# Media Distribution System

*Katsuhiko Kawazoe*† *and Satoshi Hayama*

**Abstract**

NTT Cyber Solutions Laboratories is developing a media distribution system that supports the various different media of broadcasting and communications as well as fixed and mobile environments with the goal of implementing more advanced content distribution and portal business services. This article gives an overview of its capabilities and roles of its main technologies. By implementing cooperative combinations of different media, this system will open the way to novel business scenarios with much larger markets than could be achieved by each medium alone.

## 1. Introduction

It is clear that much of the difficulty of implementing cooperative combinations of different kinds of media these days can be attributed to the different business models of IT (information technology) providers and broadcasters. Broadcasters derive income from viewers, so naturally their business model emphasizes attracting viewers to the programs they produce and raising the value of media that increase their income. The Internet—no matter how abundant, convenient, and free its content is—will not have a significant impact on changing this established business model unless the advantages of going beyond the risk of the existing model collapsing are perceived.

Yet at the same time, broadcasters have plunged into a number of businesses such as music download services to mobile phones based on the belief that TV viewing and the use of mobile phones are separate and can be compartmentalized, and they have come to the conclusion that these new services offer great potential for new profits without any change to the existing business model.

Thus, figuring out how to implement cooperative combinations of the different media of broadcasting and communication (IT) services on the one hand and between fixed and mobile environments on the other is the fundamental challenge of the content distribution service.

† NTT Cyber Solutions Laboratories
Yokosuka-shi, 239-0847 Japan
E-mail: kawazoe.katsuhiko@lab.ntt.co.jp

## 2. Media distribution system

Research and development on the broadcasting and communication cooperative system [1] that we are studying in this project has focused on developing a platform that will support both broadcasting and communications services. Metadata is a key technology for implementing broadcasting and communication cooperative services. Our system uses international standardized metadata defined by the TV-Anytime Forum and was developed as a total system that supports all functions needed to implement content and metadata distribution services such as a metadata generation function and content/metadata delivery and reception functions. Moreover, we are working out the system operation regulations in conjunction with broadcasters (all the major broadcasters in Tokyo), who are examining various broadcasting/communication cooperative services besides ours. Our system should be the first to achieve broadcasting/communication cooperative services because no other systems currently under development have specifications defined for these operation regulations.

Our media distribution system supports the same cooperation even when the usage environment is extended from the home to outdoors and the ubiquitous environment. There are essentially four types of

content distribution-related services, as shown in **Fig. 1**. If we assume two axes—broadcasting versus communication and fixed versus mobile—this leads to four types of services: fixed broadcasting, mobile broadcasting, mobile communications, and fixed communications, yielding six cooperative combinations.

(1) fixed broadcasting & fixed communications
(2) fixed broadcasting & mobile broadcasting
(3) mobile broadcasting & mobile communications
(4) mobile communications & fixed communications
(5) fixed broadcasting & mobile communications
(6) mobile broadcasting & fixed communications

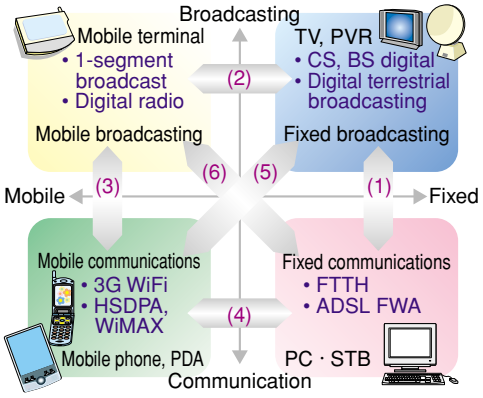
Through these six cooperative combinations, we can create content distribution services that cut across different media. For example, by combining fixed broadcasting with fixed communications (1), we can implement a server-type broadcast service that enables viewers to watch programs at home whenever they want [2]. Or by combining fixed broadcasting with mobile broadcasting (2), we can implement a service that supports continuous viewing so a user can continue to watch a show by changing terminal while moving from indoors to outdoors. Note that these six cooperative interfaces convey content, services, and rights. When these three entities are distributed, they are accompanied by metadata that indicates the content of the entity. Thus, metadata will lead to the distribution of more content.

