Japan's Co-Regulatory Approach to Net Neutrality and its Flaw: Insufficient Literacy on Best-Effort QoS

Toshiya JITSUZUMI (*)
Kyushu University, Japan

Abstract: With the boom in bit-intensive and live streaming content in the broadband Internet ecosystem, the phenomenon of increasing and persisting congestion on the Internet is no longer a mere engineering possibility, but a grave and imminent reality in developed nations. To deal with this problem, "network neutrality" has become the focus of discussion among operators, academics, telecom regulators, and various interest groups in recent years. From an economic viewpoint, this problem is nothing but a combination of a congestion problem with a limited network capacity and the potential for anti-competitive behaviors by dominant Internet service providers (ISPs). Thus, from a theoretical viewpoint, it is not difficult to develop a set of "optimal" solutions. However, since the development and execution of such policy must take into account the ever-developing broadband ecosystem and changing market conditions, each telecom authority must develop its own solution. In Japan, where competition rules have successfully maintained competitiveness in the retail ISP market, the Ministry of Internal Affairs and Communications (MIC) has introduced a co-regulatory approach that focuses on congestion control. However, it is flawed in that it lacks sufficient participation from the demand side. Using a web-based questionnaire, the author discusses the remaining missing piece in Japan's efforts to address net neutrality issues, that is, possible government action to disseminate relevant QoS information to individual subscribers.

Key words: net neutrality, best-effort, QoS, co-regulation, Japan's approach.

The rapid development of information and communication technology has facilitated Internet use considerably. In particular, with the expansion of broadband Internet, consumers have benefited from an ever-increasing number of applications that enable various activities, leading to the improvement of social

(*) Acknowledgements: I am grateful for a grant from the Abe Fellowship Program administered by the Social Science Research Council and the American Council of Learned Societies in cooperation with and with the funds provided by the Japan Foundation Center for Global Partnership, from 2007 to 2008, which gave me my first opportunity to research network neutrality. This study was also supported by Grant-in-Aid for Scientific Research (C) No. 22530230 from the Japan Society for the Promotion of Science.

welfare. In response to strong demand from users, network operators and Internet service providers (ISPs) have been aggressive in network investment for capacity expansion. However, due to the much higher pace of demand growth, which comes from the boom in bit-intensive and live streaming content, the phenomenon of increasing and persisting congestion on the Internet is no longer a mere engineering possibility, but a grave and imminent reality that may harm the user experience. For example, congestion on the Internet forces users to wait longer to download content from distant servers and makes quality of service (QoS)-sensitive applications, such as Voice over Internet Protocol (VoIP) and online games, unusable. Rapid migration to the ultra-high-speed broadband environment - next-generation access and 4G mobile service - will motivate users to try out "richer" content and applications, thereby aggravating the congestion problem. Cisco (2011) stated, "Global IP traffic has increased eightfold over the past 5 years, and will increase fourfold over the next 5 years. Overall, IP traffic will grow at a compound annual growth rate (CAGR) of 32 percent from 2010 to 2015" (p. 1). Japan is no exception; according to the Ministry of Internal Affairs and Communications (MIC), as of November 2010, the total volume of download packets by Japanese broadband users had reached 1.71 terabits per second (Tbps), which amounts to 125.4% of the previous year's downloads (MIC, 2011). Fortunately, owing to massive investments in its Internet ecosystem, Japan has not yet experienced a traffic blackout. However, as early as 2007, the MIC reported that 90% of downloading capacity and 80% of uploading capacity were utilized during peak hours (MIC, 2007).

According to SPULBER & YOO (2009), "one of the distinguishing features of TCP/IP is that it handles packets anonymously on a ‘first come, first served' basis without regard to the application with which they are associated" (p. 383). Therefore, if the current broadband structure remains as it is, heavy users will clog up the system during peak times [1] and damage the Internet experience of all users, leading to an inefficient and unfair outcome. In addition, a market-dominating ISP could take advantage of this situation and harm competition by preventing its competitors from using "valuable" network resources; this is a serious competition issue. For example, by secretly throttling IP packets of competing ISPs or of unaffiliated

[1] The number of such heavy users is exceptionally small in comparison to the whole Internet population. According to Sandvine (2011), in North America, "the top subscribers continue to account for a disproportionate percentage of total subscriber consumption - almost half (49.7%) of upstream monthly usage originates with 1% of the subscriber base, and more than a quarter (25.13%) of downstream bytes are destined for 1% of subscribers" (p. 7).

contents and applications, an ISP can degrade the quality of such services and make its vertically integrated or affiliated content more attractive to subscribers. Unless its covert manipulation is revealed to users, the ISP will not be blamed for degraded QoS if it claims that it provides services under the best-effort standard and performs congestion management. If it has dominating power in a local market and certain conditions [2] are met, an ISP will have a strong incentive to engage in such anti-competitive behavior in order to earn a monopolistic rent. To address these potential harms, "network neutrality," a term coined by WU (2003) to connote the equal and fair treatment of Internet packets by ISPs, has become the focus of discussion among operators, academics, and telecom regulators in recent years.

