

X.25 DDN Encapsulation

Document ID: 18325

Contents

Introduction

Prerequisites

- Components Used

- Requirements

- Conventions

X.25 DDN Address Translation

- Class A

- Class B

- Class C

Configure

- Network Diagram

- Configurations

Verify

Troubleshoot

- Troubleshooting Commands

Related Information

Introduction

This document describes how to match an IP address to an X.25 address (which is actually an X.121 address). This information is also described in RFC1236 .

In order to connect to a Defense Data Network (DDN) using X.25, you need to carry IP datagrams so that you can communicate through DDN. This means that the IP address configured on your interface needs to match the X.121 address.

This is also true for accessing remote addresses. Whenever you want to reach IP address x.x.x.x, you need to make sure that the X.121 address used in the destination of your X.25 call matches the remote IP address.

Prerequisites

Components Used

The information in this document is based on the software and hardware versions below.

- Cisco 2500 Series Routers
- Cisco IOS® Software Release 12.0(7)T on goya and Cisco IOS Software Release 12.2(6) on traxbol.

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.

Requirements

There are no specific requirements for this document.

Conventions

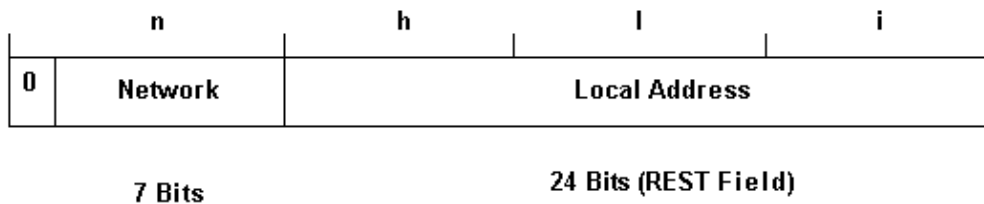
For more information on document conventions, see the Cisco Technical Tips Conventions.

X.25 DDN Address Translation

In order to translate an address IP to X.25 you need to understand the different classes of IP networks:

- Class A networks have the highest-order bit set to 0 X.
- Class B networks have the highest-order bit set to 1 0.
- Class C networks have the highest-order bit set to 1 1.

Class A



In this diagram:

- n =network
- h =host
- l = logical address
- i = Interface Message Processor (IMP) or Packet Switch Node (PSN)

There are two possible options for h:

- If h is less than 64, the DDN X.25 address is represented as *ZZZZ F III HH ZZ (SS)*, where:
 - ◆ *ZZZZ* = 0000
 - ◆ *F* = 0 (because the address is a physical address)
 - ◆ *III* = 3 digits equal to i
 - ◆ *HH* = 2 digits of h
 - ◆ *ZZ* = 00 is optional
 - ◆ *(SS)* = Sub Address field which is ignored in the DDN (optional)
- If h is more than or equal to 64, the DDN X.25 address is represented as *ZZZZ F RRRRR ZZ (SS)*, where:
 - ◆ *ZZZZ* = 0000
 - ◆ *F* = 1 (because the address is a logical address)
 - ◆ *RRRRR* = a five-decimal digit representation of the result (r) of the calculation $r = h * 256 + i$

Example 1 – IP Address is 12.0.0.2

In this first example, h is less than 64 (in this case h = 0) so the DDN X.25 address is represented as *ZZZ F III HH ZZ (SS)*, and:

- *ZZZZ* = 0000

- F = 0
- III = 002
- ZZ = 00

This yields an X.25 address of 0000 0 002 00 00 (ZZZZ F III ZZ SS).

Example 2 – IP Address is 12.64.0.2

In this example, h is more than or equal to 64, so the DDN X.25 address is represented as ZZZZ F RRRRR ZZ (SS), and:

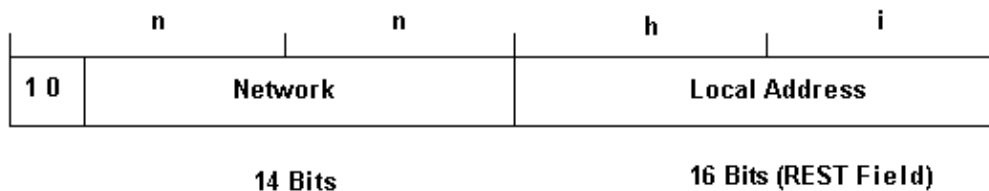
- ZZZZ = 0000
- F = 1
- RRRRR = $r = h * 256 + i = 64 * 256 + 2 = 16386$

This yields an X.25 address of 0000 1 16386 00 (ZZZZ F RRRRR ZZ).

