

Source: EDITOR (Hayder Radha, AT&T Bell Laboratories)  
Title: DRAFT RECOMMENDATION H.32Y  
Purpose: DISCUSSION

## 1. Scope

This Recommendation describes technical specifications for adapting narrow-band audiovisual terminals, as defined in Recommendation H.320, to broad-band ISDN environments. The terminal conforming to this Recommendation interworks with the same type of terminals (i.e., other H.32Y terminals) accommodated in B-ISDN as well as existing H.320 terminals accommodated in N-ISDN.

It is noted some of the functionalities supported by H.32Y terminals are also supported by broad-band audiovisual terminals defined in Recommendation H.32X. The interworking among H.32X, H.32Y, and H.320 terminals is a mandatory requirement. Interworking between H.320 and H.32Y terminals is achieved since the different H.32Y terminal types, defined in this Recommendation, includes the *same* functions supported by the corresponding H.320 terminal types. (See § 4.4 for more details.) Interworking between H.320/H.32Y and H.32X terminals is achieved through a common set of H.320/H.32Y functions (defined in § 7 of this Recommendation). For example, in addition to supporting the ITU-T H.262 video (MPEG-2 video) standard, H.32X terminals shall support Recommendation H.261 which is part of both Recommendation H.320 and Recommendation H.32Y.

In H.32Y terminals, the adaptation of H.320 functions over B-ISDN is achieved through ATM Adaptation Layer 1 (AAL 1). Both Segmentation-and-Reassembly (SAR) and Convergence Sub-layer (CS) functions, as defined in Recommendation I.363, are considered in this Recommendation.

{Editor's note - H.32Y may optionally support extra inband functionalities beyond those of existing H.320 terminals, such as negotiation for the use of the Adaptive Clock Recovery method (asynchronous mode) or a common clock (available at both ends) for synchronous timing recovery. The signalling of some of these functionalities can be accomplished through Q.2931 Information Elements as shown §5.7 of this Recommendation. Contributions are requested for identifying inband functionalities (if any) which are not covered in §5.7.}

## 2. References

### ITU-T Recommendations

- H.221      Frame structure for a 64 to 1920 kbit/s channel in audiovisual telester-  
vices (revised at Helsinki, 1993)

H.230	Frame-synchronous control and indication signals for audiovisual systems (revised at Helsinki, 1993)
H.242	System for establishing communication between audiovisual terminals using digital channels up to 2 Mbit/s (revised at Helsinki, 1993)
H.243	Procedures for establishing communication between three or more audiovisual terminals using digital channels up to 2 Mbit/s (Helsinki, 1993)
H.261	Video coded for audiovisual services at px64 kbit/s (revised at Helsinki, 1993)
H.320	Narrow-band visual telephone systems and terminal equipment (revised at Helsinki, 1993)
H.32X	Broadband audiovisual communication systems and terminal equipment (???, 199?)
H.32Z	Visual telephone systems and terminal equipment for local area networks (???, 199?)
I.361	B-ISDN ATM layer specification (revised at Helsinki, 1993)
I.363	B-ISDN ATM adaptation layer (AAL) specification (revised at Helsinki, 1993)
I.431	B-ISDN user-network interface (Geneva, 199?)
I.580	General arrangements for interworking between B-ISDN and 64 kbit/s based ISDN (Geneva, 199?)
Q.2931	B-ISDN Digital Subscriber Signaling System No. 2 (DSS 2) - User Network Interface Layer 3 Specification for Basic Call/Connection Control, ITU-T SG11/WP2 Working Document, July 1994, Edinburgh.
Q.939	Typical DSS 1 Service Indicator Codings for ISDN Telecommunications Services

### 3. Definitions

{Editor's note - a list of terms and abbreviations will be added here or in a dedicated Annex of this recommendation. During the Experts Group meeting in Singapore, it was agreed that a common list of definitions for H.32X, H.22X, H.32Y, and H.32Z can be used. This list can be the extension of other lists found in H.320 and other ITU-T/ISO standards (e.g., Q.2931 and MPEG-2). It is also understood that not all definitions used in H.32X, for example, are applicable to H.32Y. However, it is agreed that there is a value in keeping a superset of (consistent) terms and definitions where the different recommendations (i.e., H.32X, H.22X, H.32Y, and H.32Z) can use different subsets of. A volunteer is requested to be the Editor of this list of terms and definitions.}

## 4. System description

### 4.1 Applications

This terminal can be used for various applications such as conversational services, distributive services, retrieval services, messaging services as the existing H.320 terminal can. This Recommendation does not specify any particular service.

