INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

V.75
(08/96)

SERIES V: DATA COMMUNICATION OVER THE TELEPHONE NETWORK

Interfaces and voiceband modems

DSVD terminal control procedures

ITU-T Recommendation V.75

ITU-T   V-SERIES   RECOMMENDATIONS

DATA COMMUNICATION OVER THE TELEPHONE NETWORK

<table>
<tr><td>1 – General</td></tr>
<tr><td>2 – Interfaces and voiceband modems</td></tr>
<tr><td>3 – Wideband modems</td></tr>
<tr><td>4 – Error control</td></tr>
<tr><td>5 – Transmission quality and maintenance</td></tr>
<tr><td>6 – Interworking with other networks</td></tr>
</table>

For further details, please refer to ITU-T List of Recommendations.

FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

ITU-T Recommendation V.75 was prepared by ITU-T Study Group 14 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 16th of August 1996.

_____

NOTE

1.   In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

2.   The status of annexes and appendices attached to the Series V Recommendations should be interpreted as follows:

–   an *annex* to a Recommendation forms an integral part of the Recommendation;

–   an *appendix* to a Recommendation does not form part of the Recommendation and only provides some complementary explanation or information specific to that Recommendation.

CONTENTS

INTRODUCTION

This Recommendation describes the DSVD control procedures for exchanging terminal capabilities, transmission of control information and establishing/releasing audio and data channels between two Digital Simultaneous Voice and Data (DSVD) terminals that comply with Recommendation V.70[6]. This Recommendation should be associated with Recommendation H.245 [1]. Recommendation H.245 defines a common encoding and syntax for multimedia terminals. The procedures described within this Recommendation use a subset of H.245 control messages carried within conventional HDLC frames specified by Recommendation V.76 to provide DSVD terminal control.

DSVD TERMINAL CONTROL PROCEDURES

(Geneva, 1996)

1   Scope

DSVD terminals provide communication of real-time audio and data information using ITU-T V-Series modems over the GSTN. This Recommendation specifies control procedures to establish a point-to-point DSVD connection. The procedures described within this Recommendation can be incorporated, for example, by a Multipoint Control Unit (MCU), to support a multipoint DSVD terminal conference.

The procedures described within this Recommendation specify the manner in which DSVD terminals with different connection capability sets exchange media and data link capability information so that a common mode of communication can be established. Procedures are defined for exchange of capabilities at the beginning of a DSVD connection and while a DSVD connection is in progress.

Establishing the physical connection (call control) is outside the scope of this Recommendation and is described elsewhere. DSVD terminals are made aware of a remote terminal's support of DSVD capabilities prior to a DSVD session using the procedures described in Recommendation V.8 *bis* [2].

DSVD specifies the use of two types of *media streams* – data and audio. Data and audio streams are multiplexed onto one physical connection using LAP-based multiplexing as defined in Recommendation V.76 [7].

Optional procedures are described within this Recommendation to support the exchange of connection capabilities that are independent of a media stream.

2   Normative references

The following Recommendations contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1]   ITU-T Recommendation H.245 (1996), *Control protocol for multimedia communication*.

[2]   ITU-T Recommendation V.8 *bis* (1996), *Procedures for the identification and selection of common modes of operation between Data Circuit-Terminating Equipments (DCEs) and between Data Terminal Equipments (DTEs) over the general switched telephone network and leased point-to-point telephone-type circuits*.

[3]   CCITT Recommendation V.25 (1984), *Automatic answering equipment and/or parallel automatic calling equipment on the general switched telephone network including procedures for disabling of echo control devices for both manually and automatically established calls*.

[4]   ITU-T Recommendation V.34 (1994), *A modem operating at data signalling rates of up to 28 800 bit/s for use on the general switched telephone network and on leased point-to-point 2-wire telephone-type circuits*.

[5]   ITU-T Recommendation V.42 (1993), *Error-correcting procedures for DCEs using asynchronous-to-synchronous conversion*.

[6]   ITU-T Recommendation V.70 (1996), *Procedures for the simultaneous transmission of data and digitally encoded voice signals over the GSTN, or over, 2-wire leased point-to-point telephone type circuit*.

[7]   ITU-T Recommendation V.76 (1996), *Generic multiplexer using V.42 LAPM-based procedures*.

3 Definitions

For the purposes of this Recommendation, the following definitions apply.

3.1 **in-band**: In-band messages are those that are transported within the channel or logical channel to which they refer.

3.2 **out-of-band**: Out-of-band messages are those that are transported outside of the channel or logical channel to which they refer.

4 Symbols and abbreviations

For the purposes of this Recommendation, the following abbreviations are used.

CE	Control Entity
CESAP	Control Entity Service Access Point
DCE	Data Circuit-Terminating Equipment
DLCI	Data Link Connection Identifier
DSVD	Digital Simultaneous Voice and Data
DTE	Data Terminal Equipment
DTMF	Dual Tone Multiple Frequency
ERM	Error Recovery Mode
GSTN	General Switched Telephone Network
I frame	LAPM frame for error corrected data transmission
LAPM	Link Access Procedure for Modems
MF	Multiplexer Function
MFSAP	Multiplexer Function Service Access Point
PDU	Protocol Data Unit
SAP	Service Access Point
SCF	Supervisory and Control Function
UNERM	Unacknowledged Non-Error Recovery Mode
XID frame	LAPM frame for control information

5 Overview

DSVD control procedures use HDLC frames as defined in Recommendation V.76 for transport of H.245 messages. The application of H.245 messages for DSVD control conforms to the overall H.245 message syntax.

This Recommendation describes, in an abstract manner, those interface functions provided to the DSVD SCF (Supervisory and control function), the DSVD audio processing function, the data processing function and those interfaces required of the Multiplexer Function (MF) in order to support the functionality of DSVD. Collectively these functions are referred to in this Recommendation as the DSVD Control Entity (CE). The DSVD SCF is defined in V.70.

