CHAPTER

Configuring the MWR 1941-DC in an IP-RAN

Note Cisco IOS Release 12.3(11)T supports the Cisco IOS IP-RAN feature set (software image) for the MWR 1941-DC router.

This chapter describes how to use the Cisco IOS software command-line interface (CLI) to configure the following features of the Cisco MWR 1941-DC in an IP-RAN:

- Before You Begin, page -2

  Verifying the Version of Cisco IOS Software, page -2

  Configuring the Host Name and Password, page -2

  Configuring Multilink Interfaces, page -8

  Configuring Fast Ethernet Interfaces, page -4

  Configuring Multilink Interfaces, page -8

  Configuring T1 and E1 Interfaces, page -13

  Configuring QoS Attributes, page -16

  Configuring Redundancy, page -18

  Configuring the Link Noise Monitor, page -20

  Saving Configuration Changes, page -22

  Verifying the Configuration, page -22

  Monitoring and Managing the MWR 1941-DC, page -26

  Where to Go Next, page -28

Follow the procedures in this chapter to configure the router manually or if you want to change the configuration after you have run the setup command facility (described in Chapter 1, “First-Time Configuration”).

This chapter describes how to configure features related to the use of the MWR 1941-DC in an IP-RAN. For additional configuration topics, refer to the Cisco IOS configuration guide and command reference publications. These publications are available on the Documentation CD-ROM that came with your router, on the World Wide Web from Cisco’s home page, or you can order printed copies separately.

If you skipped the previous chapter, Chapter 1, “Cisco IOS Software Basics,” and you have never configured a Cisco router, go back to that chapter and read it now. The chapter contains important information you need to successfully configure your router.

Before You Begin

- Cisco IOS Release 12.2(8)MC2 or later “mwr1900-i-mz” image must be installed on the Cisco MWR 1941-DC router.
- You cannot disable Cisco Express Forwarding (CEF) on the MWR 1941-DC. Commands such as **no ip cef** will display an error message “%Cannot disable CEF on this platform.” Some commands, such as **no ip route-cache cef** **not**

should ensure that the order of the IP addresses of the E1/T1 interfaces of the active router corresponds to the order of the IP addresses of the E1/T1 interfaces of the standby router.

Verifying the Version of Cisco IOS Software

show version

show version

Configuring the Host Name and Password

	Command	Purpose

Step 1	`Router> enable`
	`Password: password`
	`Router#`
		`Router#`

Step 2	`configure terminal`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`Router(config)#`
		`Router(config)#.`

Step 3	`Router(config)# hostname Router`	

Step 4		provides access to privileged EXEC mode. When a user types **enable**
Step 5	**line con 0** Router(config-line)# **exec-timeout 0 0** **exit**	

Step 1 **show config**

```
                show config
Using 1888 out of 126968 bytes
!
version XX.X
.
.
.
!
hostname Router
!
enable secret 5 $1$60L4$X2JYOwoDc0.kqa1loO/w8/
.
.
.



Router# exit
.
.
.
Router con0 is now available
Press RETURN
        enable
          guessme
```

Configuring Loopback Interfaces

router. The revertive interface is required to ensure that the switchover takes place. We recommend that you use 101 for the health interface and 102 for the revertive interface.

To configure a loopback interface, do the following beginning in global configuration mode:

Step 1 Create a loopback interface for each multilink interface:

```
interface loopback number
   ip address ip_address subnet_mask
```

Configuring Fast Ethernet Interfaces

-
-
-
-
-
-

Configuring the FE Interface IP Address

Step 1

```
slot port
```

slot *port*

Setting the Speed and Duplex Mode

-
-
-
  both interfaces; do not use the auto setting on the supported side or the duplex setting will be half.

To configure speed and duplex operation, do the following while still in interface configuration mode:

Step 1 Specify the duplex operation.

