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Amendment 2
(09/98)

SERIES X: DATA NETWORKS AND OPEN SYSTEM COMMUNICATIONS

Public data networks – Transmission, signalling and switching

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Network-to-network interface between public data networks providing the frame relay data transmission service

Amendment 2: Frame relay service classes and priorities

ITU-T Recommendation X.76 – Amendment 2
Superseded by a more recent version

(Previously CCITT Recommendation)

Superseded by a more recent version

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Superseded by a more recent version

ITU-T RECOMMENDATION X.76

NETWORK-TO-NETWORK INTERFACE BETWEEN PUBLIC DATA NETWORKS PROVIDING THE FRAME RELAY DATA TRANSMISSION SERVICE

AMENDMENT 2

Frame relay service classes and priorities

Summary

Amendment 2 to Recommendation X.76 includes additions for Frame Relay Service Classes and Priorities, Enhancement to Switched PVC Information Element, Addition of a new Calling Party Switched PVC Information Element and support of NSAP format address coding. The additions for Frame Relay Service Classes and Priorities in Amendment 2 to Recommendation X.76 are related to Recommendation X.146 on Frame Relay Service Classes and to the related Amendment 3 to Recommendation X.36.

Source

Amendment 2 to ITU-T Recommendation X.76 was prepared by ITU-T Study Group 7 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 25th of September 1998.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the 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.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation the term *recognized operating agency (ROA)* includes any individual, company, corporation or governmental organization that operates a public correspondence service. The terms *Administration*, *ROA* and *public correspondence* are defined in the *Constitution of the ITU (Geneva, 1992)*.

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As of the date of approval of this Recommendation, the ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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NETWORK-TO-NETWORK INTERFACE BETWEEN PUBLIC DATA NETWORKS PROVIDING THE FRAME RELAY DATA TRANSMISSION SERVICE

AMENDMENT 2

Frame relay service classes and priorities

(Geneva, 1998)

1) Subclause 10.4.9 – SETUP

Add the following entry to the SETUP message in Table 10-9/X.76:

Information element	Reference	Type	Length
Priority and Service Class parameters information element	10.5.22 *bis*	O	2-8

2) Subclause 10.5

a) Add the following item to the list of information elements in 10.5/X.76, Amendment 1:

Information Element	*IE Identifier coding*
Priority and Service Classes parameters information element	0110 1010

b) Changes to the Called Party Number information element to support NSAP coding in 10.5.7:

To signal in the called party number information element, an ATM End System Address (AESA) coded as an NSAP, the Called Party Number information element coding is modified. The following are additions to Table 10-15/X.76:

Type of number (octet 3)

Bits
7 6 5
1 0 1 Alternative address (Note 2)

NOTE 2 – This code point is used in conjunction with the coding of an NSAP format calling party number. See also Numbering plan identification.

Numbering plan identification coding (octet 3) when type of number is coded as Alternative address

Bits
4 3 2 1
0 0 0 1 ISO NSAP address coded in accordance with Annex A of ITU-T Rec. X.213 | ISO/IEC 8348 and Annex F of Recommendation X.36 Amendment 3.

Valid combination of TON and NPI

Type of number (TON)	Numbering Plan Identification (NPI)	Format
Alternative address	ISO NSAP	AESA (Note 3)

NOTE 3 – This combination is used to allow the addressing of an AESA coded as an NSAP. The support of this combination is subject to bilateral agreements between networks. It is used to provide interworking of frame relay and ATM networks. The use of this combination does not imply that a frame relay network supports the numbering plans or addressing schemes identified in the AESA. It rather allows the selection of a route towards a frame relay/ATM interworking unit.

c) Changes to the Calling Party Number information element to support NSAP coding in 10.5.9:

To allow frame relay networks and DTEs to receive, in the Calling Party Number information element, the address of an ATM end system coded as an NSAP, the Calling Party Number information element is modified. The following are additions to Table 10-16/X.76:

Replace "Type of number (octet 2)" with:

Type of Number (octet 3)

Bits 7 6 5	
0 0 1	International number (Note 1)
1 0 1	Alternative address (Note 2)

All other values are reserved.

NOTE 1 – Prefix or escape digits shall not be included in the number digits.

NOTE 2 – This code point is used in conjunction with the coding of an NSAP format. See also Numbering Plan Identification.

Numbering Plan Identification (octet 3)

Bits 4 3 2 1	
0 0 0 1	ISO NSAP address coded in accordance with Annex A of ITU-T Rec. X.213 | ISO/IEC 8348 and Annex F of Recommendation X.36 Amendment 3.