Metadata can also control the degree of cooperation between different types of media. For example, it might be used to define the scope of permissible use of broadcast programs that tend to be subject to many copyright restrictions. A schematic block diagram of the media distribution system is shown in **Fig. 2**. In the case of broadcast programs, the following types of metadata are defined.

(a) Distribution control information (distribution format, date)
(b) Rights information (content usage conditions)
(c) Program information (genre, detailed information)
(d) Advertising information (sales promotion information)

These types of metadata are standard, and they require a format that is expandable. The program information metadata must comply with TV-Anytime Forum international standards, as described in detail in Ref. [3]. We have already proposed [1] that distribution control (a) and rights information (b) metadata should be formatted in XML (extensible markup language). For the media distribution system introduced here, we now propose that advertising information metadata tags (d) should be used to define the content and that various usage scenarios should be supported.

The extension of the content usage to outdoor environments introduces two additional requirements: more efficient metadata transmission and realtime performance. In mobile environments, metadata must be sent in the same limited bandwidth as the content, and the processing performed in the mobile terminal must be minimized. The metadata, including broadcast program segment unit information, can amount to as much as several megabits, so efficient compression/expansion technology is required to reduce the amount of processing. And to support realtime viewing of sporting events and other live programming, a scheme for generating metadata on-the-fly in real




(1) Server-based broadcast service
• Viewing of missed programs
• Online shopping
• Internet-based electronic program guide
• Program retrieval
• TV portal
(2) Expansion of broadcast viewing area
• Continuous viewing (indoors to outdoors)
• Continuous viewing (outdoors to indoors)
(3)–(5) Mobile server type broadcasting
• Digest viewing
• TV remote control i-appli
• TV-linked i-appli
• Recommendation for individuals
• Music downloading
(6) Internet radio
• Area expansion
• Music downloading

PVR: personal video recorder
CS: communication satellite
BS: broadcast satellite
3G: third-generation
HSDPA: high-speed downlink packet access
WiMAX: worldwide interoperability for microwave access
PDA: personal digital assistant
FTTH: fiber to the home
ADSL: asymmetric digital subscriber line
FWA: fixed wireless access
PC: personal computer
STB: set-top box

Fig. 1. Interface between media.