### 4.2 System configuration

The H.32Y terminal is mapped onto the B-ISDN reference configuration, which is depicted in Recommendation I.413, as shown in Figure 1.

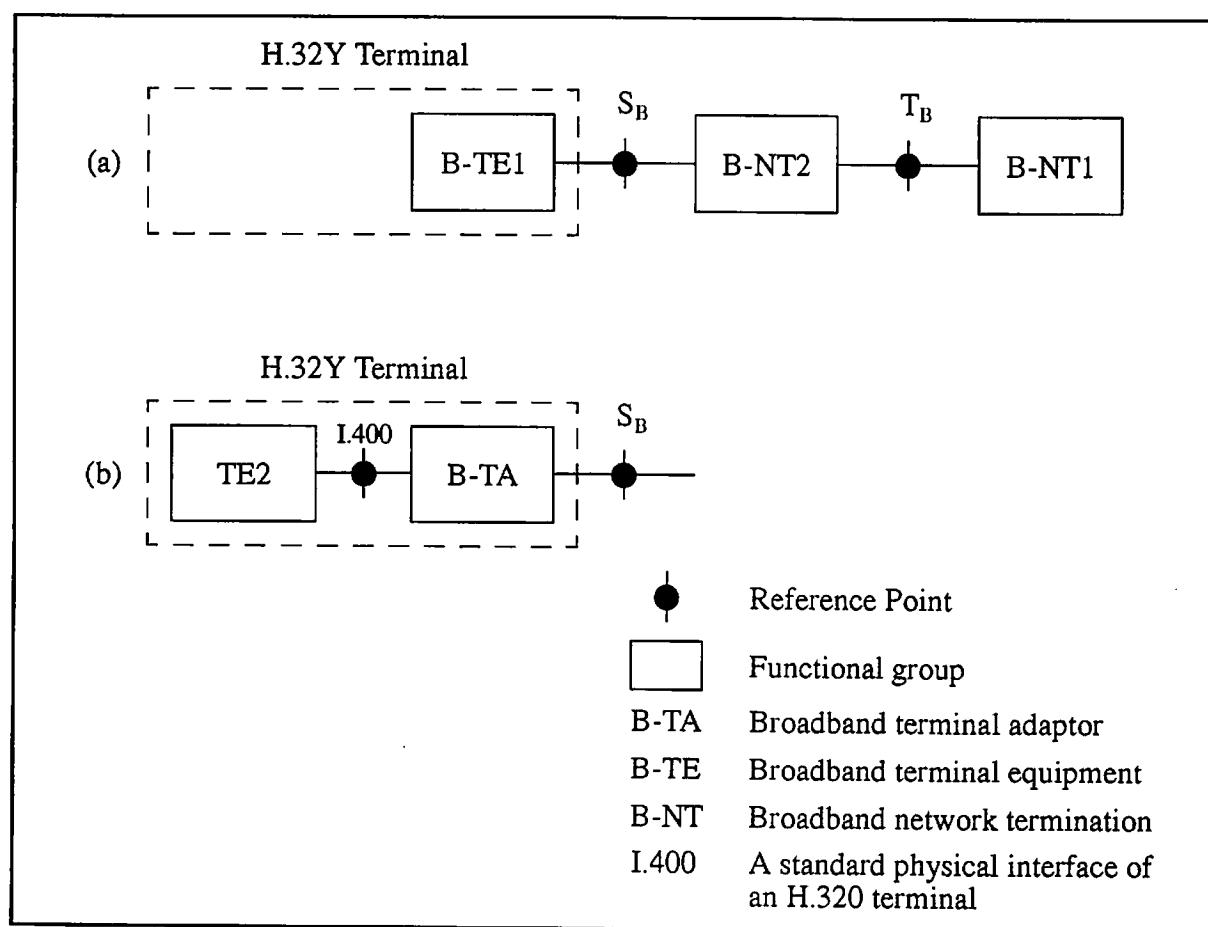


FIGURE 1/H.32Y: Reference Configuration

There are two possible implementations of an H.32Y terminal. The first one is of an integrated design which includes H.320, ATM Adaptation Layer (AAL), and ATM functions in a single terminal unit (i.e., B-TE1 in Figure 1).

The second implementation consists of an H.320 terminal equipment (TE2) and a broadband terminal adaptor (B-TA). In this case, an H.320 signal (i.e., with an H.221 framing format) is transmitted at the interface between the H.320 terminal equipment (TE2) and the terminal adaptor (B-

TA). Moreover, terminal-to-network signalling is performed in B-TA with possible interaction with TE2.

