通过OTV单播配置ASR1000加密

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简介

本文档介绍用于启用带IPSec加密的重叠传输虚拟化(OTV)的基本配置集。OTV加密不需要OTV端进行任何其他配置。您只需了解OTV和IPSEC如何共存。

为了在OTV上添加加密，您需要在OTV PDU顶部添加封装安全负载(ESP)报头。您可以通过以下两种方式在ASR1000边缘设备(ED)上实现加密：(i)IPSec(ii)GETVPN。

先决条件

要求

本文档没有任何特定的要求。

使用的组件

本文档中的信息基于以下软件和硬件版本：

- 适用于边缘设备(ED)的ASR1000路由器
- 核心（ISP云）
- Catalyst 2960交换机作为任一站点上的接入交换机

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您的网络处于活动状态，请确保您了解所有命令的潜在影响。

背景信息

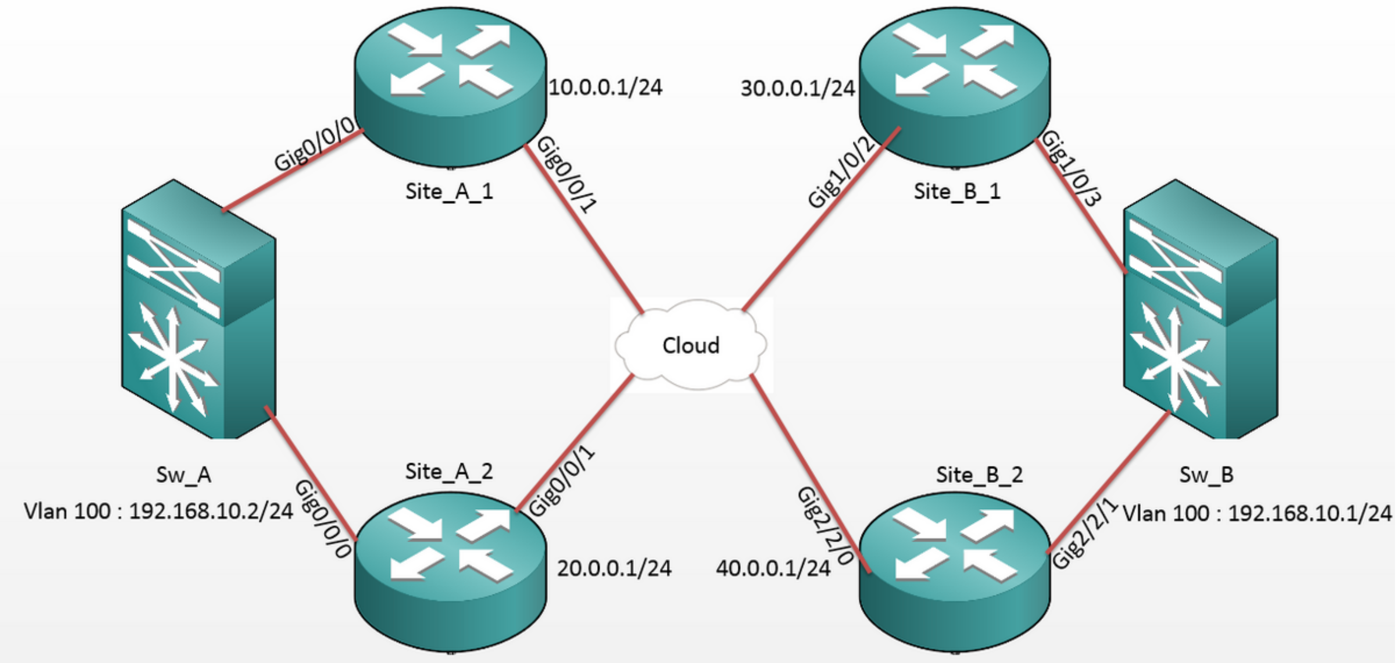
本文档的用户假定知道OTV的基本功能和配置。

您也可以按照以下文档操作：

- OTV单播配置
- OTV组播配置

配置

网络图



配置

站点 A：ED配置：

```
Site_A_1#show run
Building configuration...
otv site bridge-domain 99
!
otv site-identifier 0000.0000.0001
crypto isakmp policy 10
 hash md5
 authentication pre-share
crypto isakmp key cisco address 30.0.0.1
crypto isakmp key cisco address 40.0.0.1
!
crypto ipsec transform-set tset esp-aes esp-md5-hmac
```

```
Site_A_2#show run
Building configuration...
otv site bridge-domain 99
!
otv site-identifier 0000.0000.0001
crypto isakmp policy 10
 hash md5
 authentication pre-share
crypto isakmp key cisco address 30.0.0.1
crypto isakmp key cisco address 40.0.0.1
!
crypto ipsec transform-set tset esp-aes esp-md5-hmac
```

```
 mode tunnel
!
crypto map cmap 1 ipsec-isakmp
 set peer 30.0.0.1
 set transform-set tset
 match address cryptoacl
crypto map cmap 3 ipsec-isakmp
 set peer 40.0.0.1
 set transform-set tset
 match address cryptoacl3
!
interface Overlay99
 no ip address
 otv join-interface GigabitEthernet0/0/1
 otv adjacency-server unicast-only
 service instance 100 ethernet
 encapsulation dot1q 100
 bridge-domain 100
 !
 service instance 101 ethernet
