Configure ASA IPsec VTI Connection Amazon Web Services

Contents

Introduction

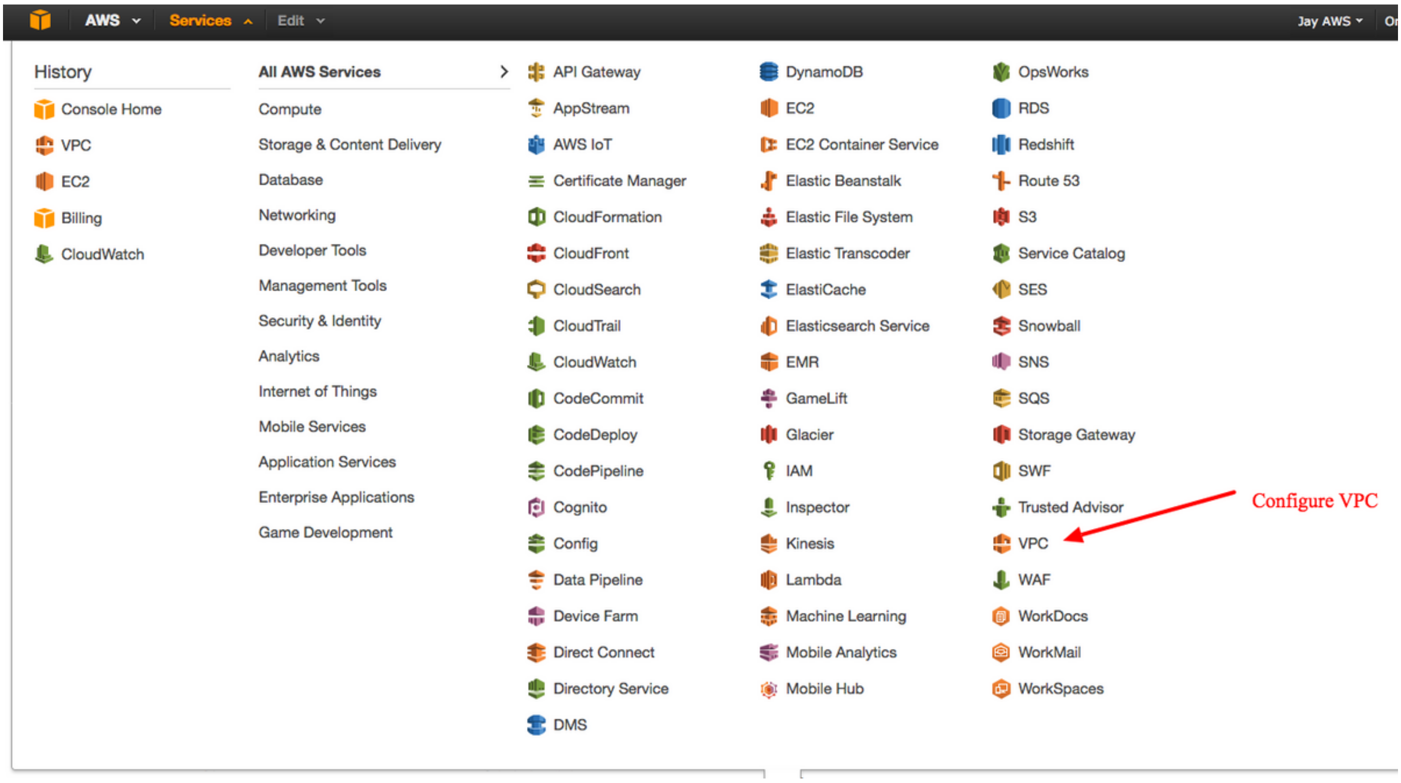
This document describes how to configure an Adaptive Security Appliance (ASA) IPsec Virtual Tunnel Interface (VTI) connection. In ASA 9.7.1, IPsec VTI has been introduced. It is limited to sVTI IPv4 over IPv4 using IKEv1 in this release. This is an example configuration for the ASA to connect to Amazon Web Services (AWS).

> **Note**: Currently VTI is only supported in single-context, routed mode.

Configure AWS

Step 1.

Log in to the AWS console and navigate to the VPC panel.

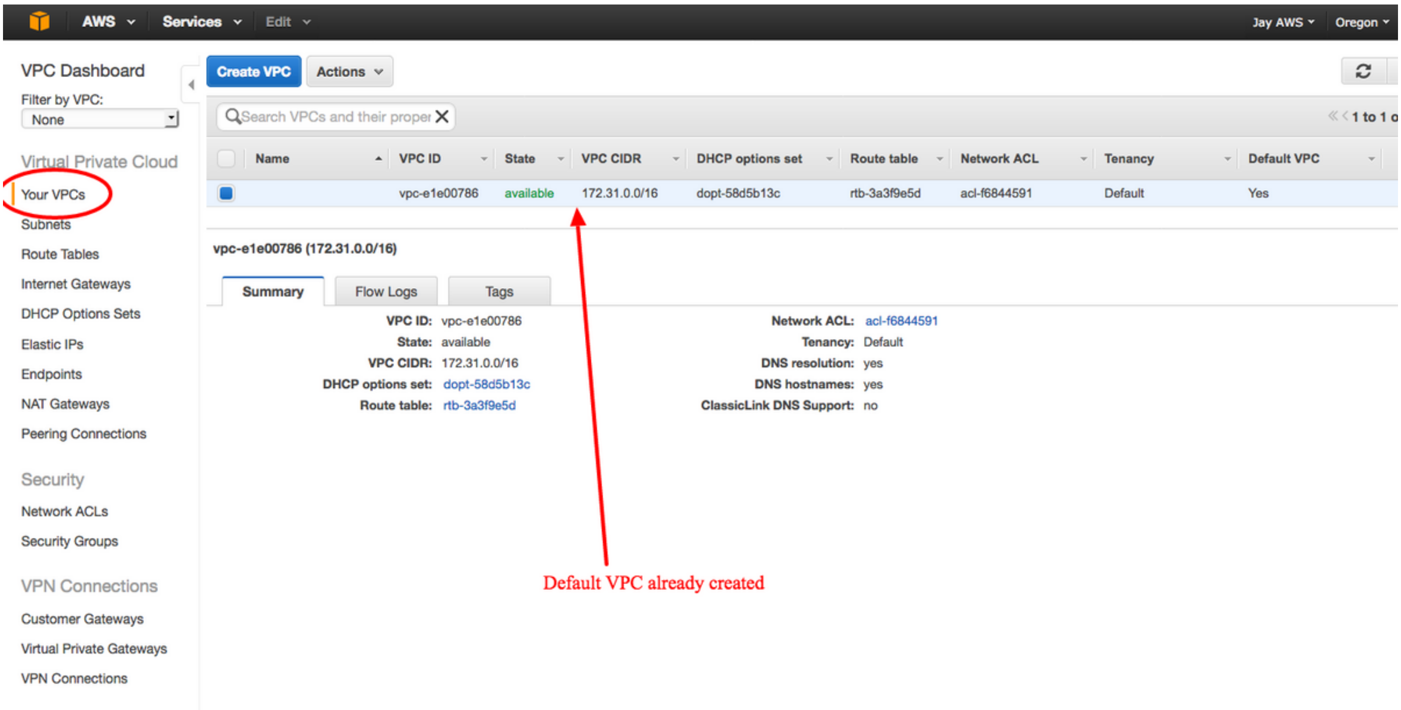


Configure VPC

Navigate to the VPC Dashboard

Step 2.

Confirm that a Virtual Private Cloud (VPC) is already created. By default, a VPC with 172.31.0.0/16 is created. This is where Virtual Machines (VMs) will be attached.



