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Purpose: Proposal

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1. Introduction

At the Yokosuka meeting, the two alternative start-up solutions, "1 VC solution" and "2 VC solution", were discussed based on our contribution [1] and their characteristics are summarized in Annex 7 to AVC-854R [2]. The questions were:

- Are both workable for intended audiovisual communications?
- If both are workable, do we mandate the two or specify that one is mandatory and the other optional?
- Is there any interoperability difficulty between the two solutions?

This document examines the two solutions against interworking among various type of terminals and concludes that :

- H.310 should specify the "2 VC solution" as mandatory;
- the "1 VC solution" should be achieved as a future option when the tariff structure really benefits this solution;
- this option will be to drop the initial VC of the 2 VCs involved instead of starting with a single VC to avoid the backward compatibility problem between the new 1 VC solution terminal and the existing 2 VC solution terminal.

2. Examination of various terminal combinations

Some typical combinations of the following type of terminals have been examined for checking whether the two solutions are workable.

- H.310 RAST-P
- H.310 RAST-P with AAL5 option
- H.310 RAST-C/AAL5
- H.310 ROT/AAL5
- H.310 ROT AAL1 & AAL5
- H.321
- H.320 accommodated in N-ISDN

The details are described in Annex 1. Some important observations are listed below.

1) Most of the cases, the both solutions work. Only the case where the 1 VC solution needs a retry is the case where AAL mismatch exists; e.g. an H.310 ROT with both AAL1 and AAL5 places a call with AAL1 to H.310 SOT with AAL5.

2) When an H.310 calls an H.321 or H.320, it should have pre-knowledge that the remote terminal requires the circuit transport service, thus both broadband and narrowband related information elements are in the Q.2931 messages.

3) Broadband bearer capability (B-BC) for the initial VC should be BCOB-C because of its signal chracteristics. See Annex 2.

4) B-HLI needs to indicate only "H.310" in this solution, because all H.310 terminals support the H.245 protocol, thus further terminal identification can be through the capability messages. This conforms with the guideline that "only essential elements should be indicated in Q.2931" (6.3/AVC-743R). However, the indication of precise terminal protocol in the initial VC allows rejection of the call from a clearly incompatible terminal such as from RAST-P (AAL1 only) to ROT AAL5.

5) Terminal protocol identification indication in the additional VC uses the same one in the initial VC. The receiving terminal may ignore this information element because the called terminal can unconditionally accept the additional call expecting that the calling terminal uses such parameters as being inside the capabilities of the called terminal based on the in-band H.245 message exchange.

6) Compatibility checking requires definition of terminal protocol. This aspect is discussed in the companion document AVC-873 [4].

3. Proposal to adopt the 2 VC solution

Based on the analysis and the following considerations, we propose that H.310 should adopt the 2 VC solution for its start up procedures:

- It works for all the possible combination of different terminals.
- It is simple and straightforward requiring only basic signalling services of the network.
- It does not require H.222.1 decoding at the gateway when different terminals accommodated in different networks interwork, thus H.245 messages can be more easily communicated between different systems.

4. Problems of the 2 VC solution and their resolutions

There were identified two problems in the 2 VC solution at the Yokosuka meeting [2]. We propose the following methods to clear them.

1) Audio start time

In conversational services, people are conditioned to say "hello" as soon as the connection is sensed to be established. This comes from the long telephone practice. A problem identified in the N-ISDN videophone is that users are embarrassed if audio is muted after the remote end has responded to the call until an agreed communication mode is established.

This problem can be alleviated by making indication to the human user only when the second VC call reaches the calling end (ALERT is issued by the called end). As soon as the called end human user responds, audio is available in an agreed coding rule without any glitch (note) during the communication. The calling delay which the calling user senses is the time from when he/she starts the initial VC call to the time the remote end is alerted. This can be tolerated to the extent that we experience in current ordinary telephone calls (up to about 10 seconds).

Note - In the 1 VC solution, the initial audio is e.g. default G.711 and the final form will be MPEG-1 Layer 2 in H.310 native mode. At some point after the bandwidth change, the audio coding law should be switched. This causes some transient phenomena as quality change, switching noises due to different coding/decoding delay, etc.

2) Cost

It might happen that setting up 2 VCs, one with a small bandwidth and the other with a large bandwidth, is more costly than 1 VC with an aggregate bandwidth. This depends on the tariff structure which is not known at the moment. If the B-ISDN tariff reveals that the use of 2 VC

has cost disadvantage compared to the use of 1 VC, we will need a mechanism to cope with it without causing interoperability problems.

