Next-generation IPTV Service

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Abstract

NTT is developing next-generation Internet protocol television (IPTV) technology as standard specifications for digital televisions and other types of consumer electronics. In this article, we examine the trends in IPTV services and explain the role of the next-generation IPTV technology. This technology provides video distribution service to standard televisions via fiber to the home (FTTH), thus creating a new broadband business scenario.

1. Trends in IPTV services

Internet protocol television (IPTV) uses a broadband IP network to deliver video to ordinary television sets that are connected to a personal computer or telephone to serve as a third terminal. NTT has been attempting to distribute video to televisions using IP since the ISDN era. However, it was not until 2002–2004, after the world's first video distribution service delivered over a broadband network, that the content, quality, and functionality of IPTV were recognized to be on a par with the video service provided by broadcasters. The NTT Group also provides commercial IPTV as part of a triple-play service (IP telephony, Internet access, and TV) [1]-[3].

One example of a successful IPTV service that has attracted attention is the one offered by FastWeb, by an Italian Internet service provider [4]. Since the service began in October 2002, the subscriber base has expanded rapidly and FastWeb is already providing a service that re-broadcasts terrestrial digital broadcasting.

The IPTV services that began in the period between 2002 and 2004 have developed into a promising industry, with various companies developing systems and terminals based on proprietary methods and providing services to a market that has reached the scale of several hundred thousand subscribers. Further market expansion, however, requires terminals that are more economical and have a higher degree of interoperability to promote the flow of content. Since about 2005, IPTV has been recognized as a common service provided by communications companies, and research on common specifications has begun in various countries. In the USA, the Consumer Electronics Association (CEA) and AT&T, Verizon, and Bell South took a step toward IPTV standardization by concluding an agreement on guidelines for connections between the network and terminals in April 2006 [5]. In China, where there has been striking growth in IPTV, expansion of the IPTV market has been made a national policy that extends over the communication, broadcasting, and consumer electronics industries. Also in April of this year, ITU-T established the IPTV Focus Group (IPTV-FG) [6], whose objective is standard specifications for IPTV.

This article explains the objectives for the next-generation IPTV service, which is now being studied in various countries, as well as NTT's work in this area up to now, the trends in ITU, and technical issues for the future.

2. Next-generation IPTV service

The current IPTV services are classified into three types of video distribution services: (1) IP broadcast-

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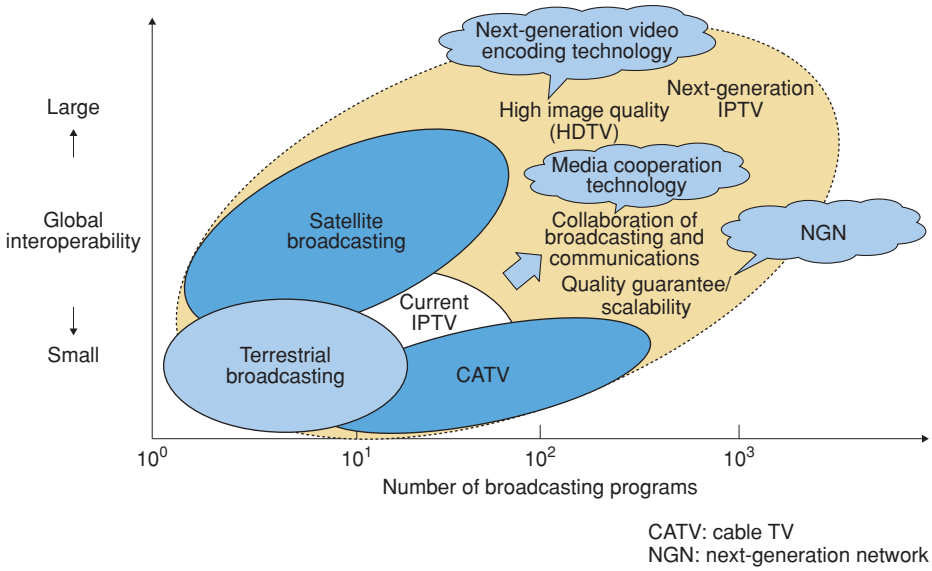


Fig. 1. Overview of the next-generation IPTV service.

ing using multicast distribution of broadcasts provided by broadcasters, (2) video on demand (VOD) using unicast distribution, and (3) video downloading using file distribution methods. In the next-generation IPTV service, it will be necessary to economically deliver many programs at higher quality (ranging from standard definition TV (SDTV) to high-definition TV (HDTV)) to more subscribers (from the current few hundred thousand to several million) by managing and expanding the service area for each video distribution service (**Fig. 1**).

