IPsec over kabel Samsung-configuraties en debugs

Inhoud

Inleiding

Internet Protocol Security (IPsec) is een raamwerk van open standaarden dat beveiligde privé communicatie via IP-netwerken garandeert. Op basis van normen die zijn ontwikkeld door de Internet Engineering Task Force (IETF), garandeert IPsec vertrouwelijkheid, integriteit en authenticiteit van datacommunicatie via een openbaar IP-netwerk. IPsec vormt een noodzakelijke component voor een op standaarden gebaseerde, flexibele oplossing om een op het hele netwerk geldend veiligheidsbeleid te implementeren.

Dit document biedt een configuratievoorbeeld van IPsec tussen twee Cisco-kabelmodems. Deze configuratie maakt een encryptie-tunnel over een kabelnetwerk tussen twee Cisco uBR9xx Series kabelmodemrouters. Al het verkeer tussen de twee netwerken is versleuteld. Maar verkeer dat bestemd is voor andere netwerken mag niet worden versleuteld. Voor kleine Office-, startkantoor-(SOHO)-gebruikers kan u virtuele particuliere netwerken (VPN’s) via een kabelnetwerk maken.

Voorwaarden

Vereisten

Er zijn geen specifieke vereisten van toepassing op dit document.

Gebruikte componenten

De modems moeten aan deze vereisten voldoen om IPsec op twee kabelmodems te configureren:

- Cisco uBR904, uBR905 of uBR924 in routingmodus
- IPsec 56-functieset
- Cisco IOS® softwarerelease 12.0(5)T of hoger

Daarnaast moet u een Cable Modem Termination System (CMTS) hebben, dat is elke DOCSIS-conforme head-end kabelrouter (Data-over-Cable Service Interface Specifications), zoals Cisco uBR7246, Cisco uBR7223 of Cisco uBR7246VXR.

De informatie in dit document is gebaseerd op de apparaten in een specifieke laboratoriumomgeving. Alle apparaten die in dit document worden beschreven, hadden een opgeschoonde (standaard)configuratie. Als uw netwerk live is, moet u de potentiële impact van elke opdracht begrijpen.

Conventies

Raadpleeg Cisco Technical Tips Conventions (Conventies voor technische tips van Cisco) voor meer informatie over documentconventies.

Achtergrondinformatie

Het voorbeeld in dit document gebruikt een uBR904-kabelmodem, een uBR924-kabelmodem en een uBR7246VXR CMTS. De kabelmodems voeren Cisco IOS-softwarerelease 12.1(6)E uit en de CMTS voert Cisco IOS-softwarerelease 12.1(4)EC uit.

Opmerking: Dit voorbeeld wordt gedaan met handmatige configuratie op de kabelmodems door de console poort. Als een geautomatiseerd proces wordt uitgevoerd via het DOCSIS-configuratiebestand (het ios.cfg-script is gemaakt met de IPsec-configuratie) dan *kunnen* de toegangslijsten 100 en 101 *niet* worden gebruikt. Dit komt doordat de Cisco-implementatie van de Simple Network Management Protocol (SNMP) docsDevNmAccess-tabel Cisco IOS-toegangslijsten gebruikt. Er wordt één toegangslijst per interface gemaakt. Op uBR904, 924 en 905 worden de eerste twee toegangslijsten over het algemeen gebruikt (100 en 101). Op een kabelmodem die Universal Serial Bus (USB) ondersteunt, zoals CVA120, worden drie toegangslijsten gebruikt (100, 101 en 102).

