

# Configuration de la technologie Hub and Spoke IPSec de routeur à routeur avec communication entre satellites

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## [Introduction](#)

Cet exemple de configuration illustre une conception de réseau IPSec en étoile entre trois routeurs. Cette configuration diffère des autres configurations de réseau en étoile, car dans cet exemple, la communication est activée entre les sites en étoile en passant par le hub. En d'autres termes, il n'y a pas de tunnel IPsec direct entre les deux routeurs en étoile. Tous les paquets sont envoyés à travers le tunnel au routeur central qui les redistribue dans le tunnel IPsec partagé avec l'autre routeur en étoile. Cette configuration est possible suite à la résolution du bogue Cisco ID [CSCdp09904](#) (clients [enregistrés](#) uniquement). Cette correction a été intégrée dans la version 12.2(5) du logiciel Cisco IOS® et cette version est la condition minimum requise pour cette configuration.

Afin de configurer le tunnel GRE (Generic Routing Encapsulation) sur IPSec avec OSPF, référez-vous à [Configuration d'un tunnel GRE sur IPSec avec OSPF](#).

Afin de configurer la configuration de base du pare-feu Cisco IOS® sur un tunnel GRE avec traduction d'adresses de réseau (NAT), référez-vous à [Configuration d'IPSec routeur à routeur \(clés prépartagées\) sur le tunnel GRE avec pare-feu IOS et NAT](#).

## [Conditions préalables](#)

## [Conditions requises](#)

Ce document exige une connaissance de base du protocole IPSec. Référez-vous à [Introduction au cryptage de sécurité IP \(IPSec\)](#) pour en savoir plus sur IPSec.

L'objectif de ce document est de s'assurer que le chiffrement est effectué entre ces routeurs :

- 172.16.1.0/24 (Spoke 1) à 10.1.1.0/24 (Hub)
- 192.168.1.0/24 (Spoke 2) à 10.1.1.0/24 (Hub)
- 172.16.1.0/24 (Spoke 1) à 192.168.1.0/24 (Spoke 2)

## [Components Used](#)

Les informations dans ce document sont basées sur les versions de logiciel et matériel suivantes :

- Logiciel Cisco IOS Version 12.2(24a) (c2500-ik8s-l.122-24a.bin)
- Routeurs Cisco 2500

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

## [Conventions](#)

Pour plus d'informations sur les conventions utilisées dans ce document, reportez-vous à [Conventions relatives aux conseils techniques Cisco](#).

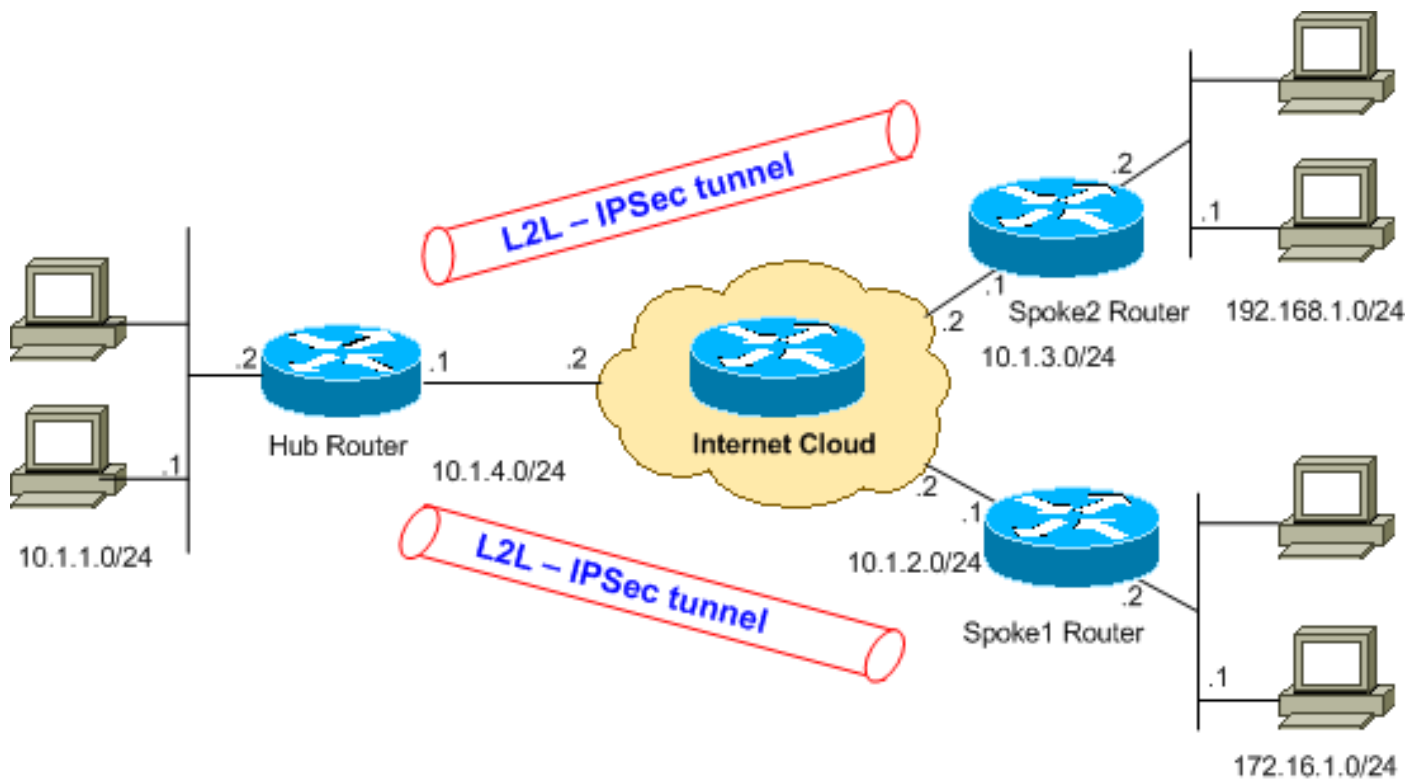
## [Configuration](#)

Cette section vous fournit des informations pour configurer les fonctionnalités décrites dans ce document.

**Remarque :** Utilisez [l'outil de recherche de commandes](#) (clients [inscrits](#) seulement) pour en savoir plus sur les commandes figurant dans le présent document.

## [Diagramme du réseau](#)

Ce document utilise la configuration réseau indiquée dans le diagramme suivant.



**Remarque :** les schémas d'adressage IP utilisés dans cette configuration ne sont pas routables légalement sur Internet. Ce sont des adresses [RFC 1918 qui ont été utilisés dans un environnement de laboratoire.](#)

## Configurations

Ce document utilise les configurations suivantes.

