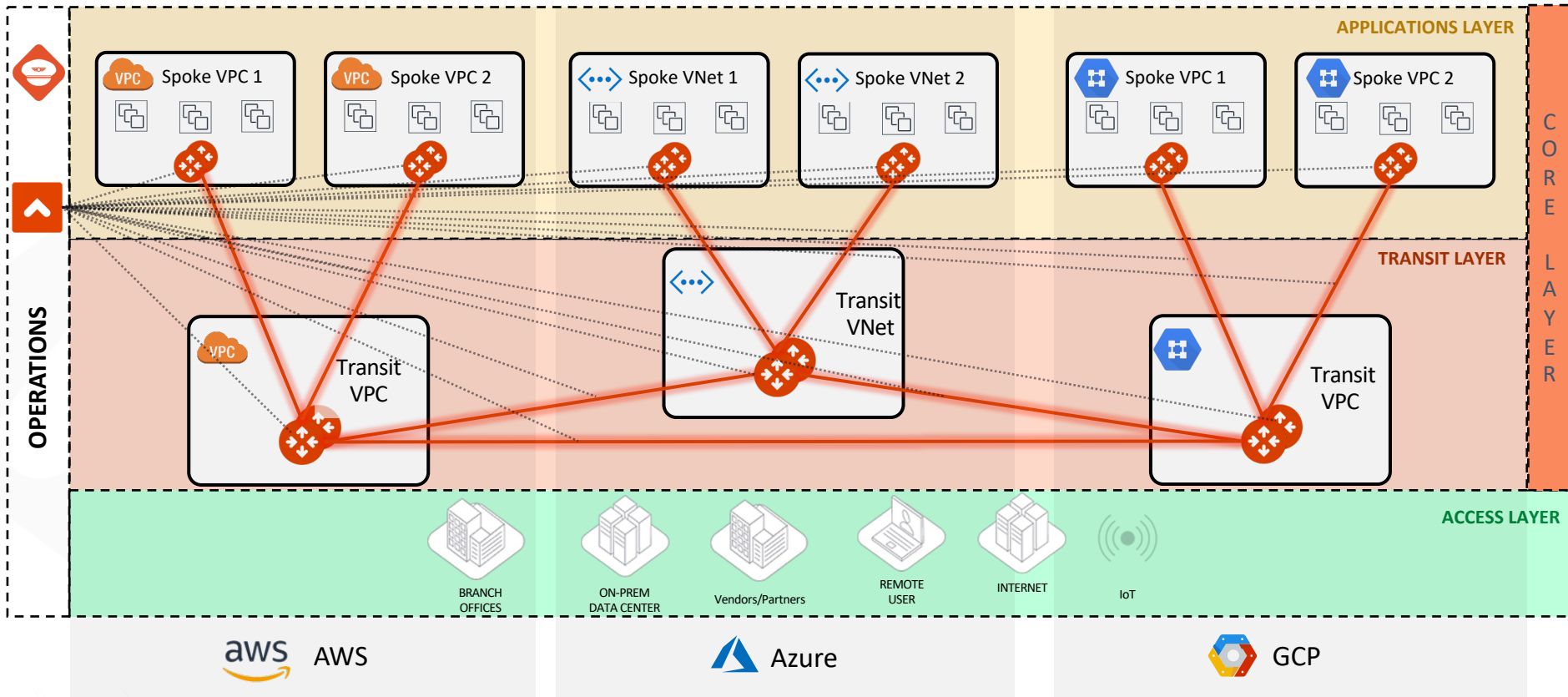




Transit Networking

Solutions Engineering

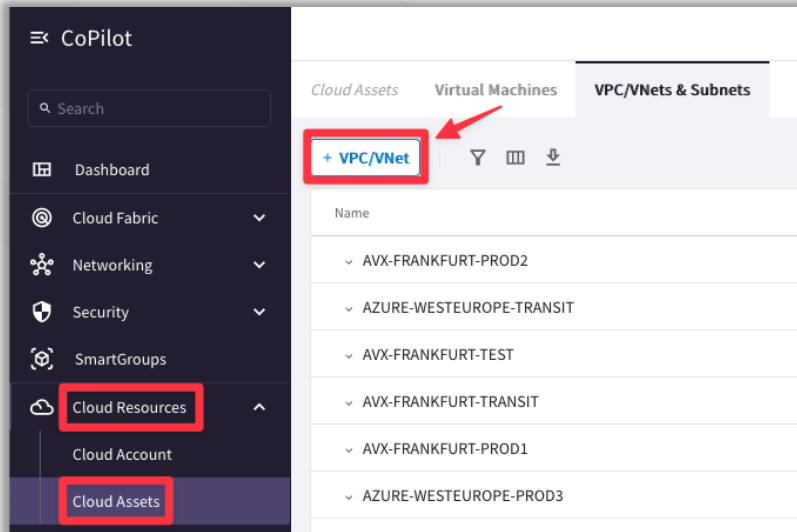
MCNA Deployment: the Foundations



Greenfield Deployment (VPC/VNet/VCN creation)

☐ CLOUD ASSETS

- On the CoPilot you can create a new VPC/VNet/VCN.
- This feature is not only useful in a Greenfield deployment, but also if you need to add a new VPC/VNet/VCN on an existing environment, based on the architecture design.
- You can create two types of VPC/VnNet/VCN:
 - **Default** (i.e. Spoke)
 - **Transit + FireNet**



The 'Create VPC/VNet' dialog box is shown. It has a title bar with a question mark icon. The form contains the following fields and options:

- Name:** AVX-FRANKFURT-TRANSIT
- Cloud:** A row of cloud provider icons: AWS (selected with a blue border), Azure, GCP, OCI, and Alibaba. The AWS icon has a 'Standard' dropdown next to it.
- Account:** aws-account
- Region:** eu-central-1 (Frankfurt)
- VPC CIDR:** 10.11.0.0/23
- VPC Function:** A dropdown menu with 'Transit + FireNet' selected. Below it, 'Default' and 'Transit + FireNet' are listed as options.
- Advanced Settings:** A section header with a downward arrow.
- Buttons:** 'Cancel' and 'Save' at the bottom right.

Greenfield Deployment (VPC/VNet/VCN creation)

Caveat: for the sake of simplicity, only the deployment in AWS is explained

❑ Creation of the Transit VPC

CIDR 10.11.0.0/23



- The VPC CIDR range for a Transit VPC is from /16 to /23
- There is a specific reason why the Aviatrix Controller does not allow less than /23 prefix length for the Transit VPC (this will be discussed on the **HPE** lecture).



