Networking in AWS

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October 16, 2020

Agenda

- Amazon VPC – Virtual Private Cloud
- VPC Building Blocks
- VPC Security
- VPC Connectivity Options
- Connect your Data Center to AWS
- Traffic Distribution

Amazon VPC

Amazon VPC - Virtual Private Cloud

Provision a logically isolated section of the AWS Cloud where you can launch AWS resources in a virtual network that you define.

Bring your own network

IP Addresses

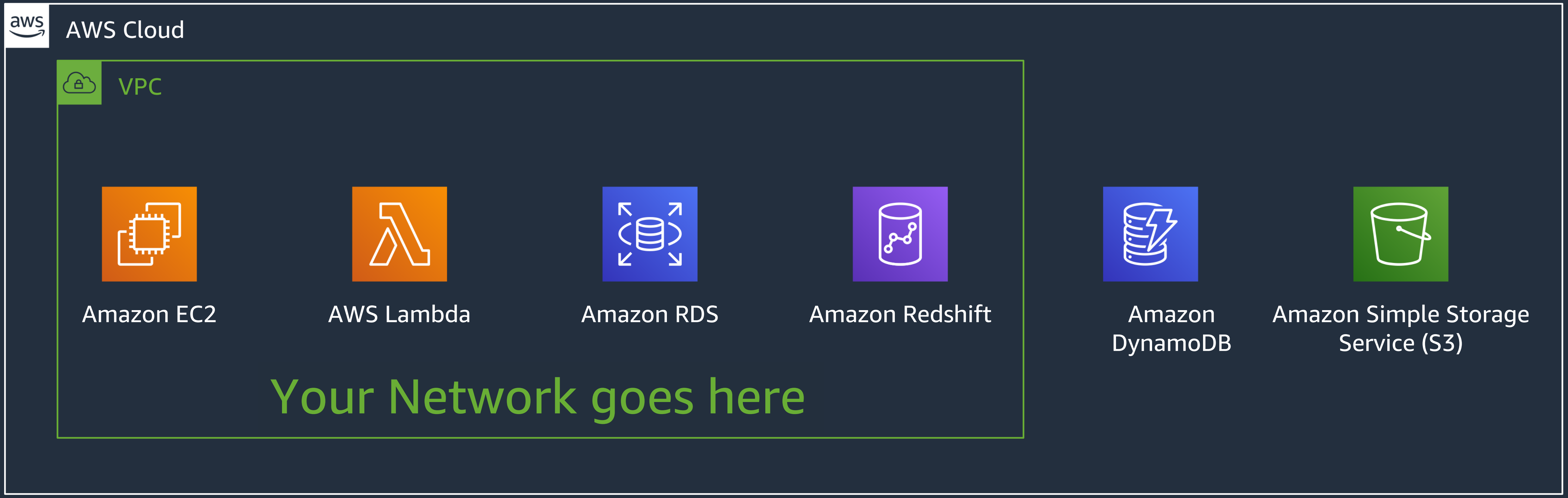
Subnets

Network Topology

Routing Rules

Security Rules

Amazon Virtual Private Cloud (VPC)



VPC IP Addressing

Bring your own addressing plan

No concerns around broadcast domain size

Plan your IP address space before creating it

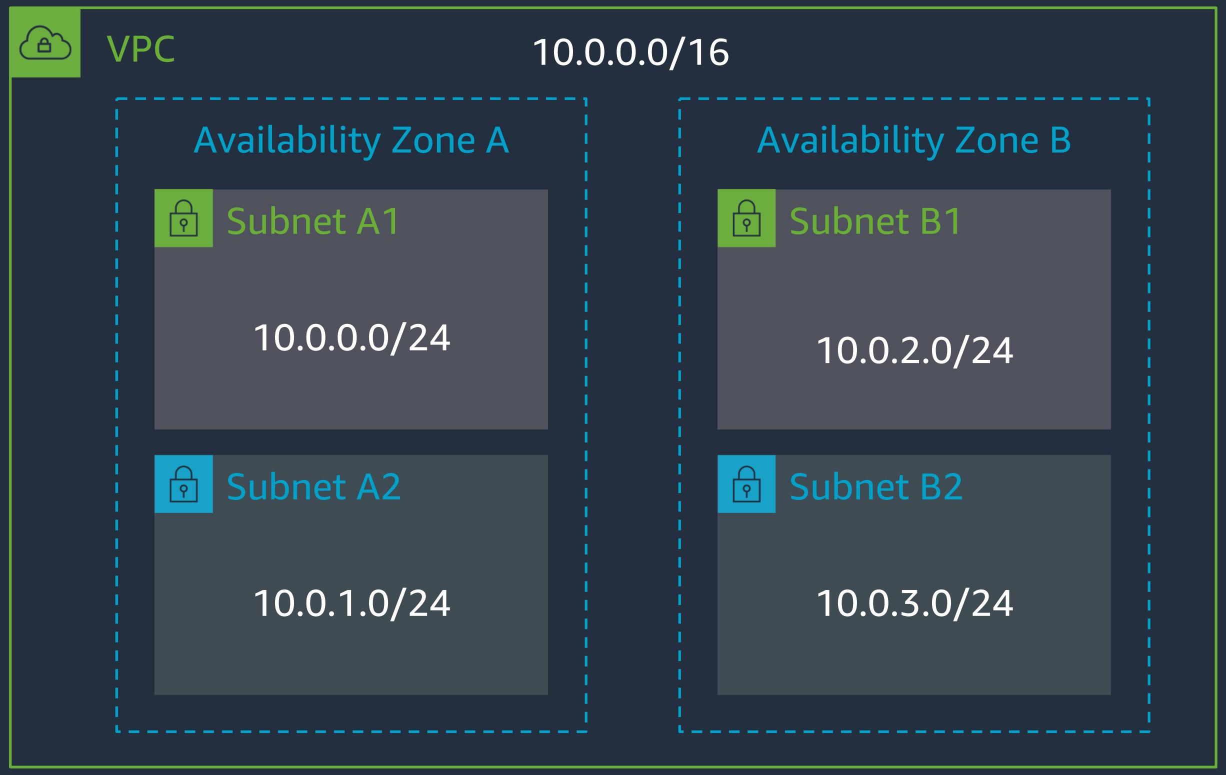
- Consider future AWS region expansion
- Consider future connectivity to corporate networks
- Consider subnet design
- VPCs can be /16 between and /28
- CIDR cannot be modified once created
    - But you can add new CIDRs to expand the VPC IP addressing
- Overlapping IP spaces = future headache

