ITU-T Telecommunications Standardization Sector
Study Group 15
Experts Group for Video Coding and Systems
in ATM and Other Network Environments

Document AVC-731
24 January 1995

Source: Vahe Balabanian Bell-Northern Research, Canada
Title: DSM-CC over ATM Profiles for Hybrid ATM/MPEG and Full ATM architectures
Purpose: Discussion

Abstract:

This contribution builds protocol stack profiles for three potential DSM-CC ATM architectures: hybrid ATM/MPEG switching, full ATM switching of MPEG TS with segregated session signaling and full ATM switching of MPEG TS with integrated session signaling. The purpose for this submission is to promote discussion on harmonization between DSM-CC and H.32X, H.24X and H.222.1.

1. Introduction

Contribution [1] has identified at least three potential architectures for the operation of DSM-CC over ATM, see figures 1, 2 and 3. In this contribution protocol stack profiles are identified for each architecture and the relationships of H.32X, H.24X and H.222.1 to the architectures and their profiles is expanded upon.

2. MPEG DSM-CC Procedures

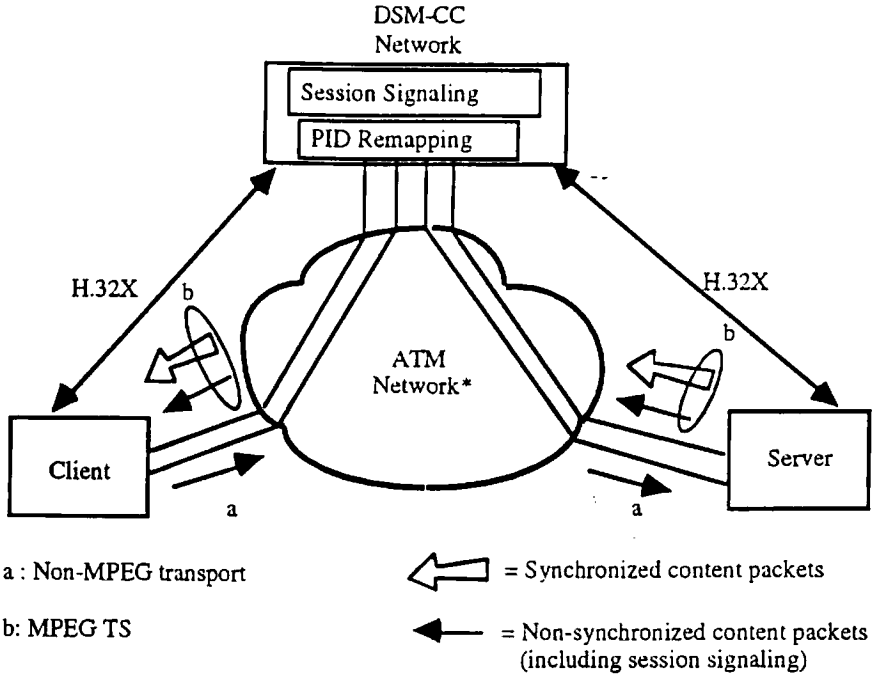
The DSM-CC working document contains a number of procedures [2]. These procedures are listed below with brief explanations:

a) Client or Server Configuration

This procedure allows the Client or Server device to be connected to the network. It is carried through User-to-Network messages, where Network refers to the DSM-CC network and not the ATM network, see figures 1 and 2. After successful completion of the procedure the Client or the Server is ready to initiate session establishment.