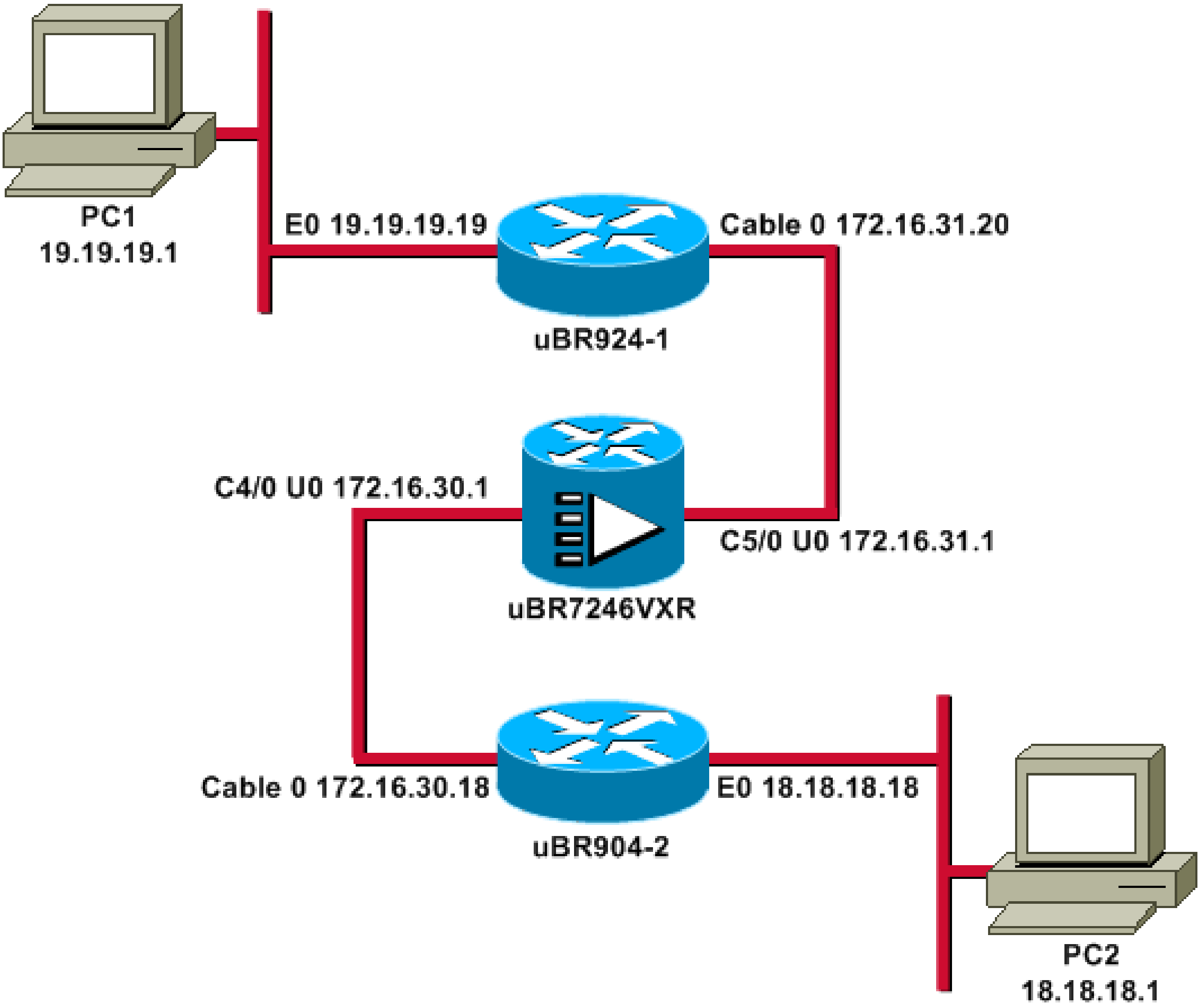
Configureren

Deze sectie bevat informatie over het configureren van de functies die in dit document worden beschreven.

N.B.: Gebruik het Opdrachtupgereedschap (alleen geregistreerde klanten) om meer informatie te vinden over de opdrachten in dit document.

Netwerkdiagram

Het netwerk in dit document is als volgt opgebouwd:



Opmerking: Alle IP-adressen in dit diagram hebben een 24-bits masker.

Configuraties

Dit document gebruikt deze configuraties:

- uBR924-1
- uBR904-2
- uBR7246VXR router

uBR924-1

```
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname ubr924-1
!
enable password ww
!
!
!
```

```
!
clock timezone - -8
ip subnet-zero
no ip finger
!
ip audit notify log
ip audit po max-events 100
!
!
crypto isakmp policy 10
!--- Creates an Internet Key Exchange (IKE) policy with
the specified priority !--- number of 10. The range for
the priority is 1 to 10000, where 1 is the !--- highest
priority. This command also enters Internet Security
Association !--- and Key Management Protocol (ISAKMP)
policy configuration command mode. hash md5
!--- Specifies the MD5 (HMAC variant) hash algorithm for
packet authentication. authentication pre-share
!--- Specifies that the authentication keys are pre-
shared, as opposed to !--- dynamically negotiated using
Rivest, Shamir, and Adelman (RSA) public !--- key
signatures. group 2
!--- Diffie-Hellman group for key negotiation. lifetime
3600
!--- Defines how long, in seconds, each security
association should exist before !--- it expires. Its
range is 60 to 86400, and in this case, it is 1 hour.
crypto isakmp key mykey address 18.18.18.18
!--- Specifies the pre-shared key that should be used
with the peer at the !--- specific IP address. The key
can be any arbitrary alphanumeric key up to !--- 128
characters. The key is case-sensitive and must be
entered identically !--- on both routers. In this case,
the key is mykey and the peer is the !--- Ethernet
address of uBR904-2
.
!
crypto IPSec transform-set TUNNELSET ah-md5-hmac esp-des
!--- Establishes the transform set to use for IPsec
encryption. As many as !--- three transformations can be
specified for a set. Authentication Header !--- and ESP
are in use. Another common transform set used in
industry is !--- esp-des esp-md5-hmac.

!
crypto map MYMAP local-address Ethernet0
!--- Creates the MYMAP crypto map and applies it to the
Ethernet0 interface.

crypto map MYMAP 10 ipsec-isakmp
!--- Creates a crypto map numbered 10 and enters crypto
map configuration mode. set peer 18.18.18.18
!--- Identifies the IP address for the destination peer
router. In this case, !--- the Ethernet interface of the
remote cable modem (ubr904-2) is used. set transform-set
TUNNELSET
!--- Sets the crypto map to use the transform set
previously created. match address 101
!--- Sets the crypto map to use the access list that
specifies the type of !--- traffic to be encrypted. !---
Do not use access lists 100, 101, and 102 if the IPsec
config is !--- downloaded through the ios.cfg in the
DOCSIS configuration file.
```

```
!
!
!
!
voice-port 0
 input gain -2
 output attenuation 0
!
voice-port 1
 input gain -2
 output attenuation 0
!
!
!
interface Ethernet0
 ip address 19.19.19.19 255.255.255.0
 ip rip send version 2
 ip rip receive version 2
 no ip route-cache
 no ip mroute-cache
!
interface cable-modem0
 ip rip send version 2
 ip rip receive version 2
 no ip route-cache
 no ip mroute-cache
 cable-modem downstream saved channel 525000000 39 1
 cable-modem mac-timer t2 40000
 no cable-modem compliant bridge
 crypto map MYMAP
!--- Applies the previously created crypto map to the
cable interface. ! router rip version 2 network 19.0.0.0
network 172.16.0.0 ! ip default-gateway 172.16.31.1 ip
classless ip http server ! access-list 101 permit ip
19.19.19.0 0.0.0.255 18.18.18.0 0.0.0.255
!--- Access list that identifies the traffic to be
encrypted. In this case, !--- it is setting traffic from
the local Ethernet network to the remote !--- Ethernet
network. snmp-server manager ! line con 0 transport
input none line vty 0 4 password ww login ! end
```