Adding the 1 VC solution as an option at a later date causes an interoperability problem because its call may be rejected by the existing 2 VC start up terminal. Of course, the new terminal can infer that the remote end may be an existing terminal by this rejection and make a retry with the 2 VC start up procedure.

A better way will be to overcome the cost problem by using first the 2 VC start up procedure and then drop the initial VC. For this purpose, the second VC should provide an H.245 channel inside the H.222.1 multiplex, the messages which have been flowing through the initial VC are moved to the additional VC, then the initial VC is dropped. A protocol to handle to switch the H.245 channel is required.

5. Conclusion and proposed wording for H.310

This document has proposed the 2 VC solution of basic H.310 start up procedures. Particular wordings to be included in draft H.310 are as follows:

1) Delete the "SOT/ROT" procedures and the right half of Figure 3. We need not two separate procedures for bidirectional terminals and unidirectional terminals as far as they are specified in H.310.

2) Change the second sentence in Footnote 38 to "A procedure to drop the initial VC after establishment of the additional VC is under study."

3) In Table 5, mandatory support of ATM VCs should be 2 for all terminals listed.

4) Signalling parameters of the initial VC should be listed as an Annex to the Recommendation. The list is contained as Annex 3 to this document.

5) RAST/H.321 procedures should include that "the use of Circuit Transport Service requires inclusion of both broadband and narrowband information elements (B-BC, ATM TD, AAL parameters etc.; N-BC, N-LLC, B-HLC)."

A suggested rewording for the current Section 5.5 is contained in Annex 4.

END

References

[1] AVC-841 Start up procedures for H.310 terminals (Japan), 16 October 1995

[2] AVC-854R Report of the twentieth experts group meeting in Yokosuka - 24-27 October 1995 (Rapporteur) , 27 October 1995, Annex 7

[3] AVC-868 Draft Recommendation H.310 revised by WP1/15 (Editor; Hayder Radha) 21 December 1995

[4] AVC-873 Definition of terminal type and B-HLI terminal protocol identification (Japan), January 1996

Annex 1 to AVC-872

Examination of various combinations of different terminal types

A. 2 VC scenario

A.0 Assumptions

1) The called end will respond according to the compatibility check defined in Section 5.2.2.2 and Annex B of Rec. Q.2931.

2) Parameters of the initial call for H.245 channel

- AAL: AAL5
- ATM Traffic Descriptor: 64 kbit/s, bi-directional symmetrical
- B-BC: BCOB-C
- B-HLI terminal protocol identification: H.310 RAST-P etc.
- B-HLI forward/backward multiplexing capability: no multiplex
- GIT Correlation ID: Session ID=0x0001 (Note 2), Resource ID=0x0001 (Note 3)

Note 1 - abbreviations

B-BC:	Broadband Bearer Capability
B-HLI:	Broadband High Layer Information
GIT:	Generic Identifier Transport

Note 2 - this is managed by the calling terminal.
Note 3 - indicates the initial VC.

3) Parameter of the additional call for audiovisual channel

- AAL: AAL1 or AAL5
- ATM Traffic Descriptor: nx64 kbit/s, e.g. 96x64 kbit/s = 6.144 Mbit/s uni-directional or bi-directional (symmetrical or asymmetrical)
- B-BC: BCOB-A
- B-HLI: terminal protocol identification (the same as that of the initial VC)
- B-HLI forward/backward multiplexing capability: TS
- GIT Correlation ID: Session ID=0x0001, Resource ID=0x0002 (Note 4)

Note 4 - indicates the additional VC.

A.1 Case 1

calling: H.310 RAST-P
called: H.310 RAST-P with AAL5 option

1) The called H.310 RAST accepts the initial call based on the compatibility of AAL, B-BC, B-HLI.

Note - B-HLI needs to indicate only "H.310" in this solution, because all H.310 terminals support the H.245 protocol, thus further terminal identification can be through the capability messages. This conforms with the guideline that "only essential elements should be indicated in Q.2931" (6.3/AVC-743R). However, the indication of precise terminal protocol in the initial VC allows rejection of the call from a clearly incompatible terminal.

2) H.245 capability messages through the initial VC decide an audiovisual communication mode and parameters for the additional call.

- AAL: AAL1
- ATM Traffic Descriptor: e.g. 6.144 Mbit/s bi-directional symmetrical
- B-BC: BCOB-A
- B-HLI terminal protocol identification: H.310 RAST-P
- B-HLI forward/backward multiplexing capability: TS
- GIT Correlation ID: Session ID=0x0001, Resource ID=0x0002

3) The called terminal accepts the additional call by identifying it being associated with the initial call from the terminal party number and GIT information.

