

Como decodificar o certificado DOCSIS para o diagnóstico de estado estacionado do modem

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Introduction

Este documento descreve as etapas para decodificar o certificado DOCSIS para diagnosticar por que os modems a cabo estão presos no estado reject(pk) ou w-reject(pk) no Cable Modem Termination System (CMTS).

Informações de Apoio

Em vários casos, os modems acabam no estado reject(pk). Pode ser causado por condições específicas, por exemplo, no certificado CM, o emissor CM não corresponde ao nome do requerente da AC.

Por exemplo:

```
SLOT 5/0: May 10 10:13:48.272 CET: Got Issuer 0^A^A1^K0 ^F^CU^D^F^S^BTW1^\0^Z^F^CU^D
^S^SHitron Technologies1^00
^F^CU^D^K^S^FDOCSIS1C0A^F^CU^D^C^S:Hitron Technologies Cable Modem Root Certificate Authority
from Certificate.
SLOT 5/0: May 10 10:13:48.272 CET: Got a new Invalid CM cert from a84e.3fdd.84c4
SLOT 5/0: May 10 10:13:48.272 CET: CA Cert Subject does not match CM Cert Issuer
SLOT 5/0: May 10 10:13:48.272 CET: BPI+ CM Cert Dump:

SLOT 5/0: May 10 10:13:48.272 CET: Failed CM Issuer not found. CMTS sent AUTH reject.
SLOT 5/0: May 10 10:13:48.272 CET: Sending KEK REJECT. Reason Code:6 Reason:16
SLOT 5/0: May 10 10:13:48.272 CET: BPI Authorization Reject Packet: a84e.3fdd.84c4
```

Essa saída não mostra claramente a causa raiz do problema.

Este artigo pode ser usado para produzir um certificado legível (que pode ser aberto por openssl ou KeyChain no Mac), para identificar a incompatibilidade.

Requirements

A Cisco recomenda que você tenha conhecimento destes tópicos:

- BPI (Base Line Privacy) em DOCSIS
- Sistema de terminação de modem a cabo (CMTS)

Tip: Para entender melhor a privacidade da linha base no DOCSIS, é recomendável passar pela [privacidade da linha de base DOCSIS 1.0 no artigo do Cisco CMTS](#).

Componentes Utilizados

Este documento não se restringe a versões de software e hardware específicas.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. Se a rede estiver ativa, certifique-se de que você entenda o impacto potencial de qualquer comando.

Procedimento de decodificação

Tarefa 1. Coletar os registros

No CMTS, para obter o dump hex do certificado, você precisa ativar os registros. Digite estes comandos.

```
debug cable mac-address
```

Faça Telnet para a placa de linha e colete os registros do **LINECARD** no CMTS.

```
CMTS#telnet 127.0.0.XY
Trying 127.0.0.XY ... Open
```

```
clc_X_Y>en
clc_X_Y#
clc_X_Y#show log
```

Você pode obter uma saída semelhante a esta.

```
SLOT 5/0: May 10 10:13:48.260 CET: BPI+ Manufacturer Cert Dump: a84e.3fdd.84c4
SLOT 5/0: May 10 10:13:48.260 CET: CA Certificate Dump:
SLOT 5/0: May 10 10:13:48.260 CET: 0x0000: 30 82 03 22 30 82 02 0A A0 03 02 01 02 02 10 43
SLOT 5/0: May 10 10:13:48.260 CET: 0x0010: 64 B5 50 E8 ED 7E E5 57 14 5A C0 A2 67 52 EC 30
SLOT 5/0: May 10 10:13:48.260 CET: 0x0020: 0D 06 09 2A 86 48 86 F7 0D 01 01 05 05 00 30 6F
SLOT 5/0: May 10 10:13:48.260 CET: 0x0030: 31 0B 30 09 06 03 55 04 06 13 02 42 45 31 1F 30
SLOT 5/0: May 10 10:13:48.260 CET: 0x0040: 1D 06 03 55 04 0A 13 16 74 43 6F 6D 4C 61 62 73
```

SLOT 5/0: May 10 10:13:48.260 CET: 0x0050: 20 2D 20 45 75 72 6F 2D 44 4F 43 53 49 53 31 15
SLOT 5/0: May 10 10:13:48.260 CET: 0x0060: 30 13 06 03 55 04 0B 13 0C 43 61 62 6C 65 20 4D
SLOT 5/0: May 10 10:13:48.260 CET: 0x0070: 6F 64 65 6D 73 31 28 30 26 06 03 55 04 03 13 1F
SLOT 5/0: May 10 10:13:48.260 CET: 0x0080: 45 75 72 6F 2D 44 4F 43 53 49 53 20 43 61 62 6C
SLOT 5/0: May 10 10:13:48.260 CET: 0x0090: 65 20 4D 6F 64 65 6D 20 52 6F 6F 74 20 43 41 30
SLOT 5/0: May 10 10:13:48.260 CET: 0x00A0: 1E 17 0D 30 34 30 38 31 33 30 30 30 30 30 5A
SLOT 5/0: May 10 10:13:48.260 CET: 0x00B0: 17 0D 32 34 30 38 31 32 32 33 35 39 35 39 5A 30
SLOT 5/0: May 10 10:13:48.260 CET: 0x00C0: 81 86 31 0B 30 09 06 03 55 04 06 13 02 54 57 31
SLOT 5/0: May 10 10:13:48.260 CET: 0x00D0: 1C 30 1A 06 03 55 04 0A 13 13 48 69 74 72 6F 6E
SLOT 5/0: May 10 10:13:48.260 CET: 0x00E0: 20 54 65 63 68 6E 6F 6C 6F 67 69 65 73 31 14 30
SLOT 5/0: May 10 10:13:48.260 CET: 0x00F0: 12 06 03 55 04 0B 13 0B 45 75 72 6F 2D 44 4F 43
SLOT 5/0: May 10 10:13:48.260 CET: 0x0100: 53 49 53 31 43 30 41 06 03 55 04 03 13 3A 48 69
SLOT 5/0: May 10 10:13:48.260 CET: 0x0110: 74 72 6F 6E 20 54 65 63 68 6E 6F 6C 6F 67 69 65
SLOT 5/0: May 10 10:13:48.260 CET: 0x0120: 73 20 43 61 62 6C 65 20 4D 6F 64 65 6D 20 52 6F
SLOT 5/0: May 10 10:13:48.260 CET: 0x0130: 6F 74 20 43 65 72 74 69 66 69 63 61 74 65 20 41
SLOT 5/0: May 10 10:13:48.260 CET: 0x0140: 75 74 68 6F 72 69 74 79 30 81 9F 30 0D 06 09 2A
SLOT 5/0: May 10 10:13:48.260 CET: 0x0150: 86 48 86 F7 0D 01 01 01 05 00 03 81 8D 00 30 81
SLOT 5/0: May 10 10:13:48.260 CET: 0x0160: 89 02 81 81 00 B8 47 DA 9D F1 F6 30 1B 8E 79 BE
SLOT 5/0: May 10 10:13:48.260 CET: 0x0170: BE 10 C3 2D 9F 7D D6 C7 B2 50 16 AB 85 5C 1C 8C
SLOT 5/0: May 10 10:13:48.260 CET: 0x0180: 9E 6B F7 15 60 B2 53 F4 2F 6D 49 0C 2C 3E 76 88
SLOT 5/0: May 10 10:13:48.260 CET: 0x0190: 8A 8A 23 6B 25 47 61 AE B9 DF A8 A7 8C 4D 51 FB
SLOT 5/0: May 10 10:13:48.260 CET: 0x01A0: E6 C2 0F D9 C7 27 DD F7 D8 CC F0 D8 70 F8 75 75
SLOT 5/0: May 10 10:13:48.260 CET: 0x01B0: F3 D8 B7 80 C2 36 B0 53 02 A4 E9 84 02 5F 66 AE
SLOT 5/0: May 10 10:13:48.260 CET: 0x01C0: E7 59 9A 17 4A A0 B1 B4 BA F3 3B 63 C4 75 05 11
SLOT 5/0: May 10 10:13:48.260 CET: 0x01D0: 40 F1 EB B3 C8 A0 E8 AD 6E 1B 59 CC 41 20 F8 94
SLOT 5/0: May 10 10:13:48.260 CET: 0x01E0: B3 94 23 A2 99 02 03 01 00 01 A3 26 30 24 30 12
SLOT 5/0: May 10 10:13:48.260 CET: 0x01F0: 06 03 55 1D 13 01 01 FF 04 08 30 06 01 01 FF 02
SLOT 5/0: May 10 10:13:48.264 CET: 0x0200: 01 00 30 0E 06 03 55 1D 0F 01 01 FF 04 04 03 02
SLOT 5/0: May 10 10:13:48.264 CET: 0x0210: 01 06 30 0D 06 09 2A 86 48 86 F7 0D 01 01 05 05
SLOT 5/0: May 10 10:13:48.264 CET: 0x0220: 00 03 82 01 01 00 09 DB 24 B9 46 76 D7 D0 9F 70
SLOT 5/0: May 10 10:13:48.264 CET: 0x0230: 86 59 ED 7F 9B AC 96 FD AE 19 DD B3 51 3B A5 C0
SLOT 5/0: May 10 10:13:48.264 CET: 0x0240: 98 DA 80 2B 53 26 42 FA 6A 11 9F 6D 16 6F 76 F8
SLOT 5/0: May 10 10:13:48.264 CET: 0x0250: 9A F3 81 53 E8 DB EF 22 DF AC 3F 57 78 0E 70 78
SLOT 5/0: May 10 10:13:48.264 CET: 0x0260: 07 30 1D FF 19 70 34 E5 7A 52 47 99 B0 EE 7F EA
SLOT 5/0: May 10 10:13:48.264 CET: 0x0270: 23 99 DF CB 72 FF 0D BE AB 68 20 9F 16 C0 7C 69
SLOT 5/0: May 10 10:13:48.264 CET: 0x0280: 88 2D 00 6A AF 4B FF 93 A5 07 D3 F2 A8 F9 5B C4
SLOT 5/0: May 10 10:13:48.264 CET: 0x0290: DD 9F BF 49 36 C4 12 8A 64 C8 35 41 BB E2 B9 9B
SLOT 5/0: May 10 10:13:48.264 CET: 0x02A0: 52 45 67 38 DC 92 55 E3 33 A4 70 68 FC E7 6E 54
SLOT 5/0: May 10 10:13:48.264 CET: 0x02B0: 96 CA 89 B4 65 8B 2C AA 58 24 FC 4D 68 D7 84 4E
SLOT 5/0: May 10 10:13:48.264 CET: 0x02C0: 36 3B B3 CA 9A 42 13 B1 FF 8C 66 D8 52 10 56 74
SLOT 5/0: May 10 10:13:48.264 CET: 0x02D0: C7 DD 58 C3 EE 9D E3 65 E6 C1 5D B9 75 C2 A8 C9
SLOT 5/0: May 10 10:13:48.264 CET: 0x02E0: 54 5B A1 85 38 3B E1 E1 DC 55 5D 3E DD 90 ED F8
SLOT 5/0: May 10 10:13:48.264 CET: 0x02F0: 3A B0 68 93 E9 4A C2 D4 7F DC 90 E3 86 E2 CF C3
SLOT 5/0: May 10 10:13:48.264 CET: 0x0300: F2 A3 92 84 B3 A3 9A F8 71 30 F8 24 71 C2 07 BD
SLOT 5/0: May 10 10:13:48.264 CET: 0x0310: E8 6C 3C F7 FC 82 08 86 84 84 1B C4 D8 97 D3 50
SLOT 5/0: May 10 10:13:48.264 CET: 0x0320: 59 72 2D D5 4C 0B
SLOT 5/0: May 10 10:13:48.264 CET: Found existing manufacturer certificate for a84e.3fdd.84c4
with subject cn=Hitron Technologies Cable Modem Root Certificate Authority,ou=Euro-
DOCSIS,o=Hitron Technologies,c=TW
SLOT 5/0: May 10 10:13:48.264 CET: BPI: setting a84e.3fdd.84c4 caidx:3