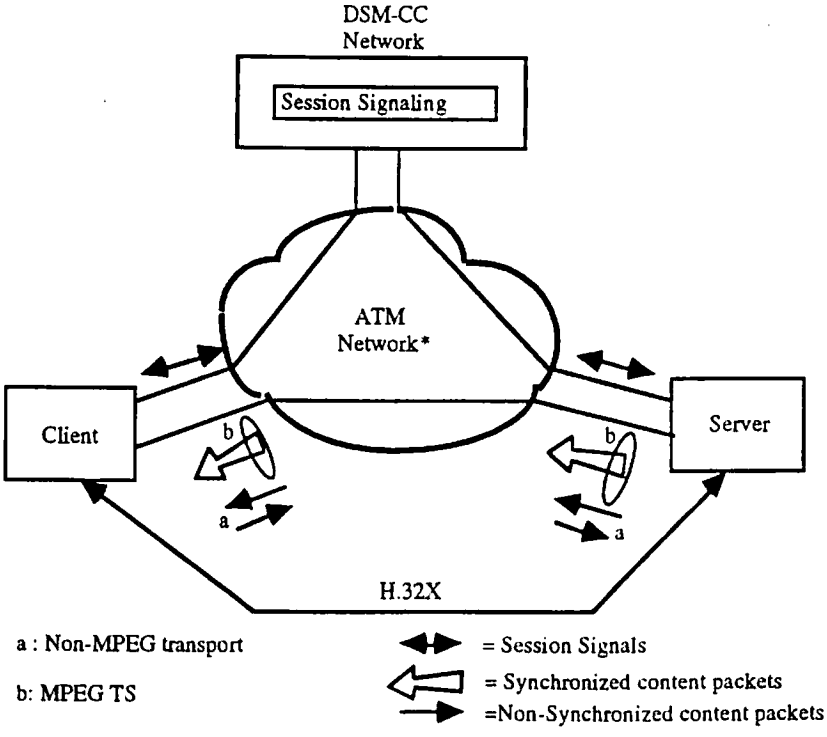
b) Session Control

This covers session establishment, resource reservation, resource renegotiation and teardown. The session establishment procedure ensures that resources are in place in readiness for a user-to-user communication between the Client and the Server. Resource renegotiation ensures that the resources are kept up to date with the needs for communication during the session. The session establishment and teardown procedures can be initiated either by the Client or the Server. The session control is carried through User-to-Network messages, where Network refers to the DSM-CC network and not the ATM network, see figures 1 and 2.



