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Shape of universal service policy for IoT: an exploration from US and Japanese policies on universal service for broadband.

Tomoaki Watanabe¹

Abstract:

This paper has two major parts. First, it reviews U.S. and Japanese broadband universal service policies, with special attention to the process of and discussions on (re)defining scope of the network services to be dealt with in the policy. Second, it explores the shape of universal service policy for Internet of Things.

IoT is still in its formative years, but there is a potential for IoT-based devices and services to be popular and important for the social life in the near future. This paper takes an approach to first review how the universal service policies determine target service for the policy. More specifically, recent policy discussions and formal processes in the U.S. and Japan regarding inclusion of broadband network for universal service are reviewed. In the U.S. formal inclusion process of broadband network for universal service has happened in the early 2010's. In Japan, there is an ongoing policy discussion, which may or may not lead to inclusion of broadband in the near future. U.S. values advanced services more in the context of universal service, while Japan has a more welfare-oriented approach, the kind which emphasize guarantee of essential services for individuals.

Broadband, when compared to traditional telephone network, supports a wider range of uses. This is the case almost by definition – telephone is primarily a simultaneous, two-way, two-person, voice communication, whereas broadband simply means a large amount of bandwidth, without specifying the type of communication or services such network supports. Similarly, IoT may be greater in scope of uses it supports. This is again a consequence of the meaning of the term: greater scope of physical objects are (going to be) connected to the Internet. It is not difficult to imagine such services as health and safety monitoring services for the elderly and in the near future to be considered essential for the society.

In case of IoT, however, there is still a degree of uncertainty regarding the diversity of network infrastructure. That is, it seems that there is a fair amount of chance that specific network is tied (such as by technological standard and contract terms) to specific set of devices and services. Home monitoring service, e-reader, and other devices and services may have different sets of network requirements to provide optimal

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services.

In this sense, IoT may present a set of relatively new challenges to universal service policy. As we see in some existing products, network cost may be internally subsidized in case of bundled offers, and difficult to single out. We may face such questions as how meaningful is it to subsidize only network-related cost, ignoring service and device charges; how we can define supported services when speed may or may not be all that matters. Helpful lessons could be drawn from handling of difference of mobile and fixed broadband. The two are rather different from fixed broadband in terms of connectable devices and services offered.

Introduction: Thinking about universal service for IoT from the experience of policy adoption for broadband

Internet of Things, or IoT, is still in its formative years, but there is a potential for IoT-based devices and services to be popular and important for our social life in the near future. Even within the consumer context, IoT may change shopping, home electricity use, maintenance of housing, monitoring of health conditions, controlling of electric and electronic devices, and so on. The question driving this paper is: how does important institution like universal service would interact with the emerging potentials of IoT?

The question is dealt with in two contexts – the U.S. and Japan, with the focus on the way a particular class of service such as IoT is included into universal service system. This paper takes an approach to first review how the universal service policies determine target service for the policy. More specifically, recent policy discussions and

formal processes in the U.S. and Japan regarding inclusion of broadband network for universal service are reviewed. In the U.S. formal inclusion process of broadband network for universal service has happened in the early 2010's. In Japan, there is an ongoing policy discussion, which may or may not lead to inclusion of broadband in the short-term. Two countries seem contrasting in at least two ways. U.S. values advanced services more in the context of universal service, while Japan has a more welfare-oriented approach, the kind which emphasize guarantee of essential services for individuals. U.S. regime seems to be a combination of a number of different components, whereas Japan's is rather simple and unified. The question of how universal service system can incorporate IoT is drawn on these observations on how a particular service is included in the two countries. Universal service reform is often a major undertaking, given that it could affect not the access to and affordability of certain service, but a large portion of the telecommunications ecosystem through levying and subsidization. The business models and competitive situation of individual firms may change, and that means investment and innovation may not remain the same.

On the surface, broadband and IoT has one thing in common. Compared to POTS, broadband is more versatile, serving a vastly wider range of purposes. This can be seen in definition of the terms – telephone is primarily a simultaneous, two-way,

two-person, voice communication, whereas broadband simply means a large amount of bandwidth, without specifying the type of communication or services such network supports. In turn, IoT is more versatile and multi-purpose when compared to conventional broadband Internet with PCs and mobile devices. This is again a consequence of the meaning of the term, one can say: greater scope of physical objects are (going to be) connected to the Internet.

