



Configuring Basic Broadband Internet Access

This chapter describes the parameters of configuring and maintaining basic broadband Internet access. The chapter contains these sections:

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Overview of Basic Broadband Internet Access

A Cisco uBR7100 series router and an intermediate frequency (IF)-to-RF upconverter are installed at the headend or distribution hub to transmit digital data. The Cisco uBR7100 series router downstream ports transmit IF signals to the upconverter, which translates the downstream signals to RF for broadcast.

Receivers, scramblers, and descramblers then process the TV signals to encode or decode signals as needed for broadcast. Modulators format the analog TV and digital signals.

The analog and digital signals then pass through the RF combiner. The signals are broadcast from the headend through optical transmitters to fiber nodes.

Amplifiers, coaxial cable, and taps carry the signals to the subscriber premises. Signals are processed as follows:

- Tuners that handle MPEG video, audio and broadcast services in STBs, TVs, and VCRs receive one-way analog signals.
- CMs, or tuners in EuroDOCSIS STBs that handle IP data, receive digital data signals:
 - Two-way CMs transmit RF signals back through amplifiers to optical fiber receivers at the headend. These receivers pass the upstream signal to upstream ports on the Cisco uBR7100 series router where they are processed.
 - Telco return CMs transmit over the PSTN. Refer to *Telco Return for the Cisco CMTS* for additional information.

Figure 4-1 on page 4-2 illustrates this general signal flow and associated processes in the CMTS.

- DHCP Address Pools—The Cisco uBR7111 router acts as a DHCP server, providing different address spaces on the basis of the cable modem's service level, including those customers whose network access should be denied access because they have cancelled their service. Different default pools can be used for cable modems and for the IP hosts behind them. Static IP addresses can also be assigned to specific clients on the basis of the client's MAC address.
- DOCSIS Cable Modem Configuration Files—These configuration files provide several different service level options:
 - platinum.cm—Users are given a maximum upstream bandwidth of 128kbps, with a guaranteed minimum bandwidth of 10kbps. The downstream has a maximum bandwidth of 10Mbps. Up to 8 PCs are allowed on this connection.
 - gold.cm—Users are given a maximum upstream bandwidth of 64kbps and a maximum downstream bandwidth of 5Mbps. Up to 3 PCs are allowed on this connection.
 - silver.cm—Users are given a maximum upstream bandwidth of 64kbps and a maximum downstream bandwidth of 1Mbps. Only 1 PC is allowed on this connection.
 - disable.cm—Users are denied access to the cable network. This configuration file can be used for users who have cancelled service or have not paid their bills.

```

!
version 12.1
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
service compress-config
service udp-small-servers max-servers 500
!
hostname ubr7100
!
boot system slot0:
!
no cable qos permission create
no cable qos permission update
cable qos permission modems
cable time-server
!
cable config-file platinum.cm
  service-class 1 max-upstream 128
  service-class 1 guaranteed-upstream 10
  service-class 1 max-downstream 10000
  service-class 1 max-burst 1600
  cpe max 8
  timestamp
!
cable config-file gold.cm
  service-class 1 max-upstream 64
  service-class 1 max-downstream 5000
  service-class 1 max-burst 1600
  cpe max 3
  timestamp
!
cable config-file silver.cm
  service-class 1 max-upstream 64
  service-class 1 max-downstream 1000
  service-class 1 max-burst 1600
  cpe max 1
  timestamp
!
cable config-file disable.cm
  access-denied
  service-class 1 max-upstream 1
  service-class 1 max-downstream 1
  service-class 1 max-burst 1600
  cpe max 1