### 4.3 Generic terminal architecture

A generic architecture of an H.32Y terminal (corresponding to the configuration of Figure 1-a) is shown in Figure 2, where constituent elements and corresponding Recommendations are indicated. The figure includes the following functional units: a video I/O equipment, an audio I/O equipment, a telematic equipment, a system control unit, video and audio codecs, an audio delay unit, and a mux/demux unit. These functional units are defined in § 3.1 of Recommendation H.320.

The AAL, ATM, and physical units provide the adaptation and interface functions required for accommodating an H.32Y terminal over a broadband network.

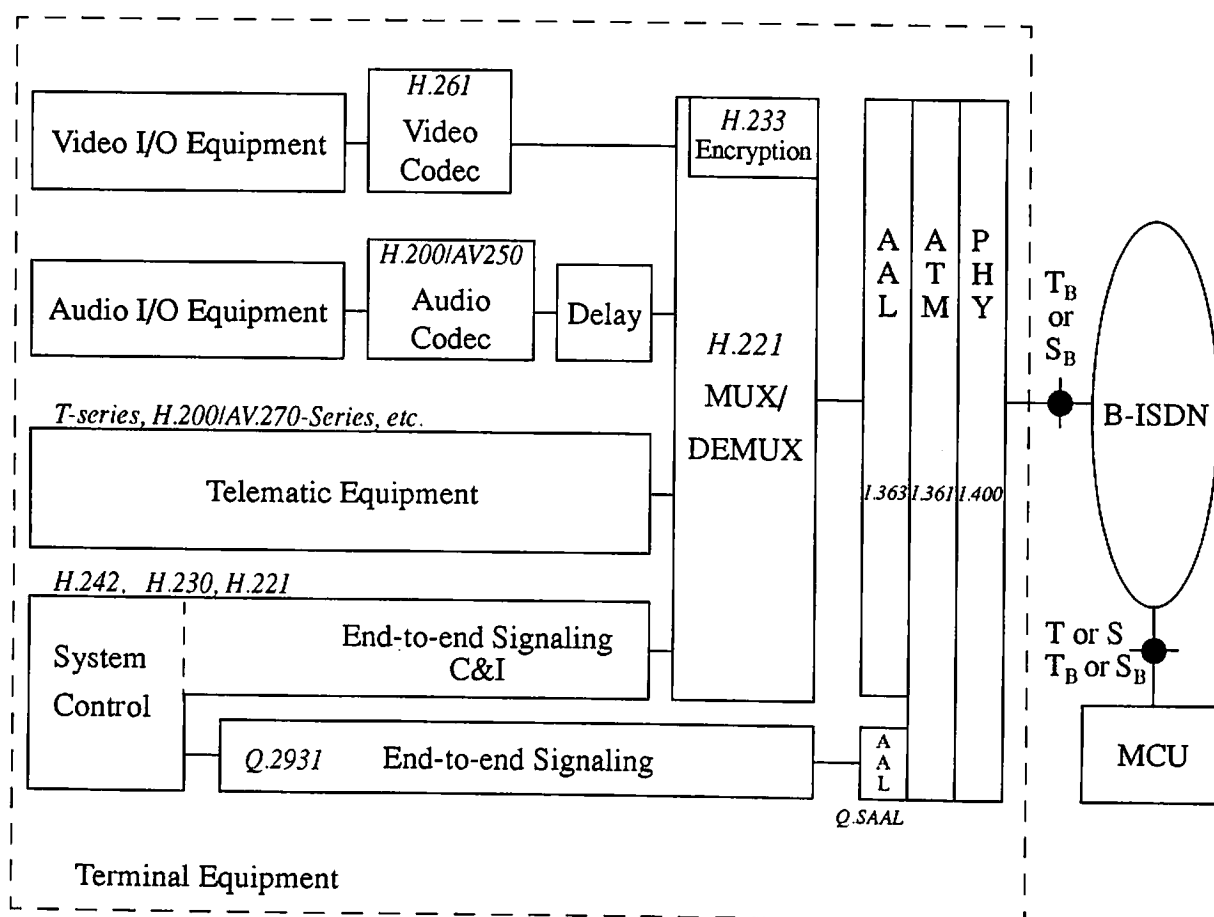


FIGURE 2/H.32Y: Protocol stack of the H.32Y terminal

### 4.4 Terminal type

Several H.32Y terminal types are defined according to the channel access capability (e.g., B, H0, and H11/H12), bit rate classes, and audio coding schemes. Each H.32Y terminal type has a corre-

sponding terminal defined in Recommendation H.320. Table 1/H.32Y outlines the different communication and audio coding modes supported by this Recommendation. (This table corresponds to Table 1/H.320.)