> Note - B-HLI terminal protocol identification information is no more significant, because all the relevant information has already been exchanged through H.245 capability messages.

4) H.245 logical channel signalling messages set up subchannels in the additional VC for audio, video, VFS C&I, data etc. as necessary.

> Note - Default subchannels need not be used. We can have the communication in an agreed mode from the outset.

Naturally, no problem in this case.

A.2 Case 2

calling: H.310 RAST-P
called: H.310 RAST-C/AAL5

1) The call from H.310 RAST-P addresses the gateway in the customer premises which behaves as if it were an H.310 RAST-P with or without AAL5 option. If the called terminal has only AAL5, the gateway makes conversion between AAL1 and AAL5. In any case, the gateway accepts the call.

> Note - In the meantime the gateway calls the called RAST-C? or the gateway consults with the called RAST-C when there is an incoming call from RAST-P?

A.3 Case 3

calling: H.310 RAST-P
called: H.310 ROT/AAL-1

1) ROT accepts the initial call anticipating that the remote end RAST-P will operate as a SOT/AAL1.

> Note - The calling RAST may terminate the call after having known the remote end is a ROT through B-HLI? ==> This is not possible because the CONNECT message does not include B-HLI.

2) After having exchanged H.245 capability messages, the calling RAST may terminate the call by knowing that the remote end is a ROT. Otherwise, an audiovisual communication mode and parameters for the additional call are selected.

- AAL: AAL1
- ATM Traffic Descriptor: e.g. 6.abc Mbit/s uni-directional
- B-BC: BCOB-A
- B-HLI terminal protocol identification: H.310 RAST-P
- B-HLI forward/backward multiplexing capability: TS

- GIT Correlation ID: Session ID=0x0001, Resource ID=0x0002

3) The called terminal accepts the additional call.

4) H.245 logical channel signalling messages set up desired subchannels in the additional VC.

A.4 Case 4

calling: H.310 RAST-P
called: H.321

1) H.310 must know before the call that the remote endpoint is H.321 so that SETUP message includes the parameters related to the N-ISDN service (see 5.7/H.321):

- AAL: AAL1, Circuit Transport, CBR rate=64 kbit/s, etc.
- ATM Traffic Descriptor: 64 kbit/s, bi-directional symmetrical
- B-BC: BCOB-A, susceptible to clipping
- N-BC: 64 kbit/s UDI
- N-LLC: 64 kbit/s UDI, layer 1 protocol=H.221 and H.242
- N-HLC: e.g. videotelephony (F.711)

2) If H.310 RAST-P places an initial call with the following SETUP message parameters, anticipating that the remote end is another H.310, the call will be rejected by the remote H.321 due to incompatibility, particularly lack of N-BC element.

- AAL: AAL5
- ATM Traffic Descriptor: 64 kbit/s, bi-directional symmetrical
- B-BC: BCOB-C
- B-HLI terminal protocol identification: H.310 RAST-P etc.
- B-HLI forward/backward multiplexing capability: no multiplex
- GIT Correlation ID: Session ID=0x0001, Resource ID=0x0001

3) RELEASE COMPLETE with cause #88 "incompatible destination" is returned. The calling H.310 can re-dial with H.321 parameters by inferring from the cause that the remote end may be an H.321 terminal.

Note - If B-BC=BCOB-C, the incoming call is incompatible for H.321.

A.5 Case 5

calling: H.310 RAST-P
called: H.320 accommodated in N-ISDN

This case is very similar to Case 4. An only difference is that if H.310 places a broadband call, Interworking Function (IWF) returns RELEASE COMPLETE with cause #63 "service or option not available, unspecified".

A.6 Case 6

calling: H.310 ROT AAL1 & AAL5
called: H.310 SOT AAL5

1) Through the capability exchange in the initial VC, the calling party can know that the remote end is capable of only AAL5.

2) The additional VC is set up with AAL5.

B. 1 VC scenario

B.0 Assumptions

1) The calling terminal places a call with default bandwidth (e.g. 64 kbit/s with H.245 control channel and default audio, 6 Mbit/s with H.245 control channel, default audio, default video?) and predetermined AAL type (e.g. AAL1).

2) After the H.245 capability message exchange, Q.2963.1 Peak Cell Rate modification is carried out to set up final ATM Traffic Descriptors.

