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Contents

Foreword

This Technical Committee Reference Technical Report (TCR-TR) was produced by the etwork Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI). It was given the classification of TCR-TR by the 17th TC Chairmen Co-ordination (TCC) meeting and approval by the 20th Technical Assembly (TA).

A TCR-TR is a deliverable for use inside ETSI which records output results of ETSI Technical Committee (TC) or Sub-Technical Committee (STC) studies which are not appropriate for European Telecommunication Standard (ETS), Interim European Telecommunication Standard (I-ETS) or ETSI Technical Report (ETR) status. They can be used for guidelines, status reports, co-ordination documents, etc. They are to be used to manage studies inside ETSI and shall be mandatorily applied amongst the concerned TCs. They shall also be utilised by the TC with overall responsibility for a study area for co-ordination documents (e.g. models, reference diagrams, principles, structures of standards, framework and guideline documents) which constitute the agreed basis for several, if not all, TCs and STCs to pursue detailed standards.

Executive summary

This TCR-TR has been developed by ETSI STC NA2 at a request from ETSI Strategic Review Committee (SRC) to identify the required standards for provisioning of the frame relay service in Europe.

The structure of the TCR-TR is as follows:

- it presents first a configuration in which the required frame relay standards can be placed;

- priorities are given to all kinds of items related to frame relay services. The required standards shall cover the items of priority;

- finally, subjects are listed for which standards are required. For each subject it is indicated:

  - which ETSI STC is responsible;

  - which starting material (e.g. CCITT recommendations) should be used;

  - what is its priority. This priority is deduced from the priorities given to the items as mentioned earlier.

The priorities given in this TCR-TR take into account the market demands for frame relay services, as expected for the forthcoming years, the current status of frame relay services in various standards setting organisations, today's state of the art of frame relay technology and the efforts required to implement frame relay services in Europe.

The ETSI STCs identified as responsible for a particular standard are requested to start the work which should lead to either the adoption of existing material as a standard or the development of a new standard.

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1   Scope

In Strategic Review Committee (SRC) Recommendation C.2.2./1 "Network Standards for Frame Relay Service", ETSI SRC [9] recommends that NA should conduct urgently a study item to determine what further network standards are required or have to be adopted in order to enable the introduction of an European frame relay service. These results should be made available in the time that the work may be included in the 92/93 ETSI Work Programme. Any missing standards should be produced with minimum delay.

In view of this SRC Recommendation which was passed on to ETSI STC NA2 WP JAG, this TCR-TR shall identify the required standards for provisioning of the frame relay service in Europe. In order to achieve this in the given time frame, priorities will be assigned for the development of features and standards.

In principle, there is not just one frame relay service but rather various variants, provided by various networks, e.g. Integrated Services Digital Network (ISDN), Public Data Network (PDN), Broadband Integrated Services Digital Network (B-ISDN), etc. It is, however, the point of view of this TCR-TR that these variants should be highly similar such that they can use an (almost) identical set of standards, with minor items of difference. Therefore, it does make sense to refer to the frame relay service when in reality this means a family of similar services. The scope of this TCR-TR includes the frame relay service in all kinds of public networks, as well as interworking with all kinds of private networks.

2   References

For the purposes of this TCR-TR, the following references apply:

[1]   CCITT Recommendation I.233.1: "Frame mode bearer services ISDN frame relaying bearer service".

[2]   ITU-T Recommendation Q.72.2: "Stage 2 description for packet mode and frame mode services Section 2: Frame mode".

[3]   CCITT Recommendation Q.922: "ISDN data link layer specification for frame mode bearer services".

[4]   ITU-T Recommendation Q.933: "Layer 3 signalling specification for frame mode bearer service".

[5]   CCITT Recommendation I.370: "Congestion management for the ISDN frame relaying bearer service".

[6]   ITU-T Recommendation I.372:   "Frame   relaying   bearer   service network-to-network interface requirements".

[7]   ITU-T Recommendation I.555: "Frame mode bearer services interworking".

[8]   ETS 300 099: "Integrated Services Digital Network (ISDN); Specification of the Packet Handler access point Interface (PMI)".

[9]   TA 14(92)29: "SRC Report on Public Networks".

[10]   ETS 300 007: "Integrated Services Digital Network (ISDN); Support of packet-mode terminal equipment by an ISDN".

[11]   CCITT Recommendation G.703:   "Physical/electrical   characteristics   of hierarchical digital interfaces".

[12]   ITU-T Recommendation I.431: "Primary rate user-network interface - Layer 1 specification".

[13]   ITU-T Recommendation X.3x: "FMBS/FRDTS - X25/X31 interworking".

[14]   ITU-T Recommendation X.25: "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet-mode and connected to public data networks by dedicated circuit".

[15]   CCITT Recommendation X.75: "Packet-switched signalling system between public networks providing data transmission services".

3   Definitions

The definitions presented here are only for the purpose of this TCR-TR. More precise definitions should be formulated in the standards.

access network: The part of the ISDN giving access to a RFH or a NIFH, consisting of the CRF-S, CRF-F and all intermediate CRFs (if any).

Connection Related Function at Frame handler side (CRF-F): The CRF to which the RFH or the NIFH is connected.

> NOTE 1:   This definition is similar to that of the CRF-P in ETS 300 099 [8].

Connection Related Function at Subscriber side (CRF-S): The Connection Related Function (CRF) to which the subscriber is connected.

> NOTE 2:   This definition is identical to that of the CRF-S in ETS 300 099 [8].

Frame Concentrator (FC): An adjunct to the frame handler functionality, located in the CRF-S, required to (de)concentrate frame relay traffic from/to the NIFH, according to the FHI standard.

> NOTE 3:   The FC is the frame mode equivalent of the frame handler for packet mode.

Frame Handler (FH): The set of all network functions required to handle autonomously U- and C-plane for the ISDN frame relay bearer service.

> NOTE 4:   The frame handler in this context is different from the frame handler in the context of ETS 300 099 [8].

Frame Handler Interface (FHI): The interface between the CRF-F and the NIFH.

> NOTE 5:   The FHI is the frame mode equivalent of the PHI for packet mode.

Integrated Frame Handler (IFH): A type of frame handler which is assumed to be local with respect to the subscriber and which is integrated in the CRF-S. The assumption of local location is reflected in the signalling procedure (case B signalling mode).

long duration connection: A circuit switched connection which can be established in order to convey multiple overlapping frame mode calls. In principle, the connection is retained for an unlimited period of time, unless faults occur which cause its forced release (and later re-establishment). The establishment and release of a long duration connection are independent of frame mode calls. Such a connection lasts longer than the last frame mode call.

Non-Integrated Frame Handler (NIFH): A type of frame handler which is assumed to be local with respect to the subscriber but which is not integrated in the CRF-S. The remote location of the frame handler is invisible to the subscriber and is rather a network configuration decision. The NIFH may reside in another network.

> NOTE 6:   The NIFH is the frame mode equivalent of the packet handler for packet mode, accessed through the PHI (refer to ETS 300 099 [8]).

Remote Frame Handler (RFH): A type of frame handler which is assumed to be remote with respect to the subscriber. The remote location of the frame handler is well known to the subscriber and the signalling procedures are adapted to this situation (case A signalling mode). The RFH may reside in another network.

NOTE 7: The RFH is not quite the frame mode equivalent of the access unit for packet mode: the access unit belongs logically to the Packet Switched Public Data Network (PSPDN) and provides the PSPDN service, whereas the remote frame handler belongs logically to the ISDN and provides the ISDN frame relay bearer service.

Remote Frame Handler Interface (RFHI): The interface between the CRF-F and the RFH.

4 Symbols and abbreviations

For the purposes of this TCR-TR, the following symbols and abbreviations apply:

B-ISDN	Broadband Integrated Services Digital Network
CRF	Connection Related Function
CRF-F	Connection Related Function at Frame handler side
CRF-S	Connection Related Function at Subscriber side
CS	Circuit Switching
DN	dedicated Data Network
DSS1	Digital Subscriber Signalling System No. 1
FC	Frame Concentrator
FH	Frame Handler
FHI	Frame Handler Interface
FRBS	Frame Relay Bearer Service
FRDTS	Frame Relay Data Transmission Service
IFH	Integrated Frame Handler
ISDN	Integrated Services Digital Network
IWF	Interworking Function
MAN	Metropolitan Area Network
NIFH	Non-Integrated Frame Handler
NNI	Network-to-Network Interface
OAM	Operation And Maintenance
PDN	Public Data Network
PSPDN	Packet Switched Public Data Network
PVC	Permanent Virtual Circuit (CCITT Recommendation I.233.1 [1]) or Permanent Virtual Connection (ITU-T Recommendation Q.933 [4])
QOS	Quality Of Service
RFH	Remote Frame Handler
RFHI	Remote Frame Handler Interface
SDTS	Switched Data Transmission Service
SS7	Signalling System No.7
SVC	Switched Virtual Circuit (CCITT Recommendation I.233.1 [1]) or Switched Virtual Connection (ITU-T Recommendation Q.933 [4])
UNI	User-to-Network Interface

5 Configurations for frame relay services

This clause deals with various network configurations for the provisioning of frame relay services. The only goal is to help understanding of the priority items and standards formulated in clauses 6 and 7.

