CHAPTER 6

Configuring Basic Broadband Internet Access

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

Overview of Basic Broadband Internet Access

A Cisco uBR7200 series router and an intermediate frequency (IF)-to-radio frequency (RF) upconverter are installed at the headend or distribution hub to transmit digital data. The Cisco uBR7200 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.

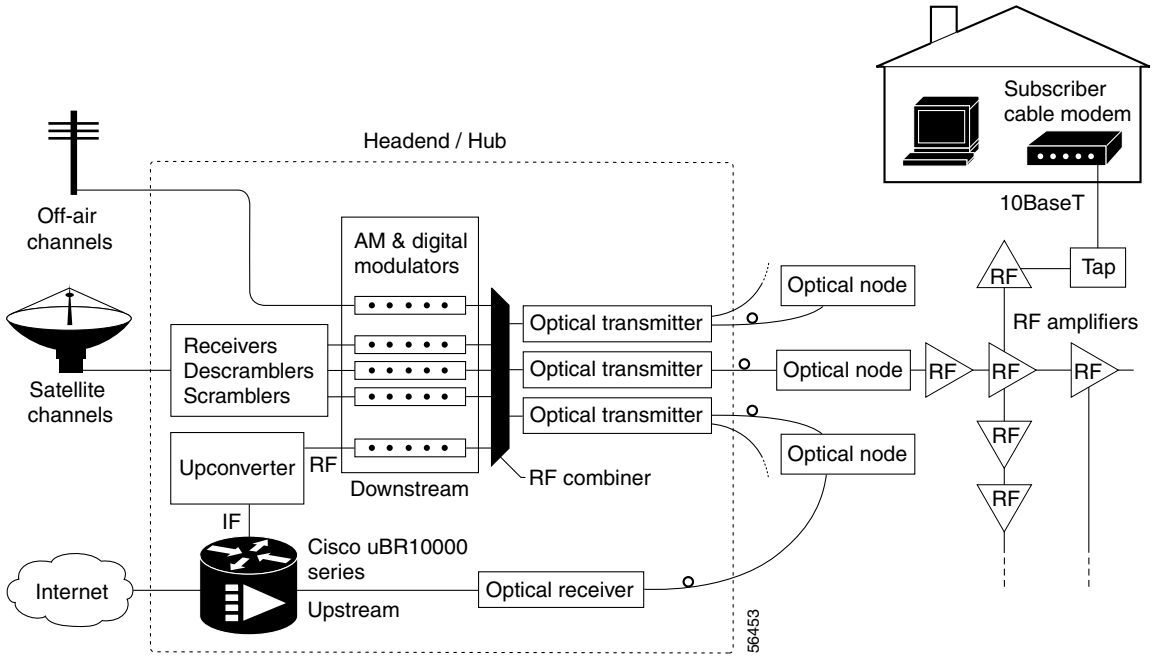
The analog and digital signals then pass through the RF combiner. The signals are broadcast from the headend through optical transmitters to fiber nodes.

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 set-top boxes (STBs), TVs, and VCRs receive one-way analog signals.
- CMs 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 uBR7200 series router, where they are processed.

Figure 6-1 on page 6-2 illustrates this general signal flow and associated processes in the CMTS.

Figure 6-1 Two-Way Internet Access Network Example



Note The external upconverter shown in Figure 6-1 is needed only if you are not using the router's integrated upconverter.

Recommended Basic Configuration for High-Speed Internet Access

The Cisco uBR7200 series router is fully capable of self-provisioning all CMs and hosts to which it is attached. The router supports multiple IP subnets, including different subnets for hosts and CMs. Configuration options are limited only by available configuration file length.

The Cisco uBR7200 series CMTS automatically connects DOCSIS-compliant CMs and hosts right out of the box. Therefore, the factory-supplied configuration activates the downstream RF to 851 MHz center frequency, and the upstream to 37 MHz.

Step 1 Connect one upstream port and the downstream port to a duplex filter.

Note Do not combine multiple ports, because they are all set on the same frequency.

Step 2 Use at least 40 dB attenuation before the first modem, and modems will connect in under 5 minutes.

Basic Internet Access Sample Configuration File

General

The following sample configuration file for the Cisco uBR7200 series router includes the following features:

- Basic DOCSIS Internet Access
- DHCP Address Pools—The Cisco uBR7200 series router acts as a DHCP server, providing different address spaces on the basis of the CM'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 CMs 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 CM Configuration Files—These configuration files provide several different service level options:
  - platinum.cm—Users are given a maximum upstream bandwidth of 128 kbps, with a guaranteed minimum bandwidth of 10 kbps. The downstream has a maximum bandwidth of 10 Mbps. Up to 8 PCs are allowed on this connection.
  - gold.cm—Users are given a maximum upstream bandwidth of 64 kbps and a maximum downstream bandwidth of 5 Mbps. Up to 3 PCs are allowed on this connection.
  - silver.cm—Users are given a maximum upstream bandwidth of 64 kbps and a maximum downstream bandwidth of 1 Mbps. 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 uBR7200
!
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 Cable5/0
```

```
   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
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 **cable modulation-profile** command 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 uses both the spectrum management and the modulation profile configured in the sample:

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