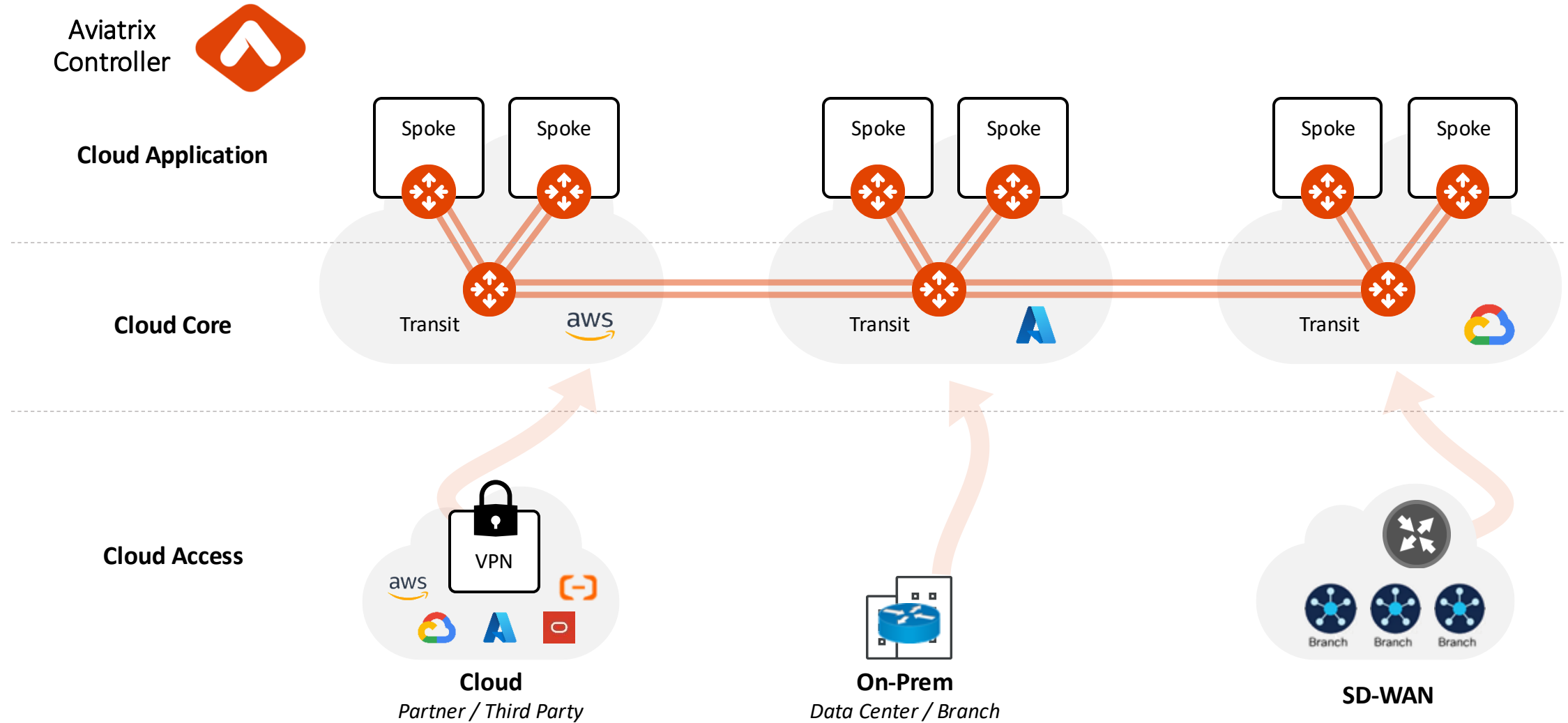




Site2Cloud

ACE Team

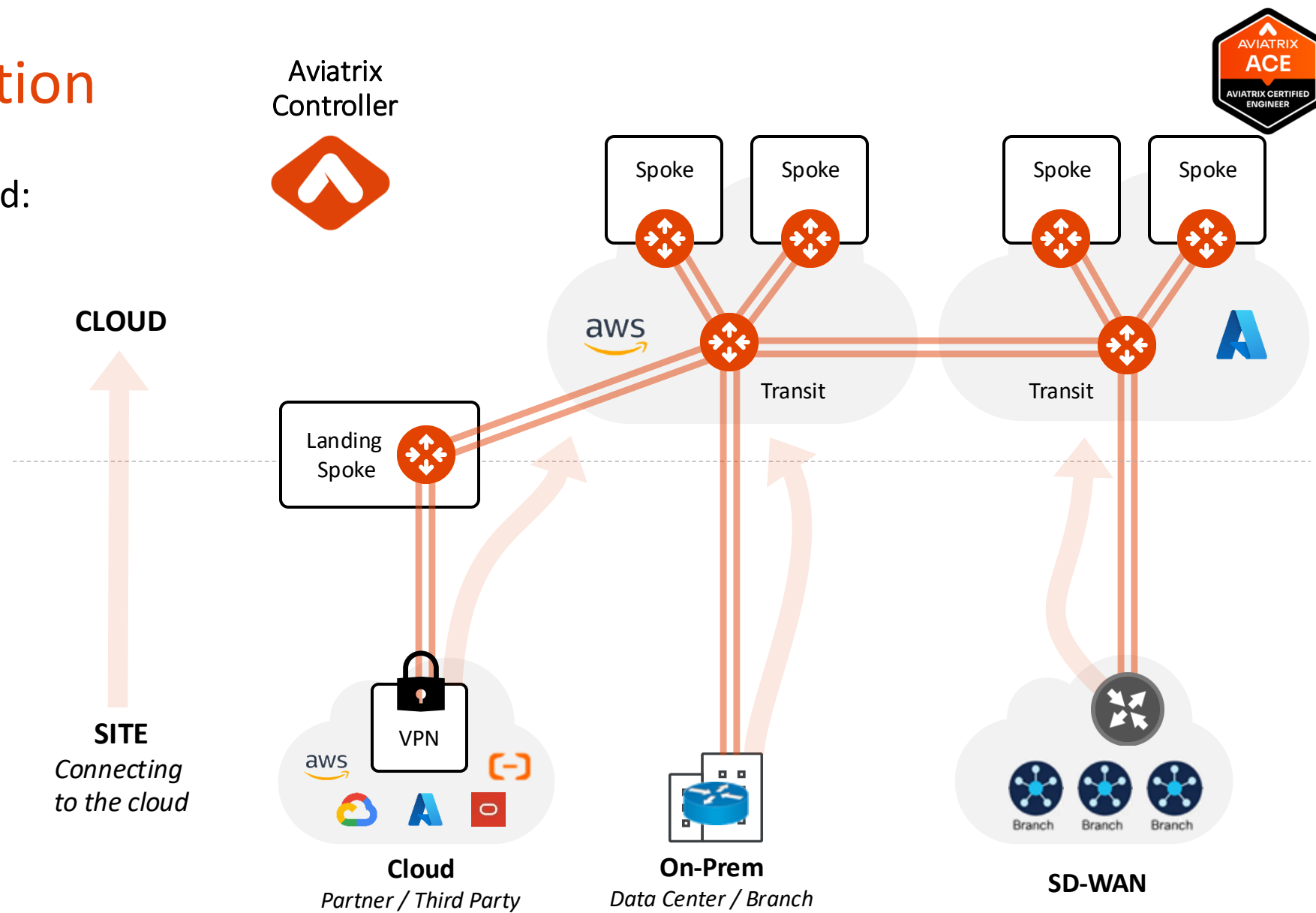
# Aviatrix Multicloud Network Architecture



# Site2Cloud Introduction

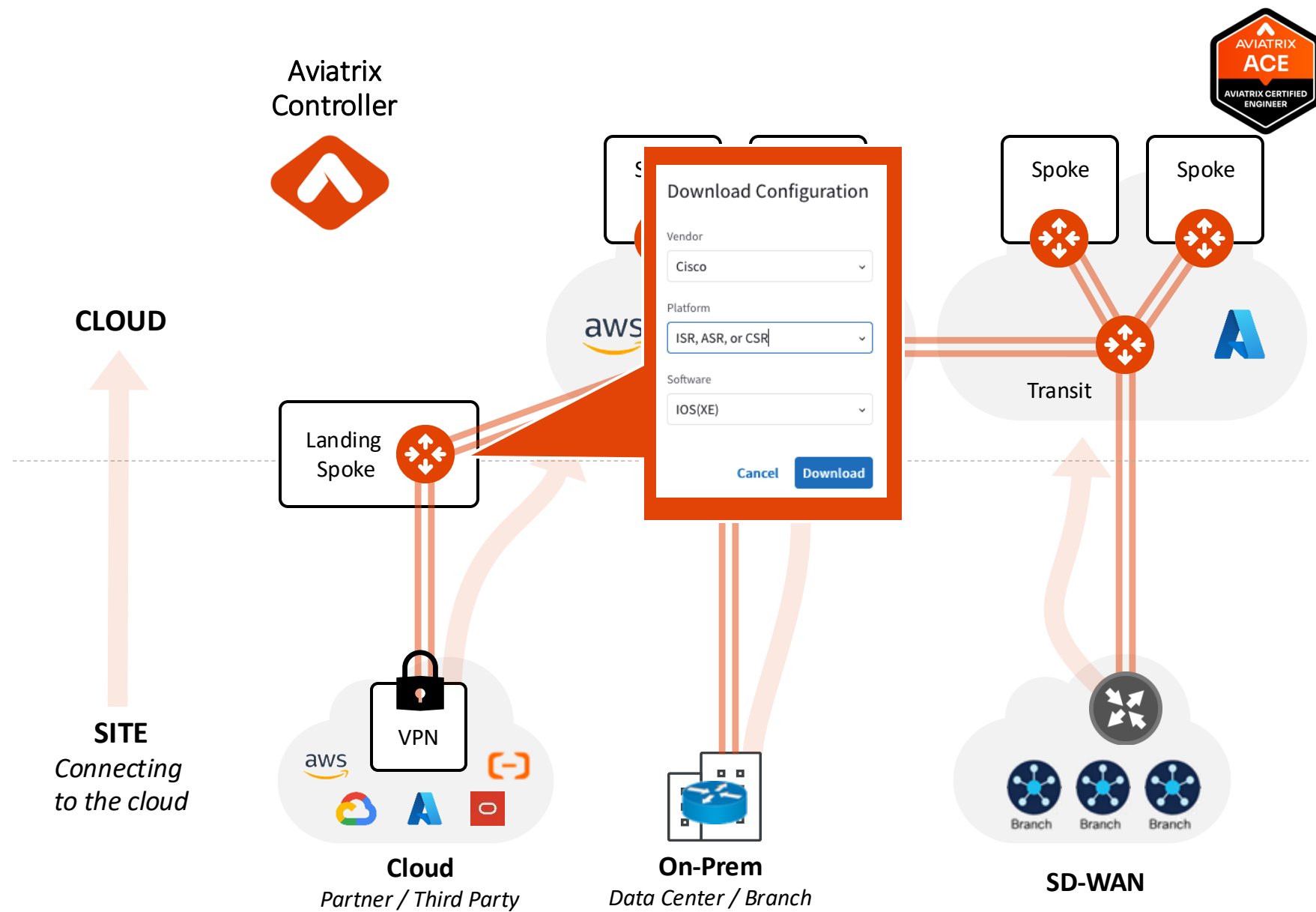
## IPsec connection to Public Cloud:

- On-Prem DC
- Branch
- 3rd Party Appliances, SD-WAN
- Clouds Native Constructs (VPCs/VNets/VCNs)



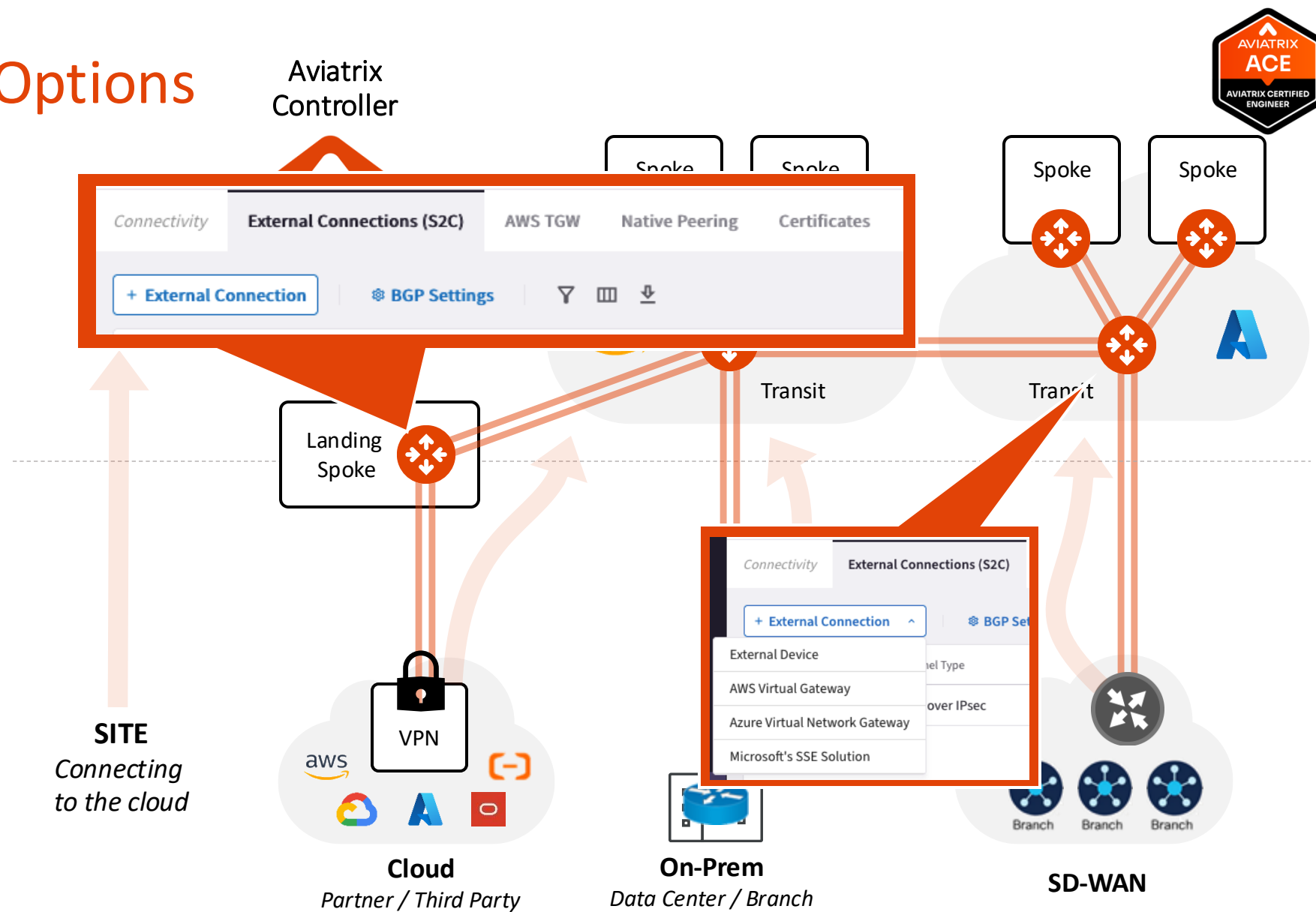
# Site2Cloud Solution

- Easy to use and template-driven
- Built-in diagnostic tools
- Solves Overlapping IPs Challenges



# Site2Cloud Landing Options

- **Landing on Transit**
  - Extend Core
  - SD-WAN
- **Landing on Spoke**
  - Scale
  - Partners
  - Complex Overlapping IP
  - Advanced NAT capabilities



# Site2Cloud – Deployment



**BGP** is supported on Site2Cloud tunnels to either Transit Gateway or Spoke Gateway

Create External Connection to External Device

Name

S2C-PARTNER

Connect Using

☐ BGP

☒ Static-Route Based

☐ Static-Policy Based

Type

Mapped

Custom Mapped

Off

Connect overlapping networks between the cloud and on-premises from a Transit, Spoke, or Specialty Gateway.

Local Gateway

ace-gcp-us-east1-spoke1

Real Local Subnet CIDR(s)

172.16.211.0/24

Virtual Local Subnet CIDR(s)

192.168.1.0/24

Remote Gateway Type

Generic

Real Remote Subnet CIDR(s)

172.16.211.0/24

Virtual Remote Subnet CIDR(s)

192.168.2.0/24

Advanced Settings

Authentication Method

☒ PSK

☐ Certificate

Over Private Network

Off

IKEv2

On

Algorithms

☒ Default

☐ Custom

Tunnel Configuration

Single IP HA

Off

Remote Gateway IP

Local Gateway Instance

Local Tunnel IP

Remote Tunnel IP

Pre-Shared Key

1

18.130.247.103

ace-gcp-us-e ...

169.254.0.1/30

169.254.0.1/30

.....

Cancel

Save

Connectivity				
External Connections (S2C)				
AWS TGW Native Peering Certificates				
+ External Connection BGP Settings				
Name	Tunnel Type	Local Gateway	Remote Gateway IP	
ACE-ONPREM-DC	BGP over IPsec	ace-aws-eu-west-1-transit1	35.178.213.109	
S2C-PARTNER	Static Route-Based (Mapped)	ace-gcp-us-east1-spoke1	18.133.109.111	

Connect Using

☒ BGP

☐ Static-Route Based

☐ Static-Policy Based

Type

IPSec

Run BGP over an IPsec connection from a Transit or BGP Spoke Gateway.

Local Gateway

Over Private Network

IKEv2

Algorithms

Connect Using

☐ BGP

☒ Static-Route Based

☐ Static-Policy Based

Type

Mapped

Custom Mapped Off

Connect overlapping networks between the cloud and on-premises from a Transit, Spoke, or Specialty Gateway.

Local Gateway

Real Local Subnet CIDR(s)

Virtual Local Subnet CIDR(s)

Remote Gateway Type

Generic

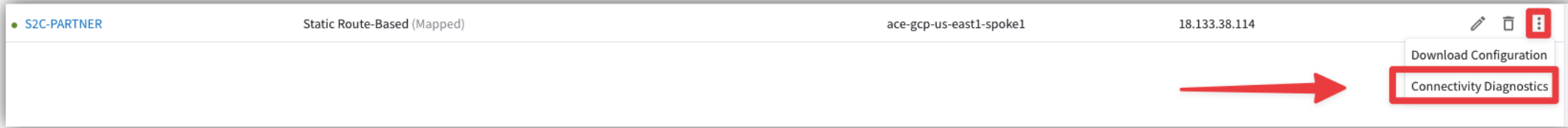
Real Remote Subnet CIDR(s)

Virtual Remote Subnet CIDR(s)

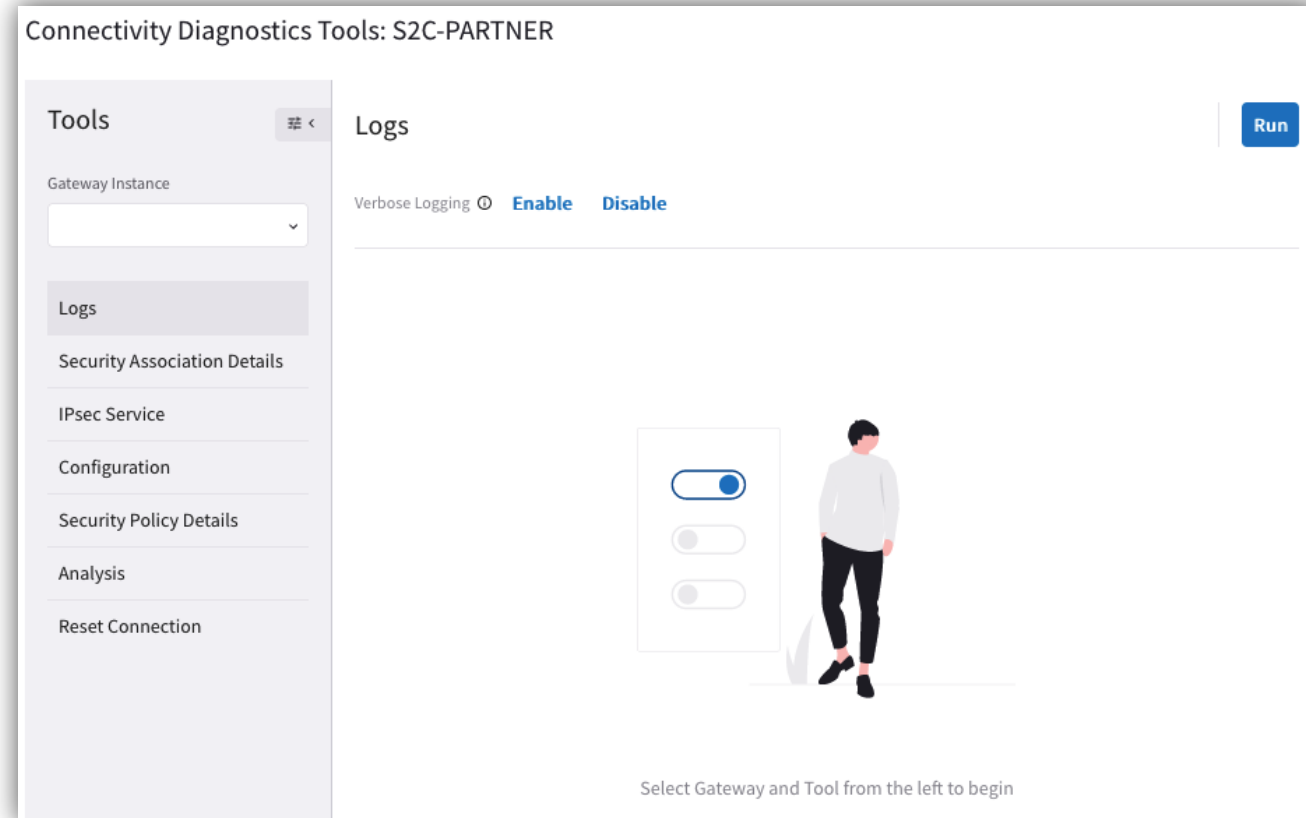


# Monitoring & Troubleshooting Site2Cloud

# Connectivity Diagnostics



- Tunnel is operational?
- 'Current' number is increasing on both ends
  - **CoPilot> Networking > Connectivity > External Connections (S2C) > Connectivity Diagnostics**
  - Make sure SPI (Security Parameter Index) matches on remote end
  - SPI is an identification tag added to the header while using IPsec for tunneling the IP traffic
  - SPI is required part of an IPsec Security Association (SA)
  - [https://en.wikipedia.org/wiki/Security\\_Parameter\\_Index](https://en.wikipedia.org/wiki/Security_Parameter_Index)



