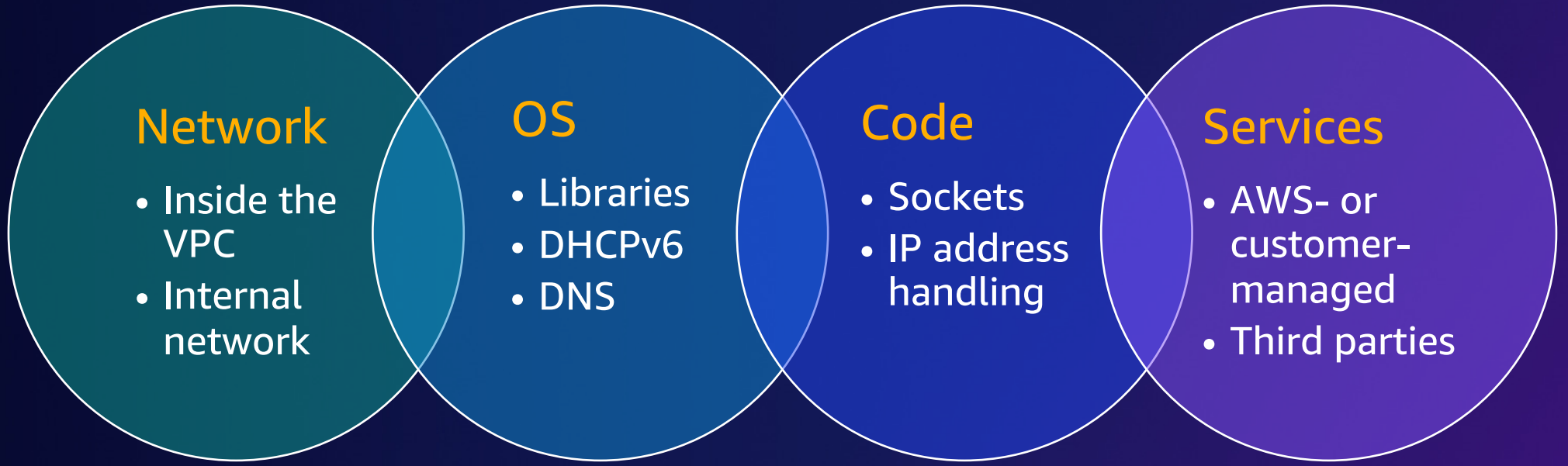
Architecting AWS networks with IPv6

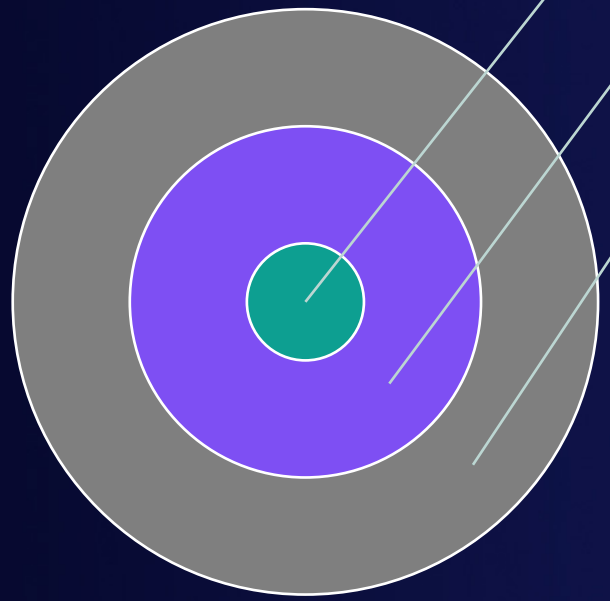
Alexandra Huides
Principal Solutions Architect - Networking Specialist
AWS Strategic Accounts

IPv6 adoption: approaches

Focus areas

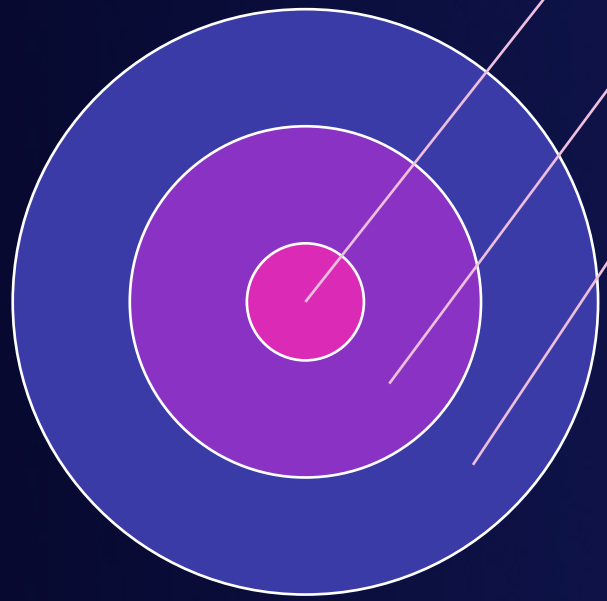


Network-driven approach



- Driven by severe private IPv4 exhaustion
- Dual stack VPC and IPv6-only subnets
- Dual stack internal network routing

Business-driven approach



Inside the VPC

Services (edge) layer

Internal network

Solution for expansion of services to IPv6 clients. Driven by the extensive IPv6 adoption in certain geographies.

Dual stack VPC and dual stack ELBs

Amazon VPC IP Address Manager

Edit CIDRs Info

Add or remove CIDR blocks for your VPC.

IPv4 CIDRs Info

CIDR	Status	
10.0.0.0/16	Associated	Remove

Add new IPv4 CIDR

Randomly assigned CIDR

IPv6 CIDRs Info

CIDR (Network border group)	Pool	Status	
2600:1f18:46f9:be00::/56 (us-east-1)	Amazon	Associated	Remove

Add new IPv6 CIDR

Close

Edit CIDRs Info

Add or remove CIDR blocks for your VPC.

IPv4 CIDRs Info

CIDR	Status	
10.10.10.0/24	Associated	Remove

Add new IPv4 CIDR

BYOIPv6 contiguous pool → customers can control their addressing plan

IPv6 CIDRs Info

CIDR (Network border group)	Pool	Status	
2605:9cc0:1ff0::/56 (us-east-1)	ipam-pool-07e09d88ad9335236	Associated	Remove

