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SERIES X: DATA NETWORKS AND OPEN SYSTEM
COMMUNICATIONS

Public data networks – Transmission, signalling and
switching

Interworking procedures between networks providing frame relay data transmission services via B-ISDN

ITU-T Recommendation X.78

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ITU-T RECOMMENDATION X.78

INTERWORKING PROCEDURES BETWEEN NETWORKS PROVIDING FRAME RELAY DATA TRANSMISSION SERVICES VIA B-ISDN

Summary

This Recommendation defines the procedures for interworking case of concatenation of networks providing FRDTS via B-ISDN. It includes reference configurations, protocol stacks and detailed signalling procedures. This Recommendation may be used in the case where frame relay links between networks providing FRDTS services are transferred over B-ISDN networks as backbone networks. Interworking scenario used in this Recommendation is Network interworking scenario as specified in Recommendation I.555, and port access method of interworking as specified in the X.300-series Recommendations.

Source

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.

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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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Recommendation X.78

INTERWORKING PROCEDURES BETWEEN NETWORKS PROVIDING FRAME RELAY DATA TRANSMISSION SERVICES VIA B-ISDN

(Geneva, 1999)

1   Scope

This Recommendation defines the procedures for interworking case of concatenation of networks providing FRDTS via B-ISDN. It includes reference configurations, protocol stacks and detailed signalling procedures. Interworking scenario used in this Recommendation is Network interworking scenario as specified in Recommendation I.555, and port access method of interworking as specified in the X.300-series Recommendations.

2   References

The following ITU-T Recommendations and other references 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 and other references 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 and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1]   ITU-T Recommendation E.164 (1997), *The international public telecommunication numbering plan.*

[2]   CCITT Recommendation G.702 (1988), *Digital hierarchy bit rates.*

[3]   ITU-T Recommendation G.804 (1998), *ATM cell mapping into Plesiochronous Digital Hierarchy (PDH).*

[4]   ITU-T Recommendation I.361 (1999), *B-ISDN ATM layer specification.*

[5]   ITU-T Recommendation I.362 (1993 – withdrawn in 1997), *B-ISDN ATM adaptation layer (AAL) functional description.*

[6]   ITU-T Recommendation I.363 (1993), *B-ISDN ATM adaptation layer (AAL) specification.*

[7]   ITU-T Recommendation I.365.1 (1993), *Frame Relaying Service Specific Convergence Sublayer (FR-SSCS).*

[8]   ITU-T Recommendation I.371 (1996), *Traffic control and congestion control in B-ISDN.*

[9]   ITU-T Recommendation I.413 (1993), *B-ISDN user-network interface.*

[10]   ITU-T Recommendation I.430 (1995), *Basic user-network interface – Layer 1 specification.*

[11]   ITU-T Recommendation I.432, *B-ISDN user-network interface – Physical layer specification.*

[12]   ITU-T Recommendation I.555 (1997), *Frame relaying bearer service interworking.*

[13]   ITU-T Recommendation I.610 (1999), *B-ISDN operation and maintenance principles and functions.*

[14]   ITU-T Recommendation Q.2110 (1994), *B-ISDN ATM adaptation layer – Service specific connection oriented protocol (SSCOP).*

[15]   ITU-T Recommendation Q.2130 (1994), *B-ISDN signalling ATM adaptation layer – Service specific coordination function for support of signalling at the user-network interface (SSCF at UNI)*.

[16]   ITU-T Recommendation Q.2931 (1995), *Digital Subscriber Signalling System No. 2 – User-Network Interface (UNI) layer 3 specification for basic call/connection control*.

[17]   ITU-T Recommendation X.76 (1995), *Network-to-network interface between public data networks providing the frame relay data transmission service*.

[18]   ITU-T Recommendation X.76 (1995)/Amendment 1 (1997), *Network-to-network interface between public data networks providing the frame relay data transmission service – Amd. 1: Switched Virtual Circuits*.

3   Terms and Definitions

This Recommendation defines the following term:

3.1   Frame Relay Service Specific Convergence Sublayer: FR SSCS is used at the TE and AU to interworking between AAL and Link Access Procedure for Frame mode bearer service (LAPF) (see Recommendation I.365.1).

4   Abbreviations

This Recommendation uses the following abbreviations:

AAL   ATM Adaptation Layer

ATM   Asynchronous Transfer Mode

AU   Access Unit

B-ISDN   Broadband ISDN

BCOB   Broadband Connection Oriented Bearer class

CPCS   Common Part Convergence Sublayer

FRDTS   Frame Relay Data Transmission Services

FRPDN   Frame Relay Public Data Network

ISDN   Integrated Services Digital Network

PVC   Permanent Virtual Circuit

QoS   Quality of Service

SSCS   Service Specific Convergence Sublayer

STE   Signalling Terminal

SVC   Switched Virtual Circuit

VCI   Virtual Channel Identifier

VPCI   Virtual Path Connection Identifier

5 Conventions

No particular conventions are included.

6 Reference Configurations

There are two cases in terms of the connection establishment method through the B-ISDN network (see Figure 6-1).

– The case where B-ISDN connections are PVC (Permanent virtual channel).

– The case where B-ISDN connections are SVC (Switched virtual channel).

In this configuration, an X.78 signalling terminal (X.78-STE) with X.76 and ATM capabilities is equivalent to a combination consisting of an X.76 signalling terminal (STE) and a ATM-adaptor with ATM capabilities. (For ATM adaptor functionalities, see clause 13.)