A model of the DSVD CE and its interfaces is given in 5.1 and the services provided at each interface are listed in Tables 1a, 1b and 2. Detailed procedures are described in clause 6 for the interface functions provided to the DSVD SCF and audio/data processing functions by the DSVD control entity. Clause 6 also describes what interface functions are required by the control entity of the MF. Clause 7 defines the master/slave role assignment for DSVD and clause 8 defines the MF user-data field encoding for DSVD control. The audio header is defined in clause 9 and clause 10 defines the encoding and procedures for handling of break events.

The DSVD control procedures define a subset of H.245 messages that are mandatory for DSVD control. For this subset of control messages, the message structure defined in Recommendation H.245 in ASN.1 notation shall be followed. Parameters contained within this structure not pertaining to a DSVD session shall be ignored.

MF user-data is carried in HDLC frames. The structure and format of these frames is defined in Recommendation V.76.

5.1 Model of the DSVD control entity

The DSVD CE communicates to a DSVD CE user through the CESAP by means of service primitives defined in this Recommendation. DSVD control entities communicate with each other through the MFSAP using multiplex function service primitives as specified in Table 2 and defined in Recommendation V.76. Figure 1 illustrates the relationship between the DSVD CE and its Service Access Points (SAPs). These abstractions are provided here for descriptive purposes only and are not meant to imply any requirements on implementations.
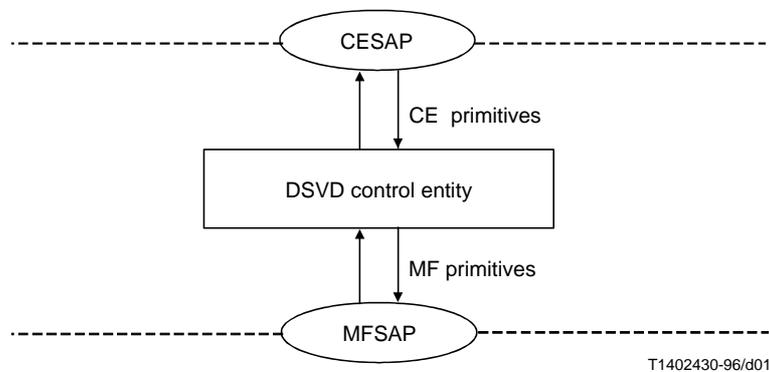
FIGURE 1/V.75

Model of the DSVD control entity

5.2 Services provided to the DSVD SCF

Primitives are specified here that are provided to the DSVD Supervisory and Control Function (SCF). See Table 1a.

5.3 Services provided to the data protocol and audio processing functions

Primitives are specified here that are provided to the data protocol and audio processing functions depicted in Figure 1/V.70. See Table 1b.

5.4 Services provided by the MF

Primitives are specified here that are required by the DSVD CE of the Multiplexer Function (MF). See Table 2.

TABLE 1a/V.75

Services provided to the DSVD SCF

Service	Primitive	Types	Parameters	Param. No.

Establish a channel	CE-ESTABLISH	– request
		– indication
			– channel parameter selection
			  • CHANNEL NUMBER
			  • MEDIA/CONTROL
			  • AUDIO HEADER
			
			– multiplex parameter selection
			  • CRC OPTIONS
			  • ERM
			    – ERROR RECOVERY
			  • UNERM
			  • SUSPEND/RESUME
			
			– media association parameter
			  • PORT NUMBER
			
			– media parameters
			  • FORWARD PARAMETERS
			  • REVERSE PARAMETERS
				1a.1
				1a.2
				1a.3
				
				1a.4
				1a.5
				1a.6
				1a.7
				1a.8
				
				1a.9
				
				1a.10
				1a.11

		– response
		– confirm
			– channel parameters
			  • CHANNEL NUMBER
			
			– media association parameter
			  • PORT NUMBER
				1a.12
				
				1a.13

Release a channel	CE-RELEASE	– request – indication	– channel parameters • CHANNEL NUMBER	1a.14
		– request – indication	– refusal parameters • REASON	1a.15

Exchange terminal capabilities and communicate control functions	CE-SETPARM	– request
		– indication
			– channel parameters
			  • CHANNEL NUMBER
			
			– multiplex capabilities
			  • CRC OPTIONS
			  • ERROR RECOVERY
			  • SUSPEND/RESUME
			
			– media capabilities
			  • RCVANDTRANSCAPS
				1a.16
				
				1a.17
				1a.18
				1a.19
				
				1a.20

		– response – confirm	– ack – nack parameters • REASON	 1a.21

Transfer data	CE-DATA	– request
		– indication
			(all of above CE-SETPARM parameters)
			
			– session termination
			  • MODES
			
			– simultaneous capabilities
			  • SIMULCAPS
				
				1a.22
				
				1a.23

		– response – confirm	(all of above CE-SETPARM parameters)	

TABLE 1b/V.75

Services provided to the data protocol and audio processing functions

Service	Primitive	Types	Parameters	Param. No.
Transfer data	CE-DATA	– request – indication	– channel parameters • CHANNEL NUMBER – media-data • DATA • AUDIO HEADER INFO – parameters • DTMF • SILENCE • BREAK • BREAK LENGTH • BREAK OPTION	1b.1 1b.2 1b.3 1b.4 1b.5 1b.6 1b.7 1b.8

TABLE 2/V.75

Services provided by the MF

Service	Primitive	Types	Parameters
Establish a channel	L-ESTABLISH	– request – indication – response – confirm	– user-data
Release a channel	L-RELEASE	– request – indication	– user-data
Exchange terminal capabilities	L-SETPARM	– request – indication – response – confirm	– user-data – control parameter • COMMAND • RESPONSE
Transfer information (errror corrected)	L-DATA	– request – indication	– user-data
Transfer information (non-errror corrected)	L-UNITDATA	– request – indication	– user-data

6 DSVD procedures

Procedures for DSVD use H.245 messages for terminal capability exchange, channel establishment and release and out-of-band control. Syntax in Recommendation H.245 supports the mandatory and optional modes of operation for DSVD terminals.