# Monitoring – SPI



## Cisco IOS outcome

```
OnPrem-Partner#show crypto ipsec sa interface tu1

interface: Tunnel1
  Crypto map tag: Tunnel1-head-0, local addr 172.16.211.36

protected vrf: (none)
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 34.139.73.146 port 4500
  PERMIT, flags={origin_is_acl,}
  #pkts encaps: 8, #pkts encrypt: 8, #pkts digest: 8
  #pkts decaps: 8, #pkts decrypt: 8, #pkts verify: 8
  #pkts compressed: 0, #pkts decompressed: 0
  #pkts not compressed: 0, #pkts compr. failed: 0
  #pkts not decompressed: 0, #pkts decompress failed: 0
  #send errors 0, #recv errors 0

local crypto endpt.: 172.16.211.36, remote crypto endpt.: 34.139.73.146
plaintext mtu 1422, path mtu 1500, ip mtu 1500, ip mtu idb GigabitEthernet1
current outbound spi: 0xC1B5E56C(3249923436)
PFS (Y/N): N, DH group: none

inbound esp sas:
  spi: 0x81432F90(2168663952)
    transform: esp-256-aes esp-sha256-hmac ,
    in use settings ={Tunnel UDP-Encaps, }
    conn id: 2001, flow_id: CSR:1, sibling_flags FFFFFFFF80000048, crypto map: Tunnel1-head-0
    sa timing: remaining key lifetime (sec): 2021
    Kilobyte Volume Rekey has been disabled
    IV size: 16 bytes
    replay detection support: Y
    Status: ACTIVE(ACTIVE)
  spi: 0x3A53A9B9(978561465)
    transform: esp-256-aes esp-sha256-hmac ,
    in use settings ={Tunnel UDP-Encaps, }
    conn id: 2004, flow_id: CSR:4, sibling_flags FFFFFFFF80000048, crypto map: Tunnel1-head-0
```

## Aviatrix CoPilot outcome

Connectivity Diagnostics Tools: s2c-partner

Tools

Gateway Instance

ace-gcp-us-east1-sp ... × ▾

Logs

Security Association Details

IPsec Service

Configuration

Security Policy Details

Analysis

Reset Connection

Security Association Details

Last Run: Jan 30, 2024 11:52 PM

Run

```
172.16.211.2[4500] 3.11.235.99[4500]
  esp-udp mode=tunnel spi=978561465(0x3a53a9b9) reqid=2(0x00000002)
  E: aes-cbc bf319f33 0c38a8ee 78955df1 1ba02557 7b7f1e87 dd4dd120 e8414390 4462d2e0
  A: hmac-sha256 2cd6f0be a83d8b44 d5c4519c e232fb62 dfbe355f 5a567a52 f0c7f9c7
b46958c8
  seq=0x00000000 replay=0 flags=0x00000000 state=mature
  created: Jan 30 22:26:33 2024 current: Jan 30 22:52:54 2024
  diff: 1581(s) hard: 3960(s) soft: 3454(s)
  last: Jan 30 22:33:03 2024 hard: 0(s) soft: 0(s)
  current: 677(bytes) hard: 0(bytes) soft: 0(bytes)
  allocated: 8 hard: 0 soft: 0
  sadb_seq=1 pid=3662 refcnt=0
3.11.235.99[4500] 172.16.211.2[4500]
  esp-udp mode=tunnel spi=3249923436(0xc1b5e56c) reqid=2(0x00000002)
  E: aes-cbc cd182749 e122ccd7 f4668d2c 9361341c 2d698735 60778402 6dbcb2d0 4c2e0ffd
  A: hmac-sha256 c9536926 532f504e 5fdcc950 d1594047 2687cecb d9e74556 e798354f
d8c93b98
  seq=0x00000000 replay=0 flags=0x00000000 state=mature
  created: Jan 30 22:26:33 2024 current: Jan 30 22:52:54 2024
  diff: 1581(s) hard: 3960(s) soft: 3253(s)
  last: Jan 30 22:33:03 2024 hard: 0(s) soft: 0(s)
  current: 672(bytes) hard: 0(bytes) soft: 0(bytes)
  allocated: 8 hard: 0 soft: 0
  sadb_seq=2 pid=3662 refcnt
```

SPI matches on both ends

# Monitoring – ‘Current’ number is increasing

## Aviatrix CoPilot outcome – First Time

## Aviatrix CoPilot outcome – Second Time

Connectivity Diagnostics Tools: s2c-partner

Tools ☰ <

Gateway Instance  
ace-gcp-us-east1-sp ... x v

Logs

Security Association Details

IPsec Service

Configuration

Security Policy Details

Analysis

Reset Connection

Security Association Details

Last Run: Jan 31, 2024 12:02 AM Run

```
172.16.211.2[4500] 3.11.235.99[4500]
esp-udp mode=tunnel spi=978561465(0x3a53a9b9) reqid=2(0x00000002)
E: aes-cbc bf319f33 0c38a8ee 78955df1 1ba02557 7b7f1e87 dd4dd120 e8414390 4462d2e0
A: hmac-sha256 2cd6f5be a83d8b44 d5c4519c e232fb62 dfbe355f 5a567a52 f0c7f9c7
b46958c8
seq=0x00000000 replay=0 flags=0x00000000 state=mature
created: Jan 30 22:26:33 2024 current: Jan 30 23:02:58 2024
diff: 2185(s) hard: 3960(s) soft: 3454(s)
last: Jan 30 22:33:03 2024 hard: 0(s) soft: 0(s)
current: 1008(bytes) hard: 0(bytes) soft: 0(bytes)
allocated: 12 hard: 0 soft: 0
sadb_seq=3 pid=5409 refcnt=0
3.11.235.99[4500] 172.16.211.2[4500]
esp-udp mode=tunnel spi=3249923436(0xc1b5e56c) reqid=2(0x00000002)
E: aes-cbc cd182749 e122ccd7 f4668d2c 9361341c 2d698735 60778402 6dbcb2d0 4c2e0ffd
A: hmac-sha256 c9536926 532f504e 5fdcc950 d1594047 2687cecb d9e74556 e798354f
```

Connectivity Diagnostics Tools: s2c-partner

Tools ☰ <

Gateway Instance  
ace-gcp-us-east1-sp ... x v

Logs

Security Association Details

IPsec Service

Configuration

Security Policy Details

Analysis

Reset Connection

Security Association Details

Last Run: Jan 31, 2024 12:04 AM Run

```
172.16.211.2[4500] 3.11.235.99[4500]
esp-udp mode=tunnel spi=978561465(0x3a53a9b9) reqid=2(0x00000002)
E: aes-cbc bf319f33 0c38a8ee 78955df1 1ba02557 7b7f1e87 dd4dd120 e8414390 4462d2e0
A: hmac-sha256 2cd6f5be a83d8b44 d5c4519c e232fb62 dfbe355f 5a567a52 f0c7f9c7
b46958c8
seq=0x00000000 replay=0 flags=0x00000000 state=mature
created: Jan 30 22:26:33 2024 current: Jan 30 23:04:49 2024
diff: 2296(s) hard: 3960(s) soft: 3454(s)
last: Jan 30 22:33:03 2024 hard: 0(s) soft: 0(s)
current: 1428(bytes) hard: 0(bytes) soft: 0(bytes)
allocated: 17 hard: 0 soft: 0
sadb_seq=3 pid=5464 refcnt=0
3.11.235.99[4500] 172.16.211.2[4500]
esp-udp mode=tunnel spi=3249923436(0xc1b5e56c) reqid=2(0x00000002)
E: aes-cbc cd182749 e122ccd7 f4668d2c 9361341c 2d698735 60778402 6dbcb2d0 4c2e0ffd
A: hmac-sha256 c9536926 532f504e 5fdcc950 d1594047 2687cecb d9e74556 e798354f
```

‘Current’ number is increasing

In the event of an IPsec VPN tunnel going down, follow these steps in sequence:

1. **Confirm Layer 3 connectivity**
  - Public IP reachable? Is there an ISP (BGP) issue?
  - If ping is disabled, check packet capture on remote public IP for ISAKMP packets
2. **Confirm SG/NSG allowed for outbound**
  - UDP 500 (ISAKMP – for ESP)
  - UDP 4500 (NAT- Traversal)
3. **Confirm whether IPsec Phase 2 or IPsec SA negotiation is stuck**
  - Restart IPsec service from SITE2CLOUD > Diagnostics
4. **Check policies outside each end of the tunnel**
  - ACL policies on remote end
  - Security Groups/NACLs on Cloud side

# Supported IPsec Encryption Algorithms

Type	Value
Phase 1 Authentication	SHA-1, SHA-512, SHA-384, SHA-256
Phase 1 DH Groups	1, 2, 5, 14, 15, 16, 17, 18, 19, 20, 21
Phase 1 Encryption	AES-256-CBC, AES-256-GCM-64, AES-256-GCM-96, AES-256-GCM-128, AES-192-CBC, AES-128-CBC, AES-128-GCM-64, AES-128-GCM-96, AES-128-GCM-128, 3DES
Phase 2 Authentication	HMAC-SHA-1, HMAC-SHA-512, HMAC-SHA-384, HMAC-SHA-256, NO-AUTH
Phase 2 DH Groups	1, 2, 5, 14, 15, 16, 17, 18, 19, 20, 21
Phase 2 Encryption	AES-128-CBC, AES-192-CBC, AES-256-CBC, AES-256-GCM-64, AES-256-GCM-96, AES-256-GCM-128, AES-128-GCM-64, AES-128-GCM-96, AES-128-GCM-128, 3DES, NULL-ENCR

[https://docs.aviatrix.com/HowTos/site2cloud\\_faq.html](https://docs.aviatrix.com/HowTos/site2cloud_faq.html)

# Diagnostics - Run Analysis



### Connectivity Diagnostics Tools: S2C-PARTNER

#### Tools

Gateway Instance  
ace-gcp-us-east1-sp ... x v

Logs

Security Association Details

IPsec Service

Configuration

Security Policy Details

Analysis

Reset Connection

#### Analysis

Last Run: Nov 3, 2023 3:58 PM

Run

Connection S2C-PARTNER is UP.

