Video Communication Technology for Resonant Communication

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Abstract

As part of its overall strategy to expand broadband and ubiquitous network services, the NTT Group has developed a multipoint video communication service that features high-resolution picture quality, ease-of-use, and affordability. This service was launched commercially in March of this year. It offers convenient carrier-grade videoconferencing and videophone functions and can be used in the same way as IP-phone services.

1. Targeting the expansion of broadband services

With the rapid expansion of broadband IP (Internet protocol) communications made possible by the diffusion of fiber-optic access, major service developments are not limited only to the improvements in Internet access. IP telephones and video content viewing have now reached the same level of quality and usability as traditional telephones and televisions.

Based on the "Resonant Vision" announced in 2003 [1], NTT Laboratories and NTT Resonant are committed to creating attractive services for the fiber-optic age. Specifically, we are developing a video-communication service, and based on it, we are developing and providing new business applications. One such initiative is our development of the PC Communicator (PCC), which makes possible high-resolution, easy-to-use, affordable multipoint video communication among personal computers (PCs). NTT Communications introduced "OCN Dot Phone [.Phone] Business V" in March of this year. This is a commercial service that runs on the OCN[*1] services of NTT Communications and is targeted at SOHO (small office, home office) and corporate customers. NTT Resonant designed, built, and now operates this service, which it provides to NTT Communications as a service function, i.e., on a service wholesaling basis. Another significant feature of this system is its connectivity with NTT DoCoMo's FOMA[*2] videophones, which makes it a ubiquitous service suitable for practical use.

2. Video communication

NTT Group's vision for broadband and ubiquitous service evolution is presented in **Fig. 1**. As part of this vision, we are developing and offering realtime, highly natural video communication services that support multipoint videoconferencing. This system leverages the ultrafast interactive video services made possible by fiber optics and connections to mobile communication services. While drawing on the combined strength of our corporate group, we will continue to meet the ever more demanding needs of our customers by developing and providing dependable, easy-to-use portal services. Through the blending of services, we aim to respond flexibly to the needs of

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*1 OCN: open computer network. An Internet connection service provided by NTT Communications. OCN provides broadband Internet connection, contents delivery, and ".phone" IP telephony services etc. (http://www.ocn.ne.jp/english/personal/option/voip/).

*2 FOMA: A third-generation (3G) mobile communications service operated by NTT DoCoMo that provides videophone and high-speed data communications (http://www.nttdocomo.com/corebiz/network/3g/index.html).

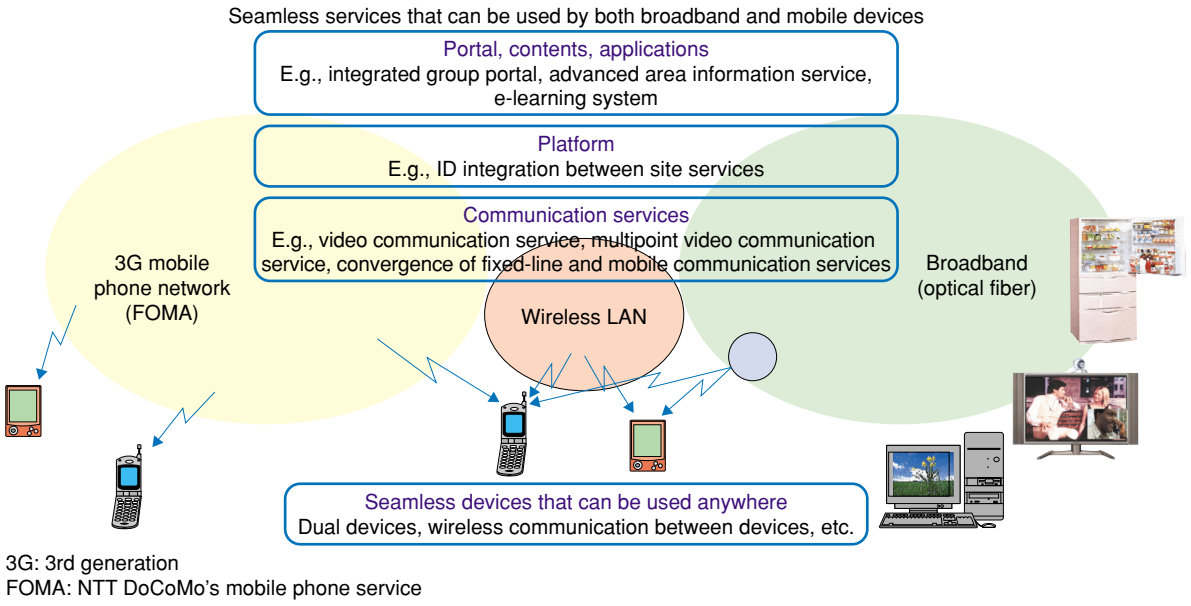

Fig. 1. Evolution of broadband and ubiquitous network services.