From an economic viewpoint, as discussed in JITSUZUMI (2010), this problem is nothing but a combination of a congestion problem with a limited network capacity and the potential for anti-competitive behaviors by dominant ISPs; thus, it is not difficult to develop a set of "optimal" solutions. Discussions on this topic first attracted considerable attention in the United States, but similar discussions were held in other developed nations as well. For example, in Japan, the MIC issued policy reports in September 2007 and February 2009. The European Union adopted a new rule to address their network neutrality concerns in November 2009 and put it into practice in May 2011. However, the development and execution of such policy must take into account the ever-developing broadband ecosystem and changing market conditions; each telecom authority must develop its own solution. Indeed, the trend of traffic exaflood and ongoing business practices in the broadband ecosystem are common in many developed nations; however, owing to the unique industrial structure of broadband Internet, Japan's discussion has not followed the same path as discussions in the United States and the European Union.

The rest of this paper is organized as follows. Fundamental conditions that dictate the uniqueness of Japan's discussion and policy are explained in the 2nd Section. The 3rd Section identifies one of its flaws and its relationship with current business practices and users' literacy on Internet experience quality (hereafter called "QoS literacy"). The following Section describes Japan's situation concerning the best-effort standard and users' QoS literacy, using a web-based questionnaire survey. The Section after

[2] Such conditions are summarized in FARRELL & WEISER (2003) and van SCHEWICK (2007).

discusses possible government action to improve QoS awareness among broadband users, and the last Section concludes.

■ Japan's co-regulatory solution

Network neutrality solutions must address both traffic congestion under the capacity constraint and the anti-competitive behavior of dominant ISPs. Since competition rules in Japan have successfully dealt with competitiveness in the ISP market, the MIC has been able to focus solely on congestion control while addressing network neutrality issues.

In contrast with the United States, Japan's cable television industry has no significant presence in the broadband market. Instead, the incumbent telecommunications carriers, Nippon Telegraph and Telephone East Corporation (NTT East) and Nippon Telegraph and Telephone West Corporation (NTT West) (hereafter collectively called NTTEW), dominate the network market. According to the MIC (2008), as of March 2007, NTTEW physically owned 92.5% of broadband-capable access lines and, as of September 2007, had a share of 78.6% in the broadband access line wholesale market from which broadband access line providers acquired their inputs. [3] Meanwhile, cable companies had 5.4% of broadband-capable access lines and a 13.5% share in the broadband access line wholesale market. In response to the overwhelming dominance of NTTEW, the MIC has been practicing strong regulatory supervision over NTTEW's bottleneck businesses. For example, NTTEW cannot freely expand its scope of business, and is currently prevented from vertically integrating with ISP services. [4] In addition, because of NTTEW's massive share, the Telecommunications Business Law (TBL) stipulates that NTTEW must prepare nondiscriminatory "interconnection tariffs" for service-based

[3] Broadband-capable access lines are composed of optical fiber and metal cable, both of which can be used not only for broadband access but also for fixed phones and leased lines; the size of this market was 66.3 million lines as of March 2007. As of September 2007, 27.4 million lines out of these lines were employed in the broadband access line wholesale market for wholesale broadband access.

[4] It is true that its group companies, such as NTT Communications and NTT Plala, provide broadband ISP services; however, the MIC's regulation prohibits NTTEW from favoring these group companies. On May 26, 2011, the Diet passed a revision of NTT Law that somewhat deregulates the line-of-business rules. However, according to my interview with an MIC official, the basic structure of the rule remains the same and NTTEW has no more discretion than before.

competitors who seek to use their infrastructures.[5] As a result, purely service-based ISPs can cover the whole nation without making massive investments in physical infrastructure by using NTTEW's local IP network and unbundled local loops (ULLs).

Thus far, these measures have achieved success in curbing NTTEW's dominance in the retail market. Although Nippon Telegraph and Telephone Corporation (NTT) (2008) expressed its strong intention to expand its ISP business in its action plan, the shares of NTT groups in the broadband access and broadband ISP markets were only 49.1% and 29.1%, respectively, as of September 2007; both of these numbers are much lower than the broadband access line wholesale market figures.[6] This is quite a contrast with the United States, where market dominance in the physical layer is well preserved in the upper layer (Figure 1). Since there are no dominant ISPs who control the bottleneck facility, the Japanese ISP market has been very competitive. According to the MIC (2010), the top three large ISPs,[7] NEC Biglobe, NTT Communications, and Softbank BB, accounted for 56.4% of the market for large ISPs in 2010, and this figure has gradually been decreasing (Figure 2).

