Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
International Comparison and Consumer Survey Requirements in the Broadband Data Improvement Act	)	GN Docket No. 09-47
	)	
A National Broadband Plan for Our Future	)	GN Docket No. 09-51
	)	
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, as Amended by the Broadband Data Improvement Act	)	GN Docket No. 09-137

COMMENTS OF GOOGLE INC. – NBP PUBLIC NOTICE #1

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August 31, 2009

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COMMENTS OF GOOGLE INC. – NBP PUBLIC NOTICE #1

Google, Inc., by its attorneys, files these comments in response to the Federal Communication Commission's ("FCC" or "Commission") Public Notice seeking comment on the definition of "broadband" for purposes of developing the National Broadband Plan[1] (the "NBP"), pursuant to the American Recovery and Reinvestment Act of 2009.[2] Google agrees that

[1] *A National Broadband Plan for Our Future,* NBP Public Notice #1, DA 09-1842, Released August 20, 2009 ("NBP Public Notice #1"). *See also A National Broadband Plan for Our Future,* Notice of Inquiry, 24 FCC Rcd. 4342 (2009) ("NOI"). These comments generally follow the structure of NBP Public Notice #1. The FCC's questions are in *italics* and are followed by our responses.

[2] American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115 (2009) ("2009 Recovery Act"); *see also Comment Sought on International Comparison and Consumer Survey Requirements in the Broadband Data Improvement Act*, Public Notice, 24 FCC Rcd. 3908 (2009); *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such*

to ensure "every American has access to broadband capability," it is important to establish benchmarks for measuring progress and meeting that goal.[3] As many have noted, the NBP has the potential to stimulate our country's economy, drive user innovation and exploit the immense potential of the applications and functionality that broadband platforms support. No step in the development of the NBP is more critical than first appropriately defining key terms, including the definition of broadband.

INTRODUCTION AND SUMMARY

While "broadband can be defined in myriad ways,"[4] it is vital to reach agreement and a common understanding of what broadband is, and why we care about it as a public policy matter. Practically speaking, broadband serves as a physical platform for connecting people, transporting data, and enabling highly desirable emergent properties.

Put simply, broadband is infrastructure. The begged question is why there appears to be such a struggle to define broadband with more precision. After all, how do we define other forms of physical infrastructure, like a road or an electric grid? There we look at the number of highway lanes, or the number of transmission lines, to know what amount and types of traffic can be supported. In the case of broadband, however, focusing exclusively on more quantifiable metrics, like the throughput or the medium employed, tends to miss the essence of the overall system. A broadband platform is a complex network, which as a whole is greater than the sum of its parts. Ultimately what interests us about broadband is not what it is, but what it enables.

Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act, Notice of Inquiry, FCC 09-65 (rel. Aug. 7, 2009).

[3] 2009 Recovery Act § 6001(k).

[4] NOI at ¶ 15.

Importantly, broadband is not the Internet, or even access to the public Internet. The network layers model serves us well here.[5] Pursuant to this well-defined and accepted architectural framework, broadband constitutes the lower layer network activities provided by communications carriers, while "the Internet" is the upper layer activities supplied by users, such as applications and content providers. Internet service providers ("ISPs"), operating at the logical layer, typically provide consumers with access to the public Internet, utilizing last mile, middle mile, and backbone communications facilities, as well as access to stored information hosted on an array of servers. Under this approach, then, broadband is the physical connective pathway that allows consumers to reach the Internet and utilize its capabilities. Online applications and content (including but not limited to access to the public Internet) can be viewed as "riding on top of" broadband networks. In these comments, we will refer to "broadband Internet" or "Internet over broadband" when describing this joint functionality.[6]

The distinction between physical infrastructure (broadband platforms) and the services broadband enables (a host of human activities) is crucial. Policymakers should have different policy goals, and different policy priorities, geared towards broadband platforms and broadband

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[5] Richard S. Whitt, *Evolving Broadband Policy: Taking Adaptive Stances to Foster Optimal Internet Platforms*, 17 COMMLAW CONSPECTUS 417, 429-431 (2009); Richard S. Whitt, *A Horizontal Leap Forward: Formulating A New Communications Public Policy Framework based on the Network Layers Model*, 56 FED. COMM. L.J. 587, 653-62 (2004) (explaining the utility of a network layered model for analyzing broadband-related policy issues); Kevin Werbach, *A Layered Model for Internet Policy*, JOURNAL OF TELECOMMUNICATIONS AND HIGH-TECH LAW, Vol. 1, 37 (2002).