[| |]

```
Router(config-if)#       [     | 100 | 10]
```

Configuring Routing Protocol Attributes

Step 1 Enable OSPF Message Digest 5 (MD5) authentication.

message-digest-key *key-id* **md5** *key*

ip ospf hello-interval *seconds*

seconds

```
                          {             |                   |             [
{                   |                   }]}
```

Configuring HSRP Support

Note

Step 1

```
Router(config-if)#          group       group-name
```

standby

1 name one **standby 2 name two**

Tip

group-name

hellotime *holdtime*

must

number decrement_value

group *number decrement_value*

group *number decrement_value*

standby track

Step 6

Note

Enabling the FE Interface

Step 1

Configuring Multilink Interfaces

-
-
-
- Configuring RTP/UDP Compression, page -11
- Configuring the RTP/UDP Compression Flow Expiration Timeout Duration, page -11
- Configuring Routing Protocol Attributes, page -12
- Configuring PIM, page -12

Configuring Multilink PPP

multilink interface serves to coordinate the configuration of the bundled link, and presents a single object for the aggregate links. However, the individual PPP links that are aggregated together, must also be configured. Therefore, to enable Multilink PPP on multiple serial interfaces, you need to first set up the multilink interface, and then configure each of the serial interfaces and add them to the same multilink interface.

The MWR 1941-DC router can support up to 16 T1 interfaces through the multilink interface.

To set up the multilink interface, do the following beginning in global configuration mode:

Specify the multilink interface to be configured.

```
RPM-3(config)#


RPM-3(config-if)#


RPM-3(config-if)#                          umber


RPM-3(config-if)#                              umber


RPM-3(config-if)#                           umber
```

number

Configuring IP Address Assignment

command, provided by TACACS+ or the Dynamic Host Configuration Protocol (DHCP), or from a locally administered pool.

IP address pooling uses a pool of IP addresses from which an incoming interface can provide an IP address to a remote node through IPCP address negotiation process. IP address pooling also enhances configuration flexibility by allowing multiple types of pooling to be active simultaneously.

To configure IP address assignment, do the following do the following while still in multilink interface configuration mode:

Specify an IP address, an address from a specific IP address pool, or an address from the Dynamic Host Configuration Protocol (DHCP) mechanism to be returned to a remote peer connecting to this interface:

To enable and control the multiplexing of PPP frames, do the following while still in multilink interface configuration mode:

Enable PPP multiplexing:

Specify the parameters of multiplexing.

To set the maximum time delay, enter:

To set the maximum length of the subframe, enter:

To set maximum length of the superframe, enter:

To set the maximum number of subframes in a superframe, enter:

To set the default PPP protocol ID, enter:

Configuring ACFC and PFC Handling During PPP Negotiation

Note

Step 1

```
reject   ignore
```

—ACFC options are accepted and ACFC may be performed on frames sent to the remote peer.

reject

ignore

```
request   forbid
```

request

forbid

apply

reject

ignore

request

forbid

Configuring RTP/UDP Compression

Step 1

```
SRPM-3(config-if)#
```

```
SRPM-3(config-if)#
```

Step 2

```
RPM-3(config-if)#
```

Note

Configuring the RTP/UDP Compression Flow Expiration Timeout Duration

Caution

Step 1

Configuring Routing Protocol Attributes

Step 1

Step 2

Step 3

Configuring PIM

Step 1

Configuring T1 and E1 Interfaces

Note

Configuring T1 Interfaces

Step 1

Step 2

Step 3

```
linecode b8zs
```

```
channel-group 0 timeslots 1-24 speed 64
```

```
cablelength feet
```

```
exit
```

Step 7

slot/port

Step 8

Step 9

Step 10

Note

Step 11

Step 12

Step 13

Configuring E1 Interfaces

Step 1

Step 2

Step 3

```
linecode hdb3
```

Step 4

```
channel-group 0 timeslots 1-24 speed 64
```

Note

Step 5

```
interface serial          :0

cablelenth
```

```
ip address

encapsulation ppp

keepalive
```

```
carrier-delay

exit
```

Configuring QoS Attributes

Note

http://www.cisco.com/univercd/cc/td/doc/product/aggr/10000/10kfm/fm_qos.htm), as well as the "Cisco IOS Quality of Service Solutions Configuration Guide" and the "Cisco IOS Quality of Service Solutions Command Reference."

Creating a Class Map

For each class map that you want to create, do the following in global configuration mode:

Step 1 Assign a name to your class map.

Where means a single match rule is sufficient for class membership and means only those packets that have all the attributes you specify are part of the class.

When you enter the class-map command, you are placed in class map configuration mode.

Step 2 Describe the characteristics of the packets that are subject to QoS using one or more of the following.

- specifies access control list (ACL) that a packet must match.
- specifies the IP differentiated service code point (DSCP) that a packet must match.
- specifies the precedence values (0-7) that a packet must match.

specifies the name of the input interface used as a match criterion.

specifies the protocol that a packet must match.