La commande [show running-config](#) affiche la configuration en cours sur le routeur.

- [Routeur concentrateur](#)
- [Routeur Spoke 1](#)
- [Routeur Spoke 2](#)

### Routeur concentrateur

```

Hub#show running-config
Building configuration...
Current configuration : 1466 bytes
!
version 12.2

service timestamps debug datetime msec
service timestamps log uptime
no service password-encryption
!
hostname Hub
!

!
ip subnet-zero
!

```

```

!
!--- Configuration for IKE policies. crypto isakmp
policy 10
!--- Enables the IKE policy configuration (config-
isakmp) !--- command mode, where you can specify the
parameters that !--- are used during an IKE negotiation.
hash md5
authentication pre-share
crypto isakmp key cisco123 address 10.1.2.1
crypto isakmp key cisco123 address 10.1.3.1
!--- Specifies the preshared key "cisco123" which should
!--- be identical at both peers. This is a global !---
configuration mode command. ! !--- Configuration for
IPsec policies. crypto ipsec transform-set myset esp-des
esp-md5-hmac
!--- Enables the crypto transform configuration mode, !-
-- where you can specify the transform sets that are
used !--- during an IPsec negotiation. ! crypto map
mymap 10 ipsec-isakmp
!--- Indicates that IKE is used to establish !--- the
IPsec security association for protecting the !---
traffic specified by this crypto map entry. set peer
10.1.2.1
!--- Sets the IP address of the remote end. set
transform-set myset
!--- Configures IPsec to use the transform-set !---
"myset" defined earlier in this configuration. match
address 110
!--- Specifies the traffic to be encrypted. crypto map
mymap 20 ipsec-isakmp
set peer 10.1.3.1
set transform-set myset
match address 120
!
!
!
!
interface Ethernet0
ip address 10.1.1.1 255.255.255.0
!
interface Ethernet1
ip address 10.1.4.1 255.255.255.0
no ip route-cache
!--- You must enable process switching for IPsec !--- to
encrypt outgoing packets. This command disables fast
switching. no ip mroute-cache crypto map mymap
!--- Configures the interface to use the !--- crypto map
"mymap" for IPsec. ! !--- Output suppressed. ip
classless ip route 172.16.1.0 255.255.255.0 Ethernet1
ip route 192.168.1.0 255.255.255.0 Ethernet1
ip route 10.1.0.0 255.255.0.0 Ethernet1
ip http server
!
access-list 110 permit ip 10.1.1.0 0.0.0.255 172.16.1.0
0.0.0.255
access-list 110 permit ip 192.168.1.0 0.0.0.255
172.16.1.0 0.0.0.255
access-list 120 permit ip 10.1.1.0 0.0.0.255 192.168.1.0
0.0.0.255
access-list 120 permit ip 172.16.1.0 0.0.0.255
192.168.1.0 0.0.0.255
!--- This crypto ACL-permit identifies the !--- matching
traffic flows to be protected via encryption.

```

## Routeur Spoke 1

```
Spoke1#show running-config
Building configuration...
Current configuration : 1203 bytes
!
version 12.2

service timestamps debug datetime msec
service timestamps log uptime
no service password-encryption
!
hostname Spoke1
!
enable secret 5 $1$DOX3$rIrxEnTVTw/7LNbxi.akz0

!
ip subnet-zero
no ip domain-lookup
!
!
crypto isakmp policy 10
hash md5
authentication pre-share
crypto isakmp key cisco123 address 10.1.4.1
!
!
crypto ipsec transform-set myset esp-des esp-md5-hmac
!
crypto map mymap 10 ipsec-isakmp
set peer 10.1.4.1
set transform-set myset
match address 110
!
!
!
!
interface Ethernet0
ip address 172.16.1.1 255.255.255.0
!
interface Ethernet1
ip address 10.1.2.1 255.255.255.0
no ip route-cache
no ip mroute-cache
crypto map mymap
!
.
.
!--- Output suppressed. . . ip classless
ip route 192.168.1.0 255.255.255.0 Ethernet1
ip route 10.1.0.0 255.255.0.0 Ethernet1
no ip http server

!
access-list 110 permit ip 172.16.1.0 0.0.0.255 10.1.1.0
0.0.0.255
access-list 110 permit ip 172.16.1.0 0.0.0.255
192.168.1.0 0.0.0.255
!
end
```

2509a#

## Routeur Spoke 2

```
Spoke2#show running-config
Building configuration...
Current configuration : 1117 bytes
!
version 12.2

service timestamps debug datetime msec
service timestamps log uptime
service password-encryption
!
hostname Spoke2
!
!
ip subnet-zero
no ip domain-lookup
!
!
crypto isakmp policy 10
hash md5
authentication pre-share
crypto isakmp key cisco123 address 10.1.4.1
!
!
crypto ipsec transform-set myset esp-des esp-md5-hmac
!
crypto map mymap 10 ipsec-isakmp
set peer 10.1.4.1
set transform-set myset
match address 120
!
!
!
!
interface Ethernet0
ip address 192.168.1.1 255.255.255.0
!
interface Ethernet1
ip address 10.1.3.1 255.255.255.0
!--- No ip route-cache. no ip mroute-cache crypto map
mymap
!
.
.
!--- Output suppressed. . . ip classless
ip route 172.16.0.0 255.255.0.0 Ethernet1
ip route 10.1.0.0 255.255.0.0 Ethernet1
no ip http server
!
access-list 120 permit ip 192.168.1.0 0.0.0.255
172.16.1.0 0.0.0.255
access-list 120 permit ip 192.168.1.0 0.0.0.255 10.1.1.0
0.0.0.255
!
end
```

## [Ajouter un autre rayon](#)

Si vous devez ajouter un autre routeur en étoile (Spoke3) au routeur concentrateur existant en plus de Spoke1 et Spoke2, il suffit de créer un nouveau tunnel LAN à LAN (L2L) à partir du concentrateur vers Spoke3. Cependant, comme une seule carte de chiffrement peut être configurée par interface physique, vous devez utiliser le même nom de carte de chiffrement lors de l'ajout de ce tunnel. Cela est possible lorsque vous utilisez des numéros de ligne différents pour chaque site distant.

**Remarque :** Il peut être nécessaire de supprimer la carte de chiffrement et de la réappliquer à l'interface lorsque la nouvelle entrée de tunnel est ajoutée. Lorsque la carte de chiffrement est supprimée, tous les tunnels actifs sont effacés.

