FOMA Videophone Multipoint Platform

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NTT DoCoMo has developed a visual communication system that enables conference calls as an application using FOMA Videophones. This article describes the outline of the system.

1. Introduction

The population coverage of the Freedom Of Mobile multimedia Access (FOMA) service reached 60% in April 2002, and is expected to be 90% by the end of FY2002.

Visual communication systems that use existing FOMA Videophones enable one-to-one communications. As a mobile application tool that further expands the possibilities of communications, we developed the FOMA Videophone Multipoint Platform, which enables conference calls.

This article explains the outline of the FOMA Videophone Multipoint Platform developed lately.

2. Service Profile

This platform enables the implementation of a service that allows visual conference calls using FOMA Videophones. There are two operation phases for the user as described below, the call reservation phase and the multipoint call phase.

2.1 Call Reservation

To make a multipoint call, the user must first connect to the multipoint platform's server via i-mode and set the call time, call destination, and display mode. The multipoint platform searches the vacancy status of the system based on the specified information and completes call reservation by securing the resources. After the completion of call reservation, the multipoint platform sends a reservation mail to each party to the call, stating the date and time of the multipoint call, the parties, and the phone number.

When accessing the server to make a call reservation, security is guaranteed by executing user authentication using member information which is pre-registered at the server and the personal identification information from the mobile terminal (MT).
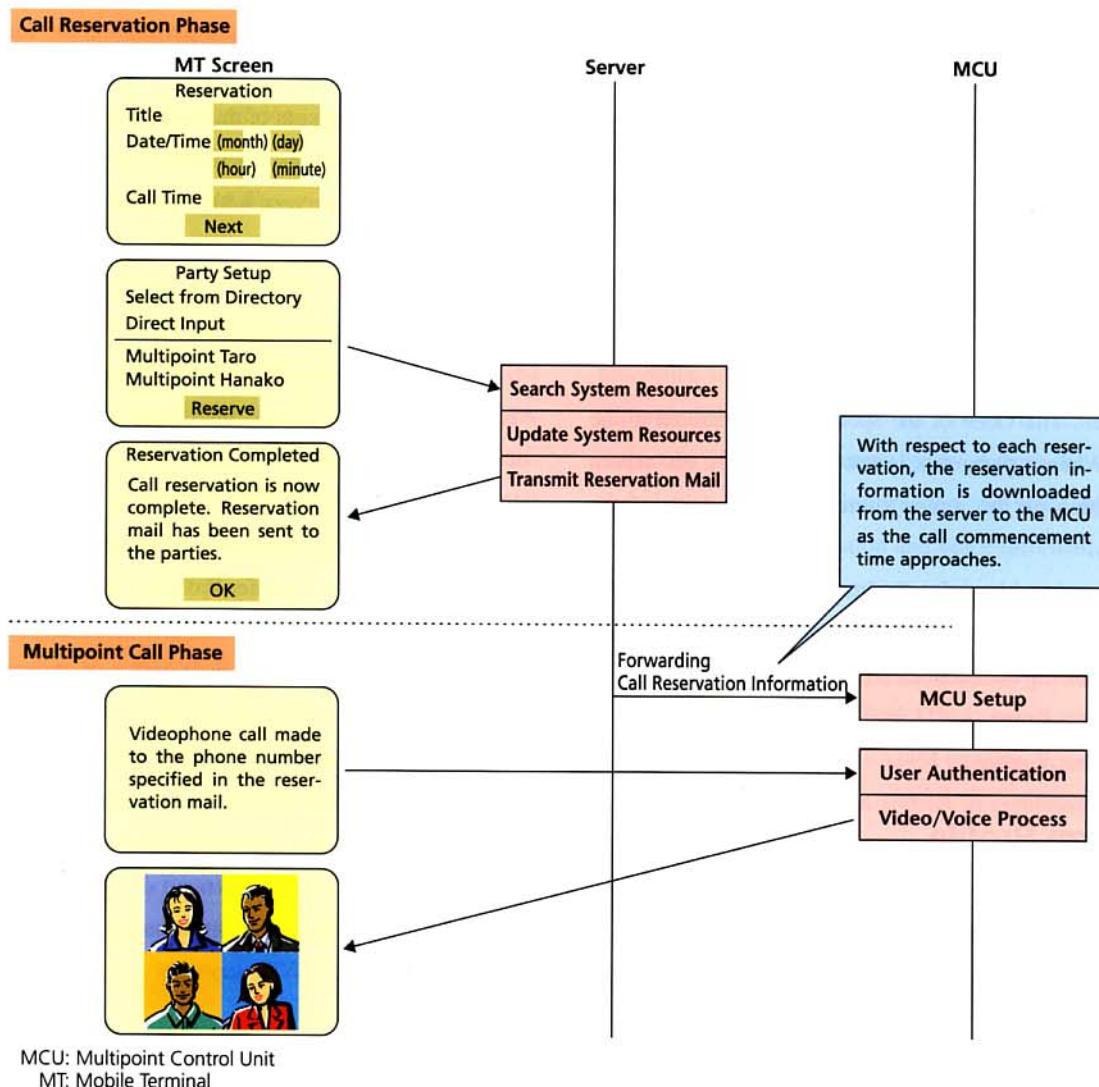
Call Reservation Phase