Type in **bold** indicates message types and fields defined in Recommendation H.245.

6.1 Channel establishment

6.1.1 Purpose

Establish a logical channel within the multiplex to communicate information and indicate the mode to communicate on the channel. This function is mandatory.

> NOTE – Data Link Connection Identifiers (DLCIs) are assigned by Recommendation V.76 and are numerically independent of the DSVD SCF channel numbers. However, the DLCI and the DSVD SCF channel numbers have a one-to-one relationship through the DSVD CE.

6.1.2 MF service primitives

The procedure uses the L-ESTABLISH multiplexer service primitive.

6.1.3 DSVD SCF service primitives

The procedure uses the CE-ESTABLISH DSVD control entity primitive.

6.1.4 Procedure

On receipt of a CE-ESTABLISH request, the DSVD control entity shall transmit a H.245 **OpenLogicalChannel** message as the user-data of an L-ESTABLISH request.

On receipt of an L-ESTABLISH indication with the H.245 **OpenLogicalChannel** message as the user-data, the responding DSVD control entity shall issue a CE-ESTABLISH indication.

On receipt of a CE-ESTABLISH response, the responding DSVD control entity shall transmit a H.245 **OpenLogicalChannelAck** as the user-data of an L-ESTABLISH response. If CE-RELEASE response is received by the responding DSVD control entity indicating that the channel cannot be accepted by the DSVD control entity user then 6.2 applies.

On receipt of an L-ESTABLISH confirm with an **OpenLogicalChannelAck** as the user-data, the DSVD control entity shall consider the channel established and issue a CE-ESTABLISH confirm.

NOTE – An L-ESTABLISH request primitive shall contain the **DataType** as either **AudioCapability** or **DataApplicationCapability** when opening a channel for a media stream. Within either of these capability substructures shall be contained the H.245 data or audio mode to be transmitted on the channel once established. AN L-ESTABLISH request primitive with the **DataApplicationCapability** set to **DSVDControl** indicates the request to establish an out-of-band control channel.

6.2 Channel establishment refusal

6.2.1 Purpose

Describes the DSVD control entity functions action when refusing establishment of a channel. This could be due to the inability to accept another channel or an invalid mode selection. This function is mandatory.

6.2.2 MF service primitives

The procedure uses the L-RELEASE multiplexer service primitive.

6.2.3 DSVD SCF service primitives

The procedure uses the CE-RELEASE DSVD control entity primitive.

6.2.4 Procedure

On receipt of a CE-RELEASE request the DSVD control entity shall transmit a H.245 **OpenLogicalChannelReject** message as the user-data of an L-RELEASE request.

On receipt of an L-RELEASE indication containing the **OpenLogicalChannelReject** message as the user-data, the DSVD control entity shall issue a CE-RELEASE indication with the H.245 cause parameters as the CE-RELEASE reason parameter.

NOTE – Reception of a CE-RELEASE indication from a DSVD control entity is not an indication of an error condition, but rather an indication of unsupported channel parameters, and that the channel may subsequently be established using other channel parameter values.

6.3 Channel release

6.3.1 Purpose

To close an existing channel. This function is mandatory.

6.3.2   MF service primitives

The procedure uses the L-RELEASE multiplexer service primitive.

6.3.3   DSVD SCF service primitives

The procedure uses the CE-RELEASE DSVD control function primitive.

6.3.4   Procedure

On receipt of a CE-RELEASE request, the initiating DSVD control entity shall transmit a H.245 **CloseLogicalChannel** message as the user-data field of an L-RELEASE request. The local DSVD CE shall consider the channel closed.

On receipt of an L-RELEASE indication with a H.245 **CloseLogicalChannel** message as the user-data field, the responding DSVD control entity shall issue a CE-RELEASE indication and issue an L-RELEASE request primitive with a H.245 **CloseLogicalChannelAck** message as the user-data field. The remote DSVD CE shall consider the channel closed.

On receipt of an L-RELEASE indication the DSVD control entity shall consider the channel closed.

6.4   Capability exchange

6.4.1   Purpose

These procedures invoked by both terminals in a DSVD session communicate the complete set of transmit and receive capabilities of each terminal. Syntax defined in Recommendation H.245 allows each terminal to convey the ability to handle simultaneous audio and data channels. Those capabilities that are not understood by a DSVD terminal shall be ignored and no fault implied.

Non-standard capabilities may be signalled using the H.245 **NonStandardParameter** structure defined in Recommendation H.245.

6.4.2   MF service primitives

The procedure uses the L-SETPARM multiplexer service primitive for in-band capability negotiation and the L-DATA multiplexer service primitive for out-of-band capability negotiation.

6.4.3   DSVD SCF service primitives

The procedure uses the CE-SETPARM DSVD control entity primitive.

6.4.4   In-band and out-of-band procedures

The DSVD control entity may exchange terminal capabilities in-band or out-of-band. In-band exchange procedures use the same DLC for capabilities exchange as for data transfer. Out-of-band procedures use a separate DLC for capability exchange and other DSVD terminal control and indication functions.

When using in-band terminal capability exchange, the procedures, defined in 6.4.4.1 shall be followed. The user-data within an L-SETPARM shall contain the H.245 **TerminalCapabilitySe**t message with a single **AlternativeCapabilitySet** listing. Multiple **AlternativeCapabilitySet** listings within a **simultaneousCapabilities** structure are not allowed for in-band terminal negotiation.