A special attention should be paid to the ATM virtual channel capabilities and AAL functions supported by the different H.32Y terminals. (ATM and AAL related characteristics are highlighted in Table 1/H.32Y.)

Table 1/H.32Y: Communication modes of H.32Y terminals

Visual telephone mode		Channel rate (kbit/s)	N-ISDN channel (Note 1)	Number of ATM Virtual Channels (VC)	AAL Functions	Coding	
						Audio	Video
a <sup>y</sup>	a <sub>0</sub>	64	B	1	AAL Type 1 with both SAR and CS functions. (Note 2)	G.711 (Note 3)	Not applicable
	a <sub>1</sub>					G.728	
b <sup>y</sup>	b <sub>1</sub>	128	2B	2		G.711	
	b <sub>2</sub>			G.722			
	b <sub>3</sub> (Note 4)			G.728			
g <sup>y</sup> (Note 5)	g <sup>y</sup> <sub>1</sub>	nx64	nB	n		G.711	
	g <sup>y</sup> <sub>2</sub>					G.722	
	g <sup>y</sup> <sub>3</sub>					G.728	
g <sup>y</sup>		384	H <sub>0</sub>	1		G.722 (Note 6)	H.261
h <sup>y</sup>		768	2H <sub>0</sub>	2			
i <sup>y</sup>		1152	3H <sub>0</sub>	3			
j <sup>y</sup>		1536	4H <sub>0</sub>	4			
k <sup>y</sup>		1536	H <sub>11</sub>	1			
l <sup>y</sup>		1920	5H <sub>0</sub>	5			
m <sup>y</sup>		1920	H <sub>12</sub>	1			

Note 1 - For multiple B/ $H_0$  connections, all channels are synchronized at the receiving terminal using the multiframe structure mechanism as described in § 2.7 of Recommendation H.221.

Note 2 - The support of certain Convergence Sublayer (CS) functions (e.g., the structure data pointer) is under study.

Note 3 - If a visual telephone interwork with a G.725 terminal, G.722 audio may be used instead of G.711 audio.

Note 4 - (Audio coding of mode  $b_3$ ) In addition to G.728, higher quality audio coding such as H.200/AV.253 may be used for this mode.

Note 5 -  $g=c/d/e/f$  corresponds to  $n=3/4/5/6$ , respectively. This mode is applicable to the ISDN basic rate interface if multiple basic accesses are used.

Note 6 - Other audio modes (G.711 and G.728) can be invoked using the appropriate H.242 procedures.

The number of ATM VC's supported by a given H.32Y terminal is the same number of N-ISDN channels (i.e., B or H0 channels) supported by that terminal type (or the corresponding H.320 terminal). For example, under the  $b^y$  transfer mode, two separate channels are established between two H.32Y terminals. Multimedia synchronization (e.g., audio and video) between the two channels is achieved through the multiframe structure described in Recommendation H.221. Similarly, an H.320 terminal using the  $b$  transfer mode (i.e., two B channels over a N-ISDN network) can communicate with an H.32Y terminal that is capable of supporting the  $b^y$  mode (i.e., two B channels each of which is carried by an ATM VC over a B-ISDN network through circuit emulation).

#### 4.5 Point to point communication

An H.32Y terminal may have a variety of capabilities. In point to point communications, a common set of them is determined on a call by call basis through the communication procedures defined in H.242.

#### 4.6 Multipoint communication

The H.32Y terminal can participate in multipoint communications through MCUs which are accommodated in B-ISDN or N-ISDN. Necessary communication procedures are found in Recommendation H.243.

{Editor's note - the following should be mentioned here?

- Use of B-ISDN services such as multicasting
- System solution for the mixture of H.32X and H.32Y/H.320

**Contributions are requested to cover the multipoint communication aspects of H.32Y terminals.** }

### 5. Infrastructure

#### 5.1 Audio coding

As per G.711, G.722, G.728 or other standardized coding methods which may be added in the future.

#### 5.2 Video coding

As per H.261.

#### 5.3 Multimedia multiplexing and synchronization

As per H.221.

#### **5.4 End-to-end control**

Mandatory Control & Indication signals are defined in Table 4/H.320. Other C&I signals are defined in H.230.

#### **5.5 Communication procedures**

As per H.242 and H.243.

