

故障排除 UBR 电缆调制解调器不上线的问题

目录

[简介](#)

[开始使用前](#)

[规则](#)

[先决条件](#)

[使用的组件](#)

[电缆调制解调器状态故障排除](#)

[脱机状态](#)

[测距过程- init\(r1\)、init\(r2\) 和 init\(rc\) 状态](#)

[DHCP - init\(d\) 状态](#)

[DHCP - init\(i\) 状态](#)

[TOD 交换 init\(t\) 状态](#)

[选项文件传输已启动 - init\(o\) 状态](#)

["Online, Online\(d\), Online\(pk\), Online\(pt\) 状态"](#)

[在线电话回传](#)

[Reject\(pk\) 和 Reject\(pt\) 状态](#)

[注册- 拒绝 \(m\) 状态](#)

[注册- 拒绝 \(c\) 状态](#)

[Appendix](#)

[从 CM 显示show controller命令](#)

[CM 端的完全调试捕获](#)

[从 CMTS 显示show controller命令](#)

[已解释的计时器](#)

[CMTS 配置示例](#)

[相关信息](#)

简介

本文档讨论电缆调制解调器(CM)在联机和建立IP连接之前经历的不同状态。本文档重点介绍最常用的Cisco IOS®软件故障排除命令，以验证CM处于什么状态，以及导致调制解调器到达该状态的原因。在电缆调制解调器端接系统(CMTS)和CM上都通过调试和show命令来说明这一点。本文档还讨论了达到正确状态可采取的一些步骤，在(pt)或(d)。

注：请参阅了[解电缆调制解调器初始化流程图](#)的基本初始化工作方式和快速概述。

开始使用前

规则

有关文档规则的详细信息，请参阅 [Cisco 技术提示规则](#)。

先决条件

本文档的读者应熟悉DOCSIS协议。

使用的组件

本文档不限于特定的软件和硬件版本。

电缆调制解调器状态故障排除

在CMTS中使用的第一个最有用的命令是show cable modem:

```
sydney# show cable modem
```

Interface	Prim Sid	Online State	Timing Offset	Rec Power	QoS	CPE	IP address	MAC address
Cable2/0/U0	4	online(d)	2814	-0.50	6	0	10.1.1.20	0030.96f9.65d9
Cable2/0/U0	5	online(pt)	2290	-0.25	5	0	10.1.1.25	0050.7366.2223
Cable2/0/U0	6	offline	2287	-0.25	2	0	10.1.1.26	0050.7366.2221
Cable2/0/U0	7	online(d)	2815	-0.25	6	0	10.1.1.27	0001.9659.4461

上述状态字段显示CM处于什么状态。该字段可以具有以下值：

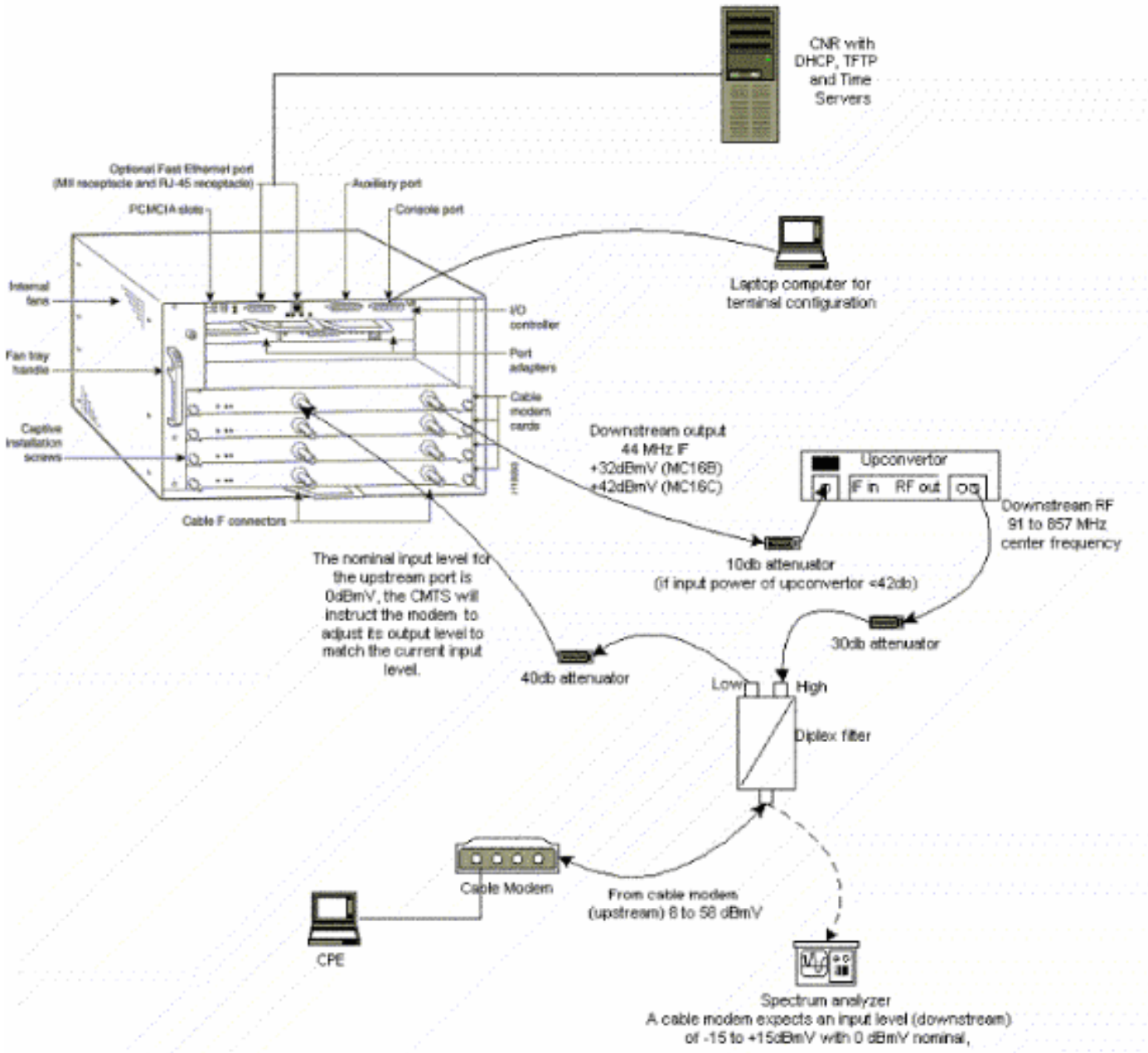
CM状态 (如 CMTS所示)	含义
	电缆调制解调器被视为脱机
init(r1)	电缆调制解调器发送初始测距
init(r2)	电缆调制解调器范围
init(rc)	电缆调制解调器范围完整
init(d)	收到DHCP请求
init(i)	收到DHCP应答；分配的IP地址
init(t)	TOD交换已启动
init(o)	选项文件传输已启动
	电缆调制解调器已注册，已启用数据
(d)	已注册电缆调制解调器，但电缆调制解调器的网络访问已禁用
(pk)	已注册电缆调制解调器，已启用BPI并分配KEK
(pt)	已注册电缆调制解调器，已启用BPI并分配TEK
reject(pk)	KEK调制解调器密钥分配已拒绝
(pt)	TEK调制解调器密钥分配已拒绝
(m)	电缆调制解调器确实尝试过注册；由于MIC错误而拒绝注册（消息完整性检查）
(c)	电缆调制解调器确实尝试过注册；由于COS（服务类别）错误，注册被拒绝

CM端的等效命令是[show controllers cable-modem 0 mac state](#)，并查看MAC状态段。我们主要关注CMTS上show cable modem命令输出显示的状态字段和CM上[debug cable-modem mac log verbose](#)的状态字段。由于后一命令的输出显示可能非常大，因此只显示某些适用的部分。在此技术说明末尾的CM端的[Full Debug Capture](#)部分中，可以找到调试电缆调制解调器mac log verbose的完整捕获。

注意：在CMTS上，您可以使用[debug cable interface cable x/y sid sid value verbose](#)根据SID值进行过滤，然后运行其他调试命令，例如debug cable range。这样，调试输出将限制为指定的SID值，不会影响CMTS性能。

以下各节将讨论每个状态值、可能的原因以及可采取哪些步骤来达到正确的在线状态。

注意：在开始排除任何状态故障之前，必须查看所有电缆调制解调器的状态，以查看此状态是否适用于所有调制解调器或仅适用于少数调制解调器，以及这是新网络还是现有网络。如果它是现有网络，则调查任何最近的更改。在本文档的大部分部分中，我们假设问题影响所有电缆调制解调器，并且以下实验拓扑适用：



上述设置可用于故障排除，并排除RF问题，因为此设置不包括有线电视信号。

注意：uBR7100具有集成的上变频器，因此不需要外部上变频器。有关详细信息，[请参阅设置集成上变频器](#)。

脱机状态

```
sydney# show cable modem
```

Interface	Prim Sid	Online State	Timing Offset	Rec Power	QoS	CPE	IP address	MAC address
Cable2/0/U0	5	offline	2290	0.00	2	0	10.1.1.25	0050.7366.2223
Cable2/0/U0	6	offline	2811	0.00	2	0	10.1.1.22	0050.7366.1e01
Cable2/0/U0	7	offline	2810	-0.50	2	0	10.1.1.20	0030.96f9.65d9
Cable2/0/U0	8	offline	2810	-0.25	2	0	10.1.1.21	0030.96f9.6605

从上面show cable modem命令的输出显示中，我们有四个调制解调器处状态。在某些情况下，调制解调器可能会循环到其他状态，然后返回。以下列表列出了调制解调器无法实现正交幅度调制(QAM)锁的最常见原因：

- 电缆调制解调器未连接到网络或未打开
- 弱载波信号（噪声过大）
- 下游中心频率不正确
- 在DOCSIS文件中指定的频率不正确
- 下游数字QAM调制信号的缺失
- 在CMTS路由器上的**电缆调制解调器更改频率**中指定的频率不正确
- MCxx卡中的填充不正确

下面是从电缆调制解调器(Kuffing)端取下的show controllers cable-modem 0的输出显示：

```
kuffing# show controllers cable-modem 0
```

```
BCM Cable interface 0:
CM unit 0, idb 0x8086C88C, ds 0x8086E460, regaddr = 0x2700000, reset_mask 0x80
station address 0030.96f9.65d9 default station address 0030.96f9.65d9
PLD VERSION: 1
Concatenation: ON Max bytes Q0: 2000 Q1: 2000 Q2: 2000 Q3: 2000

MAC State is ds_channel_scanning_state, Prev States = 3
MAC mcfilter 01E02F00 data mcfilter 00000000

MAC extended header ON
DS: BCM 3300 Receiver: Chip id = BCM3300
US: BCM 3300 Transmitter: Chip id = 3300

Tuner: status=0x00
Rx: tuner_freq 529776400, symbol_rate 5361000, local_freq 11520000
    snr_estimate 166(TenthdB), ber_estimate 0, lock_threshold 26000
    QAM not in lock, FEC not in lock, qam_mode QAM_64 (Annex B)
Tx: tx_freq 27984000, symbol rate 8 (1280000 sym/sec)
    power_level: 6.0 dBmV (commanded)
                7 (gain in US AMP units)
                63 (BCM3300 attenuation in .4 dB units)
.....
!--- Rest of display omitted.
```

从上面可以看出，信噪比估计为16.6 dB。理想情况下，该值应至少为30dB，以便CM能正确运行64 QAM。请参[阅RF规范](#)，了解有线服务接口数据规范(DOCSIS)下游和上游规范，以及[验证下行信号](#)。在某些情况下，您的信噪比(SNR)可能比较好，例如34dB，但是仍然存在噪声，例如脉冲噪声。这通常由具有干扰调制解调器信号的信号的前向路径扫描发射器引起。这只能由在零跨度模式下运

行的频谱分析仪检测到。

有关使用频谱分析仪检查噪音问题的详细信息，请[参阅将Cisco uBR7200系列路由器连接到电缆头端](#)。冲激噪声的一个指示是show interfaces cable 2/0 upstream 0输出中出现的不可纠正错误，如下所示：

```
sydney# show interfaces cable 2/0 upstream 0

Cable2/0: Upstream 0 is up
  Received 46942 broadcasts, 0 multicasts, 205903 unicasts
  0 discards, 12874 errors, 0 unknown protocol
  252845 packets input, 1 uncorrectable
  12871 noise, 0 microreflections
  Total Modems On This Upstream Channel : 3 (3 active)
  Default MAC scheduler
  Queue[Rng Polls] 0/64, fifo queueing, 0 drops
  Queue[Cont Mslots] 0/104, 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 77057520, Req/Data IEs 0
  Init Mtn IEs 1194343, Stn Mtn IEs 117174
  Long Grant IEs 46953, Short Grant IEs 70448
  Avg upstream channel utilization : 1%
  Avg percent contention slots : 96%
  Avg percent initial ranging slots : 4%
  Avg percent minislots lost on late MAPs : 0%
  Total channel bw reserved 0 bps
  CIR admission control not enforced
  Current minislot count : 7192093 Flag: 0
  Scheduled minislot count : 7192182 Flag: 0
```

注意：如果存在的不可纠正错误量大于1/10,000最可能的脉冲噪声。

在CM处的最佳输入功率电平为0dBmV，接收机的范围为-15dBmV至+15dBmV。这可以通过频谱分析仪来测量。如果电源太低，您可能需要根据《Cisco uBR7200系列硬件安装指南》[配置上变频器](#)。如果信号太强，则可能需要在高频端口连接处增加更多衰减。如果特定频率存在过多噪声，则可能需要在频谱中选择另一个频率。