SLOT 5/0: May 10 10:13:48.264 CET: Mfg serial no. from a84e.3fdd.84c4 certificate:
4364B550E8ED7EE557145AC0A26752EC
SLOT 5/0: May 10 10:13:48.264 CET: Finger print of a84e.3fdd.84c4 manufacturer certificate
matched.
SLOT 5/0: May 10 10:13:48.264 CET: crl0k_clc_snmp_bpplus_broadcast_cert() CA idx:3
state:Chained rowStatus:Active prov:0 len:1078 idx:3 state:Chained rowState:Active prov:0
learn:1 idx:3
SLOT 5/0: May 10 10:13:48.268 CET: BPI: Sent CA Cert to RP successfully.
SLOT 5/0: May 10 10:13:48.268 CET: Success in validating AUTH Info message from a84e.3fdd.84c4.
SLOT 5/0: May 10 10:13:48.268 CET: CMTS Received AUTH REQ from a84e.3fdd.84c4.
SLOT 5/0: May 10 10:13:48.268 CET: BPI Authorization Request Packet: a84e.3fdd.84c4
SLOT 5/0: May 10 10:13:48.268 CET: BPKM Attributes: a84e.3fdd.84c4
SLOT 5/0: May 10 10:13:48.268 CET: Found COMPOUND CM Identification (length = 173):

