# 排除uBR纜線資料機無法聯機故障

## 目錄



## 簡介

本檔案將討論纜線資料機(CM)在連線和IP連線之前經歷的不同狀態。本文檔重點介紹最常用的Cisco IOS®軟體故障排除命令，以驗證CM處於什麼狀態，以及可能導致數據機達到該狀態的原因。舉例說明了在電纜數據機終端系統(CMTS)和CM上調試和show命令。本文還討論了為達到正確狀態可以採取的一些步驟，其中包括`online`狀態，如`online(pt)`或`online(d)`。

**註：請**參閱瞭解電纜數據機初始化的基本工作原理流程圖和快速概述。

## 開始之前

### 慣例

如需文件慣例的詳細資訊，請參閱思科技術提示慣例。

## 必要條件

閱讀本文時應熟悉DOCSIS協定。

## 採用元件

本文件所述內容不限於特定軟體和硬體版本。

# 電纜數據機狀態故障排除

在CMTS中使用的第一個也是最有用的命令是show cable modem:

```
sydney# show cable modem

Interface   Prim Online     Timing Rec    QoS CPE IP address      MAC address
            Sid  State      Offset Power
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
```

上面的狀態欄位顯示CM處於什麼狀態。該欄位可以具有以下值：

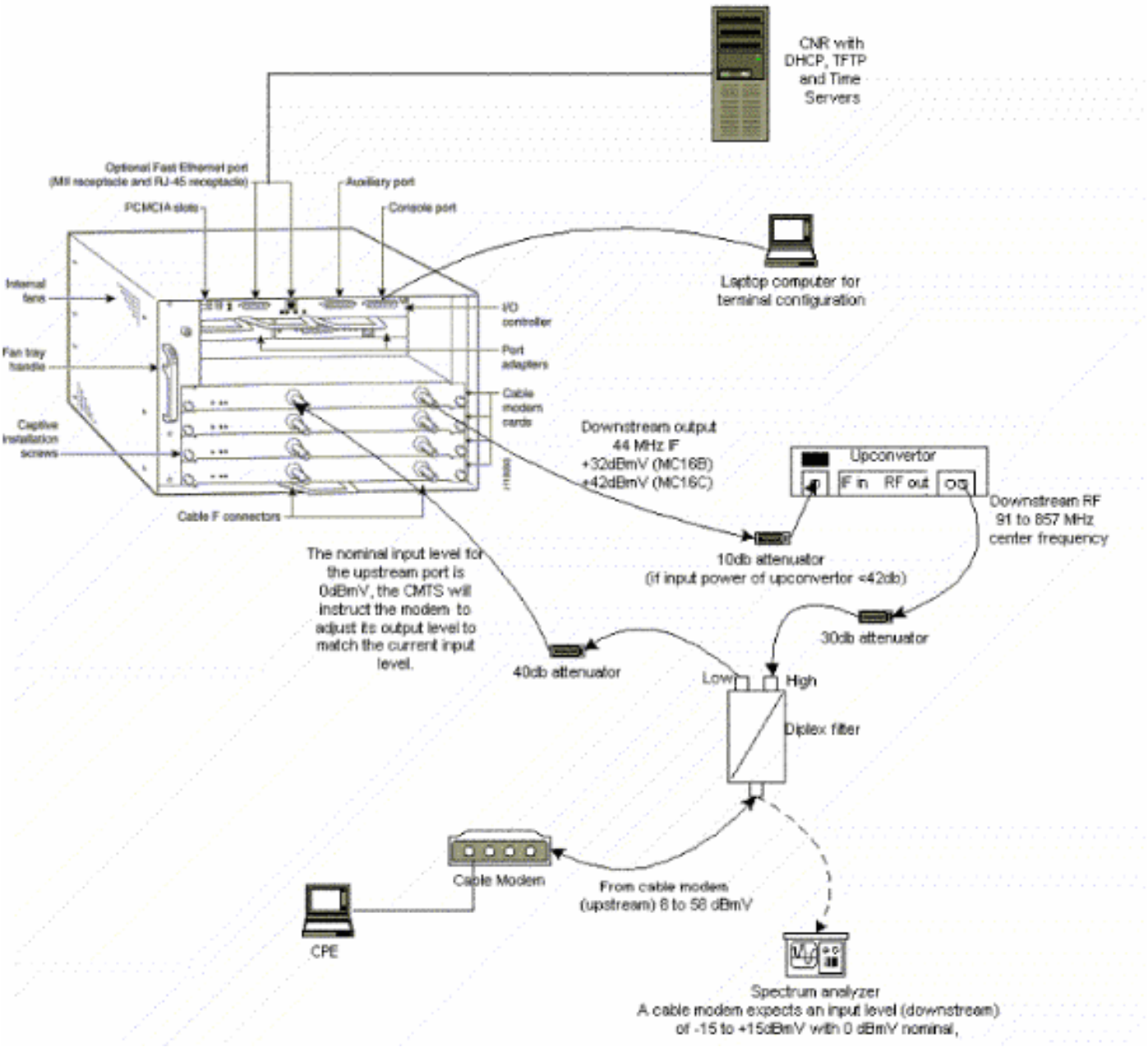
| CM狀態（如CMTS所示） | 含義 |
|---|---|
| | 電纜數據機被視為離線 |
| init(r1) | 電纜數據機傳送初始測距資訊 |
| init(r2) | 電纜數據機正在測距 |
| init(rc) | 電纜數據機測距完成 |
| init(d) | 已收到DHCP請求 |
| init(i) | 收到DHCP回覆；已分配IP地址 |
| init(t) | TOD交換已啟動 |
| init(o) | 選項檔案傳輸已啟動 |
| | 已註冊電纜數據機，已啟用資料 |
| (d) | 已註冊電纜數據機，但電纜數據機的網路訪問已禁用 |
| (pk) | 已註冊電纜數據機，已啟用BPI並分配了KEK |
| online(pt) | 已註冊電纜數據機，已啟用BPI並分配了TEK |
| (pk) | KEK數據機金鑰分配被拒絕 |
| reject(pt) | TEK數據機金鑰分配被拒絕 |
| (m) | 電纜數據機嘗試註冊；由於MIC錯誤（消息完整性檢查），註冊被拒絕 |
| (c) | 電纜數據機嘗試註冊；由於COS（服務類別）錯誤，註冊被拒絕 |