Valid combination of TON and NPI

Type of number (TON)	Numbering Plan Identification (NPI)	Format
Alternative address	ISO NSAP	AESA (Note 3)

NOTE 3 – This combination is used to allow the transport of an ATM end system calling address coded as an NSAP. The support of this combination is subject to bilateral agreements between networks.

d) Add the following new subclause 10.5.22 bis:

10.5.22 *bis* Priority and Service Class parameters information element

The purpose of the Priority and Service Class parameters information element is to convey information in the SETUP message on the priorities or service class applicable to the call.

The Priority and Service Class parameters information element is shown in Figure 10-24 *bis*/X.76 and in Table 10-21 *bis*/X.76.

8	7	6	5	4	3	2	1	Octet
Priority and Service Class parameters information element identifier								
0	1	1	0	1	0	1	0	1
Length of Priority and Service Class parameters information element contents								2
Frame Transfer Priority identifier								
0	0	0	0	0	0	0	1	3*
Outgoing Transfer Priority index				Incoming Transfer Priority index				3.1*
Frame Discard Priority identifier								
0	0	0	0	0	0	1	0	4*
Outgoing Discard Priority index				Incoming Discard Priority index				4.1*
Service Class identifier								
0	0	0	0	0	0	1	1	5
Service Class value								5.1*

Figure 10-24 *bis*/X.76 – Priority and Service Class parameters information element

Table 10-21 *bis*/X.76 – Priority and Service Class parameters information element

Outgoing transfer priority index (octet 3.1 bits 5-8) (Notes 1 and 2)

A binary number in the range of 0 to 15 indicating the Frame transfer priority index for the outgoing direction. 0 denotes the lowest priority and 15 the highest.

Incoming requested transfer priority index (octet 3.1 bits 1-4) (Notes 1 and 2)

A binary number in the range of 0 to 15 indicating the Frame transfer priority index for the incoming direction. 0 denotes the lowest priority and 15 the highest.

NOTE 1 – A frame transfer priority index has a local significance.

NOTE 2 – The term outgoing refers to the calling-to-called DTE direction, and the term incoming refers to the direction from the called-to-calling DTE.

Outgoing Frame Discard Priority index (octet 4.1 bits 5-8) (Notes 3 and 4)

A binary number in the range of 0 to 7 indicating the Frame Discard Priority index in the outgoing direction. 0 denotes the lowest priority (first to be discarded) and 7 the highest. Other values (8 to 15) are reserved.

Incoming Frame Discard Priority index (octet 4.1 bits 1-4) (Notes 3 and 4)

A binary number in the range of 0 to 7 indicating the Frame Discard Priority index in the incoming direction. 0 denotes the lowest priority (first to be discarded) and 7 the highest. Other values (8 to 15) are reserved.

NOTE 3 – A frame discard priority index has local significance.

NOTE 4 – The term outgoing refers to the calling-to-called DTE direction, and the term incoming refers to the direction from the called-to-calling DTE.

Service class value

A binary number in the range 0 to 3 indicating the specified service Class. Other values are reserved. Service classes and their associated quality of service characteristics are standardized – see Table 10-27/X.76 and Recommendation X.146.

NOTE 5 – Priorities and service class parameters may not both be present in the same Priority and Service Class parameters information element.

3) Subclause 10.6.9.7

Rename the title of subclause 10.6.9.7 and add the following new subclauses:

10.6.9.7 Frame Relay Priority and Service Class

10.6.9.7.1 Frame transfer priority

10.6.9.7.1.1 General description

The frame transfer priority is a network facility used by bilateral agreements between networks. The frame transfer priority allows networks the possibility to apply different priorities to virtual circuits. During the data transfer phase, a virtual circuit with a higher frame transfer priority will have, in general, its frames serviced (processed and transmitted) before the frames of virtual circuits assigned a lower priority resulting in a lower end-to-end delay. Frame transfer priorities are assigned per virtual circuit and possibly for each direction of the data transmission. Frame transfer priority provides frame relay networks with a capability allowing them to support and meet the time-sensitivity requirements of real-time applications.

A frame transfer priority class corresponds to a distinct frame transfer priority supported by the network. The number and characteristics of frame transfer priority classes rely highly on internal network capabilities and, as such, are not standardized. When interconnecting their networks, service providers will describe their own mapping between frame transfer priority indices and frame transfer priority classes. In addition, to have a uniform service, by bilateral agreements, service providers will agree to support the same number of frame transfer priority classes and agree on the meaning of each class.

