

# ISDN DDR using HDLC Encapsulation with Dynamic Multiple Encapsulations

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## **Introduction**

There are two different ways to use high-level data link control (HDLC) over ISDN:

- Define the physical interface to run HDLC. In other words, no encapsulation is defined since HDLC is the default encapsulation used by Cisco IOS® Software. This was the original way to configure HDLC with dial-on-demand routing (DDR). For more information on this method, refer to *ISDN DDR using HDLC Encapsulation*.
- Use dialer interface to bind the protocol you want (in this example, HDLC) to a specific dialer. This is the newer method and allows for a specific physical interface to handle multiple protocols (for example, PPP and HDLC). Since the protocol is configured on the dialer interface, the physical interface is not restricted. This method is known as dynamic multiple encapsulations and is discussed in this document.

For a more detailed explanation about dynamic multiple encapsulations, refer to *Dynamic Multiple Encapsulations*.

## **Prerequisites**

### **Requirements**

There are no specific requirements for this document.

### **Components Used**

The information in this document is based on these software and hardware versions:

- Three routers taxbol, aneto, and goya, which are Cisco 2500 Series routers used in a lab environment with cleared configurations.
- The Cisco IOS Software version used in taxbol is 11.2(22).
- The Cisco IOS Software version of goya is 12.0(7)T.
- The Cisco IOS Software version of aneto is 12.1(12.1).

HDLC over ISDN with dynamic multiple encapsulations is supported from Cisco IOS Software version 12.0(4)T and later. However, use the Software Advisor (registered customers only) to verify that the Cisco IOS Software version you are running supports it.

The information presented in this document was created from devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If you are working in a live network, ensure that you understand the potential impact of any command before using it.

## Conventions

For more information on document conventions, refer to Cisco Technical Tips Conventions.

## Background Information

### Why use HDLC?

The reason why anyone requires HDLC on the ISDN is not obvious, since it has a lot of disadvantages compared to PPP. The only purpose is probably to simplify the configuration, however it also simplifies access to the router for hackers. HDLC does not support any kind of authentication, hence the best protection here would be to verify the calling number with the **isdn caller** command on your interface, refer to Configuring CLI Screening or ISDN Authentication and Callback with Caller ID. Calling line ID (CLID)-based authentication assumes that your Telco supplies the calling number in the ISDN setup messages. However, since many Telcos do not supply CLID, so verify with your Telco before you configure CLID-based screening. If CLID is not supplied by the Telco, then all incoming calls into the router will fail.

Another disadvantage of HDLC is that the router does not install a dynamic map, so a dialer map needs to be configured on each end for the HDLC peer.

**Note:** If only one side makes the call (for example, one router always accepts the call and does not dial out) make sure that you include a name for the remote peer in the dialer map statement of the receiving side. However, the name can be some bogus made up name since the router has no way of authenticating the peer name to determine if it matches the dialer map name.

Example:

```
description This ISDN number is 8130
 ip address 172.16.1.6 255.255.255.252
 isdn caller 8129

!--- This is to accept only calls from 8129.

dialer map ip 172.16.1.5 name bogus_to_accept_command

!--- This is a dialer-map with a bogus name.

dialer-group 1
```

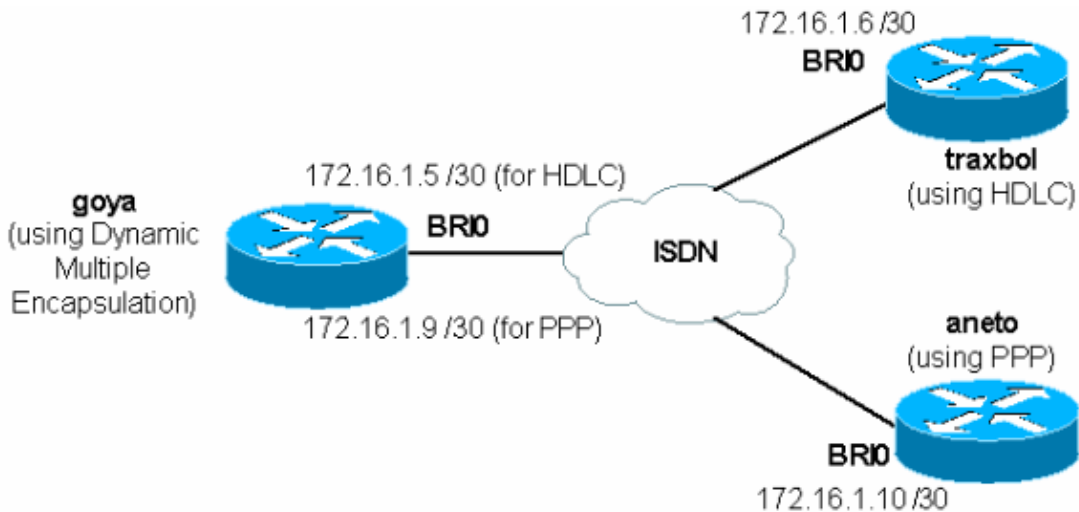
# Configure

In this section, you are presented with the information to configure the features described in this document.

**Note:** To find additional information on the commands used in this document, use the Command Lookup Tool (registered customers only).

## Network Diagram

This document uses this network setup:



## Configurations

This document uses these configurations:

- goya
- aneto
- traxbol

goya
<pre>Current configuration: ! version 12.0 service timestamps debug datetime msec service timestamps log datetime msec no service password-encryption ! hostname goya ! enable password ww ! username aneto password 0 cisco  ! no ip domain-lookup ! isdn switch-type basic-net3 !  interface Ethernet0</pre>

```
ip address 10.48.74.56 255.255.252.0
no ip redirects
!
interface BRI0
description This ISDN number is 8129
no ip address
no ip directed-broadcast
encapsulation ppp

!--- It is important that the encapsulation is set to PPP because
!--- the physical interface supports both PPP and HDLC (the default).

no ip mroute-cache
dialer pool-member 1
isdn switch-type basic-net3
no fair-queue
!
interface Dialer0
description dialer for aneto
ip address 172.16.1.9 255.255.255.252
no ip directed-broadcast
encapsulation ppp
dialer remote-name aneto
dialer pool 1
dialer string 8102
dialer caller 8102

!--- The dialer caller command is used to bind the call
!--- to the correct dialer.

dialer-group 1
ppp authentication chap
!
interface Dialer1
description dialer interface for traxbol
ip address 172.16.1.5 255.255.255.252
no ip directed-broadcast
dialer remote-name traxbol
dialer pool 1
dialer string 8130
dialer caller 8130

!--- The dialer caller command is used to bind the call
!--- to the correct dialer.

dialer hold-queue 10
dialer-group 1
no cdp enable
!
ip classless
!
ip route 10.10.10.0 255.255.255.0 Dialer1
ip route 10.10.20.0 255.255.255.0 Dialer0

!--- Two static routes to point to the LAN network of each remote router.
!--- Of course, any dynamic routing also works.

no ip http server
!
access-list 105 permit icmp any any

!--- As we see in the debugs, this access-list is used for
!--- debug Internet Control Message Protocol (ICMP) only.
!--- For more information, see Important Information on Debug Commands.
```

```
dialer-list 1 protocol ip permit
!
line con 0
  exec-timeout 0 0
  transport input none
line aux 0
line vty 0 4
  exec-timeout 0 0
  password WW
  login
!
end
```

## aneto

```
Current configuration : 1808 bytes
!
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname aneto
!
username goya password 0 cisco
!

no ip domain-lookup
!
isdn switch-type basic-net3
!

interface Ethernet0
  ip address 10.10.20.1 255.255.255.0

!--- In this scenario we use a dialer profile but a
!--- rotary-group would also work.

interface BRI0
  description this is ISDN 8102
  no ip address
  encapsulation ppp
  dialer pool-member 1
  isdn switch-type basic-net3
  ppp authentication chap
  ppp multilink
!
interface Dialer1
  ip address 172.16.1.10 255.255.255.252
  encapsulation ppp
  dialer pool 1
  dialer remote-name goya
  dialer string 8129
  dialer-group 1
  ppp authentication chap
!
ip route 0.0.0.0 0.0.0.0 Dialer1
dialer-list 1 protocol ip permit
!
line con 0
  exec-timeout 0 0
line aux 0
line vty 0 4
```

```
exec-timeout 0 0
password WW
login
!
end
```

## traxbol

Building configuration...

Current configuration:

```
!
version 11.2
service tcp-keepalives-in
service tcp-keepalives-out
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname traxbol
!
enable password WW
!
ip subnet-zero
no ip domain-lookup
!
isdn switch-type basic-net3
!
interface Ethernet0
 ip address 10.10.10.1 255.255.254.0
 no ip redirects
!
interface BRI0
 description This ISDN number is 8130
 ip address 172.16.1.6 255.255.255.252
 isdn caller 8129
 ! -- Because there is no authentication on HDLC, this is used to verify the
 ! -- incoming number.
 Dialer map ip 172.16.1.5 name goya 8129
 dialer-group 1
!
ip route 0.0.0.0 0.0.0.0 bri0
!
access-list 105 permit icmp any any

!-- As we see in the debugs, this access-list is used for debug ICMP only.
!-- For more information, see Important Information on Debug Commands.

dialer-list 1 protocol ip permit
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 exec-timeout 0 0
 password WW
 login
!
end
```

# Verify

This section provides information you can use to confirm your configuration is working properly.

Certain **show** commands are supported by the Output Interpreter Tool ( registered customers only) , which allows you to view an analysis of **show** command output.

- **show interfaces bri** *number* displays the D channel for that BRI interface when you specify just the number.

<i>number</i>	Interface number. The value is 0 through 7 if the router has one 8–port BRI network interface module.(NIM), or 0 through 15 if the router has two 8–port BRI NIMs. Interface number values will vary, depending on the hardware platform used. The Cisco 3600 Series router for example, can have up to 48 interfaces.
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On goya, no encapsulation was defined in the configuration, so by default it will be HDLC. This can be verified with the **show interface** command as shown below:

```
goya#show interfaces bri 0
BRI0 is up, line protocol is up (spoofing)
Hardware is BRI
Description: This ISDN number is 8129
Internet address is 172.16.1.5/30
MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation HDLC, loopback not set
```

*!--- Here you can see that HDLC has been configured automatically.*

```
Last input 00:00:00, output 00:00:00, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/1000/64/0 (size/max total/threshold/drops)
Conversations 0/1/256 (active/max active/max total)
Reserved Conversations 0/0 (allocated/max allocated)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
 3933 packets input, 20462 bytes, 0 no buffer
Received 15 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
3926 packets output, 26100 bytes, 0 underruns
0 output errors, 0 collisions, 10 interface resets
0 output buffer failures, 0 output buffers swapped out
7 carrier transitions
```

# Troubleshoot

This section provides information you can use to troubleshoot your configuration.

