QOS Control Functions for Group Communication System

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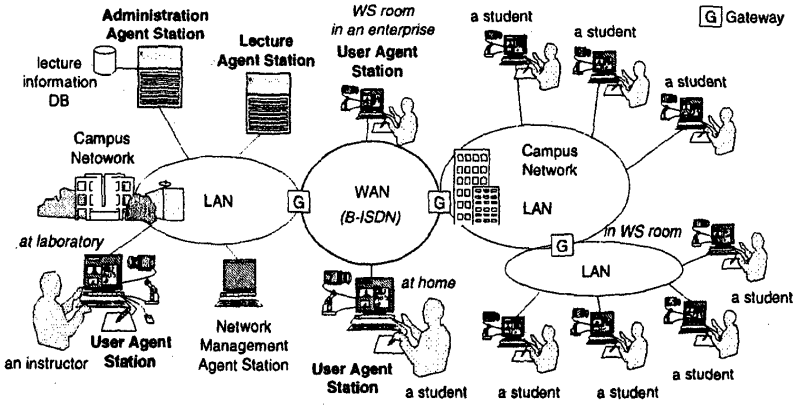

Figure 1: Remote Lecture Support System

1. Abstract

In group communication, multicast transmission is more effective than unicast transmission because many users can simultaneously receive the same data at the same time, so that the total traffic over the network can be reduced. However, since the computing resources and network environment of the all of the users are not necessarily same, various quality of service(QOS) requirements are existed. In this paper, we introduce QOS control functions for group communication based on consensus protocol. In order to define the QOS functions, an interface group (IG) model is newly introduced. Such a modeling technique is useful for QOS negotiation in a remote multimedia lecturing system.

2. Remote multimedia lecturing system

Our remote multimedia lecturing system as shown in Figure 1 is consisted of a number of user agent stations(UA), a lecture agent(LA) and an Administration agent(AdA). All of the agent as a lecturer and students can interactively communicate each other through the bidirectional communication links. In order to meet the lecture purpose, the lecture type and group connection can be dynamically changed according to the lecturer's desire.

UA performs the I/O functions and processing of the media data, QOS negotiation for different QOS requirement by users using consensus protocol and management and the dynamic reconstruction functions of the lecture.

LA manages the all of the information with the existing lectures and their status, the QOS requirement by all of the users.

AdA manages information of each lecture such as curriculums, instructor's name, time tables, cancellation/or postponement of the lectures, etc.

3. Interface Group Model

Group connection is model by using the interface group model to perform QOS negotiation as shown in Figure 2. The sender/receiver interfaces of UAs are grouped together to negotiate their QOSs. In group communication, the multicasting capability is used to transmit media effectively. Thus, all receiver are served with the same quality. Therefore a QOS requirement is decided in RIG with the consensus of all members. In order to negotiate QOS requirements for multiple streams at once, a QOS requirement is decided in SIG with the consensus. A consensus protocol is used as indicated in Figure 3 in which the negotiation is initiated by sender.

The QOS is determined by the user's requirement and available computing and network re-

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sources and consisted of the desired value and admissible value of QOSs, such as image size, frame rate, the number of color bits and image quality(when the compression technique is used).

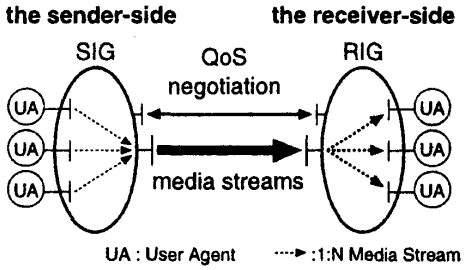

Figure 2: Interface Group Model

4. QOS Negotiation

The QOS negotiation within a IG is used to get consensus of the QOS requirements from all of the members with in the IG. It is assumed that all of the members should participate to the lecture even though the desired QOS is not offered during the session. Two phase commitment protocol without abort is used to negotiate the QOS within the IG. If some of the members cannot make consensus, they can locally adjust their QOS to participate the session. In order to determine the QOS from each member within the IG, the maximum value, minimum value, majority and priority consensus methods are selected.

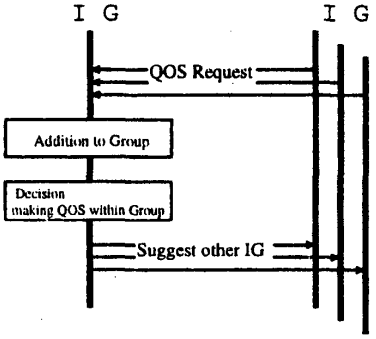

Figure 3: QoS Negotiation in Interface Group

On the other hand, the QOS negotiation between the SIG and RIG is executed to determine the final decision of the QOS at the beginning of the session as indicated in Figure 4. As consensus policy, the sender-priority, receiver-priority and equal priority are selected. Figure 5 depict an example of the video frame rate negotiation as one of QOS parameters. 15 ~ 30 frames as the QOS parameter as the sender side can be selected using maximum value selection policy. On the other

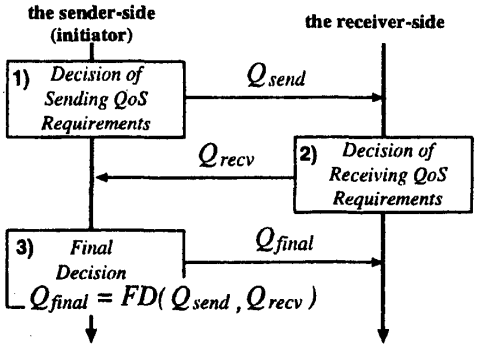

Figure 4: QOS Negotiation Protocol between SIG and RIG

hand, 5 ~ 25 frames as QOS parameter as the receiver side can be selected using minimum value selection policy. Finally the frame rate 15 ~ 25 between senders and receivers is determined by receiver-priority policy.

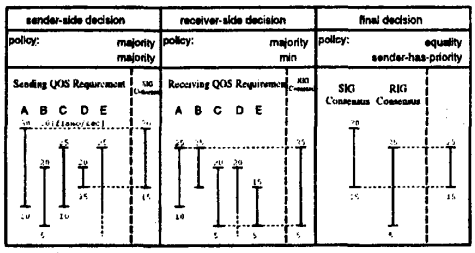

Figure 5: An Example of QOS Negotiation using a Resolution Parameter

5. Summaries

In this paper, we introduced QOS control functions for group communication based on consensus protocol. In order to define the QOS functions, an interface group (IG) model are newly introduced to organize QOS negotiation process. Currently we are implementing a prototyped multimedia lecture supporting system, which is organized by 14 Sun Sparc stations(SunOs 4.1.3) and three SGI Indys(IRIX 5.3) to evaluate video frame rate control/negotiation function as a QOS parameter.

Reference

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