For more information about these commands, see the "Cisco IOS Quality of Service Solutions Command Reference."

Exit class map configuration mode.

Creating a Policy Map

Step 1

Step 2

class_name

shape max-buffers

bandwidth percent **priority percent**

qos-group-value

Assigning a QoS Boilerplate to an Interface

Step 1

Step 2

Configuring Redundancy

Note

Redundant MWR 1941-DCs

Step 1

Step 2

Step 3

Note

Step 4

Note

Step 5

Stand-Alone MWR 1941-DC

Step 1

Step 2

Step 3

Step 4

Configuring the Link Noise Monitor

Note

- Line Code Violation (LCV)—A Bi-Polar Violation (BPV) or Excessive Zeroes (EXZ) error has occurred.
- Path Code Violation (PCV)—A Cyclic Redundancy Check (CRC) error, which is generally caused by one or more LCV or logic errors, has occurred in a time slot.

The LNM provides the following types of noise monitors:

- Link Warning—Issues a warning when the noise level of a link exceeds a user-defined threshold and notifies the operator when the noise level improves to the point that it drops below a second user-defined threshold.
- Link Removal—Issues an error and removes a link from service when the noise level of the link exceeds a user-defined threshold and restores the link and provides notification when the noise level improves to the point that it drops below a second user-defined threshold.

Note If the noise level on the last active link in a multilink bundle exceeds the Link Removal threshold, an alert is issued but the link will not be removed from service. If this situation occurs, the standard T1 error rate is used to determine if the last active link must be removed from service.

Usage Notes

-

-
-
-
-
-
-

```
- %LNM-4- WARNEXCEED:Controller <Controller IF>, exceeded noise warning threshold
  <int>, duration <int>
- %LNM-4- WARNIMPROVE:Controller <Controller IF>, noise improved below threshold
  <int>, duration <int>
- %LNM-2-REMOVE:Interface <Serial IF> removed, noise exceeded threshold <int>,
  duration <int>
- %LNM-2- RESTORE:Interface <Serial IF> restored, noise improved below threshold
  <int>, duration <int>
- %LNM-2- REMEXCEED:Interface <Serial IF>, noise exceeded threshold <int>,
  duration <int>
- %LNM-2- REMIMPROVE:Interface <Serial IF>, noise improved below threshold <int>,
  duration <int>
```

Configuring LNM

{ | **remove** } [{ [*value* *value*]] [*seconds*] } |]

where:

—Enables Link Warning monitoring on the link.

—Enables Link Removal monitoring on the link.

—Threshold (in bit errors per second) that when exceeded for the configured duration when the keyword has been specified, creates a condition (warning or link removal), or when fallen below for the configured duration when the keyword has been specified, clears the condition.

For T1 links:

