

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

Study Group 15 - CONTRIBUTION

Question: 2/15

SOURCE: IBM

TITLE: Video Distribution using CBR MPEG-2 over AAL5

ABSTRACT: Exclusive of the H.222.1 Packing proposal, ATM Forum/94-0857 (attached) was adopted by the ATM Forum SAA group as a strawman text for the Video-on-Demand section of the Phase 1 AMS Implementation Agreement.

Title: Video Distribution using CBR MPEG-2 over AAL5

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Abstract:

With the ATM network bounding the cell jitter and the other QOS characteristics that an application can expect, video distribution using Constant Bit Rate (CBR) MPEG-2 over AAL5 is feasible. Dejittering and timebase recovery can be achieved using either adaptive buffering, a prefilter buffer, or simply relying on the robustness of the MPEG-2 systems layer implementation.

This contribution suggests a generic video distribution reference configuration and introduces a strawman MPEG-2 over AAL5 proposal.

Notice: This contribution has been prepared to assist the ATM Forum. This proposal is made as a basis of discussion. This contribution should not be construed as a binding proposal on any of the submitting companies. Each company reserves the right to amend or modify the statements contained herein.

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INTRODUCTION

With the ATM network bounding the cell jitter and the other QOS characteristics that an application can expect, video distribution using Constant Bit Rate (CBR) MPEG-2 over AAL5 is feasible. As highlighted by ATM Forum Contributions, 94-0434 [3] and 94-0570 [6], dejittering and timebase recovery can be achieved using either adaptive buffering, a prefilter buffer, or simply relying on the robustness of the MPEG-2 systems layer implementation.

; contribution:

- suggests a generic video distribution reference configuration
- introduces a strawman MPEG-2 over AAL5 proposal, and
- identifies Q.2931 Signaling requirements for CBR MPEG-2 video distribution.

VIDEO DISTRIBUTION

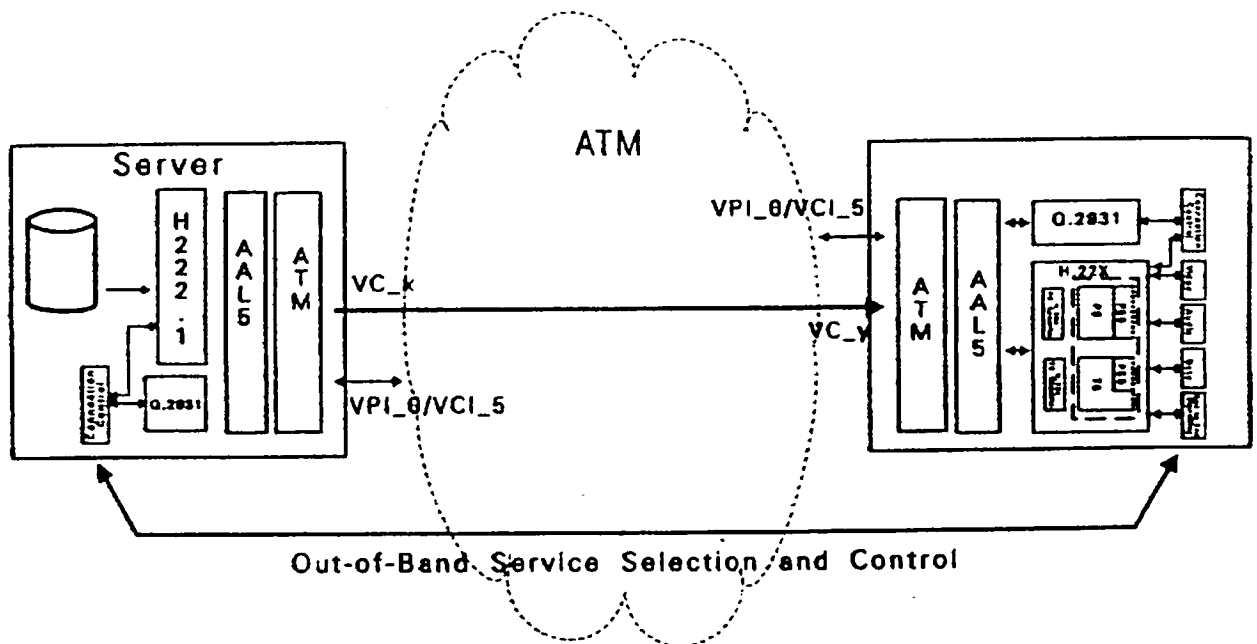
Video distribution is a fundamental characteristic of applications such as Video-on-Demand (VOD), Near Video on Demand, and broadcast or multicast programming. It is primarily a unidirectional service that does not have the rigorous end-to-end delay requirements of interactive conversational person-to-person services.

