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TECHNICAL REPORT

SUBJECT/TASK (title)

ELCOM-90 Presentation protocol specification

CONTRIBUTOR(S)

ELCOM Working Group
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CLIENT(S)

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TR NO.	DATE	CLIENT'S REF.	PROJECT NO.
A3706.03	2009-12-17		12X513

ELECTRONIC FILE CODE	RESPONSIBLE (NAME, SIGN.)	CLASSIFICATION
	Ove Grande	Unrestricted

ISBN NO.	REPORT TYPE	RESEARCH DIRECTOR (NAME, SIGN.)	COPIES	PAGES
82-594-1262-4		Petter Støa		88

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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 Future updates and new versions will NOT be published for this reason.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.

KEYWORDS

SELECTED BY AUTHOR(S)		
	Data communications	Control centres
	Communication protocols	Energy management

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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.

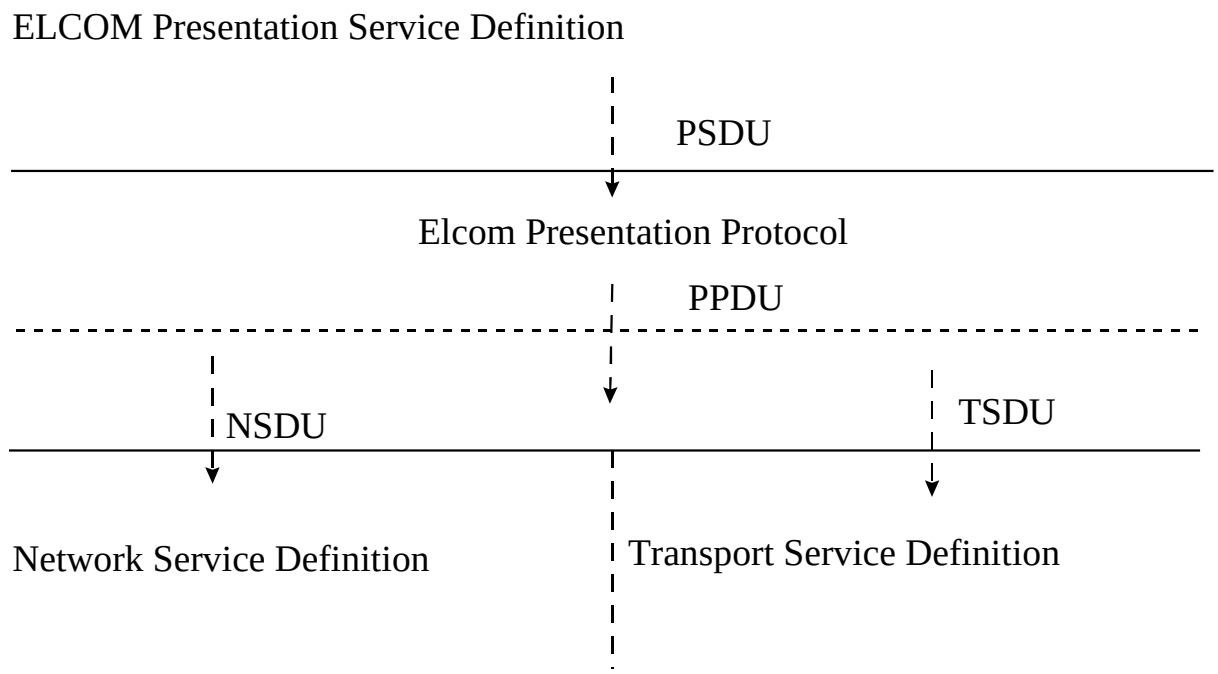

Figure 1.1 Model of the mapping

Acknowledgement

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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 Establishment Facility		
P-Connect	Connection Establishment	Confirmed
Presentation-connection Termination Facility		
P-Release P-P-Abort	Connection Release Provider Initiated Abort	Confirmed 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 Establishment Facility		
N-CONNECT	Connection Establishment	Confirmed
Network-connection Release 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 Establishment Facility		
T-CONNECT	Connection Establishment	Confirmed
Transport-connection Release Facility		
T-DISCONNECT	Connection Release and Provider Initiated Abort	Non-confirmed/ Provider-init.
Information Transfer Facility		
T-DATA	Data Transfer	Non-confirmed
Administration for Incoming 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
	Incoming events
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-Connect indication
P-EV18	P-Connect confirm
P-EV19	P-Release indication
P-EV20	P-Release confirm
P-EV21	P-P-Abort indication
P-EV22	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

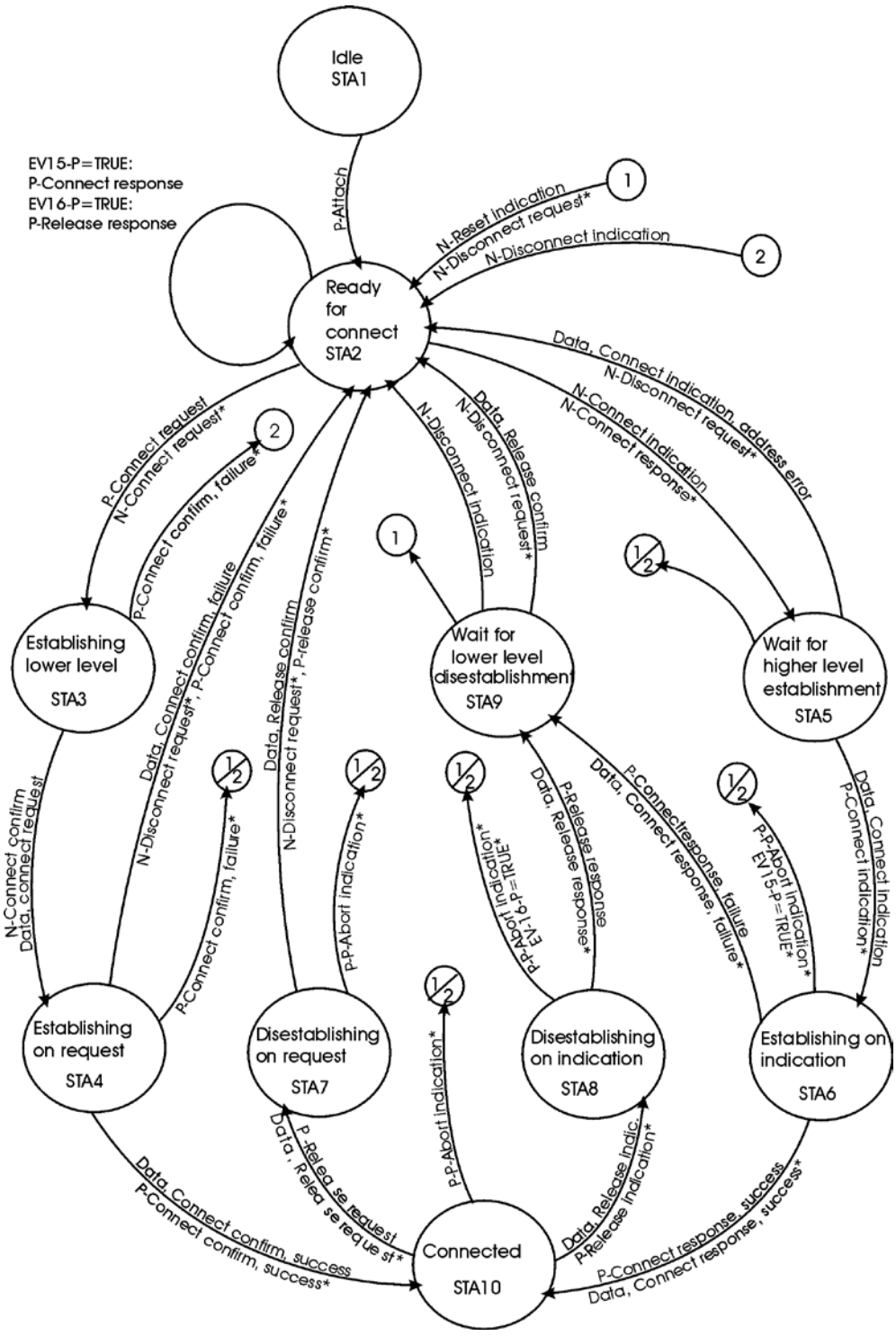


Figure 6.1. State diagram for NC-based connection.

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.

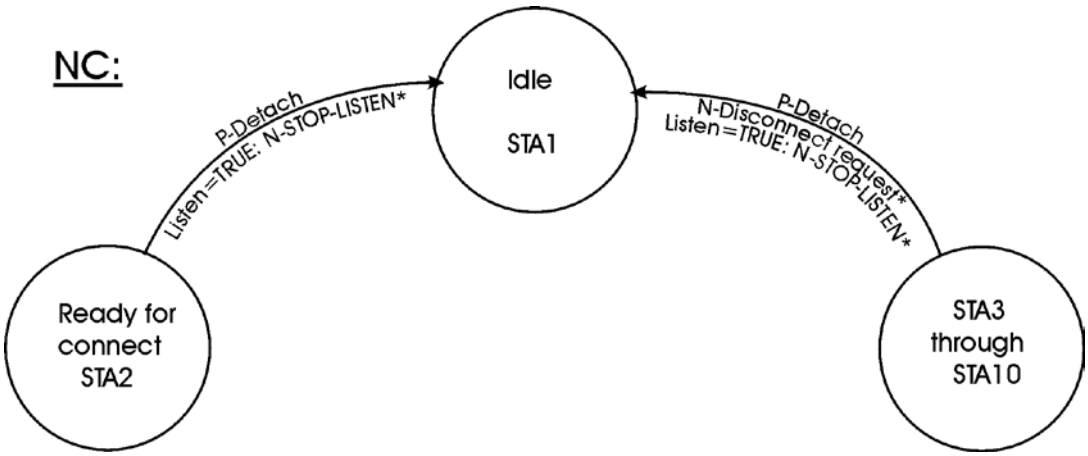


Figure 6.2. State diagram for P-Detach.

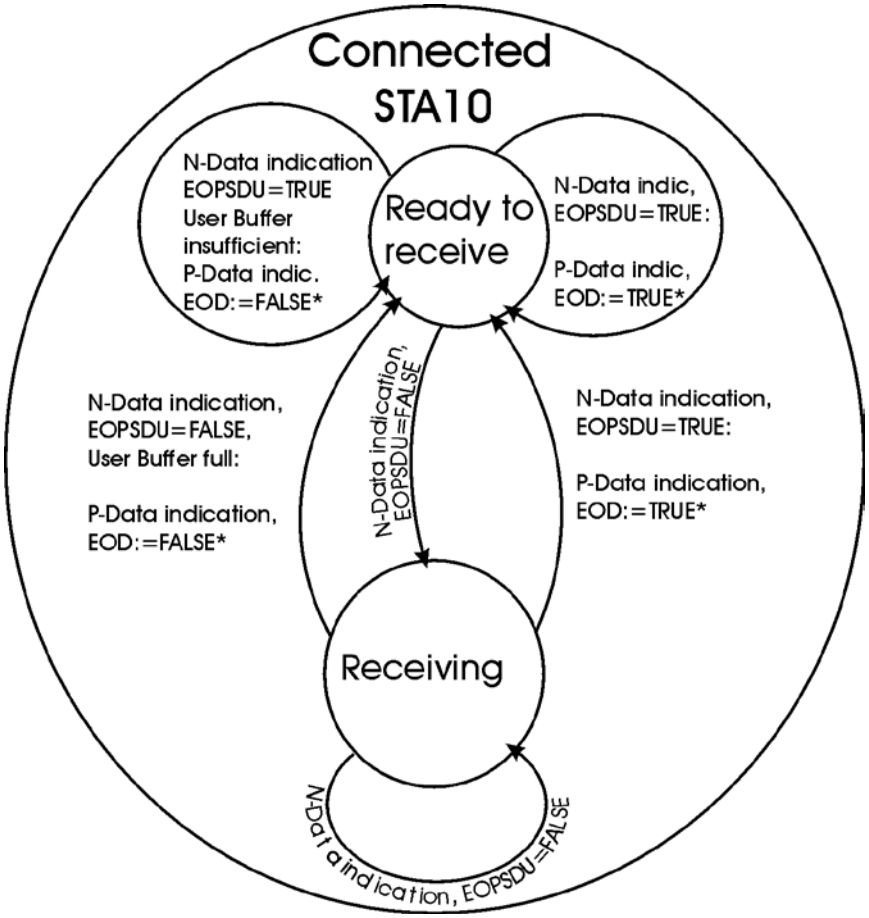


Figure 6.3. State Diagram for incoming data.

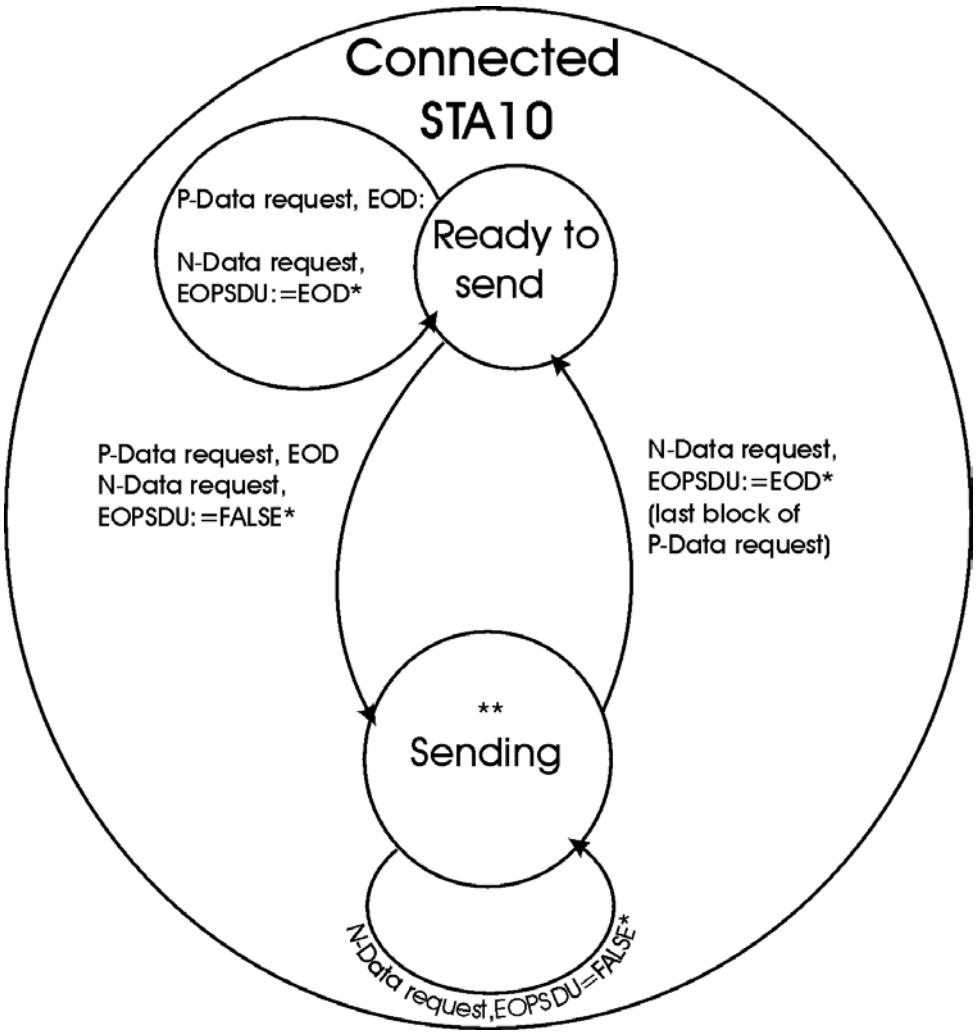


Figure 6.4. State Diagram for outgoing Data.

**) 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

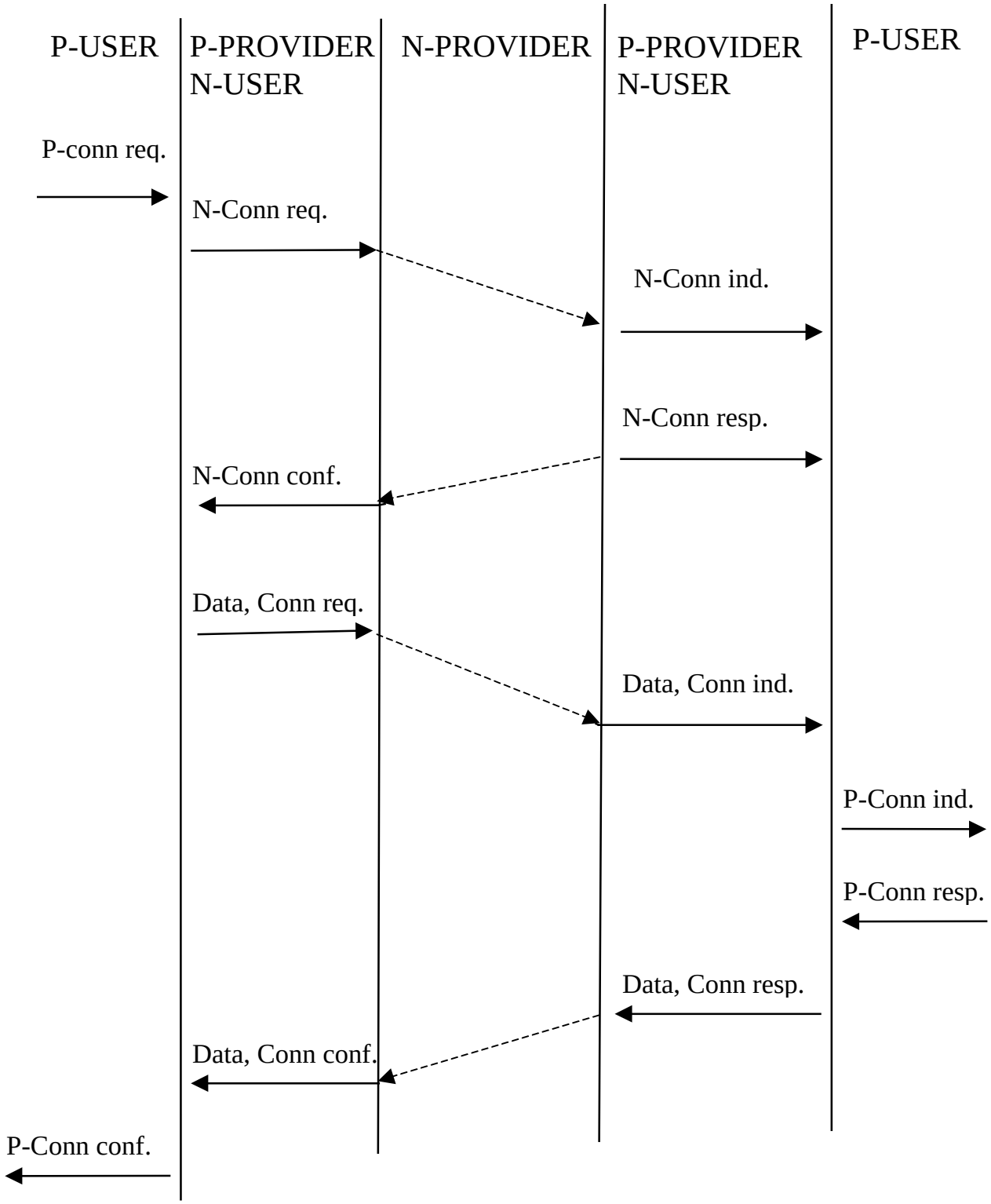


Figure 6.5. Time-sequence diagram for normal establishment.