SLOT 5/0: May 10 10:13:48.268 CET: Found Serial Number (length = 12):
 SLOT 5/0: May 10 10:13:48.268 CET: 32353331 36433030 38303433
 SLOT 5/0: May 10 10:13:48.268 CET: Found Manufacturer ID (length = 3):
 SLOT 5/0: May 10 10:13:48.268 CET: 0050F1
 SLOT 5/0: May 10 10:13:48.268 CET: Found MAC Address (length = 6):
 SLOT 5/0: May 10 10:13:48.268 CET: A84E3FDD 84C4
 SLOT 5/0: May 10 10:13:48.268 CET: Found RSA Public Key (length = 140):
 SLOT 5/0: May 10 10:13:48.268 CET: 30818902 818100B0 D4F2B649 87FCE340
 SLOT 5/0: May 10 10:13:48.268 CET: B21FB1E0 8CFE04DD DB3D05D5 34170886
 SLOT 5/0: May 10 10:13:48.268 CET: 7623EE25 4E4A61FC 6D134830 55F402CF
 SLOT 5/0: May 10 10:13:48.268 CET: 89B11B34 867B3EF7 D9FE6CBE 8B4C251F
 SLOT 5/0: May 10 10:13:48.268 CET: DA5A2E47 D65C2120 8EFC72E2 238D5443
 SLOT 5/0: May 10 10:13:48.268 CET: 786F151A A7FE6C21 371957DD 3FEB8435
 SLOT 5/0: May 10 10:13:48.268 CET: 8AA1B7A2 181DAF7A 4F7DD4E9 128D953C
 SLOT 5/0: May 10 10:13:48.268 CET: 146B77F4 51A9F868 5D1A253F A9590AC0
 SLOT 5/0: May 10 10:13:48.268 CET: F69D24DF 2B84C102 03010001
SLOT 5/0: May 10 10:13:48.268 CET: Found CM Certificate (length = 652):
SLOT 5/0: May 10 10:13:48.268 CET: 30820288 308201F1 A0030201 02020C41
SLOT 5/0: May 10 10:13:48.268 CET: 38344533 46444438 34433430 0D06092A
SLOT 5/0: May 10 10:13:48.268 CET: 864886F7 0D010105 05003081 81310B30
SLOT 5/0: May 10 10:13:48.268 CET: 09060355 04061302 5457311C 301A0603
SLOT 5/0: May 10 10:13:48.268 CET: 55040A13 13486974 726F6E20 54656368
SLOT 5/0: May 10 10:13:48.268 CET: 6E6F6C6F 67696573 310F300D 06035504
SLOT 5/0: May 10 10:13:48.268 CET: 0B130644 4F435349 53314330 41060355
SLOT 5/0: May 10 10:13:48.268 CET: 0403133A 48697472 6F6E2054 6563686E
SLOT 5/0: May 10 10:13:48.268 CET: 6F6C6F67 69657320 4361626C 65204D6F
SLOT 5/0: May 10 10:13:48.268 CET: 64656D20 526F6F74 20436572 74696669
SLOT 5/0: May 10 10:13:48.268 CET: 63617465 20417574 686F7269 7479301E
SLOT 5/0: May 10 10:13:48.268 CET: 170D3137 30313031 30303030 30305A17
SLOT 5/0: May 10 10:13:48.268 CET: 0D333631 32323832 33353935 395A3081
SLOT 5/0: May 10 10:13:48.268 CET: 86310B30 09060355 04061302 5457311C
SLOT 5/0: May 10 10:13:48.268 CET: 301A0603 55040A13 13486974 726F6E20
SLOT 5/0: May 10 10:13:48.268 CET: 54656368 6E6F6C6F 67696573 313D303B
SLOT 5/0: May 10 10:13:48.268 CET: 06035504 0B13344E 6F2E2034 302C2057
SLOT 5/0: May 10 10:13:48.268 CET: 752D6B75 6E672035 74682052 642E2C20
SLOT 5/0: May 10 10:13:48.268 CET: 57752D6B 752C2054 61697065 69204873
SLOT 5/0: May 10 10:13:48.268 CET: 69656E2C 20546169 77616E31 1A301806
SLOT 5/0: May 10 10:13:48.268 CET: 03550403 13114138 3A34453A 33463A44
SLOT 5/0: May 10 10:13:48.268 CET: 443A3834 3A433430 819F300D 06092A86
SLOT 5/0: May 10 10:13:48.268 CET: 4886F70D 01010105 0003818D 00308189
SLOT 5/0: May 10 10:13:48.268 CET: 02818100 B0D4F2B6 4987FCE3 40B21FB1