5.1 Overall configuration

The configuration for frame relay services includes private and public ISDNs, PDNs and B-ISDNs. The interfaces with B-ISDN requires further study and input from NA5. More detailed configurations for ISDN frame relay bearer services, PDN frame relay services and B-ISDN frame relay bearer services are elaborated below.
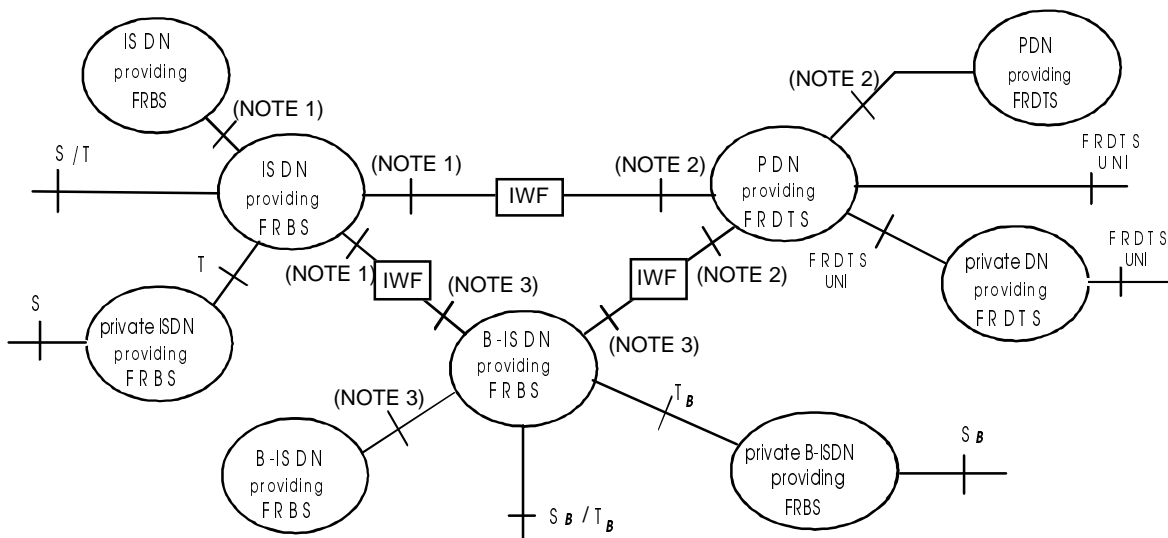
NOTE 1:   This interface is a Network-to-Network Interface (NNI) between two ISDNs providing Frame Relay Bearer Service (FRBS) or between an ISDN providing FRBS and an Interworking Function (IWF). This interface will be based on ITU-T Recommendation I.372 [6].

NOTE 2:   This interface is a NNI between two PDNs providing Frame Relay Data Transmission Service (FRDTS) or between a PDN providing FRDTS and an IWF. This interface may be based on ITU-T Recommendation I.372 [6].

NOTE 3:   This interface is a NNI between two B-ISDNs providing FRBS or between a B-ISDN providing FRBS and an IWF.

Figure 1: Frame relay overall configuration

The configuration in figure 1 does not show all possibilities. Private networks may for instance interwork with various public networks, e.g. a private ISDN providing FRBS may interwork with a PDN and/or with a public B-ISDN providing FRBS. In addition to the shown cases, feeder networks could exist between the User-to-Network Interfaces (UNIs) and the networks providing frame relay services. Two networks providing frame relay services could also be interconnected by transit networks, not using any frame relay functionality. These cases, however, do not require any specific frame relay related standards and, therefore, are not mentioned further in the main text. Annex B addresses the topic of feeder networks and transit networks in more detail.

Interworking between the various frame relay services offered by different networks is included in this configuration. In this case IWFs as shown in figure 1 are needed. Other interworking aspects (e.g. with frame switching services, or with packet mode bearer services) are not included.

5.2   Configurations for ISDN frame relay bearer services

5.2.1   General

Configurations for ISDN frame relay bearer services are based on ITU-T Recommendations Q.933 [4] and Q.72.2 [2] which define case A and case B signalling procedures to be used in combination with local and remote locations of frame handling functions. This results in three configurations, which are elaborated below.

The configurations do not show network internal interfaces (e.g. between frame handlers) as these are not subject to ETSI standardization.

5.2.2   Case A services provided by a remote frame handler

Signalling procedures for case A are used for B-channel and multiple rate channel associated frame relay connections, provided by a RFH. The RFH belongs logically to the ISDN but may reside in another network (ITU-T Recommendation Q.933 [4], figure 2-1).

> NOTE 1:   The signalling procedures employed in case A, as defined in ITU-T Recommendation Q.933 [4] for frame mode bearer services, differ from the case A signalling mode, as defined in ETS 300 007 [10] for packet switched services: packet switched case A gives access to PSPDN services; frame mode case A is used to access an ISDN FH.

> NOTE 2:   The signalling procedures employed in case A would also apply for accessing, through the ISDN, frame relay services of another network (e.g. FRDTS of a PDN) but this would then rather belong to the configuration of that other network.

Functional split

The ISDN access network has no FRBS capabilities: only Circuit Switching (CS) functions and related signalling capabilities are required. All typical frame handling functions and related signalling capabilities are located in the RFH.

Standards

The RFHI is trivial and needs little standardization. It could be based on, e.g. digital trunk interface (CCITT Recommendation G.703 [11] with circuit mode Signalling System No.7 (SS7) signalling) or ISDN primary rate interface (ITU-T Recommendation I.431 [12] with circuit mode Digital Subscriber Signalling System No. 1 (DSS1) signalling).

S/T | CRF-S | CRF-F | RFHI **CRF providing a** | I.372 (note 2)
RFH function
(note 1)

CS   CS   RFH

B-channel

Multirate-channel
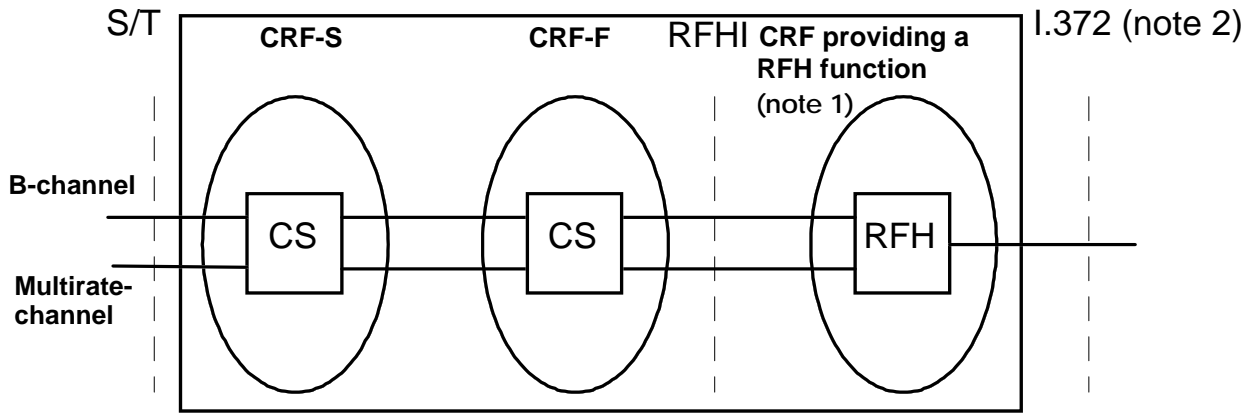
ISDN providing case A FRBS

NOTE 1: The RFH belongs logically to the ISDN but may reside in another network.

NOTE 2: If both sides reside in the same network, a network internal protocol may be used instead.

Figure 2: Configuration for case A

5.2.3 Case B services provided by the integrated FH

Signalling procedures employed for case B are used for frame relay connections provided by a FH integrated in the local exchange (IFH). This IFH belongs logically to and resides physically in the CRF-S (ITU-T Recommendation Q.933 [4], figure 2-2).

As compared to case A, case B signalling procedures offer some additional functions:

a) D-channel frame relay bearer services;

b) integrated Operation And Maintenance (OAM);

c) integrated supplementary services (Switched Virtual Circuit (SVC) only);

d) channel negotiation for frame relay connections (SVC only).

Functional split

All frame handling functions and related signalling capabilities are located in the CRF-S.

Standards

None specially related to this configuration.