[6] Notably, broadband infrastructure can be harnessed for services and applications other than access to the public Internet. For example, broadband can serve as a conduit for managed network service offerings utilizing virtual private networks ("VPNs"). Broadband also can deliver proprietary streaming video content, and support other applications that do not necessarily utilize the public Internet. Though these functions may not involve access to the public Internet, they may all well employ the Internet Protocol ("IP") as the Layer 3 transmission medium. IP, of course, is merely software routing protocol that underlies the Internet, and not itself the Internet.

services. A regulatory agency's legal authority also may be tied to specific network layers. For purposes of this proceeding, and the promotion of a sound NBP, the Commission's broadband public policy should be to promote a means of unencumbered access to the public Internet and all its richness for every American.

To reach this goal, the FCC should adopt a single essential set of characteristics to define broadband. Section 706 of the Telecommunications Act of 1996 is instructive as it embodies an evolving standard that focuses on user functionality to define "advanced telecommunications capability": "high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video telecommunications using any technology."[7] Similarly, here, the FCC should find that broadband means a high-quality, "always on," packet switched, technology-neutral, high speed communications transmission platform. This platform further should allow users to harness the Internet, access and upload content, and otherwise engage in high-speed two-way connectivity and interactivity. When used as an optimal Internet platform, broadband – like most forms of basic infrastructure – is most likely to generate a myriad of positive externalities.

DISCUSSION

I. FORM, CHARACTERISTICS, AND PERFORMANCE INDICATORS

- *The form the definition of broadband should take; whether to develop a single definition, or multiple definitions; the key characteristics and specific performance indicators that should be used to define broadband:*

Google proposes a single, essential set of characteristics to define broadband. As a threshold matter, the FCC should clarify that broadband is not the Internet, or even access to the Internet. The FCC should also ensure that the following baseline characteristics are present in

[7] 47 U.S.C. ¶ 157 nt.

defining infrastructure as broadband: a high-quality, "always on," packet switched, technology-neutral, high speed communications transmission platform that allows users to harness the Internet, access and upload content, and otherwise engage in high-speed two-way connectivity and interactivity. The FCC should further make clear that there must a sufficiently robust connection to permit users to receive, generate and interact with voice, data, graphics and video, which will enable users to receive the maximum value of broadband.

Broadband should be defined to ensure that Americans have access to speeds that enable full utilization of broadband services and applications. Using a target residential broadband benchmark that evolves over time, the FCC will be best able to take into account technology that currently exists, while keeping an eye towards future requirements of broadband applications and services. Indeed, it is almost certain that what Americans perceive as "robust" broadband capabilities today will become outdated before long (after all, 56 kbps once was considered "robust"). Today we cannot predict how and when technological breakthroughs will bring capacity and related improvements, or what future broadband applications will require. To ignore the future, however, would essentially "hem-in" applications innovators to the current requirements of broadband Internet and today's applications, and inevitably would deter the development of new and improved ways to further usage and enhance the value of broadband.

Greater symmetry of speeds and throughput is also fundamental to enabling Americans to use broadband for much more than one-way entertainment. Connections allowing proportionately more upload bandwidth than typically offered today can foster home businesses, enhance telecommuting opportunities, and enable individuals to become publishers of bandwidth-rich content such as videos and interactive applications. As individuals are

empowered to exploit their high-speed connectivity fully, ideas and innovation will grow in novel ways.

As such, Google proposes that the FCC establish a national residential broadband goal that will enable America to emerge as a worldwide leader of broadband platform performance levels. In our comments in the NBP proceeding, we suggested a symmetrical standard of 5/5 Mbps as a national benchmark. Others have suggested more aggressive, but still attainable goals.[8] There are, however, other possible ways to set nationwide goals. For instance, according to statistics released by the Organization for Economic Co-operation and Development ("OECD"), the average advertised broadband connection speeds of the top 10 highest ranking countries is approximately 177 Mbps,[9] and the average advertised download speed of the top 10 highest ranking countries is approximately 34 Mbps.[10] While these speeds may be viewed as ambitious initial goals, it is highly likely that these broadband targets and high capacity levels will be necessary over the course of the next decade and beyond.