```

```

        timestamp
    !
    ip subnet-zero
    ip cef
    no ip domain-lookup
    ip dhcp excluded-address 10.128.1.1 10.128.1.15
    ip dhcp excluded-address 10.254.1.1 10.254.1.15
    ip dhcp ping packets 1
    !
    ip dhcp pool CableModems
        network 10.128.1.0 255.255.255.0
        bootfile platinum.cm
        next-server 10.128.1.1
        default-router 10.128.1.1
        option 128 ip 10.128.1.1
        option 4 ip 10.128.1.1
        option 2 hex ffff.8f80
        option 11 ip 10.128.1.1
        option 10 ip 10.128.1.1
        lease 1 0 10
    !
    ip dhcp pool hosts
        network 10.254.1.0 255.255.255.0
        next-server 10.254.1.1
        default-router 10.254.1.1
        dns-server 10.254.1.1 10.128.1.1
        domain-name ExamplesDomainName.com
        lease 1 0 10
    !
    ip dhcp pool staticPC(012)
        host 10.254.1.12 255.255.255.0
        client-identifier 0108.0009.af34.e2
        client-name staticPC(012)
        lease infinite
    !
    ip dhcp pool goldmodem
        host 10.128.1.129 255.255.255.0
        client-identifier 0100.1095.817f.66
        bootfile gold.cm
    !
    ip dhcp pool DisabledModem(0010.aaaa.0001)
        host 10.128.1.9 255.255.255.0
        client-identifier 0100.1095.817f.66
        bootfile disable.cm
    !
    ip dhcp pool DisabledModem(0000.bbbb.0000)
        client-identifier 0100.00bb.bb00.00
        host 10.128.1.10 255.255.255.0
        bootfile disable.cm
    !
    !
    !
    interface FastEthernet0/0
        no ip address
        no ip mroute-cache
        shutdown
        duplex auto
        speed auto
    !
    interface FastEthernet0/1
        no ip address
        no ip mroute-cache
        shutdown
        duplex auto
        speed auto
    !
    interface Cable1/0
        description Cable Downstream Interface
        ip address 10.254.1.1 255.255.255.0 secondary
        ip address 10.128.1.1 255.255.255.0
        no keepalive

```

```

cable downstream annex B
cable downstream modulation 64qam
cable downstream interleave-depth 32
cable downstream frequency 851000000
cable down rf-power 55
cable upstream 0 description Cable upstream interface, North
cable upstream 0 frequency 37008000
cable upstream 0 power-level 0
cable upstream 0 admission-control 150
no cable upstream 0 shutdown
cable upstream 1 description Cable upstream interface, South
cable upstream 1 frequency 37008000
cable upstream 1 power-level 0
cable upstream 1 admission-control 150
no cable upstream 1 shutdown
cable upstream 2 description Cable upstream interface, East
cable upstream 2 frequency 37008000
cable upstream 2 power-level 0
cable upstream 2 admission-control 150
no cable upstream 2 shutdown
cable upstream 3 description Cable upstream interface, West
cable upstream 3 frequency 37008000
cable upstream 3 power-level 0
cable upstream 3 admission-control 150
no cable upstream 3 shutdown
no cable arp
cable source-verify dhcp
cable dhcp-giaddr policy
!
ip classless
no ip forward-protocol udp netbios-ns
ip route 0.0.0.0 0.0.0.0 FastEthernet0/0
no ip http server
!
!
alias exec scm show cable modem
alias exec scf show cable flap
alias exec scp show cable qos profile
!
line con 0
    transport input none
line aux 0
line vty 0 4
    login
!
end

```

To set up spectrum management in your configuration, use the following commands to set up the critical elements:

cable spectrum-group 1 frequency 40000000

cable spectrum-group 1 frequency 20000000 2

In this illustration, the user has configured spectrum management group number “1” to be available to upstream channels. As defined by the two previous command lines, the “preferred” choice is for the upstream to operate on a 40-MHz channel. If that channel is not suitable for the transmission scheme available, the upstream automatically moves over to transmitting at 20 MHz and increases the receive power rating by 2 dB.

The command lines in the sample configuration file beginning with the string **cable modulation-profile** contain the critical elements necessary to set up a modulation profile in your overall configuration:

```

cable modulation-profile 3 request 0 16 1 8 16qam scrambler 152 no-diff 128 fixed uw16
cable modulation-profile 3 initial 5 34 0 48 16qam scrambler 152 no-diff 256 fixed uw16
cable modulation-profile 3 station 5 34 0 48 16qam scrambler 152 no-diff 256 fixed uw16
cable modulation-profile 3 short 5 75 6 8 16qam scrambler 152 no-diff 144 fixed uw8
cable modulation-profile 3 long 8 220 0 8 16qam scrambler 152 no-diff 160 fixed uw8

```

In this case, the user has configured modulation profile number “3” to be available to upstream channels wherever they are configured to apply it. Note that this modulation profile has been configured to operate with a QAM-16 modulation scheme. The default modulation scheme for any upstream profile (if it is not set to QAM-16) is QPSK.