S/T   **CRF-S**   I.372 (NOTE)

D-channel

B-channel

Multirate-
channel

IFH

ISDN providing case B FRBS locally
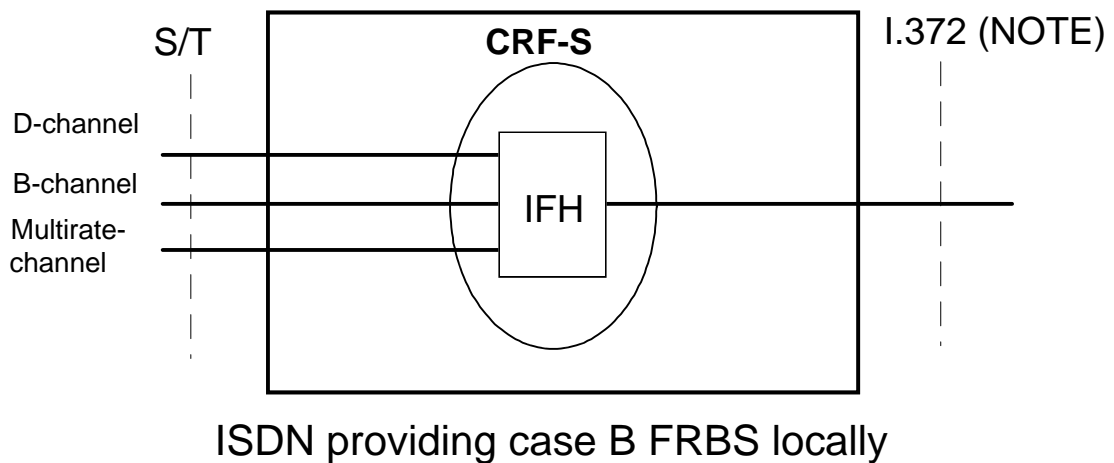
NOTE: If both sides reside in the same network, a network internal protocol may be used instead.

Figure 3: Configuration for case B with IFH

5.2.4 Case B services provided by the non-integrated FH

Signalling procedures for case B are used for frame relay connections, provided by a FH not integrated in the local exchange (NIFH). This NIFH belongs logically to the CRF-S but may reside physically in another network (ITU-T Recommendation Q.933 [4], figure 2-2, note 2).

Functional split

The functions needed in the ISDN access network are:

- CS functions for B-channels and multiple rate channels;

- FC functions for D-channel frame mode connections;

- circuit mode and frame mode signalling capabilities.

More complete frame handling functions and related signalling capabilities are located in the NIFH.

Standards

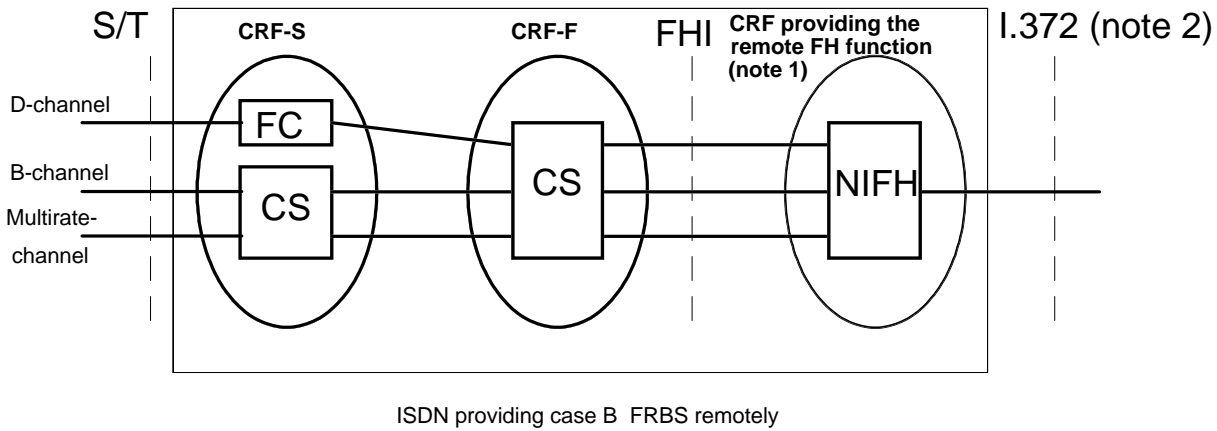The FHI is, in general, complex and needs standardization. It could be based on, e.g. a digital trunk interface (CCITT Recommendation G.703 [11]) or ISDN primary rate interface (ITU-T Recommendation I.431 [12]).

ISDN providing case B FRBS remotely

NOTE 1:   The RFH belongs logically to the ISDN but may reside in another network.

NOTE 2:   If both sides reside in the same network, a network internal protocol may be used instead.

Figure 4: Configuration for case B with NIFH

5.3   Configuration for FRDTS

FRDTS is a frame relay service provided by the PDN. PDNs may be based on various technologies and be implemented in new dedicated (to frame relay) networks or in existing networks (such as PSPDNs, Metropolitan Area Networks (MANs)). In spite of this variety, they all provide one and the same service: FRDTS.

NOTE 1:   Annex A shows one possible implementation of FRDTS in a PSPDN.

NOTE 2:   Interworking between FRDTS and other services which may be offered by the PDN (e.g. with Switched Data Transmission Service (SDTS) of a PSPDN) are not part of the configuration.

PDN providing FRDTS
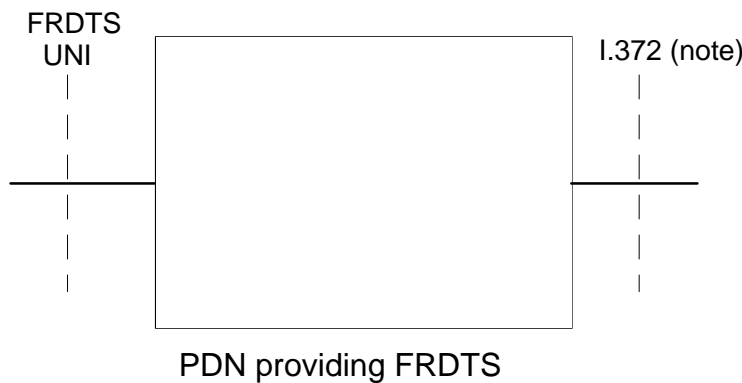
NOTE: This interface is under study in ITU-T SG 13, SG 11 and SG 7. Implementation agreements related to this interface exist in frame relay forum.

Figure 5: Configuration for FRDTS

For the FRDTS provided by the PDN, there is no need for a more detailed configuration in order to identify the required standards.

5.4 Configurations for FRBSs offered by B-ISDN

5.4.1 FRBS provided by frame relay service function inside B-ISDN

In this case the frame relay service function is provided within the B-ISDN. The Frame Relay Service Function (FRSF) handles frame relay protocols and routes data according to routeing information provided during frame relay connection establishment.

S_B/T_B NNI

ATM switching capabilities

P

FRSF

B-ISDN providing B-ISDN FRBS
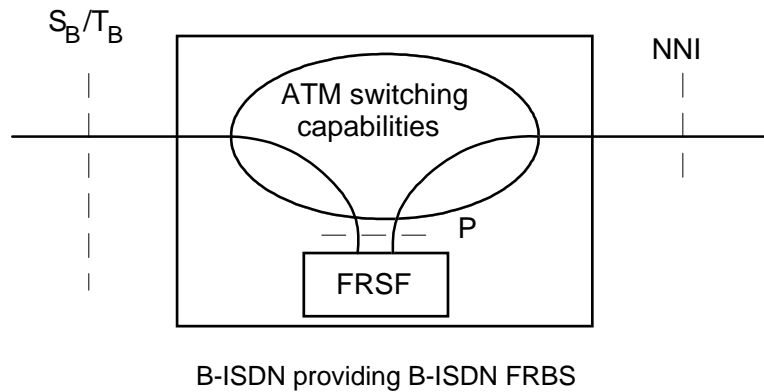
Figure 6: Configuration for B-ISDN FRBS provided by FRSF inside B-ISDN

5.4.2 FRBS provided by frame relay service function outside B-ISDN

In this case A transparent connection of the ATM layer, either permanent, reserved or on demand, is used between B-ISDN interfaces (at reference points S_B/T_B or M). Frame relay protocols operating on and above the adaptation layer are transparent to the B-ISDN. The frame relay service and adaptation layer functions are implemented outside the B-ISDN.

S_B/T_B NNI

ATM switching capabilities

M

FRSF   B-ISDN providing access to FRSF
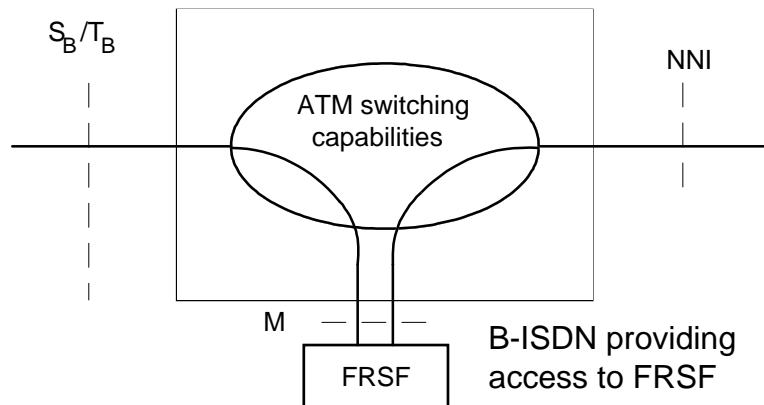
Figure 7: Configuration for B-ISDN FRBS provided by FRSF outside B-ISDN

5.5 Configurations for interworking with private networks

Several configurations (scenarios) for private networks are considered. The list of scenarios is not exhaustive but should show at least those with relevance to the required frame relay standards.