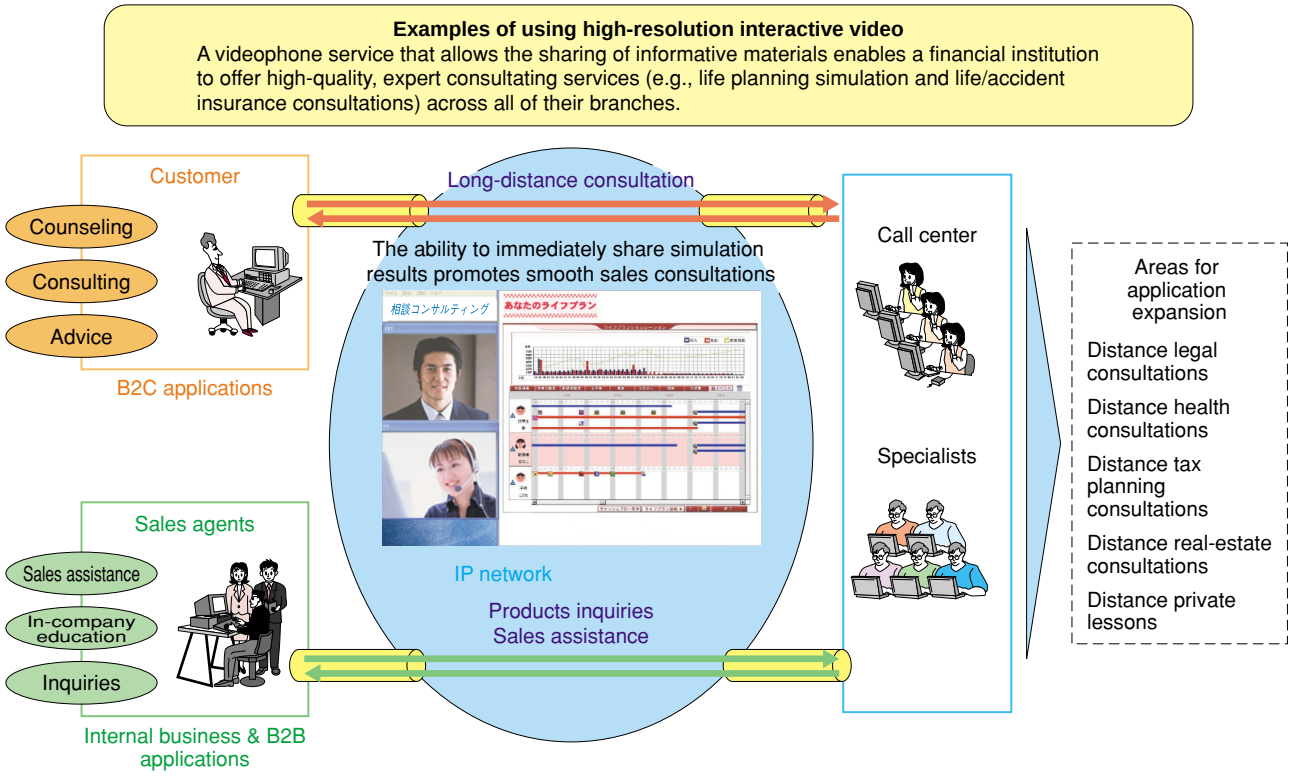

Fig. 2. Examples of videophone usage.

our customers.