Note 1 - H.245 message is always through H.222.1 multiplex. Can this lose flexibility, for example to communicate with other type of terminals than H.310?

Note 2 - The use of this modification service requires additional cost???

Note 3 - This modification procedure requires similar amount of time as that of placing an additional call.

3) If AALs do not match between the calling and called sides, the call is rejected. This call, however, should be in any case rejected.

B.1 Case 1

calling: H.310 RAST-P
called: H.310 RAST-P with AAL5 option

OK, the call uses AAL1.

B.2 Case 2

calling: H.310 RAST-P
called: H.310 RAST-C/AAL5

OK, the call uses AAL1 and AAL1/5 conversion is taken care of by the gateway.

B.3 Case 2-1

calling: H.310 RAST-P with AAL5 option
called: H.310 RAST-C/AAL5

OK, the call uses AAL1, but use of AAL5 would not have required AAL conversion at the gateway.

B.4 Case 3

calling: H.310 RAST-P
called: H.310 ROT/AAL-1

OK, the call uses AAL1, but audio communication which RAST expects may not happen.

B.5 Case 4

calling: H.310 RAST-P
called: H.321

OK if H.310 RAST starts in H.321/320 communication mode.

Retry is needed if H.310 RAST starts in H.310 native mode, because the call is rejected by H.321.

B.5 Case 5

calling: H.310 RAST-P
called: H.320 accommodated in N-ISDN

The same with Case 4.

B.6 Case 6

calling: H.310 ROT AAL1 & AAL5
called: H.310 SOT AAL5

If the calling side starts with AAL1, the call is rejected due to AAL mismatch. If it retries with AAL5, the call goes through.

END

Annex 2 to AVC-872

Use of BCOB-C for the initial VC instead of BCOB-A?

According to the definition of I.211, BCOB-C more fits the characteristics of H.245 messages.

Definitions in I.211

Class A service is a connection-oriented, constant bit rate ATM transport service. Class A service has end-to-end timing requirements. Class A service may require stringent cell loss, cell delay and cell delay variation performance. The user chooses the desired bandwidth and the appropriate QoS in the SETUP message to establish a Class A connection.

Class C service is a connection oriented variable bit rate (Note 1) ATM transport service. Class C service has no end-to-end timing requirements. The user chooses the desired bandwidth and QoS with appropriate information elements in a SETUP message to establish a Class C connection.

Note 1- For Bearer Class C, the network may allocate resources, as if Bearer Class A was requested.

END

Annex 3 to AVC-872

SETUP message parameters for the initial VC (Phase A1)

Phase A1 establishes a VC for H.245 messages. This call has the following SETUP message. All of the optional elements are listed here; H.310 should define whether each optional element is included and with what parameters if included.

(M) mandatory element, (O) optional element

Information Element	Coding	
Protocol discriminator (M)	Q.2931 user-network call/connection control messages	
Call reference (M)	A value is assigned by the originating side of the interface for a call which is unique to the originating side only within a particular signalling VC.	
Message type (M)	SETUP	
Message length (M)	as appropriate	
AAL parameters (O)		
	AAL type (octet 5)	AAL type 5
	Forward max. CPCS-SDU size (octet 6.1 & 6.2)	2048
	Backward max. CPCS-SDU size (octet 7.1 & 7.2)	2048
	SSCS type (octet 8.1)	Frame Relay SSCS
ATM traffic descriptor (M)		
	Forward peak cell rate for CLP=0+1 (octets 7.1-3)	167 cells per second which corresponds to 64 kbit/s
	Backward peak cell rate for CLP=0+1 (octets 8.1-3)	167 cells per second which corresponds to 64 kbit/s
Broadband bearer capability (M)		
	Bearer Class (octet 5)	BCOB-C
	Traffic Type (octet 5a)	Constant Bit Rate
	Timing Requirements (octet 5a)	End-to-End Timing Not Required
	Susceptibility to clipping (octet 6)	susceptible to clipping (???)
	User plane connection configuration (octet 6)	point-to-point
Broadband high layer information (O) [4]		
	High Layer Information Type (octet 5)	Reference to ITU-T SG 15 terminal protocol Recommendation
	Terminal Protocol Identification (octet 6 for SG 15 terminal protocol identification)	H.310 ROT & SOT, or H.310 RAST(???) see the discussion in AVC-873
	Forward (bits 8-5) / Backward (bits 4-1) Multiplexing Capability (octet 6a for SG 15 terminal protocol identification)	No multiplex