Just as important to establishing broadband definitions and benchmarks, however, is for the FCC to establish an overarching framework for the NBP that considers three key broadband dimensions: (1) Is there ubiquitous *access* to affordable broadband infrastructure for Americans?; (2) Do the deployed broadband facilities have sufficient *capability and capacity* to

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[8] *See, e.g.,* GN Dkt. 09-51, Comments of Cisco at 10 (FCC should aspire to ensure all Americans have access to a connection offering 100 Mbps both upstream and downstream) (Jun. 8, 2009).

[9] *See* Organization for Economic Cooperation and Development, Broadband Portal, *"Fastest advertised connection available among all surveyed operators, by country, Sept 2008," available at* http://www.oecd.org/sti/ict/broadband. While the OECD statistics are based on advertised speeds, the NBP should ensure that any metrics are based on the actual speeds (both peak and non-peak) available to consumers. Further, the OECD statistics are used here as reference points only and to demonstrate that for America to become a world leader in broadband, it must aim as high – and eventually higher – than the currently top ranked countries.

[10] *See id., "Average advertised broadband download speed, by country, kbit/s, Sept 2008."*

provide consumers with robust access to the Internet and other broadband service functionality?; and (3) How *open* is the "Internet over broadband" connectivity?

First, to assess the availability of physical broadband infrastructure to users throughout the country, the FCC should focus initially on last mile connectivity of all currently available technology platforms – wireless (unlicensed/licensed, mobile, fixed, and satellite), wireline, and cable. Notably, broadband availability and functionality are essentially local issues since it is the individual's broadband connection (including throughput speed, congestion, and capacity) and usage factors (including pricing, computer and Internet literacy) that impact the utility of broadband Internet services, not what happens on the aggregated national or state level. In this vein, the FCC should seek and utilize reliable and unbiased data from diverse sources of broadband availability data, including non-traditional sources such as community-based and private data surveys,[11] as well as traditional sources, including state and other federal data as well as industry reports.[12]

Second, the FCC must also discern whether available transmission capacity is sufficiently robust to allow users to access their choice of content, information, and applications. Policymakers should be particularly concerned when broadband connections slow or exhibit latency issues when users access particular content, video applications, online software, gaming

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[11] *See, e.g., John B. Horrigan,* Pew Internet & American Life Project, *Home Broadband Adoption 2008*, 3 (July 2008), *available at* http://www.pewinternet.org/~/ media/Files/Reports/2008/ PIP _Broadband_2008.pdf; *See, also,* e-NC, *Broadband Access in North Carolina*, *available at* http://e-ncbroadband.org.

[12] *See, e.g.,* Stephen J. Blumberg, *et. al,* National Health Statistics Reports, *Wireless Substitution: State-level Estimates From the National Health Interview Survey, January–December 2007* (Mar. 11, 2009) *available at* http://www.cdc.gov/nchs/data/nhsr/nhsr014.pdf; California Broadband Taskforce, *The State of Connectivity, Building Innovation Through Broadband* (Jan. 2008) *available at* http://www.calink.ca.gov/pdf/CBTF_FINAL_Report.pdf; NTCA 2007 Broadband/Internet Availability Survey Report (Sept. 2007) *available at* http://www.usdoj.gov/atr/public/workshops/telecom2007/submissions/228008.htm.

applications, or unaffiliated services. Such limitations dampen productivity, squelch innovation, and hinder the unencumbered dissemination of ideas. Accordingly, the FCC's measure of broadband must include an indicator of how robust the broadband infrastructure is in supporting access to the Internet.

Finally, the FCC should consider the degree to which the broadband platforms are open to the fullness of the Internet. This measure corresponds roughly to the concept of "network neutrality" that has been the source of much industry and political discussion. In the context of the NBP, Google believes the Commission should underscore the importance of this particular dimension, rather than necessarily determine the appropriate policy response at this juncture.

- *Whether an application-based approach to defining broadband would work, and how such an approach could be expressed in terms of performance indicators:*

Relying on the capacity requirements of one current application in the marketplace today in order to define broadband is not an optimal approach. Instead, the definition of broadband must evolve upwards over time, and it must be sufficiently comprehensive to include the functionality that incorporates a variety of different broadband applications. Thus, the Commission must define broadband with more rigor than would result from the capacity demands of a single application. Further, defining broadband with respect to just current applications would quite likely limit the utility of the definition to incorporate broadband capacity requirements of tomorrow's broadband "killer" apps, wherever and whenever they emerge.

