Inspection Deployment Models with AWS Network Firewall

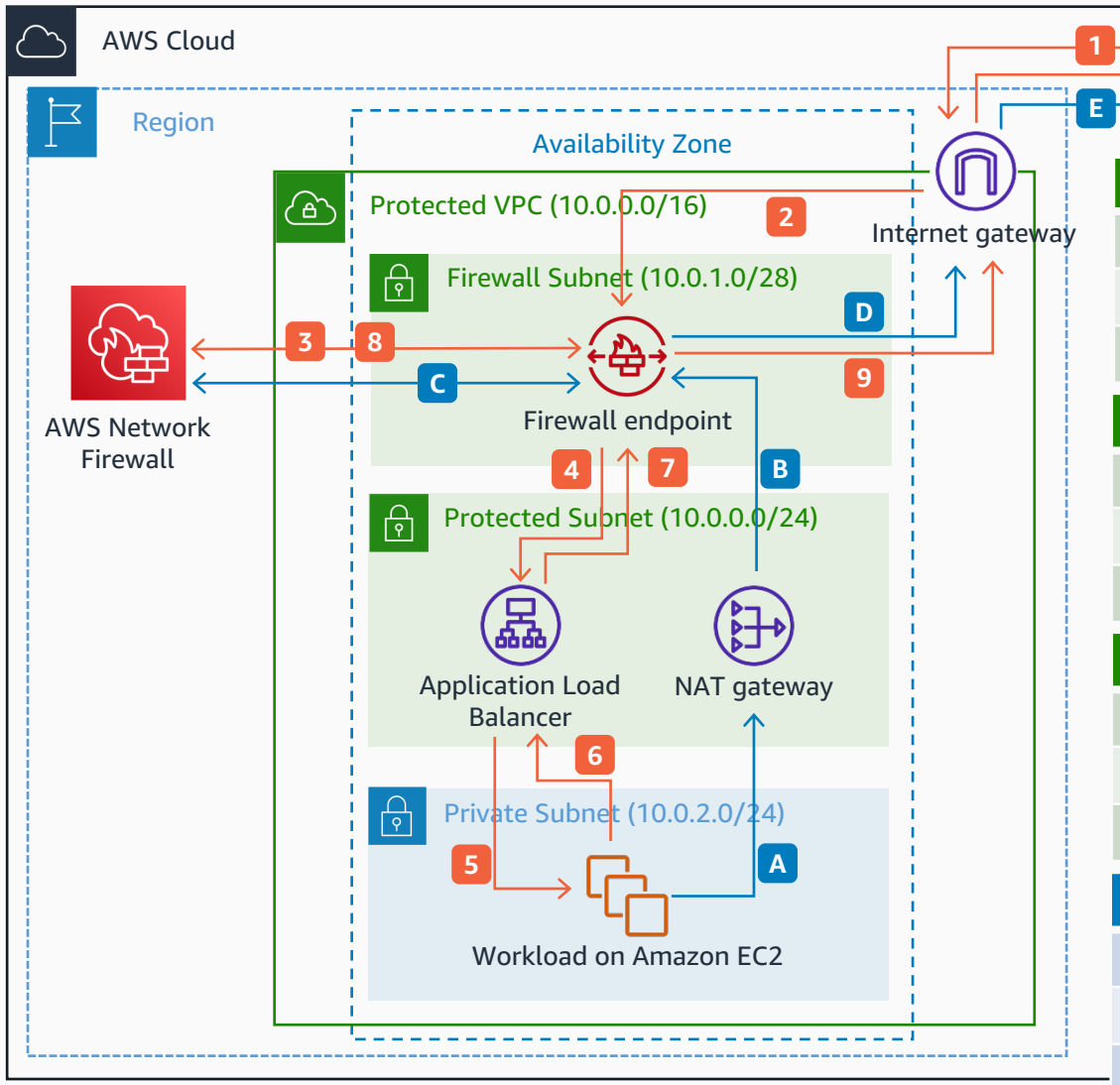
1. *Single VPC inspection with AWS Network Firewall (Distributed Inspection)*
2. *Intra-VPC inspection with AWS Network Firewall and VPC routing enhacement*
3. *East-West centralized inspection with AWS Network Firewall and AWS Transit Gateway*
4. *North-South centralized inspection with AWS Network Firewall and AWS Transit Gateway*
5. *Combined inspection with AWS Network Firewall and AWS Transit Gateway*
6. NEW *Multi-Region centralized inspection with AWS Network Firewall and AWS Transit Gateway*

Reviewed for technical accuracy March 16, 2022

AWS Reference Architecture

Traffic Inspection with AWS Network Firewall

Inspect inbound and outbound traffic using AWS Network Firewall.



