IPv6 architectures on AWS

IPv6 Council - Belgium

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AWS

Questions of The Universe…

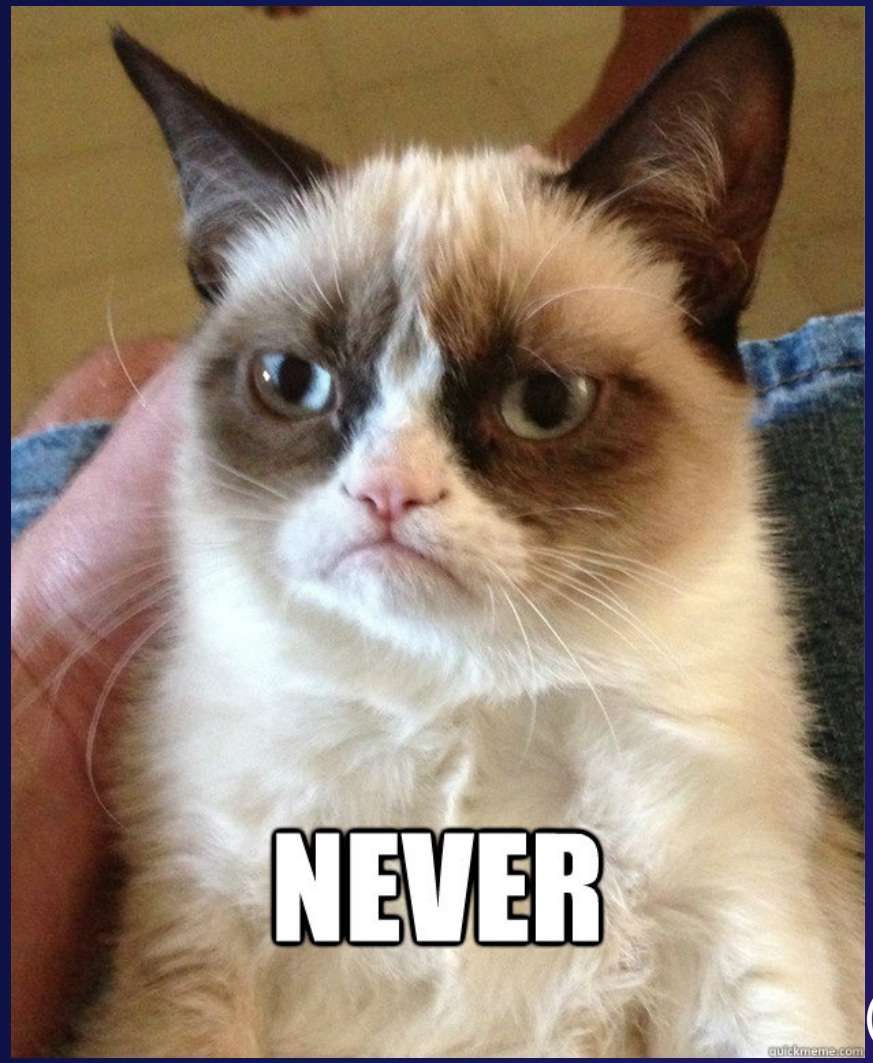
Are Aliens real?

…

What’s inside a black hole?

…

When will we go to IPv6?



(A pessimist)

(An optimist)

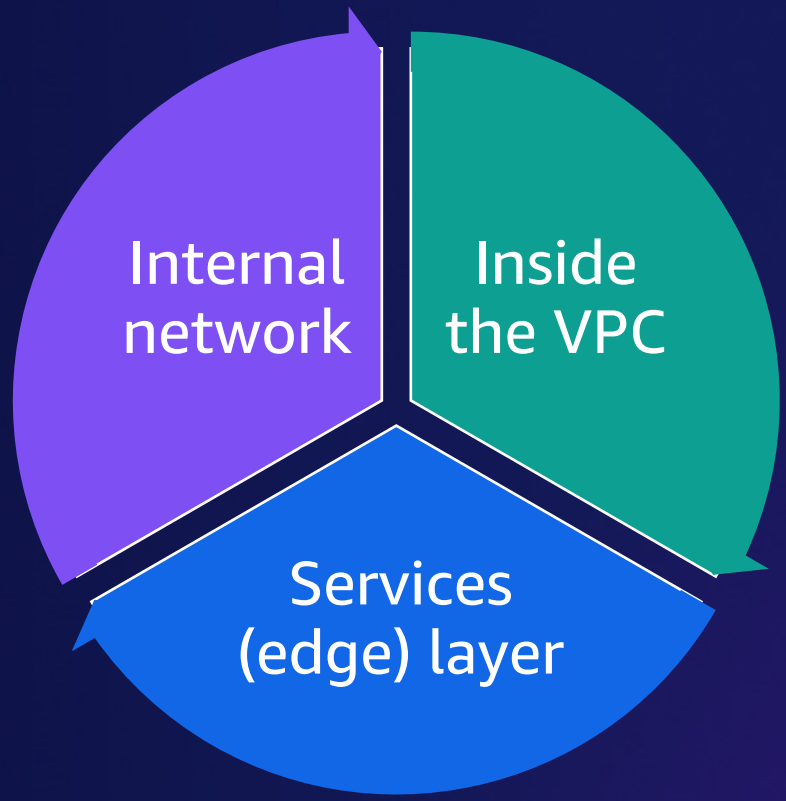
It depends…

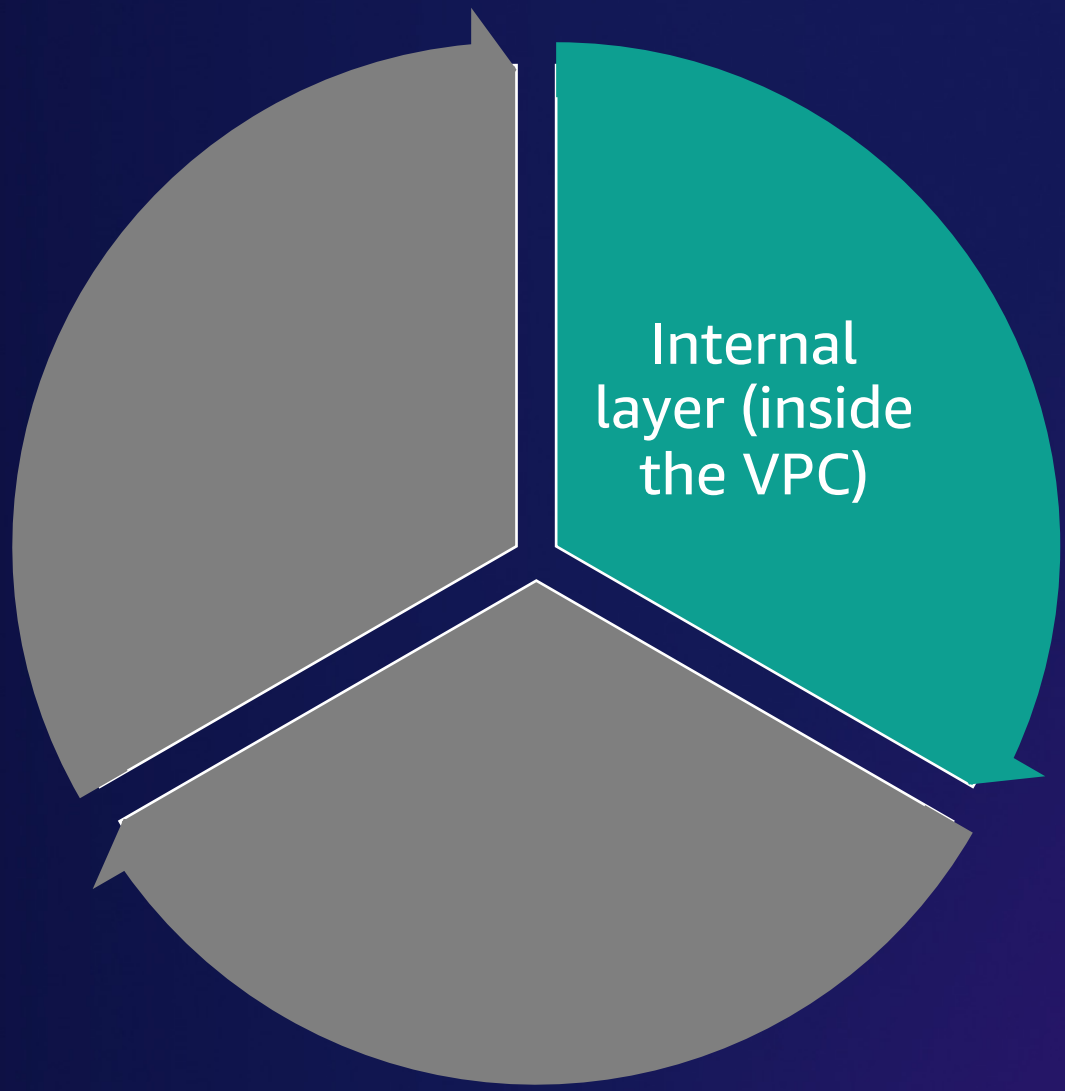
(A network engineer)

The real answer is…no one knows

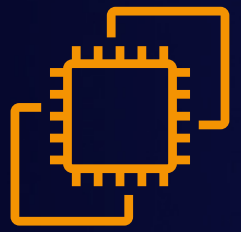
Let’s focus on what we know then…

There are three areas of focus for IPv6 adoption



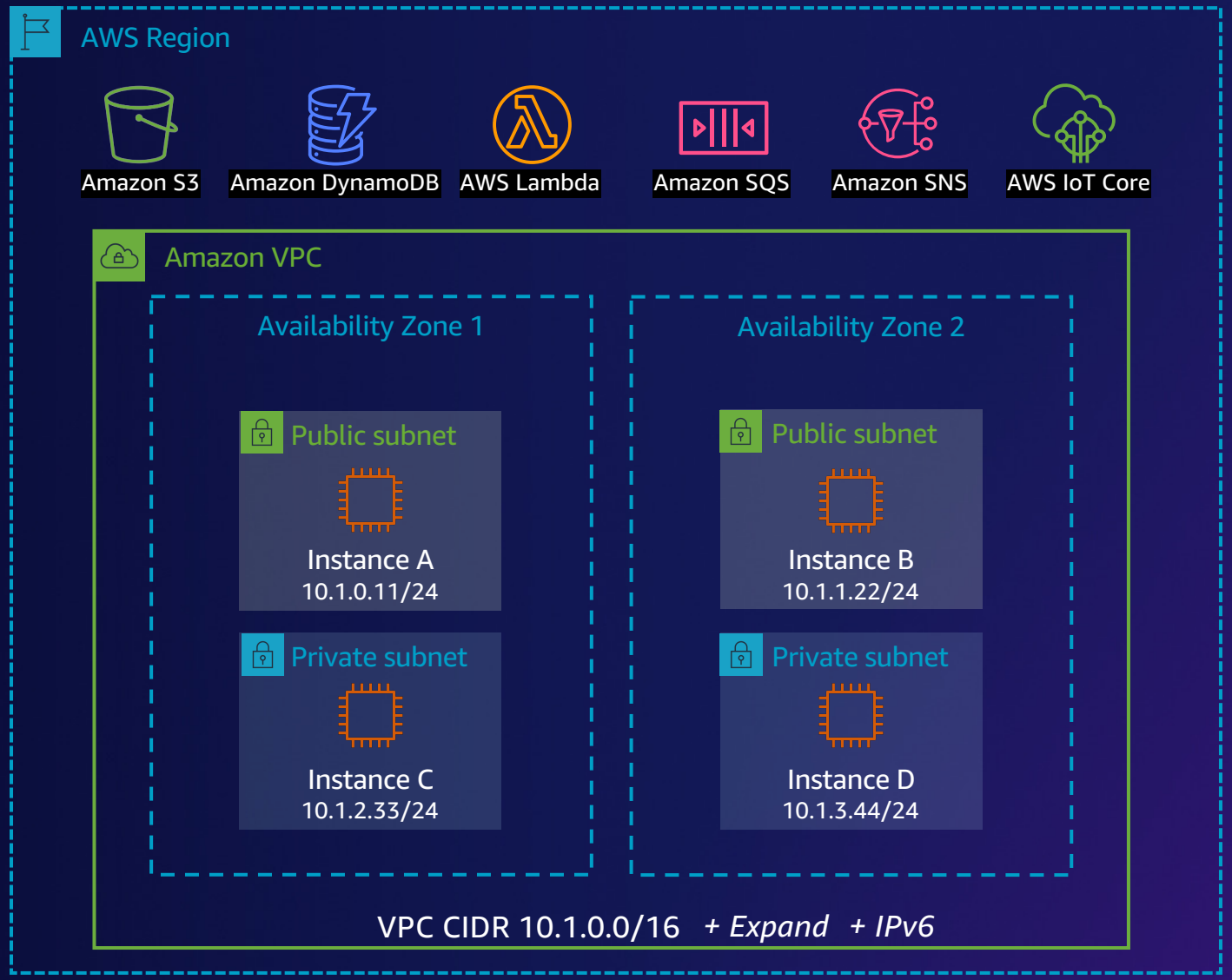


Amazon VPC networking

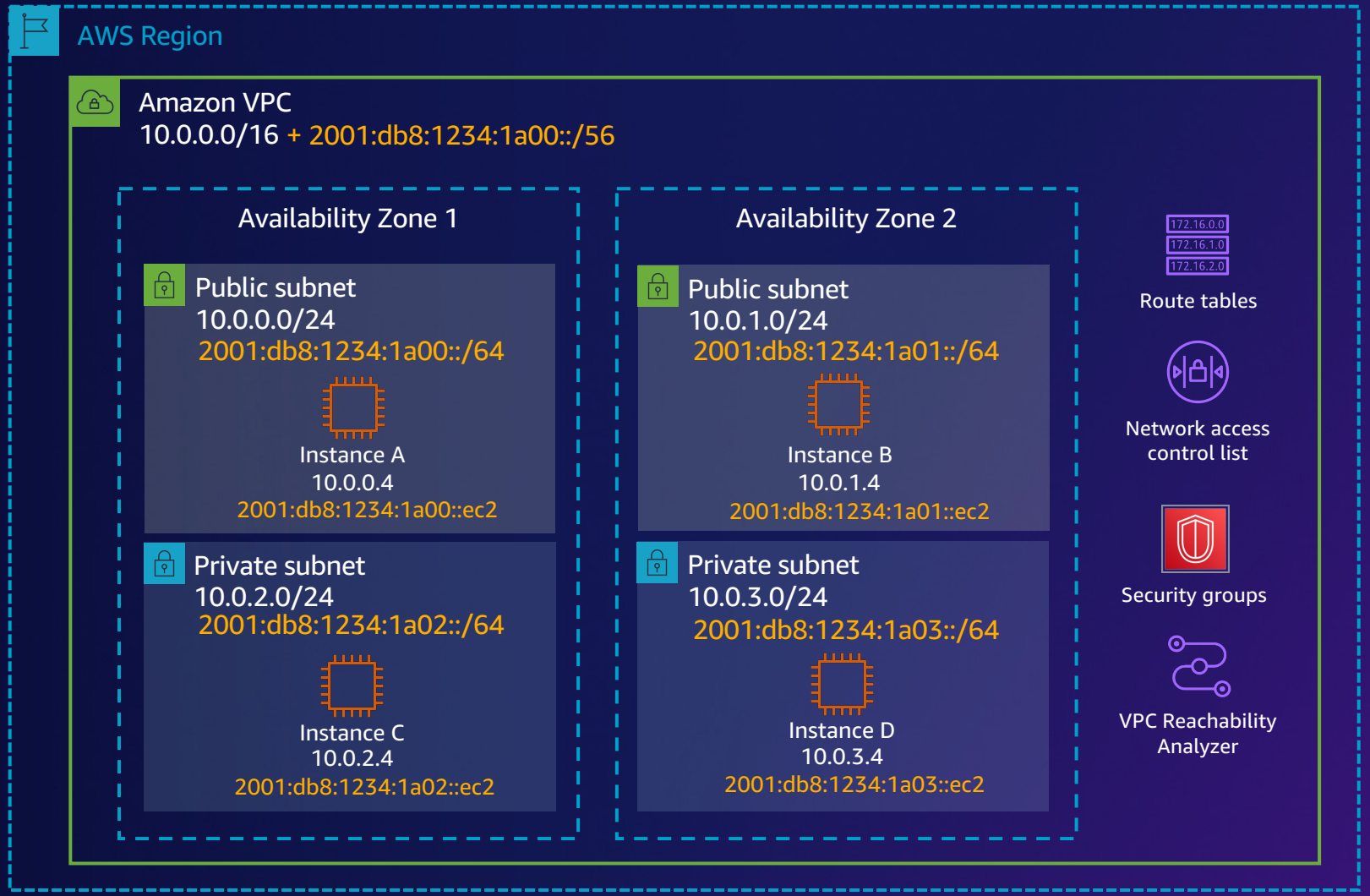


Amazon Elastic Cloud Compute (Amazon EC2)

