Cisco DOCSIS 3.0 Downstream Solution Overview for the I-CMTS

This chapter provides an overview of the Cisco DOCSIS 3.0 Downstream Solution for Integrated Cable Termination System (I-CMTS), and contains the following major topics:

Cisco integrated cable modem termination systems (I-CMTS) DOCSIS 3.0 solution enables high-bandwidth access networks. The Cisco family of DOCSIS-compliant I-CMTS routers includes the high-capacity Cisco uBR10012 and the mid-range Cisco uBR7246XVR, and Cisco uBR7225VXR universal broadband routers.

Description and Scope

Cisco IOS Release 12.3(23)SCD introduces the DOCSIS 3.0 Downstream Channel Bonding feature for the Cisco uBR7200 series routers.

In the Cisco I-CMTS implementation, the downstream (DS) channels are processed and encapsulated by the downstream (DS) channels of the line cards, which can be used either as primary-capable channels (narrowband channels), or as part of bonded channels (wideband channels), or both.

Architecture and Scope

The Cisco DOCSIS 3.0 Downstream Channel Bonding includes these major components:

- Integrated cable modem termination system (I-CMTS)—Cisco uBR10012, Cisco uBR7246VXR, and Cisco uBR7225VXR routers

  The I-CMTS solution provides the building blocks to enable operators to offer highly competitive, high-bandwidth services at a reduced cost per bit.

- Cable integrated line cards—Cisco UBR-MC20X20V and Cisco uBR-MC8X8V

  For more information about the Cisco UBR-MC20X20V line card, see *Configuring the Cisco UBR-MC20X20V Cable Interface Line Card* at the following URL:

  http://www.cisco.com/en/US/docs/interfaces_modules/cable/broadband_processing_engines/ubr_mc20x20v/configuration/guide/mc20x20v_cfg.html

For more information about the Cisco uBR-MC8X8V cable interface line card, see the *Configuring the Cisco uBR-MC88V Cable Interface Line Card* at the following URL:

http://www.cisco.com/en/US/docs/interfaces_modules/cable/broadband_processing_engines/ubr_mc88v/configuration/guide/mc8x8v_cfg.html

- Wideband cable modem (WCM)

  WCMs are modems that are DOCSIS 3.0-compliant and support downstream channel bonding.

- Narrowband cable modem (NCM)

  NCMs are modems that are DOCSIS 1.x and DOCSIS 2.0 compliant and support data from a single RF channel.

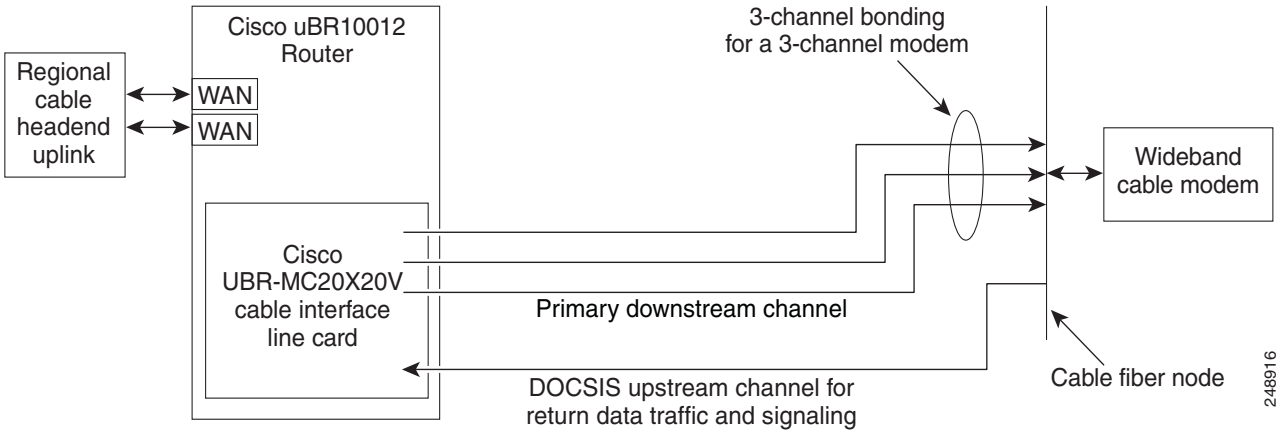
- DOCSIS Timing, Communication and Control (DTCC)

Note If you are using the Cisco UBR-MC20X20V linecards, dual DTCC are required.

Note The Cisco uBR7200 series routers do not support any external Timing and Control Cards.

Figure 3-1 presents a simplified view of the Cisco DOCSIS 3.0 Downstream Solution.

