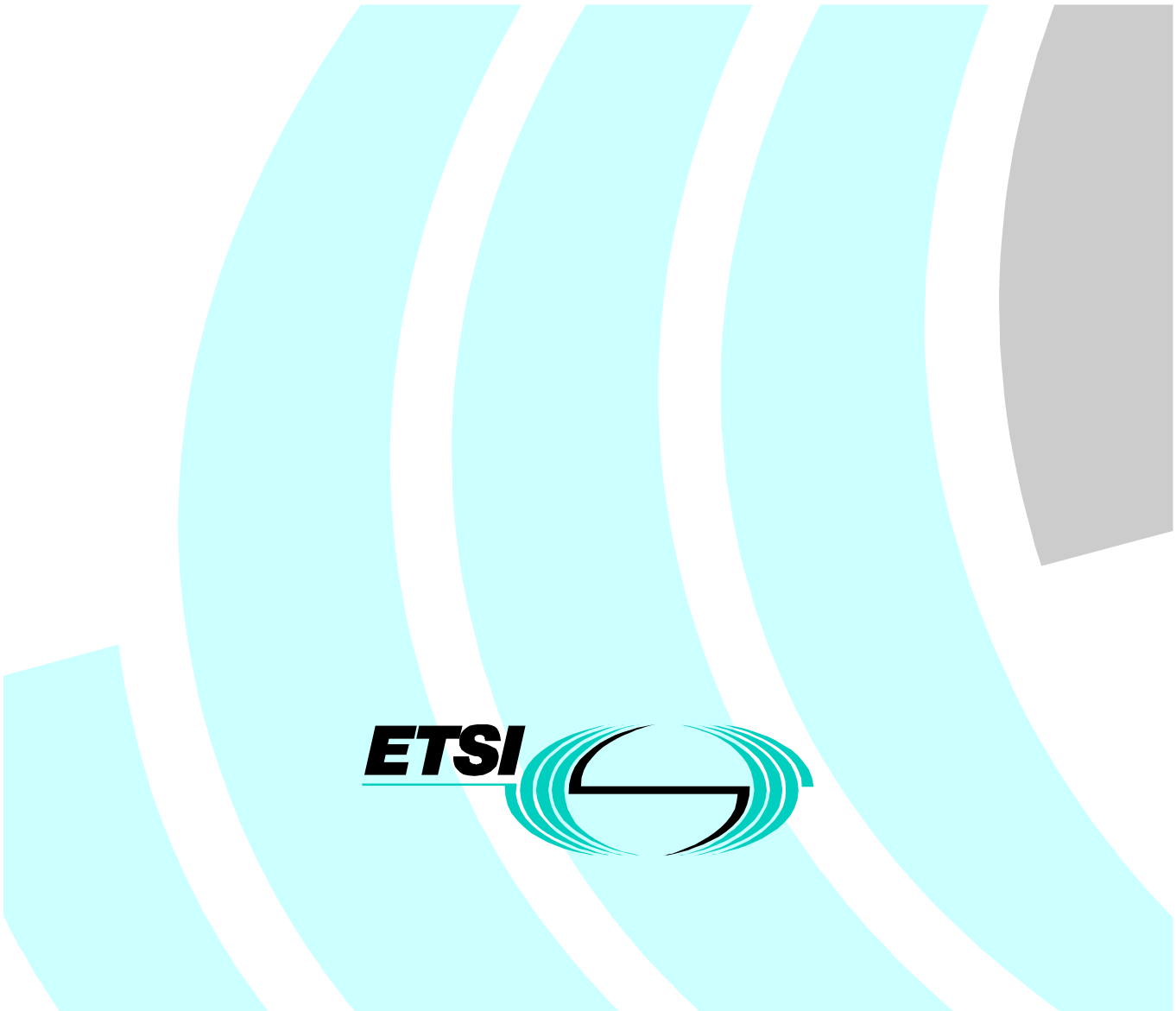
EN 301 145-1 V1.1.4 (1999-03)

European Standard (Telecommunications series)

Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Teleaction service; Part 1: Protocol specification



Reference
DEN/SPS-05106-1 (alo90ieo.PDF)

Keywords
bearer, DSS1, ISDN, protocol, service,
teleaction, teleservice

ETSI

Postal address
F-06921 Sophia Antipolis Cedex - FRANCE

Office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16
Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Internet
secretariat@etsi.fr
Individual copies of this ETSI deliverable
can be downloaded from
http://www.etsi.org
If you find errors in the present document, send your
comment to: editor@etsi.fr

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available **free of charge** from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://www.etsi.org/ipr).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Signalling Protocols and Switching (SPS).

The present document is part 1 of a multi-part EN covering the Digital Subscriber Signalling System No. one (DSS1) protocol specification for the Integrated Services Digital Network (ISDN) teleaction bearer service, as described below:

Part 1: "Protocol specification";

Part 2: "Protocol Implementation Conformance Statement (PICS) proforma specification".

In accordance with CCITT Recommendation I.130, the following three level structure is used to describe the bearer services as provided by European public telecommunications operators under the pan-European ISDN:

- Stage 1: is an overall service description, from the user's standpoint;
- Stage 2: identifies the functional capabilities and information flows needed to support the service described in stage 1; and
- Stage 3: defines the signalling system protocols and switching functions needed to implement the service described in stage 1.

The present document details the stage 3 aspects (signalling system protocols and switching functions) needed to support the teleaction bearer service. The stage 1 aspects are detailed in EN 301 131. The stage 2 aspects of the teleaction bearer service have not been specified.

National transposition dates	
Date of adoption of this EN:	12 March 1999
Date of latest announcement of this EN (doa):	30 June 1999
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 December 1999
Date of withdrawal of any conflicting National Standard (dow):	31 December 1999

1 Scope

The present document specifies the stage three of the Teleaction bearer service for the pan-european Integrated Services Digital Network (ISDN) as provided by the European public telecommunication operators at the T reference point or coincident S and T reference point (as defined in CCITT Recommendation I.411 [1]). Stage three identifies the protocol procedures and switching functions needed to support a telecommunications service (see CCITT Recommendation I.130 [2]).

The present document also provides guidance on the network functionality required to implement the Teleaction service (see annex B). The functional capabilities and information flows of such network entities are described. In the absence of a stage 2 description this information has been included in the present document. This does not preclude its future publication as a separate stage 2 standard.

In addition, the present document specifies the protocol requirements at the T reference point where the service is provided to the user via a private ISDN.

The present document does not specify the additional requirements where the service is provided to the user via a telecommunications network that is not an ISDN, but does include interworking requirements of other networks with the public ISDN.

Teleaction is a service providing for reliable, low volume, data communication and allied processing to users. The Teleaction bearer service may be used for applications such as monitoring, indicating, controlling and verifying of remote events, operations, and measurements.

Charging principles are outside the scope of the present document.

Further parts of the present document specify the method of testing required to identify conformance to the present document.

The present document is applicable to equipment, supporting the Teleaction bearer service, to be attached at either side of a T reference point or coincident S or T reference point when used as an access to the public ISDN.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] CCITT Recommendation I.411 (1993): "ISDN user-network interfaces - Reference configurations".

[2] CCITT Recommendation I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[3] CCITT Recommendation I.112 (1993): "Vocabulary of terms for ISDNs".

[4] CCITT Recommendation I.210 (1993): "Principles of telecommunication services supported by an ISDN and the means to describe them".

[5] CCITT Recommendation X.25 (1996): "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".

[6] ETS 300 011: "Integrated Services Digital Network (ISDN); Primary rate user-network interface; layer 1 specification and test principles".

[7] ETS 300 012: "Integrated Services Digital Network (ISDN); Basic user-network interface; Layer 1 specification and test principles".

[8] ETS 300 049: "Integrated Services Digital Network (ISDN); ISDN Packet Mode Bearer Service (PMBS) ISDN Virtual Call (VC) and Permanent Virtual Circuit (PVC) bearer services provided by the D-channel of the user access - basic and primary rate".

[9] ETS 300 402-1: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Data link layer; Part 1: General aspects [ITU-T Recommendation Q.920 (1993), modified]".

[10] ETS 300 402-2: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Data link layer; Part 2: General protocol specification [ITU-T Recommendation Q.921 (1993), modified]".

[11] ETS 300 099: "Integrated Services Digital network (ISDN); Specification of the Packet Handler access point Interface (PHI)".

[12] EN 300 403-1: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Signalling network layer for circuit-mode basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993), modified]".

[13] EN 301 131: "Integrated Services Digital Network (ISDN); Teleaction teleservice; Service description".

[14] CCITT Recommendation I.233 (1991): "Frame mode bearer services".

[15] ITU-T Recommendation Q.72 (1993): "Stage 2 description for packet mode service".

[16] ISO 8473-1: "Information technology - Protocol for providing the connectionless-mode network service: Protocol specification".

[17] RFC 791: "Internet Protocol (IP)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

Bd channel: 64 kbit/s timeslot over which multiple D channel connections are multiplexed using the procedures of ETS 300 099 [11], clause 9.

Bd bundle: collection of Bd channels.

Basic Network Provider (BNP): entity responsible for the installation and the maintenance of the network supporting the teleaction service.

bearer service: see CCITT Recommendation I.112 [3], subclause 2.2, definition 202.

End User (EU): entity to whom a teleaction application service is provided or who is affected by that application service.

End User Terminal (EUT): device (or location of a device) that, depending on the application (e.g. by monitoring of subdevices):

- on the basis of local conditions or by interrogation, generates information and presents this information for transmission by the network to a Service Provider (SP);
- receives information from a SP in order to affect local conditions;
- upon polling requests received from a Teleaction Management Function (TMF) executes the requested local actions (e.g. authorization, functionality checks, etc.) and sends appropriate responses to the TMF.

NOTE 1: Authorization and functionality checks are outside the scope of the present document.

EU access capability: telecommunication means used between an EUT and a TMF (e.g. ISDN bearer service, dedicated connection, etc.).

Integrated Services Digital Network (ISDN): see CCITT Recommendation I.112 [3] subclause 2.3 definition 308.

network: DSS1 protocol entity at the network side of the user network interface.

Service Provider (SP): entity which, by using one or more TMFs, provides a teleaction application service to one or more EUs.

NOTE 2: The SP may be the BNP, the TMFP, or another organization responsible for one or more SPTs.

Service Provider Terminal (SPT): device (or location of such a device) which, depending on the application:

- receives information from one or more EUTs for handling and processing in accordance with the application service offered by the SP;
- generates control messages and information requests and presents that information for transmission to one or more EUTs;
- monitors EUTs on the network, either by retrieving EUT status information stored in TMFs, and/or by receiving status information automatically from TMFs (e.g. alarms);
- receives polling requests from TMFs and sends appropriate responses to the TMF. Execution of local procedures such as authorization and functionality check is outside the scope of the present document;
- transfers to the TMF information to be broadcasted to the EUTs, if the broadcast functionality is supported by the TMF.

SPT access capability: telecommunication means used between a SPT and a TMF (e.g. ISDN bearer service, dedicated connection, etc.).

service; telecommunication service: see CCITT Recommendation I.112 [3] subclause 2.2 definition 201.

supplementary service: see CCITT Recommendation I.210 [4] subclause 2.4.

teleaction application: one specific end to end application offered by a service provider using the teleaction service.

teleaction service: teleaction service is the transport mechanism used by a teleaction application.

teleservice: see CCITT Recommendation I.112 [3], subclause 2.2, definition 203.