#### **5.6 AAL functions**

Segmentation-and-Reassembly (SAR) and Convergence Sublayer (CS) functions of AAL Type 1 (AAL-1) shall be supported by H.32Y terminals. Figure 3/H.32Y shows a functional architecture for the SAR and CS functions and their interfaces within an H.32Y terminal. At the AAL Service Access Point (AAL-SAP) the CS sublayer receives AAL Service Data Units (AAL-SDU's) from the H.320 layer. The AAL-SDU is an octet of a constant bitrate (CBR) H.320 signal.

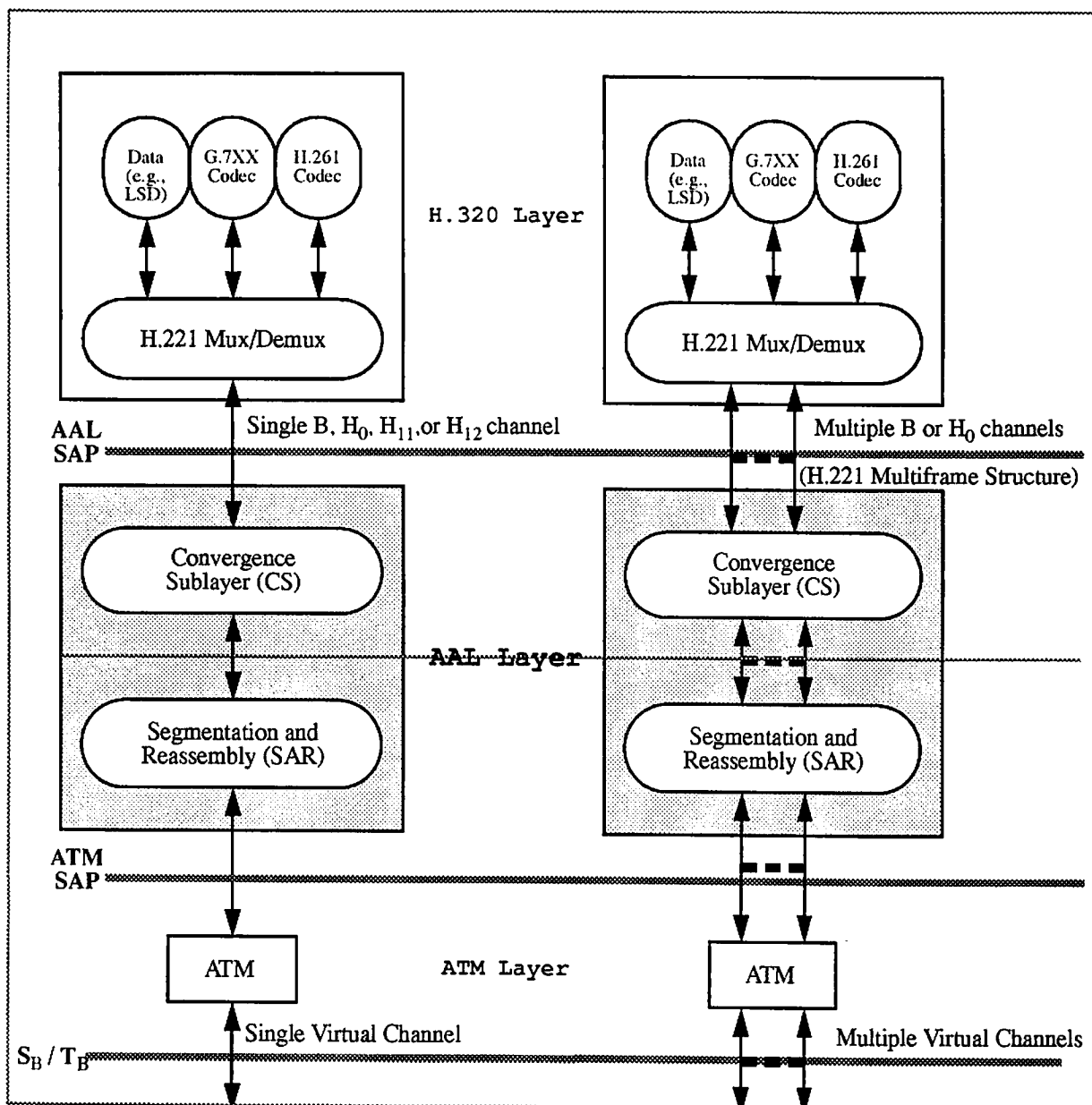


FIGURE 3/H.32Y: AAL layer interfaces for H.32Y terminals with single and multiple virtual channels.