De configuratie van de andere kabelmodem is zeer gelijkaardig, dus de meeste commentaren in de vorige configuratie worden weggelaten.

uBR904-2

```
version 12.1
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname ubr904-2
!
enable password ww
!
!
!
!
!
clock timezone - -8
ip subnet-zero
```

```
no ip finger
!
!
!
crypto isakmp policy 10
 hash md5
 authentication pre-share
 group 2
 lifetime 3600
crypto isakmp key mykey address 19.19.19.19
!
!
crypto IPSec transform-set TUNNELSET ah-md5-hmac ESP-Des
!
crypto map MYMAP local-address Ethernet0
crypto map MYMAP 10 ipsec-isakmp
 set peer 19.19.19.19
!--- Identifies the IP address for the destination peer
router. In this case, !--- the Ethernet interface of the
remote cable modem (uBR924-1) is used. set transform-set
TUNNELSET
 match address 101
!
!
!
!
interface Ethernet0
 ip address 18.18.18.18 255.255.255.0
 ip rip send version 2
 ip rip receive version 2
!
interface cable-modem0
 ip rip send version 2
 ip rip receive version 2
 no keepalive
 cable-modem downstream saved channel 555000000 42 1
 cable-modem Mac-timer t2 40000
 no cable-modem compliant bridge
 crypto map MYMAP
!
router rip
 version 2
 network 18.0.0.0
 network 172.16.0.0
!
ip default-gateway 172.16.30.1
ip classless
no ip http server
!
access-list 101 permit ip 18.18.18.0 0.0.0.255
19.19.19.0 0.0.0.255
snmp-server manager
!
line con 0
 transport input none
line vty 0 4
 password ww
 login
!
end
```

CMTS uBR7246VXR runt ook Routing Information Protocol (RIP) versie 2, zodat de routing werkt. Dit is de RIP-configuratie die op de CMTS wordt gebruikt:

uBR7246VXR router

```
router rip
 version 2
 network 172.16.0.0
 no auto-summary
```

Verifiëren

Gebruik dit gedeelte om te bevestigen dat de configuratie correct werkt.

Zo controleert u of IPsec werkt:

- Controleer deze dingen:De Cisco IOS-software ondersteunt IPsec.De draaiende configuratie is correct.Interfaces zijn omhoog.Routing werkt.De toegangslijst die is gedefinieerd om verkeer te versleutelen, is correct.
- Maak verkeer en kijk naar Encrypt en Decrypt, om de hoeveelheid te zien die stijgt.
- Zet de debugs aan voor crypto.

Het Uitvoer Tolk (uitsluitend geregistreerde klanten) (OIT) ondersteunt bepaalde **show** opdrachten. Gebruik de OIT om een analyse van **tonen** opdrachtoutput te bekijken.

Geef de **show versie** opdracht op in beide kabelmodems.

```
ubr924-1#show version
Cisco Internetwork Operating System Software
IOS (tm) 920 Software (UBR920-K1O3SV4Y556I-M), Version 12.1(6),
RELEASE SOFTWARE (fc1)
Copyright (c) 1986-2000 by Cisco Systems, Inc.
Compiled Wed 27-Dec-00 16:36 by kellythw
Image text-base: 0x800100A0, data-base: 0x806C1C20

ROM: System Bootstrap, Version 12.0(6r)T3, RELEASE SOFTWARE (fc1)

ubr924-1 uptime is 1 hour, 47 minutes
System returned to ROM by reload at 10:39:05 - Fri Feb 9 2001
System restarted at 10:40:05 - Fri Feb 9 2001
System image file is "flash:ubr920-k1o3sv4y556i-mz.121-6"

cisco uBR920 CM (MPC850) processor (revision 3.e)
with 15872K/1024K bytes of memory.
Processor board ID FAA0422Q04F
Bridging software.
1 Ethernet/IEEE 802.3 interface(s)
1 Cable Modem network interface(s)
3968K bytes of processor board System flash (Read/Write)
1536K bytes of processor board Boot flash (Read/Write)

Configuration register is 0x2102
```

