CISCO

Products & Services   **Support**   **How to Buy**   **Training & Events**   **Partners**

Cable Modems

Cable Modems Dropping Offline in a 2-way Cable Network

Contents

Document ID: 22543

Updated: Sep 03, 2006

📄 Download PDF   🖨 Print

[+] Feedback

Related Documents

Cable Modems Dropping Offline in a 2-way Cable Network

Cable Modems Troubleshooting TechNotes

Cable Modems Configuration Examples and TechNotes

Cisco uBR900 Series Cable Access Routers Configuration Examples and TechNotes

Cisco uBR900 Series Cable Access Routers Troubleshooting TechNotes

More...

Related Products

Radio Frequency (RF) Hybrid Fiber-Coaxial (HFC)

Data-over-Cable Service Interface Specifications (DOCSIS)

Cable Modems

Cisco uBR900 Series Cable Access Routers

Cisco uBR7100 Series Universal Broadband Routers

More...

Introduction

This document explains some troubleshooting steps used to determine the cause of Cable Modems dropping offline. Since, in the majority of cases, the cause will be a plant issue or low carrier-to-noise ratio, these issues will be the major emphasis of this document.

Before You Begin

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Prerequisites

There are no specific prerequisites for this document.

Components Used

The information in this document is based on these software and hardware versions:

- Cisco hardware uBR7246 VXR (NPE300) processor (revision C)

- Cisco IOS® software (UBR7200-K1P-M), Version 12.1(9)EC

- CVA122 Cisco IOS Software 12.2(2)XA

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.

Why Do Cable Modems Drop Offline?

A Cable Modem requires three main things to remain online once it is connected and operational:

- Clean RF plant with a carrier-to-noise consistently above 25 dB in the Upstream, and above 35 in the downstream.

- Unicast polls from the CMTS every 30 seconds (keepalives). These are unicast transmit opportunities for this modem's assigned SID, in which it can send a RNG-REQ to the CMTS. If the cable modem does not receive a unicast transmit opportunity within T4 seconds (30 seconds) it has to time out and re-initialise it's MAC layer. So if there is a problem (RF) in the downstream, the cable modem might not "see" this unicast transmit opportunity, and drop offline.

- If the CMTS does not get a reply from the CM to the unicast transmit opportunity, the CMTS will poll the modem 16 times in short succession in order to try and get an answer. The modem is considered offline by the CMTS if there is no reply after these retries.

RF Plant Quality

According to DOCSIS specifications, the RF plant needs to comply to following requirements for Upstream and Downstream to ensure continued operation:

- The configuration parameters

- The downstream and upstream frequencies used

- The noise measurements in dB. Make certain that they are correct and within the allowed limits. A table of the noise limits is included below:

DOCSIS Cable Upstream RF Specifications

Specifications UPSTREAM	DOCSIS Specifications[1]
System/Channel	
Frequency range	5 to 42 MHz (North America) 5 to 65 MHz (Europe)
Transit delay from the most distant CM to the nearest CM or CMTS.	< 0.800 millisecond (msec)
Carrier to noise ratio	25 dB
Carrier to ingress power ratio	> 25 dB
Carrier to interference ratio	> 25 dB (QPSK[2])[3] > 25 dB (16 QAM4)[3]
Carrier hum modulation	< -23 dBc[5] (7%)
Burst noise	Not longer than 10 µsec at a 1 kHz average rate for most cases.
Amplitude ripple	0.5 dB/MHz
Group delay ripple	200 ns/MHz
Micro reflections (single echo)	-10 dBc @ < 0.5 µsec -20 dBc @ < 1.0 µsec -30 dBc @ > 1.0 µsec
Seasonal/diurnal signal level variation	Not greater than 8 dB min to max.
Digital Signal Levels	
From cable modem (upstream)	+8 to +58 dBmV (QPSK) +8 to +55 dBmV (16 QAM)
Input amplitude to modem card (upstream)	-16 to +26 dBmV, depending on symbol rate.
Signal as relative to adjacent video signal	-6 to -10 dBc

[1]DOCSIS specifications are baseline settings for a DOCSIS-compliant, two-way data-over-cable system.

[2] QPSK = Quadrature Phase-Shift Keying: a method of modulating digital signals onto a radio-frequency carrier signal using four phase states to code two digital bits.