Figure 3-1 Cisco DOCSIS 3.0 Downstream Solution



In Scope

The scope of the Cisco DOCSIS 3.0 Downstream Channel Bonding comprises fully tested and supported Cisco and Scientific Atlanta components, as well as selected third-party components that Cisco has tested for interoperability.

The following aspects of the solution are in scope:

- DOCSIS 3.0 Downstream software
- I-CMTS routers (Cisco uBR10012, Cisco uBR7246VXR, and Cisco uBR7225VXR routers)
- Timing and Control Card
- TCC+ server

Note The Cisco uBR7200 series routers do not support any external Timing and Control Cards.

- Cable interface line cards, such as Cisco UBR-MC20X20V and Cisco uBR-MC8X8V cable interface line cards
- Wideband cable modem
- DOCSIS 1.x and DOCSIS 2.0 cable modem configuration file parameters
- DOCSIS 3.0 cable modem configuration file parameters
- Cisco IOS command set for wideband-channel configuration, provisioning, and maintenance
- Cisco IOS command set for wideband hardware monitoring, troubleshooting, and debugging
- MIBs for the wideband CMTS, wideband cable modem, and wideband channel and service statistics

Out of Scope

The hardware and software components that make up the remainder of the cable data network are out of scope of the DOCSIS 3.0 Downstream Channel Bonding solution.

Cable network management tools and operations support system (OSS) facilities for wideband cable are also outside the scope of the solution.

Cisco DOCSIS 3.0 Downstream Solution Key Features

Cisco DOCSIS 3.0 Downstream Solution that includes support for the following functionality:

- Extensible MAC domain construction using Channel Grouping Domain (CGD)
  - Load balancing
  - Virtual interface bundling
  - Full DOCSIS Quality of Service (QoS)
  - Committed Information Rate (CIR) Admission Control
  - Bonded multicast
  - Non-bonded multicast
  - DOCSIS Set-top Gateway (DSG)
  - Subscriber Accounting and Management Interface Specification (SAMIS)
  - Multiprotocol Label Switching (MPLS) and Virtual Private Network (VPN)
  - Baseline Privacy Interface (BPI) and Baseline Privacy Interface Plus (BPI+)
  - Payload Header Suppression (PHS)
  - Packet Cable and PacketCable™ Multimedia (PCMM)
  - Cable modem flaplist
  - Source verify (with Dynamic Host Configuration Protocol (DHCP) option)
  - Computer Assisted Law Enforcement Act (CALEA), Service Independent Intercept (SII), and Packet Intercept
  - Cable modem remote query

  - DOCSIS packet filters
  - Cable Address Resolution Protocol (ARP)
  - Downstream channel selection
  - Provides support for voice-enabled cable modems
- Existing Cisco uBR10012 router (CMTS) can be upgraded to wideband CMTS with add-on components.
- Cisco Wideband CMTS and line cards have resiliency features and N+1 line card high-availability (LCHA).
- DOCSIS 3.0-compliant wideband cable modems
- DOCSIS WFQ Scheduler

  The DOCSIS WFQ Scheduler is an output packet scheduler that provides output scheduling services on both WAN uplink interfaces and DOCSIS downstream interfaces.
- CMTS Dynamic Bandwidth Sharing

  The new CMTS feature enables dynamic bandwidth sharing (DBS) on modular cable and wideband cable interfaces.
- Voice support on wideband modems

  CMTS supports voice services on voice-enabled wideband (WB) cable modems.
- Wideband Modem Resiliency

  The Wideband Modem Resiliency feature provides the best possible service in the event of non-primary RF channel disruptions to ensure that a cable modem remains operational. With the implementation of this feature, the CMTS does not force a cable modem to perform a MAC reset if the CM loses connectivity to the CMTS on one or all of its non-primary RF channels.
- DOCSIS 3.0 Downstream Bonding for Bronze Certification

  The DOCSIS 3.0 Downstream Bonding for Bronze Certification feature provides new, more bandwidth-intensive services by adding one or more additional downstream quadrature amplitude modulation (QAM) channels to the standard broadband DOCSIS system.

Cisco DOCSIS 3.0 Downstream Solution Components

For the Cisco DOCSIS 3.0 Downstream Solution, the following equipment have been tested in the context of the solution:

- Cisco uBR10012 universal broadband router with route processor (PRE) modules and these components:
  - Cisco UBR-MC20X20V cable interface line cards
- Cisco uBR7225VXR and Cisco uBR7246VXR routers with NPE-G2 processor and Cisco uBR-MC8X8V line card
- Wideband cable modem
  - DOCSIS 3.0-compliant wideband cable modems