HDV Streaming System

The customer is a leading Japanese optical/semiconductor based communication company.

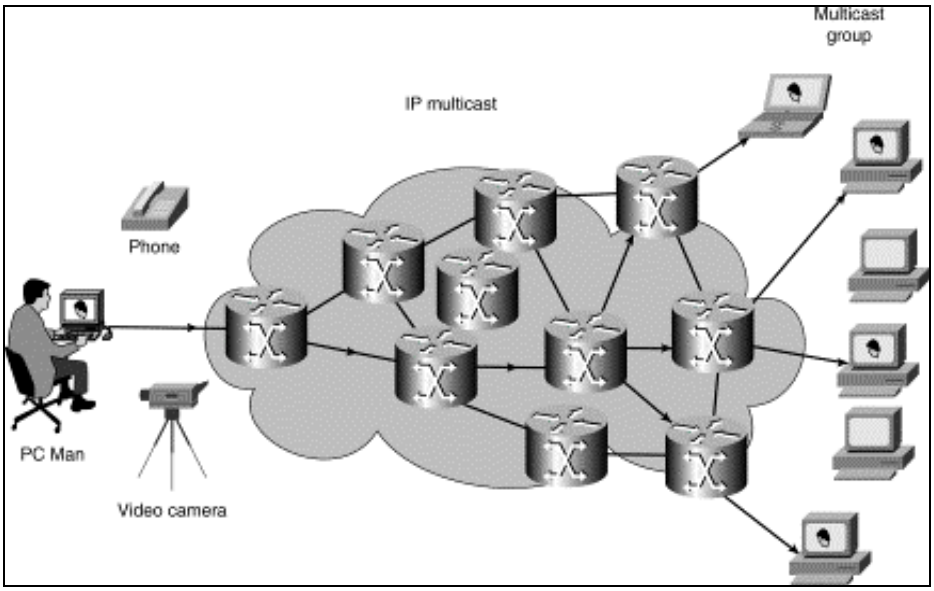
Objective

The objective of the project is to multicast a high bandwidth stream of video from High Definition Video (HDV) camera in real-time over a highly reliable private network. This can be used in high quality video applications like security cameras, videoconferencing, corporate communications, distance learning and viewing Operation Theater in real-time.

System Overview – *Challenges and Solution*

Internet Protocol (IP) multicast is a bandwidth-conserving technology that reduces traffic by simultaneously delivering a single stream of information to thousands of corporate recipients and homes. Multicasting (point-to-multipoint) refers to sending a message to a select group whereas broadcasting refers to sending a message to everyone connected to a network. Although, this can be done by sending different unicast (point-to-point) messages to each of the destinations, there are many reasons, which make having the multicasting capability desirable. The first major advantage of using multicasting is the decrease of the network load. All alternatives require the source to send more than one copy of the data; some even require the source to send an individual copy to each receiver. If there are thousands of receivers, even low-bandwidth applications benefit from using multicast. High-bandwidth applications, such as MPEG video, may require a large portion of the available network bandwidth for a single stream. In these applications, the only way to send to more than one receiver simultaneously is by using IP Multicast.

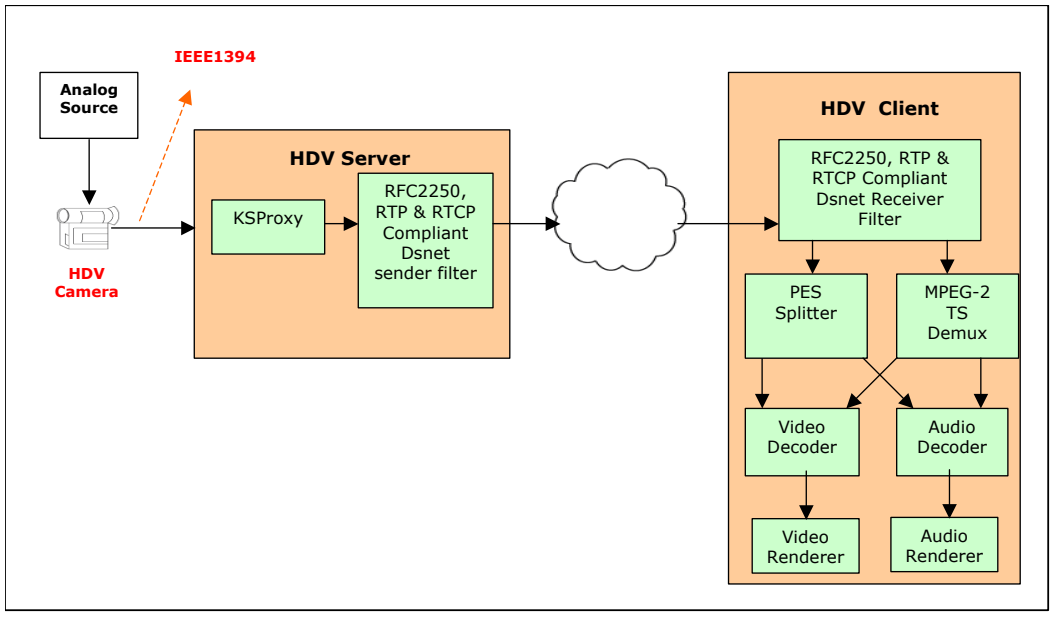
Multicast is based on the concept of a group. An arbitrary group of receivers expresses an interest in receiving a particular data stream. This group does not have any physical or geographical boundaries—the hosts can be located anywhere on the network. Hosts that are interested in receiving data flowing to a particular group must join the group. Hosts must be a member of the group to receive the data stream.



HDV Streaming System

HDV Streaming System is an implementation of HDV Server and Client on a Local Area Network. The application is based on Windows DirectX streaming architecture. Window-XP contains directX filters, which is based on 'com' architecture. We use this available DirectX library and build our applications on top of this component. Web based remote administration is also provided for controlling the application from a remote machine on the LAN.

The HDV Server receives MPEG-2 packets from a HDV camera through a Fire wire (IEEE 1394) bus connected directly to the pc card. The camera output is in audio and video multiplexed form. Server has two components – the capture component (Capture filter) and sender component (sender filter). We will modify the DirectX filters, which will capture the image do the required packetisation and then send it to the network as RTP (Real-time Transport Protocol) packets. No hardware is involved in this application. The generated RTP packets are transmitted by multicast / unicast (IPV4 or IPV6). The HDV Filter Plug-In (receiver filter) at the client-side will receive these RTP packets. The stream from the camera can be in DV or HDV format and based on this format we need to have a respective demux filter (demultiplexer) at the client side. Demux filter separates the audio and video components from the stream.



Audio decoder has to be chosen based on the audio format i.e. MPEG 2 or MPEG3. The program automatically selects the appropriate filter for each of these formats. MPEG 2 codecs are not supplied with windows so we used a third party software codec. At client side also no specific hardware is required. There is a lip-sync component which does the audio-video synchronization. Finally, the MPEG-2 decoder in the HDV Player does real-time playback. Figure below depicts an overview of the HDV Server and Client system. The System will give near real-time performance and also provide good A/V (Audio/Video) synchronization.This is a high bandwidth application; a single stream itself occupies 20Mbps. For networks with lower bandwidth we can use MPEG 4 or H.264 format so that the video size is reduced. We also developed a filter for recording the stream continuously for 34 hrs, using a D-VHS tape recorder, HD/SDI adaptor and high capacity (160GB – 17Hrs) hard disks.