.9 percent of all subscribers) experienced an average of less than 5 minutes per day of congestion. Less than one half of one percent (0.5 percent) of subscribers encountered material levels of congestion, experiencing an average of more than 30 minutes per day of congestion.

Across the entire Kansas/Arkansas network, upstream congestion averaged 0.12 percent or an average of 35 seconds per subscriber per day. The highest day was 0.28 percent and the lowest day was 0.01 percent. Some nodes experienced no upstream congestion, while the most congested portion of the market, comprising approximately one percent of the network, averaged six percent of congestion time throughout the trial.

As expected, upstream congestion most often occurred during the evening hours although congestion sporadically occurred during other parts of the day to a lesser extent. While the incidence of upstream congestion dropped to its lowest point during the early morning, typically around 5:00 a.m., the fact that congestion occurred in late evening hours suggests, not surprisingly, the use of unattended applications (such as P2P) running on computers after users likely have gone to sleep.

Traffic Shaping. Because the upstream congestion levels remained relatively low throughout most of the trial, there was a reduced need for the technology to be engaged. Only an average of 2.75 percent of the network experienced any congestion per day, and of that 2.75 percent, shaping was triggered for an average of slightly less than 53 minutes per day. The single day with the highest number of shaping minutes experienced 97 minutes of shaping. Over all portions of the network, shaping occurred an average of 0.11 percent of the time each day.

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such as a weather incident or the peak of online shopping season. Thus the congestion levels monitored did not reflect any unexpected network demands.

Notwithstanding the limited need for the congestion management tool to be invoked throughout the duration of the trial, Cox was able to confirm that shaping had a positive effect on upstream time-sensitive traffic such as gaming and over-the-top VoIP calls during moments of congestion. The trial results indicate that time-sensitive traffic increased from 39.95 percent of measured traffic to 50.92 percent of measured traffic,[60] a 25 percent increase in the amount of traffic generated by upstream time-sensitive applications compared to the pre-shaping, congested state just prior to shaping. This increase in throughput suggests that customers using one of the time-sensitive applications likely would have received a better experience when the congestion tool was activated.

Downstream Congestion. One of the surprising results of the monitoring part of the trial revealed moderate downstream congestion levels for a number of subscribers. Specifically, 59 percent of subscribers experienced some level of downstream congestion at some point during the trial—well in excess of the 8.5 percent of subscribers who experienced upstream congestion. Of the 59 percent of subscribers affected by downstream congestion, almost 10 percent experienced a material amount of congestion (defined by Cox as an average of 30 minutes per day). The downstream congestion issue will require further evaluation and a possible business solution.[61]

Customer Feedback. As part of the preparation for the launch of the trial, Cox notified each high-speed Internet customer in Kansas/Arkansas of the trial by either a letter or email dated January 28, 2009.[62] Cox discussed the trial openly with the media, numerous public

[60] Measured traffic is raw capacity minus network control traffic, commonly called network overhead.

[61] As disclosed when it announced the trial, Cox only engaged the congestion tool for upstream congestion events.

[62] While announced in January, the official start date of the trial was February 9, 2009 (as announced in the letters/emails to customers) and then with only two CMTSs. This first phase of deployment involved the installation of the equipment and a period of monitoring to assess the integration of the new hardware and software with the

interest groups, and policy makers who were interested in the technology. All parties, including customers, were encouraged to submit feedback on the trial and its impact on their experience via a dedicated email box (coxmessage@cox.com).

Fewer than 0.05 percent of customers in the market contacted Cox about the trial, and nearly all of the contact occurred prior to the full implementation of the congestion management tool. Oddly, Cox received some input from individuals located outside of the trial system. When the input was analyzed, it appeared that approximately 0.00009 percent of the subscriber base was supportive of Cox's efforts to manage congestion, 0.00019 percent wanted additional information or were neutral, and 0.00022 percent expressed disagreement or concern with the approach. The remaining 99.95 percent of customers did not contact Cox, and there was virtually no contact from customers after the trial began or after the shaping policy was applied. The relative silence suggests that Cox struck a reasonable balance in applying a congestion management tool in a manner that was not disruptive to customers and, based on our results, qualitatively improved the customer experience during periods of congestion.

B. The Commission's Policies Must Afford Network Operators a Presumption of Reasonableness to Freely Experiment With New Congestion Tools and to Implement and Adopt Innovative Network Management Technologies

The results of the Cox trial highlight the need for the Commission to afford broadband Internet access providers a presumption of reasonableness so that they can develop network management techniques that best meet the needs of their customers. This is particularly necessary if the Commission wants to encourage the further deployment of broadband and the development of increasingly advanced applications and services.[63] The Commission must

existing network. Once the network configuration was secure, the system was launched in monitoring mode only, *i.e.*, without shaping. The trial concluded in early October 2009.

[63] *See generally A National Broadband Plan For Our Future*, Notice of Inquiry, 24 FCC Rcd 4342 (2009).

recognize that the increased sophistication of advanced services and the corresponding customer demand – along with the bandwidth that supports these services – inherently requires evolving and dynamic network management technologies. As touched on above, the Commission's approach under the *Policy Statement* generally has been a success for customers, application and content providers, and network operators. New rules or actions that inhibit providers from freely testing and implementing new congestion tools would inevitably upset the way broadband providers look at investing and innovating in their broadband networks of the future.

With its trial, Cox was able to learn more about its network, and those findings will enable the company to continue to innovate and invest in a more efficient and customer-centric manner. In particular, Cox thought that it had more of an upstream congestion problem at the time. With the ability to conduct a trial, Cox now has additional insight into the network and realizes that – notwithstanding its recent network upgrades – downstream congestion in fact may be a greater issue for its broadband customers.[64] Simply put, the flexibility to conduct such trials inures directly to the benefit of subscribers and the application and content providers who need increased bandwidth to develop next generation services.

But Cox can also attest from its own experience that broadband service providers will be chilled in experimenting with new network management technologies and tools as long as the Commission does not afford them an express presumption of reasonableness. The dynamic and

[64] When Cox first considered a trial, it was most concerned about the dramatic growth of P2P traffic and the impact of that traffic on the upstream portion of the network. Indeed, the congestion management tool selected for the trial primarily was designed to address the upstream problem. As emphasized throughout these comments, consumer use of the Internet is highly dynamic and constantly evolving. Looking at the results of the trial, it now appears that P2P use may be mitigating and so, at least for today, Cox does not currently see the need to use the trialed technology as a congestion management tool. Notably, as streaming video continues to grow, it is clear that downstream congestion already is an issue and will become a greater problem in the very near future. Cox will continue to evaluate congestion across all of its markets to identify an appropriate business solution; but, it has decided not to deploy the congestion tool on the downstream today in part because of the uncertain regulatory environment surrounding network management practices and the lack of a presumption of reasonableness for broadband providers deploying new technologies.

competitive environment of the broadband market today ensures that, with appropriate disclosure, the motivations of network operators implementing such tools will be clear and subject to scrutiny. But unfortunately for broadband customers, the current attitude towards network management seems to presume that broadband network operators are "guilty" whenever they seek to implement a new congestion tool[65] – a dynamic that makes them increasingly reluctant to innovate and invest in this critical aspect of their network.

In discussing a proposed nondiscrimination rule in the *NPRM*, the Commission states its "intent to provide industry and consumers with clearer expectations, while accommodating the changing needs of Internet-related technologies and business practices."[66] If the Commission truly wants to provide the industry with "clearer expectations," it should offer specific protections for network operators testing and implementing new network management technologies. Specifically, the Commission should establish a presumption that properly disclosed network management practices are reasonable, rebuttable only by evidence that the management tools are an artifice for anti-competitive conduct.

There is no "book" on broadband network management. What is written today will be outdated tomorrow by the launch of the next BitTorrent, YouTube, or Facebook. Cox does not maintain that the congestion tool it trialed is the only, or necessarily the best, approach to managing congestion, but it strongly believes that the flexibility to work with new and innovate network management technologies is critical to the success of future broadband services. Given

[65] *See NPRM*, 24 FCC Rcd at 13092 ¶68 ("Supporters of open Internet policies contend that market forces alone are unlikely to ensure that broadband Internet access service providers will discriminate in socially efficient ways and that, absent regulation, such discrimination is likely to change fundamentally the nature of the Internet, reduce competition, and hinder innovation and growth."). Even the Commission appears to endorse this idea: "Even where there is effective competition in the Internet access market, individual broadband Internet access service providers may charge inefficiently high prices to content, application, and service providers, even though it may be in the collective interest of all providers to charge a lower price or zero price in order to maximize innovation at the edge of the network and thereby increase the overall value of broadband Internet access." *Id.* at 13093 ¶69.

[66] *NPRM* at 13105 ¶108.

the lack of any demonstrated network management harm, the Commission would be well served to ensure that the regulatory environment encourages providers to continue to innovate, but without the obligation of securing prior approval from policymakers.

VI. CONCLUSION

The Commission's commitment to a data-driven decision-making process is laudable and welcome.[67] The broadband industry has long valued similar data-driven processes in its relations with consumers: to test products before they are released; to implement service parameters that ensure quality of experience for its consumers; and to respond quickly to errors. Without the flexibility to pursue these data-driven processes, industry innovation and the customer experience will suffer. Thus, as the Commission considers this proceeding, it should be especially mindful of any action that could undermine the integrity of these consumer-oriented practices.