*Note: ATM Network includes ATM core, access and premise networks

Figure 1: Hybrid ATM/MPEG switching of MPEG TS architecture



*Note: ATM Network includes ATM core, access and premise networks

Figure 2: Full ATM switching of MPEG TS with segregated session signaling

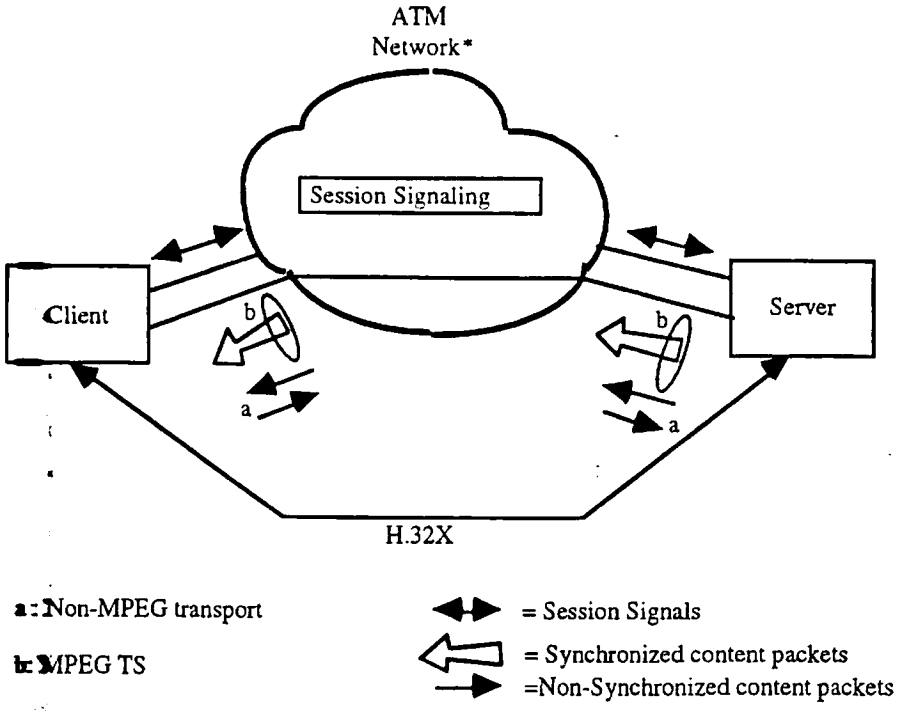


Figure 3: Full ATM switching of MPEG TS with integrated session signaling

c) Capabilities Query

This is a procedure for the server to initiate a query of the client's capabilities. Following the query the client authenticates the request and if successful sends a configuration response back to the server.

d) Application Boot

This is the procedure by which a server sends the requested application to a client. The application is the software that executes in a client environment. This procedure is carried through user-to-user messages over an application boot messaging path.

e) Client-Server Application

The client-server application procedures depend on the specific application being considered. The applications covered in DSM-CC are directory navigation, video stream control and indication, database query and file transfer.

f) Video Stream Decoding

This consists of the MPEG2 Transport Stream and its demuxing to elementary streams for data, audio and video.

3 Architecture 1 Profiles: Hybrid ATM/MPEG switching of MPEG TS

Figure 1 shows the configuration for architecture 1. The messages can be grouped into the following types:

1- User-to-Network
   a) Client-to-DSM-CC Network
   b) Server-to-DSM-CC Network
2- User-to-User (Client - Server)

In this architecture no direct physical connection is established between the client and the server. The H.32X call phases are therefore applicable between the client and the DSM-CC Network and the Server and the DSM-CC network as shown in figure 1.

Figure 4a shows the stacks involved in the case of Client-to-DSM-CC Network interactions covering the procedures in section 2 above. The procedures are shown in the figure with the associated protocols.

The connection control involves two other standards besides Q.2931, these are:

ITU-T Q.2962 for QoS negotiation during the connection setup phase [3].
ITU-T Q.2963 for Call Negotiation during the active phase [4].

Figure 4b shows the stacks involved in the case of Server-to-DSM-CC Network interaction covering the procedures in section 2 above.

A characteristic of architecture 1 is that all the User-to-User messages are carried through the DSM-CC network. These are covered in Figures 4a and 4b. As a result no specific figure is necessary to show the client to server communication. H.24X related functions are dispersed over a number of DSM-CC procedures as shown in figures 4a and 4b. Some of these functions are applicable between the client and the DSM-CC network as part of the DSM-CC User-Network Primitives and some are applicable between the client and the server such as capability query and application booting.

Figures 4a and 4b also highlight the fact that H.222.1 is shared between the application primitives (non-synchronized) and the PIDs for audio, video and data. This sharing may require restamping of the MPEG PCRs (Program Clock Reference), in case the MPEG TS is prestored on the server. The resulting complexity defeats the reason for storing the MPEG TS in advance on the server in order to save on server processing. Another issue is raised in PID remapping in the DSM-CC Network where PIDs from different servers may be required to be remapped onto the same MPEG TS for a client; this may also require clock restamping.