The SAR sublayer receives a 47-byte CS Protocol Data Unit (PDU) from the convergence sublayer, and adds a one byte of SAR header to generate the 48-byte SAR-PDU. The SAR-PDU is passed to the ATM layer across the ATM-SAP. The ATM layer adds the five-byte ATM header and forms the 53-byte ATM cell.

### 5.6.1 Convergence sublayer functions

{Editor's note - Although CS functions for H.32Y terminals is under study, it was concluded during the Singapore meeting that H.32Y terminals will not need to support the short interleaver FEC/cell-loss-recovery mechanism. In addition, and after some discussions with SG-13, it seems



that H.32Y terminals will have to support the Structure Data Pointer of the AAL-1 Convergence Sublayer (at least when communicating with H.320 terminals). As noted in §5.7, contributions are requested to verify (and clarify) these points.

### 5.6.2 SAR sublayer functions

In addition to mapping between the CS-PDU and SAR-PDU, in H.32Y terminals the SAR sublayer provides the following functions:

a. Sequence numbering:

At the transmitting end, the SAR sublayer receives a sequence number from the CS sublayer for each CS-PDU. This number occupies three bits of the four-bit sequence number (SN) field of the SAR-PDU byte header. At the receiving end, the sequence number value is passed to the CS.

b. CS indication:

The SAR sublayer indicates the existence of the CS sublayer (which is optional). The CS Indication (CSI) bit in the SN field is used for that purpose.

{ Editor's note - As noted above, CS functions for H.32Y terminals is under study }

c. Error protection:

The SAR sublayer protects the SN field (i.e., the 3-bit sequence number value and the CSI bit) using a 4-bit SN Protection (SNP) field. The SNP is divided into a 3-bit CRC code to protect the SN field, and an even parity to protect the resulting seven-bit code (4-bit SN plus 3-bit CRC).

## 5.7 Call control

Since an H.32Y terminal is, in principal, a B-ISDN terminal emulating a N-ISDN service, then a call is established through the procedures defined in § 6 of Recommendation Q.2931<sup>1</sup>.

The out-of-band signalling functional unit of an H.32Y terminal should use, during the call-connection procedure, the Q.2931 Information Elements (IE's) shown in Table 2. These IE's are part of the SETUP message<sup>2</sup> (Table 3-19/Q.2931) used when initiating a 64 kbit/s based circuit-mode ISDN service call over a broadband ISDN network.

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1. That section of Recommendation Q.2931 outlines the requirements for supporting (a) 64 kbit/s based circuit-mode ISDN services in B-ISDN and (b) access signalling interworking between N-ISDN and B-ISDN.

2. Other Q.2931 messages may also use these IE's.

Table 2/H.32Y: Q.2931 Information Elements for H.32Y terminals

Q.2931 Information Element	Information Element Field(s)	IE Parameter(s) for H.32Y terminals
<b>Narrowband bearer capability (N-BC)</b>	<b>Information transfer capability</b>	<ul style="list-style-type: none"> <li>• Unrestricted Digital Information (UDI)</li> <li>• Restricted Digital Information (RDI)</li> <li>• 3.1KHz audio</li> <li>• UDI with tone/announcement (UDI-TA)</li> </ul>
	<b>Transfer mode</b>	<ul style="list-style-type: none"> <li>• circuit</li> </ul>
	<b>Information transfer rate</b>	<ul style="list-style-type: none"> <li>• 64 kbit/s</li> <li>• 2x64 kbit/s</li> <li>• 384 kbit/s</li> <li>• 1536 kbit/s</li> <li>• 1920 kbit/s</li> <li>• multirate (64 kbit/s base rate)</li> </ul>
	<b>Rate multiplier</b>	<ul style="list-style-type: none"> <li>• 2 to the maximum number of B channels. (Note 1)</li> </ul>
	<b>User information layer 1 protocol</b>	<ul style="list-style-type: none"> <li>• Recommendation G.711 <math>\mu</math>-law</li> <li>• Recommendation G.711 A-law</li> <li>• Recommendations H.221 and H.242 (Note 2)</li> </ul>
<b>Broadband bearer capability (B-BC)</b>	<b>Bearer class</b>	<ul style="list-style-type: none"> <li>• BCOB-A</li> </ul>
	<b>Susceptibility to clipping</b>	<ul style="list-style-type: none"> <li>• Susceptible to clipping</li> </ul>
	<b>Call configuration</b>	<ul style="list-style-type: none"> <li>• point-to-point (Note 3)</li> </ul>
<b>ATM traffic descriptor</b>	<b>Forward peak cell rate</b> (for CLP 0)	(Variable: depends on the transfer rate)
	<b>Backward peak cell rate</b> (for CLP 0)	
	<b>Forward peak cell rate</b> (for CLP 0+1)	
	<b>Backward peak cell rate</b> (for CLP 0+1)	