Add new IPv6 CIDR

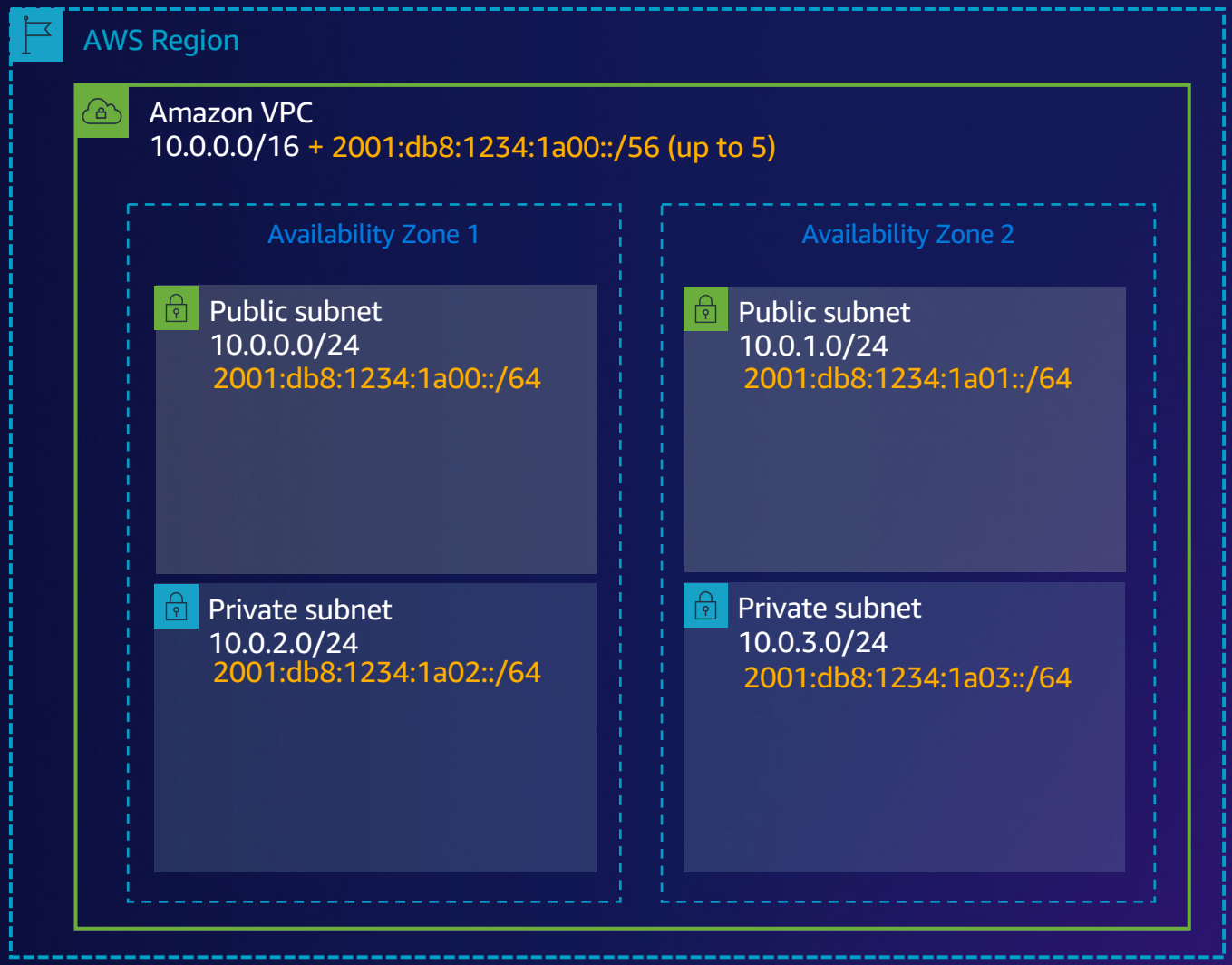
Close

Amazon VPC and IPv6

IPv6 CIDR blocks

Dual stack Amazon VPC

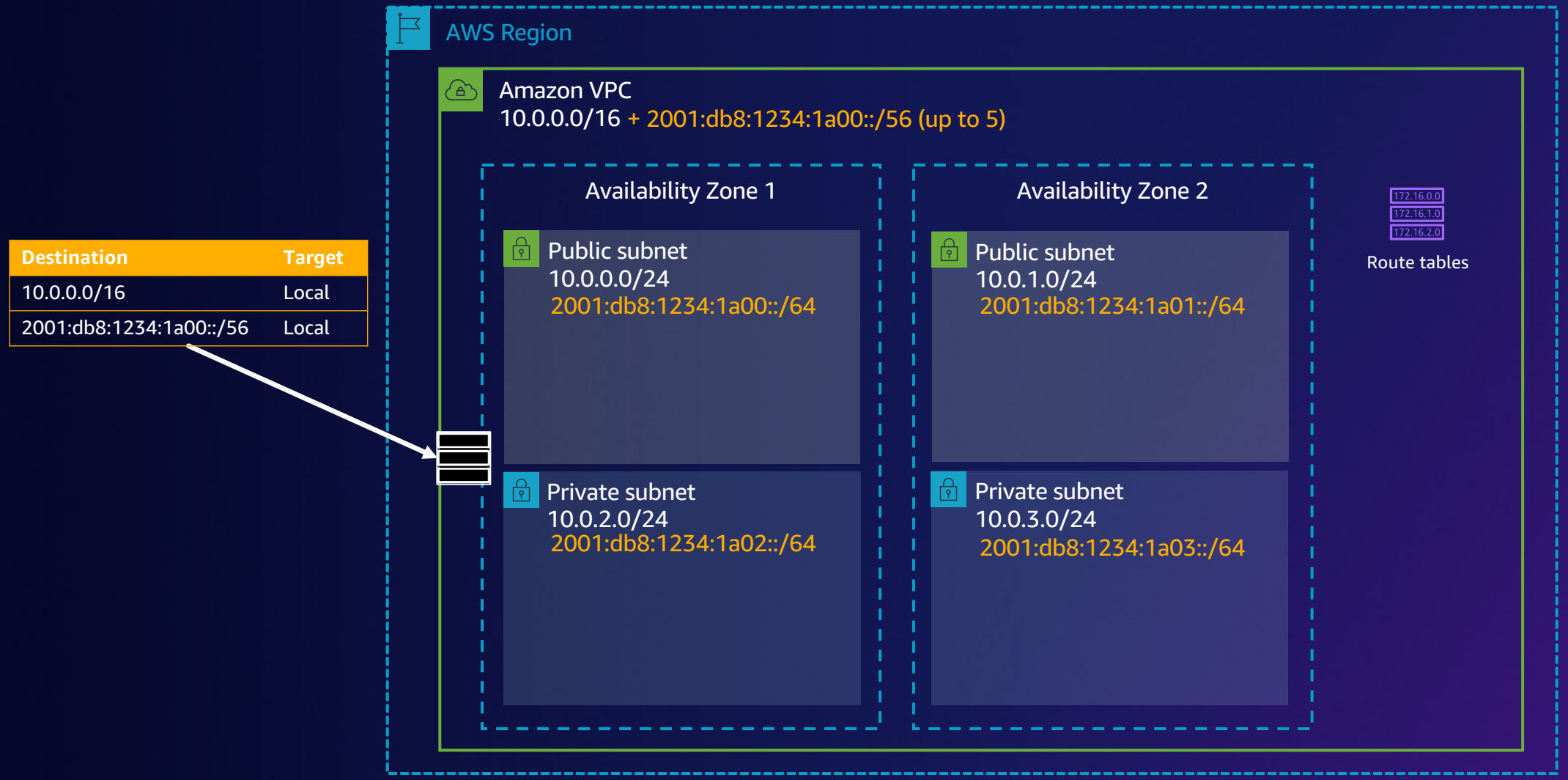
Amazon dual stack VPC



Dual stack Amazon VPC

- IPv6 prefixes
- IPv6 routing

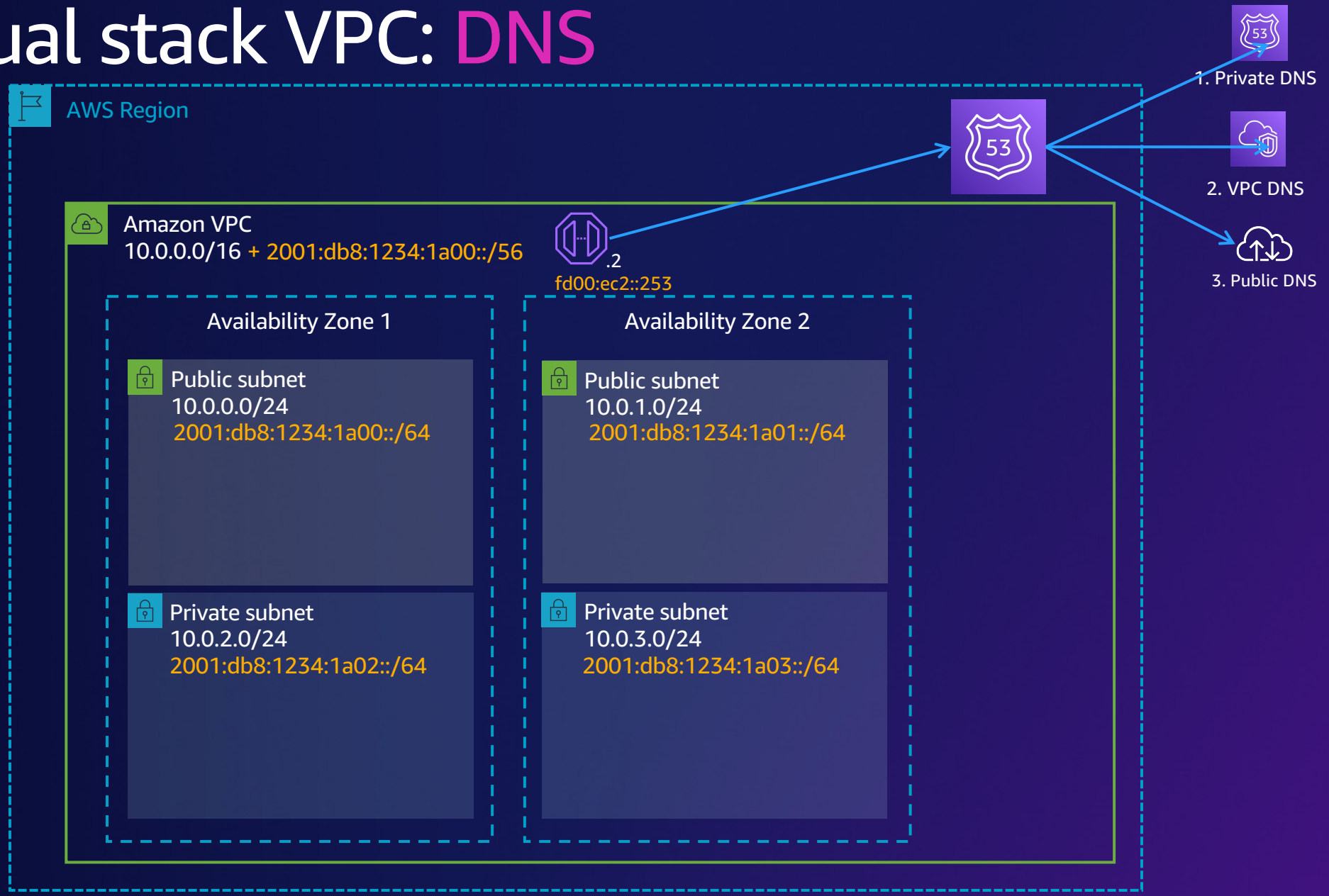
Amazon dual stack VPC: Routing



Dual stack Amazon VPC

- IPv6 CIDR block
- IPv6 routing
- VPC DNS

Amazon dual stack VPC: DNS

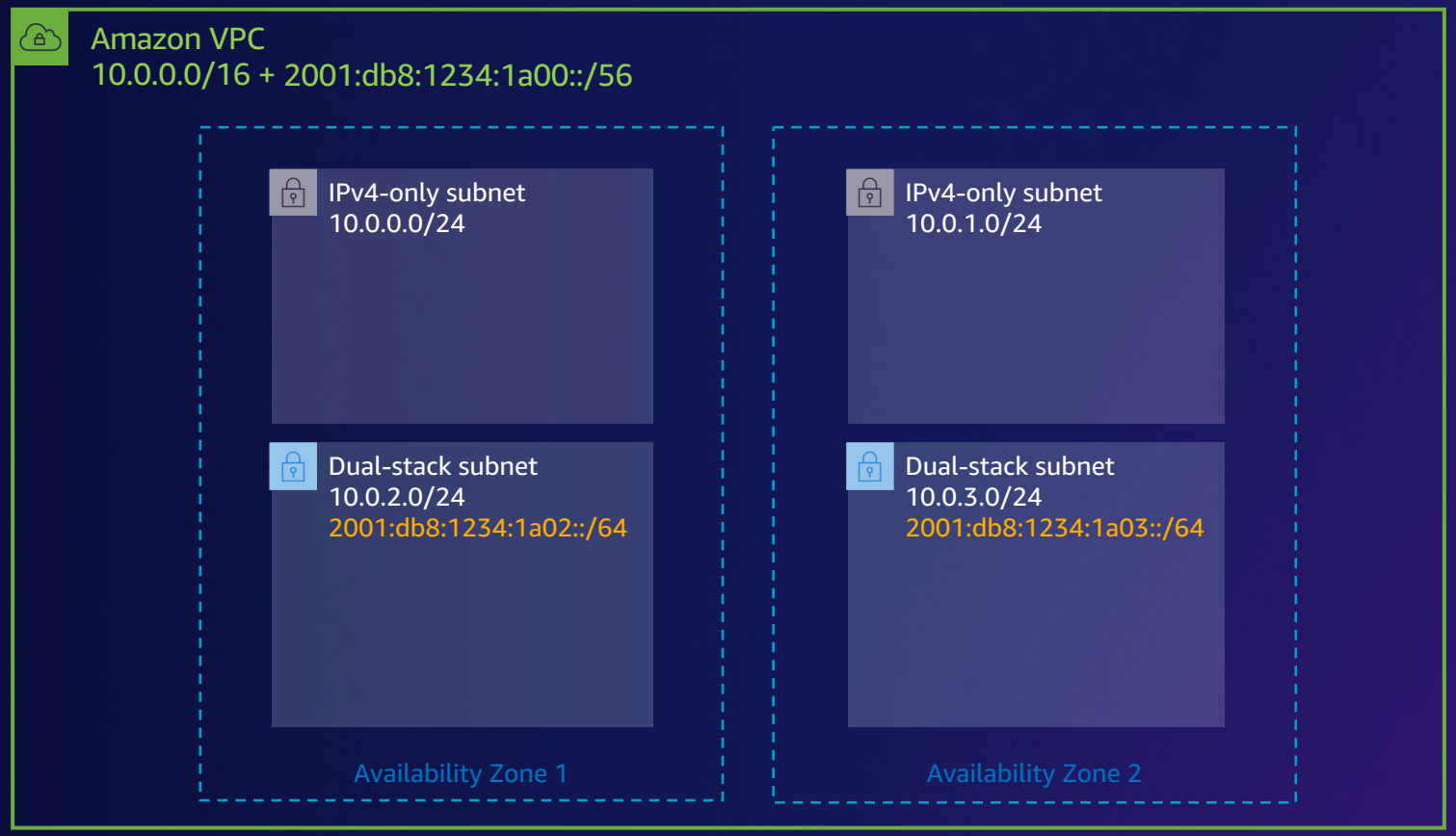


Dual stack Amazon VPC