注意：uBR7100具有集成上变频器。有关详细信息，[请参阅设置集成上变频器](#)。

警告：如果问题仅影响一个或两个调制解调器，而其他几个调制解调器运行正常，则问题不太可能出在上变频器端。发生这种情况时更改上变频器配置会严重降低网络的其余部分。

要确认CM未能实现QAM锁定，请打开debug cable-modem mac log verbose，您应看到类似于以下内容的输出：

```
5w0d: 3084365.172 CMAC_LOG_STATE_CHANGE ds_channel_scannie
5w0d: 3084365.172 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 99/805790200/99770
5w0d: 3084365.176 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 98/601780000/79970
5w0d: 3084365.176 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 97/403770100/59570
5w0d: 3084365.176 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 96/73753600/115750
5w0d: 3084365.180 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 95/217760800/39770
5w0d: 3084365.180 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 94/121756000/16970
5w0d: 3084365.180 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 93/175758700/21170
5w0d: 3084365.184 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 92/79753900/857540
5w0d: 3084365.184 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 91/55752700/677530
```

```

5w0d: 3084365.188 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 90/177000000/21300
5w0d: 3084365.188 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 89/219000000/22500
5w0d: 3084365.188 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 88/141000000/17100
5w0d: 3084365.192 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 87/135012500/13500
5w0d: 3084365.192 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 86/123012500/12900
5w0d: 3084365.192 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 85/405000000/44700
5w0d: 3084365.196 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 84/339012500/39900
5w0d: 3084365.196 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 83/333025000/33300
5w0d: 3084365.200 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 82/231012500/32700
5w0d: 3084365.200 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 81/111025000/11700
5w0d: 3084365.200 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 80/930000000/105000
5w0d: 3084365.204 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 79/453000000/85500
5w0d: 3084365.204 CMAC_LOG_WILL_SEARCH_SAVED_DS_FREQUENCY 453000000
5w0d: 3084366.324 CMAC_LOG_DS_NO_QAM_FEC_LOCK 453000000
5w0d: 3084366.324 CMAC_LOG_DS_TUNER_KEEPALIVE
5w0d: 3084367.440 CMAC_LOG_DS_NO_QAM_FEC_LOCK 453000000
5w0d: 3084368.556 CMAC_LOG_DS_NO_QAM_FEC_LOCK 453000000
5w0d: 3084369.672 CMAC_LOG_DS_NO_QAM_FEC_LOCK 459000000
5w0d: 3084370.788 CMAC_LOG_DS_NO_QAM_FEC_LOCK 465000000
5w0d: 3084371.904 CMAC_LOG_DS_NO_QAM_FEC_LOCK 471000000
5w0d: 3084373.020 CMAC_LOG_DS_NO_QAM_FEC_LOCK 477000000
5w0d: 3084374.136 CMAC_LOG_DS_NO_QAM_FEC_LOCK 483000000
5w0d: 3084375.252 CMAC_LOG_DS_NO_QAM_FEC_LOCK 489000000
5w0d: 3084376.368 CMAC_LOG_DS_NO_QAM_FEC_LOCK 495000000
5w0d: 3084376.368 CMAC_LOG_DS_TUNER_KEEPALIVE
5w0d: 3084377.484 CMAC_LOG_DS_NO_QAM_FEC_LOCK 501000000
5w0d: 3084378.600 CMAC_LOG_DS_NO_QAM_FEC_LOCK 507000000
5w0d: 3084379.716 CMAC_LOG_DS_NO_QAM_FEC_LOCK 513000000
5w0d: 3084380.832 CMAC_LOG_DS_NO_QAM_FEC_LOCK 519000000
5w0d: 3084381.948 CMAC_LOG_DS_NO_QAM_FEC_LOCK 525000000
:::.....: .....:

```

注：如果电缆调制解调器在特定下行频率上锁定后，将始终以相同频率开始扫描，除非已清除配置。（请参阅调试示例。）如果下行频率值已更改，它将继续扫描其他频率，直到锁定到其他频率。锁定后，它将保存新值以供下次使用。还需要注意的是，CMTS上的**cable downstream frequency**只是外观，对上变频器输出频率没有影响，**uBR7100是集成上变频器的例子**。在12.1之前的Cisco IOS版本中，CM将自动添加**可见且可配置的cable-modem downstream saved channel**命令。在12.1及更高版本中，此命令不再可配置，在配置中也不可见。

CM不实现QAM锁的另一个原因是上变频器上配置了不正确的下行中心频率，例如北美信道100-100使用648.0-654.0且中心频率为6的标准6 MHz信道频段的**NTSC频率图51 MHz**。大多数上变频器使用中心视频载波频率。但是，上变频器GI C6U或C8U使用的中心频率低于1.75MHz，因此您需要为信道100-100设置649.25 MHz的频率。若要了解GI上变频器为何使用此频率读**有线射频(RF))常见问题(仅限注册客户)**。

另一个常见错误是在DOCSIS CPE配置器的“射频信息”下的“下行频率”字段中指定**不正确的频率值**。通常，无需在此选项下指定频率值。但是，如果需要，例如某些调制解调器需要锁定不同的频率，则应如前所述选择适当的频率值。以下调试说明了这一点，最初CM锁定为453MHz，然后是535.25MHz（在DOCSIS配置文件中指定），因此调制解调器会重置并无限期地循环此过程：

```

4d00h: 345773.916 CMAC_LOG_WILL_SEARCH_SAVED_DS_FREQUENCY 453000000
4d00h: 345774.956 CMAC_LOG_UCD_MSG_RCVD 1
4d00h: 345775.788 CMAC_LOG_DS_64QAM_LOCK_ACQUIRED 453000000
4d00h: 345775.792 CMAC_LOG_DS_CHANNEL_SCAN_COMPLETED
4d00h: 345775.794 CMAC_LOG_STATE_CHANGE wait_ucd_state
4d00h: 345776.946 CMAC_LOG_UCD_MSG_RCVD 1
4d00h: 345778.960 CMAC_LOG_UCD_MSG_RCVD 1
4d00h: 345778.962 CMAC_LOG_ALL_UCDS_FOUND
4d00h: 345778.966 CMAC_LOG_STATE_CHANGE wait_map_state

```

```

4d00h: 345778.968 CMAC_LOG_FOUND_US_CHANNEL 1
4d00h: 345780.996 CMAC_LOG_UCD_MSG_RCVD 1
4d00h: 345781.000 CMAC_LOG_UCD_NEW_US_FREQUENCY 27984000
4d00h: 345781.004 CMAC_LOG_SLOT_SIZE_CHANGED 8
4d00h: 345781.084 CMAC_LOG_UCD_UPDATED
4d00h: 345781.210 CMAC_LOG_MAP_MSG_RCVD
4d00h: 345781.212 CMAC_LOG_INITIAL_RANGING_MINISLOTS 40
4d00h: 345781.216 CMAC_LOG_STATE_CHANGE ranging_1_state
4d00h: 345781.220 CMAC_LOG_RANGING_OFFSET_SET_TO 9610
4d00h: 345781.222 CMAC_LOG_POWER_LEVEL_IS 22.0 dBmV (comma)
4d00h: 345781.226 CMAC_LOG_STARTING_RANGING
4d00h: 345781.228 CMAC_LOG_RANGING_BACKOFF_SET 0
4d00h: 345781.232 CMAC_LOG_RNG_REQ_QUEUED 0
4d00h: 345781.272 CMAC_LOG_RNG_REQ_TRANSMITTED
4d00h: 345781.280 CMAC_LOG_RNG_RSP_MSG_RCVD
4d00h: 345781.282 CMAC_LOG_RNG_RSP_SID_ASSIGNED 3
4d00h: 345781.284 CMAC_LOG_ADJUST_RANGING_OFFSET 2288
4d00h: 345781.288 CMAC_LOG_RANGING_OFFSET_SET_TO 11898
4d00h: 345781.292 CMAC_LOG_ADJUST_TX_POWER 7
4d00h: 345781.294 CMAC_LOG_POWER_LEVEL_IS 24.0 dBmV (comma)
4d00h: 345781.298 CMAC_LOG_STATE_CHANGE ranging_2_state
4d00h: 345781.302 CMAC_LOG_RNG_REQ_QUEUED 3
4d00h: 345782.298 CMAC_LOG_RNG_REQ_TRANSMITTED
4d00h: 345782.300 CMAC_LOG_RNG_RSP_MSG_RCVD
4d00h: 345782.304 CMAC_LOG_RANGING_SUCCESS
4d00h: 345782.316 CMAC_LOG_STATE_CHANGE dhcp_state
4d00h: 345782.450 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS 10.1.1.25
4d00h: 345782.452 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS 172.17.110.136
4d00h: 345782.456 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS 172.17.110.136
4d00h: 345782.460 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS
4d00h: 345782.464 CMAC_LOG_DHCP_TZ_OFFSET 0
4d00h: 345782.466 CMAC_LOG_DHCP_CONFIG_FILE_NAME frequency.cm
4d00h: 345782.470 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR
4d00h: 345782.474 CMAC_LOG_DHCP_COMPLETE
4d00h: 345782.598 CMAC_LOG_STATE_CHANGE establish_tod_state
4d00h: 345782.606 CMAC_LOG_TOD_REQUEST_SENT
4d00h: 345782.620 CMAC_LOG_TOD_REPLY_RECEIVED 3178880491
4d00h: 345782.628 CMAC_LOG_TOD_COMPLETE
4d00h: 345782.630 CMAC_LOG_STATE_CHANGE security_associate_state
4d00h: 345782.634 CMAC_LOG_SECURITY_BYPASSED
4d00h: 345782.636 CMAC_LOG_STATE_CHANGE configuration_file
4d00h: 345782.640 CMAC_LOG_LOADING_CONFIG_FILE frequency.cm
4d00h: %LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0, changed state to up
4d00h: 345783.678 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
4d00h: 345783.682 CMAC_LOG_DS_FREQ_OVERRIDE 535250000
4d00h: 345783.686 CMAC_LOG_STATE_CHANGE reset_hardware_state
4d00h: 345784.048 CMAC_LOG_STATE_CHANGE wait_for_link_up_state
4d00h: 345784.052 CMAC_LOG_DRIVER_INIT_IDB_RESET 0x082A5226
4d00h: 345784.054 CMAC_LOG_LINK_DOWN
4d00h: 345784.056 CMAC_LOG_LINK_UP
4d00h: 345784.062 CMAC_LOG_STATE_CHANGE ds_channel_scanning_state
4d00h: 345785.198 CMAC_LOG_DS_NO_QAM_FEC_LOCK 535250000
4d00h: 345785.212 CMAC_LOG_DS_TUNER_KEEPALIVE
4d00h: 345787.018 CMAC_LOG_UCD_MSG_RCVD 1
4d00h: 345787.022 CMAC_LOG_DS_64QAM_LOCK_ACQUIRED 453000000

```

注意：频率覆盖。

在CMTS路由器上的[电缆调制解调器更改频率](#)中指定的频率不正确也会导致CM切换频率，如果未仔细选择CMTS上配置的频率，则会看到类似于上述结果的结果。CMTS上的**cable modem change-frequency**命令也是可选的，默认情况下通常不使用。

在获取下行信道后，下一任务是定位合适的上行信道。调制解调器侦听上游信道描述符(UCD)，该UCD包含上游信道的物理属性，如上游频率、调制、信道宽度，以及在DOCSIS第4部分中讨论的突发描述符中定义的其他参数。

找不到可用UCD的调制解调器可能位于未提供上行服务的下行信道上。这可能是头端配置错误。show controllers cable命令是一个很好的启动位置。调制解调器找不到可用UCD的另一个可能原因是其硬件或MAC可能不支持突发描述符中的参数。这可能是头端配置错误或低于DOCSIS兼容调制解调器。

找到可用UCD后，调制解调器将开始侦听包含上游带宽分配时间映射的MAP（带宽分配映射）消息。一段时间映射到迷你插槽，并分配给各个调制解调器。MAP中还有广播、争用型初始维护（或广播）范围的区域。调制解调器必须发送其初始测距请求，直到CMTS以测距响应(RNG-RSP)做出响应。

调制解调器在T2计时器到期前找不到初始维护区域，可能是头端配置错误。还应检查CMTS上电缆接口的插入间隔。插入间隔用作微调参数，以控制CMTS在注册期间允许调制解调器击中DHCP服务器的速度，从而间接控制任何类型的大规模故障后的DHCP/TFTP/TOD服务器负载。它直接控制恢复网络的时间长度。

注意：插入间隔设置不正确将导致调制解调器在调配服务器负载为零时处于脱机状态。插入间隔的最佳值是自动的。

文档[确定CMTS上的RF或配置问题](#)对电缆设备中的RF问题有非常详细的说明。

测距过程- init(r1)、init(r2) 和 init(rc) 状态

在此阶段，CM开始测距过程以计算到达CMTS所需输入功率电平所需的发射功率电平。在生产网络中，相当好的发射功率大约为40 - 50 dBmV。其他硬件可能不同。与下行信道一样，上行信道中的载波应足够强，以便CMTS接收机识别符号。过高的信号将在返回RF网络的活动传输中引起失真和互调，从而导致比特错误率增加，包括数据的总丢失。这将是由于信号的限幅。

CM向CMTS发送测距请求(RNG-REQ)消息，并等待测距响应(RNG-RSP)消息或T3计时器到期。如果发生T3超时，重试计数会增加。如果重试次数小于最大重试次数，调制解调器将以更高功率水平传输另一RNG-REQ。此测距过程发生在MAP的初始维护或广播区域，因为CMTS未在MAP中为调制解调器分配单播传输的服务标识符(SID)。因此，广播测距是争用的，并且容易发生冲突。为了补偿这一点，调制解调器具有测距回退算法以计算RNG-REQ传输之间的随机回退时间。这可以使用cable upstream range-backoff命令进行配置。当发射功率达到足够的CMTS电平时，它将用包含临时SID的RNG-RSP响应RNG-REQ。此SID将用于标识MAP中的单播传输区域以进行单播测距。