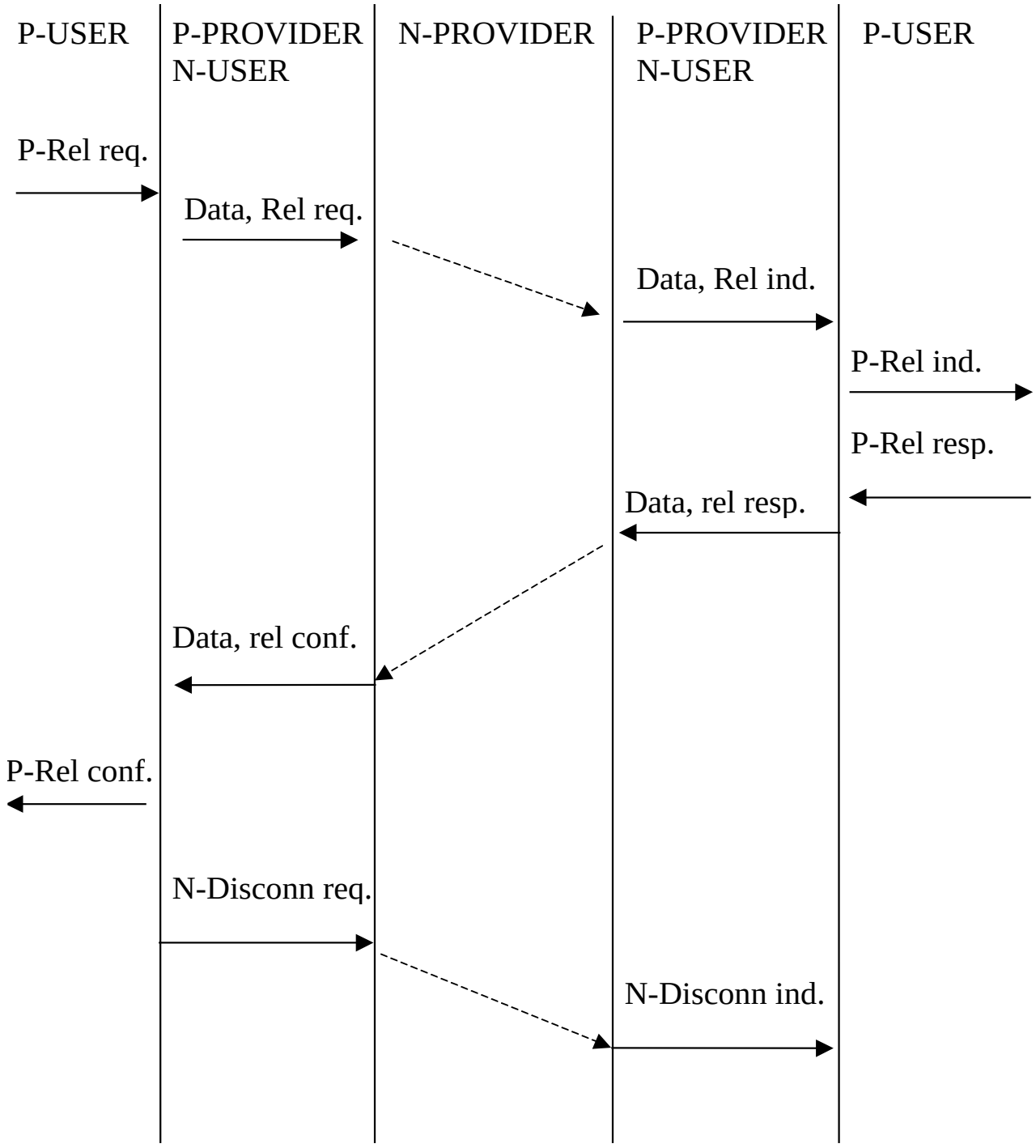


Figure 6.6. Time-sequence for normal termination.

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

7.2 Initialisation Forcing Disconnection

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

*) Concerns all connections

STATE EVENT	STA6 Establishing on indication	STA7 Disestablishing on request	STA8 Disestablishing on indication	STA9* Wait for lower level disestab-lishment
P-EV23 P-Init	Initialise entity STA1*	Initialise entity STA1*	Initialise entity STA1*	Initialise entity STA1*
P-EV24 P-Attach	Illegal use	Illegal use	Illegal use	Illegal use
P-EV25 P-Detach	Detach user from access point P-OP3 N-DIS-CONNECT request STA1	Detach user from access point P-OP3 N-DIS-CONNECT request STA1	Detach user from access point P-OP3 N-DIS-CONNECT request STA1	Detach user from access point P-OP3 N-DIS-CONNECT request STA1

*) Concerns all connections

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

*) Concerns all connections

7.3 Requested Establishment on NC

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

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

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

STATE EVENT	STA6 Establishing on indication	STA7 Disestablishing on request	STA8 Disestablishing on indication	STA9 Wait for lower level disestablishment
P-EV11 Data, Connect confirm (success/ failure)	P-EV21 P-P-Abort indication, Reason:=10 P-OP3 N-DIS-CONNECT request EV15-P:= TRUE STA2	P-EV21 P-P-Abort indication, Reason:=10 P-OP3 N-DIS-CONNECT request STA2	P-EV21 P-P-Abort indication, Reason:=10 P-OP3 N-DIS-CONNECT request EV16-P:= TRUE STA2	P-OP3 N-DIS-CONNECT request STA2

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

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

7.4 Incoming Establishment on NC

STATE EVENT	STA2 Ready for connect	STA3 Establishing lower level	STA4 Establishing on request	STA5 Wait for higher level establishment
P-EV4 N-CONNECT indication	LISTEN= TRUE: P-OP2 N-CONNECT response STA5 LISTEN= FALSE: P-OP3 N-DIS CONNECT request STA2 Local inconsistency	P-EV18 P-Connect confirm, Result:=9 P-OP3 N-DIS-CONNECT request STA2 Local inconsistency	P-EV18 P-Connect confirm, Result:=9 P-OP3 N-DIS-CONNECT request STA2 Local inconsistency	P-OP3 N-DIS-CONNECT request STA2 Local inconsistency
P-EV10 Data, Connect indication	P-OP3 N-DIS-CONNECT request STA2 Local inconsistency	P-EV18 P-Connect confirm, Result:=9 P-OP3 N-DIS-CONNECT request STA2 Local inconsistency	P-EV18 P-Connect confirm, Result:=10 P-OP3 N-DIS-CONNECT request STA2	**) Addr. ok: P-EV17 P-Connect indication STA6 **) Addr. err.: N-DISCONNECT request 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 EVENT	STA2 Ready for connect	STA3 Establishing lower level	STA4 Establishing on request	STA5 Wait for higher level establishment
P-EV15 P-Connect response (success/ failure)	EV15-P= TRUE: Ignore EV15-P= FALSE: Illegal use	Illegal use	Illegal use	Illegal use

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

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

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

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

7.5 Requested Release on NC

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

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

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

7.6 Indicated Release on NC

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

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

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

7.7 Disconnection of NC

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

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

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

7.8 Data

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

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

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

7.9 Timeout

The time limits specified are subject for future adjustments.

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

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

STATE EVENT	STA10 Connected
Timeout	No monitoring

7.10 Reset

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

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

STATE EVENT	STA10 Connected
P-EV8 N-RESET indication	P-EV21 P-P-Abort indication, Reason:=10 P-OP3 N-DIS-CONNECT request STA2
P-EV9 N-RESET confirmation	P-EV21 P-P-Abort 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-Connect indication
P-EV18	P-Connect confirm
P-EV19	P-Release indication
P-EV20	P-Release confirm
P-EV21	P-P-Abort indication
P-EV22	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	(transferred by T-DATA)
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
Timeout	Local events 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