Internet gateway ingress route table

Destination	*Target*
10.0.0.0/16	local
10.0.0.0/24	vpce-id

Inspection subnet route table

Destination	*Target*
10.0.0.0/16	local
0.0.0.0/0	igw-id

Protected subnet route table

Destination	*Target*
10.0.0.0/16	local
0.0.0.0/0	vpce-id

Private subnet route table

Destination	*Target*
10.0.0.0/16	local
0.0.0.0/0	natgw-id

1. Traffic initiated from a client on the internet and destined to the public IP of the Application Load Balancer arrives at the internet gateway.
2. In accordance with the internet gateway ingress table, traffic is sent to the firewall endpoint.
3. Traffic is transparently inspected by **AWS Network Firewall**. Allowed traffic is sent back to the firewall endpoint.
4. According to the inspection subnet route table, traffic is sent to the Application Load Balancer.
5. As per the protected subnet route table, the Application Load Balancer forwards the traffic to the target group (workload on **Amazon EC2**).
6. Response traffic is returned back to the Application Load Balancer according to the private subnet route table.
7. In accordance with the protected subnet route table, traffic is sent to the firewall endpoint.
8. Traffic is sent to **AWS Network Firewall**. Traffic that complies with firewall rules is sent back to the firewall endpoint.
9. As per the Inspection subnet route table, traffic is sent to the internet gateway.
10. Traffic is sent back to the internet.

A. Traffic initiated from an instance and directed to the internet is forwarded to the NAT gateway, in accordance with private subnet route table.

B. Source IP of traffic is changed to the IP of the NAT gateway, and the traffic is forwarded to the firewall endpoint as per the protected subnet route table.

C. Traffic is sent to **AWS Network Firewall** for inspection. Traffic that complies with firewall rules is sent back to the firewall endpoint.

D. According to inspection subnet route table, traffic is forwarded to the internet gateway.

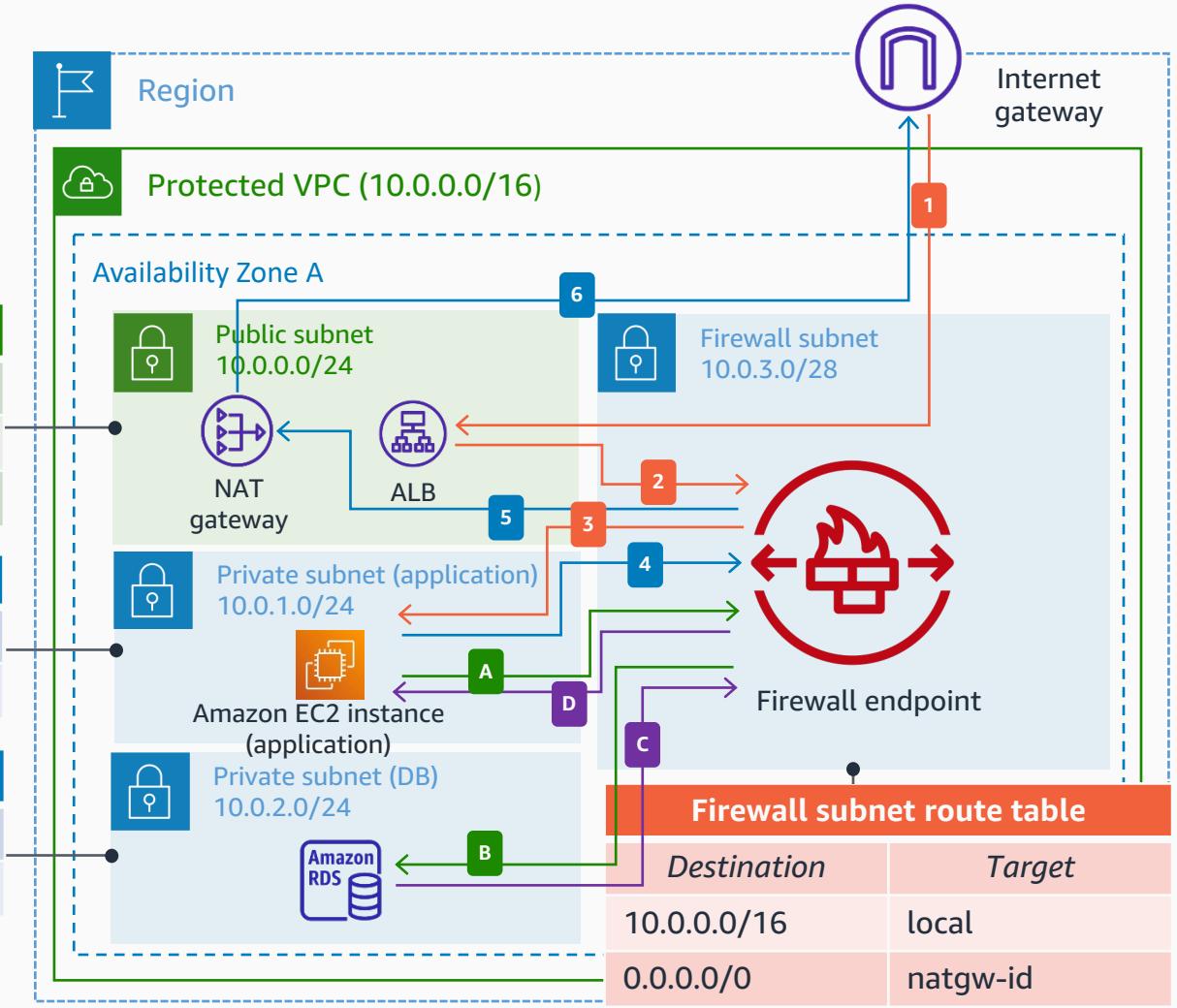
E. Traffic is sent out to the internet.

Reviewed for technical accuracy March 16, 2022

AWS Reference Architecture

Intra-VPC Inspection with AWS Network Firewall

Use the VPC routing enhancement to inspect intra-VPC traffic (between subnets of the same VPC)



Public subnet route table

Destination	*Target*
10.0.0.0/16	vpce-id-az-a
0.0.0.0/0	igw-id

Private subnet route table (application)

Destination	*Target*
10.0.0.0/16	vpce-id-az-a

Private subnet route table (DB)

Destination	*Target*
10.0.0.0/16	vpce-id-az-a

Firewall subnet route table

Destination	*Target*
10.0.0.0/16	local
0.0.0.0/0	natgw-id

AWS Reference Architecture

1. Ingress traffic is routed directly to a public workload: web servers or a load balancer.
2. Traffic between the public subnet and the application servers is inspected. It is recommended that you place the firewall endpoint in its own subnet ("Firewall subnet").
3. When the inspection is done, allowed traffic is routed to the application servers.
4. Outbound traffic to the internet from the application servers: the packets are first sent to the firewall endpoint, and
5. the allowed traffic goes to the load
6. balancer, web servers, or NAT gateway before being sent to the internet.

A. With VPC routing enhancement, any
B. traffic between private subnets in the VPC can be first sent to the firewall endpoint to inspect the traffic.

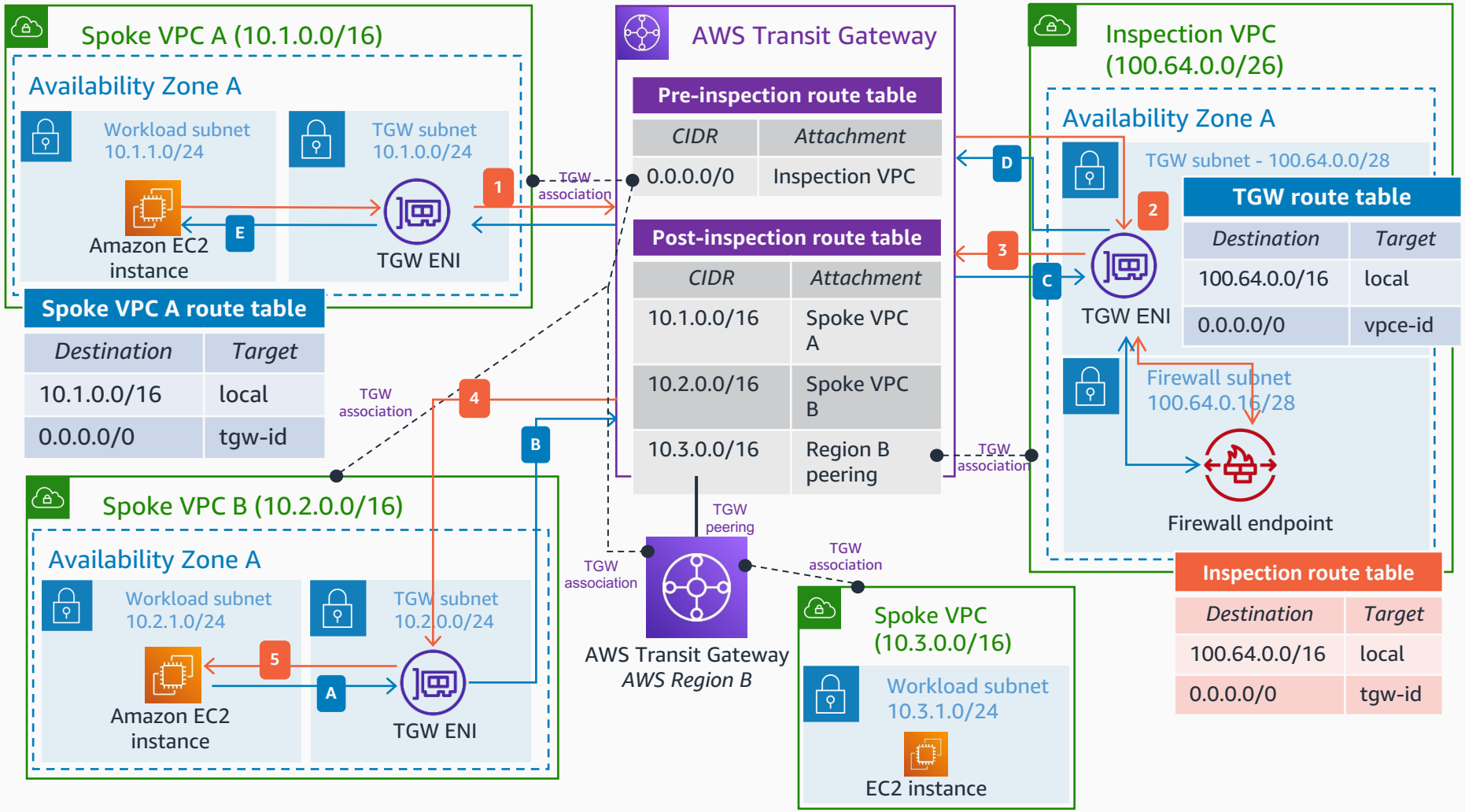
C. You can add a more specific classless
D. inter-domain routing (CIDR) block than the default block in the routing tables to select which inter-VPC traffic is inspected.

For more information about Multi-AZ options or connectivity options using **AWS Transit Gateway**, refer to: Deployment models for AWS Network Firewall with VPC routing enhancements.

Reviewed for technical accuracy March 16, 2022

East-West Inspection with AWS Network Firewall

Use AWS Transit Gateway to centralize the traffic inspection between several VPCs – both in the same Region, or between Regions.



1. Any traffic leaving a spoke VPC is routed to **AWS Transit Gateway (TGW)**. The **Transit Gateway** route table associated with the VPCs and **Transit Gateway** peering forwards the traffic to the Inspection VPC.
2. The Inspection VPC route table forwards all the traffic to the firewall endpoint. The allowed traffic is forwarded back to the **Transit Gateway**.
3. The **Transit Gateway** route table associated with the Inspection VPC attachment has all the routes within the network.
4. In this particular example, the traffic is destined to Spoke VPC B.
5. In Spoke VPC B, the **TGW** subnet route table is routing the traffic to the destination instance.

A Traffic from an instance in Spoke VPC B to Spoke VPC A first reaches the **Transit Gateway** endpoint in the **TGW** subnet. The traffic is routed to the **Transit Gateway**.

B **C** The **Transit Gateway** route table sends the traffic to the Inspection VPC, where it is routed to the firewall endpoint for inspection.

D **E** Allowed traffic comes back to the **Transit Gateway**. The route table associated with the Inspection VPC forwards the traffic to the Spoke VPC A.