### Routeur concentrateur

```
Hub#show running-config
Building configuration...
Current configuration : 1466 bytes
!
version 12.2

service timestamps debug datetime msec
service timestamps log uptime
no service password-encryption
!
hostname Hub
!

!
ip subnet-zero
!

!
crypto isakmp policy 10

hash md5
authentication pre-share
crypto isakmp key cisco123 address 10.1.2.1
crypto isakmp key cisco123 address 10.1.3.1
crypto isakmp key cisco123 address 10.1.5.1
!

crypto ipsec transform-set myset esp-des esp-md5-hmac
!
crypto map mymap 10 ipsec-isakmp
set peer 10.1.2.1
set transform-set myset
match address 110

crypto map mymap 20 ipsec-isakmp
set peer 10.1.3.1
set transform-set myset
match address 120

!--- It is important to specify crypto map line number
30 for !--- the Spoke 3 router with the same crypto map
```

```
name "mymap" crypto map mymap 30 ipsec-isakmp
set peer 10.1.5.1
set transform-set myset
match address 130
!
!
!
!
interface Ethernet0
ip address 10.1.1.1 255.255.255.0
!
interface Ethernet1
ip address 10.1.4.1 255.255.255.0
no ip route-cache
no ip mroute-cache

!--- It is important to remove and re-apply the crypto
!--- map to this interface if it is used for the
termination of other !--- spoke VPN tunnels. crypto map
mymap
!

!--- Output suppressed. ip classless ip route 172.16.1.0
255.255.255.0 Ethernet1 ip route 192.168.1.0
255.255.255.0 Ethernet1 ip route 10.1.0.0 255.255.0.0
Ethernet1 ip route 172.16.2.0 255.255.255.0 Ethernet1 ip
http server ! access-list 110 permit ip 10.1.1.0
0.0.0.255 172.16.1.0 0.0.0.255 access-list 110 permit ip
192.168.1.0 0.0.0.255 172.16.1.0 0.0.0.255 access-list
110 permit ip 172.16.2.0 0.0.0.255 172.16.1.0 0.0.0.255
access-list 120 permit ip 10.1.1.0 0.0.0.255 192.168.1.0
0.0.0.255 access-list 120 permit ip 172.16.2.0 0.0.0.255
192.168.1.0 0.0.0.255 access-list 120 permit ip
172.16.1.0 0.0.0.255 192.168.1.0 0.0.0.255 access-list
130 permit ip 10.1.1.0 0.0.0.255 172.16.2.0 0.0.0.255
access-list 130 permit ip 192.168.1.0 0.0.0.255
172.16.2.0 0.0.0.255
access-list 130 permit ip 172.16.1.0 0.0.0.255
172.16.2.0 0.0.0.255
```

### Routeur Spoke 3

```
Spoke3#show running-config
Building configuration...
Current configuration : 1117 bytes
!
version 12.2

service timestamps debug datetime msec
service timestamps log uptime
service password-encryption
!
hostname Spoke3
!
!
ip subnet-zero
no ip domain-lookup
!
!
crypto isakmp policy 10
hash md5
```



```

authentication pre-share
crypto isakmp key cisco123 address 10.1.4.1
!
!
crypto ipsec transform-set myset esp-des esp-md5-hmac
!
crypto map mymap 10 ipsec-isakmp
set peer 10.1.4.1
set transform-set myset
match address 130
!
!
!
!
interface Ethernet0
ip address 172.16.2.1 255.255.255.0
!
interface Ethernet1
ip address 10.1.5.1 255.255.255.0
no ip mroute-cache
crypto map mymap
!
.
.
!--- Output suppressed. . . ip classless
ip route 172.16.0.0 255.255.0.0 Ethernet1
ip route 10.1.0.0 255.255.0.0 Ethernet1
no ip http server
!
access-list 130 permit ip 172.168.2.0 0.0.0.255
172.16.1.0 0.0.0.255
access-list 130 permit ip 172.168.2.0 0.0.0.255 10.1.1.0
0.0.0.255
access-list 130 permit ip 172.168.2.0 0.0.0.255
192.168.1.0 0.0.0.255
!
end
VPN2509#

```

## Vérification

Référez-vous à cette section pour vous assurer du bon fonctionnement de votre configuration.

L'[Outil Interpréteur de sortie \(clients enregistrés uniquement\) \(OIT\)](#) prend en charge certaines commandes `show`. Utilisez l'OIT pour afficher une analyse de la sortie de la commande `show`.

Afin de vérifier cette configuration, essayez une commande `ping` étendue provenant de l'adresse d'interface ethernet1 sur Spoke 1, destinée à l'adresse d'interface ethernet1 dans Spoke 2.

- **ping** - Utilisé pour diagnostiquer la connectivité réseau de base.

```

Spoke1#ping
Protocol [ip]:
Target IP address: 192.168.1.1
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: y

```

```
Source address or interface: 172.16.1.1
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 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/64/68 ms
```

- [show crypto ipsec sa](#) - Affiche les paramètres utilisés par les associations de sécurité (SA) IPSec actuelles.
- [show crypto isakmp sa](#) — Affiche toutes les SA IKE en cours au niveau d'un homologue.
- [show crypto engine connections active](#) : affiche le nombre de paquets transmis sur chaque SA IPSec.

## Exemple de résultat de show

Ce résultat provient de la commande **show crypto engine connections active** exécutée sur le routeur Hub.

```
Hub#show crypto engine connections active
```

```
ID Interface IP-Address State Algorithm Encrypt Decrypt
5 Ethernet0 10.1.4.1 set HMAC_MD5+DES_56_CB 0 0
6 <none> <none> set HMAC_MD5+DES_56_CB 0 0
2000 Ethernet0 10.1.4.1 set HMAC_MD5+DES_56_CB 0 10
2001 Ethernet0 10.1.4.1 set HMAC_MD5+DES_56_CB 10 0
2002 Ethernet0 10.1.4.1 set HMAC_MD5+DES_56_CB 0 10
2003 Ethernet0 10.1.4.1 set HMAC_MD5+DES_56_CB 10 0
```

À partir de cet exemple, vous pouvez voir que chaque tunnel a chiffré et déchiffré 10 paquets, ce qui prouve que le trafic est passé par le routeur concentrateur.

**Remarque** : deux SA IPsec sont créées pour chaque homologue (une dans chaque direction). Par exemple, dans le routeur concentrateur, quatre SA IPsec sont créées pour deux homologues.

## Dépannage

Cette section fournit des informations que vous pouvez utiliser pour dépanner votre configuration.