Teleaction Management Function (TMF): set of network functions added to either the public ISDN or assigned to a separate public, or private, network entity. The tasks of the TMF are:

- to ensure reliable communication paths between the EUTs and the SPT, i.e. to ensure available and secure access for the EUTs to the network and communication paths for the SPT in the ISDN, respectively;
- authorization of connected EUTs/SPTs;
- EUT/SPT functionality check;
- to address the appropriate EUT/SPT for transfer of information generated by SPT/EUT;
- as a TMFP option, to broadcast appropriate EUTs for transfer of information generated by a SPT.

Teleaction Management Function Provider (TMFP): entity responsible for the installation and maintenance of one or more of the TMFs. A TMFP may be the same as the BNP.

user: DSS1 protocol entity at the user side of the user network interface.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

BNP	Basic Network Provider
BRA	Basic Rate Access
BRF	Basic Routing Functional
CCAT	Call Control Agent for Teleaction
CEI	Connection Endpoint Identifier
CRF	Connection Related Function
CSPDN	Circuit Switched Public Data Network
DF	Database Functional
DLCI	Data Link Connection Identifier
DSS1	Digital Subscriber Signalling System No. one
EU	End User
EUT	End User Terminal
FH	Frame Handler
FRF	Frame Routing Function
ISDN	Integrated Services Digital Network
LAPD	Link Access Procedure for the D channel
LE	Local Exchange
LIC	Link Identification Code
NT1	Network Termination type 1
NT2	Network Termination type 2
OSI	Open System Interconnection
PFH	Private Frame Handler
PH	Packet Handler
PICS	Protocol Implementation Conformance Statement
PLL	Pre-allocated Logical Link
PMBS	Packet Mode Bearer Service
PRA	Primary Rate Access
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephone Network

PTN	Private Telecommunications Network
SAPI	Service Access Point Identifier
SP	Service Provider
SPT	Service Provider Terminal
TA	Terminal Adapter
TEI	Terminal Endpoint Identifier
TMF	Teleaction Management Function
TMFP	Teleaction Management Function Provider

4 Description

Teleaction is a service providing for reliable, low volume, data communication and allied processing to users. The Teleaction bearer service may be used for applications such as monitoring, indicating, controlling and verifying of remote events, operations, and measurements.

Teleaction is applicable to both basic rate and primary rate, access.

The service provides a datalink layer service over which, by means of a suitable convergence protocol, the OSI connectionless-mode network service may operate. An explicit indication (SAPI = 12) is used at the data link layer to identify a teleaction communication. This indication is used to filter the teleaction frames, from other frames which may co-exist on the interface e.g. call-control frames (SAPI = 0) and packet data frames (SAPI = 16). Once filtered, the frames can be directed towards a TMF. The method of filtering used by the network is outside the scope of the present document. The network uses a network-internal frame address structure (DLCI) to uniquely identify both SPTs, and EUTs, to the TMF. Routing of frames is based upon the Data Link Connection Identifier (DLCI).

A network may be comprised of multiple TMFs, and multiple SPs. Figure 1 illustrates some typical access scenarios that can exist in a network. The figure is not exhaustive, but illustrates a possible network implementation where there are multiple SPs. It is possible that within the TMF "cloud", multiple TMFs could exist.

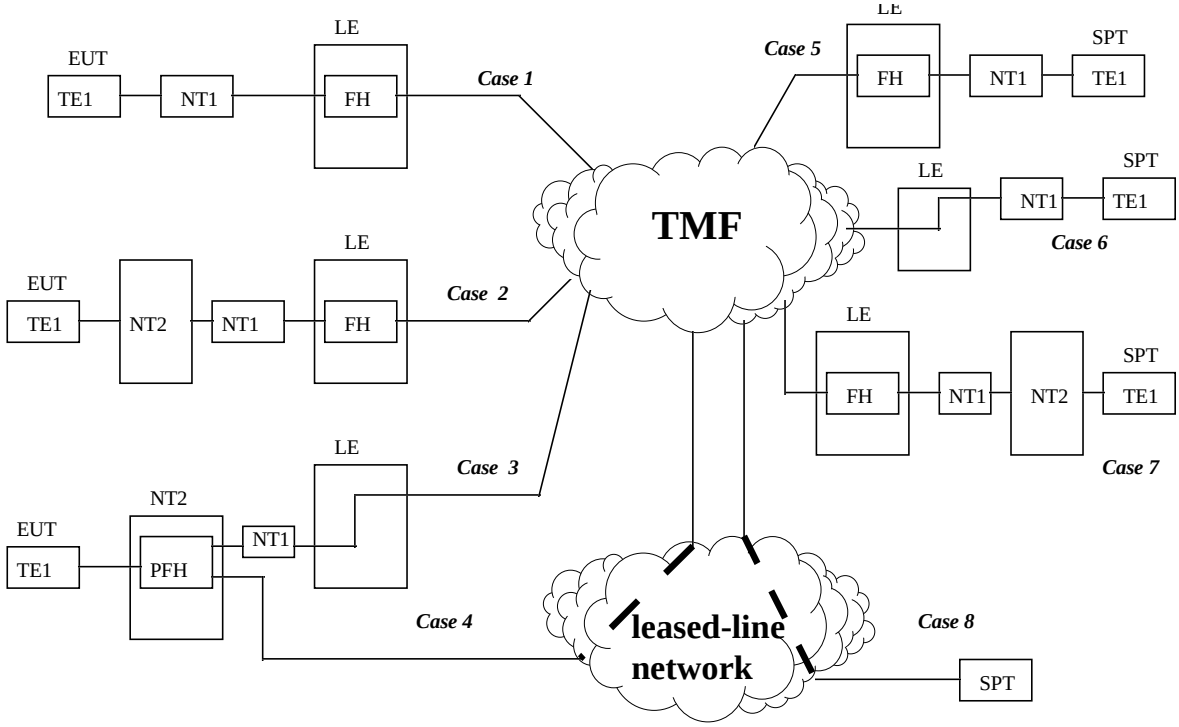


Figure 1: Teleaction access scenarios

The access scenarios presented are:

Case 1: EUT connected to S/T reference point.

Case 2: EUT connected to S reference point.

Case 3: EUT connected to S reference point but with a Frame Handler (FH) within the private network. The PFH is connected by a semipermanent B channel to the TMF.

Case 4: EUT connected to S reference point, with a FH within the private network, and the PFH connected to the TMF via a leased-line.

Case 5: SPT connected to S/T reference point.

Case 6: SPT connected to S/T reference point, but with semipermanent B channel connection to TMF.

Case 7: SPT connected to S reference point (D or semipermanent B channel connections possible).

Case 8: SPT connected via leased-line to the TMF.

NOTE 1: The TMF being implemented in the local exchange is not shown in figure 1, but is a possibility.

One EUT is logically associated with only one SPT.

NOTE 2: The context where an EUT communicates with several SPTs is outside the scope of the present document.

Of the three different methods of layer 2 activation defined in ETS 300 049 [8] (semipermanent, on demand fixed TEI (PLL), on demand variable TEI), only two are applicable to teleaction. Where either of these methods are used, the TEI value shall lie in the non-automatic range [0-63].

4.1 Semi-permanent access

For semi-permanent access, logical links between an EUT and a TMF, or between a SPT and a TMF, are allocated at subscription time. The network shall keep the access connection in the established state. Layer 2 addresses at the user-network interface are allocated at subscription time.

4.2 PLL access

For PLL access, D channel logical links between an EUT and a TMF, or between a SPT and a TMF, are permanently allocated on a subscription basis, but they can be activated and deactivated (SABME/DISC) on demand. The activation, or deactivation, of the link may be initiated by either endpoint. Layer 2 addresses at the user-network interface are allocated at subscription time.

5 Reference configuration and protocol architecture

5.1 Reference configuration

The teleaction bearer service consists of interaction between 3 essential entities: the EUT, the TMF and the SPT. As an abstraction of an actual instance of the service, these entities may be considered as part of functional planes. The EU plane and the SP plane can only communicate with each other by passing through the TMF plane. This is illustrated in figure 2.

The figure illustrates the possibility for multiple EUTs to communicate with individual SPTs, over a single connection to the TMF. The TMF is shown as being able to route the calls from EUTs to an SPT. Further, multiple SPTs may be contactable over the one link from the TMF.

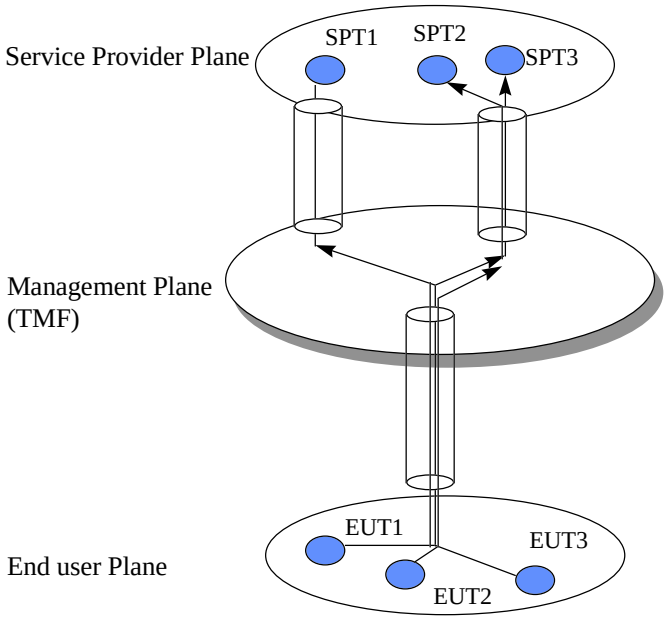


Figure 2: Abstract instance of the teleaction bearer service

Figure 3 illustrates the possibilities for realization of the TMF function within the TMF plane. The TMF may be located in a single physical location (option A), possibly being duplicated for reliability reasons. The TMF may implement various layers of the OSI reference model. The implementation of these layers is application and system dependent. The possibility exists for particular higher layer functions to be centralized in a particular location within the TMF plane, and for lower layer functions to be distributed (option B). The extent to which this can be accomplished is outside the scope of the present document.

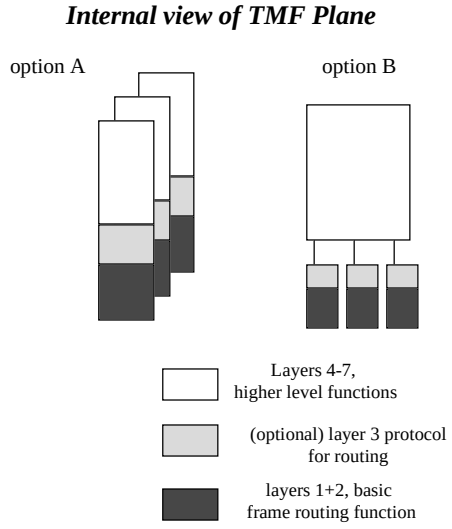


Figure 3: Possible options for realization of the TMF function within the TMF plane

Irrespective of the application, the TMF shall perform a routing function between the EUT and its associated SPT. This requires a minimum implementation of layers 1 and 2 to perform frame routing, and in some particular circumstances, a layer 3 protocol for additional routing information. This Frame Routing Function (FRF) may be performed in a centralized manner, or may be integrated into local exchanges. The FRF receives frames which have been multiplexed by a Frame Handler (FH) in accordance with clause 9 of ETS 300 099 [11]. This allows for the possibility that the FRF may route both teleaction and D channel CCITT Recommendation X.25 [5] traffic. The frames are multiplexed onto channels termed Bd channels. Where a group of such channels exist between a FH and the TMF, it is referred to as a Bd bundle.

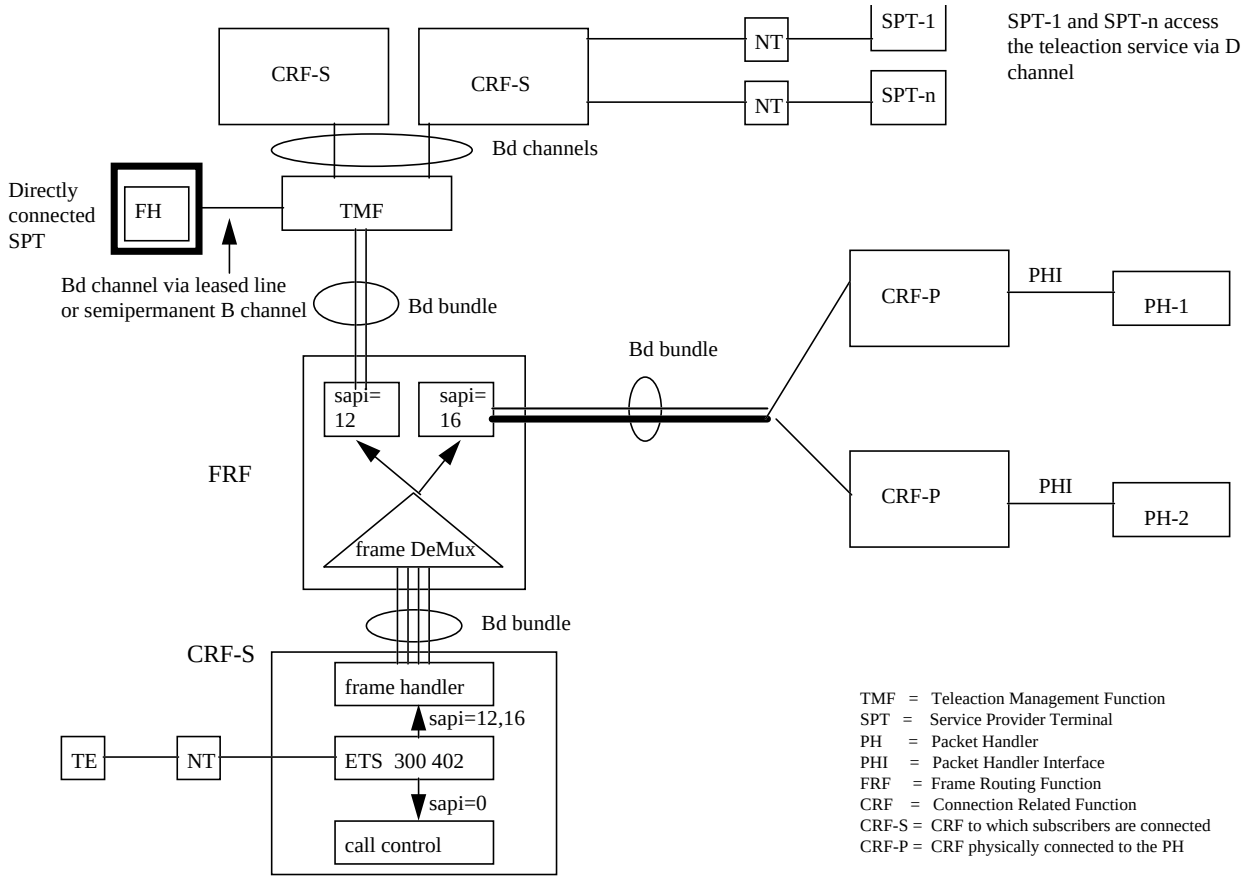


Figure 4: Centralized Frame Routing Function architecture

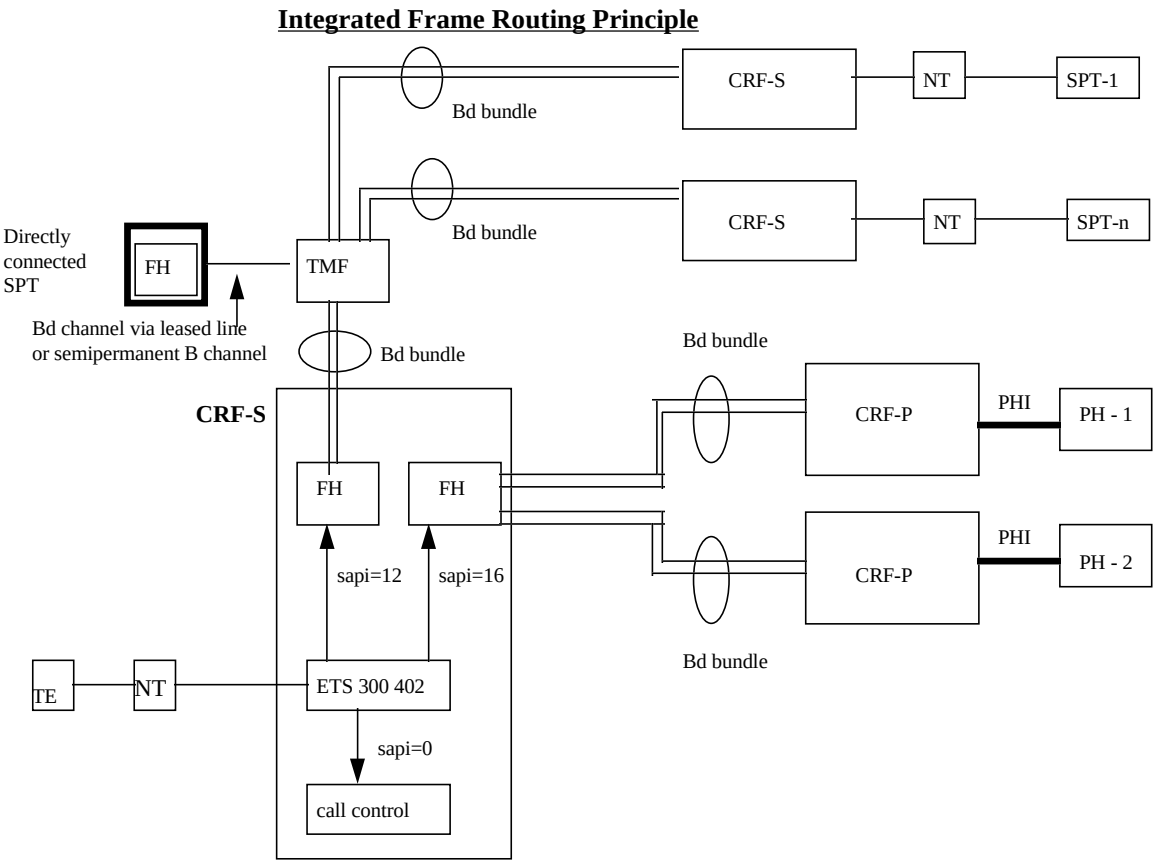
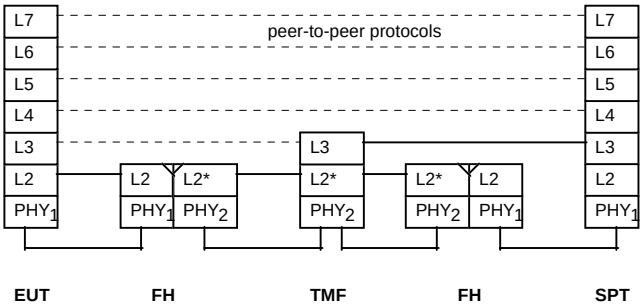


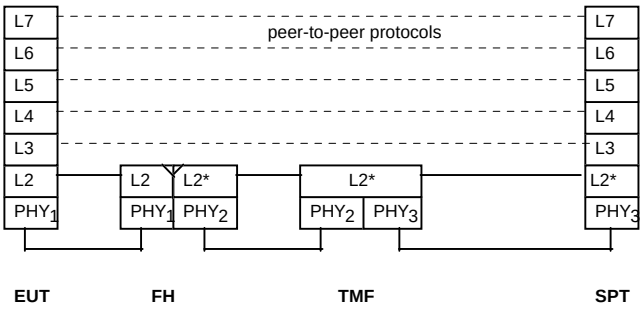
Figure 5: Integrated FRF Architecture

5.2 Protocol architecture for realizing the teleaction teleservice

Figure 6 illustrates a possible protocol architecture for implementation of the teleaction teleservice. Different possibilities exist depending on the applications supported and the mode of connection of the SPT to the TMF. The figure does not describe the possibilities that may exist where application dependent protocols could be, or are terminated in the TMF e.g. for authentication of users etc. In these cases the TMF protocol may incorporate some or all of the application protocol stacks implemented in the EUT and SPT.



Case 1: SPT accesses service via D channel



Case 2: SPT accesses service via direct connection to TMF (leased-line, or semipermanent B channel)

Figure 6: Possible protocol architectures for teleaction depending on SPT access connection

PHY_1: Physical layer - ETS 300 011 [6], ETS 300 012 [7].

PHY_2: Physical layer used between FH and TMF, typically based upon a 64 kbit/s timeslot of a G.703 transmission system.

PHY_3: Physical layer for leased-line connection. This is network specific.

L2: LAPD layer 2 protocol, ETS 300 402-2 [10].

L2*: LAPD layer 2 protocol extended (LAPD-E) ETS 300 099 [11].

L3: Layer 3 protocol e.g. CCITT Recommendation X.25 [5], OSI CLNP [16], IP [17].

L4-L7: Layers 4 to 7 higher layer protocols.

NOTE: The scenario illustrated in Case 2 represents the TMF being remote from the FH. Where the TMF is integrated with the FH, then the protocol stacks of the FH and TMF would be merged.

For Case 1 in figure 6, the TMF implements a layer 3 protocol between itself and the SPT. This arises because the SPT is not directly connected to the TMF. When the SPT is accessing the teleaction bearer service over the D channel, then the LAPD-E protocol between a FH in the LE serving the SPT, and the TMF, only indicates the DLCI of the SPT. For Case 1, there is no mechanism whereby the LAPD can route frames to/from the SPT, which also contain the address of the EUT. Hence a layer 3 protocol for routing is required. This is not necessary between TMF and EUT as the TMF can include in LAPD-E frames, which it routes to an EUT, the DLCI of the EUT.

Additional information relating to functional entities and information flows is contained in annex B.

6 Operational requirements

6.1 Provision and withdrawal

The provision of the teleaction bearer service shall be by prior arrangement with the Basic Network Provider (BNP), on a subscription basis. The teleaction bearer service shall be withdrawn at the EU's or SP's request, or for administrative reasons.

6.2 Requirements at the service provider network side

Where the SPT is using D channel access, the network shall register the DLCI of the SPT, with the TMF. The network shall register whether the procedures of clause 9 or clause 10 of the present document shall apply.

As a network option, the connection(s) between SPT and TMF may be configured as a permanent or semipermanent Bd channel, or Bd bundle. In this case, the procedures of ETS 300 099 [11], clause 9 shall apply. The SPT and TMF shall bilaterally agree on a fixed DLCI value to be used for addressing local communications between SPT and TMF e.g. for alarm reporting.

As a TMFP option, a broadcast function may be supported. The SPT shall register with the TMF if it requires use of such a function. If a broadcast function with multiple outstanding broadcast requests if offered by the TMFP, then the TMF and SPT shall agree on the maximum number of requests that may be outstanding.

6.3 Requirements at the service provider user side

When PLL or semipermanent access to the TMF from the SPT is being used, the SP shall register the TEI of the SPT with the network.

6.4 Requirements at the end-user network side

The network shall register the DLCI of the EUT with the TMF and the SPT. The network shall register whether the procedures of clause 9 or clause 10 of the present document shall apply.

NOTE: Some networks may require the EU to register the speed at which the EUT will operate.

6.5 Requirements at end-user user side

The EU shall register the TEI of the EUT with the network.

7 Coding requirements

7.1 Coding principles

The LAPD frame structure and frame types (commands and responses) as defined in ETS 300 402-2 [10] apply. To perform additional maintenance functions, necessary to enhance the reliability of the data link service offered to the teleaction user, some additional frame formats are defined below.

The maintenance flow is applicable for semipermanent and PLL access. Support of the maintenance flow is mandatory for both network and subscriber equipment. This maintenance flow is based on the use of UI frames with SAPI value 12 and is intended for logical connectivity checking, fault location and alarm reporting along the logical link path. The procedures associated with use of these frames are described in clause 13.

7.1.1 Maintenance frame layouts

The format of LAPD UI frames for the maintenance flow is described in figure 7 for the ISDN access. The format is identical for LAPD-E except that the address field is 4 octets in length.

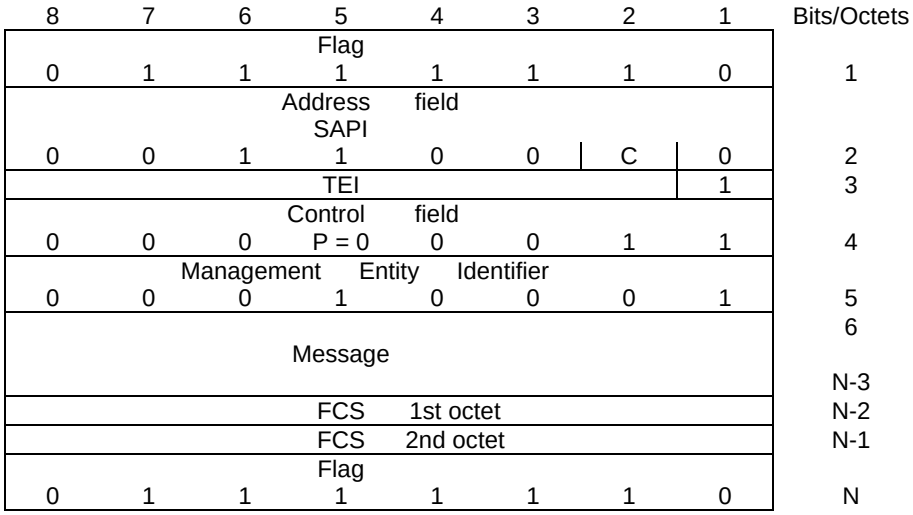


Figure 7: Format of UI frames for the maintenance flow on the D channel

7.1.2 Message Format

Three messages are defined: LOOP REQUEST, LOOP RESPONSE, and REPORT.

In a message, the information element Message type shall always appear first. The remaining information elements shall appear in ascending order, determined by the value of their information element identifiers, and as shown in the tables 1, 2 and 3.

7.1.2.1 LOOP REQUEST

The LOOP REQUEST message is sent by the originator of the loop. Table 1 defines the LOOP REQUEST message content and each information element.

Table 1: LOOP REQUEST message content

Information element	Reference (subclause)	Direction	Type	Length
Message type	7.1.3.1	n->u	M	1
Loop originator	7.1.3.3	n->u	M	3
Loop destination	7.1.3.4	n->u	M	3
Diagnostic	7.1.3.5	n->u	O	3
Test data	7.1.3.8	n->u	O	2-* (see note)
NOTE: The maximum length is (N201 - 12) octets.				

7.1.2.2 LOOP RESPONSE

The LOOP RESPONSE message is a reply to a LOOP REQUEST message. Table 2 defines the LOOP RESPONSE message content and each information element.

Table 2: LOOP RESPONSE message content

Information element	Reference (subclause)	Direction	Type	Length
Message type	7.1.3.1	u->n	M	1
Loop originator	7.1.3.3	u->n	M	3
Loop destination	7.1.3.4	u->n	M	3
Diagnostic	7.1.3.5	u->n	M	3
Test data	7.1.3.8	u->n	O	2-* (see note)
NOTE: The maximum length is (N201 - 12) octets.				

7.1.2.3 REPORT

The REPORT message is used to indicate to the TMF, EUT or SPT that an alarm event has occurred, that a broadcast is requested or that status information relating to an EUT is requested or provided. Table 3 defines the REPORT message content and each information element.

Table 3: REPORT message content

Information element	Reference (subclause)	Direction	Type	Length
Message type	7.1.3.1	both	M	1
DLCI	ETS 300 099 [11]	both	O (see note 1)	6
Diagnostic	7.1.3.5	both	O	3
Report type	7.1.3.6	both	M	3
Terminal data	7.1.3.7	both	O	2-* (see note 2)
NOTE 1: Mandatory if the message is generated by an EUT. The TMF inserts the DLCI of the originating EUT before passing the REPORT to the SPT. Absence of the information element indicates that the TMF or SPT has originated the message. NOTE 2: The maximum length is (N201 - 15) octets when the DLCI is included.				

7.1.3 Information elements coding

The information element structure follows that of the basic call protocol EN 300 403-1 [12], and consists of an information element identifier octet, followed by a length octet followed by the content, except for the Message type information element which is a single octet in length.

	Octets
Information element identifier	1
Length	2
Content	3-*

Figure 8: Structure of information elements

Table 4: Information element identifier

Information element	Bit	8	7	6	5	4	3	2	1	**Length**
DLCI		0	0	0	0	0	0	0	1	6
Loop originator		0	0	0	1	0	0	0	1	3
Loop destination		0	0	0	1	0	0	1	0	3
Diagnostic		0	0	0	1	0	0	1	1	3
Report type		0	0	0	1	0	1	0	0	3
Terminal data		0	0	0	1	0	1	0	1	2-*
Test data		0	0	0	1	0	1	1	0	2-*

7.1.3.1 Message type

The purpose of the Message type is to identify the function of the message being sent.

The message type is coded as shown in figure 9 and table 5, and is a single octet in length. Bit 8 is reserved for possible future use as an extension bit.

Bit	8	7 6 5 4 3 2 1	Octet
	0	Message type	1

Figure 9: Message type

Table 5: Message Types

Bits 8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 0	- escape to nationally specific message type; see note.
0 0 0 0 1 0 0 1	- LOOP REQUEST
0 0 0 0 1 0 1 0	- LOOP RESPONSE
0 0 0 0 1 0 1 1	- REPORT
NOTE: When used, the Message type is defined in the following octet(s), according to the national specification.	

7.1.3.2 DLCI

The DLCI information element identifies the originator of the REPORT message, when sent from EUT to SPT. This information element is 6 octets in length. The format of the information element is identical to the DLCI information element described in ETS 300 099 [11] subclause 13.2.1.

7.1.3.3 Loop originator

The purpose of the Loop originator information element is to identify the entity that initiates the loop procedure. The Loop originator information element octet is coded as shown in table 6, and is 3 octets in length.

Table 6: Loop originator information element contents

Bits 8 7 6 5 4 3 2 1	
0 1 0 0 0 0 0 0	- PH
0 1 1 0 0 0 0 0	- TMF

Values not identified in table 6 are reserved.

7.1.3.4 Loop destination

The purpose of the Loop destination information element is to identify in the LOOP REQUEST message the entity which should respond. In the LOOP RESPONSE message, this information element identifies the entity which actually responds. The Loop destination information element is coded as shown in table 7, and is 3 octets in length.

Table 7: Loop destination information element contents

Bits 8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 1	- TE1
0 0 0 0 0 0 1 0	- TA
0 0 0 0 0 1 0 0	- NT2
0 0 0 0 1 0 0 0	- PTN
0 0 0 0 1 1 1 1	- LAPD termination (see note)
0 1 0 0 0 0 0 0 to 0 1 1 1 1 1 1 1	- Reserved
1 0 0 0 0 0 0 0	- FH CRF-S
1 0 0 0 0 0 0 1	- FH CRF-P

NOTE: A LAPD termination is the entity along the logical link path farthest from the TMF. This code point is used by the loop originator in the LOOP REQUEST message when it wants to initiate an end-to-end loop, but has no knowledge of the equipment which actually terminates the logical link. This code point will not be used in the LOOP RESPONSE message.

7.1.3.5 Diagnostic

The Diagnostic information element provides for the entity that actually replies to the LOOP REQUEST message, or that generates an REPORT message, a means to inform about possible error conditions.

The Diagnostic information element is coded as shown in table 8, and is 3 octets in length.

Table 8: Diagnostic information element contents

Bits 8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 0	- Loop successful
0 0 0 0 0 0 0 1	- DLCI not registered
0 0 0 0 0 0 1 0	- Loop destination unreachable
0 0 0 0 0 0 1 1	- Transmission path unavailable due to network element failure
0 0 0 0 0 1 0 0	- Transmission path unavailable due to customer interface/premises failure
0 0 0 0 0 1 0 1	- EUT not subscribed
0 0 0 0 0 1 1 0	- Status information unavailable
0 0 0 0 0 1 1 1 up to 0 1 1 1 1 1 1 1	- Reserved for future extension
1 0 0 0 0 0 0 0 up to 1 1 1 1 1 1 1 1	- Network dependent diagnostics

7.1.3.6 Report type

The Report type information element is 3 octets in length, and indicates what type of report is contained in the Report message. It is used to distinguish between alarm reports and broadcast requests.

The Report type information element is coded as shown in table 9.

Table 9: Report type information element contents

Bits 8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 0	- Alarm event
0 0 0 0 0 0 0 1	- Alarm cleared
0 0 0 0 0 0 1 0	- Broadcast request
0 0 0 0 0 0 1 1	- Broadcast confirm
0 0 0 0 0 1 0 0	- Broadcast denied - functionality not implemented
0 0 0 0 0 1 0 1	- Broadcast denied – maximum number of requests exceeded
0 0 0 0 0 1 1 0	- Broadcast denied - identical outstanding request
0 0 0 0 0 1 1 1	- Status report request
0 0 0 0 1 0 0 0	- Status report response
0 0 0 0 1 0 0 1 up to 1 1 1 1 1 1 1 1	- Reserved for future extension
NOTE:	0 x x 0 0 0 1 0 and 0 x x 0 0 0 1 1 and 0 x x 0 0 1 0 0 and 0 x x 0 0 1 0 1 are used to identify a numbered broadcast request/confirm/deny. Bit position 6 is the least significant bit for the purposes of numbering. Hence to indicate that a broadcast request with number 1 is required, the field is coded 0 0 1 0 0 0 10, while to indicate that broadcast request with number 2 is required, the field is coded 0 1 0 0 0 0 1 0.

7.1.3.7 Terminal data

The Terminal data information element provides a means for the EUT or SPT to include in a REPORT message a series of octets which may be used to provide further information on the source or extent of an alarm, or in a broadcast context, which should be acted upon by the EUT to alter local conditions.

The terminal data information element consists of a series of octets whose codings and semantics are determined by the teleaction application between EUT and SPT.

7.1.3.8 Test data

The Test data information element provides a means for the loop originator to send in a LOOP REQUEST message a series of octets. The loop destination, which replies to a LOOP REQUEST message, shall transparently include the received test data in the LOOP RESPONSE message.

The Test data information element consists of a series of octets whose codings and semantics are determined by the loop originator of the LOOP REQUEST message.

8 State definitions

No additional data link states are applicable other than those contained in ETS 300 402-1 [9].

9 Procedures at the coincident S and T reference point

9.1 Data link establishment at EU/SP interface

9.1.1 Normal procedures

9.1.1.1 Link establishment by EUT

Link establishment shall use the procedures contained in ETS 300 402-2 [10] subclause 5.5 using SAPI = 12. Once the link is established information transfer using I frames may occur. For such information transfer, the procedures of ETS 300 402-2 [10] subclause 5.6 shall apply.

The TMF, on receipt of the SABME from the EUT shall determine the SPT to which the EUT is subscribed. The TMF will do this by examining the DLCI value contained in the SABME and the Bd channel on which the frame was received. Further details relating to this procedure are contained in annex B.

If the SPT is connected by semipermanent Bd channel to the TMF, then the TMF shall relay the received frame from the EUT to the SPT.

NOTE 1: The DLCI in the frame sent to the SPT has to uniquely identify the EUT at the SPT. It is an operational matter between TMF and SPT to guarantee this. In some networks this may require a modification at the TMF of the DLCI originally received from the EUT.

NOTE 2: If the SPT is connected via semipermanent Bd channel, then the SPT and the TMF could agree on a single datalink to be used to carry all traffic from EUTs to the SPT. The TMF would then have to implement the network layer protocol to be able to determine addressed EUTs for SPT initiated calls.

If the SPT is connected by D channel and no datalink connection exists between TMF and SPT, then the TMF shall initiate datalink establishment towards the SPT by sending a SABME frame containing the DLCI of the SPT. Following receipt of a UA from the SPT the TMF shall, if it has not already done so, send a UA to the EUT. Subsequent data transfer via I frames shall use this established datalink.

NOTE 3: The decision on when to send a UA from TMF to EUT is an implementation matter and depends on whether frame relaying, or frame switching, is supported by the TMF.

If the SPT is connected by D channel and a datalink connection exists between TMF and SPT, then the TMF shall not initiate datalink establishment towards the SPT. The TMF shall return a UA to the EUT. Subsequent I frames received from the EUT shall be transferred to the SPT over the established datalink.

9.1.1.2 Link establishment by SPT

Two modes of establishment are possible depending on the support by the TMF of the user plane network layer protocols used between SPT and EUT. Support of such protocols by the TMF is network-dependent.

NOTE 1: A separate protocol could be used to exchange the EUT address between the SPT and TMF than the application network layer protocol used end-to-end between SPT and EUT.

Where the SPT connects to the TMF by means of one or more semipermanent B channels, in-band procedures in accordance with ETS 300 099 [11] clause 9 shall operate. To establish a communication path between SPT and EUT, the SPT shall send to the TMF, over the semipermanent B channel, a SABME command frame containing the DLCI of the EUT.

NOTE 2: Depending on the frame handling technique, on receipt of a SABME from SPT, the TMF may immediately send a UA to SPT, and simultaneously, issue a SABME towards the required EUT. Alternatively, the TMF could relay the SABME received from the SPT towards the EUT, so that any response to the SABME is generated by the EUT. The operation of such procedures is outside the scope of the present document.

Where the SPT accesses the teleaction bearer service via the D channel and where the TMF supports the user plane network layer protocol, a communication path between SPT and TMF needs to be established prior to any communication between TMF and EUT. The TMF shall use the addressing capabilities of the particular network layer protocol to derive the address (DLCI) of the EUT. The TMF shall then initiate datalink establishment towards the EUT. On successful establishment of a datalink, network layer communication procedures may commence, in accordance with the particular network layer protocol used.

NOTE 3: For an SPT using D channel access, how the TMF notifies the SPT that the communication path to the EUT is established is outside the scope of the present document.

9.1.2 Exceptional procedures

If end-to-end link establishment between EUT and SPT fails, then, if information is available e.g. as a result of polling procedures or receipt of alarm indications, the TMF may transfer in a REPORT message the reason for the link establishment failure to the SPT.

No other additional provisions beyond those contained in ETS 300 402-2 [10] have been identified.

9.2 Data link disconnection at EU/SP interface

9.2.1 Normal procedures

The procedures of ETS 300 402-2 [10] subclause 5.5 apply.

9.2.2 Exceptional procedures

No additional provisions beyond those contained in ETS 300 402-2 [10] have been identified.

As a TMFP option, when the SPT is connected via D channel, and the TMF implements the network layer protocol between EUT and SPT, then on clearing of the last network layer call on the SPT interface, the TMF may delay data link disconnection for a period of time, to allow for any new calls to be quickly established over the interface. The duration of this waiting period is network dependent.

Application and network dependent actions may occur as a result of unexpected data link disconnection during information transfer. Such actions may take the form of event recording for statistics purposes, or may result in external alarm indications being presented to the EU/SP. Procedures to recover from such unexpected data link disconnections are outside the scope of the present document.

9.3 Error procedures

When the SPT is connected via D channel, on receipt of a REPORT message originated by an EUT which contains an invalid DLCI information element or one containing an unused DLCI value, the SPT should discard the message. If a Terminal data information element is present, it may examine the Terminal data information element for possible identification of the originating terminal.

If the EUT, SPT or TMF receives an unrecognized or unexpected message then it shall discard this message. If the EUT, SPT or TMF receives a message containing an undefined or unexpected information element then it shall ignore this information element and continue processing the remainder of the message.

If the EUT, SPT or TMF receives an information element but with an information element content error, then the information element should be discarded.

NOTE: Subsequent actions are implementation dependent and are determined by the information element and message in which the error was received, and the status of the information element within that message, E.g. the error could be logged, the loop procedure invoked, an alarm generated or human intervention requested.

10 Procedures for interworking with private ISDNs

Any one of the entities necessary for a teleaction bearer service - i.e. EUT, SPT and TMF - may be situated within a private network entity.

No additional requirements beyond those in clause 9 of the present document have been identified.

NOTE: BNP may limit, by mutual agreement with TMFP's, the rate at which calls to EUT's or SPT's may be presented to the public network from a private TMF. The operation of such a restriction is network-specific.

11 Interaction with other networks

The teleaction bearer service may be provided to users (EU's or SP's) connected to networks other than the ISDN. The procedures for interworking with such networks are outside the scope of the present document.

12 Interaction with supplementary services

None identified.

13 Maintenance, polling and broadcast procedures

13.1 General

Use of the maintenance flow shall permit polling and regular reports on the availability of EUTs to be furnished to the TMF, and will increase the reliability that may be associated with the teleaction bearer service. The maintenance flow is applicable for semipermanent and PLL access, at both the T and coincident S/T interfaces.

Support of the maintenance flow is mandatory for both network and subscriber equipment.

This maintenance flow is based on the use of UI frames with SAPI value 12 and is intended for logical connectivity checking, fault location and alarm reporting along the logical link path. Connectivity checking and fault location is provided through the loop procedure which enables the TMF to send LOOP REQUEST messages to different entities along the logical link path. The loop destination replies with a LOOP RESPONSE message.

In case of errors on the links tested by the loop, diagnostic information may be included in the LOOP RESPONSE message.

13.2 Procedures

13.2.1 General

The procedures described in this subclause may be initiated regardless of the state of the logical link (activated or deactivated).

If several physical paths exist between entities involved in the maintenance flow, each UI frame related to a given deactivated logical link, may be routed on a one by one basis (i.e. independently) on the available paths.

UI frames related to a given activated logical link shall be sent on the particular path of that logical link.

13.2.2 Loop procedure

Figure 10 illustrates the principle of the loop procedure.

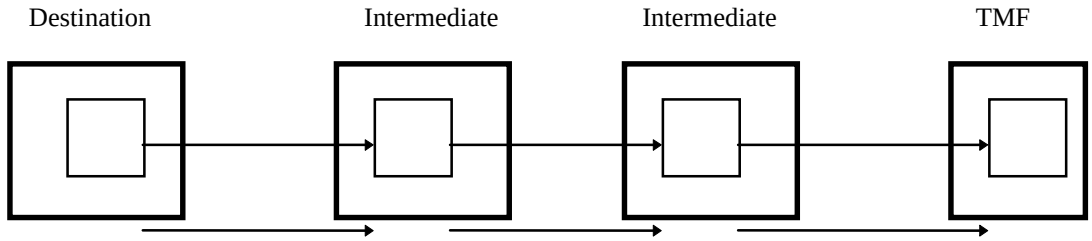


Figure 10: Loop procedure principle

The TMF, as the loop originator entity, sends a LOOP REQUEST message. This LOOP REQUEST message shall be relayed by intermediate entities to the loop destination entity (ISDN FHs, PTN, NT2, TA, TE1). The destination entity shall reply with a LOOP RESPONSE message, which shall be in turn relayed up to the TMF.

The conditions used by a TMF to determine when it wants to initiate a loop procedure on a particular logical link are network and application dependent.

13.2.2.1 LOOP REQUEST message generation by the TMF

The LOOP REQUEST message is generated and sent by the TMF as follows:

- the Loop originator information element octet is set to TMF code point (see table 6);
- the Loop destination information element octet codes the identity of the entity that is requested to respond to the LOOP REQUEST message. The code point LAPD termination is used when the TMF wishes to initiate an end-to-end loop procedure but has no knowledge of the actual entity which terminates the logical link (e.g. TE1, TA) (see table 7);
- the Diagnostic information element may be included chose content is set to 0 by default, since it carries no meaningful information in the LOOP REQUEST message;
- a Test data information element may be included, whose content is determined by the TMF;
- the TMF shall use a timer (T-LOOP) to detect that LOOP RESPONSE messages have not been received.

13.2.2.2 LOOP REQUEST message relaying

Intermediate entities, which are not identified in the Loop destination information element of received LOOP REQUEST messages, shall relay the UI frames on the adjacent logical link path.

In case an intermediate entity knows that the relaying of the UI frames is not possible on the adjacent logical link path, the intermediate entity shall act as a loop destination entity and send a LOOP RESPONSE message to the TMF as described in subclause 13.2.2.4. In this case, the Diagnostic information element shall be used to report the impossibility of relaying the LOOP REQUEST message by inserting one of "Destination loop unreachable", "DLCI not registered" or network dependent code points.

If a TE1/TA/NT2/PTN that is the LAPD termination entity receives a LOOP REQUEST message with a Loop destination information element different from its own loop destination code point and from "LAPD termination", it should discard this LOOP REQUEST message.

13.2.2.3 LOOP REQUEST message reception by the requested loop destination

The entity identified in the Loop destination information element of the received LOOP REQUEST message shall reply by sending a LOOP RESPONSE message to the TMF as described in subclause 13.2.2.4.

If a TE1/TA/NT2/PTN that is the LAPD termination entity receives a LOOP REQUEST message with a Loop destination information element equal to "LAPD termination", it should also reply with a LOOP RESPONSE message.

The Diagnostic information element should normally be coded as "loop successful".

In situations where a LAPD termination entity, as the requested loop destination, is able to reply to the loop, but has information about faults further on, a network dependent diagnostic may be used to indicate such faults (e.g. a Terminal Adapter (TA) could report the state of the R interface).

13.2.2.4 LOOP RESPONSE message generation by the actual loop destination

The LOOP RESPONSE message shall be generated and sent by the actual loop destination as follows:

- the Loop originator information element octet is set to TMF code point (see table 6);
- the Loop destination information element octet codes the identity of the actual destination loop (see table 7);
- the Diagnostic information element octet is coded taking into account the fact that the actual loop destination is, or is not, the requested loop destination, or indicating other faults (see subclauses 13.2.2.2 and subclause 13.2.2.3);
- if a Test data information element is received in the LOOP REQUEST message, then an identical Test data information element content shall be included in the LOOP RESPONSE message.

13.2.2.5 LOOP RESPONSE message relaying

All intermediate entities up to the TMF shall relay on the adjacent logical link path LOOP RESPONSE messages.

Where an intermediate entity knows such relaying is not possible, it shall discard these LOOP RESPONSE messages.

13.2.2.6 LOOP RESPONSE message reception by the TMF

The TMF shall check:

- the Loop destination information element;
- the Diagnostic information element;
- the Test data information element;

and shall stop the relevant time to T-LOOP. It shall also determine which entity actually responded and, if this entity differs from the requested loop destination, shall ascertain the reason in order to detect possible logical connectivity problems or other faults on the logical link.

The TMF shall store the Diagnostic information contained in the Diagnostic information element received from the EUT, and use it, if requested, to report the status of the EUT to an SPT.

Subsequent actions undertaken by the TMF are network and application dependent.

13.2.2.7 Expiry of the loop timer

Expiry of the timer T-LOOP means that either the corresponding LOOP REQUEST or LOOP RESPONSE messages have been lost or discarded and consequently that the loop procedure has failed.

Actions undertaken by the TMF upon T-LOOP expiry are network and application dependent.

13.2.2.8 Loop timer value

The value of the timer T-LOOP is network dependent.

13.2.3 Alarm reporting procedures

The alarm reporting procedure is defined to enable all parties involved in provision of the communication facilities (EUT, TMF, SPT) to become aware of situations which will result in the loss, or degradation of service. The procedures enable the source of the fault to be determined exactly in the case of an EUT fault. For network-internal faults, indications of the unavailability of network transmission paths are provided to EUT and/or SPT through the loop mechanism. Network-internal localization of fault origin is outside the scope of the present document. Faults, which result in loss of communication facilities, are outside the scope of the present document.

The definition of what constitutes an alarm is subjective and application dependent. Hence no attempt is made to specify different procedures for particular alarm situations. The network shall always treat the unavailability of a transmission path as an alarm. The notification to involved parties, however, of the occurrence of an alarm, shall meet the requirements for the Fault Report Delay Classes defined in EN 300 131 [13].

13.2.3.1 Detection of an alarm at the EUT

On detection that an alarm generating event has occurred, the EUT shall send a REPORT message to the TMF containing:

- a Report type information element indicating "Alarm event";
- a Diagnostic information element indicating the cause of the alarm;
- optionally, terminal related data which may assist the SP to resolve the fault.

On receipt of the REPORT message, the TMF may either store the message for later transfer to the SPT, or immediately transfer the message to the SPT. Where the EUT is subscribed to an SPT that the TMF knows is accessing the service via the D channel, the TMF shall insert into the REPORT message a DLCI information element containing the DLCI of the EUT, before sending it to the SPT.

Other actions, which the TMF may take to ensure that future communication with a faulty EUT is suspended, pending resolution of the fault, are outside the scope of the present document.

13.2.3.2 Detection of an alarm situation at the SPT

On detection that an alarm generating event has occurred, the SPT shall send a REPORT message to the TMF containing:

- a Report type information element indicating "Alarm event";
- a Diagnostic information element indicating the cause of the alarm;
- optionally, terminal related data which may provide additional information to EUTs on the characteristics of the fault.

The TMF shall send the received REPORT message to all EUTs subscribed to the teleaction application provided by the SPT. The TMF shall ensure that transmission of the REPORT message to all EUTs meets the Fault Report Delay Class limits as specified in EN 301 131 [13].

13.2.3.3 Detection of an alarm situation at the TMF

If an alarm event occurs in the TMF, the TMF shall broadcast to all connected EUTs and SPTs a REPORT message containing a Report type information element coded "alarm event" and with a Diagnostic information element coded as "Transmission path unavailable due to network element failure". The TMF shall ensure that transmission of the REPORT message to all EUTs/SPTs meets the Fault Report Delay Class limits as specified in EN 301 131 [13]. On receipt of the REPORT message all EUTs and SPTs shall suspend attempts to establish communication paths through the network.

NOTE: It is possible that the Terminal data information element could be used to provide additional information to EUTs and SPTs about the fault in the TMF.

Local actions to request human intervention are outside the scope of the present document.

13.2.4 Alarm clearance

An alarm shall be indicated as being cleared by an EUT or SPT by sending a REPORT message to the TMF. If the REPORT message is sent by an EUT it shall include the Report type information element coded to indicate "Alarm clear" and may include a Diagnostic information element, and/or Terminal data information element. The TMF shall pass without modification the REPORT message received from the EUT to the SPT at the earliest possible opportunity. Where the EUT is subscribed to an SPT that the TMF knows is accessing the service via the D channel, the TMF shall insert into the REPORT message a DLCI information element containing the DLCI of the EUT, before sending it to the SPT.

If the REPORT message is sent by a SPT, it shall include a Report type information element coded to indicate "Alarm clear", and may include a Diagnostic information element, and/or Terminal data information element. The TMF shall pass without modification the REPORT message received from the SPT to all EUTs subscribed to that SPT, at the earliest possible opportunity.

An alarm shall be indicated as being cleared by the TMF by sending a REPORT message with the Report type information element coded to indicate "Alarm clear" to all connected EUTs and SPTs.

The TMF shall ensure that transmission of the REPORT message to all EUTs/SPTs meets the Fault Report Delay Class limits as specified in EN 301 131 [13].

13.3 Broadcast procedures

Support of the broadcast procedure is optional for the TMF. The broadcast procedure enables the SPT to notify the TMF by means of a single message that the information contained in that message be sent to all the EUTs subscribed to the teleaction application service operated by the SPT.

The broadcast mechanism is a confirmed procedure i.e. the TMF will confirm to the SPT that a broadcast has been executed. As a TMFP option, it may be possible for the SPT to send additional broadcast requests to a TMF prior to confirmation being received that existing outstanding requests have been executed. The maximum number of outstanding requests possible is 4. When making a numbered broadcast request, the SPT shall always use the lowest free number. Receipt by the TMF of a numbered broadcast request not containing the lowest free number shall not be considered as an error situation.

The SPT shall indicate to the TMF that a message is to be broadcast by sending a REPORT message to the TMF containing a Report type information element coded as "Broadcast request" and if multiple broadcast requests are supported, with appropriate numbering of bit positions 6 and 7 of the content octet.

The TMF on receiving this message, shall:

- perform a lookup to determine all EUTs subscribed to the teleaction application offered by the SPT;
- transfer the REPORT message to all such EUTs.

On completion of the broadcast, the TMF shall indicate to the SPT that the broadcast is complete by sending a REPORT message to the SPT containing a Report type information element coded as "broadcast confirm", and, if supported, the appropriate number of the request in bit positions 6 and 7 of the content octet.

If the TMF receives a broadcast request, either numbered or unnumbered, and does not support the broadcast functionality, then it shall discard the received message and send to the SPT a REPORT message containing a Report type information element coded as "broadcast denied - functionality not implemented".

If the TMF supports the broadcast function but not the multiple broadcast option, and the TMF receives a numbered broadcast request, then it shall discard the received message and send to the SPT a REPORT message containing a Report type information element coded as "broadcast denied - functionality not implemented" with identical numbering of bit positions 6 and 7 of the content octet as were contained in the received broadcast request.

If the TMF supports the broadcast function and the multiple broadcast option, and the TMF receives a numbered broadcast request but with a number exceeding that supported, then it shall discard the received message and send to the SPT a REPORT message containing a Report type information element coded as "broadcast denied – maximum number of requests exceeded" with identical numbering of bit positions 6 and 7 of the content octet as were contained in the received broadcast request.

If the TMF supports the broadcast function, and the TMF receives a numbered broadcast request but a number identical to that of a broadcast request currently being processed, then it shall discard the received message and send to the SPT a REPORT message containing a Report type information element coded as "broadcast denied - identical outstanding request" with identical numbering of bit positions 6 and 7 of the content octet as were contained in the received broadcast request.

NOTE: An error situation can arise where the SPT sends multiple broadcast requests each with identical sequence numbers. Some of these may overlap with broadcast responses from the TMF. There is potential for confusion in the SPT which has to decide to which request the response is intended given that more than one outstanding request with an identical sequence number exist. This can be alleviated by the SPT supporting a queue into which all outstanding requests are placed pending their acknowledgement. Then a response can be matched against the entry which has been in the queue the longest.

13.4 Status request procedure

The status request procedure enables the SPT to ask the TMF for the status information of a specific EUT subscribed to the teleaction application service operated by that SPT. To request the status information of a specific EUT, the SPT shall send a REPORT message to the TMF containing:

- a Report type information element coded as "Status report request";
- a DLCI information element coded as the DLCI of the EUT.

The TMF on receiving this message, shall:

- perform a lookup to determine the last EUT's status information stored;
- send a REPORT message to the SPT containing a Report type information element coded as "Status report response", a DLCI information element coded as the DLCI of the EUT and a Diagnostic information element coded as "EUT not subscribed" if the EUT has not subscribed to the SPT, "Status information not available" if no status information is available for that EUT or no status information is obtained by the lookup (see note).

NOTE: A TMF may have no status information available for an EUT if the EUT has never sent an alarm report, or if a loopback procedure has not yet occurred. This would typically occur when an EUT is first connected to the network and prior to the first polling routine.

13.5 Forward compatibility procedures

For forward compatibility reasons and because of national specific messages that may be defined, ISDN Frame Handlers and also subscriber frame handlers (e.g. contained in NT2 or PTN) should relay maintenance frames, as described in subclause 7.1, containing messages not described in the present document.

For the same reasons, LAPD termination entities, which are not able to process the content of received maintenance frames, should discard them.

14 Parameter values

The parameter values specified in ETS 300 402-1 [9] table 10 shall apply to any users accessing the service via the D channel. For users accessing the service via a permanent or semipermanent B channel over which Bd channel procedures operate, then the parameter values specified in ETS 300 099 [11] apply.

15 Dynamic description

Not required.

Annex A (informative): Signalling flows

The diagrams contained in this annex are meant to be illustrative and to complement the text in the main body of the present document. They do not address every possible scenario. The diagrams indicate an advancing time from top to bottom without any fixed scale. The following conventions are used:

s SAPI value

tei TEI value

dlci DLCI value

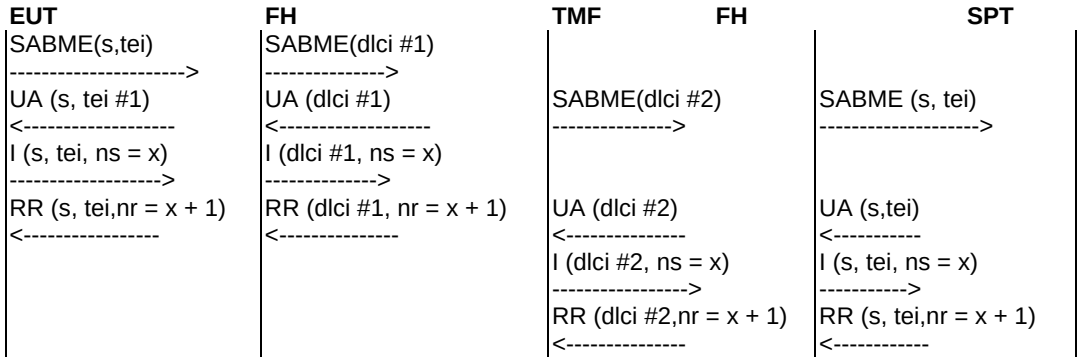


Figure A.1: Datalink establishment by EUT; SPT connected via D channel; no previous path from TMF to SPT established

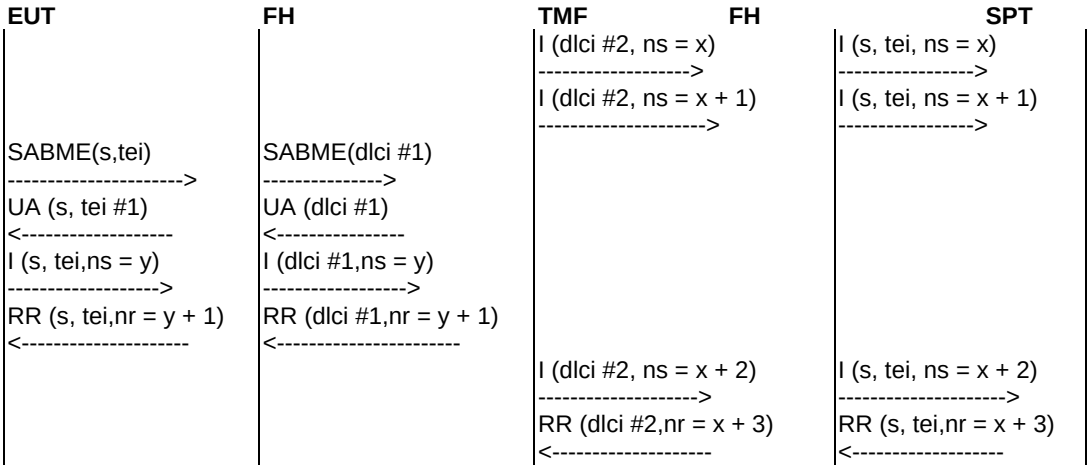
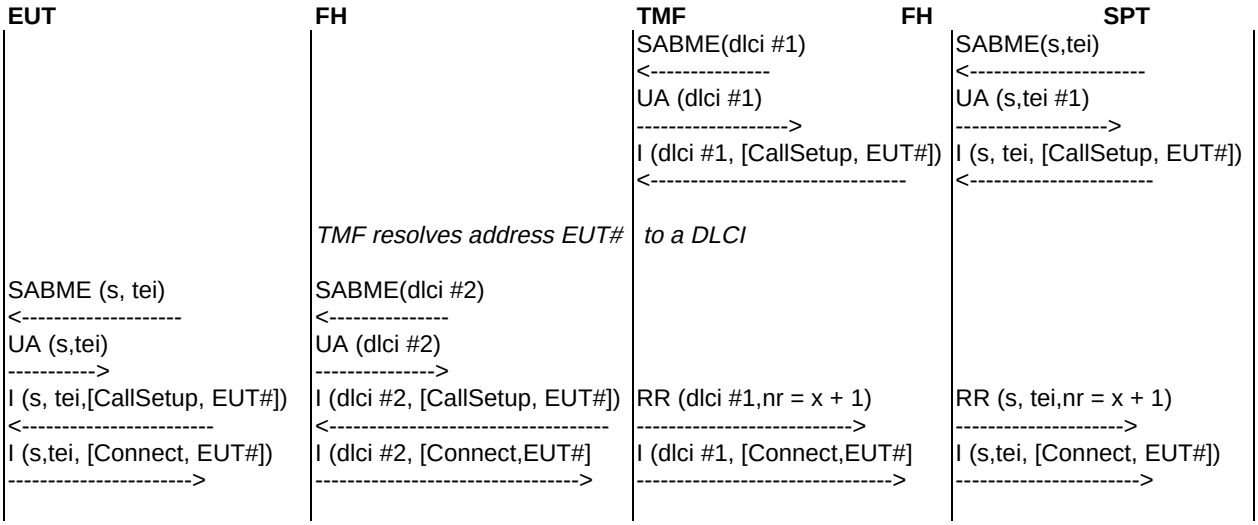


Figure A.2: Datalink establishment by EUT; SPT connected via D channel; previous path from TMF to SPT established



NOTE: The network layer protocol messages CallSetup, Connect are meant to be illustrative only and are not intended to reflect any particular layer 3 protocol.

Figure A.3: Datalink establishment by SPT; SPT connected via D channel; no previous path to TMF established; TMF implements network-layer protocol

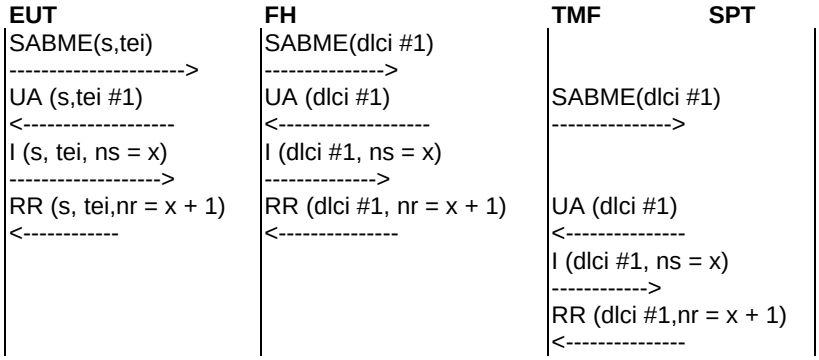


Figure A.4: Datalink establishment by EUT; SPT connected via Bd channel; no previous path from TMF to SPT established; TMF performs frame switching

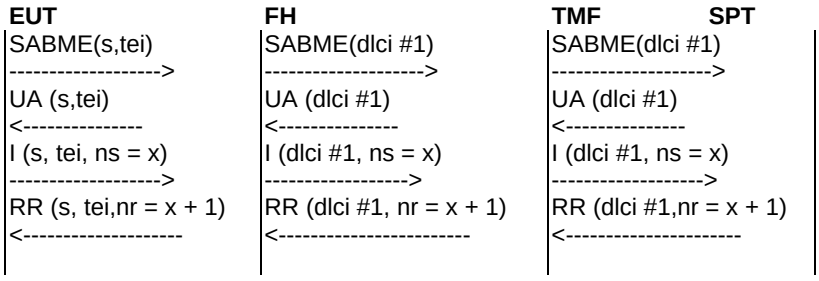
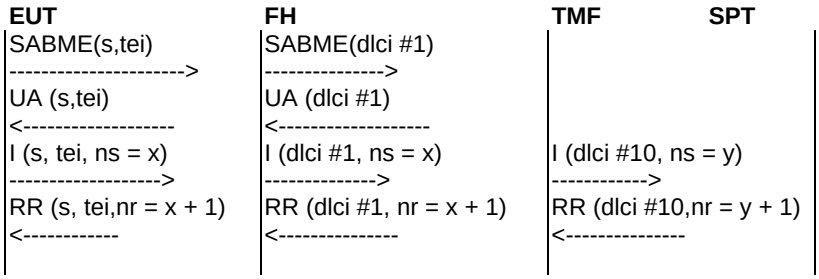
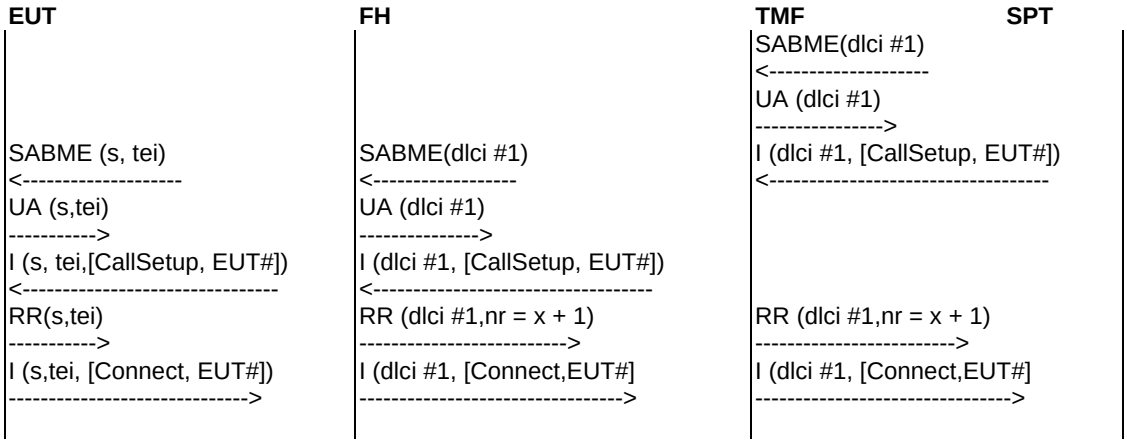


Figure A.5: Datalink establishment by EUT; SPT connected via Bd channel; no previous path from TMF to SPT established; TMF performs frame relaying



NOTE: dlci = 10 is the value of dlci on the established datalink.

Figure A.6: Datalink establishment by EUT; SPT connected via Bd channel; previous path from TMF to SPT established and used for all communication; TMF performs frame relaying



NOTE: The network layer protocol messages CallSetup, Connect are meant to be illustrative only and are not intended to reflect any particular layer 3 protocol.

Figure A.7: Datalink establishment by SPT; SPT connected via Bd channel; no previous path to TMF established; TMF does not implement network-layer protocol

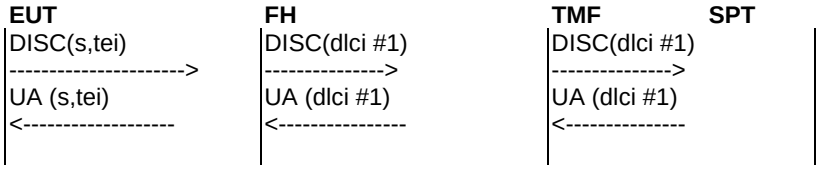


Figure A.8: Datalink disconnection by EUT; SPT connected via Bd channel; TMF performs frame relaying

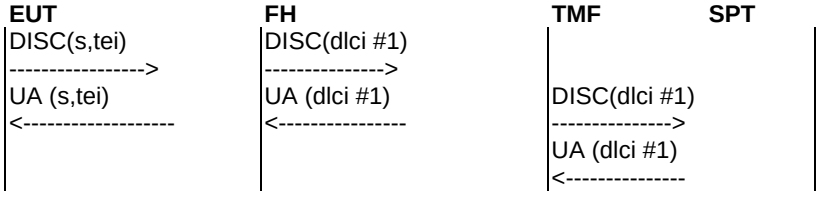


Figure A.9: Datalink disconnection by EUT; SPT connected via Bd channel; TMF performs frame switching

Annex B (informative): Functional capabilities and information flows for an FRF

B.1 Introduction and scope

This annex is provided for information and guidance purposes to assist the reader in understanding the essential network functionality i.e. frame routing, needed to implement the teleaction bearer service described in the main text. It identifies the functional capabilities and information flows required by an FRF to support the teleaction bearer service. In addition, possible locations in the network where such a function may reside are identified. Where the possibility exists to integrate the FRF with other functions used to realize the teleaction bearer service e.g. TMF, or to realize the ISDN D channel PMBS, then these are noted at appropriate places in the text.

B.2 Description

The FRF does not by itself support any service, but acts as an agent to realize a routing capability, which may be used by other services e.g. teleaction, PMBS. The FRF may be centrally located in a network, or may be distributed within each local, public or private, exchange. When centralized, the FRF may be used to concentrate traffic from multiple network sources towards a lesser number of destinations (either other network entities or service providers).