 encapsulation dot1q 101
 bridge-domain 101
 !
!
interface GigabitEthernet0/0/0
 no ip address
service instance 99 ethernet
 encapsulation dot1q 99
 bridge-domain 99
 !
 service instance 100 ethernet
 encapsulation dot1q 100
```

```
 mode tunnel
!
crypto map cmap 2 ipsec-isakmp
 set peer 30.0.0.1
 set transform-set tset
 match address cryptoacl2
crypto map cmap 3 ipsec-isakmp
 set peer 40.0.0.1
 set transform-set tset
 match address cryptoacl3
!
interface Overlay99
 no ip address
 otv join-interface GigabitEthernet0/0/1
 otv use-adjacency-server 10.0.0.1 30.0.0.1 unicast-only
 service instance 100 ethernet
 encapsulation dot1q 100
 bridge-domain 100
 !
 service instance 101 ethernet
 encapsulation dot1q 101
 bridge-domain 101
 !
!
interface GigabitEthernet0/0/0
 no ip address
service instance 99 ethernet
 encapsulation dot1q 99
 bridge-domain 99
 !
 service instance 100 ethernet
 encapsulation dot1q 100
 bridge-domain 100

 !

 service instance 101 ethernet

 encapsulation dot1q 101

 bridge-domain 101

 !

!

interface GigabitEthernet0/0/1

 ip address 10.0.0.1 255.255.255.0

 crypto map cmap

!

ip access-list extended cryptoacl

 permit gre host 10.0.0.1 host 30.0.0.1

ip access-list extended cryptoacl3

 permit gre host 10.0.0.1 host 40.0.0.1
```

```
 bridge-domain 100

 !

 service instance 101 ethernet

 encapsulation dot1q 101

 bridge-domain 101

 !

!

interface GigabitEthernet0/0/1

 ip address 20.0.0.1 255.255.255.0

 crypto map cmap

!

ip access-list extended cryptoacl2

 permit gre host 20.0.0.1 host 30.0.0.1

ip access-list extended cryptoacl3

 permit gre host 20.0.0.1 host 40.0.0.1
```