Optionally, DSVD terminals may use an out-of-band DLC to support other functions defined in Recommendation H.245. A DSVD control channel for out-of-band information exchange shall be established prior to using the procedures defined in 6.1. The user-data field of the L-ESTABLISH primitive shall contain the **DataApplicationCapability** parameter set to **DSVDControl** within the **OpenLogicalChannel** message indicating establishment of a control channel.

> NOTE – Channels may be opened without prior capability negotiation. In this case, the responding DSVD control entity may indicate during channel establishment with a CE-RELEASE response that the indicated mode was not acceptable.

6.4.4.1 In-band procedure

On receipt of a CE-SETPARM request, the initiating DSVD control entity shall transmit a H.245 **TerminalCapabilitySet** message as the user-data of an L-SETPARM request.

On receipt of an L-SETPARM indication with the H.245 **TerminalCapabilitySet** message as the user-data, the responding DSVD control entity shall issue a CE-SETPARM indication with the terminal capabilities of the remote DSVD terminal listed in the transmit and receive parameters.

On receipt of a CE-SETPARM response, the responding DSVD control entity shall transmit a H.245 **TerminalCapabilitySetAck** or a H.245 **TerminalCapabilitySetReject** message as the user-data of an L-SETPARM response.

On receipt of an L-SETPARM confirm with a H.245 **TerminalCapabilitySetAck** message, the DSVD control entity shall issue a CE-SETPARM confirm with the ack parameter indicating a successful capability transmission. On receipt of an L-SETPARM confirm with a H.245 **TerminalCapabilitySetReject** message as the user-data, the DSVD control entity shall issue a CE-SETPARM confirm with the rejection indicated in the reason parameter.

For in-band capability exchange procedures, the L-SETPARM request control parameter shall be set to indicate "COMMAND" and the L-SETPARM response control parameter shall be set to "RESPONSE".

6.4.4.2 Out-of-band procedure

On receipt of a CE-SETPARM request, the initiating DSVD control entity shall transmit a H.245 **TerminalCapabilitySet** message as the user-data of an L-DATA request.

On receipt of an L-DATA indication with the H.245 **TerminalCapabilitySet** message as the user-data, the responding DSVD control entity shall issue a CE-SETPARM indication with the terminal capabilities of the remote DSVD terminal listed in the transmit and receive parameters.

On receipt of a CE-SETPARM response, the responding DSVD control entity shall transmit a H.245 **TerminalCapabilitySetAck** or a H.245 **TerminalCapabilitySetReject** message as the user-data of an L-DATA request.

On receipt of an L-DATA indication with a H.245 **TerminalCapabilitySetAck** message, the DSVD control entity shall issue a CE-SETPARM confirm with the ack parameter indicating a successful capability exchange. On receipt of an L-DATA indication with a H.245 **TerminalCapabilitySetReject** message as the user-data, the DSVD control entity shall issue a CE-SETPARM confirm with the rejection indicated in the reason parameter.

6.5 Data transfer

Segmentation/reassembly of synchronous data streams is described in clause 11.

6.5.1 Purpose

Describes the DSVD control entity functions for transfer of control and media data.

6.5.2 MF service primitives

The procedure uses the L-DATA and L-UNITDATA multiplexer service primitives.

6.5.3 DSVD data protocol and audio processing service primitives

The procedure uses the CE-DATA DSVD control entity primitive.

6.5.4   Procedures on UNERM channels

On receipt of a CE-DATA request, the DSVD control entity shall transmit the media-data as the user-data of an L-UNITDATA request primitive. If the UNERM channel was opened specifying the AUDIO HEADER parameter, the DSVD control entity shall transmit the media-data prepended with the audio header as defined in clause 9 as the user-data of the L-UNITDATA request primitive. The DSVD control entity shall increment the sequence number of the audio frame header upon issue of the L-UNITDATA request primitive.

On receipt of an L-UNITDATA indication, the DSVD control entity shall issue a CE-DATA indication primitive with the media-data field set to the user-data field of the L-UNITDATA indication primitive. If the channel was opened using the AUDIO HEADER parameter, the DSVD control entity shall remove the audio header and issue a CE-DATA indication primitive with the audio header information encoded in the CE-DATA AUDIO HEADER INFO parameter and the remaining octets in the user-data field as the media-data of a CE-DATA indication primitive.

The procedures for signalling DTMF events outside of the audio coder are for further study.

6.5.5   Procedures on ERM channels

On receipt of a CE-DATA request on an ERM channel the DSVD control entity shall transmit the media data as the user-data of an L-DATA request primitive. On receipt of a CE-DATA request with the control parameter indicating "BREAK", the DSVD control entity shall transmit the break encoding as defined in clause 10 as the user-data of an L-UNITDATA request primitive.

On receipt of an L-DATA indication, the DSVD control entity shall issue a CE-DATA indication with the media-field containing the L-DATA user-data field. On receipt of an L-UNITDATA indication containing the break encoding defined in clause 10, the DSVD control entity shall issue a CE-DATA primitive with the parameter field "BREAK".

7   Master-slave determination

For the purpose of Recommendation H.245, the master/slave role is determined by procedures defined in clause 7/V.70.

8   Encoding of multiplexer function user-data fields

MF user-data fields are encoded as defined in Recommendation H.245. H.245 messages and parameters listed in Tables 3 to 6 shall be interpreted as a complete list of H.245 messages and parameters for the purposes of control and indications for DSVD. All H.245 parameters defined as substructures to the DSVD H.245 parameters listed in Tables 3 to 6 shall be understood to be applicable DSVD parameters.