Close

# Analysis – On-prem router is down

On-prem router is **down**...



## Analysis

Last Run: Jan 31, 2024 12:50 AMRun

Tunnel analysis for connection s2c-partner:

Tunnel ace-gcp-us-east1-spoke1<-->3.11.235.99: ISAKMP Phase 1 SA is not established. Possible reasons:

1. Peer gateway not reachable (IP address incorrect or blocked)
2. Peer gateway not reachable over UDP port 500

# Analysis – UDP port 500 is not permitted

Security group rule ID ▾	IP version ▾	Type ▾	Protocol ▾	Port range ▾	Source
sgr-0176887910548ab41	IPv4	Custom UDP	UDP	4500	0.0.0.0/0
sgr-00e743fbe80ad493f	IPv4	All ICMP - IPv4	ICMP	All	0.0.0.0/0
sgr-0befa511b6d1e85f5	IPv4	SSH	TCP	22	0.0.0.0/0



Analysis

Last Run: Jan 31, 2024 12:50 AM

Run

Tunnel analysis for connection s2c-partner:

Tunnel ace-gcp-us-east1-spoke1<-->3.11.235.99: ISAKMP Phase 1 SA is not established. Possible reasons:

1. Peer gateway not reachable (IP address incorrect or blocked)
2. Peer gateway not reachable over UDP port 500

# Analysis – Pre-shared key mismatch

```
crypto ikev2 keyring OnPrem-Aviatrix
peer OnPrem-Aviatrix
address 34.139.73.146
identity address 34.139.73.146
pre-shared-key WRONG
!
```



Analysis Last Run: Jan 31, 2024 1:01 AM Run

Tunnel analysis for connection s2c-partner:

Tunnel ace-gcp-us-east1-spoke1<-->3.11.235.99: ISAKMP Phase 1 SA is not established. Possible reasons:

1. IPSEC Phase 1 authentication method is not pre-shared key
2. Pre-shared key mismatch
3. IPSEC remote id mismatch

# Analysis – DH Group mismatch

```
OnPrem-Partner#show crypto ikev2 proposal
IKEv2 proposal: avx-s2c
  Encryption : AES-CBC-256
  Integrity  : SHA256
  PRF       : SHA256
  DH Group   : DH_GROUP_1536_MODP/Group 5
```



## Analysis

Last Run: Jan 31, 2024 1:10 AM

Run

Tunnel analysis for connection s2c-partner:

Tunnel ace-gcp-us-east1-spoke1<-->3.11.235.99: IPsec Phase 2 SA is not established. Possible reasons:

1. Encryption/Authentication algorithm mismatch
2. DH group number mismatch

# Analysis – Encryption algorithm mismatch

## AviaTriX CoPilot outcome

Configuration

Last Run: Jan 31, 2024 12:09 AM

Run

```

    "id": "3.11.235.99"
  },
  "children": {
    "net-0_0_0_0-0_0_0_0": {
      "local_ts": [
        "0.0.0.0/0",
        "::/0"
      ],
      "remote_ts": [
        "0.0.0.0/0",
        "::/0"
      ],
      "rekey_time": 3600,
      "esp_proposals": [
        "aes256-sha256-modp2048"
      ],
    }
  }

```

## Cisco IOS outcome

```

OnPrem-Partner#show crypto ipsec transform-set
Transform set default: { esp-aes esp-sha-hmac }
will negotiate = { Transport, },

Transform set OnPrem-Aviatrix: { esp-256-aes esp-md5-hmac }
will negotiate = { Tunnel, },

OnPrem-Partner#

```



## Analysis

Last Run: Jan 31, 2024 12:24 AM

Run

Tunnel analysis for connection s2c-partner:

Tunnel ace-gcp-us-east1-spoke1<-->3.11.235.99: IPsec Phase 2 SA is not established. Possible reasons:

1. Encryption/Authentication algorithm mismatch
2. DH group number mismatch

# Diagnostics – show logs



### Connectivity Diagnostics Tools: S2C-PARTNER

#### Tools

Gateway Instance

ace-gcp-us-east1-sp ... x v

Logs

Security Association Details

IPsec Service

Configuration

Security Policy Details

Analysis

Reset Connection

#### Logs

Last Run: Nov 3, 2023 3:57 PM

Verbose Logging ☒ Enable ☐ Disable

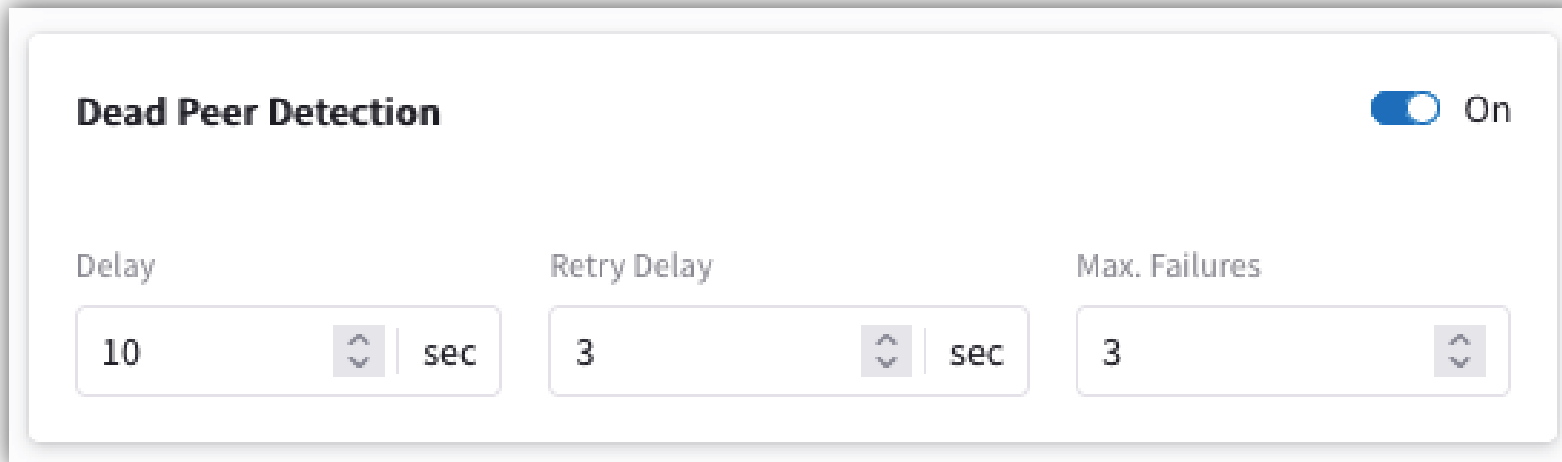
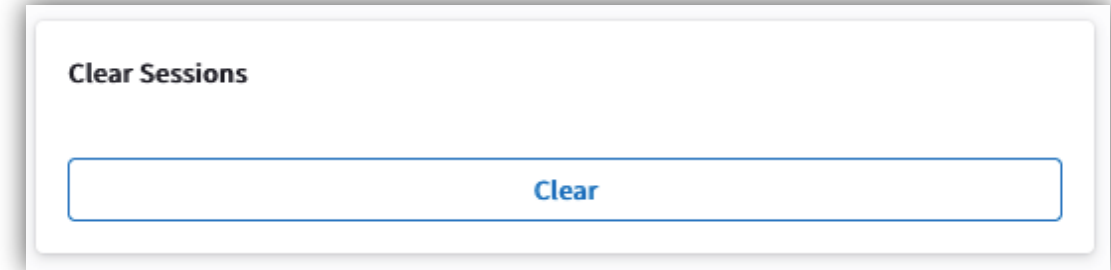
Run

```
2023-11-03T14:15:58.182653+00:00 GW-ace-gcp-us-east1-spoke1-35.237.68.55 charon: 213[IKE]
<gw-172_16_211_2-18_133_38_114|8> outbound CHILD_SA net-0_0_0_0-0_0_0_0_0{54} established
with SPIs cbdd1cf6_i c535c2d4_o and TS 0.0.0.0/0 == 0.0.0.0/0
2023-11-03T14:15:58.181406+00:00 GW-ace-gcp-us-east1-spoke1-35.237.68.55 charon: 213[IKE]
<gw-172_16_211_2-18_133_38_114|8> CHILD_SA closed
2023-11-03T14:15:58.181000+00:00 GW-ace-gcp-us-east1-spoke1-35.237.68.55 charon: 213[IKE]
<gw-172_16_211_2-18_133_38_114|8> sending DELETE for ESP CHILD_SA with SPI cf004751
2023-11-03T14:15:58.180647+00:00 GW-ace-gcp-us-east1-spoke1-35.237.68.55 charon: 213[IKE]
<gw-172_16_211_2-18_133_38_114|8> closing CHILD_SA net-0_0_0_0-0_0_0_0_0{52} with SPIs
cf004751_i (2268 bytes) b44433dd_o (2268 bytes) and TS 0.0.0.0/0 == 0.0.0.0/0
2023-11-03T14:15:58.180039+00:00 GW-ace-gcp-us-east1-spoke1-35.237.68.55 charon: 213[IKE]
<gw-172_16_211_2-18_133_38_114|8> received DELETE for ESP CHILD_SA with SPI b44433dd
2023-11-03T14:15:58.072201+00:00 GW-ace-gcp-us-east1-spoke1-35.237.68.55 charon: 212[ENC]
<gw-172_16_211_2-18_133_38_114|8> generating CREATE_CHILD_SA response 1004 [ SA No KE TSi
TSr ]
2023-11-03T14:15:58.071101+00:00 GW-ace-gcp-us-east1-spoke1-35.237.68.55 charon: 212[IKE]
<gw-172_16_211_2-18_133_38_114|8> inbound CHILD_SA net-0_0_0_0-0_0_0_0_0{54} established
with SPIs cbdd1cf6_i c535c2d4_o and TS 0.0.0.0/0 == 0.0.0.0/0
2023-11-03T14:15:58.063697+00:00 GW-ace-gcp-us-east1-spoke1-35.237.68.55 charon: 212[ENC]
<gw-172_16_211_2-18_133_38_114|8> parsed CREATE_CHILD_SA request 1004 [ N(REKEY_SA) SA No KE
TSi TSr ]
2023-11-03T13:21:11.679741+00:00 GW-ace-gcp-us-east1-spoke1-35.237.68.55 charon: 105[IKE]
<gw-172_16_211_2-18_133_38_114|8> outbound CHILD_SA net-0_0_0_0-0_0_0_0_0{52} established
with SPIs cf004751_i b44433dd_o and TS 0.0.0.0/0 == 0.0.0.0/0
2023-11-03T13:21:11.678766+00:00 GW-ace-gcp-us-east1-spoke1-35.237.68.55 charon: 105[IKE]
<gw-172_16_211_2-18_133_38_114|8> CHILD_SA closed
```