At the same time, it seems that broadband and IoT are fundamentally different in that performance of broadband tends to be measured just simply by speed, whereas the performance of IoT seem to be rather diverse. Some applications of IoT require very low latency, others voluminous upload bandwidth, yet others tolerance of spikes in traffic. This is partly because of the nascent nature of IoT as a field and underdevelopment of technical standards. Yet this is also because applications of IoT may indeed are very diverse as to require diverse network characteristics that may conflict with each another. What, then, is the shape of universal service like? Should we have diverse universal service programs?

Broadband is considered essential by many now, hence the discussion around universal service for broadband. It is not difficult to imagine such IoT-based services as health and safety monitoring for the elderly to be considered essential for some societies

in the near future. Yet it seems that the nature of policy changes being required for the inclusion of these two different class of services may be rather starkly different, as discussed below.

Before delving into the review and analyses, a note on the scope is in order.

The term universal service entails a wide range of policies when looked at internationally. In this paper, the focus will be decided following what is called universal service in national-level policy discussions of each country, as opposed to substantively. This simple decision has a number of consequences. Most notably, it so happens that policies for supporting the use of telecommunications services by the disabled are not positioned as a part of universal service systems in either of the two countries. It should also be pointed out that Japan does not have a formal national policy to directly subsidize low-income consumers on their telecommunications expenses. Closest is what is called welfare-phones, provided by some local governments based on such considerations as income level, age, or disabilities.

Both countries have sporadic or sometimes sustained policy initiatives promoting investment into broadband and other telecommunications infrastructure, some large, some small. They are not part of the universal service policies. The author bares in mind all these policies in the following analysis, but they are not in the focus of

the paper.

2. Broadband policies in the U.S. and Japan.

2.1. Definitions of Scope

In the scope of the services subject to universal service policy is defined in the Communications Act, section 254 (b). The provision was introduced as a part of the Telecommunications Act of 1996, the major overhaul of the Communications Act since its creation in 1934. The provision stipulates a set of principles to follow in designing universal service, including not just how to define its scope, but also how to collect and distribute funding, who should be the beneficiaries, and so on. The relevant parts for the scope definition are 254(b)(2) and (3), which say that:

(2) Access to advanced services

Access to advanced telecommunications and information services should be provided in all regions of the Nation.

(3) Access in rural and high cost areas

Consumers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications and information services, including interexchange services and advanced

telecommunications and information services, that are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas.

These principles make it relatively clear that advanced services are to be included in the scope of universal service,² but not if broadband should be included, or under which conditions. Section 254(c)(1) provides further guidance, according to which, a scope of the service for universal service should be decided considering four factors - if the services

(A) are essential to education, public health, or public safety;

(B) have, through the operation of market choices by customers, been subscribed to by a substantial majority of residential customers;

(C) are being deployed in public telecommunications networks by telecommunications carriers; and

(D) are consistent with the public interest, convenience, and necessity.

In Japan, Article 7 of the Telecommunications Business Law includes the

² It should be noted, however, that there are disagreements if this provision really supports the inclusion of broadband into universal service. FCC (2011) In the Matter of Connect America Fund, A National Broadband Plan for Our Future Establishing Just and Reasonable Rates for Local Exchange Carriers High-Cost Universal Service Support, Developing an Unified Intercarrier Compensation Regime, Federal-State Joint Board on Universal Service, Lifeline and Link-Up: Notice of Proposed Rulemaking and Further Notice of Proposed Rulemaking. FCC 11-13. 26 FCC Rcd. 4554., para.61. (referred as FCC 11-13 hereafter) https://apps.fcc.gov/edocs_public/attachmatch/FCC-11-13A1_Rcd.pdf

definition of services subject to universal service. Called fundamental telecommunications service, the definition is written in the parenthesis: telecommunications services that are designated by the Order of Ministry of Internal Affairs and Communications to be ensured of its universal provision nationwide because of its indispensability for the lives of the people

Comparing the two sets of rules, the term telecommunication services in this context span both what is called telecommunication services and information service in the U.S. regulatory context. In that sense, the two countries are not very different. The U.S. emphasis on advanced services is completely lacking. While the U.S. considers essentiality to education, health, and safety, Japan considers essentiality to the lives of its people – a difference seemingly open to many interpretations. The consideration of popularity in the market, present in the U.S., is not in the Japanese law. Comparing what are actually included in the universal service, some of these differences in the rules seem to explain different decisions. Internet service to schools and hospitals are covered in the U.S., and public payphones are covered in Japan.