## Troubleshooting Commands

Certain **show** commands are supported by the Output Interpreter Tool ( registered customers only) , which allows you to view an analysis of **show** command output.

**Note:** Before you issue **debug** commands, refer to Important Information on Debug Commands.

- **debug dialer** displays debugging information about the packets received on a dialer interface.
- **debug ip packet detail 105** allows you to debug IP packet that are only ICMP (see access-list 105 in the configuration). For an example see Important Information on Debug Commands.
- **debug isdn q931** allows you to view the ISDN Q931 event and packets.
- **debug ppp authentication** displays authentication protocol messages, which include Challenge Authentication Protocol (CHAP) packet exchanges and Password Authentication Protocol (PAP) exchanges.

Debugs are provided in two parts, the first would be between goya and traxbol (with the help of HDLC), the second will be between goya and aneto (with the use of PPP).

## Debugs Between goya and traxbol

```
!--- First we show a call from traxbol to goya as seen on goya.  
!--- This is important because it checks whether the binding is correct.  
!--- Remember to bind this correctly. You used the isdn caller command  
!--- in the dialer interface.
```

```
goya#debug dialer  
Dial on demand events debugging is on  
goya#debug isdn q931  
ISDN Q931 packets debugging is on  
goya#debug ip packet detail 105
```

```
!--- This points to the ICMP access-list.
```

```
IP packet debugging is on (detailed) for access list 105  
goya#  
*Mar 1 00:02:51.679: ISDN BR0: RX <- SETUP pd = 8 callref = 0x1D  
*Mar 1 00:02:51.683: Bearer Capability i = 0x8890  
*Mar 1 00:02:51.687: Channel ID i = 0x89  
*Mar 1 00:02:51.691: Calling Party Number i = 0xA1, '8130'  
*Mar 1 00:02:51.695: Called Party Number i = 0xC1, '8129'  
*Mar 1 00:02:51.703: ISDN BR0: Event:  
Received a DATA call from 8130 on B1 at 64 Kb/s  
*Mar 1 00:02:51.707: BR0:1 DDR:  
Caller id 8130 matched to profile traxbol  
*Mar 1 00:02:51.711: %DIALER-6-BIND:  
Interface BRI0:1 bound to profile Dialer1
```

```
!--- The call is successfully bound to Dailer1 based on the caller ID.  
!--- This must take place for the call to succeed.  
!--- If binding does not take place, verify the caller ID  
!--- on the dialer interface.
```

```
*Mar 1 00:02:51.723: ISDN BR0: TX -> CALL_PROC pd = 8 callref = 0x9D  
*Mar 1 00:02:51.731: %LINK-3-UPDOWN: Interface BRI0:1, changed state to up  
*Mar 1 00:02:51.759: Dialer1 DDR: dialer protocol up  
*Mar 1 00:02:52.035: ISDN BR0: TX -> CONNECT pd = 8 callref = 0x9D  
*Mar 1 00:02:52.099: ISDN BR0: RX <- CONNECT_ACK pd = 8 callref = 0x1D  
*Mar 1 00:02:52.103: Channel ID i = 0x89  
*Mar 1 00:02:53.555: IP: s=172.16.1.6 (Dialer1), d=172.16.1.5 (Dialer1),  
len 100, rcvd 3  
*Mar 1 00:02:53.559: ICMP type=8, code=0  
*Mar 1 00:02:53.559: IP: s=172.16.1.5 (local), d=172.16.1.6 (Dialer1),  
Len 100, sending  
*Mar 1 00:02:53.563: ICMP type=0, code=0  
*Mar 1 00:02:53.611: IP: s=172.16.1.6 (Dialer1), d=172.16.1.5 (Dialer1),  
Len 100, rcvd 3  
*Mar 1 00:02:53.615: ICMP type=8, code=0
```

```
*Mar 1 00:02:53.615: IP: s=172.16.1.5 (local), d=172.16.1.6 (Dialer1),
  Len 100, sending
*Mar 1 00:02:53.619:      ICMP type=0, code=0
*Mar 1 00:02:53.667: IP: s=172.16.1.6 (Dialer1), d=172.16.1.5 (Dialer1),
  Len 100, rcvd 3
*Mar 1 00:02:53.671:      ICMP type=8, code=0
*Mar 1 00:02:53.675: IP: s=172.16.1.5 (local), d=172.16.1.6 (Dialer1),
  Len 100, sending
*Mar 1 00:02:53.679:      ICMP type=0, code=0
*Mar 1 00:02:53.723: IP: s=172.16.1.6 (Dialer1), d=172.16.1.5 (Dialer1),
  Len 100, rcvd 3
*Mar 1 00:02:53.727:      ICMP type=8, code=0
*Mar 1 00:02:53.731: IP: s=172.16.1.5 (local), d=172.16.1.6 (Dialer1),
  Len 100, sending
*Mar 1 00:02:53.735:      ICMP type=0, code=0
```

*!--- The ping from traxbol was successful.*

```
*Mar 1 00:02:57.751: %ISDN-6-CONNECT: Interface BRI0:1 is now connected
to 8130
```

!

