Standardization Trends of Internet Protocol Television (IPTV) and Activities Undertaken by OKI

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Internet Protocol Television (IPTV) services that use Internet Protocol (IP) to offer content services, including video distribution, have become popular since the availability of broadband services, which has spread in recent years. In order to popularize IPTV, it is important that more and more companies create new services and products for the individual elements of IPTV, such as content, services, networks and terminal devices. The standardization of specifications becomes necessary for such purposes. A focus group has been launched and work towards the standardization of IPTV has started at ITU-T, which has been responsible for establishing communication related global standards, since July 2006.

OKI is providing products related to IPTV and conducting standardization activities for IPTV. This paper describes the standardization trends of IPTV[1), 2), 3)] and the activities undertaken by OKI.

IPTV history

Video distribution for personal computers using the internet, started around 1998. This service was called internet streaming and entailed streams of video images transmitted using bandwidths, ranging between a few kbit/s to several hundred kbit/s, with images a screen size smaller than that of a desktop on the monitor of a personal computer. Internet streaming was an innovative service as it provided real-time video images but it was far from the video services that can otherwise be displayed like broadcasts on television and enjoyed for recreational purposes.

Around 2003 an IPTV broadcasting service started with a level of quality adequate for displaying on television sets, due to popularization of broadband services, progress in video compression technologies and advancements of IP technologies. The definition of IPTV includes internet streaming in its broad interpretation and according to its narrow interpretation it is a service for distributing video via a closed IP network to ordinary television sets connected to set top boxes (STB), using broadband access networks established since around 2003. The IPTV service hereinafter refers to the narrow interpretation of IPTV.

When the Act Concerning Broadcast on Telecommunications Service was enforced in Japan in January 2002, it became possible for broadcasting businesses to use telecommunication lines. Telecommunication service operators offering services based on this act were registered as Priority Broadcasters and the services provided were considered official broadcasting services, for which assurance of quality was essential, much like broadcasting using radio waves. Packets carrying video data, therefore, were distributed through dedicated networks that were managed by telecommunication service operators (called Managed IP networks).

Standardization of IPTV

Because services provided for IPTV are delivered over IP networks managed by communication carriers, many of these services have different technical specifications stipulated by individual communication carriers. Standardization of the details relating to IPTV is ongoing around the world for the purpose of popularizing IPTV services. Once standardized services become popular, users ideally will be able to receive a variety of services without using different terminals suitable for individual carriers.

IPTV related specifications are being considered by the Alliances for Telecommunications Industry Solutions (ATIS) in the United States. In Europe such efforts are being conducted by Digital Video Broadcasting (DVB) as well as Telecoms and Internet-converged Services and Protocols for Advanced Networks (TISPAN) of the European Telecommunications Standards Institute (ETSI).

Forum activities intended for the preparation of industrial standards for IPTV are also being conducted. The IPTV Forum Japan, comprised of domestic telecommunication service operators, broadcasters and consumer electronics manufacturers, intends to promote the utilization of IPTV services as well as popularize them by broadcasting and providing communication services, through the standardization of technical specifications that enable to mount IPTV functions in receivers available on the market. The Open IPTV Forum, comprised of companies in the United States, Europe and Asia, is aiming to prepare a industrial standard that encompasses the complete aspects of IPTV by summarizing standards prepared by various standardization organizations and forums.

Standardization trends of IPTV at ITU-T

With such standardization activities in various regions and a diverse range of organizations in the background, ITU-T established the Focus Group IPTV (FG IPTV) in April 2006 to promote and start coordinating for the establishment of an international IPTV standard. A total of 1,300 participants attended and 20 resulting documents were output from the seven meetings conducted by FG IPTV, the sheer number of which was due to the fact that participation was not limited to ITU