UBR924-1 voert Cisco IOS-softwarerelease 12.1(6)E uit met de WAARDE SMALL OFFICE/VOICE/FW IPSec 56 functieset.

```
ubr904-2#show version
Cisco Internetwork Operating System Software
IOS (TM) 900 Software (UBR900-K1OY556I-M), Version 12.1(6),
RELEASE SOFTWARE (fc1)
Copyright (c) 1986-2000 by cisco Systems, Inc.
Compiled Wed 27-DEC-00 11:06 by kellythw
Image text-base: 0x08004000, database: 0x085714DC

ROM: System Bootstrap, Version 11.2(19980518:195057), RELEASED SOFTWARE
ROM: 900 Software (UBR900-RBOOT-M), Version 11.3(11)NA,
EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)

ubr904-2 uptime is 1 hour, 48 minutes
System returned to ROM by reload at 10:38:44 - Fri Feb 9 2001
System restarted at 10:40:37 - Fri Feb 9 2001
System image file is "flash:ubr900-k1oy556i-mz.121-6"

cisco uBR900 CM (68360) processor (revision D)
with 8192K bytes of memory.
Processor board ID FAA0235Q0ZS
Bridging software.
1 Ethernet/IEEE 802.3 interface(s)
1 Cable Modem network interface(s)
4096K bytes of processor board System flash (Read/Write)
2048K bytes of processor board Boot flash (Read/Write)

Configuration register is 0x2102
```

UBR904-2 voert Cisco IOS-softwarerelease 12.1(6)E uit met KLEIN KANTOOR/FW IPSec 56 functieset.

```
ubr924-1#show ip interface brief
Interface            IP-Address      OK? Method Status          Protocol
Ethernet0            19.19.19.19     YES NVRAM  up              up
cable-modem0         172.16.31.20    YES unset  up              up

ubr904-2#show ip interface brief
Interface            IP-Address      OK? Method Status          Protocol
Ethernet0            18.18.18.18     YES NVRAM  up              up
cable-modem0         172.16.30.18    YES unset  up              up
```

Van de laatste opdracht, kunt u zien dat de Ethernet interfaces omhoog zijn. De IP adressen van de Ethernet interfaces werden handmatig ingevoerd. De kabelinterfaces zijn ook omhoog en ze hebben hun IP-adressen door DHCP geleerd. Omdat deze kabeladressen dynamisch toegewezen worden, kunnen zij niet als peers in de configuratie van IPSec worden gebruikt.

```
ubr924-1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - ISIS level-1, L2 - ISIS level-2, ia - ISIS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 172.16.31.1 to network 0.0.0.0

     19.0.0.0/24 is subnetted, 1 subnets
C       19.19.19.0 is directly connected, Ethernet0
R    18.0.0.0/8 [120/2] via 172.16.31.1, 00:00:23, cable-modem0
     172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
R       172.16.135.0/25 [120/1] via 172.16.31.1, 00:00:23, cable-modem0
R       172.16.29.0/27 [120/1] via 172.16.31.1, 00:00:23, cable-modem0
```

```
R       172.16.30.0/24 [120/1] via 172.16.31.1, 00:00:23, cable-modem0
C       172.16.31.0/24 is directly connected, cable-modem0
R    192.168.99.0/24 [120/3] via 172.16.31.1, 00:00:24, cable-modem0
     10.0.0.0/24 is subnetted, 2 subnets
R       10.10.10.0 [120/2] via 172.16.31.1, 00:00:24, cable-modem0
S*   0.0.0.0/0 [1/0] via 172.16.31.1
```

Je kunt aan deze output zien dat uBR924-1 leert over route 18.18.18.0, de Ethernet interface van uBR904-2.

```
ubr904-2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - ISIS, L1 - ISIS level-1, L2 - ISIS level-2, IA - ISIS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 172.16.30.1 to network 0.0.0.0

R    19.0.0.0/8 [120/2] via 172.16.30.1, 00:00:17, cable-modem0
     18.0.0.0/24 is subnetted, 1 subnets
C       18.18.18.0 is directly connected, Ethernet0
     172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
R       172.16.135.0/25 [120/1] via 172.16.30.1, 00:00:17, cable-modem0
R       172.16.29.224/27 [120/1] via 172.16.30.1, 00:00:17, cable-modem0
C       172.16.30.0/24 is directly connected, cable-modem0
R       172.16.31.0/24 [120/1] via 172.16.30.1, 00:00:17, cable-modem0
R    192.168.99.0/24 [120/3] via 172.16.30.1, 00:00:18, cable-modem0
     10.0.0.0/24 is subnetted, 1 subnets
R       10.10.10.0 [120/2] via 172.16.30.1, 00:00:18, cable-modem0
S*   0.0.0.0/0 [1/0] via 172.16.30.1
```

Van de routingtabel van uBR904-2, kunt u zien dat het netwerk voor Ethernet van uBR924-1 in de routingtabel is.

Opmerking: Er kunnen gevallen zijn waarin u geen routingprotocol tussen de twee kabelmodems kunt uitvoeren. In dergelijke gevallen moet u statische routes op CMTS aan direct verkeer voor de Ethernet interfaces van de kabelmodems toevoegen.