以下输出显示CM，SID 6处于init(r1)状态，表示CM无法通过初始测距阶段：

```
sydney#show cable modem
Interface   Prim Online   Timing Rec   QoS CPE IP address   MAC address
           Sid  State      Offset Power
Cable2/0/U0 5   offline    2287    0.00  2  0  10.1.1.25   0050.7366.2223
Cable2/0/U0 6   init(r1)  2813    12.00  2  0  10.1.1.22   0050.7366.1e01
Cable2/0/U0 7   offline    2810    0.25  2  0  10.1.1.20   0030.96f9.65d9
```

以下调试显示CM在T3计时器到期后未能完成测距过程和重置，超出重试次数。注意来自CMTS的CMAC_LOG_ADJUST_TX_POWER消息，要求CM调整其功率：

```
1w3d: 871160.618 CMAC_LOG_STATE_CHANGE          ranging_1_state
1w3d: 871160.618 CMAC_LOG_RANGING_OFFSET_SET_TO 9610
```



```

1w3d: 871160.622 CMAC_LOG_POWER_LEVEL_IS 19.0 dBmV (comman)
1w3d: 871160.622 CMAC_LOG_STARTING_RANGING
1w3d: 871160.622 CMAC_LOG_RANGING_BACKOFF_SET 0
1w3d: 871160.622 CMAC_LOG_RNG_REQ_QUEUED 0
1w3d: 871160.678 CMAC_LOG_RNG_REQ_TRANSMITTED
1w3d: 871160.682 CMAC_LOG_RNG_RSP_MSG_RCVD
1w3d: 871160.682 CMAC_LOG_RNG_RSP_SID_ASSIGNED 6
1w3d: 871160.682 CMAC_LOG_ADJUST_RANGING_OFFSET 2813
1w3d: 871160.682 CMAC_LOG_RANGING_OFFSET_SET_TO 12423
1w3d: 871160.686 CMAC_LOG_ADJUST_TX_POWER -48
1w3d: 871160.686 CMAC_LOG_STATE_CHANGE ranging_2_state
1w3d: 871160.686 CMAC_LOG_RNG_REQ_QUEUED 6
1w3d: 871161.690 CMAC_LOG_RNG_REQ_TRANSMITTED
1w3d: 871161.690 CMAC_LOG_RNG_RSP_MSG_RCVD
1w3d: 871161.694 CMAC_LOG_ADJUST_TX_POWER -36
1w3d: 871161.694 CMAC_LOG_RANGING_CONTINUE
1w3d: 871162.698 CMAC_LOG_RNG_REQ_TRANSMITTED
1w3d: 871162.898 CMAC_LOG_T3_TIMER
1w3d: 871163.734 CMAC_LOG_RNG_REQ_TRANSMITTED
1w3d: 871163.934 CMAC_LOG_T3_TIMER
1w3d: 871164.766 CMAC_LOG_RNG_REQ_TRANSMITTED
1w3d: 871164.966 CMAC_LOG_T3_TIMER
131.CABLEMODEM.CISCO: 1w3d: %UBR900-3-RESET_T3_RETRIES_EXHAUSTED: R03.0 Ranging
1w3d: 871164.966 CMAC_LOG_RESET_T3_RETRIES_EXHAUSTED
1w3d: 871164.966 CMAC_LOG_STATE_CHANGE reset_interface_state
1w3d: 871164.966 CMAC_LOG_STATE_CHANGE reset_hardware_state

```

注意： init(r1)为ranging_1_state,init(r2)为ranging_2_state 通过显示以下命令，可以获取CM上传输功率的指示：

```
Staryn# show controllers cable-modem 0
```

```

BCM Cable interface 0:
CM unit 0, idb 0x2010AC, ds 0x86213E0, regaddr = 0x800000, reset_mask 0x80
station address 0050.7366.2223 default station address 0050.7366.2223
PLD VERSION: 32

```

```

MAC State is wait_for_link_up_state, Prev States = 2
MAC mcfiter 00000000 data mcfiter 00000000

```

```

MAC extended header ON
DS: BCM 3116 Receiver: Chip id = 2
US: BCM 3037 Transmitter: Chip id = 30AC

```

```

Tuner: status=0x00
Rx: tuner_freq 0, symbol_rate 5055932, local_freq 11520000
    snr_estimate 30640, ber_estimate 0, lock_threshold 26000
    QAM not in lock, FEC not in lock, qam_mode QAM_64
Tx: tx_freq 27984000, power_level 0x20 (8.0 dBmV), symbol_rate 8 (1280000 sym/s)

```

如果调制解调器无法继续超出测距状态，则可能的原因是传输功率电平不足。在上述设置中，可通过调节低频端口处的衰减来调节发射功率。衰减增加将导致传输功率电平增加。大约20 - 30 dB的衰减是一个很好的开始。在初始测距初始化(r1)后，调制解调器继续到init(r2)，调制解调器必须在此配置发射定时偏移和功率电平，以确保从调制解调器发送的数据在正确的时间被接收，并且在CMTS接收器处处于可接受的输入功率电平。这通过单播RNG-REQ和RNG-RSP消息的会话执行。RNG-RSP消息包含调制解调器必须进行的功率和定时偏移校正。调制解调器继续传输RNG-REQ并按RNG-RSP执行调整，直到RNG-RSP消息通过到达初始(rc)状态指示测距成功或测距完成。如果调制解调器无法从init(r2)中继续，则需要优化传输功率。以下是处于init(r2)状态的CM的输出显示。

```
sydney# show cable modem
```

Interface	Prim Sid	Online State	Timing Rec Offset	Rec Power	QoS CPE	IP address	MAC address
Cable2/0/U0	5	init(r2)	2289	*4.00	2 0	10.1.1.25	0050.7366.2223
Cable2/0/U0	6	online	2811	-0.25	5 0	10.1.1.22	0050.7366.1e01
Cable2/0/U0	7	online	2811	-0.50	5 0	10.1.1.20	0030.96f9.65d9

注意：“接收功率”列旁边的*符号表示噪音功率调整方法对此调制解调器处于活动状态。如果您看到！这意味着调制解调器已达到其最大传输功率。

CMTS 上:

```
sydney# conf t
```

Enter configuration commands, one per line. End with CNTL/Z.

```
sydney(config)#access-list 101 permit ip host 10.1.1.10 host 172.17.110.136
```

```
sydney(config)#access-list 101 permit ip host 172.17.110.136 host 10.1.1.10
```

```
sydney(config)#^Z
```

where **10.1.1.10** is ip address of Cable interface on the CMTS

and 172.17.110.136 is ip address of DHCP server

```
sydney# debug list 101
```

```
sydney# debug ip packet detail
```

```
IP packet debugging is on
    for access list: 101
(detailed)
```

```
sydney#
```

```
2w5d: IP: s=10.1.1.10 (local), d=172.17.110.136 (Ethernet1/0), len 604, sending
```

```
2w5d:      UDP src=67, dst=67
```

```
2w5d: IP: s=172.17.110.136 (Ethernet1/0), d=10.1.1.10, len 328, rcvd 4
```

```
2w5d:      UDP src=67, dst=67
```

如果这是测试路由器或实验路由器，您也可以使用debug ip udp:

```
sydney# debug ip udp
```

```
2w5d: UDP: rcvd src=0.0.0.0(68), dst=255.255.255.255(67), length=584
```

```
2w5d: UDP: sent src=10.1.1.10(67), dst=172.17.110.136(67), length=604
```

```
2w5d: UDP: rcvd src=172.17.110.136(67), dst=10.1.1.10(67), length=308
```

```
2w5d: UDP: sent src=0.0.0.0(67), dst=255.255.255.255(68), length=328
```

```
2w5d: UDP: rcvd src=0.0.0.0(68), dst=255.255.255.255(67), length=584
```

```
2w5d: UDP: sent src=10.1.1.10(67), dst=172.17.110.136(67), length=604
```

```
2w5d: UDP: rcvd src=172.17.110.136(67), dst=10.1.1.10(67), length=308
```

```
2w5d: UDP: sent src=0.0.0.0(67), dst=255.255.255.255(68), length=328
```

注意：在通用宽带路由器(uBR)上运行**debug ip udp**命令不能与访问列表一起使用，因为这可能导致uBR停止系统以跟上调试。在这种情况下，所有调制解调器都可能失去同步，调试将无用。建议使用网络分析器跟踪进出CMTS的IP数据包，并且debug IP命令仅用作最后手段。

注意：上述访问列表是全局配置的，对IP操作没有影响。它用于在调试ip数据包详细信息期间将调试限制为指定的IP地址。确保先运行调试列表101。

如果调试消息未显示任何数据包，请检查此调制解调器所[连接的有线](#)接口上cable helper-address语句的配置。如果配置正确，并且DHCP服务器子网的数据包跟踪也不显示来自调制解调器的DHCP数据包，那么最好看调制解调器电缆接口的输出错误或uBR电缆接口的输入错误。

如果发现数据包被传输到DHCP服务器子网，则最好仔细检查调制解调器调试消息，看是否存在参数请求或分配错误。这将是故障排除阶段，在此阶段，您应该调查调制解调器和DHCP服务器之间的路由。建议再次检查DHCP服务器配置和DHCP日志。

以下是在CM上运行debug cable-modem mac log verbose命令执行的调试示例：

```
1w3d: 865015.920 CMAC_LOG_RANGING_SUCCESS
1w3d: 865015.920 CMAC_LOG_STATE_CHANGE                               dhcp_state
1w3d: 865053.580 CMAC_LOG_RNG_REQ_TRANSMITTED
1w3d: 865053.584 CMAC_LOG_RNG_RSP_MSG_RCVD
1w3d: 865055.924 CMAC_LOG_WATCHDOG_TIMER
131.CABLEMODEM.CISCO: 1w3d: %UBR900-3-RESET_DHCP_WATCHDOG_EXPIRED:
Cable Interface Reset due to DHCP watchdog timer expiration
1w3d: 865055.924 CMAC_LOG_RESET_DHCP_WATCHDOG_EXPIRED
1w3d: 865055.924 CMAC_LOG_STATE_CHANGE                               reset_interface_state
1w3d: 865055.924 CMAC_LOG_DHCP_PROCESS_KILLED
1w3d: 865055.924 CMAC_LOG_STATE_CHANGE                               reset_hardware_state
```

如上所示，DHCP进程失败，电缆调制解调器已重置。

如果使用Cisco Network Registrar(CNR)，请阅读[“使用Cisco Network Registrar调试排除有线网络中的DHCP问题”](#)，以帮助您进行初始化(d)故障排除。本文档包含有关如何使用CNR调试的非常详细的信息。

DHCP - init(d) 状态

成功测距后的下一阶段是通过DHCP获取网络配置。CM发送DHCP请求，CMTS在两个方向中继这些DHCP数据包。以下是show cable modem的输出显示，其中显示了一个调制解调器，在init(d)中为SID 7，表示从Cable Modem收到了DHCP请求：

```
sydney# show cable modem
```

Interface	Prim Sid	Online State	Timing Rec Offset	Power	QoS	CPE	IP address	MAC address
Cable2/0/U0	7	init(d)	2811	0.25	2	0	10.1.1.20	0030.96f9.65d9
Cable2/0/U0	8	online	2813	0.25	3	0	10.1.1.21	0030.96f9.6605
Cable2/0/U0	9	online	2812	-0.75	3	0	10.1.1.22	0050.7366.1e01

注意：电缆调制解调器无限地通过init(r1)循环到init(d)。可能的原因如下：

- CMTS中缺少cable helper-address ip address命令或IP地址不正确
- 从CMTS到DHCP服务器的IP连接问题
- DHCP服务器关闭
- 在DHCP服务器上配置的默认网关错误
- 在CM处传输功率低或上行SNR低，请参阅[RF规范](#)。
- DHCP服务器过载
- DHCP服务器的IP地址不足
- 调制解调器的保留IP地址范围错误，请参阅《Network Registrar GUI用户指南》中的“了解IP地址管理”。

注意：检验DHCP服务器上是否设置了正确的默认网关。验证IP连接的一种方法是使用扩展ping，源IP地址是CMTS电缆接口上配置的主地址，目的地是DHCP服务器的IP地址。这可以以辅助IP地址作为源地址重复，以检验CPE是否具有IP连接。请参阅[CMTS示例配置](#)。

DHCP进程由发送广播DHCP发现消息的电缆调制解调器启动。如果DHCP服务器使用OFFER响应

DISCOVER，调制解调器可能会选择发送请求以获取所提供的配置。DHCP服务器可以使用确认(ACK)或未确认(NAK)做出响应。NAK可能是IP地址和网关地址不兼容的结果，如果调制解调器从一个下行信道跳到另一个位于不同子网的下行信道，则可能会发生这种情况。当调制解调器寻求续约租约时，DHCP REQUEST消息的IP地址和网关地址将是不同的网络号，DHCP服务器将拒绝带NAK的REQUEST。这些情况非常罕见，调制解调器只需释放租用，然后使用DHCP DISCOVER消息重新开始。

通常，DHCP状态的错误表现为超时而不是NAK。DHCP消息的顺序应为DISCOVER、OFFER、REQUEST、ACK。如果调制解调器正在从DHCP服务器发送没有OFFER响应的DISCOVER，请在CMTS上打开IP调试。这可以通过以下步骤完成：

DHCP - init(i) 状态

一旦收到对DHCP请求的回复，并且为电缆调制解调器分配了IP地址，show cable modem给出的下一个是init(i)：

```
sydney# show cable modem
```

Interface	Prim Sid	Online State	Timing Offset	Rec Power	QoS	CPE	IP address	MAC address
Cable2/0/U0	7	init(i)	2815	-0.25	2	0	10.1.1.20	0030.96f9.65d9
Cable2/0/U0	8	online	2813	0.25	3	0	10.1.1.21	0030.96f9.6605
Cable2/0/U0	9	online	2812	0.50	3	0	10.1.1.22	0050.7366.1e01

从上面看，带SID 7的电缆调制解调器永远不会超出init(i)。重复的show cable modem显示通常会显示电缆调制解调器在init(r1)、init(r2)、init(rc)、init(d)和init(i)之间无限循环。