Owing to the industrial structure of broadband Internet, the Japanese discussion on network neutrality has developed quite differently from that in the United States. In particular, the MIC has been able to ignore the possibility of ISPs' anti-competitiveness as long as the current SMP regulations remain the same. Because of the competitiveness in the retail ISP market, a subscriber can always find an alternative service provider when his or her ISP abuses its power and damages his or her Internet

---

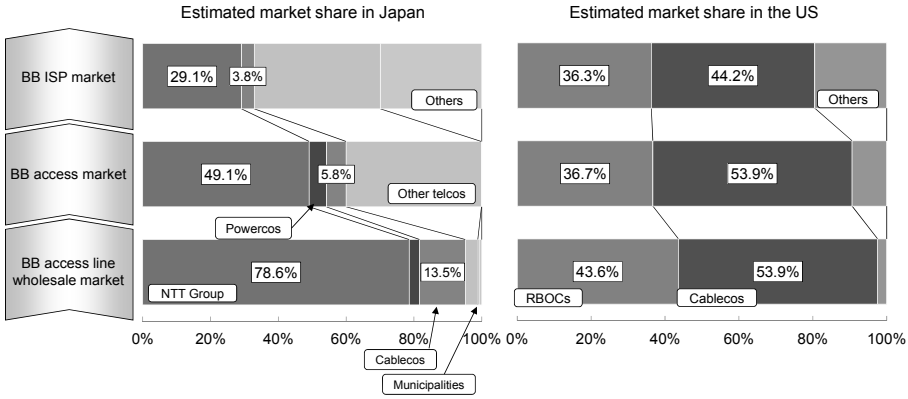
5 This is the core of Japan's dominant firm regulation, or significant market power (SMP) regulation, in the fixed telecommunications industry. Article 33 of the TBL requires a firm with more than 50% of fixed transmission facilities installed in a prefectural area (only NTTEW falls into this category currently) to file interconnection tariffs for MIC's approval, which includes a "cost-of-service"-based rate regulation. Further, it requires such a firm to make the interconnection tariffs public. As for mobile networks, similar but less stringent rules are applicable to firms that control more than 25% of mobile handsets in each prefecture (Articles 30 and 34). Currently, NTT DoCoMo, KDDI, and Okinawa Cellular are all under these mobile SMP rules.

6 However, it is not necessarily guaranteed that this situation will last in the upcoming ultra-broadband era. It is likely that the NTTEW's share of the broadband access market will increase in the future; as of March 2010, NTTEW had 34.8% of the shrinking ADSL market, whereas it had 74.4% of the currently expanding FTTH access market (MIC, 2010).

7 Large ISPs have more than 50,000 subscriber lines. There are 51 such ISPs, and the size of their market is 34.7 million contracts as of March 2010.

experience. From the ISPs' perspective, this possibility is a significant reason for investing in QoS improvements.

Figure 1 - Broadband markets in Japan and the US

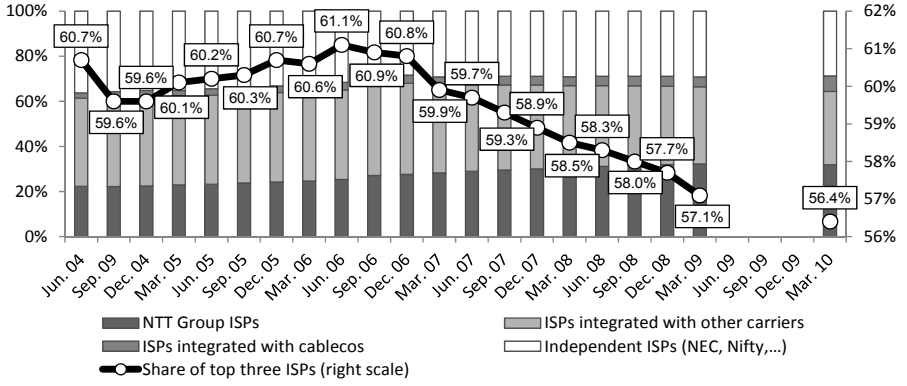


Note 1: ISP shares in the US are based on revenues in 2006 (NOAM, 2009), which include satellite Internet; the shares in other markets are based on the FCC's line count and include fixed lines only.

Note 2: RBOCs stand for Regional bell Operating Companies, telcos for telecommunications companies, powercos for power companies, and cablecos for cable companies.

Source: Created on the basis of MIC (2008), FCC (2008a, 2008b), and NOAM (2009)

Figure 2 - Long-term share trends in the Japanese broadband ISP market



Source: Created on the basis of MIC data (2008, 2009a, 2010)

Accordingly, MIC's efforts to resolve net neutrality issues have been focused on optimal congestion control. On September 19, 2007, after a 10-month-long discussion, the MIC's Working Group on Network Neutrality

issued a final report (MIC, 2007). In this report, network neutrality was defined as a situation in which the following three principles are satisfied (MIC, 2007, p. 7):

- *Principle 1:* Consumers are entitled to use IP-based networks flexibly and access the content/application layer freely.
- *Principle 2:* Consumers are entitled to connect to IP-based networks freely through terminals that comply with technical standards provided by laws and regulations, and these terminals may connect to each other flexibly.
- *Principle 3:* Consumers are entitled to use the communication layer and the platform layer free from discrimination at a reasonable price.