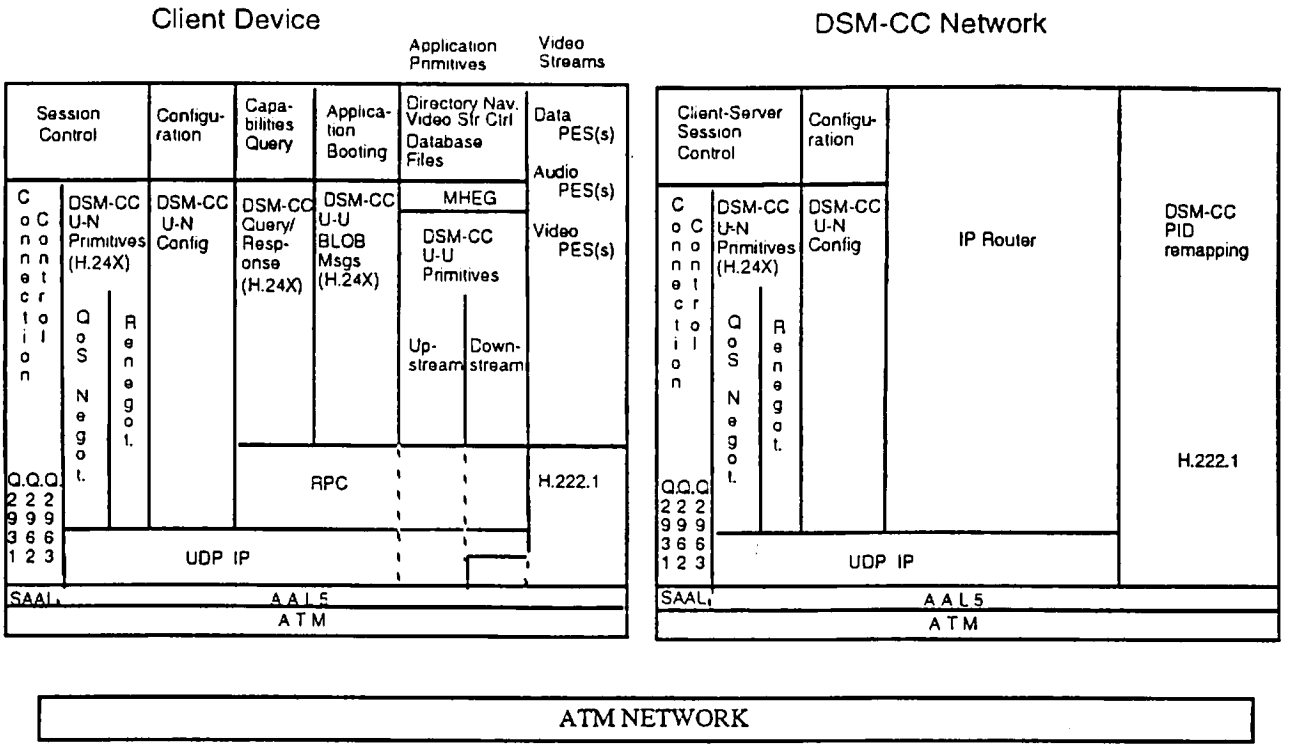


Figure 4a: A Standards Profile for Client-to-Network operation for hybrid ATM/MPEG switching