Close

# Dead Peer Detection Mismatch

- Dead Peer Detection is configured on AviaTriX gateways by default as follows (can be configured):
  - interval 10 seconds
  - retry 3 times
  - max failure 3 times
- If DPD is disabled on remote end:
  - Disable it on Site2Cloud gateway from **Networking > Connectivity > S2C conn. > Settings**
  - Restart the VPN service from **Networking > Connectivity > S2C conn. > Connectivity Diagnostics**



## NOTE:

- This will restart all tunnels on this gateway
- Could impact your service till the tunnels come up

# BGP Troubleshooting



- **PATH:** CoPilot> Networking > Connectivity > External Connections (S2C) > BGP Diagnostics

Connectivity | **External Connections (S2C)** | AWS TGW | Native Peering | Certificates

[+ External Connection](#) | [BGP Settings](#) |


All Connections ▾

Name	Tunnel Type	Local Gateway	Remote Gateway IP	
• <a href="#">ACE-ONPREM-DC</a>	BGP over IPsec	ace-aws-eu-west-1-transit1	18.170.34.236	
• <a href="#">S2C-PARTNER</a>	Static Route-Based (Mapped)	ace-gcp-us-east1-spoke1	18.133.38.114	



[Download Configuration](#)  
[Connectivity Diagnostics](#)  
[BGP Diagnostics](#)

# BGP Troubleshooting – List of commands

BGP Diagnostics Tools: ACE-ONPREM-DC

Tools  <

Gateway Instance

ace-aws-eu-west...  

BGP Command

BGP Command

Run

Command


- show running
- show ip bgp
- show ip bgp neighbors
- show ip bgp paths
- show ip bgp summary
- show bgp memory
- show ip bgp attribute-info
- show ip bgp flap-statistics
- show ip prefix-list
- debug bgp as4 segment
- debug bgp events
- debug bgp filters

Close



# BGP Troubleshooting – show running



BGP Diagnostics Tools: ACE-ONPREM-DC

Tools 


Gateway Instance


ace-aws-eu-west...  

BGP Command

BGP Command


Command

show running 

Last Run: Nov 3, 2023 4:15 PM 

```
show running

Current configuration:
!
hostname ip-10-1-201-175
password 8 9vYpDhy25C4YA
log file /var/log/quagga/bgpd.log
log stdout
log syslog
service password-encryption
!
debug bgp as4
debug bgp events
debug bgp keepalives
debug bgp updates
debug bgp fsm
!
router bgp 65011
 bgp router-id 169.254.74.130
 network 10.1.211.0/24
 network 10.1.212.0/24
 network 172.16.211.0/24 route-map prepend-8ffc7ca367064962aa7f9286e8463c0e
 network 192.168.211.0/24 route-map prepend-8ffc7ca367064962aa7f9286e8463c0e
 network 192.168.212.0/24 route-map prepend-8ffc7ca367064962aa7f9286e8463c0e
 neighbor 169.254.74.129 remote-as 65012
```



# BGP Troubleshooting – show ip bgp



## BGP Diagnostics Tools: ACE-ONPREM-DC

### Tools

Gateway Instance

ace-aws-eu-west... x v

BGP Command

### BGP Command

Last Run: Nov 3, 2023 4:16 PM

Run

Command

show ip bgp

```
show ip bgp
BGP table version is 0, local router ID is 169.254.74.130
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
               i internal, r RIB-failure, S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete
```

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 0.0.0.0	169.254.74.129			0	65012 i
*> 10.0.0.0/24	169.254.74.129	0		0	65012 ?
*> 10.0.111.0/24	169.254.74.129	0		0	65012 ?
*> 10.0.211.0/24	169.254.74.129	0		0	65012 ?
*> 10.1.211.0/24	0.0.0.0	0		32768	i
*> 10.1.212.0/24	0.0.0.0	0		32768	i
*> 169.254.74.128/30	169.254.74.129	0		0	65012 ?
*> 172.16.211.0/24	0.0.0.0	0		32768	65011 i
*> 192.168.211.0	0.0.0.0	0		32768	65011 i
*> 192.168.212.0	0.0.0.0	0		32768	65011 i

Displayed 10 out of 10 total prefixes

Close



Edge

# Introducing Aviatrix Edge

**The only multi-cloud native platform with enterprise-grade visibility and control for public cloud and the edge**  
Aviatrix software in multiple form factors providing consistent network, security, and visibility to the edge.  
Edge locations appear and behave as another VPC/VNET with spoke and transit capabilities.