Table 2/H.32Y: Q.2931 Information Elements for H.32Y terminals

Q.2931 Information Element	Information Element Field(s)	IE Parameter(s) for H.32Y terminals
AAL parameters	AAL type	<ul style="list-style-type: none"><li>AAL 1</li></ul>
	Subtype identifier	<ul style="list-style-type: none"><li>Circuit Transport</li></ul> <div>(Note 4)</div>
	CBR rate	<ul style="list-style-type: none"><li>64 kbit/s</li><li>nx64 kbit/s</li></ul>
	Multiplier	<ul style="list-style-type: none"><li>6, 24, or 30</li></ul> <div>(Note 5)</div>
	Source clock frequency recovery method	<ul style="list-style-type: none"><li>Null (synchronous)</li><li>Adaptive Clock Method</li></ul> <div>(Note 6)</div>
	Error correction method	<ul style="list-style-type: none"><li>Null (No error correction is provided)</li></ul> <div>(Note 7)</div>
	Structure data transfer block size	<div>(Note 8)</div>
	Partially filled cells method	<ul style="list-style-type: none"><li>47</li></ul>
End-to-End transit delay	Cumulative transit delay value	<div>(Note 9)</div>
	Maximum end-to-end tran- sit delay value	
Quality of service (QOS)	<div>(Note 9)</div>	

Table 2/H.32Y: Q.2931 Information Elements for H.32Y terminals

Q.2931 Information Element	Information Element Field(s)	IE Parameter(s) for H.32Y terminals
<b>Narrowband low layer compatibility (N-LLC)</b>  (Note 10)	<b>Information transfer capability</b>	<ul style="list-style-type: none"> <li>• Unrestricted Digital Information (UDI)</li> <li>• Restricted Digital Information (RDI)</li> <li>• 3.1KHz audio</li> <li>• UDI with tone/announcement (UDI-TA)</li> </ul>
	<b>Negotiation indicator</b>	<ul style="list-style-type: none"> <li>• out-band negotiation not possible</li> <li>• out-band negotiation possible</li> </ul>
	<b>Transfer mode</b>	<ul style="list-style-type: none"> <li>• circuit</li> </ul>
	<b>Information transfer rate</b>	<ul style="list-style-type: none"> <li>• 64 kbit/s</li> <li>• 2x64 kbit/s</li> <li>• 384 kbit/s</li> <li>• 1536 kbit/s</li> <li>• 1920 kbit/s</li> <li>• multirate (64 kbit/s base rate)</li> </ul>
	<b>Rate multiplier</b>	<ul style="list-style-type: none"> <li>• 2 to the maximum number of B channels.</li> </ul> (Note 11)
	<b>User information layer 1 protocol</b>	<ul style="list-style-type: none"> <li>• Recommendation G.711 <math>\mu</math>-law</li> <li>• Recommendation G.711 A-law</li> <li>• Recommendations H.221 and H.242</li> </ul> (Note 12)
<b>Narrowband high layer compatibility (N-HLC)</b>	(Note 13)	
<b>OAM traffic descriptor</b>	(Under Study)	

Note 1 - {Editor's note: It is not clear if the "Rate multiplier" field is required or not. If it is not required, then how an nx64 kbit/s rate is specified when  $n$  is larger than two? How multiples of  $H_0$  rates are specified? Is a separate call setup procedure used for each B or  $H_0$  connection? If that is the case, then why there is a designated entry for the 2x64 kbit/s transfer rate? Contributions are requested to clarify this point. }

Note 2 - {Editor's note: Is it sufficient to use the "Recommendations H.221 and H.242" parameter only? In addition, if an H.320 terminal sets this field to the "Recommendations H.221 and H.242" option, can this information be used by the interworking unit (between the N-ISDN and B-ISDN network) to eliminate the need for including the Structure Data Pointer in the convergence sublayer of the AAL-1 function? Contributions are requested to clarify (a) what option is used by existing H.320 terminals for the "User Information Layer 1 Protocol" field of the Q.931 N-BC information element, and (b) if an interworking unit is required to look at that field. }

Note 3 - {Editor's note: Should the "point-to-multipoint" option (found in Q.2931) be considered here for certain (e.g., broadcast) applications?}

Note 4 - {Editor's note: Is it possible that a "Video Signal Transport" mode is used?}