Name	VPC ID	State	VPC CIDR	DHCP options set	Route table	Network ACL	Tenancy	Default VPC
	vpc-e1e00786	available	172.31.0.0/16	dopt-58d5b13c	rtb-3a3f9e5d	acl-f6844591	Default	Yes

vpc-e1e00786 (172.31.0.0/16)

VPC ID: vpc-e1e00786
State: available
VPC CIDR: 172.31.0.0/16
DHCP options set: dopt-58d5b13c
Route table: rtb-3a3f9e5d

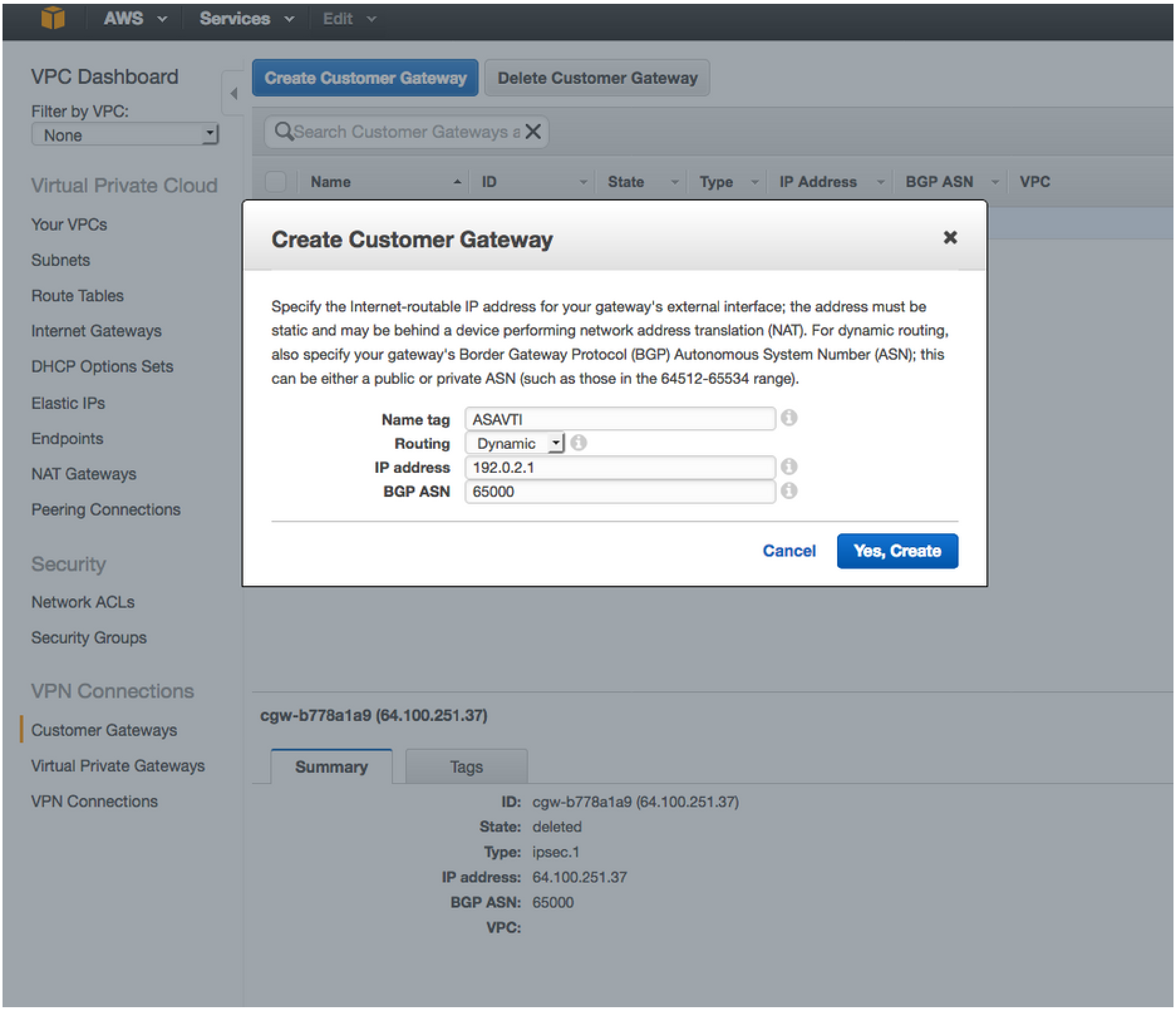
Network ACL: acl-f6844591
Tenancy: Default
DNS resolution: yes
DNS hostnames: yes
ClassicLink DNS Support: no

Default VPC already created

Step 3.

Create a "Customer Gateway". This is a an endpoint that represents the ASA.

Field	Value
Name Tag	This is just a human readable name to recognize the ASA.
Routing	Dynamic - This means that Border Gateway Protocol (BGP) will be used in order to exchange routing information.
IP Address	This is the Public IP address of the ASA's outside interface.
BGP ASN	The Autonomous System (AS) number of the BGP process than runs on the ASA. Use 65000 unless your organization has a public AS number.



Create Customer Gateway

Specify the Internet-routable IP address for your gateway's external interface; the address must be static and may be behind a device performing network address translation (NAT). For dynamic routing, also specify your gateway's Border Gateway Protocol (BGP) Autonomous System Number (ASN); this can be either a public or private ASN (such as those in the 64512-65534 range).

Name tag	ASAVTI
Routing	Dynamic
IP address	192.0.2.1
BGP ASN	65000

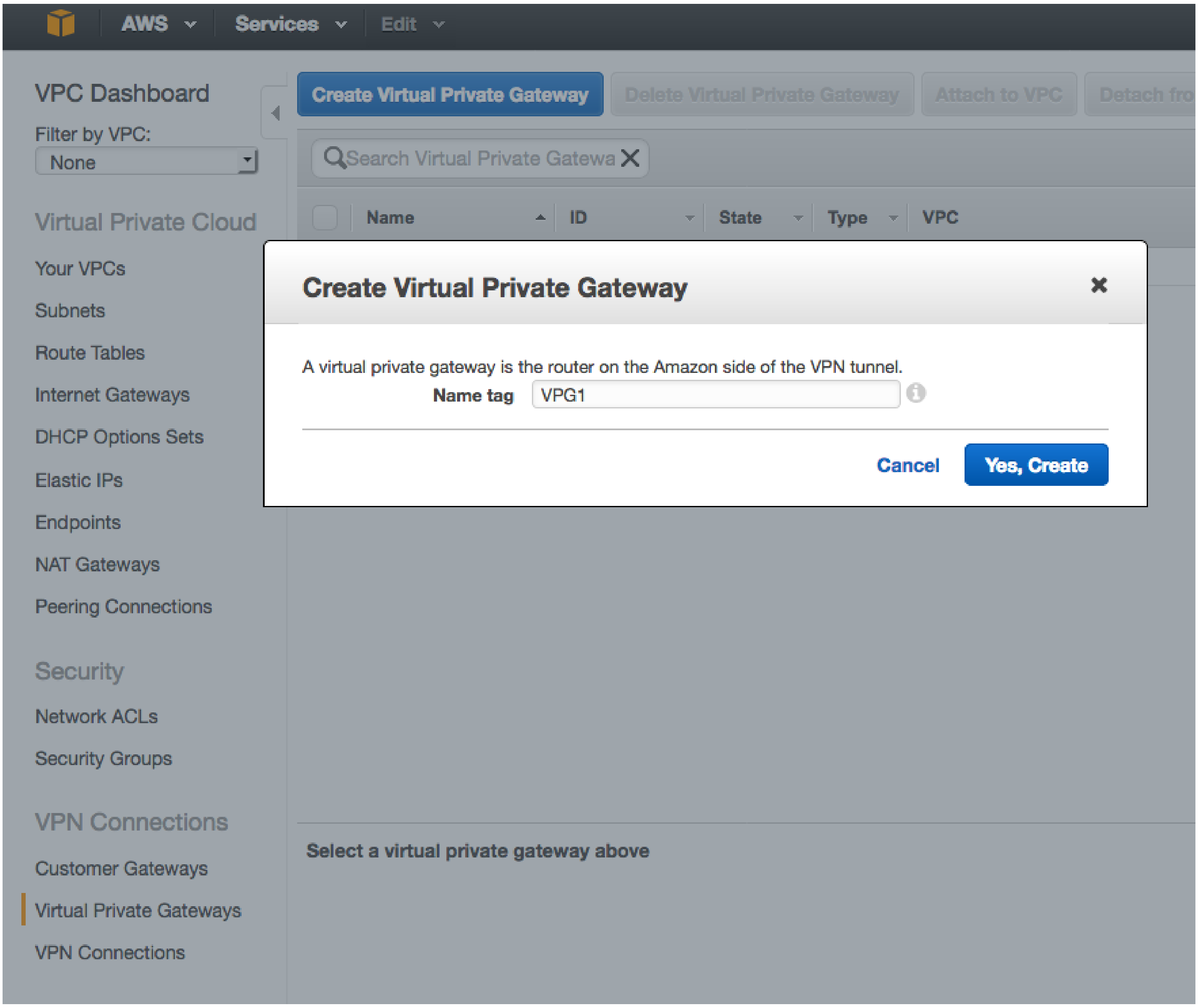
cgw-b778a1a9 (64.100.251.37)

