Chapter 13
Next Generation Home Network and Home Gateway Associated with Optical Access

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ABSTRACT
As optical broadband access networks have been popularized, triple play services using IP technologies, such as Internet access, IP telephony, and IP video distributing services, have been also popularized. However, consumers expect new services for a more comfortable life. Especially, when QoS guarantee and high reliable services are provided in NGN (Next Generation Network) era, various home network services over NGN are deployed. For this purpose, the home gateway has been installed in consumer houses for the connection between access and home networks, and providing various services to consumers. Even though, the broadband router currently plays a role similar to the home gateway, this home gateway should comprehend functionalities of the broadband router, and should have additional features. The functional requirements of such home gateway have been discussed in standard bodies. That is, the next generation home gateway in NGN era generally should have four features as follows; High performance for IP processing, Compliance with the interface of carrier grade infrastructure including NGN, Flexible platform for various services, and Easy management and maintenance. This chapter describes the standardization of the home gateway and, proposes its evolution scenario the present to the future. Then, it also proposes these four requirements, and technologies to comply with features described above.

INTRODUCTION
Internet services have been popularized widely by the deployment of broadband communication infrastructure. In particular, the performance of broadband communication has been improved by optical fiber transmission technologies. Although transmission rate by metal transmission technologies including ADSL will approach the upper bound, e.g., less than 100Mb/s, rate by optical fiber transmission

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rate has been still improved. 1Gb/s transmission in optical access networks is currently feasible. The deployment of 10Gb/s transmission will be started within the next several years. Moreover, when NGN discussed in ITU-T is deployed, various functionalities will be supported in addition to an improvement of the performance. For example, QoS control and high reliable transmission control will be available. In this situation, consumers expect an enhancement of the existing services and a deployment of new services for a more comfortable life. For this purpose, the “Next Generation” home gateway will be installed for consumers. The home gateway currently provides IP processing, mainly. It looks like the broadband router. However, in NGN era, the home gateway comprehends functionalities provided by the conventional one, and provides an additional functionality and the high performance.

In short, this home gateway provides a high performance transmission without the degradation of a transmission performance of an optical access network, and various services over broadband networks for consumers. Therefore, as this home gateway is one of the key components for the high performance communication and new services across telecom networks, most telecom operators are interested in requirements of such home gateway.

ITU-T and other standard bodies activated by telecom operators currently have discussed these requirements actively. This Chapter summarizes a discussion about the next generation home gateway focusing on the standardization, and presents its evolution scenarios. Then, it describes key features of the next generation home gateway.

**Worldwide Trends of Internet and Broadband Services**

The growth of Internet has been continued worldwide. Figure 1 shows report of ITU-D (See, ITU-D (2008)) about the popularity of Internet worldwide. The number of Internet users currently occupies only 17% of worldwide residents. However, its growing rate is rapid. In particular, broadband services by DSL (Digital Subscriber Line), FTTH (Fiber To The Home), and cable modem has been installed. As shown in Figures 2 and 3 (See, ITU-D (2008)), the number of users of broadband services has been increased. Especially, in US, Asia, and European countries, the number of users is grown up rapidly. As broadband services provides high speed IP based communication by economic and fixed rate for consumers, consumers enjoy IP centric triple play services, such as high speed Internet access, IP telephony, IP video distribution services.

**Evolution of Broadband Services**

Broadband services have been enhanced by the evolution of optical fiber communication technologies. Figure 4 is the Japanese case in broadband service transition (Yokotani, Nakaniishi, Ogasawara, & Maeda, 2006) as one of the examples. Since Japan is one of the countries which initiates the deployment of broadband services, it can looks like a good guideline for a future prediction. In Figure 4, although transmission rate by metal transmission, mainly ADSL is saturated to less than 100Mb/s, a fiber transmission technology for FTTH still contributes increasing of transmission rate. Especially, PON (Passive Optical Network) (Maeda, Okada, & Faulkner, 2001) architecture contributes a promotion of FTTH. As PON architecture provides economical FTTH services by many advantages described in the later. Although STM-PON was proprietary, B-PON (Broadband PON) (ITU-T G.983, 2001) and G-PON (Gigabit PON) (ITU-T G.984, 2002) have

**POPULARITIES OF INTERNET AND BROADBAND SERVICES**

This section describes the present and the future broadband services which motivate an installation of home networks and the home gateway.