Note 5 - {Editor's note: Is it possible to use a multiplier of "2" for 2x64 kbit/s connections? This question might be related to the last issue raised in Note 1 above.} Contributions are requested to clarify the issues identified in Notes 3, 4, and 5 above. }

Note 6 - {Editor's note: There are two possible solutions for recovering the source clock in H.32Y terminals: (1) If a common clock is available at both ends, then this clock is used to recover timing and synchronize both ends as usually done in a synchronous circuit transport. Therefore, in this case, the Synchronous Residual Time Stamp (SRTS) approach is not needed. (2) When a common clock is not available, then the Adaptive Clock Recovery method is used.}

Note 7 - {Editor's note: During the Experts Group meeting in Singapore, it was decided to eliminate the short interleaver (FEC and cell-loss recovery mechanism) option. It was also decided that the H.261 BCH code provides an appropriate protection against random bit-error events. These conclusions were based on the ATM network performance assumptions outlined in AVC-635. Contributions are solicited to verify (or even nullify) these conclusions. }

Note 8 - {Editor's note: There are two issues associated with the structure data pointer (SDP) function: (a) When an H.320 terminal places a call, how would an interworking unit (IWU), between the N-ISDN and B-ISDN networks, recognize that the incoming call is an H.320 call, and therefore there is no need for the SDP?. (b) If both the SDP and short-interleaver FEC functions have to be supported, then how they can be supported simultaneously? Both of these (and other) issues have been addressed through correspondence documents from Mr. Okubo to Rapporteurs in SG-13 and SG-11.}

Note 9 - {Editor's note: Should H.32Y specify transit delay and other QOS parameters for audiovisual services? If there is a need to specify QOS parameters for H.32Y terminals, contributions are requested to identify and quantify these parameters. }

Note 10 - {Editor's note: The (optional) N-LLC information element is used for compatibility checking between the two communicating ends. The attributes in here should not be in conflict with the attributes specified in the N-BC information element. Does the interworking unit between N-ISDN and B-ISDN networks look at the N-LLC?}

Note 11 - {Editor's note: See Note 1 above.}

Note 12 - {Editor's note: See Note 2 above. If (a) an H.320 terminal sends an N-LLC IE during call-setup, (b) the terminal sets this field to the "Recommendations H.221 and H.242" option, and (c) the interworking unit actually looks at the N-LLC IE, can this information be used by the interworking unit to eliminate the need for including the Structure Data Pointer in the convergence sublayer of the AAL-1 function? Contributions are requested to clarify (a) if H.320 terminals use the N-LLC information element and what option is used for the "User Information Layer 1 Protocol" field of this information element, and (b) if an interworking unit is required to look at that field.}

Note 13 - {Editor's note: The (optional) N-HLC information element is used for compatibility checking between the two communicating ends.}

## 6. Terminal equipment

### 6.1 Environments

### 6.2 Audio source and arrangement

### 6.3 Video source and arrangement

### 6.4 Data and other auxiliary equipment

### 6.5 Optional enhancements

{Editor's note - in these 5 sections, there may be nothing new for H.32Y which is different from the H.320 description}

### 6.6 Error resilience

In B-ISDN environments, a communication channel may suffer from occasional bit errors and cell losses. Audio and video source coding/decoding have inherent or built-in error correction or resilience mechanisms such as the BCH FEC code in H.261.

{Editor's note -As explained in Note 7 of Table 2 above, it was decided to eliminate the short interleaver (FEC and cell-loss recovery mechanism) option. It was also decided that the H.261 BCH code provides an appropriate protection against random bit-error events. These conclusions were based on the ATM network performance assumptions outlined in AVC-635. Contributions are solicited to verify (or even nullify) these conclusions.}

## 7. Intercommunications

### 7.1 Intercommunication between different terminal types

{Editor's note - the following will be covered:

- H.32Y depending on bit rate class
- H.32X terminals connected to B-ISDN}

### 7.2 Intercommunication with N-ISDN terminals

H.32Y terminals have the capability of interworking with H.320 terminals through the network support of interconnection between B-ISDN and N-ISDN as specified in I.580.

### **7.3 Intercommunication with telephony**

H.32Y terminals shall be able to interwork with telephones accommodated in N-ISDN and PSTN. Its operational mode of communication is 3.1 kHz audio.

{Editor's note - use of signalling elements such as Bearer Capability should be mentioned. There remains a general question of telephone support on B-ISDN.}

### **7.4 Intercommunication with audiovisual terminals connected to other networks**

- H.32Z for LANs

END