8.1   User-data encoding in L-ESTABLISH primitive

This subclause lists the valid parameters of an H.245 message used to establish a logical channel. The H.245 message shall be contained within the user-data field of the MF L-ESTABLISH primitive. Other parameters defined in Recommendation H.245 shall be ignored by the DSVD control entity. The L-ESTABLISH request/indication primitive shall contain both H.245 forward and reverse channel parameters. The user-data of an L-ESTABLISH primitive shall be contained within an FI field encoded as "133_D".

8.2   User-data encoding in L-RELEASE primitive

This subclause lists the valid parameters of an H.245 message used to release/refuse establishment of a logical channel. The H.245 message shall be contained within the user-data field of the MF L-RELEASE primitive. Other parameters defined in Recommendation H.245 shall be ignored by the DSVD control entity. The user-data of an L-RELEASE primitive shall be contained within an FI field encoded as "133_D".

TABLE 3/V.75

L-ESTABLISH user-data parameters

L-ESTABLISH			
MF primitives	Applicable H.245 parameters	CE reference	Comments
– request – indication	– OpenLogicalChannel.forwardLogicalChannelNumbr. LogicalChannelNumber	1a.1	
	– OpenLogicalChannel.forwardLogicalChannelParameters. portNumber	1a.9	– required to be present for DSVD and shall identify a logical channel user
	– OpenLogicalChannel.forwardLogicalChannel Parameters.multiplexParameters.VGMUXLogicalChannelPa rameters	1a.4 – 1a.8	– shall be present for DSVD
	– OpenLogicalChannel.reverseLogicalChannelParameters. multiplexParameters.vGMUXLogicalChannelParameters	1a.4 – 1a.8	– shall be present for DSVD
	– OpenLogicalChannel.forwardLogicalChannelParameters. v75Parameters	1a.3	– shall be present for DSVD
	– OpenLogicalChannel.forwardLogicalChannelParameters. dataType.AudioData	1a.10	
	– OpenLogicalChannel.forwardLogicalChannelParameters. dataType.dataDataApplicationCapability	1a.10	
	– OpenLogicalChannel.reverseLogicalChannelParameters	1a.11	– shall be present for DSVD
	– OpenLogicalChannel.reverseLogicalChannelParameters. v75Parameters	1a.3	– shall be present for DSVD
	– OpenLogicalChannel.reverseLogicalChannelParameters. dataType	1a.11	– identical to forward datatype parameters with the exception of the AudioCapability INTEGER
– response – confirm	– OpenLogicalChannelAck.forwardLogicalChannelNumber	1a.12	
	– OpenLogicalChannelAck.portNumber	1a.13	

TABLE 4/V.75

L-RELEASE user-data parameters

L-RELEASE			
MF primitives	Applicable H.245 parameters	CE reference	Comments
– request – indication (channel close)	– CloseLogicalChannel.forwardLogicalChannelNumber	1a.14	
	– CloseLogicalChannel.source	N/A	= user from SCF = lcse from CE
(channel establishment refusal)	– OpenLogicalChannelReject.cause	1a.15	– shall be present for DSVD
	– OpenLogicalChannelReject.forwardLogicalChannelNumber	1a.14	
– response – confirm	– CloseLogicalChannelAck.forwardLogicalChannelNumber	1a.14	

8.3 User-data encoding in L-SETPARM primitive

This subclause lists the valid parameters of an H.245 message used for in-band negotiation of capability modes for a logical channel. A single H.245 message shall be contained within the user-data field of the MF L-SETPARM primitive. Other parameters defined in Recommendation H.245 shall be ignored by the DSVD control entity.

TABLE 5/V.75

L-SETPARM user-data parameters

L-SETPARM			
MF primitives	Applicable H.245 parameters	CE reference	Comments
– request – indication	– TerminalCapabilitySet.sequenceNumber	N/A	= 0 pour DSVD
	– TerminalCapabilitySet.OBJECTIDENTIFIER	N/A	= {0 0 8 245 0 1}
	– TerminalCapabilitySet.MultiplexCapability. VGMUXCapability	1a.17, 1a.18	– required to be present for DSVD, all subparameters apply
	– TerminalCapabilitySet.capabilityTable	N/A	– required to be present for DSVD,
	– TerminalCapabilitySet.capabilityTable.capability		– required to be present for DSVD,
	– TerminalCapabilitySet.capabilityTable.capability. receiveandTransmitAudioCapability	1a.20	– all subparameters apply
	– TerminalCapabilitySet.capabilityTable.capability. receiveandTransmitDataApplicationCapability	1a.20	
	– TerminalCapabilitySet.capabilityDescriptors. CapabilityDescriptorNumber	N/A	
	– TerminalCapabilitySet.capabilityDescriptors. simultaneousCapabilities	N/A	– required to be present for DSVD, set size shall be = 1 for in band capability exchange
	– TerminalCapabilitySet.capabilityDescriptors. simultaneousCapabilities. AlternativeCapabilitySet	N/A	
– response – confirm (acknowled-gement)	– TerminalCapabilitySetAck – TerminalCapabilitySetAck.sequenceNumber	N/A	= 0 for DSVD
– response – confirm (reject)	– TerminalCapabilitySetReject.cause	1a.21	– all subparameters apply
	– TerminalCapabilitySetReject.sequenceNumber		= 0 for DSVD

8.3.1 L-SETPARM user-data structure

For the purposes of DSVD sessions, data link parameters associated with the "parameter negotiation" and "private parameter negotiation" subfield shall be included as user-data in the H.245 **TerminalCapabilitySet** message within an L-SETPARM primitive. The user-data of an L-SETPARM primitive shall be contained within an FI field encoded as "133_D".

8.4 User-data encoding in L-DATA primitive

This subclause lists the valid parameters of an H.245 message used for out-of-band information transfer of capability modes for a logical channel. The H.245 message shall be contained within the user-data field of the MF L-DATA primitive. Other parameters defined in Recommendation H.245 shall be ignored by the DSVD control entity.