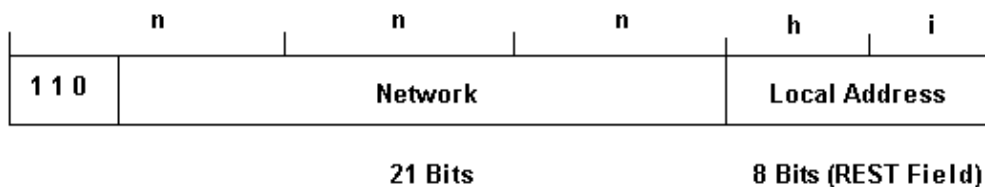
Note: You can see in the second example above that SS was not added. This is allowed in RFC1236 , but you can also configure it.

The same rules are applied on class B and class C networks. However, a portion of the logical address is removed, so the h and i fields are therefore smaller.

Class B



Class C



Let's compare the address to what this yields using the second example above:

The IP address in Example 2 was 12.64.0.2. This yields an X.25 address of 000011638600. If you configure the IP address to be in class B (for example, 128.10.64.2), this yields an X.25 address of 000011638600. This is normal, since both interfaces are in different networks. Therefore, in DDN, the host portion is part of the calculation, rather than the network. You can verify this using single subnetting on two different interfaces. For example:

```
interface Serial0
  description connection to goya ser 0
  ip address 128.11.64.2 255.255.255.0
  no ip directed-broadcast
  ip mtu 576
```

```

encapsulation x25 dce ddn
no ip mroute-cache
shutdown
x25 address 000011638600
!
interface Serial1
ip address 128.10.64.2 255.255.255.0
no ip directed-broadcast
ip mtu 576
encapsulation x25 ddn
no ip mroute-cache
x25 address 000011638600

```

This is a normal issue, covered by RFC1236 . The translation method described below is totally independent of IP subnetting and of any masking that may be used in support of IP subnetting. However, 128.10.x.x is a different network from 128.11.x.x.

Note: The X.25 address is automatically configured on the interface as soon as the IP address is configured. Do not try to make any relation to IPV6, as this is not supported.

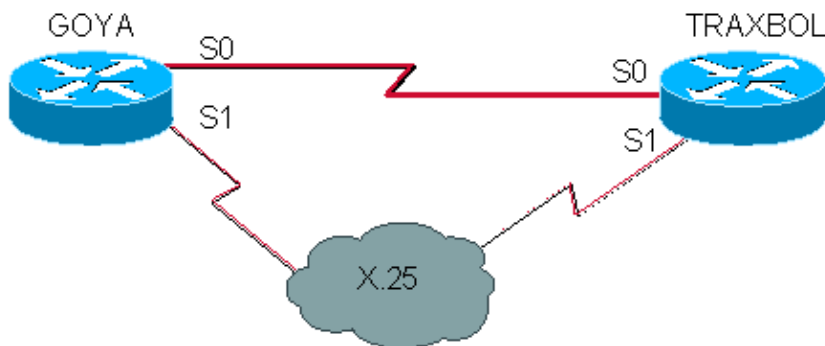
Configure

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 the network setup shown in the diagram below.



Configurations

This document uses the configurations shown below.

- goya
- traxbol

goya
<pre> goya#show running-config interface serial 0 Building configuration... Current configuration: ! </pre>

```

interface Serial0
description connection to traxbol ser 0
ip address 128.11.64.2 255.255.255.0
no ip directed-broadcast
!
ip mtu 576

!--- MTU is set to 576 automatically (required for DDN.

encapsulation x25 dce ddn
no ip mroute-cache
x25 address 000011638600
end

goya#show running-config interface serial 1
Building configuration...
Current configuration:
!
interface Serial1
description connection to x25 network
ip address 128.10.64.2 255.255.255.0
no ip directed-broadcast
ip mtu 576
encapsulation x25 ddn
no ip mroute-cache
x25 address 000011638600
end

```

traxbol

```

traxbol#show running-config interface serial 0
Building configuration...
Current configuration : 179 bytes
!
interface Serial0
description connection to goya ser 0
ip address 128.11.64.1 255.255.255.0
ip mtu 576
encapsulation x25 ddn
x25 address 000011638500
clockrate 64000
end

traxbol#show running-config interface serial 1
Building configuration...
Current configuration : 167 bytes
!
interface Serial1
description connection to x25 network
ip address 128.10.64.1 255.255.255.0
ip mtu 576
encapsulation x25 ddn
x25 address 000011638500
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 x25 map** – Displays information about configured address maps.
- **show ip route** – Displays all the IP routes.

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 issuing **debug** commands, please see Important Information on Debug Commands.

- **debug x25 events** – Displays information about all X.25 traffic except data and resource record packets.
- **ping** – Checks the accessibility of devices.

Troubleshooting on goya

Turn debugging on for X.25 events:

```
goya#debug x25 events
X.25 special event debugging is on
```

Ping the remote router through the X.25 network:

```
goya#ping 128.10.64.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 128.10.64.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 68/88/164 ms
goya#
*Mar 12 14:11:13.438: Serial1: X.25 O R1 Call (25) 8 lci 1024

!--- The X.25 destination is calculated automatically,
!--- so there is no need to configure an X.25 MAP.

*Mar 12 14:11:13.442: From (12): 000011638600 To (12): 000011638500
*Mar 12 14:11:13.446: Facilities: (4)
*Mar 12 14:11:13.450: Local network facility block

!--- The following facilities are important since they
!--- define the DDN service.

*Mar 12 14:11:13.450: DDN standard service
*Mar 12 14:11:13.454: Call User Data (4): 0xCC000000 (ip)
*Mar 12 14:11:13.522: Serial1: X.25 I R1 Call Confirm (5) 8 lci 1024
*Mar 12 14:11:13.526: From (0): To (0):
*Mar 12 14:11:13.526: Facilities: (0)
goya#
```

Use the **show x25 map** command to look at the map created:

```
goya#show x25 map
Serial1: X.121 000011638500 <-> ip 128.10.64.1
constructed, method ietf, 1 VC: 1024
goya#
```

To test this, shut down the serial 1 interface connecting to the X.25 network. Then ping the other side (this is still up because it is connecting to an X.25 switch, so the serial 1 interface on traxbol is UP and the IP address is alive). Add an **ip route** here to make this successful.

```
goya#configure
Configuring from terminal, memory, or network [terminal]? t
Enter configuration commands, one per line. End with CNTL/Z.
goya(config)#ip route 128.10.0.0 255.255.0.0 128.11.64.1 200
goya(config)#^Z
goya#show ip route 128.10.0.0
Routing entry for 128.10.0.0/16
Known via "static", distance 200, metric 0
Routing Descriptor Blocks:
* 128.11.64.1
Route metric is 0, traffic share count is 1
goya#ping 128.10.64.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 128.10.64.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/47/96 ms
```

!--- This was again forwarded without a problem.

```
goya#
*Mar 12 14:36:15.238: Serial0: X.25 O R1 Call (25) 8 lci 1
*Mar 12 14:36:15.242: From (12): 000011638600 To (12): 000011638500
*Mar 12 14:36:15.246: Facilities: (4)
*Mar 12 14:36:15.250: Local network facility block
*Mar 12 14:36:15.250: DDN standard service
*Mar 12 14:36:15.254: Call User Data (4): 0xCC000000 (ip)
*Mar 12 14:36:15.294: Serial0: X.25 I R1 Call Confirm (3) 8 lci 1
goya#

goya#show x25 map
Serial0: X.121 000011638500 <-> ip 128.11.64.1
constructed, method ietf, 1 VC: 1
goya#
```

Troubleshooting on traxbol

The **debug** output displayed when call arrives via the switch is as follows:

```
traxbol#debug x25 events
X.25 special event debugging is on
traxbol#
*Mar 1 23:23:57.474: Serial1: X.25 I R1 Call (25) 8 lci 1
*Mar 1 23:23:57.478: From (12): 000011638600 To (12): 000011638500
*Mar 1 23:23:57.486: Facilities: (4)
*Mar 1 23:23:57.486: Local network facility block
*Mar 1 23:23:57.490: DDN standard service
*Mar 1 23:23:57.490: Call User Data (4): 0xCC000000 (ip)
*Mar 1 23:23:57.502: Serial1: X.25 O R1 Call Confirm (3) 8 lci 1

traxbol#show x25 map
Serial1: X.121 000011638600 <-> ip 128.10.64.2 constructed,
method ietf, 1 VC: 1
traxbol#
```

!--- This shows goya connecting on serial 0.

```
*Mar 1 23:48:59.246: Serial0: X.25 I R1 Call (25) 8 lci 1
*Mar 1 23:48:59.246: From (12): 000011638600 To (12): 000011638500
*Mar 1 23:48:59.254: Facilities: (4)
*Mar 1 23:48:59.258: Local network facility block
*Mar 1 23:48:59.258: DDN standard service
*Mar 1 23:48:59.262: Call User Data (4): 0xCC000000 (ip)
*Mar 1 23:48:59.270: Serial0: X.25 O R1 Call Confirm (3) 8 lci 1
traxbol#
traxbol#show x25 map
Serial0: X.121 000011638600 <-> ip 128.11.64.2
constructed, method ietf, 1 VC: 1
traxbol#
```

Related Information

- [Access–Dial Technology Support Page](#)
 - [Technical Support – Cisco Systems](#)
-

[Contacts & Feedback](#) | [Help](#) | [Site Map](#)

© 2010 – 2011 Cisco Systems, Inc. All rights reserved. [Terms & Conditions](#) | [Privacy Statement](#) | [Cookie Policy](#) | [Trademarks of Cisco Systems, Inc.](#)

Updated: Nov 15, 2007

Document ID: 18325