[3] These settings are measured relative to the digital carrier. Add 6 or 10 dB, as determined by your company's policy and derived from the initial cable network setup, relative to the analog video signal.

[4] QAM = Quadrature Amplitude Modulation: a method of modulating digital signals onto a radio-frequency carrier signal involving both amplitude and phase coding.

[5] dBc = decibels relative to carrier.

DOCSIS Cable Downstream RF Specifications

Specification DOWNSTREAM	DOCSIS Specifications[1]
System/Channel	
RF channel spacing (bandwidth)	6 MHz
Transit delay[2]	0.800 millisecond (msec)
Carrier to noise ratio	35 dB
Carrier-to-interference ratio for total power (discrete and broadband ingress signals).	> 35 dB

Composite triple beat distortion	< -50 dBc[3]
Carrier to second order	< -50 dBc
Cross-modulation level	< -40 dBc
Amplitude ripple	0.5 dB in 6 MHz
Group delay	75 ns[4] in 6 MHz
Micro reflections bound for dominant echo	-10 dBc @ < 0.5 µsec -15 dBc @ < 1.0 µsec -20 dBc @ < 1.5 µsec -30 dBc @ > 1.5 µsec
Carrier hum modulation	< -26 dBc (5%)
Burst noise	Not longer than 25 µsec at a 10 kHz average rate.
Seasonal/diurnal signal level variation	8 dB
Signal level slope (50 to 750 MHz)	16 dB
Maximum analog video carrier level at CM input, inclusive of above signal level variation.	+17 dBmV
Minimum analog video carrier level at CM input, inclusive of above signal level variation.	-5 dBmV
Digital Signal Levels	
Input to cable modem (level range, one channel)	-15 to +15 dBmV
Signal as relative to adjacent video signal	-6 to -10 dBc

[1]DOCSIS specifications are baseline settings for an DOCSIS-compliant, two-way data-over-cable system.

[2]Transit delay is defined as the "round trip" from the cable headend to the furthest customer and back.

[3]dBc = decibels relative to carrier.

[4]ns = nanoseconds.

**Note:** For a full set of the specifications for the European Standard, please read RF Specifications.

For a document on how to troubleshoot RF issues in your cable plant, go to the Determining RF or Configuration Issues on the CMTS document. For more information on RF measurements using a spectrum analyzer refer to Connecting the Cisco uBR7200 Series Router to the Cable Headend.

Periodic Ranging (CM View)

The CMTS MUST provide each CM a Periodic Ranging opportunity at least once every T4 seconds. The CMTS MUST send out Periodic Ranging opportunities at an interval sufficiently shorter than T4 that a MAP could be missed without the CM timing out. The size of this "subinterval" is CMTS dependent. The CM MUST reinitialize its MAC after T4 seconds have elapsed without receiving a Periodic Ranging opportunity. The default value for T4 is 30 seconds.

T4 is defined as "wait for unicast ranging opportunity". This is the time a modem will wait to get a dedicated transmit opportunity from the CMTS. The value is defined to be minimum 30 seconds, and maximum 35 seconds per SP-RFIv1.1-I03-991105.
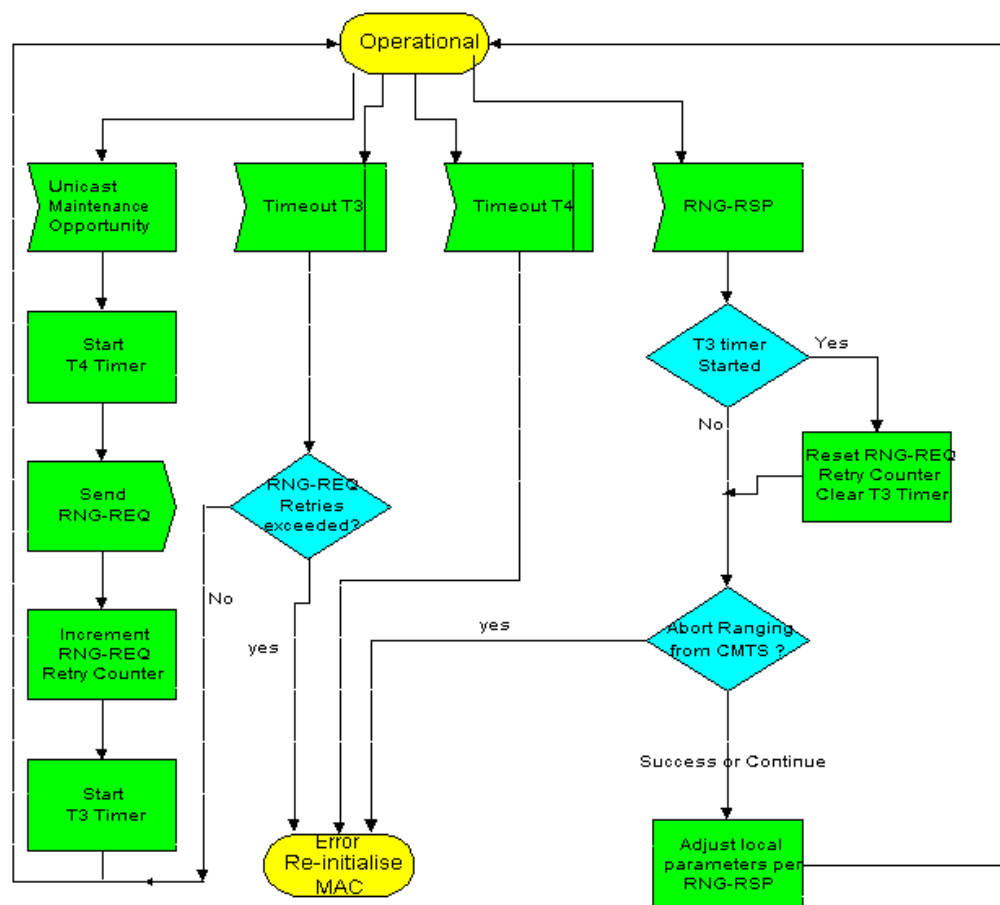
If a UBR9xx modem goes offline because of a T4 timeout, you will see following error messages in the **debug cable mac log**:

```
router#debug cable mac log verbose
....
11:05:07: 39907.082 CMAC_LOG_T4_TIMER
11:05:07: %UBR900-3-RESET_T4_EXPIRED: R04.0 Received Response to
Broadcast Maintenance Request, But no Unicast Maintenance opportunities received. T4
timeout.
11:05:07: 39907.090 CMAC_LOG_RESET_T4_EXPIRED
....
```

This usually points to a problem in the RF, so the troubleshooting should focus on that.

Periodic Ranging (CMTS View)
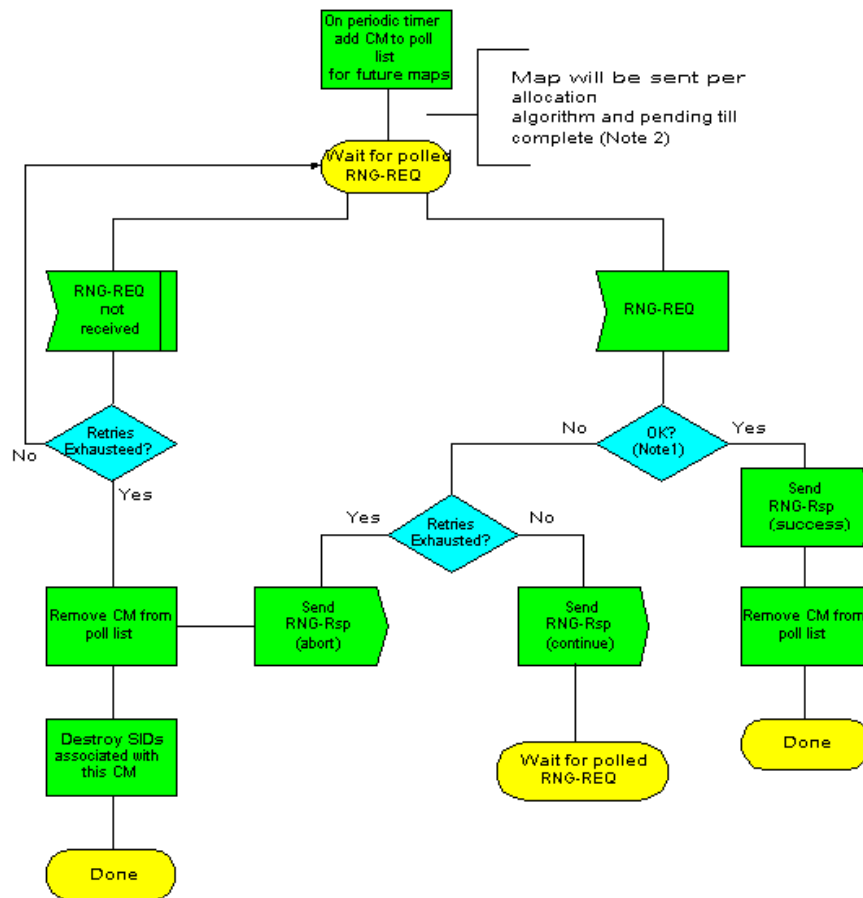
Note 1: Measures ranging request is within the tolerance limits of the CMTS for power and tra equalisation (if supported)