Because current IPTV services use a best-effort network, quality can be degraded when other services are used at the same time. In the next-generation IPTV service, various requirements concerning quality must be satisfied. Furthermore, while MPEG-2 video encoding for SDTV (about 6 Mbps) has been the mainstream video encoding method, commercial use of H.264 encoding for HDTV began at the end of last year. For the next-generation IPTV service, a resolution of 1440 × 1080 pixels, corresponding to the H.264 high profile, will become mainstream.

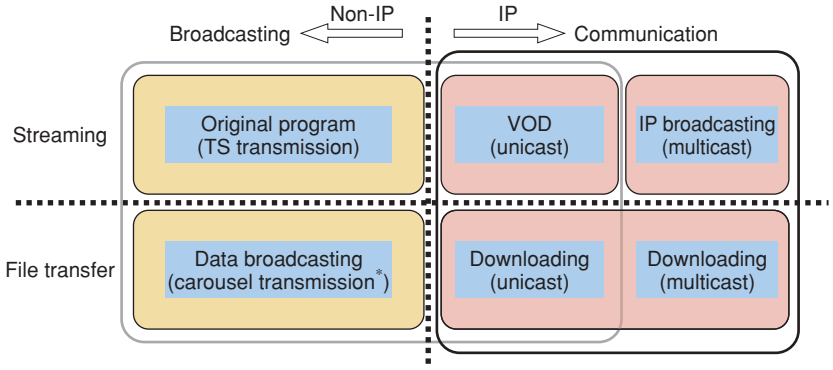
3. NTT efforts toward the next-generation IPTV service

NTT has conducted research and development on media collaboration technology to achieve cooperation between broadcasting and communications [7], [8]. A specific means of cooperation between broadcasting and communication would be a common platform of program distribution technology, program navigation technology (program searching), and content protection technology. That would allow common services using IP for both broadcasting and communication (**Fig. 2**). One broadcasting service that employs IP is the server-type broadcasting service, which is planned to begin in 2008. Suggested server-type broadcasting services include the downloading of programs to terminals via telecommunication lines together with wireless broadcasting and a VOD form of service in which viewers can obtain the program they want at any time from a server. Having a common platform for these downloading and VOD services and the same services provided by communications companies can create various synergetic effects. For example, convenience to the user would be increased by seamless switching between services provided by broadcasters and communication carriers. In addition, a common platform of cooperation technology could save money by allowing a common terminal to be used. A configuration example for the case in which the processing modules in the receiver are shared to the fullest extent is shown in **Fig. 3**.

An example of implementation as a digital television compatible with the next-generation IPTV is shown in **Fig. 4**. In this example, IPTV service is possible without the conventional set-top box.

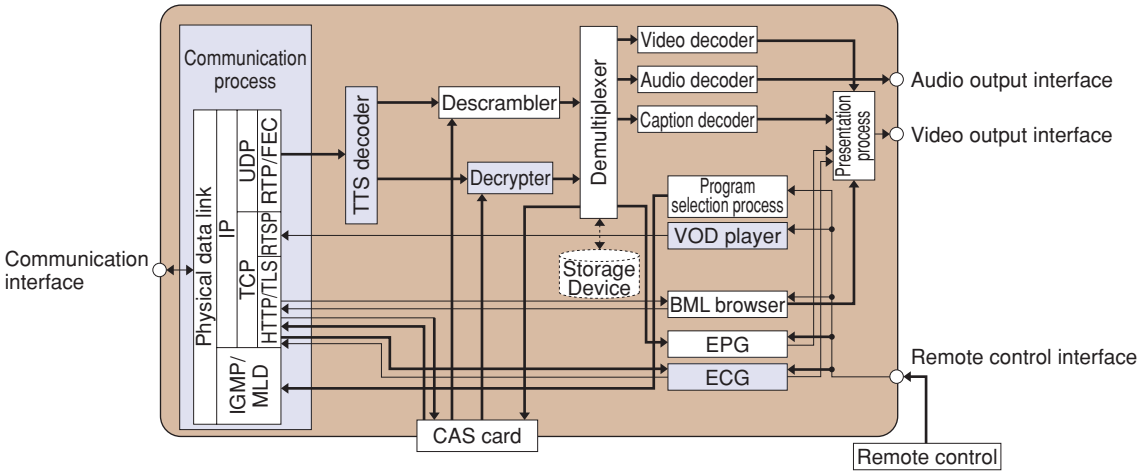
4. ITU-T IPTV-FG

ITU-T (International Telecommunication Union Telecommunication Sector) took the lead in IPTV standardization with the announcement of the forma-



TS: transport stream
* Carousel transmission is a scheme that transmits the same data repeatedly using data elementary streams. Its full name is Digital Storage Media Command and Control (DSM-CC) download carousel and it is defined in ISO/IEC13818-6.