A commonality to both countries is that they have relatively restrained set of policy goals compared to what are discussed in wider policy discussion. Inclusion of the Internet to universal service received fair amount of attention in the late 1990, and

policy goals and benefits discussed included much wider range of things than education, public health, or public safety. The universal service of the Internet was argued to serve democracy or acceleration of innovation.³ The same can be said of universal service of broadband. Benefit of universal service of broadband would arguably include better democracy and pro-innovation effects. Yet the laws are not currently based on consideration of such factors in determining the scope of services.

2.2. U.S. Universal Service (mobile, waste, inter-carrier comp, analog-digital transition, and broadband)

2.2.1. Political and regulatory sources of the reform

U.S. universal service regime has been going under a major reform, and inclusion of broadband is just a small part of the transformation. Other relevant issues include inclusion of mobile services and inter-carrier compensation system, among others. The complexity of the undertaking can be seen even in the fact some policy documents well exceed 500 pages.⁴

³ Watanabe, T. and J. Kim (2001) "Universal service policy in the digital convergence era: Regarding the treatment of the Internet." *InfoCom Review*, vol.25, pp.44-62. (July 2001). See also a long list of "national purposes" that broadband connectivity is expected to be able to contribute to, in America Recovery and Reinvestment Act of 2009 (Pub.L. 111-5, 2009), SEC. 6001. (k)(2)(D). <http://www.gpo.gov/fdsys/pkg/PLAW-111pub15/pdf/PLAW-111pub15.pdf>

⁴ For example, the following is over 700 page-long: FCC (2011) *In the Matter of Connect America Fund; A National Broadband Plan for Our Future; Establishing Just and Reasonable Rates for Local Exchange Carriers; High-Cost Universal Service Support; Developing an*

Inclusion of broadband into universal service is not completely new in the U.S.

After the enactment of Telecommunications Act of 1996, the U.S. policy have supported internet connectivity for schools, libraries, and healthcare institutions in rural areas.

Since 2007, the support for healthcare institutions started including broadband access.

The current reform can be traced back at least to two sources. One had to do with the concern shown by the President Obama during his first presidential campaign. He as a candidate pointed out that the U.S. position in international broadband ranking was low. After taking the presidency, his very first policy package was a response to the rapidly developing financial crisis. In this America Recovery and Reinvestment Act of 2009 was budget for some of the key policy initiatives addressing the broadband ranking concern: creation of national broadband plan, support for broadband infrastructure investment in unserved and underserved areas. The national broadband plan was required, among other things, to “seek to ensure that all people of the United States have access to broadband capability.”⁵

The FCC drafted the National Broadband Plan, and submitted to the Congress

Unified Intercarrier Compensation Regime; Federal-State Joint Board on Universal Service; Lifeline and Link-Up; Universal Service Reform – Mobility Fund: Report and Order and Further Notice of Proposed Rulemaking. WC Docket No. 10-90, GN Docket No. 09-51, WC Docket No. 07-135, WC Docket No. 05-337, CC Docket No. 01-92, CC Docket No. 96-45, WC Docket No. 03-109, WT Docket No. 10-208. FCC 11-161. 26 FCC Rcd 17664. para. 94. (referred as FCC 11-161 hereafter)

https://apps.fcc.gov/edocs_public/attachmatch/FCC-11-161A1_Rcd.pdf

⁵ America Recovery and Reinvestment Act of 2009 (Pub.L. 111–5, 2009), SEC. 6001. (k)(2)

<http://www.gpo.gov/fdsys/pkg/PLAW-111publ5/pdf/PLAW-111publ5.pdf>

in 2010. The Plan suggested the initiation of Connect America Fund, to support broadband for universal service. It also recommended that the current support for telephony in high cost areas should be phased out, and replaced by the Connect America Fund. The definition of the broadband should also be revised to download speed of 4 Mbps.⁶ On the same day, the FCC Commissioners jointly issued a statement stating their view that Universal Service Fund needs comprehensive reform in order to promote investment into broadband infrastructure.⁷ They follow the provision in ARRA 6001(k)(2)(B) requiring the Plan to have “a detailed strategy for achieving affordability of such service and maximum utilization of broadband infrastructure and service by the public.”