Table 1 Recommendation documents of IPTV at ITU-T

Technical field	Q/SG in charge	Recommendation No.	Title	Description
Architecture and services	Q2/13	Y.1901 (Y. IPTV-Req.)	Requirements for Support of IPTV Services	IPTV service requirements
	Q3/13	Y.1910 (Y. IPTV-Arch.)	IPTV Functional Architecture	IPTV functional architecture
	Q1/13	Y.Sup5 (TRY. IPTV-Service)	ITU-T Y.1900 Series - Supplement on IPTV Service Use Cases	IPTV service use cases
Service quality and QoS/QoE models	Q13/12	G.1080 (G.IPTV-QoE)	Quality of Experience Requirements for IPTV Services	IPTV QoE requirements
		G0.1081 (G.IPTV-PMP)	Performance Monitoring Points for IPTV	IPTV performance monitoring - Measuring points -
		Y.1544 (Y. IPMulti)	Multicast IP Performance Parameters	IP multicast quality measurement items
		G.1082 (G.IPTV-MMRP)	Measurement-based Methods for Improving the Robustness of IPTV Performance	Maintenance of IPTV service quality based on measurement results
Security and content protection	Q9/17	X.1191 (X.iptvsec-X)	Functional Requirements and Architecture for IPTV Security Aspects	Functional requirements and architecture of IPTV security
Middleware, application and content platforms	Q13/16	H.750 (H.IPTV-MD)	High-level Specification of Metadata for IPTV Services	Metadata for IPTV
	Q13/16	H.760 (H.IPTV-MAFR.0)	Overview of Multimedia Application Frameworks for IPTV	General descriptions of IPTV multimedia application framework
	Q13/16	H.761 (H.IPTV-MAFR.9)	Nested Context Language (NCL) and Ginga-NCL for IPTV Services	NCL for IPTV
	Q13/16	H.701 (H.IPTV-CDER)	Content Delivery Error Recovery for IPTV Services	Content distribution error correction for IPTV services
	Q4/9	J.701 (TP.BIPTVM)	Broadcast-centric IPTV Terminal Middleware	IPTV terminal middleware for broadcasting services
	Q5/9	J.700 (J.iptvfra)	IPTV Service Requirements and Framework for Secondary Distribution	Framework for secondary distribution of IPTV
Home networks	Q21/16	H.622.1 (H.IPTV-HN)	Architecture and Functional Requirements for Home Networks Supporting IPTV Services	Architecture and functional requirements of home network for IPTV
End systems	Q13/16	H.720 (H.IPTV-TDES.0)	Overview of IPTV Terminal Devices and End Systems	IPTV terminal devices - General descriptions
	Q13/16	H.721 (H.IPTV-TDES.2)	IPTV Terminal Device, Basic Model	IPTV terminals: Basic models
	Q5/9	J.702 (J.IPTV-TDES.1)	Enablement of Current Terminal Devices for the Support of IPTV Services	IPTV terminal devices - Early recommendation models

members but was open to any individual or organization from any member country of the ITU. In December 2007 the IPTV Global Standard Initiative (IPTV-GSI) was established as a consequence, with the preparation of recommendations starting in January 2008 based on the resulting documents and discussions by the Study Group (SG) at ITU on the relevant topics. A list of documents relating to IPTV that have been approved by ITU-T, as of July 2009, is shown in **Table 1**. Among these documents are not only recommendations but also supplementary and technical documents intended to complement these documents. General descriptions of the major recommendations, which are classified into categories of "Architecture and Services", "Middleware, Applications, Content Platforms" and "End Systems", are provided below.

(1) Architecture and services

The requirements for realizing IPTV services are described in Y.1901 (Y.IPTV-Req). The requirements pertaining to the design, mounting and operation of the system are stipulated therein. This document is the basis for the preparation of recommendations regarding IPTV at ITU-T and other recommendations can be considered to have stipulations on technical specifications that satisfy the conditions provided in this document. Individual requirements are classified into levels of "required", "recommended" and "can optionally".

The recommendation on architecture for IPTV services, Y.1910 (Y.IPTV-Arch) stipulates architecture for IPTV with a high degree of abstractness as shown in **Fig. 1**. The end user function group is intended to provide functions to serve users that are comprised of IPTV terminal functions such as a set top box and a home