- IPv6 CIDR block
- IPv6 routing
- DNS
- Subnet types

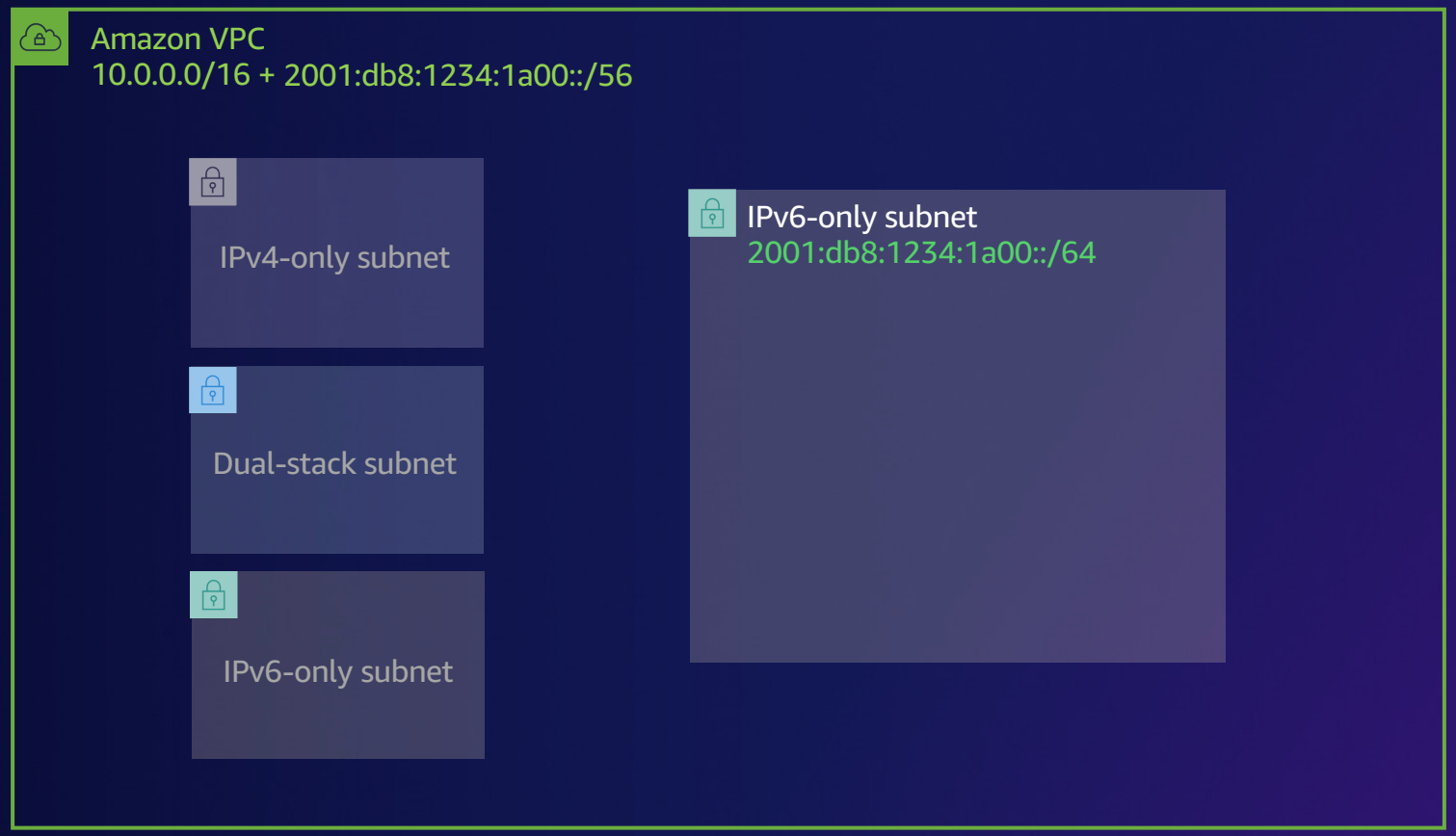
Amazon dual stack VPC: Subnet types

IPV4-ONLY AND DUAL STACK SUBNETS



Amazon dual stack VPC: Subnet types

IPV6-ONLY SUBNETS



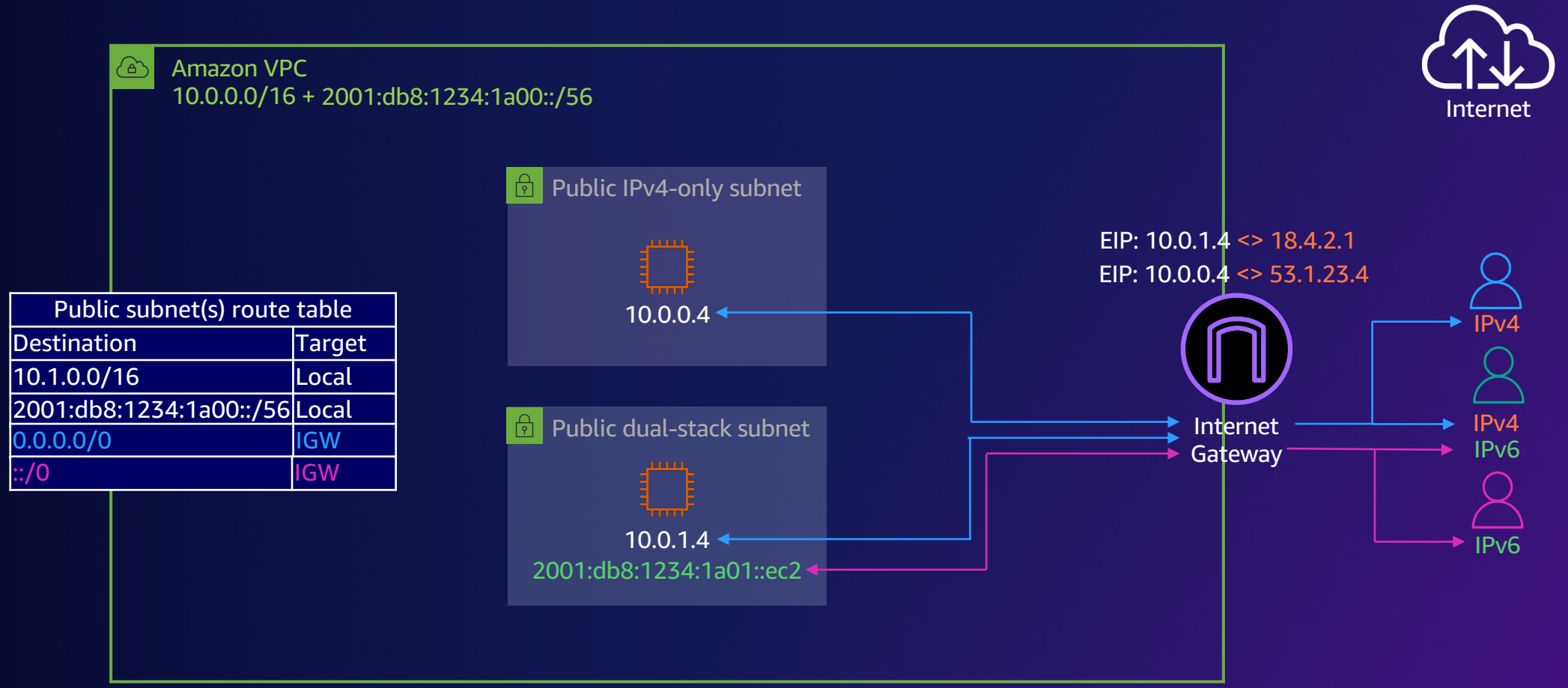
Dual stack Amazon VPC

- IPv6 CIDR block
- IPv6 routing
- DNS
- Subnet types
- IPv6 Internet connectivity

Public subnets internet connectivity

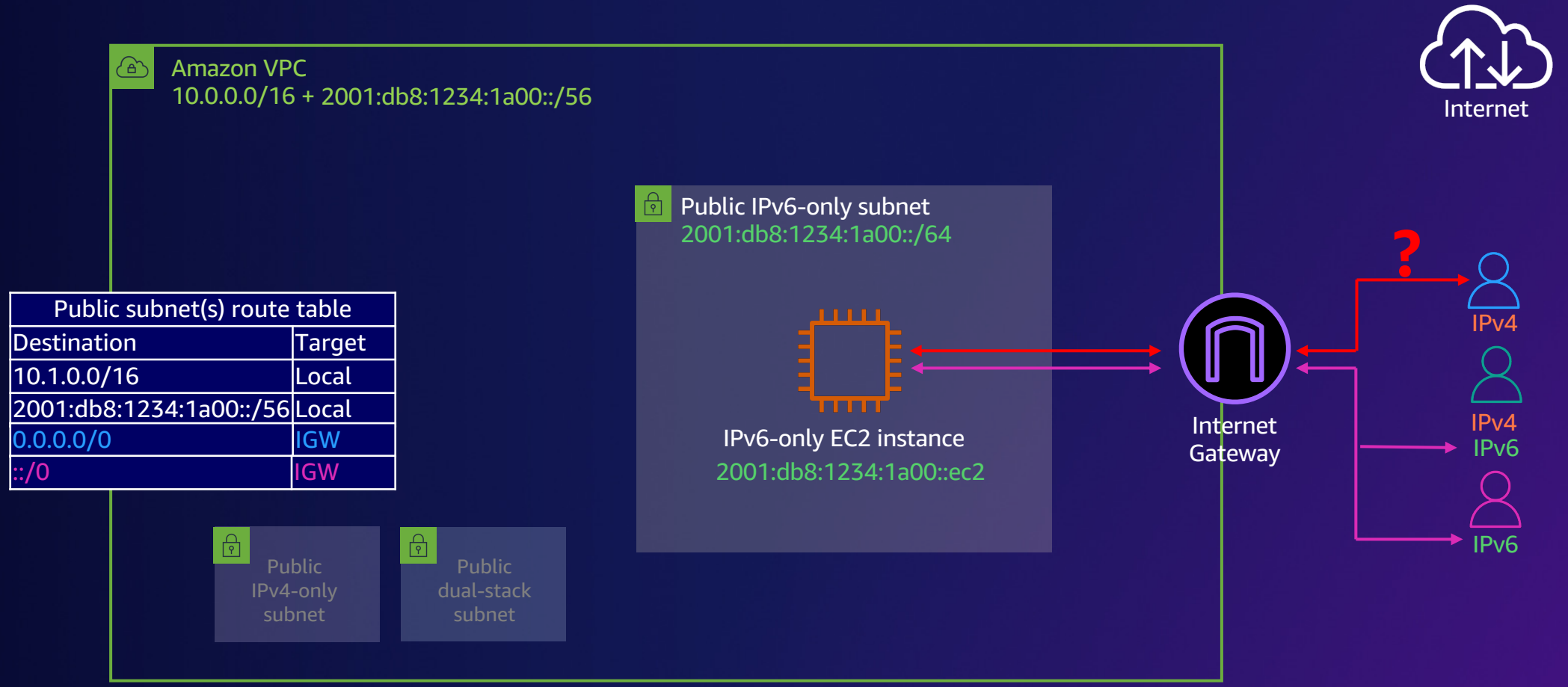
Amazon dual-stack VPC: Internet connectivity

