

Cross Connect and Frame Forward Signaling for Cisco MC3810 PRI

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Introduction

This document uses information already presented in the Common Channel Signaling (CCS) document on cisco.com, but it further presents the subject with other examples.

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:

- Cisco MC3810 routers with T1 and digital voice modules (DVMs)
- WAN leased line
- Cisco IOS® Software version 12.0.2T and later

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

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

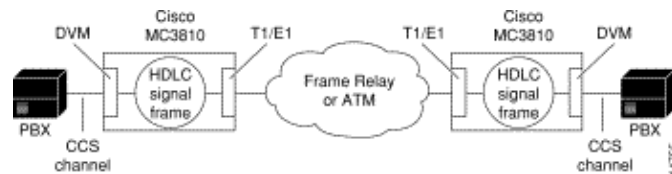
PRI Signaling for Cisco MC3810

A PRI (which is the T1 connection on the Cisco MC3810s in the examples in this document) consists of 23B (bear) channels and 1D (signaling) channel for T1 signaling. In contrast to channel associated signaling

the D channel.

CCS Frame Forwarding Example

This topology shows an example of CCS frame forwarding:



In this example, the Cisco MC3810 captures the signaling frame from the PBX. The Cisco MC3810 then transports the signaling frame as a data frame through the Frame Relay or ATM network to the second Cisco MC3810. The second Cisco MC3810 then forwards the signaling frame to the PBX signaling channel.

- The signaling channel must be in HDLC format at 64Kbps.
- The WAN line can be HDLC (Point-to-Point T1/E1), Frame Relay, or ATM.
- These configurations are for the MC3810s in the CCS frame forwarding example topology above. The first configuration is for the MC3810 on the left of the topology, and the second configuration is for the MC3810 on the right side of the topology.

3810-dig-1

```
controller T1 0
  framing esf
  clock source internal
  linecode b8zs
  channel-group 1 timeslots 1-24 speed 64
!
controller T1 1
  framing esf
  linecode b8zs
  mode ccs frame-forwarding
  voice-group 0 timeslots 1-23 type ext-sig-master
```

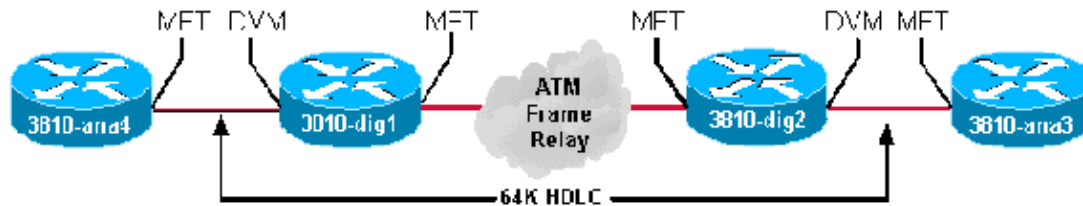
3810-dig-2

```
controller T1 0
  framing esf
  clock source internal
  linecode b8zs
  channel-group 1 timeslots 1-24 speed 64
!
controller T1 1
  framing esf
  linecode b8zs
  mode ccs frame-forwarding
  voice-group 0 timeslots 1-23 type ext-sig-slave
```

There is no special requirement for a MC3810 to be designated as **ext-sig-master** or **ext-sig-slave** in the **voice-group 0 timeslots 1-23 type** command. A channel configured as **ext-sig-master** automatically generates the off-hook signal and stays in the off-hook state. A channel configured as **ext-sig-slave** automatically generates the answer signal when a call is terminated to that channel. These types of options are available only when the mode **ccs cross-connect** command is enabled.

Verify

In order to verify the functionality of frame forwarding, an alternate example with four connected routers is shown in this topology:



Routers 3800-ana-3 and 3800-ana-4 are configured to send data packets in HDLC format over channel 24 to the directly connected MC3810s. 3810-dig-1 and 3810-dig-2 are the routers that perform the frame forwarding in this situation. These configurations make it possible for 3810-ana-3 and 3810-ana-4 to communicate through the ATM frame relay cloud.

3810-ana-3

```
3810-ana-3#show running config
Building configuration...

controller T1 0
 framing esf
 linecode b8zs
 channel-group 1 timeslots 24 speed 64
!
interface Serial0:1
 ip address 1.1.1.1 255.255.255.0
 no ip directed-broadcast
 no fair-queue

!
end
```

3810-ana-4

```
3800-ana-4#show running config
Building configuration...

controller T1 0
 framing esf
 clock source internal
 linecode b8zs
 channel-group 1 timeslots 24 speed 64
!
interface Serial0:1
 ip address 1.1.1.2 255.255.255.0
 no ip directed-broadcast
 no fair-queue

!
end
```

Note: The configurations listed here are for 3810-dig-1 and 3810-dig-2, which perform frame forwarding:

3810-dig-2

```
3810-dig-2#show run

Current configuration:
```

```

!
frame-relay switching
!
!
controller T1 0
 framing esf
 linecode b8zs
 channel-group 1 timeslots 1-24 speed 64
!
controller T1 1
 framing esf
 linecode b8zs
 mode ccs frame-forwarding
 voice-group 1 timeslots 1-23 type ext-sig-master
!
!
interface Serial0:1
 ip address 20.20.20.2 255.255.255.252
 no ip directed-broadcast
 encapsulation frame-relay
 no ip route-cache
 no keepalive
 cdp enable
 frame-relay traffic-shaping
 frame-relay map ip 20.20.20.1 100 broadcast
 frame-relay interface-dlci 100
 class tNt
  vofr cisco
 frame-relay intf-type dce
!
interface Serial1:23

```

```

!--- The virtual Serial 1:23 interface above will be generated once CCS
!--- frame forwarding mode is declared

```

```

 ip address 1.1.1.1 255.255.255.252
 no ip directed-broadcast
 no keepalive
 ccs connect Serial0:1 100

```

```

!--- Direct data on signaling channel to be transmitted over DLCI 100 on interface
!--- serial 0:1

```

```

!
!
map-class frame-relay tNt
 frame-relay voice bandwidth 256000
 frame-relay fragment 800
 no frame-relay adaptive-shaping
 frame-relay cir 768000
 frame-relay bc 2000
 frame-relay fair-queue
!
voice-port 1/1
 timeouts call-disconnect 0
 connection plar 101
!
voice-port 1/2
 timeouts call-disconnect 0
 connection plar 102
!
voice-port 1/3

```

```

    timeouts call-disconnect 0
    connection plar 103
!
voice-port 1/4
    timeouts call-disconnect 0
    connection plar 104
-snip-
voice-port 1/23
    timeouts call-disconnect 0
    connection plar 123
!
dial-peer voice 100 vofr
    no vad
    dtmf-relay
    destination-pattern 1..
    session target Serial0:1 100
end

```

The **connection plar** statement under each voice port is to be used to establish the nail-down connections for the B channels. The common practice is to have the **connection plar** commands configured on the MC3810 with the **ext-sig-master** command configured.

3810-dig-1

```

3810-dig-1
!
controller T1 0
    framing esf
    clock source internal
    linecode b8zs
    channel-group 1 timeslots 1-24 speed 64
!
controller T1 1
    framing esf
    linecode b8zs
    mode ccs frame-forwarding
    voice-group 0 timeslots 1-23 type ext-sig-slave
!
!
!
interface Serial0:1
    ip address 20.20.20.1 255.255.255.252
    no ip directed-broadcast
    encapsulation frame-relay
    no ip route-cache
    no keepalive
    cdp enable
    frame-relay traffic-shaping
    frame-relay interface-dlci 100
        class tNt
        vofr cisco
!
interface Serial1:23
    ip address 1.1.1.2 255.255.255.252
    no ip directed-broadcast
    no keepalive
    no fair-queue
    ccs connect Serial0:1 100
!
!
!
map-class frame-relay ff1
    frame-relay adaptive-shaping becn
    frame-relay cir 1544000
    frame-relay bc 1000

```

```

!
map-class frame-relay tNt
  frame-relay voice bandwidth 256000
  frame-relay fragment 800
  no frame-relay adaptive-shaping
  frame-relay cir 768000
  frame-relay bc 2000
  frame-relay fair-queue
!
-snip-
dial-peer voice 101 pots
  destination-pattern 101
  port 1/1
!
dial-peer voice 102 pots
  destination-pattern 102
  port 1/2
!
dial-peer voice 103 pots
  destination-pattern 103
  port 1/3
-snip-
!
dial-peer voice 123 pots
  destination-pattern 123
  port 1/23
end

```

Note: In the above command sequence, the **dial-peer voice xxx pots** commands are needed on this MC3810, as it terminates the calls from the other MC3810. It is also advisable to assign a unique private line, automatic ringdown (PLAR) ID for each channel to facilitate the troubleshooting process.