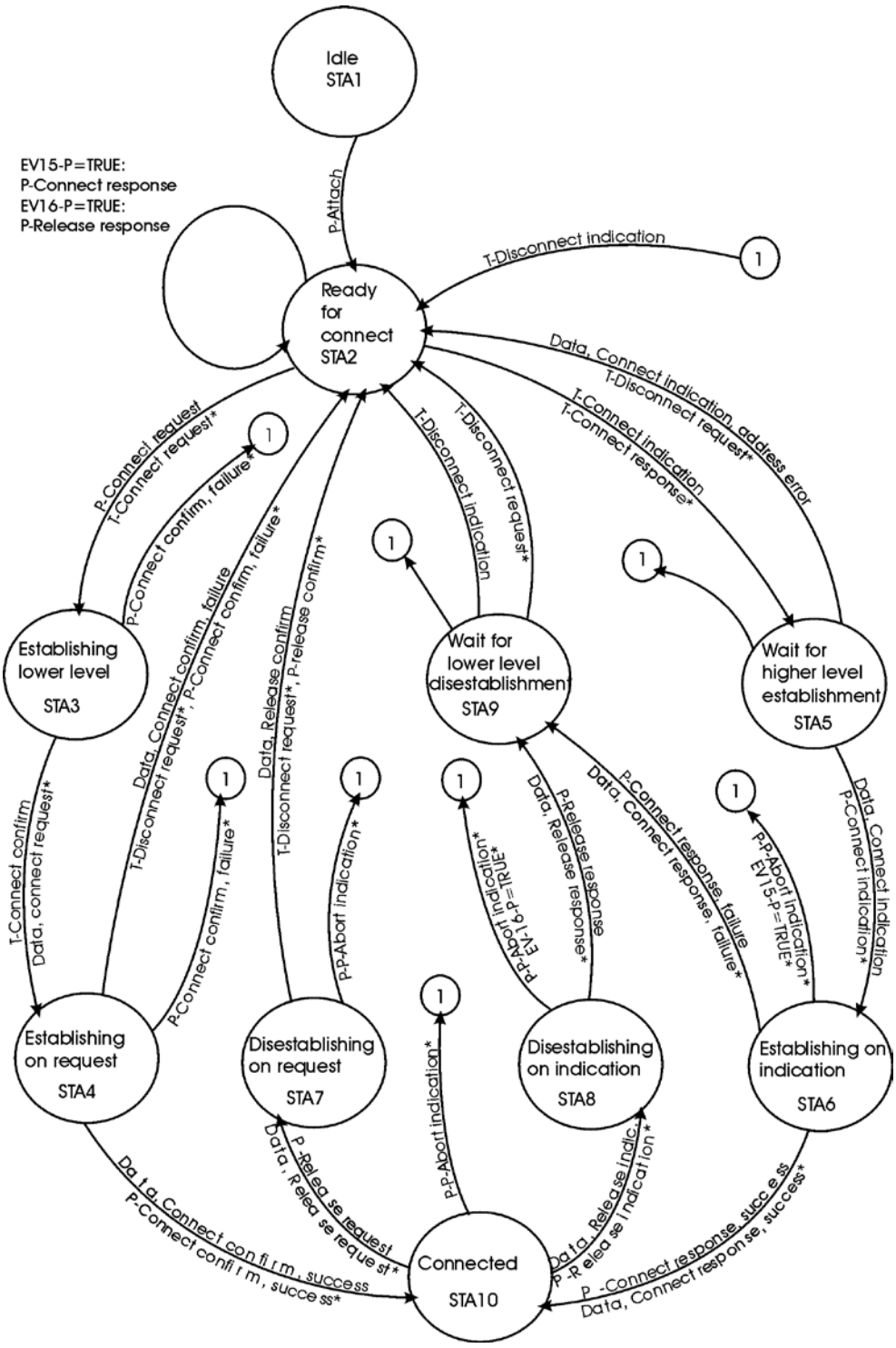


Figure 8.1. State diagram for TC-based presentation-connection.

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.

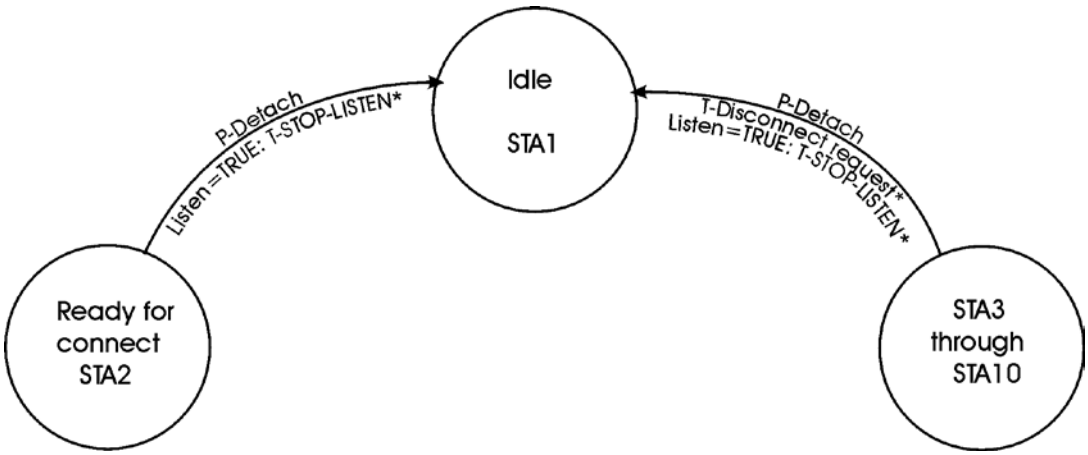


Figure 8.2. State diagram for P-Detach.

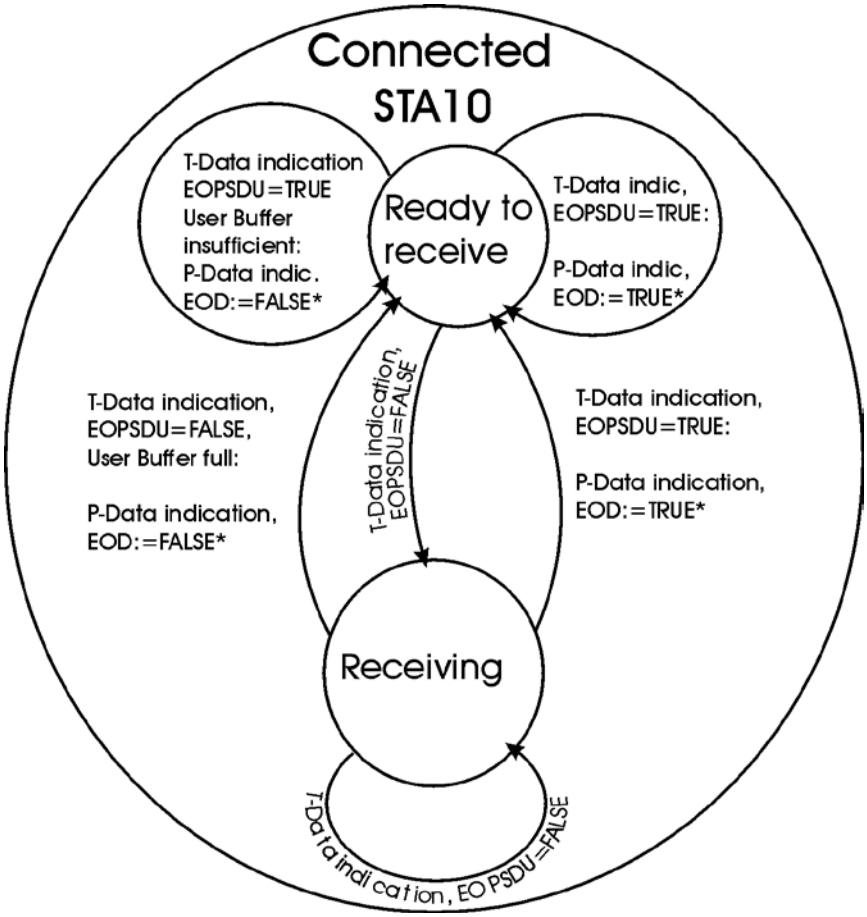


Figure 8.3. State Diagram for incoming data.