**Cloud Out Architecture**



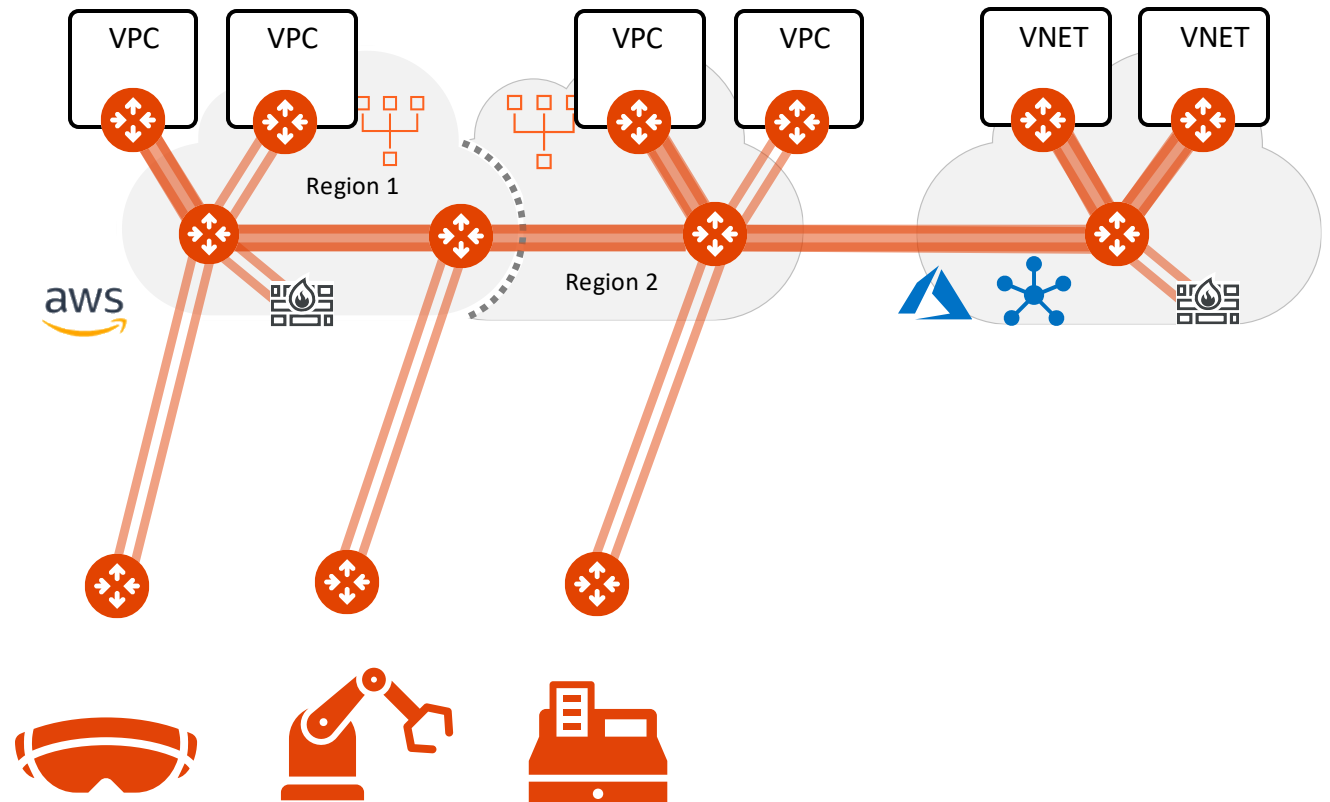
**Simplified Edge Management**



**Consistent Secure Edge**



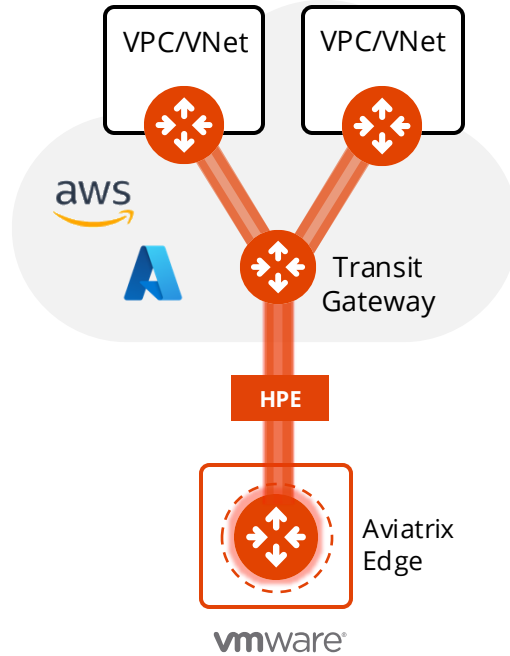
**Simplified Edge On-boarding**



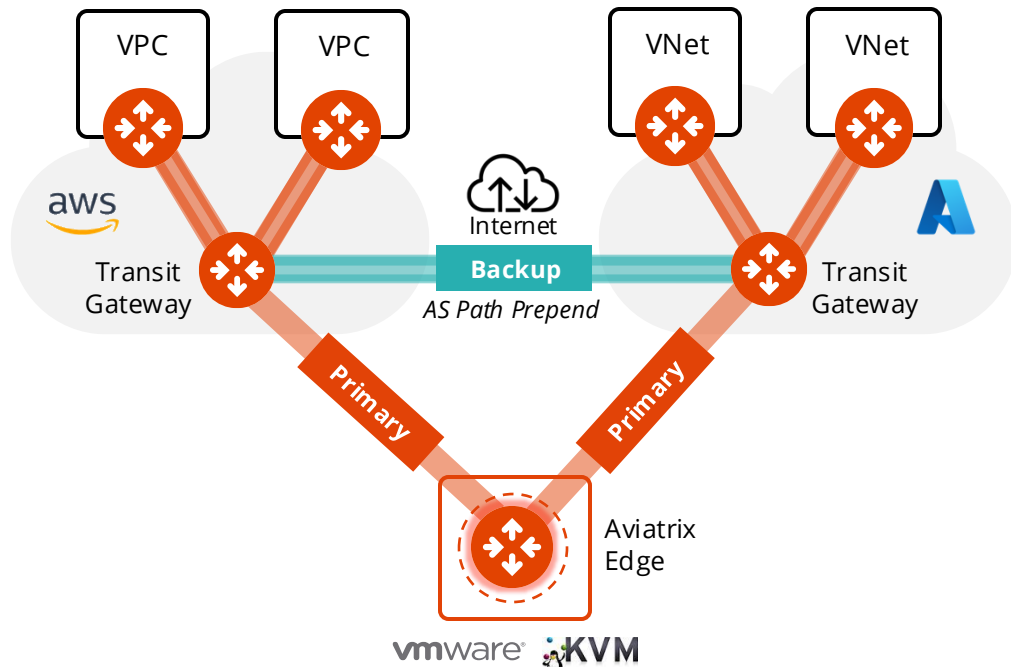
# Aviatrix Edge Use Cases



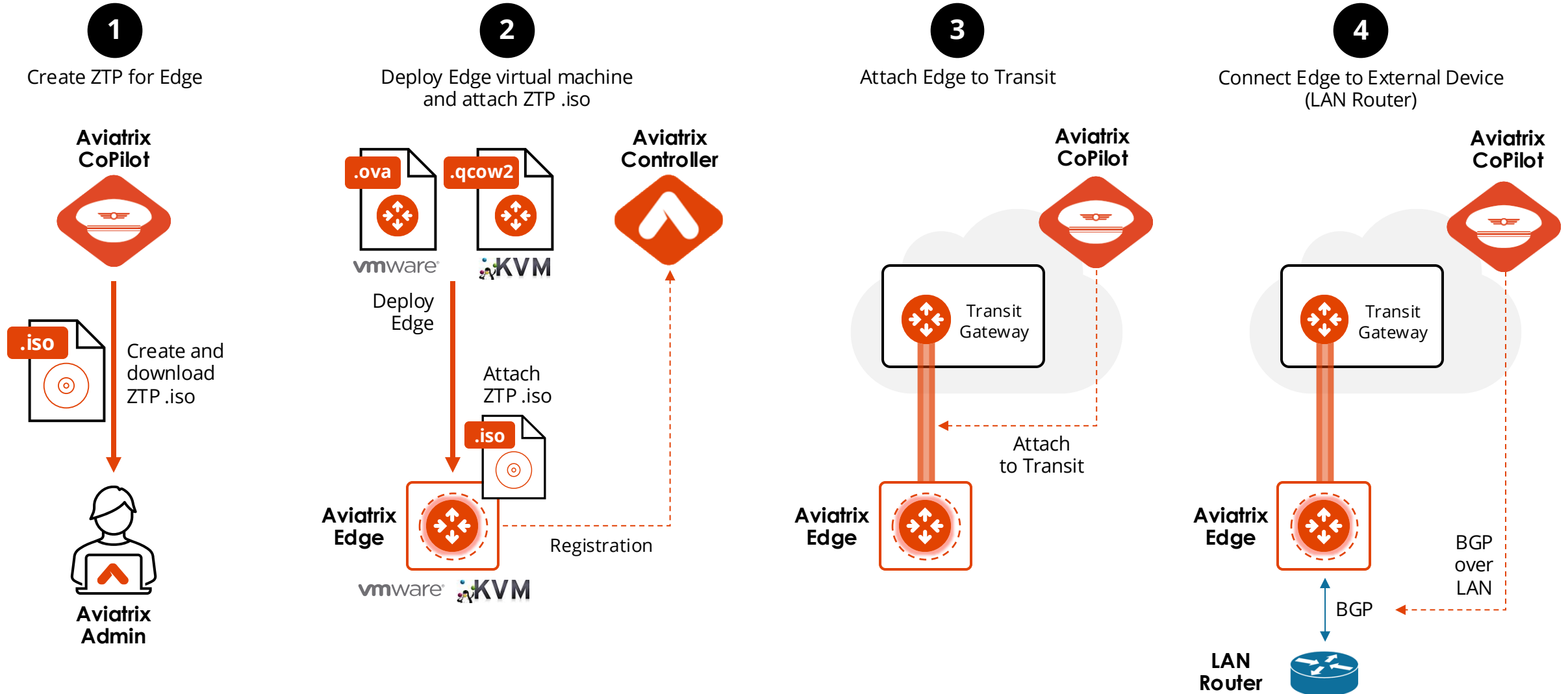
## Extend the Aviatrix Platform to the Edge



## Multi-Cloud Connectivity via Aviatrix Edge



# Edge 2.0 Deployment Workflow - Demo



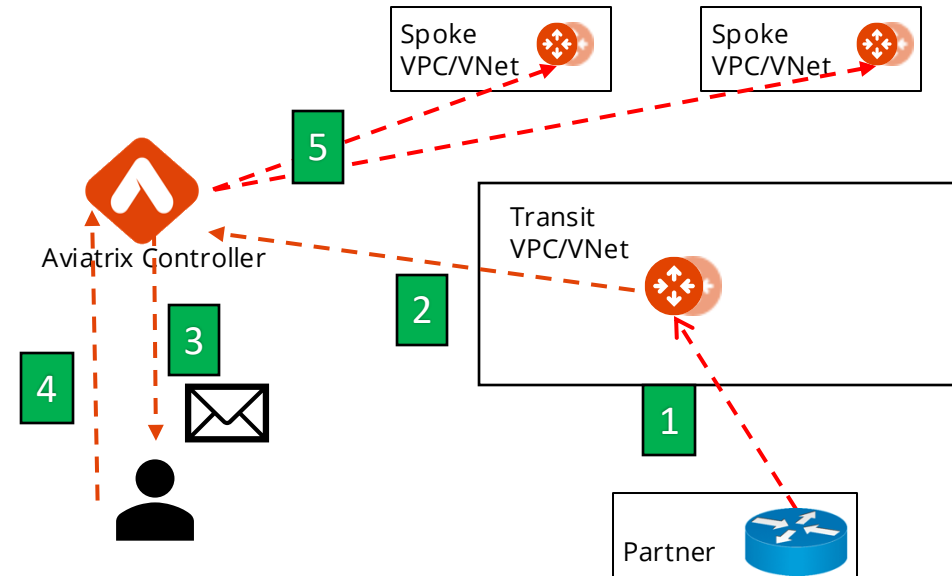


# BGP Route Approval

# BGP Route Approval

- Can explicitly **approve** any BGP-learned route from Partner or on-prem into the cloud network
- **Prevents unwanted advertisement** of routes such as 0/0

1. New routes arrive at Aviatrix Transit GW
2. Transit GW reports new routes to Controller
3. Controller notifies admin via email
4. Admin accesses the Controller to approve
5. If approved, Controller programs the new routes to Spoke VPCs



```

From Aviatrix Controller: Route Approval Request

N © no-reply@aviatrix.com <no-reply@aviatrix.com>
To: © Umair Hoodbhoy

Number of Events: 1.

*****
Time Detected: 2022-07-21 13:55:43.288542

Request approval for new learned CIDR(s):

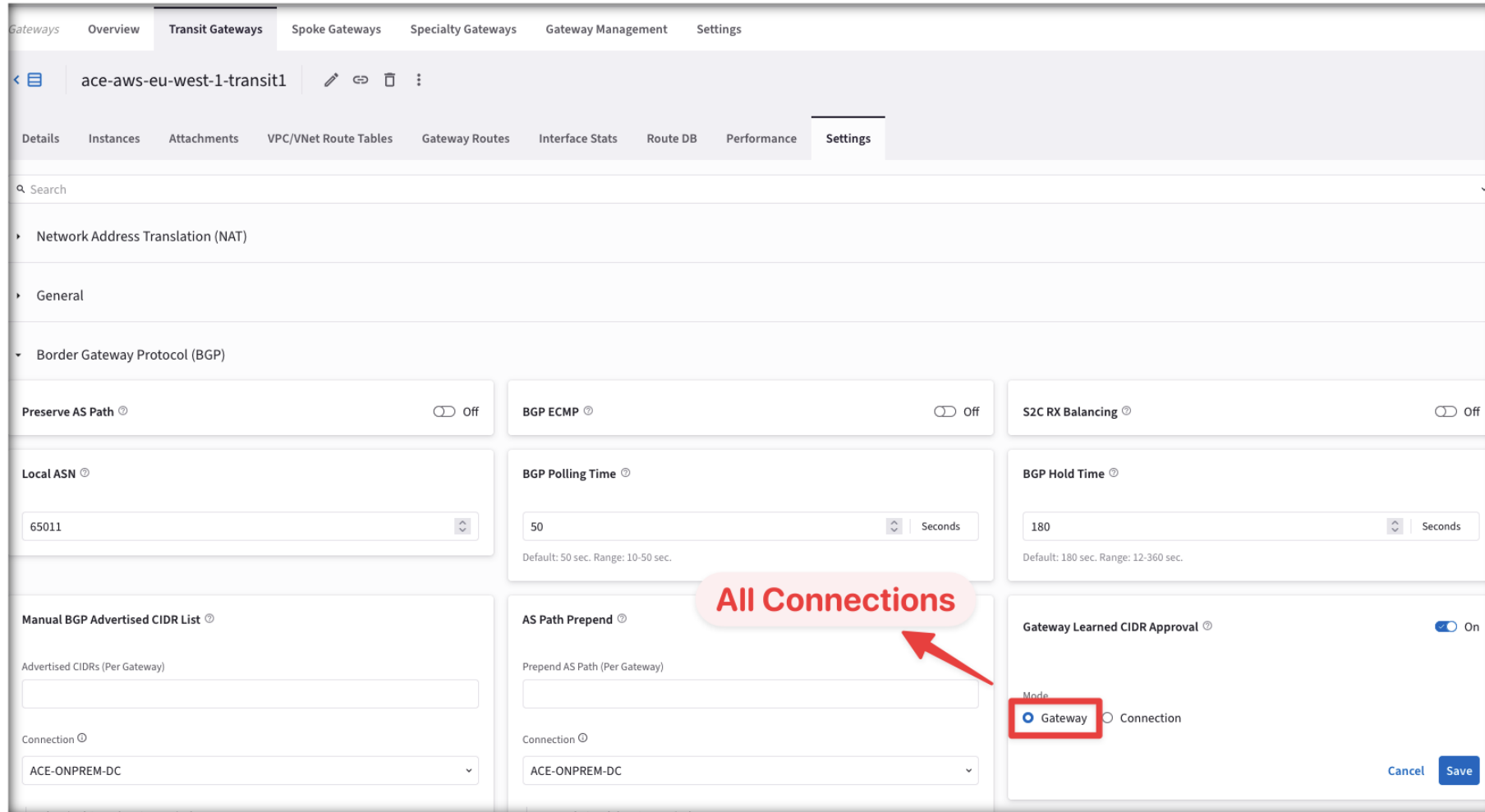
Gateway: aws-us-east-1-transit1, Connection: ONPREM-DC, CIDRs(1): 10.120.96.0/20

To approve, please login to the Aviatrix Controller and go to Multi-Cloud Transit-> Approval.

Controller IP: 54.163.74.31
Controller Name: ACE Inc
Controller Version: UserConnect-6.7.1324
Time Detected: 2022-07-21 13:55:43.289339
  