SLOT 5/0: May 10 10:13:48.268 CET: E08CFE04 DDBB3D05 D5341708 867623EE
SLOT 5/0: May 10 10:13:48.268 CET: 254E4A61 FC6D1348 3055F402 CF89B11B
SLOT 5/0: May 10 10:13:48.268 CET: 34867B3E F7D9FE6C BE8B4C25 1FDA5A2E
SLOT 5/0: May 10 10:13:48.268 CET: 47D65C21 208EFC72 E2238D54 43786F15
SLOT 5/0: May 10 10:13:48.268 CET: 1AA7FE6C 21371957 DD3FEB84 358AA1B7
SLOT 5/0: May 10 10:13:48.268 CET: A2181DAF 7A4F7DD4 E9128D95 3C146B77
SLOT 5/0: May 10 10:13:48.268 CET: F451A9F8 685D1A25 3FA9590A C0F69D24
SLOT 5/0: May 10 10:13:48.268 CET: DF2B84C1 02030100 01300D06 092A8648
SLOT 5/0: May 10 10:13:48.268 CET: 86F70D01 01050500 03818100 08DFC2DA
SLOT 5/0: May 10 10:13:48.268 CET: 8C3ECCDA 98289410 E1B8657A 9A3F220D
SLOT 5/0: May 10 10:13:48.268 CET: AE368029 0E89923F 0DF09E06 8142BAB7
SLOT 5/0: May 10 10:13:48.268 CET: E8A6D5B3 6D7604FF 6A07A8B8 409D0B0B
SLOT 5/0: May 10 10:13:48.268 CET: 6D568AF4 F9395199 AB54126C E9C22F1B
SLOT 5/0: May 10 10:13:48.268 CET: 6390543A 3B67EFB8 FCF0E755 F642E1E0
SLOT 5/0: May 10 10:13:48.268 CET: 273A3853 F4DDBFF1 391E63CE 8BB7BBC0
SLOT 5/0: May 10 10:13:48.268 CET: 8AFC59FC 767C3FA5 A5EB255C 8878F4AB
SLOT 5/0: May 10 10:13:48.272 CET: 63665AA9 CDCF779A 3DFE0C4C
 SLOT 5/0: May 10 10:13:48.272 CET: Found COMPOUND SA Capabilities (length = 13):
 SLOT 5/0: May 10 10:13:48.272 CET: Found Crypto Suite List (length = 6):
 SLOT 5/0: May 10 10:13:48.272 CET: 01000200 0300
 SLOT 5/0: May 10 10:13:48.272 CET: Found BPI Version (length = 1):
 SLOT 5/0: May 10 10:13:48.272 CET: 01
 SLOT 5/0: May 10 10:13:48.272 CET: Found SAID (length = 2):

```

SLOT 5/0: May 10 10:13:48.272 CET:      0000
SLOT 5/0: May 10 10:13:48.272 CET: END BPKM Attributes: a84e.3fdd.84c4
SLOT 5/0: May 10 10:13:48.272 CET: Get a CM Certificate.
SLOT 5/0: May 10 10:13:48.272 CET: Cable5/0/12: Auth-Req contains 1 SID(s).
SLOT 5/0: May 10 10:13:48.272 CET: Cable5/0/12: AuthReq with NULL SAID - D3.0 modem.
SLOT 5/0: May 10 10:13:48.272 CET: EAE_BPI_REQ:  DISABLE a84e.3fdd.84c4 - OK
SLOT 5/0: May 10 10:13:48.272 CET: BPI_AES:  Encryption priority is: aes128-des56-des40.
SLOT 5/0: May 10 10:13:48.272 CET: BPI_AES:  AES is a candidate.
SLOT 5/0: May 10 10:13:48.272 CET: BPI Crypto Algorithm: sid:0 cfg_mod:1, cm_cap:0x7, assigned:3
aes_support:1
SLOT 5/0: May 10 10:13:48.272 CET: CMTS generated AUTH_KEY.
SLOT 5/0: May 10 10:13:48.272 CET: CMTS received 0 as primary SAID - D3.0
SLOT 5/0: May 10 10:13:48.272 CET:  CM state:2050 MAC:a84e.3fdd.84c4
SLOT 5/0: May 10 10:13:48.272 CET: Parsed/Matched MAC Address:a84e.3fdd.84c4
SLOT 5/0: May 10 10:13:48.272 CET: Got Issuer 0^A^A1^K0 ^F^CU^D^F^S^BTW1^\0^Z^F^CU^D
^S^SHitron Technologies1^00
^F^CU^D^K^S^FDOCSIS1C0A^F^CU^D^C^S:Hitron Technologies Cable Modem Root Certificate Authority
from Certificate.
SLOT 5/0: May 10 10:13:48.272 CET: Got a new Invalid CM cert from a84e.3fdd.84c4
SLOT 5/0: May 10 10:13:48.272 CET: CA Cert Subject does not match CM Cert Issuer