A frame transfer priority index is an integer from zero to fifteen used at the frame relay NNI to identify a frame transfer priority class. Zero is the lowest priority index and fifteen the highest. A frame transfer priority index has a local significance, its meaning is established according to the receiving network.

For permanent virtual circuits, frame transfer priority classes are assigned at subscription time. For switched virtual circuits, the assignment of frame transfer priority classes is done using the signalling protocol defined in this subclause.

10.6.9.7.2 Frame discard priority

10.6.9.7.2.1 General description

The frame discard priority is a network facility used by bilateral agreements between networks. The frame discard priority allows networks and DTEs the ability to apply different priorities to virtual circuits. Each frame discard priority can be associated with a different frame loss ratio. When frame relay frames have to be discarded under adverse network conditions, frames belonging to a virtual circuit assigned a lower discard priority will be discarded by the network prior to those belonging to virtual circuits assigned higher frame discard priorities. Frame discard priorities are assigned per virtual circuit at the NNI and may be assigned for each direction of data transmission.

A frame discard priority class corresponds to a distinct frame discard priority supported by the network. The number and characteristics of frame discard priority classes rely highly on internal network capabilities and, as such, are not standardized. When interconnecting their networks, service providers will describe their own mapping between frame discard priority indices and frame discard priority classes. In addition, to have a uniform service, by bilateral agreements, service providers will agree to support the same number of frame discard priority classes and agree on the meaning of each class.

A frame discard priority index is an integer from zero to seven used at the frame relay NNI to identify a frame discard priority class. Zero is the lowest priority index (first to be discarded, that is highest frame loss ratio) and seven is the highest (last to be discarded, that is lowest frame loss ratio). Service providers when interconnecting their networks will agree on the mapping between frame discard priority indices and frame discard priority classes. A frame discard priority index has a local significance, its meaning is established according to the receiving network.

For permanent virtual circuits, frame discard priority classes are assigned at subscription time. For switched virtual circuits, the assignment of frame discard priority classes is done using the signalling protocol defined in this subclause.

10.6.9.7.3 Procedures for priorities

10.6.9.7.3.1 Action by the calling STE applicable to frame transfer and frame discard priorities

Before including frame transfer and frame discard priorities parameters in the Priority and Service Class parameters information element in a SETUP message, the calling STE shall check whether a bilateral agreement exists at the NNI for the use of priorities. If no bilateral agreement exists, and the calling STE received a request formulated in terms of priorities, the action to be taken by the calling STE is clearing of the SVC call in the backward direction with cause No. 63, *Service or option not available, unspecified*, and diagnostic as the Priority and Service Class parameters information element identifier.

If there is a bilateral agreement authorizing the use of priorities, and the calling STE received a request formulated in terms of priorities, the calling STE will signal priority parameters in the SETUP message.

If there is a bilateral agreement authorizing only the use of priorities, and the calling STE received a request with no priority indication, the calling STE will signal a SETUP message with no priority and service class parameters information element.

If there is a bilateral agreement authorizing only the use of service Class, and the calling STE received a request formulated in terms of priorities, the calling STE will map the priority parameter values to the equivalent service class and signal the service class parameter in the SETUP message. If no standardized service class is equivalent to the transfer and/or discard priority request, then the calling STE shall clear the call in the backward direction with cause No. 49, *Quality of Service not available*.

NOTE – The calling STE shall not include both priority and service class parameters in the same Priority and Service Class parameters information element.

If the calling STE receives a request formulated either in terms of a standardized service Class, or priorities, and it is not possible for the calling STE to establish the call with the specified values, the calling STE shall clear the call in the backward direction with cause No. 49, *Quality of Service not available*.

After sending a SETUP message with a Priority and Service Class parameters information element as required, the calling STE shall follow the normal SVC procedures of clause 10/X.76.

10.6.9.7.3.2 Action by the called STE applicable to frame transfer and frame discard priorities

If the called STE receives a SETUP message containing priorities parameters, in addition to the SVC procedures in clause 10/X.76, it shall take one of the following actions:

If the called STE recognizes the Priority and Service Class parameters information element, and priority parameters, the called network will establish the call on the basis of the requested priority parameters. If it is not possible to establish the call with the specified values, the called STE shall clear the call in the backward direction with cause No. 49, *Quality of Service not available*.

If the called STE receives a Priority and Service Class information element when no bilateral agreement exists (due to an error of the calling STE), the Priority and Service Class information element will be discarded by the called STE.