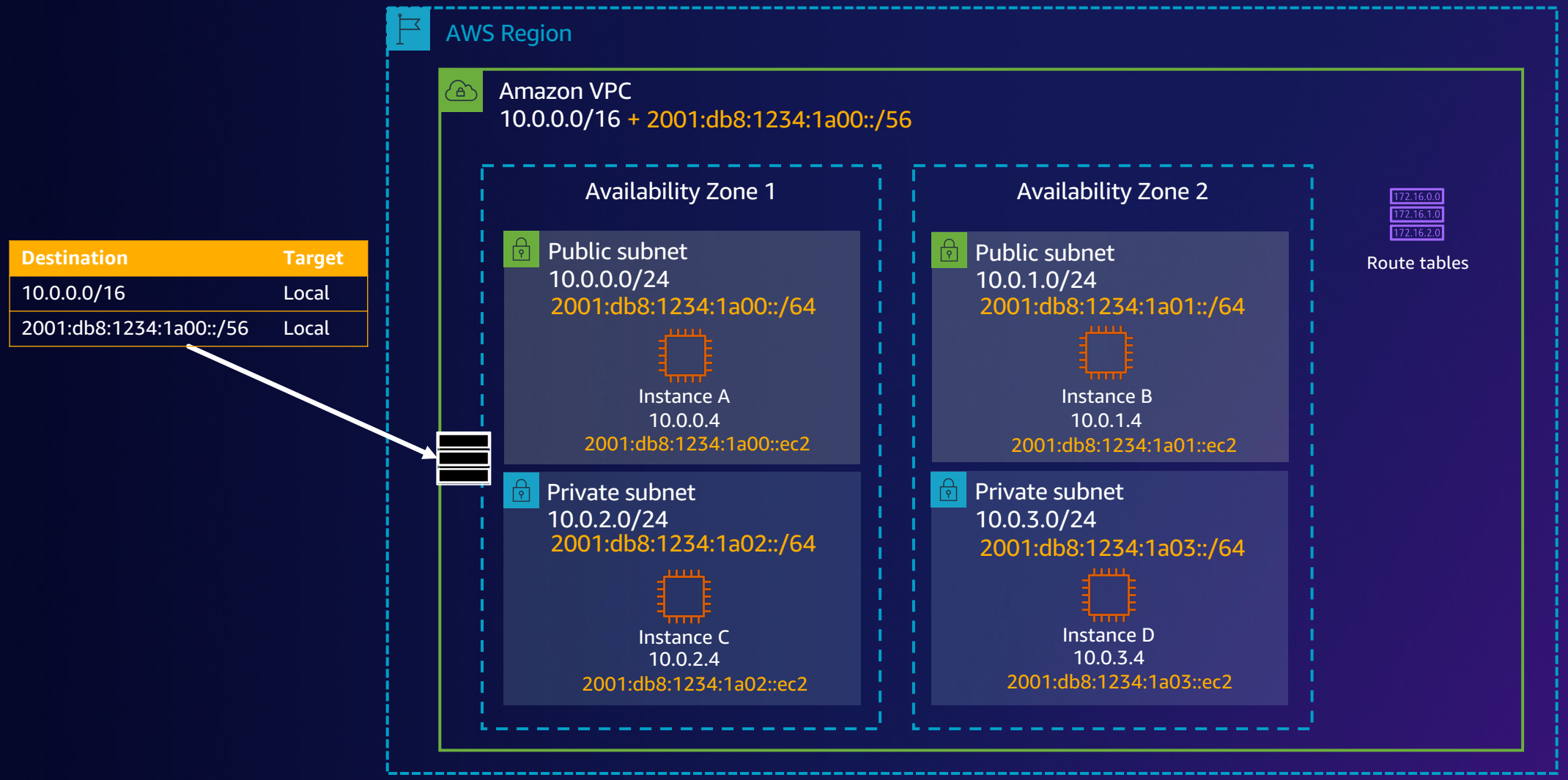
Amazon Virtual Private Cloud (Amazon VPC)