Considering that, unlike traditional "technological neutrality" and "competitive neutrality," network neutrality must address not only horizontal relationships among network operators but also vertical relationships with adjacent players such as content providers, the report proposed "fairness in network cost sharing" and "fairness in network use" as the two basic principles for addressing this new neutrality. For the first principle (fairness in network cost sharing), the report pointed out that "coping with rapid increases in traffic (network congestion) requires dynamic terminal-network collaboration and the flexibility to absorb fluctuations in traffic" (p. 23). Considering the dramatic increase in Internet traffic, the report evaluated several engineering solutions (including peer-to-peer (P2P), IP multicasting, overlay multicasting, content distribution networks, packet shaping, and capacity expansion) to alleviate traffic congestion. The report then analyzed how the cost of such solutions could be allocated to various stakeholders, and concluded that the MIC has been able to allow the markets to determine such an arrangement, since the wholesale ISP market in Japan was sufficiently competitive. [8] In addition, based on similar logic, the report stated that placing a surcharge on content providers [9] should not be considered a standard treatment, and should instead be left to voluntary negotiations among stakeholders.

[8] However, the report recommended a surcharge for heavy users from the viewpoint of the beneficiary-burden principle.

[9] Such an arrangement would contradict the so-called zero-price rule, which prohibits ISPs from charging anyone other than their own subscribers (HEMPHILL, 2008). NUECHTERLEIN (2008) defined this as a "strong" proposal for restricting access pricing. This "rule" is widely shared by network neutrality proponents as a policy to be maintained, and was reiterated in the Notice of Proposed Rulemaking (FCC 09-93), published by the Federal Communications Commission (FCC) in 2009.

Although the report recognized the effectiveness of packet shaping in dealing with particularly heavy users, it also recognized its anti-competitive potential to stifle competition, and suggested a two-stage approach:

- *1st stage:* Establish minimum rules (packet shaping guidelines) that include operating requirements based on the mutual consent of diverse stakeholders.

- *2nd stage:* Allow each ISP to set a specific policy based on the guidelines.

This method is a shift toward co-regulation, through which a regulatory body provides legal oversight to the private sector's collaborative effort. WERBACH (2009) proposed that because "the increasing decentralization and complexity of the network environment poses a challenge to the existing regulatory paradigm" (p. 189), actual standard-setting should be conducted in private discussions. Responding to this call from the MIC, ISPs and network operators organized a committee in September 2007 and presented the "Guideline for Packet Shaping" in May 2008 that set a voluntary standard regarding the shaping of packets and the disclosure of related information to subscribers (Japan Internet Providers Association [JAIPA] *et al.*, 2008; JAIPA *et al*., 2010). The Guideline declares the following:

- Increased traffic must be primarily dealt with by network investments or enhancing network capacity; packet shaping must be considered an exceptional measure.

- Packet shaping should be targeted solely at network congestion, the existence of which must be substantiated by objective data.

- In order not to jeopardize the secrecy of communication (Article 21 of the Constitution), ISPs must obtain the "clear" and "individual" consent of users, unless the practice can be considered a pursuit of lawful business (Article 35 of the Penal Code).

- To maintain fairness in use (Article 6 of the TBL), packet shaping must be nondiscriminatory and adequate, unless there are valid reasons for such treatments.

- ISPs must disclose their packet shaping information beforehand, as requested by the Guidelines for the Telecommunications Business Act Consumer Protection Rules. Since the packet shaping of a certain ISP might influence the entire broadband ecosystem, disclosure must be targeted at all stakeholders, including interconnecting ISPs and mobile virtual network operators (MVNOs).

In addition, the Guideline states that proper packet shaping must satisfy the "validity of means" criteria; for example, throttling a certain application that occupies excessive capacity is acceptable, but complete blocking is considered excessive. It also stipulates that throttling the traffic of heavy users does not violate the "fairness in use" principle as long as heavy users can experience the same actual speed that average users can.

Concerning the second principle (fairness in network use), the report mainly focused on the next generation network (NGN) of the dominant NTTEW. An NGN is a carrier-managed network that achieves both the flexibility of an IP-based network and the reliability of a traditional circuit-switching network by implementing intelligence within NGN, and can guarantee QoS and security. Therefore, an NGN can act as an equal or better substitute for the ordinary Internet; thus, if combined with market-dominating power, it may have the potential to change industrial organization and the rules of the game that are heavily dependent on the competitive collaboration of numerous ISPs. Declaring the need "to maintain an environment in which consumers can freely choose and use networks" (freedom to choose networks) (MIC, 2007, p. 8), the report offered several proposals to expand the current SMP regulation to deal with the possible vertical leveraging of NTTEW's dominant market power.

■ Insufficient user participation and QoS literacy

Considering that Japanese broadband users have not experienced a total blackout in the Internet or anti-competitive greed from dominant ISPs, it can be concluded that Japan's current effort to address net neutrality is working well. However, several flaws may undermine the entire framework of net neutrality solutions. Three most important are suboptimal user participation in the standard-setting process, lack of auditing and enforcement mechanisms, and insufficient attention to long-term efficiency. The rest of this section focuses on the first of these three flaws. [10]

Insufficient user participation in the guideline-setting process is a potentially serious problem. In order to lend proper authority to the Guideline under the co-regulatory approach, the participation of all related stakeholders is essential from the viewpoint of a democratic regime.