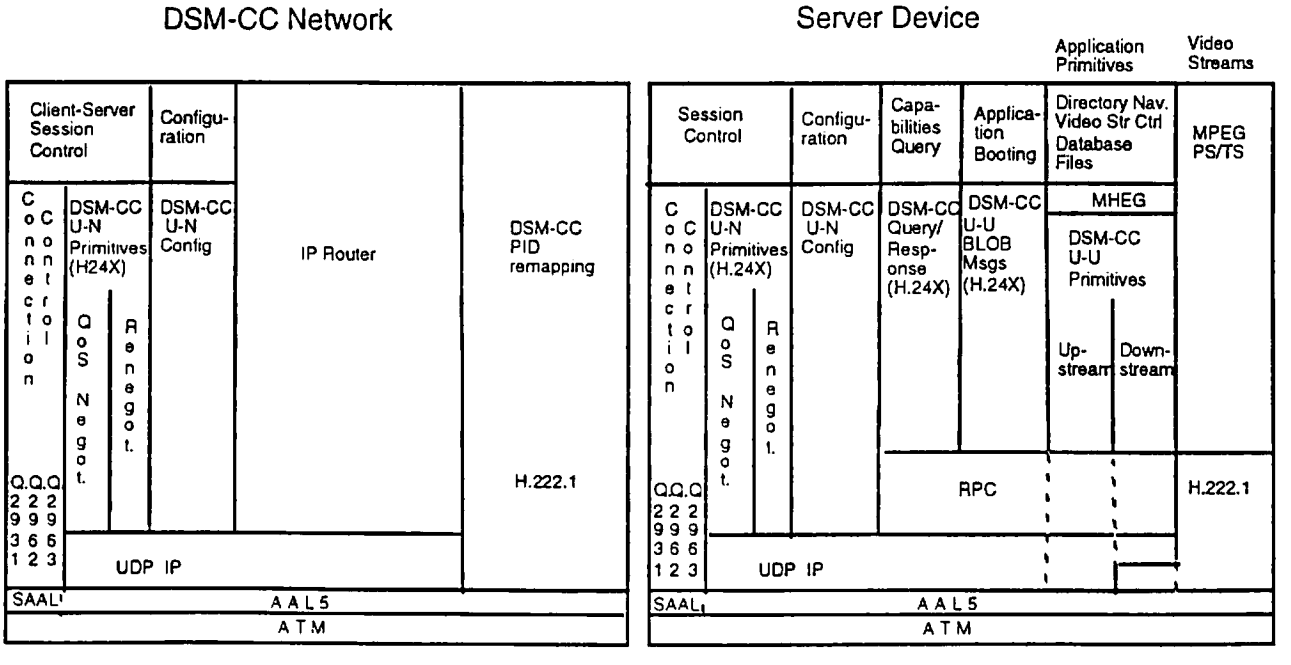


Figure 4b: A Standards Profile for Server-to-Network operation for hybrid ATM/MPEG switching

4. Architecture 2: Full ATM switching of MPEG TS with segregated Session Signaling

Figure 2 shows an example of architecture 2. In this architecture the DSM-CC Network groups a number of VCs related to interactions between a client and a server(s), within a same session [1]. The session signaling function is carried within the DSM-CC Network outside of the ATM network. The messages can be grouped, similar to architecture 1 into the following types:

1- User-to-Network
   a) Client-to-DSM-CC Network
   b) Client-to-ATM Network
   c) Server-to-DSM-CC Network
   d) Server-to-ATM Network
2- User-to-User (Client - Server)

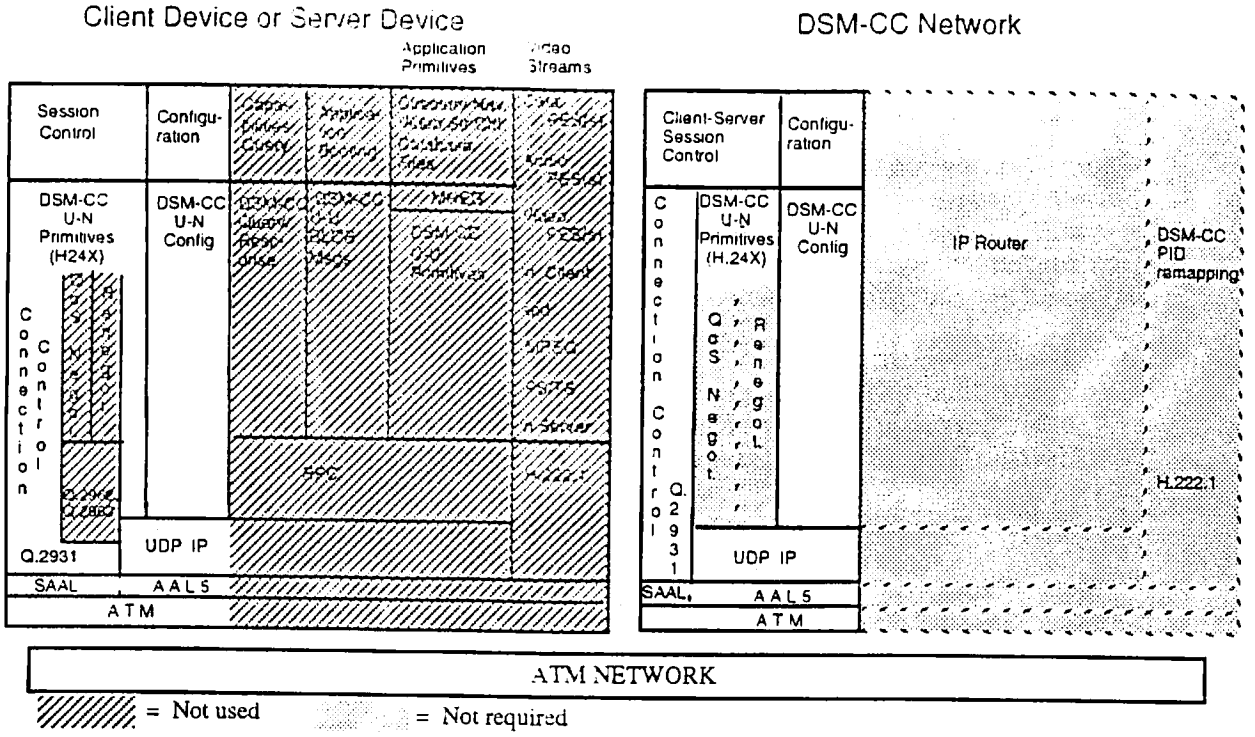
In this architecture a direct physical connection is established between the client and the server. The H.32X call phases are therefore applicable between the client and the server.