```

Vocês podem ver nesses registros que há duas lixeiras hex separadas.

1. Despejo hexadecimal para o certificado CA. Começa com uma linha em negrito **de Certificado CA:** .
2. Despejo hexadecimal para o certificado CM. Começa com uma linha em negrito **Certificado CM Encontrado (comprimento = 652):** .

Tarefa 2. Santificar os certificados

Para que o despejo de certificado seja processado corretamente, você precisa remover todas as informações extras e manter apenas os valores de despejo hexadecimal.

Nota: as maiúsculas/minúsculas e os espaços no despejo de certificado são irrelevantes para este processo.

Tip: Uma maneira rápida e fácil de remover todos os cabeçalhos de linha (número de slot, carimbo de data/hora, etc.) é manter a tecla ALT em um editor de texto, como Sublime ou Notepad++.

Um exemplo do despejo de certificado CA.

```

30 82 03 22 30 82 02 0A A0 03 02 01 02 02 10 43
64 B5 50 E8 ED 7E E5 57 14 5A C0 A2 67 52 EC 30
0D 06 09 2A 86 48 86 F7 0D 01 01 05 05 00 30 6F
31 0B 30 09 06 03 55 04 06 13 02 42 45 31 1F 30
1D 06 03 55 04 0A 13 16 74 43 6F 6D 4C 61 62 73
20 2D 20 45 75 72 6F 2D 44 4F 43 53 49 53 31 15
30 13 06 03 55 04 0B 13 0C 43 61 62 6C 65 20 4D
6F 64 65 6D 73 31 28 30 26 06 03 55 04 03 13 1F
45 75 72 6F 2D 44 4F 43 53 49 53 20 43 61 62 6C
65 20 4D 6F 64 65 6D 20 52 6F 6F 74 20 43 41 30
1E 17 0D 30 34 30 38 31 33 30 30 30 30 30 30 5A
17 0D 32 34 30 38 31 32 32 33 35 39 35 39 5A 30
81 86 31 0B 30 09 06 03 55 04 06 13 02 54 57 31
1C 30 1A 06 03 55 04 0A 13 13 48 69 74 72 6F 6E

```

20 54 65 63 68 6E 6F 6C 6F 67 69 65 73 31 14 30
12 06 03 55 04 0B 13 0B 45 75 72 6F 2D 44 4F 43
53 49 53 31 43 30 41 06 03 55 04 03 13 3A 48 69
74 72 6F 6E 20 54 65 63 68 6E 6F 6C 6F 67 69 65
73 20 43 61 62 6C 65 20 4D 6F 64 65 6D 20 52 6F
6F 74 20 43 65 72 74 69 66 69 63 61 74 65 20 41
75 74 68 6F 72 69 74 79 30 81 9F 30 0D 06 09 2A
86 48 86 F7 0D 01 01 01 05 00 03 81 8D 00 30 81
89 02 81 81 00 B8 47 DA 9D F1 F6 30 1B 8E 79 BE
BE 10 C3 2D 9F 7D D6 C7 B2 50 16 AB 85 5C 1C 8C
9E 6B F7 15 60 B2 53 F4 2F 6D 49 0C 2C 3E 76 88
8A 8A 23 6B 25 47 61 AE B9 DF A8 A7 8C 4D 51 FB
E6 C2 0F D9 C7 27 DD F7 D8 CC F0 D8 70 F8 75 75
F3 D8 B7 80 C2 36 B0 53 02 A4 E9 84 02 5F 66 AE
E7 59 9A 17 4A A0 B1 B4 BA F3 3B 63 C4 75 05 11
40 F1 EB B3 C8 A0 E8 AD 6E 1B 59 CC 41 20 F8 94
B3 94 23 A2 99 02 03 01 00 01 A3 26 30 24 30 12
06 03 55 1D 13 01 01 FF 04 08 30 06 01 01 FF 02
01 00 30 0E 06 03 55 1D 0F 01 01 FF 04 04 03 02
01 06 30 0D 06 09 2A 86 48 86 F7 0D 01 01 05 05
00 03 82 01 01 00 09 DB 24 B9 46 76 D7 D0 9F 70
86 59 ED 7F 9B AC 96 FD AE 19 DD B3 51 3B A5 C0
98 DA 80 2B 53 26 42 FA 6A 11 9F 6D 16 6F 76 F8
9A F3 81 53 E8 DB EF 22 DF AC 3F 57 78 0E 70 78
07 30 1D FF 19 70 34 E5 7A 52 47 99 B0 EE 7F EA
23 99 DF CB 72 FF 0D BE AB 68 20 9F 16 C0 7C 69
88 2D 00 6A AF 4B FF 93 A5 07 D3 F2 A8 F9 5B C4
DD 9F BF 49 36 C4 12 8A 64 C8 35 41 BB E2 B9 9B
52 45 67 38 DC 92 55 E3 33 A4 70 68 FC E7 6E 54
96 CA 89 B4 65 8B 2C AA 58 24 FC 4D 68 D7 84 4E
36 3B B3 CA 9A 42 13 B1 FF 8C 66 D8 52 10 56 74
C7 DD 58 C3 EE 9D E3 65 E6 C1 5D B9 75 C2 A8 C9
54 5B A1 85 38 3B E1 E1 DC 55 5D 3E DD 90 ED F8
3A B0 68 93 E9 4A C2 D4 7F DC 90 E3 86 E2 CF C3
F2 A3 92 84 B3 A3 9A F8 71 30 F8 24 71 C2 07 BD
E8 6C 3C F7 FC 82 08 86 84 84 1B C4 D8 97 D3 50
59 72 2D D5 4C 0B

Salve este arquivo com um nome **cacert.txt** .

Um exemplo de despejo de certificado CM.