[10] For a comprehensive discussion on these three flaws, please refer to JITSUZUMI (2011b).

WERBACK (2009) emphasized the importance of open and fair participation in the standard-development process. In addition, such widespread participation is important to establish an efficient standard for packet shaping, because the decision regarding which packet should be delayed or cast out entirely must be made from both a technological and a socioeconomic perspective. For example, during peak hours, VoIP packets used by first responders should be given the highest priority, but telemarketers' VoIP packets can be delayed, although both of these IP packets are technologically identical. Economic theory states that the optimal "packet shaping" solution must give priority to the packets that bear the highest reservation prices. MACKIE-MASON & VARIAN (1994), for example, proposed a mechanism called a "smart market," in which every packet makes on-going and real-time competitive bidding for scarce network capacity; however, this is difficult to implement in the real world. On the other hand, while not theoretically perfect, including the subscriber's perspectives in setting standards is a more practical way to get closer to optimum resource allocation. However, the current signatories of the Guideline (JAIPA, Telecommunications Carriers Association [TCA], Telecom Services Association [TELESA], Japan Cable and Telecommunications Association [JCTA], and the MVNO Committee) represent only the side of network operators, and the MIC, which is supposed to represent the consumer side, is only an observer. According to my interview with a JAIPA staff member, content creators and data-center providers were invited to the discussion, but none of them showed sufficient interest in the process. Until now, this lack of participation by content creators and end users has been a prominent feature of network neutrality discussions in Japan.

The most important motivation for user involvement is a reward for participation; in this case, a possible reward can be the potential for QoS improvement in users' personal Internet experience. If end users understand that their actual QoS is far less than they expect, and that it can be improved if a different packet-shaping rule is adopted, they will be strongly motivated to become involved in the rule-making process. However, under the dominant business model in the broadband ecosystem, almost all retail broadband access is offered under the "best-effort QoS," in which subscribers only know that their actual QoS is somewhat less than the advertised upper limit, and ISPs do not usually provide real-time QoS information to individual subscribers. Even if a certain ISP reveals its QoS information, such information only indicates a local QoS within a respective network, which is not equal to the global or end-to-end QoS that subscribers really are concerned about. There are web-based speed testing sites that

allow individuals to measure the download speed between their terminals and speed testing host servers; however, its estimates may not be particularly helpful to individual subscribers because assumptions for such estimations do not necessarily match with subscribers' ordinary usage patterns. Moreover, as discussed later, such web-based services are not well recognized by Japanese users. The MIC requires ISPs to mention in their tariffs that they are offering best-effort services and that they do not guarantee a specific QoS; again, however, the data shows that this is not well understood by the public. As a result, ordinary subscribers do not have sufficient knowledge about what their actual QoS is, and therefore they have little motivation to participate in rulemaking.

Not everyone is quick to get interested in actual QoS once the related information is provided; some people are more ready to become QoS-conscious than others. Based on the responses to a Web-based questionnaire survey, JITSUZUMI (2011a) analyzed a variation of QoS sensitivity among various demographic groups and identified several factors that contribute to the improvement of QoS consciousness among Internet users in Japan. Jitsuzumi's study showed empirically that improving users' QoS consciousness would contribute to the solution of network neutrality problems.

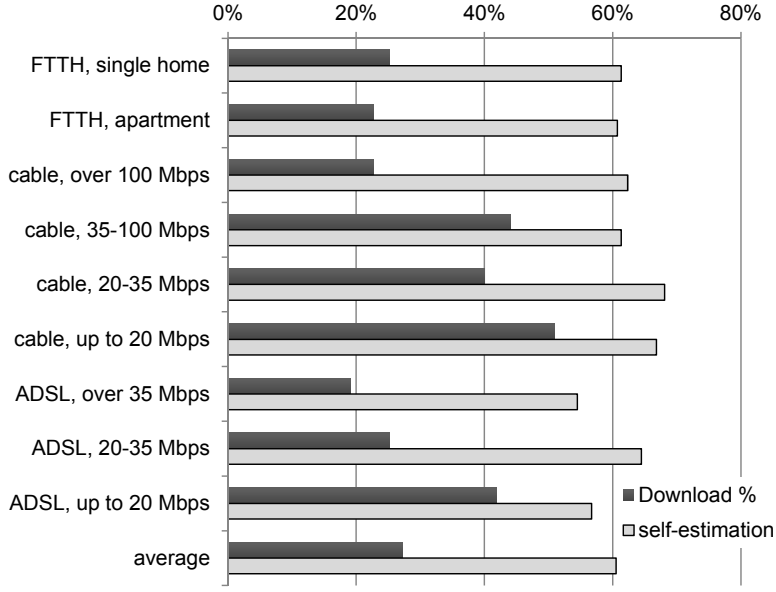
■ The *status quo* of the Japanese broadband market