Respectfully submitted,

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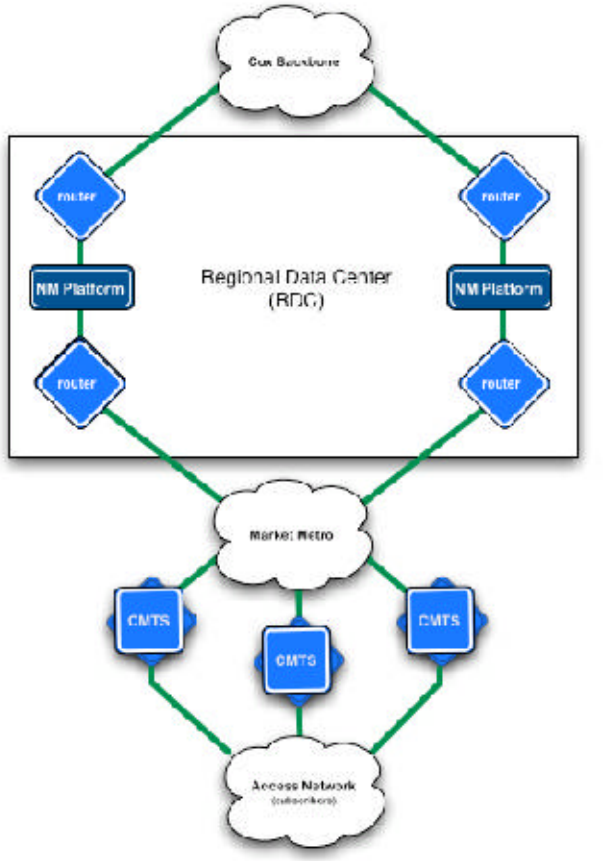
[67] Julius Genachowski, Chairman, Federal Communications Commission, Remarks to the Staff of the Federal Communications Commission, at 4 (June 30, 2009) ("Our policy decisions will be fact-based and data-driven.").

APPENDIX A: DESCRIPTION OF THE CONGESTION MANAGEMENT SYSTEM

The Cox broadband network is much like any other hybrid fiber-coax ("HFC") network. The Cox subscriber's cable modem is attached to the network via a coaxial cable which then connects to an Optical Node. The Optical Node is then connected via fiber optic cable to a Cable Modem Termination System ("CMTS"). A CMTS has multiple Optical Nodes connected to it, with each connection referred to as an interface. There are both upstream and downstream interfaces. This part of the network is commonly referred to as the Access Network.



The CMTS then is connected to additional routers that transport data throughout the local market. Fiber optic cables are also used to connect these routers. This part of the network is referred to as the Metro Area Network ("MAN").

Finally, the MAN is connected to the Cox Backbone network through a series of routers that reside in the market's Regional Data Center ("RDC"). It is within the RDC that Cox has deployed its network management ("NM") platform.

The NM platform is comprised of network hardware that resides in the RDC and through which all traffic entering and leaving the market must pass. The NM platform is "intelligent" in the sense that it is aware of which CMTS upstream and downstream interface each subscriber is on and what IP address each subscriber is assigned, which makes the platform "subscriber and topology aware." Furthermore, the NM platform knows the maximum speed of each CMTS upstream and downstream interface – which makes the NM platform "congestion aware." Lastly, the NM platform is protocol aware. Protocol awareness is derived by analyzing the traffic as it passes through the NM platform. Thus, the NM platform can determine in real time what CMTS interfaces are congested and what protocols are responsible for the congestion. This collective network intelligence will greatly aid in network planning and customer protection.

The network intelligence also enables the NM platform to employ algorithm-driven traffic shapers. These traffic shapers are based on two broad categories of traffic: Time Sensitive ("TS") and Non-Time Sensitive ("NTS"). TS traffic is defined as traffic that is real-time in nature and intolerant of latency, packet drops, or jitter. NTS traffic is defined as traffic that is tolerant to latency, packet drops, and jitter.

For the trial, the policy that initiated the interaction between the traffic shapers and the traffic categories (TS/NTS) was based upon the following engineering guidelines.

- Congestion occurs when an interface reached 65 percent of raw capacity.
- Only NTS traffic will be shaped.
- NTS traffic will always receive at least 25 percent of raw capacity.

The traffic optimization logic for the policy in this trial then follows: When total traffic (TS + NTS) on an interface is less than 65 percent of raw capacity, the NM platform takes no action. When total traffic is greater than or equal to 65 percent, the NM platform begins shaping the NTS traffic to bring total interface utilization under 65 percent, while also monitoring NTS traffic to ensure it does not fall below 25 percent. Of note, the NM platform never shapes TS traffic. If total utilization remains above 65 percent after NTS traffic is shaped, normal TCP/IP congestion control functionality applies, resulting in the delay or dropping of TS and NTS packets. However, this TCP/IP functionality should happen much less frequently with this approach to network management.