** It is recommended to use Transit Gateway appliance mode in the Inspection VPC **Transit Gateway** attachment to maintain flow symmetry.*

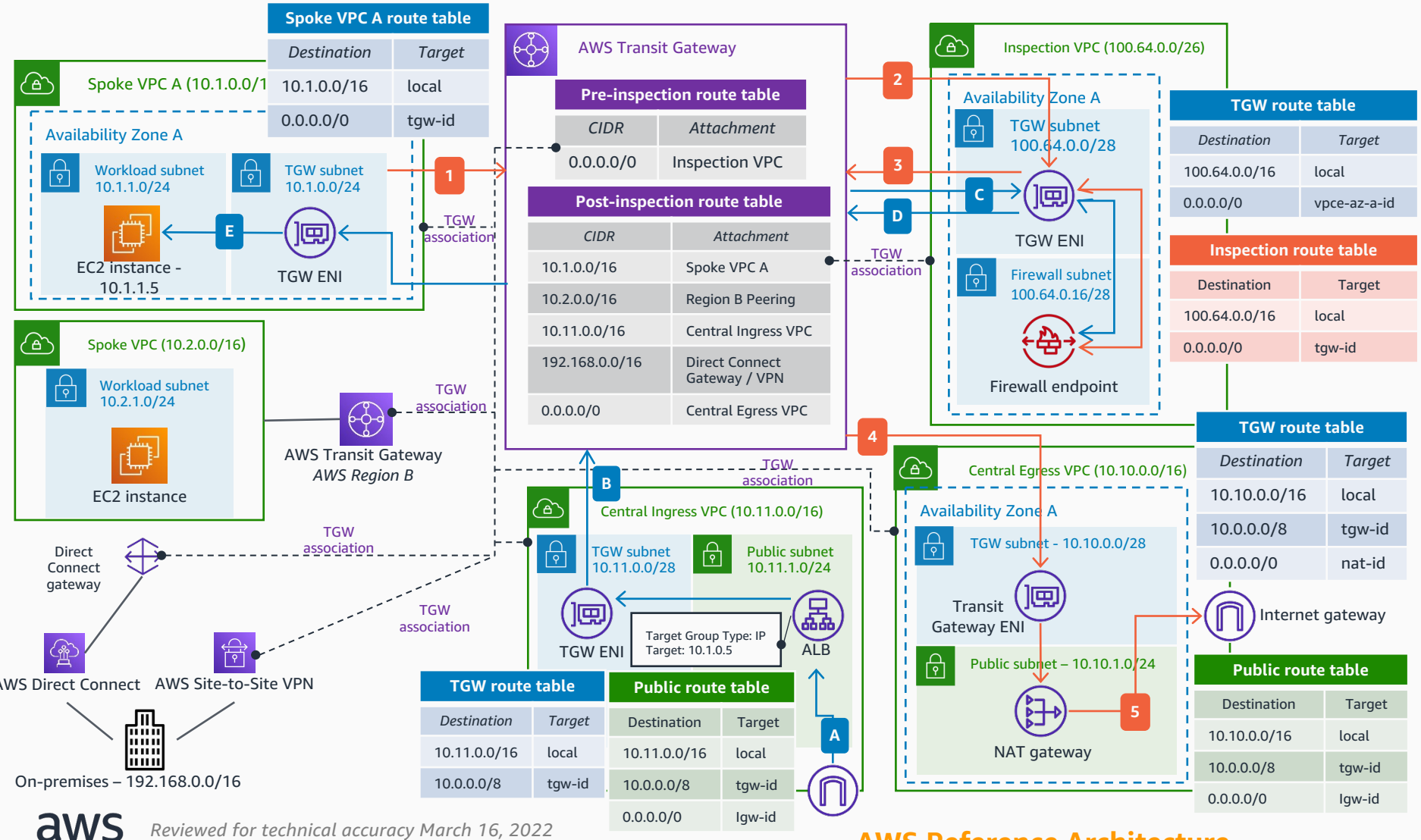
For more information about deployment models with **AWS Network Firewall** and **AWS Transit Gateway**, refer to: Deployment Models for AWS Network Firewall.

Reviewed for technical accuracy March 16, 2022

AWS Reference Architecture

North-South Inspection with AWS Network Firewall

Use AWS Transit Gateway to centralize the traffic inspection from/to the Internet, or from/to on-prem facilities connected via AWS Direct Connect or AWS Site-to-Site VPN.