MT Screen | **Server** | **MCU**

Reservation
Title
Date/Time (month) (day)
(hour) (minute)
Call Time
Next

Party Setup
Select from Directory
Direct Input

Multipoint Taro
Multipoint Hanako
Reserve

Search System Resources

Update System Resources

Transmit Reservation Mail

Reservation Completed

Call reservation is now complete. Reservation mail has been sent to the parties.

OK

With respect to each reservation, the reservation information is downloaded from the server to the MCU as the call commencement time approaches.

Multipoint Call Phase

Forwarding
Call Reservation Information

MCU Setup

Videophone call made to the phone number specified in the reservation mail.

User Authentication

Video/Voice Process

MCU: Multipoint Control Unit
MT: Mobile Terminal

Figure 1 Call Reservation and Multipoint Call Sequence

2.2 Multipoint Call

A multipoint call using FOMA Videophones can be made by making a videophone call over the multipoint platform during the reserved time (the phone number is informed by the reservation mail) (**Figure 1**).

The Multipoint Control Unit (MCU) in the multipoint platform processes calls, voice and video from videophones, and realizes multipoint calls thereby (**Figure 2**). From the videophone connected to the MCU, the voice and video of the user is transmitted to the MCU based on the 3G-324M communications protocol, as in the case of ordinary videophones. The MCU determines the speaker based on the voice information, combines the three voices based on the "add first voice first" rule[*], and transmits them to each videophone. The video can be displayed either on a screen divided into quarters (**Photo 1**) or
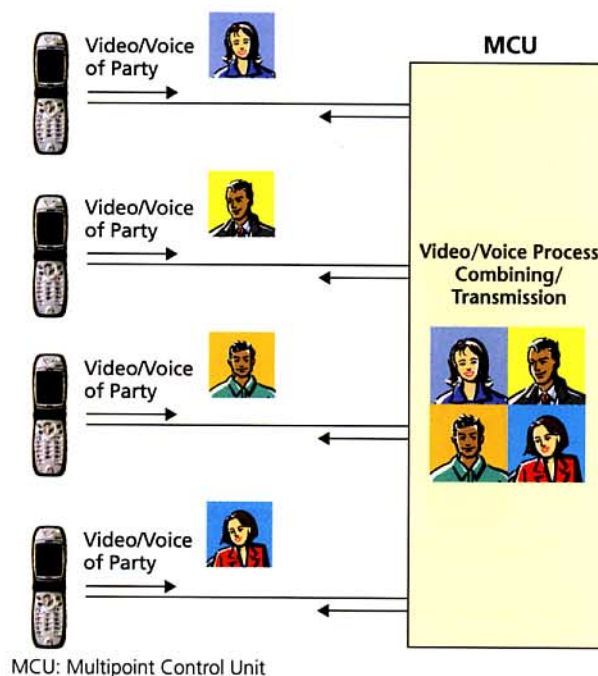
Video/Voice
of Party

Video/Voice
of Party

Video/Voice
of Party

Video/Voice
of Party

MCU

Video/Voice Process
Combining/
Transmission

MCU: Multipoint Control Unit

Figure 2 MCU Operation

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[*] "Add first voice first" rule: The voice that has been produced before others during a call is given priority as a subject of addition under this rule.