[AVXERR-TOOLS-0030] VPC/VNet CIDR size must be between 16 to 23. e.g. 10.0.0.0/20

- An IGW with the same name of the Transit VPC will be created and attached to the VPC, automatically

Internet gateways (1/1) [Info](#)

🔍 Filter internet gateways

search: AVX-FRANKFURT-TRANSIT ✕

Clear filters

<input checked="" type="checkbox"/>	Name	Internet gateway ID	State	VPC ID
<input checked="" type="checkbox"/>	AVX-FRANKFURT-TRANSIT	lgw-06d499f4d0f772915	🟢 Attached	vpc-01f51fa31db0c8458 AVX-FRANKFURT-TRANSIT

Greenfield Deployment (VPC/VNet/VCN creation)

CIDR 10.11.0.0/23

Creation of the Transit VPC

- The Aviatrix Controller will create 8 subnets, in two availability zones:
 - 4x Private subnets for the FW
 - 2x Public subnets for Ingress-Egress
 - 2x Public subnets for GW-FW-mgmt.
- All the subnets will have a /28 prefix length



❖ The subnets' size can be customized

Advanced Settings

Subnet Size: Optional

Number of Subnet Pair(s): Optional

[Cancel](#) [Save](#)

Subnets (8) [Info](#)

search: AVX-FRANKFURT-TRANSIT [X](#) [Clear filters](#)

<input type="checkbox"/>	Name	Subnet ID	IPv4 CIDR	Availability Zone
<input type="checkbox"/>	AVX-FRANKFURT-TRANSIT-Private-FW-north-eu-central-1a	subnet-04d1f3362661ae02a	10.11.0.16/28	eu-central-1a
<input type="checkbox"/>	AVX-FRANKFURT-TRANSIT-Private-FW-north-eu-central-1b	subnet-0a35db8130d9f9031	10.11.0.48/28	eu-central-1b
<input type="checkbox"/>	AVX-FRANKFURT-TRANSIT-Private-FW-south-eu-central-1a	subnet-06f4b955d965f1457	10.11.0.0/28	eu-central-1a
<input type="checkbox"/>	AVX-FRANKFURT-TRANSIT-Private-FW-south-eu-central-1b	subnet-0560c62d12c3ff59b	10.11.0.32/28	eu-central-1b
<input type="checkbox"/>	AVX-FRANKFURT-TRANSIT-Public-FW-ingress-egress-eu-central-1a	subnet-07818dd7b731a32a2	10.11.0.80/28	eu-central-1a
<input type="checkbox"/>	AVX-FRANKFURT-TRANSIT-Public-FW-ingress-egress-eu-central-1b	subnet-04094cc05bcd736a3	10.11.0.112/28	eu-central-1b
<input type="checkbox"/>	AVX-FRANKFURT-TRANSIT-Public-gateway-and-firewall-mgmt-e...	subnet-08228163bc8ca6f7d	10.11.0.64/28	eu-central-1a
<input type="checkbox"/>	AVX-FRANKFURT-TRANSIT-Public-gateway-and-firewall-mgmt-e...	subnet-002f879d78f686a57	10.11.0.96/28	eu-central-1b

Greenfield Deployment (VPC/VNet/VCN creation)

CIDR 10.11.0.0/23



Creation of the Transit VPC

- 2x Routing Tables will be created:
 - Public RTB will encompass the 4 public subnets
 - Private RTB will encompass the 4 private subnets

Destination	Target
0.0.0.0/0	igw-06d499f4d0f772915
10.11.0.0/23	local

Destination	Target
10.11.0.0/23	local

Route tables (2) [Info](#)

search: AVX-FRANKFURT-TRANSIT X

Clear filters

<input type="checkbox"/>	Name	Route table ID	Explicit subnet associations
<input type="checkbox"/>	AVX-FRANKFURT-TRANSIT-Public-rtb	rtb-0e5a22d0060c17eac	4 subnets
<input type="checkbox"/>	AVX-FRANKFURT-TRANSIT-Private-rtb	rtb-085cf49590ee4592d	4 subnets

Greenfield Deployment (VPC/VNet/VCN creation)

CIDR 10.1.1.0/24



AVX-FRANKFURT-SPOKE-PROD

Creation of the Application/Spoke VPC

- The VPC CIDR range for a Spoke VPC is from /16 to /24
- An IGW with the same name of the Spoke VPC will be created and attached to the VPC, automatically

Internet gateways (1/1) [Info](#)

Filter internet gateways

search: AVX-FRANKFURT-SPOKE-PROD [X](#) [Clear filters](#)

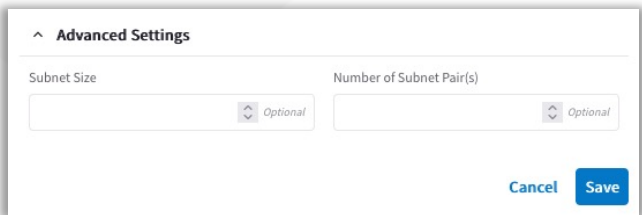
<input checked="" type="checkbox"/>	Name	Internet gateway ID	State	VPC ID
<input checked="" type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD	lgw-0327c092c11fbd749	Attached	vpc-068d94ca168a85633 AVX-FRANKFURT-SPOKE-PROD

Greenfield Deployment (VPC/VNet/VCN creation)

CIDR 10.1.1.0/24



❖ The subnets' size can be customized



❑ Creation of the Application/Spoke VPC

- The Aviatrix Controller will create a pair of subnets, a public subnet and a private subnet, on each availability zone
- All the subnets will have a /28 prefix length

A screenshot of the 'Subnets (6)' page in the AWS console. It shows a list of six subnets for the VPC 'AVX-FRANKFURT-SPOKE-PROD'. The table has columns for Name, Subnet ID, VPC, and IPv4 CIDR. The subnets are organized into three pairs, each representing an availability zone (eu-central-1a, eu-central-1b, eu-central-1c). Each pair consists of a private subnet and a public subnet.

	Name	Subnet ID	VPC	IPv4 CIDR
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Private-1-eu-central-1a	subnet-060df41c64a2c643a	vpc-068d94ca168a85633 AV...	10.1.1.0/28
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Private-2-eu-central-1b	subnet-00bf95727955ec09b	vpc-068d94ca168a85633 AV...	10.1.1.16/28
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Private-3-eu-central-1c	subnet-0bd05503b4b1f880c	vpc-068d94ca168a85633 AV...	10.1.1.32/28
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Public-1-eu-central-1a	subnet-0b22457ff5b1a4895	vpc-068d94ca168a85633 AV...	10.1.1.48/28
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Public-2-eu-central-1b	subnet-0c140dc3d0af1fa65	vpc-068d94ca168a85633 AV...	10.1.1.64/28
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Public-3-eu-central-1c	subnet-06219ac03978942e3	vpc-068d94ca168a85633 AV...	10.1.1.80/28

Greenfield Deployment (VPC/VNet/VCN creation)

CIDR 10.1.1.0/24



Creation of the Application/Spoke VPC

- a Public RTB per each availability zone will encompass the corresponding subnet

Destination	Target
0.0.0.0/0	lgw-0327c092c11fbd749
10.1.1.0/24	local

- a Private RTB per each availability zone will encompass the corresponding subnet

Destination	Target
10.1.1.0/24	local

Route tables (6) [info](#)