CM端的一個等效命令是show controllers cable-modem 0 mac state ，然後檢視MAC state欄位。我們將主要關注CMTS上show cable modem 命令的輸出顯示的狀態欄位，以及CM上的debug cable-modem mac log verbose。由於後一個命令的輸出顯示可能很大，因此只顯示適用的某些部分。在本技術說明末尾的CM端的Full Debug Capture部分中可找到**debug cable-modem mac log verbose**的完整捕獲。

**注意：**在CMTS上，可以使用**debug cable interface cable x/y sid *sid value* verbose**過濾SID值，然後運行其他debug命令，例如**debug cable range**。這樣，調試輸出將限製為指定的SID值，並且不會影響CMTS效能。

以下各節將討論每個狀態值、可能的原因以及可以採取哪些步驟來達到正確的聯機狀態。

**註：在開始排除任何狀態的故障**前，必須檢視所有纜線資料機的狀態，瞭解此狀態是否適用於所有資料機，還是僅適用於少數資料機，以及此網路是新網路還是現有網路。如果網路是現有網路，則調查最近的任何更改。在本文檔的大部分內容中，假設問題影響所有電纜數據機，並且以下實驗拓撲適用：




上述設定可用於故障排除，排除RF問題，因為此設定不包括有線電視訊號。

**註：**uBR7100具有整合上變頻器，因此不需要外部上變頻器。如需詳細資訊，請參閱設定整合式上變頻器。

## 離線狀態

```
sydney# show cable modem

Interface   Prim Online     Timing Rec    QoS CPE IP address      MAC address
            Sid  State      Offset Power
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
```

從上面的**show cable modem**命令的輸出顯示，我們有4個數據機處於offline狀態。在某些情況下，數據機可能會在其他狀態之間循環，然後返回offline。以下清單列出了數據機無法實現正交幅度調制(QAM)鎖的最常見原因：

- 電纜數據機未連線到網路或未開啟
- 弱載波訊號（雜訊過多）
- 下游中心頻率不正確
- DOCSIS檔案中指定的頻率不正確
- 沒有下行數字QAM調制訊號
- CMTS路由器上**電纜數據機更改頻率**中指定的頻率不正確
- MCxx卡中的填充不正確

下面是從Cable Modem(Kuffing)端擷取的**show controllers cable-modem 0**的輸出顯示：

```
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.
```