Later in the configuration file example, upstream port 0 on the cable interface card installed in slot 5 utilizes both the spectrum management and the modulation profile configured in the sample.

```
cable upstream 0 spectrum-group 1
cable upstream 0 modulation-profile 3
```

EuroDOCSIS Operation

The Cisco uBR7111E and Cisco uBR7114E routers support the EuroDOCSIS channel plans that use an 8 MHz channel width. Key commands that appear in the Cisco uBR7100 series configuration file that denote EuroDOCSIS operation include:

- **cable downstream annex A**—Annex A is reserved for EuroDOCSIS operations (Annex B is used for DOCSIS NTSC operations). Annex A is chosen by default on the Cisco uBR7111E and Cisco uBR7114E routers.
- **cable upstream 0 frequency**—The EuroDOCSIS upstream valid range is from 5,000,000 to 65,000,000 Hz.

The following is a typical configuration file for EuroDOCSIS operation:

```
!
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname UBR7114
!
!
cable modulation-profile 1 request 0 16 1 8 16qam scrambler 152
no-diff 128 fixed uw16
cable modulation-profile 1 initial 5 34 0 48 16qam scrambler 152
no-diff 256 fixed uw16
cable modulation-profile 1 station 5 34 0 48 16qam scrambler 152
no-diff 256 fixed uw16
cable modulation-profile 1 short 6 75 6 8 16qam scrambler 152 no-diff
144 fixeduw8
cable modulation-profile 1 long 8 220 0 8 16qam scrambler 152 no-diff
160 fixeduw8
cable modulation-profile 2 request 0 16 1 8 qpsk scrambler 152 no-diff
64 fixeduw8
cable modulation-profile 2 initial 5 34 0 48 qpsk scrambler 152
no-diff 128 fixed uw16
cable modulation-profile 2 station 5 34 0 48 qpsk scrambler 152
no-diff 128 fixed uw16
cable modulation-profile 2 short 5 75 6 8 qpsk scrambler 152 no-diff
72 fixed uw8
cable modulation-profile 2 long 8 220 0 8 qpsk scrambler 152 no-diff
80 fixed uw8
!
no cable qos permission create
no cable qos permission update
cable qos permission modems
!
```

```
!  
!  
!  
interface Loopback0  
  ip address 222.2.4.1 255.255.255.255  
  no ip directed-broadcast  
!  
interface Loopback2  
  ip address 111.0.4.2 255.255.255.255  
  no ip directed-broadcast  
!  
interface FastEthernet0/0  
  ip address 1.8.93.9 255.255.0.0  
  no ip directed-broadcast  
!  
interface Cable1/0  
  ip address 3.214.1.1 255.255.255.0  
  no ip directed-broadcast  
  load-interval 30  
  no keepalive  
  cable spectrum-group 1  
  cable helper-address 1.8.93.100  
cable downstream annex A  
  cable downstream modulation 64qam  
  cable downstream frequency 669000000  
cable upstream 0 frequency 5008000  
  cable upstream 0 power-level 0  
  no cable upstream 0 shutdown  
  cable upstream 1 frequency 10000000  
  cable upstream 1 power-level 0  
  no cable upstream 1 shutdown  
  cable upstream 2 frequency 15008000  
  cable upstream 2 power-level 0  
  no cable upstream 2 shutdown  
  cable upstream 3 frequency 20000000  
  cable upstream 3 power-level 0  
  no cable upstream 3 shutdown  
!  
ip default-gateway 1.8.0.1  
ip classless  
ip route 223.255.254.254 255.255.255.255 1.8.0.1  
!  
alias exec scm show cable modem  
!  
line con 0  
  exec-timeout 0 0  
  transport input none  
line aux 0  
line vty 0 4  
  password secret  
  login  
!  
end
```

Transparent Bridging Configuration

Bridging operation between the cable interface and port adapter interfaces is typically not used in DOCSIS CMTS installations because of potential performance and security problems, but bridging operations is appropriate for certain MDU/MTU applications. For example, a hotel could offer Internet connectivity for customers who want to use a fixed IP address, as opposed to being assigned a temporary IP address from the local server's DHCP address pool.