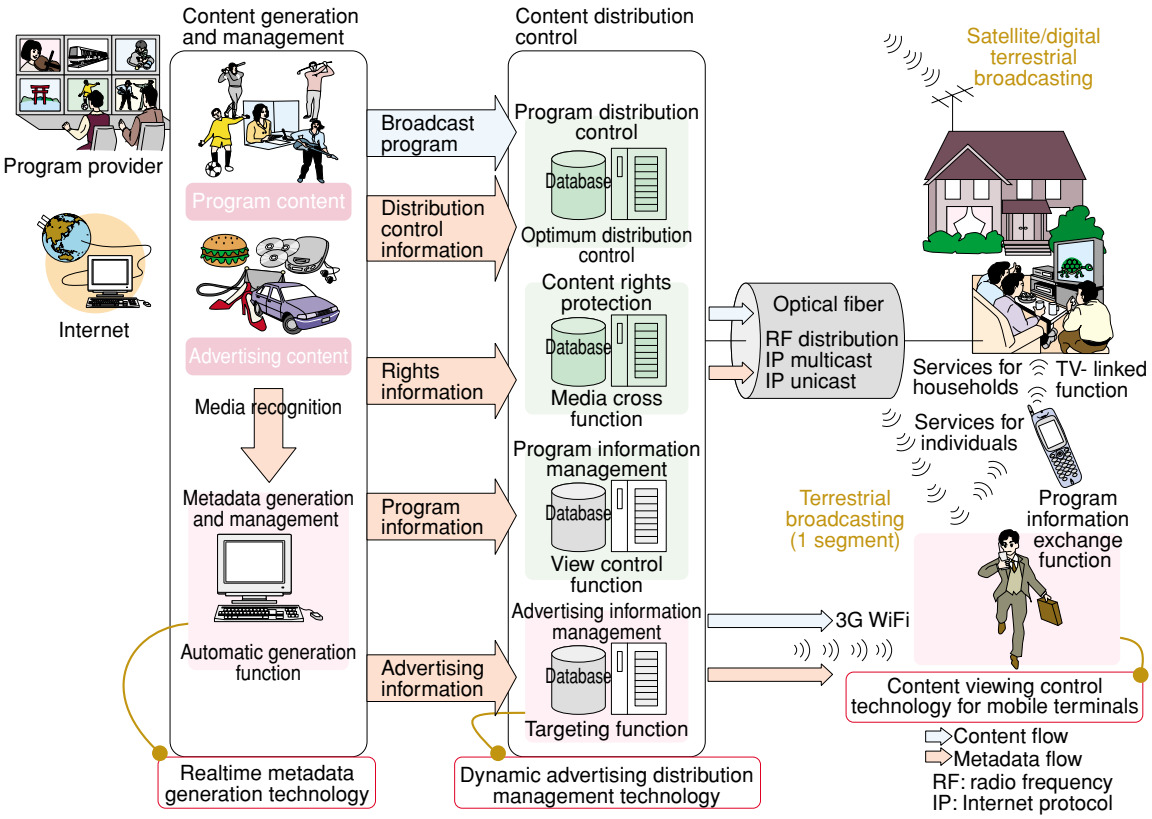



Fig. 2. Media distribution system.

time as the game proceeds is required.

Besides the platform technologies related to cooperative broadcasting and communication described in Ref. [1], the special feature in this issue introduces three key technologies for the media distribution system that are needed to support new services: a dynamic advertising distribution technology for implementing new advertising functions linked to the Internet, a realtime metadata generation technology that automatically generates metadata on the fly and can thus keep up with live broadcasts, and a content viewing control technology for mobile terminals for implementing metadata transmission and processing suitable for ubiquitous environments. These topics are explained in detail in the following three articles.

## References

[1] K. Kawazoe and S. Hayama, "Cooperative Broadcasting and Communication Technology for a New Way of Viewing TV," NTT Technical Review, Vol. 2, No. 8, pp. 50-51, 2004.
[2] Association of Radio Industries and Businesses (ARIB): http://www.arib.or.jp/
[3] TV-Anytime Forum: http://www.tv-anytime.org/

**Katsuhiko Kawazoe**
Senior Research Engineer, Supervisor, NTT Cyber Solutions Laboratories.
He received the B.E. and M.E. degrees in engineering from Waseda University, Tokyo in 1985 and 1987, respectively. Since joining NTT in 1987, he has mainly been engaged in R&D of radio communication systems, satellite communication systems, and the personal handy-phone system (PHS). His specialty is forward error correction systems. He is currently a co-chairman of the Association of Radio Industries and Businesses Working Group for Broadcasting Systems based on a Home Server. He is a member of the Institute of Electronics, Information and Communication Engineers (IEICE) of Japan and received the Young Engineer Award from IEICE in 1995.

**Satoshi Hayama**
Senior Research Engineer, Supervisor, NTT Cyber Solutions Laboratories.
He received the B.E. and M.E. degrees in engineering from Tohoku University, Sendai, Miyagi in 1981 and 1983, respectively. In 1983, he joined Nippon Telegraph and Telephone Public Corporation (now NTT) and he has mainly been engaged in R&D of communication processing systems, OCN service providing systems, and Internet digital video content distribution systems.