电缆调制解调器不比init(i)进一步的原因可能有一个数字。以下是最常见的列表：

- DHCP服务器中指定的DOCSIS文件不正确或无效
- TFTP服务器问题，例如IP地址不正确、TFTP服务器无法访问
- 获取TOD或计时偏移时出现问题
- DHCP配置中的路由器设置不正确

由于电缆调制解调器已到达init(i)，我们知道它已到达获取IP地址的程度。在下面的Cable Modem (电缆调制解调器) 处，debug cable-modem mac log verbose输出的输出显示中可以清楚地显示这一点：

```
3d20h: 334402.548 CMAC_LOG_RANGING_SUCCESS
3d20h: 334402.548 CMAC_LOG_STATE_CHANGE dhcp_state
3d20h: 334415.492 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS 10.1.1.20
!--- IP address Assigned to CM. 3d20h: 334415.492 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS
172.17.110.136 3d20h: 334415.492 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS 172.17.110.136 3d20h:
334415.492 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS 3d20h: 334415.492 CMAC_LOG_DHCP_TZ_OFFSET 0 3d20h:
334415.496 CMAC_LOG_DHCP_CONFIG_FILE_NAME nofile
!--- DOCSIS file CM is trying to load. 3d20h: 334415.496
CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR 3d20h: 334415.496
CMAC_LOG_DHCP_ERROR_ACQUIRING_LOG_ADDRESS 3d20h: 334415.496 CMAC_LOG_DHCP_COMPLETE 3d20h:
334415.508 CMAC_LOG_STATE_CHANGE establish_tod_state 3d20h: 334415.512 CMAC_LOG_TOD_REQUEST_SENT
172.17.110.136 3d20h: 334415.524 CMAC_LOG_TOD_REPLY_RECEIVED 3178343318 3d20h: 334415.524
CMAC_LOG_TOD_COMPLETE 3d20h: 334415.528 CMAC_LOG_STATE_CHANGE security_association_state 3d20h:
334415.528 CMAC_LOG_SECURITY_BYPASSED 3d20h: 334415.528 CMAC_LOG_STATE_CHANGE
configuration_file
3d20h: 334415.528 CMAC_LOG_LOADING_CONFIG_FILE nofile

!--- DOCSIS file name. 133.CABLEMODEM.CISCO: 3d20h: %LINEPROTO-5-UPDOWN: Line protocol on
```

```
Interface cap 3d20h: 334416.544 CMAC_LOG_CONFIG_FILE_TFTP_FAILED -1
3d20h: 334416.548 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
3d20h: 334416.548 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
```

同样，TFTP服务器问题也会产生类似错误，导致CM重置和无限期地循环同一进程：

```
3d21h: 336136.520 CMAC_LOG_STATE_CHANGE dhcp_state
3d21h: 336149.404 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS 10.1.1.20
3d21h: 336149.404 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS 172.17.110.100
!--- Incorrect TFTP Server address. 3d21h: 336149.404 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS
172.17.110.136 3d21h: 336149.404 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS 3d21h: 336149.404
CMAC_LOG_DHCP_TZ_OFFSET 0 3d21h: 336149.408 CMAC_LOG_DHCP_CONFIG_FILE_NAME platinum.cm 3d21h:
336149.408 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR 3d21h: 336149.408
CMAC_LOG_DHCP_ERROR_ACQUIRING_LOG_ADDRESS 3d21h: 336149.408 CMAC_LOG_DHCP_COMPLETE 3d21h:
336149.420 CMAC_LOG_STATE_CHANGE establish_tod_state 3d21h: 336149.424 CMAC_LOG_TOD_REQUEST_SENT
172.17.110.136 3d21h: 336149.436 CMAC_LOG_TOD_REPLY_RECEIVED 3178345052 3d21h: 336149.436
CMAC_LOG_TOD_COMPLETE 3d21h: 336149.440 CMAC_LOG_STATE_CHANGE security_association_state 3d21h:
336149.440 CMAC_LOG_SECURITY_BYPASSED 3d21h: 336149.440 CMAC_LOG_STATE_CHANGE configuration_file
3d21h: 336149.440 CMAC_LOG_LOADING_CONFIG_FILE platinum.cm 133.CABLEMODEM.CISCO: 3d21h:
%LINEPROTO-5-UPDOWN: Line protocol on Interface cap 3d21h: 336163.252
CMAC_LOG_RNG_REQ_TRANSMITTED 3d21h: 336163.252 CMAC_LOG_RNG_RSP_MSG_RCVD 3d21h: 336165.448
CMAC_LOG_CONFIG_FILE_TFTP_FAILED -1
!--- TFTP process failing. 3d21h: 336165.448 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
3d21h: 336165.452 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
3d21h: 336165.452 CMAC_LOG_STATE_CHANGE reset_interface_state
```

测试TFTP服务器的一种方法是尝试将小文件（如DOCSIS配置文件）下载到CMTS的闪存卡中。这可以通过使用copy tftp flash命令完成。请注意，在下面的输出中，尝试打开名为platinum.cm的文件时出错。原因是CMTS与TFTP服务器172.17.110.100的IP地址没有连接，因为它是假的。

```
sydney# copy tftp flash
Address or name of remote host []? 172.17.110.100
Source filename []? platinum.cm
Destination filename [platinum.cm]?
Accessing tftp://172.17.110.100/platinum.cm...
%Error opening tftp://172.17.110.100/platinum.cm (Permission denied)
sydney#
```

此处需要检查与TFTP服务器的连接。

获取时间(TOD)或计时偏移时出现问题也会导致调制解调器无法实现在线状态：

```
3d21h: 338322.500 CMAC_LOG_STATE_CHANGE dhcp_state
3d21h: 338334.260 CMAC_LOG_RNG_REQ_TRANSMITTED
3d21h: 338334.260 CMAC_LOG_RNG_RSP_MSG_RCVD
3d21h: 338335.424 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS 10.1.1.20
3d21h: 338335.424 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS 172.17.110.136
3d21h: 338335.424 CMAC_LOG_DHCP_ERROR_ACQUIRING_TOD_ADDRESS
3d21h: 338335.424 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS
3d21h: 338335.424 CMAC_LOG_DHCP_ERROR_ACQUIRING_TZ_OFFSET
3d21h: 338335.424 CMAC_LOG_DHCP_CONFIG_FILE_NAME platinum.cm
3d21h: 338335.428 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR
```

```

3d21h: 338335.428 CMAC_LOG_DHCP_ERROR_ACQUIRING_LOG_ADDRESS
3d21h: 338335.428 CMAC_LOG_DHCP_COMPLETE
3d21h: 338335.428 CMAC_LOG_RESET_DHCP_FAILED
3d21h: 338335.432 CMAC_LOG_STATE_CHANGE reset_interface_state
3d21h: 338335.432 CMAC_LOG_STATE_CHANGE reset_hardware_state
3d21h: 338336.016 CMAC_LOG_STATE_CHANGE wait_for_link_up_state

```

注意：在Cisco IOS软件版本12.1(1)之前，需要在DHCP服务器中指定TOD，以便电缆调制解调器联机。但是，在Cisco IOS软件版本12.1(1)之后，不需要TOD，但电缆调制解调器仍需要获得定时偏移，如以下调试所示：

```

344374.528 CMAC_LOG_STATE_CHANGE dhcp_state
344377.292 CMAC_LOG_RNG_REQ_TRANSMITTED
344377.292 CMAC_LOG_RNG_RSP_MSG_RCVD
344387.412 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS 10.1.1.20
344387.412 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS 172.17.110.136
344387.412 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS 172.17.110.136
!--- TOD server IP address obtained. 344387.412 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS 344387.412
CMAC_LOG_DHCP_ERROR_ACQUIRING_TZ_OFFSET
!--- Timing offset not specified in DHCP server. 344387.412 CMAC_LOG_DHCP_CONFIG_FILE_NAME
platinum.cm 344387.412 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR 344387.412
CMAC_LOG_DHCP_ERROR_ACQUIRING_LOG_ADDRESS 344387.412 CMAC_LOG_DHCP_COMPLETE 344387.412
CMAC_LOG_RESET_DHCP_FAILED 344387.412 CMAC_LOG_STATE_CHANGE reset_interface_state !--- Modem
resetting.

```

在下面的调试中，我们没有指定时间服务器，但在DHCP服务器中配置了时间偏移，因此电缆调制解调器将联机：

```

3d23h: 345297.516 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS 10.1.1.20
3d23h: 345297.516 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS 172.17.110.136
3d23h: 345297.516 CMAC_LOG_DHCP_ERROR_ACQUIRING_TOD_ADDRESS
3d23h: 345297.516 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS
3d23h: 345297.516 CMAC_LOG_DHCP_TZ_OFFSET
03d23h: 345297.516 CMAC_LOG_DHCP_CONFIG_FILE_NAME platinum.c
3d23h: 345297.520 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR
3d23h: 345297.520 CMAC_LOG_DHCP_ERROR_ACQUIRING_LOG_ADDRESS
3d23h: 345297.520 CMAC_LOG_DHCP_COMPLETE
3d23h: 345297.532 CMAC_LOG_STATE_CHANGE establish_tod_state
3d23h: 345297.532 CMAC_LOG_TOD_NOT_REQUESTED_NO_TIME_ADDR
3d23h: 345297.532 CMAC_LOG_STATE_CHANGE security_association_state
3d23h: 345297.536 CMAC_LOG_SECURITY_BYPASSED
3d23h: 345297.536 CMAC_LOG_STATE_CHANGE configuration_file
3d23h: 345297.536 CMAC_LOG_LOADING_CONFIG_FILE platinum.cm
3d23h: 345297.568 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
3d23h: 345297.568 CMAC_LOG_STATE_CHANGE registration_state
3d23h: 345297.592 CMAC_LOG_REG_RSP_MSG_RCVD
3d23h: 345297.592 CMAC_LOG_COS_ASSIGNED_SID 1/7
3d23h: 345297.596 CMAC_LOG_RNG_REQ_QUEUED 7
3d23h: 345297.596 CMAC_LOG_REGISTRATION_OK
3d23h: 345297.596 CMAC_LOG_STATE_CHANGE establish_privacy_state
3d23h: 345297.596 CMAC_LOG_PRIVACY_NOT_CONFIGURED
3d23h: 345297.596 CMAC_LOG_STATE_CHANGE maintenance_state

```

133.CABLEMODEM.CISCO: 3d23h: %LINEPROTO-5-UPDOWN: Line protocol on Interface changed state to up
有关需要哪些DHCP选项以及哪些选项是可选选项的综合列表，请参阅[DHCP和电缆调制解调器的DOCSIS配置文件\(DOCSIS 1.0\)技术说明](#)。

注：注意：将CNR用作DHCP服务器时，常犯的错误是在Policy configuration菜单的Servers选项下选择NTP服务器。相反，应在Bootp Compatible选项下选择时间偏移和时间服务器。有关配置CNR的详细信息，请参阅CNR[文档](#)中的配置DHCP。

如果不在DHCP服务器中包含路由器选项设置，或在路由器选项字段中指定无效IP地址，则调制解调器不会超出初始(i)状态，如下**debug cable-modem mac log verbose**所示：

```
1d16h: 146585.940 CMAC_LOG_CONFIG_FILE_TFTP_FAILED -
1d16h: 146585.940 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
1d16h: 146585.944 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
1d16h: 146585.944 CMAC_LOG_STATE_CHANGE reset_interface_state
1d16h: 146585.944 CMAC_LOG_STATE_CHANGE reset_hardware_state
```

注意：无效的DOCSIS配置文件，特别是DOCSIS CPE配置器中服务类别中最大上游传输突发设置为255的DOCSIS配置文件，可防止调制解调器继续执行init(i)。这在早期的DOCSIS规范中很常见，这些规范在迷你插槽单元中设置了此值。建议的值为1600或1800字节。

TOD 交换 init(t) 状态

调制解调器获取其网络参数后，必须从一天中的某个时间(TOD)服务器请求一天中的某个时间。TOD使用UTC时间戳（从1970年1月1日开始的秒）。当与DHCP的时间偏移选项值结合时，可以计算当前时间。时间用于系统日志和事件日志时间戳。