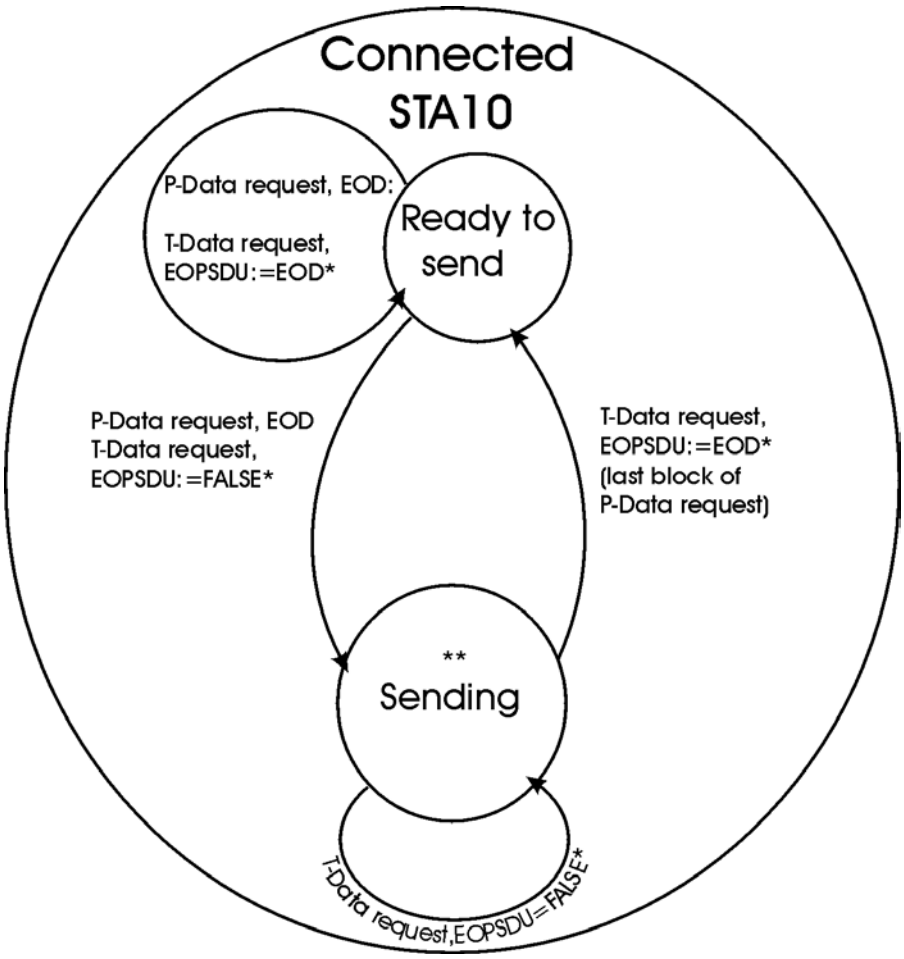


Figure 8.4. State Diagram for outgoing Data.

**) 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

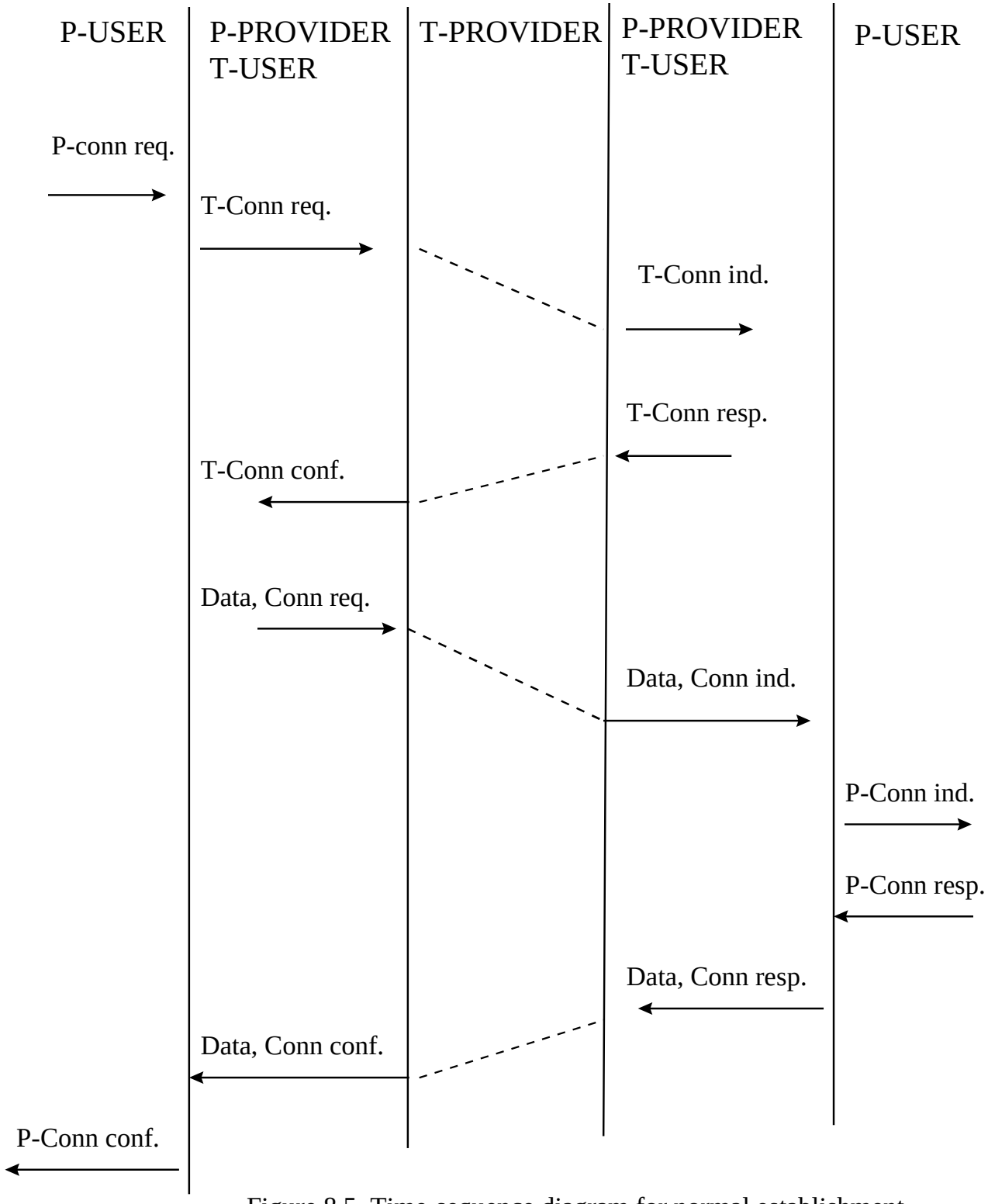


Figure 8.5. Time-sequence diagram for normal establishment.