```

# BGP Route Approval – Activation

- **PATH:** CoPilot > Cloud Fabric > Gateways > select the relevant Gateway > Settings > Border Gateway Protocol (BGP)



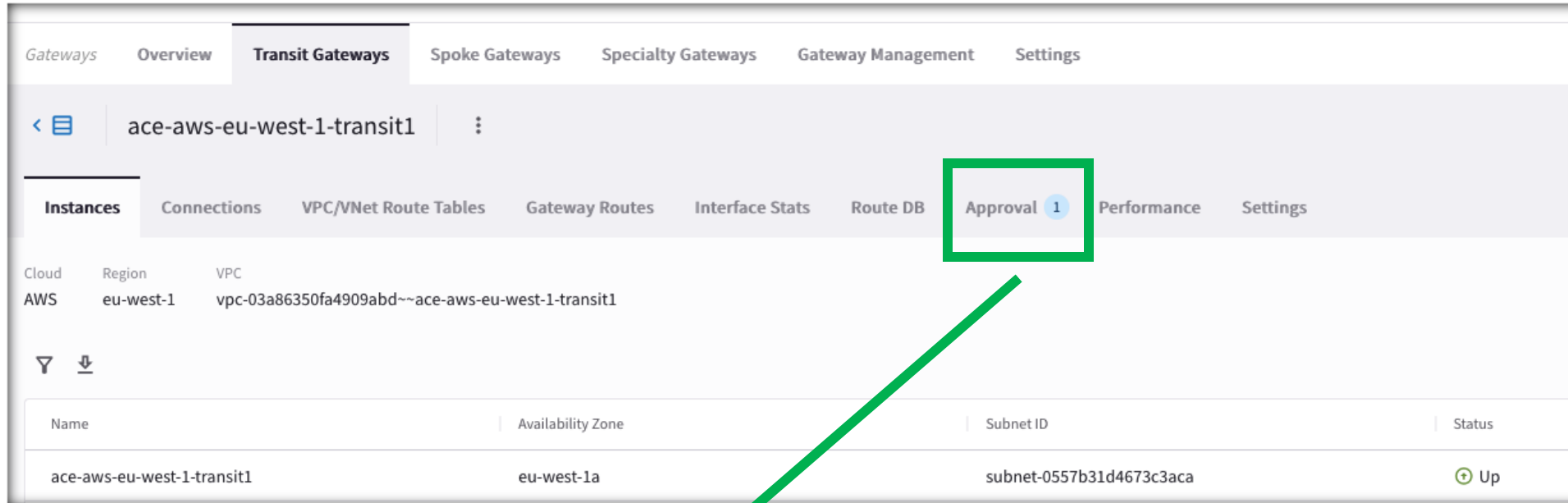
The screenshot shows the AWS Management Console interface for a Transit Gateway. The breadcrumb trail is: Gateways > Overview > Transit Gateways > ace-aws-eu-west-1-transit1 > Settings. The 'Settings' tab is selected, and the 'Border Gateway Protocol (BGP)' section is expanded. The following settings are visible:

- Preserve AS Path:** Off
- BGP ECMP:** Off
- S2C RX Balancing:** Off
- Local ASN:** 65011
- BGP Polling Time:** 50 Seconds (Default: 50 sec. Range: 10-50 sec.)
- BGP Hold Time:** 180 Seconds (Default: 180 sec. Range: 12-360 sec.)
- Manual BGP Advertised CIDR List:** (Empty text area)
- AS Path Prepend:** (Empty text area)
- Gateway Learned CIDR Approval:** On
- Mode:** Gateway (selected), Connection

A red arrow points to the 'Gateway' radio button under 'Gateway Learned CIDR Approval' with the text 'All Connections'.

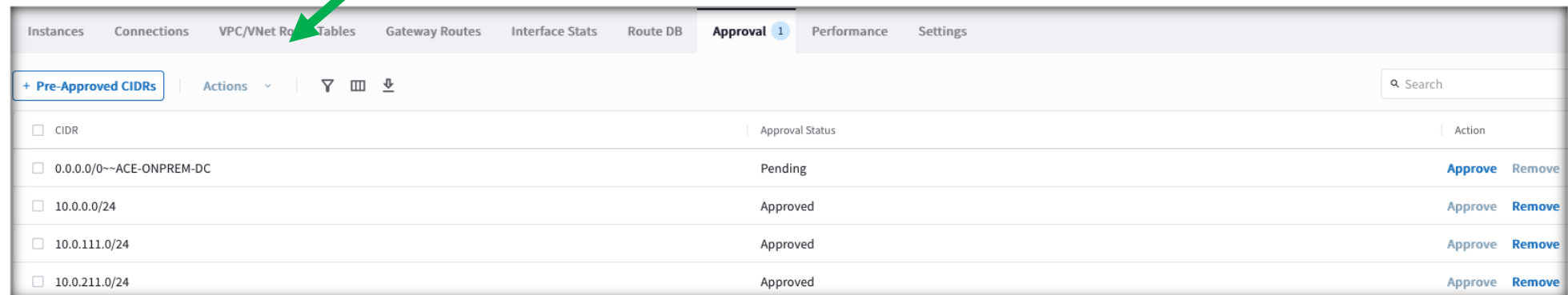
# BGP Route Approval – Verification

- PATH:** CoPilot > Cloud Fabric > Gateways > select the relevant Gateway



The screenshot shows the AWS Management Console interface for a Transit Gateway. The breadcrumb navigation is: Gateways > Overview > Transit Gateways > ace-aws-eu-west-1-transit1. The 'Approval' tab is highlighted with a green box. Below the tabs, the gateway details are shown: Cloud (AWS), Region (eu-west-1), and VPC (vpc-03a86350fa4909abd). A table below shows the gateway's status as 'Up'.

Name	Availability Zone	Subnet ID	Status
ace-aws-eu-west-1-transit1	eu-west-1a	subnet-0557b31d4673c3aca	Up

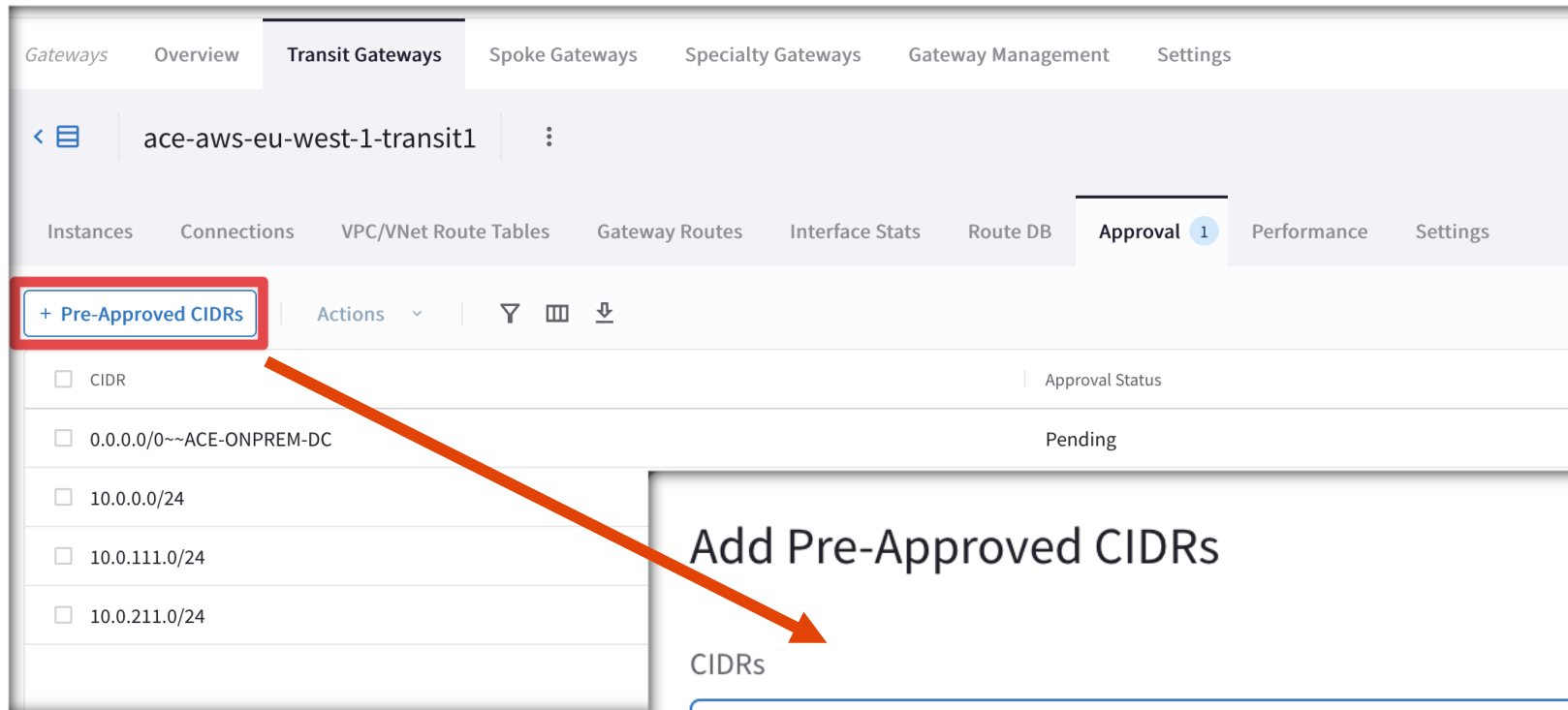


The screenshot shows the 'Approval' tab for the gateway. It displays a table of BGP routes with their approval status. The table has columns for 'CIDR', 'Approval Status', and 'Action'.