1 Traffic from the instance in Spoke VPC A destined to the internet is routed to the **Transit Gateway**. The **Transit Gateway** route table associated with the attachment sends all the traffic (0.0.0.0/0) to the Inspection VPC.

2 The Inspection VPC **TGW** subnet route table sends all the traffic to the firewall endpoint. The allowed traffic is forwarded back to the **Transit Gateway**.

3 The **Transit Gateway** route table associated with the Inspection VPC attachment has all the routes within the network.

4 In this particular use case, as the traffic needs to be routed to the internet, the **Transit Gateway** will forward the traffic to the Central Egress VPC.

5 The **TGW** subnet route table of the Central Egress VPC sends the traffic to the NAT gateway, so the private IP of the client can be translated to the private IP of the NAT gateway, and in turn, translated to the public IP by the internet gateway.

A Traffic coming from the internet reaches the Central Ingress VPC. In this example, an Application Load Balancer sends the request to the target group of configured IP addresses through the **Transit Gateway**.

B The traffic is forwarded to the Inspection VPC in accordance to the Pre-inspection route table in **Transit Gateway**.

C **D** As with the egress traffic, the Inspection VPC **TGW** subnet route table sends all the traffic to the firewall endpoint. Allowed traffic is forwarded back to the **Transit Gateway** and subsequently to the destination VPC (Spoke VPC A).

E The Spoke VPC A route table sends the traffic to the desired instance - 10.1.1.5.

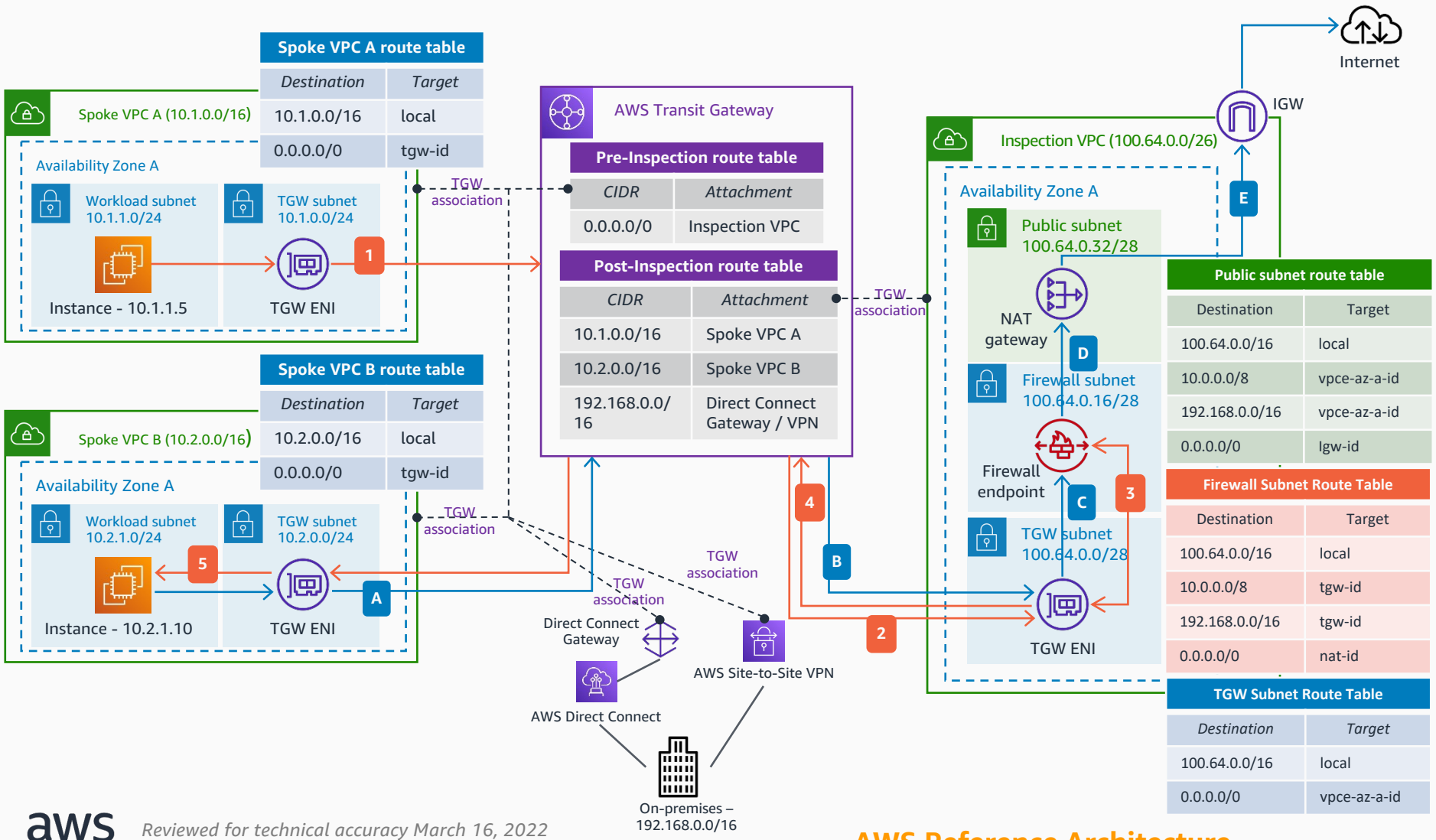
** It is recommended to use Transit Gateway appliance mode in the Inspection VPC Transit Gateway attachment to maintain flow symmetry.*