FCC then inquired Federal-State Joint Board. The Board responded positively about the inclusion of broadband into the universal service,⁸ touching on the National Broadband Plan and the Recommendation the Board has issued in 2007.⁹

Federal-State Joint Board constitutes another source of current reform. In its

⁶ FCC (2001) Connection America: The National Broadband Plan, para. 135
<https://transition.fcc.gov/national-broadband-plan/national-broadband-plan.pdf>

⁷ Joint Statement on Broadband, GN Docket No. 10-66. FCC 10-42. para.3
https://apps.fcc.gov/edocs_public/attachmatch/FCC-10-42A1_Rcd.pdf

⁸ Federal-State Joint Board (2010). In the Matter of Federal-State Joint Board on Universal Service; Lifeline and Link Up. FCC 10J-3
https://apps.fcc.gov/edocs_public/attachmatch/FCC-10J-3A1_Rcd.pdf

⁹ Federal-State Joint Board on Universal Service (2007) In the Matter of High-Cost Universal Service Support; Federal-State Joint Board on Universal Service; WC Docket No. 05-337, CC Docket No. 96-45. FCC 07J-1. (hereafter referred as FCC 07J-1)
https://apps.fcc.gov/edocs_public/attachmatch/FCC-07J-4A1.pdf

November 2007 Recommendation, the Joint Board has already proposed the outline of the universal service system embracing both mobile and broadband. Termed Broadband Fund, the idea included service to unserved and underserved areas, emphasis on availability information, and greater role of State government in managing and distributing the fund, and so on. There broadband is not specifically defined, although it is clearly indicated that definition is important, and pointer to the FCC's inquiry on the definition of broadband was provided.¹⁰ The FCC's definition back then, with 200KBps downstream looked obsolete to many at the time. This recommendation on Broadband Fund is a result of public comment initiated by the Joint Board in May.¹¹ The comment started following the Board's recommendation on more immediate issue related to the same high-cost support program of the universal service.¹² The author is not aware how closely these two sources of the universal service reform were connected. For the purpose of this paper, suffice it to say that the discussion seems to have taken years of time, preceding the top political recognition that such reform is really important.

¹⁰ FCC 07J-4, para. 72.

¹¹ Federal-State Joint Board on Universal Service (2007) Federal-State Joint Board on Universal Service seeks comment on long term, comprehensive high-cost universal service reform. WC Docket No. 05-337; CC Docket No. 96-45; FCC 07J-2. https://apps.fcc.gov/edocs_public/attachmatch/FCC-07J-2A1.pdf

¹² Federal-State Joint Board on Universal Service (2007d) In the Matter of High-Cost Universal Service Support, WC Docket No. 05-337; Federal-State Joint Board on Universal Service, CC Docket No. 96-45. FCC 07-J1. (hereafter referred as FCC 07-J1) https://apps.fcc.gov/edocs_public/attachmatch/FCC-07J-1A1.pdf
See Statement of Commissioner Larry S. Landis in particular on the timing.

2.2.2. Developments under FCC

Year 2010 saw a Notice of Inquiry and Notice of Proposed Rule Making with the express intent of accommodating broadband by universal service while phasing out the support for traditional telephony.¹³ The press release of the notice characterized it as the “once-in-a-generation transformation” of universal service,¹⁴ while Chairman Genachowski characterized as “an important milestone in our deeply important effort.” It led to February 2011’s Notice of Proposed Rule Making showing the proposed treatment of broadband.¹⁵ It included the proposed revision of definition of broadband, citing National Broadband Plan.¹⁶

The decision on a number of issues is made October 2011 order. The definition of broadband is revised to 4Mbps downstream and 1Mbps upstream.¹⁷ Connect America Fund was proposed in the February NPRM to provide support for initial funding for infrastructure deployment projects (as opposed to recurring operational

¹³ FCC (2010) In the Matter of Connect America Fund, A National Broadband Plan for Our future, High-Cost Universal Service support, Notice of Inquiry and Notice of Proposed Rulemaking. FCC 10-58. 25 FCC Rcd 6657.

https://apps.fcc.gov/edocs_public/attachmatch/FCC-10-58A1_Rcd.pdf

¹⁴ FCC (2010) FCC Kicks off universal service reform: Reform key to making broadband available for millions of Americans who lack access.

https://apps.fcc.gov/edocs_public/attachmatch/DOC-297662A1.pdf

¹⁵ FCC 11-13.

¹⁶ FCC 11-13. para. 107-114.