Het volgende om te controleren is de certificering van de toegangslijst. geef de opdracht **toegangslijsten** op beide routers uit.

```
ubr924-1#show access-lists
Extended IP access list 101
    permit ip 19.19.19.0 0.0.0.255 18.18.18.0 0.0.0.255 (2045 matches)

ubr904-2#show access-lists
Extended IP access list 101
    permit ip 18.18.18.0 0.0.0.255 19.19.19.0 0.0.0.255 (2059 matches)
```

De toegangslijst stelt de IPsec-sessie in wanneer het LAN achter uBR924-1 (19.19.19.0) IP-verkeer naar het LAN achter uBR904-2 (18.18.18.0) en vice versa stuurt. Gebruik 'geen' op de toegangslijsten, omdat dit problemen veroorzaakt. Zie IPsec-netwerkbeveiliging configureren voor meer informatie.

Er is geen IPsec-verkeer. Geef de **actieve** opdracht **van de** sleutelverbinding uit.

```
ubr924-1#show crypto engine connection active
ID Interface     IP-Address     State    Algorithm           Encrypt  Decrypt
1                                set     HMAC_MD5+DES_56_CB        0        0

ubr904-2#show crypto engine connection active
ID Interface     IP-Address     State    Algorithm           Encrypt  Decrypt
1                                set     HMAC_MD5+DES_56_CB        0        0
```

Er zijn geen IPsec-verbindingen omdat er geen verkeer is dat de toegangslijsten heeft aangepast.

Opmerking: Raadpleeg Belangrijke informatie over debug Commands voordat u **debug**-opdrachten gebruikt.

De volgende stap is het aanzetten van een aantal crypto-debugs om interessant verkeer te genereren.

In dit voorbeeld worden deze apparaten ingeschakeld:

- **debug van crypto-motor**
- **debug van crypto IPsec**
- **debug van crypto-sleuteluitwisseling**
- **debug van crypto isakmp**

U moet eerst wat interessant verkeer genereren om de output van de debugs te zien. Geef een uitgebreid ping uit van de Ethernet poort van uBR904-2 naar de PC op uBR924-1 (IP-adres 19.19.19.1).

```
ubr904-2#ping ip
Target IP address: 19.19.19.1
!--- IP address of PC1 behind the Ethernet of uBR924-1. Repeat count [5]: 100
!--- Sends 100 pings. Datagram size [100]: Timeout in seconds [2]: Extended commands [n]: y
Source address or interface: 18.18.18.18
!--- IP address of the Ethernet behind uBR904-2. Type of service [0]: Set DF bit in IP header?
[no]: Validate reply data? [no]: Data pattern [0xABCD]: Loose, Strict, Record, Timestamp,
Verbose[none]: Sweep range of sizes [n]: Type escape sequence to abort. Sending 100, 100-byte
ICMP Echos to 19.19.19.1, timeout is 2 seconds:
```

UBR924-2 toont deze debug uitvoer:

```
ubr904-2#
01:50:37: IPSec(sa_request): ,
 (key eng. msg.) src= 18.18.18.18, dest= 19.19.19.19,
    src_proxy= 18.18.18.0/255.255.255.0/0/0 (type=4),
    dest_proxy= 19.19.19.0/255.255.255.0/0/0 (type=4),
    protocol= AH, transform= ah-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0x19911A16(428939798), conn_id= 0, keysize= 0, flags= 0x4004
01:50:37: IPSec(sa_request): ,
  (key Eng. msg.) src= 18.18.18.18, dest= 19.19.19.19,
    src_proxy= 18.18.18.0/255.255.255.0/0/0 (type=4),
    dest_proxy= 19.19.19.0/255.255.255.0/0/0 (type=4),
    protocol= ESP, transform= ESP-Des ,
    lifedur= 3600s and 4608000kb,
    spi= 0x7091981(118036865), conn_id= 0, keysize= 0, flags= 0x4004
01:50:37: ISAKMP: received ke message (1/2)
01:50:37: ISAKMP (0:1): sitting IDLE. Starting QM immediately (QM_IDLE)
01:50:37: ISAKMP (0:1): beginning Quick Mode exchange, M-ID of 1108017901
01:50:37: CryptoEngine0: generate hmac context for conn id 1
01:50:37: ISAKMP (1): sending packet to 19.19.19.19 (I) QM_IDLE
```

```
01:50:37: ISAKMP (1): received packet from 19.19.19.19 (I) QM_IDLE
01:50:37: CryptoEngine0: generate hmac context for conn id 1
01:50:37: ISAKMP (0:1): processing SA payload. message ID = 1108017901
01:50:37: ISAKMP (0:1): Checking IPSec proposal 1
01:50:37: ISAKMP: transform 1, AH_MD5
01:50:37: ISAKMP:   attributes in transform:
01:50:3.!!!!!!!!!!!!!!!!!!!!!!!7: ISAKMP:      encaps is 1
01:50:37: ISAKMP:      SA life type in seconds
01:50:37: ISAKMP:      SA life duration (basic) of 3600
01:50:37: ISAKMP:      SA life type in kilobytes
01:50:37: ISAKMP:      SA life duration (VPI) of  0x0 0x46 0x50 0x0
01:50:37: ISAKMP:      authenticator is HMAC-MD5
01:50:37: validate proposal 0
01:50:37: ISAKMP (0:1): atts are acceptable.
01:50:37: ISAKMP (0:1): Checking IPSec proposal 1
01:50:37: ISAKMP: transform 1, ESP_DES
01:50:37: ISAKMP:   attributes in transform:
01:50:37: ISAKMP:      encaps is 1
01:50:37: ISAKMP:      SA life type in seconds
01:50:37: ISAKMP:      SA life duration (basic) of 3600
01:50:37: ISAKMP:      SA life type in kilobytes
01:50:37: ISAKMP:      SA life duration (VPI) of  0x0 0x46 0x50 0x0
01:50:37: validate proposal 0
01:50:37: ISAKMP (0:1): atts are acceptable.
01:50:37: IPSec(validate_proposal_request): proposal part #1,
  (key Eng. msg.) dest= 19.19.19.19, src= 18.18.18.18,
  dest_proxy= 19.19.1!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Success rate is 99 percent (99/100), round-trip min/avg/max = 30/40/70 ms
ubr904-2#
```