30820288 308201F1 A0030201 02020C41
38344533 46444438 34433430 0D06092A
864886F7 0D010105 05003081 81310B30
09060355 04061302 5457311C 301A0603
55040A13 13486974 726F6E20 54656368
6E6F6C6F 67696573 310F300D 06035504
0B130644 4F435349 53314330 41060355
0403133A 48697472 6F6E2054 6563686E
6F6C6F67 69657320 4361626C 65204D6F
64656D20 526F6F74 20436572 74696669
63617465 20417574 686F7269 7479301E
170D3137 30313031 30303030 30305A17
0D333631 32323832 33353935 395A3081
86310B30 09060355 04061302 5457311C
301A0603 55040A13 13486974 726F6E20
54656368 6E6F6C6F 67696573 313D303B
06035504 0B13344E 6F2E2034 302C2057
752D6B75 6E672035 74682052 642E2C20
57752D6B 752C2054 61697065 69204873
69656E2C 20546169 77616E31 1A301806
03550403 13114138 3A34453A 33463A44

```
443A3834 3A433430 819F300D 06092A86
4886F70D 01010105 0003818D 00308189
02818100 B0D4F2B6 4987FCE3 40B21FB1
E08CFE04 DDDB3D05 D5341708 867623EE
254E4A61 FC6D1348 3055F402 CF89B11B
34867B3E F7D9FE6C BE8B4C25 1FDA5A2E
47D65C21 208EFC72 E2238D54 43786F15
1AA7FE6C 21371957 DD3FEB84 358AA1B7
A2181DAF 7A4F7DD4 E9128D95 3C146B77
F451A9F8 685D1A25 3FA9590A C0F69D24
DF2B84C1 02030100 01300D06 092A8648
86F70D01 01050500 03818100 08DFC2DA
8C3ECCDA 98289410 E1B8657A 9A3F220D
AE368029 0E89923F 0DF09E06 8142BAB7
E8A6D5B3 6D7604FF 6A07A8B8 409D0B0B
6D568AF4 F9395199 AB54126C E9C22F1B
6390543A 3B67EFB8 FCF0E755 F642E1E0
273A3853 F4DDBFF1 391E63CE 8BB7BBC0
8AFC59FC 767C3FA5 A5EB255C 8878F4AB
63665AA9 CDCF779A 3DFE0C4C
```

Salve este arquivo com um nome **cmcert.txt** .

Tarefa 3. Prepare o arquivo para o utilitário xxd

XXD é um utilitário Linux/Mac que permite converter um dump hexadecimal em um arquivo binário e vice-versa. O XXD precisa dos dados hexadecimais para ter um cabeçalho de linha específico para funcionar. Use o seguinte script python que adiciona o cabeçalho necessário:

```
TVANEGRO-M-N1QP:Desktop tvanegro$ cat addoffset.py
import fileinput
import sys

i = 0
for line in fileinput.input():
    line=line.replace(" ", "")
    print("%06x: %s" % (i,line.strip()))
    i = i+int(len(line.strip())/2)
```

Tarefa 4. Converter certificados de Hexdump em formato binário

Execute este comando para converter o certificado CA.

```
python3.5 addoffset.py cacert.txt | xxd -r > cacert.crt
```

Execute este comando para converter o certificado CM.

```
python3.5 addoffset.py cmcert.txt | xxd -r > cmcert.crt
```

Esses arquivos CRT gerados agora podem ser verificados quanto a qualquer incompatibilidade.

Tarefa 5. Revisar certificados

Para ler os arquivos, use o utilitário Openssl ou Keychain.

Um exemplo com utilitário openssl para certificado CA.

```
TVANEGRO-M-N1QP:Desktop tvanegro$ openssl x509 -inform der -in cacert.crt -noout -text
Certificate:
Data:
Version: 3 (0x2)
Serial Number:
43:64:b5:50:e8:ed:7e:e5:57:14:5a:c0:a2:67:52:ec
Signature Algorithm: sha1WithRSAEncryption
Issuer: C=BE, O=tComLabs - Euro-DOCSIS, OU=Cable Modems, CN=Euro-DOCSIS Cable Modem Root CA
Validity
Not Before: Aug 13 00:00:00 2004 GMT
Not After : Aug 12 23:59:59 2024 GMT
Subject: C=TW, O=Hitron Technologies, OU=Euro-DOCSIS, CN=Hitron Technologies Cable Modem Root
Certificate Authority
Subject Public Key Info:
Public Key Algorithm: rsaEncryption
RSA Public Key: (1024 bit)
Modulus (1024 bit):
00:b8:47:da:9d:f1:f6:30:1b:8e:79:be:be:10:c3:
2d:9f:7d:d6:c7:b2:50:16:ab:85:5c:1c:8c:9e:6b:
f7:15:60:b2:53:f4:2f:6d:49:0c:2c:3e:76:88:8a:
8a:23:6b:25:47:61:ae:b9:df:a8:a7:8c:4d:51:fb:
e6:c2:0f:d9:c7:27:dd:f7:d8:cc:f0:d8:70:f8:75:
75:f3:d8:b7:80:c2:36:b0:53:02:a4:e9:84:02:5f:
66:ae:e7:59:9a:17:4a:a0:b1:b4:ba:f3:3b:63:c4:
75:05:11:40:f1:eb:b3:c8:a0:e8:ad:6e:1b:59:cc:
41:20:f8:94:b3:94:23:a2:99
Exponent: 65537 (0x10001)
X509v3 extensions:
X509v3 Basic Constraints: critical
CA:TRUE, pathlen:0
X509v3 Key Usage: critical
Certificate Sign, CRL Sign
Signature Algorithm: sha1WithRSAEncryption
09:db:24:b9:46:76:d7:d0:9f:70:86:59:ed:7f:9b:ac:96:fd:
ae:19:dd:b3:51:3b:a5:c0:98:da:80:2b:53:26:42:fa:6a:11:
9f:6d:16:6f:76:f8:9a:f3:81:53:e8:db:ef:22:df:ac:3f:57:
78:0e:70:78:07:30:1d:ff:19:70:34:e5:7a:52:47:99:b0:ee:
7f:ea:23:99:df:cb:72:ff:0d:be:ab:68:20:9f:16:c0:7c:69:
88:2d:00:6a:af:4b:ff:93:a5:07:d3:f2:a8:f9:5b:c4:dd:9f:
bf:49:36:c4:12:8a:64:c8:35:41:bb:e2:b9:9b:52:45:67:38:
dc:92:55:e3:33:a4:70:68:fc:e7:6e:54:96:ca:89:b4:65:8b:
2c:aa:58:24:fc:4d:68:d7:84:4e:36:3b:b3:ca:9a:42:13:b1:
ff:8c:66:d8:52:10:56:74:c7:dd:58:c3:ee:9d:e3:65:e6:c1:
5d:b9:75:c2:a8:c9:54:5b:a1:85:38:3b:e1:e1:dc:55:5d:3e:
dd:90:ed:f8:3a:b0:68:93:e9:4a:c2:d4:7f:dc:90:e3:86:e2:
cf:c3:f2:a3:92:84:b3:a3:9a:f8:71:30:f8:24:71:c2:07:bd:
e8:6c:3c:f7:fc:82:08:86:84:84:1b:c4:d8:97:d3:50:59:72:
2d:d5:4c:0b
```