In the following figures, the TE functional entity may represent two physical implementations:

- a single ISDN terminal;

- a LAN including its non-ISDN terminals.

5.5.1 Interworking of public ISDNs with private ISDNs

5.5.1.1 Scenario 1: B-channel or multiple rate channel access to public ISDN case A FRBS via CS functions of private and public ISDN

The private and the public ISDN employ CS functions (see figure 8).

Depending on the location of the RFH, the location of the RFHI may coincide with the interface at the T reference point, or may occur anywhere within the pubic ISDN, or may occur beyond the public ISDN (as shown in figure 8).
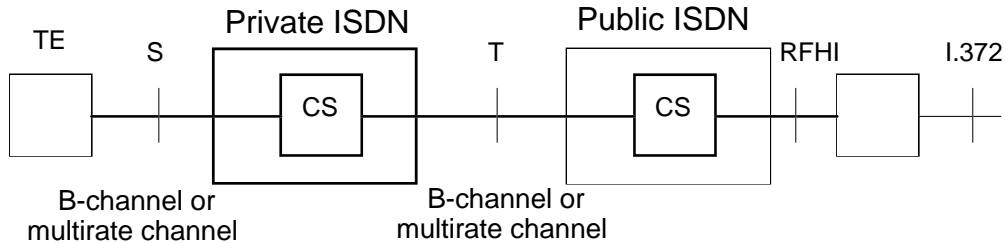
Figure 8: Scenario 1

5.5.1.2 Scenario 2: B-channel or multiple rate channel access to public ISDN case B FRBS via CS functions of the private ISDN

Two kinds of FRBS provisioning by the public ISDN are possible:

- FRBS by the integrated FH (IFH, see figure 9);

- FRBS by the non-integrated FH (NIFH, see figure 10).

There is no difference between the two kinds of provisioning at the T reference point.

Interworking between B-channels at the S reference point and multiple rate channels at the T reference point and vice versa is outside the scope of this TCR-TR.
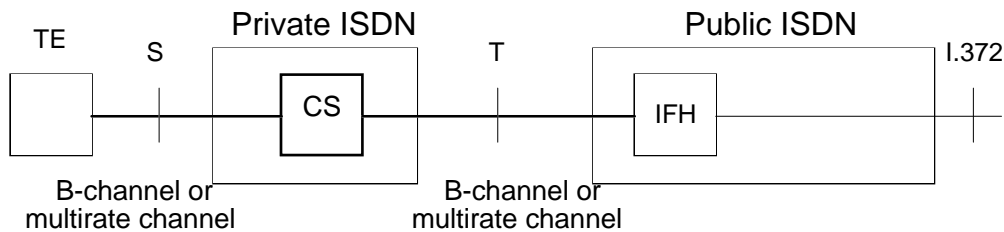
Figure 9: Scenario 2.1
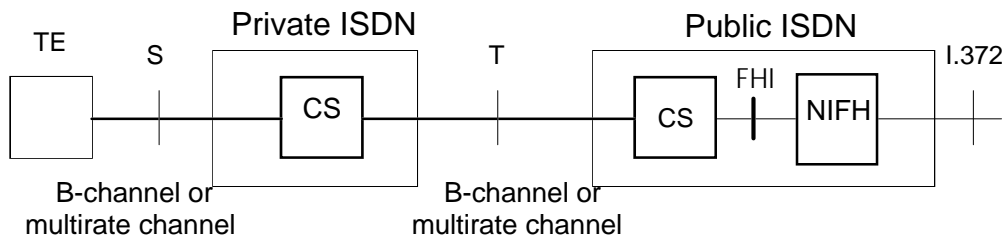
Figure 10: Scenario 2.2

5.5.1.3   Scenario 3: D-channel access to public ISDN case B FRBS via a frame handling function in the private ISDN

The concatenation of the D-channel link at S and the D-channel link at T is achieved by a frame handling function in the PTN. This frame handling function does not necessarily handle local frame relay traffic.

Two kinds of FRBS provisioning by the public ISDN are possible:

- FRBS by the integrated FH (IFH, see figure 11);

- FRBS by the non-integrated FH (NIFH, see figure 12).

There is no difference between the two kinds of provisioning at the T reference point.
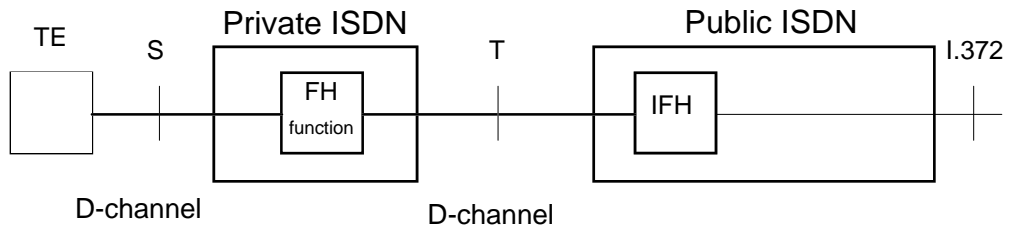
Figure 11: Scenario 3.1
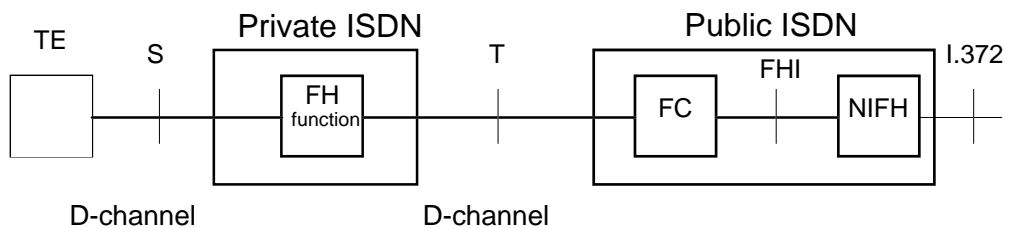
Figure 12: Scenario 3.2

5.5.1.4   Scenario 4: B-channel access from the private ISDN FC to public ISDN case B FRBS

This scenario uses a private FC which concentrates the connections to the public IFH or NIFH. It represents the extension of the public network D-channel FRBS into the private ISDN by allocating the FHI relevant local CRF-S to the frame concentrator of the private ISDN.

Two kinds of FRBS provisioning by the public ISDN are possible:

- FRBS by the integrated FH (IFH, see figure 13);

- FRBS by the non-integrated FH (NIFH, see figure 14).

Whether there are differences at the T Reference point between these two kinds of provisioning has to be clarified.
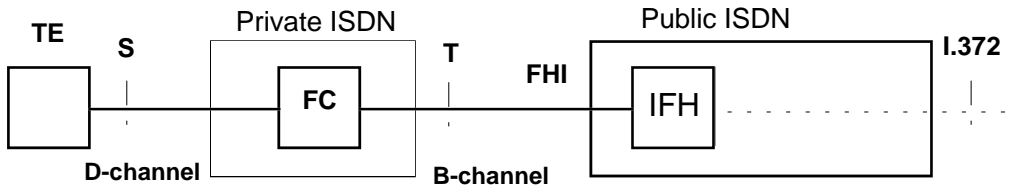
Figure 13: Scenario 4.1
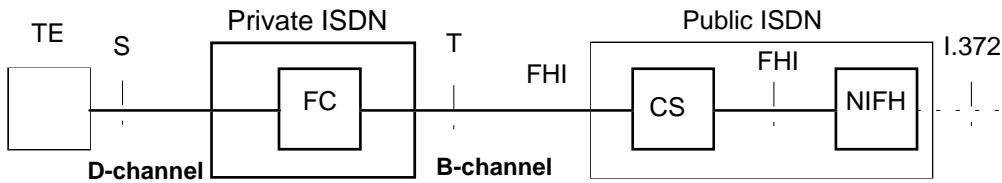
Figure 14: Scenario 4.2

5.5.1.5 Scenario 5: B-channel and/or multiple rate channel access from the private IFH to the public ISDN case B FRBS

In this scenario a private IFH is connected to the public ISDN providing FRBS. Private network internal FRBS connections are possible. Interworking at the T reference point is according to the ITU-T Recommendation I.372 [6] (see figure 15).
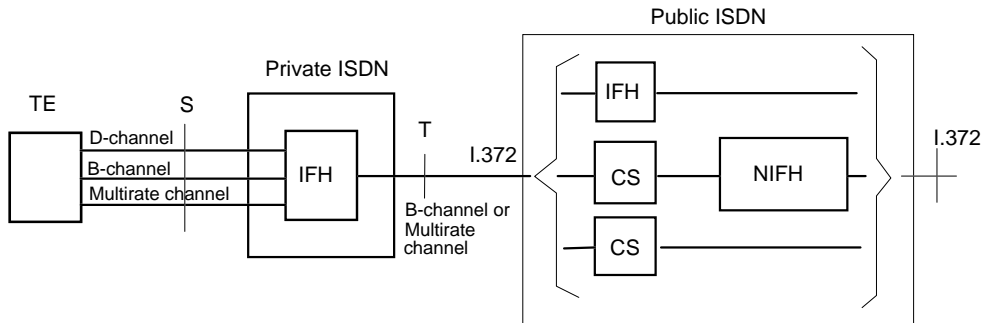
Figure 15: Scenario 5

5.5.2 Access from private ISDN to public data networks providing FRDTS

In the following two scenarios the Access Unit (AU) can be placed within the private ISDN or within the PDN. In the second case the private ISDN and the PDN employ ISDN circuit switching functions.