Merk op dat het eerste ping mislukt is. Dat komt omdat het de verbinding moet leggen.

UBR924-1 toont deze debug uitvoer:

```
ubr924-1#
01:50:24: ISAKMP (1): received packet from 18.18.18.18 (R) QM_IDLE
01:50:24: CryptoEngine0: generate hmac context for conn id 1
01:50:24: ISAKMP (0:1): processing SA payload. Message ID = 1108017901
01:50:24: ISAKMP (0:1): Checking IPSec proposal 1
01:50:24: ISAKMP: transform 1, AH_MD5
01:50:24: ISAKMP:   attributes in transform:
01:50:24: ISAKMP:      encaps is 1
01:50:24: ISAKMP:      SA life type in seconds
01:50:24: ISAKMP:      SA life duration (basic) of 3600
01:50:24: ISAKMP:      SA life type in kilobytes
01:50:24: ISAKMP:      SA life duration (VPI) of  0x0 0x46 0x50 0x0
01:50:24: ISAKMP:      authenticator is HMAC-MD5
01:50:24: validate proposal 0
01:50:24: ISAKMP (0:1): atts are acceptable.
01:50:24: ISAKMP (0:1): Checking IPSec proposal 1
01:50:24: ISAKMP: transform 1, ESP_DES
01:50:24: ISAKMP:   attributes in transform:
01:50:24: ISAKMP:      encaps is 1
01:50:24: ISAKMP:      SA life type in seconds
01:50:24: ISAKMP:      SA life duration (basic) of 3600
01:50:24: ISAKMP:      SA life type in kilobytes
01:50:24: ISAKMP:      SA life duration (VPI) of  0x0 0x46 0x50 0x0
01:50:24: validate proposal 0
01:50:24: ISAKMP (0:1): atts are acceptable.
01:50:24: IPSec(validate_proposal_request): proposal part #1,
  (key Eng. msg.) dest= 19.19.19.19, src= 18.18.18.18,
    dest_proxy= 19.19.19.0/255.255.255.0/0/0 (type=4),
    src_proxy= 18.18.18.0/255.255.255.0/0/0 (type=4),
    protocol= AH, transform= ah-md5-hmac ,
    lifedur= 0s and 0kb,
    spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4
01:50:24: IPSec(validate_proposal_request): proposal part #2,
  (key Eng. msg.) dest= 19.19.19.19, src= 18.18.18.18,
    dest_proxy= 19.19.19.0/255.255.255.0/0/0 (type=4),
    src_proxy= 18.18.18.0/255.255.255.0/0/0 (type=4),
    protocol= ESP, transform= ESP-Des ,
    lifedur= 0s and 0kb,
    spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4
01:50:24: validate proposal request 0
01:50:24: ISAKMP (0:1): processing NONCE payload. Message ID = 1108017901
01:50:24: ISAKMP (0:1): processing ID payload. Message ID = 1108017901
01:50:24: ISAKMP (1): ID_IPV4_ADDR_SUBNET src 18.18.18.0/255.255.255.0
   prot 0 Port 0
01:50:24: ISAKMP (0:1): processing ID payload. Message ID = 1108017901
01:50:24: ISAKMP (1): ID_IPV4_ADDR_SUBNET dst 19.19.19.0/255.255.255.0
   prot 0 Port 0
01:50:24: ISAKMP (0:1): asking for 2 spis from IPSec
01:50:24: IPSec(key_engine): got a queue event...
01:50:24: IPSec(spi_response): getting spi 393021796 for SA
        from 18.18.18.18     to 19.19.19.19     for prot 2
01:50:24: IPSec(spi_response): getting spi 45686884 for SA
        from 18.18.18.18     to 19.19.19.19     for prot 3
01:50:24: ISAKMP: received ke message (2/2)
01:50:24: CryptoEngine0: generate hmac context for conn id 1
01:50:24: ISAKMP (1): sending packet to 18.18.18.18 (R) QM_IDLE
01:50:24: ISAKMP (1): received packet from 18.18.18.18 (R) QM_IDLE
01:50:24: CryptoEngine0: generate hmac context for conn id 1
01:50:24: IPSec allocate flow 0
01:50:24: IPSec allocate flow 0
01:50:24: ISAKMP (0:1): Creating IPSec SAs
01:50:24:         inbound SA from 18.18.18.18 to 19.19.19.19