Reviewed for technical accuracy March 16, 2022

AWS Reference Architecture

Combined Inspection with AWS Network Firewall

Use AWS Transit Gateway to centralize the East/West inspection between VPCs, while you have a NAT gateway in the Inspection VPC for centralized egress and the North/South inspection.



1. Traffic from an instance in Spoke VPC A destined to another instance in Spoke VPC B (East/West traffic) is routed to the **Transit Gateway**.
2. The **Transit Gateway** route table associated with the attachment sends all the traffic (0.0.0.0/0) to the Inspection VPC.
3. The Inspection VPC TGW subnet route table sends all the traffic to the firewall endpoint. The allowed traffic is forwarded back to the TGW ENI.
4. As per the **Transit Gateway** route table associated with the Inspection VPC, the traffic is sent to Spoke VPC B.
5. Finally, in the TGW subnet route table of the Spoke VPC B, the traffic is sent to the destination – 10.2.1.10.

A. Traffic from an instance in Spoke VPC B destined to the internet (North/South traffic) is routed to the **Transit Gateway**.

B. The **Transit Gateway** route table associated with the attachment sends all the traffic (0.0.0.0/0) to the Inspection VPC – same as in the previous example.

C. The Inspection VPC **TGW** subnet route table sends all the traffic to the firewall endpoint, where it is transparently analyzed.

D. Allowed traffic is sent to the NAT gateway as per the Firewall subnet route table.

E. The private IP of the client is translated to the private IP of the NAT gateway, and in turn, translated to the public IP by the internet gateway.

** It is recommended to use Transit Gateway appliance mode in the Inspection VPC **Transit Gateway** attachment to maintain flow symmetry.*