### Dépannage des commandes

**Remarque** : Consulter les [renseignements importants sur les commandes de débogage](#) avant d'utiliser les commandes de **débogage**.

- [debug crypto ipsec](#) : Cette commande affiche les négociations IPSec de la phase 2.
- [debug crypto isakmp](#) - Affiche les négociations ISAKMP de la phase 1.
- [debug crypto engine](#) - Montre le trafic crypté.
- [clear crypto isakmp](#) : efface les SA liées à la phase 1.
- [clear crypto sa](#) : efface les SA liées à la phase 2.

## Exemple de sortie de débogage

Il s'agit de la sortie du routeur concentrateur des commandes **debug crypto ipsec** et **debug crypto isakmp**.

```
*Mar 1 00:03:46.887: ISAKMP (0:0): received packet
  from 10.1.2.1 (N) NEW SA
*Mar 1 00:03:46.887: ISAKMP: local port 500, remote port 500
*Mar 1 00:03:46.899: ISAKMP (0:1): processing SA payload. message ID = 0
*Mar 1 00:03:46.899: ISAKMP (0:1): found peer pre-shared key matching 10.1.2.1
*Mar 1 00:03:46.903: ISAKMP (0:1): Checking ISAKMP transform 1 against priority
  10 policy
*Mar 1 00:03:46.903: ISAKMP:      encryption DES-CBC
*Mar 1 00:03:46.907: ISAKMP:      hash MD5
*Mar 1 00:03:46.907: ISAKMP:      default group 1
*Mar 1 00:03:46.911: ISAKMP:      auth pre-share
*Mar 1 00:03:46.911: ISAKMP:      life type in seconds
*Mar 1 00:03:46.911: ISAKMP:      life duration (VPI) of 0x0 0x1 0x51 0x80
*Mar 1 00:03:46.915: ISAKMP (0:1): atts are acceptable. Next payload is 0
!--- The initial IKE parameters have been !--- successfully exchanged between Spoke 1 and Hub.
*Mar 1 00:03:48.367: ISAKMP (0:1): SA is doing pre-shared key authentication using id type
ID_IPV4_ADDR *Mar 1 00:03:48.371: ISAKMP (0:1): sending packet to 10.1.2.1 (R) MM_SA_SETUP *Mar
1 00:03:56.895: ISAKMP (0:1): received packet from 10.1.2.1 (R) MM_SA_SETUP *Mar 1 00:03:56.899:
ISAKMP (0:1): phase 1 packet is a duplicate of a previous packet. *Mar 1 00:03:56.899: ISAKMP
(0:1): retransmitting due to retransmit phase 1 *Mar 1 00:03:56.903: ISAKMP (0:1):
retransmitting phase 1 MM_SA_SETUP... *Mar 1 00:03:57.403: ISAKMP (0:1): retransmitting phase 1
MM_SA_SETUP... *Mar 1 00:03:57.403: ISAKMP (0:1): incrementing error counter on sa: retransmit
phase 1 *Mar 1 00:03:57.407: ISAKMP (0:1): retransmitting phase 1 MM_SA_SETUP *Mar 1
00:03:57.407: ISAKMP (0:1): sending packet to 10.1.2.1 (R) MM_SA_SETUP *Mar 1 00:03:58.923:
ISAKMP (0:1): received packet from 10.1.2.1 (R) MM_SA_SETUP *Mar 1 00:03:58.931: ISAKMP (0:1):
processing KE payload. message ID = 0 *Mar 1 00:04:00.775: ISAKMP (0:1): processing NONCE
payload. message ID = 0 *Mar 1 00:04:00.783: ISAKMP (0:1): found peer pre-shared key matching
10.1.2.1 *Mar 1 00:04:00.795: ISAKMP (0:1): SKEYID state generated *Mar 1 00:04:00.799: ISAKMP
(0:1): processing vendor id payload *Mar 1 00:04:00.803: ISAKMP (0:1): speaking to another IOS
box! *Mar 1 00:04:00.811: ISAKMP (0:1): sending packet to 10.1.2.1 (R) MM_KEY_EXCH *Mar 1
00:04:02.751: ISAKMP (0:1): received packet from 10.1.2.1 (R) MM_KEY_EXCH *Mar 1 00:04:02.759:
ISAKMP (0:1): processing ID payload. message ID = 0 *Mar 1 00:04:02.759: ISAKMP (0:1):
processing HASH payload. message ID = 0 *Mar 1 00:04:02.767: ISAKMP (0:1): SA has been
authenticated with 10.1.2.1 *Mar 1 00:04:02.771: ISAKMP (1): ID payload next-payload : 8 type :
1 protocol : 17 port : 500 length : 8 *Mar 1 00:04:02.775: ISAKMP (1): Total payload length: 12
*Mar 1 00:04:02.783: ISAKMP (0:1): sending packet to 10.1.2.1 (R) QM_IDLE *Mar 1 00:04:02.871:
ISAKMP (0:1): received packet from 10.1.2.1 (R) QM_IDLE
!--- IKE phase 1 SA has been successfully negotiated !--- between Spoke 1 and Hub. *Mar 1
00:04:02.891: ISAKMP (0:1): processing HASH payload. message ID = 581713929 *Mar 1 00:04:02.891:
ISAKMP (0:1): processing SA payload. message ID = 581713929 *Mar 1 00:04:02.895: ISAKMP (0:1):
Checking IPsec proposal 1
!--- IKE exchanges IPsec phase 2 parameters !--- between Spoke 1 and Hub. *Mar 1 00:04:02.895:
ISAKMP: transform 1, ESP_DES *Mar 1 00:04:02.899: ISAKMP: attributes in transform: *Mar 1
00:04:02.899: ISAKMP: encaps is 1 *Mar 1 00:04:02.899: ISAKMP: SA life type in seconds *Mar 1
00:04:02.903: ISAKMP: SA life duration (basic) of 3600 *Mar 1 00:04:02.903: ISAKMP: SA life type
in kilobytes *Mar 1 00:04:02.907: ISAKMP: SA life duration (VPI) of 0x0 0x46 0x50 0x0 *Mar 1
00:04:02.911: ISAKMP: authenticator is HMAC-MD5 *Mar 1 00:04:02.915: ISAKMP (0:1): atts are
acceptable.
!--- IPsec phase 2 parameters have been !--- successfully exchanged between Spoke 1 and Hub.
*Mar 1 00:04:02.915: IPSEC(validate_proposal_request): proposal part #1, (key eng. msg.) INBOUND
local= 10.1.4.1, remote= 10.1.2.1, local_proxy= 192.168.1.0/255.255.255.0/0/0 (type=4),
remote_proxy= 172.16.1.0/255.255.255.0/0/0 (type=4), protocol= ESP, transform= esp-des esp-md5-
hmac , lifedur= 0s and 0kb, spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4 *Mar 1 00:04:02.931:
ISAKMP (0:1): processing NONCE payload. message ID = 581713929 *Mar 1 00:04:02.935: ISAKMP
(0:1): processing ID payload. message ID = 581713929 *Mar 1 00:04:02.935: ISAKMP (0:1):
processing ID payload. message ID = 581713929 *Mar 1 00:04:02.939: ISAKMP (0:1): asking for 1
```