*!--- Next we view the call from traxbol to goya as seen on traxbol.*

```
!
traxbol#debug dialer events
Dial on demand events debugging is on
traxbol#debug isdn q931
ISDN Q931 packets debugging is on
traxbol#debug ip packet detail 105
IP packet debugging is on (detailed) for access list 105
!
traxbol#ping 172.16.1.5
```

*!--- Ping from traxbol to goya.*

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 172.16.1.5, timeout is 2 seconds:

```
*Mar 1 00:04:07.683: IP: s=172.16.1.6 (local), d=172.16.1.5 (BRI0),
  Len 100, sending
*Mar 1 00:04:07.687:      ICMP type=8, code=0
*Mar 1 00:04:07.691: BRI0: Dialing cause ip (s=172.16.1.6, d=172.16.1.5)
*Mar 1 00:04:07.691: BRI0: Attempting to dial 8129
*Mar 1 00:04:07.695: IP: s=172.16.1.6 (local), d=172.16.1.5 (BRI0),
  Len 100, encapsulation failed
*Mar 1 00:04:07.699:      ICMP type=8, code=0
*Mar 1 00:04:07.711: ISDN BR0: TX -> SETUP pd = 8  callref = 0x01
*Mar 1 00:04:07.711:      Bearer Capability i = 0x8890
*Mar 1 00:04:07.715:      Channel ID i = 0x83
*Mar 1 00:04:07.719:      Called Party Number i = 0x80, '8129'
*Mar 1 00:04:07.799: ISDN BR0: RX <- CALL_PROC pd = 8  callref = 0x81
*Mar 1 00:04:07.803:      Channel ID i = 0x89
*Mar 1 00:04:08.251: ISDN BR0: RX <- CONNECT pd = 8  callref = 0x81
*Mar 1 00:04:08.267: %LINK-3-UPDOWN: Interface BRI0:1, changed state to up
*Mar 1 00:04:08.291: ISDN BR0: TX -> CONNECT_ACK pd = 8  callref = 0x01
*Mar 1 00:04:08.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 56/56/56 ms
traxbol#.299: dialer Protocol up for BR0:1
*Mar 1 00:04:08.751: %LINEPROTO-5-UPDOWN: Line protocol on
Interface BRI0:1,
  changed state to up
*Mar 1 00:04:09.683: IP: s=172.16.1.6 (local), d=172.16.1.5 (BRI0),
  Len 100, sending
*Mar 1 00:04:09.687:      ICMP type=8, code=0
*Mar 1 00:04:09.735: IP: s=172.16.1.5 (BRI0), d=172.16.1.6 (BRI0),
```

```
Len 100, rcvd 3
*Mar 1 00:04:09.735: ICMP type=0, code=0
*Mar 1 00:04:09.739: IP: s=172.16.1.6 (local), d=172.16.1.5 (BRI0),
Len 100, sending
*Mar 1 00:04:09.743: ICMP type=8, code=0
*Mar 1 00:04:09.791: IP: s=172.16.1.5 (BRI0), d=172.16.1.6 (BRI0),
Len 100, rcvd 3
*Mar 1 00:04:09.795: ICMP type=0, code=0
*Mar 1 00:04:09.795: IP: s=172.16.1.6 (local), d=172.16.1.5 (BRI0),
Len 100, sending
*Mar 1 00:04:09.799: ICMP type=8, code=0
*Mar 1 00:04:09.847: IP: s=172.16.1.5 (BRI0), d=172.16.1.6 (BRI0),
Len 100, rcvd 3
*Mar 1 00:04:09.851: ICMP type=0, code=0
*Mar 1 00:04:09.855: IP: s=172.16.1.6 (local), d=172.16.1.5 (BRI0),
Len 100, sending
*Mar 1 00:04:09.855: ICMP type=8, code=0
*Mar 1 00:04:09.907: IP: s=172.16.1.5 (BRI0), d=172.16.1.6 (BRI0),
Len 100, rcvd 3
*Mar 1 00:04:09.907: ICMP type=0, code=0
*Mar 1 00:04:14.699: %ISDN-6-CONNECT: Interface BRI0:1 is now connected
to 8129 goya
!
```

*!--- Now we show a call from goya to traxbol as seen on goya.*

```
!
goya#ping 172.16.1.6
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.1.6, timeout is 2 seconds:
```

*!--- In this case there is no need to worry about the binding, because  
!--- the IP routing decided to use Dialer1. This way is easier to control.  
!--- It just depends on the network configuration under the dialer.*

```
*Mar 1 00:07:56.691: IP: s=172.16.1.5 (local), d=172.16.1.6 (Dialer1),
Len 100, sending
*Mar 1 00:07:56.695: ICMP type=8, code=0
*Mar 1 00:07:56.699: BRI0 DDR: rotor dialout [priority]
*Mar 1 00:07:56.703: BRI0 DDR: Dialing cause ip
(s=172.16.1.5, d=172.16.1.6)
*Mar 1 00:07:56.707: BRI0 DDR: Attempting to dial 8130
*Mar 1 00:07:56.711: IP: s=172.16.1.5 (local), d=172.16.1.6 (BRI0),
Len 100, encapsulation failed
```