Photo 1 Screen divided into Quarters

on a full screen. The video of the speaker is transmitted to the videophone. When a party that is not displayed on the screen speaks, the video on the screen switches to the video of the speaking party.

As for the connection of calls from the videophone to the MCU, security is guaranteed at the time of making a multipoint call by only allowing connections with the reserved phone number at the reserved time, while rejecting connections with any unreserved phone number.

3. Platform Profile

The multipoint call model is established by reserving the parties to the call and the call time at the multipoint platform in advance, so that the parties would connect to the multipoint platform via videophone at the specified time.

The FOMA Videophone Multipoint Platform can simultaneously connect up to sixty FOMA Videophones. For example, it can support up to twenty conference calls assuming that all calls are three-party calls. Moreover, it can simultaneously connect up to eight people per conference call. The maximum number of

people it can connect (i.e. eight persons) is the functional limit of the platform.

The platform consists of the FOMA Videophones; the MCU, which transmits/receives 3G-324M streams and combines video and voice; and the servers, which control the MCU and manage the user interface including call reservation (**Figure 3**).

3.1 Servers

The servers primarily have the "admission function," the "control function" and the "MCU management function," each of which are defined as follows.

(1) Admission Function

This is a function to exchange requests and acknowledgements by HyperText Transfer Protocol (HTTP) communications as the admission front of the user interface, including call reservation using i-mode. It also gives mail notices such as reservation mail.

(2) Control Function

This is a function to execute resource management including the search of the system vacancy status based on user requests, build-up and management of DB associated with user information and reservation information, and user authentication at the time of WWW access in liaison with the admission function.

(3) MCU Management Function

This is a function to execute control, such as giving instructions to the MCU to start a conference call. It also receives various information from the MCU and updates the resource information in liaison with the control function.
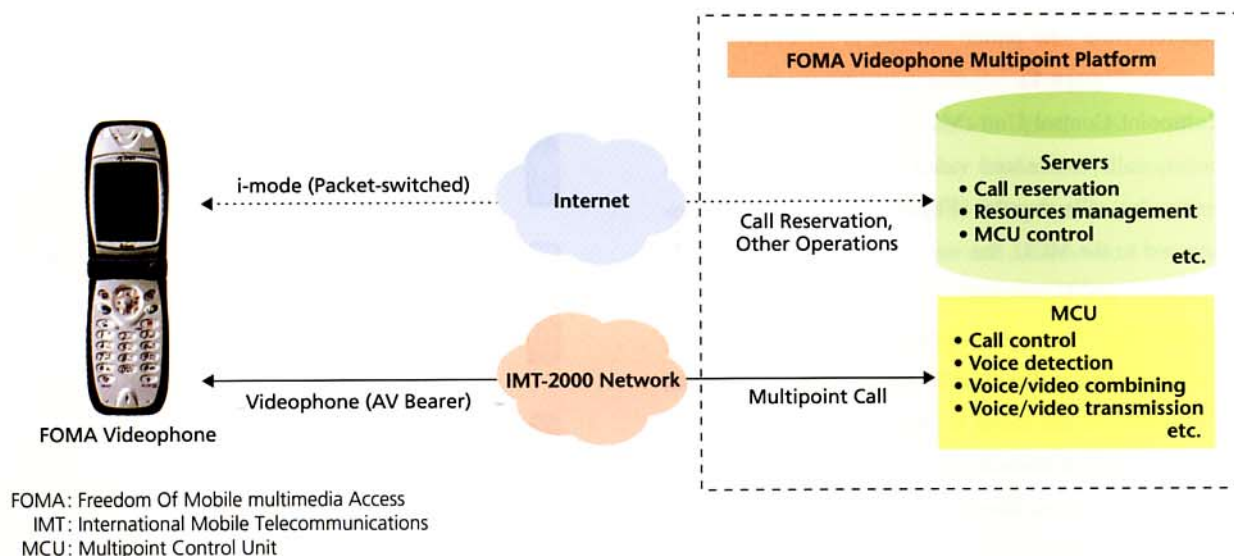

FOMA: Freedom Of Mobile multimedia Access
IMT: International Mobile Telecommunications
MCU: Multipoint Control Unit

Figure 3 FOMA Videophone Multipoint Platform Profile

3.2 MCU

The MCU carries out a wide range of processes in the multi-point call phase. Its principal functions include the "terminal connection function," the "call management function," and the "media process function" (**Figure 4**).