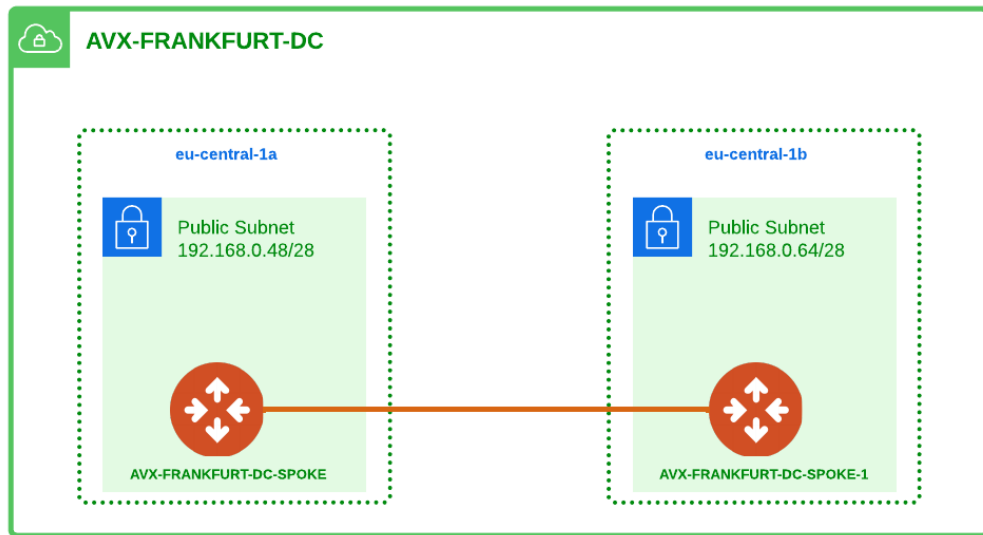
Filter route tables

search: AVX-FRANKFURT-SPOKE-PROD [X](#) [Clear filters](#)

<input type="checkbox"/>	Name	Route table ID	Explicit subnet associations
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Private-1-eu-central-1a-rtb	rtb-0ca98234a5088dceb	subnet-060df41c64a2c643a / AVX-FRANKFURT-SPOKE-PROD-Private-1-eu-central-1a
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Private-2-eu-central-1b-rtb	rtb-0cad721a70d6256d9	subnet-00bf95727955ec09b / AVX-FRANKFURT-SPOKE-PROD-Private-2-eu-central-1b
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Private-3-eu-central-1c-rtb	rtb-04afaa976264662ac	subnet-0bd05503b4b1f880c / AVX-FRANKFURT-SPOKE-PROD-Private-3-eu-central-1c
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Public-1-eu-central-1a-rtb	rtb-0c52cd5084b440f2d	subnet-0b22457ff5b1a4895 / AVX-FRANKFURT-SPOKE-PROD-Public-1-eu-central-1a
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Public-2-eu-central-1b-rtb	rtb-0c973dec3847ae8ce	subnet-0c140dc3d0af1fa65 / AVX-FRANKFURT-SPOKE-PROD-Public-2-eu-central-1b
<input type="checkbox"/>	AVX-FRANKFURT-SPOKE-PROD-Public-3-eu-central-1c-rtb	rtb-099810bba6608f17	subnet-06219ac03978942e3 / AVX-FRANKFURT-SPOKE-PROD-Public-3-eu-central-1c

Name Convention with Multiple Gateways

Cluster of Gateways



- ❖ If you create two or more Gateways, they will be encompassed inside a **cluster**.
- ❖ The name of the cluster will match the name of the first gateway.
- ❖ The second gateway will have the string “-1” appended to its name.
- ❖ The third gateway will have the string “-2” appended to its name.
-
-
-
- ❖ The sixteenth gateway will have the string “-14” appended to its name.

CLUSTER

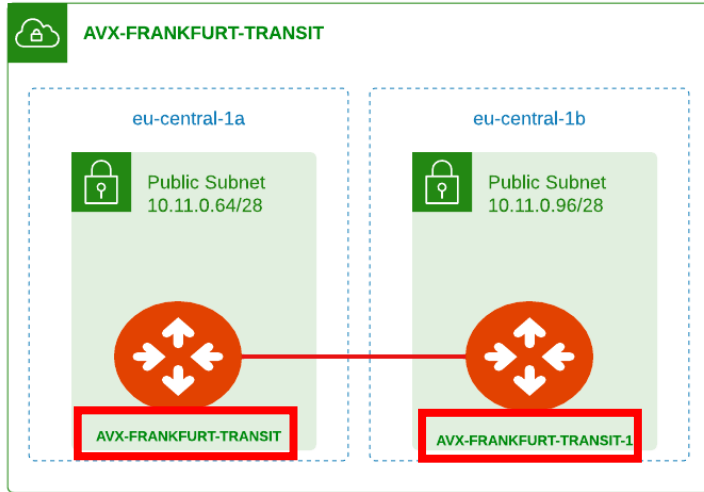
GW #1

GW #2

• AVX-FRANKFURT-DC-SPOKE	eu-central-1	vpc-04d947b7b73180e3c~~AVX-FRANKFURT-DC	
• AVX-FRANKFURT-DC-SPOKE	eu-central-1	vpc-04d947b7b73180e3c~~AVX-FRANKFURT-DC	192.168.0.48/28
• AVX-FRANKFURT-DC-SPOKE-1	eu-central-1	vpc-04d947b7b73180e3c~~AVX-FRANKFURT-DC	192.168.0.64/28

Greenfield Deployment (Transit Gateways deployment)

CIDR 10.11.0.0/23



- ❖ The connection between the Transit Gateways is automatically created by the Controller.
- ❖ Best Practice: always deploy the Transit Gateway-1 (i.e the second gateway), and choose a different AZ.
- ❖ Only two Transit Gateways can be deployed per Transit VPC
- ❖ Aviatrix gateways are deployed in Public subnets

Transit Gateways Deployment through the CoPilot

Create Transit Gateway

Name: AVX-FRANKFURT-TRANSIT

Cloud: ☒ AWS Standard ☐ Azure ☐ GCP ☐ OCI ☐ Alibaba

Account: AWS-AVIATRIX Region: eu-central-1 (Frankfurt) VPC/VNet: AVX-FRANKFURT-TRANSIT

Instance Size: c5n.large High Performance Encryption: ☐ Off

Peer To Transit Gateways: Optional

Instances

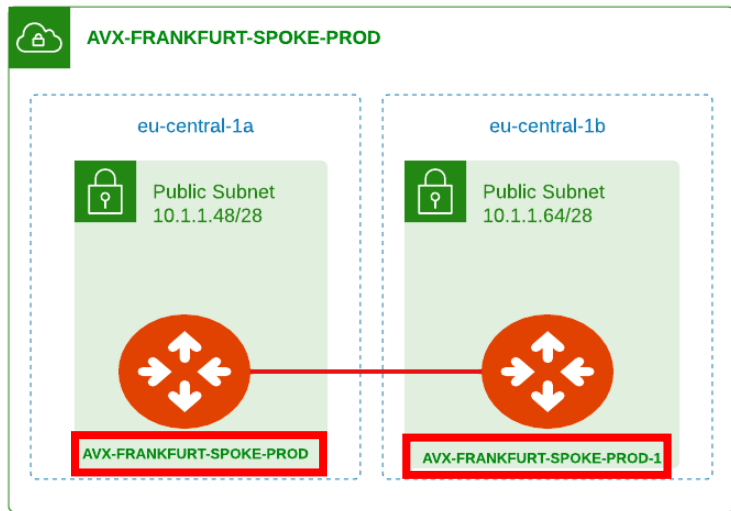
+ Instance

	Attach to Subnet	Public IP
1	10.11.0.64/28	Allocate New Static Public IP
2	10.11.0.96/28	Allocate New Static Public IP