Note

Transparent bridging is supported only when using Cisco IOS Release 12.1(7)EC or greater. For complete details on transparent bridging and IRB operation, see the *Bridging* chapters in the *Cisco IOS Bridging and IBM Networking Configuration Guide, Release 12.1*, available on CCO and the Documentation CD-ROM.

The following sample configuration file configures the Cisco uBR7111 router for basic bridging operation with the following features:

- Basic DOCSIS Internet Access using bridging operations—This requires the following:
 - IP routing is disabled.
 - The FastEthernet and cable interfaces are assigned to the same bridge group.
 - Each interface receives the same IP address since they form one logical network.
 - The **subscriber-loop-control** bridging option is enabled on the cable interface to allow packets received on an upstream to be forwarded to another cable modem host on the downstream.



Note

The spanning-tree protocol is disabled, by default, on the cable interface, but this is not required.

- DOCSIS Cable Modem Configuration Files—These configuration files provide several different service level options:
 - platinum.cm—Users are given a maximum upstream bandwidth of 128kbps, with a guaranteed minimum bandwidth of 10kbps. The downstream has a maximum bandwidth of 10Mbps. Up to 8 PCs are allowed on this connection.
 - gold.cm—Users are given a maximum upstream bandwidth of 64kbps and a maximum downstream bandwidth of 5Mbps. Up to 3 PCs are allowed on this connection.
 - silver.cm—Users are given a maximum upstream bandwidth of 64kbps and a maximum downstream bandwidth of 1Mbps. Only 1 PC is allowed on this connection.
 - disable.cm—Users are denied access to the cable network. This configuration file can be used for users who have cancelled service or have not paid their bills.
- TFTP server provides access to the cable modem configuration files (but a DHCP server is not supported in bridging mode)

The following is a typical configuration file for transparent bridging operation:

```
!
version 12.1
no service pad
service timestamps debug datetime msec localtime
service timestamps log datetime
no service password-encryption
service udp-small-servers max-servers no-limit
service tcp-small-servers max-servers no-limit
```

```
!  
hostname ubr7100  
!  
no cable qos permission create  
no cable qos permission update  
cable qos permission modems  
cable time-server  
!  
cable config-file platinum.cm  
    service-class 1 max-upstream 128  
    service-class 1 guaranteed-upstream 10  
    service-class 1 max-downstream 10000  
    service-class 1 max-burst 1600  
    cpe max 8  
    timestamp  
!  
cable config-file gold.cm  
    service-class 1 max-upstream 64  
    service-class 1 max-downstream 5000  
    service-class 1 max-burst 1600  
    cpe max 3  
    timestamp  
!  
cable config-file silver.cm  
    service-class 1 max-upstream 64  
    service-class 1 max-downstream 1000  
    service-class 1 max-burst 1600  
    cpe max 1  
    timestamp  
!  
cable config-file disable.cm  
    access-denied  
    service-class 1 max-upstream 1  
    service-class 1 max-downstream 1  
    service-class 1 max-burst 1600  
    cpe max 1  
    timestamp  
!  
!  
clock timezone PST -9  
clock calendar-valid  
ip subnet-zero  
no ip routing  
no ip finger  
no ip domain-lookup  
!  
interface FastEthernet0/0  
    ip address 10.1.1.1 255.255.255.0  
    no ip route-cache  
    no ip mroute-cache  
    no keepalive  
    duplex half  
    speed auto  
    no cdp enable  
    bridge-group 1  
    bridge-group 1 spanning-disabled  
!  
interface FastEthernet0/1  
    ip address 10.1.1.1 255.255.255.0  
    no ip route-cache  
    no ip mroute-cache  
    duplex auto  
    speed 10  
    no cdp enable
```

```

bridge-group 1
bridge-group 1 spanning-disabled
!
interface Cable1/0
ip address 10.1.1.1 255.255.255.0
no ip route-cache
no ip mroute-cache
load-interval 30
no keepalive
cable downstream annex B
cable downstream modulation 256qam
cable downstream interleave-depth 32
cable downstream frequency 525000000
no cable downstream rf-shutdown
cable upstream 0 frequency 17808000
cable upstream 0 power-level 0
cable upstream 0 timing-adjust threshold 0
cable upstream 0 timing-adjust continue 0
cable upstream 0 channel-width 3200000
no cable upstream 0 shutdown
bridge-group 1
bridge-group 1 subscriber-loop-control
bridge-group 1 spanning-disabled
!
ip default-gateway 1.10.0.3
ip classless
no ip http server
!
no cdp run
tftp-server bootflash:platinum.cm alias platinum.cm
tftp-server bootflash:gold.cm alias gold.cm
tftp-server bootflash:silver.cm alias silver.cm
tftp-server bootflash:disable.cm alias disable.cm
!
line con 0
exec-timeout 0 0
privilege level 15
length 0
transport input none
line aux 0
line vty 0 4
privilege level 15
no login
!
end