In order to identify the actual QoS of the Japanese broadband market and end users' perception of best-effort QoS, the author conducted a Web-based questionnaire survey in January 2011. The survey period was from January 24 to 27, 2011; 768 valid responses were collected from 8,992 contracted monitors of Rakuten Research, Inc. The average age of the respondents was 44.5 years, and the average annual household income was 5.947 million yen. At the time of the survey, respondents had, on average, 129.5 months (10.8 years) of Internet experience, spent 22.1 hours per week on the Internet, and paid 4,668.7 yen per month for their Internet access. Among them, 472 respondents (61.5%) were FTTH users, 176 (22.9%) were ADSL users, and 100 (13.0%) were cable users. The share of FTTH users was 5.3 percentage points higher than the national average as of September 2010. [11]

[11] http://www.soumu.go.jp/johotsusintokei/field/data/gt010103.xls

All of the respondents' broadband contracts were offered under the "best-effort" condition, meaning they were almost certainly experiencing less than the advertised QoS. QoS is determined not only by actual download/upload speed but also by many other indices; however, BAUER *et al*. (2010) stated, "Although speed is not the only determinant of the technical quality of service, it is one of the important characteristics and is often positively correlated with other indices of service quality (e.g., latency, jitter, packet loss, etcetera)" (pp. 36-37). Therefore, owing to the importance and comparative simplicity in measurement of download speed, this paper considers it as the primary index of broadband QoS.

Figure 3 - Self-estimation *vs.* actual measurement



In the questionnaire, respondents were first asked to estimate their current download speed without checking it, and were then guided to the site of the Ookla speed test [12] to execute a speed estimation. On average, respondents thought they were receiving 60.5% of the advertised speed, but were actually experiencing only 27.4%, an almost two-to-one difference between estimated and actual speeds (Figure 3). Nearly all active mobile users (95.2%) said that actual speed is important for their Internet experience; however, Figure 3 shows that they did not have an accurate

12 http://www.speedtest.net/

idea of their actual speeds. The questionnaire results also show that 26.7% of respondents did not realize that their actual speed could be less than the advertised speed, and that only 26.6% had heard of and knew what "best effort" meant. Although the Guidelines for the Telecommunications Business Act Consumer Protection Rules (MIC, 2009b) require ISPs to notify subscribers about the best-effort feature of their service, only 27.2% of respondents recognized from their tariffs; of these, only two-thirds had read the description of it. Thus, it is not surprising that only 6.4% of the respondents measured their actual download speed more than once a month, while 38.3% never had.

■ Implications for governmental policy

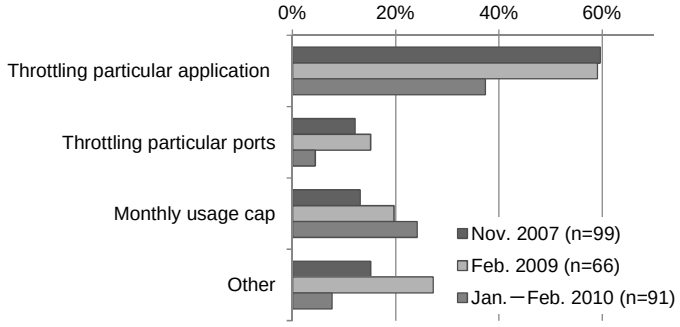
As JITSUZUMI (2011a) pointed out, insufficient QoS consciousness will hinder efficiency in the retail broadband market, in turn hampering the resolution of network neutrality problems. Alternatively, educating users and making them sufficiently QoS literate will bring market discipline to ISPs and ultimately help solve the network neutrality problem. Although this is a straightforward and efficient solution in the long run, it is extremely time-consuming and costly. Therefore, this solution by itself may not be able to resolve the problems in this fast-evolving industry in a timely manner. This is precisely the situation in which regulations on network neutrality must be introduced, even as merely a stopgap measure.

In this sense, even the regulatory-incomplete Guideline for Packet Shaping has performed an important role; it has worked not as a rule per se but as an illuminating document for the entire broadband ecosystem, especially for ISPs. Before the Guideline was set, ISPs engaged in fierce competition in the market without paying enough attention to "reasonable" traffic management. The Guideline was the first document with some authority to define "reasonable," and it has achieved some success in terms of educating ISPs. According to the MIC's questionnaire surveys conducted from 2007 to 2010, [13] ever since the Guideline was published, the share of firms that throttle specific applications such as P2P or restrict particular ports (both of which are not sound business practices according to the Guideline's

[13] http://www.soumu.go.jp/menu_news/s-news/2008/pdf/080317_1_bs1.pdf, http://www.jaipa.or.jp/other/bandwidth/report_2009.pdf, and http://www.jaipa.or.jp/other/bandwidth/1006_report.pdf.

standard), has significantly reduced and usage caps for heavy users have become increasingly popular (Figure 4).