Broadband repeat indication (O)	???	
Broadband low layer information (O)	User information layer 1 protocol (octet 5) User information layer 2 protocol (octet 6) User information layer 3 protocol (octet 7)	{all values reserved} ITU-T Recommendation Q.922 {?} [3] ???
Generic identifier transport (O?) (tentative, see AVC-807	Resource correlation number tag (octet 6) Resource correlation number length (octet 6.1) Resource correlation number (octets 6.2 to 6.5)	H.245 resource/correlation number correlation_ID
Called party number (O)		
Called party subaddress (O)		
Calling party number (O)		
Calling party subaddress (O)		
Connection identifier (O)	VP-associated signalling (octet 5) Preferred / exclusive (octet 5) Virtual Path Connection Identifier (octet 6 and 7) Virtual Channel Identifier (octet 8 and 9)	VP-associated signalling (same VPI for user information as for signalling) {?} Exclusive VPCI; exclusive VCI {?} as appropriate as appropriate
End-to-end transit delay (O)	Cumulative transit delay value (octets 5.1 and 5.2) Maximum end-to-end transit delay value (octets 6.1 and 6.2)	as appropriate as appropriate
Notification indicator (O)		
OAM traffic descriptor (O)		
QOS parameter (M)	QOS-class forward (octet 5) QOS-class backward (octet 6)	Unspecified QOS class Unspecified QOS class
Broadband sending complete (O)		
Transit network selection (O)		

Suggested rewording for Section 5.5 of Draft H.310

5.5 H.310 Call Phases

The call and signaling procedures (between two H.310 terminals or between an H.310 terminal and an H.320/H.321 terminal) described in this section are based on the following principles:

1. An H.310 terminal (initiating or receiving a call) will be able to identify the remote terminal type (H.320/H.321, H.310 RAST, etc.) via Q.2931 signaling at the beginning of the call (i.e., prior to audiovisual communications)[34].
2. When two H.310 terminals are communicating, a default H.245 (logical) channel is established over the initial ATM VC at the beginning of the call.
3. When two H.310 terminals communicate, each terminal can indicate its capabilities (specified ~~outlined~~ in Section 5.2) to the remote terminal using the capability-exchange messages and procedures[35] described in ITU-T Recommendation H.245.
4. When an H.310 terminal communicates with an H.320/H.321 terminal, the two terminals use the H.242 and H.230 messages and procedures for capability exchanges and other in-band signaling needs as done in H.320/H.321 terminals.
5. For the different types of native H.310 communication modes, in-band signaling during the call will be based on H.245 messages and procedures. After using H.245 capability exchanges and call procedures, some H.310 terminals may invoke a DSM-CC channel depending on the particular mode of operation and the intended application (e.g., VOD).

Depending on the type of the two communicating terminals, an H.310 terminal will employ one of the following two ~~three~~ call procedures:

I. Native H.310 communication call procedures

The native H.310 call procedures shall be supported by all unidirectional and bidirectional H.310 terminals.

II. H.320/H.321 interworking call procedures

The H.320/H.321 interworking call procedures shall be supported by all bidirectional (RAST-P and RAST-C) H.310 RAST type terminals.

~~I. **Receive-And-Send-Terminal/Receive-And-Send-Terminal (RAST/RAST)**~~
~~The *RAST/RAST* call procedures have to be supported by all bidirectional (RAST-P and RAST-C) H.310 terminals.~~
~~II. **Send-Only-Terminal/Receive-Only-Terminal (SOT/ROT)**~~
~~The *SOT/ROT* call procedures have to be supported by all H.310 unidirectional (SOT and ROT) terminals. The support of these procedures by bidirectional H.310 terminals is optional.~~
~~III. **Receive-And-Send-Terminal/H.321 terminals (RAST/H.321)**~~
~~The RAST/H.321 call procedures, which are used for communications between H.310 bidirectional and H.320/H.321 terminals, has to be supported by all RAST H.310 terminals.~~

It is important to note that the two ~~three~~ above procedures share common phases as explained below. In particular, common start-up procedures will be supported by all H.310 terminals. This will ensure maximum interoperability among the different types of H.310 terminals.