PUBLIC SUBNETS



Amazon dual-stack VPC: Internet connectivity

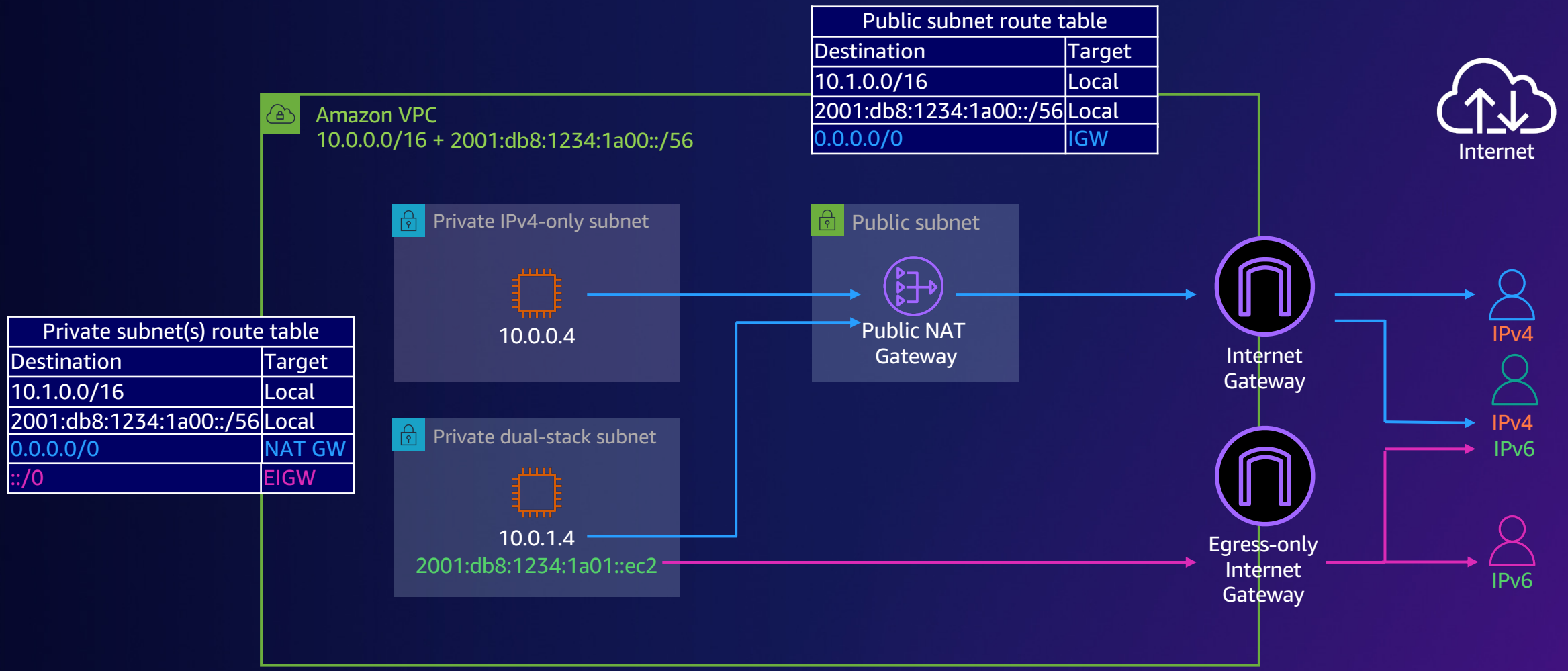
PUBLIC IPV6-ONLY SUBNETS



Private subnets internet connectivity

Amazon dual-stack VPC: Internet connectivity

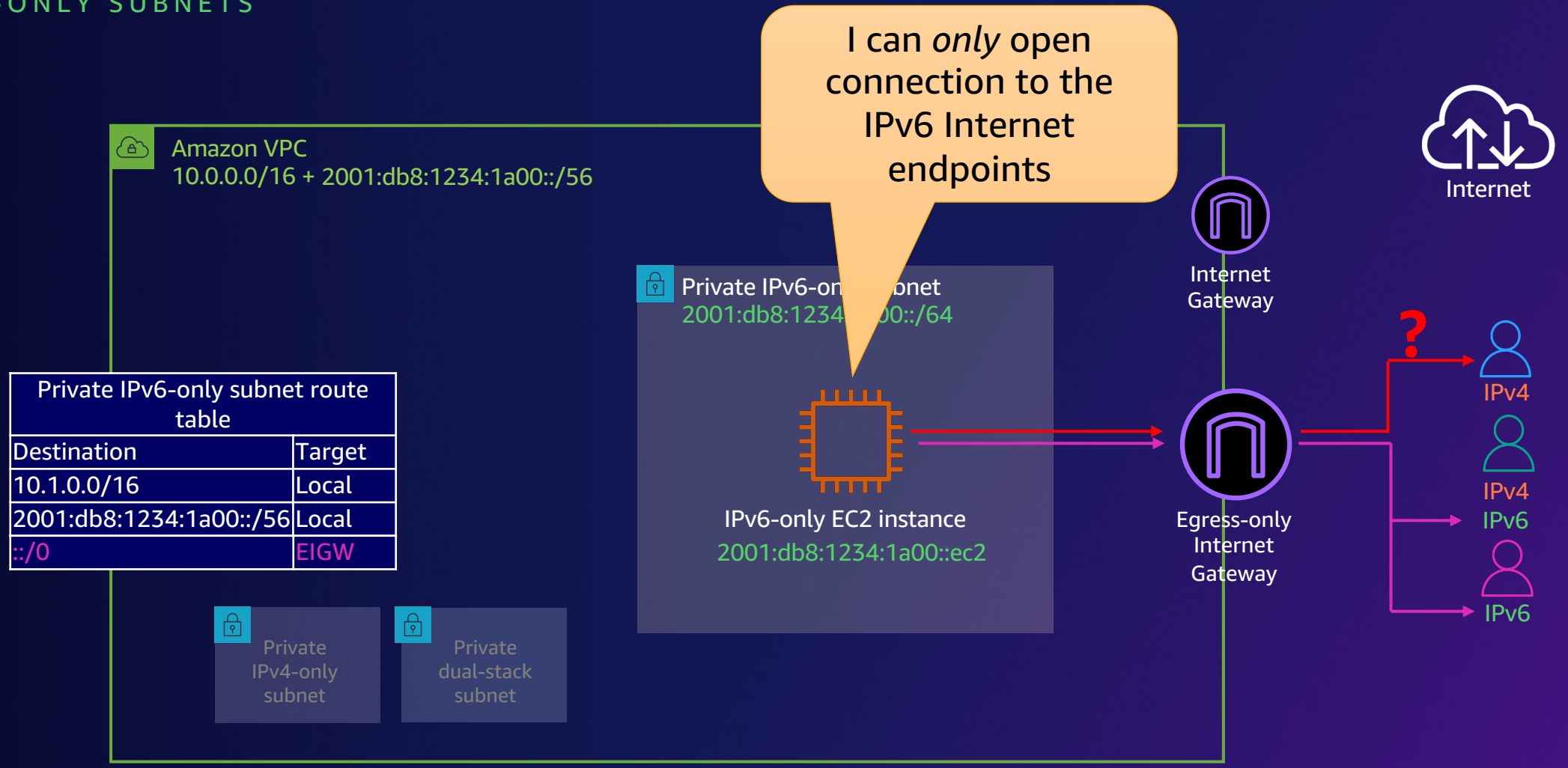
PRIVATE SUBNETS



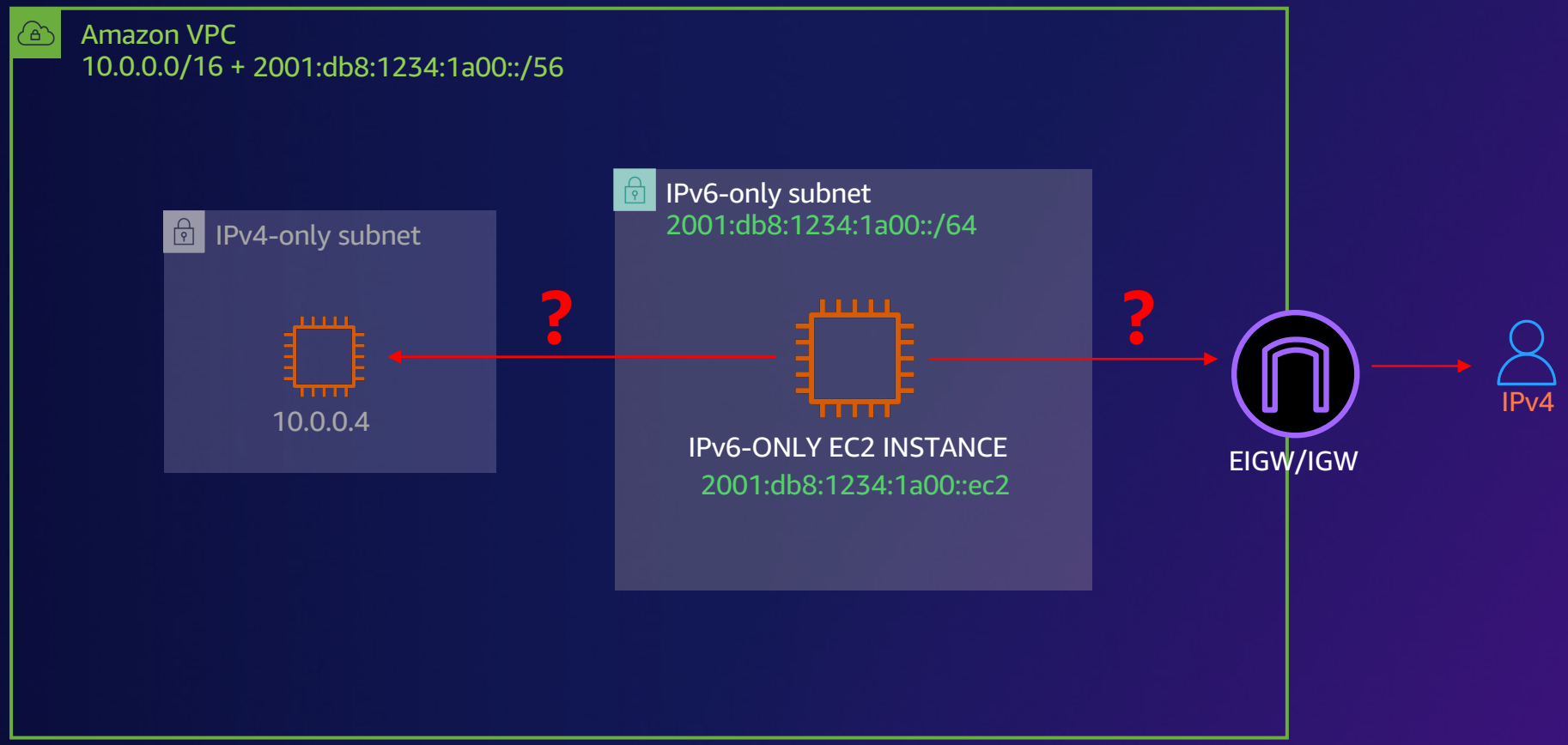
The EIGW does not allow internet connections to be opened to IPv6 resources in private subnets