Adding IPv6 to your VPC

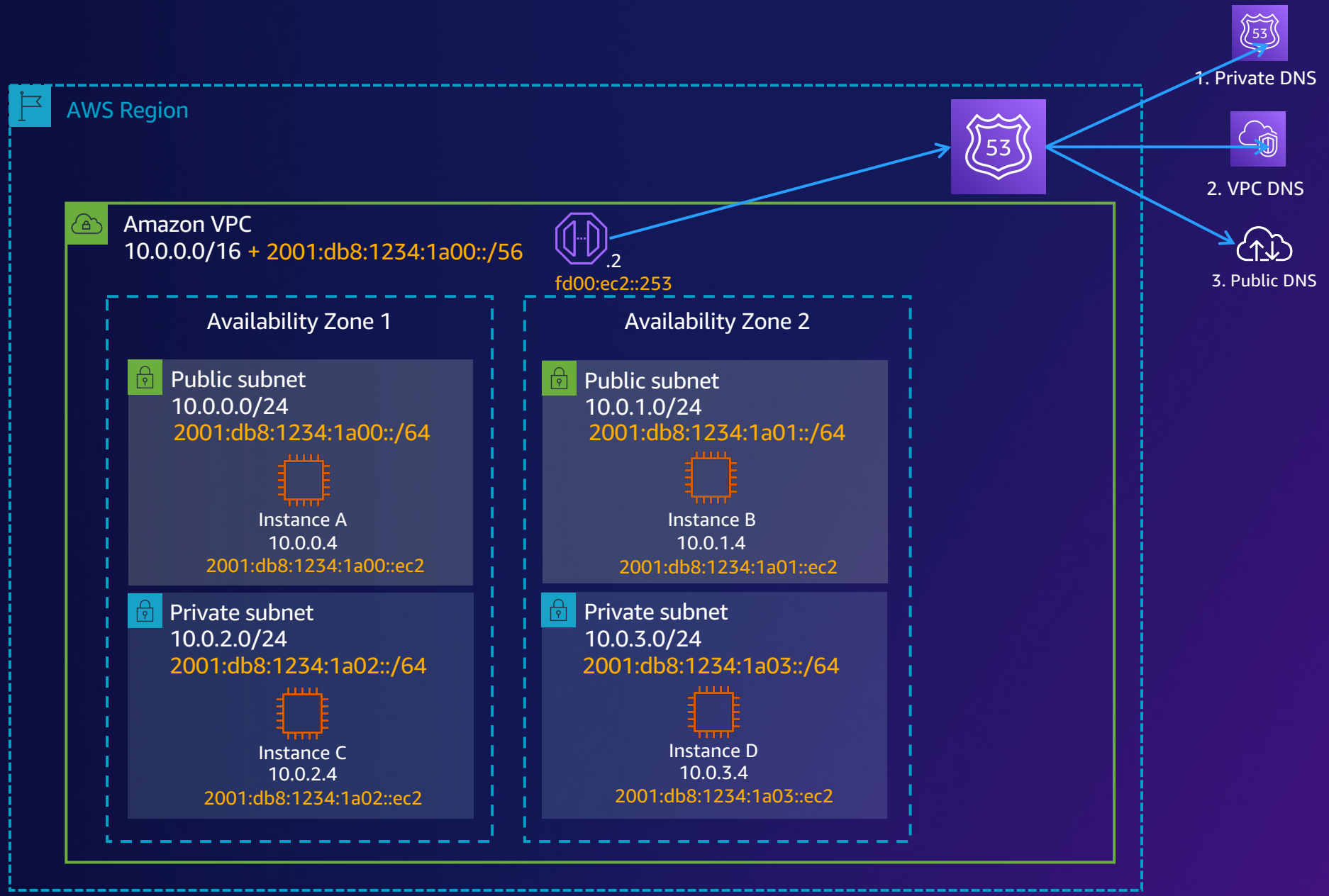


VPC routing



Destination	Target
10.0.0.0/16	Local
2001:db8:1234:1a00::/56	Local

VPC DNS

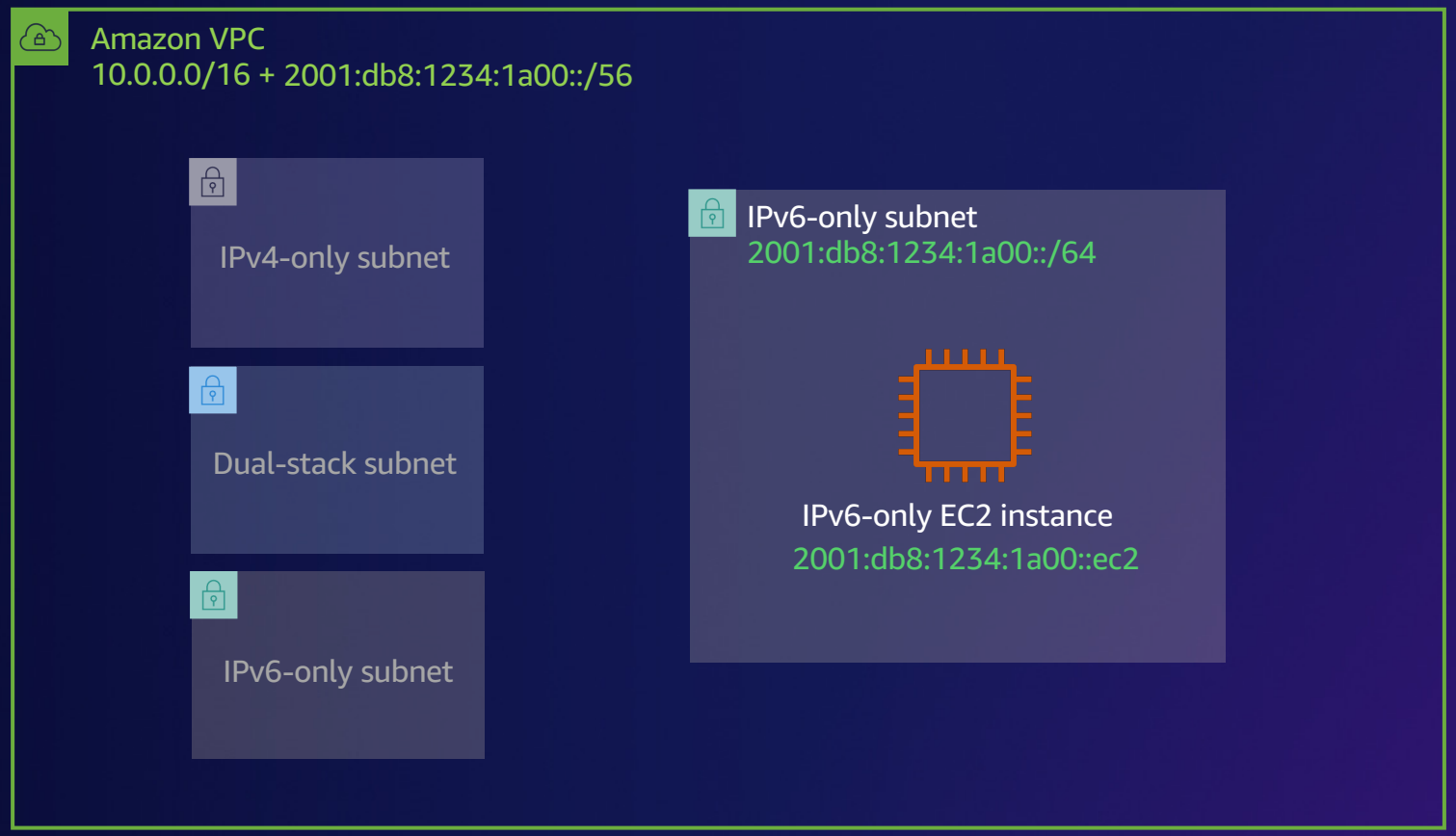


Amazon dual stack VPC

IPV4-ONLY AND DUAL STACK SUBNETS

Amazon dual-stack VPC

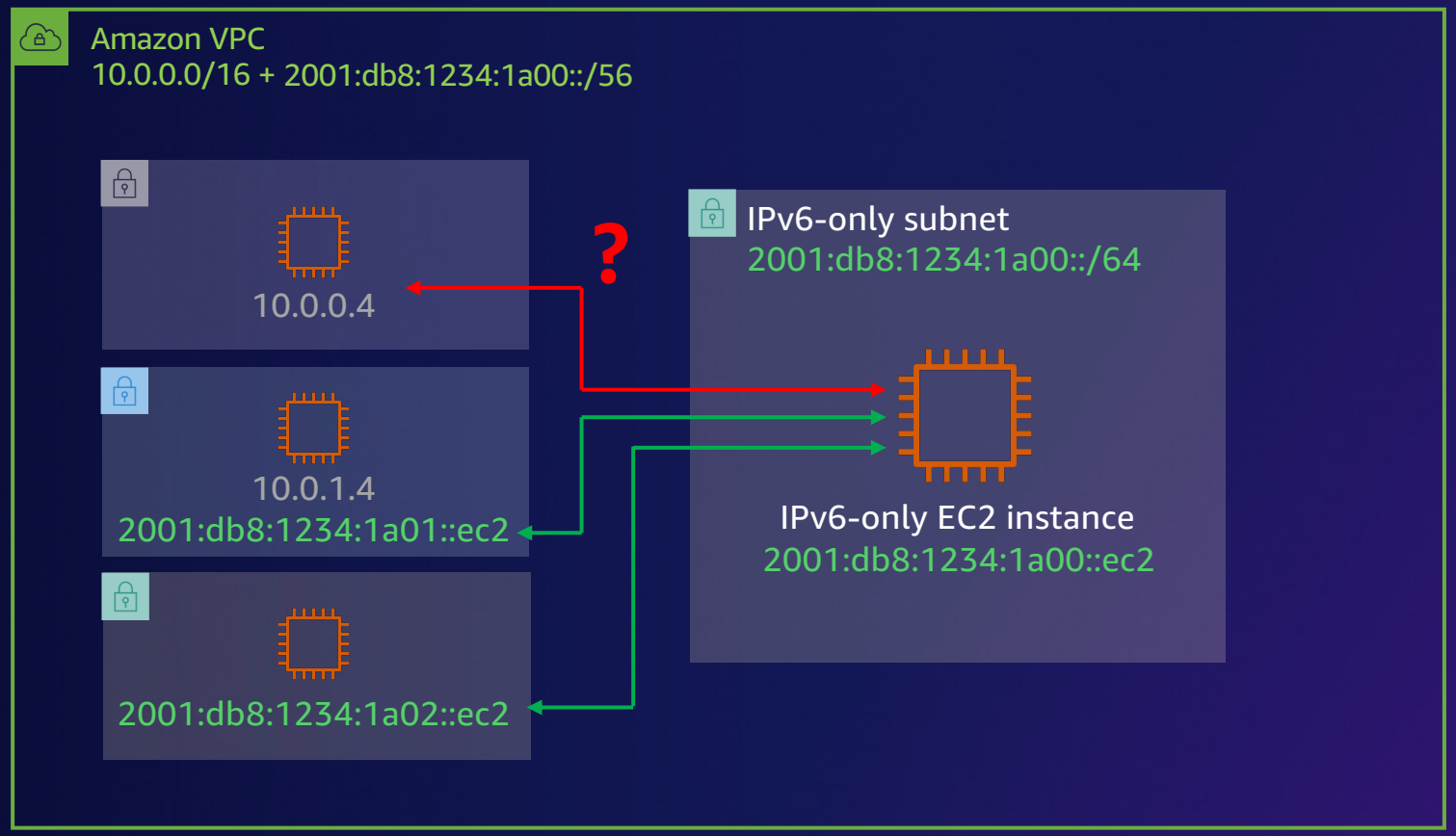
IPV6-ONLY SUBNETS



Traffic flows inside the Amazon VPC

Amazon dual-stack VPC: IPv6 only subnets

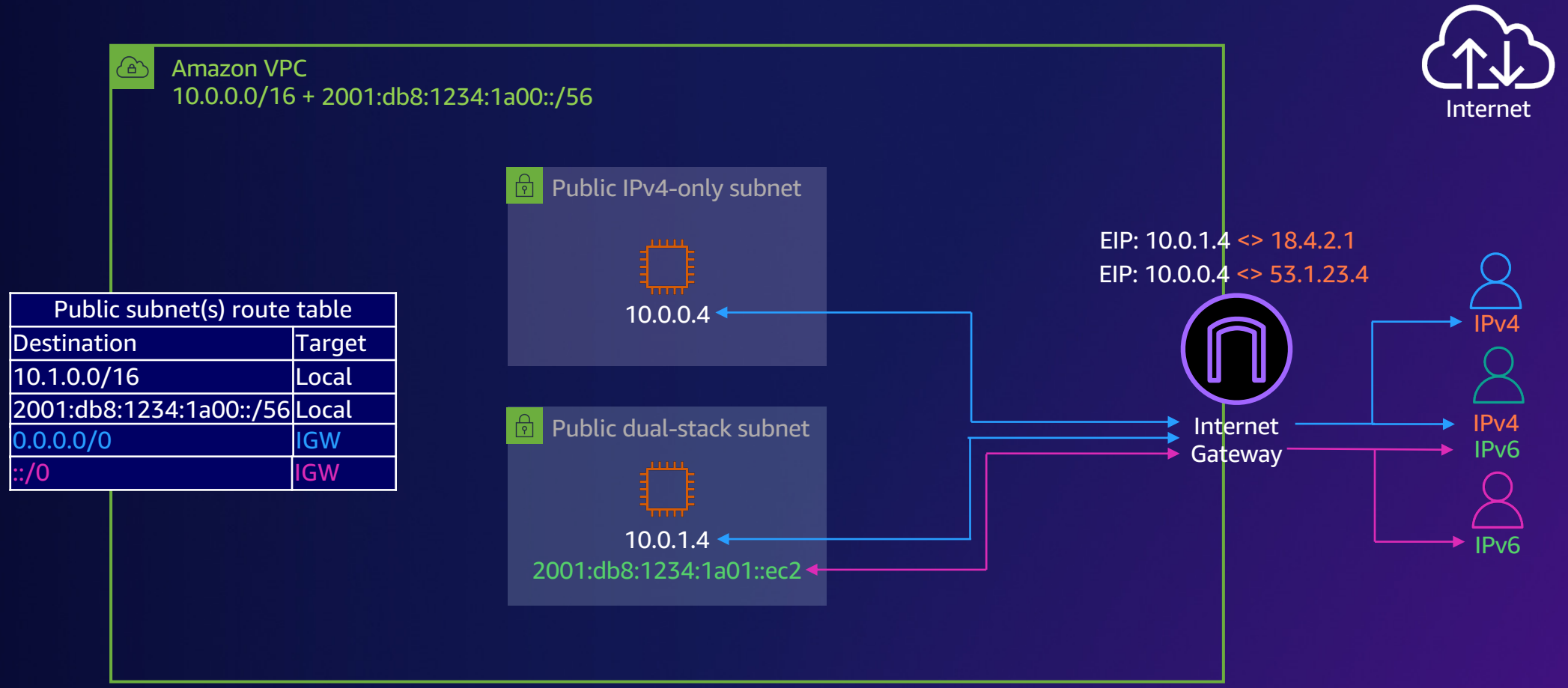
FLOWS



Public subnets internet connectivity

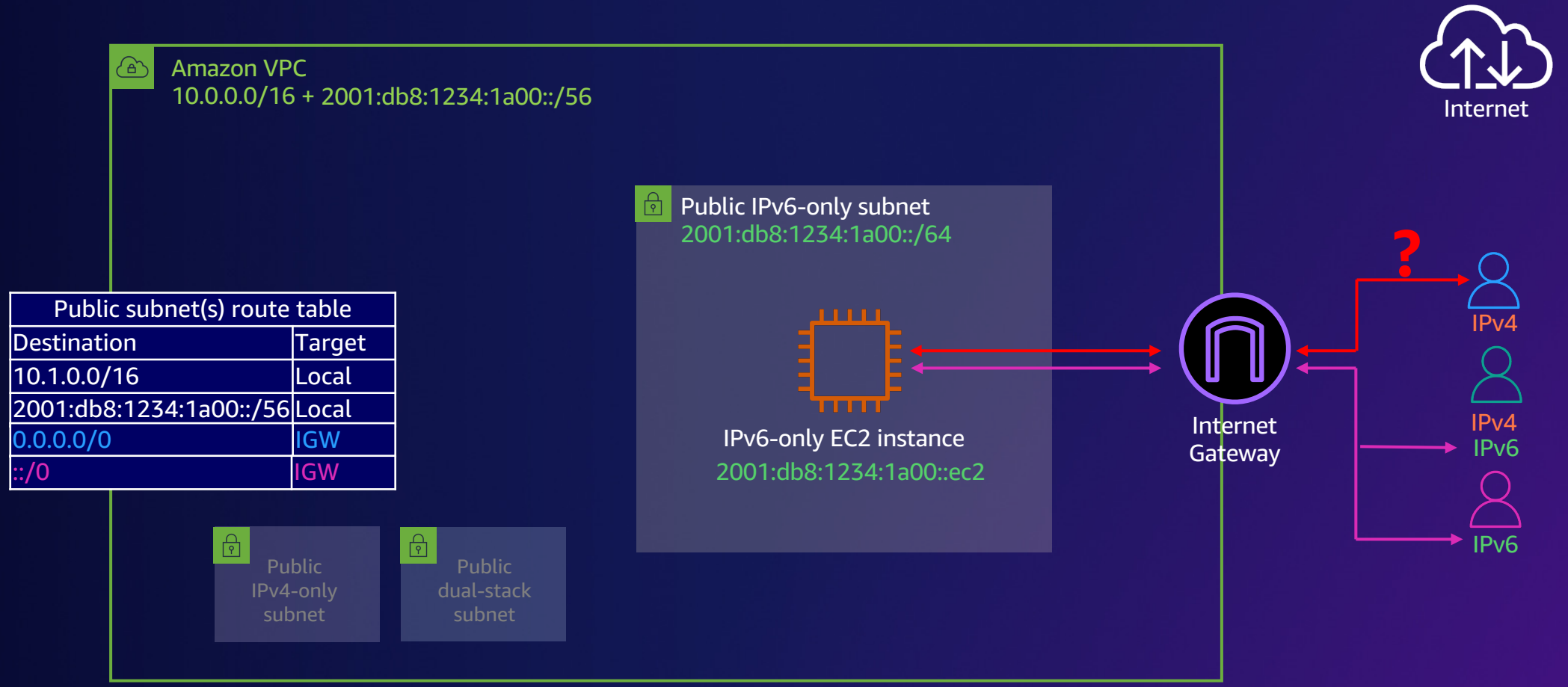
Amazon dual-stack VPC: Internet connectivity

PUBLIC SUBNETS



Amazon dual-stack VPC: Internet connectivity

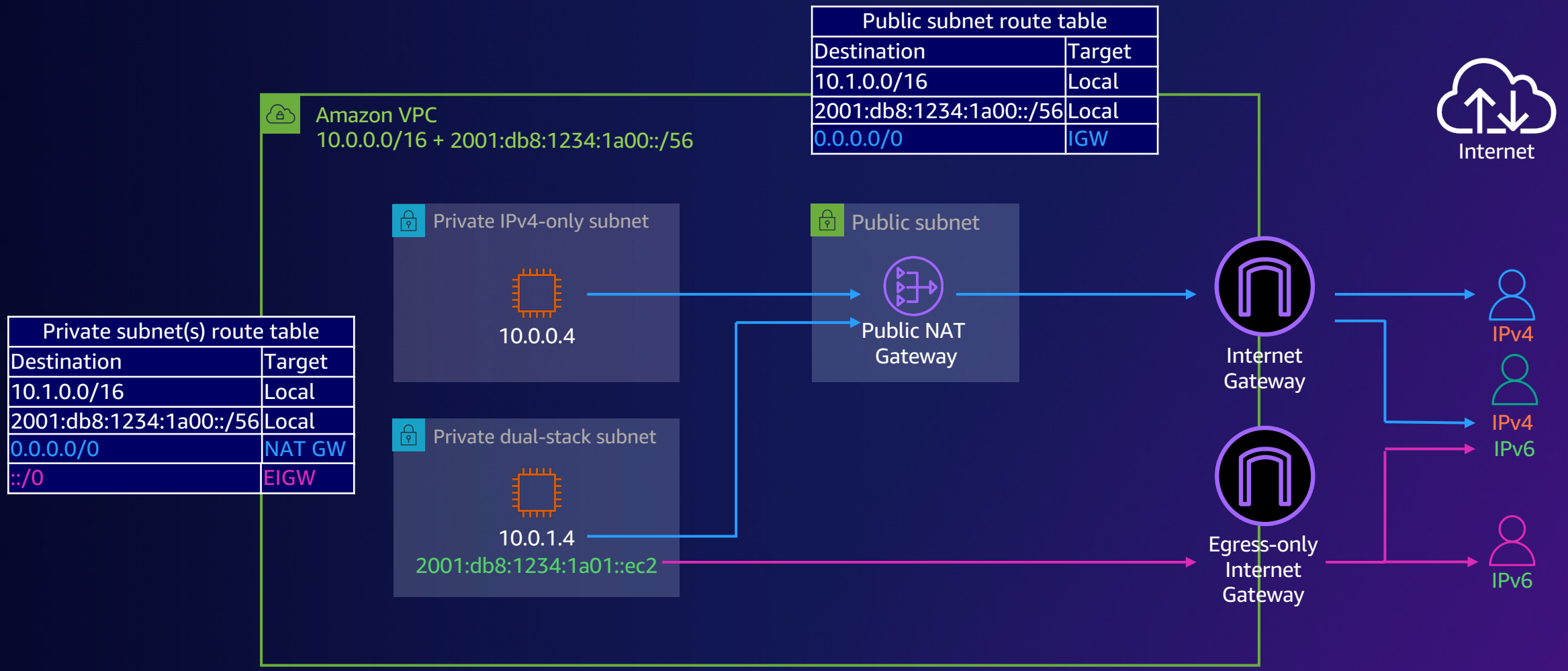
PUBLIC IPV6-ONLY SUBNETS



Private subnets internet connectivity

Amazon dual-stack VPC: Internet connectivity

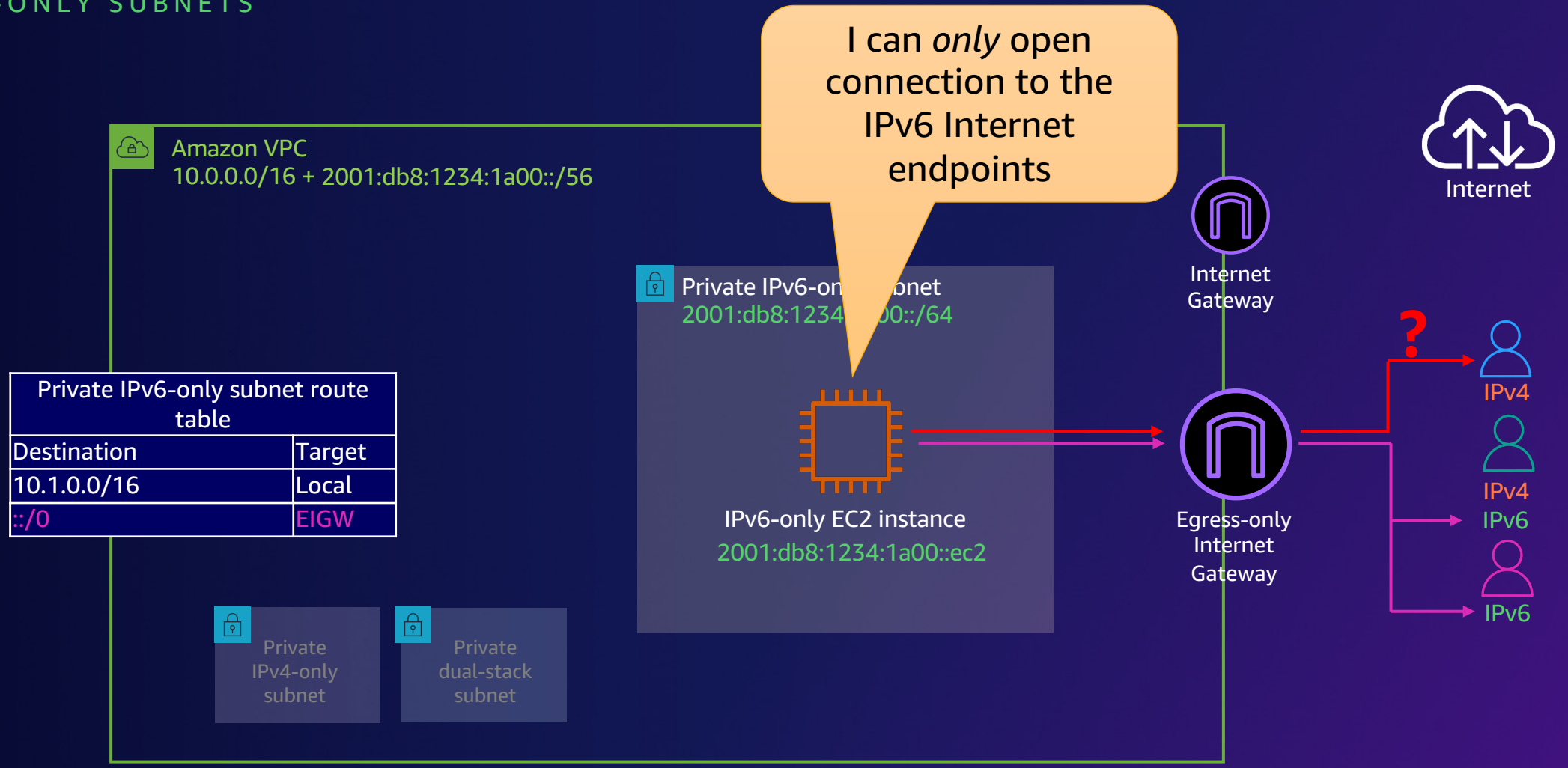
PRIVATE SUBNETS



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

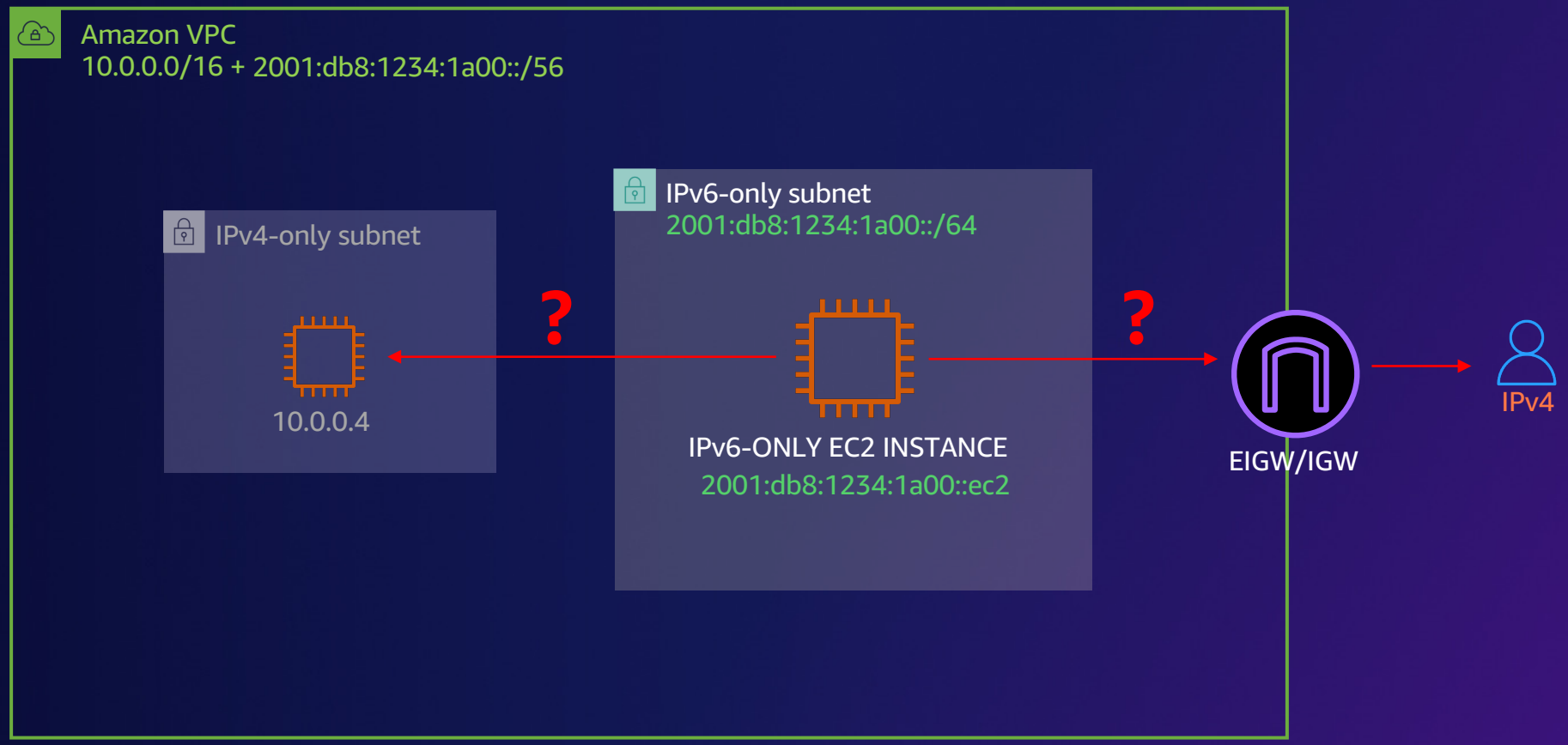
Amazon dual-stack VPC: Internet connectivity