從上面我們可以看出，訊雜比估計是16.6dB。理想情況下，此值應至少為30dB，以便CM能夠為64 QAM正常工作。請參閱有線電纜資料服務介面規範(DOCSIS)下游和上游規範的RF規範，以及關於驗證下游訊號的說明。在某些情況下，您可能有大約34dB的良好訊雜比(SNR)，但是仍然有諸如脈衝雜訊之類的雜訊。這通常是由具有干擾數據機訊號的訊號的前向路徑掃描發射器引起的。這只能

由以零跨度模式運行的頻譜分析儀檢測到。

有關使用頻譜分析儀調查噪音問題的詳細資訊，請參閱將Cisco uBR7200系列路由器連線到電纜頭端。**show interfaces cable 2/0 upstream 0**輸出中出現的不可糾正錯誤是脈衝雜訊的一個指示，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
```

**註：**如果不可糾正的錯誤數大於1（10,000中），則最有可能出現脈衝雜訊。

CM處的最佳輸入功率電平是**0dBmV**，接收機的範圍是–15dBmv到+15dBmV。這可以通過頻譜分析儀測量。如果電源過低，您可能需要根據Cisco uBR7200系列硬體安裝指南配置上轉換器。如果訊號太強，那麼您可能需要在高頻埠連線處新增更多衰減。如果某個特定頻率包含太多雜訊，則可能需要在頻譜中選擇其他頻率。

**註：**uBR7100具有整合上變頻器。如需詳細資訊，請參閱設定整合式上變頻器。

**注意：** 如果問題只影響一個或幾個數據機，而其它幾個數據機運行正常，則問題不太可能出現在上轉換器端。發生這種情況時更改上變頻器配置會嚴重降低網路的其餘部分。

要確認CM無法實現QAM鎖定，請開啟**debug cable-modem mac log verbose**，您應該會看到類似以下的輸出：

```
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      80/93000000/105000
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
::::::::::::::::::::::::::::::::::::::::::::::::              ::::::::::
```

**註：如**果電纜數據機鎖定到特定的下行頻率，則它將始終以該頻率開始掃描，除非清除配置。（請參閱調試示例。）如果下游頻率值已更改，它會繼續掃描其他頻率，直到鎖定到另一個頻率。鎖定後，它將儲存新值以供下次使用。另外值得注意的是，CMTS上的組態指令**cable downstream frequency**只是無關緊要的，對上變頻器輸出頻率沒有影響，只有具有整合式上變頻器的uBR7100的情況除外。在12.1版之前的Cisco IOS版本中，CM將自動新增**cable-modem downstream saved channel**命令，該命令可見且可配置。在12.1及更高版本中，此命令在配置中不再可配置或可見。

CM無法實現QAM鎖定的另一個原因是，上變頻器上配置的下游中心頻率不正確，例如，北美頻道100-100的標準6 MHz頻道頻段的National Television Systems Committee(NTSC)頻率對映使用中心頻率為651 MHz的648.0-654.0。大多數上變頻器使用中心影片載頻。但是，上轉換器GI C6U或C8U使用低於中心頻率的1.75MHz，則需要為通道100-100設定649.25 MHz的頻率。要瞭解為什麼GI上轉換器使用此頻率，請閱讀Cable Radio Frequency(RF)常見問題(僅限註冊客戶)。

另一個常見的錯誤是，在DOCSIS CPE配置器的「射頻資訊」下的「下游頻率」(**Downstream Frequency)欄位中指定**不正確的頻率值。通常不需要在此選項下指定頻率值。然而，如果需要例如某些數據機需要鎖定在不同頻率，則應選擇如前所述的正確頻率值。以下調試通過CM鎖定說明了這一點，最初在453MHz和535.25MHz（在DOCSIS配置檔案中指定），因此導致數據機重置並無限期地循環此過程：