Amazon dual-stack VPC: Internet connectivity

PRIVATE IPV6-ONLY SUBNETS



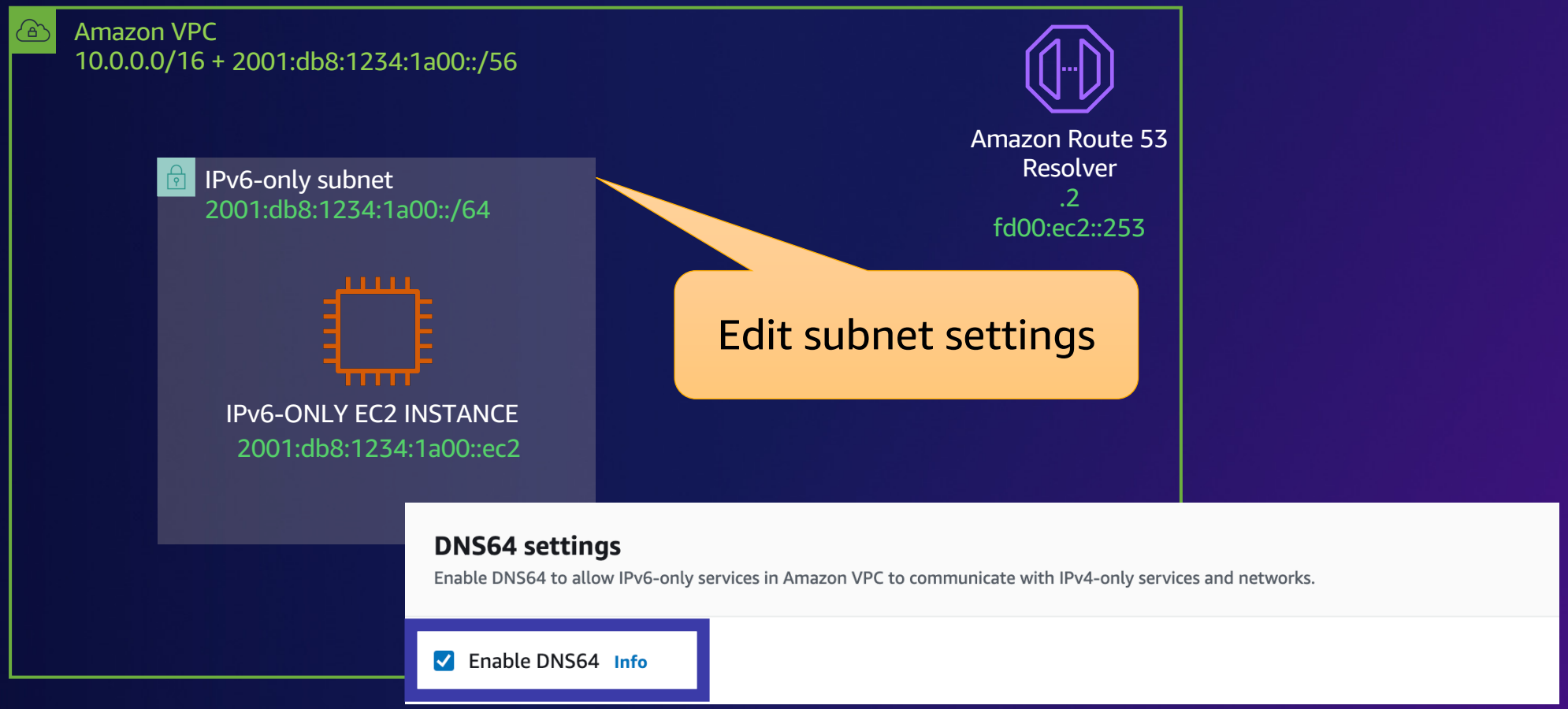
Amazon dual-stack VPC: IPv6 to IPv4



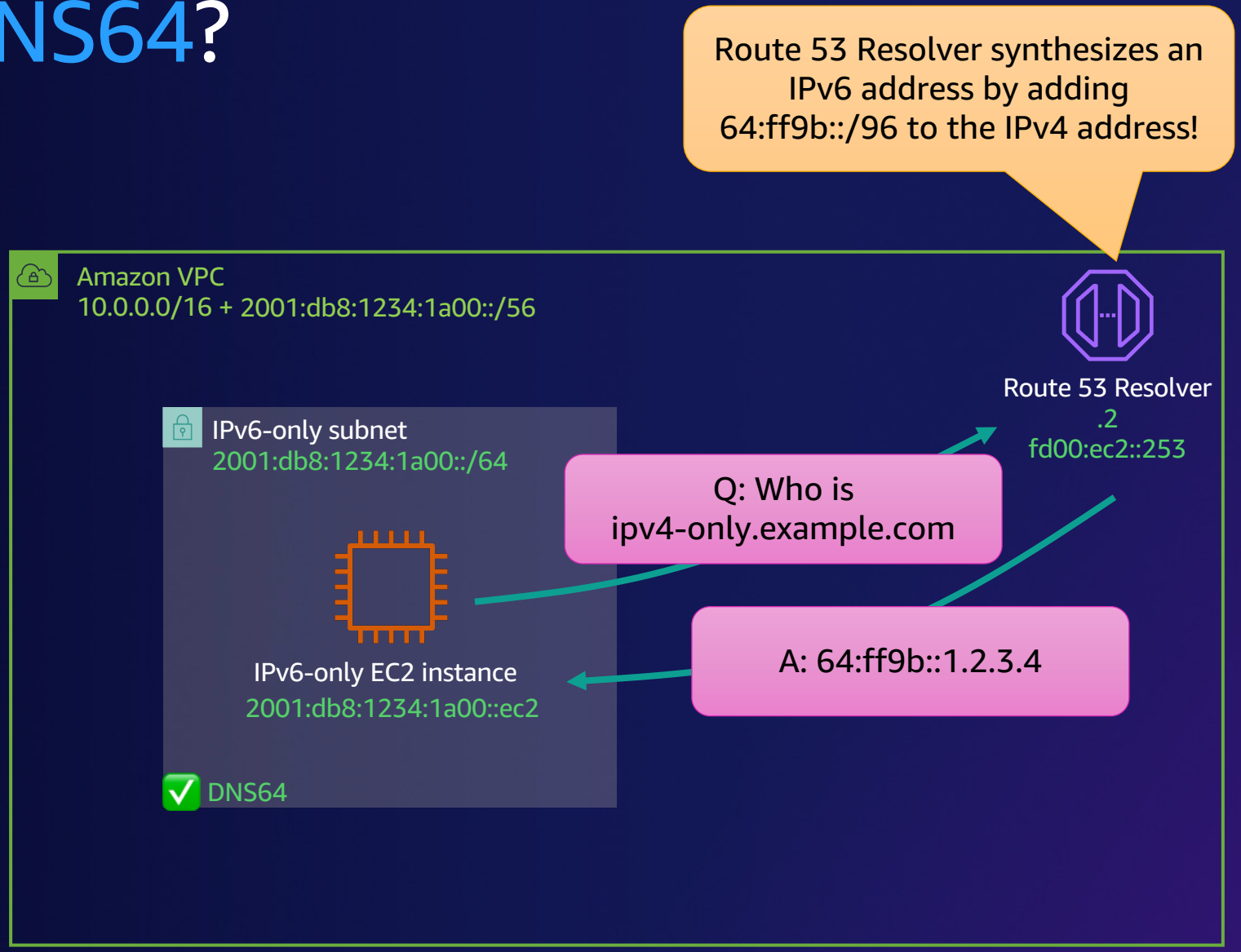
Dual stack Amazon VPC

- IPv6 CIDR block
- IPv6 routing
- DNS
- Subnet types
- IPv6 Internet connectivity
- DNS64 and NAT64

What is DNS64?

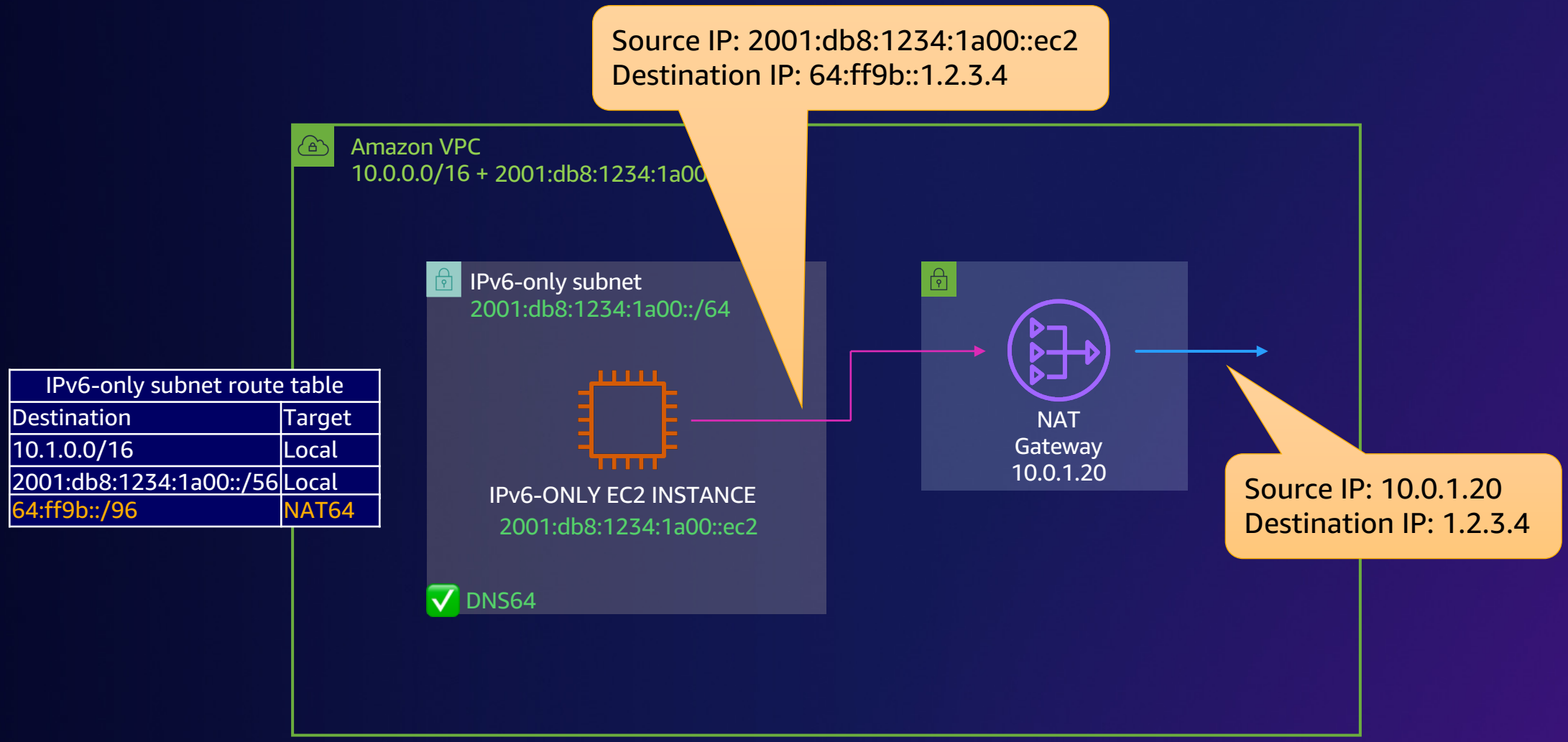


What is DNS64?



