Teldat Router

XOT Protocol

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Chapter 1
Introduction

1. Introduction to XOT Protocol

X.25 over TCP/IP -XOT- (X. 25 sobre TCP/IP)

The XOT Interface allows X.25 packets to be transported over TCP/IP networks. This demands a reliable link level to transfer the packets. This link is generally LAPB (or LAPD) protocol in packet switch networks. However, when it is a different type of network, e.g. Frame Relay switch networks the LAPB link must be substituted for a distinct reliable link. If the TCP/IP is chosen as a link layer, this permits the interconnection of terminals (which operate in X.25 over Frame Relay networks and local Ethernet, Token Ring networks etc.), as the packet sequences are converted into datagram sequences. These are forwarded and routed over all IP networks until they reach their destination where the X.25 packets are recovered.

This method of encapsulating X.25 over TCP is defined in the RFC (Request For Comments) 1613 standard with which the XOT is compatible.

Chapter 2
Configuration

1. Configuration Commands

The XOT Protocol configuration is accessed through the main menu in the following way:

1. At the (*) prompt, enter PROCESS 4 (or P 4).
2. At the configuration (Config>) prompt, enter **NODE XOT** or **NETWORK xxxx**, xxxx being the name of the XOT interface that can be viewed through **LIST DEVICES**.
3. At the XOT protocol configuration (XOT Config>) prompt, use the configuration commands described in this chapter to configure the XOT protocol parameters.

In this chapter the XOT Protocol configuration commands are explained in detail.

Command	Function
? (HELP)	Lists all the available commands or options.
ADDRESS	Associates an NA to an IP address.
DISABLE	Disable a functionality.
ENABLE	Enable a functionality
FACILITY	Configures X.25 facilities.
LIST	List the parameters.
NO	Permits you to delete a parameter or an element from a table.
RESTORE	Restore the default values.
ROUTING	Adds routing.
SET	Set the value of a parameter.
EXIT	Return to Config> prompt.

1.1. ? (HELP)

Displays a list of the available commands or their options.

Syntax:

```
XOT Config>?
```

Example:

```
XOT config>?
ADDRESS
DISABLE
ENABLE
FACILITY
LIST
NO
RESTORE
ROUTING
SET
EXIT
XOT Config>
```

1.2. ADDRESS

Allows you to assign a determined NA to an IP address. The NAs can be generic. You can also set an alternative IP address which you can use to connect when the configured timeout terminates in this command.

Syntax:

```
XOT config>ADDRESS <na>
ip-address                  ip-address to stablish a tcp connection
alternative-ip-address      alternative-ip-address to try if primary fails
timeout                     timeout to try with the alternative ip address
```

Each option has the following meaning:

<na>   Calling NA for the indicated IP address.

ip-address   IP address to which an X.25 address is associated. (This parameter must be introduced - mandatory).

alternative-ip-address Alternative-ip-address to try if primary fails

timeout   Wait time before trying with the alternative IP address.

Example:

```
XOT Config>ADDRESS 21324242 IP 192.22.24.56 AL 172.43.55.23 TI 120
XOT Config>
```

1.3. DISABLE

Syntax:

```
XOT Config>DISABLE ?
EXT-PACKET-MODE
XOT Config>
```

a) DISABLE EXT-PACKET-MODE

Configures the port to work in 8 mode.

Example:

```
XOT Config>DISABLE EXT-PACKET-MODE
XOT Config>
```

1.4. ENABLE

Syntax:

```
XOT Config>ENABLE ?
EXT-PACKET-MODE
XOT Config>
```

a) ENABLE EXT-PACKET-MODE

Configures the port to work in 128 mode.