```
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
```

**註：頻率覆蓋。**

在CMTS路由器上**電纜數據機更改頻率**中指定的頻率不正確也可能會導致CM切換頻率；如果未仔細選擇CMTS上配置的頻率，則會出現與上述類似的結果。CMTS上的**cable modem change-frequency**命令也是可選的，預設情況下通常不使用。

在已經獲取了下游通道之後，下一個任務是找到合適的上游通道。數據機偵聽上游通道描述符(UCD)，該描述符包含上游通道的物理屬性，例如上游頻率、調制、通道寬度以及在DOCSIS 第4部分中討論的突發描述符中定義的其他引數。

找不到可用UCD的數據機可能位於未為其提供上游服務的下游通道上。這可能是頭端配置錯誤。show controllers cable 命令是一個很好的起點。數據機找不到可用UCD的另一個可能原因是，其硬體或MAC可能不支援突發描述符中的引數。這可能是頭端配置錯誤或低於DOCSIS相容數據機。

找到可用的UCD後，數據機將開始偵聽包含上行頻寬分配時間對映的MAP（頻寬分配對映）消息。一部分時間被對映到迷你插槽並分配給單個數據機。在MAP中也有區域用於廣播、基於爭用的初始維護（或廣播）範圍。在CMTS以測距響應(RNG-RSP)響應之前，數據機必須傳送其初始測距請求。

在T2計時器到期前找不到初始維護區域的數據機可能是頭端配置錯誤。您還應檢查CMTS上電纜介面的插入間隔。Insertion-interval被用作微調參數，以控制CMTS允許數據機在註冊期間命中DHCP伺服器的速度，因此可在任何型別的大規模中斷後間接控制DHCP/TFTP/TOD伺服器負載。它直接控制恢復網路的時間長度。

**注意**：插入間隔設定不正確將導致數小時的資料機離線，而調配伺服器的負載為零。insertion-interval的最佳值是**automatic**。

文檔確定CMTS上的RF或配置問題對電纜廠中的RF問題有非常詳細的說明。

## 範圍進程 — init(r1)、init(r2)和init(rc)狀態

在這個階段，CM開始測距過程以計算必要的發射功率電平以在其期望的輸入功率電平到達CMTS。在生產網路中，相當好的發射功率大約為40 - 50 dBmV。其他硬體可能有所不同。與下行通道一樣，上行通道中的載波應當足夠強，以使CMTS接收機能夠識別符號。過高的訊號將在返回的RF網路的主動傳輸中引起失真和互調，這將導致增加的位元誤位元速率，包括資料的全部丟失。這是由於訊號被截斷。

CM向CMTS傳送測距請求(RNG-REQ)消息並等待測距響應(RNG-RSP)消息或T3計時器過期。如果發生T3超時，則重試計數增加。如果重試次數小於最大重試次數，數據機將在更高功率級別傳送另一個RNG-REQ。由於CMTS沒有為數據機分配用於MAP中單播傳輸的服務識別符號(SID)，因此該測距過程在MAP的初始維護或廣播區域中發生。因此，廣播範圍是競爭性的，並且可能會發生衝突。為了補償這一點，數據機具有測距回退演算法以計算RNG-REQ傳輸之間的隨機回退時間。可以使用cable upstream range-backoff 命令對此進行配置。當CMTS的發射功率達到足夠的水準時，它將用包含臨時SID的RNG-RSP響應RNG-REQ。此SID將用於標識MAP中的單播傳輸區域以進行單播範圍。

以下輸出顯示CM的SID 6處於**init(r1)狀**態，指示CM無法通過初始測距階段：

```
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
```

以下調試顯示出CM如何在T3計時器過期並超出重試次數後無法完成測距過程和重置。請注意來自CMTS的**CMAC_LOG_ADJUST_TX_POWER**消息，該消息要求CM調整其電源：

```
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
```

**附註：** init(r1) is `ranging_1_stateinit(r2)` is `ranging_2_stateCM`

```
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 mcfilter 00000000  data mcfilter 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)
```

如果數據機不能脫離測距狀態運行，則可能是因為傳輸功率級別不足。在設定中，上述發射功率可以通過調節低頻埠處的衰減來調節。衰減增加將導致發射功率電平增加。衰減大約20-30 dB是一個很好的起點。在初始測距初始化(r1)之後，數據機繼續進入init(r2)，在該處數據機必須配置傳輸定時偏移和功率級別，以確保來自數據機的傳輸在正確的時間被接收，並且在CMTS接收機處處於可接受的輸入功率級別。這是通過單播RNG-REQ和RNG-RSP消息的會話執行的。RNG-RSP消息包含數據機必須進行的電源和定時偏移校正。數據機繼續傳送RNG-REQ並執行每個RNG-RSP的調整，直到RNG-RSP消息指示測距成功或通過到達init(rc)狀態來測距完成。如果數據機不能從init(r2)開始運行，則需要最佳化傳輸功率。下面是處於init(r2)狀態的CM的輸出顯示。

```
sydney# show cable modem

Interface   Prim Online     Timing Rec    QoS CPE IP address      MAC address
            Sid  State      Offset Power
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
```

**註：**「Rec Power（接收功率）」列旁邊的*符號，表示此數據機的雜訊功率調整方法處於活動狀態。如果您看到一個！這表示數據機已達到其最大傳輸功率。

在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
```