下面是电缆调制解调器，其SID为1,2 in in init(t)。请注意，使用最新的IOS，比Cisco IOS软件版本12.1(1)更高版本，即使TOD交换失败，电缆调制解调器仍将联机，请参阅以下**show cable modem**命令后的调试输出：

```
sydney# show cable mode
```

```
Interface   Prim Online   Timing Rec   QoS CPE IP address   MAC address
          Sid  State      Offset Power
Cable2/0/U0 1   init(t)    2808    0.00  2  0   10.1.1.20    0030.96f9.65d9
Cable2/0/U0 2   init(t)     2809    0.25  2  0   10.1.1.21    0030.96f9.6605
Cable2/0/U0 3   init(i)     2810   -0.25  2  0   10.1.1.22    0050.7366.1e01
2d01h: 177933.712 CMAC_LOG_STATE_CHANGE dhcp_state
2d01h: 177933.716 CMAC_LOG_RNG_REQ_TRANSMITTED
2d01h: 177933.716 CMAC_LOG_RNG_RSP_MSG_RCVD
2d01h: 177946.596 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS 10.1.1.20
2d01h: 177946.596 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS 172.17.110.136
2d01h: 177946.596 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS 172.17.110.130
2d01h: 177946.596 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS
2d01h: 177946.596 CMAC_LOG_DHCP_TZ_OFFSET 0
2d01h: 177946.600 CMAC_LOG_DHCP_CONFIG_FILE_NAME platinum.cm
2d01h: 177946.600 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR
2d01h: 177946.600 CMAC_LOG_DHCP_ERROR_ACQUIRING_LOG_ADDRESS
2d01h: 177946.600 CMAC_LOG_DHCP_COMPLETE
2d01h: 177946.612 CMAC_LOG_STATE_CHANGE establish_tod_state
2d01h: 177946.716 CMAC_LOG_RNG_REQ_TRANSMITTED
2d01h: 177946.716 CMAC_LOG_RNG_RSP_MSG_RCVD
133.CABLEMODEM.CISCO: 2d01h: %LINEPROTO-5-UPDOWN: Line protocol on Interface cap
2d01h: 177947.716 CMAC_LOG_RNG_REQ_TRANSMITTED
2d01h: 177947.716 CMAC_LOG_RNG_RSP_MSG_RCVD
2d01h: 177948.616 CMAC_LOG_TOD_REQUEST_SENT 172.17.110.130
2d01h: 177948.716 CMAC_LOG_RNG_REQ_TRANSMITTED
2d01h: 177954.616 CMAC_LOG_TOD_REQUEST_SENT 172.17.110.130
2d01h: 177954.716 CMAC_LOG_RNG_REQ_TRANSMITTED
2d01h: 177954.716 CMAC_LOG_RNG_RSP_MSG_RCVD
2d01h: 177960.616 CMAC_LOG_TOD_REQUEST_SENT 172.17.110.130
2d01h: 177960.712 CMAC_LOG_RNG_REQ_TRANSMITTED
2d01h: 177960.716 CMAC_LOG_RNG_RSP_MSG_RCVD
2d01h: 177961.716 CMAC_LOG_RNG_REQ_TRANSMITTED
```

```

131.CABLEMODEM.CISCO: 2d01h: %UBR900-3-TOD_FAILED_TIMER_EXPIRED:TOD failed,
but Cable Interface proceeding to operational state
2d01h: 177986.616 CMAC_LOG_TOD_WATCHDOG_EXPIRED
2d01h: 177986.616 CMAC_LOG_STATE_CHANGE security_association_state
2d01h: 177986.616 CMAC_LOG_SECURITY_BYPASSED
2d01h: 177986.616 CMAC_LOG_STATE_CHANGE configuration_file
2d01h: 177986.620 CMAC_LOG_LOADING_CONFIG_FILE platinum.cm
2d01h: 177986.644 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
2d01h: 177986.644 CMAC_LOG_STATE_CHANGE registration_state
2d01h: 177986.644 CMAC_LOG_REG_REQ_MSG_QUEUED
2d01h: 177986.648 CMAC_LOG_REG_REQ_TRANSMITTED
2d01h: 177986.652 CMAC_LOG_REG_RSP_MSG_RCVD
2d01h: 177986.652 CMAC_LOG_COS_ASSIGNED_SID 1/1
2d01h: 177986.656 CMAC_LOG_RNG_REQ_QUEUED 1
2d01h: 177986.656 CMAC_LOG_REGISTRATION_OK
!--- Modem online. 2d01h: 177986.656 CMAC_LOG_STATE_CHANGE establish_privacy_state 2d01h:
177986.656 CMAC_LOG_PRIVACY_NOT_CONFIGURED 2d01h: 177986.656 CMAC_LOG_STATE_CHANGE
maintenance_state 2d01h: 177988.716 CMAC_LOG_RNG_REQ_TRANSMITTED

```

以下是运行Cisco IOS软件版本12.0(7)T的电缆调制解调器捕获的调试，显示由于TOD计时器过期而重置的调制解调器。在这种情况下，调制解调器从未达到在线状态。

```

18:31:23: 66683.974 CMAC_LOG_STATE_CHANGE dhcp_state
18:31:24: 66684.110 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS 10.1.1.25
18:31:24: 66684.114 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS 172.17.110.136
18:31:24: 66684.118 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS 172.17.110.130
! Deliberate wrong IP Address
18:31:24: 66684.122 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS
18:31:24: 66684.124 CMAC_LOG_DHCP_TZ_OFFSET 0
18:31:24: 66684.128 CMAC_LOG_DHCP_CONFIG_FILE_NAME platinum.cm
18:31:24: 66684.132 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR
18:31:24: 66684.136 CMAC_LOG_DHCP_COMPLETE
18:31:24: 66684.260 CMAC_LOG_STATE_CHANGE establish_tod_state
18:31:24: 66684.268 CMAC_LOG_TOD_REQUEST_SENT
18:31:25: %LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0, changed state to up
18:31:29: 66689.952 CMAC_LOG_RNG_REQ_TRANSMITTED
18:31:29: 66689.956 CMAC_LOG_RNG_RSP_MSG_RCVD
18:32:04: 66724.266 CMAC_LOG_WATCHDOG_TIMER
18:32:04: %UBR900-3-RESET_TOD_WATCHDOG_EXPIRED: Cable Interface Reset due to TOD watchdog timer
18:32:04: 66724.272 CMAC_LOG_RESET_TOD_WATCHDOG_EXPIRED
18:32:04: 66724.274 CMAC_LOG_STATE_CHANGE reset_interface
!--- Modem resetting.

```

一天中的时间错误几乎总是指DHCP配置错误。可能导致TOD错误的可能配置错误是网关地址配置错误或TOD服务器地址错误。确保可以ping时间服务器以排除IP连接问题，并确保时间服务器可用。

为了进行故障排除，可将CMTS配置为ToD服务器。命令包括：

```

sydney# conf t
Enter configuration commands, one per line. End with CNTL/Z.
sydney(config)# cable time-server
sydney(config)# service udp-small-servers max-servers 25

```

当CMTS配置为ToD时，可用于调试ToD问题的一些命令是show cable clock, show controllers clock-reference。

选项文件传输已启动 - init(o) 状态

电缆调制解调器的主要配置和管理接口是从调配服务器下载的配置文件。此配置文件包含：

- 下行信道和上行信道识别和特征
- 服务类别设置
- 基线隐私设置
- 常规操作设置
- 网络管理信息
- 软件升级字段
- 过滤器
- 供应商特定设置

电缆调制解调器停滞在init(o)状态通常表示电缆调制解调器已启动或准备下载配置文件，但由于以下可能原因失败：

- 不正确，损坏(例如：ASCII而非二进制)，或缺少DOCSIS配置文件无法到达TFTP服务器，无法使用、太忙或没有IP连接
- DOCSIS文件中的配置参数无效或缺失
- TFTP服务器上的文件权限错误

注意：您可能并不总是看到init(o)，而是看到init(i)，然后从init(r1)循环到init(i)。通过显示show controller cable-modem 0 mac状态的输出，可以得出更精确的状态。下面是一个精简显示：

```
kuffing# show controller cable-modem 0 mac state
```

```
MAC State:                configuration_file_state
Ranging SID:              4
Registered:              FALSE
Privacy Established:     FALSE
```

在下面show cable modem命令后,debug cable-modem mac log verbose命令不会告诉您配置文件是否损坏或TFTP服务器是否发生故障。调试指向这两个。

```
sydney# show cable modem
```

Interface	Prim Sid	Online State	Timing Rec Offset	Power	QoS CPE	IP address	MAC address
Cable2/0/U0	1	init(o)	2812	0.00	2 0	10.1.1.21	0030.96f9.6605
Cable2/0/U0	2	init(o)	2814	0.50	2 0	10.1.1.22	0050.7366.1e01

```
w3d: 880748.992 CMAC_LOG_STATE_CHANGE dhcp_state
1w3d: 880751.652 CMAC_LOG_RNG_REQ_TRANSMITTED
1w3d: 880751.656 CMAC_LOG_RNG_RSP_MSG_RCVD
1w3d: 880761.876 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS 10.1.1.20
1w3d: 880761.876 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS 172.17.110.136
1w3d: 880761.876 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS 172.17.110.136
1w3d: 880761.876 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS
1w3d: 880761.876 CMAC_LOG_DHCP_TZ_OFFSET 0
1w3d: 880761.880 CMAC_LOG_DHCP_CONFIG_FILE_NAME data.cm
!--- Corrupt configuration file. 1w3d: 880761.880 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR
1w3d: 880761.880 CMAC_LOG_DHCP_ERROR_ACQUIRING_LOG_ADDRESS 1w3d: 880761.880
CMAC_LOG_DHCP_COMPLETE 1w3d: 880761.892 CMAC_LOG_STATE_CHANGE establish_tod_state 1w3d:
880761.896 CMAC_LOG_TOD_REQUEST_SENT 172.17.110.136 1w3d: 880761.904 CMAC_LOG_TOD_REPLY_RECEIVED
3180091733 1w3d: 880761.908 CMAC_LOG_TOD_COMPLETE 1w3d: 880761.908 CMAC_LOG_STATE_CHANGE
security_association_state 1w3d: 880761.908 CMAC_LOG_SECURITY_BYPASSED 1w3d: 880761.912
CMAC_LOG_STATE_CHANGE configuration_file_state 1w3d: 880761.912 CMAC_LOG_LOADING_CONFIG_FILE
```

```

data.cm lw3d: 880762.652 CMAC_LOG_RNG_REQ_TRANSMITTED lw3d: 880762.652 CMAC_LOG_RNG_RSP_MSG_RCVD
133.CABLEMODEM.CISCO: lw3d: %LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0,
changed state to up lw3d: 880762.928 CMAC_LOG_CONFIG_FILE_TFTP_FAILED -1
lw3d: 880762.932 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
lw3d: 880762.932 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
lw3d: 880762.932 CMAC_LOG_STATE_CHANGE reset_interface_state
lw3d: 880762.932 CMAC_LOG_STATE_CHANGE reset_hardware_state

```

DOCSIS CPE配置器中无效配置参数的示例无效或缺少供应商ID或供应商特定信息。除以下消息外，结果与上述调试类似：

```

133.CABLEMODEM.CISCO: 00:13:07: %LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0,
changed state to up

```

```

00:13:08: 788.004 CMAC_LOG_CONFIG_FILE_CISCO_BAD_TYPE 155
00:13:08: 788.004 CMAC_LOG_CONFIG_FILE_CISCO_BAD_TYPE 115
00:13:08: 788.004 CMAC_LOG_CONFIG_FILE_CISCO_BAD_TYPE 116
00:13:08: 788.004 CMAC_LOG_CONFIG_FILE_CISCO_BAD_ATTR_MAX LENG128
00:13:08: 788.008 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
00:13:08: 788.008 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED

```

"Online, Online(d), Online(pk), Online(pt) 状态"

```

sydney#show cable modem

```

Interface	Prim Sid	Online State	Timing Offset	Rec Power	QoS	CPE	IP address	MAC address
Cable2/0/U0	4	online	2810	-0.75	6	0	10.1.1.20	0030.96f9.65d9
Cable2/0/U0	5	online(pt)	2290	0.25	5	0	10.1.1.25	0050.7366.2223
Cable2/0/U0	7	online(d)	2815	0.00	6	0	10.1.1.27	0001.9659.4461

除在线(d)外，在线、在线(pk)和在线(pt)表明CM已实现在线状态并能够发送和接收数据。但是，在线(d)表示调制解调器已联机，但网络访问被拒绝。这通常是由在DOCSIS CPE配置器中的射频信息下禁用网络访问选项引起的。网络访问的默认值已启用。了解如何创建拒绝PC连接到CM的DOCSIS配置文件。

从上面显示的show cable modem和debug cable-modem mac log verbose中可以清楚地看到这一点：

```

04:11:34: 15094.700 CMAC_LOG_STATE_CHANGE dhcp_state

04:11:46: 15106.392 CMAC_LOG_RNG_REQ_TRANSMITTED
04:11:46: 15106.396 CMAC_LOG_RNG_RSP_MSG_RCVD
04:11:47: 15107.620 CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS 10.1.1.20
04:11:47: 15107.620 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS 172.17.110.136
04:11:47: 15107.620 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS 172.17.110.136
04:11:47: 15107.620 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS
04:11:47: 15107.620 CMAC_LOG_DHCP_TZ_OFFSET 0
04:11:47: 15107.624 CMAC_LOG_DHCP_CONFIG_FILE_NAME noaccess.cm
!--- Network Access disabled. 04:11:47: 15107.624 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR
04:11:47: 15107.624 CMAC_LOG_DHCP_ERROR_ACQUIRING_LOG_ADDRESS 04:11:47: 15107.624
CMAC_LOG_DHCP_COMPLETE 04:11:47: 15107.636 CMAC_LOG_STATE_CHANGE establish_tod_state 04:11:47:
15107.640 CMAC_LOG_TOD_REQUEST_SENT 172.17.110.136 04:11:47: 15107.648
CMAC_LOG_TOD_REPLY_RECEIVED 3179226080 04:11:47: 15107.652 CMAC_LOG_TOD_COMPLETE 04:11:47:
15107.652 CMAC_LOG_STATE_CHANGE security_association_state 04:11:47: 15107.652
CMAC_LOG_SECURITY_BYPASSED 04:11:47: 15107.652 CMAC_LOG_STATE_CHANGE configuration_file_state
04:11:47: 15107.652 CMAC_LOG_LOADING_CONFIG_FILE noaccess.c 133.CABLEMODEM.CISCO: 04:11:48:
%LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0, changed state to up 04:11:48:
15108.672 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE 04:11:48: 15108.672 CMAC_LOG_STATE_CHANGE

```

```

registration_state 04:11:48: 15108.672 CMAC_LOG_REG_REQ_MSG_QUEUED 04:11:48: 15108.676
CMAC_LOG_REG_REQ_TRANSMITTED 04:11:48: 15108.680 CMAC_LOG_REG_RSP_MSG_RCVD 04:11:48: 15108.680
CMAC_LOG_COS_ASSIGNED_SID 1/4 04:11:48: 15108.684 CMAC_LOG_RNG_REQ_QUEUED 4 04:11:48: 15108.684
CMAC_LOG_NETWORK_ACCESS_DENIED
04:11:48: 15108.684 CMAC_LOG_REGISTRATION_OK
04:11:48: 15108.684 CMAC_LOG_STATE_CHANGE establish_privacy_state
04:11:48: 15108.684 CMAC_LOG_PRIVACY_NOT_CONFIGURED
04:11:48: 15108.684 CMAC_LOG_STATE_CHANGE maintenance_state
04:11:49: 15109.392 CMAC_LOG_RNG_REQ_TRANSMITTED

