Teldat Router

PPPoE Interface

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Chapter 1
PPPoE Protocol

1. Introduction

The PPP protocol (Point-to-Point Protocol) provides a mechanism to transmit multi-protocol datagrams over a point-to-point link. The PPPoE protocol (PPP over Ethernet) permits you to establish PPP sessions and encapsulate PPP packets over Ethernet. In this way, you can achieve a multipoint connection such as that of Ethernet with the authentication characteristics, link control etc., and point-to-point connection characteristics. The PPPoE is basically used in broadband remote access technologies which provide a bridged Ethernet topology when the access providers wish to maintain the session abstraction associated to PPP. This protocol is specified in the RFC 2561.

Currently, it is only possible to configure PPPoE in interfaces where the PPP is set up over an ATM subinterface.

2. Description of the PPPoE protocol

The PPPoE protocol is made up of two distinct stages: the Discovery stage and a PPP Session stage.

2.1. Discovery Stage

When a device wishes to initiate a PPPoE session, it must first perform Discovery to identify the Ethernet Mac address of the peer and establish a PPPoE session identifier. In the Discovery process, a client device discovers a PPPoE server known as an Access Concentrator. Depending on the network topology, there may be more than one Access Concentrator. The Discovery stage allows the client to identify all the Access Concentrators and then select one.

The discovery stage is divided into four parts:

1. the client sends an initiation packet (PADI: PPPoE Active Discovery Initiation) to the whole of the network (broadcast packet), indicating the services they expect to receive.
2. the Access Concentrator, if this can fulfill the required services, sends the client an offer packet (PADO: PPPoE Active Discovery Offer), indicating the services offered.
3. the client then selects the Access Concentrator which has sent the offer that best suits their necessities. Subsequently the client sends the said concentrator a Session Request packet (PADR: PPPoE Active Discovery Request).
4. the Access Concentrator receives the Session Request and sends a Confirmation packet (PADS: PPPoE Active Discovery Session-confirmation), indicating the identifier of the established session. From this point onwards the session stage begins.

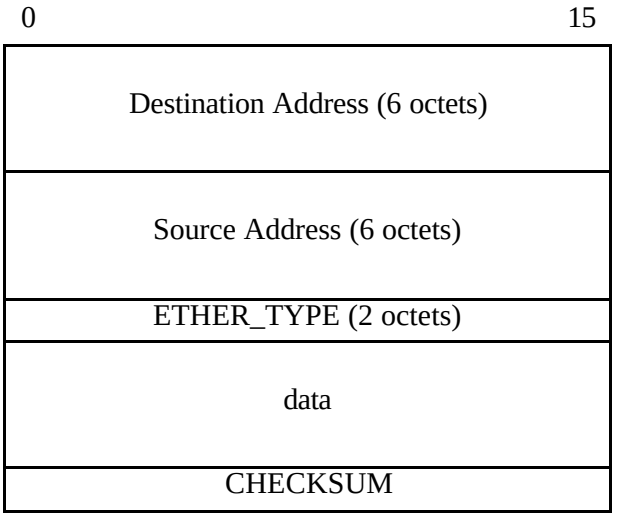
2.2. Session Stage

Once the discovery stage has been successfully completed, both the client and the Access Concentrator have the necessary information to construct their point-to-point connection over Ethernet. In the session stage, the frames exchanged between both ends correspond to those from a PPP session, with the peculiarity that the said frames are encapsulated over Ethernet frames.

3. PPPoE frame structure

The PPPoE frame is basically an Ethernet frame with some additionally encapsulation as regards data.

3.1. Ethernet frame format



DESTINATION ADDRESS

Packet destination MAC address. In the discovery stage, this may contain the 0xFFFFFFFFFFFF broadcast address.

SOURCE ADDRESS

Packet source MAC Address.

ETHER_TYPE

Indicates that the frame must be interpreted as PPPoE. This has a value equal to 0x8863 in the discovery stage and 0x8864 in the session stage.

DATOS

Ethernet frame data. The structure of this data for PPPoE is explained in the next section.

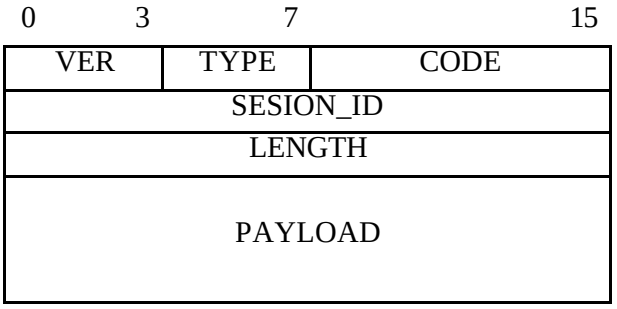
CHECKSUM

Ethernet frame data checksum.

NOTE: Currently, the PPPoE frames are sent via ATM. If you wish, you can configure this 'bridge' in the device to include (or not) the checksum field.

3.2. Data format: PPPoE frame

The Ethernet frame data for PPPoE has the following format:



VER

This is a four bit field indicating the PPPoE version. This must be 0x1.

TYPE

This is an eight bit field indicating the type of PPPoE. This must be 0x1.

CODE

This is an eight bit field indicating the type of PPPoE packet according to the following table:

CODE	TYPE OF PPPoE PACKET
0x09	PADI: PPPoE Active Discovery Initiation
0x07	PADO: PPPoE Active Discovery Offer
0x19	PADR: PPPoE Active Discovery Request
0x65	PADS: PPPoE Active Discovery Session-Confirmation
0xA7	PADT: PPPoE Active Discovery Terminate
0x0	Packet in the session stage

SESSION_ID

This is a two byte field identifying the established PPPoE session. In the discovery stage, this takes a value equal to 0 until the Access Concentrator assigns an identifier to the session in progress. The source and destination addresses together uniquely identify a PPPoE session.

LENGTH

This is a two byte field indicating the size, in bytes, of the PPPoE data part (payload). This does not include the Ethernet or the PPPoE header.

PAYLOAD

PPPoE data. In the session stage, this really is PPP protocol data. In the discovery stage, the payload contains zero or more tags. Each tag is made up of two bytes indicating the type of tag, two bytes indicating the tag length in bytes and the tag value. The distinct tags are used to negotiate the establishment conditions of the PPPoE session.

4. References

RFC 2516
A Method for Transmitting PPP Over Ethernet (PPPoE), February 1999
RFC 2684
Multiprotocol Encapsulation over ATM Adaptation Layer 5, September 1999

Chapter 2
Configuring the PPPoE Interface

1. Creating the PPP Interface

To create PPP interfaces, enter the **ADD DEVICE PPP** command found in the general configuration menu. Once added, indicate the number of the interface assigned to the PPP interface that has been created.

```
Config>ADD DEVICE PPP
Interface Id[9999-1]? 1
Added PPP interface ppp1
Config>
```

You can check that the created interface has been correctly added by listing the interfaces that exist in the device:

```
Config>LIST DEVICES

 Interface       Con    Type of interface            CSR     CSR2  int
 ethernet0/0     LAN1   Quicc Ethernet           fa200a00 fa203c00   5e
 serial0/0       WAN1   X25                      fa200a00 fa203c00   5e
 bri0/0          ISDN1  ISDN Basic Rate Int      fa200a40 fa203e00   5c
 x25-node        ---    Router->Node                    0             0
 ppp1            ---    Generic PPP                     0             0
Config>
```

2. Configuring the PPPoE Interface

To configure the PPPoE parameters associated to the interfaces, enter the **PPPoE** command within the PPP interface configuration menu.

```
Config>NETWORK ppp1

Generic PPP User Config
GenPPP Cfg>PPPoE
PPPoE User Config
PPPoE Cfg>
```

NOTE: The creating and configuring of a PPP interface is described in manual Dm 710-I. In order to access the PPPoE configuration menu, the PPP base interface must be an ATM subinterface.

The options for this configuration menu are as follows:

```
PPPoE Cfg>?
AC-NAME
BRIDGE-TYPE
DISABLE
ENABLE
HOST-UNIQ
LIST
NO
N_PADI
N_PADR
SERVICE-NAME
T_PADO
T_PADS
WAIT-ALGORITHM
EXIT
```

2.1. AC-NAME

Configures the Access Concentrator name with which you wish to establish a PPPoE session. If none is configured, offers are accepted from all the concentrators available in the network.

```
PPPoE Cfg>AC-NAME
Host-Uniq  [Access1]? Concentrator1
PPPoE Cfg>
```

2.2. BRIDGE-TYPE

Configures, in the cases where the PPPoE frames are sent via an interface distinct to Ethernet and therefore a 'bridge' is required, whether the Ethernet frame checksum is also sent in the packet (or not).

```
PPPoE Cfg>BRIDGE-TYPE ?
FCS
NO-FCS
PPPoE Cfg>
```

a) BRIDGE-TYPE FCS

Configures the frames with 'bridge' to include the Ethernet frames checksum.

b) BRIDGE-TYPE NO-FCS

Configures the frames with 'bridge' to not include the Ethernet frames checksum.

2.3. DISABLE

```
PPPoE Cfg>DISABLE ?
PPPoE
PPPoE Cfg>
```

a) DISABLE PPPoE

Configures the interface as PPP (disabling PPPoE mode).

2.4. ENABLE

```
PPPoE Cfg>ENABLE ?
PPPoE
PPPoE Cfg>
```

a) ENABLE PPPoE

Configures the interface as PPPoE (enabling PPPoE mode).

2.5. HOST-UNIQ

Configures the Host identifier for a PPPoE client. This is used to uniquely associate the response from an Access Concentrator to a specific Host request.

```
PPPoE Cfg>HOST-UNIQ
Host-Uniq  [Teldat]? Router1
PPPoE Cfg>
```

2.6. LIST

Displays the PPPoE interface configuration.

```
PPPoE Cfg>LIST
Status ..................... Enabled
Host-Uniq ..................... Teldat
Service-Name .................. PPPoE Service
AC-Name ....................... Access1
PADI attempts ................. 3
PADR attempts ................. 3
PADO timeout .................. 5 seconds
PADS timeout .................. 5 seconds
Timeout ....................... Exponential
Bridge (for bridged frames) ... Do not send FCS
PPPoE Cfg>
```

"Status", PPPoE status, enabled or disabled.

"Host-Uniq", identifier of the configured Host.

"Service-Name", configured service name.

"AC-Name", configured Access Concentrator name.

"PADI Attempts", maximum number of PADI transmissions.

"PADR Attempts", maximum number of PADR transmissions.

"PADO timeout", PADO wait time (time between PADI retransmissions).

"PADS timeout", PADS wait time (time between PADR retransmissions).

"Timeout", indicates the type of algorithm used to calculate the wait time between retransmissions. This can be constant or exponential. In this latter case, the wait time is multiplied by two in each new retransmission.

"Bridge (for bridged frames)", indicates if you must send (or not) the Ethernet frames checksum when these are transmitted through an interface distinct to Ethernet (ATM for example).

2.7. NO

Permits you to delete different configuration parameters.

```
PPPoE Cfg>NO ?
AC-NAME
BRIDGE-TYPE
HOST-UNIQ
N_PADI
N_PADR
SERVICE-NAME
T_PADO
T_PADS
WAIT-ALGORITHM
PPPoE Cfg>
```

a) NO AC-NAME

Deletes the Access Concentrator name required in the PPPoE session. In this way, offers from all the concentrators available in the network are accepted.

```
PPPoE Cfg>NO AC-NAME
PPPoE Cfg>
```

b) NO BRIDGE-TYPE

Configures the default value for sending (or not) the Ethernet frame checksum in the packet in cases where the PPPoE frames are sent through an interface distinct to Ethernet and therefore a 'bridge' is required. By default, the checksum is not sent.

```
PPPoE Cfg>NO BRIDGE-TYPE
PPPoE Cfg>
```

c) NO HOST-UNIQ

Deletes the unique identifier for the host configured in the device.

```
PPPoE Cfg>NO HOST-UNIQ
PPPoE Cfg>
```

d) NO N-PADI

Configures the number of times that a PPPoE Active Discovery Initiation packet (PADI) is transmitted before the negotiation is considered as failed to the default value. The default value is 3 transmissions.

```
PPPoE Cfg>NO N-PADI
PPPoE Cfg>
```

e) NO N-PADR

Configures the number of times that a PPPoE Active Discovery Request packet (PADR) is transmitted before the negotiation is considered as failed to the default value. The default value is 3 transmissions.

```
PPPoE Cfg>NO N-PADR
PPPoE Cfg>
```

f) NO SERVICE-NAME

Deletes the service name required in the PPPoE session. In this way, any offered service is accepted.

```
PPPoE Cfg>NO SERVICE-NAME
PPPoE Cfg>
```

g) NO T-PADO

Configures the time, in seconds, that must lapse without receiving an offer (PADO), before re-sending the PPPoE Active Discovery Initiation packet (PADI) to the default value. The default value is 5 seconds.

```
PPPoE Cfg>NO T-PADO
PPPoE Cfg>
```

h) NO T-PADS

Configures the time, in seconds, that must lapse without receiving a PPPoE Active Discovery Session-confirmation packet (PADS), before resending the PPPoE Active Discovery Request packet (PADR) to the default value. The default value is 5 seconds.

```
PPPoE Cfg>NO T-PADS
PPPoE Cfg>
```

i) NO WAIT-ALGORITHM

Configures the algorithm to be used in order to calculate the frame wait time in the PPPoE Discovery stage to the default value. The default value is the exponential wait algorithm (in each new wait session the wait time duplicates).

```
PPPoE Cfg>NO WAIT-ALGORITHM
PPPoE Cfg>
```

2.8. N-PADI

Configures the number of times that a PPPoE Active Discovery Initiation packet (PADI) is transmitted before the negotiation is considered as failed.

```
PPPoE Cfg>N-PADI
PADI attempts [3]? 4
PPPoE Cfg>
```

2.9. N-PADR

Configures the number of times that a PPPoE Active Discovery Request packet (PADR) is transmitted before the negotiation is considered as failed.

```
PPPoE Cfg>N-PADR
PADO attempts [3]? 5
PPPoE Cfg>
```

2.10. SERVICE-NAME

Configures the required service name for the client. If none is configured, the client indicates that any service is required.

```
PPPoE Cfg>SERVICE-NAME
Host-Uniq  []? PPPoE Service
PPPoE Cfg>
```

2.11. T-PADO

Configures the time, in seconds, that must lapse without receiving an offer (PADO), before re-sending the PPPoE Active Discovery Initiation packet (PADI).

```
PPPoE Cfg>T-PADO
PADO timeout (sec)[5]? 3
PPPoE Cfg>
```

2.12. T-PADS

Configures the time, in seconds, that must lapse without receiving a PPPoE Active Discovery Session-confirmation packet (PADS), before resending the PPPoE Active Discovery Request packet (PADR).

```
PPPoE Cfg>T-PADS
PADS timeout (sec)[5]? 4
PPPoE Cfg>
```

2.13. WAIT-ALGORITHM

Configures the algorithm to be used in order to calculate the frame wait time in the PPPoE Discovery stage.

```
PPPoE Cfg>WAIT-ALGORITHM ?
EXPONENTIAL
CONSTANT
PPPoE Cfg>
```

a) WAIT-ALGORITHM EXPONENTIAL

Configures the wait-time between the retransmissions of frames in the Discovery stage as exponential. The initial time is that configured in T_PADO or T-PADS. Each time the timer times out and a frame must be re-transmitted, the wait time is duplicated.

b) WAIT-ALGORITHM CONSTANT

Configures the wait-time between the retransmissions of frames in the Discovery stage as constant. The wait-time is that configured in T_PADO or T-PADS and does not vary for each transmission.

2.14. EXIT

Exits the PPPoE interface configuration menu.

```
PPPoE Cfg>EXIT
GenPPP config>
```

Chapter 3
PPPoE Interface Monitoring

1. PPPoE interface monitoring

In order to access the PPPoE monitoring, enter the command **PPPoE** within the PPP interface monitoring menu.

```
Config>NETWORK ppp1
Generic PPP Console
GenPPP>PPPoE
PPPoE Console
PPPoE>
```

The options for this monitoring menu are as follows:

```
PPPoE >?
LIST
CLEAR statistics
EXIT
PPPoE>
```

1.1. LIST

Displays the status of a PPPoE session as well as the distinct generic statistics for the PPPoE interface.

```
PPPoE>LIST ?
CONNECTION
STATISTICS
ALL
PPPoE>
```

a) LIST CONNECTION

Displays the status of a PPPoE connection.

```
PPPoE>LIST CONNECTION

CONNECTION

Connection status ..... Closed
PPPoE>
PPPoE>LIST CONNECTION

CONNECTION

Connection status ..... Opening
Discovery status ..... Waiting for PADS
PADI attempts ..... 2 / 3
PADO timeout ..... 5 seconds
PADR attempts ..... 1 / 3
PADS timeout ..... 2 seconds
Session id ..... 0 (0x0)
Remote MAC ..... 00C0DFAA184B
Host-Uniq ..... Router1
Service-Name ..... PPPoE Service
AC-Name ..... Access1
Cookie ..... No
Relay Session Id ..... 12345
PPPoE>
```

The fields that are displayed depend on the status of the connection. The information shown can include the following fields:

- *"Connection status"*: The connection may be Closed, Closing, Opening (Discovery stage in progress) or Opened (PPPoE session established).
- *"Discovery status"*. This can be Initial state (the PADI frame has not been sent as yet), Waiting for PADO (the PADI frame has been sent and it is waiting to receive PADO frames), Waiting for PADS (the PADR frame has been sent and it is waiting to receive PADS frames), Session established or PADT received (a session termination frame has been received and the PPPoE connection will close).
- *"PADI attempts"*, number of PADI frames sent in the Discovery stage of this PPPoE session. This also indicates the maximum number of configured retransmissions.
- *"PADO timeout"*, wait time for a PADO frame before re-transmitting the PADI frame. In cases of an exponential wait algorithm, this reflects the last wait time used.
- *"PADR attempts"*, number of PADR frames sent in the Discovery stage of this PPPoE session. This also indicates the maximum number of configured retransmissions.
- *"PADS timeout"*, wait time for a PADS frame before re-transmitting the PADR frame. In cases of an exponential wait algorithm, this reflects the last wait time used.
- *"Session id"*, identifier of the established PPPoE session. In the Discovery stage, this indicates a value equal to zero.
- *"Remote MAC"*, remote MAC address. This is only displayed when a packet from the Access Concentrator has been received.
- *"Host-Uniq"*, identifier of the Host used in the PPPoE session. This identifier is the one configured in the device, should one have been configured.
- *"Service-Name"*, name of the service used in the PPPoE session. This is the one configured in the device if a name has been configured, the one indicated by the remote end in cases where none has been configured and the remote end indicates one, or none if there is no service name configured and the Access Concentrator does not provide one.
- *"AC-Name"*, name of the Access Concentrator with which the PPPoE session is established. This is the one configured in the device if a name has been configured, the one indicated by the remote end in cases where none has been configured and the remote end indicates one, or none if there is no Access Concentrator name configured and the Access Concentrator does not provide one.
- *"Cookie"*, indicates if the Access Concentrator has used a 'cookie' during the Discovery stage. The value of the 'cookie' is not displayed: this is usually large and includes illegible characters.
- *"Relay Session Id"*, identifier of the Relay, if this exists, situated between the device and the Access Concentrator. This value is not shown if the Relay is not detected. The Relay identifier is truncated into 19 bytes in order to display this on the screen.

b) LIST STATISTICS

Displays the statistics of the PPPoE sessions established in the interface. This includes information on each type of received frames and errors produced.

```
PPPoE>LIST STATISTICS

STATISTICS

PADI transmitted ........................ 269
PADO received ........................... 9 (ok: 3)
PADR transmitted ........................ 3
PADS received ........................... 3 (ok: 3)
PADT transmitted ........................ 0
```

```
PADT received ............................ 1 (ok: 0)
Session packets transmitted .............. 62
Session packets received ................. 51 (ok: 48)
Tag-length errors ........................ 0
Service-Name errors ...................... 0
AC-Name errors ........................... 0
Host-Uniq errors ......................... 0
Tags Service-Name error .................. 0
Tags AC-System error ..................... 0
Tags Generic error ....................... 0
Packets with destination MAC error ....... 0
Packets with eth-type error .............. 0
Packets with version error ............... 0
Packets with type error .................. 0
Packets with code error .................. 6
Packets with tags missing ................ 0
Packets with session error ............... 4
Packets discarded after PADT reception ... 0
Transmit packet errors ................... 0
Excessive length packet errors (xmt) ..... 0
Packets not transmitted .................. 0
Maximum PADI retries reached ............. 88
Maximum PADR retries reached ............. 0
PADO timeout ............................. 266
PADS timeout ............................. 0

PPPoE>
```

The displayed statistics include the following:

- *"PADI transmitted"*, number of PADI frames sent by the interface.
- *"PADO received"*, number of PADO frames received by the interface. This indicates, between brackets, how many of these frames were correct, i.e. received at the point of the negotiation where a PADO frame is expected and with the expected tags and the identifier of the session.
- *"PADR transmitted"*, number of PADR frames sent by the interface.
- *"PADS received"*, number of PADS frames received by the interface. This indicates, between brackets, how many of these frames were correct, i.e. received at the point of the negotiation where a PADS frame is expected and with the expected tags and the identifier of the session.
- *"PADT transmitted"*, number of PADT frames sent by the interface.
- *"PADT received"*, number of PADT frames received by the interface. This indicates, between brackets, how many of these frames were correct, i.e. with a correct session identifier.
- *"Session packets transmitted"*, number of frames sent by the interface with the session established.
- *"Session packets received"*, number of frames received by the interface with the session established.
- *"Tag-length errors"*, frames received with an error in a tag length.
- *"Service-Name errors"*, frames received with an erroneous 'Service-Name' (different from that configured in the device).
- *"AC-Name errors"*, frames received with an erroneous 'AC-Name' Name' (different from that configured in the device).
- *"Host-Uniq errors"*, frames received with an erroneous 'Host-Uniq' Name' (different from that configured in the device).
- *"Tags Service-Name error"*, frames received with an erroneous tag in the 'Service-Name'. This frame indicates that the Access Concentrator for some reason or other cannot provide the requested service.

- *"Tags AC-System error"*, frames received with an erroneous tag in the 'AC-Name'. This frame indicates that the Access Concentrator had an error in processing the petition.
- *"Tags Generic error"*, frames received with an erroneous generic tag.
- *"Packets with destination MAC error"*, frames received with incorrect destination MAC.
- *"Packets with eth-type error"*, frames received with an error in the Ethernet frame 'ether_type field.
- *"Packets with version error"*, frames received with an error in the PPPoE frame 'version' field.
- *"Packets with type error"*, frames received with an error in the PPPoE frame 'type' field.
- *"Packets with code error"*, frames received with an error in the PPPoE frame 'code' field.
- *"Packets with tags missing"*, frames received with fewer tags than expected.
- *"Packets with session error"*, frames received with an error in the session identifier.
- *"Packets discarded after PADT reception"*, frames received after receiving a PADT frame indicated the end of the established session. These frames are discarded without being processed.
- *"Transmit packet errors"*, total number of frames not transmitted due to an internal error.
- *"Excessive length packet errors (xmt)"*, frames not transmitted as the data exceeds the maximum Ethernet frame size.
- *"Packets not transmitted"*, frames not transmitted as the PPPoE session is not established or because a PADT frame has been received indicating the end of the session.
- *"Maximum PADI retries reached"*, number of times that the maximum number of retransmissions configured for a PADI frame has been reached.
- *"Maximum PADR retries reached"*, number of times that the maximum number of retransmissions configured for a PADR frame has been reached.
- *"PADO timeout"*, number of times that a maximum wait time out for a PADO frame has been produced without receiving anything.
- *"PADS timeout"*, number of times that a maximum wait time out for a PADS frame has been produced without receiving anything.

1.2. CLEAR statistics

Deletes the PPPoE statistics.

```
PPPoE>CLEAR
PPPoE>
```

1.3. EXIT

Exits the PPPoE interface monitoring menu.

```
PPPoE>EXIT
GenPPP>
```