Traffic from the IPv6-only instances to the synthesized IPv6 address needs to go through NAT64

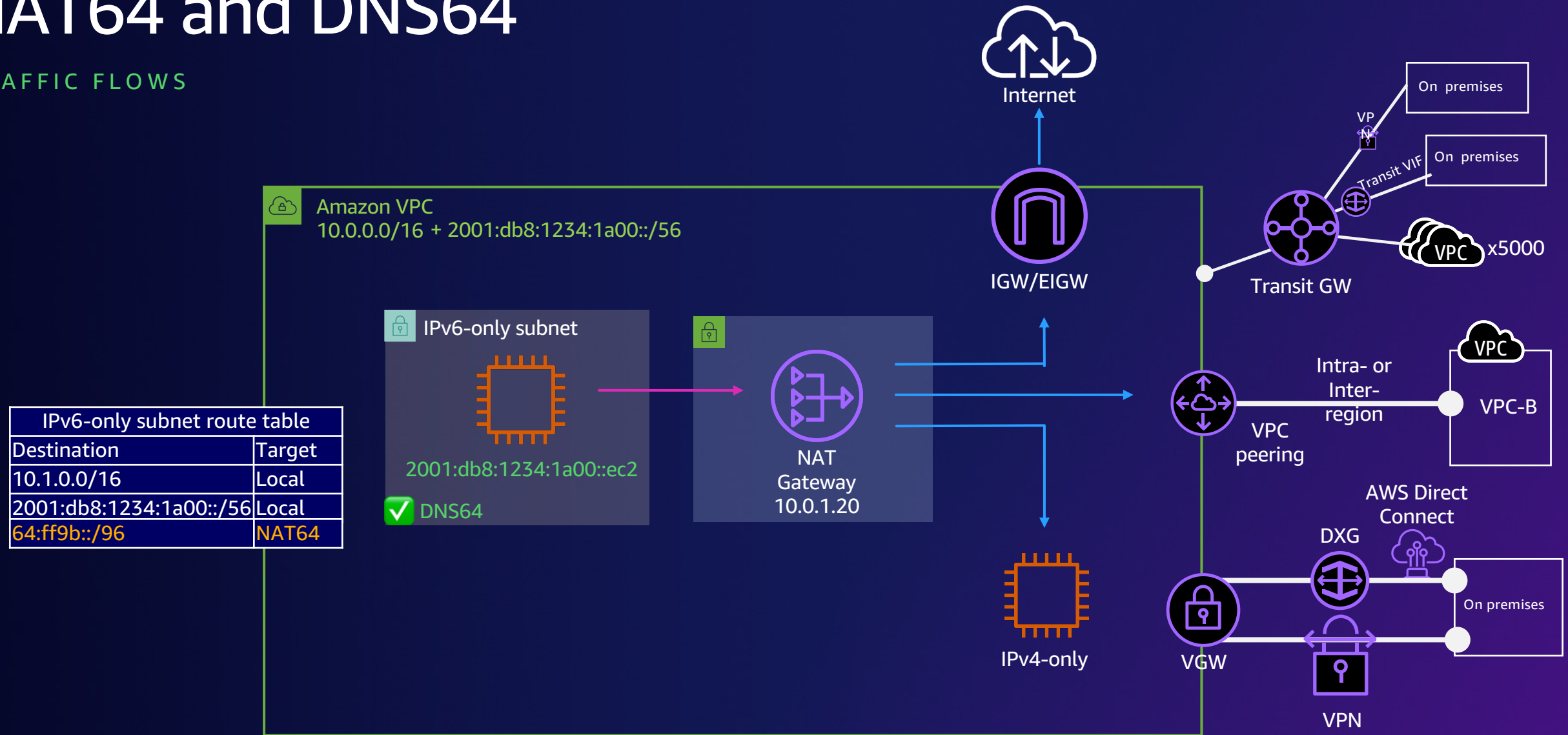
How does NAT64 work?



IPv6-only subnet route table	
Destination	Target
10.1.0.0/16	Local
2001:db8:1234:1a00::/56	Local
64:ff9b::/96	NAT64

NAT64 and DNS64

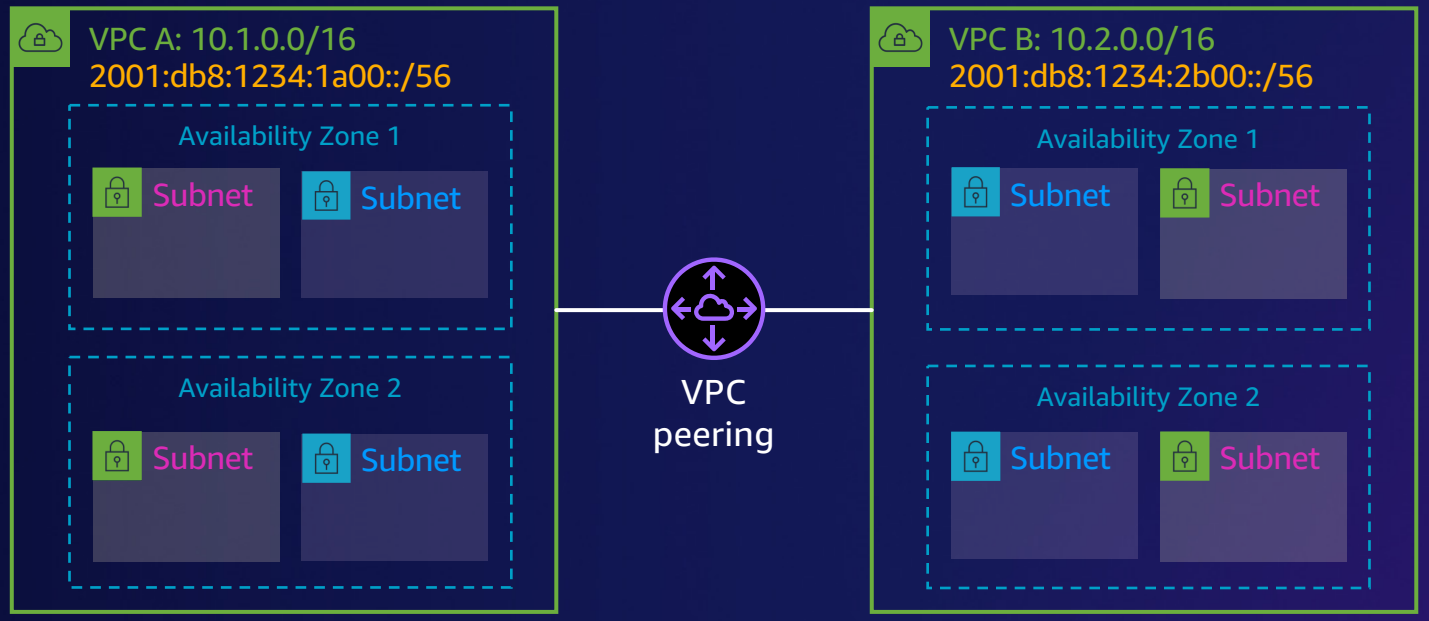
TRAFFIC FLOWS



VPC IPv6 connectivity on AWS

Dual stack VPC-to-VPC connectivity

VPC PEERING



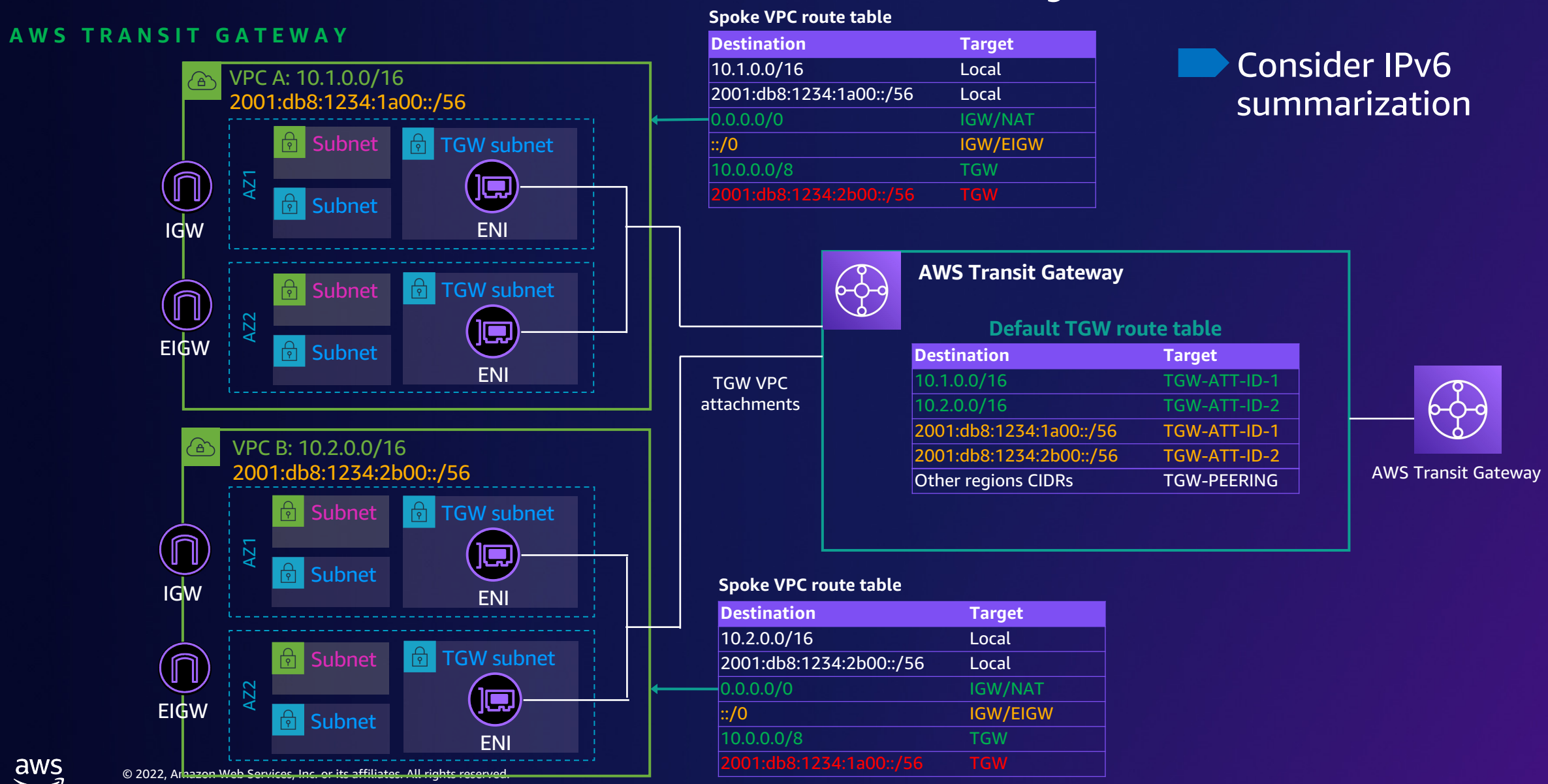
VPC A route table

Destination	Target
10.1.0.0/16	Local
2001:db8:1234:1a00::/56	Local
10.2.0.0/16	PCX-ID
2001:db8:1234:2b00::/56	PCX-ID