如果這是測試路由器或實驗室路由器，您還可以使用**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：在通用寬頻路由器(uBR)上運行debug ip udp命令無法與訪問清單結合使用，因為這可能導致uBR為了與調試保持同步而停止系統。**在這種情況下，所有數據機都可能失去同步，並且調試將無用。建議使用網路分析器跟蹤CMTS內外IP資料包，並且debug IP命令僅作為最後手段使用。

**注意：**上述訪問清單是全域性配置的，對IP操作沒有影響。在**debug ip packet detail**期間，它用於將調試限製為指定IP地址。請確保先執行**偵錯清單**101。

如果透過偵錯訊息沒有看到封包，請檢查此資料機所連線的電纜介面上的cable helper-address陳述式的組態。如果配置正確，並且DHCP伺服器子網的資料包跟蹤也顯示沒有來自數據機的DHCP資

料包，則最好檢視數據機電纜介面的輸出錯誤或uBR電纜介面的輸入錯誤。

如果發現資料包被傳輸到DHCP伺服器子網中，最好仔細檢查數據機調試消息，檢視是否存在引數請求或分配錯誤。這是故障排除的階段，在此階段應調查數據機與DHCP伺服器之間的路由。建議再次檢查DHCP伺服器配置和DHCP日誌。

以下是執行**debug cable-modem mac log verbose**指令在CM上進行的偵錯範例：

```
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
```

如上圖所示，DHCP進程失敗且電纜數據機已重置。

如果使用Cisco Network Registrar(CNR)，請閱讀使用Cisco Network Registrar Debugs對有線網路中的DHCP問題進行故障排除以幫助您排除init(d)故障。本文包含有關如何使用CNR調試的詳細資訊。

## DHCP - init(d)狀態

成功測距後的下一階段是通過DHCP獲取網路配置。CM傳送DHCP請求，CMTS在兩個方向上中繼這些DHCP資料包。以下是**show cable modem**的輸出顯示，顯示init(d)中具有SID 7的數據機，表示從電纜數據機接收了DHCP請求：

```
sydney# show cable modem

Interface   Prim Online     Timing Rec    QoS CPE IP address      MAC address
            Sid  State      Offset Power
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**：電纜數據機無限期地從init(r1)循環到init(d)。可能的原因如下：

- CMTS中缺少**cable helper-address** ip address 命令或ip address*不正確*
- 從CMTS到DHCP伺服器的IP連線問題
- DHCP伺服器關閉
- 在DHCP伺服器上配置的預設網關錯誤
- CM的低發射功率或低上游SNR，請參閱RF規範。
- DHCP伺服器過載
- DHCP伺服器的IP地址不足
- 為數據機保留的IP地址在錯誤的範圍內，請參閱Understanding IP Address Management in Network Registrar GUI User's Guide。

**注意**：驗證DHCP伺服器上設定的預設網關是否正確。檢驗IP連通性的一種方法是使用擴展ping，其中源IP地址是CMTS電纜介面上配置的主地址，目標是DHCP伺服器的IP地址。可以用輔助IP地址作為源地址來重複此過程，以驗證CPE是否具有IP連線。請參閱CMTS範例設定。

DHCP過程由傳送廣播DHCP DISCOVER消息的電纜數據機啟動。如果DHCP伺服器使用OFFER響應DISCOVER，數據機可以選擇傳送REQUEST以獲得提供的配置。DHCP伺服器可以使用已確認(ACK)或未確認(NAK)進行響應。NAK可能是由不相容的IP地址和網關地址造成的，如果數據機從一個下游通道跳到位於不同子網上的另一個下游通道，則會出現這種情況。當數據機請求續訂租約時，DHCP請求消息的IP地址和網關地址將不同，並且DHCP伺服器將使用NAK拒絕請求。這種情況很少發生，數據機將簡單地釋放租期並以DHCP DISCOVER消息重新開始。

通常，DHCP狀態中的錯誤表現為超時，而不是NAK。DHCP消息的順序應為DISCOVER、OFFER、REQUEST和ACK。如果數據機正在從DHCP伺服器傳送沒有OFFER響應的DISCOVER，請開啟CMTS上的IP調試。這可以通過以下步驟完成：

## DHCP - init(i)狀態

收到對DHCP請求的回覆並為電纜數據機分配的IP地址後，**show cable modem**提供的下一個地址為`init(i)`：