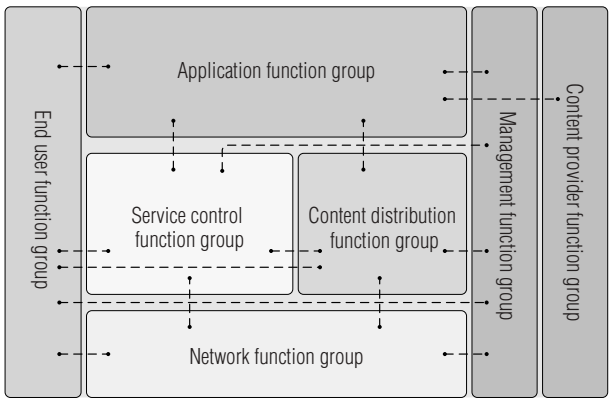

Fig. 1 Outline of architecture for IPTV

network function. The application function group provides application functions for using IPTV services. Program guides for selecting or purchasing content, as well as guides for video on demand (VOD) content are included in the application functions. Furthermore, protection functions for the services and content will also be provided. A service control function group releases networks and service resources according to requests from terminals, in order to provide the services of IPTV in an appropriate manner. A content distribution function group is a group of functions that actually distributes content to the terminals of users and includes the distribution of VOD by unicasting and distributing IP broadcasts through multicasting. Included among these are functions for selecting the most suitable server for a user, depending on the positional information of the user and load conditions of the servers, whenever distribution functions are provided by multiple servers. A network function group provides managed IP networks. These functions also dispense IP addresses and secure the bandwidth necessary for video distributions. A management function group monitors the status and sets the aforementioned end user functions, application functions, service control functions, content distribution functions and network functions. A content provider function group is comprised of functions that provide content and metadata.

In anticipation of evolution of a future network, Y.1910 (Y.IPTV-Arch) provides stipulations for three architecture types:

(a) IPTV over non-NGN networks

(b) IPTV over NGN networks (non-IMS based)

(c) IPTV over NGN networks (IMS-based)

Although IP technologies are used in the Next Generation Network (NGN), unlike existing internet technologies, quality and security can be assured with NGN networks. IMS is an abbreviation for IP Multimedia Subsystem and this stipulates service controls by the Session Initiate Protocol (SIP), which are necessary for providing IP telephone and IP video phone services. The use of IMS as a function for providing multimedia services over NGN networks is actually anticipated. When IPTV is classified into the above three mentioned architectures, the service management function group is expected to use the existing specifications, such as RTSP or HTTP for (a), protocols that are based on (a), which will be stipulated in the future for the case of (b) and SIP, a control protocol of IMS for (c).

Various services provided by IPTV are described in Y.Sup5. This is not a document of recommendation that stipulates technical specifications, but rather, it is a supplementary document. The services described in this document are therefore not limited to the services provided by some carriers somewhere at the present time, but include service scenarios for new services that can be expected to be launched in the future. Aside from the technical requirements, this document is considered to be important from the perspective of considering and realizing services for the future.

(2) Middleware, application and content platforms

Metadata necessary to realize services, such as Electronic program guide for IPTV services, is stipulated by H.750 (H.IPTV-MD). This document, however, does not offer stipulations to the extent of XML tags describing specific metadata but it does stipulate in writing the elements of metadata necessary to realize various services. This document encompasses the metadata of specific elements stipulated thus far by the TV-Anytime Forum.

IPTV does not only stream video but it is also capable of offering services that converge with data broadcasting or utilize the bidirectionality of IP services. An outline of the framework for multimedia features necessary to realize such services is stipulated by H.760 (H.IPTV-MAFR.0). It is also adaptable to the framework of digital broadcasting that has already been put into practical implementation in various countries, with a number of documents relating to the H.760 series expected to be prepared into recommendations in the future. Stipulations of H.761 (H.IPTV-MAFR.9) are based on the Ginga middleware component, which is used for digital broadcasting in Brazil. At the present time, the preparation of a recommendation based on the Broadcast Markup Language (BML), used for digital broadcasting in Japan, is being considered.

(3) End systems

Terminals used to receive IPTV services are stipulated by documents of the H.720 series (H.IPTV-TDES.x). A general description is provided in H.720 (H.IPTV-TDES.0) and consideration is being given for the preparation of recommendations for various terminals in the documents of series 721 and thereafter. Of these, H.721 (H.IPTV-TDES.2) is a recommendation based on the specifications of the IPTV Forum, a standardization organization for IPTV in Japan. A feature of this recommendation includes the stipulation of IPTV terminals that accommodate conformity to existing digital broadcast receivers in Japan, which make it possible to receive services not only with a set top box but also with the IPTV receiver function built into television receivers. Currently, television sets with features based on these specifications are actually available on the market in Japan, with “Hikari TV”[4] as an IPTV service[5].