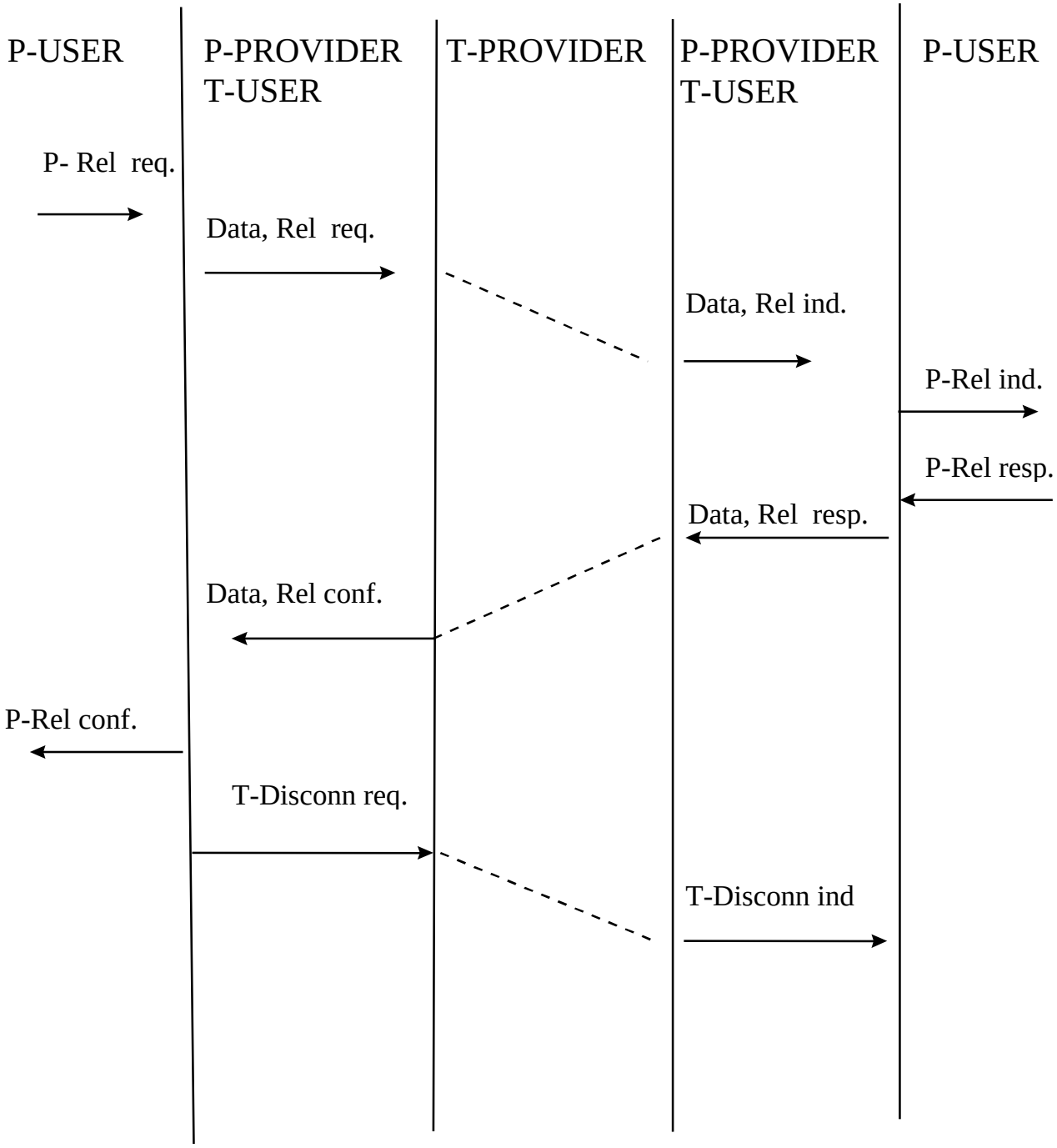


Figure 8.6. Time-sequence diagram for normal termination.

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

*) Concerns all connections

9.2 Initialisation Forcing Disconnection

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

*) Concerns all connections.

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

*) Concerns all connections.

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

*) Concerns all connections.

9.3 Requested Establishment on TC

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

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

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

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

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

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

9.4 Incoming Establishment on TC

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

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

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

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

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

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

9.5 Requested Release on TC

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

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

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

9.6 Indicated Release on TC

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

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

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

9.7 Disconnection of TC

STATE EVENT	STA2 Ready for connect	STA3 Establishing lower level	STA4 Establishing on request	STA5 Wait for higher level establishment
P-EV6T T-DIS-CONNECT indication	STA2 Local inconsistency	P-EV18 P-Connect confirm, Result:= 41-47 *) STA2	P-EV18 P-Connect confirm, Result:= 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 EVENT	STA6 Establishing on indication	STA7 Disestablishing on request	STA8 Disestablishing on indication	STA9 Wait for lower level disestab-lishment
P-EV6T T-DIS-CONNECT indication	P-EV21 P-P-Abort indication, Reason:= 10, 41-45 *) EV15-P:= TRUE STA2	COLLISION:= TRUE: P-EV20 P-release confirm, Result:=12 STA2 COLLISION= FALSE: P-EV21 P-P-Abort indication, Reason:= 10, 41-45 *) STA2	P-EV21 P-P-Abort indication, Reason:= 10, 41-45 *) EV16-P:= TRUE STA2	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.

STATE EVENT	STA10 Connected
P-EV6T T-DIS- CONNECT indication	P-EV21 P-P-Abort 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 / EVENT	STA2 Ready for connect	STA3 Establishing lower level	STA4 Establishing on request	STA5 Wait for higher level establishment
P-EV3 P-Data request	Illegal use	Illegal use	Illegal use	Illegal use
P-EV14 Data, Data indication	P-OP3T T-DIS-CONNECT request Local inconsistency STA2	P-EV18 P-Connect confirm, Result:=9 P-OP3T T-DIS-CONNECT request Local inconsistency STA2	P-EV18 P-Connect confirm, Result:=10 P-OP3T T-DIS-CONNECT request STA2	P-OP3T T-DIS-CONNECT request STA2

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

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

9.9 Timeout

The time limits specified are subject for future adjustments.

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

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

STATE EVENT	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 all X.25 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.

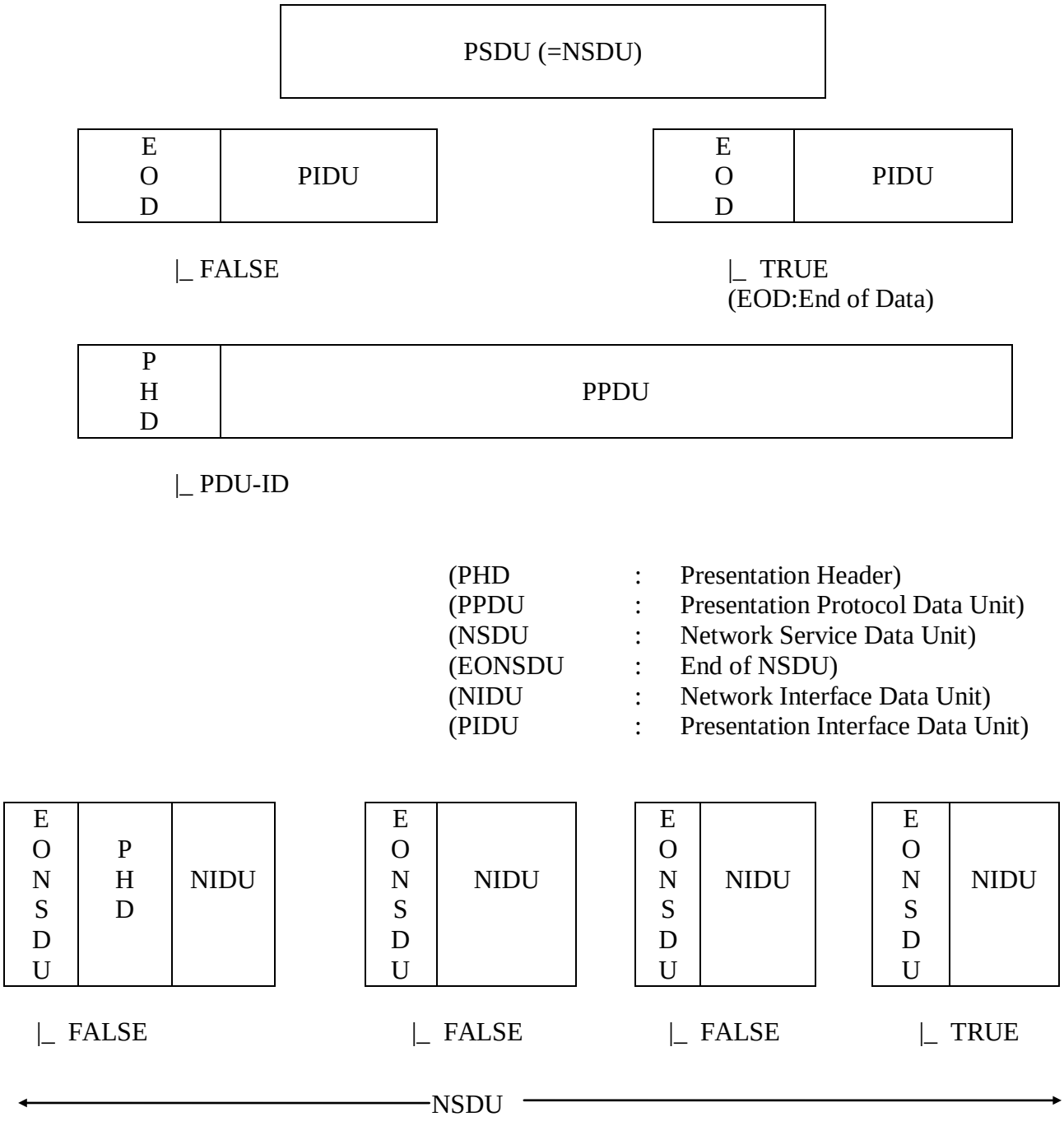
All the PPDUs are sent as N-DATA. N-EXPEDITED-DATA is never used.