Interfaces between X.78-STE/ATM-adaptor and the B-ISDN are UNI of the B-ISDN (see Recommendation I.413). An X.76 data link connection shall be associated with one ATM virtual channel.
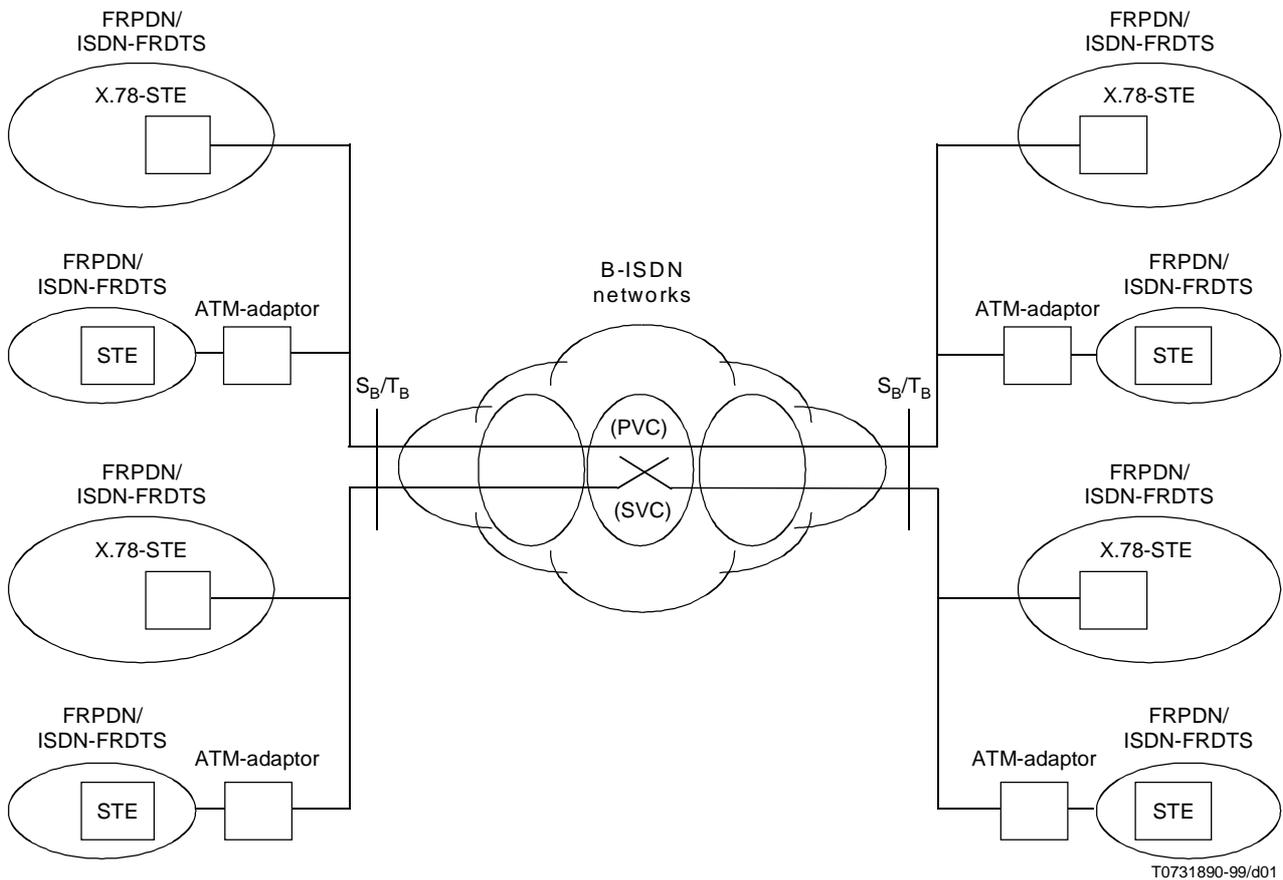
NOTE – SVC case of using ATM-Adaptor is for further study.

Figure 6-1/X.78 – Reference configuration of interworking between networks providing FRDTS via B-ISDNs

6.1 Case where B-ISDN provides PVC

In the case where ATM connection is PVC, the protocol stack is shown in Figure 6-2.

Either ATM-adaptor or X.78-STE should support AAL type 5 Common part function and FR-SSCS to convey X.76 frames.

NOTE – Use of AAL type 1 instead of AAL type 5 should not be precluded.

In the case where AAL type 5 is used, AAL type 5 message mode service will be available. The functionality of FR-SSCS only provides for the mapping of the equivalent primitives of AAL to CPCS and vice versa.

In this case, the ATM connection shall be established by procedures beyond the scope of this Recommendation.
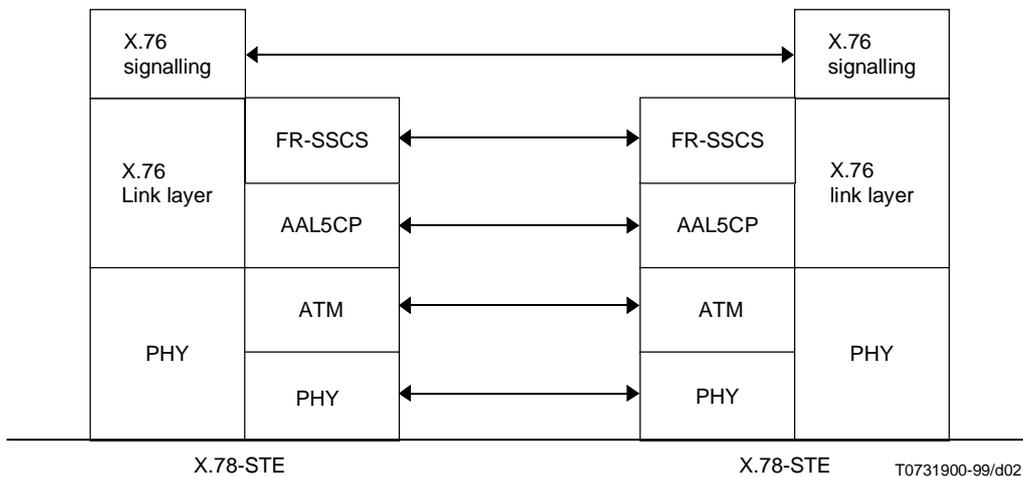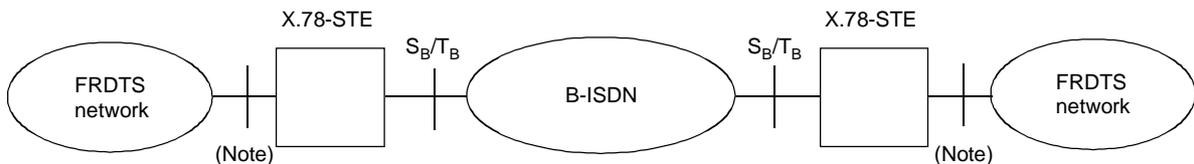
This figure shows the protocol stack where X.76 is used

NOTE – X.76 or some equivalent internal network protocols.

**Figure 6-2/X.78 – Frame relay interworking based on reference configuration
of concatenation of networks providing FRDTS via B-ISDN
where B-ISDN provides PVCs (U-plane)**

6.2 Case where B-ISDN provides SVC

6.2.1 U-plane

See 6.1.

6.2.2 C-plane

C-plane protocol stack is shown in Figure 6-3.

ATM connection shall be established by the procedures specified in clause 12.

NOTE – X.76 or some equivalent internal network protocols.