```
sydney# show cable modem

Interface   Prim Online     Timing Rec    QoS CPE IP address      MAC address
            Sid  State      Offset Power
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
```

從上面看，具有SID 7的**電纜數**據機永遠不會`init(i)`。 重複的**show cable modem**顯示通常顯示init(r1)、init(r2)、init(rc)、init(d)和init(i)之間的電纜數據機循環。

纜線資料機無法比init(i)更進階的原因可能有多種。 以下是最常見問題清單：

- DHCP伺服器中指定的DOCSIS檔案不正確或無效
- TFTP伺服器問題，例如IP地址不正確、TFTP伺服器無法訪問
- 獲取TOD或定時偏移時出現問題
- DHCP配置中的路由器設定不正確

由於纜線資料機已經到達了init(i)，因此我們知道它已經到達了IP位址。這可以在以下纜線資料機上**debug cable-modem mac log verbose**輸出的輸出畫面中清楚顯示：

```
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
```

同樣地，TFTP伺服器問題也會產生類似的錯誤，導致CM重置並在同一進程中無限循環：

```
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
```

測試TFTP伺服器的方法是，嘗試將小型檔案（例如DOCSIS組態檔）下載到CMTS的快閃卡中。這通過使用**copy tftp flash**命令完成。請注意，在下面的輸出中，嘗試開啟名為platinum.cm的檔案時出錯。原因是CMTS無法連線到TFTP伺服器的IP地址172.17.110.100，因為它是假的。

```
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#
```

此處需要檢查與TFTP伺服器的連線。

獲取一天中的時間(TOD)或定時偏移量時也會導致數據機不能進入聯機狀態：

```
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
```

**註：**在Cisco IOS軟體版本12.1(1)之前的版本中，需要在DHCP伺服器中指定TOD才能使電纜數據機聯機。但是，在Cisco IOS軟體版本12.1(1)之後，不需要使用TOD，但電纜數據機仍需要獲得定時偏移，如以下調試所示：

```
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.
```

在下面的調試中，我們沒有指定**time-server**，但在DHCP伺服器中配置了定時偏移，因此電纜數據機開始聯機：

```
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
```

有關所需的DHCP選項和可選選項的綜合清單，請參閱DHCP和電纜數據機的DOCSIS配置檔案(DOCSIS 1.0)技術說明。

**附註：**附註：將CNR用作DHCP伺服器時經常犯的一個錯誤是，在策略配置選單的Servers選項下選擇NTP伺服器。相反，應在Bootp相容選項下選擇time-offset和time-server。有關配置CNR的詳細資訊，請參閱CNR文檔中的配置DHCP。

在DHCP伺服器中不包括路由器選項設定，或在Router option欄位中指定無效的IP地址，也會導致

數據機不能超出init(i)狀態，如下面的**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
```

**註：無效的DOCSIS配置文**件，特別是在[DOCSIS CPE配置器的服務類別中將最大上行傳輸突發量設定為255的配置檔案，可能阻止數據機繼續執行，而非init(i)](#)。 這在早期的DOCSIS規範中是常見的，該規範將該值設定為迷你插槽單元。建議的值為1600或1800位元組。

## TOD交換 — init(t)狀態

數據機獲取其網路引數後，必須從「一天中的時間」(TOD)伺服器請求一天中的時間。TOD使用UTC時間戳（從1970年1月1日起的秒數）。 與DHCP的時間偏移選項值組合使用時，可以計算當前時間。時間用於系統日誌和事件日誌的時間戳。

下方是init(t)中具有SID 1和2的電纜資料機。 請注意，對於較新IOS(低於Cisco IOS軟體版本12.1(1)版本)，電纜數據機將仍然聯機，即使TOD交換失敗，請參閱下面的**show cable modem**命令之後的調試輸出：

```
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
```

以下是從執行Cisco IOS軟體版本12.0(7)T的纜線資料機中擷取的偵錯，顯示由於TOD計時器到期而重新設定的資料機。在這種情況下，數據機永遠不會達到聯機狀態。

```
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.
```

一天中的時間錯誤幾乎總是指向DHCP配置錯誤。可能導致TOD錯誤的錯誤配置包括網關地址配置錯誤或TOD伺服器地址錯誤。確保您可以ping通time-server以排除IP連線問題，同時確保該time-server可用。

出於故障排除目的，可以將CMTS配置為ToD伺服器。命令如下：

```
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
```

當CMTS設定為ToD時，一些可用於調試ToD問題的命令是**show cable clock**、**show controllers clock-reference**。

