ITU-T TELECOMMUNICATION STANDARDIZATION SECTOR
Study Group 15
Experts Group for Video Coding and Systems
in ATM and other Environments

(Rapporteur's Group on part of Q.2/15)

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Study Group 15 - CONTRIBUTION

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TITLE: **EVOLUTION OF H.22X - MULTIMEDIA MULTIPLEX TO INCLUDE MPEG-2 SYSTEMS**

ABSTRACT: After a brief review of H.22x (multimedia multiplex in H.32x terminal equipment) and MPEG-2 status in Study Group 15, this paper suggests that Study Group 15 capitalize on the MPEG-2 Systems Layer as a common enabling technology for both multimedia conferencing and video distribution. It concludes with a specific recommendation of adopting MPEG-2 systems as a fundamental component of H.22x.

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1. INTRODUCTION

After a brief review of H.22x (multimedia multiplex in H.32x terminal equipment) and MPEG-2 status in Study Group 15, this paper suggests that Study Group 15 capitalize on the MPEG-2 Systems Layer as a common enabling technology for both multimedia conferencing and video distribution. It concludes with a specific recommendation of adopting MPEG-2 systems as a fundamental component of H.22x.

2. OVERVIEW: MPEG-2 STANDARD

The following is a brief summary of the MPEG-2 Standard defined by the Moving Picture Experts Group (ISO/IEC JTC1/SC29/WG11). The standard consists of three major parts: MPEG-2 Video, MPEG-2 Audio, and MPEG-2 Systems.

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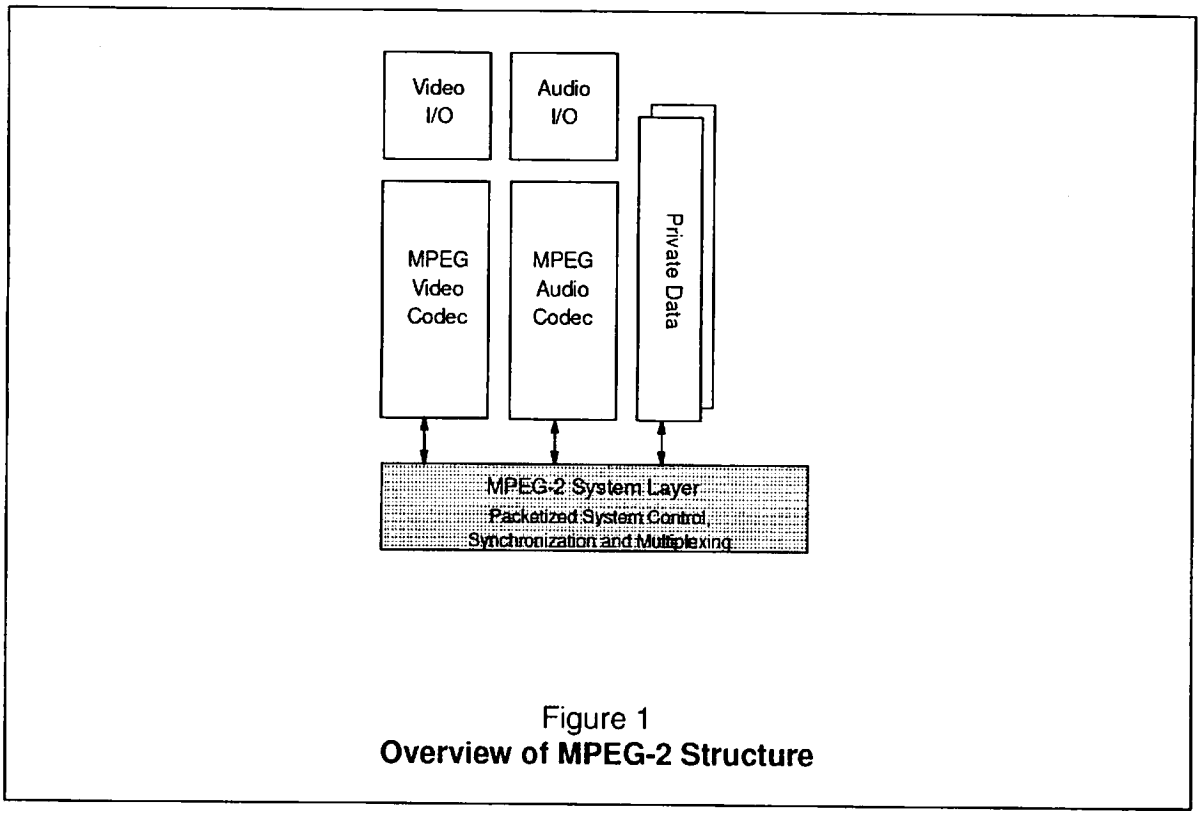

Figure 1
Overview of MPEG-2 Structure

2.1 MPEG-2 Video

MPEG-2 Video specifies the coded bit stream for high-quality digital video. In addition to being compatible with the MPEG-1 Video standard (ISO/IEC IS 11172-2), MPEG-2 also supports interlaced video formats, increased image quality, several picture aspect ratios, including 4:3 and 16:9, and a number of other advanced features, including those needed for HDTV. MPEG-2 Video is being defined in terms of profiles, each of which will support the features needed by a different class of applications.