**Figure 6-3/X.78 – Frame relay interworking based on reference configuration
of concatenation of networks providing FRDTS via B-ISDN
where B-ISDN provides SVCs (U-plane and C-plane)**

7 Service parameters and Service quality

7.1 Peak cell rate

The Peak Cell Rate in the Source Traffic Descriptor specifies an upper bound on the traffic that can be applied on an ATM connection. Enforcement of this bound by the UPC/NPC allows the network operator to allocate sufficient resources to ensure that the performance objectives (e.g. for Cell Loss Ratio) can be achieved. (See 2.4.1/I.371.)

7.2 Service quality

The QoS level for Peak Cell Rate may be delivered within a certain probability.

NOTE – Other parameters are for further study.

8 Addressing and routing aspects

One E.164 number of the B-ISDN is associated with one X.78-STE/X.76-STE + ATM adaptor.

The Q.2931 SETUP message, when used, contains the request for class C bearer service. The SETUP message also contains the B-ISDN address of the X.78-STE/ATM adaptor of the remote FRDTS network.

NOTE – Request of class A bearer service in the SETUP message should not be precluded.

X.76 call request packet contains the address of the destination terminal.

X.78-STE/ATM-adaptor can establish multiple ATM connections to some destinations. X.78-STE/ATM-adaptor using multiple ATM virtual paths and virtual channels.

9 Physical layer

Physical medium characteristics of UNI are defined in Recommendation I.432.

ATM cell mapping into Plesiochronous Digital Hierarchy (PDH) defined in Recommendation G.702 is also possible. See Recommendation G.804.

10 ATM layer

See Recommendation I.361 for ATM layer specification.

11 ATM Adaptation layer

11.1 U-plane

Type 5 of the AAL functions applies (see Recommendations I.362 and I.363). Over the AAL Type 5, FR-SSCS (see Recommendation I.365.1) is used to convey frame relay frames.

11.2 C-plane

Type 5 of the AAL functions applies (see Recommendations I.362 and I.363). Over the AAL Type 5, Service Specific Connection Oriented Protocol (SSCOP specified in Recommendation Q.2110) is used to transfer data link frames which convey Signalling messages (see clause 12). In addition, SSCF-UNI (see Recommendation Q.2130) is used to coordinate between SSCOP and Q.2931 signalling.

12 Signalling procedures

12.1 General

The procedures specified in this Recommendation are based on the port access method of interworking.

An ATM virtual channel connection is established between the X.78-STEs. An ATM SVC is established and released using the procedures specified in this clause. The ATM virtual channel connection may be either a PVC or an SVC. An ATM PVC is established by means which are beyond the scope of this Recommendation.

The physical access connection between an X.78-STE and ATM network must be established by procedures beyond the scope of this Recommendation before the ATM virtual channel connection procedures specified in this Recommendation can be used.

Within the physical access connection, in-channel signalling as specified in Recommendation Q.2931 is used to establish ATM SVCs. In-channel signalling is employed on the virtual channel identified by the Virtual Channel Identifier (VCI) = 5. The ATM Adaptation Layer protocol employed on the VCI = 5 channel is Signalling ATM Adaptation Layer (SAAL) protocol which is specified in Recommendations Q.2100 and Q.2130.

An example message sequences are shown in Annex A.

NOTE 1 – VCI value for Q.2931 point-to-multipoint procedure needs to be added once defined in this Recommendation.

NOTE 2 – No X.76 PVCs are allowed over an ATM SVC.

NOTE 3 – If an ATM PVC is established through the B-ISDN, then X.76 PVCs as well as X.76 virtual calls may be established between the calling X.78-STE and the remote X.78-STE.

12.2   Outgoing X.76 Call

A calling X.78-STE, wishing to set up an X.76 call to a remote X.78-STE, uses an ATM virtual channel connection that is established through the B-ISDN to the X.78-STE. If no ATM virtual channel connection is established through the B-ISDN to the remote X.78-STE, the calling X.78-STE uses the procedures specified in 12.2.1 below before setting up the X.76 call.

12.2.1   Outgoing ATM Switched Virtual Channel Connection Setup

The ATM virtual channel connection is established on a Virtual Channel available for support of user information on the B-ISDN user-network interface as defined in clause 5/Q.2931.

A calling X.78-STE uses the following procedures:

1)   The procedures specified in 5.1.1/Q.2931 for the ATM connection setup. In the SETUP message sent by the calling X.78-STE.

    i)   The Called Party Address information element contains the address of the remote X.78-STE.

        NOTE 1 – The procedures for overlap sending specified in 6.5.2/Q.2931 do not apply.

    ii)   The Broadband Bearer Capability information element shall be encoded as follows:

        –   bearer class set to "BCOB-C";

        –   timing requirements set to "End-to-end timing not required";

        –   susceptibility to clipping set to "not susceptible to clipping";

        –   user plane connection configuration set to "Point-to-Point".

        NOTE 2 – See Recommendation Q.2961.2.

    iii)   The Broadband Low Layer Information element is included to pass compatibility information from the calling X.78-STE to the remote X.78-STE.

        The user information layer 2 protocol (octet 6 of the Broadband Low Layer information element) is encoded as follows:

        –   Recommendation X.76. Single Link Procedure (SLP).

2)   The procedures specified in 5.1.2/Q.2931 for connection identifier (VPCI/VCI) allocation and selection.

3)   The procedures specified in 5.1.3/Q.2931 to request a certain Quality of Service (QoS).

12.2.2   Outgoing X.76 Call Setup and Call Clearing

The X.76 procedures are used on DLCI = 0 link set over the established ATM virtual channel connection.

NOTE – A logical channel number is unique within a VCI.

12.3   Incoming X.76 Call

A called X.78-STE, wished to set up an X.76 call from a remote X.78-STE, uses an ATM virtual channel connection that is established through the B-ISDN from the X.78-STE.

12.3.1   Incoming ATM Switched Virtual Channel Connection Setup

When X.78-STE receives an Q.2931 SETUP message, it checks the following conditions in addition to performing the routing functions:

–   availability of the X.76 logical channel, either two-way or incoming, on which the *incoming call* packet is sent.

NOTE – Some other X.78-STE may perform additional procedures to decide to offer the call or reject the call.

12.3.2   Incoming X.76 Call Setup and Call Clearing

The X.76 procedures specified in Recommendation X.76 apply.

NOTE – A logical channel number is unique within a VCI.

12.4   ATM Switched Virtual Channel Connection Clearing

The X.78-STE follows the procedures specified in 5.4.3/Q.2931 to clear an ATM SVC.