Example:

```
XOT Config>ENABLE EXT-PACKET-MODE
XOT Config>
```

1.5. FACILITY

This permits you to change the called NA, add or change user data, and add or change facilities in the call packets (window and packet length negotiation, reverse charge, closed user group and network

user identifier).   In order to eliminate a facility entry, introduce the command **NO** in front of
FACILITY. For further information, please see the section describing the **NO** command function.
Syntax:

```
XOT config>FACILITY <id>
called                      window and packet length called facilities
    window                  window value
    packet-length           packet-length value

caller                      window and packet length caller facilities
    window                  window value
    packet-length           packet-length value

na-value                    na value to match (digit or X)
new-na-value                new na value (digit , X or S)
no
    reverse-charge          Disable reverse charge facility option
    packet-length-negotiation  Disable packet-length negotiation facility
    window-negotiation      Disable window-negotiation facility
    user-group              Disable user-group facility

packet-length-negotiation   packet-length negotiation facility
interface                   interface to match
priority                    priority of this entry
reverse-charge              reverse charge facility option
user                        serveral user facilities
    bilateral-group         bilateral group type
    normal-group            normal group type
    outgoing-group          outgoing group type
    id                      user id
    data                    user data

window-negotiation          window-negotiation facility
XOT config>
```

Each option has the following meaning:

<id>   Number of the facility entry (item).
called   Window size and packet length called facilities.
  - window   Window size (1-128) default value 7.
  - packet-length   Packet length (1-4096) default value 256.

caller   Window size and packet length caller facilities.
  - window   Window size (1-128) default value 7.
  - packet-length   Packet length (1-4096) default value 256.

na-value   NA value (digits or X)
new-na-value   New NA value (digits, X or S). **S** suppresses the digit figuring in this position, **X**
                        does not change it.
no
  - reverse-charge   Disables the reverse charge facility option.
  - packet-length-negotiation   Disables the packet length negotiation facility option.
  - window-negotiation   Disables the window size negotiation facility option.
  - user-group   Disables the user group facility option.

packet-length-negotiation   Enables the packet length negotiation facility option.

interface	Assigns an interface to which the outgoing calls facility is applied. In cases where this is not configured, the facility is applied to all the device's outgoing calls.
priority	Permits you to configure the priority for this entry. (0 a 9)
reverse-charge	Enables the reverse charge facility option.
user	Permits you to configure various user facilities.
bilateral-group	Configures the bilateral group type user.
<num>	Group number. (4 Hexadecimal digits from 0 to F).
normal-group	Configures normal group type user.
<num>	Group number. (2 Hexadecimal digits from 0 to F).
outgoing-group	Configures the closed user group type user with outgoing access.
<num>	Group number. (2 Hexadecimal digits from 0 to F).
id	User identifier (ASCII characters)
data	User data. (Characters in hexadecimal without 0x in front).
window-negotiation	Enables the window size negotiation facility option.

Example:

```
XOT Config>FACILITY 1 CALLED WINDOW 4 CALLED PACKET-LENGTH 128 NA-VALUE 232X2X3 RE
VERSE-CHARGE
XOT Config> FACILITY 1 CALLER WINDOW 4 CALLER PACKET-LENGTH 128
XOT Config>
```

1.6. <u>LIST</u>

Lists the different parameters.

Syntax:

```
XOT Config>LIST ?
ADDRESS
ALL
FACILITY
PORT
ROUTING
XOT Config>
```

a) <u>LIST ADDRESS</u>

Lists the address table.

Example:

```
XOT Config>LIST ADDRESS
  X25 Address            IP Address         Altern. IP Addr.  Call Timeout.
      123456              1.1.1.1           1.1.1.2              30
XOT Config>
```

b) <u>LIST ALL</u>

Lists all the XOT configuration.

Example:

```
Config>LIST ALL
Port information: xot
Layer 3 Window: 2
Ext pkt mode:  Disabled
Packet size: 128
Caller Number:
NA calling process: Outgoing calls
PVC low: 0
PVC high: 0
SVC low: 100
SVC high: 100
Channel Direction: DEC

  X25 Address              IP Address            Altern. IP Addr.  Call Timeout.
        123456               1.1.1.1             1.1.1.2              30

Interface       Con     Type of interface           CSR       CSR2   int
 ethernet0/0    LAN1    Fast Ethernet interface   fa200e00            27
 serial0/0      WAN1    Frame Relay               fa200a00 fa203c00   5e
 serial0/1      WAN2    X25                       fa200a20 fa203d00   5d
 serial0/2      WAN3    X25                       fa200a60 fa203f00   5b
 bri0/0         ISDN1   ISDN Basic Rate Int       fa200a40 fa203e00   5c
 x25-node       ---     Router->Node                     0            0
 xot            ---     XOT                              0            0
 ip-router      ---     Node->Router                     0            0

Entry        Port      priority      routing             NA          UD
  1       serial0/1       0             N         XXXXXXXXXXXXXXX

X.25 global data:
Max. datagram length: 1500
Backup recover attempt time: 0
Max dinamically added addresses: 10
Check input call:  Enabled


Packet facilities:
num P   Port     NA                NNA              Wcd Wcr Lcd  Lcr  RC CUG   NUI/UD
1   0 serial0/1 XXXXXXXXXXXXXXX XXXXXXXXXXXXXXX 7   7   256  256  N B/0434 rest/3
XOT Config>
```