ID:	cgw-b778a1a9 (64.100.251.37)
State:	deleted
Type:	ipsec.1
IP address:	64.100.251.37
BGP ASN:	65000
VPC:	

Step 4.

Create a Virtual Private Gateway (VPG). This is a simulated router that is hosted with AWS that terminates the IPsec tunnel.

Field	Value
Name Tag	A human readable name to recognize the VPG.



Create Virtual Private Gateway

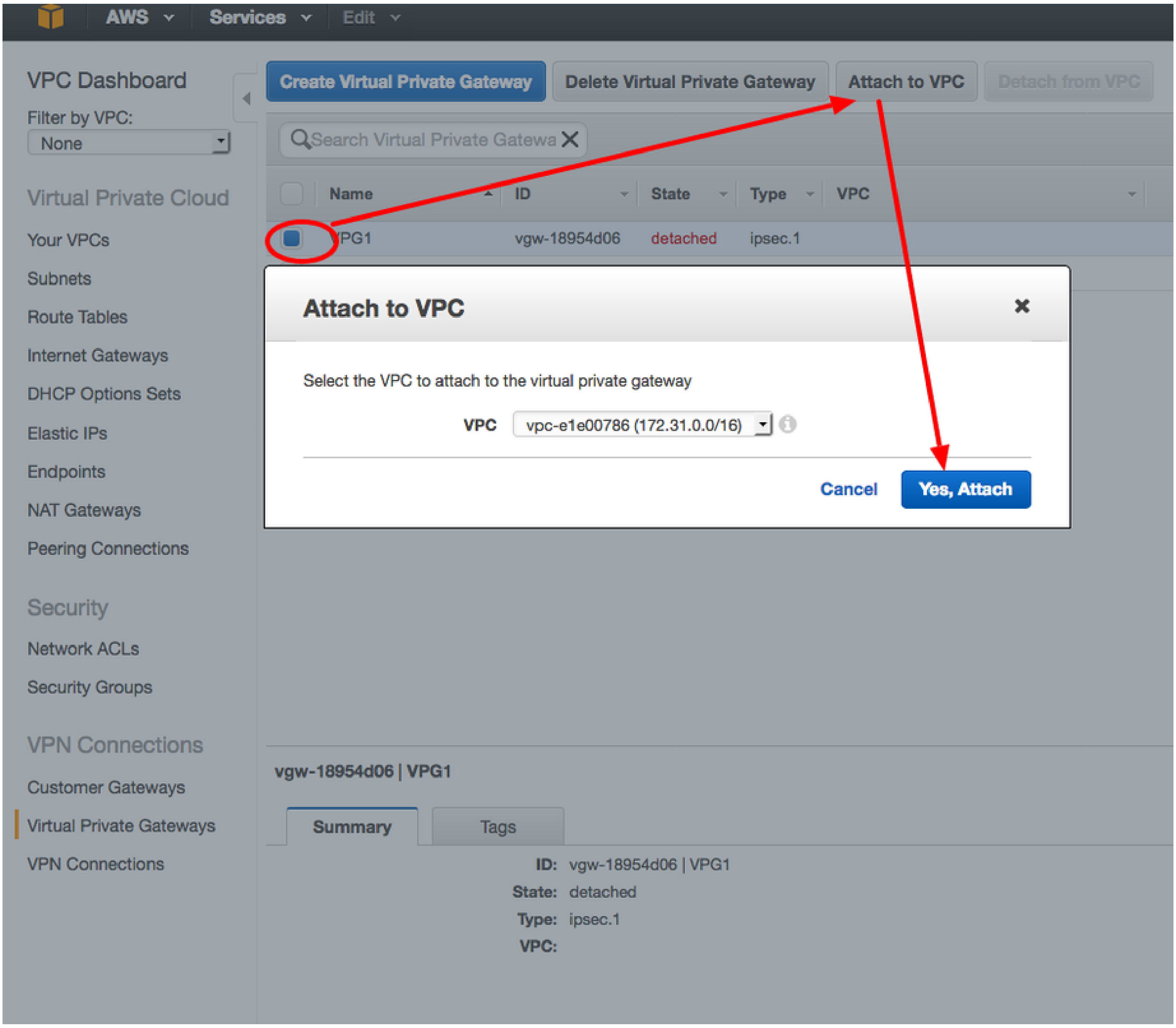
A virtual private gateway is the router on the Amazon side of the VPN tunnel.

Name tag: VPG1

Step 5.

Attach the VPG to the VPC.

Choose the Virtual Private Gateway, click **Attach to VPC**, choose the VPC from the VPC drop-down list, and click **Yes, Attach**.



Name	ID	State	Type	VPC
VPG1	vgw-18954d06	detached	ipsec.1	

Attach to VPC

Select the VPC to attach to the virtual private gateway

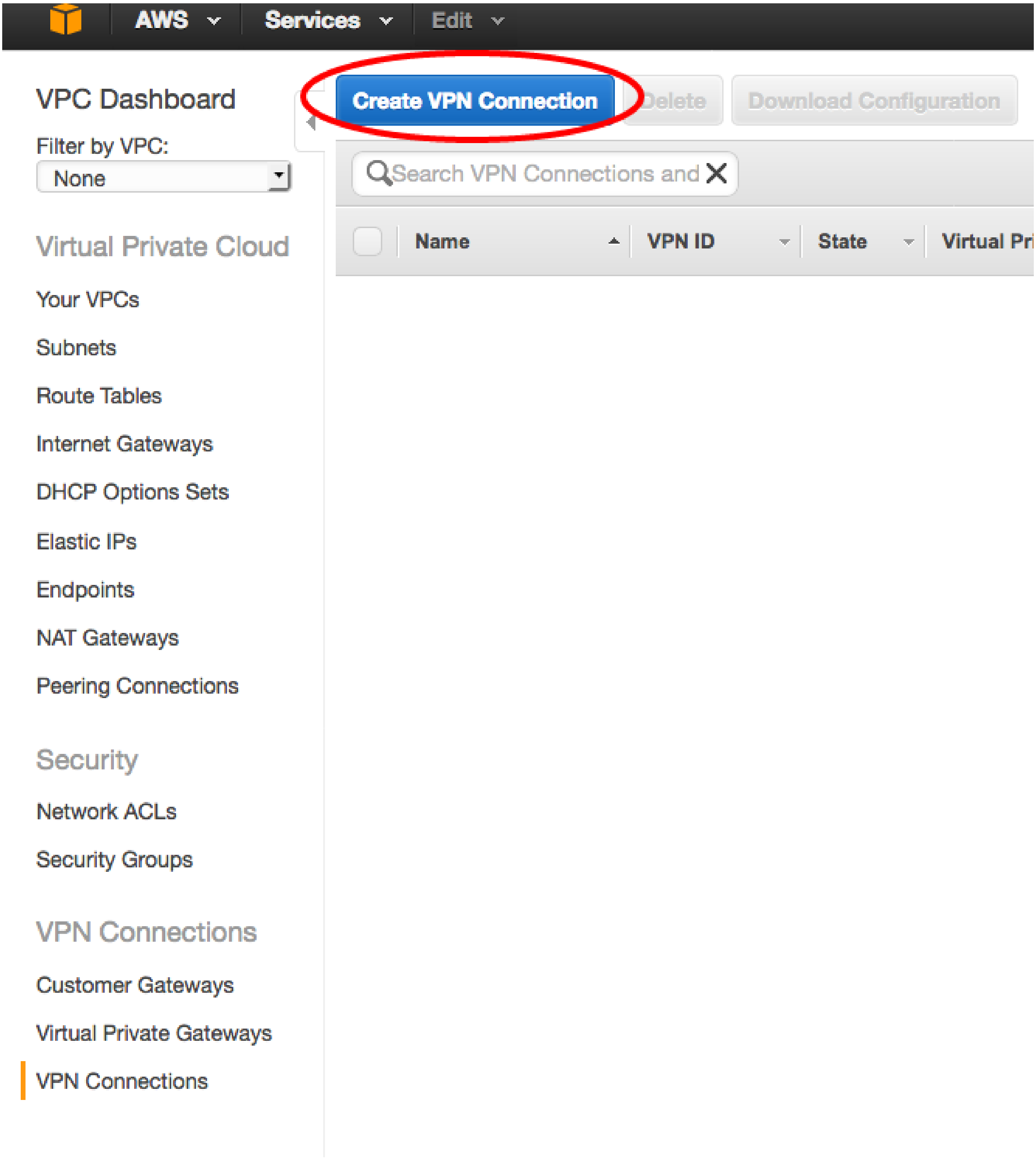
VPC vpc-e1e00786 (172.31.0.0/16)