TABLE 6/V.75

L-DATA user-data parameters

L-DATA MF primitives	Valid H.245 parameters	CE reference	Comments
– request – indication	– TerminalCapabilitySet.OBJECTIDENTIFIER	N/A	= {0 0 8 245 0 1}
	– TerminalCapabilitySet.MultiplexCapability.VGMUX Capability	1a.17, 1a.18	– required to be present for DSVD, all subparameters apply
	– TerminalCapabilitySet.capabilityTable	N/A	– required to be present for DSVD
	– TerminalCapabilitySet.capabilityTable.capability	N/A	– required to be present for DSVD
	– TerminalCapabilitySet.capabilityTable.capability. receiveandTransmitAudioCapability	1a.20	– all subparameters apply
	– TerminalCapabilitySet.capabilityTable.capability. receiveandTransmitDataApplicationCapability	1a.20	– all subparameters apply
	– TerminalCapabilitySet.capabilityDescriptors.Capability DescriptorNumber	N/A	
	– TerminalCapabilitySet.capabilityDescriptors.simultaneous Capabilities	1a.22	– required to be present for DSVD
	– TerminalCapabilitySet.capabilityDescriptors.simultaneous Capabilities. AlternativeCapabilitySet	1a.23	
	– EndSessionCommand	1a.22	– all subparameters apply
– response – confirm (acknow-ledgement)	– TerminalCapabilitySetAck.sequenceNumber	N/A	= 0 for DSVD
– response – confirm (reject)	– TerminalCapabilitySetReject.cause.unspecified	1a.21	– all subparameters apply

9 Encoding of audio header

The use of the audio frame header is negotiated during channel establishment and is prepended to media-data by the procedures described in 6.5.4. Audio control information contained within the audio stream takes precedence over the audio header information.

TABLE 7/V.75

L-DATA user-data parameters

Bit	Meaning
0	1: Silence frame 0: Not a silence frame
1	1: Silence insertion descriptor 0: Not a silence insertion descriptor
2 – 6	UI frame sequence number (bit 2 = LSB)
7	Reserved

10 Break handling

The definitions for break handling defined in this clause apply only to ERM channels.

10.1 Transfer of break signal

Upon receipt of a break signal on the V.24 interface, the DSVD control entity shall determine:

a) how to handle data (discard or deliver) not yet transmitted across the V.24 interface or to the remote DCE; and

b) in what sequence (in sequence or preceding) the break signal shall be delivered to the remote V.24 interface with respect to data delivery.

The DSVD control entity shall issue an L-UNITDATA request primitive with a BRK message to the MF, indicating the break-handling option corresponding to the appropriate actions. The break-handling option and the actions to be followed are given in Table 8. The L-UNITDATA request primitive may also indicate the length of the break. If break lengths are not so indicated, the L-UNITDATA request primitive shall be issued at the earliest opportunity following detection of the break condition on the DTE/DCE interface. If break lengths are being indicated, the L-UNITDATA request primitive shall be issued at the earliest opportunity following the detection of the end of the break condition. Should the break condition continue for more than 2.54 seconds, however, the L-UNITDATA request primitive indicating a break exceeding 2.54 seconds (break length field value equal to 255) shall be issued at the earliest opportunity following determination that the break has exceeded 2.54 seconds.

The DSVD control entity shall not issue a subsequent L-UNITDATA request primitive before a prior one has been acknowledged by an L-UNITDATA confirm primitive from the multiplex function. If Destructive/Expedited or Non-destructive/Expedited breaks are being used, and a subsequent break is detected on the DTE interface prior to receipt of the L-UNITDATA indication primitive associated with a previous break, the DCE may discard and ignore the subsequent break. If non-destructive/non-expedited breaks are being used, however, subsequent breaks must remain pending and signalled following receipt of the L-UNITDATA indication primitive associated with any previous break.

NOTE – Because break signals are not subject to flow control, the buffer capacity of the DSVD terminal may be exceeded by the receipt of multiple consecutive breaks, resulting in subsequent breaks being discarded. The maximum number of pending non-expedited non-destructive breaks which can be accommodated is manufacturer-specific.

10.2 Receipt of break

The DSVD control entity is informed of a break upon receipt of an L-UNITDATA indication primitive with BRK. It shall acknowledge this primitive with an L-UNITDATA request primitive with a BRKACK as soon as possible. Actions to be taken on receipt of the break depend on the break-handling option, as shown in Table 9. If a break length is not indicated or contains a zero value, a break of default length is delivered to the DTE.

TABLE 8/V.75

Transmitting DSVD terminal actions on receipt of break signal on the V.24 interface

Break handling option	With respect to data			
	Going to remote DSVD terminal	Going to local DTE	Coming from remote DSVD terminal	Coming from local DTE
Destructive/ Expedited [a]	– Complete data transmission in progress, then transmit break – Discard data not yet transmitted	– Discard data not yet delivered	– Discard data until receive acknowledgement	– Hold data until receive acknowledgement
Non-destructive/ Expedited	– Complete data transmission in progress, then transmit break – Hold data until receive acknowledgement	– Continue delivering data	– Continue receiving data	– Continue receiving data
Non-destructive/ Non-expedited	– Wait for acknowledgement of data previously transmitted, and then transmit break – Hold data until receive acknowledgement	– Continue delivering data	– Continue receiving data	– Continue receiving data

[a] All state variables pertaining to control function and multiplex function operation, except those pertaining to break transfer, are reset to their initial values.

TABLE 9/V.75

Receiving DCE actions on receipt of break from the remote DCE

Break handling option [b]	With respect to data	
	Going to remote DSVD terminal	Going to local DTE
Destructive/Expedited [a]	– Discard data not yet transmitted	– Discard data not yet delivered – Deliver break signal
Non-Destructive/Expedited	– No effect	– Deliver break signal immediately – Resume normal data delivery
Non-destructive/ Non-expedited	– No effect	– Deliver break signal in sequence with respect to data

[a] All state variables pertaining to control function and multiplex function operation, except those pertaining to break transfer, are reset to their initial values.