*!--- The encapsulation failed because the HDLC is not ready.*

```
*Mar 1 00:07:56.715: ICMP type=8, code=0
*Mar 1 00:07:56.727: ISDN BR0: TX -> SETUP pd = 8 callref = 0x01
*Mar 1 00:07:56.727: Bearer Capability i = 0x8890
*Mar 1 00:07:56.731: Channel ID i = 0x83
*Mar 1 00:07:56.735: Called Party Number i = 0x80, '8130'
*Mar 1 00:07:56.799: ISDN BR0: RX <- CALL_PROC pd = 8 callref = 0x81
*Mar 1 00:07:56.803: Channel ID i = 0x89
*Mar 1 00:07:56.955: ISDN BR0: RX <- CONNECT pd = 8 callref = 0x81
*Mar 1 00:07:56.967: ISDN BR0: TX -> CONNECT_ACK pd = 8 callref = 0x01
*Mar 1 00:07:56.971: %LIN.!!!K-3-UPDOWN: Interface BRI0:1,
changed state to up
*Mar 1 00:07:56.991: %DIALER-6-BIND: Interface BRI0:1
bound to profile Dialer1
*Mar 1 00:07:56.999: %ISDN-6-CONNECT: Interface BRI0:1
is now connected to 8130
*Mar 1 00:07:57.015: Dialer1 DDR: dialer protocol up
*Mar 1 00:07:58.691: IP: s=172.16.1.5 (local), d=172.16.1.6 (Dialer1),
Len 100, sending
```

```
*Mar 1 00:07:58.695: ICMP type=8, code=0
*Mar 1 00:07:58.739: IP: s=172.16.1.6 (Dialer1), d=172.16.1.5 (Dialer1),
  Len 100, rcvd 3
*Mar 1 00:07:5!
Success rate is 80 percent (4/5), round-trip min/avg/max = 56/64/88 ms
goxa#8.743: ICMP type=0, code=0
*Mar 1 00:07:58.747: IP: s=172.16.1.5 (local), d=172.16.1.6 (Dialer1),
  Len 100, sending
*Mar 1 00:07:58.751: ICMP type=8, code=0
*Mar 1 00:07:58.799: IP: s=172.16.1.6 (Dialer1), d=172.16.1.5 (Dialer1),
  Len 100, rcvd 3
*Mar 1 00:07:58.803: ICMP type=0, code=0
*Mar 1 00:07:58.807: IP: s=172.16.1.5 (local), d=172.16.1.6 (Dialer1),
  Len 100, sending
*Mar 1 00:07:58.811: ICMP type=8, code=0
*Mar 1 00:07:58.855: IP: s=172.16.1.6 (Dialer1), d=172.16.1.5 (Dialer1),
  Len 100, rcvd 3
*Mar 1 00:07:58.859: ICMP type=0, code=0
*Mar 1 00:07:58.863: IP: s=172.16.1.5 (local), d=172.16.1.6 (Dialer1),
  Len 100, sending
*Mar 1 00:07:58.867: ICMP type=8, code=0
*Mar 1 00:07:58.947: IP: s=172.16.1.6 (Dialer1), d=172.16.1.5 (Dialer1),
  Len 100, rcvd 3
*Mar 1 00:07:58.951: ICMP type=0, code=0
*Mar 1 00:08:03.003: %ISDN-6-CONNECT: Interface BRI0:1 is now connected
to 8130
!
```

*!--- Next we show the ping from goxa to traxbol as seen on traxbol.*

```
!
traxbol#
*Mar 1 00:09:12.983: ISDN BR0: RX <- SETUP pd = 8 callref = 0x03
*Mar 1 00:09:12.987: Bearer Capability i = 0x8890
*Mar 1 00:09:12.987: Channel ID i = 0x89
*Mar 1 00:09:12.991: Calling Party Number i = 0xA1, '8129'
*Mar 1 00:09:12.995: Called Party Number i = 0xC1, '8130'
*Mar 1 00:09:13.007: %LINK-3-UPDOWN: Interface BRI0:1,
  changed state to up
*Mar 1 00:09:13.043: ISDN BR0: TX -> CONNECT pd = 8
  callref = 0x83
*Mar 1 00:09:13.047: dialer Protocol up for BR0:1
*Mar 1 00:09:13.103: ISDN BR0: RX <- CONNECT_ACK pd = 8
  callref = 0x03
*Mar 1 00:09:13.103: Channel ID i = 0x89
*Mar 1 00:09:13.119: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI0:1,
  changed state to up
*Mar 1 00:09:14.863: IP: s=172.16.1.5 (BRI0), d=172.16.1.6 (BRI0),
  Len 100, rcvd 3
*Mar 1 00:09:14.867: ICMP type=8, code=0
*Mar 1 00:09:14.867: IP: s=172.16.1.6 (local), d=172.16.1.5 (BRI0),
  Len 100, sending
*Mar 1 00:09:14.871: ICMP type=0, code=0
*Mar 1 00:09:14.919: IP: s=172.16.1.5 (BRI0), d=172.16.1.6 (BRI0),
  Len 100, rcvd 3
*Mar 1 00:09:14.923: ICMP type=8, code=0
*Mar 1 00:09:14.927: IP: s=172.16.1.6 (local), d=172.16.1.5 (BRI0),
  Len 100, sending
*Mar 1 00:09:14.927: ICMP type=0, code=0
*Mar 1 00:09:14.979: IP: s=172.16.1.5 (BRI0), d=172.16.1.6 (BRI0),
  Len 100, rcvd 3
*Mar 1 00:09:14.979: ICMP type=8, code=0
*Mar 1 00:09:14.983: IP: s=172.16.1.6 (local), d=172.16.1.5 (BRI0),
  Len 100, sending
*Mar 1 00:09:14.983: ICMP type=0, code=0
*Mar 1 00:09:15.035: IP: s=172.16.1.5 (BRI0), d=172.16.1.6 (BRI0),
```

```
Len 100, rcvd 3
*Mar 1 00:09:15.035: ICMP type=8, code=0
*Mar 1 00:09:15.039: IP: s=172.16.1.6 (local), d=172.16.1.5 (BRI0),
Len 100, sending
*Mar 1 00:09:15.043: ICMP type=0, code=0
*Mar 1 00:09:19.783: %ISDN-6-CONNECT: Interface BRI0:1 is now connected
to 8129 goya
```