Videophone and videoconferencing services are representative video communication services made possible by PCC. Some examples of videophone uses are shown in **Fig. 2**. High-speed video transmission makes possible high-resolution video and interactivity: this allows non-verbal visual cues such as facial expressions to be exchanged, which is not possible with voice-only calls. For consulting services where face-to-face interaction is critical (e.g., legal, health-

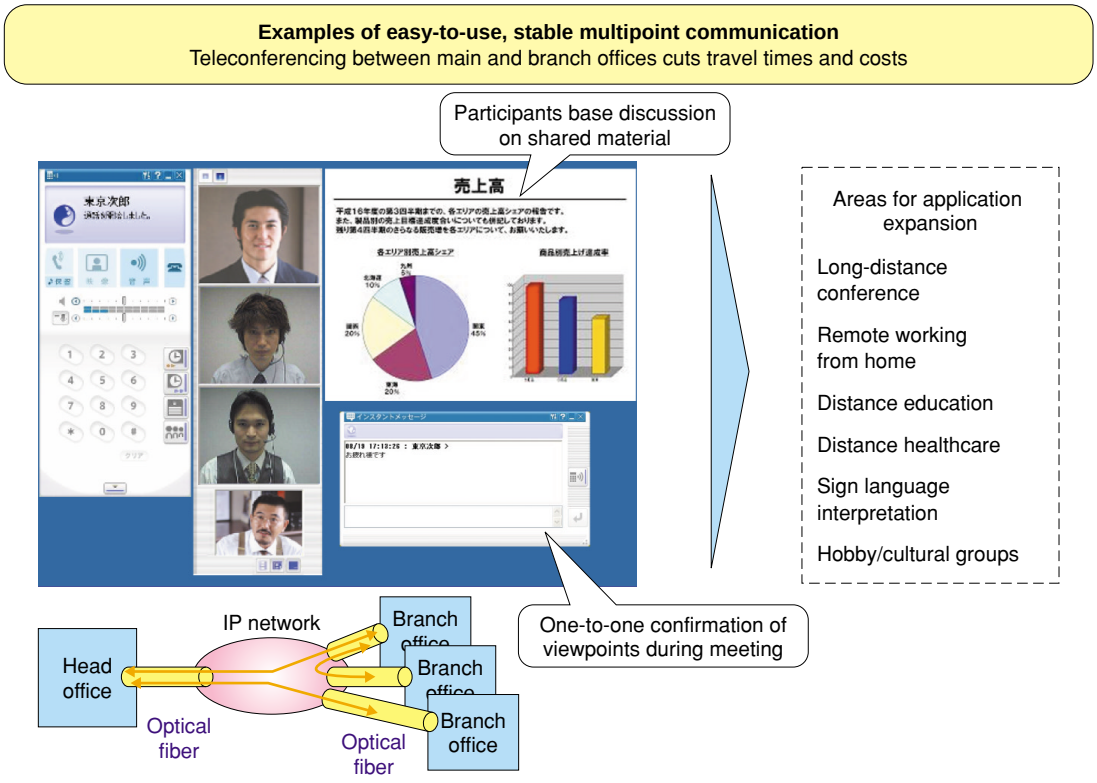

Fig. 3. Videoconference.

care, tax, and real-estate counseling), the videophone service enables sensitive customer care. The fact that PCC allows explanatory materials to be shared to aid in discussion further promotes a deeper communication with the customer.

Some usage scenarios for the videoconferencing service are shown in **Fig. 3**. The service allows multiple participants, separated by long distances, to hold discussions as if they were in the same room. Communication and understanding is enhanced by features such as the document sharing function, which allows the display of materials to all participants, and the whiteboard function, which allows participants to cooperatively draw out ideas on a shared virtual whiteboard.

Although videoconferencing services are already available over ISDN and dedicated lines, there are issues related to video quality as well as equipment and transmission costs. Broadband IP transmission over optical fiber access lines overcomes all these problems, making multipoint video communication easy and affordable.

Furthermore, the integration of fixed-line and mobile access makes it possible for users to participate in videoconferences via FOMA mobile phones. This is handy in situations where quick decisions need to be made remotely: the on-site conditions can be communicated through the videophone and quick feedback or decisions can given by the central office.

3. Carrier-grade video communication service

An overview of the video communication service using PCC is shown in **Fig. 4**. PCC offers carrier-grade service, which NTT is well-positioned to provide.

The PCC system provides QoS (quality of service) management capabilities, making it possible for us to offer a high-quality, reliable service with quality and reliability levels equivalent to those of traditional phone services. Connection and transmission management between the video clients is done using SIP (session initiation protocol), the protocol used by IP-phone services. Each PC client can be assigned an 050 telephone number, which makes authentication possible. The PCC system is flexible enough to cope with further developments in convergence. Flexible billing to support various types of service models is possible. The system also supports interconnectivity with analog and IP phones and video communication

PCC combines various communication tools such as videophones and videoconferencing into a single system.
It makes possible a variety of video communication methods from a PC.