c) *LIST FACILITY*

Lists the facilities table.

Example:

```
XOT Config>LIST FACILITY
Packet facilities:
num P   Port     NA                NNA              Wcd Wcr Lcd  Lcr  RC CUG   NUI/UD
1   0 serial0/1 XXXXXXXXXXXXXXX XXXXXXXXXXXXXXX 7   7   256  256  N B/0434 rest/3
XOT Config>
```

d) *LIST PORT*

Lists the XOT port parameters.

Example:

```
XOT Config>LIST PORT
Port information: xot
Layer 3 Window: 2
Ext pkt mode:  Disabled
Packet size: 128
Caller Number:
NA calling process: Outgoing calls
PVC low: 0
PVC high: 0
SVC low: 100
```

```
SVC high: 100
Channel Direction: DEC
XOT Config>
```

e) *LIST ROUTING*

Lists the routing table.

Example:

```
XOT Config>LIST ROUTING

Interface        Con      Type of interface          CSR      CSR2    int
 ethernet0/0     LAN1     Fast Ethernet interface    fa200e00          27
 serial0/0       WAN1     Frame Relay                fa200a00 fa203c00  5e
 serial0/1       WAN2     X25                        fa200a20 fa203d00  5d
 serial0/2       WAN3     X25                        fa200a60 fa203f00  5b
 bri0/0          ISDN1    ISDN Basic Rate Int        fa200a40 fa203e00  5c
 x25-node        ---      Router->Node                      0           0
 xot             ---      XOT                               0           0
 ip-router       ---      Node->Router                      0           0

Entry       Port      priority     routing          NA        UD
  1       serial0/1       0           N        XXXXXXXXXXXXXXX
XOT Config>
```

1.7. NO

Permits you to delete a parameter or an element from a table.

Syntax:

```
XOT Config>NO ?
ADDRESS
FACILITY
NA-CALLING
ROUTING
XOT Config>
```

a) *NO ADDRESS*

Permits you to delete an element from the address table.

Example:

```
XOT Config>NO ADDRESS
Value of NA? 1321231
XOT Config>
```

b) *NO FACILITY*

Permits you to delete an element from a facility table.

Example:

```
XOT Config>NO FACILITY
facility id[1]? 1
XOT Config>
```

c) *NO NA-CALLING*

Deletes the NA calling assigned to the XOT port.

Example:

```
XOT Config>NO NA-CALLING
Deleted NA-CALLING port xot
XOT Config>
```

d) *NO ROUTING*

Deletes a routing from the table.

Example:

```
XOT Config>NO ROUTING
route id[1]? 2
XOT Config>
```

1.8. RESTORE

Restores the default values.

Syntax:

```
XOT Config>RESTORE ?
ALL
PORT
XOT Config>
```

a) *RESTORE ALL*

Restores default values for all ports.

Example:

```
XOT Config>RESTORE ALL
Restored default values for all ports
XOT Config>
```

b) *RESTORE PORT*

Restores default values for the XOT port.

Example:

```
XOT Config>RESTORE PORT
Restored default values port: xot
XOT Config>
```

1.9. ROUTING

Permits you to asociate the X.25 addresses with the physical ports. In order to eliminate a route, introduce the command **NO** in front of **ROUTING**. For further information, please see the section describing the **NO** command.