                  (proxy 18.18.18.0 to 19.19.19.0)
01:50:24:         has spi 393021796 and conn_id 2000 and flags 4
01:50:24:         lifetime of 3600 seconds
01:50:24:         lifetime of 4608000 kilobytes
01:50:24:         outbound SA from 19.19.19.19 to 18.18.18.18
                  (proxy 19.19.19.0 to 18.18.18.0)
01:50:24:         has spi 428939798 and conn_id 2001 and flags 4
01:50:24:         lifetime of 3600 seconds
01:50:24:         lifetime of 4608000 kilobytes
01:50:24: ISAKMP (0:1): Creating IPSec SAs
01:50:24:         inbound SA from 18.18.18.18 to 19.19.19.19
                  (proxy 18.18.18.0 to 19.19.19.0)
01:50:24:         has spi 45686884 and conn_id 2002 and flags 4
01:50:24:         lifetime of 3600 seconds
01:50:24:         lifetime of 4608000 kilobytes
01:50:24:         outbound SA from 19.19.19.19 to 18.18.18.18
                  (proxy 19.19.19.0 to 18.18.18.0)
01:50:24:         has spi 118036865 and conn_id 2003 and flags 4
01:50:25:         lifetime of 3600 seconds
01:50:25:         lifetime of 4608000 kilobytes
01:50:25: ISAKMP (0:1): deleting node 1108017901 error FALSE reason
          "quick mode done (await()"
01:50:25: IPSec(key_engine): got a queue event...
01:50:25: IPSec(initialize_sas): ,
  (key Eng. msg.) dest= 19.19.19.19, src= 18.18.18.18,
    dest_proxy= 19.19.19.0/255.255.255.0/0/0 (type=4),
    src_proxy= 18.18.18.0/255.255.255.0/0/0 (type=4),
    protocol= AH, transform= ah-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0x176D0964(393021796), conn_id= 2000, keysize= 0, flags= 0x4
```

```
01:50:25: IPSec(initialize_sas): ,
  (key Eng. msg.) src= 19.19.19.19, dest= 18.18.18.18,
    src_proxy= 19.19.19.0/255.255.255.0/0/0 (type=4),
    dest_proxy= 18.18.18.0/255.255.255.0/0/0 (type=4),
    protocol= AH, transform= ah-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0x19911A16(428939798), conn_id= 2001, keysize= 0, flags= 0x4
01:50:25: IPSec(initialize_sas): ,
  (key Eng. msg.) dest= 19.19.19.19, src= 18.18.18.18,
    dest_proxy= 19.19.19.0/255.255.255.0/0/0 (type=4),
    src_proxy= 18.18.18.0/255.255.255.0/0/0 (type=4),
    protocol= ESP, transform= ESP-Des ,
    lifedur= 3600s and 4608000kb,
    spi= 0x2B92064(45686884), conn_id= 2002, keysize= 0, flags= 0x4
01:50:25: IPSec(initialize_sas): ,
  (key Eng. msg.) src= 19.19.19.19, dest= 18.18.18.18,
    src_proxy= 19.19.19.0/255.255.255.0/0/0 (type=4),
    dest_proxy= 18.18.18.0/255.255.255.0/0/0 (type=4),
    protocol= ESP, transform= ESP-Des ,
    lifedur= 3600s and 4608000kb,
    spi= 0x7091981(118036865), conn_id= 2003, keysize= 0, flags= 0x4
01:50:25: IPSec(create_sa): sa created,
  (sa) sa_dest= 19.19.19.19, sa_prot= 51,
    sa_spi= 0x176D0964(393021796),
    sa_trans= ah-md5-hmac , sa_conn_id= 2000
01:50:25: IPSec(create_sa): sa created,
  (sa) sa_dest= 18.18.18.18, sa_prot= 51,
    sa_spi= 0x19911A16(428939798),
    sa_trans= ah-md5-hmac , sa_conn_id= 2001
01:50:25: IPSec(create_sa): sa created,
  (sa) sa_dest= 19.19.19.19, sa_prot= 50,
    sa_spi= 0x2B92064(45686884),
    sa_trans= ESP-Des , sa_conn_id= 2002
01:50:25: IPSec(create_sa): sa created,
  (sa) sa_dest= 18.18.18.18, sa_prot= 50,
    sa_spi= 0x7091981(118036865),
    sa_trans= ESP-Des , sa_conn_id= 2003
ubr924-1#
```

