Presentation Control Functions for Flexible Multimedia System

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Koji Hashimoto†, Yoshitaka Shibata†, and Norio Shiratori‡

†Faculty of Software and Information Science, Iwate Prefectural Univ.

‡Research Institute of Electrical Communication, Tohoku University

1.Introduction

We have been investigating the agent oriented Flexible Multimedia System (FMS)[1] which is able to organize required functions dynamically and offer multimedia communication services to users accordance with each user's multimedia environment, the resources conditions and QoS requirements from users.

Figure 1 shows the system configuration using the FMS in the case of multimedia teleconference service.

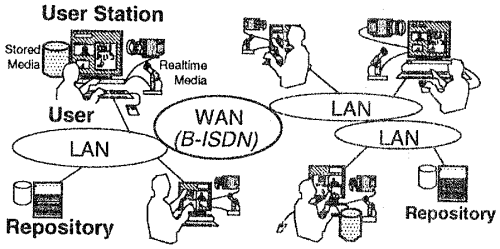

Figure 1: Mutlimedia Teleconferencing System

The users can not only communicate using a number of realtime media such as audio, video and white board but also make presentation using distributed multimedia information which consists of the stored media such as audio, video, text and graphics in the user station.

In order to realize these services, the system must be including suitable presentation functions which are described in this paper.

2.Flexible Multimedia System

In order to effectively and dynamically perform multimedia service functions with QoS, we have been introducing the agent-oriented architecture based on ATM system architecture shown in figure 2.

User Interface Layer performs user interface function for service requirements and QoS requirements from user and offers multimedia data to user. *Resource Management Plane* manages user station's resources such as OS type, devices, network configurations, CPU and memories, and allocates/releases the required resources. *Service Management Plane* manages multimedia communication service such as Video-on-Demand, TV-Phone and multimedia teleconference services. In this plane, the required modules are organized dynamically.

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Media Management Plane manages media processing for user required multimedia communication services. *Media Data Plane* processes media data. In this plane, *Synchronization Layer* processes various media synchronizations, *Data Transform Layer* appropriate media format conversion depending on the used computers and networks and *Media Flow Control Layer* controls various media data flow.

In Media Management and Media Data Plane, the functional modules are also organized dynamically.

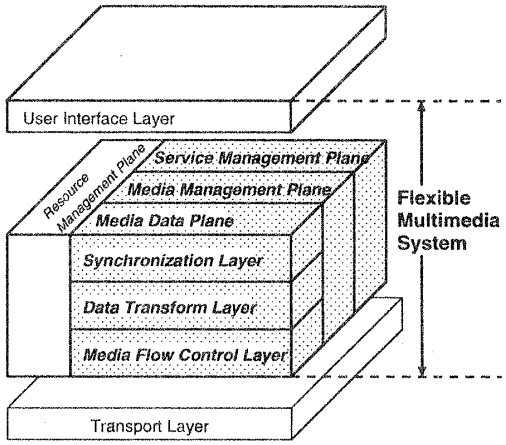

Figure 2: Architecture of Flexible Multimedia System

3.Presentation Control Functions

Multimedia communication services have large styles depending on the target applications and should be realized based on a unified model, not separately. Figure 3 illustrates a unified multimedia transmission protocol architecture in the FMS Media Data Plane which provides multimedia services uniformly for various applications.

In the multimedia presentation, most important functions are synchronization functions. We apply the synchronization reference model[2] in the synchronization layer.

Media Sublayer : Intra-media synchronization within single continuous media stream such as a audio or a video is performed.

Stream Sublayer : Lip synchronization between more than two continuous media streams is performed.

Object Sublayer : Scene synchronization among different types of media streams such as audio,

video, image and text is performed based on the presentation scenario.

Specification Sublayer : Multiple presentations are handled to provide sophisticated multimedia service; ex. the play-out synchronization, dynamic linking for user's interactions.

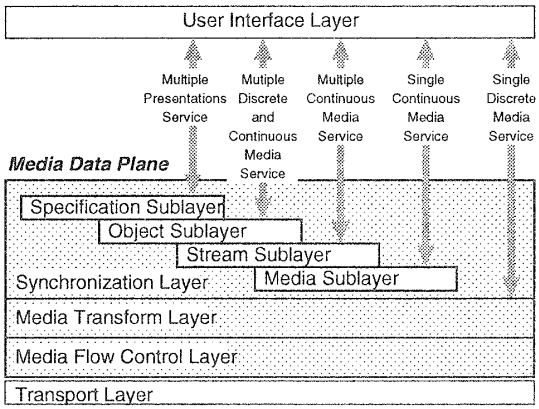

Figure 3: Synchronization Sublayers in the FMS

4.Functional Modules

It is considerable that more than two presentations may be provided concurrently in the same application. For an example of the multimedia teleconference, the live presentations organized by participations face images and voices are exchanged between these participations and stored presentations may be also provided as the reference data of the conference concurrently.

Figure 4 shows the functional modules in the Media Data Plane to handle multiple presentations; one is stored multimedia play-out, another is transmitting realtime audio video.

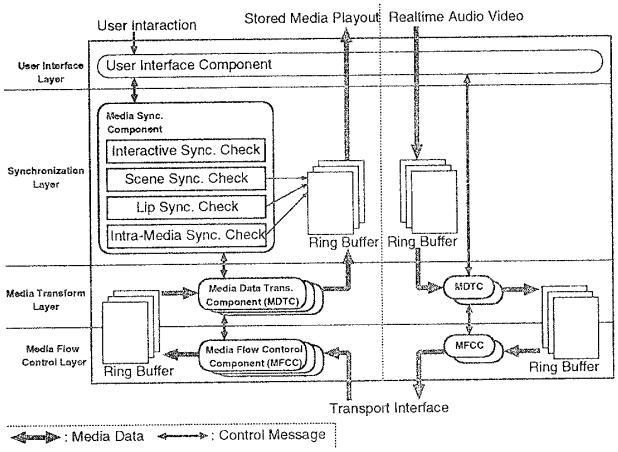

Figure 4: Presentation Control Functional Modules

In this figure, *User Interface Component (UIC)* performs user interface depending on the window system and available devices in each user station. In addition, Media Synchronization Component (MSC) performs each synchronization sublayer's functions. Media Data Transform Component (MDTC) performs compression/decompression and data format conversion of media, such as JPEG, MPEG1/2 and H.261 for video. Media Flow Control Component (MFCC) performs variable packet flow control and packet loss rate control[3].

These components are dynamically organized in the user station from repository accordance with each user's multimedia environment, the resources conditions, QoS requirements and service requirements from users. For example, in this figure, user has been requiring stored multimeida and realtime audio video service.

MSC has four functions for synchronization sublayers; Interactive Synchronization, Scene Synchronization, Lip Synchronization and Intra-Media Synchronization functions. When each media should be synchronized, each synchronization function check the ring buffer which has been filled with media data by MDTC. Then, checked media data are played.

On the other hand, for example of realtime audio video, the system not organizes MSC, because realtime audio video not requires strict synchronization.

Thus the FMS is able to process some presentations for dynamic organized required synchronization functions.

5.Conclusions

In this paper, we described presentation control functions for FMS. Now, we are implementing these functions on SGI WorkStation/IRIX Release 6.4 using C++ and Java programming language over ATM and Ethernet network. Each component is developed by C++ language, archived by shared library in the repository. When the organization of each component, required shared libraries are linked and its process is invoked. Thus, dynamic organization is realized.

As future works, we wil evaluate the each synchronization functions on the prototyped FMS.

References

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