TECHNICAL REPORT

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ELCOM-90
Presentation programming interface 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 Future updates and new versions will NOT be published for this reason.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.

This document describes the interface between the application and the presentation layer of the ELCOM-90 data communication system. The services provided by the presentation layer are described in Technical Report: ELCOM-90 Presentation Service Element. Service Definition".

KEYWORDS

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

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1   INTRODUCTION

The implementation of an API for the Elcom-90 Presentation Layer is not mandatory, and may not be available for an Elcom-90 Service Element implementation.

Acknowledgement

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2 ASSOCIATED DOCUMENTS

2.1 ELCOM-83 documentation

[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

2.2 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.
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[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 ABBREVIATIONS AND DEFINITIONS

PS	-	Presentation Service
PSAP	-	Presentation Service Access Point
PSDU	-	Presentation Service Data Unit
PCEP	-	Presentation Connection End Point
U-PCEP	-	User Identification of PCEP
P-PCEP	-	Provider Identification of PCEP
PC	-	Presentation Connection

The connection identifiers (U-PCEP and P-PCEP) are used to distinguish between different connections at the same PSAP (i.e. same address). All that is strictly required to identify a connection is one reference number used by both the service provider and the user. However, as an implementation aid to the user the interface provides for the exchange of identifiers between the provider and the user. The motivation for this is to enable both the provider and the user to identify a connection in a manner convenient to themselves.

Octet - Eight bits of binary information. (Right adjusted when transferred as integer, and first octet left adjusted when transferred as integer array.) The mode and structure used for parameter passing shall comply with the definition given for actual programming language.

4 OVERVIEW OF INTERACTION

4.1 PROCEDURE NAMES

PROCEDURE	FULL NAME OF PRIMITIVE	USE
PINIT	P-Init	Local
PATT	P-Attach	Local
PDET	P-Detach	Local
PCONRQ	P-Connect request	Send
PCONI	P-Connect indication	Receive
PCONRS	P-Connect response	Send
PCONC	P-Connect confirmation	Receive
PRELRQ	P-Release request	Send
PRELI	P-Release indication	Receive
PRELRS	P-Release response	Send
PRELC	P-Release confirmation	Receive
PPABT	P-P-Abort indication	Receive
PDTRQ	P-Data request	Send
PDTI	P-Data indication	Receive
PSWAIT	P-Special-Wait	Local (Receive)
PGWAIT	P-General-Wait	Local (Receive)
GTBU	Get buffer	Local
FRBU	Free buffer	Local

4.2 IMPLEMENTATION CONSIDERATIONS

The PS-interface procedures are specified with arguments presuming that a buffer system is available for internal use. Buffers for sending could then be acquired at high level, filled with data, and passed to the PS-provider. Receive buffers could be acquired by the PS-provider, filled with incoming data, and delivered to the PS-user.

To make the PS accessible from ordinary high level languages (e.g. FORTRAN), all interactions between a PS-user and the PS-provider are initiated by the PS-user by issuing PS-interface procedure calls.

The implementation of an PS programming interface is not mandatory.

4.3   ATTACHMENT AND DETACHMENT OF PCEP

Establishing an association between a PS-user and the PS-provider (attachment) is achieved by activation of the PATT interface procedure.

An attachment can be established for the purpose of establishing a presentation connection supporting a two-way data path. The type of attachment wanted is specified in the procedure call. When an attachment is made, a PCEP is reserved for the PS-user.

After use an attachment is terminated by activating the PDET interface procedure.

4.4   EVENT WAIT

A PS-user waiting for the PS-provider uses the PSWAIT or PGWAIT interface procedures. It is assumed that these procedures often will be based on operating system services. The procedure, when called, will return when some event affecting the PS user has occurred. Such events may be:

- The PS-provider has some information ready for transfer to the PS-user.
- A time-out has occured.

An indication about the occured event is returned from the procedure.

4.5   PROCEDURE CALL SEQUENCES

The possible sequences of successful PS-interface procedure calls involving one particular PCEP are as shown in the state diagrams in [22] .

5 SPECIFICATION OF SERVICE INTERFACE PROCEDURES

In the procedure call specifications output arguments are underlined while input arguments are not.

The data structure and mode for use in parameter passing shall be in accordance with the definition given for actual programming language.

5.1 INITIALISATION

Function
Initialises the presentation service provider. This initialisation affects all connection endpoints provided.

Procedure call and arguments
PINIT   <u>Status</u>

Status   Integer. Status on return
+1 - Provider initialised.
-3 - PS-provider out of operation.

5.2   ATTACHMENT AND DETACHMENT PROCEDURES

5.2.1   PATT

Function
The PATT procedure creates an association between a PS-user and the PS-provider through a PSAP. The association is identified by PCEP-IDs which are used in subsequent procedure calls. (Logically there is no limit to the number of PCEPs for each PSAP.)

Procedure call and arguments

PATT   **Entity-id**, **P-suffix**, **U-PCEP**, **type**, **Status**, **P-PCEP**.

Entity-id   Integer. Unique identification of the user entity. (Only one entity is allowed to access the service access point at a time.)

P-suffix   2 octets. P-suffix part of the PSAP-address. The PSAP-address consists of the lower level address followed by the P-suffix.

U-PCEP   Integer. User PCEP identifier used in subsequent calls to PGWAIT.

Type   Integer. Type of PCEP.
                  1 - Connection-oriented transfer. Local PS-user will use this PCEP as a calling PS-user.
                  2 - Connection-oriented transfer. Local PS-user will use this PCEP as a called PS-user (listener).

Status   Integer. Status on return.
                  +1 - PCEP attached to user.
                  -1 - PCEP not available.
                  -2 - Illegal argument.
                  -3 - PS-provider out of operation.

P-PCEP   Integer. PCEP identifier to be used in subsequent procedure calls involving the same PCEP.

5.2.2 PDET

Function

The PDET procedure releases an association between a PS-user and the PS-provider.

Procedure call and arguments

PDET   **Entity-id**, **P-PCEP**, <u>**Status**</u>.

Entity-id   Integer. Unique identification of the user entity.

P-PCEP   Integer. PCEP identifier.

<u>**Status**</u>   Integer. Status on return.
            +1 - PCEP detached.
            -2 - Illegal argument.
            -3 - PS-provider out of operation.

5.3 CONNECTION ESTABLISHMENT PROCEDURES

5.3.1 PCONRQ

Function
The PCONRQ interface procedure requests the PS-provider to establish a presentation connection.

Procedure call and arguments

PCONRQ **P-PCEP**, **Initiator**, **Accepto**r, **User-data**, **Length**, **Status**.

P-PCEP Integer. PCEP identifier.

Initiator PSAP-address of the initiator.
1 octet = x   Number of octets in the lower level part of the PSAP-address (Network protocol dependant, see Elcom90 User Element Conventions).
x octets   The lower level part.
1 octet = y   Number of octets in the P suffix (max 2).
y octets   The P suffix

Acceptor PSAP-address of the acceptor coded in the same format as the Initiator address.

User-data 0 to 82 octets. Data which are transparently transferred to the called PS-user.

Length Integer. Number of octets of user data.

Status Integer. Status on return.
+1 - Call accepted.
-2 - Illegal argument.
-3 - PS-provider out of operation.
-4 - Illegal use.
-6 - Temporarily unavailable (try again).

5.3.2   PCONI

Function

The PCONI interface procedure is used by a called PS-user to receive an indication of a presentation connection establishment initiated by a calling PS-user.

Procedure call and arguments

PCONI,   **P-PCEP**, **Status**, **Initiator, Acceptor**, **User-data**, **Length**

P-PCEP   Integer. PCEP identifier.

Status   Integer. Status on return.
  +1 - Successful call.
   0 - Connection establishment indication not received.
  -2 - Illegal argument.
  -3 - PS-provider out of operation.
  -4 - Illegal use.

Initiator   PSAP-address of calling PS-user. The format is as for the address in PCONRQ.

Acceptor   PSAP-address of called PS-user. The format is the same as in PCONRQ.

User-data   0 to 82 octets. Data transferred transparently from the calling PS-user.

Length   Integer. Number of octets in user data.

5.3.3   PCONRS

Function
The PCONRS interface procedure is used by a called PS-user who has received an indication of a presentation connection and wants to accept or refuse the PS-establishment.

Procedure call and arguments

PCONRS,   P-PCEP, Initiator,   Acceptor, **Result**, **User-data**, **Length**, <u>**Status**</u>.

P-PCEP   Integer. PCEP identifier.

Initiator   PSAP-address of the calling PS-user. The format is as for the address in
                   PCONRQ.

Acceptor   PSAP-address of the called PS-user. The format is the same as in PCONRQ.

Result   Integer.
                   - Result ok (call accepted).
                   - Remote lack of resources.
                   - Remote service user unavailable.
                   - Rejected by service user.
                   - System implementation dependent reason.

User-data   0 to 82 octets. Data which are transparently transferred to the calling PS-user.

Length   Integer. Number of octets in user data.

<u>**Status**</u>   Integer. Status on return.
                   +1 - Call accepted (locally).
                   -2 - Illegal argument.
                   -3 - PS-provider out of operation.
                   -4 - Illegal use.

5.3.4   PCONC

Function

The PCONC interface procedure is used by the calling PS-user to receive a confirmation of a PC establishment.

Procedure call and arguments

PCONC   **P-PCEP**, **Status**, **Initiator**, **Acceptor**, **Result**, **User-data**, **Length**.

P-PCEP   Integer. PCEP identifier.

Status   Integer. Status on return.
         +1 - Successful call.
           0 - Connection establishment confirmation not received.
         -2 - Illegal argument.
         -3 - PS-provider out of operation.
         -4 - Illegal use.

Initiator   PSAP-address of the calling PS-user. The format is as for the address in PCONRQ.

Acceptor   PSAP-address of the called PS-user. The format is the same as in PCONRQ.

Result   Integer.
         - Result ok
         - Local lack of resources
         - Remote lack of resources
         - No answer from remote system
         - Remote service user unavailable
         - Called user unknown
         - Misbehaviour of local service user
         - Misbehaviour of remote service user
         - Misbehaviour of local part of provider
         - Misbehaviour of remote part of provider
         - No available lower level connection
         - Rejected by service user
         - System implementation dependent reason
         - Unknown reason
         - Disconnected by the network layer
         - Disconnected by the remote transport entity
         - Disconnected by the local transport entity

- Remote transport entity congestion
- Protocol error
- Transport connection reference error
- Connect negotiation failed

User-data   0 to 82 octets. Data which are transparently transferred to the calling PS-user.

Length   Integer. Number of octets of user data.

5.4   CONNECTION TERMINATION PROCEDURES

5.4.1   PRELRQ

Function

The PRELRQ interface procedure is used by a PS-user to initiate the termination of an established PC.

The PRELRQ procedure call may be issued by either or both PS-users on an established PC.

Procedure call and arguments

PRELRQ   **P-PCEP**, **user-reason**, <u>**Status**</u>.

P-PCEP   Integer. PCEP identifier.

User-reason 1 octet. Code specifying user's reason for initiating a disconnection. Transferred transparently to the remote PS-user.

<u>**Status**</u>   Integer. Status on return.
+1 - Call accepted.
-2 - Illegal argument.
-3 - PS-provider out of operation.
-4 - Illegal use.
-5 - P-Release indication received

5.4.2 PRELI

Function

The PRELI interface procedure is used by a PS-user to receive an indication of a PC release which is initiated by the other PS-user during data transfer.

Procedure call and arguments

PRELI   **P-PCEP**, **<u>Status</u>**, **<u>user-reason</u>**.

P-PCEP   Integer. PCEP identifier.

<u>Status</u>   Integer. Status on return.
        +1 - Successful call.
          0 - Release indication not received.
        -2 - Illegal argument.
        -3 - PS-provider out of operation.
        -4 - Illegal use.

<u>User-reason</u>   1 octet transferred transparently from the remote PS-user. Assignment and meaning of values are left for agreement between the communication PS-users.

5.4.3   PRELRS

Function

The PRELRS interface procedure is used by a PS-user to initiate a response to a received release indication.