```

Integrated Routing and Bridging Configuration

Integrated Routing and Bridging (IRB) operation allows bridging within a specific segment of networks or hosts, yet also allows those hosts to connect to devices on other, routed networks, without having to use a separate router to interconnect the two networks. IRB operation is typically not used in DOCSIS CMTS installations because of potential performance and security problems, but bridging operations is appropriate for certain MDU/MTU applications. For example, a hotel could offer Internet connectivity for customers who want to use a fixed IP address, as opposed to being assigned a temporary IP address from the local server's DHCP address pool.

**Note**

IRB operation is supported only when using Cisco IOS Release 12.1(7)EC or greater. For complete details on transparent bridging and IRB operation, see the *Bridging* chapters in the *Cisco IOS Bridging and IBM Networking Configuration Guide, Release 12.1*, available on CCO and the Documentation CD-ROM.

The following sample configuration file configures the Cisco uBR7111 router for basic IRB operation with the following features:

- Basic DOCSIS Internet Access using IRB operations—This requires the following:
 - IRB bridging is enabled.
 - The FastEthernet and cable interfaces are assigned to the same bridge group.
 - An IP address is configured only on the virtual BVI interface. No IP address is configured on any physical interface.
 - The **subscriber-loop-control** bridging option is enabled on the cable interface to allow packets received on an upstream to be forwarded to another cable modem host on the downstream.
 - The virtual BVI interface is configured with an IP address.

**Note**

The spanning-tree protocol is disabled, by default, on the cable interface, but this is not required.

- DOCSIS Cable Modem Configuration Files—These configuration files provide several different service level options:
 - platinum.cm—Users are given a maximum upstream bandwidth of 128kbps, with a guaranteed minimum bandwidth of 10kbps. The downstream has a maximum bandwidth of 10Mbps. Up to 8 PCs are allowed on this connection.
 - gold.cm—Users are given a maximum upstream bandwidth of 64kbps and a maximum downstream bandwidth of 5Mbps. Up to 3 PCs are allowed on this connection.
 - silver.cm—Users are given a maximum upstream bandwidth of 64kbps and a maximum downstream bandwidth of 1Mbps. Only 1 PC is allowed on this connection.
 - disable.cm—Users are denied access to the cable network. This configuration file can be used for users who have cancelled service or have not paid their bills.
- TFTP server provides access to the cable modem configuration files (but a DHCP server is not supported in bridging mode)

The following is a typical configuration file for IRB operation:

```
!
version 12.1
no service pad
service timestamps debug datetime msec localtime
service timestamps log datetime
no service password-encryption
service udp-small-servers max-servers no-limit
service tcp-small-servers max-servers no-limit
!
hostname ubr7100
!
logging buffered 409600 debugging
no logging console
!
```

```

no cable qos permission create
no cable qos permission update
cable qos permission modems
cable time-server
!
cable config-file platinum.cm
  service-class 1 max-upstream 128
  service-class 1 guaranteed-upstream 10
  service-class 1 max-downstream 10000
  service-class 1 max-burst 1600
  cpe max 8
  timestamp
!
cable config-file gold.cm
  service-class 1 max-upstream 64
  service-class 1 max-downstream 5000
  service-class 1 max-burst 1600
  cpe max 3
  timestamp
!
cable config-file silver.cm
  service-class 1 max-upstream 64
  service-class 1 max-downstream 1000
  service-class 1 max-burst 1600
  cpe max 1
  timestamp
!
cable config-file disable.cm
  access-denied
  service-class 1 max-upstream 1
  service-class 1 max-downstream 1
  service-class 1 max-burst 1600
  cpe max 1
  timestamp
!
!
clock timezone PST -9
clock calendar-valid
ip subnet-zero
no ip finger
no ip domain-lookup
!
bridge irb
!
interface FastEthernet0/0
  no ip address
  no ip mroute-cache
  no keepalive
  duplex half
  speed auto
  no cdp enable
  bridge-group 1
  bridge-group 1 spanning-disabled
!
interface FastEthernet0/1
  no ip address
  no ip mroute-cache
  duplex auto
  speed 10
  no cdp enable
  bridge-group 1
  bridge-group 1 spanning-disabled
!
interface Cable1/0

