MPEG and RTP

Introduction

The Moving Pictures Experts Group (MPEG) created a series of standards for the compression and transmission of compressed audio and video signals. These standards embrace the delivery of high quality television (both audio and video) over digital networks and via physical media such as CD's, and DVD disks.

The Internet Engineering Task Force (IETF), recognizing that real time services over IP were important, developed the Real Time Protocol to address certain multiplexing, control and management issues. These standards address higher-level protocols, but do not attempt to address the Quality of Service issues.

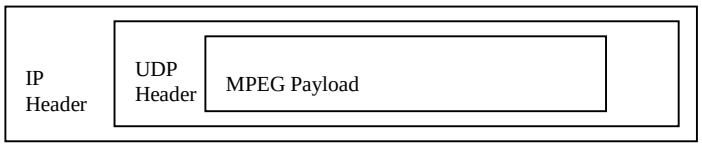
MPEG and RTP do not depend on the other, and each has independent advantages and disadvantages.

MPEG Transmission

MPEG means different things to different people. For our purposes, we are talking about MPEG-1, MPEG-2 or MPEG-4. Each of these standards have their own profiles, levels, and formats. We can think of MPEG as a stream of compressed audio, and a stream of compressed video. Because we want the audio and video to be synchronized to each other, the MPEG standards define a mechanism to provide time stamps

associated with each independent stream as it is encoded so that a decoder knows exactly how to keep them aligned in time.

The MPEG standards go on to define exactly how to multiplex the audio and video together to create a "MPEG-1 System Stream", a "MPEG-2 Transport Stream", or an "MPEG-2 Program Stream". These combined audio/video streams stand by themselves and require no further processing. Such streams have the audio and video (and other optional data) delivered in perfect synchronization. In fact, a standard MPEG-1 file is in reality an MPEG-1 System Stream saved as a file, and a MPEG-2 file is in reality a MPEG-2 Program or Transport Stream* saved as a file. Because such MPEG formats already contain fully synchronized audio/video, MPEG streams may be sent directly over a network using UDP/IP.



An important advantage of MPEG System Stream or Transport Stream transmission is that when such streams are saved to disk, they are standard MPEG files that may be immediately edited or retransmitted. Any number of standard video players and editors recognize such standard audio/video MPEG files, and standard Set Top Boxes directly decode such streams

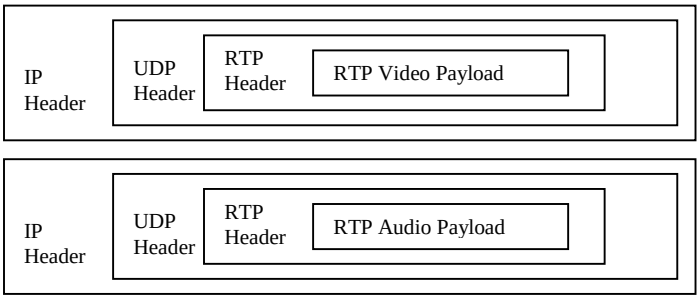
* A MPEG-2 Program Stream is intended for error-free environments such as disks, while a Transport Stream is intended for use when transmitting MPEG over digital networks.

directly. The MPEG stream itself contains all of the information a decoder needs to play it, including the audio and video rates.

Various methods exist to ensure that a decoder plays the video exactly as it was sent, including VBrick's patented clock recovery technology. In addition, MPEG-2 Transport Streams may include multiple programs within a single stream, allowing one stream to carry a large number of DVD-quality television channels. A Transport Stream's ability to carry multiple programs is useful in certain satellite broadcast applications, but in most IP networks the capability is not used. This is because there is much less bandwidth use and more flexibility when each program has its own IP address.

RTP

The Real Time Protocol provides certain network-based multiplex and control capabilities that are wholly independent from the video and audio compression method used. RTP adds its own timestamps to an audio stream and to a video stream such that each stream may be sent over a network independently.



A receiver then receives the two independent streams via RTP/UDP/IP and uses the RTP timestamps to establish audio/video synchronism.

One advantage of RTP is that it allows a receiver to chose only the audio, which is of value in a highly bandwidth constrained network.

It is interesting to note that since video often starts as a fully synchronized MPEG audio/video file anyway, RTP attempts to split the audio/video streams and convert the perfectly acceptable MPEG timestamps to RTP timestamps.

RTP is used in conjunction with the Real Time Control Protocol. RTCP provides support for source identification, QoS feedback, and plays an important role in maintaining audio/video sync.

It should be observed that RTP by itself does not suggest interoperability. For example, a player from Microsoft or Real may use RTP and RTCP, but only to deliver proprietary audio/video content that may only be decoded by a proprietary player.

VBrick and RTP

VBrick model 1200 and 3200 live MPEG encoders support RTP as well as industry standard MPEG System streams. These products support either format, or both simultaneously. As a result, live MPEG streams may be viewed with VBrick's StreamPlayerII (which plays MPEG-1 System Streams and MPEG2 Transport Streams), or with older 3rd party players such as Cisco's IP/TV, and with Apple's Quicktime player.