Synchronization Issues in HMC Project at SRI

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Multimedia services, in which stored media objects are retrieved on demand by end users, are rapidly emerging to be offered on digital communication networks. The HMC [4] project[1] at SRI focuses on the design and implementation of network algorithms and protocols to support heterogeneous multicast (HMC). There are two distinguishing requirements of media playback: intra-media continuity and inter-media synchronization [5]. HMC makes use of layered/hierarchical coding of images and video, which allows viewing at different quality levels according to the number of layers received and processed. Recently, continuity and synchronization issues have been investigated in MPEG [2]. In this work, we are investigating continuity and synchronization in HMC.

The HMC project develops network multicast techniques for delivering different numbers of layers of hierarchical streams to different multicast session participants according to bandwidth and terminal constraints and individually expressed preferences. Techniques are also developed for processing multiple received hierarchical streams and for establishing and maintaining HMC sessions. The HMC design is based on a connection-oriented network paradigm, with resources allocated to connections based on availability of network bandwidth and quality requests from the user terminals. The transport layer protocol used by HMC applications is based on an extended version of the Internet Transport Protocol for Real-Time applications. (RTP) [3], which supports transmission of layered data units. The extended protocol is referred to as Hierarchical RTP to reflect its suitability for hierarchically coded data.

RTP provides a packet framework for adding synchronization information such

[1] More information on HMC project can be found on the WWW site: <http://www.csl.sri.com/shacham/hmc-94.html>

as a Synchronization Source (SSRC) identifier, which is independent of the network address. The RTP draft [3] suggests the use of a mixer that receives packets from various sources such as a camera and a microphone as the SSRC of the various media streams. At the time of playback, the mixer, depending on network delays, can employ adaptive feedback techniques for synchronization [1].

A HMC prototype implemented at SRI is based on ATM technology. The HMC signaling and routing protocols have been implemented in an ATM network as a parallel signaling system. An HMC connection consists of one or more ATM virtual channel connections (VCCs); each VCC maps into a different layer of the connection. Each layer of a connection may terminate at a different subset of terminals, but all of the ATM VCCs comprising an HMC connection follow the same route to reduce interlayer delay variance.

References

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