```

```

no ip address
no ip mroute-cache
load-interval 30
no keepalive
cable downstream annex B
cable downstream modulation 256qam
cable downstream interleave-depth 32
cable downstream frequency 525000000
no cable downstream rf-shutdown
cable upstream 0 frequency 17808000
cable upstream 0 power-level 0
cable upstream 0 timing-adjust threshold 0
cable upstream 0 timing-adjust continue 0
cable upstream 0 channel-width 3200000
no cable upstream 0 shutdown
bridge-group 1
bridge-group 1 subscriber-loop-control
bridge-group 1 spanning-disabled
!
interface BVI1
 ip address 100.1.1.1 255.255.255.0
!
ip default-gateway 1.10.0.3
ip classless
no ip http server
!
no cdp run
tftp-server bootflash:platinum.cm alias platinum.cm
tftp-server bootflash:gold.cm alias gold.cm
tftp-server bootflash:silver.cm alias silver.cm
tftp-server bootflash:disable.cm alias disable.cm

bridge 1 protocol ieee
 bridge 1 route ip
alias exec scm show cable modem
alias exec sib show ip int brief
!
line con 0
 exec-timeout 0 0
 privilege level 15
 length 0
 transport input none
line aux 0
line vty 0 4
 privilege level 15
 no login
!
end

```

Baseline Privacy Interface

The Cisco uBR7100 series CMTS supports 56-bit and 40-bit encryption/decryption; 56 bit is the default. After you choose a CMTS image that supports BPI, BPI is enabled by default for the Cisco uBR7100 series routers.

When baseline privacy is enabled, the Cisco uBR7100 series router routes encrypted/decrypted packets from a host or peer to another host or peer. BPI is configured with Key Encryption Keys (KEKs) and traffic encryption keys (TEKs). A KEK is assigned to a cable modem based on the cable modem's service

identifier (SID), and permits the cable modem to connect to the Cisco uBR7100 series router when baseline privacy is activated. The TEK is assigned to a cable modem when its KEK has been established. The TEK is used to encrypt data traffic between the cable modem and the Cisco uBR7100 series CMTS.

Keys and TEKs can be set to expire based on a grace-time or a lifetime value. A grace-time key is used to assign a temporary key to a cable modem to access the network. A lifetime key is used to assign a more permanent key to a cable modem. Each cable modem that has a lifetime key assigned will request a new lifetime key from the Cisco uBR7100 series CMTS before the current one expires.

**Tip**

Use the **show cable modem** command to identify a cable modem with encryption/decryption enabled. The *online(pk)* output of this command reveals a cable modem that is registered with BPI enabled and a KEK assigned. The *online(pt)* output reveals a cable modem that is registered with BPI enabled and a TEK assigned.

Commands that enable, disable, and configure BPI encryption/decryption include:

- cable privacy kek grace-time 800
- cable privacy kek life-time 750000
- cable privacy tek grace-time 800
- cable privacy tek life-time 56000
- cable privacy enable
- cable privacy mandatory

To change the Cisco uBR7100 series default of 56-bit encryption/decryption to 40-bit, use the “40 bit des” option:

```
CMTS(config-if)# cable privacy ?
 40-bit-des          select 40 bit DES
 ^^^^^^^^^^
 authenticate-modem turn on BPI modem authentication
 authorize-multicast turn on BPI multicast authorization
 kek                 KEK Key Params
 mandatory           force privacy be mandatory
 tek                 TEK Key Params
```

Software then generates a 40-bit DES key, where the DES key that is generated and returned masks the first 16-bits of the 56-bit key to zero in software. To return to 56-bit encryption/decryption after changing to 40-bit, enter the **no** command in front of the “40 bit des” option.

**Caution**

Cisco uBR7100 series telco return images that support BPI do not support encryption/decryption in the telco return path.