Communicating points	Communication medium	Details		Video communication function	Voice communication function	Other functions
Multi-point	Video-conference	• Multi-location conversations enabled by audio-mixing functions • Convenient hands-free conversation enabled by echo-canceller • Videoconference between as many as 20 locations with high-quality MPEG-4 video	PC, Video-conference, PC, PC, FOMA (option)	MPEG-4 high-quality picture Up to 20 participating points	Sound mixing Echo-canceling Sound quality equivalent to fixed-line phones Hands-free talking	Sharing of presentation materials/chatting Application sharing Whiteboard Participation by FOMA devices (option)
1:1	Video-phone	• Area-free videophone (unrestricted by location limitations) made possible by communication between FOMA videophones and PC conferencing clients • Facial expressions and atmosphere communicated by high-resolution video • Highly realistic sensation of presence created between participants despite the distance by fundamental functions needed for meetings such as application sharing board and file transfer	PC, Video-phone, FOMA	Videophone call between PC and FOMA MPEG-4 high-quality picture	Sound quality equivalent to fixed-line phones Hands-free talking	
			PC, Video-phone, PC	MPEG-4 high-quality picture	Sound quality equivalent to fixed-line phones Hands-free talking	File transfer Application sharing board Instant messaging

Fig. 4. Service overview.

with FOMA videophones. The main functions supported by PCC are described below. Some of these functions are described in more detail in the other articles in this Special Feature.

(1) Videophone

The videophone has an 050 telephone number just like an IP telephone. It uses MPEG-4 encoding for high-resolution video communication. The phone can also be used as a standard IP phone making voice only calls to analog and mobile phones. Video-calls to FOMA videophones are supported.

(2) File transfer

During the videoconference, files can be transferred to specified participants (file size: up to 100 MB).

(3) Application sharing board

Two people may share a window where text can be entered and shapes can be drawn. Both users can simultaneously view the same whiteboard and sketch on it.

(4) Instant messaging

Two people can send text messages in real time. The text is automatically saved, so it can be referred to after the chat conversation.

(5) Videoconferencing

Up to 20 people at a time can participate in a videoconference. The system incorporates a high-performance echo-canceller, so users do not need to use headsets: they can hold natural conversations using ordinary microphones and speakers.

Because the voice mixing function continuously sends and mixes the sound from all conference participants, any participant can speak at any time, just like in a real meeting. While holding a conversation

using video and voice transmission, users can exchange instant messages and use the whiteboard. Participation in the videoconference by FOMA mobile phones is also supported.

(6) Conference schedule registration

The videoconference time and participant list can be set from a Web browser. Once the time for the conference has been reserved, an email invitation is sent out to all participants.

(7) Sharing of materials

During a videophone call or a videoconference, it is possible to share documents (e.g., Excel and Powerpoint files.) among all the participants.

(8) Application sharing

An application on one participant's PC can be shared by all of the participants. This is handy for joint editing of materials or cooperative software development.

(9) Whiteboard

During a videoconference, participants can freely draw onto the virtual whiteboard using standard writing implements such as pencils. Multiple participants can draw simultaneously on the same whiteboard.

(10) Address book

A user can register participants in his/her own address book. This makes it easy to search for users by their name or phone number when one wants to set up a videophone call or videoconference.

(11) Active list (presence)

A user can check the presence of persons on his/her registered list, where presence means that the person is currently online

(12) Call history

A user can view his/her transmission history log for videophones, videoconferences, and instant messaging and view the content of the instant message chats.

4. System architecture

The overall architecture for this system is presented in **Fig. 5**. The blue parts represent the PCC system, which has three main types of functions. These are described below and summarized in **Table 1**.

(1) SIP proxy and presence functions

Connection management of clients is done using the SIP protocol. Presence information for all registered clients is managed. This portion also includes authentication and billing functions.

(2) Videophone and videoconferencing functions

These are composed of a number of objects including the multipoint videoconference server, which makes it possible for multiple clients to simultaneously connect for conferencing, the document sharing server, and the gateway to the FOMA network. The client is an ordinary PC with special software installed.