¹⁷ FCC 11-161. para. 94.

support),¹⁸ and was a part of their decision in this October order. It was clearly stated that the CAF is to replace FCC's universal service support programs for high-cost areas.¹⁹ It is also notable that the FCC in this order decided to introduce nuances to the bold idea. Mobile broadband was recognized to have value of its own, and in order to foster the deployment of mobile broadband infrastructure, so-called CAF Mobility Fund was established. Both CAF, which is for both mobile and fixed, and CAF Mobility Fund are structured with phases, Phase I being the immediate action and Phase II for the longer-term reform. For CAF, rate-of-return carriers and price-cap carriers are treated differently. It is no surprise to see such nuanced approach given that reform of this magnitude affects the industry eco-system severely. The decisions regarding this reform are not easy, as some commented.²⁰

2.3. Japanese Universal Service

If the U.S. universal service discussion is characterized as political will meeting with the bottom-up proposal, Japanese discussion seems to be one of gradual

¹⁸ FCC 11-13. para.24.

¹⁹ FCC 11-161. para. 20.

²⁰ See, for example, FCC 07J-1. Concurring Statement of Commissioner Ray Baum. FCC 11-13. Statement of Commissioner Meredith Attwell Baker.

change and repeated postponement. The reason, however, seems to be not completely attributable to the process characteristics of politics and government agencies. Prospect of extensive broadband deployment is much better in Japan, as explained below.

2.3.1. Discussions up to 2005

In 2005, the Information and Communications Council answered to the Inquiry from Ministry of Internal Affairs and Communications regarding universal service.²¹ In the answer, the idea of including broadband for universal service was rejected, citing a number of reasons. One was that the broadband was adopted only by 37% of the household at the time, making it difficult to argue that it is essential for social participation. As a general principle, the Council answered, it is appropriate to consider cost burdens associated with expansive list of services, speed of technological change, and timing of the support for legacy and emerging technologies. The last point meant that supporting legacy telephone for too long might have a detrimental effect of slowing down otherwise efficiency-enhancing technological change, and supporting broadband too early might borne excessive burden for people.

²¹ Information and Communications Council (2005) Answer: Design of Universal Service Fund System. p.10.
http://warp.da.ndl.go.jp/info:ndljp/pid/283520/www.soumu.go.jp/s-news/2005/pdf/051025_5_2.pdf

Before discussing this issue further, it would be helpful to explain policy context of universal service. Japan's universal service did not take the current form of independent fund for long. It did not in the mid-1980's when the government owned monopoly telecommunications carrier NTT became a public corporation. It did not happen in the mid-1990's when the NTT was broken up and privatized. It happened in the early 2000's, as a part of the competition policy package to promote the IT revolution. The amendment to the Telecommunications Business Law took effect in 2002. Until that time, the NTT companies were providing internal subsidy from low-cost to high-cost areas to fulfill its universal service obligation. In addition, for the first 3 years, there was reportedly no disbursement, because there was no net loss to trigger the support. Interestingly, the idea of covering the Internet as well as mobile phone services was discussed in the early 2000's. The idea was rejected, and those services were characterized as "next generation" services for universal service coverage.

Another notable feature of the Japanese context is that broadband deployment was relatively fast and pervasive in Japan. The policy initiative in the early 2000's, competitive environment around ADSL and fiber optic cable, and NTT's own initiative made it possible to cover over 70% of population in 2005 with fiber infrastructure, and over 90% by the end of the decade, all without universal service subsidy. ADSL

coverage was over 90% already at the time of 2005. In comparison to the U.S., Japan was much smaller country, about 1/25th, having smaller amount of high-cost, unprofitable areas. Some point out that NTT deployed fiber networks even for some of those unprofitable areas as a part of their corporate strategy. Government policy of promoting broadband infrastructure deployment served as pressure or encouragement, but not impediment. Japan often prided itself to have world's best broadband infrastructure, and focused attention on the shortage of attractive applications, services, and strong platforms. It was not a major surprise, then, that there was not such aggressive support for broadband infrastructure as in the U.S. at the time of mid-2000's.