5.5.2.1 Scenario 6: Access to public frame relay service
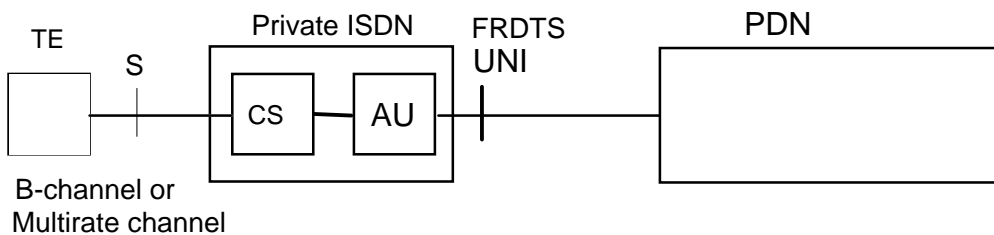
Figure 16: Scenario 6.1
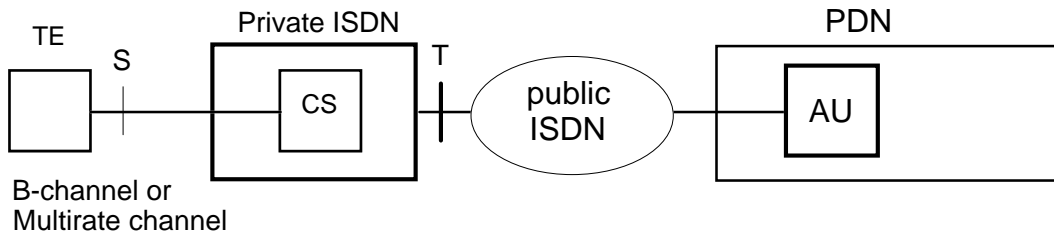
Figure 17: Scenario 6.2

5.5.2.2   Scenario 7: Access from the Private ISDN FC to a PDN

This scenario uses a private FC function which concentrates the connections to the PDN providing FRDTS.
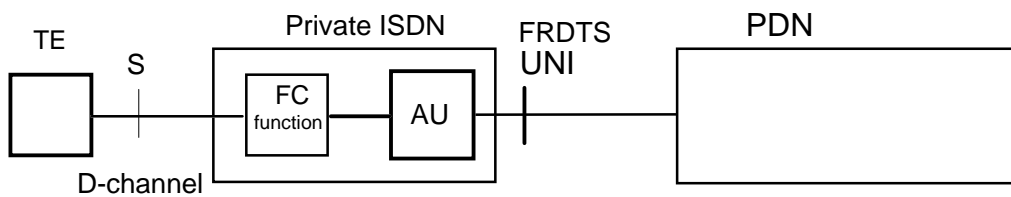
Figure 18: Scenario 7.1
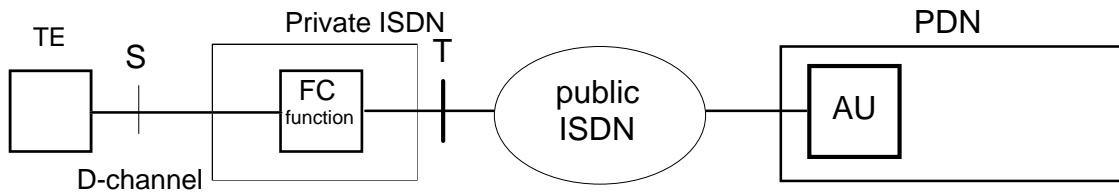
Figure 19: Scenario 7.2

5.5.3   Other interworking cases of public and private networks

For example, in case of interworking of:

-     public ISDNs providing FRBS with private dedicated Data Networks;

-     public B-ISDNs with private B-ISDNs;

-     PDNs with private B-ISDNs;

-     PDNs with private DN.

There is not currently enough information available to derive detailed descriptions.

6 Service classes for frame relay bearer service

This clause deals with the service aspects of FRBS with the aim to help understanding the priority items and standards formulated in clauses 7 and 8. Clause 6 concentrates on FRBS only because the service stacks are more complex in this case.

6.1 Service classes at the S/T reference point

6.1.1 Physical circuit characteristics

6.1.1.1 Demand circuit, virtual call dependent

The establishment of the circuit switched connection between FH and TE is initiated by the beginning of the first frame mode call, and its release is initiated by the end of the last frame mode call. Connection establishment and disestablishment are under ISDN call control.

6.1.1.2 Demand circuit, long duration, virtual call independent

Establishment and release of the circuit switched connection between FH and TE are independent of frame mode calls; instead, they are initiated by the user. Typically the circuit switched connection lasts longer than the last active frame mode call (long duration). Connection establishment and disestablishment are under ISDN call control.

6.1.1.3 Permanent circuit, virtual call independent

Establishment and release of the circuit switched connection between FH and TE are achieved independently of frame mode calls by OAM procedures of the network provider.

6.1.2 Virtual circuit characteristics

6.1.2.1 Demand (switched virtual circuit)

The establishment and disestablishment of the virtual circuit are under ISDN call control.

6.1.2.2 Permanent (permanent virtual circuit)

Establishment and release of the virtual circuit between FH and TE are achieved by OAM procedures of the network provider.

6.1.3 Service classes

A service class is a combination of physical and virtual circuit characteristics. An overview of service classes is given in table 1.

Table 1: Overview of service classes for FRBS

Physical circuit characteristics	Demand circuit, virtual call dependent		Demand circuit, Long duration, virtual call independent		Permanent circuit, virtual call independent	
ISDN channel	multiple rate, unrestricted B-channel (case A/B)		multiple rate, unrestricted B-channel (case A)		multiple rate, unrestricted B-channel (case A/B) D-channel (case B)	
Initialization	by the user or the network		by the user		by the network, on subscription	
Resilience	by the user		by the user		by the network	
Virtual circuit characteristics	**Demand**	**Permanent**	**Demand**	**Permanent**	**Demand**	**Permanent**
Initialization	by the user or the network	by the network	by the user or the network	by the network	by the user or the network	by the network, on subscription
Resilience	by the user	by the network	by the user	by the network	by the user	by the network
Address Data Link	(note)	fixed	(note)	fixed	(note)	fixed
NOTE: case A: determined by an inband ITU-T Recommendation Q.933 [4] procedure (DLCI = 0). case B: determined by a ITU-T Recommendation Q.933 [4] procedure across the D-channel.						

6.2 Particular service classes at the T reference point

The number of available frame mode links which finally is responsible for the total number of TEs supported at the various instances of S reference points over a given B-channel at the T reference point needs to be studied. Special care should be taken of load sharing when overflow involves B-channels of more than one interface.

6.3 Service classes at the S reference point in private ISDN

This shall be the subject of private network standardization.

6.4 Combination of service classes at the S and T reference points

This shall be the subject of private network standardization.

7 Items and priorities for standardization of frame relay services

For the standardization of frame relay services, distinction is made according to priorities for:

1) items with high priority, which should be covered in a first release of ETSI standards. Such items are marked with "(1)". First release of ETSI standards (STC approval) is expected by spring 1994;

2) items which need to be considered for a later release of ETSI standards. Such items are marked with "(2)". Standards in the first release may already keep in mind these items;

3) items which, at the moment, are not considered for ETSI standardization. Such items are absent from the priority list.

The following reasons and arguments were considered for grouping standardization items into these priority classes:

- urgency for inclusion of the item in the first set of standards, in order to obtain a complete basis for a first implementation step of frame relay services;

- status of supporting standards, e.g. ITU-T Recommendation Q.933 [4], ITU-T Recommendation I.372 [6];

- feasibility to meet the time schedule (spring 94) for the first set of ETSI frame relay standards;

- demand by users (e.g. as seen by European frame relay forum);

- coverage of application by other services (e.g. D-channel PMBS);

- technical feasibility of realization in a first implementation step.

The following priority items have been identified:

Service characteristics

Physical service characteristics:

(1)   permanent circuit, VC independent;
(1)   demand circuit, VC independent;
(1)   demand circuit, VC dependent.

Virtual circuit characteristics:

(1)   Permanent Virtual Circuit (PVC);
(1)   SVC, case A;
(2)   SVC, case B.