(3) Operations functions

User registration and overall maintenance and operations are performed via the system console.

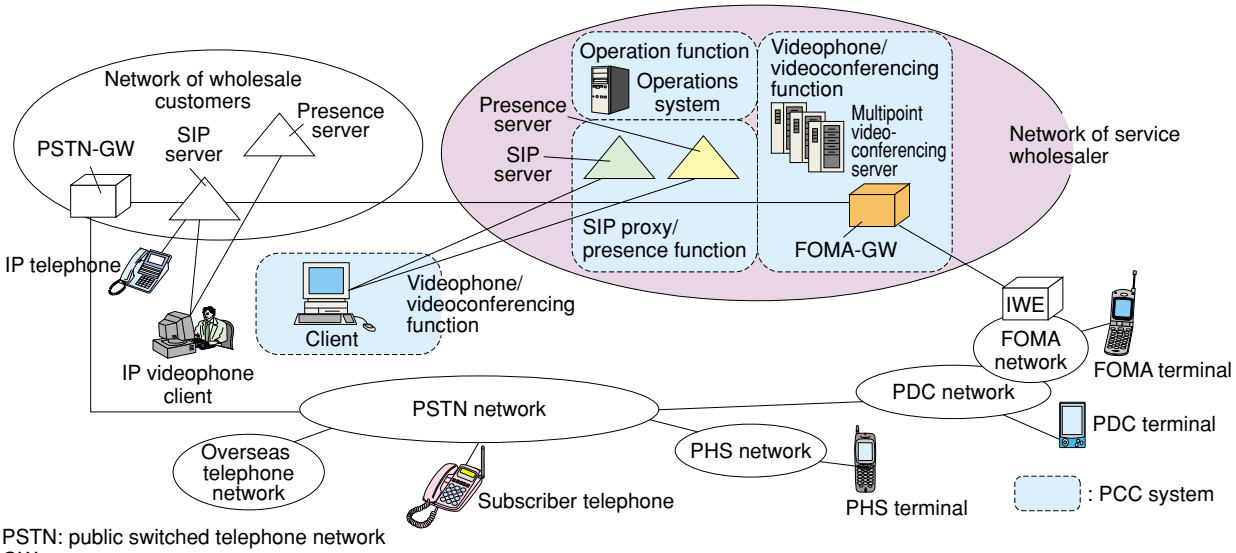

Fig. 5. System architecture.

Table 1. Overview of functions.

SIP proxy and presence functions	SIP server	SIP session control function
	Presence server	Function for managing conference terminal's presence and profile information
Videophone and videoconferencing functions	Multipoint video-conferencing server	Multipoint conferencing basic functions (user management, conference reservation management, voice synthesis, video distribution, etc.), functions for sharing presentation materials among conference participants, etc.
	Client	Client software installed on PC for videophone and videoconferencing functions
	FOMA-GW	Gateway for connecting to FOMA videophones
Operations functions		Functions related to maintenance and operations performed via the console

5. Future plans

PCC, the video communication service presented in this article, was developed to offer videophone and videoconferencing services to small enterprises. Next, we plan to build a system that can serve a wide range of customers in various usage scenarios.

Reference

[1] "Next Generation Network—RENA," NTT Technical Review, Vol. 1, No. 6, pp. 48-61, 2003.

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He received the B.S. and M.S. in physics from Tokyo Institute of Technology, Tokyo in 1979 and 1981, respectively. He joined Musashino Electrical Communication Laboratories, Nippon Telegraph and Telephone Public Corporation (now NTT) in 1981. He has been engaged in R&D of communication network architectures and communication switching software. From 1984 to 1986, he was at NTT Basic Research Laboratories, where he researched formal description methods for service specifications. From 1987 to 1990, he was at NTT Software Development Center, where he was active in the development of NTT's switching system (called D70) software. From 1991 to 1997, he was involved in R&D of a software development environment for communication switching systems at NTT Network Service Systems Laboratories. From 1998 to 2001, he was active in the development of the new signaling transfer point for NTT's SS7 network and R&D of VoIP systems at NTT Network Service Systems Laboratories. He is currently working on establishing NTT's next-generation communication network architecture and planning the overall R&D strategy for NTT's next-generation communication networks. He has been a member of the Multiswitching Forum Board of Directors since 2002.

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