vgw-18954d06 | VPG1

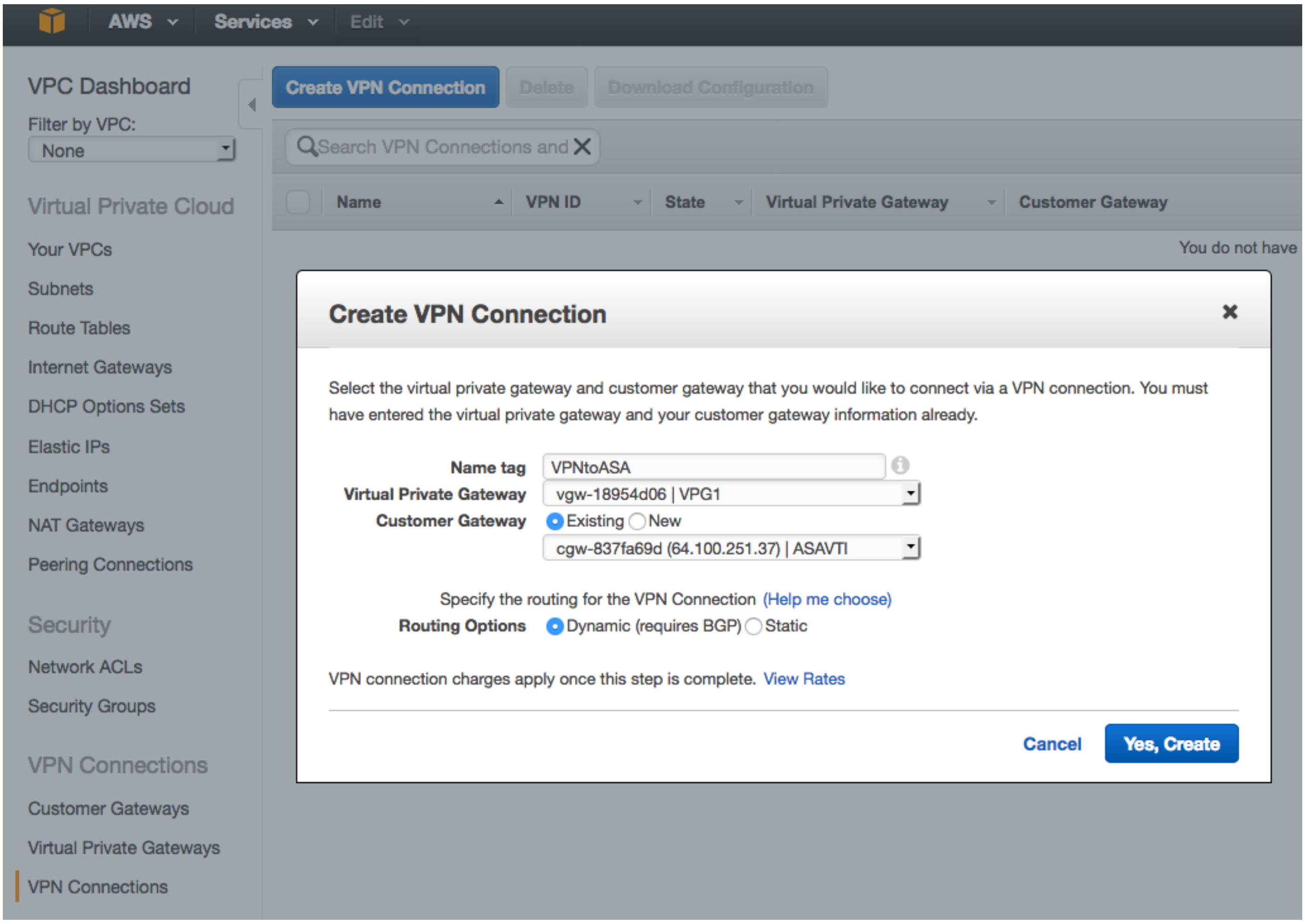
ID: vgw-18954d06 | VPG1
State: detached
Type: ipsec.1
VPC:

Step 6.

Create a VPN connection.



Field	**Value**
Name Tag	A human readable tag of the VPN connection between AWS and the ASA.
Virtual Private Gateway	Choose the VPG just created.
Customer Gateway	Click the **Existing** radio button and choose the gateway of the ASA.
Routing Options	Click the **Dynamic (requires BGP)** radio button.



Create VPN Connection

Select the virtual private gateway and customer gateway that you would like to connect via a VPN connection. You must have entered the virtual private gateway and your customer gateway information already.