Section 706 of the Telecommunications Act of 1996 can be instructive on this point. With Section 706(c), Congress chose the following evolving standard to define "advanced telecommunications capability": "high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video

telecommunications using any technology."[13] Section 706(c) is not articulated in terms covering just a single application, but rather requires "high-quality" services that enable subscribers to engage in bi-directional communications that would include a variety of modes, such as "voice, data, graphics, and video . . . ." The FCC should follow Congress' direction. For example, while the definition of broadband today should capture characteristics that would support near-real-time video IP applications today, the next iteration of the broadband definition should possibly include only those services capable of offering multiple high-definition video streams.

- *What segment(s) of the network each performance indicator should measure, such as the local access link to the end user, or an end-to-end path: The feasibility and verifiability of measuring different performance indicators:*

While middle mile and backbone facilities are no doubt important to our national broadband strategy and performance, it is the local access link that is the critical portion of the pathway to be measured in order to make a determination of whether the broadband baseline requirements and benchmarks are being met, and to assess the actual ability for consumers to access and utilize the Internet. The last mile user typically determines whether or not to download and to upload the content they desire, use online applications, or otherwise access and utilize the Internet's resources. A key metric that directly affects the broadband user's experience is the delivered speed versus the advertised "up to" speed. Measurement tools for users, including those provided by Measurement Lab ("M-Lab")[14] and the BroadbandCensus.com efforts,[15] offer useful data on these metrics.

For example, M-Lab is an open, distributed server platform for researchers to deploy Internet measurement tools. Many researchers are already developing tools that allow users to

[13] 47 U.S.C. ¶ 157 nt.

[14] *See*, http://measurementlab.net/measurement-lab-tools.

[15] *See*, http://broadbandcensus.com.

test their broadband connections by briefly communicating with a server elsewhere on the Internet. Along with generating useful data for research, the tools provide individual users with a way to measure connection speed, analyze application performance, and run diagnostics. M-Lab supports four tools today, and the goal is to foster the development of a variety of tools that can measure broadband along several different dimensions, in order to advance research and empower the public with useful information about their Internet connections.

M-Lab demonstrates the promise that effective collaboration among public and private entities, including researchers and users, can have in this area. M-Lab was founded by a group of individual researchers, the New America Foundation's Open Technology Initiative, PlanetLab, and Google. The researchers provide the tools and underlying software environment, while Google has provided the initial infrastructure. The project is intended as an open, community-based effort and the founders are actively building partnerships with additional companies and institutions. Recently, the Hellenic Telecommunications and Post Commission (EETT), Greece's telecommunications regulator, along with the Greek Research and Technology Network (GRnet), announced that it would provide infrastructure for M-Lab, and incorporate its tools into the country's broadband mapping efforts.[16]

By using data from M-Lab and other similar efforts, the FCC will be in the best position to consider any needed steps regarding the speed and performance of last mile Internet connections.

- *How factors such as latency, jitter, traffic loading, diurnal patterns, reliability, and mobility should specifically be taken into account:*

In developing a broadband definition, the FCC should ensure consideration is given to any and all factors that reduce the quality of a broadband connection. Several technical factors –

[16] *See* http://www.eett.gr/opencms/opencms/admin/News/news_0954.html.

including latency, jitter, traffic loading, diurnal patterns, and reliability – can impact the user's overall broadband experience, depending on the application. For example, a broadband platform that introduces unacceptable levels of latency, jitter and unreliability can severely degrade the quality and suitability of broadband applications that combine voice communications or voice-based services or even the functionality of online business applications. For these reasons, the technical qualities of the broadband platform should support the provision of voice and data services and be of sufficient quality to allow inline applications to perform well. Just as Congress in Section 706(c) requires "advanced telecommunications capability to be "high quality" services, so should the FCC define broadband to include minimum technical criteria that permit the transmission of "high-quality" voice and data services across the broadband platform.