Syntax:

```
XOT config>ROUTING <id>
na-value      na value to match this entry
no
  re-route    disable re-route
port          port to route this na
protocol      protocol
priority      priority of this route
re-route      enable re-route
  exclusive       enable re-route excluding the incoming call port
  all             enable re-route for all ports
XOT config>
```

Each option has the following meaning:

<id>   ROUTING entry number (item).

na-value	NA value to match to activate this route. (digets or X).
port	Port to route this NA. (serialx/x or ip-router).
protocol	Protocol identifier. You must introduce this value in hexadecimal.
priority	Priority for this route. The highest priority routing corresponds to the lowest number. (0-9)

reroute	Enables rerouting
exclusive	Enables rerouting, excluding the incoming call port.
all	Enables rerouting for all the ports.
no re-route	Disables rerouting.

(*) The rerouting option permits you to carry out rerouting if the highest priority routing or route is unavailable or all its logical channels are busy. The possible values are:

> Y: Yes carry out rerouting.

> N: No do not carry out rerouting.

> E: Exclusive rerouting: This option prevents an X.25 call from being routed towards the same port it came in by. I.e. if the highest priority routing routes the call towards a SVC of the same port the call entered through, then a search is carried out for other routings to other ports.

(**) The Protocol identifier field permits routing to be carried out depending on the first octet in the user data field, which identifies the protocol. If this is not programmed, this field is ignored.

Example:

You configure:

<id>	3
na-value	32323XXXX
port	serial0/1
priority	1
re-route	Enable normal rerouting.

```
XOT config>ROUTING 3 PO serial0/1 NA 32323XXXX PRI 1 RE AL
```

> *NOTE: The first time you introduce this command, you must enter as a minimum the <id>, port and na-value in the given order. Subsequently in order to change any parameter, you will only have to introduce the <id> and the parameters you wish to modify.*

1.10. <u>SET</u>

Assigns values to parameters.

Syntax:

```
XOT Config>SET ?
CHANNEL-DIRECTION
NA-CALLING
```

```
PACKET-SIZE
PACKET-WINDOW
PROCESS-NA-CALLING
SVC
XOT Config>
```

a) SET CHANNEL-DIRECTION

Permits you to define if the outgoing calls SVCs are to be assigned in descending or ascending order.

Syntax:

```
Config>SET CHANNEL-DIRECTION ?
DECREASING
INCREASING
XOT Config>
```

· SET CHANNEL-DIRECTION DECREASING

Assigns the channels in decreasing order beginning with the highest.

Example:

```
XOT Config>SET CHANNEL-DIRECTION DECREASING
XOT Config>
```

· SET CHANNEL-DIRECTION INCREASING

Assigns the channels in increasing order beginning with the lowest.

Example:

```
XOT Config>SET CHANNEL-DIRECTION INCREASING
XOT Config>
```

b) SET NA-CALLING

Permits you to configure the NA calling which is sent in the call request packets.

Example:

```
XOT Config>SET NA-CALLING
NA calling?123456
XOT Config>
```

c) SET PACKET-SIZE

Permits you to configure the packet size.

Example:

```
XOT Config>SET PACKET-SIZE
Packet size[1-4096][128]? 256
XOT Config>
```

d) SET PACKET-WINDOW

Permits you to configure the window size.

Example:

```
XOT Config>SET PACKET-WINDOW
Packet window(1-128)[2]? 7
XOT Config>
```

e) SET PROCESS-NA-CALLING

This option allows you to add or suppress the NA of the calling packets processed by the **Teldat Router**. The values that can be given are:

A: Automatic. Automatic according to the interface. If it is DCE the NA is added to the calls coming in through the port. If the interface is DTE, the NA is added to the outgoing calls.

S: Suppress. Suppresses the NA in all the calls passing through the port.

O: Outgoing calls. Adds the NA to the outgoing calls.

I: Incoming calls. Adds the NA to the incoming calls.

T: In all calls. Adds the NA to all calls.

Example:

```
XOT Config>SET PROCESS-NA-CALLING
Calling NA process (T,S,I,O,A)O: S
XOT Config>
```

f) *SET SVC*

Configures the logical channels.

Syntax:

```
XOT Config>SET SVC ?
LOW
HIGH
XOT Config>
```

· SET SVC LOW

Configures the lowest logical channel.