```

另一种检查方法是检查电缆调制解调器上show controllers cable-modem 0 mac状态的输出。

(已省略显示开始)

Config File:

```

Network Access: FALSE
!--- Network Access denied. Maximum CPEs: 3 Baseline Privacy: Auth. Wait Timeout: 10 Reauth.
Wait Timeout: 10 Auth. Grace Time: 600 Op. Wait Timeout: 1 Retry Wait Timeout: 1 TEK Grace Time:
600 Auth. Reject Wait Time: 60 COS 1: Assigned SID: 4 Max Downstream Rate: 10000000 Max Upstream
Rate: 1024000 Upstream Priority: 7 Min Upstream Rate: 0 Max Upstream Burst: 0 Privacy Enable:
FALSE

```

(显示屏的其余部分已省略。)

在线意味着调制解调器已联机并能够与CMTS通信。如果未启用基线隐私接口(BPI)，则假设电缆调制解调器初始化成功，在线状态为默认状态。如果配置了BPI，则您将在在线(pk)态，然后很快(pt)。以下是CM端的调试输出显示，其中debug cable-modem mac log verbose仅显示注册部分：

```

5d03h: 445197.804 CMAC_LOG_STATE_CHANGE registration_state
5d03h: 445197.804 CMAC_LOG_REG_REQ_MSG_QUEUED
5d03h: 445197.812 CMAC_LOG_REG_REQ_TRANSMITTED
5d03h: 445197.816 CMAC_LOG_REG_RSP_MSG_RCVD
5d03h: 445197.816 CMAC_LOG_COS_ASSIGNED_SID 1/4
5d03h: 445197.816 CMAC_LOG_RNG_REQ_QUEUED 4
5d03h: 445197.816 CMAC_LOG_REGISTRATION_OK
5d03h: 445197.816 CMAC_LOG_STATE_CHANGE establish_privacy_state
5d03h: 445197.820 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE
machine: KEK, event/state: EVENT_1_PROVISIONED/STATE_A_START, new state: STATE_B_AUTH_WAIT
5d03h: 445197.828 CMAC_LOG BPKM_REQ_TRANSMITTED
5d03h: 445197.848 CMAC_LOG BPKM_RSP_MSG_RCVD
5d03h: 445197.848 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE
machine: KEK, event/state: EVENT_3_AUTH_REPLY/STATE_B_AUTH_WAIT, new state: STATE_C_AUTHORIZED
5d03h: 445198.524 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE
machine: TEK, event/state: EVENT_2_AUTHORIZED/STATE_A_START, new state: STATE_B_OP_WAIT
5d03h: 445198.536 CMAC_LOG RNG_REQ_TRANSMITTED
5d03h: 445198.536 CMAC_LOG RNG_RSP_MSG_RCVD
5d03h: 445198.536 CMAC_LOG BPKM_REQ_TRANSMITTED
5d03h: 445198.536 CMAC_LOG BPKM_RSP_MSG_RCVD
5d03h: 445198.540 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE
machine: TEK, event/state: EVENT_8_KEY_REPLY/STATE_B_OP_WAIT, new state: STATE_D_OPERATIONAL
5d03h: 445198.548 CMAC_LOG_PRIVACY_INSTALLED_KEY_FOR_SID 4
5d03h: 445198.548 CMAC_LOG_PRIVACY_ESTABLISHED
5d03h: 445198.552 CMAC_LOG_STATE_CHANGE maintenance_state
5d03h: 445201.484 CMAC_LOG_RNG_REQ_TRANSMITTED
5d03h: 445201.484 CMAC_LOG_RNG_RSP_MSG_RCVD

```

如果BPI一般存在问题，您将看到reject(pk)，这意味着我们无法通过密钥身份验证阶段。这在拒绝(pk)和拒绝(pt)部分中介绍。

注意：为了正确的BPI操作，请确保CMTS和CM都运行启用BPI的映像，该映像由映像名称中的符号K1表示。另外，请确保在DOCSIS CPE配置器的“服务类别”选项下，将“基线隐私启用”[字段设置](#)

为1。如果CMTS运行启用BPI的映像而CM不运行，并且我们在DOCSIS CPE配置器中启用了BPI，则您会看到调制解调器在联机和脱机之间循环。

在线电话回传

当电缆调制解调器在Telco Return环境中在线时，它们会显示“T”，而不显示上游端口，如“U0”。以下输出显示了这种情况

```
ubr7223# show cable modem
```

Interface	Prim	Online	Timing	Rec	QoS	CPE	IP address	MAC address
	Sid	State	Offset	Power				
Cable2/0/T	94	online	0	0.00	3	2	10.10.169.151	0020.4066.b6b0
Cable2/0/T	95	online	0	0.00	3	1	10.10.168.18	0020.4061.db5e
Cable2/0/T	96	online	0	0.00	3	1	10.10.169.240	0020.4066.b644
Cable2/0/U0	97	online	307	0.25	4	1	10.10.168.108	0020.4002.fc7c
Cable2/0/T	98	online	0	0.00	3	1	10.10.169.245	0020.4003.65fe
Cable2/0/U0	99	online	332	0.25	4	0	10.10.168.110	0020.400b.9b40
Cable2/0/U0	100	online	277	0.25	4	1	10.10.169.114	0020.4002.ff42
Cable2/0/T	101	online	0	0.00	3	1	10.10.169.175	0020.4066.b6c8

以上输出显示了混合环境中处于在线状态的电缆调制解调器。请注意，SID为97、99和100的电缆调制解调器使用端口upstream 0，而其余电缆调制解调器使用telco return作为上行路径。Telco Return的配置和故障排除过程不在本文档的讨论范围之内。读者可以参阅[Cisco uBR7200系列有线路由器的电话返回](#)和[Cisco CMTS的电信返回](#)信息。

Reject(pk) 和 Reject(pt) 状态

以下是CMTS路由器上show cable modem的显示输出：

```
sydney# show cable modem
```

Interface	Prim	Online	Timing	Rec	QoS	CPE	IP address	MAC address
	Sid	State	Offset	Power				
Cable2/0/U0	1	offline	2811	0.00	2	0	10.1.1.27	0001.9659.4461
Cable2/0/U0	2	reject(pk)	2812	0.00	6	0	10.1.1.20	0030.96f9.65d9
Cable2/0/U0	3	online	2287	0.00	5	0	10.1.1.25	0050.7366.2223

```
01:58:51: %UBR7200-5-UNAUTHSIDTIMEOUT: CMTS deleted BPI unauthorized Cable Modem 0030.96f9.65d9
```

在BPI配置出现问题的大多数情况下，您会看到reject(pk)。此状态通常由以下因素引起：

- CM在身份验证请求中损坏公钥。有关事件的正确顺序，请参阅调试电缆隐私示例。
- CMTS路由器上存在电缆隐私验证调制解调器配置命令，但没有Radius服务器。
- Radius服务器配置不正确。
- Radius服务器配置不正确。

(pt)常由无效的TEK或流量加密密钥引起。

有关详细信息，请参阅[基线隐私接口规范](#)。

```
sydney# debug cable privacy
```

```

02:32:08: CMTS Received AUTH REQ.
02:32:08: Created a new CM key for 0030.96f9.65d9.
02:32:08: CMTS generated AUTH_KEY.
02:32:08: Input : 70D158F106B0B75
02:32:08: Public Key:
02:32:08: 0x0000: 30 68 02 61 00 DA BA 93 3C E5 41 7C 20 2C D1 87
02:32:08: 0x0010: 3B 93 56 E1 35 7A FC 5E B7 E1 72 BA E6 A7 71 91
02:32:08: 0x0020: F4 68 CB 86 A8 18 FB A9 B4 DD 5F 21 B3 6A BE CE
02:32:08: 0x0030: 6A BE E1 32 A8 67 9A 34 E2 33 4A A4 0F 8C DB BD
02:32:08: 0x0040: D0 BB DE 54 39 05 B0 E0 F7 19 29 20 8C F9 3A 69
02:32:08: 0x0050: E4 51 C6 89 FB 8A 8E C6 01 22 02 34 C5 1F 87 F6
02:32:08: 0x0060: A3 1C 7E 67 9B 02 03 01 00 01
02:32:08: RSA public Key subject:
02:32:08: 0x0000: 30 7C 30 0D 06 09 2A 86 48 86 F7 0D 01 01 01 05
02:32:08: 0x0010: 00 03 6B 00 30 68 02 61 00 DA BA 93 3C E5 41 7C
02:32:08: 0x0020: 20 2C D1 87 3B 93 56 E1 35 7A FC 5E B7 E1 72 BA
02:32:08: 0x0030: E6 A7 71 91 F4 68 CB 86 A8 18 FB A9 B4 DD 5F 21
02:32:08: 0x0040: B3 6A BE CE 6A BE E1 32 A8 67 9A 34 E2 33 4A A4
02:32:08: 0x0050: 0F 8C DB BD D0 BB DE 54 39 05 B0 E0 F7 19 29 20
02:32:08: 0x0060: 8C F9 3A 69 E4 51 C6 89 FB 8A 8E C6 01 22 02 34
02:32:08: 0x0070: C5 1F 87 F6 A3 1C 7E 67 9B 02 03 01 00 01
02:32:08: RSA encryption result = 0
02:32:08: RSA encrypted output:
02:32:08: 0x0000: B6 CA 09 93 BF 2C 05 66 9D C5 AF 67 0F 64 2E 31
02:32:08: 0x0010: 67 E4 2A EA 82 3E F7 63 8F 01 73 10 14 4A 24 ED
02:32:08: 0x0020: 65 8F 59 D8 23 BC F3 A8 48 7D 1A 08 09 BF A3 A8
02:32:08: 0x0030: D6 D2 5B C4 A7 36 C4 A9 28 F0 6C 5D A1 3B 92 A2
02:32:08: 0x0040: BC 99 CC 1F C9 74 F9 FA 76 83 ED D5 26 B4 92 EE
02:32:08: 0x0050: DD EA 50 81 C6 29 43 4F 73 DA 56 C2 29 AF 05 53
02:32:08: CMTS sent AUTH response.
02:32:08: CMTS Received TEK REQ.
02:32:08: Created a new key for SID 2.
02:32:08: CMTS sent KEY response.

```

以下是CM上授权失败时的调试输出示例：

```

6d02h: 527617.480 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
6d02h: 527617.480 CMAC_LOG_STATE_CHANGE registration_state
6d02h: 527617.484 CMAC_LOG_REG_REQ_MSG_QUEUED
6d02h: 527617.488 CMAC_LOG_REG_REQ_TRANSMITTED
6d02h: 527617.492 CMAC_LOG_REG_RSP_MSG_RCVD
6d02h: 527617.492 CMAC_LOG_COS_ASSIGNED_SID 1/2
6d02h: 527617.492 CMAC_LOG_RNG_REQ_QUEUED 2
6d02h: 527617.492 CMAC_LOG_REGISTRATION_OK
6d02h: 527617.496 CMAC_LOG_STATE_CHANGE establish_privacy_state
6d02h: 527617.496 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE
machine: KEK, event/state: EVENT_1_PROVISIONED/STATE_A_START, new state: STATE_B_AUTH_WAIT
6d02h: 527617.504 CMAC_LOG BPKM_REQ_TRANSMITTED
6d02h: 527617.504 CMAC_LOG BPKM_RSP_MSG_RCVD
6d02h: 527617.508 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE
machine: KEK, event/state: EVENT_2_AUTH_REJECT/STATE_B_AUTH_WAIT, new state:
STATE_E_AUTH_REJ_WAIT
129.CABLEMODEM.CISCO: 6d02h: %CMBPKM-1-AUTHREJECT: Authorization request rejected by CMTS:
Unauthorized CM
6d02h: 527618.588 CMAC_LOG_RNG_REQ_TRANSMITTED
6d02h: 527618.592 CMAC_LOG_RNG_RSP_MSG_RCVD

```

同样，CMTS路由器上的调试电缆隐私也会导致以下错误：

```
02:47:00: CMTS Received AUTH REQ.
```

```
02:47:00: Sending KEK REJECT.
```

```
02:47:05: %UBR7200-5-UNAUTHSIDTIMEOUT: CMTS deleted BPI unauthorized Cable Modem 0030.96f9.65d9
```

注意：CM将无限期地从拒绝(pk)循环到init(r1)。

可能遇到的另一个错误是，由于加密导出限制，某些供应商的调制解调器在接口配置中可能需要在CMTS路由器上使用以下命令：

```
sydney(config-if)# cable privacy 40-bit-des
```

注册- 拒绝 (m) 状态

配置后，调制解调器发送注册请求(REG-REQ)，其中包含配置设置的必需子集以及CM和CMTS消息完整性检查(MIC)。CM MIC是对配置文件设置进行的散列计算，它为调制解调器提供了一种方法，确保配置文件在传输过程中未被篡改。CMTS MIC大体相同，但它还包括电缆共享密钥身份验证字符串的设置。CMTS知道此共享密钥，并确保仅允许授权调制解调器向CMTS注册。

```
sydney# show cable modem
```

Interface	Prim Sid	Online State	Timing Offset	Rec Power	QoS	CPE	IP address	MAC address
Cable2/0/U0	1	reject (m)	2807	0.00	2	0	10.1.1.20	0030.96f9.65d9
Cable2/0/U0	2	online	2284	-0.50	5	0	10.1.1.25	0050.7366.2223
Cable2/0/U0	3	offline	18669	0.25	2	0	10.1.1.26	0050.7366.2221

```
01:17:59: %UBR7200-5-AUTHFAIL: Authorization failed for Cable Modem 0030.96f9.60
```

```
01:18:21: %UBR7200-5-AUTHFAIL: Authorization failed for Cable Modem 0030.96f9.60
```

上述输出显示SID为1的电缆调制解调器处于拒绝(m)状态。这是由错误的消息完整性检查(MIC)引起的，通常由以下因素引起：

- 在电缆接口下配置的电缆共享密钥与DOCSIS CPE配置器“他”选项下的“CMTS身份验证”值不匹配。默认情况下，两个值都为空，如果未指定，则不会导致任何问题。
- 配置文件 (DOCSIS文件) 损坏。