Cancel Save

Greenfield Deployment (Spoke Gateways deployment)

CIDR 10.1.1.0/24



Spoke Gateways Deployment through the CoPilot

The screenshot shows the "Create Spoke Gateway" form in the CoPilot. The form is titled "Create Spoke Gateway" and includes the following fields and options:

- NAME:** AVX-FRANKFURT-SPOKE-PROD
- Cloud:** AWS (Standard)
- Account:** AWS-AVIATRIX
- Region:** eu-central-1 (Frankfurt)
- VPC/VNet:** AVX-FRANKFURT-SPOKE-PROD
- Instance Size:** t3.micro
- High Performance Encryption:** Off
- Attach To Transit Gateway:** Optional
- Advanced Settings:**
 - BGP:** Off
- Instances:**

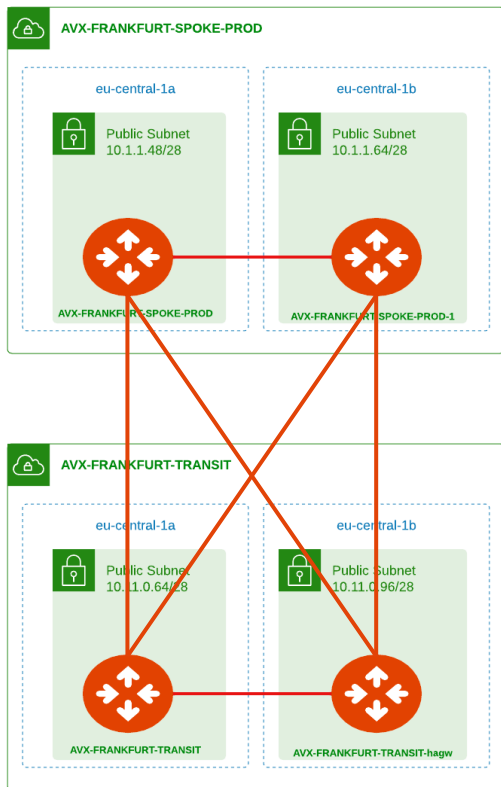
	Attach to Subnet	Public IP
1	10.1.1.48/28	Allocate New Static Public IP
2	10.1.1.80/28	Allocate New Static Public IP

The form includes "Cancel" and "Save" buttons at the bottom right.

- ❖ The connection between the Spoke Gateways is automatically created by the Controller.
- ❖ Best Practice: deploy the Spoke Gateway-1 (i.e the second gateway) on a different AZ.
- ❖ You can deploy up to **15 Spoke Gateways per each Spoke VPC**
- ❖ Aviatrix gateways are deployed in Public subnets

Greenfield Deployment (Attachment deployment)

Deployment of the attachments through the CoPilot



Edit Spoke Gateway: AVX-FRANKFURT-SPOKE-PROD

Name: AVX-FRANKFURT-SPOKE-PROD

Cloud: AWS

Account: AWS-AVIATRIX Region: eu-central-1 VPC/VNet: AVX-FRANKFURT-SPOKE-PROD

Instance Size: t3.micro High Performance Encryption: Off

Attach To Transit Gateway: AVX-FRANKFURT-TRANSIT *Optional*

Advanced Settings

BGP: Off

Instances

+ Instance

	Attach to Subnet	Public IP
1	10.1.1.48/28	3.72.194.207
2	10.1.1.80/28	18.192.199.249

Cancel Save

Greenfield Deployment (Attachment deployment)

- As soon as the Controller completes the deployment of the **attachments** between Spoke Gateways and Transit Gateways, it will also program the *three RFC1918 routes* in the route tables to point to the ENI of the Spoke Gateways.

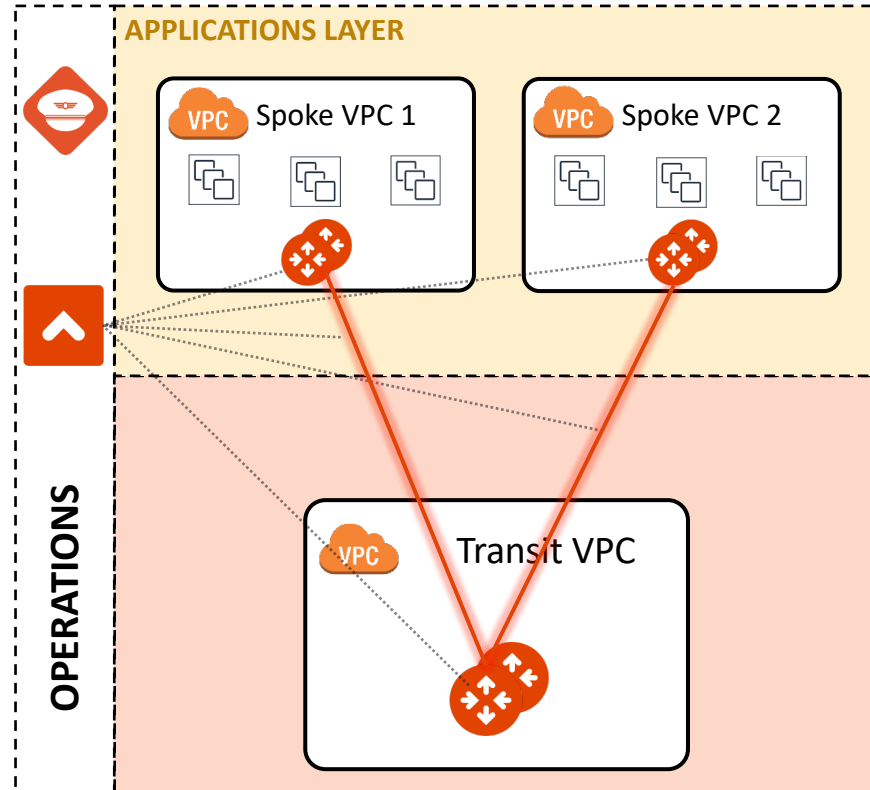
Routes		Subnet associations	Edge associations	Route propagation	Tags
Routes (4)					
Filter routes					
Destination		Target			
10.0.0.0/8		eni-08ac50fc16cd8c4a5			
10.1.1.0/24		local			
172.16.0.0/12		eni-08ac50fc16cd8c4a5			
192.168.0.0/16		eni-08ac50fc16cd8c4a5			

Route table for
Private Subnet

Routes		Subnet associations	Edge associations	Route propagation	Tags
Routes (5)					
Filter routes					
Destination		Target			
0.0.0.0/0		igw-07c6ddedd190d12d3			
10.0.0.0/8		eni-08ac50fc16cd8c4a5			
10.1.1.0/24		local			
172.16.0.0/12		eni-08ac50fc16cd8c4a5			
192.168.0.0/16		eni-08ac50fc16cd8c4a5			