Example:

```
XOT Config>SET SVC LOW
SVC low[0-4096][100]?1
XOT Config>
```

· SET SVC HIGH

Configures the highest logical channel.

Example:

```
XOT Config>SET SVC HIGH
SVC high[0-4096][100]?10
XOT Config>
```

1.11. EXIT

Use the **EXIT** command to return to the previous prompt.

Syntax:

```
XOT Config>EXIT
```

Example:

```
XOT Config>EXIT
Config>
```

Chapter 3
Monitoring

1. Monitoring Commands

The XOT Protocol monitoring is accessed through the main menu in the following way:

1. At the (*) prompt, enter PROCESS 3 (or P 3).
2. At the monitoring (+) prompt, enter NODE XOT.
3. At the XOT protocol monitoring (XOT>) prompt, use the monitoring commands described in this chapter to monitor the Teldat router parameters.

In this chapter the XOT monitoring commands are explained in detail.

Command	Function
? (HELP)	Lists the available commands or their options.
LIST	Lists the TCP servers state.
EXIT	Returns to previous prompt.

1.1. ? (HELP)

Displays a list of available commands or their options.

Syntax:

```
XOT>?
```

Example:

```
XOT>?
LIST
EXIT
XOT>
```

1.2. LIST

Syntax:

```
XOT>LIST ?
STATE
XOT>
```

a) LIST STATE

Lists the TCP servers state.

Example:

```
XOT>LIST STATE

Total Servers:     0
Servers listening: 0
Servers opened:    0
Servers clients:   0
XOT>
```

1.3. EXIT

Use the **EXIT** command to return to the previous prompt.

Syntax:

```
XOT>EXIT
```

Example :

```
XOT>EXIT
+
```

Chapter 4
XOT Interfaces

1. Creating XOT interfaces

Firstly you need to create the XOT interface.

This is achieved through the configuration menu using the **ADD DEVICE XOT** command. This creates the interface and assigns an interface name.

```
*P 4
User configuration
Config>ADD DEVICE XOT
Added XOT interface xot
Config>
```

A list of the interfaces configured in the **Teldat Router** can be seen by entering the **LIST DEVICES** command after the user configuration prompt *Config>*.

```
*P 4
User configuration
Config>LIST DEVICES
 Interface       Con     Type of interface         CSR      CSR2    int
 ethernet0/0     LAN1    Fast Ethernet interface   fa200e00          27
 serial0/0       WAN1    Frame Relay               fa200a00 fa203c00 5e
 serial0/1       WAN2    X25                       fa200a20 fa203d00 5d
 serial0/2       WAN3    X25                       fa200a60 fa203f00 5b
 bri0/0          ISDN1   ISDN Basic Rate Int       fa200a40 fa203e00 5c
 x25-node        ---     Router->Node                     0         0
 xot             ---     XOT                              0         0
Config>
```

When you create an XOT interface, the routing is carried out towards it by using the node routing commands. It is only necessary to create one XOT interface as the X.25 calls are routed with an IP address.

2. Configuring XOT Interfaces

Before configuring the XOT protocol, it is advisable to have the corresponding part for the IP protocol configured so the addresses are assigned to the interfaces.

In order to achieve the XOT protocol configuration, the following operation must be carried out:

From the system console, type P 4 to access the configuration process.

```
*
*P 4
Config>
```

- Accessing the XOT prompt

From the configuration prompt, enter the command **NODE XOT** to access the XOT port configuration.

Syntax:

```
Config>NODE XOT
```

Example:

```
Config>NODE XOT
XOT Config>
```

- To display the present values of the port you wish to use on screen

Enter the command **LIST PORT** at the XOT prompt *XOT Config>*.

Example:

```
XOT Config>LIST PORT
Port information: xot
Packet window: 2
Ext pkt mode:  Disabled
Packet size: 128
Caller Number: 101010
NA caller process: Automatic
PVC low: 0
PVC high: 0
SVC low: 100
SVC high: 100
Channel Direction:  DEC
XOT Config>
```

3. Configuring the X.25 parameters

The meaning of the commands and the parameters which modify them are as follows:

Packet window

Specifies the maximum number of X.25 packets awaiting acknowledgment. This window can have values between 1 and 128. Default value is 2.