[b] For all break options, acknowledgement should be returned as soon as possible.

11 Segmentation/reassembly

Segmentation/reassembly is an optional feature for the transmission of data protocols over an UNERM channel. The incoming data protocol frame is segmented such that each segment can be accommodated within a multiplexer frame.

When segmentation/reassembly is negotiated for the handling of data protocols in a DLC, the following procedures shall apply.

11.1 Header octet coding

An H-header octet is added before the address field of the frame to be transmitted on the DLC. The format of the H octet is shown in Figure 2.

8	7	6	5	4	3	2	1	Bit
res	I	res	res	res	res	B	F	

I   HDLC idle
B   "begin" segment bit
F   "final" segment bit
res   reserved for future standardization

FIGURE 2/V.75

The I bit is used to indicate whether an HDLC idle condition exists at the user interface. A "1" in this position indicates that an HDLC idle condition (all binary 1s – minimum 15) exists.

The B and F bits are used for segmenting and reassembly of data protocol messages. Setting the B bit to "1" indicates that the frame contains an information portion signifying the start of a message. Setting the F bit to "1" indicates the frame contains the final portion of the user frame. If the entire message is contained within a single frame then both B and F bits shall be set to "1". A frame which is neither first nor last is termed a middle frame. The meaning of the B and F bits is summarized in Table 10.

TABLE 10/V.75

Coding of B and F bits

B	F	
1	0	Begin frame
0	0	Middle frame
0	1	Final frame
1	1	Single frame

11.1.1 Processing of frames received from the user interface

Data protocol messages shall be segmented, if necessary, with each segment proceeded by the header. Segmentation shall be such that each frame transmitted to the peer entity via the V.70 system shall be inserted between voice frames. The data is placed in frames ordered so that it is transmitted to the peer entity in the order it was received.

If only one segment is required, the header shall indicate a single frame for the data (i.e. both the "begin" segment bit and the "final" segment bit set to "1") If more than one frame is required, the header of the first frame shall indicate the "begin" segment and the last frame of the message shall indicate the "final" frame. All intermediate frames shall have both "begin" and "final" segment indicators set to "0".

If an HDLC idle condition (i.e. continuous marking) is received at the user interface, a frame with the I bit in the H octet set to "1" shall be transmitted. The I bit may be set to "1" in the last segment of a previous frame, or in a frame containing no user data. When the end of the HDLC idle condition is received, a frame with the I bit of the H octet set to "0" shall be transmitted.

11.1.2 Processing of frames received from the peer entity

The following processing shall be performed on the data received:

1) The header shall be checked as follows:

    a) if the "begin" segment bit is "1" and the previous segment did not have the "final" segment bit set to "1", then the previous user message shall be deleted;

    b) if the "begin" segment bit is "0" and there is no user frame currently in progress, the segment will be discarded.

2) In the case when UI frames are used for encapsulation, the FCS received in the data stream may be examined and the appropriate action taken; if the FCS is not examined, it shall be passed on as the FCS of the reconstructed user frame.

If the I bit is "1", then an HDLC idle condition is generated after processing the received data. The HDLC idle condition shall be maintained until a frame is received with its I bit set to "0".