spis from ipsec \*Mar 1 00:04:02.943: IPSEC(key\_engine): got a queue event... \*Mar 1  
00:04:02.951: IPSEC(spi\_response): getting spi 4208568169 for SA from 10.1.4.1 to 10.1.2.1 for  
prot 3 \*Mar 1 00:04:02.955: ISAKMP: received ke message (2/1) \*Mar 1 00:04:03.207: ISAKMP (0:1):  
sending packet to 10.1.2.1 (R) QM\_IDLE \*Mar 1 00:04:03.351: ISAKMP (0:1): received packet from  
10.1.2.1 (R) QM\_IDLE \*Mar 1 00:04:03.387: ISAKMP (0:1): Creating IPsec SAs \*Mar 1 00:04:03.387:  
inbound SA from 10.1.2.1 to 10.1.4.1 (proxy 172.16.1.0 to 192.168.1.0) \*Mar 1 00:04:03.391: has  
spi 0xFAD9A769 and conn\_id 2000 and flags 4 \*Mar 1 00:04:03.395: lifetime of 3600 seconds \*Mar 1  
00:04:03.395: lifetime of 4608000 kilobytes \*Mar 1 00:04:03.399: outbound SA from 10.1.4.1 to  
10.1.2.1 (proxy 192.168.1.0 to 172.16.1.0 ) \*Mar 1 00:04:03.403: has spi -732960388 and conn\_id  
2001 and flags C \*Mar 1 00:04:03.407: lifetime of 3600 seconds \*Mar 1 00:04:03.407: lifetime of  
4608000 kilobytes \*Mar 1 00:04:03.411: ISAKMP (0:1): deleting node 581713929 error FALSE reason  
" quick mode done (await())" \*Mar 1 00:04:03.415: IPSEC(key\_engine): got a queue event... \*Mar 1  
00:04:03.415: IPSEC(initialize\_sas): , (key eng. msg.) INBOUND local= 10.1.4.1, remote=  
10.1.2.1, local\_proxy= 192.168.1.0/255.255.255.0/0/0 (type=4), remote\_proxy=  
172.16.1.0/255.255.255.0/0/0 (type=4), protocol= ESP, transform= esp-des esp-md5-hmac , lifedur=  
3600s and 4608000kb, spi= 0xFAD9A769(4208568169), conn\_id= 2000, keysizes= 0, flags= 0x4 \*Mar 1  
00:04:03.427: IPSEC(initialize\_sas): , (key eng. msg.) OUTBOUND local= 10.1.4.1, remote=  
10.1.2.1, local\_proxy= 192.168.1.0/255.255.255.0/0/0 (type=4), remote\_proxy=  
172.16.1.0/255.255.255.0/0/0 (type=4), protocol= ESP, transform= esp-des esp-md5-hmac , lifedur=  
3600s and 4608000kb, spi= 0xD44FE97C(3562006908), conn\_id= 2001, keysizes= 0, flags= 0xC \*Mar 1  
00:04:03.443: **IPSEC(create\_sa): sa created,**  
    (sa) **sa\_dest= 10.1.4.1**, sa\_prot= 50,  
        sa\_spi= 0xFAD9A769(4208568169),  
        sa\_trans= esp-des esp-md5-hmac , sa\_conn\_id= 2000  
\*Mar 1 00:04:03.447: **IPSEC(create\_sa): sa created,**  
    (sa) **sa\_dest= 10.1.2.1**, sa\_prot= 50,  
        sa\_spi= 0xD44FE97C(3562006908),  
        sa\_trans= esp-des esp-md5-hmac , sa\_conn\_id= 2001  
*!--- IPsec tunnel has been created between !--- routers Spoke 1 and Hub. \*Mar 1 00:05:02.387:*  
IPSEC(sa\_request): , *!--- Since an IPsec tunnel is created between Spoke 1 !--- and Spoke 2*  
*through the Hub, the Hub router !--- initializes a new IPsec tunnel between itself and Spoke 2.*  
(key eng. msg.) OUTBOUND local= 10.1.4.1, remote= 10.1.3.1, local\_proxy=  
172.16.1.0/255.255.255.0/0/0 (type=4), remote\_proxy= 192.168.1.0/255.255.255.0/0/0 (type=4),  
protocol= ESP, transform= esp-des esp-md5-hmac , lifedur= 3600s and 4608000kb, spi=  
0x1B7A414E(460996942), conn\_id= 0, keysizes= 0, flags= 0x400C \*Mar 1 00:05:02.399: ISAKMP:  
received ke message (1/1) \*Mar 1 00:05:02.403: ISAKMP: local port 500, remote port 500 \*Mar 1  
00:05:02.411: ISAKMP (0:2): beginning Main Mode exchange \*Mar 1 00:05:02.415: ISAKMP (0:2):  
sending packet to 10.1.3.1 (I) MM\_NO\_STATE \*Mar 1 00:05:12.419: ISAKMP (0:2): retransmitting  
phase 1 MM\_NO\_STATE... \*Mar 1 00:05:12.419: ISAKMP (0:2): incrementing error counter on sa:  
retransmit phase 1 \*Mar 1 00:05:12.423: ISAKMP (0:2): retransmitting phase 1 MM\_NO\_STATE \*Mar 1  
00:05:12.423: ISAKMP (0:2): sending packet to 10.1.3.1 (I) MM\_NO\_STATE \*Mar 1 00:05:22.427:  
ISAKMP (0:2): retransmitting phase 1 MM\_NO\_STATE... \*Mar 1 00:05:22.427: ISAKMP (0:2):  
incrementing error counter on sa: retransmit phase 1 \*Mar 1 00:05:22.431: ISAKMP (0:2):  
retransmitting phase 1 MM\_NO\_STATE \*Mar 1 00:05:22.431: ISAKMP (0:2): sending packet to 10.1.3.1  
(I) MM\_NO\_STATE \*Mar 1 00:05:22.967: ISAKMP (0:2): received packet from 10.1.3.1 (I) MM\_NO\_STATE  
\*Mar 1 00:05:22.975: ISAKMP (0:2): processing SA payload. message ID = 0 \*Mar 1 00:05:22.975:  
ISAKMP (0:2): found peer pre-shared key matching 10.1.3.1 \*Mar 1 00:05:22.979: ISAKMP (0:2):  
Checking ISAKMP transform 1 against priority 10 policy \*Mar 1 00:05:22.979: ISAKMP: encryption  
DES-CBC \*Mar 1 00:05:22.983: ISAKMP: hash MD5 \*Mar 1 00:05:22.983: ISAKMP: default group 1 \*Mar  
1 00:05:22.987: ISAKMP: auth pre-share \*Mar 1 00:05:22.987: ISAKMP: life type in seconds \*Mar 1  
00:05:22.987: ISAKMP: life duration (VPI) of 0x0 0x1 0x51 0x80 \*Mar 1 00:05:22.991: ISAKMP  
(0:2): **atts are acceptable.**  
Next payload is 0  
*!--- IKE phase 1 parameters have been successfully !--- exchanged between Hub and Spoke 2. \*Mar*  
1 00:05:24.447: ISAKMP (0:2): SA is doing pre-shared key authentication using id type  
ID\_IPV4\_ADDR \*Mar 1 00:05:24.455: ISAKMP (0:2): sending packet to 10.1.3.1 (I) MM\_SA\_SETUP \*Mar  
1 00:05:26.463: ISAKMP (0:2): received packet from 10.1.3.1 (I) MM\_SA\_SETUP \*Mar 1 00:05:26.471:  
ISAKMP (0:2): processing KE payload. message ID = 0 \*Mar 1 00:05:28.303: ISAKMP (0:2):  
processing NONCE payload. message ID = 0 \*Mar 1 00:05:28.307: ISAKMP (0:2): found peer pre-  
shared key matching 10.1.3.1 \*Mar 1 00:05:28.319: ISAKMP (0:2): SKEYID state generated \*Mar 1  
00:05:28.323: ISAKMP (0:2): processing vendor id payload \*Mar 1 00:05:28.327: ISAKMP (0:2):  
speaking to another IOS box! \*Mar 1 00:05:28.331: ISAKMP (2): ID payload next-payload : 8 type :  
1 protocol : 17 port : 500 length : 8 \*Mar 1 00:05:28.335: ISAKMP (2): Total payload length: 12  
\*Mar 1 00:05:28.343: ISAKMP (0:2): sending packet to 10.1.3.1 (I) MM\_KEY\_EXCH \*Mar 1

