



April 13, 2001

NTT'S [MPEG-2 HDTV encoder](#): Worlds' smallest and lightest HDTV encoder for portable camera use. AND "The service technology based on utilizing content ID".

- Exhibiting visual communication technologies for the broadband network age at NAB2001 -

The distribution of broadband contents in Hikari-Soft Service([*1](#)) will be greatly enhanced by the advanced technologies of NTT.

The use of these technologies in creating the next generation of broadcasting services will be demonstrated at NAB2001.

Let us introduce to you "Content ID([*2](#))", which uniquely identifies each content, and the "[HDTV with built-in MPEG-2 Encoder](#)". The former strengthens the promotion of digital contents while the latter opens the world to the production of HDTV content. These technologies are reinforced by our two service-related advances of "ContentConcierge" and "VisionMark".

All of these technologies will be on display at "NAB2001 ([*3](#))". Over the four days from Monday, April 23 to Thursday, 26th, we will be running live HDTV camera feeds from Japan to the NAB2001 exhibition hall in the Las Vegas convention center (Las Vegas, America).

The HDTV video transmission demonstration, called "HD-WAVEp" ([*4](#)), is a joint effort between the international NTT group (NTT, NTT Communications, and NTT Electronics) and Tokyo Broadcasting System, Inc. You must see this demonstration to truly comprehend the superiority of the new communication broadcasting technology in achieving the broadband Networked Age.

1. Background to our work

In the field of contents distribution, we focus on communication and broadcasting here, the globalization of production, transmission, and use continues to advance rapidly. The real advance in the popularity of digital contents will come when HDTV images become easier to acquire and distribute.

There is an urgent need to develop truly practical technologies that allow high quality pictures to be taken, stored, accessed, edited, and distributed. Advances are needed in several fields. We have tackled several of these fields.

The world's first portable [HDTV MPEG-2 encoder](#) has been created by NTT Cyber Communications Laboratory Group (hereafter, NTT Cyber Lab) and built into a regular HDTV camera unit.

This means that it is now possible to provide real-time coverage of many areas; excellent image quality is now combined with excellent mobility.

The variety of contents, services, and applications is now expected to increase rapidly. The distribution of digital contents over the network does not mean exposure to fraud and abuse. To solve these problems, NTT Cyber Lab has created copyright management and control schemes based on "Content ID" defined by the Content ID

Forum (cIDf), and additional technology to confirm the validity of contents throughout the network.

This combination of production support and security assurance will allow the rapid expansion of global contents usage in the broadband age.

2. Exhibition Contents

(1) Wireless HD camera

To best appreciate the advances made, you really must see the "Wireless HDTV camera". It consists of the world's smallest and lightest "[HDTV MPEG-2 encoder built into a camera](#)" together with a digital wireless communication module. Developed by NTT Cyber Lab, this is the world's first camera to achieve this level of portability (everything is battery operated) and performance.

The key advance is the portable MPEG-2 encoder. Based on our advanced SuperENC II chip, this encoder is about 75% smaller than its nearest rival and uses about 50% less power. Low processing delay is assured through the concurrent operation of nine SuperENC II chips set in a parallel arrangement.

High processing efficiency and excellent image quality are achieved by optimizing the distribution of image data among the nine SuperENC II chips.

When built into the camera, this encoder is combined with a digital radio transmission module and the "HD-TS bridge ([*5](#))". This forms the world's first "Wireless HD camera".

The HDTV video transmission demonstration "HD-WAVExp", which will present an international HDTV video feed, will use pictures taken by this wireless HD camera.

(2) Contents utilization technology based on "Content ID"

"ContentConcierge" (Figure 1)

The ContentConcierge is a system that introduces various value-added services associated with each content distributed over the Internet by using a unique identifier called "Content ID" issued to each content.

Currently users can only follow the links between contents that had been prepared beforehand by the content provider. In contrast, Content Concierge can meet individual demands emerging from the user side such as "I would like to reuse the content that I found on a certain page for another application", and "I would like to know about associated value-added services such as retail sales related to the content."

First, a Content ID defined by the Content ID Forum is embedded into each content by a certain technology, digital watermarking ([*6](#)) for example, before its distribution on the network. Then, at user terminals, the Content ID is extracted by watermark detection, and the user terminal is connected to a service gateway through the network. This service gateway introduces value-added services associated with the content based on a service registry database.

One of the value-added services that could be introduced by the service gateway is provided by the Content ID management center, which is jointly trusted by content holders. It includes official attributes display of the content, alteration detection of the content, and download of the same content at different bit rates or display formats. In addition, there could be some extended services provided by third parties, such as content retrieval and provision of content-related information such as retail sales or advertisements. Service providers can register their own services to the service gateway to establish new links between contents and services.

