Project Title: IP Conferencing System on Network

Project ID: AO4-02

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The objective of this project is to develop a PC based video conferencing system software, which provides a channel of communication among people within the network. The project consists of multiple clients and a Multipoint Control Unit (MCU). ITU H.264 video coding standard is implemented into the system so as to provide high video quality and low bitrate consumption. The implementation of ITU G.723.1 speech coding standard can further reduce the consumption of bandwidth for a multimedia conferencing network. In addition, a set of signaling protocol is defined in the project for communication inside the network.

Schematic diagram of the System:
**System Features**
- H.264 Video Recorder/Player
- G.723.1 Speech Recorder/Player
- Real-time Camcorder
- Multi-group Videoconferencing
- Multi-User In Group
- File Transfer
- Instant Messaging

**Selective Network Modes**
- Conferencing Active Client
- Conferencing Listener
- Surveillance Server
- Surveillance Client

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**System Interface Diagram**

[Diagram showing the system interface with steps for receiving and sending encoded bitstream, system decoder, network interface, video and audio coders/decoders, and GUI player.]
Video Mixing in MCU

The MCU receives video packets from different clients. Redundant data such as the RTP packet header and slice header of video bitstream will be sent to the clients if packets are forwarded to the clients directly. In order to reduce the overhead of the video packet, MCU is adapted to combine different video bitstreams into a single bitstream. It can also reduce the cost of the video conferencing system as multiple video bitstreams is handled in one single signal-processing chip simultaneously.

Frame Type Synchronization

For video mixing, it must be guaranteed that all the frames from different clients that enter the video mixer must be either all I-frames or P-frames. Therefore, the Multi-point Control Unit (MCU) of the system must handle the synchronization of frame type by retrieving information on RTP timestamp, NTP time and sequence number of packets. Mismatched frames are dropped to ensure that the process of video mixing runs properly.

The Concept behind Video Mixing in MCU: