

TECHNICAL REPORT

SUBJECT/TASK (title)

ELCOM-90 Presentation protocol specification

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RESULT (summary)

This document is one of a series of technical reports which form the complete ELCOM-90 documentation. This is version .03 of the report with minor changes regarding responsible people and references. Future updates and new versions will NOT be published for this reason. New versions will only be submitted when technical changes are made.

Please see SINTEF's homepage at: http://www.sintef.no/ELCOM-90. From here you can download the latest version of all relevant documents as pdf-files for free.

In the current version of ELCOM the presentation services is mapped directly to the network layer and transport layer. This document defines the mapping between presentation services and the network/transport services.

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1 INTRODUCTION

This document defines the mapping between presentation services and the network/transport service.

ELCOM presentation protocol is a part of this mapping. The protocol is then mapped on

- the network layer
- the transport layer

Fig. 1.1 shows a model of the mapping. The services assumed from the network/transport layers are described in this document.

Some of the OSI layers (e.g. session) will be empty.

The use of the session layer is for further study.

The mapping in this document is an interim solution until a suitable presentation protocol is available.



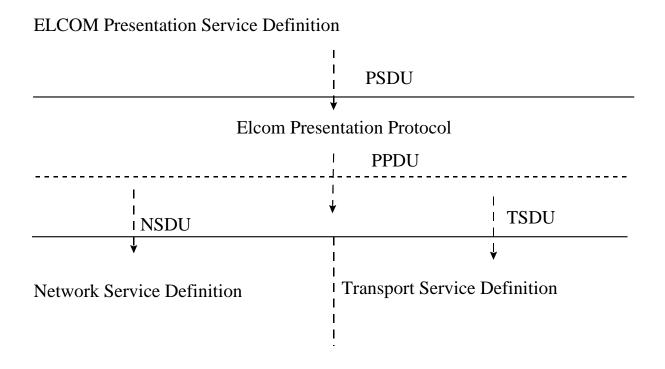


Figure 1.1 Model of the mapping

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2 SCOPE AND FIELD OF APPLICATION

This document defines in detail the mapping between the presentation layer and

- the network layer
- the transport layer

The protocol defined shall be used as the presentation protocol in distributed process control systems.



3 ASSOCIATED DOCUMENTS

3.1 ELCOM-83 documents

- [1]: TR 3522: **ELCOM-83 Application Service Definition**Norwegian Electric Power Research Institute, Trondheim, Norway, 1988-07-05
- [2]: TR 3528: **ELCOM-83 Application Protocol Definition**Norwegian Electric Power Research Institute, Trondheim, Norway, 1988-07-14
- [3]: TR 3523: **ELCOM-83 Definition of Local Application Interface**Norwegian Electric Power Research Institute, Trondheim, Norway, 1988-07-05
- [4]: TR 3524: **ELCOM-83 Presentation Service Definition**Norwegian Electric Power Research Institute, Trondheim, Norway, 1988-07-06
- [5]: TR 3527: **ELCOM-83 Presentation Protocol Definition**Norwegian Electric Power Research Institute, Trondheim, Norway, 1988-07-13
- [6]: TR 3532: **ELCOM-83 Definition of Local Presentation Interface**Norwegian Electric Power Research Institute, Trondheim, Norway, 1988-09-12
- [7]: TR 3649: **ELCOM-83 Conventions**Norwegian Electric Power Research Institute, Trondheim, Norway, 1989-12-20
 ISBN 82-594-0086-3

3.2 ELCOM-90 documentation

This document is one of a series of technical reports which form the complete ELCOM-90 documentation. Below you will find the numbers and titles for all the associated technical reports. New versions may be submitted when technical changes are made. Please see SINTEF's homepage at: http://www.sintef.no//ELCOM-90. From here you can download the latest version of all relevant documents as pdf-files for free.

- [8]: TR 3701: ELCOM-90 Application Programming Interface Specification
- [9]: TR 3702: ELCOM-90 Application Service Element. Service Definition
- [10]: TR 3703: ELCOM-90 Application Service Element. Protocol Specification
- [11]: TR 3704: ELCOM-90 Presentation Programming Interface Specification
- [12]: TR 3705: ELCOM-90 Presentation Service Definition
- [13]: TR 3706: ELCOM-90 Presentation Protocol Specification
- [14]: TR 3825: ELCOM-90 User Element Conventions



- [15]: TR A3933: **ELCOM-90 Local Conventions**
- [16] TR A4687: PONG. The ELCOM net-watch procedure for TCP/IP networks
- [17] TR A4124: ELCOM-90 Application Service Element, User's manual.
- [18] TR A6196: Securing ELCOM-90 with TLS.

3.3 Other References

[19] ISO 7498 - 2: Information Processing Systems - Open Systems Interconnection

Security Architecture

- [20] ITU-T X.509 (1988) The Directory Authentication framework
- [21] ISO-TR 8509: Service Conventions
- [22] ISO-7498-1: ISO Basic Reference Model
- [23] ISO-8348: Network Service Definition



4 DEFINITIONS AND ABBREVIATIONS

4.1 Definitions

This document is based on the concepts defined in the reference model [20].

For the purpose of this document, the following definitions also apply:

PPM - Presentation Protocol Machine defining the presentation protocol (mapping).

4.2 Abbreviations

EOD End of Data

EONSDU End of Network Service Data Unit

EOPSDU End of Presentation Service Data Unit

EOTSDU End of Transport Service Data Unit

IP Internet Protocol

NC Network Connection

NIDU Network Interface Data Unit

NSDU Network Service Data Unit

PDU Protocol Data Unit

PDU-ID Protocol Data Unit Identification

PHD Presentation Header

PIDU Presentation Interface Data Unit

PPDU Presentation Protocol Data Unit

PPM Presentation Protocol Machine

PS Presentation Service

PSDU Presentation Service Data Unit

PVC Permanent Virtual Circuit

TC Transport Connection



TCP Transmission Control Protocol

TIDU Transport Interface Data Unit

TSDU Transport Service Data Unit

VC Virtual Cal



5 OVERVIEW OF THE PRESENTATION PROTOCOL

5.1 Services Provided by the Presentation Layer

The protocol specified in this report supports the presentation service defined in [12].

Information is transferred to and from the PS-user in the presentation service primitives listed in table 5.1.

Table 5.1 Presentation service primitives.

Prefix of Name of Service Primitives	Name of Service	Type of Service
Presentation-connection Es	tablishment Facility	
P-Connect	Connection Establishment	Confirmed
Presentation-connection Termination Facility		
P-Release	Connection Release	Confirmed
P-P-Abort	Provider Initiated Abort	Non-confirmed
Information Transfer Facility		
P-Data	Send Information	Non-confirmed

The presentation protocol defines two types of PPDUs:

- Control PDUs
- Data PDUs

The Control PDUs are:

- Connect Request PDU
- Connect Response PDU
- Release Request PDU
- Release Response PDU

The Data PDU is:

- Data Request PDU



The table below defines the relationship between the PPDUs and the presentation service primitives:

Table 5.2. Relationship between the PPDUs and the Presentation Service primitives.

Service	Primitive	Associated PPDUs
Presentation Connection	P-CONNECT Request P-CONNECT Indication P-CONNECT Response P-CONNECT Confirmation	Connect Request PDU Connect Request PDU Connect Response PDU Connect Response PDU
Normal Data Transfer	P-DATA Request P-DATA Indication	Data Request PDU Data Request PDU
Orderly Release	P-RELEASE Request P-RELEASE Indication P-RELEASE Response P-RELEASE Confirmation	Release Request PDU Release Request PDU Release Response PDU Release Response PDU
P-Abort	P-P-ABORT Indication	None (error from the lower layer or presentation protocol error).

A PSDU shall be transferred as one Data Request PDU. A PSDU may be presented to the presentation layer as one or more PIDUs.



5.2 Service Assumed from the Lower Layers

5.2.1 Service Assumed from the Network Layer

The information is transferred to and from the network service provider with the network service primitives listed in table 5.3.

Table 5.3 Network service primitives.

Prefix of Name of Service Primitives	Name of Service	Type of Service
" ====================================	====================================	====================================
Network-connection Establ	lishment Facility	
N-CONNECT	Connection Establishment	Confirmed
Network-connection Release	se Facility	
N-DISCONNECT	Connection Release and Provider initiated Abort	Non-confirmed/ Provider-init.
Information Transfer Facility		
N-DATA	Data Transfer	Non-confirmed
Network Reset Facility		
N-RESET	Connection Reset	Confirmed
Administration of Incoming Network-Connections		
N-START-LISTEN	Start listen for an N-CONNECT indication	Local
N-STOP-LISTEN	Stop listen for an N-CONNECT indication	Local

The use of PVC is not supported in ELCOM-90.

For detailed description consult [21].



5.2.2 Services Assumed from the Transport Layer

The information is exchanged between the presentation layer and the transport layer with the transport service primitives listed in table 5.4.

Table 5.4. Transport Service Primitives.

Prefix of Name of Service Primitives	Name of Service	Type of Service
Transport-connection Estab	olishment Facility	
T-CONNECT	Connection Establishment	Confirmed
Transport-connection Relea	ase Facility	
T-DISCONNECT	Connection Release and Provider Initiated Abort	Non-confirmed/ Provider-init.
Information Transfer Facility		
T-DATA	Data Transfer	Non-confirmed
Administration for Incomin	g Transport-connections	
T-START-LISTEN	Start listen for a T-CONNECT indication	Local
T-STOP-LISTEN	Stop listen for a T-CONNECT indication	Local

5.3 Functions Provided by the Protocol

The presentation protocol defines mapping between PSDUs and NSDUs, or between PSDUs and TSDUs.

The functions in the present ELCOM presentation layer are those necessary to bridge the gap between the services available from the network/transport layer and those required by the PS-users.



5.4 Model of the Layer

The PPM describes the mapping between the PS-user and the network or transport layer. There is one PPM for the mapping with the network layer, and one PPM for the mapping with the transport layer.

The behaviour of each PPM is described by decision tables. The horizontal dimension of each table is the set of all the states.

The vertical dimension of each table is the set of all relevant events. For each event there is an entry, i.e. a row.

Each valid intersection contains:

- One or more conditions (where relevant);
- One or more actions (where relevant);
- The new state (when different from the existing one).

A presentation entity may receive the following events:

- Request or Response service primitives from the PS-user(s).
- Indication or Confirm service primitives from the lower layer (network or transport layer).
- Presentation PDUs received as user data from the lower layer.
- Timer expirations or local event indications.

A presentation entity may take the following actions:

- Issue Indication or Confirm service primitives to the PS-user.
- Issue Request or Response service primitives to the lower layer.
- Send presentation PDUs as user data to the lower layer.
- Start timer supervision.

The relation between events and actions is described with time sequence diagrams later in this document.

The new state is the state which is entered after the specified action is completed.



5.5 Event and Action Categories

5.5.1 Event and Categories

The events are grouped in four different categories:

- Request events.
 (Request service primitives from a PS-user. These primitives may have local or global significance).
- Incoming events.
 (Indication service primitives from the lower layer).
- Response events.
 (Response service primitives from a PS-user).
- Local events.
 (Events generated by the PPM).

5.5.2 Action Categories

The actions are grouped in three different categories:

- PPM generated events to the PS-user. (Indication or Confirm service primitives)
- PPM generated events to the lower layer. (Request and Response service primitives)
- -Activation of timers.



6 PROTOCOL MECHANISMS - MAPPED ON THE NETWORK LAYER

6.1 Events and Actions

6.1.1 Events

Code	Description
	Request events (global significance)
P-EV1	P-Connect request
P-EV2	P-Release request
P-EV3	P-Data request
	Request events (local significance)
P-EV23	P-Init
P-EV24	P-Attach
P-EV25	P-Detach
	<u>Incoming events</u>
P-EV4	N-CONNECT indication
P-EV5	N-CONNECT confirmation
P-EV6	N-DISCONNECT indication
P-EV8	N-RESET indication
P-EV9	N-RESET confirmation
P-EV10	Data, Connect indication (transferred by N-DATA)
P-EV11	Data, Connect confirmation (" ")
P-EV12	Data, Release indication (" ")
P-EV13	Data, Release confirmation (" ")
P-EV14	Data, Data indication (" ")
	Response events
P-EV15	P-Connect response
P-EV16	P-Release response



6.1.2 Actions

Code	Description
	PPM generated events to the PS-user
P-EV17 P-EV18 P-EV19 P-EV20 P-EV21 P-EV22	P-Connect indication P-Connect confirm P-Release indication P-Release confirm P-P-Abort indication P-Data indication

Code	Description
	PPM generated events to the network layer
P-OP1	N-CONNECT request
P-OP2	N-CONNECT response
P-OP3	N-DISCONNECT request
P-OP5	N-RESET request
P-OP6	N-RESET response
P-OP7	Data, Connect request (transferred by N-DATA)
P-OP8	Data, Connect response (" ")
P-OP9	Data, Release request (" ")
P-OP10	Data, Release response (" ")
P-OP11	Data, Data request (" ")



6.1.3 Local Events

Code	Description
Timeout	Local events Timer expirations in the states:
	STA3 STA4 STA5 STA6 STA7 STA8 STA9

6.2 Conditions

Condition	Meaning
LISTEN	= TRUE: only incoming calls = FALSE: only outgoing calls
DETACHED	= TRUE: P-Detach received
EOPSDU	End of Presentation Service Data Unit indicator
COLLISION	P-Release initiated from both sides



6.3 PPM States

Code	Description
	Main States
STA1	Idle
STA2	Ready for connect
STA3	Establishing lower level
STA4	Establishing on request
STA5	Wait for higher level establishing
STA6	Establishing on indication
STA7	Disestablishing on request
STA8	Disestablishing on indication
STA9	Wait for lower level disestablishment
STA10	Connected
	Substates
EV15-P	P-Connect response pending (STA2)
EV16-P	P-Release response pending (STA2)



6.4 State Diagrams

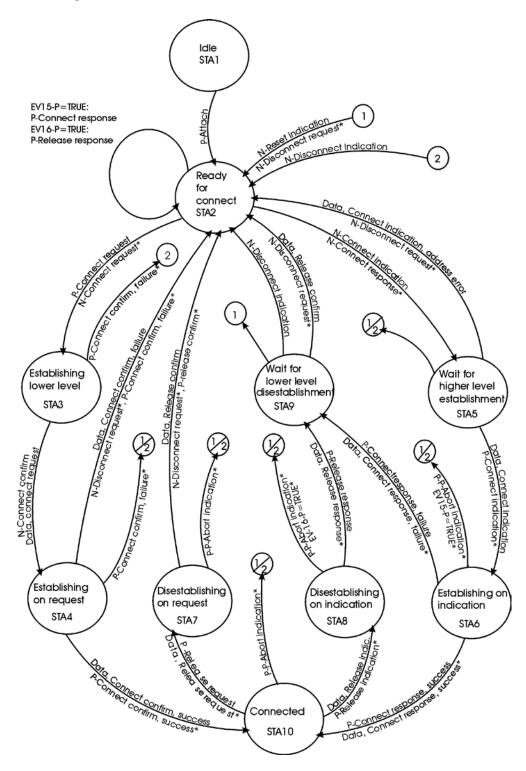


Figure 6.1. State diagram for NC-based connection.

- Note 1: Each transition is labelled with the triggering event. Generated events are marked with an asterisk.
- Note 2: P-Detach is shown in separate diagrams.
- Note 3: Data transfer within state 10 is shown in a separate diagram.



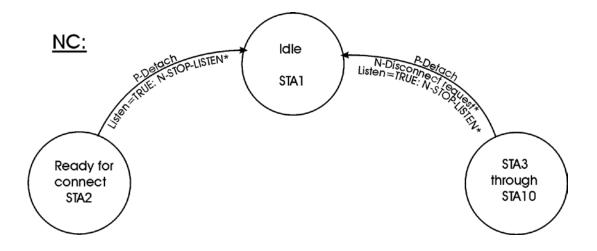


Figure 6.2. State diagram for P-Detach.

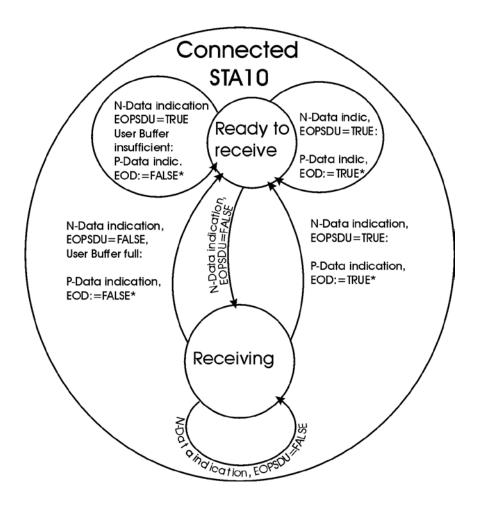


Figure 6.3. State Diagram for incoming data.



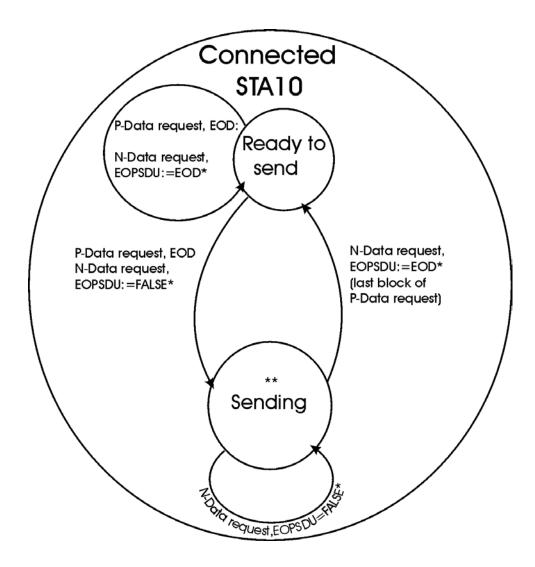


Figure 6.4. State Diagram for outgoing Data.

**) Internal artificial state.

This state is only entered when the contents of the user buffer has to be sent as a sequence of more than one block.



6.5 Use of Permanent Virtual Circuits (PVC)

The use of PVC is not supported in ELCOM-90



6.6 Time Sequence Diagrams

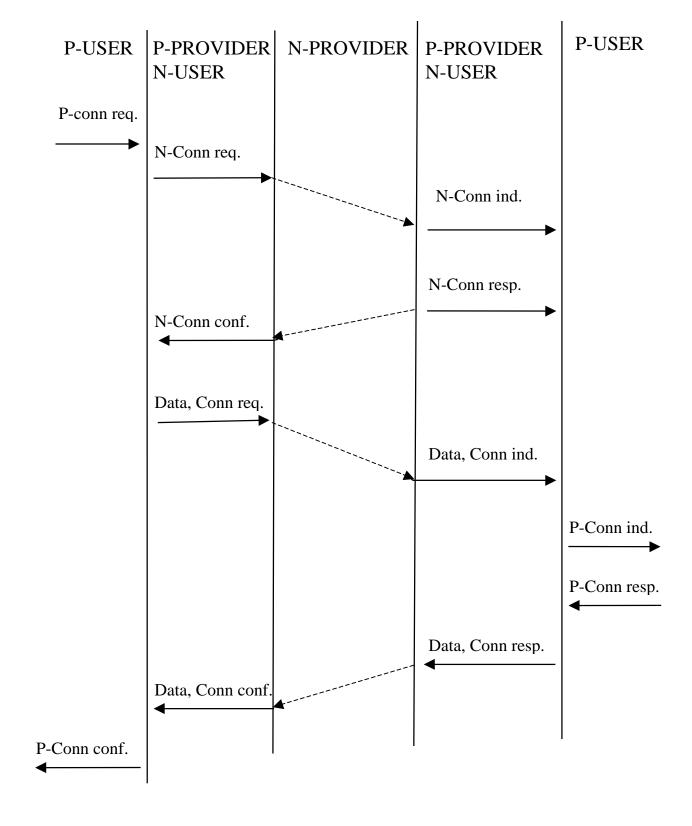


Figure 6.5. Time-sequence diagram for normal establishment.



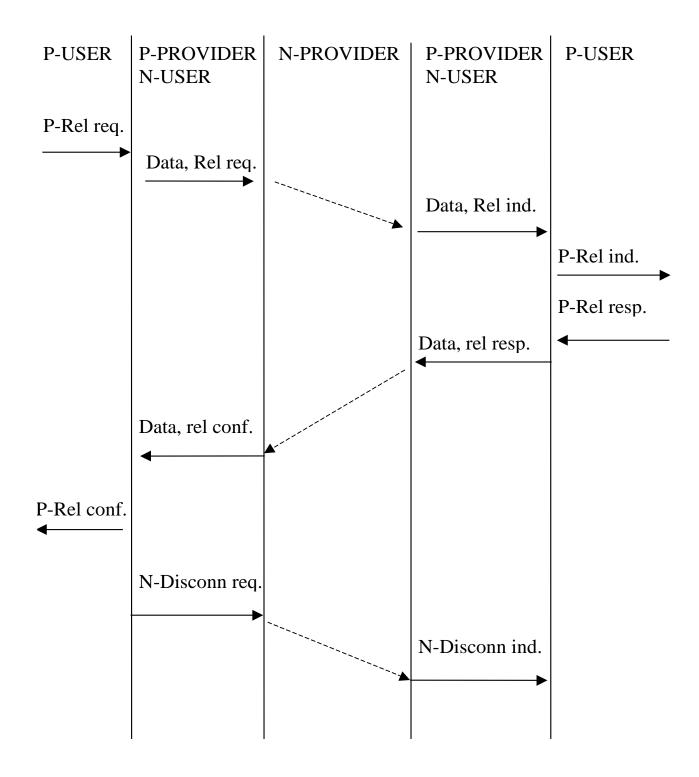


Figure 6.6. Time-sequence for normal termination.



7 DECISION TABLES – MAPPED ON THE NETWORK LAYER

The following general action is not shown in the tables:

The PPM input queue for actual connection shall be purged each time a connection is broken or reset.

7.1 Normal Initialisation

STATE	Undefined (Entity not initialised)	STA1 Idle
EVENT	(Entity not initialised)	Tule
P-EV23 P-Init	Initialise entity. STA1	Initialise entity.
1 Time	(Concerns all connections)	(Concerns all connections)
P-EV24	Illegal use	Attach service user
P-Attach		to access point. STA2
P-EV25	Illegal use	Ignore (OK)
P-Detach		
Any other event	Illegal use	Illegal use



7.2 Initialisation Forcing Disconnection

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV23	Initialise entity	Initialise entity	Initialise entity	Initialise entity
P-Init	STA1*	STA1*	STA1*	STA1*
P-EV24	Illegal	Illegal	Illegal	Illegal
P-Attach	use	use	use	use
P-EV25	Detach user	Detach user	Detach user	Detach user
P-Detach	from access	from access	from access	from access
	point	point	point	point
	STA1	P-OP3	P-OP3	P-OP3
		N-DIS-	N-DIS-	N-DIS-
		CONNECT	CONNECT	CONNECT
		request	request	request
		STA1	STA1	STA1

^{*)} Concerns all connections

CTATE	C/T/A/C	C/T/A/7	CTLAO	CTL 4.0*
STATE	STA6	STA7	STA8	STA9 [*]
	Establishing on	Disestablishing	Disestablishing	Wait for lower
	indication	on request	on indication	level disestab-
EVENT				lishment
P-EV23	Initialise entity	Initialise entity	Initialise entity	Initialise entity
P-Init	STA1*	STA1*	STA1*	STA1*
P-EV24	Illegal	Illegal	Illegal	Illegal
P-Attach	use	use	use	use
P-EV25	Detach user	Detach user	Detach user	Detach user from
P-Detach	from access	from access	from access	access point
	point	point	point	P-OP3
	P-OP3	P-OP3	P-OP3	N-DIS-
	N-DIS-	N-DIS-	N-DIS-	CONNECT
	CONNECT	CONNECT	CONNECT	request
	request	request	request	STA1
	STA1	STA1	STA1	

^{*)} Concerns all connections



STATE	STA10
	Connected
EVENT	
P-EV23	Initialise entity
P-Init	STA1*
P-EV24	Illegal
P-Attach	use
P-EV25	Detach user from access point
P-Detach	P-OP3
	N-DIS-
	CONNECT
	request
	STA1

*) Concerns all connections



7.3 Requested Establishment on NC

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing on	Wait for higher
	connect	lower level	request	level
EVENT			1	establishment
P-EV1	LISTEN=	Illegal use	Illegal use	Illegal use
P-Connect	FALSE:	_	_	_
request	P-OP1			
_	N-CONNECT			
	request			
	STA3			
	LISTEN=			
	TRUE:			
	Illegal use			
P-EV5	P-OP3	P-OP7	P-EV18	P-OP3
N-CONNECT	N-DIS-	Data,	P-Connect	N-DIS-
confirm	CONNECT	Connect	confirm,	CONNECT
	request	request	Result:=9	request
	STA2	STA4	P-OP3	STA2
	Local		N-DIS-	Local
	inconsistency		CONNECT	inconsistency
			request	
			STA2	
			Local	
			inconsistency	



STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV11	P-OP3	P-EV18	SUCCESS:	P-OP3
Data,	N-DIS-	P-Connect	P-EV18	N-DIS-
Connect	CONNECT	confirm,	P-Connect	CONNECT
confirm	request	Result:=9	confirm,	request
(success/	STA2	P-OP3	success	STA2
failure)	Local	N-DIS-	STA10	
	inconsistency	CONNECT	FAILURE:	
		request	P-OP3	
		STA2	N-DIS-	
		Local	CONNECT	
		inconsistency	request	
			P-EV18	
			P-Connect	
			confirm,	
			failure	
			STA2	

STATE	STA6	STA7	STA8	STA9
	Establishing on	Disestablishing	Disestablishing	Wait for lower
	indication	on request	on indication	level
EVENT				disestablishment
P-EV1	Illegal use	Illegal use	Illegal use	Temporarily
P-Connect				unavailable
request				(try again)
P-EV5	P-EV21	P-EV21	P-EV21	P-OP3
N-CONNECT	P-P-Abort	P-P-Abort	P-P-Abort	N-DIS-
confirm	indication,	indication,	indication,	CONNECT
	Reason:=9	Reason:=9	Reason:=9	request
	P-OP3	P-OP3	P-OP3	STA2
	N-DIS-	N-DIS-	N-DIS-	Local
	CONNECT	CONNECT	CONNECT	inconsistency
	request	request	request	
	EV15-P:=	STA2	EV16-P:=	
	TRUE	Local	TRUE	
	STA2	inconsistency	STA2	
	Local		Local	
	inconsistency		inconsistency	



Disestablishing on request	Disestablishing on indication	Wait for lower level
on request	on indication	level
		10 (01
		disestablishment
P-EV21	P-EV21	P-OP3
P-P-Abort	P-P-Abort	N-DIS-
ndication,	indication,	CONNECT
Reason:=10	Reason:=10	request
P-OP3	P-OP3	STA2
N-DIS-	N-DIS-	
CONNECT	CONNECT	
equest	request	
STA2	EV16-P:=	
	TRUE	
	STA2	
n	P-Abort dication, eason:=10 OP3 -DIS- ONNECT quest	P-Abort dication, indication, eason:=10 P-OP3 P-OP3 P-OPS N-DIS-ONNECT CONNECT request EV16-P:= TRUE

ir .	
STATE	STA10
	Connected
EVENT	
P-EV1	Illegal use
P-Connect	
request	
P-EV5	P-EV21
N-CONNECT	P-P-Abort
confirm	indication,
	Reason:=9
	P-OP3
	N-DIS-
	CONNECT
	request
	STA2
	Local
	inconsistency



STATE	STA10
	Connected
EVENT	
P-EV11	P-EV21
Data,	P-P-Abort
Connect	indication,
confirm	Reason:=10
(success/	P-OP3
failure)	N-DIS-
	CONNECT
	request
	STA2



7.4 Incoming Establishment on NC

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT			1	establishment
P-EV4	LISTEN=	P-EV18	P-EV18	P-OP3
N-CONNECT	TRUE:	P-Connect	P-Connect	N-DIS-
indication	P-OP2	confirm,	confirm,	CONNECT
	N-CONNECT	Result:=9	Result:=9	request
	response	P-OP3	P-OP3	STA2
	STA5	N-DIS-	N-DIS-	Local
	LISTEN=	CONNECT	CONNECT	inconsistency
	FALSE:	request	request	
	P-OP3	STA2	STA2	
	N-DIS	Local	Local	
	CONNECT	inconsistency	inconsistency	
	request			
	STA2			
	Local			
	inconsistency			**)
D EVIIO	D 0D2	D FILLS	D EVIIO	, ,
P-EV10	P-OP3	P-EV18	P-EV18	Addr. ok:
Data,	N-DIS-	P-Connect	P-Connect	P-EV17
Connect	CONNECT	confirm,	confirm,	P-Connect
indication	request	Result:=9	Result:=10	indication
	STA2	P-OP3	P-OP3	STA6
	Local	N-DIS-	N-DIS-	, , , , , , , , , , , , , , , , , , ,
	inconsistency	CONNECT	CONNECT	Addr. err.:
		request	request	N-
		STA2	STA2	DISCONNECT
		Local		request
		inconsistency		STA2

^{**)} The lower level address part of the calling PSAP-address is compared with the calling DTE number in the N-CONNECT indication. The implementation of this check is optional.



STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV15	EV15-P=	Illegal use	Illegal use	Illegal use
P-Connect	TRUE:			
response	Ignore			
(success/	EV15-P=			
failure)	FALSE:			
	Illegal use			

STATE	STA6	STA7	STA8	STA9
	Establishing on	Disestablishing	Disestablishing	Wait for lower
	indication	on request	on indication	level
EVENT				disestablishment
P-EV4	P-EV21	P-EV21	P-EV21	P-OP3
N-CONNECT	P-P-Abort	P-P-Abort	P-P-Abort	N-DIS-
indication	indication,	indication,	indication,	CONNECT
	Reason:=9	Reason:=9	Reason:=9	request
	P-OP3	P-OP3	P-OP3	STA2
	N-DIS-	N-DIS-	N-DIS-	Local
	CONNECT	CONNECT	CONNECT	inconsistency
	request	request	request	
	EV15-P:=	STA2	EV16-P:=	
	TRUE	Local	TRUE	
	STA2	inconsistency	STA2	
	Local		Local	
	inconsistency		inconsistency	
P-EV10	P-EV21	P-EV21	P-EV21	P-OP3
Data,	P-P-Abort	P-P-Abort	P-P-Abort	N-DIS-
Connect	indication,	indication,	indication,	CONNECT
indication	Reason:=10	Reason:=10	Reason:=10	request
	P-OP3	P-OP3	P-OP3	STA2
	N-DIS-	N-DIS-	N-DIS-	
	CONNECT	CONNECT	CONNECT	
	request	request	request	
	EV15-P:=	STA2	EV16-P:=	
	TRUE		TRUE	
	STA2		STA2	



STATE	STA6	STA7	STA8	STA9
	Establishing on	Disestablishing	Disestablishing	Wait for lower
	indication	on request	on indication	level
EVENT				disestablishment
P-EV15	P-OP8	Illegal use	Illegal use	Illegal use
P-Connect	Data,			
response	Connect			
(success/	response			
failure)	SUCCESS:			
	STA10			
	FAILURE:			
	STA9			

STATE	STA10
	Connected
EVENT	
P-EV4	P-EV21
N-CONNECT	P-P-Abort
indication	indication,
	Reason:=9
	P-OP3
	N-DIS-
	CONNECT
	request
	STA2
	Local
	inconsistency
P-EV10	P-EV21
Data,	P-P-Abort
Connect	indication,
indication	Reason:=10
	P-OP3
	N-DIS-
	CONNECT
	request
	STA2



STATE	STA10 Connected
EVENT	
P-EV15	Illegal use
P-Connect	
response	
(success/	
failure)	



7.5 Requested Release on NC

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing on	Wait for higher
	connect	lower level	request	level
EVENT				establishment
P-EV2	Illegal use	Illegal use	Illegal use	Illegal use
P-Release				
request				
P-EV13	P-OP3	P-EV18	P-EV18	P-OP3
Data,	N-DIS-	P-Connect	P-Connect	N-DIS-
Release	CONNECT	confirm,	confirm,	CONNECT
confirm	request	Result:=9	Result:=10	request
	STA2	P-OP3	P-OP3	STA2
	Local	N-DIS-	N-DIS-	
	inconsistency	CONNECT	CONNECT	
		request	request	
		STA2	STA2	
		Local		
		inconsistency		

STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for higher
	on indication	on request	on indication	level
EVENT				disestablishment
P-EV2	Illegal use	Illegal use	P-Release	Illegal use
P-Release			indication	
request			received	
P-EV13	P-EV21	P-EV20	P-EV21	P-OP3
Data,	P-P-Abort	P-Release	P-P-Abort	N-DIS-
Release	indication,	confirm,	indication,	CONNECT
confirm	Reason:=10	P-OP3	Reason:=10	request
	P-OP3	N-DIS-	P-OP3	STA2
	N-DIS-	CONNECT	N-DIS-	
	CONNECT	request	CONNECT	
	request	STA2	request	
	EV15-P:=		EV16-P:=	
	TRUE		TRUE	
	STA2		STA2	



STATE	STA10
	Connected
EVENT	
P-EV2	P-OP9
P-Release	Data,
request	Release
	request
	STA7
P-EV13	P-EV21
Data,	P-P-Abort
Release	indication,
confirm	Reason:=10
	P-OP3
	N-DIS-
	CONNECT
	request
	STA2



7.6 Indicated Release on NC

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing on	Wait for higher
	connect	lower level	request	level
EVENT				establishment
P-EV12	P-OP3	P-EV18	P-EV18	P-OP10
Data,	N-DIS-	P-Connect	P-Connect	Data,
Release	CONNECT	confirm,	confirm,	Release
indication	request	Result:=9	Result:=10	response,
	STA2	P-OP3	P-OP3	Result:=0
	Local	N-DIS-	N-DIS-	STA9
	inconsistency	CONNECT	CONNECT	
		request	request	
		STA2	STA2	
		Local	Local	
		inconsistency	inconsistency	
P-EV16	EV16-P=	Illegal use	Illegal use	Illegal use
P-Release	TRUE:			
response	Ignore			
	EV16-P=			
	FALSE:			
	Illegal use			

STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for lower
	on indication	on request	on indication	level disestab-
EVENT				lishment
P-EV12	P-EV21	P-OP10	P-EV21	P-OP3
Data,	P-P-Abort	Data,	P-P-Abort	N-DIS-
Release	indication,	Release	indication,	CONNECT
indication	Reason:=10	response,	Reason:=10	request
	P-OP3	Result:=12	P-OP3	STA2
	N-DIS-	COLLISION:=	N-DIS-	
	CONNECT	TRUE	CONNECT	
	EV15-P:=	STA7	request	
	TRUE		EV16-P:=	
	STA2		TRUE	
			STA2	
P-EV16	Illegal use	Illegal use	P-OP10	Illegal use
P-Release			Data,	
response			Release	
			response,	
			STA9	



STATE	STA10
	Connected
EVENT	
P-EV12	P-EV19
Data,	P-Release
Release	indication
indication	STA8
P-EV16	Illegal use
P-Release	
response	



7.7 Disconnection of NC

		T	I	~
STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing on	Wait for higher
	connect	lower level	request	level
				establishment
EVENT				
P-EV6	STA2	P-EV18	P-EV18	STA2
N-DIS-	Local	P-Connect	P-Connect	
CONNECT	inconsistency	confirm,	confirm,	
indication		Result:=	Result:=	
		30-Remote	30-Remote	
		party clears	party clears	
		31-Number	32-Out of	
		busy	order	
		32-Out of	33-Network	
		order	congestion	
		33-Network	34-Other	
		congestion	STA2	
		34-Other		
		STA2		



STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for lower
	on indication	on request	on indication	level disestab-
EVENT		_		lishment
P-EV6	P-EV21	COLLISION:=	P-EV21	STA2
N-DIS-	P-P-Abort	TRUE:	P-P-Abort	
CONNECT	indication,	P-EV20	indication,	
indication	Reason:=	P-Release	Reason:=	
	10-Misbe-	confirm	10-Misbe-	
	havior of	Result:=12	haviour of	
	remote part	STA2	remote	
	of provider	COLLISION=	part of	
	30-Remote	FALSE:	provider	
	party clears	P-EV21	30-Remote	
	32-Out of	P-P-Abort	party clears	
	order	indication,	32-Out of	
	33-Network	Reason:=	order	
	congestion	10-Misbe-	33-Network	
	34-Other	haviour of	congestion	
	EV15-P:=	remote	34-Other	
	TRUE	part of	EV16-P:=	
	STA2	provider	TRUE	
		30-Remote	STA2	
		party clears		
		32-Out of		
		order		
		33-Network		
		congestion		
		34-Other		
		STA2		

STATE	STA10
	Connected
EVENT	
P-EV6	P-EV21
N-DIS-	P-P-Abort
CONNECT	indication,
indication	Reason:=
	10-Misbehaviour of
	remote part
	of provider
	30-Remote party
	clears
	32-Out of order



7.8 Data

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing on	Wait for higher
	connect	lower level	request	level
EVENT				establishment
P-EV3	Illegal use	Illegal use	Illegal use	Illegal use
P-Data,				
request				
P-EV14	P-OP3	P-EV18	P-EV18	P-OP3
Data, Data	N-DIS-	P-Connect	P-Connect	N-DIS-
indication	CONNECT	confirm,	confirm,	CONNECT
	request	Result:=9	Result:=10	request
	Local	P-OP3	P-OP3	STA2
	inconsistency	N-DIS-	N-DIS-	
	STA2	CONNECT	CONNECT	
		request	request	
		Local	STA2	
		inconsistency		
		STA2		



STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for lower
	on indication	on request	on indication	level disestab-
EVENT				lishment
P-EV3	Illegal use	Illegal use	Illegal use	Illegal use
P-Data,				
Request				
P-EV14	P-EV21	Ignore	P-EV21	P-OP3
Data, Data	P-P-Abort	(STA7)	P-P-Abort	N-DIS-
indication	indication,		indication,	CONNECT
	Reason:=10		Reason:=10	request
	EV15-P:=		EV16-P:=	STA2
	TRUE		TRUE	
	P-OP3		P-OP3	
	N-DIS-		N-DIS-	
	CONNECT		CONNECT	
	request		request	
	STA2		STA2	

STATE	STA10
	Connected
EVENT	
P-EV3	P-OP11
P-Data,	Data, Data
request	request
	STA10
P-EV14	P-EV22
Data, Data	P-Data
indication	indication
	STA10



7.9 Timeout

The time limits specified are subject for future adjustments.

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing on	Wait for higher
	connect	lower level	request	level
EVENT				establishment
Timeout	No monitoring	T=180s:	T=60s:	T=60s:
		P-EV18	P-EV18	P-OP3
		P-Connect	P-Connect	N-DIS-
		confirm,	confirm,	CONNECT
		Result:=35	Result:=4	request
		P-OP3	P-OP3	STA2
		N-DIS-	N-DIS-	
		CONNECT	CONNECT	
		request	request	
		STA2	STA2	

STATE	STA6	STA7	STA8	STA9	
	Establishing	Disestablishing	Disestablishing	Wait for lower	
	on indication	on request	on indication	level disestab-	
EVENT				lishment	
Timeout	T=10s:	T=30s:	T=10s:	T=60s:	
	EV15-P:=	P-EV21	EV16-P:=	P-OP3	
	TRUE	P-P-Abort	TRUE	N-DIS-	
	P-EV21	indication,	P-EV21	CONNECT	
	P-P-Abort	Reason:=4	P-P-Abort	request	
	indication,	P-OP3	indication,	STA2	
	Reason:=7	N-DIS-	Reason:=7		
	P-OP8	CONNECT	P-OP10		
	Data,	request	Data,		
	Connect	STA2	Release		
	response,		response,		
	Result:=7		Result:=7		
	STA9		STA9		

	STATE	STA10 Connected
EVENT		
Timeout		No monitoring



7.10 Reset

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing on	Wait for higher
	connect	lower level	request	level
EVENT			-	establishment
P-EV8	P-OP3	P-EV18	P-EV18	P-OP3
N-RESET	N-DIS-	P-Connect	P-Connect	N-DIS-
indication	CONNECT	confirm,	confirm,	CONNECT
	request	Result:=9	Result:=10	request
	STA2	P-OP3	P-OP3	STA2
	Local	N-DIS-	N-DIS-	
	inconsistency	CONNECT	CONNECT	
		request	request	
		STA2	STA2	
		Local		
		inconsistency		
P-EV9	P-OP3	P-EV18	P-EV18	P-OP3
N-RESET	N-DIS-	P-Connect	P-Connect	N-DIS-
confirmation	CONNECT	confirm,	confirm,	CONNECT
	request	Result:=9	Result:=10	request
	STA2	P-OP3	P-OP3	STA2
	Local	N-DIS-	N-DIS-	
	inconsistency	CONNECT	CONNECT	
		request	request	
		STA2	STA2	
		Local		
		inconsistency		



C/D A /D/D	OTT A C	CITA 7	C/TLA O	C/TLA O	
STATE	STA6	STA7	STA8	STA9	
	Establishing	Disestablishing	Disestablishing	Wait for lower	
	on indication	on request	on indication	level disestab-	
EVENT				lishment	
P-EV8	P-EV21	P-EV21	P-EV21	P-OP3	
N-RESET	P-P-Abort	P-P-Abort	P-P-Abort	N-DIS-	
indication	indication,	indication,	indication,	CONNECT	
	Reason:=10	Reason:=10	Reason:=10	request	
	EV15-P:=	P-OP3	EV16-P:=	STA2	
	TRUE	N-DIS-	TRUE		
	P-OP3	CONNECT	P-OP3		
	N-DIS-	request	N-DIS-		
	CONNECT	STA2	CONNECT		
	request		request		
	STA2		STA2		
P-EV9	P-EV21	P-EV21	P-EV21	P-OP3	
N-RESET	P-P-Abort	P-P-Abort	P-P-Abort	N-DIS-	
confirmation	indication,	indication,	indication,	CONNECT	
	Reason:=10	Reason:=10	Reason:=10	request	
	EV15-P:=	P-OP3	EV16-P:=	STA2	
	TRUE	N-DIS-	TRUE		
	P-OP3	CONNECT	P-OP3		
	N-DIS-	request	N-DIS-		
	CONNECT	STA2	CONNECT		
	request		request		
	STA2		STA2		



STATE	STA10
	Connected
EVENT	
P-EV8	P-EV21
N-RESET	P-P-Abort
indication	indication,
	Reason:=10
	P-OP3
	N-DIS-CONNECT
	request
	STA2
P-EV9	P-EV21
N-RESET	P-P-Abort
confirmation	indication,
	Reason:=10
	P-OP3
	N-DIS-CONNECT
	request
	STA2



8 PROTOCOL MECHAMISMS -MAPPED ON THE TRANSPORT LAYER

8.1 Events and actions

8.1.1 Events

Code	Description
	Request events (global significance)
P-EV1	P-Connect request
P-EV2	P-Release request
P-EV3	P-Data request
	Request events (local significance)
P-EV23	P-Init
P-EV24	P-Attach
P-EV25	P-Detach
	Incoming events
P-EV4	T-CONNECT indication
P-EV5	T-CONNECT confirmation
P-EV6	T-DISCONNECT indication
P-EV10	Data, Connect indication (transferred by T-DATA)
P-EV11	Data, Connect confirmation (" ")
P-EV12	Data, Release indication (" ")
P-EV13	Data, Release confirmation (" ")
P-EV14	Data, Data indication (" ")
	Response events
P-EV15	P-Connect response
P-EV16	P-Release response



8.1.2 Actions

Code	Description
	PPM generated events to the PS-user
P-EV17 P-EV18 P-EV19 P-EV20 P-EV21 P-EV22	P-Connect indication P-Connect confirm P-Release indication P-Release confirm P-P-Abort indication P-Data indication

Code	Description						
	PPM generated events to the network layer						
P-OP1T	T-CONNECT request						
P-OP2T	T-CONNECT response						
P-OP3T	T-DISCONNECT request						
P-OP7	Data, Connect request	(trar	nsferred	by T-D	ATA)		
P-OP8	Data, Connect response	("	"	")		
P-OP9	Data, Release request (" ")						
P-OP10	Data, Release response (" ")						
P-OP11	Data, Data request	(**	"	")		



8.1.3 Local Events

Code	Description
	<u>Local events</u>
Timeout	Timer expirations in the states:
	STA3
	STA4
	STA5
	STA6
	STA7
	STA8
	STA9

8.2 Conditions

Condition	Meaning
TC	Transport connection
LISTEN	= TRUE: only incoming calls
	= FALSE: only outgoing calls
DETACHED	= TRUE: P-Detach received
EOPSDU	End of Presentation Service Data Unit indicator
COLLISION	P-Release initiated from both sides



8.3 PPM States

Code	Description	
	Main States	
STA1	Idle	
STA2	Ready for connect	
STA3	Establishing lower level	
STA4	Establishing on request	
STA5	Wait for higher level establishing	
STA6	Establishing on indication	
STA7	Disestablishing on request	
STA8	Disestablishing on indication	
STA9	Wait for lower level disestablishment	
STA10	Connected	
	Substates	
EV15-P	P-Connect response pending (STA2)	
EV16-P	P-Release response pending (STA2)	



8.4 State Diagrams

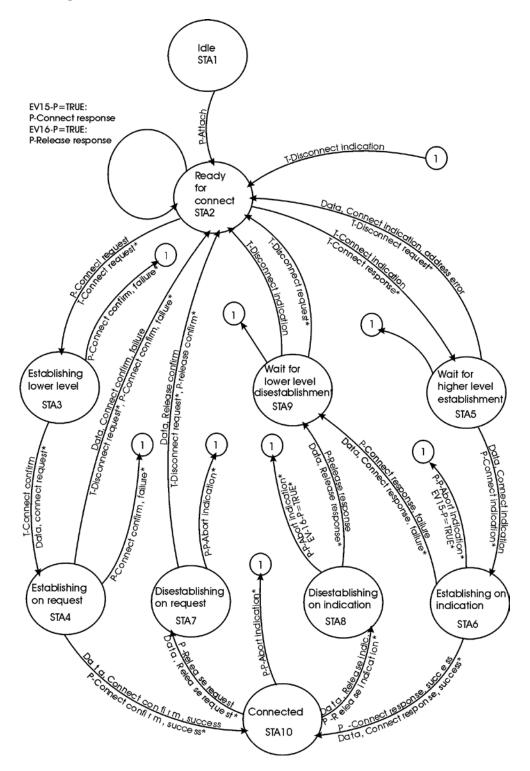


Figure 8.1. State diagram for TC-based presentation-connection.

- Note 1: Each transition is labelled with the triggering event.
- Generated events are marked with an asterisk. Note 2: P-Detach is shown in separate diagrams.
- Note 3: Data transfer within state 10 is shown in a separate diagram.



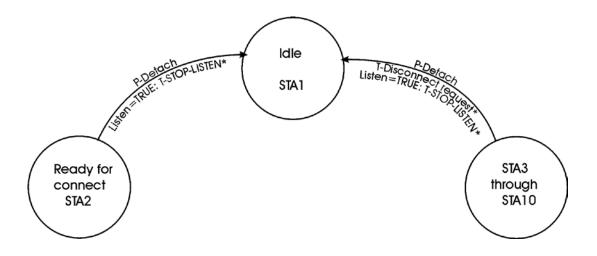


Figure 8.2. State diagram for P-Detach.

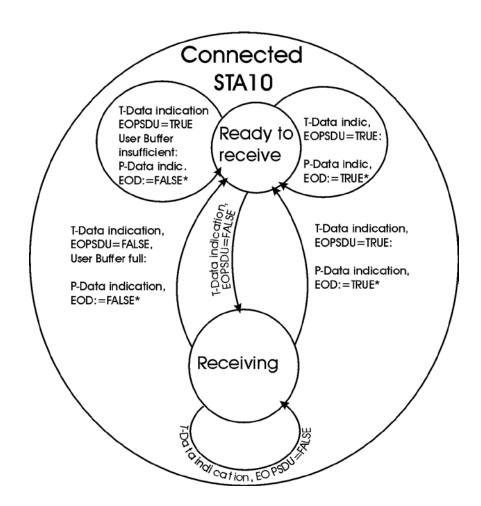


Figure 8.3. State Diagram for incoming data.



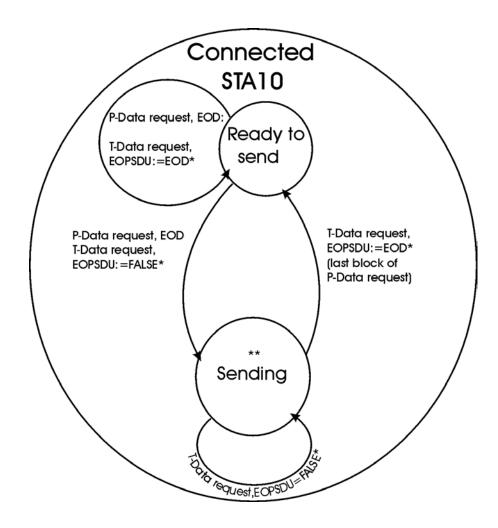


Figure 8.4. State Diagram for outgoing Data.

**) Internal artificial state.

This state is only entered when the contents of the user buffer has to be sent as a sequence of more than one block.



8.5 Time Sequence Diagrams

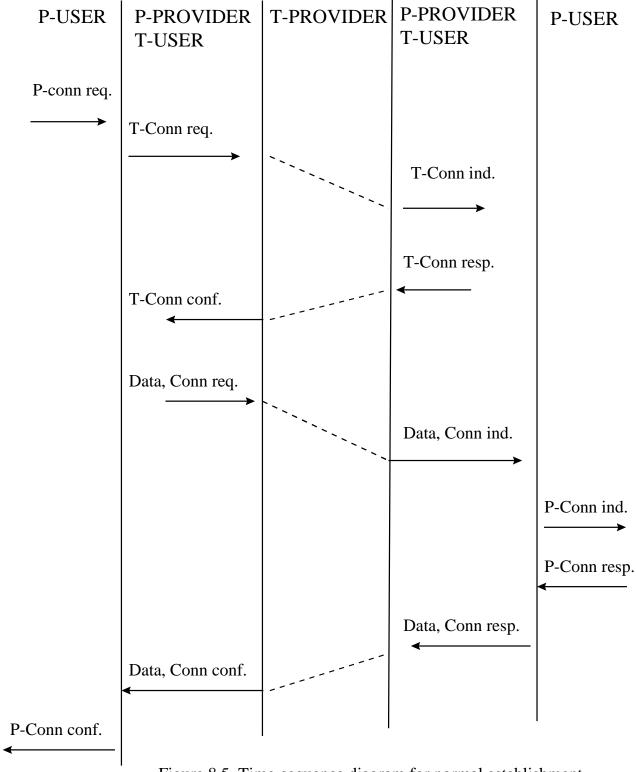


Figure 8.5. Time-sequence diagram for normal establishment.



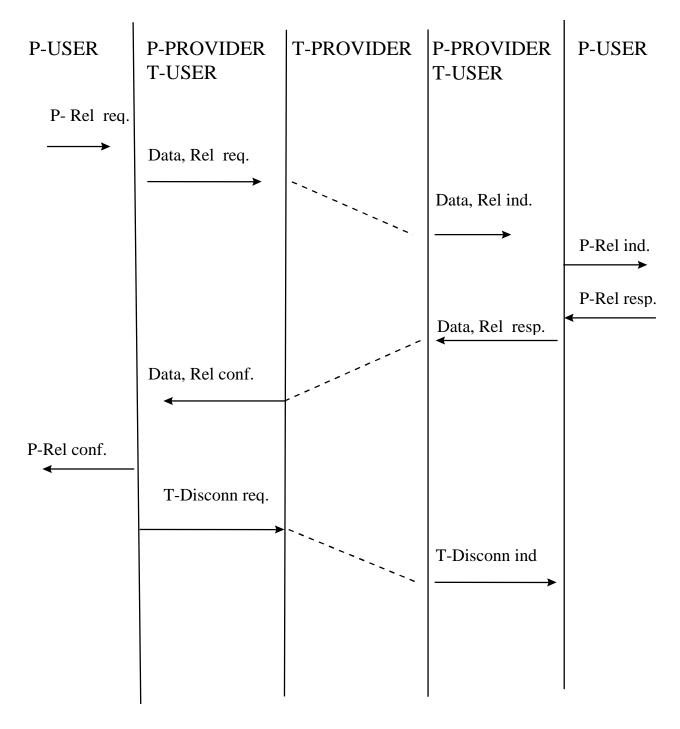


Figure 8.6. Time-sequence diagram for normal termination.



9 DECISION TABLES -MAPPED ON THE TRANSPORT LAYER

The following general action is not shown in the tables:

The PPM input queue for actual connection shall be purged each time a connection is broken or reset.

9.1 Normal Initialisation

STATE	Undefined	STA1
	(Entity not initialised)	Idle
EVENT		
P-EV23	Initialise entity.	Initialise entity.
P-Init	STA1*	STA1*
P-EV24	Illegal use	Attach service user
P-Attach		to access point.
		STA2
P-EV25	Illegal use	Ignore (OK)
P-Detach	-	
Any other event	Illegal use	Illegal use

^{*)} Concerns all connections



9.2 Initialisation Forcing Disconnection

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV23	Initialise entity	Initialise entity	Initialise entity	Initialise entity
P-Init	STA1*	STA1*	STA1*	STA1*
P-EV24	Illegal	Illegal	Illegal	Illegal
P-Attach	use	use	use	use
P-EV25	Detach user	Detach user	Detach user	Detach user
P-Detach	from access	from access	from access	from access
	point	point	point	point
	STA1			
		P-OP3T	P-OP3T	P-OP3T
		T-DIS	T-DIS	T-DIS
		CONNECT	CONNECT	CONNECT
		request	request	request
		STA1	STA1	STA1

^{*)} Concerns all connections.

STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for lower
	on indication	on request	on indication	level disestab-
EVENT				lishment
P-EV23	Initialise entity	Initialise entity	Initialise entity	Initialise entity
P-Init	STA1*	STA1*	STA1*	STA1*
P-EV24	Illegal	Illegal	Illegal	Illegal
P-Attach	use	use	use	use
P-EV25	Detach user	Detach user	Detach user	Detach user
P-Detach	from access	from access	from access	from access
	point	point	point	point
	P-OP3T	P-OP3T	P-OP3T	P-OP3T
	T-DIS	T-DIS	T-DIS	T-DIS
	CONNECT	CONNECT	CONNECT	CONNECT
	request	request	request	request
	STA1	STA1	STA1	STA1

^{*)} Concerns all connections.



	STATE	STA10
		Connected
EVENT		
P-EV23		Initialise entity
P-Init		STA1*
P-EV24		Illegal
P-Attach		use
P-EV25		Detach user from
P-Detach		access point
		P-OP3T T-DISCONNECT request STA1

^{*)} Concerns all connections.



9.3 Requested Establishment on TC

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV1	LISTEN=	Illegal use	Illegal use	Illegal use
P-Connect	FALSE:			
request	P-OP1T			
	TCONNECT			
	request			
	STA3			
	LISTEN=			
	TRUE:			
	Illegal use			
P-EV5T	P-OP3T	P-OP7	P-EV18	P-OP3T
T-CONNECT	T-DIS-	Data,	P-Connect	T-DIS-
confirm	CONNECT	connect	confirm,	CONNECT
	request	request	Result:=9	request
	STA2	STA4	P-OP3T	STA2
	Local		T-DIS-	Local
	inconsistency		CONNECT	inconsistency
			request	
			STA2	
			Local	
			inconsistency	



STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV11	P-OP3T	P-EV18	SUCCESS:	P-OP3T
Data,	T-DIS-	P-Connect	P-EV18	T-DIS-
Connect	CONNECT	confirm,	P-Connect	CONNECT
confirm	request	Result:=9	confirm,	request
(success/	STA2	P-OP3T	success	STA2
failure)	Local	T-DIS-	STA10	
	inconsistency	CONNECT	FAILURE:	
		request	P-OP3T	
		STA2	T-DIS-	
		Local	CONNECT	
		inconsistency	request	
			P-EV18	
			P-Connect	
			confirm,	
			failure	
			STA2	

STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for lower
	on indication	on request	on indication	level disestab-
EVENT				lishment
P-EV1	Illegal use	Illegal use	Illegal use	Temporarily
P-Connect				unavailable
request				(try again)
P-EV5T	P-EV21	P-EV21	P-EV21	P-OP3T
T-CONNECT	P-P-Abort	P-P-Abort	P-P-Abort	T-DIS-
confirm	indication,	indication,	indication,	CONNECT
	Reason:=9	Reason:=9	Reason:=9	request
	P-OP3T	P-OP3T	P-OP3T	STA2
	T-DIS-	T-DIS-	T-DIS-	Local
	CONNECT	CONNECT	CONNECT	inconsistency
	request	request	request	
	EV15-P:=	STA2	EV16-P:=	
	TRUE	Local	TRUE	
	STA2	inconsistency	STA2	
	Local		Local	
	inconsistency		inconsistency	



STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for lower
	on indication	on request	on indication	level disestab-
EVENT				lishment
P-EV11	P-EV21	P-EV21	P-EV21	P-OP3T
Data,	P-P-Abort	P-P-Abort	P-P-Abort	T-DIS-
Connect	indication,	indication,	indication,	CONNECT
confirm	Reason:=10	Reason:=10	Reason:=10	request
(success/	P-OP3T	P-OP3T	P-OP3T	STA2
failure)	T-DIS-	T-DIS-	T-DIS-	
	CONNECT	CONNECT	CONNECT	
	request	request	request	
	EV15-P:=	STA2	EV16-P:=	
	TRUE		TRUE	
	STA2		STA2	

STATE	STA10
	Connected
EVENT	
P-EV1	Illegal
P-Connect	use
request	
P-EV5T	P-EV21
T- CONNECT	P-P-Abort
confirm	indication,
	Reason:=9
	P-OP3T
	T-DISCONNECT
	request
	STA2
	Local
	inconsistency

	STATE	STA10
		Connected
EVENT		
P-EV11		P-EV21
Data,		P-P-Abort
Connect		indication,
confirm		Reason:=10
		P-OP3T
		T-DISCONNECT
		request
		STA2



9.4 Incoming Establishment on TC

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV4T	LISTEN=1	P-EV18	P-EV18	P-OP3T
T-Connect	TRUE:	P-Connect	P-Connect	T-DIS-
indication	P-OP2T	confirm,	confirm,	CONNECT
	T-CONNECT	Reason:=9	Reason:=9	request
	request	P-OP3T	P-OP3T	STA2
	STA5	T-DIS-	T-DIS-	Local
	LISTEN=	CONNECT	CONNECT	inconsistency
	FALSE:	request	request	
	P-OP3T	STA2	STA2	
	T-DIS-	Local	Local	
	CONNECT	inconsistency	inconsistency	
	request			
	STA2			
	Local			
	inconsistency			
P-EV10	P-OP3T	P-EV18	P-EV18	P-EV17
Data,	T-DIS-	P-Connect	P-Connect	P-Connect
Connect	CONNECT	confirm,	confirm,	indication
indication	request	Reason:=9	Result:=10	STA6
	STA2	P-OP3T	P-OP3T	
	Local	T-DIS-	T-DIS-	
	inconsistency	CONNECT	CONNECT	
		request	request	
		STA2	STA2	
		Local		
		inconsistency		

_

 $^{^{1}}$ If a particular instance has the substate EV15-P set it should not be eligible for incoming connections, as handshake between A and P will be incomplete.



STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV15	EV15-P=	Illegal use	Illegal use	Illegal use
P-Connect	TRUE:			
response	Ignore			
(success/	EV15-P=			
failure)	FALSE:			
	Illegal use			

COT A COT	OTT 4.6	CFD A F	CITE A O	CITE A O
STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for lower
	on indication	on request	on indication	level disestab-
EVENT				lishment
P-EV4T	P-EV21	P-EV21	P-EV21	P-OP3T
T-CONNECT	P-P-Abort	P-P-Abort	P-P-Abort	T-DIS-
indication	indication,	indication,	indication,	CONNECT
	Reason:=9	Reason:=9	Reason:=9	request
	P-OP3T	P-OP3T	P-OP3T	STA2
	T-DIS-	T-DIS-	T-DIS-	Local
	CONNECT	CONNECT	CONNECT	inconsistency
	request	request	request	
	EV15-P:=	STA2	EV16-P:=	
	TRUE	Local	TRUE	
	STA2	inconsistency	STA2	
	Local		Local	
	inconsistency		inconsistency	
P-EV10	P-EV21	P-EV21	P-EV21	P-OP3T
Data,	P-P-Abort	P-P-Abort	P-P-Abort	T-DIS-
Connect	indication,	indication,	indication,	CONNECT
indication	Reason:=10	Reason:=10	Reason:=10	request
	P-OP3T	P-OP3T	P-OP3T	STA2
	T-DIS-	T-DIS-	T-DIS-	
	CONNECT	CONNECT	CONNECT	
	request	request	request	
	EV15-P:=	STA2	EV16-P:=	
	TRUE		TRUE	
	STA2		STA2	



STA6	STA7	STA8	STA9
Establishing	Disestablishing	Disestablishing	Wait for lower
on indication	on request	on indication	level disestab-
			lishment
P-OP8	Illegal use	Illegal use	Illegal use
Data,			
Connect			
response			
SUCCESS:			
STA10			
FAILURE:			
STA9			
	Establishing on indication P-OP8 Data, Connect response SUCCESS: STA10 FAILURE:	Establishing on indication P-OP8 Data, Connect response SUCCESS: STA10 FAILURE: Disestablishing on request Illegal use	Establishing on indication P-OP8 Data, Connect response SUCCESS: STA10 FAILURE: Disestablishing on indication Disestablishing on indication Illegal use Illegal use Figure 5. The property of the prope

CTLA TELE	CTLA 10
STATE	STA10
	Connected
EVENT	
P-EV4T	P-EV21
T-CONNECT	P-P-Abort
indication	indication,
	Reason:=9
	P-OP3T
	T-DISCONNECT
	request
	STA2
	Local inconsistency
P-EV10	P-EV21
Data,	P-P-Abort
Connect	indication,
indication	Reason:=10
	P-OP3T
	T-DISCONNECT
	request
	STA2

	STATE	STA10
		Connected
EVENT		
P-EV15		Illegal use
P-Connect		
response		
(success/		
failure)		



9.5 Requested Release on TC

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV2	Illegal use	Illegal use	Illegal use	Illegal use
P-Release				
request				
P-EV13	P-OP3T	P-EV18	P-EV18	P-OP3T
Data,	T-DIS-	P-Connect	P-Connect	T-DIS-
Release	CONNECT	confirm,	confirm,	CONNECT
confirm	request	Result:=9	Result:=10	request
	STA2	P-OP3T	P-OP3T	STA2
	Local	T-DIS-	T-DIS-	
	inconsistency	CONNECT	CONNECT	
		request	request	
		STA2	STA2	
		Local		
		inconsistency		

STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for lower
	on indication	on request	on indication	level disestab-
EVENT				lishment
P-EV2	Illegal use	Illegal use	P-Release	Illegal use
P-Release			indication	
request			received	
P-EV13	P-EV21	P-EV20	P-EV21	P-OP3T
Data,	P-P-Abort	P-Release	P-P-Abort	T-DIS-
Release	indication,	confirm,	indication,	CONNECT
confirm	Reason:=10	P-OP3T	Reason:=10	request
	P-OP3T	T-DIS-	P-OP3T	STA2
	T-DIS-	CONNECT	T-DIS-	
	CONNECT	request	CONNECT	
	request	STA2	request	
	EV15-P:=		EV16-P:=	
	TRUE		TRUE	
	STA2		STA2	



	STATE	STA10
	~	Connected
EVENT		
P-EV2		P-OP9
P-Release		Data,
request		Release
		request
		STA7
P-EV13		P-EV21
Data,		P-P-Abort
Release		indication,
confirm		Reason:=10
		P-OP3T
		T-DISCONNECT
		request
		STA2



9.6 Indicated Release on TC

		1	T	T
STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV12	P-OP3T	P-EV18	P-EV18	P-OP10
Data,	T-DIS-	P-Connect	P-Connect	Data,
Release	CONNECT	confirm,	confirm,	Release
indication	request	Result:=9	Result:=10	response,
	STA2	P-OP3T	P-OP3T	Result:=10
	Local	T-DIS-	T-DIS-	STA9
	inconsistency	CONNECT	CONNECT	
		request	request	
		STA2	STA2	
		Local	Local	
		inconsistency	inconsistency	
P-EV16	EV16-P=	Illegal use	Illegal use	Illegal use
P-Release	TRUE:			
response	Ignore			
	EV16-P=			
	FALSE:			
	Illegal use			



STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for lower
	on indication	on request	on indication	level disestab-
EVENT		_		lishment
P-EV12	P-EV21	P-OP10	P-EV21	P-OP3T
Data,	P-P-Abort	Data,	P-P-Abort	T-DIS-
Release	indication,	Release	indication,	CONNECT
indication	Reason:=10	response,	Reason:=10	request
	P-OP3T	Result:=12	P-OP3T	STA2
	T-DIS-	COLLISION:=	T-DIS-	
	CONNECT	TRUE	CONNECT	
	request	STA7	request	
	EV15-P:=		EV16-P:=	
	TRUE		TRUE	
	STA2		STA2	
D DV4.6	711 1	711 1	D 0D10	711 1
P-EV16	Illegal use	Illegal use	P-OP10	Illegal use
P-Release			Data,	
response			Release	
			response,	
			Result:=0	
			STA9	

	STA10 Connected
EVENT	
P-EV12 Data Release indication	P-EV19 P-Release indication STA8
P-EV16 Data, Release response	Illegal use



9.7 Disconnection of TC

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV6T	STA2	P-EV18	P-EV18	STA2
T-DIS-	Local	P-Connect	P-Connect	
CONNECT	inconsistency	confirm,	confirm,	
indication		Result:=	Result:=	
		41-47 *)	41-45 *)	
		STA2	STA2	

*) Result:

- 41 Disconnected by the network layer.
- 42 Disconnected by the remote transport entity.
- 43 Disconnected by the local transport entity.
- 44 Remote transport entity congestion.
- 45 Protocol error.
- 46 Transport connection reference error.
- 47 Connect negotiation failed.



STATE	STA6	STA7	STA8	STA9
	Establishing on	Disestablishing	Disestablishing	Wait for lower
	indication	1 1		level disestab-
EVENT				lishment
P-EV6T	P-EV21	COLLISION:=	P-EV21	STA2
T-DIS-	P-P-Abort	TRUE:	P-P-Abort	
CONNECT	indication,	P-EV20	indication,	
indication	Reason:=	P-release	Reason:=	
		confirm,		
	10, 41-45 *)	Result:=12	10, 41-45 *)	
		STA2		
	EV15-P:=	COLLISION=	EV16-P:=	
	TRUE	FALSE:	TRUE	
	STA2	P-EV21	STA2	
		P-P-Abort		
		indication,		
		Reason:=		
		10 41 45 4		
		10, 41-45 *)		
		STA2		
		SIAZ		
			<u> </u>	

*) Reason:

- 10 Misbehaviour of remote part of provider.
- 41 Disconnected by the network layer.
- 42 Disconnected by the remote transport entity.
- 43 Disconnected by the local transport entity.
- 44 Remote transport entity congestion.
- 45 Protocol error.



	STATE	STA10
		Connected
EVENT		
P-EV6T		P-EV21
T-DIS-		P-P-Abort
CONNECT		indication,
indication		Reason:=
		10, 41-45 *)
		STA2

*) Reason:

- 10 Misbehaviour of remote part of provider.
- 41 Disconnected by the network layer.
- 42 Disconnected by the remote transport entity.
- 43 Disconnected by the local transport entity.
- 44 Remote transport entity congestion.
- 45 Protocol error.



9.8 Data

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
P-EV3	Illegal use	Illegal use	Illegal use	Illegal use
P-Data				
request				
P-EV14	P-OP3T	P-EV18	P-EV18	P-OP3T
Data, Data	T-DIS-	P-Connect	P-Connect	T-DIS-
indication	CONNECT	confirm,	confirm,	CONNECT
	request	Result:=9	Result:=10	request
	Local	P-OP3T		STA2
	inconsistency	T-DIS-	P-OP3T	
	STA2	CONNECT	T-DIS-	
		request	CONNECT	
		Local	request	
		inconsistency	STA2	
		STA2		

STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for lower
	on indication	on request	on indication	level disestab-
EVENT				lishment
P-EV3	Illegal use	Illegal use	Illegal use	Illegal use
P-Data,				
request				
P-EV14	P-EV21	Ignore	P-EV21	P-OP3T
Data, Data	P-P-Abort	(STA7)	P-P-Abort	T-DIS-
indication	indication,		indication,	CONNECT
	Reason:=10		Reason:=10	request
	EV15-P:=		EV16-P:=	STA2
	TRUE:		TRUE:	
	P-OP3T		P-OP3T	
	T-DIS		T-DIS	
	CONNECT		CONNECT	
	request		request	
	STA2		STA2	



	STATE	STA10
		Connected
EVENT		
P-EV3		P-OP11
P-Data		Data, Data
request		request
		STA10
P-EV14		P-EV22
Data, Data		P-Data
indication		indication
		STA10



9.9 Timeout

The time limits specified are subject for future adjustments.

STATE	STA2	STA3	STA4	STA5
	Ready for	Establishing	Establishing	Wait for higher
	connect	lower level	on request	level
EVENT				establishment
Timeout	No monitoring	T=180s:	T=60s:	T=60s:
		P-EV18	P-EV18	P-OP3T
		P-Connect	P-Connect	T-DIS
		confirm,	confirm,	CONNECT
		Result:=35	Result:=4	request
		P-OP3T		STA2
		T-DIS-	P-OP3T	
		CONNECT	T-DIS-	
		request	CONNECT	
		STA2	request	
			STA2	

STATE	STA6	STA7	STA8	STA9
	Establishing	Disestablishing	Disestablishing	Wait for lower
	on indication	on request	on indication	level disestab-
EVENT				lishment
Timeout	T=10s:	T=30s:	T=10s:	T=60s:
	EV15-P:=	P-EV21	EV16-P:=	P-OP3T
	TRUE	P-P-Abort	TRUE	T-DIS-
	P-EV21	indication	P-EV21	CONNECT
	P-P-Abort	Reason:=4	P-P-Abort	request
	indication,		indication,	STA2
	Reason=7	P-OP3T	Reason:=7	
	P-OP8	T-DIS-	P-OP10	
		CONNECT	Data,	
	Data,	request	Release	
	Connect	STA2	response,	
	response,		Result:=7	
	Result:=7			
			STA9	
	STA9			

EVENT	STATE	STA10 Connected
Timeout		No monitoring



10 USE OF THE LOWER LAYER SERVICE

The presentation entity can use the network layer or the transport layer. This chapter defines how the services shall be used.

10.1 Use of the Network Service

- In ELCOM-83 the P-provider is identified by means of the 'ELCOM-83' string in the Call User Data (CUD) field in the X.25 call request packet. In addition the A-suffix (two bytes but without the length field) is appended to the string.
- To achieve compatibility the ELCOM-90 provider shall insert 'ELCOM-83<A-suffix>' in the CUD for outgoing calls.
- The ELCOM-90 P-provider will accept <u>all X.25</u> calls with a CUD field starting with the string 'ELCOM-83' When the P-connect is received, it shall reject the call if the specified A-suffix is not created.

No PPDUs are used during the assignment of the network connection.

All the PPDUs are sent as N-DATA. N-EXPEDITED-DATA is never used.

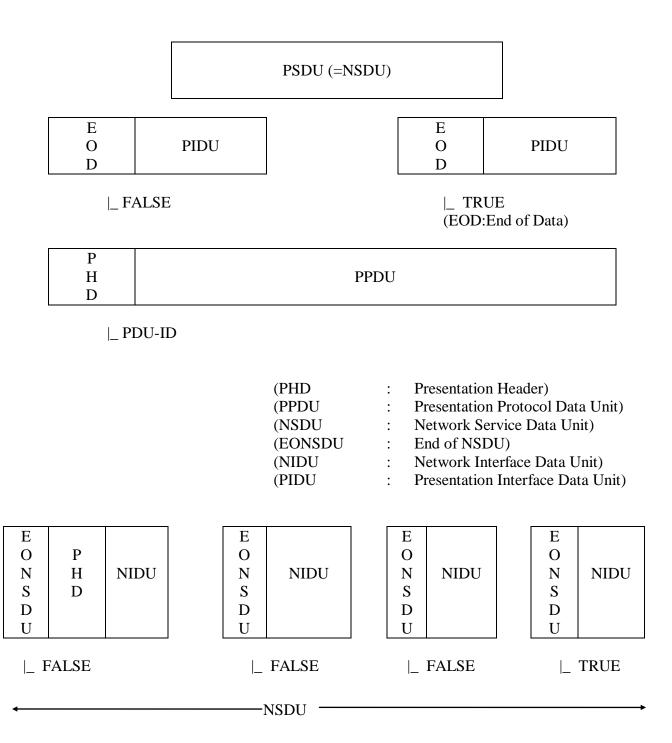
There is one-to-one mapping between a PPDU and an NSDU.

An NSDU may be presented to the network entity as one or more NIDUs.

The mapping is shown in figure 10.1.

When a presentation-connection has been disconnected, the network connection shall be disconnected as well. No PPDUs are used during the termination of the network connection. The network connection can not be reused by another presentation-connection.





Note

The EOD-field of the PIDU is named EOPSDU elsewhere in this document. (The M-bit of the X.25 protocol shall be used to form an NSDU when the X.25 protocol is used.)

Figure 10.1 Mapping when the network layer is used.



10.2 Use of the Transport Service

The transport connection is established before the presentation-connection is established. No PPDUs are used during the assignment of the transport connection.

All the PPDUs are sent as T-DATA. T-EXPEDITED-DATA is never used.

There is a one-to-one mapping between a PPDU and a TSDU. A TSDU may be presented to the transport entity as one or more TIDUs.

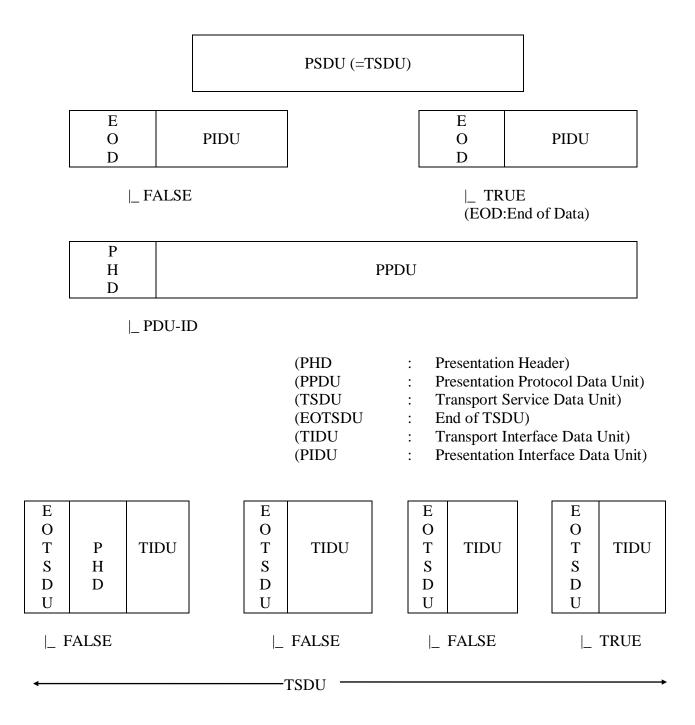
The mapping is described in fig. 10.2.

When a presentation-connection has been disconnected, the transport connection shall be disconnected as well. No PPDUs are used during the termination of a transport connection. The transport connection can not be reused.

TCP/IP networks do not have any function to control that the receiver actually receives the transmitted data from a sender. This means that certain network errors may go undetected for a long period of time. For Elcom connections this means that the LAN/WAN connections can be broken for several minutes before the User Element detects a network error.

For Elcom connections over TCP/IP the network connection should be tested with a configurable time interval. A solution for this testing procedure is implemented in the Elcom reference version. The implementation of this procedure in the Presentation Protocol is optional. The design of the testing procedure is described in [16].





Note: The EOD-field of the PIDU is named EOPSDU elsewhere in this document.

Figure 10.2 Mapping when the transport layer is used.



11 ENCODING OF PPDUS

11.1 Summary

NAME OF PPDU	PDU-ID
Control PDUs:	
Connect Request Connect Response Release Request Release Response	0 0 0 0 0 0 0 1 0 0 1 0 0 0 1 1
<u>Data PDU:</u>	
Data Request	1 0 0 0



11.2 Structure

All Presentation Protocol Data Units (PPDUs) shall contain an integral number of octets. The octets of a PPDU are numbered starting from 1 and increasing in order of transmission. The bits of an octet are numbered from 0 to 7, with bit 0 as the low order bit.

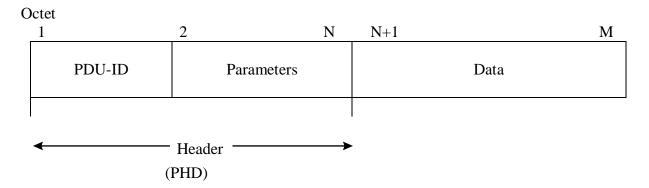


Figure 11.1. Structure of Presentation Protocol Data Units.

Octets are numbered in decimal. All values and parameters are given as integer numbers unless otherwise explicitly stated. The code identifying a PPDU (PDU-ID) is given as a binary number. All bits of unused fields shall be set to zero.

When TCP/IP is used, the TSDU size will be set to zero. A 2-byte PPDU length field in Network Byte Order is inserted before the PHD. This field indicates the length in octets of the PPDU.



11.3 Control PDU's

11.3.1 Connect request

Oct	tet					
1	-		2	N	N+1	M
	0 0 0 0	unused	ADDRI	ESSES	USER-D	DATA

ADDRESSES: The Initiator address is immediately followed by Acceptor address. The

Initiator and Acceptor addresses shall be

coded as described for the corresponding parameters in the

Connected Request interface procedure [11].

USER-DATA: Optional data field containing 0 to 82 octets of user data.

11.3.2 Connect Response

Octet1		2 N	N+1	N+2 M	
0 0 0 1	unused	ADDRESSES	RESULT	USER-DATA	

ADDRESSES: As described for the Connect Request PDU.

RESULT: Result of request. Coding as described for the result

parameter of the Connect Confirmation interface procedure [11].

USER-DATA: Optional data field containing 0 to 81 octets of user data.

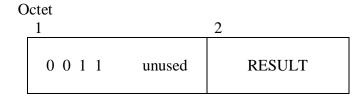


11.3.3 Release Request

Octet 1		2
0 0 1 0	unused	REASON

REASON: Coding as described for the Reason parameter in the Release Request interface procedure [11].

11.3.4 Release Response



REASON: Coding as for the result parameter of the Release Response interface procedure [11].



11.4 Data PDU's

11.4.1 Data Request

Octet 1		2	N
1 0 0 0	unused	USER-DATA	A

USER-DATA: Data field containing any number of user data octets.



APPENDIX A

Mapping Between the Assumed Transport Service and Unix System V Transport Level Interface (TLI)

<u>T-primitive</u>	TLI call
T-START-LISTEN request (listen=false)	t_open t_bind
T-START-LISTEN request (listen=true)	t_open t_bind t_listen
T-CONNECT request T-CONNECT indication T-CONNECT response T-CONNECT confirmation T-DISCONNECT request T-DISCONNECT indication	t_connect t_accept <dummy -="" action="" no=""> t_rcvaccept t_snddis t_rcvdis</dummy>
T-DATA request T-DATA indication	t_snd t_rcv
T-STOP-LISTEN request	t_unbind t_close

To poll a specific transport connection for asynchronous events the function TLOOK must be used.

To wait for an event to happen on any transport connection, the STREAMS function POLL must be used. When an event has occured on a transport connection, the POLL call returns identifying the connection where the event occured. TLOOK can then be used for this connection.