"VisionMark" (Figure 2)

VisionMark is a system that provides information related to a TV and/or network broadcast content. When you're watching TV and you come across a scene that

interests you, or about which you'd like to have more details, you need only push a button to indicate your interest. The system automatically acquires information related to the scene from the content service gateway by using the content ID and the broadcast time, and displays the result as a mark(VisionMark). Using this mark, you can obtain interactive contents related to the interested scene through the Internet at your leisure after you have finished watching the program.

We will demonstrate this(VisionMark) by interactively acquiring more detailed information about a TV commercial message. In addition, we will demonstrate automatic marking(AutoVisionMark) and a replay service for sports programs. By setting user's preferences ahead of time, when exciting plays, like hits and homeruns occur, the system automatically marks the scene and gives an alarm. You can replay the scene as desired, through the VisionMark.

The main points of these two technologies are as follows.

(i) Content ID: embedding an unique code into each content e.g. an image or a video clip for the purpose of copyright verification. The contents management information database called IPR-DB uses the contents ID as a unique identifier to provide a matching access key. Obviously, the persistency of the Content ID is critical. Thus Content ID should to be impossible to eliminate, and it should remain readable even after image compression or alteration. NTT Cyber Lab has developed an original digital watermarking method that withstands MPEG or JPEG compression and decompression.

In the user terminal, Content ID can be detected even from within office applications, such as web browsers, e-mail programs, and word processors, and inquiries can be made to the service gateway.

(ii) Content Service Gateway: conforms to the global standard "Contents ID".

We have developed service gateways in accordance with the Content ID standard specifications released by the Content ID Forum.

First of all, the address in the service gateway corresponding to content ID is specified by the global resolution mechanism ([*7](#)).

When the service gateway receives an inquiry containing Content ID from the user, it confirms content validity by accessing the content management information database called IPR-DB.

Moreover, dynamic hyperlinks are used to link the user's preferences and the user terminal settings to the contents, known from the Content ID and program broadcast time, to the service gateway.

This allows the most appropriate service menu information for the user to be displayed in real time.

3. Developments in the future

We will, from an international perspective, continue to demonstrate the contents distribution service (established by contents holders), the contents provision service, as well as visualizing the global contents distribution service in the broadband Networked Age, and conducting further service and technological verification experiments.

(glossary)

*1:Hikari-Soft Service

"Hikari" is a Japanese word meaning "Optical." "Hikari-Soft Services"are innovative information sharing services that utilize the three characteristics of the optical network, that is, "high-speed and broad bandwidth", "interactivity", and "convergence of communications and broadcasting media."

NTT has coined the term "Hikari-Soft Services" to describe the services that can be made available by the information sharing platform and application software, running on photonic network hardware, and the services that help to distribute content, which can be considered a form of software.

***2:Content ID**

This represents the attribute data needed to manage the distribution of contents standardized by the Content ID Forum (www.cidf.org).

Content ID includes "Content attributes " decided when contents are produced in addition to an identifier that uniquely identifies the content; "Rights attributes (original copyright information)" "Rights operation attributes (relevant copyright-contract information)", "Circulation attributes (range of use permission)", and "Distribution attributes" (royalty distribution plan for the authorized persons), etc. decided when contents circulated.

*** 3:NAB**

(The National Association of Broadcasters)

The world's biggest broadcast related equipment exhibition. It was originally a conference of broadcasters, then the makers' exhibition was merged into it, and finally the style of current exhibition is established.

The main exhibitors are the broadcast equipment makers and the professional sound equipment makers etc.

*** 4:HD-WAVExp**

This is the system used to verify international signal transfer, digital relay, a remote control system that uses optical circuits, and domestic digital SNG relay. Its origins are the introduction of digital BS broadcasting in Japan which began last December.

It is used to connect the exhibition hall (Las Vegas) to the relay point (Tokyo: Akasaka Broadcasting center, Tokyo Broadcasting System, Inc.) by ATM service, and thence to the HD relay cars in the vicinity of Mt. Fuji by digital SNG. The bidirectional transmission of the MPEG-2 HDTV images is established.

An HDTV camera set in Shibuya is remotely controlled from Las Vegas at the same time.

*** 5:HD-TS bridge**

Jointly developed by Tokyo Broadcasting System, Inc. and NTT Electronics, this is an interface that connects the encoder to the transmission modules.

***6: Digital watermarking**

This is a technology that embeds an ID or a short message into a digital content such as background images, dynamic scenes, and music. The watermarks are small, not perceptible, and cannot be removed or altered.

They can be used for illegal copy detection and so on.

***7: Global resolution mechanism**

This is a standard mechanism to identify the address of the service gateway from the content by using the Content ID. For this part, the publicly released "Handle System plug-in module", developed by CNRI (Corporation for National Research Initiatives), is used.



HDTV with built-in MPEG-2 Encoder

- [Figure-1 ContentConcierge Interactive Content Service Finder Using Content ID](#)
- [Figure-2 VisionMark](#)

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