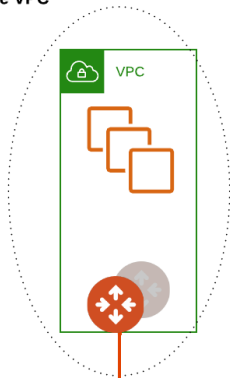
Route table for
Public Subnet

Attachment = RFC1918 Routes Injection

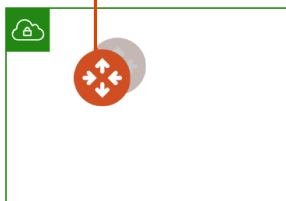


Greenfield Deployment (Repeatable Design)

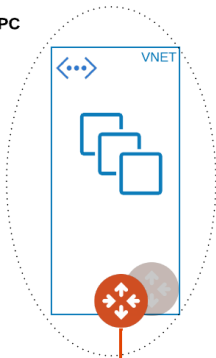
Spoke VPC



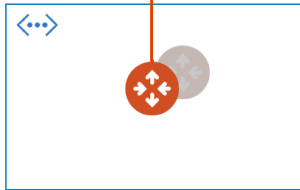
Transit VPC



Spoke VNET

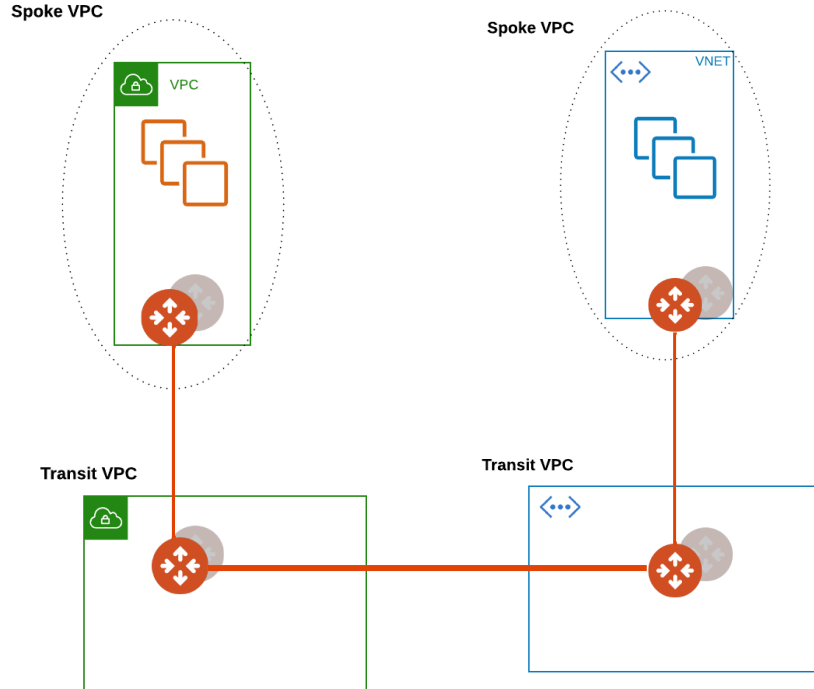


Transit VPC



- ❑ The hub and spoke topology can be extended to another CSP or to another region within the same CSP
- ❑ In Azure all subnets are public by nature
- ❑ Aviatrix Controller creates “Private” subnets:
 - Aviatrix Controller programs a **default route 0.0.0.0 pointing to the next hop type “None”**: in User Defined Route Table (UDR) for all private subnets it creates
 - This will blackhole 0/0 traffic

Greenfield Deployment (Peering deployment)



- ❑ The creation of the Transit Peering represents the last step for the completion of the **MCNA**.

Edit Transit Gateway: AVX-FRANKFURT-TRANSIT

Name
AVX-FRANKFURT-TRANSIT

Cloud
AWS

Account
AWS-AVIATRIX

Region
eu-central-1

VPC/VNet
AVX-FRANKFURT-TRANSIT

Instance Size
c5n.large

High Performance Encryption
Off

Peer To Transit Gateways
AZURE-WESTEUROPE-TRANSIT x Optional x

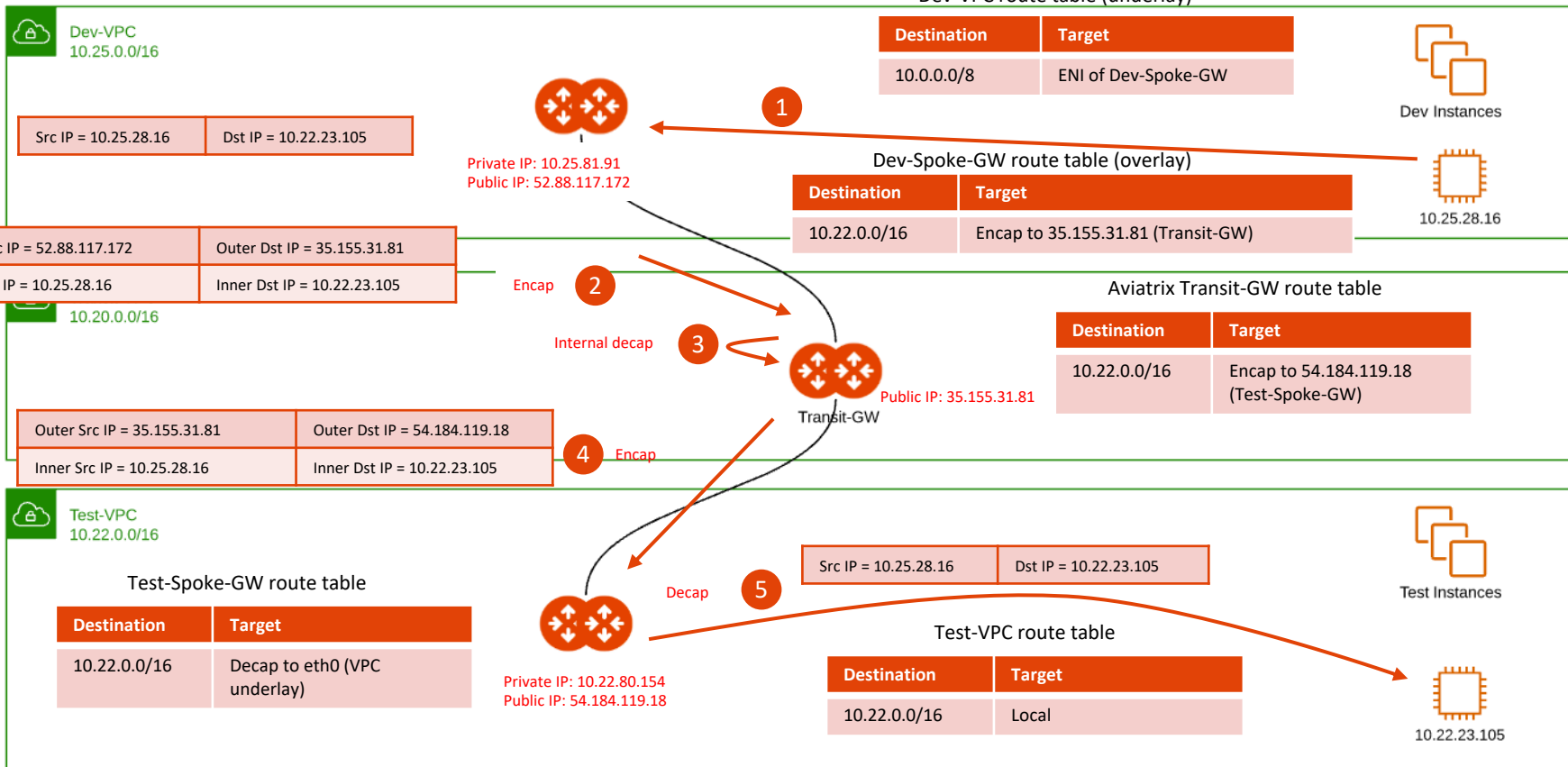
Instances

+ Instance

	Attach to Subnet	Public IP
1	10.11.0.64/28	3.75.164.186
2	10.11.0.96/28	3.127.251.156