–
–
–
–
–
–

–
–
–

–
–
–

•

span warn lcv 55 duration 20 **pan warn duration 20 lcv 55**

set **span**

clear **span**

Saving Configuration Changes

Step 1

Note **Ctrl-z** **exit**

```
! description Loopback IP for O & M
!
interface loopback 0
 ip address 10.1.170.3 255.255.255.255
!
! description Loopback IP for IP Unnumbered
!
interface loopback 2
 ip address 192.168.170.2 255.255.255.255
!
interface loopback101
 description Health Loopback Interface
 no ip address
!
interface loopback102
 description Revertive Loopback Interface
 no ip address
!
enable password cisco
!
memory-size iomem 25
!
redundancy
  mode y-cable
   standby use-interface Loopback101 health
   standby use-interface Loopback102 revertive
   standby use-interface Multilink2 backhaul
!
controller T1 0/0
 framing esf
 cablelength short 133ft
 clock source internal
 linecode b8zs
 channel-group 0 timeslots 1-1 speed 64
 channel-group 1 timeslots 2-24 speed 64
!
controller T1 0/1
 framing esf
 clock source internal
 linecode b8zs
 cablelength short 133ft
!
!
class-map match-all class1_fch
 match ip dscp cs5
class-map match-all class2_sch
 match ip dscp cs4
class-map match-any class3_paging_ospf
 match ip dscp cs3
match access-group 101
!
policy-map llq-policy
 class class1_fch
  priority percent 68
 class class2_sch
  bandwidth percent 20
  queue-limit 128
 class class3_paging_ospf
  bandwidth percent 2
  queue-limit 128
 class class-default
  queue-limit 512
!
ip dhcp excluded-address 192.168.146.1 192.168.146.3
```

```
ip dhcp ping packets 0
!
ip dhcp pool pbts
 network 192.168.146.0 255.255.255.0
 bootfile CENOMIbts.img
 next-server OMCR-IPaddr
 option 43 ascii "Logical-IPaddr CENOMI-IPaddr another-IPaddr

            OMCR-IPaddr
```

```
              OMCR_ip_address
               OMCIP_ip_address
               CW4MW_ip_address
```

```
description Backhaul Interface
ip unnumbered loopback 2
 cdp enable
 ppp multilink
 ip ospf hello-interval 1
 ip ospf dead-interval 3
 ip ospf message-digest-key 1 md5 mymd5pw
!
interface Multilink2
 description
 ip unnumbered loopback 2
 ip mroute-cache
 ip mtu 256
 cdp enable
 ppp multilink
 ip rtp header-compression ignore-id
 ip rtp compression-connections 700
 ppp mux
 ppp mux subframe length 64
 ppp mux subrame count 15
 ppp mux frame 256
```

```
 ppp mux delay 800
 ppp mux pid 0x2067
 ip ospf hello-interval 1
 ip ospf dead-interval 3
 ip ospf message-digest-key 1 md5 mymd5pw
 ip pim sparse-mode
 ip pim version 2
 service-policy output llq-policy
!
interface FastEthernet0/0
 ip address 192.168.146.1 255.255.255.0
 no ip proxy-arp
 no ip mroute-cache
 keepalive 1
 full-duplex
 speed 100
 ntp broadcast version 3
 standby 1 ip 192.168.146.3
 standby 1 timers 1 3
 standby 1 priority 100
 standby 1 preempt
 standby 1 name one
 standby 1 track FastEthernet0/1 10
 standby 1 track Loopback101 10
 standby 1 track Loopback102 5
 standby 1 track Multilink2 10
 ip ospf hello-interval 1
 ip ospf dead-interval 3
 ip ospf message-digest-key 1 md5 mymd5pw
 ip pim sparse-mode
 ip pim version 2
 ip pim query-interval 2

interface FastEthernet0/1
 ip address 192.168.147.1 255.255.255.0
 standby 2 timers 1 3
 standby 2 preempt
 standby 2 priority 100
 standby 2 ip 192.168.147.3
 standby 2 name two
 standby 2 track Fa0/0 10
 standby 2 track Multilink2 10
 standby 2 track Loopback101 10
 standby 2 track Loopback102 5
 keepalive 1
 speed 100
 full-duplex
 ntp broadcast version 3
 ip ospf hello-interval 1
 ip ospf dead-interval 3
 ip ospf message-digest-key 1 md5 mymd5pw
 ip pim sparse-mode
 ip pim version 2
 ip pim query-interval 2
!
!
!interface Serial0/0:0
 no ip address
 encapsulation ppp
 keepalive 1 2
 ppp multilink
 ppp multilink group 1
!
interface Serial0/1:0
```

```
 no ip address
 encapsulation ppp
 keepalive 1 2
 ppp multilink
 ppp multilink group 2
!
router ospf 1
 log-adjacency-changes
 area 2 nssa
 area 2 authentication message-digest
 auto-cost reference-bandwidth 10240
 timers spf 1 10
 redistribute ospf 2 metric-type 1 subnets
 redistribute static metric-type 1 subnets
 network 192.168.170.2 0.0.0.3 area 2
 distribute-list 10 out
 distance ospf external 125
 summary-address area-51-prefix mask
```

Keepalives must be set for all Ethernet interfaces to ensure proper redundant behavior. A keepalive value of 1 has been selected for maximum responsiveness.

Configuring is helpful to avoid confusion with routes and ARP caches.

In a redundant configuration, both MWR 1941-DCs share a common IP address for their Multilink interface.

Monitoring and Managing the MWR 1941-DC

Step 1

Step 2

hostname is the name assigned to the Operations and Maintenance (O&M) workstation and *ip_address*

hostname

```
                                    RO
snmp-server community               RW

snmp-server enable traps

snmp-server trap-source loopback


copy running-config startup-config
```


interface	
slot port	
slot port	
interface	
type slot port	

Where to Go Next

-

- *System Error Messages* *Debug Command Reference*