PRIVATE IPV6-ONLY SUBNETS



There's *that* flow we haven't talked about, yet…

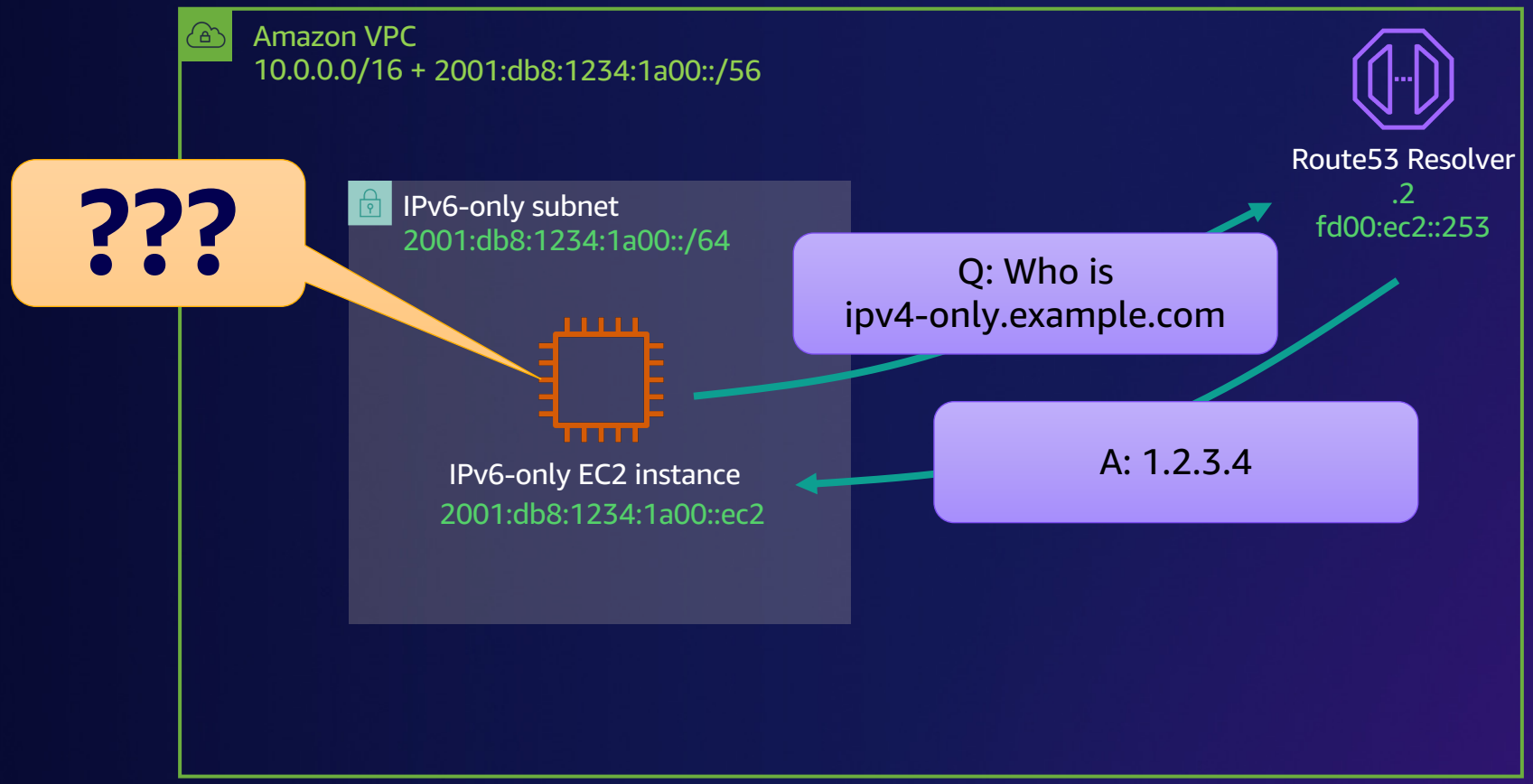
Amazon dual-stack VPC: IPv6 to IPv4



IPv6 to IPv4 and the beauty of NAT

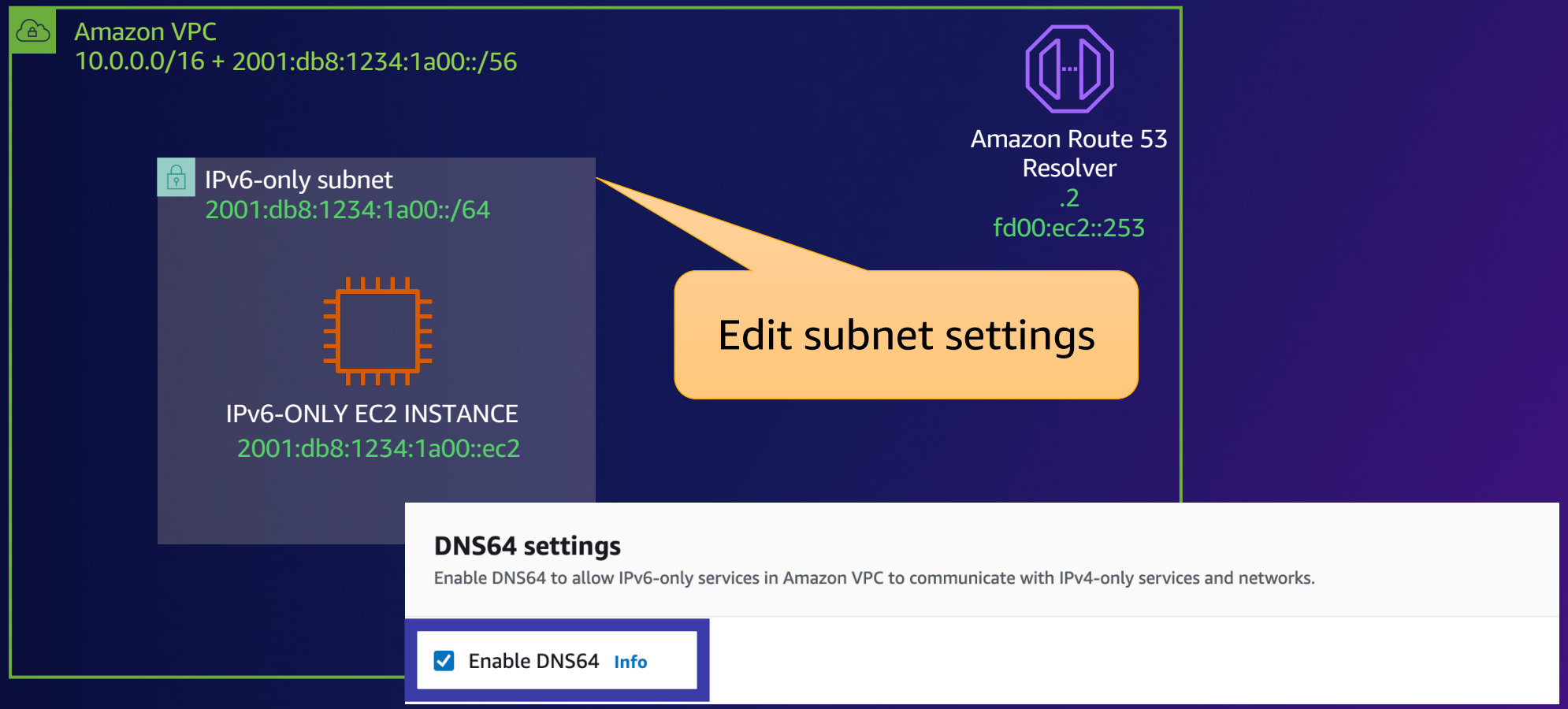
Amazon VPC DNS

BEFORE

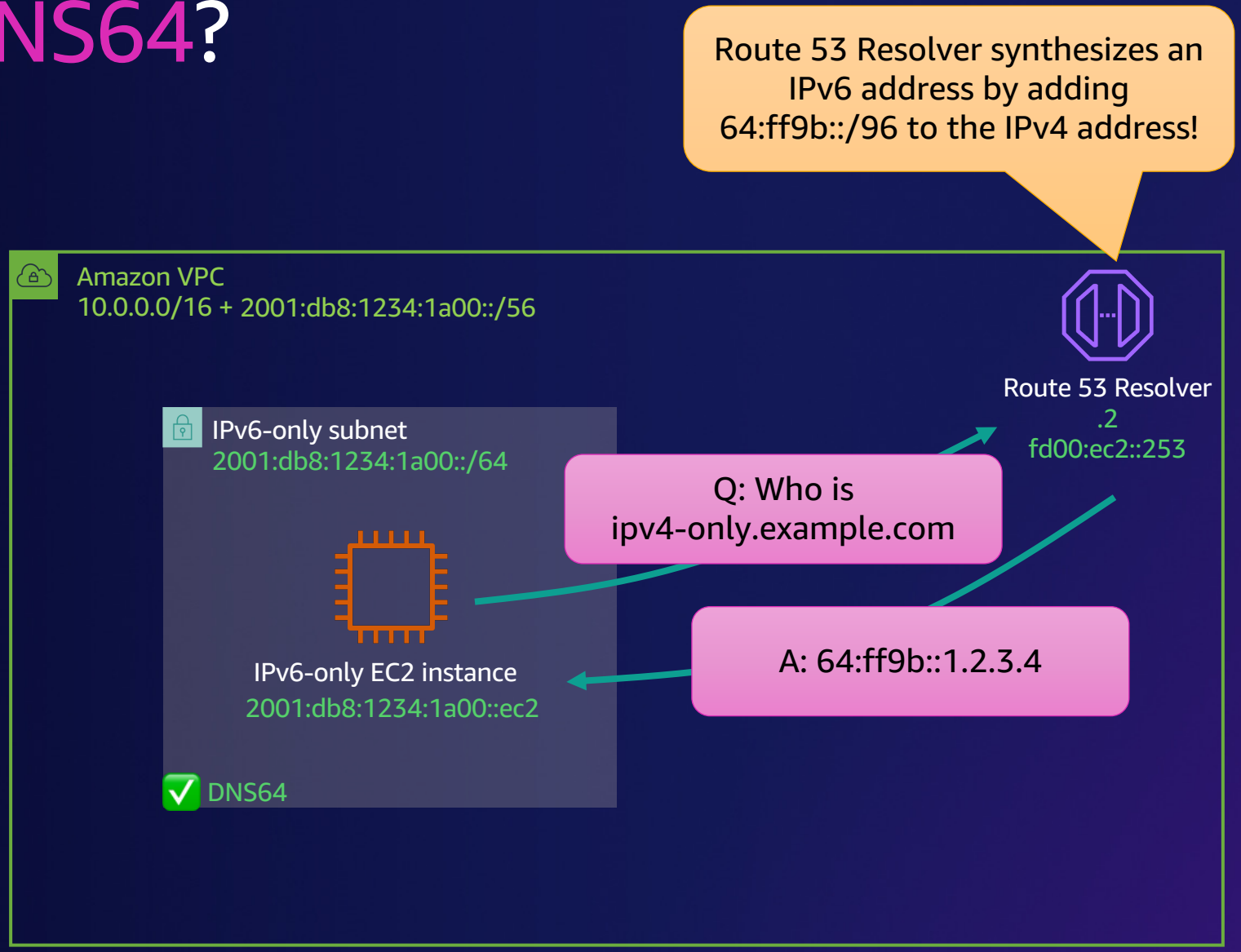


DNS64

What is DNS64?

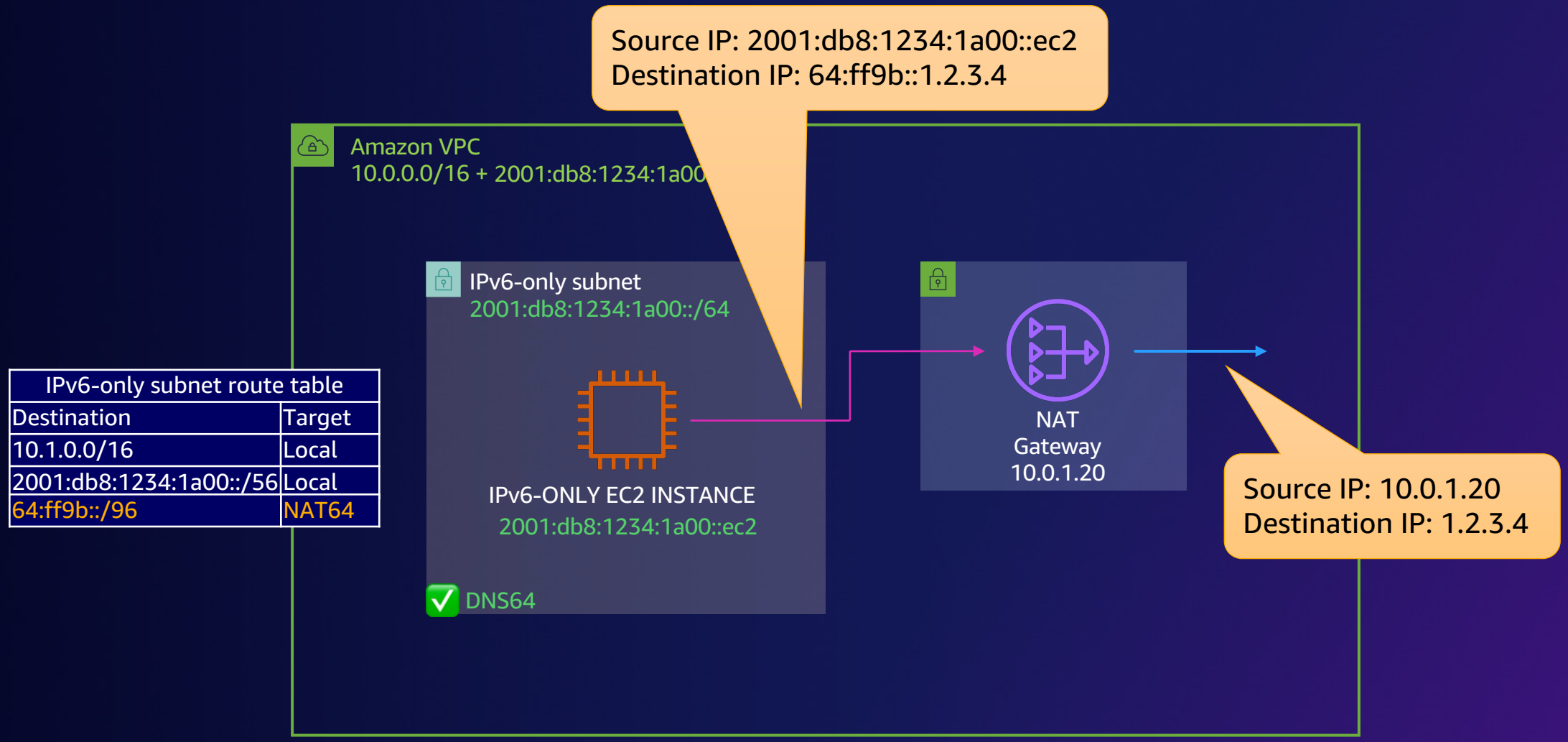


What is DNS64?



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

How does NAT64 work?

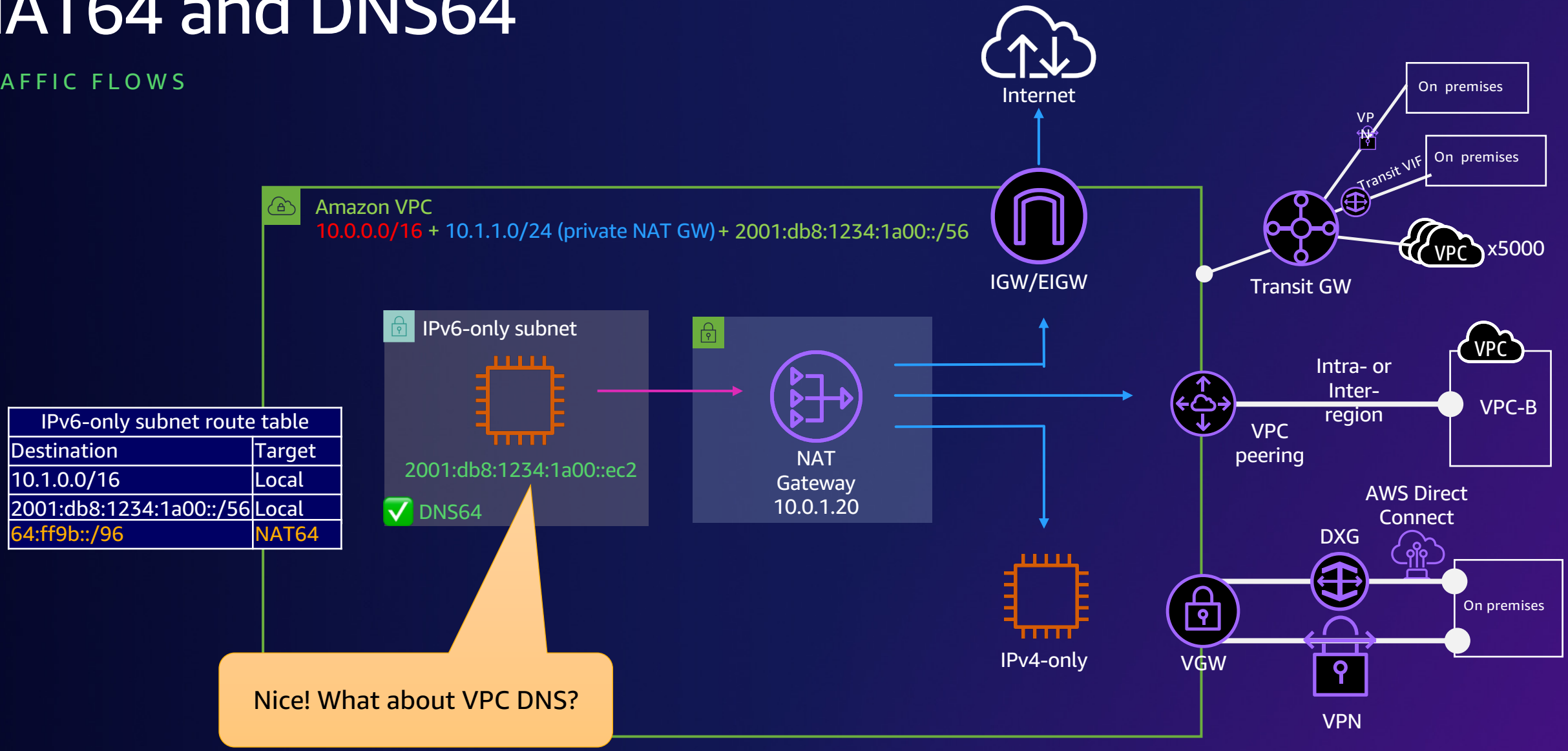


IPv6-only subnet route table	
Destination	Target
10.1.0.0/16	Local
2001:db8:1234:1a00::/56	Local
64:ff9b::/96	NAT64

NAT64 is automatically available on your existing NAT gateways or on any new NAT gateways you create

NAT64 and DNS64

TRAFFIC FLOWS

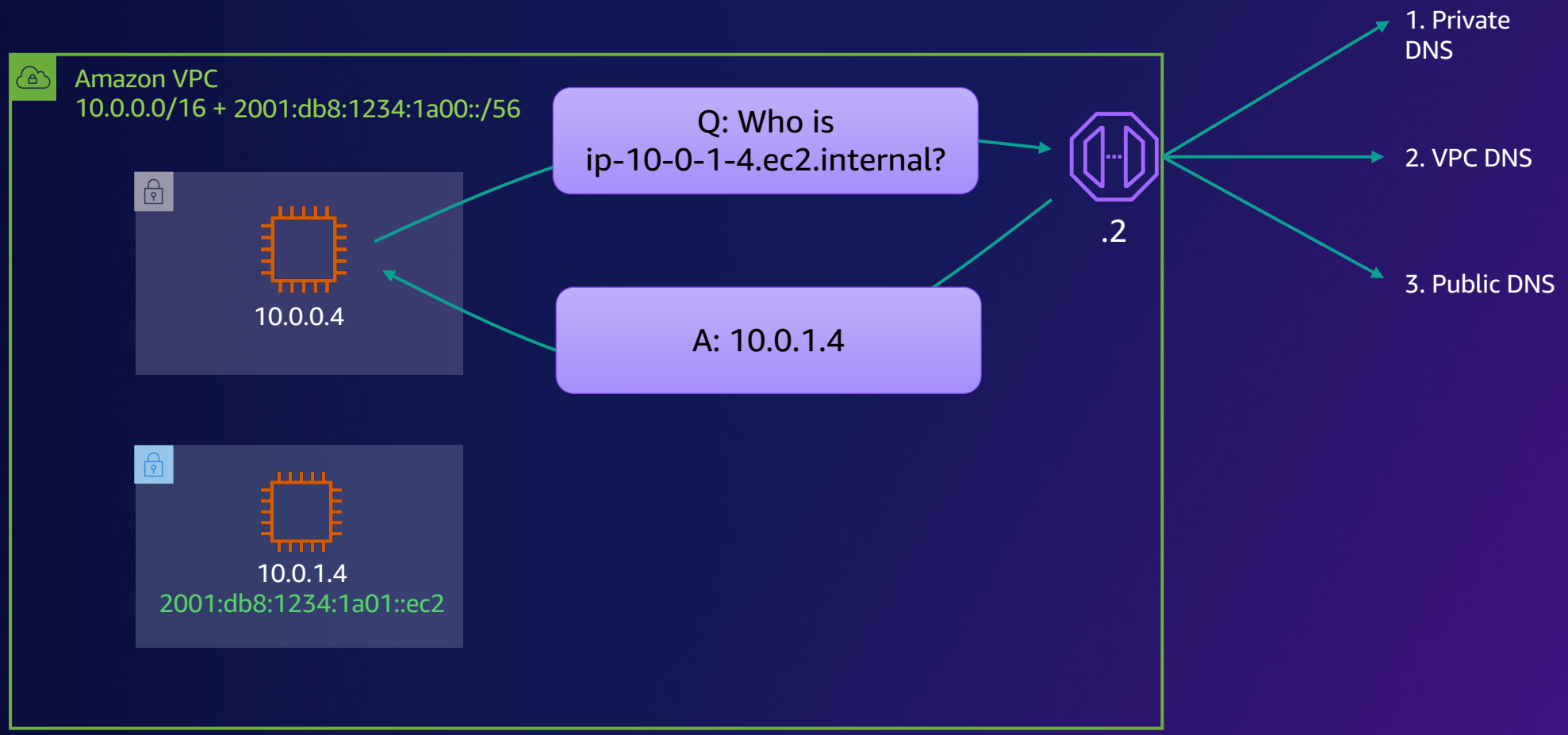


Another throwback:

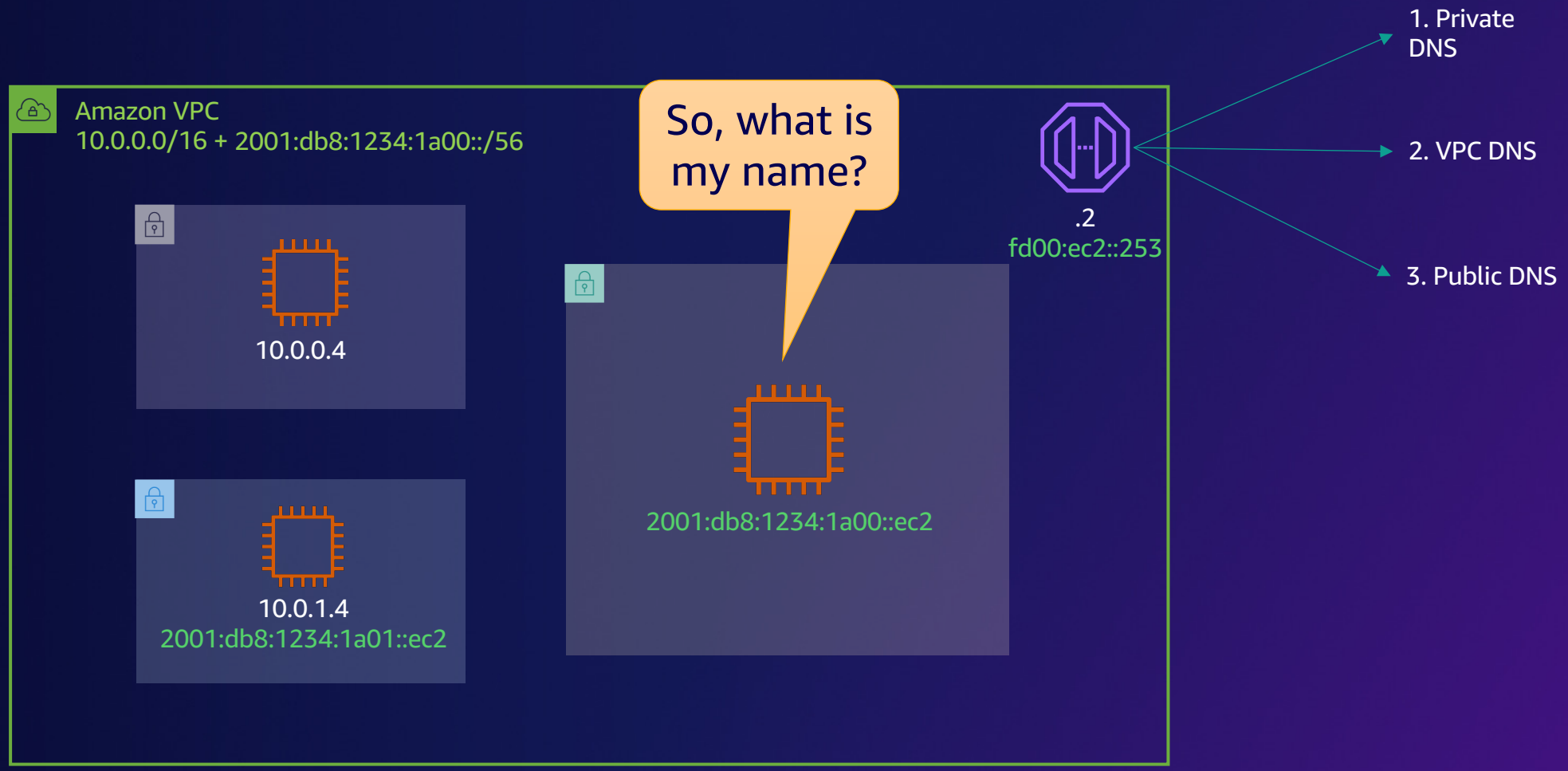
Remember ip-10-1-1-2.ec.internal?

Amazon EC2 instance naming

IPV4-BASED NAMING (IPBN)

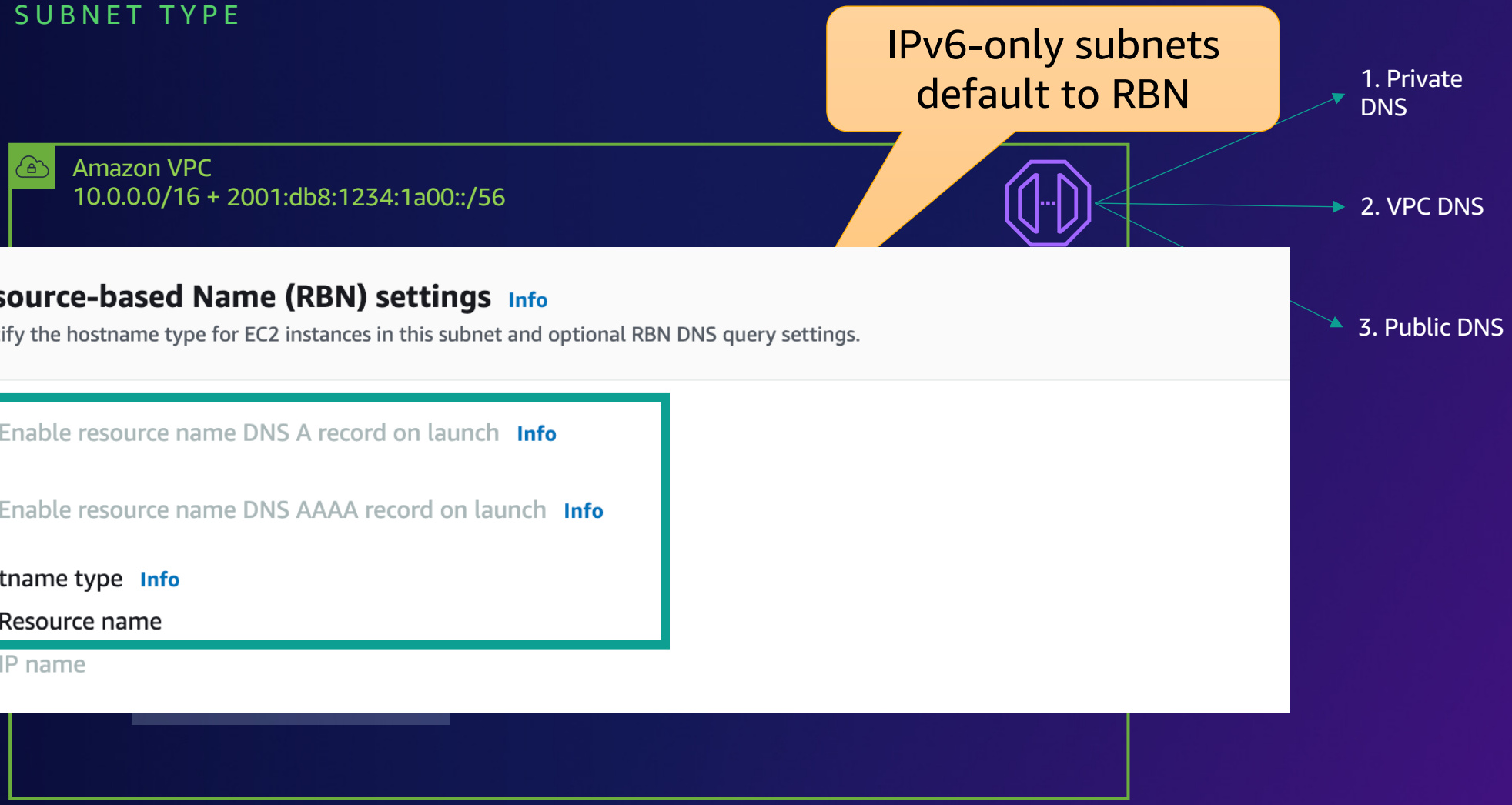


Amazon EC2 instance naming



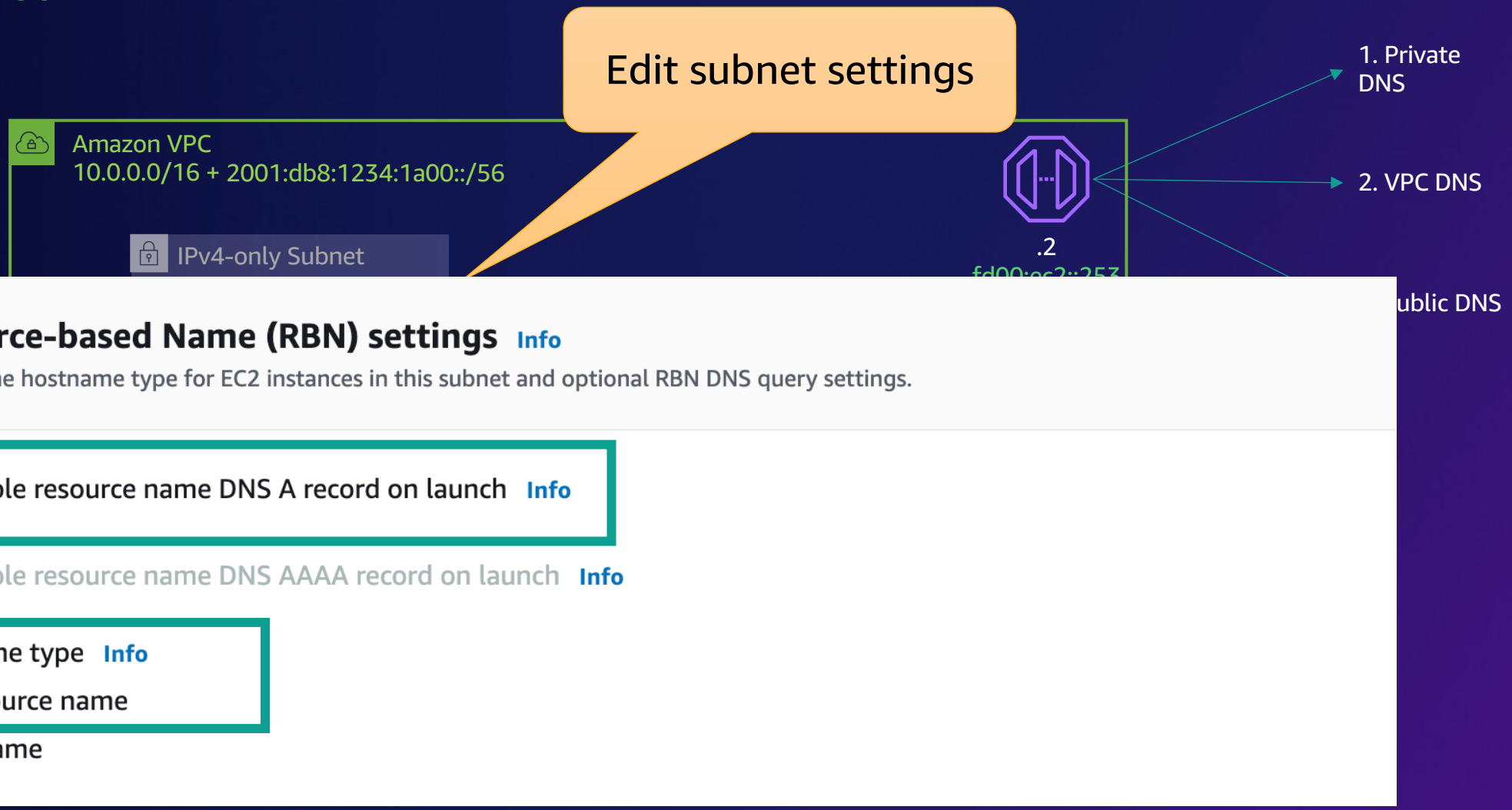
Amazon EC2: Resource-based naming (RBN)