站点 B:ED配置：

```
Site_B_1#sh run

Building configuration...

otv site bridge-domain 99

!

otv site-identifier 0000.0000.0002

crypto isakmp policy 10

 hash md5

 authentication pre-share

crypto isakmp key cisco address 10.0.0.1

crypto isakmp key cisco address 20.0.0.1

!

crypto ipsec transform-set tset esp-aes
esp-md5-hmac

 mode tunnel

!
```

```
Site_B_2#sh run

Building configuration...

otv site bridge-domain 99

!

otv site-identifier 0000.0000.0002

crypto isakmp policy 10

 hash md5

 authentication pre-share

crypto isakmp key cisco address 10.0.0.1

crypto isakmp key cisco address 20.0.0.1

!

crypto ipsec transform-set tset esp-aes
esp-md5-hmac

 mode tunnel

!
```

```
crypto map cmap 1 ipsec-isakmp
 set peer 10.0.0.1
 set transform-set tset
 match address cryptoacl
crypto map cmap 2 ipsec-isakmp
 set peer 20.0.0.1
 set transform-set tset
 match address cryptoacl2
!
interface Overlay99
 no ip address
 otv join-interface GigabitEthernet1/0/2
 otv use-adjacency-server 10.0.0.1 unicast-only
 otv adjacency-server unicast-only
 service instance 100 ethernet
 encapsulation dot1q 100
 bridge-domain 100
 !
 service instance 101 ethernet
 encapsulation dot1q 101
 bridge-domain 101
 !
!
interface GigabitEthernet1/0/3
 no ip address
service instance 99 ethernet
 encapsulation dot1q 99
 bridge-domain 99
 !
 service instance 100 ethernet
 encapsulation dot1q 100
 bridge-domain 100
```

```
crypto map cmap 1 ipsec-isakmp
 set peer 10.0.0.1
 set transform-set tset
 match address cryptoacl
crypto map cmap 2 ipsec-isakmp
 set peer 20.0.0.1
 set transform-set tset
 match address cryptoacl2
!
interface Overlay99
 no ip address
 otv join-interface GigabitEthernet2/2/0
 otv use-adjacency-server 10.0.0.1 30.0.0.1 unicast-only
 service instance 100 ethernet
 encapsulation dot1q 100
 bridge-domain 100
 !
 service instance 101 ethernet
 encapsulation dot1q 101
 bridge-domain 101
 !
!
interface GigabitEthernet2/2/1
 no ip address
 service instance 99 ethernet
 encapsulation dot1q 99
 bridge-domain 99
 !
 service instance 100 ethernet
 encapsulation dot1q 100
 bridge-domain 100
 !
 !
 service instance 101 ethernet
 encapsulation dot1q 101
 bridge-domain 101
 !
!
interface GigabitEthernet1/0/2
 ip address 30.0.0.1 255.255.255.0
crypto map cmap
!
ip access-list extended cryptoacl
 permit gre host 30.0.0.1 host 10.0.0.1
ip access-list extended cryptoacl2
 permit gre host 30.0.0.1 host 20.0.0.1
```

```
 service instance 101 ethernet
 encapsulation dot1q 101
 bridge-domain 101
 !
!
interface GigabitEthernet2/2/0
 ip address 40.0.0.1 255.255.255.0
 crypto map cmap
!
ip access-list extended cryptoacl
 permit gre host 40.0.0.1 host 10.0.0.1
ip access-list extended cryptoacl2
 permit gre host 40.0.0.1 host 20.0.0.1
```

验证

使用本部分可确认配置能否正常运行。

1. 检查内部VLAN主机（本例中为2960 catalyst交换机上的SVI）的MAC地址是否已在OTV路由表上学习。
2. 检查是否对重叠（OTV流量）流量执行加密封装和解码。

在加入接口上配置加密映射后，OTV启动后，请检查本地VLAN（本例中为VLAN 100和101）的活动转发器。 这表明，Site_A_1和Site_B_2是偶数VLAN的活动转发器，因为您将测试从站点A的VLAN 100向站点B的VLAN 100发起的ping的流量加密：

```
Site_A_1#show otv vlan
Key:  SI - Service Instance, NA - Non AED, NFC - Not Forward Capable.
Overlay 99 VLAN Configuration Information
 Inst VLAN BD   Auth ED              State              Site If(s)
 0    100  100  *Site_A_1            active            Gi0/0/0:SI100
 0    101  101   Site_A_2            inactive(NA)      Gi0/0/0:SI101
 0    200  200  *Site_A_1            active            Gi0/0/0:SI200
 0    201  201   Site_A_2            inactive(NA)      Gi0/0/0:SI201
 Total VLAN(s): 4

Site_B_2#show otv vlan

Key:  SI - Service Instance, NA - Non AED, NFC - Not Forward Capable.



Overlay 99 VLAN Configuration Information

 Inst VLAN BD   Auth ED              State                Site If(s)

0    100  100  *Site_B_2            active              Gi2/2/1:SI100

 0    101  101   Site_B_1            inactive(NA)        Gi2/2/1:SI101

 0    200  200  *Site_B_2            active              Gi2/2/1:SI200

 0    201  201   Site_B_1            inactive(NA)        Gi2/2/1:SI201

 Total VLAN(s): 4
```

为了检查数据包是否确实在任一ED上被封装和解封，您应检查IPSec会话是否处于活动状态以及加密会话中的计数器值，以确认数据包确实已被加密和解密。要检查IPSec会话是否处于活动状态，因为只有当任何流量通过时，IPSec会话才变为活动状态，请检查**show crypto isakmp sa的输出**。在此，只检查活动转发器的输出，但这应显示所有ED上的活动状态，以便OTV通过加密运行。

```
Site_A_1#show crypto isakmp sa

IPv4 Crypto ISAKMP SA

dst             src             state          conn-id status

10.0.0.1        30.0.0.1        QM_IDLE           1008 ACTIVE

10.0.0.1        40.0.0.1        QM_IDLE           1007 ACTIVE

Site_B_2#sh crypto isakmp sa

IPv4 Crypto ISAKMP SA

dst             src             state          conn-id status

20.0.0.1        40.0.0.1        QM_IDLE           1007 ACTIVE

10.0.0.1        40.0.0.1        QM_IDLE           1006 ACTIVE
```