Data rates supported on the UNI

Provided by the PDN:

(1)   rates up to 2 Mbit/s;
(2)   rates from 2 Mbit/s up to 34 Mbit/s (E3).

Provided by the ISDN:

(1)   rate of 64 kbit/s (B-channel);
(1)   rates higher than 64 kbit/s up to 2 Mbit/s (n*64 kbit/s channels);
(2)   rates of 16 kbit/s and 64 kbit/s (D-channel).

Provided by the B-ISDN:

(1)   rates of 2 Mbit/s, 34 Mbit/s, 155 Mbit/s;
(2)   rate of 620 Mbit/s.

Access to the FH

Public network configurations in ISDN:

(1)   case A, services provided by an RFH;
(1)   case B, services provided by the IFH;
(2)   case B, services provided by non-integrated FH.

Private network scenarios:

(1)   case A, CS functions in private ISDN, scenario 1;
(1)   case B, CS functions in private ISDN, scenario 2;
(2)   FH functions in private ISDN, scenario 3;
(2)   IFH functions, scenario 5 ;
(2)   CS functions to PDN, scenarios 6 and 7.

Network interworking:

(1)   interworking between any two networks providing some kind of frame relay PVC service;
(2)   interworking between any two networks providing some kind of frame relay SVC service.

Service interworking:

(2)   service interworking with ITU-T Recommendation X.25 [14] in PDN;

(2)   service interworking with PMBS in ISDN.

The priority of a combination of the items listed above can be found by applying the following rule:

The priority of a combination equals the maximum value of the priorities of its components.

EXAMPLE: The priority for standardizing SVCs over demand B-channels in an integrated
                        FH network configuration is (2) because:

-        case B services provided by the IFH   (1);

-        rate of 64 kbit/s   (1);

-        demand circuit, VC dependent   (1);

-        SVC, case B   (2).

Priorities are presented in table 2 for various methods to access the ISDN FH, in combination with the various configurations and in combination with the various service classes.

Table 2: Items and priorities for standardization of frame relay services

Service classes	D-channel service classes		B-channel service classes				Multiple rate channel service classes			
			Dem.	Long Duration	Permanent		Dem.	Long Duration	Permanent	
Virtual call characteristics	Dem. (SVC)	Perm. (PVC)	Dem. (SVC)	Dem. (SVC)	Dem. (SVC)	Perm. (PVC)	Dem. (SVC)	Dem. (SVC)	Dem. (SVC)	Perm. (PVC)
Configurations										
5.2.2 **case A services provided by a RFH**	N.A.	N.A.	(1)		(1)	(1)	(1)		(1)	(1)
5.2.3 **case B services provided by the integrated FH**	(2)	(2)	(2)		(2)	(1)	(2)		(2)	(1)
5.2.4 **case B services provided by the non-integrated FH**	(2)	(2)	(2)		(2)	(2)	(2)		(2)	(2)
5.5.1.1 **Scenario 1: B-channel or multiple rate channel access to public ISDN case A FRBS via circuit switching functions of private and public ISDN**	N.A.	N.A.	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
5.5.1.2 **Scenario 2: B-channel or multiple rate channel access to public ISDN case B FRBS via circuit switching functions of the private ISDN**	N.A.	N.A.	(2)	(2)	(2)	(1)	(2)	(2)	(2)	(1)
5.5.1.3 **Scenario 3: D-channel access to public ISDN case B FRBS via a frame handling function in the private ISDN**	(2)	(2)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
5.5.1.4 **Scenario 4: B-channel access from the private ISDN FC to the public ISDN, case B FRBS**										

(continued)

Table 2 (concluded): Items and priorities for standardization of frame relay services

Service classes	D-channel service classes		B-channel service classes				Multiple rate channel service classes			
			Dem.	Long duration	Permanent		Dem.	Long duration	Permanent	
Virtual call characteristics	Dem. (SVC)	Perm. (PVC)	Dem. (SVC)	Dem. (SVC)	Dem. (SVC)	Perm. (PVC)	Dem. (SVC)	Dem. (SVC)	Dem. (SVC)	Perm. (PVC)
Configurations										
5.5.1.5 **Scenario 5: B-channel and/or multiple rate channel access from the private IFH to the public ISDN case B FRBS**	note 1	note 1	**(2)** note 2	**(2)** note 2	**(2)** note 2	**(2)** note 2	**(2)** note 2	**(2)** note 2	**(2)** note 2	**(2)** note 2
5.5.2.1 **Scenario 6: access to public frame relay service via circuit switching functions of the private ISDN**	**N.A.**	**N.A.**	**(2)**	**(2)**	**(2)**	**(2)**	**(2)**	**(2)**	**(2)**	**(2)**
5.5.2.2 **Scenario 7: access from the private ISDN FC to a PDN**	note 1	note 1	**(3)**	**(3)**	**(3)**	**(3)**	**(3)**	**(3)**	**(3)**	**(3)**

N.A.   = Not Applicable.
(1), (2), (3) = Priorities.

NOTE 1:   In this scenario the D-channel applies only to the S reference point, which is outside the scope of this TCR-TR.

NOTE 2:   The priority refers to B-channels or multirate channels at the T reference point only.

8   Set of standards for frame relay services

The program for the standardization work regarding frame relay services should reflect the priorities given to the standardization items (see clause 7).

The standardization work should as much as possible seek alignment with CCITT Recommendations and take into consideration frame relay forum implementation agreements.

What follows is the list of subjects which need ETSI standardization, the responsible ETSI STC and some relevant material to be used as a basis. There needs not always be a one-to-one relationship between a subject and a related standard: it may, for example, be convenient to combine several subjects, of the same nature and under the same responsible ETSI STC, in one standard. The responsible ETSI STCs are requested to start work which should lead to either the adoption of an existing TCR-TR or the development of a new standard.

The subjects are distinguished according to priorities for:

1)   subjects with high priority, which need a standard urgently. Such subjects are marked with "(1)";

2)   subjects with lower priority, for which the standard may be released later in time. Such subjects are marked with "(2)".

8.1   Standards providing service descriptions including Quality Of Service (QOS) aspects and reference configuration (mainly stages 1 and 2)

In addition to the scenarios according to ITU-T Recommendation Q.72.2 [2], the scenarios developed in subclause 5.5 shall be accounted for in the stage 2 specifications and, if necessary, even take precedence over those in ITU-T Recommendation Q.72.2 [2].

(1)   General frame relay service description

-    ETSI STC NA2.
-    CCITT Recommendation I.233.1 [1].

(1)   Service definition for FRBS in N-ISDN

-    ETSI STC NA2.
-    CCITT Recommendation I.233.1 [1].

(1)   Service definition for FRDTS

-    ETSI STC NA2.
-    CCITT Recommendation I.233.1 [1].

(1)   Service definition for FRBS in B-ISDN

-    ETSI STC NA5.
-    CCITT Recommendation I.233.1 [1].

(1)   Functional model and relationships for FRBS and FRDTS

-    ETSI STC SPS1.
-    ITU-T Recommendation Q.72.2 [2].

(1)   Congestion management for FRBS and FRDTS

-    ETSI STC NA2.
-    CCITT Recommendation I.370 [5].

8.2   Standards for the user-network interface (stage 3)

(1)   Data link core sublayer

-    ETSI STC SPS5.
-    CCITT Recommendation Q.922 [3], annex A.

(1)   Frame Relay convergence sublayer

-    ETSI STC NA5.
-    CCITT Recommendation Q.922 [3], annex A.

(1)   Signalling

- ETSI STC SPS5.
- ITU-T Recommendation Q.933 [4].

8.3   Standards for interfaces between networks (/components)

(1)   NNI

- ETSI STC NA2.
- ITU-T Recommendation I.372 [6].

(1)   B-ISDN NNI

- ETSI STC NA5.
- ITU-T Recommendation I.372 [6].

(1)   Remote Frame Handler Interface

- ETSI STC NA2.
- ETS 300 099 [8].

(2)   Frame Handler Interface

- ETSI STC NA2.
- ETS 300 099 [8].

8.4   Standards for interworking of networks providing a frame relay service, and for service interworking

(1)   Network interworking

- ETSI STC NA2/NA5.
- This subject is covered by the subject B-ISDN NNI.

(2)   Service interworking

- ETSI STC NA2.
- ITU-T Recommendation I.555 [7].
- CCITT Draft Recommendation X.3x [13].

8.5   Standards for network management

- ETSI STC NA4.
- Identification of subjects to be provided by NA4.

8.6   Standards for DTE testing

- ETSI STC TE5.
- Identification of subjects to be provided by TE5.

Annex A (informative):   Configuration for FRDTS

At this point, the configuration for FRDTS have to describe two possibilities to provide FRDTS: either the PDN is dedicated to FR, or the PDN is an existing PSPDN as stated in the Stockholm NA meeting report and in the liaisons from TC TE and from SPS5.

For the NNI between PDNs providing FRDTS, the same clarification, as described in the previous clause, is needed.