ATM PVC cannot be cleared by the X.78-STE using Q.2931 clearing procedures. It is cleared by procedures (e.g. administrative, management procedures) which are beyond the scope of this Recommendation.

The clear collision procedures specified in 5.4.5/Q.2931 apply.

12.5   Restart Procedures

The Restart procedures specified in 5.5/Q.2931 apply.

If a Q.2931 RESTART message is received by the X.78-STE during the X.76 data transfer phase, the X.76 calls shall be treated as follows:

–   For switched virtual channel connections, an X.76 *DISCONNECT message* shall be sent with cause #38, "network out of order".

–   For any X.76 calls which are established on a permanent virtual channel connection to the X.78-STE, no action shall be taken.

12.6   Handling of Error condition

When an B-ISDN access connection failure occurs, the rules of 5.6/Q.2931 shall apply. In addition, the following rules for determining the appropriate cause to be used shall apply in order of decreasing priority:

1)   If a Q.2931 clearing message is received from the B-ISDN by the X.78-STE to clear an ATM switched virtual channel connection while X.76 calls still exist on the ATM switched virtual channel connection, the X.78-STE clears the corresponding calls in the network providing FRDTS with cause #58, "Bearer capability not presently available".

2)   If a Q.2931 RESTART message is received by the B-ISDN and an ATM switched virtual channel connection is released as a result while X.76 calls still exist on the ATM switched virtual channel connection, the X.78-STE also clears the corresponding X.76 call(s) with cause #58, "Bearer capability not presently available".

3)   If the establishment of an ATM SVC that is triggered by an incoming X.76 call is rejected by the called X.78-STE using Q.2931 messages on the Virtual Channel Identified by VCI = 5, the X.78-STE clears the incoming X.76 virtual call using an appropriate cause from Annex B/X.76. See also Annex B for selection of an appropriate cause.

4)   If a condition exists that prevents a Q.2931 SETUP message that is triggered by an incoming X.76 call from being delivered to the called X.78-STE on the Virtual Channel Identified by VCI = 5, the AU clears the incoming X.76 call in the FRPDN with a cause that is selected appropriate to the condition from Annex B/X.76. See also Annex B for selection of an appropriate cause.

5)   If a Q.2931 SETUP message is sent as a result of an incoming X.76 call on a Virtual Channel Identified by VCI = 5 to the called X.78-STE and no response is received prior to the second expiry of Timer T303, rule #4 above applies.

6) If a Q.2931 SETUP message is sent as a result of an incoming X.76 call on a Virtual Channel Identified by VCI = 5 to the called X.78-STE and a response other than a call rejection is received which results in the clearing of the ATM SVC, the calling X.78-STE clears the incoming X.76 call using an appropriate cause from Annex B/X.76 relative to the cause sent in the clearing message.

13   ATM-adaptor functionalities

13.1   General

ATM adaptor functions are needed to use the existing X.76-STE at the S_B/T_B reference point (see Figure 13-1). In this case, the ATM connection shall be PVC.

The main functionalities which are provided by the ATM adaptor are the following:

–   Mapping of signalling information and procedures between the X.76 interface and the S_B/T_B reference point.

–   Synchronization.

–   Maintenance.

NOTE 1 – An adaptor function supports only one X.76-STE at the X.76 interface.

NOTE 2 – The functions of X.78 is equivalent to a combination consisting of an X.76-STE and ATM-Adaptor.

Figure 13-1/X.78 – The reference configuration of ATM-Adaptor

In the following, these main functionalities are described. The procedures at the S/T reference point are described in clause 12.
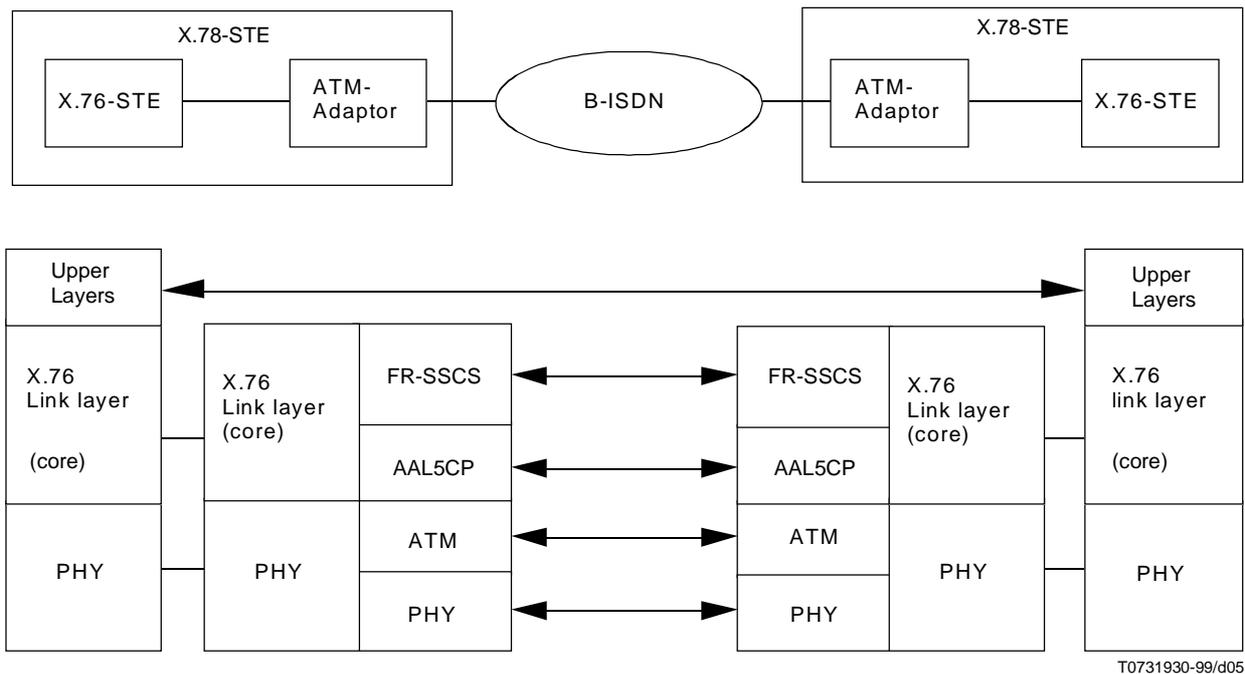
The protocol stack is shown in Figure 13-2.

Figure 13-2/X.78 – Frame relay interworking using ATM-Adaptor

13.2   Physical interface

The physical interfaces at the X.76 interface are those defined in Recommendation X.76.