2.3.2. Discussion from 2007 to 2010.

In 2007, "Research Meeting on the Future Vision of Universal Service System" was organized to discuss treatment of broadband and mobile phone, and many other issues.²² The Research Meeting was organized upon the answer from the Information and Communications Policy Council in November, 2006 recommending, among other things, that the Ministry of Internal Affairs and Communications discuss future of

²² The archived web pages of the Research Meeting including meeting minutes and handouts of each meeting is available at:
http://warp.ndl.go.jp/info:ndljp/pid/283520/www.soumu.go.jp/joho_tsusin/policyreports/chousa/universal_service/

universal service system toward a reform in 2009.²³

The background for the whole process is higher-level policies. June 2006, The Agreement between the Administration and Incumbent Parties on Telecommunications and Broadcasting was published,²⁴ which led to the formulation of Ministry's Roadmap Program for Reform in Telecommunications and Broadcasting,²⁵ deciding on the implementation schedule issues of relevant competition policies mostly articulated in another document based on the Agreement, called Final Report from Informal Gathering on Competition Policy Response to Increasing IP-tization.²⁶ These series of documents created new context for telecommunications policies, but did not have specific mandate for universal service for broadband. In the final report of Informal Gathering, the relationship between broadband and universal service was discussed at length.²⁷ The basic direction the Final Report proposed was to formulate a new concept

²³ Information and Communications Council (2006) Answer (regarding Inquiry No.1157). Relevant part is included in: Handout No.72-1, 72th Meeting of Telecommunications Business Subgroup, Information and Communications Council.
http://warp.da.ndl.go.jp/info:ndljp/pid/283520/www.soumu.go.jp/joho_tsusin/policyreports/joho_tsusin/denki_bukai/pdf/070126_1_1.pdf

²⁴ The Agreement between the Administration and Incumbent Parties on Telecommunications and Broadcasting.
http://warp.ndl.go.jp/info:ndljp/pid/283520/www.soumu.go.jp/joho_tsusin/policyreports/chousa/tsushin_hosou/pdf/060623_1.pdf

²⁵ Ministry of Internal Affairs and Communications (2006) Roadmap Program for Reform in Telecommunications and Broadcasting (September, 2006)
http://warp.ndl.go.jp/info:ndljp/pid/283520/www.soumu.go.jp/pdf/060901_2.pdf

²⁶ Informal Conference on Competition Policy Response to Increasing IP-tization (2006)
http://warp.ndl.go.jp/info:ndljp/pid/283520/www.soumu.go.jp/s-news/2006/060915_5.html

²⁷ Informal Conference on Competition Policy Response to Increasing IP-tization (2006) Final Report. pp.88-91.

of universal access. As opposed to supporting one service (telephony) by one service provider, the telephone and its equivalent services would become available from multiple providers with multiple infrastructures. In that circumstance, the role of universal service policy would possibly be to partially support the access network infrastructure for unprofitable areas.

Additionally, the final report cited that the universal service went through a reform process until 2006, and another drastic reform would cause too much disturbance. Specifically, it suggested that the already scheduled revisit to the universal service reform on 2009 should be kept, and the year 2007 should be spent with expert discussions on technical issues, feasibility examination, and other issues. Another important context is the idea that the broadband coverage will become 100% of the areas by 2010, a policy coming from the cabinet-level entity called ICT Strategic Headquarters in January 2006. It was a part of the package of high-level ICT policies.²⁸

The way to achieve such coverage was not elaborated in detail, but indicated to be creation of incentive to invest, development of local public networks and promotion of sharing thereof.²⁹ There were some earlier policies setting similar goals. Ministry of

http://warp.ndl.go.jp/info:ndljp/pid/283520/www.soumu.go.jp/s-news/2006/060915_5.html

²⁸ IT Strategic Headquarters (2006) IT New Reform Strategies: Realization of Benefits of ITs anytime, anywhere, for everybody. (January 19, 2006)

<http://www.kantei.go.jp/jp/singi/it2/kettei/060119honbun.pdf>

²⁹ IT Strategic Headquarters (2006) IT New Reform Strategies: Realization of Benefits of ITs

Internal Affairs and Communications later in the year published Next Generation Broadband Strategy 2010³⁰ along that line. No reference to universal service was included in the Strategy.

The Research Meeting after 9 meetings, including testimonies from telecommunications carriers and other organizations, the final report spoke negatively about the immediate support for broadband, suggesting that revisiting the issue in the future would be appropriate.³¹ Given the context, this is no surprise. It was suggested that schedule for reform should be shortened, on the ground that such recommendation came from Information and Communications Council. As opposed to the originally scheduled 2009 revisit, the examination of the issues would be conducted as expedite as possible. One more potential surprise was that the discussion on broadband at this point was specifically on the telephony or telephony-equivalent services, and not broadband per se. In other words, inclusion of broadband in universal service was not replacing telephony with more versatile broadband services, but simply supporting telephony

anytime, anywhere, for everybody. (January 19, 2006), p.30.