## Debugs Between goya and aneto

```
!--- First do a call from aneto to goya as seen on goya.
!--- This is important because it checks that the binding is correct.
!--- Remember to bind this correctly.
!--- You used the isdn caller command in the dialer.
```

```
goya#debug ppp authentication
```

```
!--- This debug was added because now we are using PPP with authentication.
```

```
PPP authentication debugging is on
```

```
goya#
```

```
goya#
```

```
*Mar 1 00:12:37.439: ISDN BR0: RX <- SETUP pd = 8 callref = 0x1E
*Mar 1 00:12:37.443: Bearer Capability i = 0x8890
*Mar 1 00:12:37.447: Channel ID i = 0x89
*Mar 1 00:12:37.451: Calling Party Number i = 0xA1, '8102'
*Mar 1 00:12:37.451: Called Party Number i = 0xC1, '8129'
*Mar 1 00:12:37.463: ISDN BR0: Event: Received a DATA call from 8102
on B1 at 64 Kb/s
*Mar 1 00:12:37.467: BR0:1 DDR: Caller id 8102 matched to
profile aneto
*Mar 1 00:12:37.471: %DIALER-6-BIND: Interface BRI0:1 bound to
profile Dialer0
```

```
!--- Again the important part is the binding.
```

```
*Mar 1 00:12:37.483: ISDN BR0: TX -> CALL_PROC pd = 8
callref = 0x9E
*Mar 1 00:12:37.487: %LINK-3-UPDOWN: Interface BRI0:1,
changed state to up
*Mar 1 00:12:37.507: %ISDN-6-CONNECT: Interface BRI0:1
is now connected to 8102
*Mar 1 00:12:37.515: BR0:1 PPP: Treating connection as a callin
*Mar 1 00:12:37.791: ISDN BR0: TX -> CONNECT pd = 8
callref = 0x9E
*Mar 1 00:12:37.855: ISDN BR0: RX <- CONNECT_ACK pd = 8
callref = 0x1E
*Mar 1 00:12:37.859: Channel ID i = 0x89
*Mar 1 00:12:37.947: BR0:1 CHAP: O CHALLENGE id 1
Len 25 from "goya"
*Mar 1 00:12:37.955: BR0:1 AUTH: Started process 0 pid 51
*Mar 1 00:12:37.975: BR0:1 CHAP: I CHALLENGE id 242
Len 26 from "aneto"
*Mar 1 00:12:37.979: BR0:1 CHAP: Waiting for peer to authenticate first
*Mar 1 00:12:37.987: BR0:1 CHAP: I RESPONSE id 1
Len 26 from "aneto"
*Mar 1 00:12:37.995: BR0:1 CHAP: O SUCCESS id 1
Len 4
*Mar 1 00:12:37.999: BR0:1 CHAP: Processing saved Challenge,
id 242
*Mar 1 00:12:38.007: BR0:1 CHAP: O RESPONSE id 242
Len 25 from "goya"
*Mar 1 00:12:38.031: BR0:1 CHAP: I SUCCESS id 242
Len 4
```

*!--- PPP authentication was successful.*

```
*Mar 1 00:12:38.055: BRI0:1 DDR: dialer protocol up
*Mar 1 00:12:39.035: %LINEPROTO-5-UPDOWN:
  Line protocol on Interface BRI0:1,
  changed state to up
*Mar 1 00:12:39.295: IP: s=172.16.1.10 (Dialer0), d=172.16.1.9 (Dialer0),
  Len 100, rcvd 3
*Mar 1 00:12:39.299:      ICMP type=8, code=0
*Mar 1 00:12:39.299: IP: s=172.16.1.9 (local), d=172.16.1.10 (Dialer0),
  Len 100, sending
*Mar 1 00:12:39.303:      ICMP type=0, code=0
*Mar 1 00:12:39.343: IP: s=172.16.1.10 (Dialer0), d=172.16.1.9 (Dialer0),
  Len 100, rcvd 3
*Mar 1 00:12:39.347:      ICMP type=8, code=0
*Mar 1 00:12:39.347: IP: s=172.16.1.9 (local), d=172.16.1.10 (Dialer0),
  Len 100, sending
*Mar 1 00:12:39.355:      ICMP type=0, code=0
*Mar 1 00:12:39.391: IP: s=172.16.1.10 (Dialer0), d=172.16.1.9 (Dialer0),
  Len 100, rcvd 3
*Mar 1 00:12:39.395:      ICMP type=8, code=0
*Mar 1 00:12:39.399: IP: s=172.16.1.9 (local), d=172.16.1.10 (Dialer0),
  Len 100, sending
*Mar 1 00:12:39.403:      ICMP type=0, code=0
*Mar 1 00:12:39.443: IP: s=172.16.1.10 (Dialer0), d=172.16.1.9 (Dialer0),
  Len 100, rcvd 3
*Mar 1 00:12:39.447:      ICMP type=8, code=0
*Mar 1 00:12:39.447: IP: s=172.16.1.9 (local), d=172.16.1.10 (Dialer0),
  Len 100, sending
*Mar 1 00:12:39.451:      ICMP type=0, code=0
*Mar 1 00:12:43.511: %ISDN-6-CONNECT: Interface BRI0:1 is now connected
  to 8102 aneto
!
```