13.3   Mapping of signalling information and procedures between the X.76 interface and the S_B/T_B reference point

13.3.1   Handling of X.76 frames

The rate adaption is inherent in segmentation of X.76 frames and cell based ATM transfer on the S_B/T_B reference point. In particular, the contiguous flag transmission perceived at the X.76 interface shall not be repeated at the S_B/T_B reference point.

13.3.2   Signalling

The ATM connection between the ATM-Adaptor and the remote X.78-STE/ATM-Adaptor is always available. No ATM-Adaptor functionalities is required to initiate the establishment of the ATM connection. ATM connection establishment method is beyond the scope of this Recommendation.

X.76 procedures are performed between X.76-STEs using the ATM connection via the AAL and SSCF functions defined in 11.1.

13.4   Synchronization

Synchronization between the ATM-Adaptor and the remote X.78-STE/ATM-Adaptor is provided by the cell synchronization mechanism specified in Recommendation I.361.

13.5   Maintenance

The functionalities specified in Recommendation I.610 apply.

Annex A

X.78 example message flow diagrams

A.1   X.78 call setup message flow sequences

Figures A.1 through A.4 present the complete sequences associated with setting up a call across two X.78-STEs. Figures A.1 through A.3 present the individual stages or levels for setting up the call:

- To set up a call across two X.78-STEs, first see Figure A.1. Figure A.1 presents the Q.2931 procedures for setting up the ATM channel. When the ATM channel is set up, see Figure A.2.

- Figure A.2 presents the procedures for setting up the X.76 data link between the X.78-STEs. When the X.76 data link is already set up, see Figure A.3.

- Figure A.3 presents the procedures for passing the X.76 (or equivalent) Setup across the two X.78-STEs and establishing the call.

Figure A.4 presents the combining of these three figures (A.1 through A.3) into a complete sequence for setting up a call across two X.78-STEs.
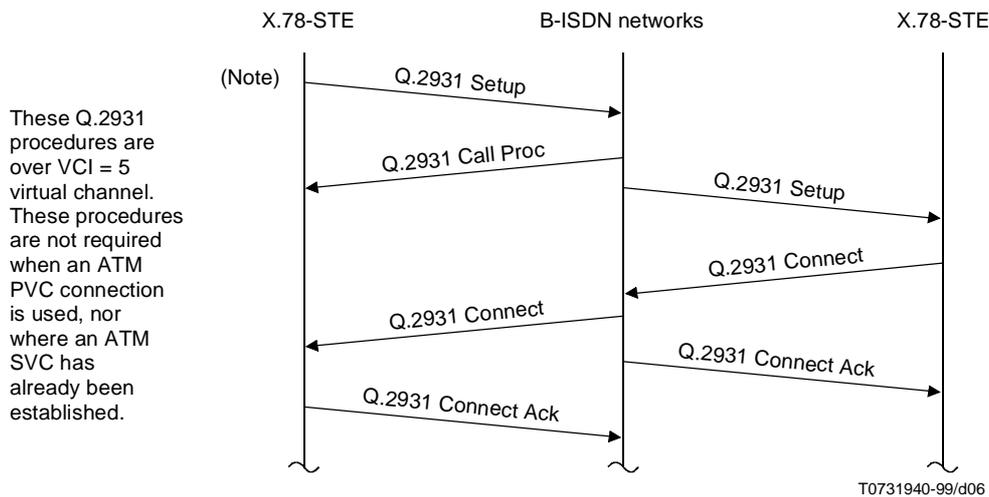
These Q.2931 procedures are over VCI = 5 virtual channel. These procedures are not required when an ATM PVC connection is used, nor where an ATM SVC has already been established.

T0731940-99/d06

NOTE – The specific event that triggers or starts this X.78 defined sequence is network implementation dependent. Some networks may establish the SVC independent of any other service request; other networks may wait to establish the SVC upon the presentation of an X.76 (or equivalent) Setup to the first STE. As such, for purposes of this diagram – and all others within this annex – the actual trigger event is not specified.

Figure A.1/X.78

The procedures are used to establish an X.76 data link between two X.78-STEs over an established ATM connection. These are not required to be used once the X.76 data link has been established.

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Figure A.2/X.78

X.78-STE   B-ISDN networks   X.78-STE
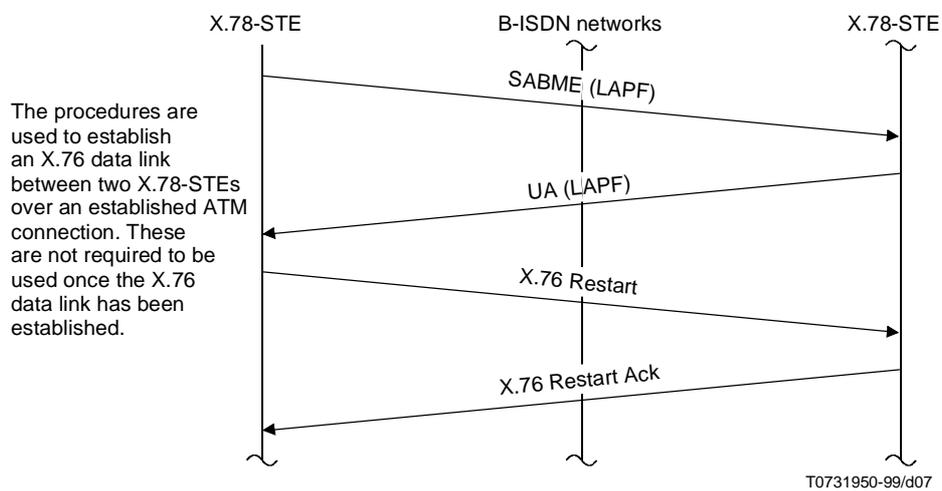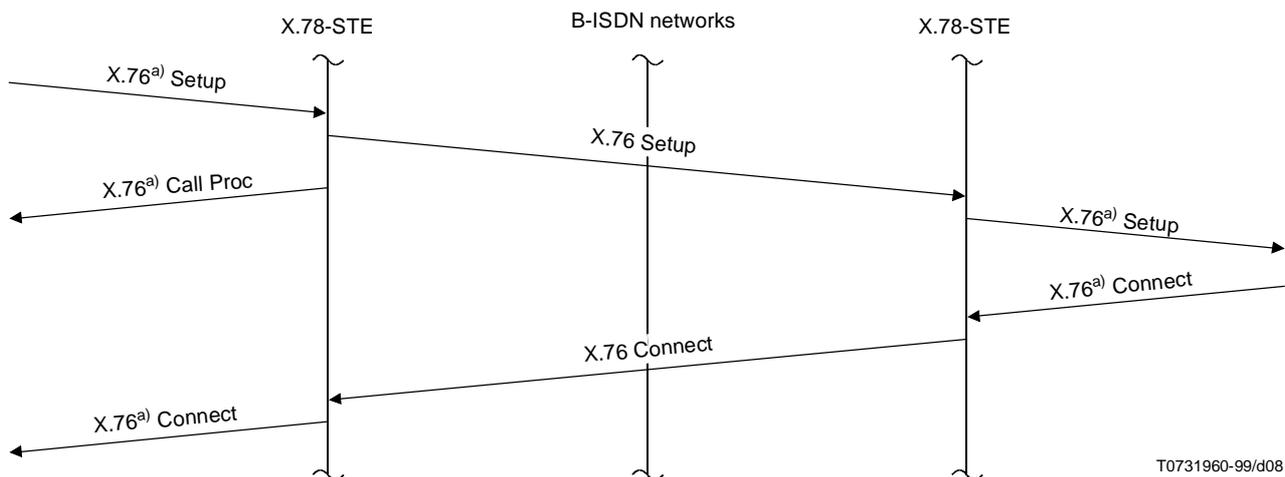
a) X.76 or some equivalent internal network protocol.