SETTINGS FOR EACH SUBNET TYPE



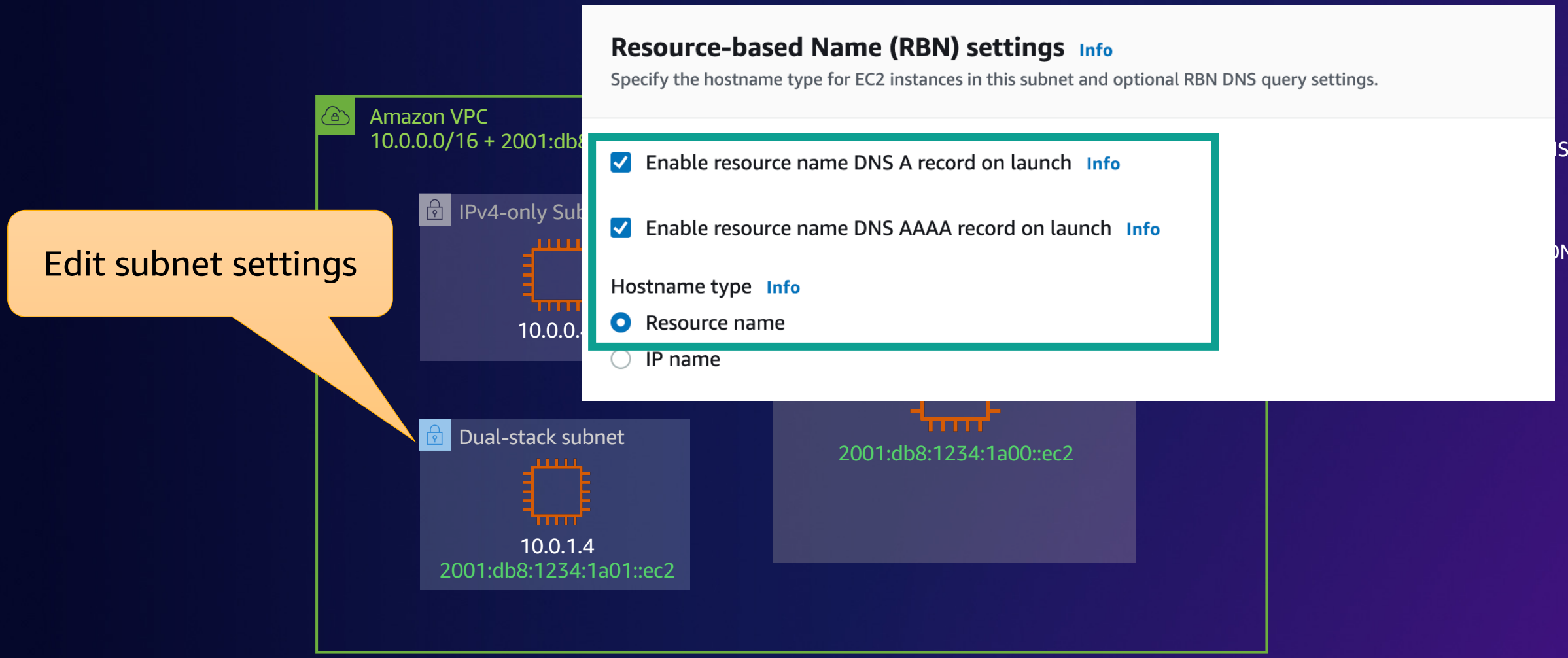
Amazon EC2: Resource-based naming

SETTINGS FOR EACH SUBNET TYPE

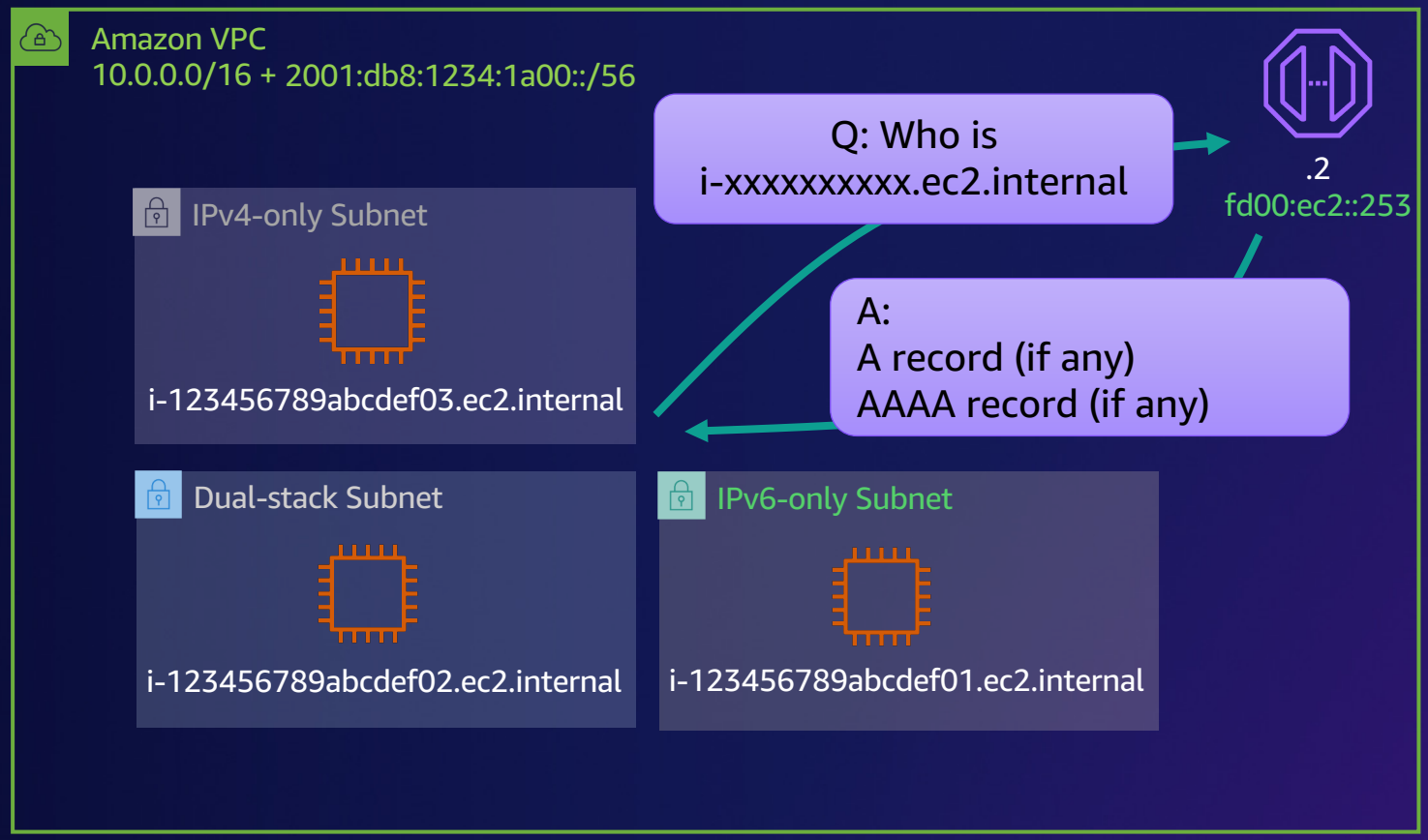


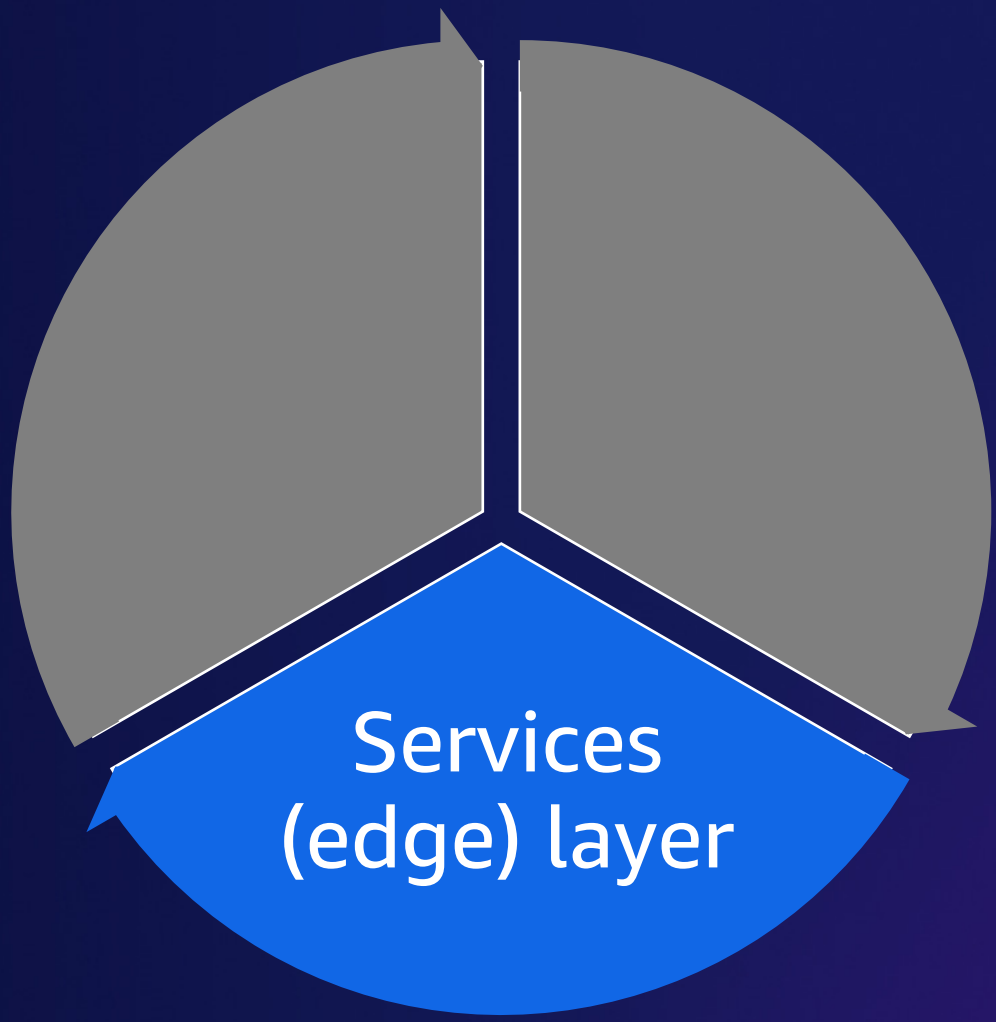
Amazon EC2: Resource-based naming

SETTINGS FOR EACH SUBNET TYPE

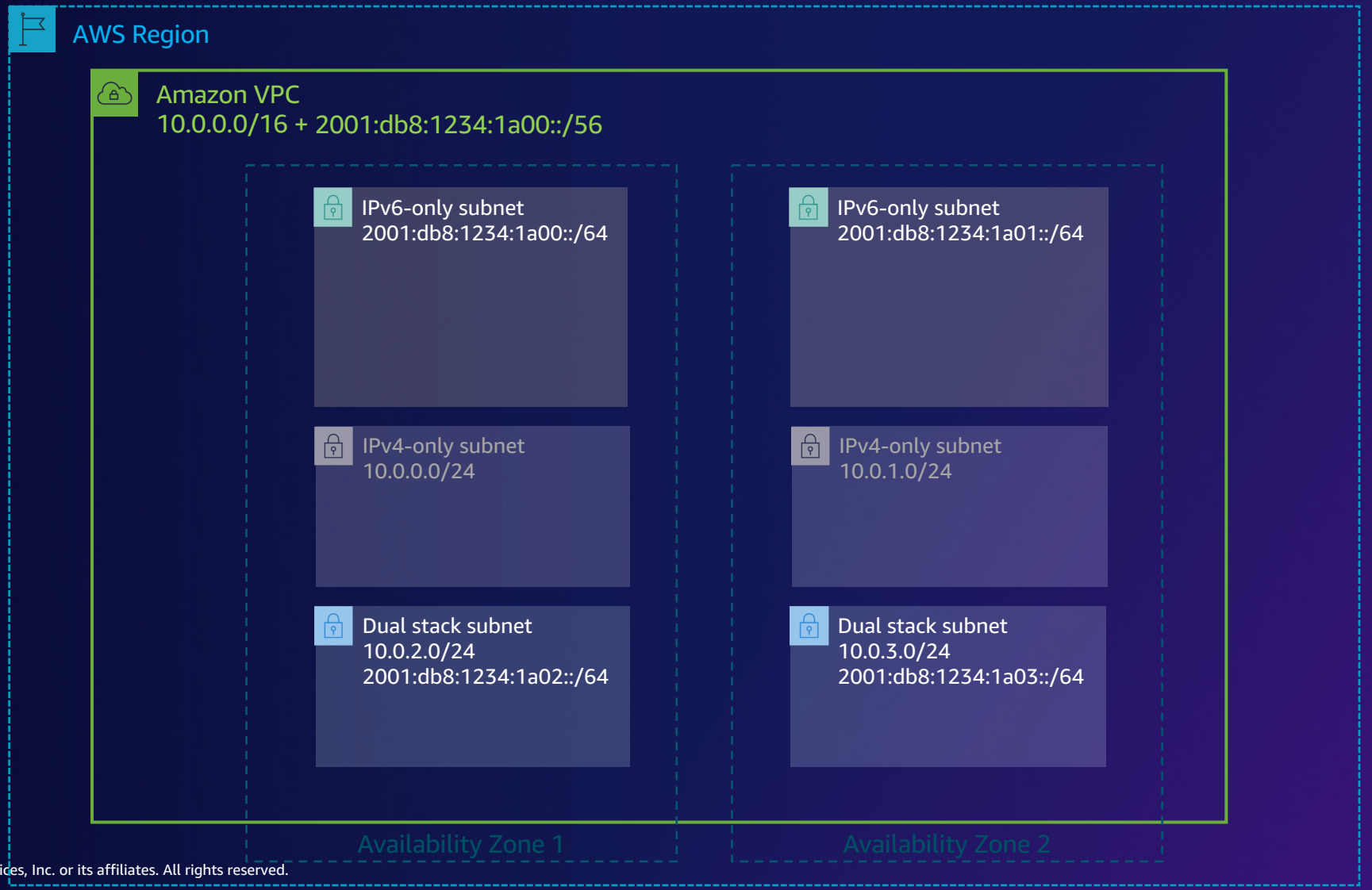


Amazon EC2: Resource-based naming



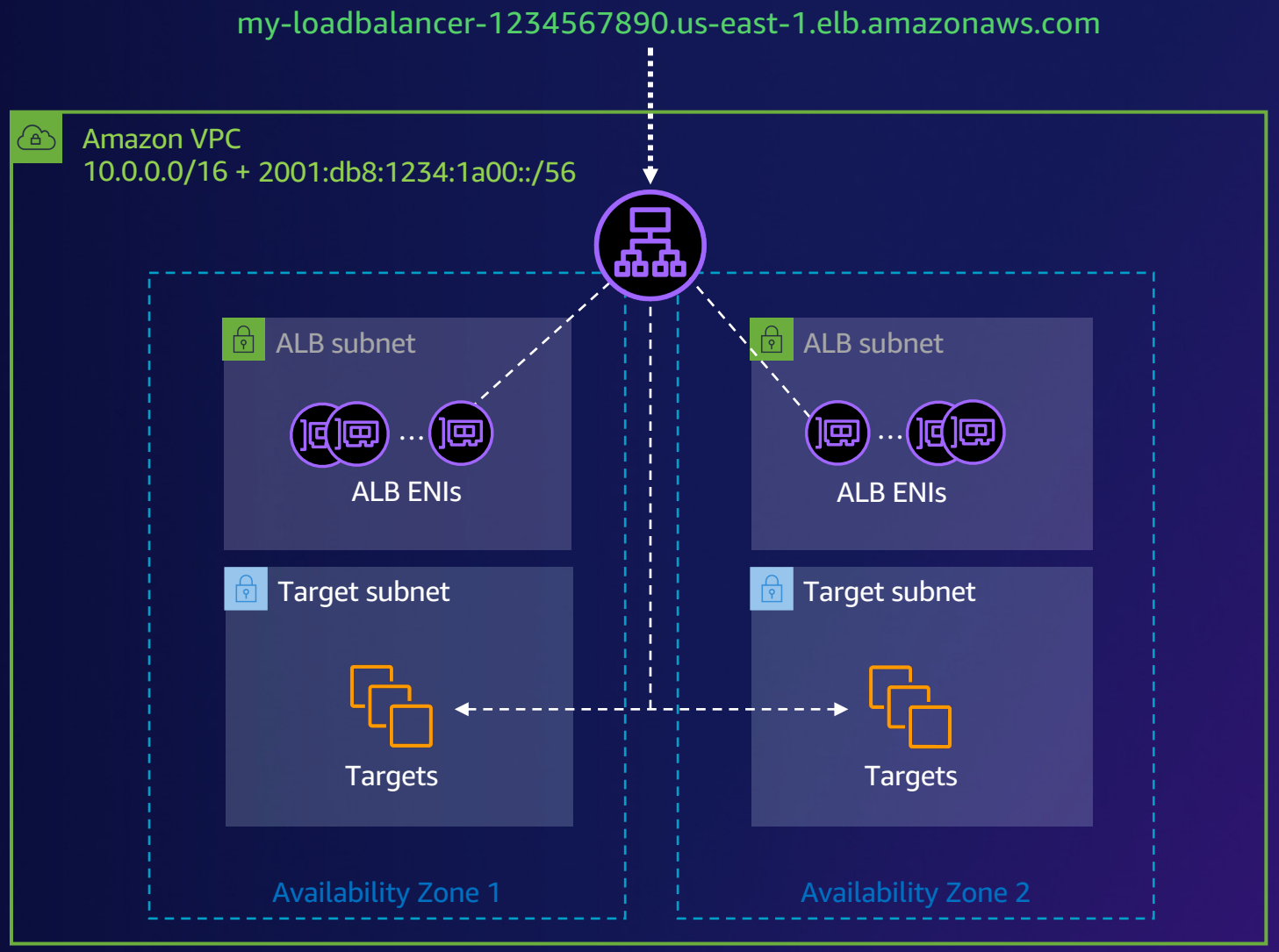


Starting from the dual-stack VPC



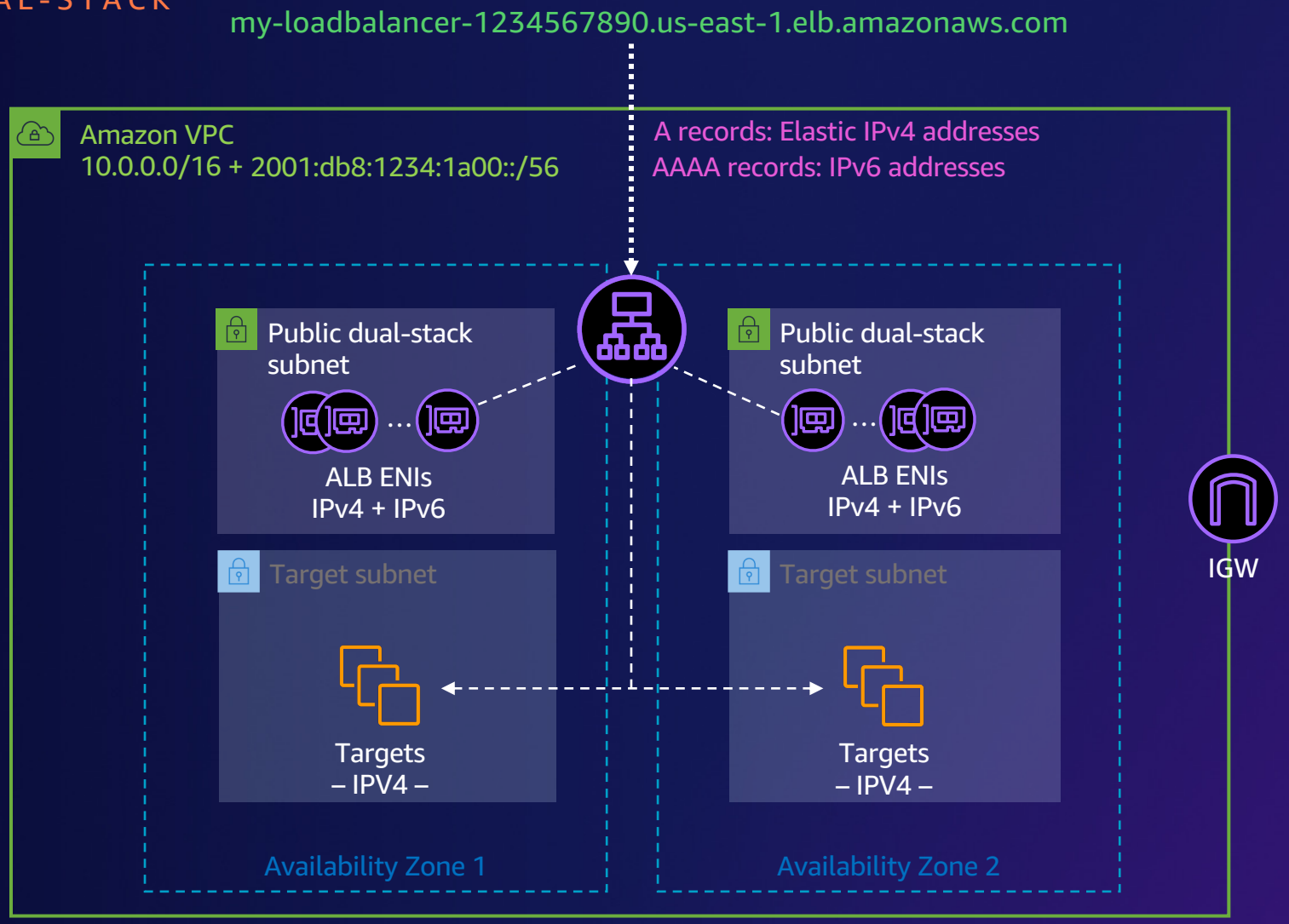
Application Load Balancer (ALB)

Application Load Balancer: Deployment



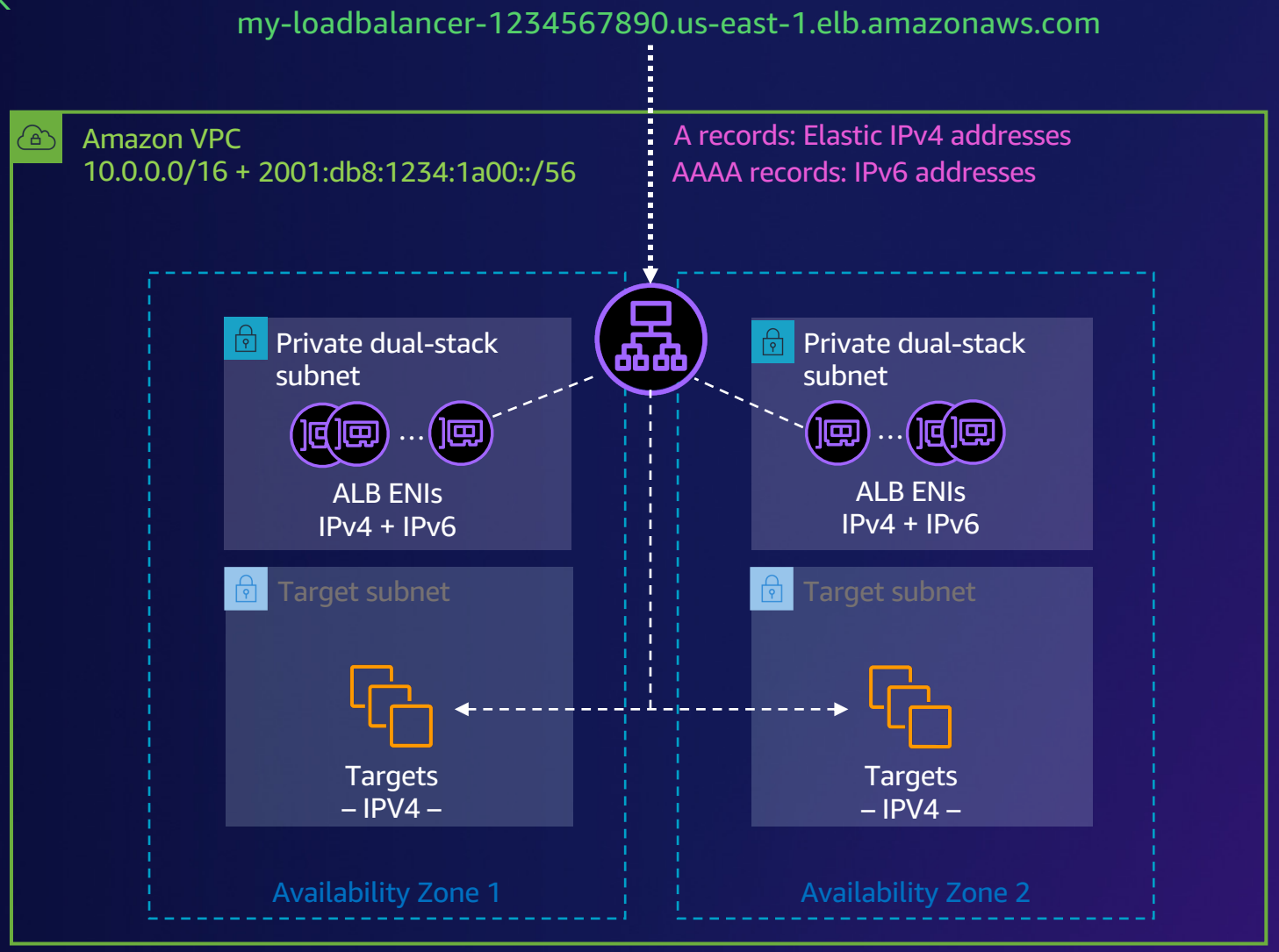
Application Load Balancer: Dual-stack support