Note 2: RNG-REQ pending-till-complete was non zero. The CMTS SHOULD hold off the static maintenance opportunity accordingly unless needed. For example to adjust the CM's power le If opportunities are offered prior to the pending-tiill-complete expiry, the "OK" test which follow receipt of a RNG-RSP MUST NOT judge the CM's transmit equalisation until pending-till-com expires.

The CMTS will retry polling the CM until it either receives a reply or until the number of retries (default is sixteen) are exhausted. At that time the CM is removed from the poll list and considered offline.

A way to detect if a modem is constantly ranging is to use the **show cable flap-list** command.

Upstream Utilization Too High

If the upstream utilization is too high, or too many modems are connected to the same upstream, it is possible that some modems will not get the required bandwidth or transmit opportunities to fulfill their periodic ranging requirements, also resulting in a T4 timeout.

Experience teaches us that customers who wish to successfully deploy data over cable networks based upon the DOCSIS standard must take into account many factors for success. One fundamental point that will ensure success is keeping customer return domains within reason. Keeping the homes passed (HHP) per upstream port to a reasonable level can significantly improve deployment success, maintenance costs, and improve customer satisfaction. For best performance it is recommended that 2000 homes passed per fiber node with ~10% penetration yielding 200 subscribing cable modems per upstream port is a highly effective framework by which to deploy.

More on the maximum number of users can be found in What is the Maximum Number of Users per CMTS?.

Use the **show interface cable** *slot/port* **upstream** *n* command as shown below to check for noise within the RF plant. If the uncorrectable errors, noise, and microreflection counters are high and increasing quickly, then this typically indicates there is noise present within the RF plant. You can check the upstream utilization by issuing following command on the CMTS:

```
VXR# show interfaces cable 6/1 upstream 0
Cable6/1: Upstream 0 is up
     Received 22 broadcasts, 0 multicasts, 247822 unicasts
     0 discards, 1 errors, 0 unknown protocol
     247844 packets input, 1 uncorrectable
     0 noise, 0 microreflections
     Total Modems On This Upstream Channel : 5 (5 active)
     Default MAC scheduler
     Queue[Rng Polls]  0/64, fifo queueing, 0 drops
     Queue[Cont Mslots]  0/52, FIFO queueing, 0 drops
     Queue[CIR Grants]  0/64, fair queueing, 0 drops
     Queue[BE Grants]  0/64, fair queueing, 0 drops
     Queue[Grant Shpr]   0/64, calendar queueing, 0 drops
     Reserved slot table currently has 0 CBR entries
     Req IEs 360815362, Req/Data IEs 0
```

```
                    Init Mtn IEs 3060187, Stn Mtn IEs 244636
                    Long Grant IEs 7, Short Grant IEs 1609
                    Avg upstream channel utilization : 0%
                    Avg percent contention slots : 95%
                    Avg percent initial ranging slots : 2%
                    Avg percent minislots lost on late MAPs : 0%
                    Total channel bw reserved 0 bps
                    CIR admission control not enforced
                    Admission requests rejected 0
                    Current minislot count   : 40084      Flag: 0
                    Scheduled minislot count : 54974      Flag: 0
          VXR#
```