10.6.9.7.4 Frame relay service class

10.6.9.7.4.1 General description

Frame relay service class is an optional facility allowing frame relay networks to apply different quality of service classes to frame relay virtual circuits to meet delay and loss requirements for different applications on a consistent basis between different networks. During the data transfer phase, frames will be processed such that the performance characteristics of the subscribed or requested service class will be met.

The use of frame relay service class at the NNI, by subscription for PVCs or by signalling for SVCs, is subject to bilateral agreements between the networks. Bilateral agreements may be made to use either or both service class and priorities. For switched virtual circuits, the service class is requested by the calling STE by signalling at the time of call establishment.

In the case of frame relay SVC, a service class number will be signalled by the originating network's calling STE in the SETUP message. The service class number will be as signalled by the calling DTE in a service class parameter in the SETUP message at the UNI, or is mapped from priority parameter(s) in the SETUP message at the UNI. Subsequent transit networks will signal the same service class parameter value to the called network.

Networks not offering any defined frame relay service classes will treat the priority and service class parameters information element as an optional information element and discard it. Such networks effectively support at least service class 0.

Defined service classes are specified in Table 10-27/X.76. Each service class has associated maximum end-to-end delay and loss values as appropriate for the requirements of applications for each class. Service classes and their defined delay and loss parameter values are as specified in Recommendation X.146.

Table 10-27/X.76 – Frame relay service classes

Service class number	Support requirement	Description
0	Mandatory (Default Class)	Unbounded frame loss and delay requirements
1	Mandatory	Moderate frame loss and moderate delay requirements
2	Optional	Stringent frame loss and moderate delay requirements
3	Optional	Stringent frame loss and stringent delay requirements
NOTE – Information on the optional service classes supported by each network is to be exchanged as part of bilateral internetwork connection arrangements.		

10.6.9.7.4.2 Action by the calling STE

Before including a service class parameter in the priority and service class parameters information element in the SETUP message, the calling STE shall check whether a bilateral agreement exists at the NNI for the use of service class. If no bilateral agreement exists, and the calling STE received a request formulated in terms of a service class, the action to be taken by the calling STE is clearing of the SVC call in the backward direction with cause No. 63, *Service or option not available, unspecified*.

If there is a bilateral agreement authorizing the use of service class, and the calling STE received a request with no priority or service class parameter, the network's default service class (service class 0) will be signalled by the calling STE in the SETUP message.

If there is a bilateral agreement authorizing the use of service class, and the calling STE received a request formulated in terms of a service class, the calling STE will signal a service class parameter in the SETUP message with the same service class value.

NOTE – The calling STE shall not include both service class and priority parameters in the same Service Class and Priority parameters Information element.

If the calling STE receives a request formulated either in terms of a standardized service class, or priorities, and it is not possible for the calling STE to establish the call with the specified values, the calling STE shall clear the call in the backward direction with cause No. 49, *Quality of Service not available*.

After sending a SETUP message with a Service Class and Priority parameters information element as required, the calling STE shall follow the normal SVC procedures of clause 10/X.76.

10.6.9.7.4.3 Action by the called STE

If the called STE receives a SETUP message containing a service class parameter, in addition to the SVC procedures in clause 10/X.76, it shall take one of the following actions:

If the called STE recognizes the Priority and Service Class parameters information element, and service class parameter, the called network will establish the call on the basis of the requested service Class. If it is not possible to establish the call with the specified values, the called STE shall clear the call in the backward direction with cause No. 49, *Quality of Service not available*.

If the called STE receives a Priority and Service Class parameters information element when no bilateral agreement exists (due to an error of the calling STE), the Priority and Service Class parameters IE will be discarded by the called STE.

10.6.9.7.4.4 Interaction between service class and priorities

If there is a bilateral agreement authorizing only the use of service class, and the calling STE received a request formulated in terms of priorities, the calling STE will map the priority parameter values to the equivalent service class and signal the service class parameter in the SETUP message. If no standardized service class is equivalent to the transfer and/or discard priority request, then the calling STE shall clear the call in the backward direction with cause No. 49, *Quality of Service not available*.

If there is a bilateral agreement authorizing only the use of Priorities, and the calling STE received a request formulated in terms of service classes, the calling STE will map the service class to equivalent priority parameters and signal the priority parameters in the SETUP message. If no priority parameters are equivalent to the requested service class, then the calling STE shall clear the call in the backward direction with cause No. 49, *Quality of Service not available*.