In order to answer to these strong requirements, subclause 5.3, which in fact seemed to be more or less empty in the first draft, may be completed as follows:
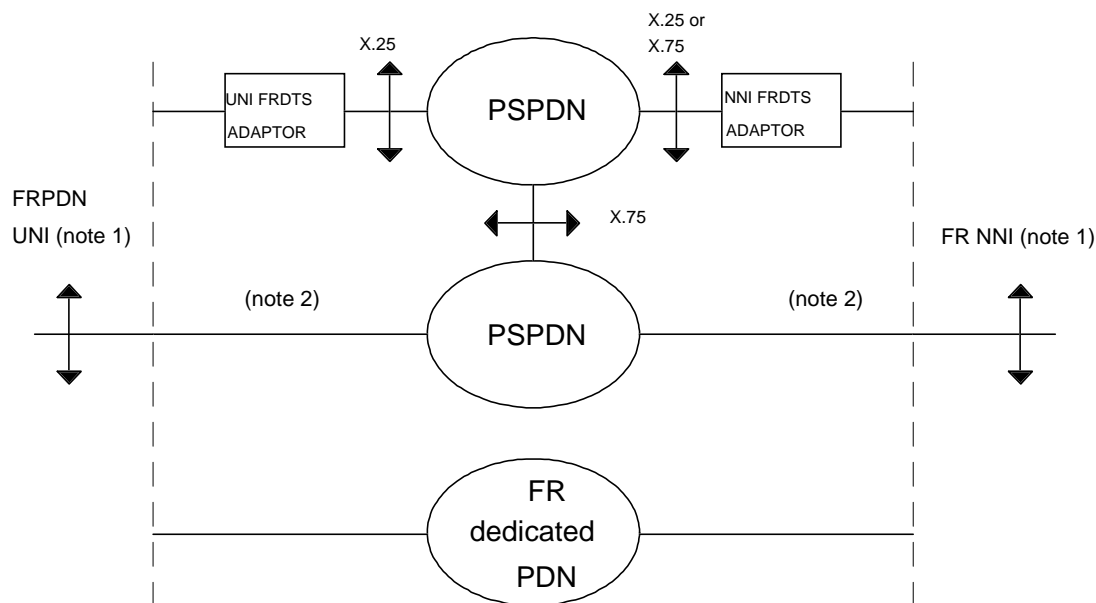
NOTE 1:   These interfaces are under study by ITU-T Study Groups 7, 11 and 13, implementation agreements related to these interfaces exist in the frame relay forum. ITU-T Recommendation I.372 [6] may be a starting point for the FR NNI interface.

NOTE 2:   The PSPDN directly provides the FRPDN UNI and FR NNI.

Figure A.1: PDNs providing FRDTS

Definitions

UNI FRDTS adaptor: A network component which uses the ITU-T Recommendation X.25 [14] interface of existing PSPDNs to provide FRPDN UNI.

NNI FRDTS adaptor: A network component which uses the ITU-T Recommendation X.25 [14] or X.75 [15] interfaces of existing PSPDNs to provide FR NNI.

Annex B (informative):   Service integration

B.1   Introduction

This annex shows the relationship between the different offerings of the frame relay service on different public interfaces. Although the service attributes concerning the access and possibly the QOS may be different, the attributes relating to the frame relay service itself are the same regardless on which interface the service is offered. This annex illustrates this point of view.

B.2   Different frame relay networks

Figure B.1 shows a configuration where the frame relay service is presented as three different services depending on the public network on which the service is offered. All possible access and feeder configurations are shown together with the necessary interworking units. Of the six possible, only three transit network (trunk) configurations are shown (also with the necessary interworking units).

> NOTE: Regardless of whether the access is direct or through a feeder network, customers can use identical equipment.
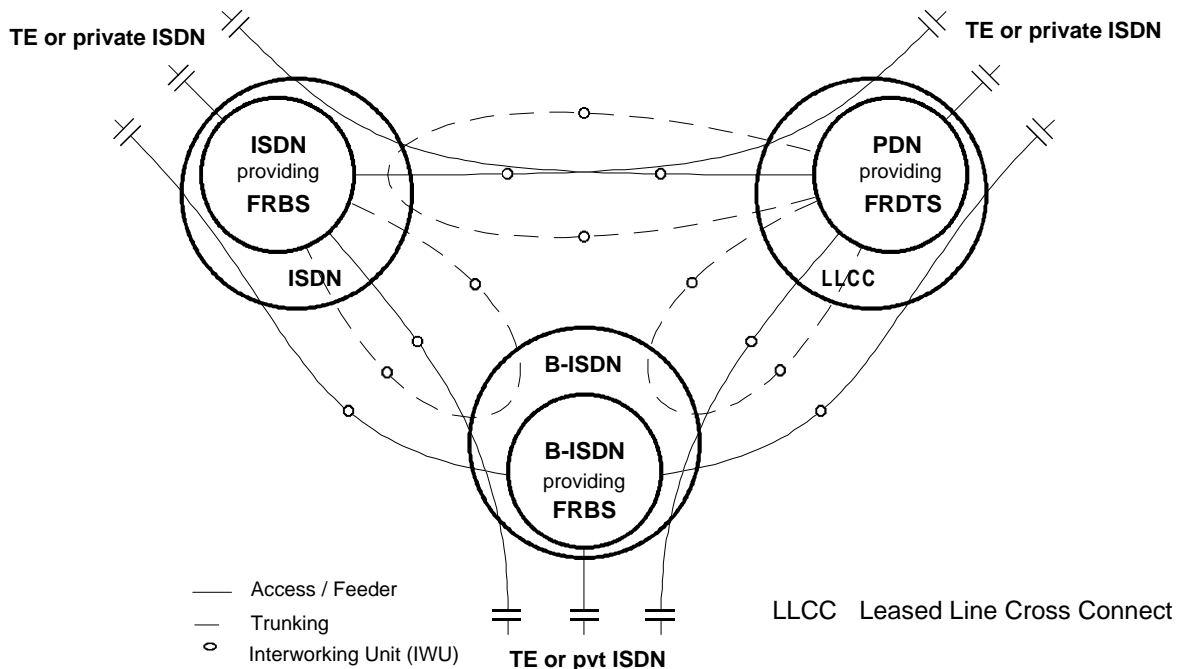

Figure B.1

B.3   Common frame relay server function

Figure B.2 shows a common frame relay server function. It is not assumed that this entity will be a single equipment but rather that a distributed implementation is also catered for with this configuration.