2.2 MPEG-2 Audio

The MPEG-2 Audio multi-channel coding supports up to five full bandwidth channels (left, right, center, and two surround channels), plus an additional low frequency enhancement channel, and/or up to seven commentary/multilingual channels. The MPEG-2 Audio standard also provides improved quality coding of mono and conventional stereo signals for bit-rates at or below 64 kbits/s.

2.3 MPEG-2 Systems

The MPEG-2 Systems Standard specifies how to combine multiple audio, video, and private-data streams into a single multiplexed stream. It performs packetized stream control/synchronization and is designed to support a wide range of broadcast, telecommunications (interactive), computing, and storage applications. MPEG-2 Systems

defines two kinds of streams: Program and Transport Streams. The Systems Layer processes the compressed video codec, audio codec, and data streams two steps:

- First the codec/data (elementary) streams are combined with system level information and packetized to produce Packetized Elementary Streams (PES).
- The PES's are then combined to form either a Program Stream or a Transport Stream.

The Program Stream supports the creation of a single audio-visual program, which could have multiple views and multi-channel audio. It utilizes variable length packets and is designed for transmission in relatively error-free environments. The Transport Stream multiplexes a number of programs, comprised of video, audio, and private data, for transmission and storage using a wide variety of media. It performs packetized stream control and synchronization. It is designed for transmission in a lossy or noisy environment and utilizes a fixed size 188 byte packet.

3. ITU AUDIOVISUAL SYSTEM CONFIGURATION

The following audiovisual system configuration is described in the November 1993 report of the Experts Group for Video Coding and Systems in ATM.

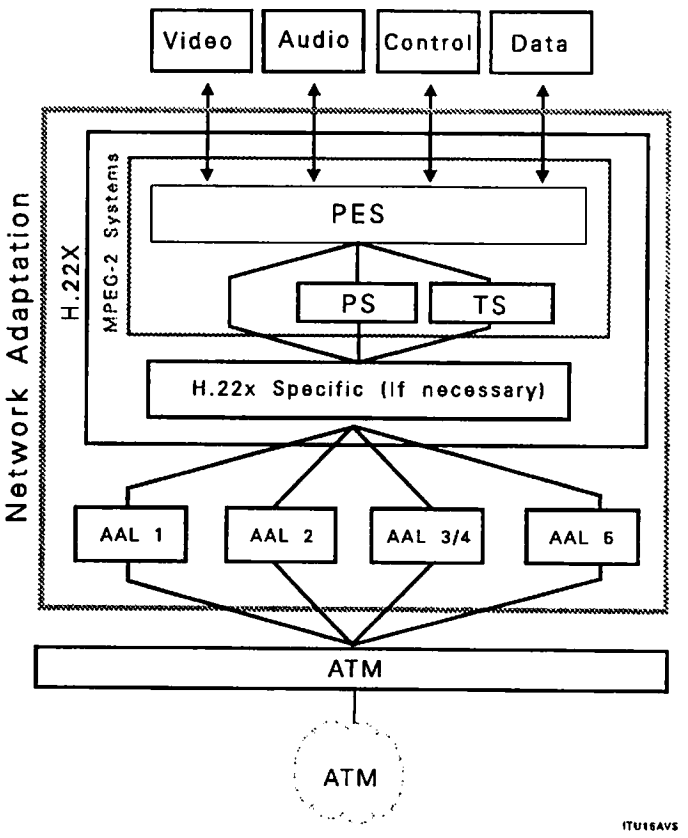

Figure 2
ITU Study Group 15 H.32x System Configuration

Two points deserve to be reviewed:

1. The figure identifies H.22x specific functions on top of the AAL layer to perform "Multimedia multiplexing" of the end-to-end signaling (H.24x), Data, Audio (G-series), and Video (H.26x) information streams. Study Group 15 has not yet fully decided on the appropriate function split between the multimedia multiplex (including H.22x specific functions) and AAL layers. An earlier report (Annex 4 to AVC-578R) identified the following functions that need to be provided by the H.22x and AAL layers:

    - transfer of variable length data units. Interval between data units may be fixed or variable;
    - multiplexing and synchronization of elementary streams;
    - capability to synchronize source and receive clocks; and
    - error detection and/or correction capability.