## 選項檔案傳輸已開始 — init(o)狀態

纜線資料機的主要組態和管理介面是從布建伺服器下載的組態檔。此配置檔案包含：

- 下行通道和上行通道的識別和特性
- 服務類別設定
- 基線隱私設定
- 常規操作設定
- 網路管理資訊
- 軟體升級欄位
- 篩選條件
- 供應商特定設定

纜線資料機停滯在init(o)狀態通常表示纜線資料機已啟動或準備下載組態檔，但由於以下可能原因而未成功：

- 不正確，已損壞(例如：ASCII（而不是二進位制），或缺少DOCSIS配置檔案無法訪問TFTP伺服器，可能不可用、太忙或沒有IP連線
- DOCSIS檔案中無效或缺少配置引數
- TFTP伺服器上的檔案許可權錯誤

**注意：**您可能並不總是看到init(o)，而是看到init(i)，然後從init(r1)循環到init(i)。通過顯示**show controller cable-modem 0 mac state** 的輸出可以得出更準確的狀態。以下是精簡顯示：

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

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

以下**show cable modem**命令之後的**debug cable-modem mac log verbose**不會告訴您是配置檔案正在損壞還是TFTP伺服器出現故障。首批資料都指向了這兩者。

```
sydney# show cable modem

Interface   Prim Online     Timing Rec    QoS CPE IP address      MAC address
            Sid  State      Offset Power
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 1w3d: 880762.652 CMAC_LOG_RNG_REQ_TRANSMITTED 1w3d: 880762.652 CMAC_LOG_RNG_RSP_MSG_RCVD
133.CABLEMODEM.CISCO: 1w3d: %LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0,
changed state to up 1w3d: 880762.928 CMAC_LOG_CONFIG_FILE_TFTP_FAILED           -1
1w3d: 880762.932 CMAC_LOG_CONFIG_FILE_PROCESS_COMPLETE
1w3d: 880762.932 CMAC_LOG_RESET_CONFIG_FILE_READ_FAILED
1w3d: 880762.932 CMAC_LOG_STATE_CHANGE                      reset_interface_state
1w3d: 880762.932 CMAC_LOG_STATE_CHANGE                      reset_hardware_state
```

DOCSIS CPE Configurator中的無效配置引數的示例無效或缺少供應商ID或供應商特定資訊。除以下消息外，該結果與上述調試類似：

```
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
```

## 聯機、聯機(d)、聯機(pk)、聯機(pt)狀態

```
sydney#show cable modem

Interface   Prim Online     Timing Rec    QoS CPE IP address      MAC address
            Sid  State      Offset Power
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
```

除線上(d)外，線上、線上(pk)和線上(pt)表明CM已經達到線上狀態並能夠傳送和接收資料。不過，Online(d)表示數據機已聯機，但被拒絕訪問網路。這通常是由在DOCSIS CPE Configurator的Radio Frequency info下禁用Network Access選項造成的。已啟用網路訪問的預設值。瞭解如何建立拒絕連線到CM的PC的DOCSIS配置檔案。

從上面的**show cable modem**和**debug cable-modem mac log verbose**的顯示中可以清楚看到這種情況：

```
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
```

另一種檢查方法是檢查纜線資料機上**show controllers cable-modem 0 mac state** 的輸出。

*（顯示開始已被省略）*

```
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
```

*（其餘的顯示內容被省略。）*

Online表示數據機已聯機並能夠與CMTS通訊。如果未啟用基線隱私介面(BPI)，則聯機狀態為預設狀態（假設電纜數據機初始化成功）。如果配置了BPI，您將看到線上狀(pk)，然後很快看到在(pt)。 以下是在CM端顯示調試輸出，其中**debug cable-modem mac log verbose**僅顯示註冊部分：

```
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
```

通常，如果BPI出現問題，您將看到reject(pk)，表示我們無法通過金鑰身份驗證階段。這在reject(pk)和reject(pt)一節中介紹。

**注意**：要獲得正確的BPI操作，請確保CMTS和CM都運行啟用了BPI的映像，該映像由映像名稱中的符號K1表示。另請確保在DOCSIS CPE Configurator中的Class of Service選項下將**Baseline**

Privacy Enable欄位設定為1。如果CMTS正在運行啟用BPI的映像，而CM未運行，並且我們在DOCSIS CPE配置器中啟用了BPI，那麼您將看到數據機在聯機與離線之間循環。

## 線上退貨

當纜線資料機在Telco Return環境中連線時，它們會顯示「T」，而不是顯示上游連線埠，例如「U0」。 以下輸出顯示了此情況

```
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
```