<http://www.kantei.go.jp/jp/singi/it2/kettei/060119honbun.pdf>

³⁰ Ministry of Internal Affairs and Communications (2006). Next Generation Broadband Strategy: Nationwide Creation of Broadband through Public-Private Coordination. (August, 2006).

http://warp.ndl.go.jp/info:ndljp/pid/283520/www.soumu.go.jp/joho_tsusin/broadband/broadbandstrategy/honpen.pdf

³¹ Research Meeting on the Future Vision of Universal Service System (2007). Final Report. (December 11, 2007). p.28, pp.32-48.

http://warp.ndl.go.jp/info:ndljp/pid/283520/www.soumu.go.jp/s-news/2007/071211_3.html

services in the broadband context. The fact that IP telephony was not quite functionally equivalent was deemed as a problem. The content of the final report was largely brought into the Information and Communications Council answer in 2008.³² The answer was suggested to be applicable until 2011, and the reform needed for 2012 and later was to be discussed at a later time.

In 2010, Information and Communications Council issued another answer on the design of universal service, this time focused mainly on the transitional period until the broadband is deployed nationwide.³³ At the time, the incumbent party was changed from Liberal Democratic Party (conservative traditional incumbent for most of the post-war Japan) to Democratic Party of Japan (liberal party taking the majority for the first time). The high-level policies have changed accordingly. For example, the goal of providing fiber optic network nationwide was still strong interest for the new administration, but the policy options now potentially included reorganization of NTT companies, and creation of new entity dedicated to the wholesale of fiber infrastructure access. In this context, the Council's answer focused mostly on the treatment of IP

³² Information and Communications Council (2008). Answer: the Design of Universal Service System. (December 16, 2008). http://warp.da.ndl.go.jp/info:ndljp/pid/3486523/www.soumu.go.jp/menu_news/s-news/2008/pdf/081216_4_bt1.pdf

³³ Information and Communications Council (2010). Answer: The design of universal service system in transitional period until broadband is deployed nationwide. (December 14, 2010) http://www.soumu.go.jp/main_content/000094793.pdf

telephony as the important emerging problem to face. Their recommendation was that certain class of IP telephony should be treated as a service supported by universal service, while the reality of the market made any disbursement unnecessary for the time. In the future, the Council suggested, there would come a time to face the question if broadband per se, not telephony, should become the focus of universal service. This was conceived as the task after the current “transitional period” is over, and broadband would be prevalent. The Council noted that the coverage of fiber network was over 90% at the time, while the take up was still around 30%, making broadband far from necessity.

After this answer from the Council, the majority party has changed back to Liberal Democratic Party, due in no small part to the Great Earthquake of Eastern Japan and subsequent nuclear disaster. The major answer from the Council regarding the universal service was related to public payphone in post-disaster situation, not broadband.

3. IoT and Universal Service

Based on the review of policy developments in the U.S. and Japan, there seem to be four major lessons for IoT for universal service: multiplicity, diversity, purpose,

and speed. To be clear, this paper is not arguing that IoT should be covered by universal service by certain point. However, sensing that IoT might be a paradigm shift for communication networks the way the Internet has been, there may come a time for universal service policy to face another challenge for adapting to a new reality. The aim of the analysis is to help the future policy response.

3.1. Multiplicity and Diversity

General challenge for universal service when dealing with the IoT is its diverse nature both at network and services. The broadband is largely about bandwidth, and connections above certain speed were the basic definition. The telephony was application specific, and therefore even simpler to handle. When we would like to deal with IoT as a part of universal service, it is not a single service or network having one specific performance characteristic. Looking back, it might seem that broadband is a narrow class of network, largely for communication involving humans, for example. IoT is more diverse and partly still in formation, escaping easy designation for universal service to accommodate it.

When dealing with multiple services, some overlapping, others competing locally, the design of universal service faces some challenge. The U.S. case provides a

hint on how to tackle it: creation of multiple funds for services of different nature. When there are home security services requiring one type of network, and health monitoring services requiring another, it is not necessary to design a single fund where two sets of different beneficiaries and payers exist. Supporting IoT as a whole or in general might be difficult to make sense, but supporting individual essential services might be easier to conceive and agree on.