    The distribution of this function has been the topic of much discussion. It is recognized that the MPEG-2 Systems packet multiplexing and time-stamp based synchronization capability provides a lot of this function. The Study Group is exploring several options regarding MPEG-2 Systems function and AAL tradeoffs, but has not reached any conclusions.

2. Work on Video coding standard H.26x, has progressed to the point that Study Group 15 has decided that this recommendation should be developed as a common text standard H.26x/MPEG-2 between ITU-T and ISO/IEC. Study Group 15 has indicated that it is not ready at this time to adopt a common text approach on MPEG-2 Systems, but there is general agreement that much of H.22x will be based on some or all of MPEG-2 Systems.

4. MPEG-2 SYSTEM LAYER: A COMPONENT OF H.22X

There is general agreement in Study Group 15 and ISO/IEC JTC1 MPEG-2 Systems that "In the interest of service integration on B-ISDN, it is desirable that multimedia multiplexing is also common among various applications." We should recognize that the volumes of the consumer video/entertainment market will drive the cost curves for MPEG-2 and that these volumes will be greater than any other application. It makes sense to capitalize on the MPEG-2 Systems layer definition as the multiplex layer for multimedia and not create a unique level of support for ATM.

At the January 1994 ATM Forum meeting, Figure 2 was discussed and modified as follows:

- Control information and data can pass through the PES layer or be fed directly into the transport stream.
- All output from the PES must proceed into either TS or PS on its way to H.22x specific functions.

The results of the ATM Forum meeting are depicted in Figure 3.

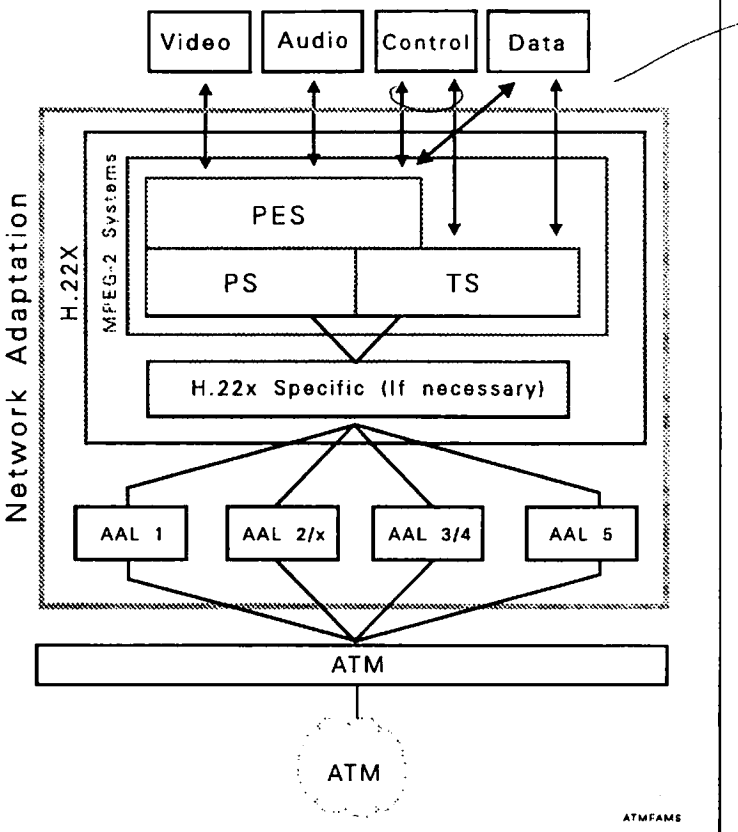

Figure 3
ATM Forum View of System Configuration

5. SUMMARY

A key objective of the Study Group 15 work on the Multimedia Conferencing and Video Distribution should be to maximize the use of common enabling technology used in both multimedia and video distribution applications. Candidates for common technology would include the multiplexing and synchronization layer, and the attendant AAL definitions. By selecting a common multiplexing and synchronization method between multimedia conferencing and video distribution, the use of a common AAL definition is achievable.

To accomplish this objective, we suggest that Study Group 15 adopt MPEG-2 systems as a fundamental component of H.22x and consider a common text approach with ISO (i.e., MPEG-2 Systems to be a subset of H.22x).

6. REFERENCES

- "MPEG-2", ISO/IEC JTC1/SC29/WG11, Coding of Moving Pictures and Associated Audio.

- ITU-T, Study Period 1993-1996: Fourteenth Progress report by the chairman of the Experts Group for ATM Video Coding and Systems in ATM and Other Environments, Questions: 2/15, 3/15, 5 November 1993.