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00:05:28.399: ISAKMP (0:2): received packet from 10.1.3.1 (I) MM_KEY_EXCH *Mar 1 00:05:28.407:
ISAKMP (0:2): processing ID payload. message ID = 0 *Mar 1 00:05:28.411: ISAKMP (0:2):
processing HASH payload. message ID = 0 *Mar 1 00:05:28.419: ISAKMP (0:2): SA has been
authenticated with 10.1.3.1 *Mar 1 00:05:28.419: ISAKMP (0:2): beginning Quick Mode exchange, M-
ID of -1872859789 *Mar 1 00:05:28.439: ISAKMP (0:2): sending packet to 10.1.3.1 (I) QM_IDLE *Mar
1 00:05:28.799: ISAKMP (0:2): received packet from 10.1.3.1 (I) QM_IDLE
!--- The IKE phase 1 SA has been successfully !--- negotiated between Hub and Spoke 2. *Mar 1
00:05:28.815: ISAKMP (0:2): processing HASH payload. message ID = -1872859789 *Mar 1
00:05:28.815: ISAKMP (0:2): processing SA payload. message ID = -1872859789 *Mar 1 00:05:28.819:
ISAKMP (0:2): Checking IPsec proposal 1
!--- IKE exchanges IPsec phase 2 parameters !--- between Hub and Spoke 2. *Mar 1 00:05:28.819:
ISAKMP: transform 1, ESP_DES *Mar 1 00:05:28.823: ISAKMP: attributes in transform: *Mar 1
00:05:28.823: ISAKMP: encaps is 1 *Mar 1 00:05:28.827: ISAKMP: SA life type in seconds *Mar 1
00:05:28.827: ISAKMP: SA life duration (basic) of 3600 *Mar 1 00:05:28.827: ISAKMP: SA life type
in kilobytes *Mar 1 00:05:28.831: ISAKMP: SA life duration (VPI) of 0x0 0x46 0x50 0x0 *Mar 1
00:05:28.835: ISAKMP: authenticator is HMAC-MD5 *Mar 1 00:05:28.839: ISAKMP (0:2): atts are
acceptable.
!--- IPsec phase 2 parameters have been successfully !--- exchanged between Hub and Spoke 2.
*Mar 1 00:05:28.843: IPSEC(validate_proposal_request): proposal part #1, (key eng. msg.) INBOUND
local= 10.1.4.1, remote= 10.1.3.1, local_proxy= 172.16.1.0/255.255.255.0/0/0 (type=4),
remote_proxy= 192.168.1.0/255.255.255.0/0/0 (type=4), protocol= ESP, transform= esp-des esp-md5-
hmac , lifedur= 0s and 0kb, spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4 *Mar 1 00:05:28.855:
ISAKMP (0:2): processing NONCE payload. message ID = -1872859789 *Mar 1 00:05:28.859: ISAKMP
(0:2): processing ID payload. message ID = -1872859789 *Mar 1 00:05:28.863: ISAKMP (0:2):
processing ID payload. message ID = -1872859789 *Mar 1 00:05:28.891: ISAKMP (0:2): Creating
IPsec SAs *Mar 1 00:05:28.891: inbound SA from 10.1.3.1 to 10.1.4.1 (proxy 192.168.1.0 to
172.16.1.0) *Mar 1 00:05:28.895: has spi 0x1B7A414E and conn_id 2002 and flags 4 *Mar 1
00:05:28.899: lifetime of 3600 seconds *Mar 1 00:05:28.899: lifetime of 4608000 kilobytes *Mar 1
00:05:28.903: outbound SA from 10.1.4.1 to 10.1.3.1 (proxy 172.16.1.0 to 192.168.1.0 ) *Mar 1
00:05:28.907: has spi -385025107 and conn_id 2003 and flags C *Mar 1 00:05:28.911: lifetime of
3600 seconds *Mar 1 00:05:28.911: lifetime of 4608000 kilobytes *Mar 1 00:05:28.915: ISAKMP
(0:2): sending packet to 10.1.3.1 (I) QM_IDLE *Mar 1 00:05:28.919: ISAKMP (0:2): deleting node -
1872859789 error FALSE reason "" *Mar 1 00:05:28.923: IPSEC(key_engine): got a queue event...
*Mar 1 00:05:28.927: IPSEC(initialize_sas): , (key eng. msg.) INBOUND local= 10.1.4.1, remote=
10.1.3.1, local_proxy= 172.16.1.0/255.255.255.0/0/0 (type=4), remote_proxy=
192.168.1.0/255.255.255.0/0/0 (type=4), protocol= ESP, transform= esp-des esp-md5-hmac ,
lifedur= 3600s and 4608000kb, spi= 0x1B7A414E(460996942), conn_id= 2002, keysize= 0, flags= 0x4
*Mar 1 00:05:28.939: IPSEC(initialize_sas): , (key eng. msg.) OUTBOUND local= 10.1.4.1, remote=
10.1.3.1, local_proxy= 172.16.1.0/255.255.255.0/0/0 (type=4), remote_proxy=
192.168.1.0/255.255.255.0/0/0 (type=4), protocol= ESP, transform= esp-des esp-md5-hmac ,
lifedur= 3600s and 4608000kb, spi= 0xE90CFBAD(3909942189), conn_id= 2003, keysize= 0, flags= 0xC
*Mar 1 00:05:28.951: IPSEC(create_sa): sa created,
(sa) sa_dest= 10.1.4.1, sa_prot= 50,
sa_spi= 0x1B7A414E(460996942),
sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2002
*Mar 1 00:05:28.959: IPSEC(create_sa): sa created,
(sa) sa_dest= 10.1.3.1, sa_prot= 50,
sa_spi= 0xE90CFBAD(3909942189),
sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2003
!--- IPsec tunnel has been created between routers !--- Hub and Spoke 2. This establishes a
tunnel between Spoke 1 !--- and Spoke 2 through Hub.

```

Ceci est la sortie du routeur Spoke 1 des commandes debug crypto isakmp et debug crypto ipsec.