Figure A.3/X.78

A.2   X.78 call releasing message flow sequences

Figures A.5 through A.8 present the complete sequences associated with releasing a call across two X.78-STEs. Figures A.5 through A.7 present the individual stages or levels for clearing the call:

• To release a call all across two X.78-STEs, first see Figure A.5. Figure A.5 presents the procedures for passing the X.76 (or equivalent) Setup across the two X.78-STEs and releasing the X.76 call. When the X.76 call is released, see Figure A.6.

• Figure A.6 presents the procedures for releasing the X.76 data link between the X.78-STEs. Note that some networks may select to maintain the X.76 data link layer for further use. When the X.76 data link is released, see Figure A.7.

• Figure A.7 presents the Q.2931 procedures for releasing the ATM channel. Note that some networks may select to maintain the ATM channel for further use.

Figure A.8 presents the combining of these three figures (A.5 through A.7) into a complete sequence for releasing a call across two X.78-STEs.

A.3   X.78 restart message flow sequences

Figures A.9 and A.10 present the sequences associated with restarting the interface across two X.78-STEs. Figure A.9 (along with Figures A.6 and A.7) present the individual stages or levels for restarting the interface:

• To restart the interface across two X.78-STEs, first see Figure A.9. Figure A.9 presents the procedures for passing an X.76 Restart between the two X.78-STEs. When the restart is confirmed, see Figure A.6.

• Figure A.6 presents the procedures for releasing the X.76 data link between the X.78-STEs. Note that some networks may select to maintain the X.76 data link layer for further use. When the X.76 data link is released, see Figure A.7.

• Figure A.7 presents the Q.2931 procedures for releasing the ATM channel. Note that some networks may select to maintain the ATM channel for further use.
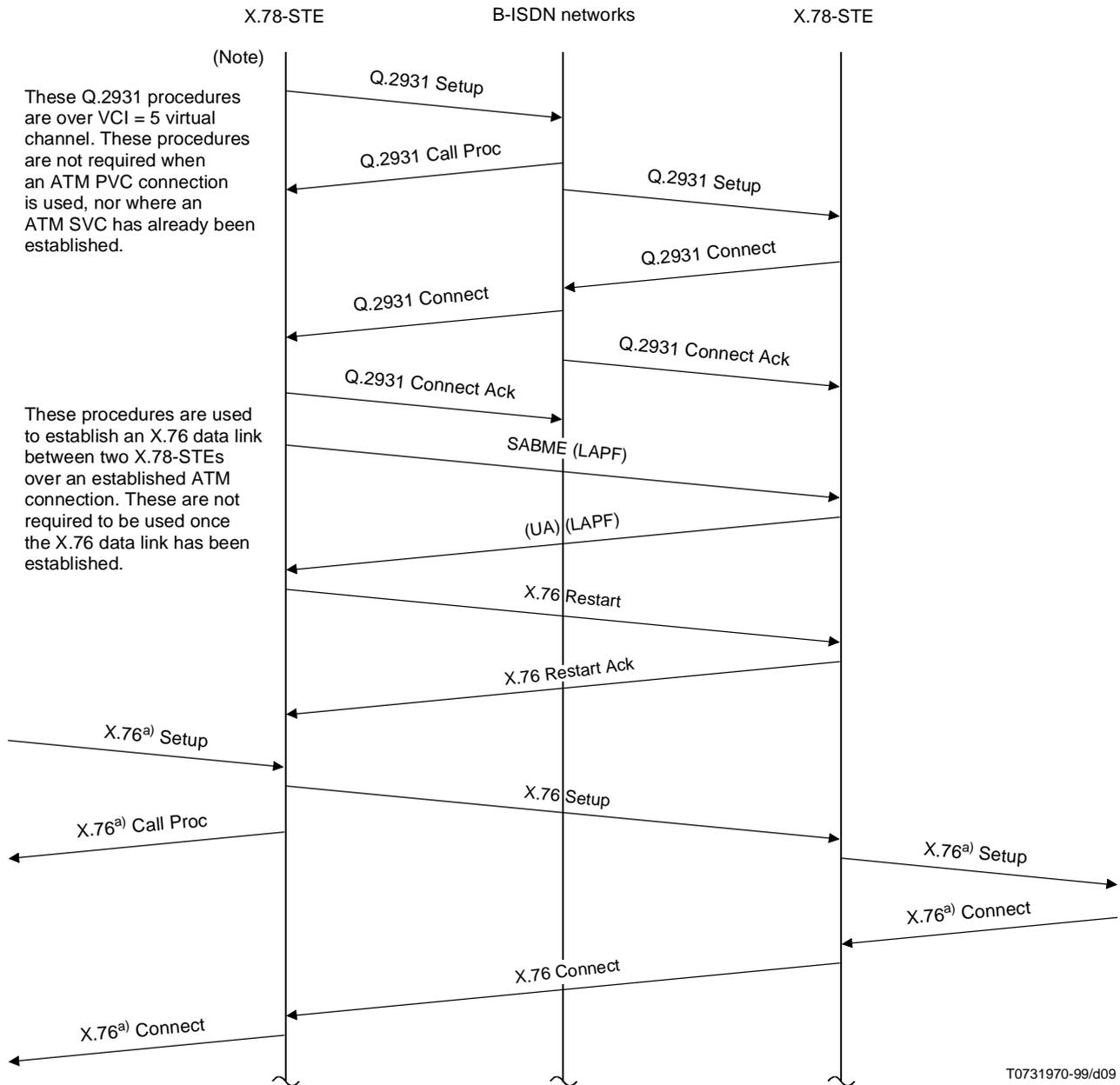
Figure A.10 presents the combining of these three figures (A.9, A.6 and A.7) into a complete sequence for restarting the interface across two X.78-STEs.

a) X.76 or some equivalent internal network protocol.