Procedure call and arguments

PRELRS   **P-PCEP**, **Result**, **Status.**

P-PCEP   Integer. PCEP identifier.

Result   Integer.
             - Result ok.
             - Collision. (Release initiated simultaneously by both parties.)

Status   Integer. Status on return.
             +1 - Call accepted.
             -2 - Illegal argument.
             -3 - PS-provider out of operation.
             -4 - Illegal use.

5.4.4   PRELC

Function

The PRELC interface procedure is used by the initiator of the release to receive a release confirmation.

Procedure call and arguments

PRELC   **P-PCEP**, **Status**, **Result**.

P-PCEP   Integer. **PCEP** identifier.

Status   Integer. Status on return.
                 +1 - Successful call.
                   0 - Release confirmation not received.
                 -2 - Illegal argument.
                 -3 - PS-provider out of operation.
                 -4 - Illegal use.

Result   Integer.
                 - Result ok.
                 - Collision. (Connection terminated. Termination initiated simultaneously by both
                   parties.)

5.4.5 PPABT

Function

The PPABT interface procedure is used by a PS-user to receive a provider initiated abort indication.

Procedure call and arguments

PPABT   **P-PCEP**, **Status**, **Reason**.

P-PCEP   Integer. **PCEP** identifier.

Status   Integer. Status on return.
+1 - Successful call.
  0 - Provider abort not received.
-2 - Illegal argument.
-3 - PS-provider out of operation.
-4 - Illegal use.

Reason   Integer. Reason for aborting the connection.
- Quality of service below minimum level.
- No answer from remote system.
- Misbehaviour of local service user.
- Misbehaviour of remote service user.
- Misbehaviour of local part of provider.
- Misbehaviour of remote part of provider.
- No available lower level connection.
- System implementation dependent reason.
- Unknown reason.
- Disconnected by the network layer
- Disconnected by the remote transport entity
- Disconnected by the local transport entity
- Remote transport entity congestion
- Protocol error

5.5 DATA TRANSFER PROCEDURE

5.5.1 PDTRQ

Function

The PDTRQ interface procedure is used by a PS-user to transfer part of a PSDU to the PS-provider for transportation to the PS-user at the other end of the PC.

Procedure call and arguments

PDTRQ   **P-PCEP**, **Udata**, **Ludata**, **EOD**, <u>**Status**</u>.

P-PCEP   Integer. PCEP identifier.

Udata   Octets. User data to be transmitted.

Ludata   Integer. Number of user data octets.

EOD   Boolean. End of PSDU-indicator. The value TRUE indicates that the current user data is the last part of a PSDU.

<u>**Status**</u>   Integer. Status on return.
    +1 - Call accepted.
    -1 - Call not accepted due to flow control. Send same data-buffer again later.
      (See PSWAIT and PGWAIT.)
    -2 - Illegal argument.
    -3 - PS-provider out of operation.
    -4 - Illegal use.

5.5.2   PDTI

Function

The PDTI interface procedure is used by a PS-user to receive from the PS-provider a part of an incoming PSDU.

Procedure call and arguments

PDTI   **P-PCEP**, **Bsize**, **Status**,   **Udata**, **Ludata**, **EOD**.

P-PCEP   Integer. PCEP identifier.

Bsize   Integer. Max number of octets that may be put into Udata.

Status   Integer. Status on return.
                +1 - Successful call.
                 0 - User data not received.
                -2 - Illegal argument.
                -3 - PS-provider out of operation.
                -4 - Illegal use.

Udata   Octets. Received user data.

Ludata   Integer. User data length in octets.

EOD   Boolean. End of PSDU-indicator. The value TRUE indicates that the currently received user data is the last part of a PSDU.

5.6   EVENT WAITING PROCEDURE

5.6.1   PSWAIT

Function

The PSWAIT interface procedure is used by a PS-user to request the PS-provider to inform the PS-user when an event has occurred on a given PCEP.

Procedure call and arguments

PSWAIT   P-PCEP, **Time-out**, <u>**Status**</u>, <u>**Event**</u>.

P-PCEP   Integer. PCEP identifier.