Closely related question has to do with diversity of services. IoT services are so diverse that different people receive different benefits, and overall market may end up fragmented very much. In such a case, a specific type of service may never reach the kind of popularity to justify the universal service support. To make the matter more difficult, it may be difficult to define and demarcate what belongs to a single type of service. Home security service may come as a part of smart home service package, neighborhood drone patrolling service, or building management using embedded sensors. While various applications all running on broadband network, these services may be based on different types of networks provided by companies in different sectors. On this issue, the U.S. and Japan have different experience. For broadband, U.S. found mobile broadband having its own value, and created CAF Mobile Fund separate from the CAF, which are technologically neutral and available for both mobile and fixed

services. Japan has considered similar situation regarding conventional telephony and IP telephony. The answer is to have cost models for infrastructures, and fund only a part of the cost associated with the covered service, not the whole package.

In short, dealing with IoT with universal service may be to take small important class of services and provide support for that segment, as opposed to the whole of it. It may be one class of service or more.

3.2. Purpose

The above approaches address only half of the issue, it seems. The other half has to do with the fragmented markets. There may be many services moderately popular but not to the level U.S. or Japan would require for the inclusion for universal service. Take the very service of telephony, for example. It may be replaced with so many different communication services involving so many different devices, modalities, and other characteristics. As a result, none may emerge as so popular a service as telephony. What is the appropriate role of universal service in that case? One answer is to revisit the higher-level policy goal for the universal service. If social inclusion and participation is an important goal, it may make sense to accommodate services that are essential for a segment of population, say elderly having problem with hearing, by

including them in universal service even without majority adoption. If spurring innovation and laying the groundwork for economic growth is another policy goal, another type of service may qualify before the majority adoption – something the U.S. policy development seems to have gone through. Universal service system of U.S. and Japan, when faced with the question of diversity, are subject to potential reinterpretation.

If we are faithful to the principle that the service is included only when it is very widely adopted by the society, then many of the IoT-based services may not qualify. Yet for the greater good of the society, that faithfulness may need reconsideration.

3.2. Speed

Assuming that the above argument is right, and taking segmented services separately and designing separate funding mechanism is one good way to handle IoT with universal service. Its administrative cost may be too large. It is analogous to handling broadband applications and services separately instead of broadband, and designing so many different funding mechanisms. Universal service reform takes years, not months, and complex system becomes unmanageable quite easily. More specifically, the speed of market change may be too fast, and regulatory support and ceasing of the

support may come too late.

In fact, it seems that Japanese reason for non-inclusion of broadband was always that it was too premature. The U.S. reason for inclusion was driven by political will, and not necessarily compatible with the idea of substantial majority signing up for the service. It is perhaps wiser to combine other welfare or innovation policies to ensure timely intervention, either for social or economic reasons. Alternatively, universal service should have two large modes of intervention, one based on a fund for longer term support, another based on grants for shorter term, for example. Whether grants and similar mode of intervention should be called universal service or something else is not very important. In either case, timed coordination of different intervention is desirable to achieve policy goals better.

However, it is also the case that U.S. has been running many different programs, some under separate funding, for rural health institutions, schools, low-income households, and different costs for different carriers in high-cost areas. For a country like Japan where the universal service has been relatively simple, this is a challenge, but still not an impossibility.

Still, there needs to be some indication of thresholds. Not every disadvantaged group or not every improvement counts equally. What counts needs some clarification

in that case. The U.S. has statutory guidance, and Japan has been governed by more informal interpretation of the law to focus on geographical gap to the exclusion of disabilities, income, or other disadvantages.

4. Conclusion

To recap, this paper has been guided by the question of how to deal with IoT with universal service? Reviewing another example of change in the scope of universal service, namely with broadband, the paper has drawn some implications.

The universal service policy can handle IoT-based services by establishing multiple small funds, for important class services separately, like the U.S. does for Connect America Fund and its Mobility Fund. Taking IoT as a whole for universal service support might be more difficult to make sense as it has diverse network infrastructure and diverse applications. When a specific function or service is bundled in a bigger package, providing a partial funding of the whole is a sensible approach, just like Japanese way to handle IP telephony's infrastructure cost within broadband infrastructure.

Simple principle of substantial majority support among residential subscribers may not be appropriate for IoT-based services, where services are possibly very much

diverse, serving various smaller groups differently. Alternative guidance is necessary for efficient decision making.

Speed of technological and service changes may turn out to be a difficult factor in managing universal service with multiple smaller funds for specific class of services.

Given the U.S. track record, it is not impossible to operate multiple universal service programs. Yet fund-based support should be combined with other simpler means such as grant issuing to be effective and timely in intervention.