The interworking units are not shown in this configuration. They can be considered a functional subset of a general FRSF, i.e. an interworking unit is a FRSF that has only two interfaces and where there exists a one-to-one relationship between the frame relay virtual circuits at the two interfaces. Without loosing generality, those interworking units have been, therefore, subsumed in the general frame relay service as shown in figure B.2. In this configuration it is visible that the same frame relay service is offered on a number of different UNIs.
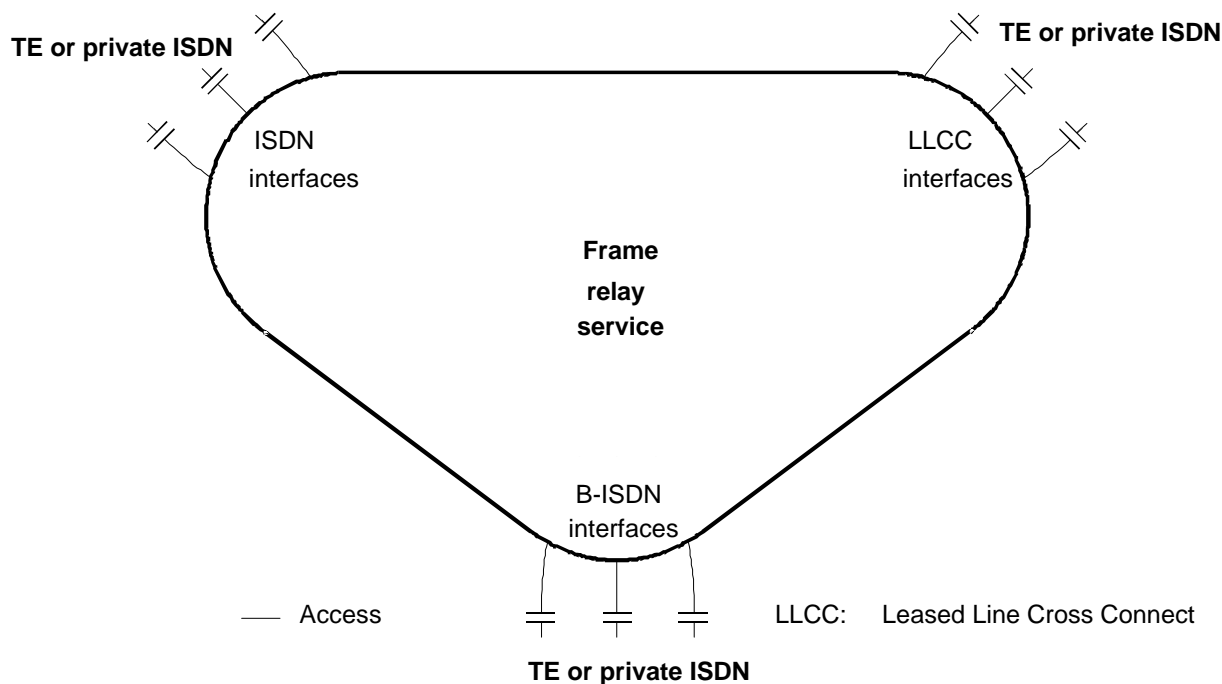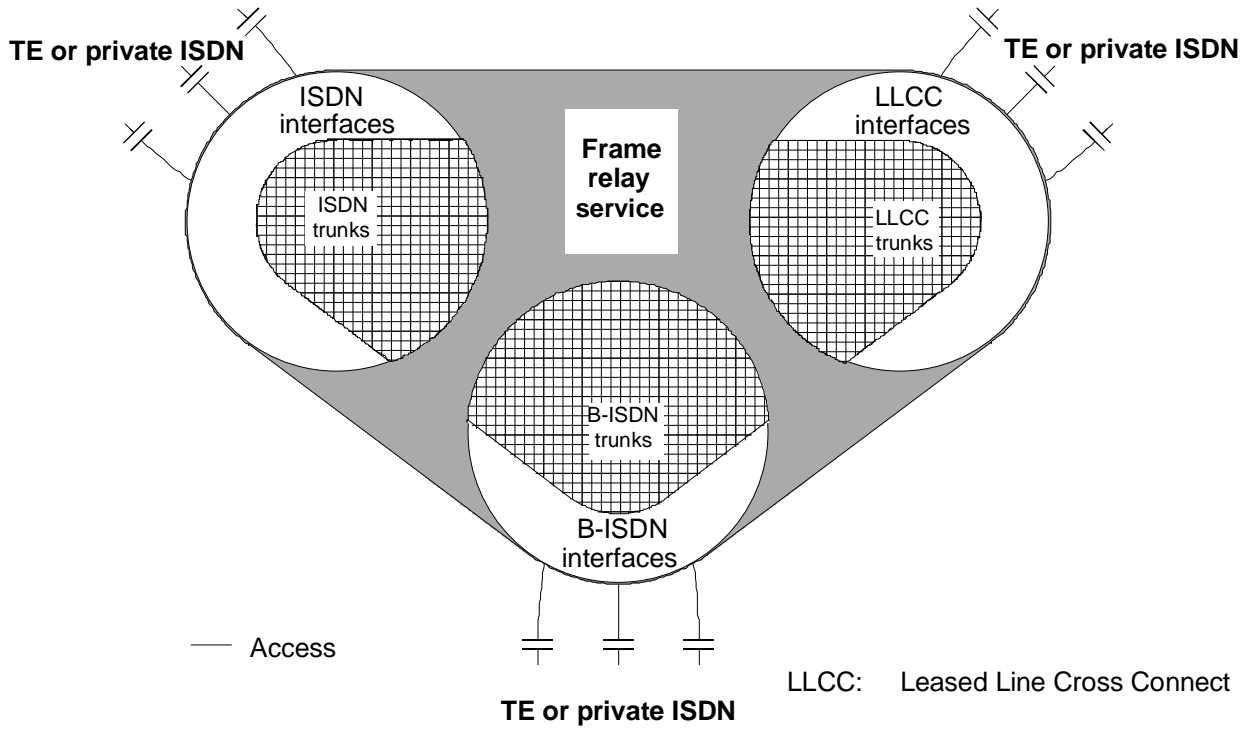

Figure B.2

B.4   Frame relay interfaces, trunks and private networks

Elaborating the configuration in figure B.2 leads to the configuration shown in figure B.3. The frame relay service is the main part that gives the reason for existence of all other parts. It is composed of a set of FRSFs (or frame handlers) that use trunking facilities among each other through any of the three network types under consideration. Similarly, they are serving UNIs through all three network types.

— Access

LLCC: Leased Line Cross Connect

TE or private ISDN

NOTE: Although the frame relay service in this configuration is shown to offer three different UNIs, it is not required that every frame relay network offer all of them.

Figure B.3

Private networks (private ISDNs, private B-ISDNs, private DNs) may adhere to the same structure as shown in figure B.4. In addition, they need interfaces to either a public or other private frame relay networks. Those interfaces may also be of any of the three different network types as discussed above.
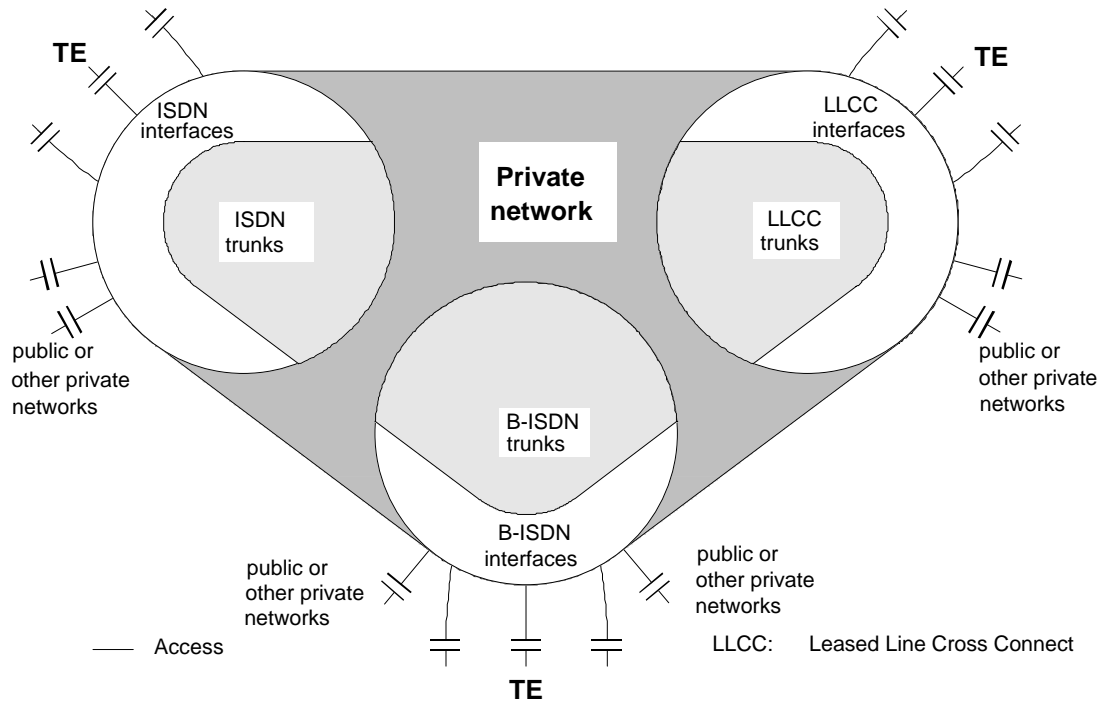

— Access

LLCC: Leased Line Cross Connect

TE

Figure B.4

B.5   Interworking

Finally, figure B.5 shows a configuration where only the relevant aspects to interworking are shown. As with the private networks, three different network types may serve as the basis for interworking.

NOTE: Only network interworking needs to be considered as there is only one common frame relay service.
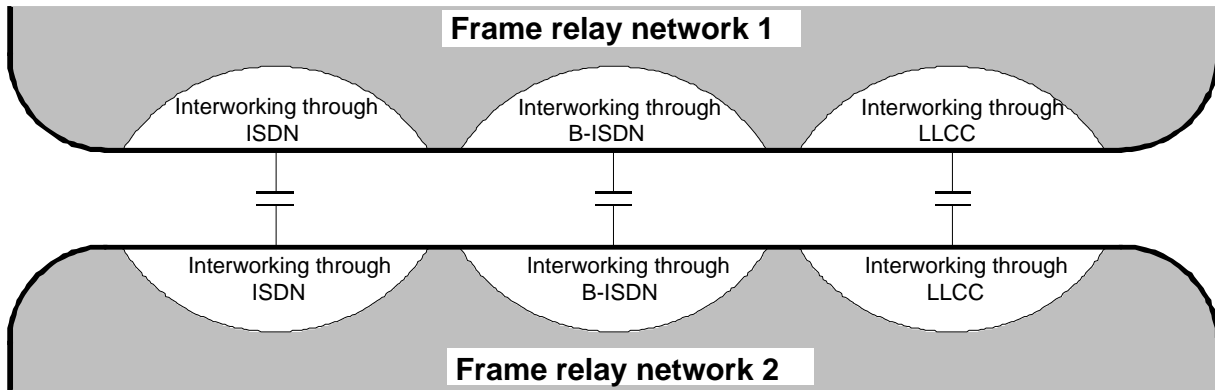

Frame relay network 1

Interworking through ISDN
Interworking through B-ISDN
Interworking through LLCC

Interworking through ISDN
Interworking through B-ISDN
Interworking through LLCC

Frame relay network 2

Figure B.5

History

Document history	
October 1994	First Edition
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