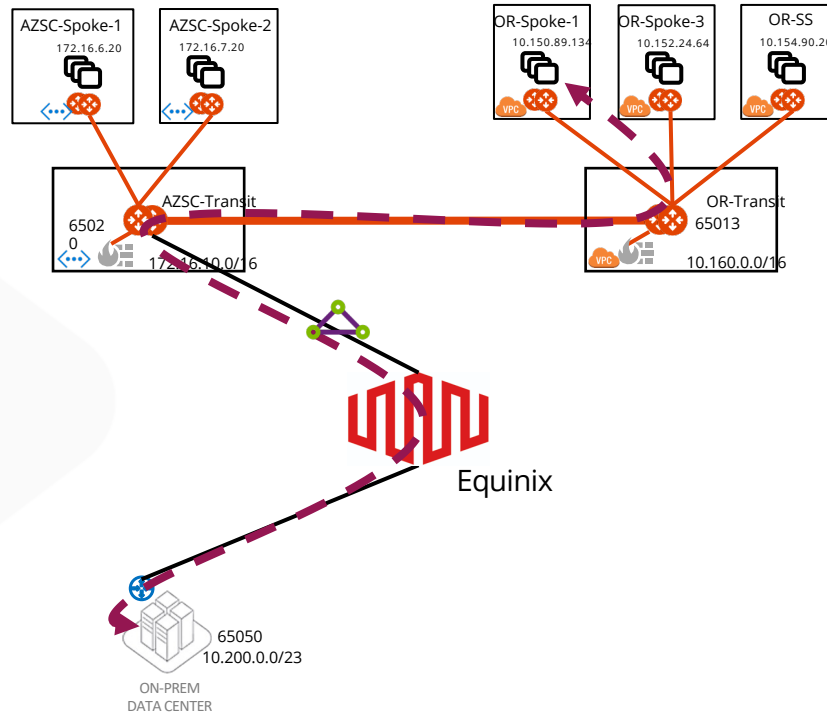
Cancel Save

us-west-2



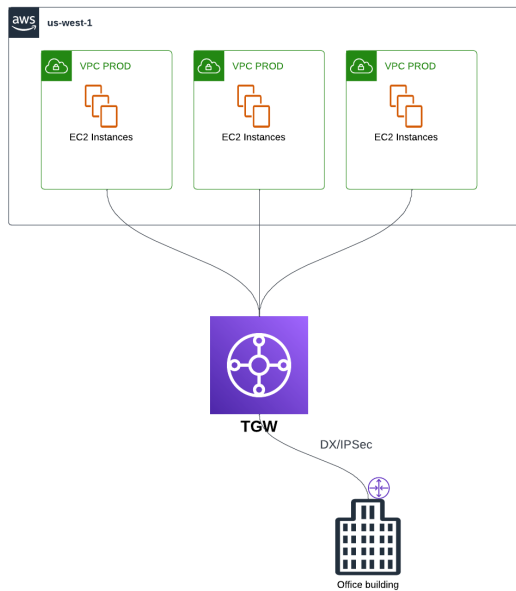
Advanced Transit Networking

AWS to on-Prem via ExpressRoute or vice versa



Single DX or ER can be used to communicate between On-Prem and multiple CSP resources

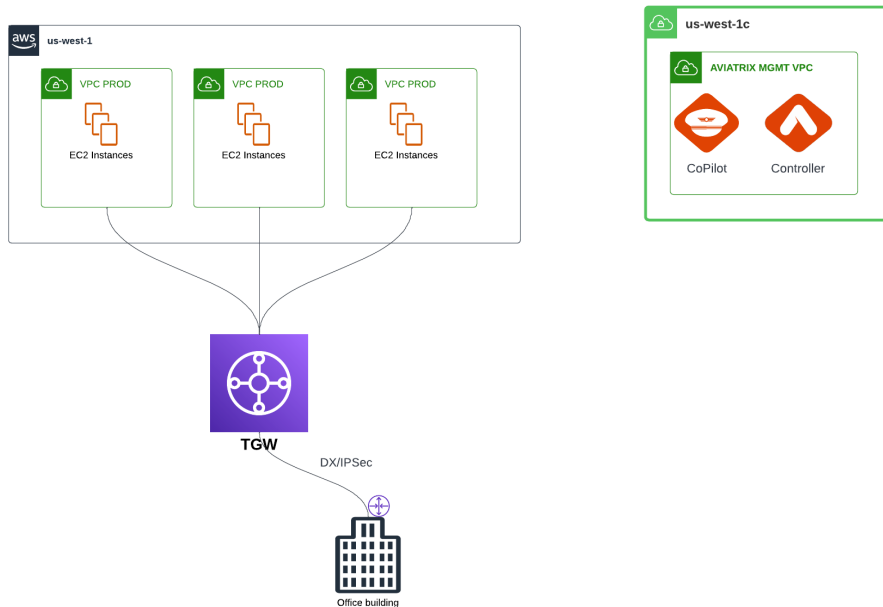
Typical Migration Deployment



Initial environment in a brownfield scenario:

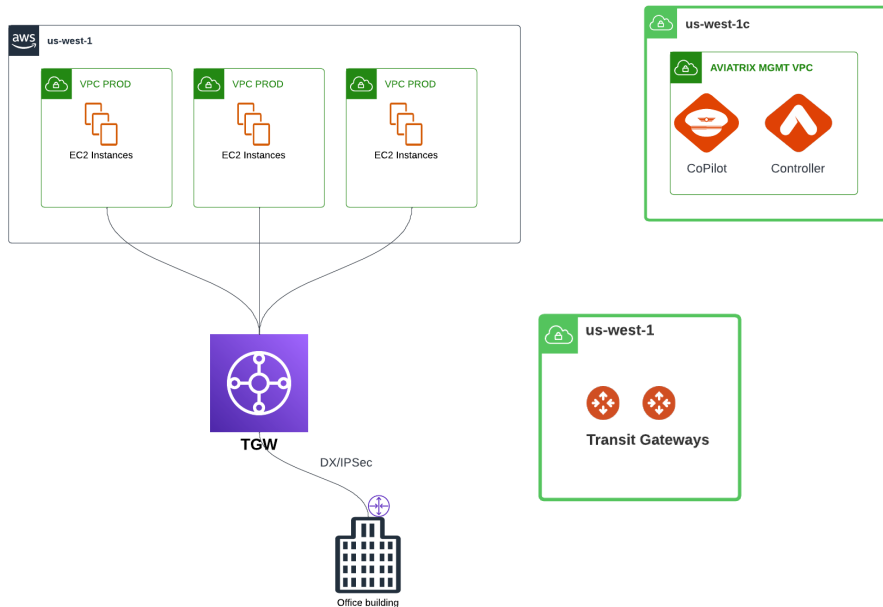
- Several Application VPCs that are connected to the TGW as attachments
- OnPrem connectivity (hybrid – can be DX/IPSec)