(1) Terminal Connection Function

This is a function to connect the FOMA Videophone terminal using the 1Bch in the 64K circuit-switching mode based on the ISDN Primary Rate Interface (PRI). The MCU is connected with the Inter Work Equipment (IWE), and the FOMA Videophone terminal is connected to the MCU via Inter-national Mobile Telecommunications-2000 (IMT-2000) and Personal Digital Cellular (PDC) networks.

(2) Call Management Function

This is a function to manage multipoint calls based on reservation information in compliance with the instructions from the MCU management function of the servers. It manages the screen display of connected FOMA Videophones (the media process function described below) and performs call manage-ment such as the disconnection of calls exceeding the reserved time. It also determines whether the connection to the MCU is permissible based on the caller's phone number and the reservation information when a call from the MT is terminated at the MCU. Security of calls is guaranteed by barring connections by any unreserved MT.

(3) Media Process Function

This is a function to execute multiplex processes on video and voice to implement multipoint calls. This function firstly separates the media based on ITU-T H.223 Annex B with respect to 3G-324M streams received from the connected MT, and picks up the video information and voice information. The picked up video information and voice information are decoded on an individual basis, and are combined and re-encoded based on the multipoint call information, which is managed under the call management function. Then, the media is multiplexed again in compliance with ITU-T H.223 Annex B and distributed to each MT in the form of 3G-324M streams. For combining video and voice, the information subject to combining is determined
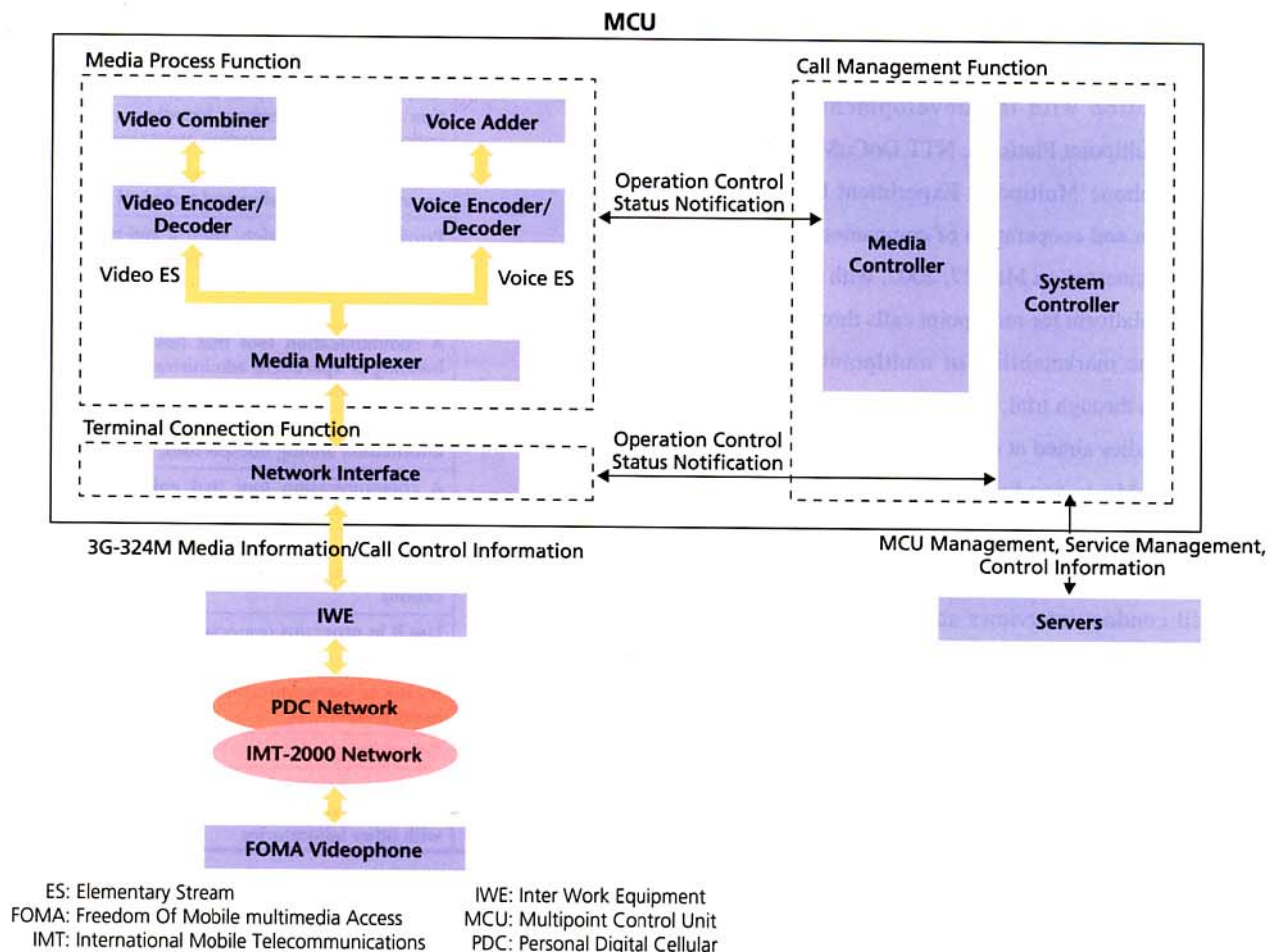