In architecture 2, the Client-to-Network and the Server-to-Network stacks are identical. This is shown in figure 5a. The procedures in figure 5a are limited to Configuration and Client-Server Session Control, see section 2, MPEG DSM-CC Procedures. For consistency the full client/server profiles are shown and the operations not being used are hashed. Some of the functions previously required in the hybrid ATM/MPEG case are no longer required leading to considerable simplification, these functions are shaded. During session control the resources are not negotiated for the connection between the client/server and the DSM-CC Network, therefore these functions are shaded in DSM-CC Network in figure 5a indicating a simplification. In addition since the downstream MPEG traffic and upstream Control and Indication traffic are not sent to the DSM-CC network, no PID remapping and IP router functions are required again shown shaded in figure 5a, leading to further simplification. Also since no merging of MPEG TS from different servers into a client MPEG TS is needed, no time restamping is required in the DSM-CC Network.

As regards to H. series specifications, some H.24X related functions are carried during the set-up phase of the session between either the client or the server and the DSM-CC Network.

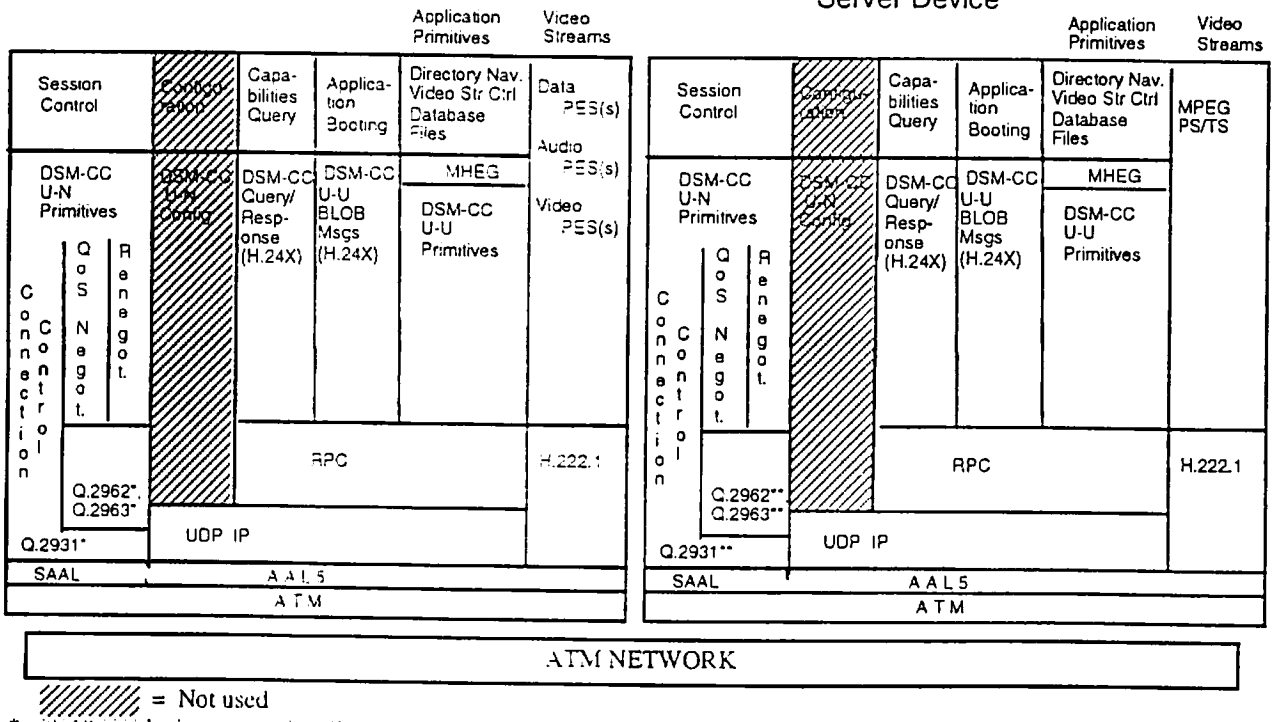
Figure 5b shows the profiles required between the Client Device and the Server Device for carrying user-to-user messages. Two aspects need to be noted, first the configuration operation is not used, therefore it is hashed and second, H.222.1 is no longer used to multiplex application primitives and the prestored MPEG TS, therefore there is no need for time restamping, leading to simplification.

