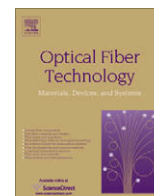




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Invited Paper

Optical fiber cable and wiring techniques for fiber to the home (FTTH)

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ABSTRACT

NTT group's new medium-term management strategy calls for 20 million optical subscribers by 2010, and NTT Laboratories is pushing forward to meet this goal. Before that date, an efficient optical access network must be constructed, and afterwards, when the era of mass optical communications finally arrives, the facilities and equipment supporting the network will have to be effectively operated and maintained.

At NTT Access Network Service Systems Laboratories, we are developing various technologies to correspond to the massive deployment of optical broadband services. We are also developing various new technologies for efficiently operating optical access network systems that will continue to expand in the future, and to supply our customers with good services.

This paper provides an overview of the new optical access network system technologies that are being developed at NTT Access Network Service Systems Laboratories to address these issues.

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1. Status of broadband services in Japan

The transition of broadband subscribers in Japan is shown in Fig. 1. Broadband Internet access is spreading rapidly in Japan. ADSL has driven this trend with a huge increase in the number of subscribers, and the use of cable Internet equipped with CATV is also steadily increasing. In contrast, we have started to see a rapid growth in the number of FTTH subscribers, and this reached 13.08 million in June 2008. The total number of broadband Internet users in Japan had exceeded 29 million by June 2008. The quarterly increase in subscribers to FTTH and ADSL services is shown in Fig. 2. By the beginning of 2005, new FTTH subscribers outnumbered new ADSL subscribers. The number of ADSL subscribers began to decrease in the middle of 2006, and this tendency is still continuing. This trend will accelerate because of the reduction in the FTTH service charge and the demand for higher speed services. The number of FTTH subscribers increases by about 0.8 million per quarter. There were more FTTH subscribers than ADSL subscribers by June 2008, and NTT had more than 10 million FTTH subscribers

by September 2008. Now most of the broadband subscribers in Japan use FTTH.

The three reasons for the growth of FTTH services in Japan are the demand for higher speed access, the shift from fixed telephones to IP telephones and the introduction of triple play services.

Internet use has shifted from e-mail and web browsing to visual services such as YouTube and video delivery, and a large amount of file exchange. The evolution of Internet services is demanding higher speed access.

IP telephone services are provided via broadband services such as ADSL and FTTH. As regards IP telephone via ADSL, users have to subscribe to a fixed telephone service because ADSL services are provided through copper wire. On the other hand, IP telephone via FTTH does not require copper wire. As a result, users can obtain both broadband and telephone services without copper wire, and we can therefore reduce the total service charge.

In addition to IP video transmission, RF video transmission by the WDM/FM modulation method started in 2007 as part of the FTTH service, thus making the FTTH service more attractive. In addition, analog television broadcasting will end in 2011. However, there are areas where the digital television broadcasting reception is poor, and this has caused a digital divide. It is expected that the broadcast services offered via FTTH will overcome the problem of the digital divide. Triple play will boost FTTH growth.

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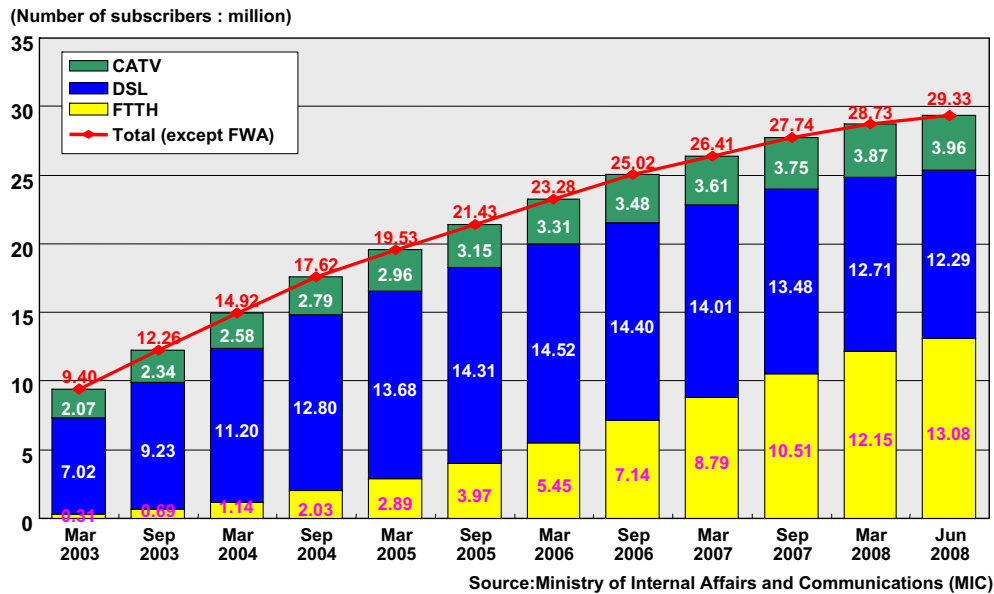