以下是在电缆调制解调器端使用debug cable-modem mac log verbose执行的调试输出。

```
00:32:08: 1928.816 CMAC_LOG_STATE_CHANGE establish_tod_e
00:32:08: 1928.820 CMAC_LOG_TOD_REQUEST_SENT 172.17.110.136
00:32:08: 1928.828 CMAC_LOG_TOD_REPLY_RECEIVED 3179139839
00:32:08: 1928.832 CMAC_LOG_TOD_COMPLETE
00:32:08: 1928.832 CMAC_LOG_STATE_CHANGE security_association_state
00:32:08: 1928.832 CMAC_LOG_SECURITY_BYPASSED
00:32:08: 1928.832 CMAC_LOG_STATE_CHANGE configuration_e
00:32:08: 1928.832 CMAC_LOG_LOADING_CONFIG_FILE platinum.cm
00:32:09: 1929.708 CMAC_LOG_RNG_REQ_TRANSMITTED
00:32:09: 1929.712 CMAC_LOG_RNG_RSP_MSG_RCVD
133.CABLEMODEM.CISCO: 00:32:09: %LINEPROTO-5-UPDOWN: Line protocol on Interface
00:32:09: 1929.852 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
00:32:09: 1929.856 CMAC_LOG_STATE_CHANGE registration_state
00:32:09: 1929.856 CMAC_LOG_REG_REQ_MSG_QUEUED
00:32:09: 1929.860 CMAC_LOG_REG_REQ_TRANSMITTED
```

```
00:32:09: 1929.864 CMAC_LOG_REG_RSP_MSG_RCVD
00:32:09: 1929.864 CMAC_LOG_RESET_AUTHENTICATION_FAILURE
00:32:09: 1929.868 CMAC_LOG_STATE_CHANGE reset_interface_state
00:32:09: 1929.868 CMAC_LOG_STATE_CHANGE reset_hardware_state
```

要纠正此问题，请确保您有有效的配置文件，并且在CMTS Authentication下具有与电缆接口下电缆共享密钥行中配置的值。

注册- 拒绝 (c) 状态

```
sydney# show cable modem
```

Interface	Prim Sid	Online State	Timing Rec Offset	Power	QoS CPE	IP address	MAC address
Cable2/0/U0	1	offline	2807	-0.25	2 0	10.1.1.20	0030.96f9.65d9
Cable2/0/U0	2	online	2284	-0.25	5 0	10.1.1.25	0050.7366.2223
Cable2/0/U0	3	reject(c)	2286	-0.25	2 0	10.1.1.26	0050.7366.2221

```
20:35:59: %UBR7200-5-CLASSFAIL: Registration failed for Cable Modem 0050.7366.2Q
```

如上所示，SID为3的电缆调制解调器由于服务类别(COS)错误或拒绝(c)而注册失败。这通常由以下因素引起：

- CMTS路由器无法或不愿授予特定请求的COS
- 在DOCSIS CPE配置器的“服务类别”选项中配置错误的参数，例如，具有两个具有相同ID的服务类别。

以下是CM端采用的debug cable-modem mac log verbose，显示由于COS错误而出现故障：

```
1w3d: 885643.820 CMAC_LOG_STATE_CHANGE registration_state
1w3d: 885643.820 CMAC_LOG_REG_REQ_MSG_QUEUED
1w3d: 885643.824 CMAC_LOG_REG_REQ_TRANSMITTED
1w3d: 885643.828 CMAC_LOG_REG_RSP_MSG_RCVD
1w3d: 885643.828 CMAC_LOG_SERVICE_NOT_AVAILABLE 0x01,0x01,0x01
1w3d: 885643.828 CMAC_LOG_RESET_SERVICE_NOT_AVAILABLE
1w3d: 885643.828 CMAC_LOG_STATE_CHANGE reset_interface_state
1w3d: 885643.832 CMAC_LOG_STATE_CHANGE reset_hardware_state
1w3d: 885644.416 CMAC_LOG_STATE_CHANGE wait_for_link_up_state
1w3d: 885644.420 CMAC_LOG_DRIVER_INIT_IDB_RESET 0x8039E23C
1w3d: 885644.420 CMAC_LOG_LINK_DOWN
1w3d: 885644.420 CMAC_LOG_LINK_UP
1w3d: 885644.420 CMAC_LOG_STATE_CHANGE ds_channel_scanning_state
133.CABLEMODEM.CISCO: 1w3d: %LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0,
changed state to down
1w3d: 885645.528 CMAC_LOG_UCD_MSG_RCVD 1
1w3d: 885646.828 CMAC_LOG_DS_64QAM_LOCK_ACQUIRED 453000000
```

同样，CMTS路由器上的调试电缆注册会显示以下消息：

```
sydney# debug cable registration
```

```
CMTS registration debugging is on
```

```
sydney#
```

```
1d04h: %UBR7200-5-CLASSFAIL: Registration failed for Cable Modem 0001.9659.4461
on interface Cable2/0/U0:
```

Bad/Missing Class of Service Config in REG-REQ
注意调制解调器最终如何重置并重新启动。

Appendix

从 CM 显示 show controller 命令

```
kuffing# show controllers cable-modem 0 mac state
```

```
MAC State:                maintenance_state
Ranging SID:              1
Registered:               TRUE
Privacy Established:      TRUE
```

```
MIB Values:
  Mac Resets:             0
  Sync lost:              0
  Invalid Maps:          0
  Invalid UCDS:          0
  Invalid Rng Rsp:       0
  Invalid Reg Rsp:       0
  T1 Timeouts:           0
  T2 Timeouts:           0
  T3 Timeouts:           0
  T4 Timeouts:           0
  Range Aborts:          0
```

```
DS ID:                    0
DS Frequency:              453000000
DS Symbol Rate:           5056941
DS QAM Mode                64QAM
```

```
DS Search:
  79 453000000 855000000 6000000
  80 930000000 105000000 6000000
  81 111025000 117025000 6000000
  82 231012500 327012500 6000000
  83 333025000 333025000 6000000
  84 339012500 399012500 6000000
  85 405000000 447000000 6000000
  86 123012500 129012500 6000000
  87 135012500 135012500 6000000
  88 141000000 171000000 6000000
  89 219000000 225000000 6000000
  90 177000000 213000000 6000000
  91 55752700 67753300 6000300
  92 79753900 85754200 6000300
  93 175758700 211760500 6000300
  94 121756000 169758400 6000300
  95 217760800 397769800 6000300
  96 73753600 115755700 6000300
  97 403770100 595779700 6000300
  98 601780000 799789900 6000300
  99 805790200 997799800 6000300
```

```
US ID:                    1
US Frequency:              27984000
US Power Level:           23.0 (dBmV)
US Symbol Rate:           1280000
Ranging Offset:           12418
```


Mini-Slot Size: 8
Change Count: 6

Preamble Pattern: CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC
CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC
CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC
CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC
CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC
CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC
CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC CC 0D 0D

Burst Descriptor 0:
Interval Usage Code: 1
Modulation Type: 1
Differential Encoding: 2
Preamble Length: 64
Preamble Value Offset: 952
FEC Error Correction: 0
FEC Codeword Info Bytes: 16
Scrambler Seed: 338
Maximum Burst Size: 1
Guard Time Size: 8
Last Codeword Length: 1
Scrambler on/off: 1

Burst Descriptor 1:
Interval Usage Code: 3
Modulation Type: 1

Differential Encoding: 2
Preamble Length: 128
Preamble Value Offset: 896
FEC Error Correction: 5
FEC Codeword Info Bytes: 34
Scrambler Seed: 338
Maximum Burst Size: 0
Guard Time Size: 48
Last Codeword Length: 1
Scrambler on/off: 1

Burst Descriptor 2:
Interval Usage Code: 4
Modulation Type: 1
Differential Encoding: 2
Preamble Length: 128
Preamble Value Offset: 896
FEC Error Correction: 5
FEC Codeword Info Bytes: 34
Scrambler Seed: 338
Maximum Burst Size: 0
Guard Time Size: 48
Last Codeword Length: 1
Scrambler on/off: 1

Burst Descriptor 3:
Interval Usage Code: 5
Modulation Type: 1
Differential Encoding: 2
Preamble Length: 72
Preamble Value Offset: 944
FEC Error Correction: 5
FEC Codeword Info Bytes: 75
Scrambler Seed: 338

Maximum Burst Size: 6
Guard Time Size: 8
Last Codeword Length: 1
Scrambler on/off: 1

Burst Descriptor 4:

Interval Usage Code: 6
Modulation Type: 1
Differential Encoding: 2
Preamble Length: 80
Preamble Value Offset: 936
FEC Error Correction: 8
FEC Codeword Info Bytes: 220
Scrambler Seed: 338
Maximum Burst Size: 0
Guard Time Size: 8
Last Codeword Length: 1
Scrambler on/off: 1

Config File:

Network Access: TRUE
Maximum CPEs: 3
Baseline Privacy:
Auth. Wait Timeout: 10
Reauth. Wait Timeout: 10
Auth. Grace Time: 600
Op. Wait Timeout: 1
Retry Wait Timeout: 1
TEK Grace Time: 600
Auth. Reject Wait Time: 60

COS 1:

Assigned SID: 1
Max Downstream Rate: 10000000
Max Upstream Rate: 1024000

Upstream Priority: 6
Min Upstream Rate: 0
Max Upstream Burst: 0
Privacy Enable: TRUE

Ranging Backoff Start: 0 (at initial ranging)
Ranging Backoff End: 3 (at initial ranging)
Data Backoff Start: 0 (at initial ranging)
Data Backoff End: 4 (at initial ranging)

IP Address: 10.1.1.20
Net Mask: 255.255.255.0
TFTP Server IP Address: 172.17.110.136
Time Server IP Address: 172.17.110.136
Config File Name: privacy.cm
Time Zone Offset: 0
Log Server IP Address: 0.0.0.0

Drop Ack Enabled: TRUE

Mac Sid Status

Max Sids: 4 Sids In Use: 1

Mac Sid 0:

Sid: 1 State: 2

Mac Sid 1:

Sid: 0 State: 1

Mac Sid 2:

Sid: 0 State: 1

Mac Sid 3:

Sid: 0 State: 1
Test sid queue: 0
kuffing#

CM 端的完全调试捕获

kuffing# **debug cable mac log verbose**

```
1w0d: 606764.132 CMAC_LOG_LINK_UP
1w0d: 606764.132 CMAC_LOG_STATE_CHANGE ds_channel_scanning_state
1w0d: 606764.136 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 99/805790200/997799800/6000300
1w0d: 606764.136 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 98/601780000/799789900/6000300
1w0d: 606764.136 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 97/403770100/595779700/6000300
1w0d: 606764.140 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 96/73753600/115755700/6000300
1w0d: 606764.140 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 95/217760800/397769800/6000300
1w0d: 606764.140 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 94/121756000/169758400/6000300
1w0d: 606764.144 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 93/175758700/211760500/6000300
1w0d: 606764.144 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 92/79753900/85754200/6000300
1w0d: 606764.148 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 91/55752700/67753300/6000300
1w0d: 606764.148 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 90/177000000/213000000/6000000
1w0d: 606764.148 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 89/219000000/225000000/6000000
1w0d: 606764.152 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 88/141000000/171000000/6000000
1w0d: 606764.152 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 87/135012500/135012500/6000000
1w0d: 606764.152 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 86/123012500/129012500/6000000
1w0d: 606764.156 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 85/405000000/447000000/6000000
1w0d: 606764.156 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 84/339012500/399012500/6000000
1w0d: 606764.160 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 83/333025000/333025000/6000000
1w0d: 606764.160 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 82/231012500/327012500/6000000
1w0d: 606764.160 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 81/111025000/117025000/6000000
1w0d: 606764.164 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 80/93000000/105000000/6000000
1w0d: 606764.164 CMAC_LOG_WILL_SEARCH_DS_FREQUENCY_BAND 79/453000000/855000000/6000000
1w0d: 606764.164 CMAC_LOG_WILL_SEARCH_SAVED_DS_FREQUENCY 453000000
1w0d: 606765.416 CMAC_LOG_UCD_MSG_RCVD 1
131.CABLEMODEM.CISCO: 1w0d: %LINK-3-UPDOWN: Interface cable-modem0, changed state to up
1w0d: 606766.576 CMAC_LOG_DS_64QAM_LOCK_ACQUIRED 453000000
1w0d: 606766.576 CMAC_LOG_DS_CHANNEL_SCAN_COMPLETED
1w0d: 606766.576 CMAC_LOG_STATE_CHANGE wait_ucd_state
1w0d: 606767.416 CMAC_LOG_UCD_MSG_RCVD 1
1w0d: 606769.416 CMAC_LOG_UCD_MSG_RCVD 1
1w0d: 606769.416 CMAC_LOG_ALL_UCDS_FOUND
1w0d: 606769.416 CMAC_LOG_STATE_CHANGE wait_map_state
1w0d: 606769.420 CMAC_LOG_FOUND_US_CHANNEL 1
1w0d: 606771.416 CMAC_LOG_UCD_MSG_RCVD 1
1w0d: 606771.416 CMAC_LOG_UCD_NEW_US_FREQUENCY 27984000
1w0d: 606771.416 CMAC_LOG_SLOT_SIZE_CHANGED 8
1w0d: 606771.436 CMAC_LOG_UCD_UPDATED
1w0d: 606771.452 CMAC_LOG_MAP_MSG_RCVD
1w0d: 606771.452 CMAC_LOG_INITIAL_RANGING_MINISLOTS 41
1w0d: 606771.452 CMAC_LOG_STATE_CHANGE ranging_1_state
1w0d: 606771.452 CMAC_LOG_RANGING_OFFSET_SET_TO 9610
1w0d: 606771.456 CMAC_LOG_POWER_LEVEL_IS 20.0 dBmV (commanded)
1w0d: 606771.456 CMAC_LOG_STARTING_RANGING
1w0d: 606771.456 CMAC_LOG_RANGING_BACKOFF_SET 0
1w0d: 606771.456 CMAC_LOG_RNG_REQ_QUEUED 0
1w0d: 606771.512 CMAC_LOG_RNG_REQ_TRANSMITTED
1w0d: 606771.516 CMAC_LOG_RNG_RSP_MSG_RCVD
1w0d: 606771.516 CMAC_LOG_RNG_RSP_SID_ASSIGNED 1
1w0d: 606771.516 CMAC_LOG_ADJUST_RANGING_OFFSET 2810
1w0d: 606771.516 CMAC_LOG_RANGING_OFFSET_SET_TO 12420
1w0d: 606771.516 CMAC_LOG_ADJUST_TX_POWER 17
1w0d: 606771.520 CMAC_LOG_STATE_CHANGE ranging_2_state
1w0d: 606771.520 CMAC_LOG_RNG_REQ_QUEUED 1
1w0d: 606772.524 CMAC_LOG_RNG_REQ_TRANSMITTED
```

```

1w0d: 606772.524 CMAC_LOG_RNG_RSP_MSG_RCVD
1w0d: 606772.524 CMAC_LOG_RANGING_SUCCESS
1w0d: 606772.524 CMAC_LOG_STATE_CHANGE dhcp_state
1w0d: 606773.564 CMAC_LOG_RNG_REQ_TRANSMITTED
1w0d: 606773.564 CMAC_LOG_RNG_RSP_MSG_RCVD
1w0d: 606775.560 CMAC_LOG_RNG_REQ_TRANSMITTED
1w0d: 606775.564 CMAC_LOG_RNG_RSP_MSG_RCVD
1w0d: 606778.560 CMAC_LOG_RNG_REQ_TRANSMITTED
1w0d: 606778.564 CMAC_LOG_RNG_RSP_MSG_RCVD
1w0d: 606780.564 CMAC_LOG_RNG_REQ_TRANSMITTED
1w0d: 606780.564 CMAC_LOG_RNG_RSP_MSG_RCVD
1w0d: 606782.560 CMAC_LOG_RNG_REQ_TRANSMITTED
1w0d: 606782.564 CMAC_LOG_RNG_RSP_MSG_RCVD
1w0d: 606785.408CMAC_LOG_DHCP_ASSIGNED_IP_ADDRESS 10.1.1.20
1w0d: 606785.408 CMAC_LOG_DHCP_TFTP_SERVER_ADDRESS 172.17.110.136
1w0d: 606785.408 CMAC_LOG_DHCP_TOD_SERVER_ADDRESS 172.17.110.136
1w0d: 606785.408 CMAC_LOG_DHCP_SET_GATEWAY_ADDRESS
1w0d: 606785.408 CMAC_LOG_DHCP_TZ_OFFSET 0
1w0d: 606785.412 CMAC_LOG_DHCP_CONFIG_FILE_NAME privacy.cm
1w0d: 606785.412 CMAC_LOG_DHCP_ERROR_ACQUIRING_SEC_SVR_ADDR
1w0d: 606785.412 CMAC_LOG_DHCP_ERROR_ACQUIRING_LOG_ADDRESS
1w0d: 606785.412 CMAC_LOG_DHCP_COMPLETE
1w0d: 606785.424 CMAC_LOG_STATE_CHANGE establish_tod_state
1w0d: 606785.428 CMAC_LOG_TOD_REQUEST_SENT 172.17.110.136
1w0d: 606785.440 CMAC_LOG_TOD_REPLY_RECEIVED 3179817738
1w0d: 606785.440 CMAC_LOG_TOD_COMPLETE
1w0d: 606785.440 CMAC_LOG_STATE_CHANGE security_association_state
1w0d: 606785.444 CMAC_LOG_SECURITY_BYPASSED
1w0d: 606785.444 CMAC_LOG_STATE_CHANGE configuration_file_state
1w0d: 606785.444 CMAC_LOG_LOADING_CONFIG_FILE privacy.cm
1w0d: 606785.560 CMAC_LOG_RNG_REQ_TRANSMITTED
1w0d: 606785.564 CMAC_LOG_RNG_RSP_MSG_RCVD
133.CABLEMODEM.CISCO: 1w0d: %LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0,
changed state to up
1w0d: 606786.460 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
1w0d: 606786.460 CMAC_LOG_STATE_CHANGE registration_state
1w0d: 606786.464 CMAC_LOG_REG_REQ_MSG_QUEUED
1w0d: 606786.468 CMAC_LOG_REG_REQ_TRANSMITTED
1w0d: 606786.472 CMAC_LOG_REG_RSP_MSG_RCVD
1w0d: 606786.472 CMAC_LOG_COS_ASSIGNED_SID 1/1
1w0d: 606786.472 CMAC_LOG_RNG_REQ_QUEUED 1
1w0d: 606786.472 CMAC_LOG_REGISTRATION_OK
1w0d: 606786.476 CMAC_LOG_STATE_CHANGE establish_privacy_state
1w0d: 606786.476 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE machine: KEK, event/state:
EVENT_1_PROVISIONED/STATE_A_START, new state: STATE_B_AUTH_WAIT
1w0d: 606786.480 CMAC_LOG_BPKM_REQ_TRANSMITTED
1w0d: 606786.496 CMAC_LOG_BPKM_RSP_MSG_RCVD
1w0d: 606786.496 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE machine: KEK, event/state:
EVENT_3_AUTH_REPLY/STATE_B_AUTH_WAIT, new state: STATE_C_AUTHORIZED
1w0d: 606787.176 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE machine: TEK, event/state:
EVENT_2_AUTHORIZED/STATE_A_START, new state: STATE_B_OP_WAIT
1w0d: 606787.184 CMAC_LOG_BPKM_REQ_TRANSMITTED
1w0d: 606787.188 CMAC_LOG_BPKM_RSP_MSG_RCVD
1w0d: 606787.192 CMAC_LOG_PRIVACY_FSM_STATE_CHANGE machine: TEK, event/state:
EVENT_8_KEY_REPLY/STATE_B_OP_WAIT, new state: STATE_D_OPERATIONAL
1w0d: 606787.200 CMAC_LOG_PRIVACY_INSTALLED_KEY_FOR_SID 1
1w0d: 606787.200 CMAC_LOG_PRIVACY_ESTABLISHED
1w0d: 606787.204 CMAC_LOG_STATE_CHANGE maintenance_state
1w0d: 606787.560 CMAC_LOG_RNG_REQ_TRANSMITTED

```

[从 CMTS 显示 show controller 命令](#)

sydney# show controllers cable 2/0

Interface Cable2/0

Hardware is MC16B

BCM3210 revision=0x56B0

idb 0x619705D8 MAC regs 0x3D100000 PLX regs 0x3D000000

rx ring entries 1024 tx ring entries 128 MAP tx ring entries 128

Rx ring 0x4B0607C0 shadow 0x6198DDF8 head 272

Tx ring 0x4B062800 shadow 0x6198EE68 head 127 tail 127 count 0

MAP Tx ring 0x4B062C40 shadow 0x6198F2D8 head 33 tail 33 count 0

MAP timer sourced from slot 2

throttled 0 enabled 0 disabled 0

Rx: spurious 769 framing_err 0 hcs_err 1 no_buffer 0 short_pkt 0

no_enqueue 0 no_enp 0 miss_count 0 latency 8

invalid_sid 0 invalid_mac 0 bad_ext_hdr_pdu 0 concat 0 bad-concat 0

Tx: full 0 drop 0 stuck 0 latency 0

MTx: full 0 drop 0 stuck 0 latency 9

Slots 132642 NoUWCollNoEngy 2 FECorHCS 1 HCS 1

Req 1547992064 ReqColl 0 ReqNoise 14211 ReqNoEnergy 1547905820

ReqData 0 ReqDataColl 0 ReqDataNoise 0 ReqDataNoEnergy 0

Rng 89613 RngColl 0 RngNoise 255

FECBlks 248575 UnCorFECBlks 2 CorFECBlks 0

MAP FIFO overflow 0, Rx FIFO overflow 0, No rx buf 0

DS FIFO overflow 0, US FIFO overflow 0, US stuck 0

Bandwidth Requests= 0x11961

Piggyback Requests= 0xECC1

Ranging Requests= 0x15D15

Timing Offset = 0x0

Bad bandwidth Requests= 0x0

No MAP buffer= 0x0

Cable2/0 Downstream is up

Frequency not set, Channel Width 6 MHz, 64-QAM, Symbol Rate 5.056941 Msps

FEC ITU-T J.83 Annex B, R/S Interleave I=32, J=4

Downstream channel ID: 0

Cable2/0 Upstream 0 is up

Frequency 27.984 MHz, Channel Width 1.600 MHz, QPSK Symbol Rate 1.280 Msps

Spectrum Group is overridden

SNR 29.8280 dB

Nominal Input Power Level 0 dBmV, Tx Timing Offset 2815

Ranging Backoff automatic (Start 0, End 3)

Ranging Insertion Interval automatic (60 ms)

Tx Backoff Start 0, Tx Backoff End 4

Modulation Profile Group 1

Concatenation is enabled

part_id=0x3137, rev_id=0x03, rev2_id=0xFF

nb_agc_thr=0x0000, nb_agc_nom=0x0000

Range Load Reg Size=0x58

Request Load Reg Size=0x0E

Minislot Size in number of Timebase Ticks is = 8

Minislot Size in Symbols = 64

Bandwidth Requests = 0x11969

Piggyback Requests = 0xECC8

Invalid BW Requests= 0x0

Minislots Requested= 0x1C13EF

Minislots Granted = 0x1C13EF

Minislot Size in Bytes = 16

Map Advance (Dynamic) : 2454 usecs

UCD Count = 40287

已解释的计时器



T1	10 秒	等待可用UCD的时间
T2	12 秒	等待广播测距的初始维护间隔的时间
T3	200 毫秒	在测距期间等待RNG-RSP的时间。
T4	30 秒	等待站维护间隔执行站维护范围的时间。
T6	6 秒	注册期间等待REG-RSP的时间。

CMTS 配置示例

sydney# **wr t**

Building configuration...

Current configuration:

```

!
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname sydney
!
boot system flash ubr7200-ik1s-mz_121-2_T.bin
no logging buffered
enable password cisco
!
no cable qos permission create
no cable qos permission update
cable qos permission modems
!
!
!
!
ip subnet-zero
no ip domain-lookup
!
!
!
!
!
interface FastEthernet0/0
 no ip address
 shutdown
 half-duplex
!
interface Ethernet1/0
 ip address 172.17.110.139 255.255.255.224
!
interface Ethernet1/1
 no ip address
 shutdown
!
interface Ethernet1/2
 no ip address
 shutdown
!

```

```
interface Ethernet1/3
  no ip address
  shutdown
!
interface Ethernet1/4
  no ip address
  shutdown
!
interface Ethernet1/5
  no ip address
  shutdown
!
interface Ethernet1/6
  no ip address
  shutdown
!
interface Ethernet1/7
  no ip address
  shutdown
!
interface Cable2/0
  ip address 10.10.1.1 255.255.255.0 secondary
  ip address 10.1.1.10 255.255.255.0
  no keepalive
  cable downstream annex B
  cable downstream modulation 64qam
  cable downstream interleave-depth 32
  cable upstream 0 frequency 28000000
  cable upstream 0 power-level 0
  no cable upstream 0 shutdown
  cable upstream 1 shutdown
  cable upstream 2 shutdown
  cable upstream 3 shutdown
  cable upstream 4 shutdown
  cable upstream 5 shutdown
  cable dhcp-giaddr policy
  cable helper-address 172.17.110.136
!
interface Cable3/0
  no ip address
  no keepalive
  shutdown
  cable downstream annex B
  cable downstream modulation 64qam
  cable downstream interleave-depth 32
  cable upstream 0 shutdown
  cable upstream 1 shutdown
  cable upstream 2 shutdown
  cable upstream 3 shutdown
  cable upstream 4 shutdown
  cable upstream 5 shutdown
!
ip classless
ip route 0.0.0.0 0.0.0.0 172.17.110.129
no ip http server
!
!
line con 0
  exec-timeout 0 0
  transport input none
line aux 0
line vty 0
  exec-timeout 0 0
  password cisco
```

```
login
line vty 1 4
  password cisco
  login
!
end
```

```
sydney# show version
```

```
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (UBR7200-IK1S-M), Version 12.1(2)T, RELEASE SOFTWARE (fc1)
Copyright (c) 1986-2000 by cisco Systems, Inc.
Compiled Tue 16-May-00 13:36 by ccai
Image text-base: 0x60008900, data-base: 0x613E8000
```

```
ROM: System Bootstrap, Version 11.1(10) [dschwart 10], RELEASE SOFTWARE (fc1)
BOOTFLASH: 7200 Software (UBR7200-BOOT-M), Version 12.0(10)SC,
EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)
```

```
sydney uptime is 1 day, 4 hours, 31 minutes
System returned to ROM by reload
System image file is "slot0:ubr7200-ik1s-mz_121-2_T.bin"
```

```
cisco uBR7223 (NPE150) processor (revision B) with 57344K/8192K bytes of memory.
Processor board ID SAB0249006T
R4700 CPU at 150Mhz, Implementation 33, Rev 1.0, 512KB L2 Cache
3 slot midplane, Version 1.0
```

```
Last reset from power-on
Bridging software.
```

```
X.25 software, Version 3.0.0.
8 Ethernet/IEEE 802.3 interface(s)
1 FastEthernet/IEEE 802.3 interface(s)
2 Cable Modem network interface(s)
125K bytes of non-volatile configuration memory.
1024K bytes of packet SRAM memory.
```

```
20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x2102
```

[相关信息](#)

- [使用Cisco DOCSIS配置器构建DOCSIS 1.0配置文件\(仅限注册客户\)](#)
- [技术支持 - Cisco Systems](#)