NOTE – In these cases, the bilateral agreement between the networks applies to both directions of call setup.

If priority and service class parameters are both present in the Priority and Service Class information element (due to an error of the calling STE), and the service class parameter appears first, the called STE will accept it and discard any priority parameters. Alternatively, if a priority parameter appears first, the called STE will discard any service class parameter.

4) Annex A

a) Signalling of VPI and VCI in X.76 SPVC information element

Revised Figure A.2/X.76, Called party SPVC information element, includes two optional octet groups. Octet Groups 6 and 7 are added to the Called party SPVC information element to signal the VPI + VCI to be used at the ATM called end of the SPVC.

8	7	6	5	4	3	2	1	Octet
Called party SPVC information element identifier								
0	0	0	0	0	1	0	1	1
Length of called party SPVC information element contents								2
ext. 1	Spare			New 0 (for further study)	Called endpoint selection type			3
ext. 0	Spare 0	DLCI (Most significant 6 bits)						4*
ext. 0/1	DLCI (Most significant 4 bits)				Spare			4a*
ext. 1	DLCI (3rd most significant 6 bits)						Reser-ved 0	4b*
ext. 0	DLCI (3rd most significant 7 bits)							4b*
ext. 1	DLCI (4th most significant 6 bits)						Reser-ved 0	4c*
ATM called endpoint Selection type								5*
VPI identifier								
1	0	0	0	0	0	0	1	6* (Note 3)
VPI value (coded according to Q.2931 Connection identification information element)								6.1* 6.2*
VCI identifier								
1	0	0	0	0	0	1	0	7* (Notes 3, 4)
VCI value (coded according to Q.2931 Connection identification information element)								7.1* 7.2*

Figure A.2/X.76 – Called party SPVC information element

Add the following Notes to apply to Figure A.2/X.76:

NOTE 3 – This octet group is not included when the ATM called endpoint selection type in octet 5 indicates "Any value".

NOTE 4 – This octet group is only present in case of a soft PVC.

Additions to Table A.1/X.76:

Called endpoint selection (octet 3)

A new value for ATM endpoint is to be added to Table A.1/X.76:

Bits 3 2 1	
1 1 1	ATM endpoint (New Note 3)

NOTE 3 – When the Called endpoint selection field is coded "ATM endpoint", octet Group 4 is not coded and additional endpoint selection information is coded in octet 5.

ATM called endpoint selection type (octet 5) (Note 4)

Bits 8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 0	Any value
0 0 0 0 0 0 1 0	Required value
0 0 0 0 0 1 0 0	Assigned value

NOTE 4 – This octet is allowed only when in octet 3 the Called endpoint selection field indicates "ATM endpoint".

VPI value (octet 6.1 and 6.2)

A two-octet binary number assigned to the ATM connection identifying the virtual path connection. The VPI value is coded according to Q.2931 Connection identification information elements.

VCI value (octet 7.1 and 7.2)

A two-octet binary number assigned to the ATM connection identifying the virtual channel connection. The VCI value is coded according to Q.2931 Connection identification information elements.

b) Addition of a new Calling Party SPVC information element

The purpose of the Calling Party SPVC information element is to identify the calling endpoint of a PVC. New Figure A.3/X.76 shows the coding of the Calling Party SPVC information element.

8	7	6	5	4	3	2	1	Octet
Calling party SPVC information element identifier								
0	0	0	0	1	0	1	1	1
Length of calling party SPVC information element contents								2
DLCI identifier								
0	0	0	0	0	0	1	1	3* (Note)
ext. 0	Spare 0	DLCI (Most significant 6 bits)						3.1*
ext. 0/1	DLCI (Most significant 4 bits)			Spare				3.2*
ext. 1	DLCI (3rd most significant 6 bits)						Reser-ved 0	3.3*
ext. 0	DLCI (3rd most significant 7 bits)							3.4*
ext. 1	DLCI (4th most significant 6 bits)						Reser-ved 0	3.5*
VPI identifier								
0	0	0	0	0	0	0	1	4* (Note)
VPI value (coded according to Q.2931 Connection identification information element)								4.1-4.2*
VCI identifier								
0	0	0	0	0	0	1	0	5* (Note)
VCI value (coded according to Q.2931 Connection identification information element)								5.1-5.2*

NOTE – Either a frame layer connection identification is coded (DLCI) or an ATM connection identification is coded (VPI/VCI).

Figure A.3/X.76 – Calling party SPVC information element

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