ES: Elementary Stream
FOMA: Freedom Of Mobile multimedia Access
IMT: International Mobile Telecommunications
IWE: Inter Work Equipment
MCU: Multipoint Control Unit
PDC: Personal Digital Cellular

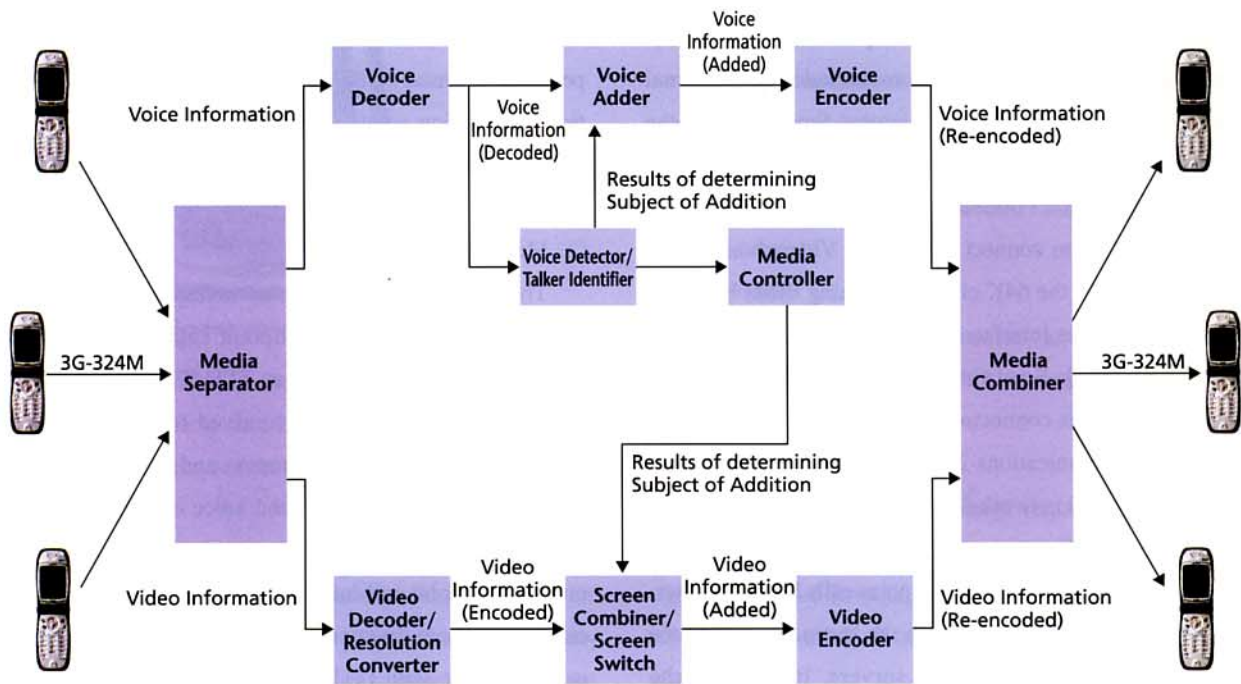**Figure 4 MCU Functional Blocks**

Figure 5 Composition of Media Process Function

according to the "Add the first voice first" rule (**Figure 5**).

4. Experiment Consortium

In conjunction with the development of the FOMA Videophone Multipoint Platform, NTT DoCoMo established the FOMA Videophone Multipoint Experiment Consortium with the participation and cooperation of companies engaged in various types of businesses on May 27, 2002, with the aim to:

- Verify the platform for multipoint calls through FOMA;
- Evaluate the marketability of multipoint calls in mobile applications through trial; and
- Conduct studies aimed at offering commercial services.

NTT DoCoMo is conducting a trial between June 1 and September 30 through the Consortium, to study and verify the applications by company based on actual usage. As part of the trial, it will conduct interviews and surveys concerning additional functions aimed at improving convenience and practical usage time.

Table 1 shows the companies participating in the Consortium by business type, and the potential applications.

5. Conclusion

This article described the latest outline of the FOMA Videophone Multipoint Platform.

The market penetration of videophones is far from sufficient

Table 1 Types of Businesses participating in Consortium and Potential Applications

Business Type	Potential Applications
Construction	Meetings between staffs at construction sites, construction offices and company branches, confirmation of execution status, and execution assistance
	Accelerate reports and confirmation tasks between workers at construction sites and technical support personnel
	Provide video for safety control and technical support related to crucial and dangerous tasks associated with base station work that are currently done over the phone (voice)
	A communication tool that links staffs at the site of a building or apartment administration system, control center and maintenance service providers