VPC B route table

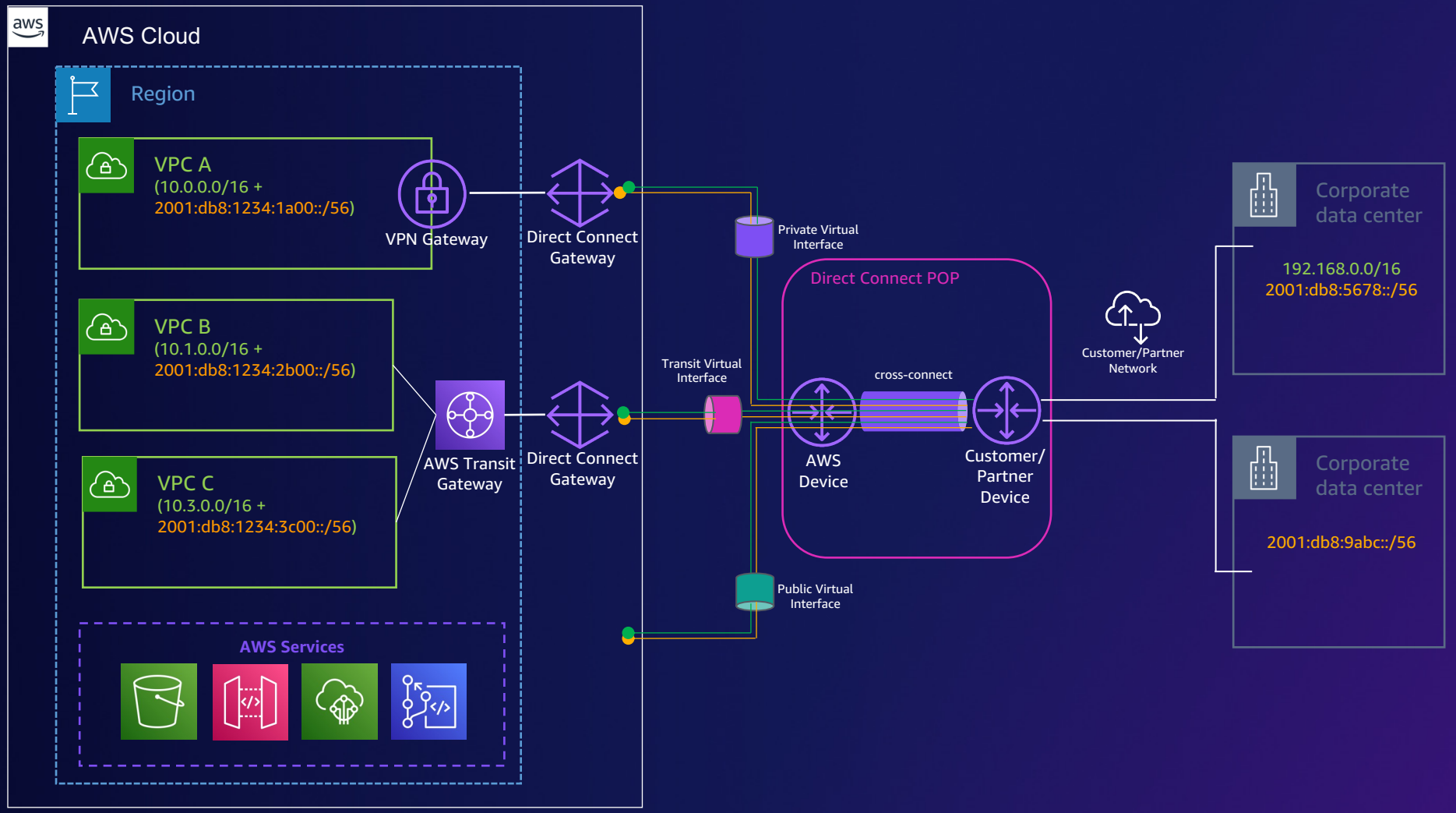
Destination	Target
10.2.0.0/16	Local
2001:db8:1234:2b00::/56	Local
10.1.0.0/16	PCX-ID
2001:db8:1234:1a00::/56	PCX-ID