Figure 4 - Types of traffic management practiced and considered

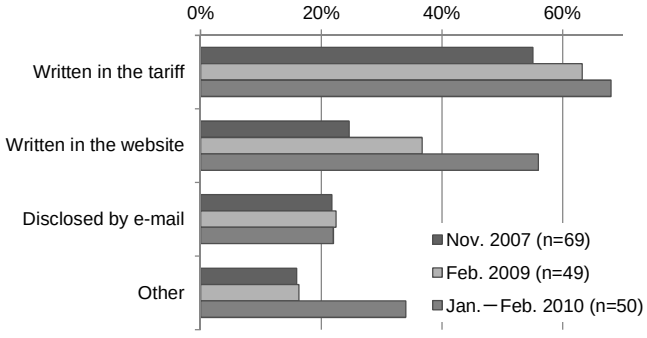


Note: Surveys other than those from Nov. 2007 are based on multiple-answer questions.

Source: Created on the basis of data from the URLs in footnote 13

On the other hand, because improving end users' QoS literacy remains the optimal way of resolving the network neutrality problem, we need to develop measures to improve QoS literacy. One such measure is introducing a mechanism that regulates the dissemination of relevant QoS information to user communities. Unfortunately, neither the Japanese broadband sector nor the Japanese government have been very successful in this respect; virtually no attempts to improve end users' QoS literacy have been made thus far, other than the Guideline, prepared by JAIPA *et al*., which has realized some increase in the disclosure of packet shaping practices to end users (Figure 5).

Figure 5 - Methods of disclosure on packet shaping



Note: The surveys are based on multiple-answer questions.

Source: Created on the basis of data from the URLs in footnote 13

Ideally, what QoS information is important for subscribers should be defined first and a QoS measurement system that is independent of or neutral toward any ISPs or network operators should be introduced. Since the most meaningful information for a particular end user is the end-to-end QoS data that reflects his or her ordinary usage pattern, we must ask each broadband user to install measuring software in his or her own PC, or to place a special machine [14] in his or her home network.

We must keep in mind, however, that disseminating QoS information is only the first step toward improving consumers' QoS literacy. In parallel, consumers must be properly educated about the meaning of "best effort" and how they can evaluate the QoS data of various ISPs. Considering the "public goods" feature of disseminating QoS information and improving the QoS literacy of broadband users, it is not reasonable for private sectors to bear these responsibilities exclusively. The author believes that in this situation, government action can be justified and that policymakers have to deal with this issue as soon as possible.

Table 1 - Recommendations of the NBP and USD

The National Broadband Plan	**Directive 2002/22/EC,** amended in Nov. 09 (Universal Service Directive)
Recommendation 4.3: The FCC, in coordination with the National Institute of Standards and Technology (NIST), should establish technical broadband measurement standards and methodology and a process for updating them. …	**Article 22 Quality of service** 1. Member States shall ensure that national regulatory authorities are, …, able to require undertakings … to publish comparable, adequate and up-to-date information for end-users on the quality of their services…
Recommendation 4.4: The FCC should continue its efforts to measure and publish data on actual performance of fixed broadband services. The FCC should publish a formal report and make the data available online.	2. National regulatory authorities may specify, inter alia, the quality of service parameters to be measured and the content, form and manner of the information to be published, …, in order to ensure that end-users, including disabled end-users, have access to comprehensive, comparable, reliable and user-friendly information. …
Recommendation 4.5: The FCC should initiate a rulemaking proceeding by issuing a Notice of Proposed Rulemaking (NPRM) to determine performance disclosure requirements for broadband.	3. In order to prevent the degradation of service and the hindering or slowing down of traffic over networks, Member States shall ensure that national regulatory authorities are able to set minimum quality of service requirements …
Recommendation 4.6: The FCC should develop broadband performance standards for mobile services, multiunit buildings and small business users.	

[14] One of such machines is the "White Box" from SamKnows; the FCC distributed 6,809 of these throughout the US in 2010. A summary of the findings from this initiative is available in FCC (2011).

On the basis of the above discussion, several recommendations of the FCC National Broadband Plan (NBP), [15] particularly Recommendations 4.3 through 4.6, as well as Article 22 of the EU Universal Service Directive (USD), [16] can be positively evaluated as an attempt to build a concrete foundation for improving QoS literacy; these may ultimately contribute to solving the network neutrality problem (Table 1). Ofcom's Voluntary Code of Practice: Broadband Speed [17] is another approach toward the same goal.

Conclusion

This paper summarizes the background and unique features of Japan's approach to the network neutrality problem, and identifies insufficient user participation as one of its critical flaws. A web-based questionnaire showed that Japanese broadband users' QoS literacy is not sufficient, and indicated that Japan's regulatory-incomplete attempt at a network neutrality solution did contribute somewhat to the improvement of ISPs' awareness of reasonable congestion management practices. The next step is to disseminate relevant QoS information to individual subscribers. This will motivate them to participate in the rule-making process, which will help correct a flaw in Japan's co-regulatory solution.