Medical	Use it as a place of introducing products and providing information among salespersons, hospitals and patients
	A communication tool that enhances liaising between staffs at nursing homes, etc.
Broadcast	A means for TV program staffs to contact each other when simultaneously sending live feeds from multiple locations
	Use it in programs (especially audience participation programs)
Events	Means of communication in quiz events participated by many people
	Orienteering
University	A conference and communication tool for 8 laboratories at 7 universities that can be used internally as well as with other laboratories

on the mobile front. While multipoint calls should serve as a new application, it is important to propose new services to users in light of developing the visual culture itself. It is also neces-

integration/systemization of elemental technologies, seek research partners on an international scale, and work on international standardization.

REFERENCES

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[3] Sawada, et al: Mobility management architecture for IP-based IMT network Platform, the Institute of Electronics, Information and Communication Engineers (IEICE) Society Conference, 2002-09.

[4] Yabusaki, et al: Special Article (3) IP^2 Mobility Management Technologies, NTT DoCoMo Technical Journal, Vol.4, No.4, pp.16-22, Mar. 2003.

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GLOSSARY

AAA: Authentication Authorization and Accounting
ANR: ANchor Router
AR: Access Router
ATM: Asynchronous Transfer Mode
FOMA: Freedom Of Mobile multimedia Access
HA: Home Agent
HLM: Home Location Management
HRM: Home Routing Management
HSDPA: High Speed Downlink Packet Access
IETF: Internet Engineering Task Force
IMT-2000: International Mobile Telecommunications-2000
IP: Internet Protocol
IP^2: IP-based IMT network Platform
LAN: Local Area Network
LLM: Local Location Management
LRM: Local Routing Management
NCPF: Network Control PlatForm
PSTN: Public Switched Telephone Network
QoS: Quality of Service
RNC: Radio Network Controller
RRM: Radio Resource Manager
SSPF: Service Support PlatForm
W-CDMA: Wideband Code Division Multiple Access
WLL: Wireless Local Loop