NOTE – The specific event that triggers or starts this X.78 defined sequence is network implementation dependent. Some networks may establish the SVC independent of any other service request; other networks may wait to establish the SVC upon the presentation of an X.76 (or any equivalent) Setup to the first STE. As such, for purposes of this diagram – and all others within this annex – the actual trigger event is not specified.

Figure A.4/X.78

X.78-STE   B-ISDN networks   X.78-STE

X.76 Release

X.76 Release Complete

T0731980-99/d10

Figure A.5/X.78

X.78-STE   B-ISDN networks   X.78-STE

These procedures are optional. Some networks may keep the link in information transfer state.

DISC (LAPF)

UA (LAPF)

T0731990-99/d11

Figure A.6/X.78

X.78-STE   B-ISDN networks   X.78-STE

These procedures do not apply when an ATM PVC is used. When an ATM SVC is used, these Q.2931 procedures are over VCI = 5 virtual channel. However, some networks that provide ATM SVC may choose to keep the SVC established.

Q.2931 Release

Q.2931 Release

Q.2931 Release Complete

Q.2931 Release Complete

T0732000-99/d12

Figure A.7/X.78

These procedures are optional. Some networks may keep the link in information transfer state.

a)

These procedures do not apply when an ATM PVC is used. When an ATM SVC is used, these Q.2931 procedures are over VCI = 5 virtual channel. However, some networks that provide ATM SVC may choose to keep the SVC established.

X.78-STE   B-ISDN networks   X.78-STE

X.76 Release

X.76 Release Complete

DISC (LAPF)

UA (LAPF))

Q.2931 Release

Q.2931 Release

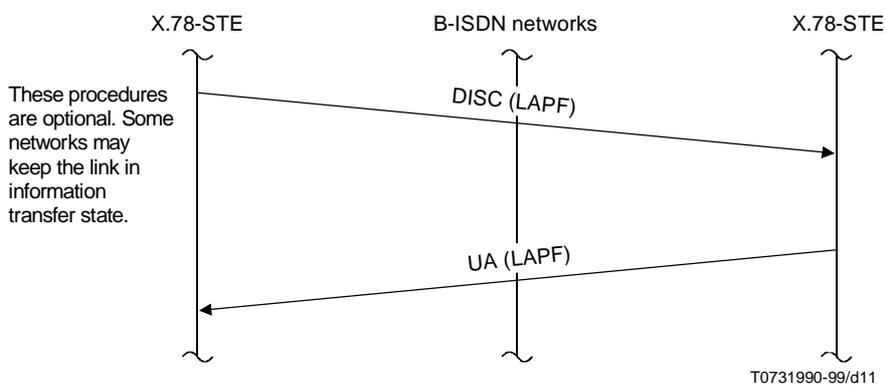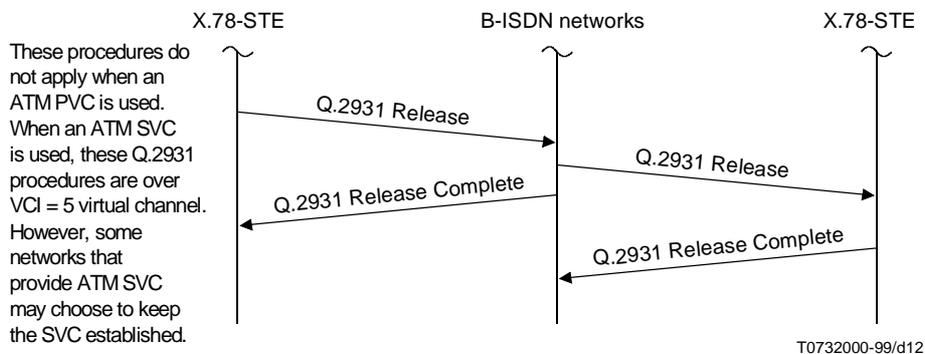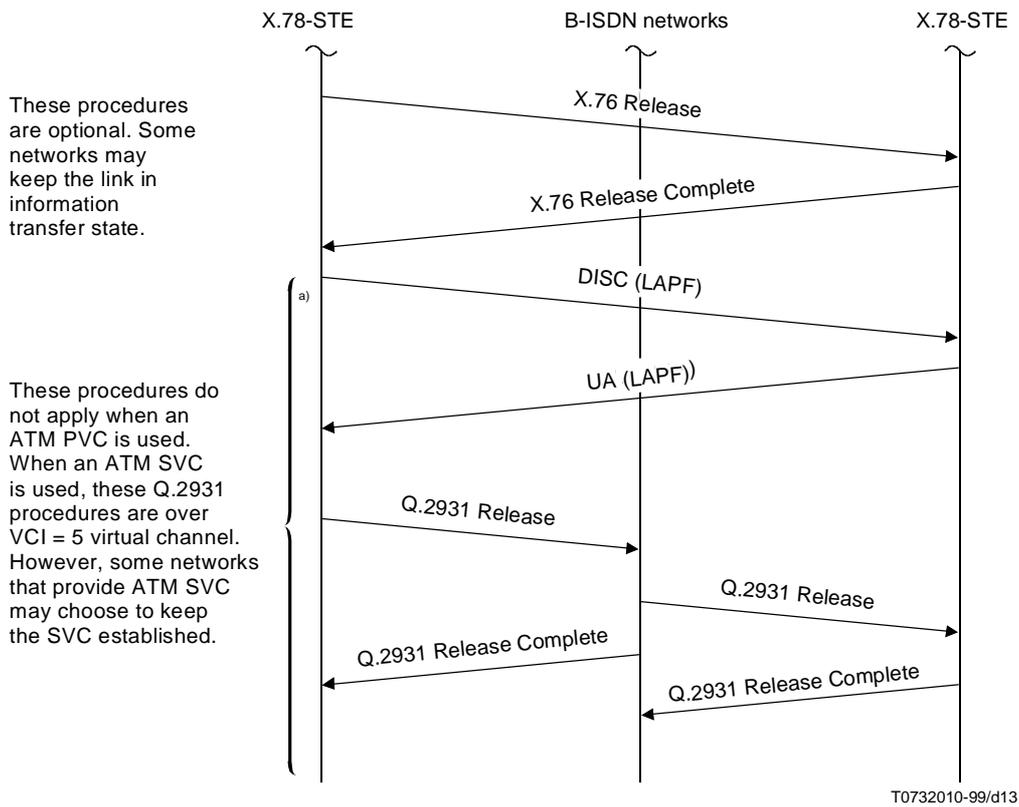Q.2931 Release Complete

Q.2931 Release Complete

T0732010-99/d13

a) This sequence is optional. This is the case when the last X.76 data link has been released.