~~Figure 3 shows the H.310 call phases for the RAST/RAST and SOT/ROT call procedures.~~

5.5.1 Native H.310 Communication Call Procedures ~~H.310 RAST/RAST Call Procedures~~

The ~~RAST/RAST~~ native H.310 communication call procedure is divided into the following call phases as shown in Figure 3:

I. **Phase A (Call-Setup)**

Phase A is a call set-up procedure phase which is divided into the following subphases:

♦ **Phase A1 (Initial VC-Setup)**

In this phase, the *initial* ATM virtual channel (VC) using a Q.2931 SETUP message is established. The exact parameters and Q.2931 Information Elements (IEs) used for this phase is described in Annex ~~under study~~. It is important to note that all H.310 terminals shall ~~has to~~ perform this phase using Q.2931. Therefore, Phase A1 is the same (except for some ~~one or two~~ Q.2931 SETUP message parameters) for both ~~all~~ of the ~~three~~ call procedure types listed above ~~(i.e., SOT/ROT, RAST/RAST, and RAST/H.321)~~.

One of the key features of this phase is that it enables an H.310 terminal (initiating or receiving a call) to either identify the type of H.310 remote terminal or infer that the remote terminal is not an H.310 terminal type (i.e., by default the remote is an H.320/H.321 terminal). This is done by using the Broadband Bearer Capability (B-BC), Narrowband Bearer Capability (N-BC) and Broadband-High Layer Information (B-HLI) IE of the Q.2931 SETUP message. An H.310 terminal shall ~~has to~~ set the Terminal Protocol Identification field of the B-HLI information element to the appropriate parameter which indicates the H.310 terminal type[36] . If an H.310 terminal does not receive the N-BC ~~B-HLI~~ information element from the remote terminal, then the H.310 terminal can ~~has to~~ assume that it is communicating with an H.310 ~~H.320/H.321~~ terminal[37].

The initial VC shall ~~should~~ have a bitrate of 64 kbit/s (with AAL-5) for the transfer of H.245 capability exchange messages as explained below[38].

♦ **Phase A2 (Capability Exchange)**

In this phase, it is assumed that each H.310 terminal has already identified that the remote terminal is an H.310 terminal type. Therefore, at this stage the two terminals can (and shall ~~should~~) exchange their capability information using the appropriate H.245 messages and procedures over the initial VC that was established in Phase A1. Based on the capabilities of the two terminals, an appropriate ~~the highest~~ common mode of communication shall ~~should~~ be determined[39].

♦ **Phase A3 (Additional VC Setup)**

In this phase, and based on the ~~highest~~ communication mode determined above, the calling[40] terminal (i.e., the one who initiated the first VC SETUP message) shall?? ~~should~~ setup an additional VC[41] with the appropriate parameters (e.g., bitrate, AAL type, etc.) for the transfer of the audiovisual and other data between the two H.310 terminals.

It is recommended to alert the human user when the additional VC call has arrived instead of the initial VC call for better human interface.

♦ **Phase A4 (Logical Channels Setup)**

The Master[42] H.310 terminal shall?? ~~should~~ open the desired video, audio, data, and/or control logical channels using the appropriate H.245 logical channel setup messages and procedures.

II. **Phase B (Audiovisual Communication)**

In addition to the transfer of audiovisual and other data during Phase B of the call, one or more of the following procedures may also take place:

♦ **Mode Request and Switching**

H.310 ~~RAST~~ terminals can request and switch to a new mode of audiovisual communication over the different logical channels (established over a given VC) using the mode request and switching messages and procedures described ~~outlined~~ in H.245.

- **Control & Indication (C&I) Signaling**

H.310 ~~RAST~~ terminals can use H.230-like video frame synchronous C&I signals. The complete definition of these signals is given in Section 5.2 of this Recommendation ~~still under study~~.

- **Maintenance and Roundtrip Delay Signaling**

H.310 ~~RAST~~ terminals can use the H.230-like maintenance (loopback) and roundtrip delay messages described in H.245.

III. **Phase C (Call Release)**

In this phase, all H.245 logical channels and ATM VCs are released using the procedures described ~~outlined~~ in H.245 and Q.2931, respectively.

~~5.5.2 H.310 SOT/ROT Call Procedures~~

~~Under study (See Figure 3.)~~

~~5.5.3~~5.5.2 **H.320/H.321 interworking call procedures** ~~RAST/H.321 Call Procedures~~

Interworking between H.310 and H.320/H.321 shall be through the use of Circuit Transport Service which requires inclusion of both broadband and narrowband information elements (B-BC, ATM TD, AAL parameters etc.; N-BC, N-LLC, B-HLC).

After determining that the remote terminal is an H.320/H.321 terminal type based on the Q.2931 SETUP message, a RAST H.310 terminal shall ~~must~~ follow the call procedures described in ITU-T Recommendations H.320 and H.321.

END