MBone VCR - Video Conference Recording on the MBone

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ABSTRACT

The MBone VCR is a Video Conference Recorder for the MBone. The MBone VCR allows records and play back of teleconferences held over the Multicast Backbone (MBone) on the Internet and not only enhances on-line multimedia teleconferencing but also enables off-line multimedia teleconferencing.

KEYWORDS: Multimedia, Teleconferencing, MBone, Recording, Playback

INTRODUCTION

Over the last few years the Multicast Backbone (MBone) changed from an infrastructure accessible by only a few selected researchers towards a facility used on a daily basis by thousands of people all over the world. In 1992, the beginning of the MBone, only scientific and research organizations were equipped with the hardware, software and network connections needed to experiment with audio and video over the Internet. In the meantime, applications have been built to support multimedia conferencing in a wide area multicast environment. In addition new standards have been developed, which will better support transport of data with real-time characteristics over lossy networks. One example is the Real Time Transport Protocol (RTP), which is designed to enable compatible exchange of real-time data between distinct applications in a heterogeneous environment. Even though the available bandwidth for this kind of traffic is still limited on a world-wide scope, high-bandwidth local area networks and broadband wide-area testbeds provide promising results in terms of achievable quality and the feasibility of MBone technology. The focus of these applications, however, is mainly on on-line audio/video teleconferencing. Nevertheless, considering the world-wide scope of the MBone, time differences should be taken into account, making it necessary to provide off-line support for MBone-based applications (off-line in this context means that an MBone session that happened on-line earlier can be re-multicasted off-line at a later point of time).

THE MBONE VCR

With this in mind we developed the MBone VCR (MBone Video Conference Recorder); the MBone VCR can enhance on-line multimedia teleconferencing and opens a new dimension for MBone usage by making off-line multimedia teleconferencing possible. MBone VCR provides functions to record and play back MBone sessions with multiple multicast multimedia data streams from different applications at various locations. Examples of these applications are *vat*, *nv*, *vic*, *nevot*, or *ivs*. A session recorded by VCR can consist of as many multicast channels as a user desires to record. During recording, the MBone VCR will synchronize these time-critical data streams based on information provided by protocols such as RTP. The MBone VCR does not need to know which particular application originates a data stream or what the exact content of the data stream is; it suffices that the data stream conforms to one of the supported protocols. To play back recorded sessions, MBone VCR sends the data out to the network, recovering the original timing of all the media streams included in a session and using the same protocols used by the applications from which the data was recorded. Therefore users run these application in order to watch and/or listen to the data played back by the MBone VCR. With this approach, we achieve three important things: (1) independence from application specific details, (2) use of already invented and implemented technology for playback and (3) off-line teleconferencing support since sessions can be recorded and sent out at a later time reaching audiences in various time zones. During playback the users of the MBone VCR can change the MBone scope, thus making it possible to reach either a larger or smaller audience depending on the intention of the "re-multicast".

DESIGN

The design of MBone VCR is object oriented, following the characteristics of a typical MBone session, which generally consists of a number of multicast channels. These multicast channels may use different protocols and may carry different kinds of media such as audio and video. However, from the MBone VCR's point of view, these multicast channels are simply media streams that need to be recorded and played back. Consequently VCR defines a class MBoneSession, which includes a set of MBoneMedia classes. These MBoneMedia classes offer a protocol-independent interface to record, playback and perform other features on media streams. Every protocol supported by MBone VCR inherits the interface of the class MBoneMedia and implements the protocol-dependent parts. The class MBoneSession basically offers the same interface as the class MBoneMedia; however, it maps requests for the session to individual requests for each media in the session. For example, a play-request on the session level for a session with two media would result in two play-requests on the media level.

FEATURES

The MBone VCR provides several interesting features by adding additional information to the recorded media data. For instance, random access is provided by generating a media independent time scale and indexing the media data. Limited content-based browsing functions such as skipping blank passages of a particular media stream (e.g. audio) by forwarding the session to the position the blank skipped media will continue to play, skipping to the next speaker (resp. the next source host of a media stream) and multilevel user-defined indices to enable users to jump to marked scenes at any given time are also provided. Synchronization with the other media streams in the session is always maintained. Other features include fast forward and rewind as well as playback at various speeds. Some macro commands allow users to write macros to ease complex tasks. Programming features, to schedule recording or playback to a specific point of time, are also provided. An interface to the current MBone session directory tool *sd* makes it possible to import sessions announced in sd into MBone VCR. Since the MBone applications are still using many different protocols, issues like synchronization and indexing needed to be solved for all these protocols. Hence, the MBone VCR maps the information provided by these protocols into a general format to be used on a media independent level. It also builds a time scale from 0 to the length of the session, mapping the various time-stamp information into one particular format to allow random access and timing information on session basis.

GRAPHICAL USER INTERFACE

The MBone VCR offers a graphical user interface that looks similar to a typical interface of a regular VCR (Video Cassette Recorder).
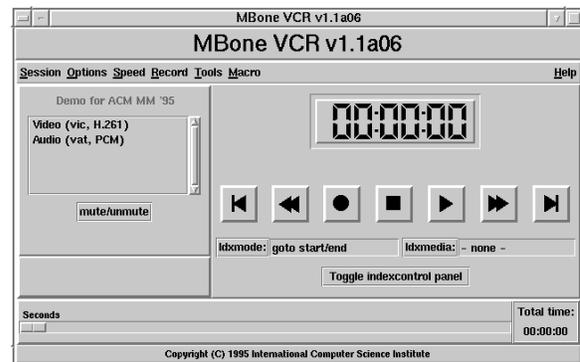

Figure 1: Graphical user interface of the MBone VCR

Therefore even first time users should be familiar with the look and functionality of most of the buttons and should be able to use at least the basic features of the tool. Figure 1 shows a screen-shot of the graphical user interface of the MBone VCR. In the middle left area you see a list of media included in the session, the upper right area shows the timer and in the middle right area are the buttons for basic control functions like record, play, fast forward or rewind. Below are some pop-up menus for index control and on the very bottom is the timescale slider for random access. Pull-down menus in the menu bar provide access to enhanced features.

CONCLUSIONS

We believe that the MBone VCR can help to enhance world-wide multimedia teleconferencing over the Multicast Backbone by allowing integrated and synchronized recording and playback of multiple MBone data streams through a user-friendly graphical user interface. With its features like random access, indexing and playing at various speeds, the MBone VCR also adds new functionality to the current MBone application suite and opens new possibilities in the use of the MBone.

REFERENCES

Deering, S., "Host Extensions for IP Multicasting", *Internet Request For Comment 1112*, August 1989

Macedonia, M., Brutzmann, D., "MBone Provides Audio and Video Across the Internet", *IEEE COMPUTER*, pp. 30-36, April 1994

Schulzrinne, H., Casner, S., "RTP: A Transport Protocol for Real-Time Applications", *Internet Engineering Task Force Draft*, March 1995