Annex A

H.245 version 1 syntax additions for V.75 control functions

V76Capability	**::=SEQUENCE**
{	
suspendResumeCapabilitywAddress	**BOOLEAN,**
suspendResumeCapabilitywoAddress	**BOOLEAN,**
rEJCapability	**BOOLEAN,**
sREJCapability	**BOOLEAN,**
mREJCapability	**BOOLEAN,**
crc8bitCapability	**BOOLEAN,**
crc16bitCapability	**BOOLEAN,**
crc32bitCapability	**BOOLEAN,**
uihCapability	**BOOLEAN,**
numOfDLCS	**INTEGER (2..8191),**
twoOctetAddressFieldCapability	**BOOLEAN,**
loopBackTestCapability	**BOOLEAN,**
n401Capability	**INTEGER (1..4095),**
maxWindowSizeCapability	**INTEGER (1..127),**
v75Capability	**V75Capability,**
...	
}	
V76LogicalChannelParameters	**::=SEQUENCE**
{	
hdlcParameters	**V76HDLCParameters,**
suspendResume	**CHOICE**
{	
wAddress	**NULL,**
woAddress	**NULL,**
...	
},	

```
        uIH                             BOOLEAN,
        mode                            CHOICE
        {
            eRM                         SEQUENCE
                {
                    windowSize          INTEGER (1..127),
                    recovery            CHOICE
                      {
                            rej         NULL,
                            sREJ        NULL,
                            mSREJ       NULL,
                        ...
                        },
                 ...
                },
            uNERM                       NULL,
            ...
        },
        v75Parameters                   V75Parameters,
        ...
}

V76HDLCParameters                       ::=SEQUENCE
{
        crcLength                       CRCLength,
        n401                            INTEGER (1..127),
        loopbackTestProcedure           BOOLEAN,
         ...
}

CRCLength                               ::=CHOICE
{
        crc8bit                         NULL,
        crc16bit                        NULL,
        crc32bit                        NULL,
        ...
}

TerminalCapabilitySet                   ::=SEQUENCE
{
        sequenceNumber                  SequenceNumber,

        protocolIdentifier              OBJECT IDENTIFIER,
                                        -- shall be set to the value
                                        -- {itu recommendation h 245 version (0) 1}

        multiplexCapability             MultiplexCapability OPTIONAL,

        capabilityTable                 SET SIZE (1..256) OF CapabilityTableEntry OPTIONAL,

        capabilityDescriptors           SET SIZE (1..256) OF CapabilityDescriptor OPTIONAL,

        ...
}

V75Capability                           ::=SEQUENCE
{
        audioHeader                     BOOLEAN,
        ...
}

AudioCapability                         ::=CHOICE
{
        nonStandard                     NonStandardParameter,
        g711Alaw64k                     INTEGER (1..256),
        g711Alaw56k                     INTEGER (1..256),
        g711Ulaw64k                     INTEGER (1..256),
        g711Ulaw56k                     INTEGER (1..256),
```

```
        g722-64k                        INTEGER (1..256),
        g722-56k                        INTEGER (1..256),
        g722-48k                        INTEGER (1..256),

        g723                            SEQUENCE
        {
            maxAl-sduAudioFrames        INTEGER (1..256),
            silenceSuppression          BOOLEAN
        },


        g728                            INTEGER (1..256),
        g729                            INTEGER (1..256),
        g729AnnexA                      INTEGER (1..256),

        is11172AudioCapability          IS11172AudioCapability,
        is13818AudioCapability          IS13818AudioCapability,
        ...
        g729AnnexAwSilenceSuppresion    INTEGER(1..256),
}

DataProtocolCapability      ::=CHOICE
{
        nonStandard                     NonStandardParameter,
        v14buffered                     NULL,
        v42lapm                         NULL,              -- may negotiate to Recommendation V.42 bis
        hdlcFrameTunnelling             NULL,
        h310SeparateVCStack             NULL,
        h310SingleVCStack               NULL,
        transparent                     NULL,
        ...
        segmentationAndReassembly       NULL,
        hdlcFrameTunnelingwSAR          NULL,
}

OpenLogicalChannel                      ::=SEQUENCE
{
        forwardLogicalChannelNumber     LogicalChannelNumber,

        forwardLogicalChannelParameters SEQUENCE
        {
            portNumber                  INTEGER (0..65535) OPTIONAL,
            dataType                    DataType,
            multiplexParameters         CHOICE
            {
                h222LogicalChannelParameters H222LogicalChannelParameters,
                h223LogicalChannelParameters H223LogicalChannelParameters,
                v76LogicalChannelParameters  V76LogicalChannelParameters,
                ...
            },
            ...
        },

        -- Used to specify the reverse channel for bi-directional open request

        reverseLogicalChannelParameters SEQUENCE
        {
            dataType                    DataType,
            multiplexParameters         CHOICE
            {
                -- H.222 parameters are never present in reverse direction
                h223LogicalChannelParameters H223LogicalChannelParameters,
                v76LogicalChannelParameters  V76LogicalChannelParameters,
                ...
            } OPTIONAL,              -- Not present for Recommendation H.222
            ...
        } OPTIONAL,                  -- Not present for uni-directional channel request
        ...
}
```

```
V75Parameters                              SEQUENCE
{
        audioHeaderPresent                 NULL,
        ...
}

OpenLogicalChannelAck                       ::=SEQUENCE
{
        forwardLogicalChannelNumber        LogicalChannelNumber,

        reverseLogicalChannelParameters    SEQUENCE
        {
            reverseLogicalChannelNumber    LogicalChannelNumber,
            portNumber                     INTEGER (0..65535) OPTIONAL,
            multiplexParameters            CHOICE
            {
                h222LogicalChannelParameters  H222LogicalChannelParameters,
                -- H.223 parameters are never present in reverse direction
                ...
            } OPTIONAL,                     -- Not present for Recommendation H.223
            ...

        } OPTIONAL,                         -- Not present for uni-directional channel request
        ...
}

ModeDescription                            ::=SET SIZE (1..256) OF ModeElement

ModeElement                                ::= SEQUENCE
{
        type                               CHOICE
        {
            nonStandard                    NonStandardParameter,
            videoMode                       VideoMode,
            audioMode                       AudioMode,
            dataMode                       DataMode,
            encryptionMode                 EncryptionMode,
            ...
        },

        h223ModeParameters                 H223ModeParameters OPTIONAL,
        ...
        v76ModeParameters                  V76ModeParameters   OPTIONAL,
}

V76ModeParameters                          CHOICE
            {
            suspendResumewAddress          NULL,
            suspendResumewoAddress         NULL,
            ...
            }
```

Appendix I

Data forwarding conditions

Data forwarding

Operation of the DSVD control entity assumes that frames will be transmitted in a "timely" fashion. Such forwarding conditions are outside the scope of the DSVD control entity and depend on the receipt of the appropriate primitive from the entity requesting data forwarding services. Recommendation V.42 (Appendix II) lists five data forwarding conditions (while not precluding others or use in combination) used by its control function that may also be applicable here. In particular, attention is drawn to the *interval timer* and *stream mode* methods as relevant when multiplexing several DLCs potentially with different characteristics (e.g., in terms of delay, importance, etc.).

ITU-T RECOMMENDATIONS SERIES

Series A   Organization of the work of the ITU-T

Series B   Means of expression

Series C   General telecommunication statistics

Series D   General tariff principles

Series E   Telephone network and ISDN

Series F   Non-telephone telecommunication services

Series G   Transmission systems and media

Series H   Transmission of non-telephone signals

Series I   Integrated services digital network

Series J   Transmission of sound-programme and television signals

Series K   Protection against interference

Series L   Construction, installation and protection of cables and other elements of outside plant

Series M   Maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits

Series N   Maintenance: international sound-programme and television transmission circuits

Series O   Specifications of measuring equipment

Series P   Telephone transmission quality

Series Q   Switching and signalling

Series R   Telegraph transmission

Series S   Telegraph services terminal equipment

Series T   Terminal equipments and protocols for telematic services

Series U   Telegraph switching

Series V   Data communication over the telephone network

Series X   Data networks and open system communication

Series Z   Programming languages