Zodra de IPsec-tunnel is gecreëerd, kunt u de verbinding en de versleutelde en gedecrypteerde pakketten zien.

```
ubr924-1#show crypto engine connection active
ID   Interface      IP-Address     State  Algorithm          Encrypt  Decrypt
   1                               set    HMAC_MD5+DES_56_CB       0        0
2000 cable-modem0   172.16.31.20   set    HMAC_MD5                 0       99
2001 cable-modem0   172.16.31.20   set    HMAC_MD5                99        0
2002 cable-modem0   172.16.31.20   set    DES_56_CBC               0       99
2003 cable-modem0   172.16.31.20   set    DES_56_CBC              99        0
```

De eerste lijn van 200x toont de 99 ontvangen pakketten. Ze moet de pakketten decrypteren om ze naar PC1 te verzenden. De tweede lijn toont 99 verzonden pakketten. Het moet de pakketten versleutelen voordat het naar uBR904-2 wordt verzonden. De derde en de vierde lijn voeren hetzelfde proces uit, maar met ESP-DES-transformatie in plaats van AH-MD5-HMAC.

Opmerking: Als de transformatieset die op de kabelmodem is geconfigureerd ESP-DES ESP-MD5-HMAC is, zie je alleen twee autonome systemen (ASs), in tegenstelling tot de vier die in de vorige **show-**opdracht zijn **getoond**.

```
ubr904-2#show crypto engine connection active
ID   Interface      IP-Address     State  Algorithm          Encrypt  Decrypt
   1                               set    HMAC_MD5+DES_56_CB       0        0
2000 cable-modem0   172.16.30.18   set    HMAC_MD5                 0       99
2001 cable-modem0   172.16.30.18   set    HMAC_MD5                99        0
2002 cable-modem0   172.16.30.18   set    DES_56_CBC               0       99
2003 cable-modem0   172.16.30.18   set    DES_56_CBC              99        0
```

Geef een uitgebreide ping uit aan PC2 van uBR924-1 om te zien of de tellers toename voor de gecodeerde en gedecrypteerde pakketten.

```
ubr924-1#ping ip
Target IP address: 18.18.18.1
Repeat count [5]: 50
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: y
Source address or interface: 19.19.19.19
Type of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 50, 100-byte ICMP Echos to 18.18.18.1, timeout is 2 seconds:
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Success rate is 100 percent (50/50), round-trip min/avg/max = 28/30/33 ms

ubr924-1#show crypto engine connection active
ID   Interface      IP-Address     State  Algorithm          Encrypt  Decrypt
   1                               set    HMAC_MD5+DES_56_CB       0        0
2000 cable-modem0   172.16.31.20   set    HMAC_MD5                 0      149
2001 cable-modem0   172.16.31.20   set    HMAC_MD5               149        0
2002 cable-modem0   172.16.31.20   set    DES_56_CBC               0      149
2003 cable-modem0   172.16.31.20   set    DES_56_CBC             149        0

ubr904-2#show crypto engine connection active
ID   Interface      IP-Address     State  Algorithm          Encrypt  Decrypt
   1                               set    HMAC_MD5+DES_56_CB       0        0
2000 cable-modem0   172.16.30.18   set    HMAC_MD5                 0      149
2001 cable-modem0   172.16.30.18   set    HMAC_MD5               149        0
2002 cable-modem0   172.16.30.18   set    DES_56_CBC               0      149
2003 cable-modem0   172.16.30.18   set    DES_56_CBC             149        0
```

Een ander uitgebreid ping kan worden uitgegeven, om te zien dat de tellers opnieuw groeien. ditmaal moet u een 500-pakje pingelen van uBR904-2 naar de Ethernet-interface van uBR924-1 (19.19.19).

```
ubr904-2#ping ip
Target IP address: 19.19.19.19
Repeat count [5]: 500
Datagram size [100]: 1000
Timeout in seconds [2]:
Extended commands [n]: y
Source address or interface: 18.18.18.18
Type of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
```

```
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 500, 1000-byte ICMP Echos to 19.19.19.19, timeout is 2 seconds:
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
01:59:06: IPSec(encapsulate): encaps area too small, moving to new buffer:
idbtype 0, encaps_size 26, header size 60, avail 84!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!
Success rate is 100 percent (500/500), round-trip min/avg/max = 98/135/352 ms

ubr904-2#show crypto engine connection active
ID   Interface       IP-Address      State  Algorithm           Encrypt  Decrypt
   1                                 set    HMAC_MD5+DES_56_CB        0        0
2000 cable-modem0    172.16.30.18    set    HMAC_MD5                  0      649
2001 cable-modem0    172.16.30.18    set    HMAC_MD5                649        0
2002 cable-modem0    172.16.30.18    set    DES_56_CBC                0      649
2003 cable-modem0    172.16.30.18    set    DES_56_CBC              649        0

ubr924-1#show crypto engine connection active
ID   Interface       IP-Address      State  Algorithm           Encrypt  Decrypt
   1                                 set    HMAC_MD5+DES_56_CB        0        0
2000 cable-modem0    172.16.31.20    set    HMAC_MD5                  0      649
2001 cable-modem0    172.16.31.20    set    HMAC_MD5                649        0
2002 cable-modem0    172.16.31.20    set    DES_56_CBC                0      649
2003 cable-modem0    172.16.31.20    set    DES_56_CBC              649        0
```

U kunt de **heldere crypto isakmp** uitgeven en **crypto als** opdrachten **verwijderen** om de verbindingen te ontgrendelen. Als er tijdens de verlooptijd geen verkeer via de IPsec-tunnel is, stelt IPsec de verbinding automatisch opnieuw in.

Problemen oplossen

Er is momenteel geen specifieke informatie beschikbaar voor het oplossen van deze configuratie.

Gerelateerde informatie

- Opdrachten voor IPsec-netwerkbeveiliging
- Een inleiding tot IP Security (IPsec) encryptie - debug-informatie
- Configuratievoorbeelden van IPsec
- IPsec-netwerkbeveiliging configureren
- De Cisco uBR9000 Series kabeltoegangsrouters configureren
- Cisco Cable/Broadband Downloads **(alleen** geregistreerde **klanten)**
- Ondersteuning van breedbandkabeltechnologie
- Technische ondersteuning en documentatie – Cisco Systems