Figure A.8/X.78

X.78-STE   B-ISDN networks   X.78-STE

X.76 Restart

X.76 Restart Ack

T0732020-99/d14

Figure A.9/X.78

These procedures are optional. Some networks may keep the link in information transfer state.

These procedures do not apply when an ATM PVC is used. When an ATM SVC is used, these Q.2931 procedures are over VCI = 5 virtual channel. However, some networks that provide ATM SVC may choose to keep the SVC established.

X.78-STE

B-ISDN networks

X.78-STE

X.76 Restart

X.76 Restart Ack

DISC (LAPF)

UA (LAPF)

Q.2931 Release

Q.2931 Release

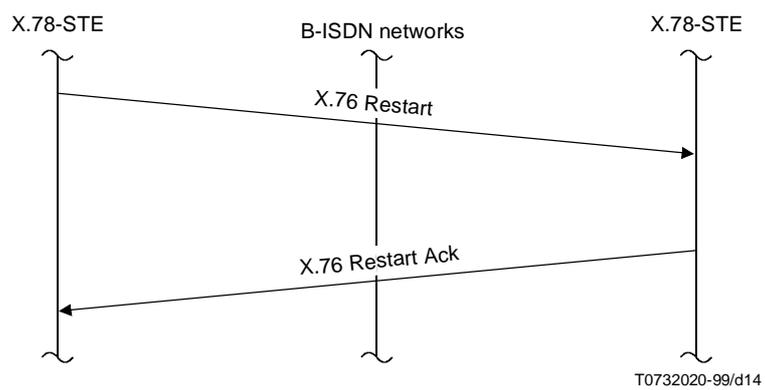Q.2931 Release Complete

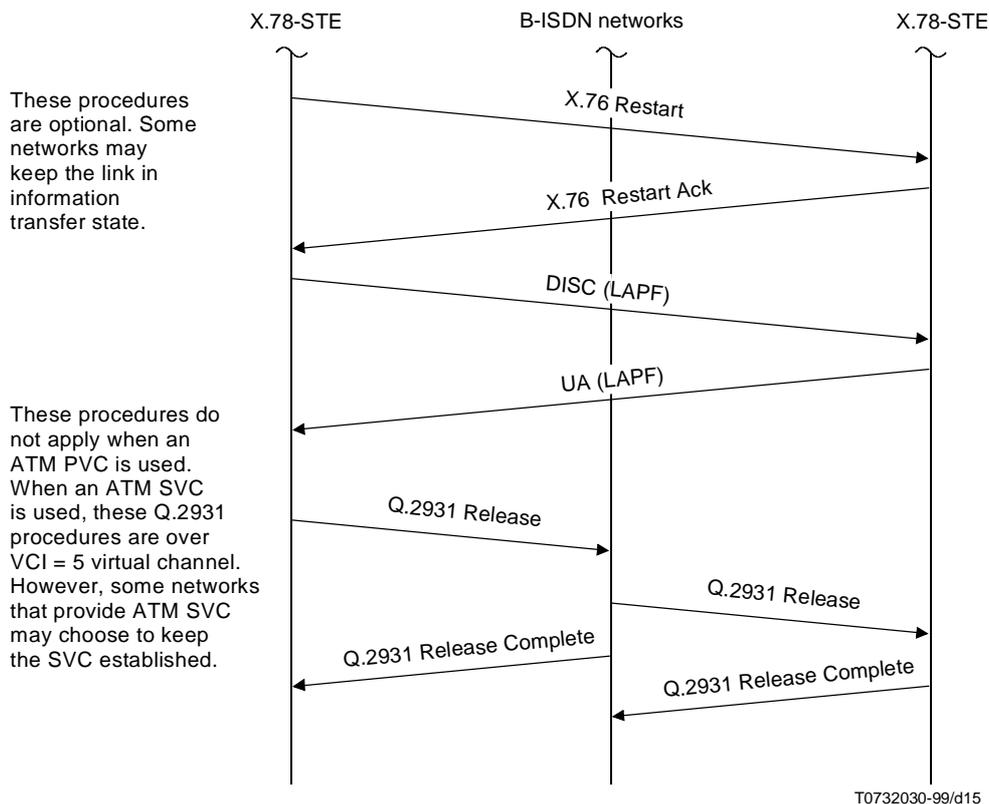Q.2931 Release Complete

T0732030-99/d15

Figure A.10/X.78

Annex B

The mapping of Q.2931 Cause information element identifier field to X.76 cause

The cause values are defined in Recommendation Q.850. They are applicable to different protocols and services. Most of the cause values of Recommendation Q.2931 are also used in Recommendation X.78 but some of the cause values of Recommendation Q.2931 are not relevant to X.76. Table B.1 shows the mapping of Q.2931 causes which are not relevant to X.76 causes.

Table B.1/X.78 – Mapping of Q.2931 cause fields to X.76 cause field

Item	Q.2931 cause	Code	Q.2931 Diagnostic	X.76 Cause	Code	X.76 Diagnostic
1	User alerting, no answer	19	(None)	No user responding	18	(None)
2	Number changed	22	New destination address	Unassigned number	1	Condition
3	Resource unavailable, unspecified	47	(None)	Facility rejected	29	Facility identification
4	Requested VPCI/VCI not available	35	(None)	Facility rejected	29	Facility identification
5	VPCI/VCI assignment failure	36	(None)	Facility rejected	29	Facility identification
6	No VPCI/VCI available	45	(None)	Facility rejected	29	Facility identification
7	User cell rate not available	37	Identified subfield identifier	Facility rejected	29	Facility identification
8	Unsupported combination of traffic parameters	73	(None)	Facility rejected	29	Facility identification
9	AAL parameters cannot be supported	93	(None)	Facility rejected	29	Facility identification

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