CIDR	Approval Status	Action
0.0.0.0/0~ACE-ONPREM-DC	Pending	<a href="#">Approve</a> <a href="#">Remove</a>
10.0.0.0/24	Approved	<a href="#">Approve</a> <a href="#">Remove</a>
10.0.111.0/24	Approved	<a href="#">Approve</a> <a href="#">Remove</a>
10.0.211.0/24	Approved	<a href="#">Approve</a> <a href="#">Remove</a>

# BGP Route Approval – Config – Pre-Approved CIDRs

- **PATH:** CoPilot > Cloud Fabric > Gateways > select the relevant Gateway > Approval



- This feature allows to pre-approving CIDRs advertised by external networks.
- The CIDRs will be propagated without the administrator logs into the CoPilot

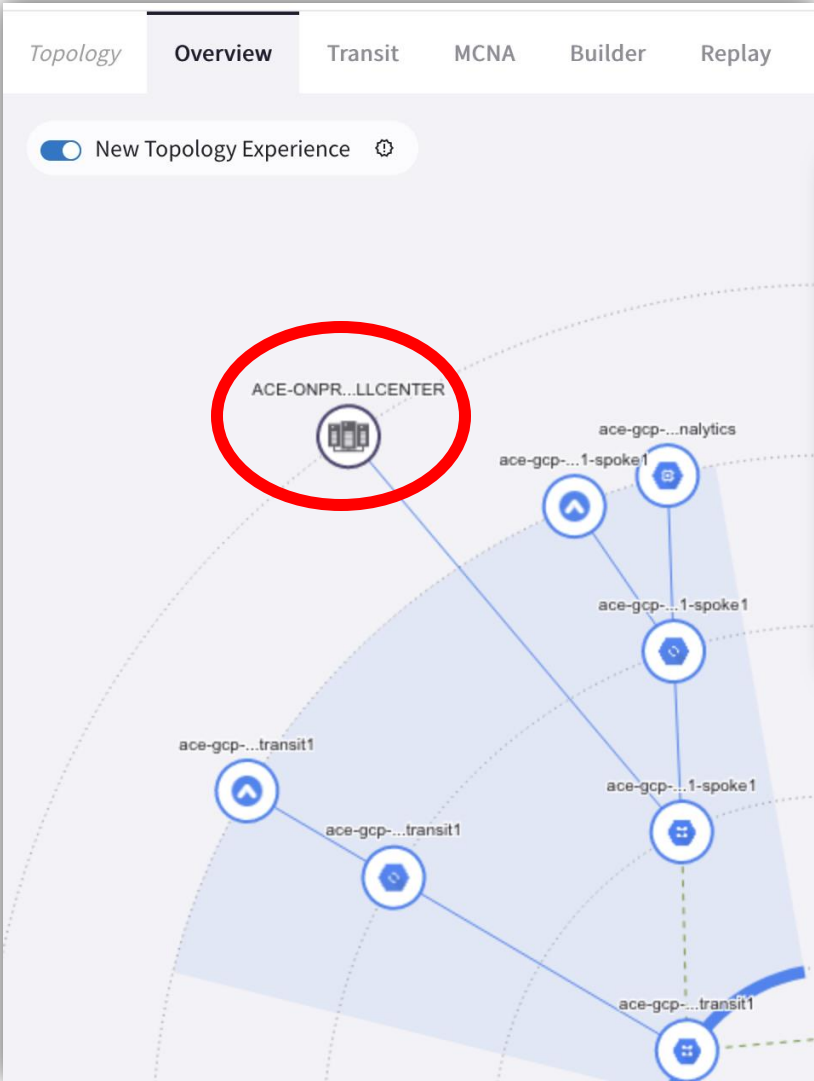


# Site2Cloud & CoPilot

# Site2Cloud Visibility via CoPilot



- **PATH:** COPILOT > Diagnostics > Cloud Routes > **Site 2 Cloud**



Cloud Routes

Cloud Routes Gateway Routes VPC/VNet Routes **Site 2 Cloud** BGP Info

Search

Last Updated: April 3rd 2023, 12:10:01 pm

S2C Name	VPC/VNet ID	BGP STATUS	HA STATUS	S2C STATUS	TUNNEL STATUS
ACE-ONPREM-CALLCENTER	ace-gcp-us-east1-spoke1~aviatrix-lab2	disabled	disabled	Up	
ACE-ONPREM-DC	vpc-0166f973c61ae76dc	enabled	disabled	Up	

Tunnels

status	tunnel_status	gw_name	ip_addr	modified	name	peer_ip	tunnel_protocol	cert_based_s2c_local_id
Active	Up	ace-aws-eu-west-1-transit1	52.210.148.241	2023-03-27T18:34:00.646541Z	tunnel-ace-aws-eu-west-1-transit1	18.133.182.174	IPsec	

Cloud Routes Gateway Routes VPC/VNet Routes **External Connections** BGP Info

Search

Name	VPC/VNet	BGP Status	Status	Tunnel Status	HA Status
ACE-ONPREM-DC	ace-aws-eu-west-1-transit1(vpc-04804a29e22b93c0)	Enabled	Up	Up	Disabled

Tunnel Name	Gateway	IP Address	Peer IP Addr...	Tunnel Proto...	Cert Based E...	Tunnel Status	HA Status	Modified
tunnel-ace-aws-eu-west-1-tran...	ace-aws-eu-west-1-transit1	52.51.35.139	35.178.41.7	IPsec		Up	Active	Jan 29, 2024 12:19 PM

# Site2Cloud BGP via CoPilot

- **PATH:** COPILOT > Diagnostics > Cloud Routes > **BGP Info**



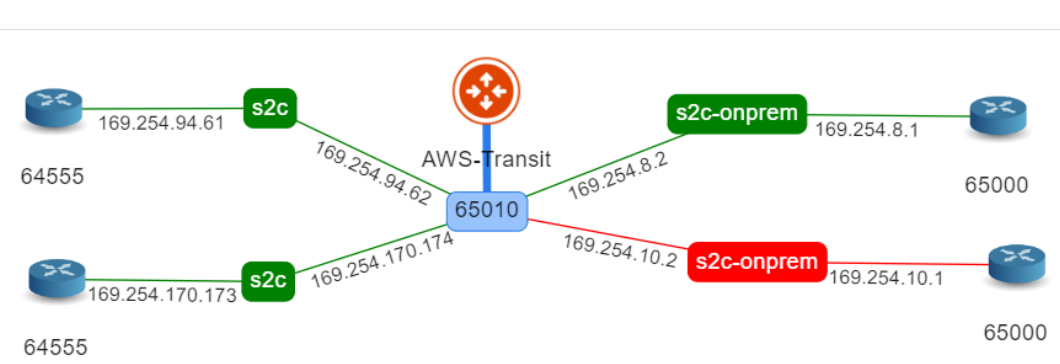
Show BGP Map

Show BGP Learned Routes

Show BGP Advertised Routes

Cloud Routes Gateway Routes VPC/VNet Routes External Connections <b>BGP Info</b>					
Gateway	VPC/VNet	BGP Mode	BGP HA Status	Local ASN	Status
^ ace-aws-eu-west-1-transit1	ace-aws-eu-west-1-transit1(vpc-03a86350fa4909abd) (10.1.200.0/24)	Enabled	activemesh	65011	Established
Connection Name	Remote AS Number	Neighbor IP	Local IP	Neighbor Status	
ACE-ONPREM-DC(169.254.74.129)	65012	169.254.74.129	169.254.74.130	Established	

BGP MAP



LEARNED CIDR

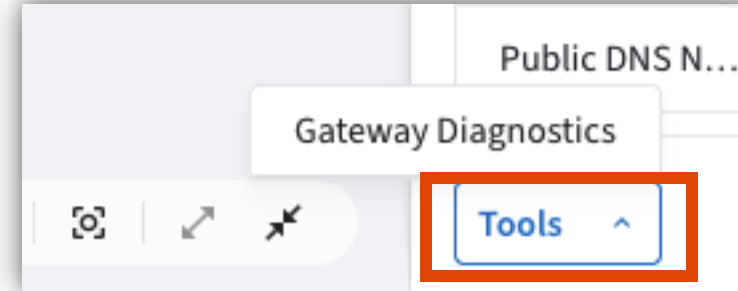
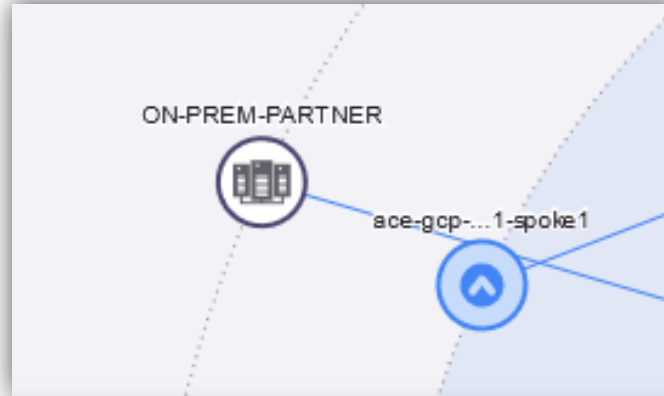
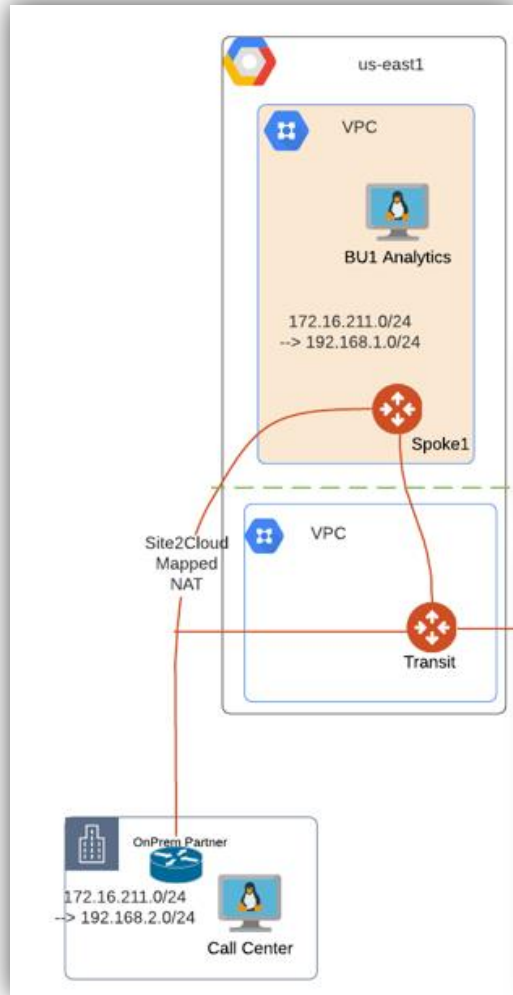
Search
Networks 5
10.230.0.0/16
10.240.0.0/24

ADVERTISED CIDR

Search
Networks 7
10.9.0.0/20
10.63.0.0/16
10.3.0.0/16

# Site2Cloud Sessions via CoPilot

- **PATH:** COPILOT > Cloud Fabric > Topology > select the relevant Gateway > **Diagnostic Tools**



Gateway Diagnostics for ace-gcp-us-east1-spoke1

Ping Traceroute Tracepath Tracelog Test Connectivity **Active Sessions** Interface Stats

Search

2 matches out of 17 sessions

Last updated November 25th 2022, 12:48:42 pm

	Orig S-IP	Orig D-IP	Orig D-Port	Orig S-Port	Proto/no	Reply S-IP	Reply D-IP	Reply D-Port	Reply S-Port	State	Timeout	M
1	172.16.211.100	192.168.2.45	NA	NA	icmp/1	172.16.211.45	192.168.1.100	NA	NA	NA	29	0



Next: Lab 6 Site2Cloud