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.

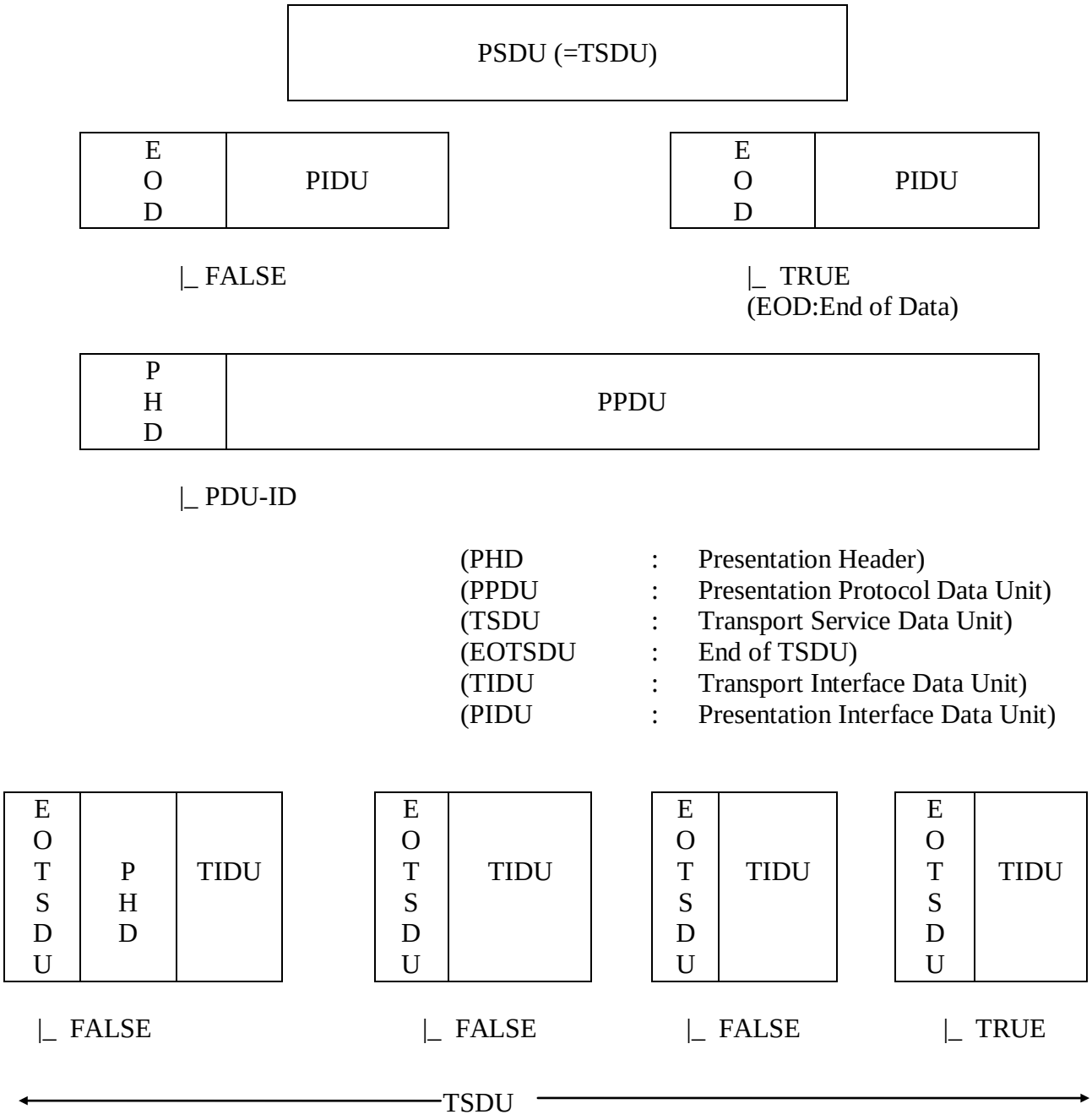
There is a one-to-one mapping between a PPDU and a TSDU. A TSDU may be presented to the transport entity as one or more TIDUs.

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	0 0 0 0
Connect Response	0 0 0 1
Release Request	0 0 1 0
Release Response	0 0 1 1
Data PDU:	
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.

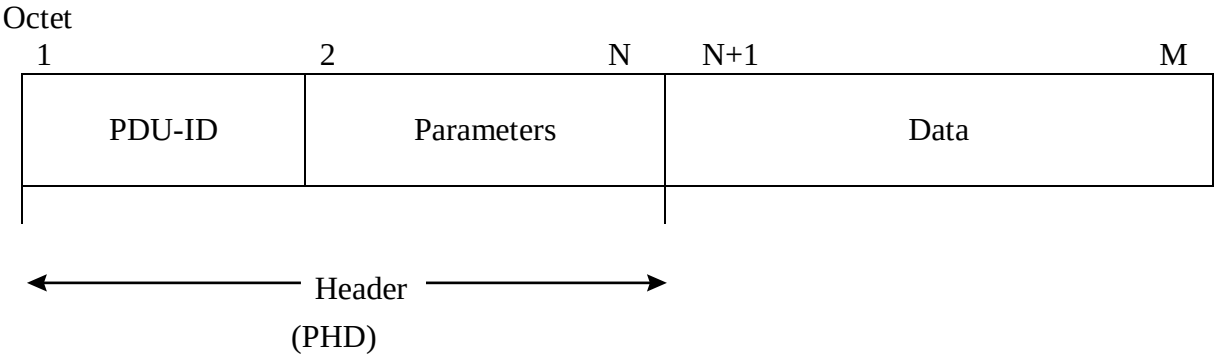


Figure 11.1. Structure of Presentation Protocol Data Units.

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 rest of the PPDU.

11.3 Control PDU's

11.3.1 Connect request

Octet

1	2 N	N+1 M
0 0 0 0 unused	ADDRESSES	USER-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

Octet

1	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

Octet

1	2
0 0 1 1 unused	RESULT

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

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)

T-primitive	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
T-CONNECT indication	t_accept
T-CONNECT response	<dummy - no action>
T-CONNECT confirmation	t_rcvaccept
T-DISCONNECT request	t_snddis
T-DISCONNECT indication	t_rcvdis
T-DATA request	t_snd
T-DATA indication	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.