As regards to H. series specifications, some H.24X related functions are carried out during the capabilities query and application booting procedures.



NOTE: For simplification, this diagram does not show ATM network proxy signalling by the DSM-CC network

Figure 5a: A Standards Profile for Client-to-Network or Server-to-Network operation for full ATM switching and segregated session signaling



*with Client device proxy signaling, this function could be moved to a 3rd party computer, and replaced by UDP IP.
**with Server device proxy signaling, this function could be moved to a server, and replaced by UDP IP.

Figure 5b: A Standards Profile for Client-to-Server operation for full ATM switching and segregated session signaling

5. Architecture 3: Full ATM switching of MPEG TS with integrated Session Signaling

Figure 3 shows an example of architecture 3. In this architecture the DSM-CC Network groups a number of VCs related to interactions between a client and a server(s), within a same session (as in architecture. 2), but the session signaling function is integrated with the ATM network [1]. The messages can be grouped, into the following types:

1- User-to-Network
   a) Client-to-ATM Network
   b) Server-to-ATM Network
2- User-to-User (Client - Server)

The H.32X call phases are applicable between the client and the server.

Figure 6 shows the profiles required for both the Client and the Server Devices for signaling the ATM Network and carrying User-to-User messages. Two aspects need to be noted, first because of the absence of the DSM-CC Network it is preferable to do the configuration using the ATM ILMI protocol [5], this would require some changes to be made to the ATM ILMI protocol, and second, session signaling would be carried over Q.2931 which may require some changes in both Q.2931 and DSM-CC [6], or modification of Q.298X (Point-to-point multiconnection call control) [7], [8].

As regards to H. series specifications, the session signaling is now out of band not requiring H.24X. Some H.24X related functions are carried out during the capabilities query and application booting procedures.

6. Summary:

In this contribution, standards profiles were identified for three MPEG DSM-CC over ATM architectures: Hybrid ATM/MPEG, Full ATM with segregated Session Signaling and Full ATM integrated Session Signaling.

This submission discussed interpretations of H.32X, H.24X and H.222.1 for different DSM-CC over ATM architectures. For customer premise equipment compatibility and efficiency, work is required to be established in SG15 for the harmonization of H.32X, H.24X and H.222.1 with DSM-CC.