*!--- Next do a call from aneto to goya as seen on aneto.*

```
!
ISDN Q931 packets debugging is on
aneto#debug dialer
Dial on demand events debugging is on
aneto#debug ppp authentication
PPP authentication debugging is on
aneto#ping 172.16.1.9
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.1.9, timeout is 2 seconds:
```

```
*Mar 18 08:26:58.820: BR0 DDR: rotor dialout [priority]
*Mar 18 08:26:58.828: BR0 DDR: Dialing cause ip
(s=172.16.1.10, d=172.16.1.9)
*Mar 18 08:26:58.828: BR0 DDR: Attempting to dial 8129
*Mar 18 08:26:58.844: ISDN BR0: TX -> SETUP pd = 8
  callref = 0x1D
*Mar 18 08:26:58.848:      Bearer Capability i = 0x8890
*Mar 18 08:26:58.856:      Channel ID i = 0x83
*Mar 18 08:26:58.864:      Called Party Number i = 0x80,
  '8129', Plan:Unknown, Type:Unknown
*Mar 18 08:26:58.948: ISDN BR0: RX <- CALL_PROC pd = 8
  callref = 0x9D
*Mar 18 08:26:58.956:      Channel ID i = 0x89
*Mar 18 08:26:59.404: ISDN BR0: RX <- CONNECT pd = 8
  callref = 0x9D
*Mar 18 08:26:59.420: ISDN BR0: TX -> CONNECT_ACK pd = 8
  callref = 0x1D
*Mar 18 08:26:59.428: %LINK-3-UPDOWN: Interface BRI0:1,
  changed state to up
```

```
*Mar 18 08:26:59.448: %DIALER-6-BIND: Interface BR0:1
bound to profile Di1.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 48/48/48 ms
aneto#
*Mar 18 08:26:59.460: BR0:1 PPP: Treating connection as a callout
*Mar 18 08:26:59.512: BR0:1 CHAP: O CHALLENGE id 242 Len 26 from "aneto"
*Mar 18 08:26:59.516: BR0:1 CHAP: I CHALLENGE id 1 Len 25 from "goya"
*Mar 18 08:26:59.524: BR0:1 CHAP: O RESPONSE id 1 Len 26 from "aneto"
*Mar 18 08:26:59.548: BR0:1 CHAP: I SUCCESS id 1 Len 4
*Mar 18 08:26:59.560: BR0:1 CHAP: I RESPONSE id 242 Len 25 from "goya"
*Mar 18 08:26:59.568: BR0:1 CHAP: O SUCCESS id 242 Len 4
*Mar 18 08:26:59.572: BR0:1 DDR: No callback negotiated
*Mar 18 08:26:59.596: BR0:1 DDR: dialer protocol up
*Mar 18 08:27:00.572: %LINEPROTO-5-UPDOWN: Line protocol on
Interface BRI0:1,
changed state to up
*Mar 18 08:27:05.456: %ISDN-6-CONNECT: Interface BRI0:1 is now connected
to 8129 goya
!
```

*!--- Now do a call from goya to aneto as seen on goya.*

```
!
goya#ping 172.16.1.10
!
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.1.10, timeout is 2 seconds:
*Mar 1 00:19:52.311: IP: s=172.16.1.9 (local), d=172.16.1.10 (Dialer0),
Len 100, sending
*Mar 1 00:19:52.315: ICMP type=8, code=0
*Mar 1 00:19:52.319: BRI0 DDR: rotor dialout [priority]
*Mar 1 00:19:52.323: BRI0 DDR: Dialing cause ip
(s=172.16.1.9, d=172.16.1.10)
*Mar 1 00:19:52.323: BRI0 DDR: Attempting to dial 8102
*Mar 1 00:19:52.327: IP: s=172.16.1.9 (local), d=172.16.1.10 (BRI0),
Len 100, encapsulation failed
*Mar 1 00:19:52.331: ICMP type=8, code=0
*Mar 1 00:19:52.347: ISDN BR0: TX -> SETUP pd = 8
callref = 0x02
*Mar 1 00:19:52.347: Bearer Capability i = 0x8890
*Mar 1 00:19:52.351: Channel ID i = 0x83
*Mar 1 00:19:52.355: Called Party Number i = 0x80, '8102'
*Mar 1 00:19:52.407: ISDN BR0: RX <- CALL_PROC pd = 8
callref = 0x82
*Mar 1 00:19:52.411: Channel ID i = 0x89
*Mar 1 00:19:52.611: ISDN BR0: RX <- CONNECT pd = 8
callref = 0x82
*Mar 1 00:19:52.627: ISDN BR0: TX -> CONNECT_ACK pd = 8
callref = 0x02
*Mar 1 00:19:52.631: %LI.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 48/48/48 ms
goya#NK-3-UPDOWN: Interface BRI0:1, changed state to up
*Mar 1 00:19:52.647: %DIALER-6-BIND: Interface BRI0:1
bound to profile Dialer0
*Mar 1 00:19:52.655: %ISDN-6-CONNECT: Interface BRI0:1
is now connected to 8102
*Mar 1 00:19:52.663: BR0:1 PPP: Treating connection as a callout
*Mar 1 00:19:52.699: BR0:1 CHAP: O CHALLENGE id 2 Len 25 from "goya"
*Mar 1 00:19:52.727: BR0:1 CHAP: I CHALLENGE id 243 Len 26 from "aneto"
*Mar 1 00:19:52.735: BR0:1 CHAP: O RESPONSE id 243 Len 25 from "goya"
*Mar 1 00:19:52.759: BR0:1 CHAP: I SUCCESS id 243 Len 4
*Mar 1 00:19:52.779: BR0:1 CHAP: I RESPONSE id 2 Len 26 from "aneto"
*Mar 1 00:19:52.787: BR0:1 CHAP: O SUCCESS id 2 Len 4
*Mar 1 00:19:52.811: BRI0:1 DDR: dialer protocol up
*Mar 1 00:19:53.787: %LINEPROTO-5-UPDOWN: Line protocol on
Interface BRI0:1,
```