Name tag VPNtoASA

Virtual Private Gateway vgw-18954d06 | VPG1

Customer Gateway ● Existing ○ New

cgw-837fa69d (64.100.251.37) | ASAVTI

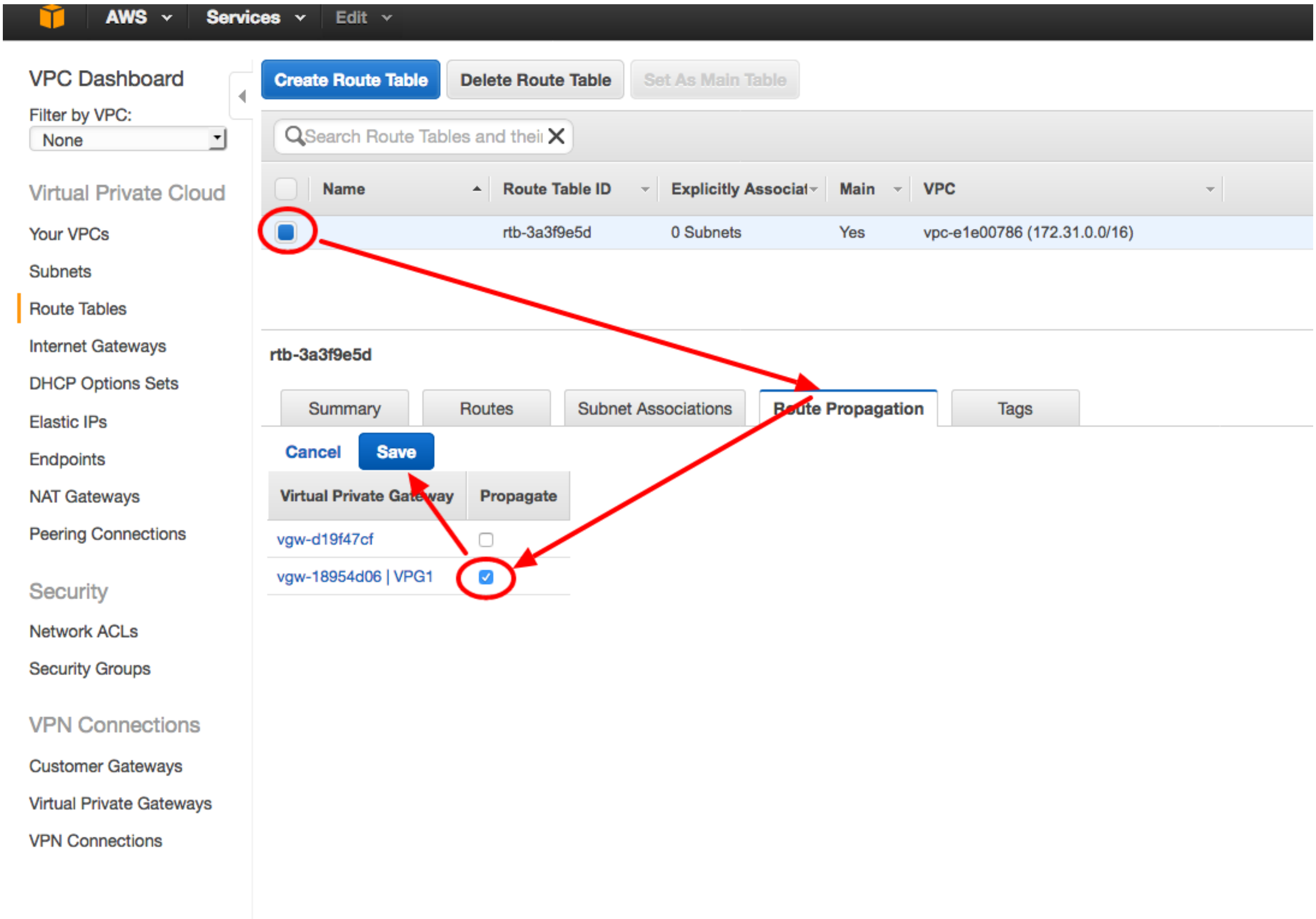
Specify the routing for the VPN Connection (Help me choose)

Routing Options ● Dynamic (requires BGP) ○ Static

VPN connection charges apply once this step is complete. View Rates

Step 7.

Configure the Route Table to propagate the routes learned from the VPG (via BGP) into the VPC.



	Name	Route Table ID	Explicitly Associat	Main	VPC
☑		rtb-3a3f9e5d	0 Subnets	Yes	vpc-e1e00786 (172.31.0.0/16)

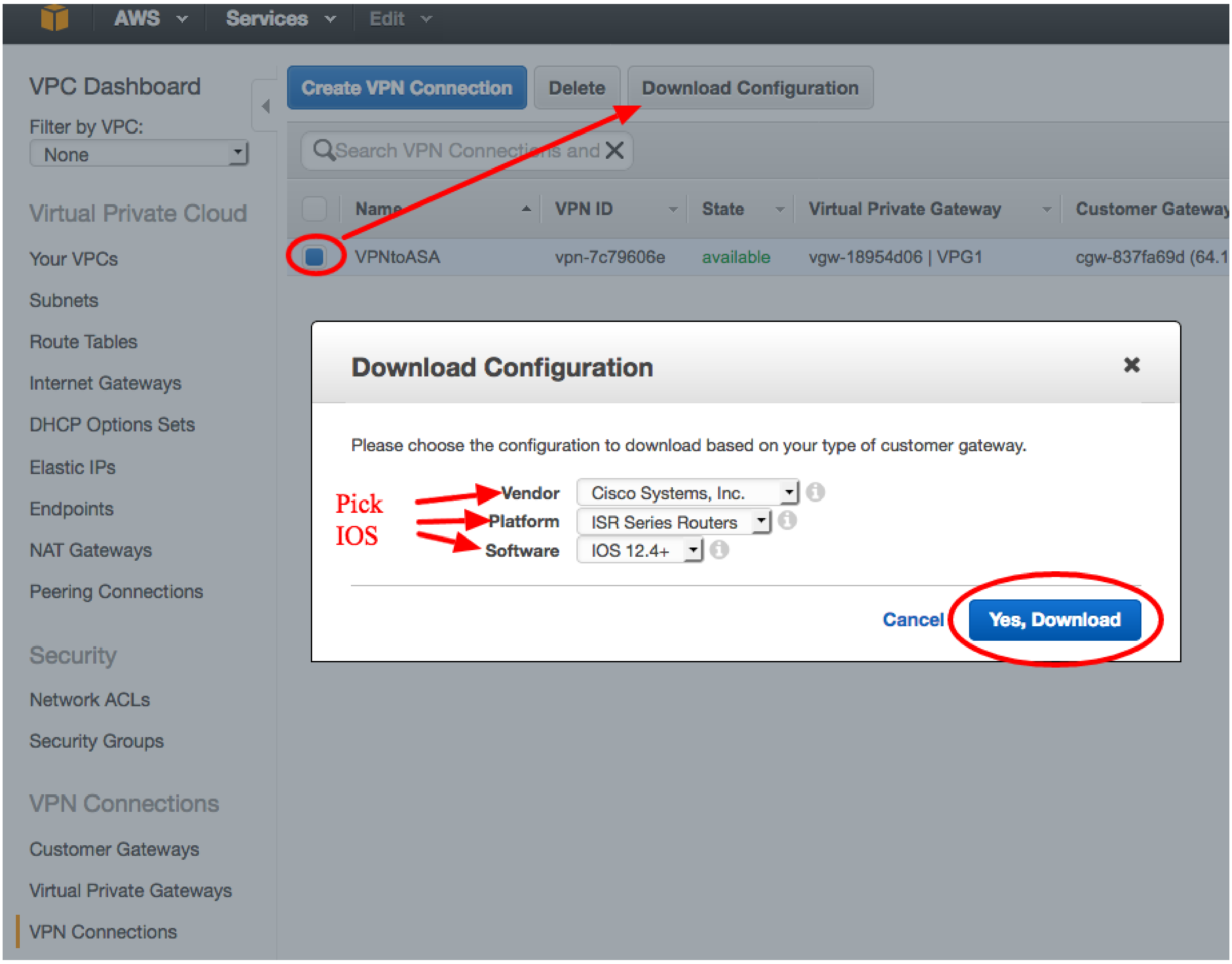
rtb-3a3f9e5d

Virtual Private Gateway	Propagate
vgw-d19f47cf	□
vgw-18954d06 | VPG1	☑

Step 8.

Download the suggested configuration. Choose the values below in order to generate a configuration that is a VTI style configuration.

Field	**Value**
Vendor	Cisco Systems, Inc.
Platform	ISR Series Routers
Software	IOS 12.4+



Name	VPN ID	State	Virtual Private Gateway	Customer Gateway
VPNtoASA	vpn-7c79606e	available	vgw-18954d06 | VPG1	cgw-837fa69d (64.1

Please choose the configuration to download based on your type of customer gateway.

Vendor: Cisco Systems, Inc.

Platform: ISR Series Routers

Software: IOS 12.4+

Configure the ASA

Once you download the configuration there is some conversion necessary.

Step 1.

`crypto isakmp policy` to `crypto ikev1 policy`. Only one policy is needed since policy 200 and policy 201 are identical.

Suggested Configuration

```
crypto isakmp policy 200
 encryption aes 128
 authentication pre-share
 group 2
 lifetime 28800
 hash sha
exit
crypto isakmp policy 201
 encryption aes 128
 authentication pre-share
 group 2
```

To

```
crypto ikev1 enable outside
crypto ikev1 policy 10
 authentication pre-share
 encryption aes
 hash sha
 group 2
 lifetime 28800
 lifetime 28800
 hash sha
exit
```

Step 2.

crypto ipsec transform-set to crypto ipsec ikev1 transform-set. Only one transform-set is needed since the two transform-sets are identical.