Time-out   Integer. Maximum waiting time in seconds.
             >0 - Time-out in seconds.
             =0 - Immediate return (poll effect).
             <0 - No time-out specified, wait until event occurs.

<u>**Status**</u>   Integer. Status on return.
             +1 - Event occurred.
              0 - Time-out occurred.
             -3 - PS-provider out of operation.

<u>**Event**</u>   Integer. Code identifying the event. (Only relevant if status = +1.)
             1 - Connect indication (PCONI).
             2 - Connect confirmation (PCONC).
             3 - Release indication (PRELI).
             4 - Release confirmation (PRELC).
             5 - Provider abort indication (PPABT).
             6 - Data indication (PDTI).
             7 - PS-provider is now ready to accept data request (PDTRQ)
             (previous call was rejected with status = -1).

5.6.2   PGWAIT

Function

The PGWAIT interface procedure is used by a PS-user to request the PS-provider to inform the PS-user when an event significant to the PS-user has occurred on any PCEP.

Procedure call and arguments

PGWAIT   **Entity-id**, **Time-out**, **Status**, **U-PCEP**, **Event**.

Entity-id   Integer. Unique identification of the user entity.
          (The same value as used in the PATT call must be supplied.)

Time-out   Integer. Maximum waiting time in seconds.
          >0 - Time-out in seconds.
          =0 - Immediate return (poll effect).
          <0 - No time-out specified, wait until event occurs.

Status   Integer. Status on return.
          +1 - Event occurred.
           0 - Time-out occurred.
          -2 - Illegal argument.
          -3 - PS-provider out of operation.

U-PCEP   Integer. PCEP identifier of the connection where an event has occurred.

Event   Integer. Code identifying the event.
          (Only relevant if status = +1.)
          1 - Connect indication (PCONI).
          2 - Connect confirmation (PCONC).
          3 - Release indication (PRELI).
          4 - Release confirmation (PRELC).
          5 - Provider abort indication (PPABT).
          6 - Data indication (PDTI).
          7 - PS-provider is now ready to accept data request (PDTRQ)
          (previous call was rejected with status = -1).

5.7 REASON/RESULT PARAMETER VALUES

0	-	Result ok.
1	-	Local lack of resources.
2	-	Remote lack of resources.
3	-	Quality of service below minimum level.
4	-	No answer from remote system.
5	-	Remote service user unavailable.
6	-	Called user unknown.
7	-	Misbehaviour of local service user.
8	-	Misbehaviour of remote service user.
9	-	Misbehaviour of local part of provider.
10	-	Misbehaviour of remote part of provider *).
12	-	Collision
30	- 50	No available lower connection.
30	-	Remote Party Clears.
3	-	Number busy.
32	-	Out of order.
33	-	Network congestion.
34	-	Other (call progress signal).
35	-	Lower levels cannot establish a connection within the specified time limit.
36	-	Rejected by service user.
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
128	- 254	System implementation dependent reason.
255		Unknown reason.

6   SPECIFICATION OF BUFFER ALLOCATION PROCEDURES

It is not required to supply these procedures, but their use can make the implementation more portable.

6.1   GTBU

Function
The GTBU procedure is used to interface to the local host buffer system. Each call returns a buffer or a negative indication to the caller.

Procedure call and arguments

GTBU   **W-SIZE**, **PRIOR**, **WAIT**, **B-ADDR**, **A-SIZE**.

W-SIZE   Integer. Wanted buffer size given in number of octets.

PRIOR   Integer. Priority.
   0 - Low.
  +1 - Medium.
  +2 - High.

WAIT   Integer.
   0 - No wait for available buffer (poll).
  +1 - Wait for buffer. (It is not guaranteed that the buffer returned is exactly of the requested size.)

B-ADDR   Integer. Buffer address/identifier.

A-SIZE   Integer. Actual buffer size in octets. A-SIZE = 0 indicates that no buffer is available for specified priority level.

6.2   FRBU

Functions
The FRBU procedure is used to return a buffer to the local host buffer system.

Procedure call and arguments

FRBU   **B-ADDR**.

B-ADDR   Integer. Buffer address/identifier.