changed state to up  
\*Mar 1 00:19:54.311: IP: s=172.16.1.9 (local), d=172.16.1.10 (Dialer0),  
Len 100, sending  
\*Mar 1 00:19:54.315: ICMP type=8, code=0  
\*Mar 1 00:19:54.351: IP: s=172.16.1.10 (Dialer0), d=172.16.1.9 (Dialer0),  
Len 100, rcvd 3  
\*Mar 1 00:19:54.355: ICMP type=0, code=0  
\*Mar 1 00:19:54.359: IP: s=172.16.1.9 (local), d=172.16.1.10 (Dialer0),  
Len 100, sending  
\*Mar 1 00:19:54.363: ICMP type=8, code=0  
\*Mar 1 00:19:54.403: IP: s=172.16.1.10 (Dialer0), d=172.16.1.9 (Dialer0),  
Len 100, rcvd 3  
\*Mar 1 00:19:54.407: ICMP type=0, code=0  
\*Mar 1 00:19:54.411: IP: s=172.16.1.9 (local), d=172.16.1.10 (Dialer0),  
Len 100, sending  
\*Mar 1 00:19:54.415: ICMP type=8, code=0  
\*Mar 1 00:19:54.451: IP: s=172.16.1.10 (Dialer0), d=172.16.1.9 (Dialer0),  
Len 100, rcvd 3  
\*Mar 1 00:19:54.455: ICMP type=0, code=0  
\*Mar 1 00:19:54.459: IP: s=172.16.1.9 (local), d=172.16.1.10 (Dialer0),  
Len 100, sending  
\*Mar 1 00:19:54.463: ICMP type=8, code=0  
\*Mar 1 00:19:54.503: IP: s=172.16.1.10 (Dialer0), d=172.16.1.9 (Dialer0),  
Len 100, rcvd 3  
\*Mar 1 00:19:54.507: ICMP type=0, code=0  
\*Mar 1 00:19:58.659: %ISDN-6-CONNECT: Interface BRI0:1 is now connected  
to 8102 aneto  
!

*!--- Next do a call from goya to aneto as seen on aneto.*

!  
\*Mar 18 08:34:13.988: ISDN BR0: RX <- SETUP pd = 8  
callref = 0x04  
\*Mar 18 08:34:13.996: Bearer Capability i = 0x8890  
\*Mar 18 08:34:14.000: Channel ID i = 0x89  
\*Mar 18 08:34:14.008: Calling Party Number i = 0xA1, '8129',  
Plan:ISDN,  
Type:National  
\*Mar 18 08:34:14.020: Called Party Number i = 0xC1, '8102',  
Plan:ISDN,  
Type:Subscriber(local)  
\*Mar 18 08:34:14.044: ISDN BR0: Event: Received a DATA call from 8129  
on B1 at 64 Kb/s  
\*Mar 18 08:34:14.056: ISDN BR0: TX -> CALL\_PROC pd = 8  
callref = 0x84  
\*Mar 18 08:34:14.064: Channel ID i = 0x89  
\*Mar 18 08:34:14.068: %LINK-3-UPDOWN: Interface BRI0:1,  
changed state to up  
\*Mar 18 08:34:14.096: BR0:1 PPP: Treating connection as a callin  
\*Mar 18 08:34:14.108: ISDN BR0: TX -> CONNECT pd = 8  
callref = 0x84  
\*Mar 18 08:34:14.156: ISDN BR0: RX <- CONNECT\_ACK pd = 8  
callref = 0x04  
\*Mar 18 08:34:14.164: Channel ID i = 0x89  
\*Mar 18 08:34:14.260: BR0:1 CHAP: O CHALLENGE id 243  
Len 26 from "aneto"  
\*Mar 18 08:34:14.268: BR0:1 CHAP: I CHALLENGE id 2  
Len 25 from "goya"  
\*Mar 18 08:34:14.268: BR0:1 CHAP: Waiting for peer to authenticate first  
\*Mar 18 08:34:14.288: BR0:1 CHAP: I RESPONSE id 243  
Len 25 from "goya"  
\*Mar 18 08:34:14.296: BR0:1 CHAP: O SUCCESS id 243  
Len 4  
\*Mar 18 08:34:14.300: BR0:1 CHAP: Processing saved Challenge, id 2  
\*Mar 18 08:34:14.308: %DIALER-6-BIND: Interface BR0:1

```
bound to profile Di1
*Mar 18 08:34:14.312: BR0:1 CHAP: O RESPONSE id 2
  Len 26 from "aneto"
*Mar 18 08:34:14.336: BR0:1 CHAP: I SUCCESS id 2
  Len 4
*Mar 18 08:34:14.340: BR0:1 DDR: No callback negotiated
*Mar 18 08:34:14.360: BR0:1 DDR: dialer protocol up
*Mar 18 08:34:15.340: %LINEPROTO-5-UPDOWN:
  Line protocol on Interface BRI0:1, changed state to up
*Mar 18 08:34:20.092: %ISDN-6-CONNECT: Interface BRI0:1 is now connected to
  8129 goya
```

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