Suggested Configuration

```
crypto ipsec transform-set ipsec-prop-vpn-
7c79606e-0 esp-aes 128 esp-sha-hmac
  mode tunnel
exit
crypto ipsec transform-set ipsec-prop-vpn-
7c79606e-1 esp-aes 128 esp-sha-hmac
  mode tunnel
exit
```

To

```
crypto ipsec ikev1 transfo
set AWS esp-aes esp-sha-hm
```

Step 3.

crypto ipsec profile to crypto ipsec profile. Only one profile is needed since the two profiles are identical.

Suggested Configuration

```
crypto ipsec profile ipsec-vpn-7c79606e-0
 set pfs group2
 set security-association lifetime seconds
3600
 set transform-set ipsec-prop-vpn-7c79606e-0
exit
crypto ipsec profile ipsec-vpn-7c79606e-1
 set pfs group2
 set security-association lifetime seconds
3600
 set transform-set ipsec-prop-vpn-7c79606e-1
exit
```

To

```
crypto ipsec profile AWS
 set ikev1 transform-set AWS
 set pfs group2
 set security-association lifet
seconds 3600
```

Step 4.

crypto keyring and crypto isakmp profile need to be converted to a tunnel-group one for each tunnel.

Suggested Configuration

```
crypto keyring keyring-vpn-7c79606e-0
 local-address 64.100.251.37
 pre-shared-key address 52.34.205.227 key QZhh90Bjf
exit
!
crypto isakmp profile isakmp-vpn-7c79606e-0
 local-address 64.100.251.37
 match identity address 52.34.205.227
 keyring keyring-vpn-7c79606e-0
 exit
```

To

```
tunnel-group
52.34.205.227 type
ipsec-l2l
tunnel-group
52.34.205.227 ipsec-
attributes
 ikev1 pre-shared-ke
QZhh90Bjf
 isakmp keepalive
threshold 10 retry 1
```

```
!
crypto keyring keyring-vpn-7c79606e-1
 local-address 64.100.251.37
 pre-shared-key address 52.37.194.219 key JjxCWy4Ae
 exit
!
crypto isakmp profile isakmp-vpn-7c79606e-1
 local-address 64.100.251.37
 match identity address 52.37.194.219
 keyring keyring-vpn-7c79606e-1
 exit
```

```
tunnel-group
52.37.194.219 type
ipsec-l2l
tunnel-group
52.37.194.219 ipsec-
attributes
 ikev1 pre-shared-ke
JjxCWy4Ae
 isakmp keepalive
threshold 10 retry 1
```

Step 5.

The tunnel configuration is almost identical. The ASA does not support the `ip tcp adjust-mss` or the `ip virtual-reassembly` command.

Suggested Configuration

```
interface Tunnel1
 ip address 169.254.13.190 255.255.255.252
 ip virtual-reassembly
 tunnel source 64.100.251.37
 tunnel destination 52.34.205.227
 tunnel mode ipsec ipv4
 tunnel protection ipsec profile ipsec-vpn-
7c79606e-0
 ip tcp adjust-mss 1387
 no shutdown
 exit
!
interface Tunnel2
 ip address 169.254.12.86 255.255.255.252
 ip virtual-reassembly
 tunnel source 64.100.251.37
 tunnel destination 52.37.194.219
 tunnel mode ipsec ipv4
 tunnel protection ipsec profile ipsec-vpn-
7c79606e-1
 ip tcp adjust-mss 1387
 no shutdown
 exit
```

To

```
interface Tunnel1
 nameif AWS1
 ip address 169.254.13.190
255.255.255.252
 tunnel source interface outsid
 tunnel destination 52.34.205.2
 tunnel mode ipsec ipv4
 tunnel protection ipsec profil
AWS
!
interface Tunnel2
 nameif AWS2
 ip address 169.254.12.86
255.255.255.252
 tunnel source interface outsid
 tunnel destination 52.37.194.2
 tunnel mode ipsec ipv4
 tunnel protection ipsec profil
AWS
```

Step 6.

In this example, the ASA will only advertise up the inside subnet (192.168.1.0/24) and receive the subnet within AWS (172.31.0.0/16).

Suggested Configuration

```
router bgp 65000
 neighbor 169.254.13.189 remote-as 7224
 neighbor 169.254.13.189 activate
 neighbor 169.254.13.189 timers 10 30 30
 address-family ipv4 unicast
  neighbor 169.254.13.189 remote-as 7224
```

To

```
router bgp 65000
 bgp log-neighbor-changes
 timers bgp 10 30 0
 address-family ipv4 unica
  neighbor 169.254.12.85
remote-as 7224
```

```
  neighbor 169.254.13.189 timers 10 30 30
  neighbor 169.254.13.189 default-originate
  neighbor 169.254.13.189 activate
  neighbor 169.254.13.189 soft-reconfiguration
inbound
  network 0.0.0.0
  exit
 exit
router bgp 65000
 neighbor 169.254.12.85 remote-as 7224
 neighbor 169.254.12.85 activate
 neighbor 169.254.12.85 timers 10 30 30
 address-family ipv4 unicast
  neighbor 169.254.12.85 remote-as 7224
  neighbor 169.254.12.85 timers 10 30 30
  neighbor 169.254.12.85 default-originate
  neighbor 169.254.12.85 activate
  neighbor 169.254.12.85 soft-reconfiguration
inbound
  network 0.0.0.0
  exit
 exit
```

```
  neighbor 169.254.12.85
activate
  neighbor 169.254.13.189
remote-as 7224
  neighbor 169.254.13.189
activate
  network 192.168.1.0
  no auto-summary
  no synchronization
 exit-address-family
```

Verify and Optimize

Step 1.

Confirm the ASA establishes the IKEv1 security associations with the two endpoints at AWS. The state of the SA should be MM_ACTIVE.

```
ASA# show crypto ikev1 sa

IKEv1 SAs:

   Active SA: 2
    Rekey SA: 0 (A tunnel will report 1 Active and 1 Rekey SA during rekey)
Total IKE SA: 2

1   IKE Peer: 52.37.194.219
    Type    : L2L             Role    : initiator
    Rekey   : no              State   : MM_ACTIVE
2   IKE Peer: 52.34.205.227
    Type    : L2L             Role    : initiator
    Rekey   : no              State   : MM_ACTIVE
ASA#
```

Step 2.