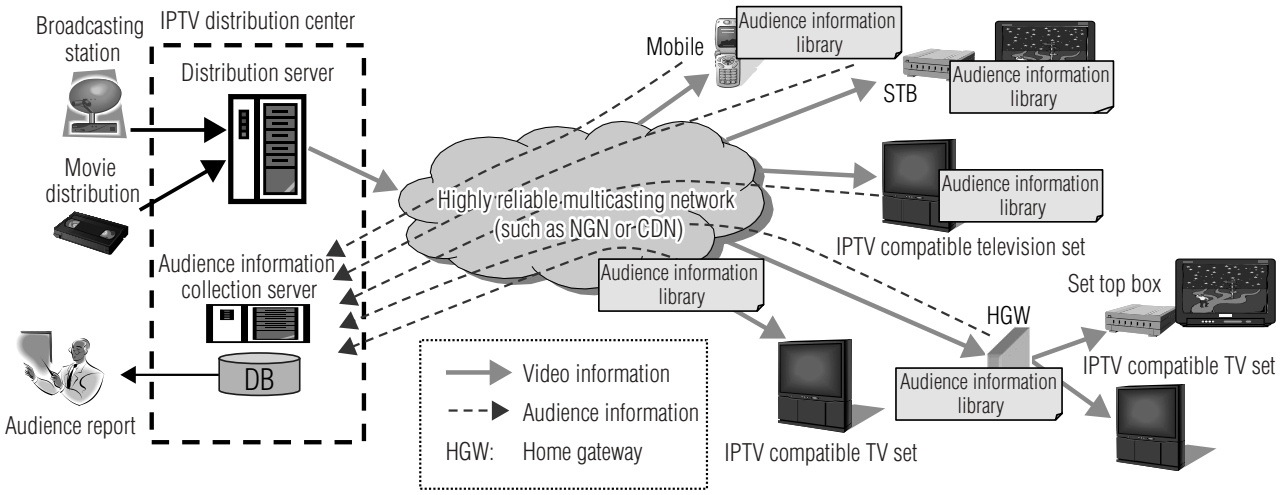

Fig. 2 Outline of audience information collected for IPTV

Activities undertaken by OKI for standardization of IPTV

OKI developed and put into practical implementation OKI MediaServer, a platform for IP video distribution that enables the provision of video distribution services on the internet and by broadband. OKI MediaServer has been adopted as a platform for IPTV. OKI has been conducting standardization activities by participating in standardization organizations, such as the Digital Audio Video Council (DAVIC) or TV-Anytime Forum, and by providing proposals. Due to the popularization of IPTV, however, OKI was participating in the IPTV Focus Group at ITU-T, and is participating in IPTV-GSI and Q13/SG16, which deals with IPTV. Amid such efforts is the standardization pertaining to the technology for utilizing audience information of IPTV, which is being carried forward as the next generation service that utilizes bidirectionality of IPTV.

The technology for utilizing audience information of IPTV will become the basis for realizing services to provide audience rating services or advertisement services that match user characteristics, through the use of the utilization information for IP broadcasting and VOD services provided by IPTV. Since audience information is personal information approval will be necessary from users prior to realizing the actual services, as the protection of information through security technologies will become vital. The overall architecture is depicted in **Fig. 2**. Functions will be necessary for collecting audience information from terminals and home gateways, which are close to users, but at the same time these functions will be required to collect such information from distribution management. Descriptions pertaining to the utilization of audience information are provided in Y.1901 (Y.IPTV-Req), which is a recommendation for requirements, as well as H.750 (H.IPTV-MD), which is a recommendation for metadata and H.720 (H.IPTV TDES.0), which is a recommendation providing a general statement for terminals. At the present time a variety of countries are expressing interest in audience information at actual standardization meetings.

Conclusion

An outline of the standards being prepared as recommendations at ITU-T was provided as a description of the standardization trends of IPTV and the activities undertaken by OKI for the purpose of standardizing IPTV were introduced in this paper. IPTV is an important application for services provided over NGN networks and a lot of progress is anticipated in the future. Further spread of IPTV is anticipated in individual countries. OKI intends to not only provide products based on video distribution servers in the evolving market for IPTV but OKI also intends to contribute towards the realization of more user-friendly IPTV by engaging in standardization activities and by providing products intended for new services.

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