Fig. 1. Transition of broadband subscribers in Japan.

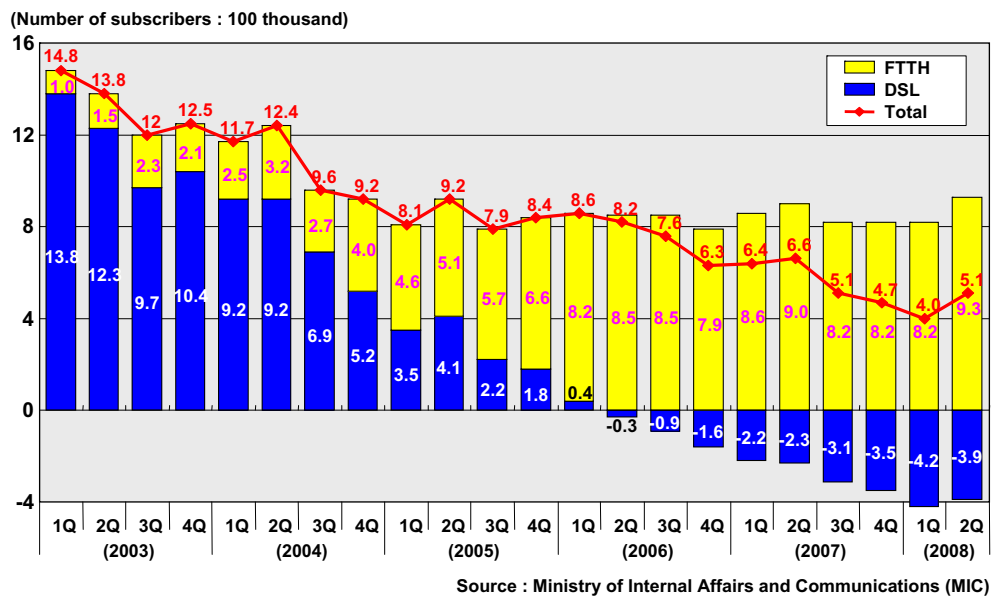


Fig. 2. Quarterly increase in subscribers.

The next generation information communication network (NGN) services were initiated by NTT at the end of March 2008. The outline of the NGN is shown in Fig. 3. The NGN has many advantages compared with the conventional PSTN and IP network. Thus the NGN provides guaranteed quality of service (QoS), security, reliability, and open interfaces. The NGN will create and provide new services in addition to the existing triple play services such as high-speed Internet, IP telephone and video services on FTTH networks. Therefore, the NGN service will accelerate FTTH expansion in Japan.

2. Configuration and technologies of optical access network

In this section we describe NTT's optical access network configuration and the component technologies. The broadband access system and capacity are shown in Fig. 4. There are three types of

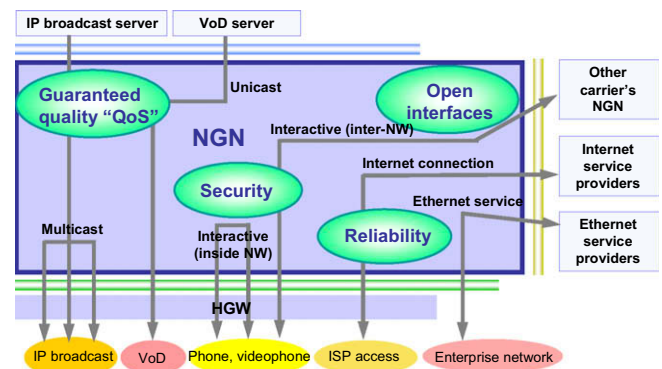


Fig. 3. Start of NGN services.

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