Fig. 2. Next-generation IPTV service for achieving cooperation between broadcasting and communications.



RTP: realtime protocol
FEC: forward error correction
UDP: user datagram protocol
RTSP: realtime streaming protocol
HTTP: hypertext transfer protocol
TCP: transmission control protocol

IGMP: Internet Group Management Protocol
MLD: multicast listener discovery
TTS: text-to-speech engine
BML: broadcast markup language
EPG: electronic program guide
ECG: electronic content guide
CAS: conditional access system

Fig. 3. Receiver configuration using common modules.

tion of an IPTV focus group at its founding meeting in April 2006. Discussion topics at that meeting included the definition of IPTV, analysis of the differences among the several different existing systems, the feasibility of cooperation between different systems, and the study of new common specifications. Many contributions on these topics from many countries (46) were received. NTT, jointly with other companies, described the state of next-generation IPTV studies in Japan [9]. For future investigation, the IPTV-FG has divided the topic into the following six issues.

- Architecture and requirements
- QoS (quality of service) and performance
- Security and content protection
- Network and control
- End systems and interoperability
- Middleware and application programs

Fig. 4. Digital television implementation for the next-generation IPTV.

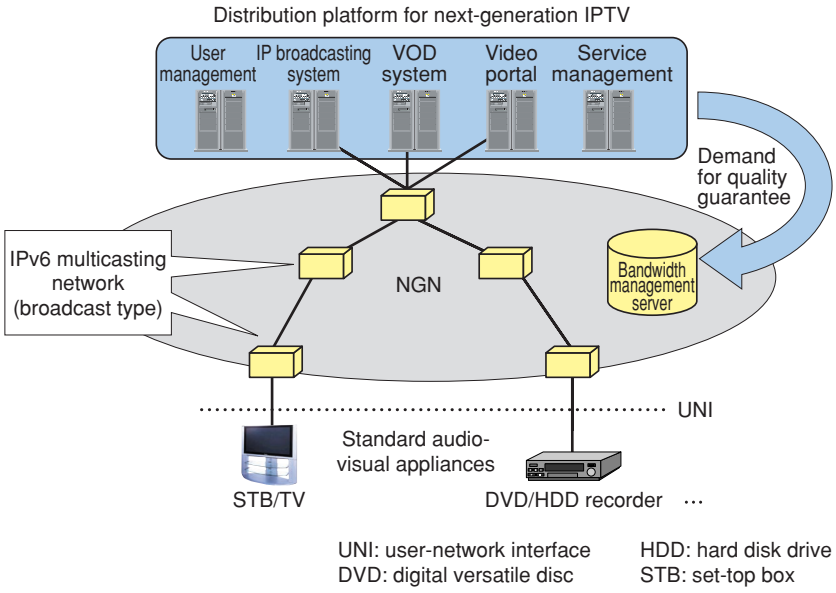


Fig. 5. Next-generation IPTV service in the NGN.

5. Technical problems for next-generation IPTV services

The implementation of the next-generation IPTV service requires cooperation with the next-generation network (NGN), in which QoS can be controlled. NTT has announced that the testing of IPv6 multicasting technology, QoS-controlled IP telephony, and video distribution services will begin in December 2006 as part of NGN verification testing [10]. As shown in Fig. 2, we are aiming to meet the new service requirements for next-generation IPTV through cooperation between the NGN and the next-generation IPTV system. Implementing the bandwidth guarantee function of the NGN as a standard method of guaranteeing quality for video distribution is an issue for the future. The other articles in this Special Feature introduce IP broadcasting technology for the next-generation IPTV [11], VOD technology for the next-generation IPTV [12], and technology for using metadata in IPTV [13] as three typical platform technologies for the next-generation IPTV service (**Fig. 5**).

6. Future plans

Our aims for the near future include early commercialization of the next-generation IPTV service, the incorporation of standard functions for cooperation with broadband networks and cellular phones in more

consumer broadcasting equipment, and the provision of more benefits to content providers, service providers, and viewers through continued research and development of new technology for cooperation between broadcasting and communications.

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