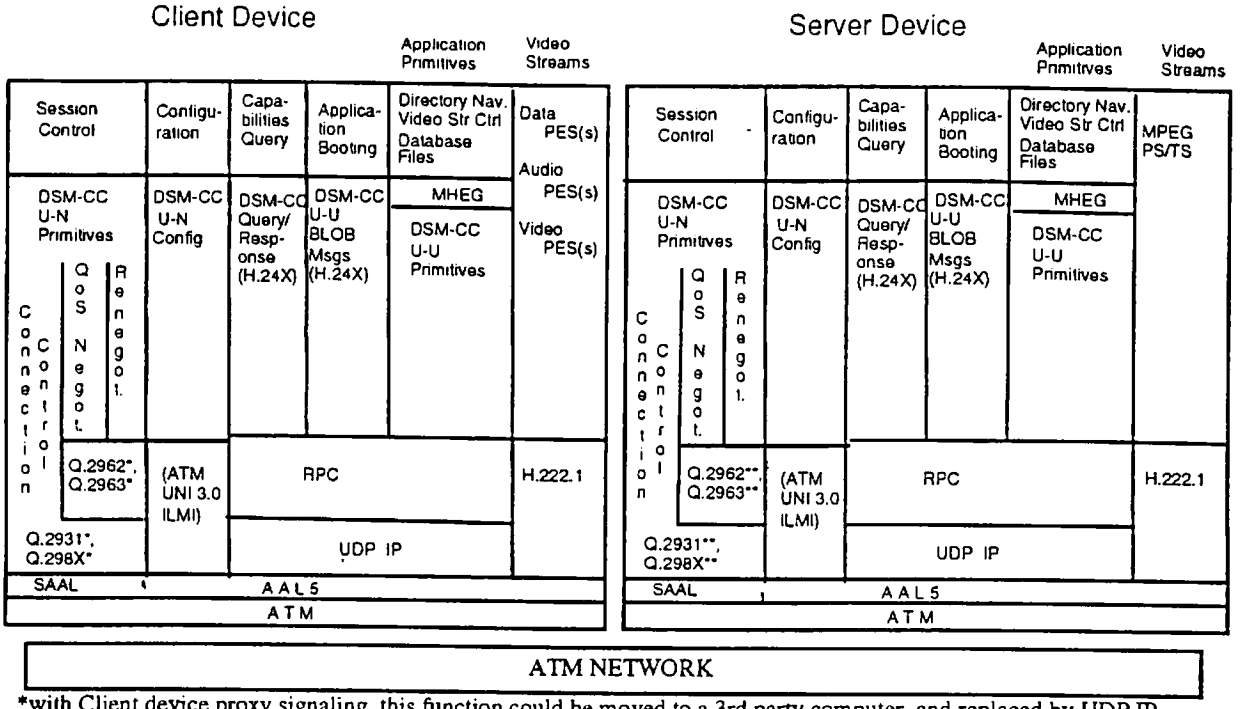
7. References:

[1] ITU-T SG15 AVC-730"DSM-CC over ATM Architectures and Session Descriptions" Vahe Balabanian, BNR, Jan/95.

[2] ISO/IEC MPEG 94/N0806 "Working Draft of ISO/IEC 13818-6: MPEG-2 Digital Storage Media Command and Control Extension" Nov./94.

[3] ITU-T SG11 TD161 "Draft Q.2962 text Connection Characteristics Negotiation during call setup", 13-21 June 1994

[4] ITU-T SG11 TD 2/11 - 102R1 "Draft Q.2963 Connection Modification", 05-23 September 1994



*with Client device proxy signaling, this function could be moved to a 3rd party computer, and replaced by UDP IP.
**with Server device proxy signaling, this function could be moved to a server, and replaced by UDP IP.

Figure 6: A Standards Profiles for Client and Server devices for full ATM switching and integrated session signaling

[5] ATM Forum "ATM UNI Version 3.0", 10 September 1993

[6] DAVIC/CFP/009-b "Harmonization of DSM-CC User-Network primitives and ATM Forum User Network Interface" Richard C. Lau, Bellcore, December 1994

[7] ITU-T SG11 TD2/11-65 "Q.298X: Clauses 1 to 8", Geneva, 5-23 September 1994

[8] ITU-T SG11 TD2/11-138 "Draft text for chapter 9 and 10 of Q.298X", Geneva, 5-23 September 1994