Received broadcasts	Broadcast packets received through this upstream interface
multicasts	Multicast packets received through this upstream interface
Unicasts	Unicast packets received through this interface
Discards	Packets discarded by this interface
Errors	Sum of all errors that prevented upstream transmission of packets
Unknown	Packets received that were generated using a protocol unknown to the Cisco uBR7246 Noise Upstream packets corrupted by line noise
Packets input	Packets received through upstream interface free from errors
Corrected	Error packets received through upstream interface that were corrected
Uncorrectable	Error packets received through upstream interface that could not be corrected
Noise	and Upstream packets corrupted by line noise
Microreflections	Upstream packets corrupted by microreflections
Total Modems On This Upstream Channel	Number of cable modems currently sharing this upstream channel. This field also shows how many of these modems are active.
Rng Polls	The MAC scheduler queue showing number of ranging polls
Cont Mslots	The MAC scheduler queue showing number of forced contention request slots in MAPS
CIR Grants	The MAC scheduler queue showing number of CIR grants pending
BE Grants	The MAC scheduler queue showing number of best effort grants pending
Grant Shpr	The MAC scheduler queue showing number of grants buffered for traffic shaping
Reserved slot table	At time command issued MAO scheduler had admitted 2 CBR slots in the reserved slot table.
Req IEs	Running counter of request IEs sent in MAPS
Req/Data IEs	Counter of request/data IEs sent in MAPS
Init Mtn IEs	Counter of Initial Maintenance IEs
Stn Mtn IES	Number of station maintenance (ranging poll) IEs
Long Grant IEs	Number of long grant IEs
ShortGrmg IEs	Number of short grantIEs
Avg upstream channel utilization	Average percent of the upstream channel bandwidth being used. If it is closed to 100% see T4 timeouts.
Avg percent contention slots	Average percent of slots available for modems to request bandwidth via contention mechanisms. Also indicates the amount of unused capacity in the network.
Avg percent initial ranging slots	Average percent of slots in initial ranging state
Avg percent	

minislots lost on late Maps	Average percent of slots lost because a MAP interrupt was too late
Total channel bw reserved	Total amount of bandwidth reserved by all modems sharing this upstream channel that require bandwidth reservation. The Class of Service for these modems specifies some non-zero value for the guaranteed upstream rate. When one of these modems is admitted on the upstream, this field value is incremented by this guaranteed-upstream rate value.

Note: Check the noise and microreflection counters. They should be very low values and, in a normal cable plant, increment slowly. If they are at a high value and increment quickly it typically indicates a problem with the RF plant.

Note: Check for uncorrectable errors. These typically indicate a problem with noise within the RF plant. Check the received upstream SNR level.

Note: Best to keep this around 200 maximum.

Configuring the Routing Protocol Causes a Reset of the Cable Modems

Be aware that when configuring a routing protocol on a Cisco uBR7200 series cable interface on older versions of IOS prior to Cisco IOS Software v12.1, the Cisco IOS software must reset the interface to enable the change. This in turn causes all cable modems on that particular downstream to reinitialize, potentially interfering with data transmission on that downstream. Therefore you should use the interface configuration commands, such as router rip, on a cable interface only when a minimum of subscribers would be affected.

Related Information

- **Determining RF or Configuration Issues on the CMTS**
- **Troubleshooting [uBR7200]**
- **Troubleshooting uBR Cable Modems Not Coming Online**
- **Connecting the Cisco uBR7200 Series Router to the Cable Headend**
- **Flap List Troubleshooting for the Cisco CMTS**
- **RF Specifications**
- **Cable Radio Frequency (RF) FAQ**
- **Technical Support - Cisco Systems**

Was this document helpful?　　Yes　　No

Open a Support Case 🔒　　(Requires a Cisco Service Contract.)

Related Cisco Support Community Discussions

The Cisco Support Community is a forum for you to ask and answer questions, share suggestions, and collaborate with your peers.

Refer to Cisco Technical Tips Conventions for information on conventions used in this document.

Updated: Sep 03, 2006   Document ID: 22543

Information For
Small Business
Midsize Business
Service Provider
Executives
Home (Linksys)
Industries ›

Contacts
Contact Cisco
Find a Partner

News & Alerts
Newsroom
Blogs
Field Notices
Security Advisories

Technology Trends
Cloud
IPv6
Mobility
Open Network Environment
Trustworthy Systems

Support
Downloads
Documentation

Communities
Developer Network
Learning Network
Support Community

Video Portal ›

About Cisco
Investor Relations
Corporate Social Responsibility
Environmental Sustainability
Tomorrow Starts Here
Career Opportunities

Programs
Cisco Powered
Financing Options

Contacts | ⊞ Feedback | Help | Site Map | Terms & Conditions | Privacy Statement | Cookie Policy | Trademarks