INTERNET-FACING DUAL-STACK



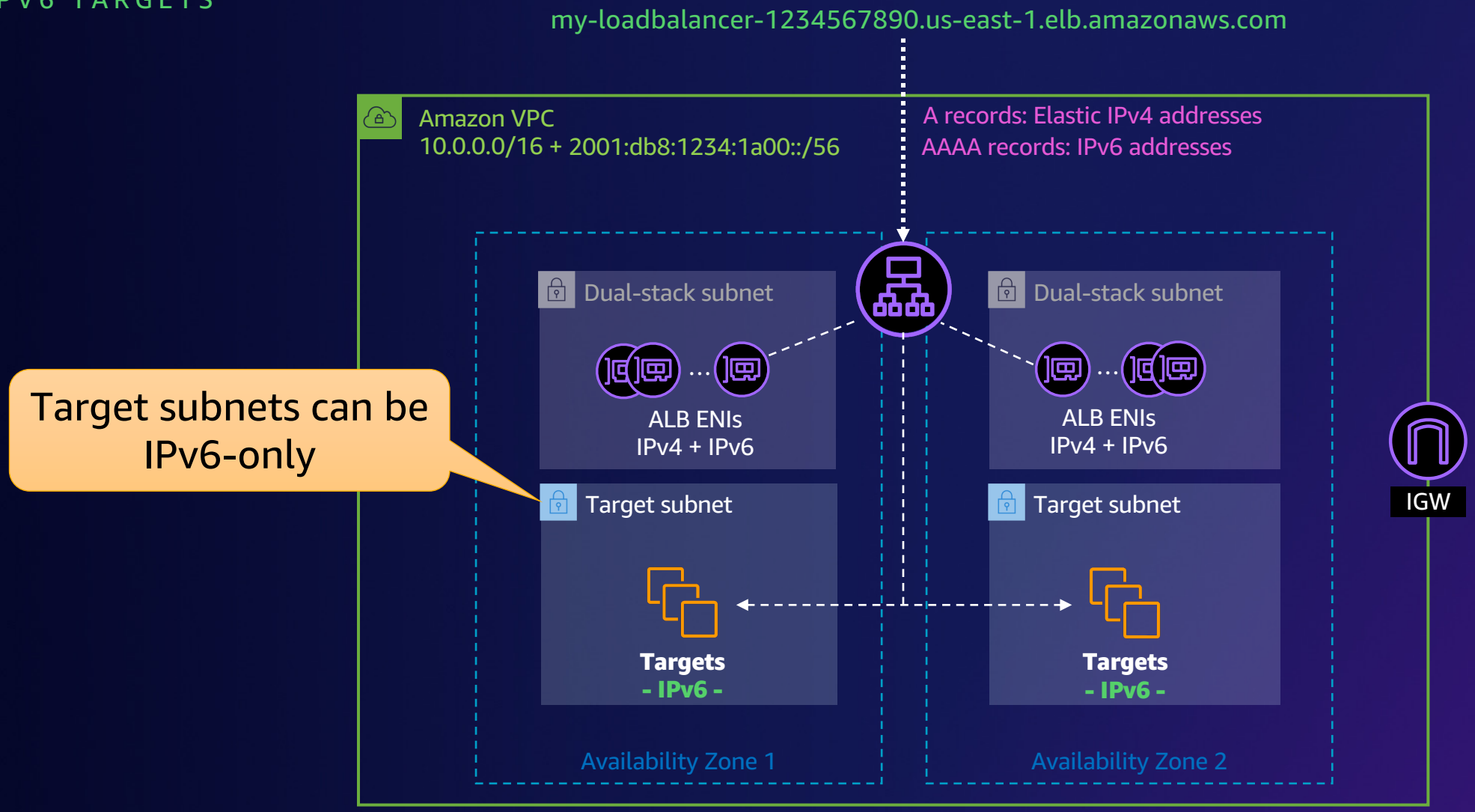
Application Load Balancer: Dual-stack support

INTERNAL DUAL STACK



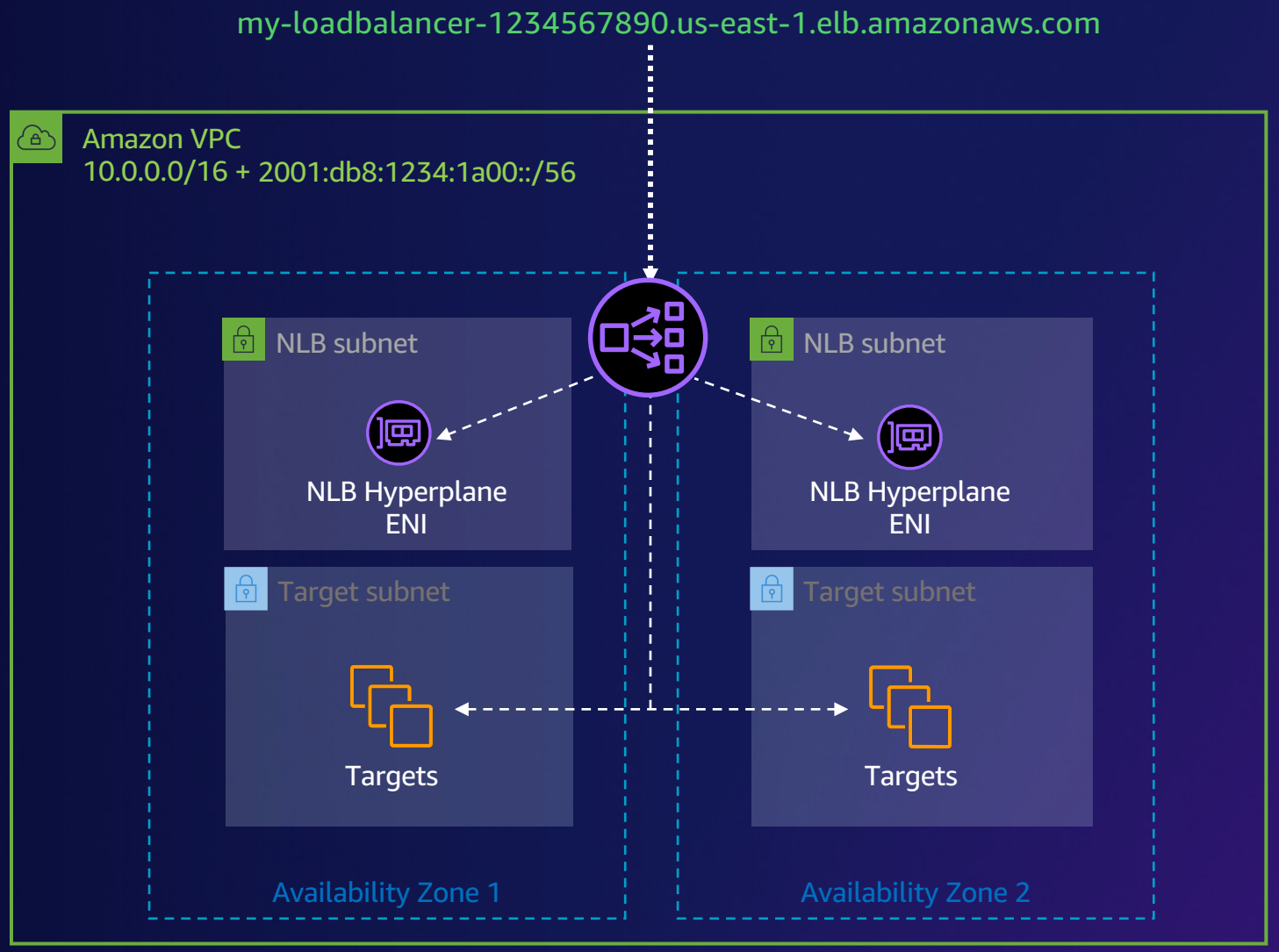
Application Load Balancer: End-to-end IPv6

IPV6 TARGETS



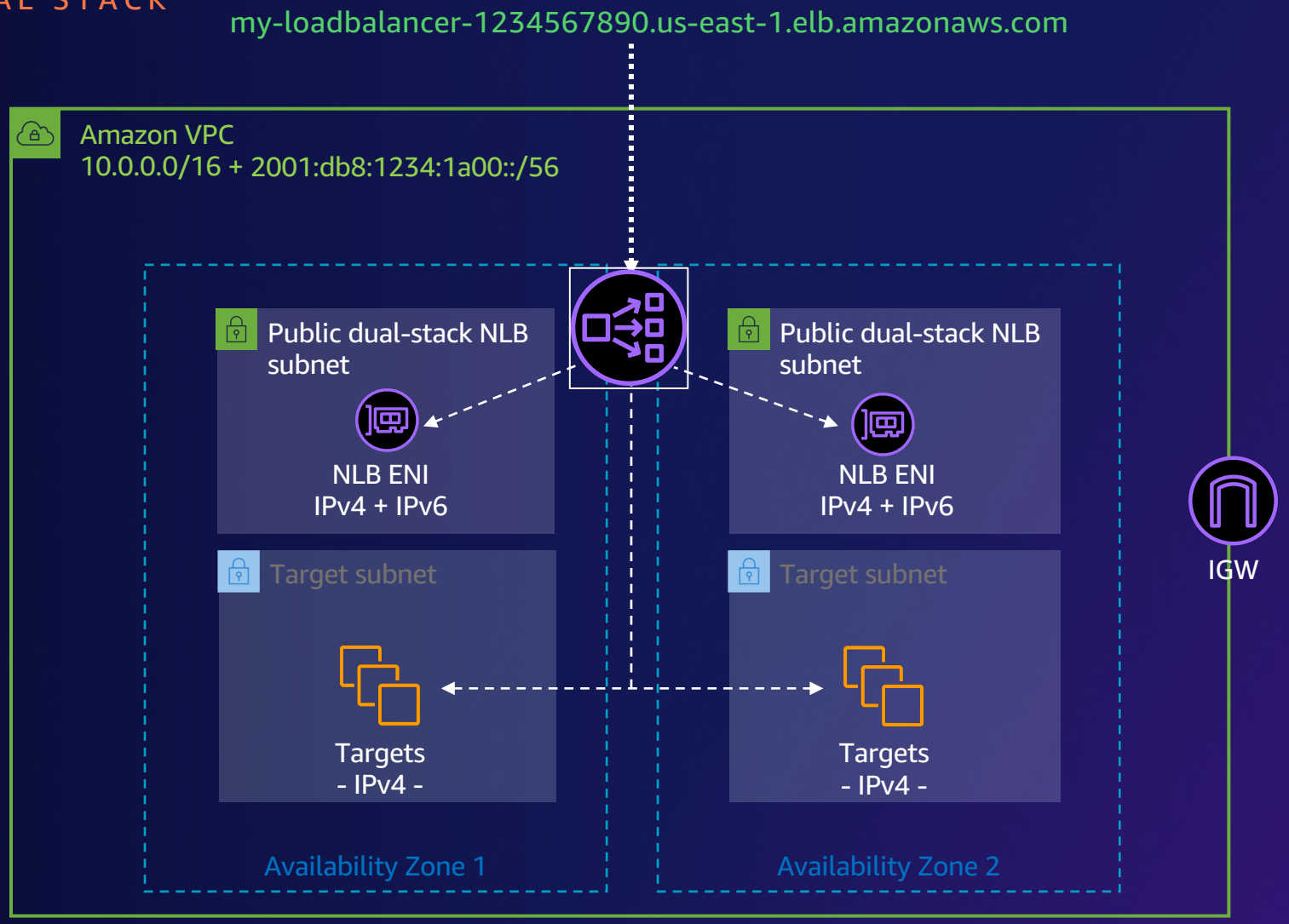
Network Load Balancer (NLB)

Network Load Balancer: Deployment



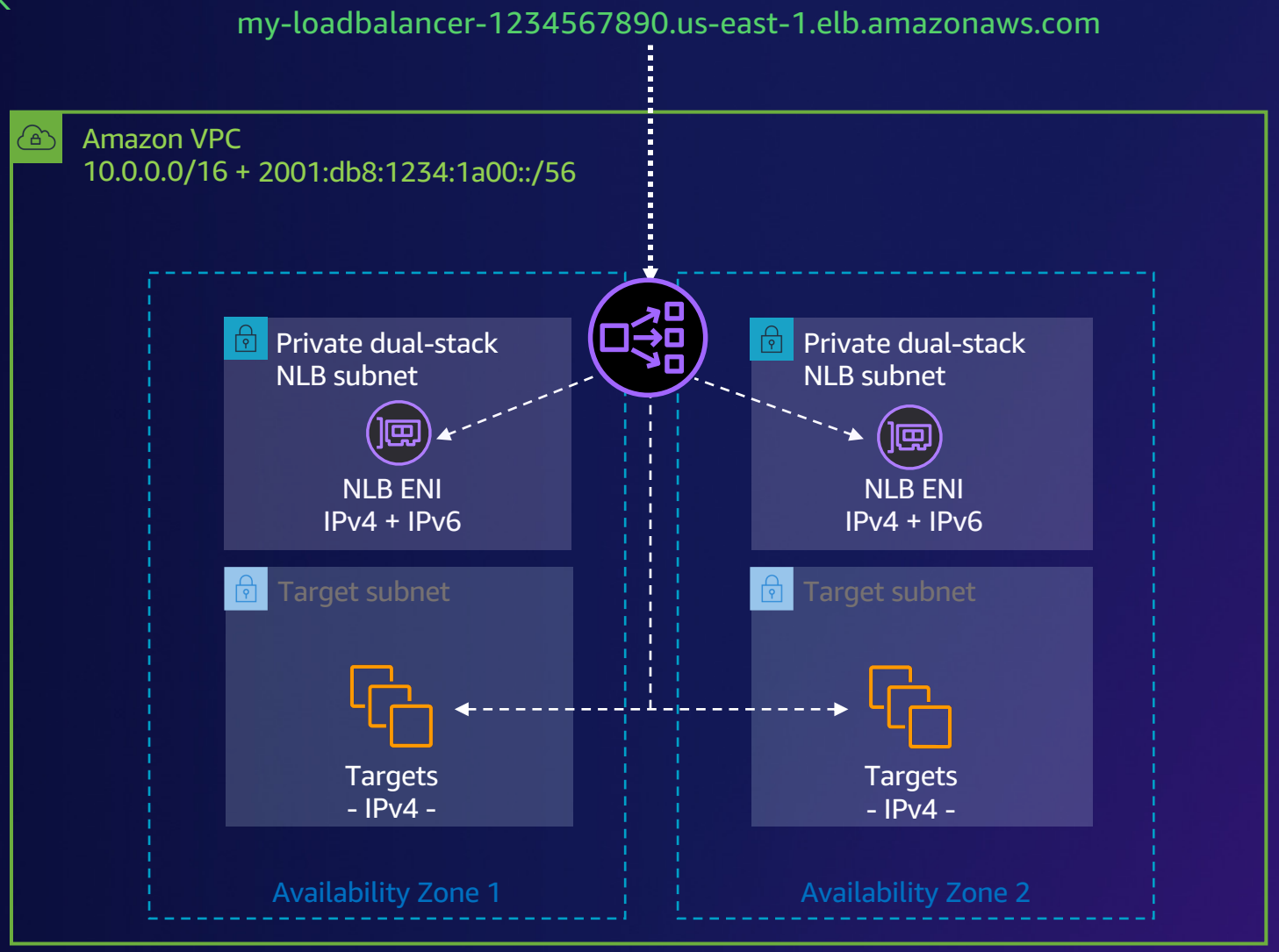
Network Load Balancer: Dual-stack support

INTERNET-FACING DUAL STACK



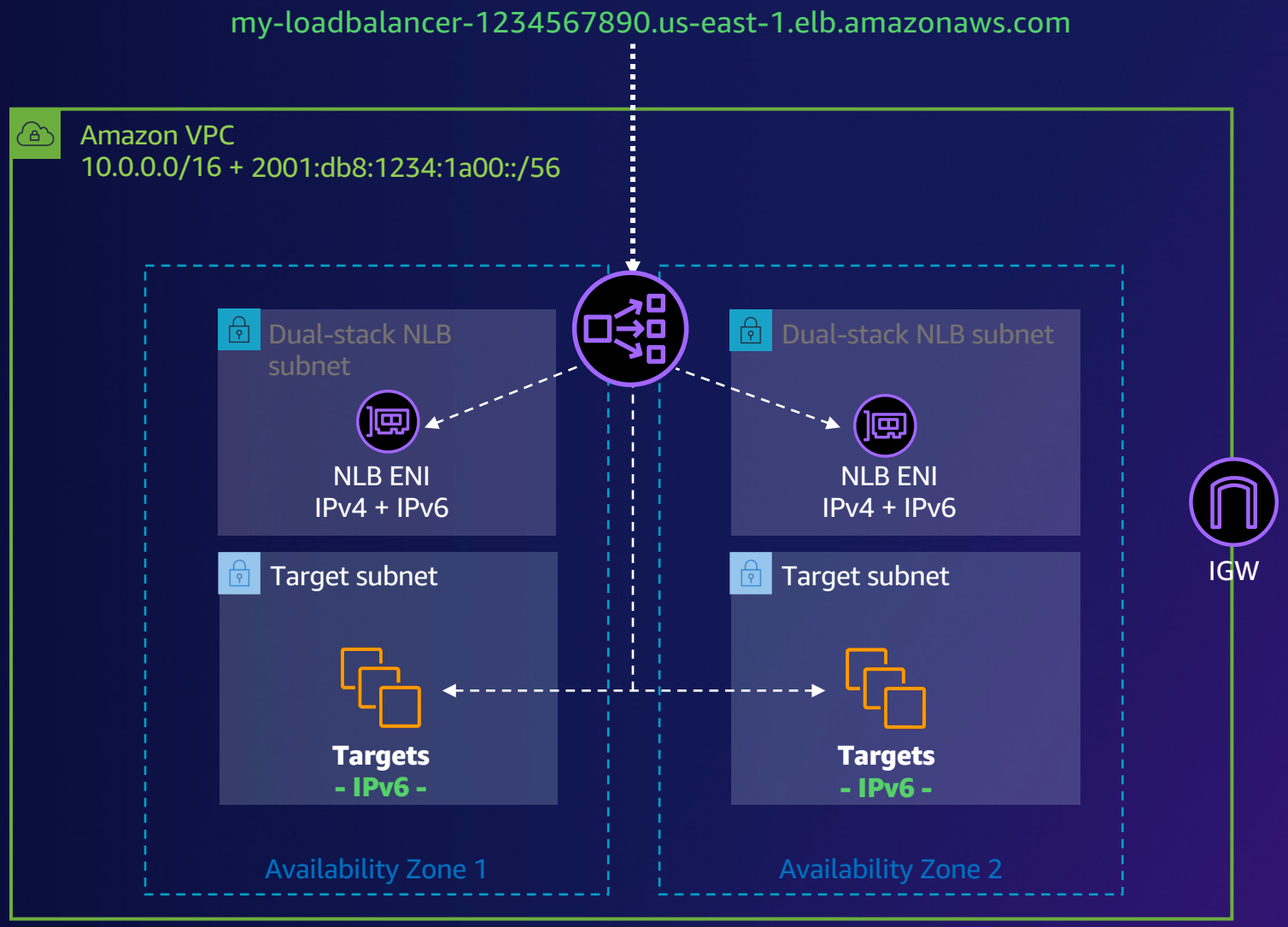
Network Load Balancer: Dual-stack support