The frame forwarding configuration also applies to ATM. These are the configurations for ATM encapsulation and CCS frame forwarding:

3810-dig-1

```

3810-dig-1
controller T1 0
  framing esf
  linecode b8zs
  mode atm

controller T1 1
  framing esf
  linecode b8zs
  mode ccs frame-forwarding
  voice-group 1 timeslots 1-23 type ext-sig-master

interface Serial1:23
  no ip address
  no ip directed-broadcast
  no keepalive
  ccs connect ATM0 1
  no cdp enable

interface ATM0
  no ip address
  no ip directed-broadcast

interface ATM0.1 point-to-point
  no ip directed-broadcast
  atm pvc 1 0 44 aal5voice 384 384 100 oam 10

```

```

interface ATM0.4 point-to-point
ip address 1.1.1.2 255.255.255.0
no ip directed-broadcast
atm pvc 2 0 33 aal5snap 384 384 100 oam 10

```

3810-dig-2

```

controller T1 0
framing esf
linecode b8zs
mode atm

```

```

controller T1 1
framing esf
clock source internal
linecode b8zs
mode ccs frame-forwarding
voice-group 1 timeslots 1-23 type ext-sig-slave

```

```

interface Serial1:23
no ip address
no ip directed-broadcast
no ip route-cache
no keepalive
ccs connect ATM0 1
no cdp enable

```

```

interface ATM0.1 point-to-point
no ip directed-broadcast
atm pvc 1 0 44 aal5voice 384 384 100 oam 10

```

```

interface ATM0.4 point-to-point
ip address 1.1.1.1 255.255.255.0
no ip directed-broadcast
atm pvc 2 0 33 aal5snap 384 384 100 oam 10

```

There is no way to monitor the status of the D channel on any of these routers. It is, however, possible to see the status of the B channels. Issue the **show voice call summary** from the user EXEC mode. Here are some sample debug outputs from the **show voice call summary** command:

From MC3810 with Private Line Auto Ringdown (PLAR) Configured

```

1/1 (orig): eecm = ST_DIGIT_COLLECT, LFXS= call_progress, CPD= failure_cont
1/2 (orig): eecm = ST_DIGIT_COLLECT, LFXS= call_progress, CPD= failure_cont
-snip-

```

```

1/22 (orig): eecm = ST_ACTIVE, LFXS= connected, CPD= connected
1/23 (orig): eecm = ST_ACTIVE, LFXS= connected, CPD= connected

```

From MC3810 with dial-peer voice xxx pots Command Configured

```

/1 ( ): eecm = IDLE, LFXO= idle, CPD= idle
1/2 ( ): eecm = IDLE, LFXO= idle, CPD= idle

```

-snip-

```
1/22 (term): eecm = ST_ACTIVE, LFXO= connected, CPD= connected
```

```
1/23 (term): eecm = ST_ACTIVE, LFXO= connected, CPD= connected
```

Channel 1 and 2 in this situation still have not established the "nail-down" connection and these channels will try forever to establish a connection. Channel 22 and 23, however, have the connection established and are able to pass voice traffic.

To test the connectivity of the D channel from 3810-ana-4 to 3810-ana-3, ping 3810-ana-3's s0:1 interface with the **ping** command. You will see this:

```
3800-ana-4#ping 1.1.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 73/80/84 ms
3800-analog-4#
```

Troubleshoot

There is currently no specific troubleshooting information available for this configuration.

Related Information

- [Configuring MC3810 for TDM Cross Connect](#)
- [Voice Technology Support](#)
- [Voice and Unified Communications Product Support](#)
- [Troubleshooting Cisco IP Telephony](#)
- [Technical Support – Cisco Systems](#)

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