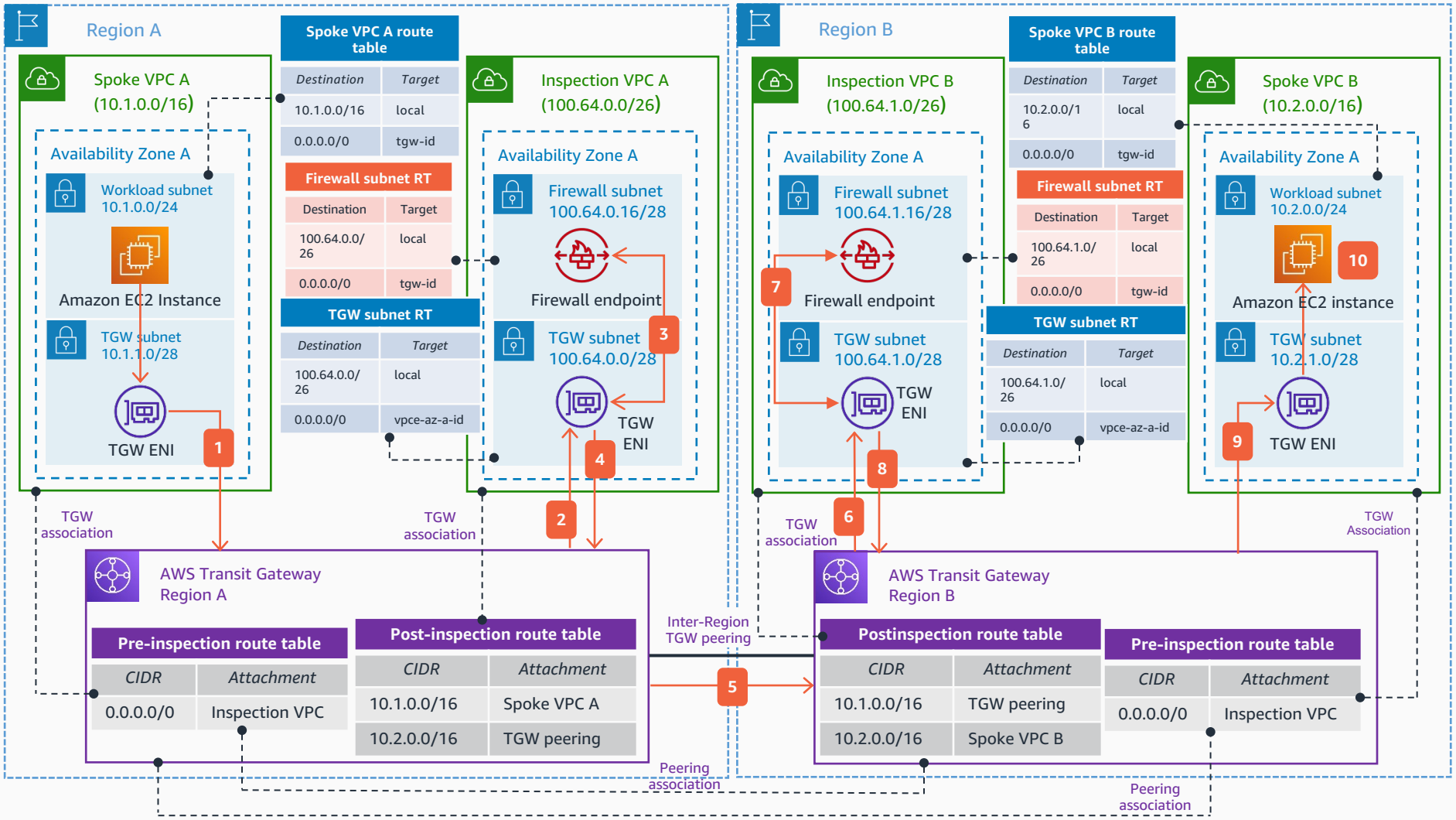
If you want to check an example of this architecture in Terraform, check: AWS Hub and Spoke Architecture with an Inspection VPC.

Reviewed for technical accuracy March 16, 2022

AWS Reference Architecture

Multi-Region Inspection with AWS Network Firewall

When using AWS Transit Gateway to centralize your inspection and inter-Region peering between two AWS Regions, it is a best practice to inspect the traffic in each AWS Region to avoid asymmetric traffic.



1. Traffic from an instance in Spoke VPC A destined to another instance in Spoke VPC B is routed to the **Transit Gateway** in Region A as per the Spoke VPC A route table.
2. The **Transit Gateway** (Region A) route table associated with the attachment (Pre-inspection route table) sends all the traffic (0.0.0.0/0) to the inspection VPC A.
3. The inspection VPC A **TGW** subnet route table sends all the traffic to the firewall endpoint for transparent inspection.
4. The allowed traffic is forwarded back to the **TGW** ENI.
5. As per the **Transit Gateway** (Region A) route table associated with the Inspection VPC A (Post-inspection route table), the traffic is sent to Region B via the **Transit Gateway** peering.
6. As per the **Transit Gateway** (Region B) route table associated with the **Transit Gateway** peering (Pre-inspection route table), the traffic is sent to the inspection VPC B for inspection.
7. The inspection VPC B TGW subnet route table sends all the traffic to the firewall endpoint for transparent inspection.
8. The allowed traffic is forwarded back to the TGW ENI.
9. As per the **Transit Gateway** (Region B) route table associated with the inspection VPC A (Post-inspection route table), the traffic is sent to Spoke VPC B.
10. Traffic is forwarded to the destination – the **Amazon EC2** instance in Spoke VPC B.

** It is recommended to use Transit Gateway appliance mode in the Inspection VPC **Transit Gateway** attachments to maintain flow symmetry.*

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