As an example, the ATM Forum Contribution 94-0688 [7] defines VOD as "an asymmetrical unidirectional service which provides the transfer of digitally compressed and encoded video information from a source, typically a video server, to a destination, typically a set top terminal (STT). At the decoder, the streams are reassembled, decoded, digital-to-analog converted and presented at the monitor."

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GENERIC REFERENCE CONFIGURATION AND FUNCTIONAL SCENARIO

The following figure depicts a generic reference configuration for stored CBR MPEG-2 video distribution over ATM.



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The figure highlights the essential components necessary for transmitting stored video across an ATM network. The MPEG-2 data flows from a file system through H.222.1 across an AAL5 ATM Virtual Circuit to the target system through H.222.1 and is eventually delivered to the MPEG-2 system layer for demultiplexing and eventual presentation.

The information (movies, commercials, etc.) is stored in files in MPEG-2 Single Program Transport Stream format. Metadata associated with the file provides:

- the MPEG-2 Bit Rate,
- whether the compressed data is VBR/CBR,

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- and any other necessary QOS information.

Since the video and audio information is already compressed and formatted, no encoder or multiplexer is present at the Server.

The actual service and content selection (movie to be played) is performed via an out-of-band data exchange. Since this exchange does not play a direct role in the transmission of the video over AAL5, I will not delve into it except to say that this exchange must provide the ATM Address (E.164 or Private ATM address), the movie title, and assign a request ID to help correlate multiple requests when more than one connection is set up between the server and client.

This information is used to establish a unidirectional VC (possibly an asymmetrical bi-directional VC with limited back channel capability) between the server and the client. The circuit setup is initiated by the server and each VC carries one MPEG-2 single program transport stream. The ATM cell transfer rate is the MPEG-2 rate specified in the file "metadata" plus all transmission overhead (headers, cell and AAL structures, . . .).

AMS H22X COMPONENT DESCRIPTIONS

H.222.1 IN THE SERVER

The H.222.1 component in the Server interfaces between the storage subsystem and the ATM AAL5 layer. It is responsible for packaging several MPEG-2 Transport Stream (TS) packets into a single AAL5 service data unit (SDU).

- Current assumption is 2 MPEG-2 TS packets per AAL5 PDU, but a larger number of TS packets/PDU needs to be investigated.

This component is also responsible for ensuring that the TS packets are "fed" to AAL5 fast enough to satisfy the transmission rate.

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H.222.1 AT THE DECODER (TARGET) SYSTEM

The H.222.1 layer in the receiving system performs dejittering and timebase recovery to the level sufficient to meet the tolerances of the MPEG-2 Systems layer. These tolerances vary depending on the specific implementation

- Various methods may be used: adaptive buffering, smoothing filter, . . .

Since no protocol between the server and the target system is needed, the dejittering and timebase recovery should be considered an H.222.1 implementation-specific detail that does not need to be standardized.

When 2 Transport Stream (TS) packets are packaged in an AAL5 PDU, the H.222.1 layer receives 2 TS packets at a time from AAL5 layer and passes these TS packets to the MPEG-2 System layer. If AAL5 indicates an error in the PDU, this is signaled to the system layer.

If the number of MPEG-2 TS packets per PDU is greater than 2, H.222.1 has the option of passing the TS packets to the systems layer as it receives them and signaling an error at the end of the PDU if a CRC is wrong.

Q.2931 SIGNALING REQUIREMENTS

The following signaling requirements are needed by this application.

- Must be capable of indicating asymmetrical upstream and downstream QOS and bandwidth requirements.
- The H.22x profile to be used must be exchanged between the systems. Enhancing the Low Layer Information element to identify H.22X and whether TS or PS is being used should suffice.
- New MM information element
 - Required to be passed by both private and public ATM networks

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- CBR or VBR operation (if not specified via other signaling parameters)
- Must identify the number of MPEG-2 TS packets per AAL5 PDU
- Content (Movie) and Service selection request correlation ID
- VC QOS
 - Quality-of-Service requirements are being investigated separately and are left for further study.
 - The parameters identified in ITU AVC-635 appear to be a good base. These are: End-to-End CLR, Severely Errored Cell Block Ratio, BER, BURST BER Event, UNI-UNI Delay, UNI-UNI CDV
 - For video distribution, the acceptable UNI-UNI end-to-end delay can be several hundred milliseconds.

It is anticipated that more study will identify additional signaling requirements.

SUMMARY

With the ATM network bounding the jitter and the other QOS characteristics that an application can expect, video distribution using Constant Bit Rate (CBR) MPEG-2 over AAL5 is feasible. Since performing dejittering and timebase recovery, using either adaptive buffering, a prefilter buffer, or simply relying on the robustness of the MPEG-2 systems layer implementation does not involve any additional protocol between the server and the target system, it should be considered an H.222.1 implementation specific detail that does not need to be standardized.

Any standardization necessary to support CBR MPEG-2 over AAL5 appears limited to additional signaling requirements.

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