Typical Migration Deployment



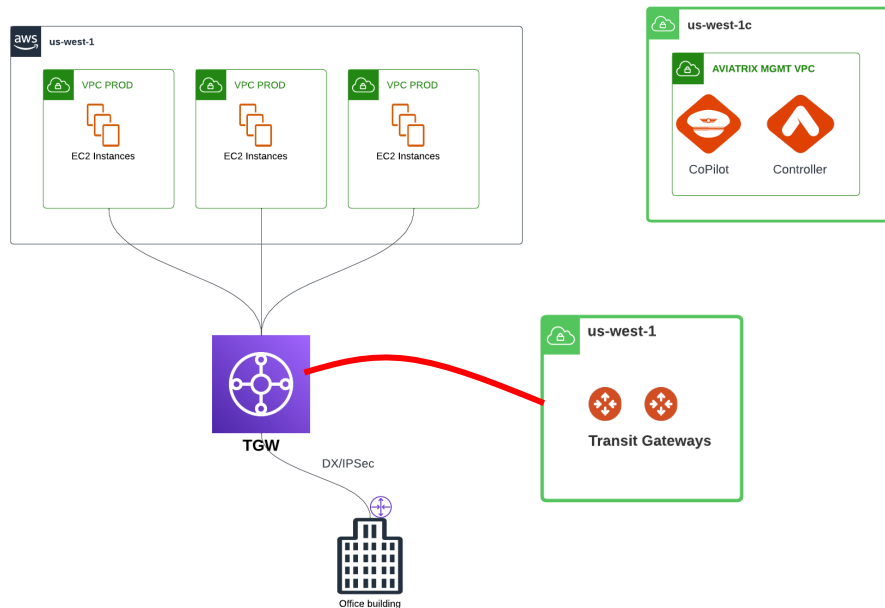
- ❑ **Initial environment in a brownfield scenario:**
 - Several Application VPCs that are connected to the TGW as attachments
 - OnPrem connectivity (hybrid – can be DX/IPSec)
- ❑ **Deploy the Aviatrix Controller and CoPilot in a dedicated VPC, in a different AZ where there are no gateways deployed (best practice)**

Typical Migration Deployment



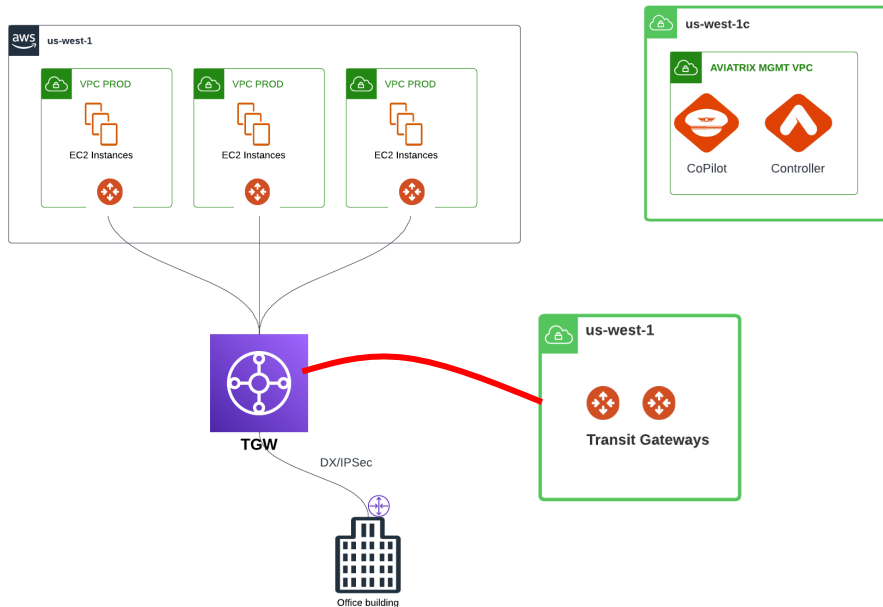
- ❑ **Initial environment in a brownfield scenario:**
 - Several Application VPCs that are connected to the TGW as attachments
 - OnPrem connectivity (hybrid – can be DX/IPSec)
- ❑ **Deploy the Aviatrix Controller and CoPilot in a dedicated VPC, in a different AZ where there are no gateways deployed (best practice)**
- ❑ **Deploy a Transit VPC and deploy a pair of Transit Gateways**

Typical Migration Deployment



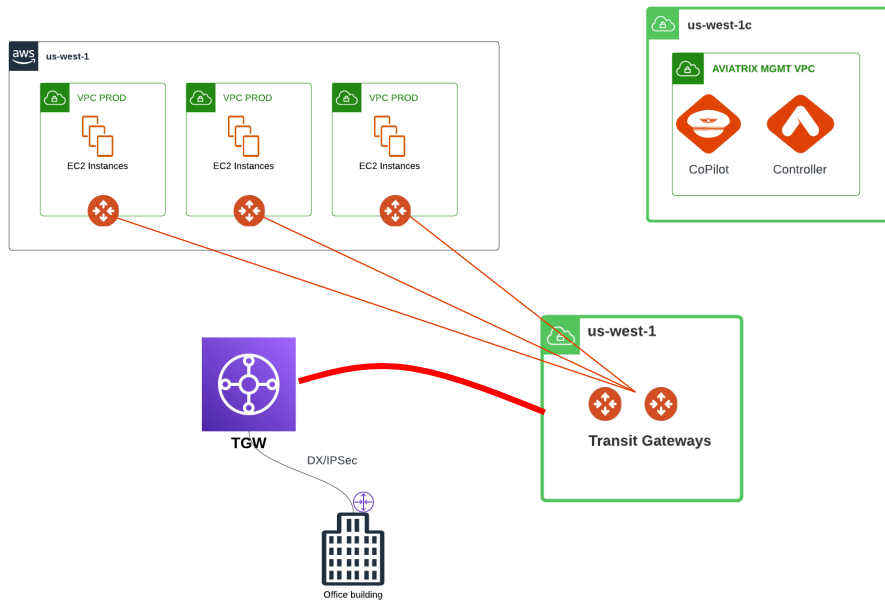
- ❑ **Initial environment in a brownfield scenario:**
 - Several Application VPCs that are connected to the TGW as attachments
 - OnPrem connectivity (hybrid – can be DX/IPSec)
- ❑ **Deploy the Aviatrix Controller and CoPilot in a dedicated VPC, in a different AZ where there are no gateways deployed (best practice)**
- ❑ **Deploy a Transit VPC and deploy a pair of Transit Gateways**
- ❑ **Establish a back-to-back connection between the Transit Gateways and the TGW**