现在，为了确认数据包是否被加密和解密，您首先需要知道show crypto session detail的输出中会**显示什么**。因此，当您从Sw_A交换机向Sw_B发起ICMP回应数据包时，应执行以下操作：

- 当ICMP回应从Site_A_1 ED离开时，它必须封装OTV负载（ICMP回应+ MPLS + GRE）
- 然后，一旦ICMP回应到达Site_B_2 ED（VLAN 100的活动转发器），它就必须解封OTV负载（ICMP回应+ MPLS + GRE）
- 现在，一旦Site_B_2 ED收到来自Sw_B的ICMP回应应答，它必须再次封装OTV负载（ICMP回应+ MPLS + GRE）
- 一旦ICMP回应应答到达Site_A_1 ED，我必须再次解封OTV负**载**(ICMP回应+ MPLS + GRE)

从Sw_A成功ping通Sw_B后，在两个活动转发器ED的**show crypto session detail**输出的“enc”和“dec”部分下，预期会看到5个计数器的增量。

现在，请从ED查看相同的信息：

```
Site_A_1(config-if)#do show crypto session detail | section enc

K - Keepalives, N - NAT-traversal, T - cTCP encapsulation

       Outbound: #pkts enc'ed 0 drop 0 life (KB/Sec) 4608000/3345

       Outbound: #pkts enc'ed 10 drop 0 life (KB/Sec) 4607998/3291 <<<< 10 counter before ping

Site_A_1(config-if)#do show crypto session detail | section dec

       Inbound:  #pkts dec'ed 0 drop 0 life (KB/Sec) 4608000/3343

       Inbound:  #pkts dec'ed 18 drop 0 life (KB/Sec) 4607997/3289 <<<< 18 counter before ping

Site_B_2(config-if)#do show crypto session detail | section enc

K - Keepalives, N - NAT-traversal, T - cTCP encapsulation

       Outbound: #pkts enc'ed 18 drop 0 life (KB/Sec) 4607997/3295 <<<< 18 counter before ping

       Outbound: #pkts enc'ed 9 drop 0 life (KB/Sec) 4607999/3295

Site_B_2(config-if)#do show crypto session detail | section dec

       Inbound:  #pkts dec'ed 10 drop 0 life (KB/Sec) 4607998/3293 <<<< 10 counter before ping

       Inbound:  #pkts dec'ed 1 drop 0 life (KB/Sec) 4607999/3293

Sw_A(config)#do ping 192.168.10.1 source vlan 100


Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.10.1, timeout is 2 seconds:

Packet sent with a source address of 192.168.10.2

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/10 ms

Sw_A(config)#

Site_A_1(config-if)#do show crypto session detail | section enc

K - Keepalives, N - NAT-traversal, T - cTCP encapsulation

       Outbound: #pkts enc'ed 0 drop 0 life (KB/Sec) 4608000/3339

       Outbound: #pkts enc'ed 15 drop 0 life (KB/Sec) 4607997/3284 <<<< 15 counter after ping
(After ICMP Echo)

Site_A_1(config-if)#do show crypto session detail | section dec

       Inbound:  #pkts dec'ed 0 drop 0 life (KB/Sec) 4608000/3338

       Inbound:  #pkts dec'ed 23 drop 0 life (KB/Sec) 4607997/3283 <<<< 23 counter after ping
(After ICMP Echo Reply)
```

```
Site_B_2(config-if)#do show crypto session detail | section enc

K - Keepalives, N - NAT-traversal, T - cTCP encapsulation

       Outbound: #pkts enc'ed 23 drop 0 life (KB/Sec) 4607997/3282 <<<< 23 counter after ping
(After ICMP Echo Reply)

       Outbound: #pkts enc'ed 9 drop 0 life (KB/Sec) 4607999/3282

Site_B_2(config-if)#do show crypto session detail | section dec

       Inbound:  #pkts dec'ed 15 drop 0 life (KB/Sec) 4607997/3281 <<<< 15 counter after ping
(After ICMP Echo)

       Inbound:  #pkts dec'ed 1 drop 0 life (KB/Sec) 4607999/3281
```

本配置指南能够通过使用IPSec传达所需的配置详细信息，用于单播核心双宿主设置。

故障排除

目前没有针对此配置的故障排除信息。