INTERNAL DUAL STACK

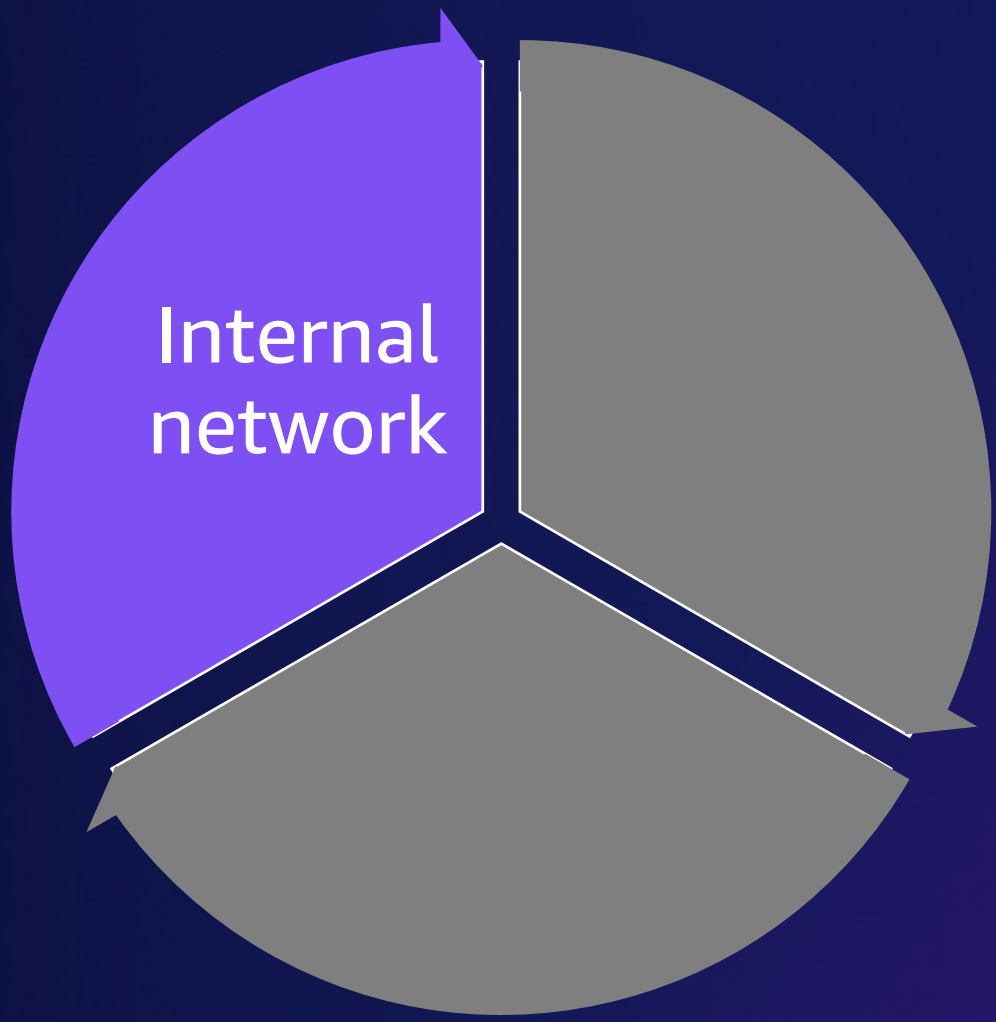


Network Load Balancer: End-to-end IPv6

IPV6 TARGETS

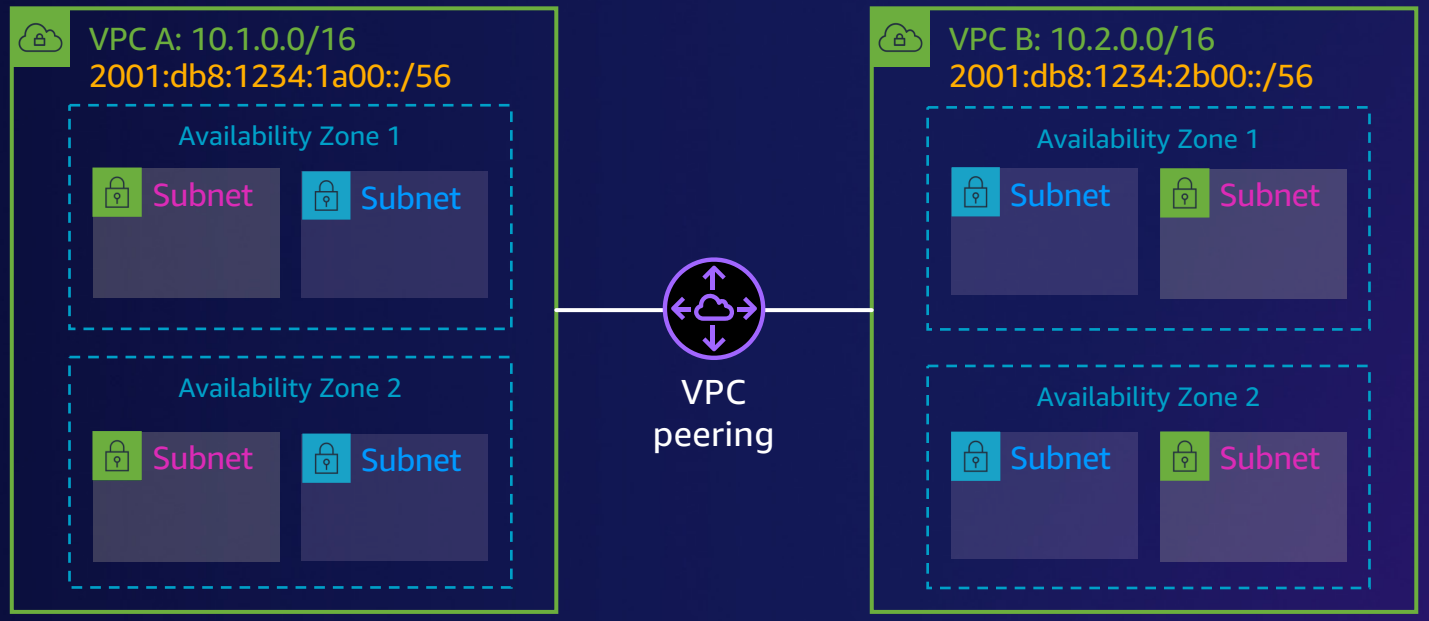


For both ALB and NLB, IPv6 targets must be IP-type, in your VPC or in a peered VPC



Dual stack VPC-to-VPC connectivity

VPC PEERING



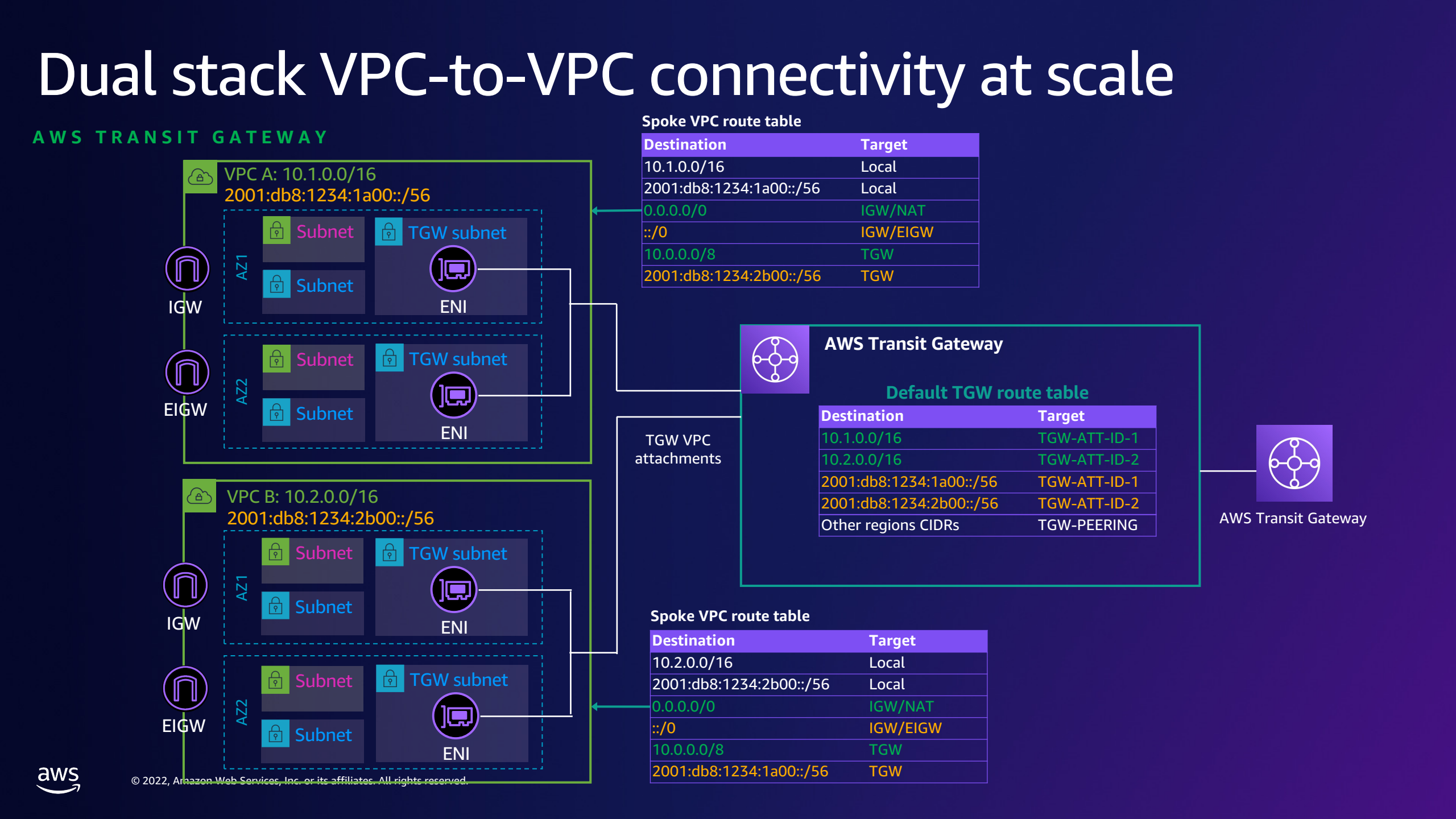
VPC A route table

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

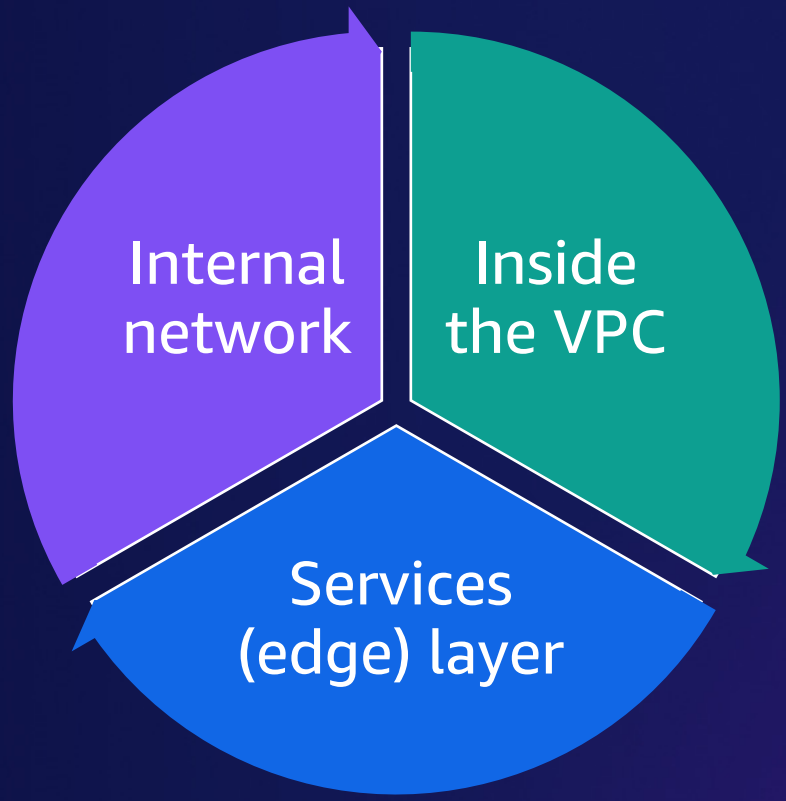
VPC B route table

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

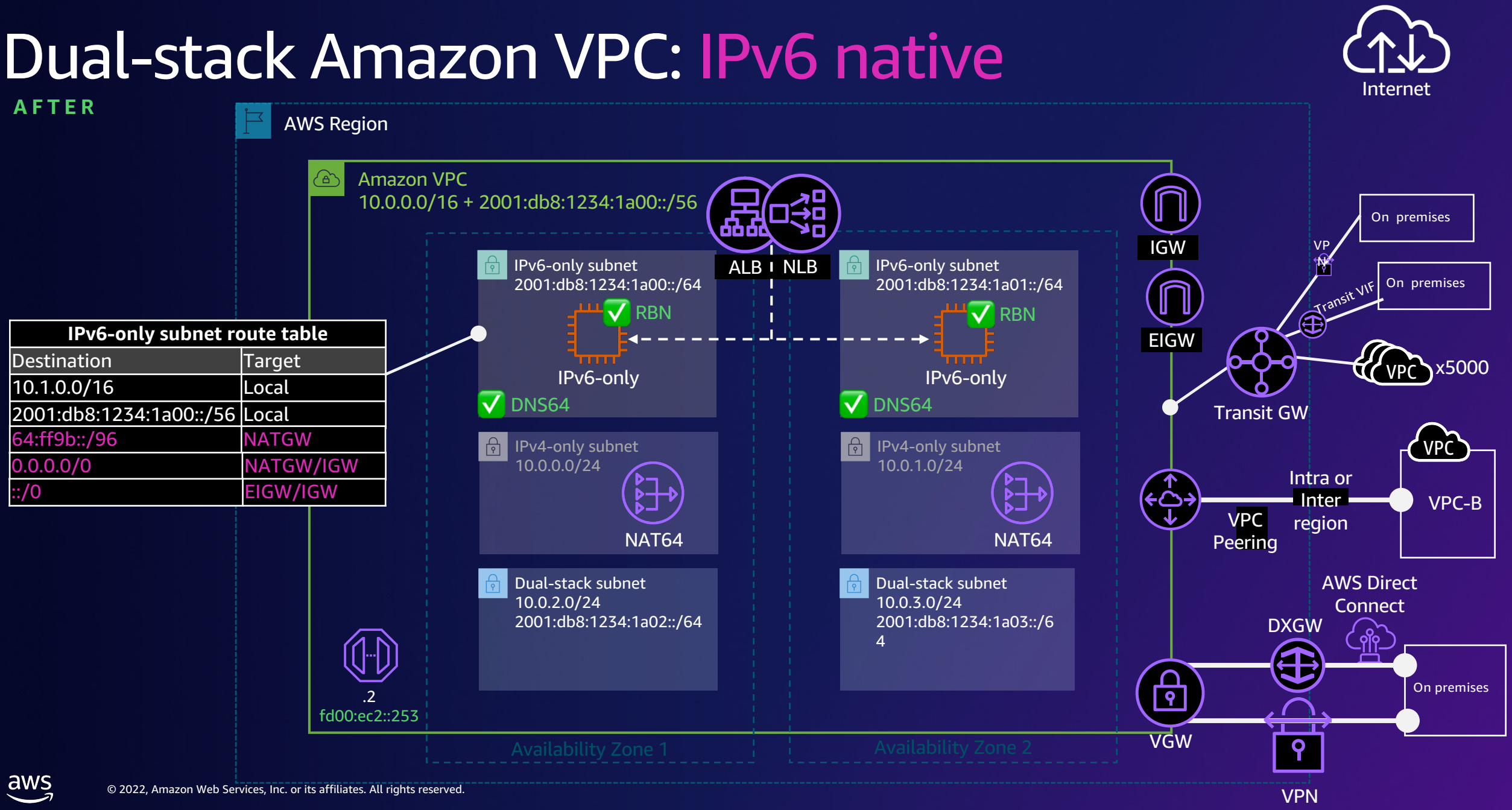


Putting everything together



Dual-stack Amazon VPC: IPv6 native

AFTER



IPv6-only subnet route table	
Destination	Target
10.1.0.0/16	Local
2001:db8:1234:1a00::/56	Local
64:ff9b::/96	NATGW
0.0.0.0/0	NATGW/IGW
::/0	EIGW/IGW

Thank you!

Alexandra Huides

huidesa@amazon.com