Confirm the IPsec SAs are installed on ASA. There should be an inbound and outbound SPI installed for each peer and there should be some `encaps` and `decaps` counters incrementing.

```
ASA# show crypto ipsec sa
interface: AWS1
    Crypto map tag: __vti-crypto-map-5-0-1, seq num: 65280, local addr: 64.100.251.37

      access-list __vti-def-acl-0 extended permit ip any any
      local ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
      remote ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
      current_peer: 52.34.205.227


      #pkts encaps: 2234, #pkts encrypt: 2234, #pkts digest: 2234
      #pkts decaps: 1234, #pkts decrypt: 1234, #pkts verify: 1234
      #pkts compressed: 0, #pkts decompressed: 0
      #pkts not compressed: 2234, #pkts comp failed: 0, #pkts decomp failed: 0
      #pre-frag successes: 0, #pre-frag failures: 0, #fragments created: 0
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
      #TFC rcvd: 0, #TFC sent: 0
      #Valid ICMP Errors rcvd: 0, #Invalid ICMP Errors rcvd: 0
      #send errors: 0, #recv errors: 0

      local crypto endpt.: 64.100.251.37/4500, remote crypto endpt.: 52.34.205.227/4500
      path mtu 1500, ipsec overhead 82(52), media mtu 1500
      PMTU time remaining (sec): 0, DF policy: copy-df
      ICMP error validation: disabled, TFC packets: disabled
      current outbound spi: 874FCCF3
      current inbound spi : 5E653906

    inbound esp sas:
      spi: 0x5E653906 (1583692038)
         transform: esp-aes esp-sha-hmac no compression
         in use settings ={L2L, Tunnel,  NAT-T-Encaps, PFS Group 2, IKEv1, VTI, }
         slot: 0, conn_id: 73728, crypto-map: __vti-crypto-map-5-0-1
         sa timing: remaining key lifetime (kB/sec): (4373986/2384)
         IV size: 16 bytes
         replay detection support: Y
         Anti replay bitmap:
          0xFFFFFFFF 0xFFFFFFFF
    outbound esp sas:
      spi: 0x874FCCF3 (2270153971)
         transform: esp-aes esp-sha-hmac no compression
         in use settings ={L2L, Tunnel,  NAT-T-Encaps, PFS Group 2, IKEv1, VTI, }
         slot: 0, conn_id: 73728, crypto-map: __vti-crypto-map-5-0-1
         sa timing: remaining key lifetime (kB/sec): (4373986/2384)
         IV size: 16 bytes
         replay detection support: Y
         Anti replay bitmap:
          0x00000000 0x00000001

interface: AWS2
    Crypto map tag: __vti-crypto-map-6-0-2, seq num: 65280, local addr: 64.100.251.37

      access-list __vti-def-acl-0 extended permit ip any any
      local ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
      remote ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
      current_peer: 52.37.194.219


      #pkts encaps: 1230, #pkts encrypt: 1230, #pkts digest: 1230
      #pkts decaps: 1230, #pkts decrypt: 1230, #pkts verify: 1230
      #pkts compressed: 0, #pkts decompressed: 0
      #pkts not compressed: 1230, #pkts comp failed: 0, #pkts decomp failed: 0
      #pre-frag successes: 0, #pre-frag failures: 0, #fragments created: 0
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
      #TFC rcvd: 0, #TFC sent: 0
      #Valid ICMP Errors rcvd: 0, #Invalid ICMP Errors rcvd: 0
      #send errors: 0, #recv errors: 0

      local crypto endpt.: 64.100.251.37/4500, remote crypto endpt.: 52.37.194.219/4500
      path mtu 1500, ipsec overhead 82(52), media mtu 1500
      PMTU time remaining (sec): 0, DF policy: copy-df
      ICMP error validation: disabled, TFC packets: disabled
      current outbound spi: DC5E3CA8
      current inbound spi : CB6647F6

    inbound esp sas:
      spi: 0xCB6647F6 (3412477942)
         transform: esp-aes esp-sha-hmac no compression
         in use settings ={L2L, Tunnel,  NAT-T-Encaps, PFS Group 2, IKEv1, VTI, }
         slot: 0, conn_id: 77824, crypto-map: __vti-crypto-map-6-0-2
         sa timing: remaining key lifetime (kB/sec): (4373971/1044)
         IV size: 16 bytes
         replay detection support: Y
         Anti replay bitmap:
          0xFFFFFFFF 0xFFFFFFFF
    outbound esp sas:
      spi: 0xDC5E3CA8 (3697163432)
         transform: esp-aes esp-sha-hmac no compression
         in use settings ={L2L, Tunnel,  NAT-T-Encaps, PFS Group 2, IKEv1, VTI, }
         slot: 0, conn_id: 77824, crypto-map: __vti-crypto-map-6-0-2
         sa timing: remaining key lifetime (kB/sec): (4373971/1044)
         IV size: 16 bytes
         replay detection support: Y
         Anti replay bitmap:
          0x00000000 0x00000001
```

Step 3.

On the ASA, confirm that BGP connections are established with AWS. The `State/PfxRcd` counter should be 1 as AWS advertises the 172.31.0.0/16 subnet towards the ASA.

```
ASA# show bgp summary BGP router identifier 192.168.1.55, local AS number 65000 BGP table
version is 5, main routing table version 5 2 network entries using 400 bytes of memory 3 path
entries using 240 bytes of memory 3/2 BGP path/bestpath attribute entries using 624 bytes of
memory 1 BGP AS-PATH entries using 24 bytes of memory 0 BGP route-map cache entries using 0
bytes of memory 0 BGP filter-list cache entries using 0 bytes of memory BGP using 1288 total
bytes of memory BGP activity 3/1 prefixes, 4/1 paths, scan interval 60 secs Neighbor V AS
MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd 169.254.12.85 4 7224 1332 1161 5 0 0
03:41:31 1 169.254.13.189 4 7224 1335 1164 5 0 0 03:42:02 1
```

Step 4.

On the ASA, verify that the route to 172.31.0.0/16 has been learned via the tunnel interfaces. This output shows that there are two paths to 172.31.0.0 from peer 169.254.12.85 and 169.254.13.189. The path towards 169.254.13.189 out Tunnel 2 (AWS2) is preferred because of the lower metric.

```
ASA# show bgp BGP table version is 5, local router ID is 192.168.1.55 Status codes: s
suppressed, d damped, h history, * valid, > best, i - internal, r RIB-failure, S Stale, m
multipath Origin codes: i - IGP, e - EGP, ? - incomplete Network Next Hop Metric LocPrf Weight
Path * 172.31.0.0 169.254.12.85 200 0 7224 i *> 169.254.13.189 100 0 7224 i *> 192.168.1.0
0.0.0.0 0 32768 i ASA# show route Codes: L - local, C - connected, S - static, 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, V - VPN i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2 ia - IS-IS
inter area, * - candidate default, U - per-user static route o - ODR, P - periodic downloaded
static route, + - replicated route Gateway of last resort is 64.100.251.33 to network 0.0.0.0 S*
0.0.0.0 0.0.0.0 [1/0] via 64.100.251.33, outside C 64.100.251.32 255.255.255.224 is directly
connected, outside L 64.100.251.37 255.255.255.255 is directly connected, outside C
169.254.12.84 255.255.255.252 is directly connected, AWS2 L 169.254.12.86 255.255.255.255 is
directly connected, AWS2 C 169.254.13.188 255.255.255.252 is directly connected, AWS1 L
169.254.13.190 255.255.255.255 is directly connected, AWS1 B 172.31.0.0 255.255.0.0 [20/100] via
169.254.13.189, 03:52:55 C 192.168.1.0 255.255.255.0 is directly connected, inside L
192.168.1.55 255.255.255.255 is directly connected, inside
```

Step 5.

In order to ensure that traffic which returns from AWS follows a symmetric path, configure a `route-map` to match the preferred path and adjust BGP to alter the advertised routes.

```
route-map toAWS1 permit 10
 set metric 100
 exit
!
route-map toAWS2 permit 10
 set metric 200
 exit
!
router bgp 65000
 address-family ipv4 unicast
  neighbor 169.254.12.85 route-map toAWS2 out
  neighbor 169.254.13.189 route-map toAWS1 out
```