The FRF holds information which is statically provisioned at subscription time, and which generates a one-to-one association between a subscriber DLCI and a communication path to a service provider. This path will always pass through a TMF. In some cases e.g. direct connection of SPT to FRF, it may be necessary for the FRF to alter the received EUT DLCI value before passing it to the SPT, to ensure that DLCI values on the local FRF-SPT interface are unique.

The FRF may support multiple paths to an SPT for reliability and diversity reasons. In this case, load sharing over the paths may operate. The existence and operation of such load sharing mechanisms is outside the scope of the present document.

The FRF may implement a frame relaying or frame switching technique. The difference between these techniques is described in ITU-T Recommendation I.233 [14].

Additional functions such as traffic policing, accounting, etc. are outside the scope of the present document.

B.3 Derivation of the functional model

The full functional model for the teleaction bearer service would be an end-to-end representation of all the functions involved in a teleaction "call". The functional model in figure B.1 is a basis for representing the functional entities and information flows for the FRF. It does include the access portion of the full model i.e. the portion from the user's Teleaction Call Control Agent (CCAT) to the call control agent in the serving local, public or private, exchange. However, as this access portion is identical in functionality to that for the PMBS service, it is not described further. The information flows between FE1 and FE2 and between FE4 and FE2 are implemented over 64 Kbit/s channels established on a permanent basis. The information flows between FE2 and FE3 are implemented over channels established on either a permanent or demand basis.

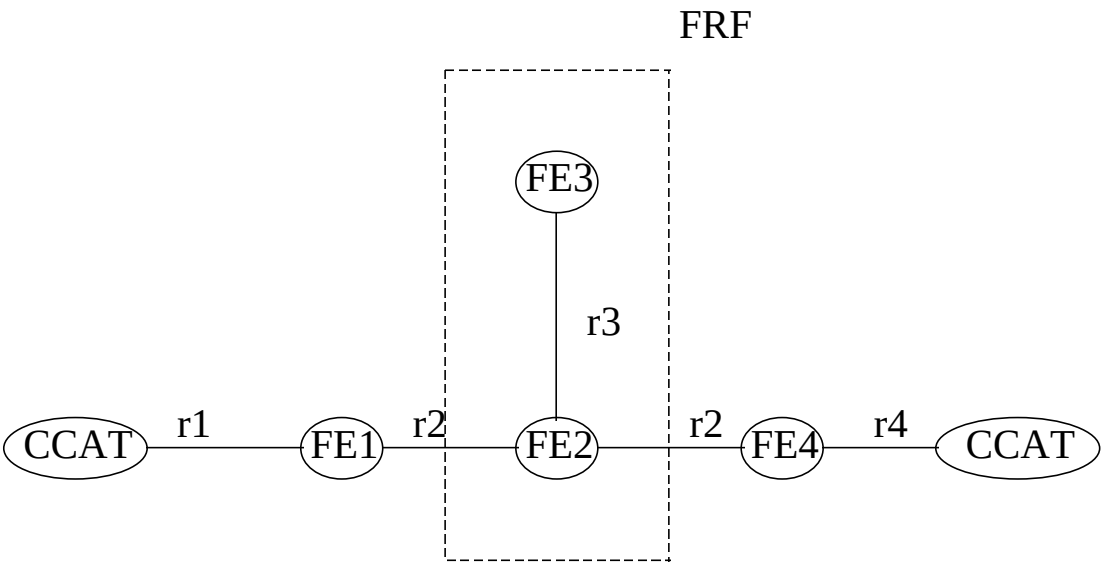


Figure B.1: Functional model for FRF

The FRF corresponds to the combination of FE2 and FE3.

Where a SPT is directly connected to an FRF, then the CCAT and FE4 entities reside within the one physical entity.

B.3.1 Description of the functional entities

B.3.1.1 Description of the Connection Related Functional entity (CRF)

FE1 and FE4 represent the originating and terminating CRFs, which:

- establish, maintain and release packet mode bearer connections, upon request (from the EU or from the SP);
- associate and relate the CCAT entities involved in a particular call and/or service;
- manage the relationship between the CCAT entities involved in a teleaction call.

The CRF incorporates the Frame Handler (FH) function described in ETS 300 099 [11].

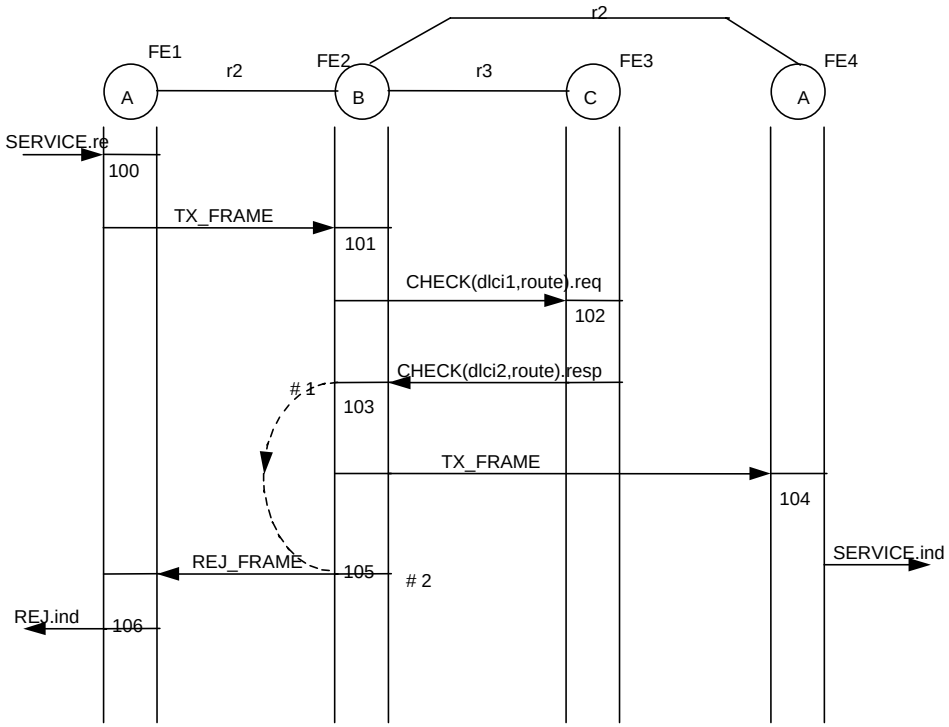
B.3.1.2 Description of the Basic Routing Functional (BRF) entity

FE2 represents the BRF which enables the routing of frames between CRFs (and/or between CRF and PH). The routing is performed on the basis of a label (DLCI) contained in each frame received. The DLCI is referred to a DF which provides an appropriate route reference number to enable final routing. The BRF does not maintain the association between the DLCI and a route. The BRF maintains a table whose entries consist of references to the physical connections existing in the physical implementation of the BRF.

B.3.1.3 Description of the Database Functional (DF) entity

FE3 represents the DF whose function is to maintain the relationship between a received DLCI in an incoming frame, and a reference to the corresponding entry in the BRF table, representing the physical connection to the CRF of the destination user.

B.4 Information flows



NOTE: #1 and #2 represent options whose selection is dependent on the contents of the CHECKS.resp.flow.

Figure B.2: Information flows

NOTE 1: As the FRF performs the same function i.e. frame routing, irrespective of the state of the associated "call" (establishment, data transfer or release) between users of the teleaction bearer service, only a single flow is necessary to illustrate its function.

NOTE 2: The information flow is based at the data-link layer level. Network layer protocols are not shown as these are network, and application, dependent. It is possible for CCITT Recommendation X.25 [5] to be used as the network layer protocol, and for the FRF to be used as an intermediate network entity in the realization of the PMBS service. In this case, one of the physical routes from the FRF terminates on a PH, and the necessary information flows are contained in ITU-T Recommendation Q.72 [15].

NOTE 3: The information flow is symmetrical between EU and SP when layer 2 based routing is used in the network.

B.4.1 Contents of TX_FRAME

Standard LAPD-E frame format, with DLCI corresponding to the service requesting user in the Address field.

B.4.2 Contents of CHECK.req

DLCI of received frame.

Incoming route reference number.

B.4.3 Contents of CHECK.resp

DLCI to be used on selected outgoing route.

Routing table entry reference number.

NOTE: The DLCI in the CHECK.resp may be identical to the DLCI in CHECK.req.

B.4.4 Contents of REJ_FRAME

Standard LAPD-E frame format, with DLCI corresponding to the service requesting user in the Address field.

B.5 Functional entity actions

Functional entity - FE1

Reference number: 100

Process service request:

- receive request from user for service;
- construct DLCI and add to frame;
- select Bd channel;
- send frame to FRF.

Functional entity - FE2

Reference number: 101

Database lookup initiate:

- receive frame from FE1;
- buffer received frame;
- copy DLCI from received frame;
- issue database query request containing received DLCI value.

Functional entity - FE3

Reference number: 102

Database response initiate:

- receive lookup query from FE2;
- search database using received DLCI;
- determine outgoing route (Bd channel) reference number and new DLCI value;
- return new DLCI and route reference number.

Functional entity - FE2

Reference number: 103

Database response received:

- receive database query response from FE3;
- using route reference number contained in the response, transmit the frame currently held in the buffer, with the DLCI contained in the response, on the route identified by the route reference number;
- clear the buffer entry.

NOTE 1: Where the SP is directly connected to the FRF then the DLCI returned in the lookup will be the same as that contained in the lookup request. When the SP is connected by D channel, then the DLCI returned, is the DLCI of the SPT.

Reference number: 105

Database response received:

- receive database query response from FE3;
- on detecting a null route reference number in the response, transmit a frame rejection using the DLCI currently held in the buffer, on the route over which the frame containing that DLCI was received;
- clear the buffer entry.

NOTE 2: This action should only occur at datalink establishment.

Functional entity - FE4

Reference number: 104

Receive service request:

- receive frame from FE2;
- map DLCI to a local SAPI and TEI;
- pass frame to user.

NOTE 3: Where FE4 is permanently connected to FE2 i.e. direct connection of an SPT to the FRF, then it is not necessary for the reverse translation of DLCI to SAPI/TEI to be performed, as this has no relevance in this instance.

Functional entity FE1

Reference number: 106

Service rejection received:

- receive reject frame from FE2;
- map DLCI to a local SAPI and TEI;
- pass reject frame to user.

B.6 SDL diagrams

Not required.

B.7 Network physical location scenarios

The following allocation of functional entities to physical network location is possible.

NOTE: As the service is symmetrical when layer 2 based routing is being used within the network, FE4 and FE1 are interchangeable. The table identifies the case where it has been assumed that the EU is connected to FE1 and the SP to FE4.

Table B.1: Functional entity possible locations

Scenario	FE1	FE2	FE3	FE4
Centralized FRF	LE/NT2	TR	TR	LE/SP
Integrated FRF	LE/NT2	LE	LE	LE/SP
Private FRF	LE/NT2	NT2	NT2	LE/SP
IN-based database function	LE/NT2	TR (SSP)	IN (SDP)	LE/SP

Legend: LE: Local exchange.
TR: Transit exchange.
SP: Service Provider.
NT2: Network Termination type 2 e.g. a private network.
IN: Intelligent network.
NOTE: Due to the simplicity of the database lookup between FE2 and FE3, co-location of these FEs leads to simpler implementations. The IN based solution is included in the table only for completeness.

History

Document history				
V1.1.1	February 1998	Public Enquiry	PE 9824:	1998-02-13 to 1998-06-12
V1.1.3	January 1999	Vote	V 9910:	1999-01-05 to 1999-03-05
V1.1.4	March 1999	Publication		

ISBN 2-7437-2944-9
Dépôt légal : Mars 1999