```

*Mar 1 00:03:28.771: IPSEC(sa_request): ,
(key eng. msg.) OUTBOUND local= 10.1.2.1, remote= 10.1.4.1,
local_proxy= 172.16.1.0/255.255.255.0/0/0 (type=4),
remote_proxy= 192.168.1.0/255.255.255.0/0/0 (type=4),
protocol= ESP, transform= esp-des esp-md5-hmac ,
lifedur= 3600s and 4608000kb,
spi= 0xD44FE97C(3562006908), conn_id= 0, keysize= 0, flags= 0x400C
!--- Request sent after the ping. *Mar 1 00:03:28.787: ISAKMP: received ke message (1/1) *Mar 1
00:03:28.791: ISAKMP: local port 500, remote port 500 *Mar 1 00:03:28.799: ISAKMP (0:1):

```

**beginning Main Mode exchange**

*!--- Initial IKE phase 1 parameters are exchanged !---* between Spoke 1 and Hub. \*Mar 1  
00:03:28.803: ISAKMP (0:1): sending packet to 10.1.4.1 (I) MM\_NO\_STATE. \*Mar 1 00:03:38.807:  
ISAKMP (0:1): retransmitting phase 1 MM\_NO\_STATE... \*Mar 1 00:03:38.807: ISAKMP (0:1):  
incrementing error counter on sa: retransmit phase 1 \*Mar 1 00:03:38.811: ISAKMP (0:1):  
retransmitting phase 1 MM\_NO\_STATE \*Mar 1 00:03:38.811: ISAKMP (0:1): sending packet to 10.1.4.1  
(I) MM\_NO\_STATE \*Mar 1 00:03:48.815: ISAKMP (0:1): retransmitting phase 1 MM\_NO\_STATE... \*Mar 1  
00:03:48.815: ISAKMP (0:1): incrementing error counter on sa: retransmit phase 1 \*Mar 1  
00:03:48.819: ISAKMP (0:1): retransmitting phase 1 MM\_NO\_STATE \*Mar 1 00:03:48.819: ISAKMP  
(0:1): sending packet to 10.1.4.1 (I) MM\_NO\_STATE \*Mar 1 00:03:49.355: ISAKMP (0:1): received  
packet from 10.1.4.1 (I) MM\_NO\_STATE \*Mar 1 00:03:49.363: ISAKMP (0:1): processing SA payload.  
message ID = 0 \*Mar 1 00:03:49.363: ISAKMP (0:1): found peer pre-shared key matching 10.1.4.1  
\*Mar 1 00:03:49.367: ISAKMP (0:1): Checking ISAKMP transform 1 against priority 10 policy \*Mar 1  
00:03:49.367: ISAKMP: encryption DES-CBC \*Mar 1 00:03:49.371: ISAKMP: hash MD5 \*Mar 1  
00:03:49.371: ISAKMP: default group 1 \*Mar 1 00:03:49.375: ISAKMP: auth pre-share \*Mar 1  
00:03:49.375: ISAKMP: life type in seconds \*Mar 1 00:03:49.375: ISAKMP: life duration (VPI) of  
0x0 0x1 0x51 0x80 \*Mar 1 00:03:49.379: ISAKMP (0:1): **atts are acceptable.**

Next payload is 0

*!--- IKE phase 1 parameters have been sucessfully !---* negotiated between Spoke 1 and Hub. \*Mar 1  
00:03:50.835: ISAKMP (0:1): SA is doing pre-shared key authentication using id type  
ID\_IPV4\_ADDR \*Mar 1 00:03:50.851: ISAKMP (0:1): sending packet to 10.1.4.1 (I) MM\_SA\_SETUP \*Mar 1  
00:03:52.759: ISAKMP (0:1): received packet from 10.1.4.1 (I) MM\_SA\_SETUP \*Mar 1 00:03:52.763:  
ISAKMP (0:1): processing KE payload. message ID = 0 \*Mar 1 00:03:54.635: ISAKMP (0:1):  
processing NONCE payload. message ID = 0 \*Mar 1 00:03:54.639: ISAKMP (0:1): found peer pre-  
shared key matching 10.1.4.1 \*Mar 1 00:03:54.651: ISAKMP (0:1): SKEYID state generated \*Mar 1  
00:03:54.655: ISAKMP (0:1): processing vendor id payload \*Mar 1 00:03:54.663: ISAKMP (0:1):  
speaking to another IOS box! \*Mar 1 00:03:54.663: ISAKMP (1): ID payload next-payload : 8 type :  
1 protocol : 17 port : 500 length : 8 \*Mar 1 00:03:54.667: ISAKMP (1): Total payload length: 12  
\*Mar 1 00:03:54.675: ISAKMP (0:1): sending packet to 10.1.4.1 (I) MM\_KEY\_EXCH \*Mar 1  
00:03:54.759: ISAKMP (0:1): received packet from 10.1.4.1 (I) MM\_KEY\_EXCH \*Mar 1 00:03:54.767:  
ISAKMP (0:1): processing ID payload. message ID = 0 \*Mar 1 00:03:54.767: ISAKMP (0:1):  
processing HASH payload. message ID = 0 \*Mar 1 00:03:54.775: ISAKMP (0:1): SA has been  
authenticated with 10.1.4.1 \*Mar 1 00:03:54.779: ISAKMP (0:1): beginning Quick Mode exchange, M-  
ID of 581713929 \*Mar 1 00:03:54.799: ISAKMP (0:1): sending packet to 10.1.4.1 (I) QM\_IDLE \*Mar 1  
00:03:55.155: ISAKMP (0:1): received packet from 10.1.4.1 (I) QM\_IDLE \*Mar 1 00:03:55.171:  