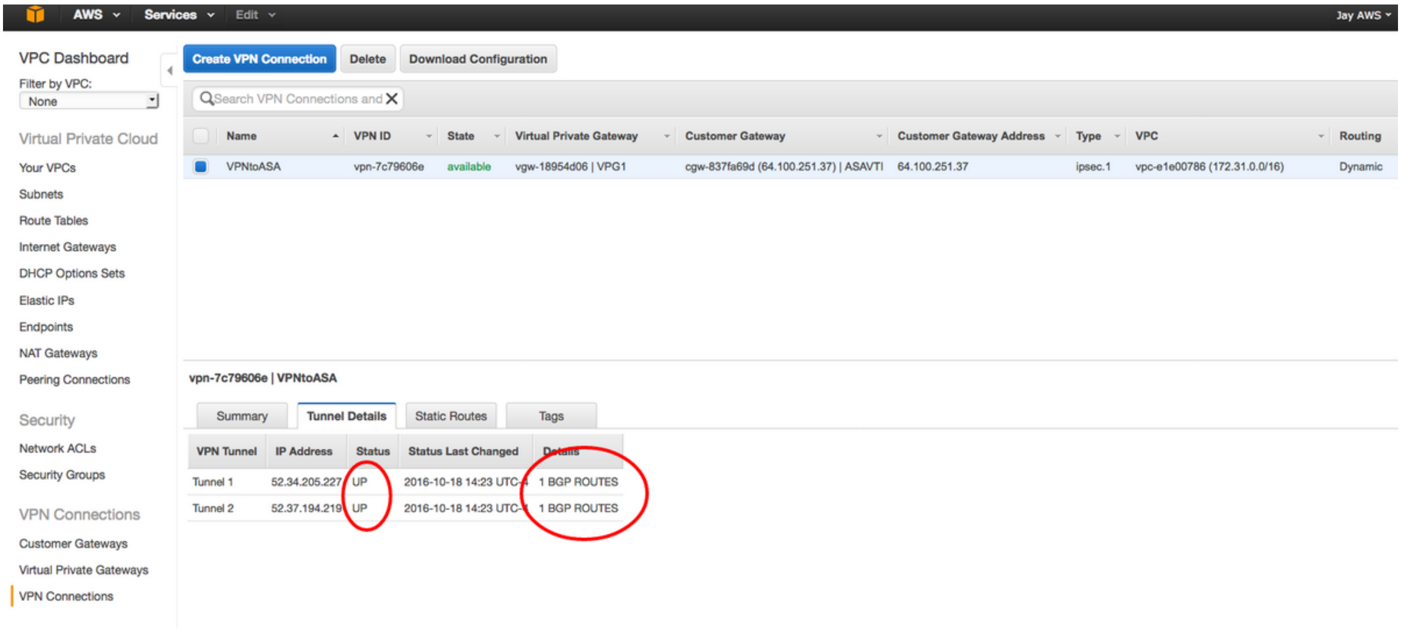
Step 6.

On the ASA, confirm that 192.168.1.0/24 is advertised to AWS.

```
ASA# show bgp neighbors 169.254.12.85 advertised-routes BGP table version is 5, local router ID
is 192.168.1.55 Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale, m multipath Origin codes: i - IGP, e - EGP, ? - incomplete Network Next
Hop Metric LocPrf Weight Path *> 172.31.0.0 169.254.13.189 100 0 7224 i *> 192.168.1.0 0.0.0.0 0
32768 i Total number of prefixes 2 ASA# show bgp neighbors 169.254.13.189 advertised-routes BGP
table version is 5, local router ID is 192.168.1.55 Status codes: s suppressed, d damped, h
history, * valid, > best, i - internal, r RIB-failure, S Stale, m multipath Origin codes: i -
IGP, e - EGP, ? - incomplete Network Next Hop Metric LocPrf Weight Path *> 192.168.1.0 0.0.0.0 0
32768 i Total number of prefixes 1
```

Step 7.

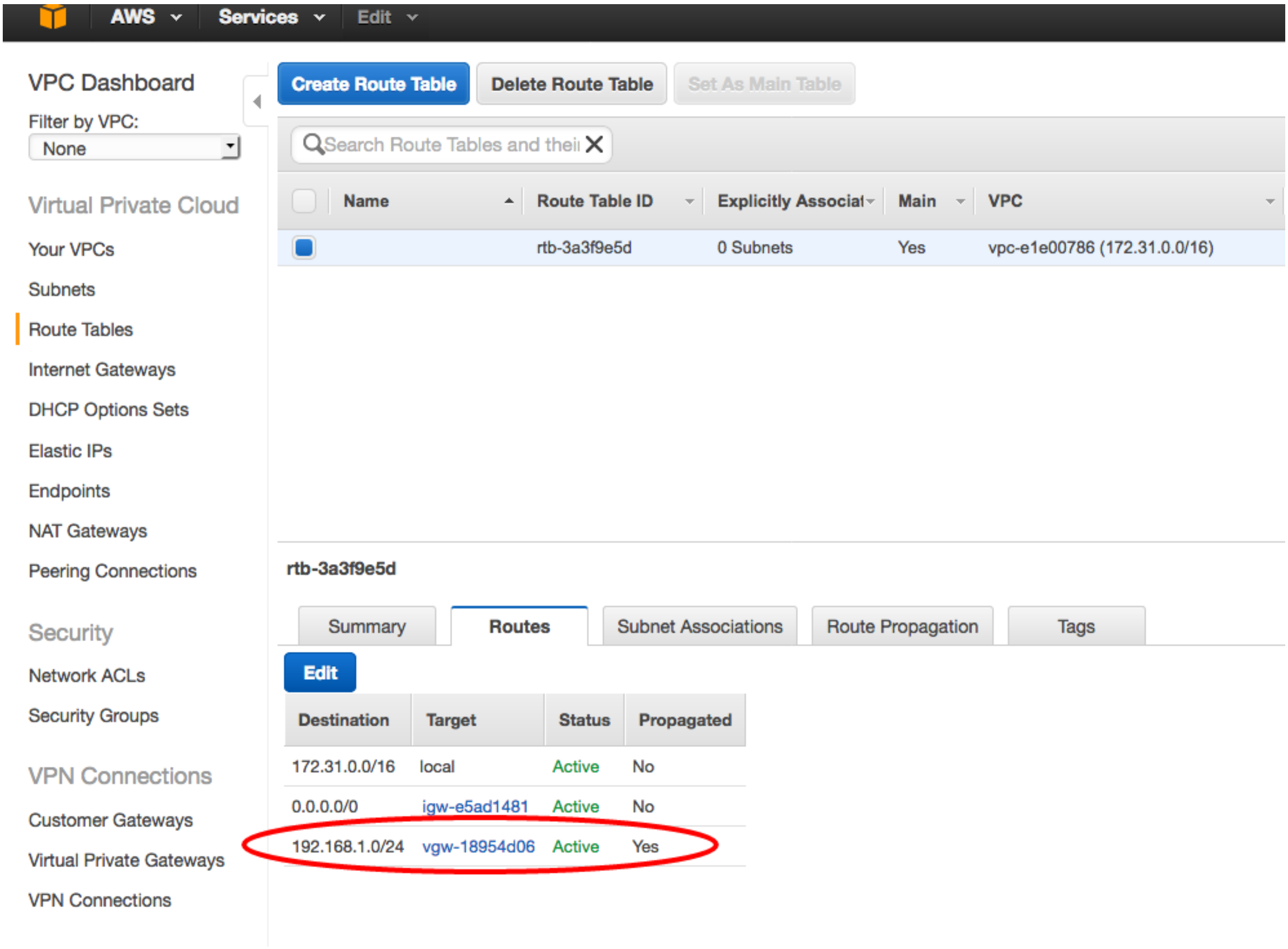
In AWS, confirm that the tunnels for the VPN connection are UP and routes are learned from the peer. Also check that the route has been propagated into the routing table.



Name	VPN ID	State	Virtual Private Gateway	Customer Gateway	Customer Gateway Address	Type	VPC	Routing
VPNtoASA	vpn-7c79606e	available	vgw-18954d06 | VPG1	cgw-837fa69d (64.100.251.37) | ASAVTI	64.100.251.37	ipsec.1	vpc-e1e00786 (172.31.0.0/16)	Dynamic

vpn-7c79606e | VPNtoASA

VPN Tunnel	IP Address	Status	Status Last Changed	Details
Tunnel 1	52.34.205.227	UP	2016-10-18 14:23 UTC-4	1 BGP ROUTES
Tunnel 2	52.37.194.219	UP	2016-10-18 14:23 UTC-4	1 BGP ROUTES



	Name	Route Table ID	Explicitly Associat	Main	VPC
■		rtb-3a3f9e5d	0 Subnets	Yes	vpc-e1e00786 (172.31.0.0/16)

rtb-3a3f9e5d

Destination	Target	Status	Propagated
172.31.0.0/16	local	Active	No
0.0.0.0/0	igw-e5ad1481	Active	No
192.168.1.0/24	vgw-18954d06	Active	Yes