15 http://download.broadband.gov/plan/national-broadband-plan.pdf

16 http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2009:337:SOM:EN:HTML

17 http://stakeholders.ofcom.org.uk/binaries/telecoms/cop/bb/copbb.pdf

References

BAUER, S., CLARK, D. & LEHR, B. (2010): *Understanding broadband speed measurements*.
http://mitas.csail.mit.edu/papers/Bauer_Clark_Lehr_Broadband_Speed_Measurements.pdf

Cisco (2011): *Cisco visual networking index: Forecast and methodology, 2010–2015*.
http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481360.pdf

FARRELL, J. & WEISER, P. J. (2003): "Modularity, vertical integration, and open access policies: Towards a convergence of antitrust and regulation in the Internet age", *Harvard Journal of Law & Technology*, 17(1), 85-134.

Federal Communications Commission:
- (2008a): *Local telephone competition: Status as of December 31, 2006*.
http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-279231A1.pdf.
- (2008b): *Local telephone competition: Status as of June 30, 2007*.
http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-280906A1.pdf.
- (2011): *Measuring broadband America: A report on consumer wireline broadband performance in the U.S*. http://www.fcc.gov/document/measuring-broadband-america-report-consumer-broadband-performance-us

HEMPHILL, C. S. (2008): "Network neutrality and the false promise of zero-price regulation", *Yale Journal on Regulation*, 25(2), 135-179.

Japan Internet Providers Association, Telecommunications Carriers Association, Telecom Services Association & Japan Cable and Telecommunications Association (2008): *Guideline for packet shaping* (in Japanese).
http://www.jaipa.or.jp/other/bandwidth/guidelines.pdf.

Japan Internet Providers Association, Telecommunications Carriers Association, Telecom Services Association, Japan Cable and Telecommunications Association & MVNO Committee (2010): *Guideline for packet shaping* (revised).
http://www.jaipa.or.jp/other/bandwidth/1006_guidelines_e.pdf.

JITSUZUMI, T.:
- (2010): "Efficiency and sustainability of network neutrality proposals", in A. Gentzoglanis & A. Henten (Eds), *Regulation and the evolution of the global telecommunications industry*, pp. 253-272, Cheltenham, UK: Edward Elgar Publishing.
- (2011a): "An analysis of consumers' perception of quality of service of fixed Internet: Its relevance to the network neutrality debate" (in Japanese), *Journal of Information & Communication Research*, 29(1), 19-28.
- (2011b): "Discussion on network neutrality: Japan's perspective", *Communications & Convergence Review*, 3(1), 71-89.

MACKIE-MASON, J. K. & VARIAN, H. R. (1994): "Economic FAQs about the Internet", *Journal of Economic Perspectives*, 8(3), 75-96.

Ministry of Internal Affairs and Communications:
- (2007): *Report on network neutrality* (in Japanese). http://www.soumu.go.jp/menu_news/s-news/2007/pdf/070920_6_bt.pdf
- (2008): *Competition review in the telecommunications business field in FY 2007* (in Japanese). http://www.soumu.go.jp/menu_news/s-news/2008/080905_3_bt.html.
- (2009a): *Competition review in the telecommunications business field in FY 2008* (in Japanese). http://www.soumu.go.jp/main_sosiki/joho_tsusin/kyousouhyouka/pdf/100519_2.pdf.
- (2009b): *Guidelines for the Telecommunications Business Act Consumer Protection Rules* (in Japanese). http://www.soumu.go.jp/main_content/000030198.pdf.
- (2010). *Competition review in the telecommunications business field in FY 2009* (in Japanese). http://www.soumu.go.jp/main_content/000082463.pdf.
- (2011): *Estimation of the traffic volume on the Japanese Internet* (in Japanese). http://www.soumu.go.jp/main_content/000109282.pdf.

Nippon Telegraph and Telephone Corporation (2008, May): *Road to Service Creation Business Group: Full-scale rollout of broadband and ubiquitous service*. http://www.ntt.co.jp/news/news08e/0805qsvh/pdf/ljzn080513d.pdf.

NOAM, E. M. (2009): *Media Ownership and Concentration in America*, New York, NY: Oxford University Press.

NUECHTERLEIN, J. E. (2008): "Antitrust oversight of an antitrust dispute: An institutional perspective on the net neutrality debate", *Journal of Telecommunications and High Technology Law*, 7(1), 19-66.

Sandvine (2011): *Global Internet phenomena report: Spring 2011*. http://www.sandvine.com/news/global_broadband_trends.asp

van SCHEWICK, I. B. (2007): "Towards an economic framework for network neutrality regulation", *Journal of Telecommunications and High Technology Law*, 5, 329-391.

SPULBER, D. F. & YOO, C. S. (2009): *Networks in telecommunications: Economics and Law*, New York, NY: Cambridge University Press.

WERBACH, K. (2009): "Higher standards regulation in the network age", *Harvard Journal of Law & Technology*, 23(1), 179-225.

WU, T. (2003): "Network neutrality, broadband discrimination", *Journal of Telecommunications and High Technology Law*, 2, 141-175.