Example:

```
XOT Config>SET PACKET-WINDOW
Packet window(1-128)[ current value]?window_size
XOT Config>
```

Extended Packet Mode

Specifies the PS field module for the X.25 network level. This is the module used to consecutively number the sent X.25 packets and can have a value between 8 and 128 corresponding to the Disable and Enable values in this parameter. The default value is 8 (Disabled).

Example:

```
XOT Config>ENABLE EXTENDED-PACKET-MODE
XOT Config>
```

Or:

```
XOT Config>DISABLE EXTENDED-PACKET-MODE
XOT Config>
```

Packet size

Specifies the maximum length of an X.25 packet. The length is limited to 4.096 octets. The default value is set to 128 octets.

Example:

```
XOT Config>SET PACKET-SIZE
Packet size[1-4096][current value]?packet_size
XOT Config>
```

NA Calling

The NA (Network Address) is the X.25 calling address for the request call packets exiting through the port. This is independent from the NA which they were received with in the **Teldat Router**. This is not programmed by default.

Example:

```
XOT Config>SET NA-CALLING
NA calling?na_calling
XOT Config>
```

This number can consist of up to 15 ASCII characters.

In order to delete, use the **DELETE NA CALLING** command**.**

Process NA calling

This option allows you to add or suppress the NA of the call packets processed by the **Teldat Router**. The values that can be given are:

A: Automatic. Automatic according to the interface. If it is DCE the NA is added to the calls coming in through the port. If the interface is DTE, the NA is added to the outgoing calls.

S: Suppress. Suppresses the NA in all the calls passing through the port.

O: Outgoing calls. Adds the NA to the outgoing calls.

I: Incoming calls. Adds the NA to the incoming calls.

T: In all calls. Adds the NA to all calls.

Example:

```
XOT Config>SET PROCESS-NA-CALLING
Calling NA process [T,S,I,O,A] I: S
XOT Config>
```

SVC low

Indicates the lowest SVC number that can be used in X.25 communications. The range of permitted values is from 0 to 4.096. The default value is 100.

Example:

```
XOT Config>SET SVC LOW
SVC low [0-4096] [current value]?SVC_low
XOT Config>
```

SVC high

Indicates the highest SVC number that can be used in X.25 communications. The range of permitted values is from 0 to 4.096. The default value is 100.

Example:

```
XOT Config>SET SVC HIGH
SVC high [0-4096] [current value]?SVC_high
XOT Config>
```

The number of logical channels are only significant at an internal level and do not necessarily have anything to do with the X.25 ports. The important point is the total number of the logical channels which are configured as this determines the maximum number of connections.

Channel direction

Specifies if the logical channel numbers are used in ascending or descending order. The possible values are *INCREASING* and *DECREASING.* The default value is decreasing.

Example:

```
XOT Config>SET CHANNEL-DIRECTION INCREASING
XOT Config>
```

Or:

```
XOT Config>SET CHANNEL-DIRECTION DECREASING
XOT Config>
```

3.1. <u>Assigning Addresses</u>

The following commands are used to associate X.25 addresses to IP destination addresses.

Add address

Example:

```
XOT Config>ADDRESS 21324242 IP 192.22.24.56 AL 172.43.55.23 TI 120
XOT Config>
```

List address

Example:

```
XOT Config>LIST ADDRESS
  X25 Address            IP Address        Altern. IP Addr.  Call Timeout.
       21324242          192.22.24.56      172.43.55.23         30
XOT Config>
```

Delete address

Example:

```
XOT Config>NO ADDRESS
Value of NA? 21324242
XOT Config>
```

In the examples given, the calls with NA 21324242 are sent to the router with the following IP address 192.22.24.56

It is unnecessary to add the addresses to the incoming calls.

If the alternative IP address is left as 0.0.0.0, the alternative IP connection feature is not used.

3.2. Liberation causes and diagnostics

Under the following circumstances, a call directed to an XOT interface is released.

Cause (hex)	**Diagnostic** (dec)	**Motive**
0D	120	A specific NA/addr association has not been configured.
09	120	A specific IP address cannot be reached.
11	119	Timer period has finalized in the TCP connection. The remote stops answering TCP packets.
09	119	The remote has closed the TCP connection.