Moreover, broadband should be provisioned in a manner that avoids, or at least minimizes, the impact on the broadband user's transmission experience due to time-of-day congestion. To do so, the FCC may wish to consider adding an element to the broadband platform definition that includes the aggregation services used to support the last mile platform are sufficient to support the broadband "last mile" services sold. These "middle mile" services between the last mile and the IP backbone have become increasingly important to support a high-population broadband network, and must, therefore, be fully adequate and reliable to handle a growing amount of bi-directional broadband usage by all Americans.

- *Whether different performance indicators or definitions should be developed based on technological or other distinctions, such as mobility or the provision of the service over a wired or wireless network:*

The FCC should recognize that there are distinguishing characteristics currently among different technologies that enable consumers to access the Internet, such as differences in speeds, scalability, and other factors between wired and wireless services. At the same, the FCC should

define broadband for purposes of the NBP, the baseline requirements and characteristics, in the same manner for all platforms: a high-quality, "always on," packet switched, technology-neutral, high speed communications transmission platform that allows users to harness the Internet, access and upload content, and otherwise engage in high speed two-way connectivity and interactivity.

II. THRESHOLDS

- *What minimum thresholds should be assigned to the performance indicators; the minimum thresholds necessary for broad classes of applications to function properly; whether we should adopt multiple, escalating tiers of minimum thresholds:*

As discussed above in the Form, Characteristics and Performance Indicators section, the minimum threshold must initially be a packet switched, "always on" connection that enables users to use fully a varying array of applications. As noted, the FCC must incorporate an evolutionary aspect into its definitions so that market, technological and other factors can be encompassed as they drive change.

III. UPDATES

- *What ongoing process should be put in place to update the definition, particularly the threshold levels; how often should such updates occur; what criteria should be used to adjust thresholds over time; how modifications over time to the definition will affect the Commission's ability to collect and publish meaningful data on broadband deployment and adoption:*

The Plan should establish a continuing process of data collection, decision making, and metrics testing. The Commission should set deadlines of less than one year from all data requests for the FCC's initial data collection and examination, and then identify and initiate FCC initial policy actions and responses within the following twelve months. Once those policies have been established, the FCC should examine the marketplace results against reliable metrics in order to determine whether those policy shifts have yielded the expected results and progress. This cyclical process of data collection, policy course correction (if warranted), and evaluation

against reliable metrics should become a continuous and periodic FCC regimen. This way, the agency will be well-positioned to tailor recommendations to the evolving and dynamic nature of broadband, gather any additional information, and exercise a strong leadership role.

To evaluate whether broadband capacity is sufficiently robust to serve all Internet user needs, it is essential to understand how user demand affects deployment and provisioning decisions. For this reason, the NBP should also include data on usage and demand metrics to determine how much broadband capacity consumers are actually demanding, and using, and consider this data in adjusting goals and benchmarks.

On an ongoing basis, the NBP must also consider the impacts of capacity and usage restrictions, as well as proprietary devices and interfaces that affect broadband utility (*e.g.*, cable set top boxes), and similar provisioning practices. The FCC should examine carefully whether these and other broadband practices encourage Internet over broadband usage, whether they are detrimental and inhibit broadband usage, and/or whether they demonstrate a possible competitive market failure. For example, do open connection devices better meet consumers' needs and expectations and drive demand? Do proprietary devices and equipment have a negative impact on Internet connectivity or on innovation in the applications marketplace? Are capacity caps (or even the threat of usage caps) affecting users' behaviors, and in what ways? Do usage patterns vary based on whether the connection is wired or wireless? Depending upon the data that emerges in answers to these questions, the FCC may seek to adjust its NBP benchmarks and take other policy steps. Thus, while 5 or even 10 Mbps symmetric broadband capacity may be a sound initial target, the FCC may find that market and technology developments warrant a reassessment or further detail regarding how broadband practices impact how this capacity is made available to users.

CONCLUSION

Developing a sound National Broadband Plan – with a forward-looking, iterative process to allow it to evolve with market and technology forces – is a complex task. The Commission requires current and thorough data as a starting point, along with a strong vision of where we can go, and a high degree of flexibility to adapt to the myriad of future opportunities. By focusing on the three interrelated dimensions of universal connectivity, robust Internet access, and user openness and choice, and with broadband baseline requirements and benchmarks set against these dimensions, the FCC will help ensure that our growing yet still constrained virtual world fully meets the challenges of the 21st century.

Respectfully submitted,

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