Um exemplo com utilitário openssl para certificado CM.

```
TVANEGRO-M-N1QP:Desktop tvanegro$ openssl x509 -inform der -in cmcert.crt -noout -text
Certificate:
Data:
Version: 3 (0x2)
Serial Number:
41:38:34:45:33:46:44:44:38:34:43:34
Signature Algorithm: sha1WithRSAEncryption
```


Issuer: C=TW, O=Hitron Technologies, **OU=DOCSIS**, CN=Hitron Technologies Cable Modem Root Certificate Authority

Validity

Not Before: Jan 1 00:00:00 2017 GMT

Not After : Dec 28 23:59:59 2036 GMT

Subject: C=TW, O=Hitron Technologies, OU=No. 40, Wu-kung 5th Rd., Wu-ku, Taipei Hsien, Taiwan, CN=A8:4E:3F:DD:84:C4

Subject Public Key Info:

Public Key Algorithm: rsaEncryption

RSA Public Key: (1024 bit)

Modulus (1024 bit):

```
00:b0:d4:f2:b6:49:87:fc:e3:40:b2:1f:b1:e0:8c:
fe:04:dd:db:3d:05:d5:34:17:08:86:76:23:ee:25:
4e:4a:61:fc:6d:13:48:30:55:f4:02:cf:89:b1:1b:
34:86:7b:3e:f7:d9:fe:6c:be:8b:4c:25:1f:da:5a:
2e:47:d6:5c:21:20:8e:fc:72:e2:23:8d:54:43:78:
6f:15:1a:a7:fe:6c:21:37:19:57:dd:3f:eb:84:35:
8a:a1:b7:a2:18:1d:af:7a:4f:7d:d4:e9:12:8d:95:
3c:14:6b:77:f4:51:a9:f8:68:5d:1a:25:3f:a9:59:
0a:c0:f6:9d:24:df:2b:84:c1
```

Exponent: 65537 (0x10001)

Signature Algorithm: sha1WithRSAEncryption

```
08:df:c2:da:8c:3e:cc:da:98:28:94:10:e1:b8:65:7a:9a:3f:
22:0d:ae:36:80:29:0e:89:92:3f:0d:f0:9e:06:81:42:ba:b7:
e8:a6:d5:b3:6d:76:04:ff:6a:07:a8:b8:40:9d:0b:0b:6d:56:
8a:f4:f9:39:51:99:ab:54:12:6c:e9:c2:2f:1b:63:90:54:3a:
3b:67:ef:b8:fc:f0:e7:55:f6:42:e1:e0:27:3a:38:53:f4:dd:
bf:f1:39:1e:63:ce:8b:b7:bb:c0:8a:fc:59:fc:76:7c:3f:a5:
a5:eb:25:5c:88:78:f4:ab:63:66:5a:a9:cd:cf:77:9a:3d:fe:
0c:4c
```

Você pode ver que o campo **OU= (Unidade Organizacional)** não corresponde. No exemplo, você vê **DOCSIS** e **Euro-DOCSIS**. É por isso que o CMTS rejeita o certificado.

Você pode usar a ferramenta Keychain no Mac OS para exibir os certificados.