Typical Migration Deployment



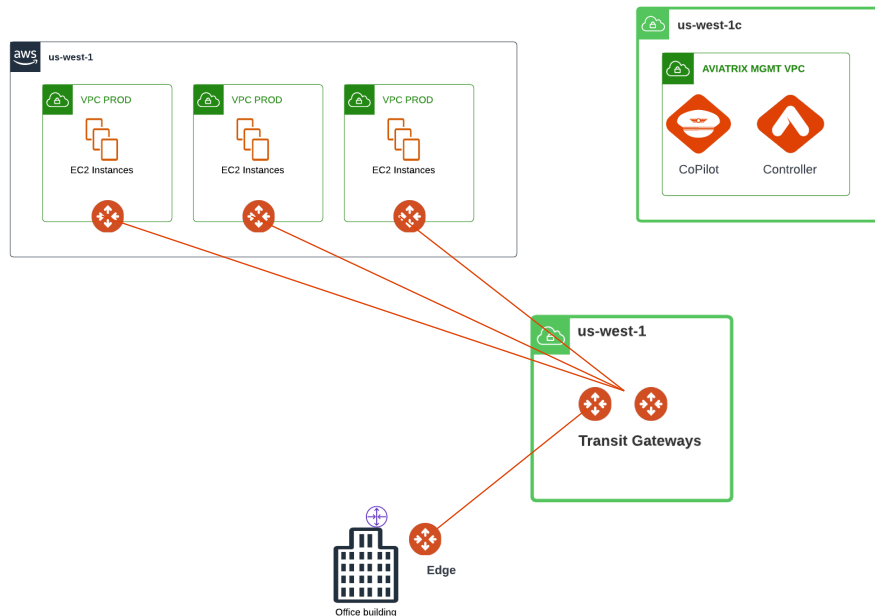
- ❑ **Initial environment in a brownfield scenario:**
 - Several Application VPCs that are connected to the TGW as attachments
 - OnPrem connectivity (hybrid – can be DX/IPSec)
- ❑ **Deploy the Aviatrix Controller and CoPilot in a dedicated VPC, in a different AZ where there are no gateways deployed (best practice)**
- ❑ **Deploy a Transit VPC and deploy a pair of Transit Gateways**
- ❑ **Establish a back-to-back connection between the Transit Gateways and the TGW**
- ❑ **Deploy the Spoke Gateways inside the Application VPCs (this action will not change any routing)**

Typical Migration Deployment



- ❑ **Initial environment in a brownfield scenario:**
 - Several Application VPCs that are connected to the TGW as attachments
 - OnPrem connectivity (hybrid – can be DX/IPSec)
- ❑ **Deploy the Aviatrix Controller and CoPilot in a dedicated VPC, in a different AZ where there are no gateways deployed (best practice)**
- ❑ **Deploy a Transit VPC and deploy a pair of Transit Gateways**
- ❑ **Establish a back-to-back connection between the Transit Gateways and the TGW**
- ❑ **Deploy the Spoke Gateways inside the Application VPCs (this action will not change any routing)**
- ❑ **Remove the connections between the VPCs and the TGW and deploy the attachments between the Spoke Gateways and the Transit Gateways**

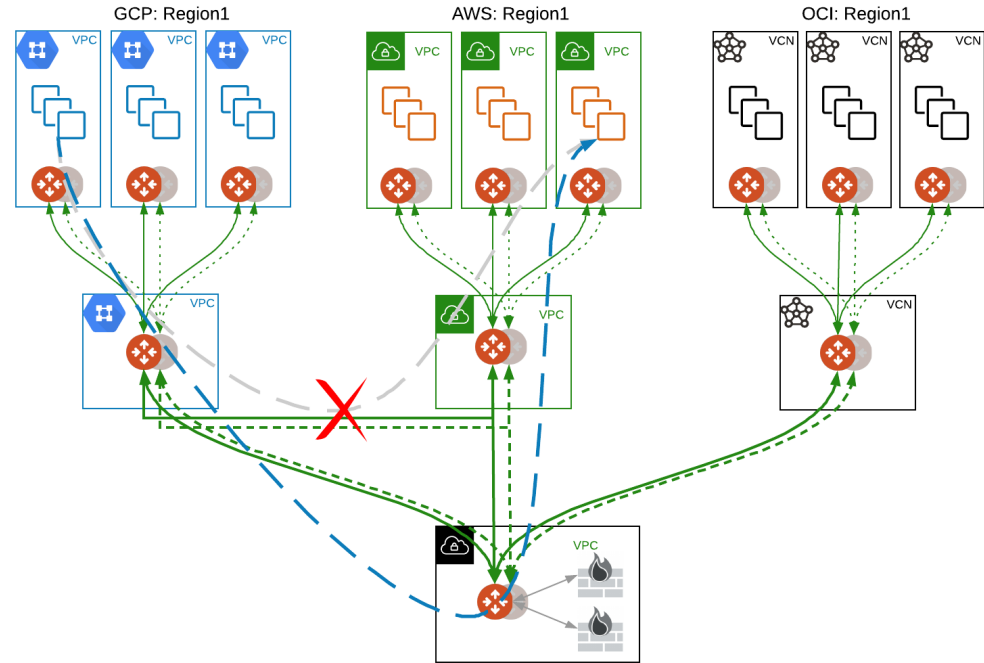
Typical Migration Deployment



- ❑ **Initial environment in a brownfield scenario:**
 - Several Application VPCs that are connected to the TGW as attachments
 - OnPrem connectivity (hybrid – can be DX/IPSec)
- ❑ **Deploy the Aviatrix Controller and CoPilot in a dedicated VPC, in a different AZ where there are no gateways deployed (best practice)**
- ❑ **Deploy a Transit VPC and deploy a pair of Transit Gateways**
- ❑ **Establish a back-to-back connection between the Transit Gateways and the TGW**
- ❑ **Deploy the Spoke Gateways inside the Application VPCs (this action will not change any routing)**
- ❑ **Remove the connections between the VPCs and the TGW and deploy the attachments between the Spoke Gateways and the Transit Gateways**
- ❑ **Deploy an Aviatrix Edge and then connect the Edge to the Transit Gateways. If you are not looking for HPE, you can also connect the WAN router as an IPSec connectivity to the Transit Gateways. Last but not least, remove the TGW.**

Multi-Tier Transit (MTT)

- Improves operational simplicity by aggregating multiple Aviatrix Transits (no need for full mesh between transits)
- Additional failover option (pictured in the diagram)
- Allows for centralized firewall design for multiple Aviatrix-Transits in a single region, which allows intra-cloud traffic without any inspection
- To configure Multi-Tier Transit, go to Multi-cloud Transit -> Advanced Config. Select the Transit Gateway and enable the Multi-Tier Transit feature





Next: Lab 2 – (MCNA) Transit Networking