Dual stack VPC-to-VPC connectivity at scale

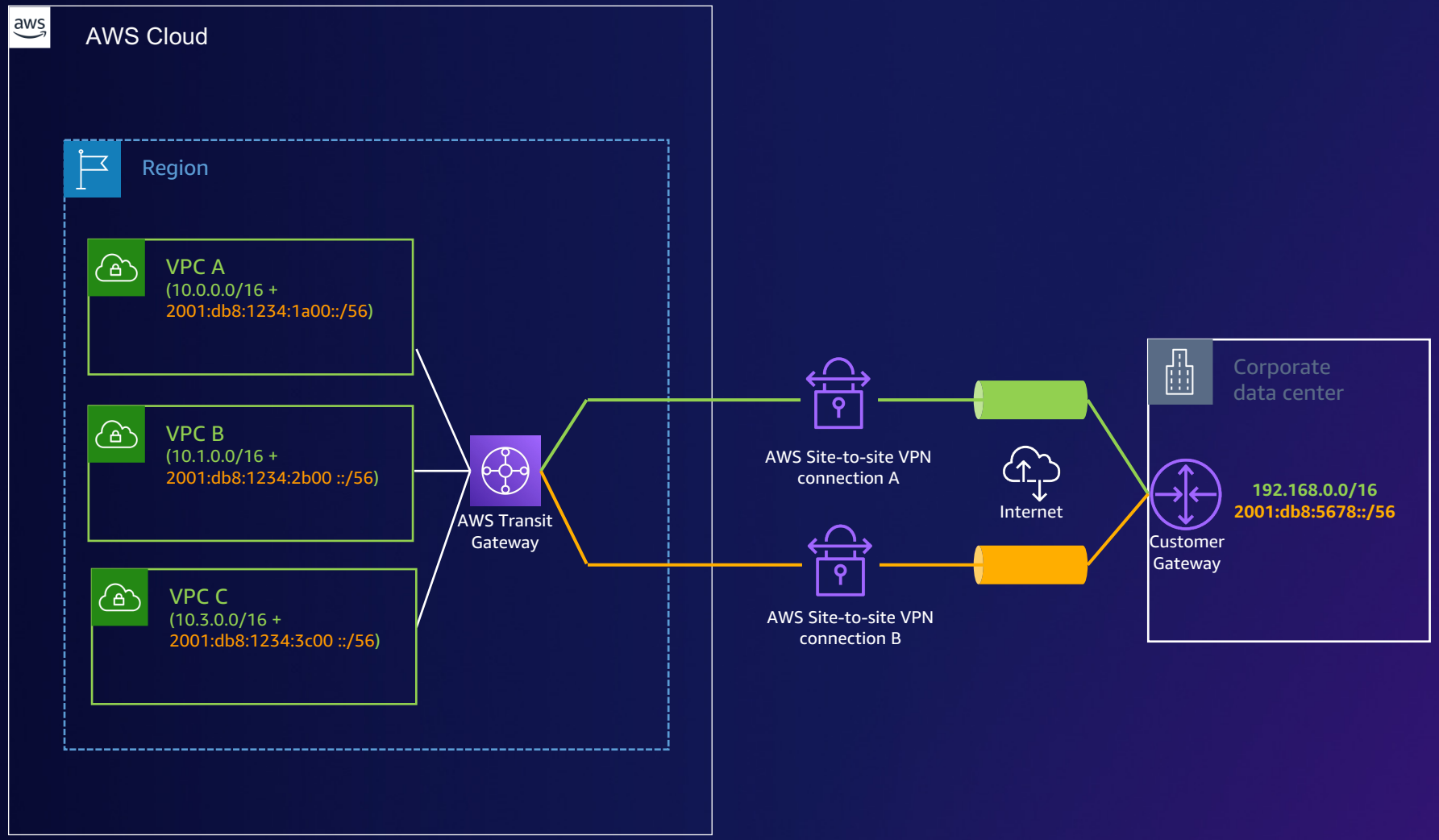


AWS TGW & Cloud WAN natively support IPv6 routing

AWS Direct Connect



AWS Site-to-site VPN



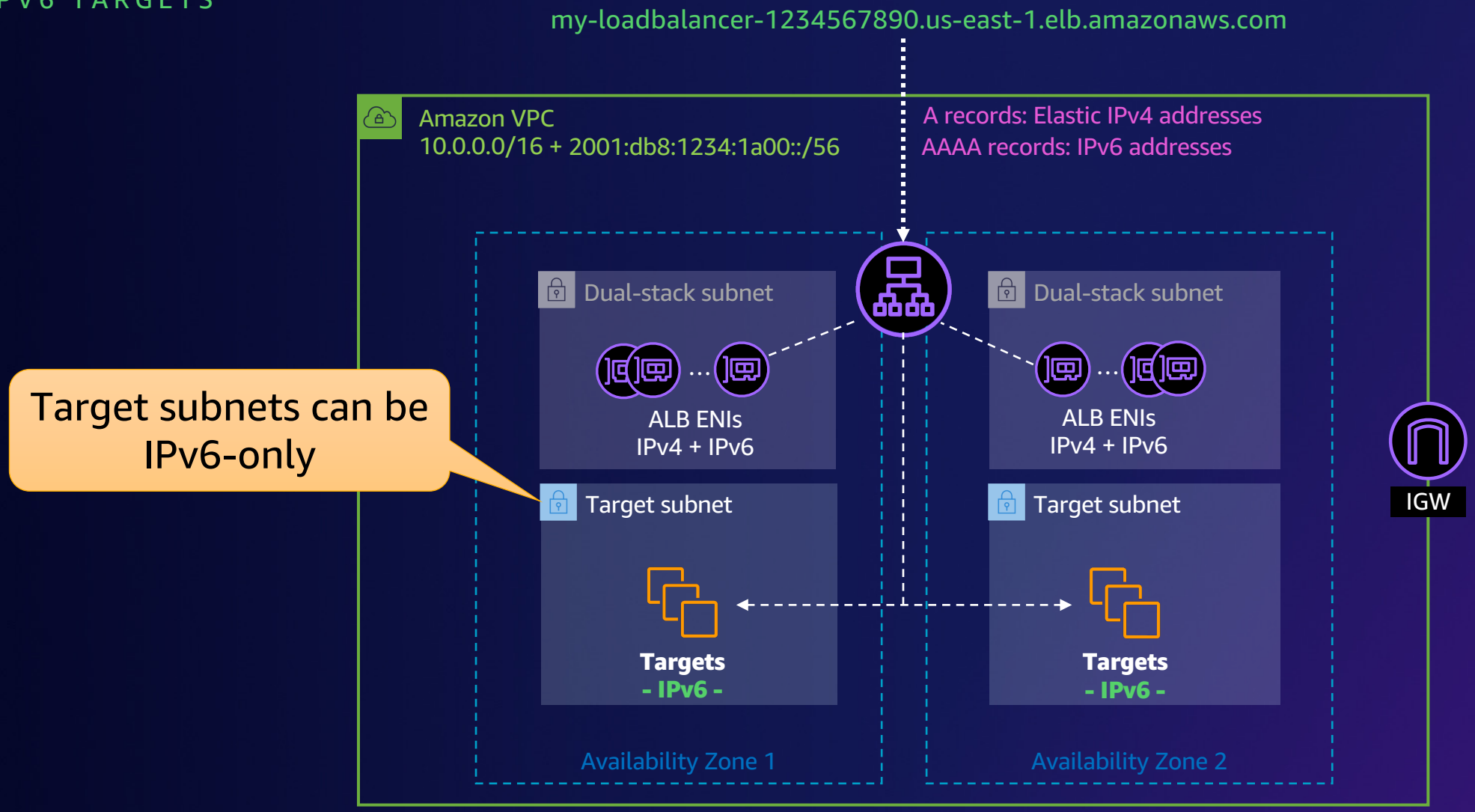
IPv6 and Elastic Load Balancers

Application and Network Load Balancers
(ALB & NLB)
support dual stack Listeners
with IPv4 or IPv6 targets.

Dual stack ALB with IPv6 targets

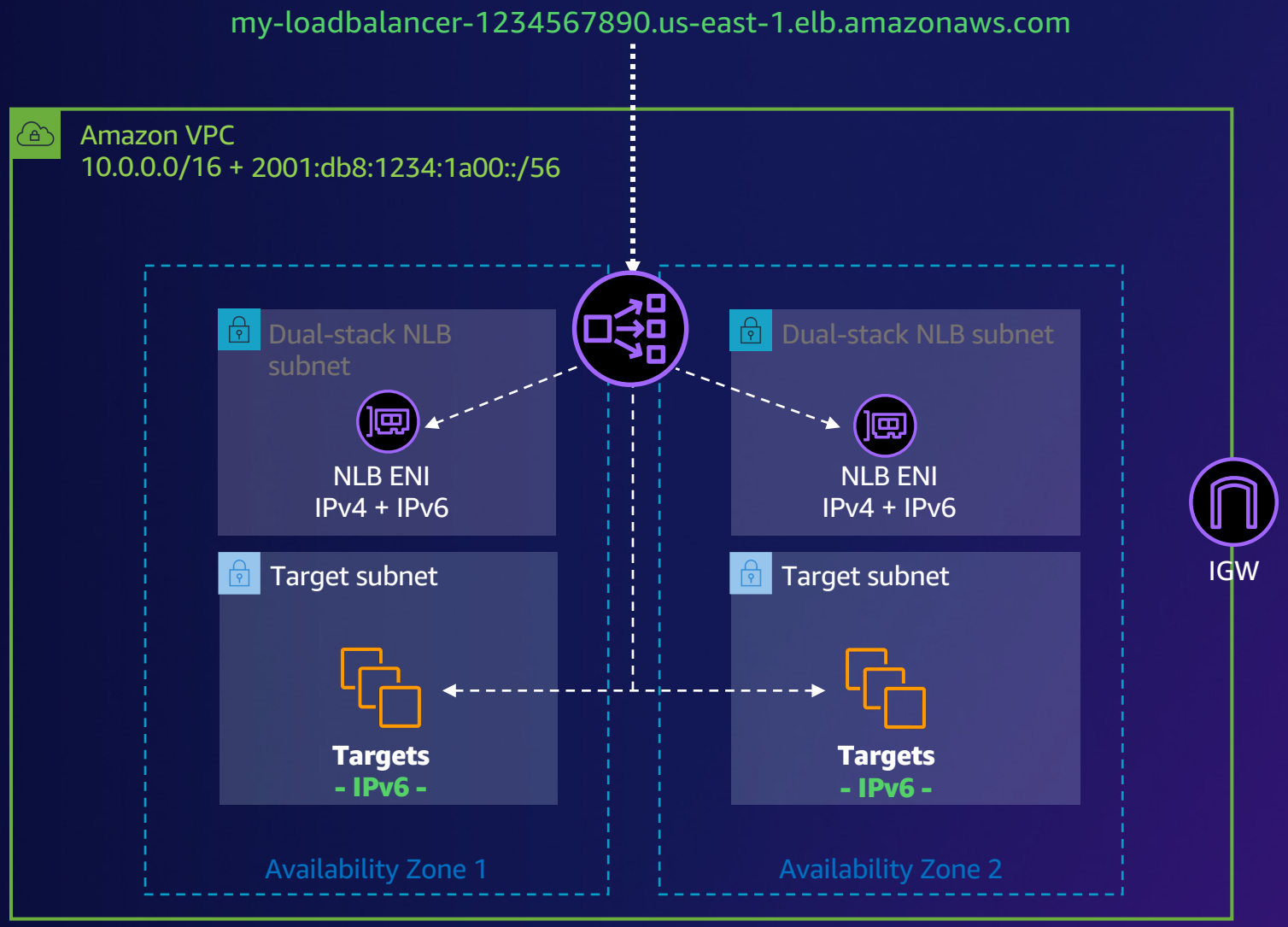
Application Load Balancer: End-to-end IPv6

IPV6 TARGETS



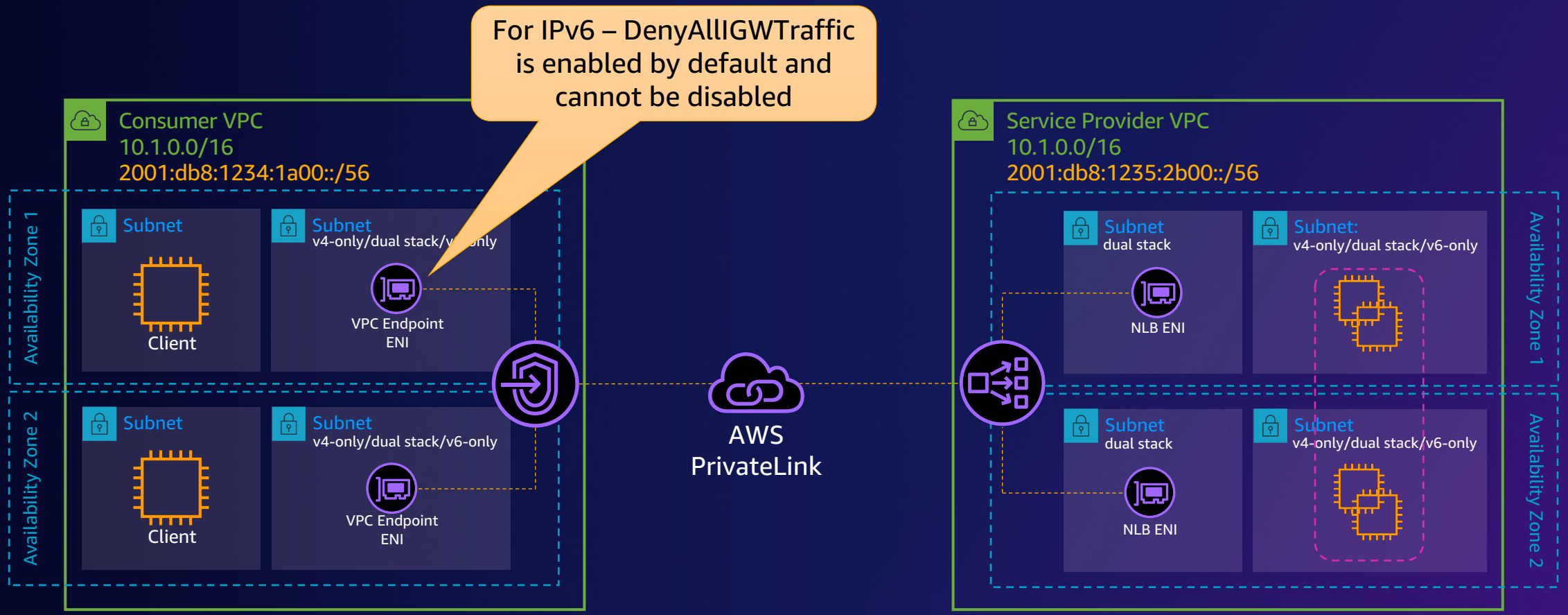
Dual stack NLB with IPv6 targets

Network Load Balancer: End-to-end IPv6



AWS PrivateLink IPv6 support

DUAL STACK AND IPV6-ONLY



AWS services IPv6 support

Amazon EC2 • dual stack and IPv6-only	Amazon VPC • VPC multiple IPv6 CIDR blocks • IPv6-only subnets • Prefix Delegation	AWS Transit Gateway	AWS Direct Connect	AWS Site-to-Site VPN	Amazon CloudFront	Amazon Route 53 (DNS records)
Amazon S3	Elastic Load Balancing (DS ALBs and NLBs + IPv6 targets)	AWS Global Accelerator	Amazon ECS	Amazon LightSail	Amazon EC2 Instance Metadata Service	Amazon Time Sync Service
Amazon Route 53 VPC Resolver	Amazon Workspaces	AWS WAF	AWS IoT services	Bring Your Own IPv6	Amazon AppStream 2.0	NAT64/DNS64
Amazon VPC IP Address Manager (IPAM)	AWS Cloud Map API	Lambda service endpoints	Amazon EKS	Amazon RDS service APIs	Amazon RDS	AWS PrivateLink (customer-managed services)
AWS App Mesh	Amazon Aurora	AWS Database Migration System	Amazon ElastiCache			

Thank you!