ISAKMP (0:1): processing HASH payload. message ID = 581713929 \*Mar 1 00:03:55.175: ISAKMP (0:1):  
processing SA payload. message ID = 581713929 \*Mar 1 00:03:55.179: ISAKMP (0:1): **Checking IPsec  
proposal 1**

*!--- IKE exchanges the IPsec phase 2 parameters between !---* Spoke 1 and Hub. \*Mar 1  
00:03:55.179: ISAKMP: transform 1, ESP\_DES \*Mar 1 00:03:55.183: ISAKMP: attributes in transform:  
\*Mar 1 00:03:55.183: ISAKMP: encaps is 1 \*Mar 1 00:03:55.183: ISAKMP: SA life type in seconds  
\*Mar 1 00:03:55.187: ISAKMP: SA life duration (basic) of 3600 \*Mar 1 00:03:55.187: ISAKMP: SA  
life type in kilobytes \*Mar 1 00:03:55.191: ISAKMP: SA life duration (VPI) of 0x0 0x46 0x50 0x0  
\*Mar 1 00:03:55.195: ISAKMP: authenticator is HMAC-MD5 \*Mar 1 00:03:55.199: ISAKMP (0:1): **atts  
are acceptable.**

*!--- IKE has successfully negotiated phase 2 IPsec !---* SA between Hub and Spoke 2. \*Mar 1  
00:03:55.203: IPSEC(validate\_proposal\_request): proposal part #1, (key eng. msg.) INBOUND local=  
10.1.2.1, remote= 10.1.4.1, local\_proxy= 172.16.1.0/255.255.255.0/0/0 (type=4), remote\_proxy=  
192.168.1.0/255.255.255.0/0/0 (type=4), protocol= ESP, transform= esp-des esp-md5-hmac ,  
lifedur= 0s and 0kb, spi= 0x0(0), conn\_id= 0, keysize= 0, flags= 0x4 \*Mar 1 00:03:55.219: ISAKMP  
(0:1): processing NONCE payload. message ID = 581713929 \*Mar 1 00:03:55.219: ISAKMP (0:1):  
processing ID payload. message ID = 581713929 \*Mar 1 00:03:55.223: ISAKMP (0:1): processing ID  
payload. message ID = 581713929 \*Mar 1 00:03:55.251: ISAKMP (0:1): Creating IPsec SAs \*Mar 1  
00:03:55.255: inbound SA from 10.1.4.1 to 10.1.2.1 (proxy 192.168.1.0 to 172.16.1.0) \*Mar 1  
00:03:55.259: has spi 0xD44FE97C and conn\_id 2000 and flags 4 \*Mar 1 00:03:55.263: lifetime of  
3600 seconds \*Mar 1 00:03:55.263: lifetime of 4608000 kilobytes \*Mar 1 00:03:55.267: outbound SA  
from 10.1.2.1 to 10.1.4.1 (proxy 172.16.1.0 to 192.168.1.0 ) \*Mar 1 00:03:55.271: has spi -  
86399127 and conn\_id 2001 and flags C \*Mar 1 00:03:55.271: lifetime of 3600 seconds \*Mar 1  
00:03:55.275: lifetime of 4608000 kilobytes \*Mar 1 00:03:55.279: ISAKMP (0:1): sending packet to  
10.1.4.1 (I) QM\_IDLE \*Mar 1 00:03:55.283: ISAKMP (0:1): deleting node 581713929 error FALSE  
reason " " \*Mar 1 00:03:55.287: IPSEC(key\_engine): got a queue event... \*Mar 1 00:03:55.291:  
IPSEC(initialize\_sas): , (key eng. msg.) INBOUND local= 10.1.2.1, remote= 10.1.4.1, local\_proxy=  
172.16.1.0/255.255.255.0/0/0 (type=4), remote\_proxy= 192.168.1.0/255.255.255.0/0/0 (type=4),  
protocol= ESP, transform= esp-des esp-md5-hmac , lifedur= 3600s and 4608000kb, spi=

```
0xD44FE97C(3562006908), conn_id= 2000, keysize= 0, flags= 0x4 *Mar 1 00:03:55.303:
IPSEC(initialize_sas): , (key eng. msg.) OUTBOUND local= 10.1.2.1, remote= 10.1.4.1,
local_proxy= 172.16.1.0/255.255.255.0/0/0 (type=4), remote_proxy= 192.168.1.0/255.255.255.0/0/0
(type=4), protocol= ESP, transform= esp-des esp-md5-hmac , lifedur= 3600s and 4608000kb, spi=
0xFAD9A769(4208568169), conn_id= 2001, keysize= 0, flags= 0xC *Mar 1 00:03:55.319:
IPSEC(create_sa): sa created,
  (sa) sa_dest= 10.1.2.1, sa_prot= 50,
    sa_spi= 0xD44FE97C(3562006908),
    sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2000
*Mar 1 00:03:55.323: IPSEC(create_sa): sa created,
  (sa) sa_dest= 10.1.4.1, sa_prot= 50,
    sa_spi= 0xFAD9A769(4208568169),
    sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2001
!--- The IPsec tunnel between Spoke 1 and Hub is set up.
```

## [Informations connexes](#)

- [Dépannage de sécurité IP - Comprendre et utiliser les commandes de dépannage](#)
- [Exemples de configuration IPsec](#)
- [Négociation IPsec/Protocole IKE](#)
- [Support et documentation techniques - Cisco Systems](#)