上面的輸出顯示了混合環境中纜線資料機處於聯機狀態。請注意，SID為97、99和100的電纜數據機使用上行埠0，而其餘的電纜數據機使用telco返回上行路徑。Telco Return的設定和疑難排解程式不在本檔案的範圍之內。閱讀器可參閱Cisco uBR7200系列電纜路由器的Telephone Return和Cisco CMTS的Telco Return，瞭解telco的退貨資訊。

## 拒絕(pk)和拒絕(pt)狀態

以下是CMTS路由器上show cable modem的顯示輸出：

```
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
```

在大多數情況下，BPI配置存在問題時，您將看到reject(pk)。 此狀態通常由以下原因導致：

- 身份驗證請求中CM損壞的公鑰。有關正確事件順序，請參閱調試電纜隱私示例。
- CMTS路由器上存在cable privacy authenticate-modem配置命令，但沒有Radius伺服器。
- Radius伺服器配置不正確。
- Radius伺服器配置不正確。

Reject(pt)是由無效的TEK或流量加密金鑰導致的。

有關詳細資訊，請參閱基線隱私介面規範 。

```
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.
```

以下是授權失敗時CM上的調試輸出示例：

```
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
```

同樣，CMTS路由器上的**debug cable privacy**也會產生以下錯誤：

```
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會無限期地從拒絕(pk)循環到init(r1)。

可能遇到的另一個錯誤是：由於加密匯出限制，某些廠商數據機在介面配置中的CMTS路由器上可能需要以下命令：

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

## 註冊 — 拒絕(m)狀態

配置後，數據機傳送註冊請求(REG-REQ)，該請求包含配置設定的必需子集以及CM和CMTS消息完整性檢查(MIC)。 CM MIC是對配置檔案設定的雜湊計算，它為數據機提供了一種方法，確保配置檔案在傳輸過程中未被篡改。CMTS MIC大致相同，只是它還包含有線共用密**碼身份驗證字串**的設定。此共用金鑰由CMTS知道，並確保只有授權數據機才允許向CMTS註冊。

```
sydney# show cable modem

Interface   Prim Online     Timing Rec    QoS CPE IP address      MAC address
            Sid  State      Offset Power
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
```

上面的輸出顯示，SID為1的電纜數據機處於reject(m)狀態。這是由錯誤的消息完整性檢查(MIC)造成的，通常是由以下原因造成的：

- 在電纜介面下配置的電纜共用金鑰與DOCSIS CPE配置器中」選項下的「CMTS身份驗證」值之間不匹配。預設情況下，兩個值都是空的，如果未指定，則不應導致任何問題。
- 配置檔案（DOCSIS檔案）損壞。

以下是使用**debug cable-modem mac log verbose**在電纜數據機端進行的調試輸出。

```
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
```

若要修正此問題，請確保您在CMTS Authentication下有一個有效的組態檔，且有一個與纜線介面下**cable shared-secret** 行中設定的值相同。

## 註冊 — 拒絕(c)狀態

```
sydney# show cable modem

Interface   Prim Online     Timing Rec    QoS CPE IP address      MAC address
            Sid  State      Offset Power
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，由於服務等級(COS)或拒絕(c)，帶有SID 3的電纜數據機註冊失敗。 這通常是由以下原因造成的：

- CMTS路由器無法或不願意授予特定請求的COS
- DOCSIS CPE Configurator中「服務類別」選項中的引數配置錯誤，例如，具有兩個ID相同的服務類別。

下面是**debug cable-modem mac log verbose**（在CM端執行），顯示由於COS錯誤而導致的故障：

```
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
```

同樣，CMTS路由器上的**debug cable registration**也會顯示以下消息：

```
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
請注意數據機最終如何重置並重新開始。

# 附錄

## CM中的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  93000000 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 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端完全調試捕獲

```
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
```

## CMTS中的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
```

## 計時器說明

| | | |
|---|---|---|

| | | |
|---|---|---|
| T1 | 10秒 | 等待可用UCD的時間 |
| T2 | 12秒 | 等待廣播範圍初始維護間隔的時間 |
| T3 | 200毫秒 | 在測距過程中等待RNG-RSP的時間。 |
| T4 | 30秒 | 等待站台維護間隔以執行站台維護範圍所需的時間。 |
| T6 | 6秒 | 註冊期間等待REG-RSP的時間。 |

## CMTS示例配置

```
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
```

# 相關資訊

- 使用Cisco DOCSIS配置器構建DOCSIS 1.0配置文件(僅限註冊客戶)
- 技術支援 - Cisco Systems