VPC Building Blocks

How to segment my networks inside a VPC?

VPC Subnets

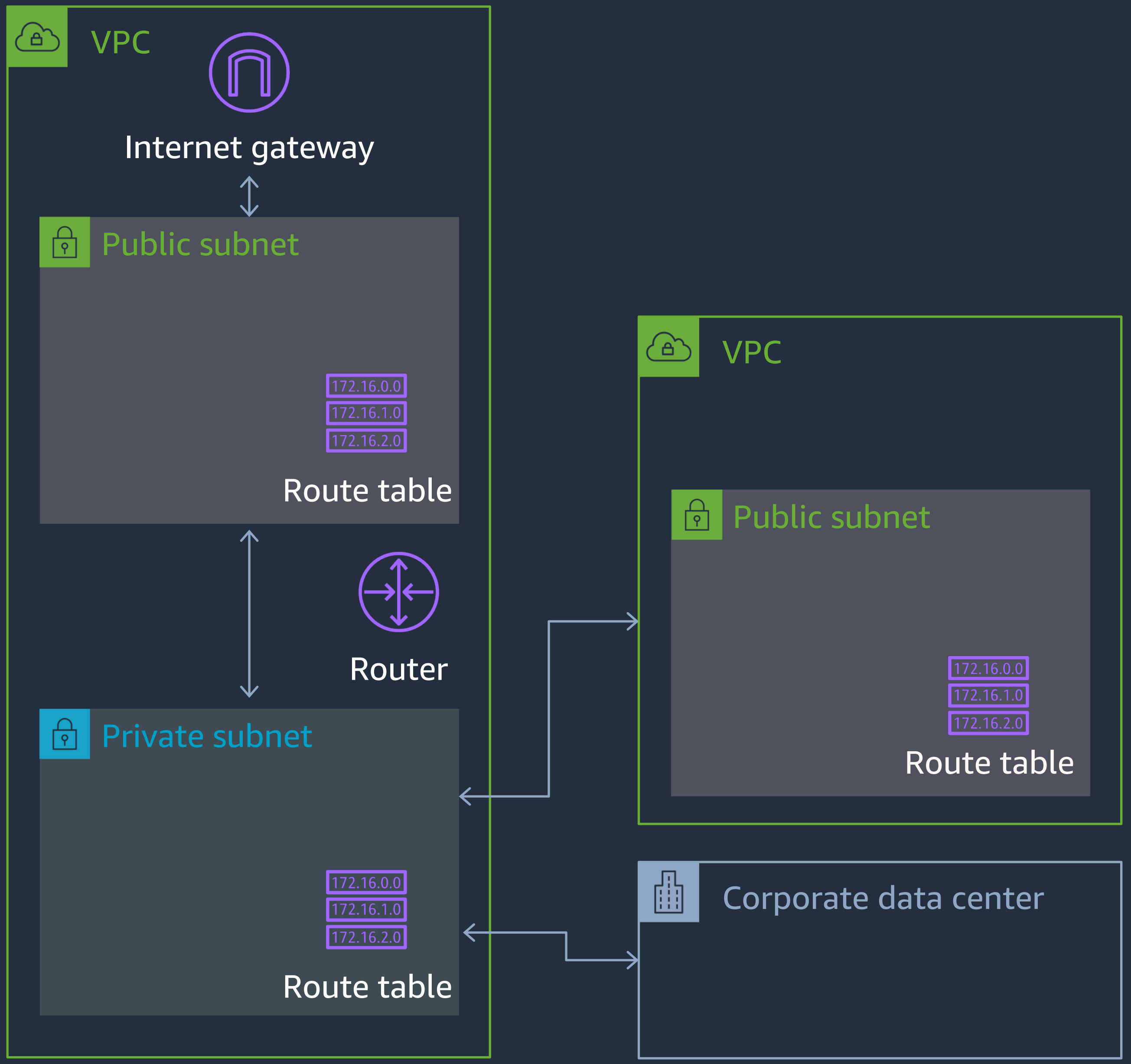
- You can add one or more subnets in each Availability Zone
- AZs provides fault isolations
- Subnets are allocated as a subset of the VPC CIDR range



How to direct traffic out of my Subnets?

Subnets and Route Tables

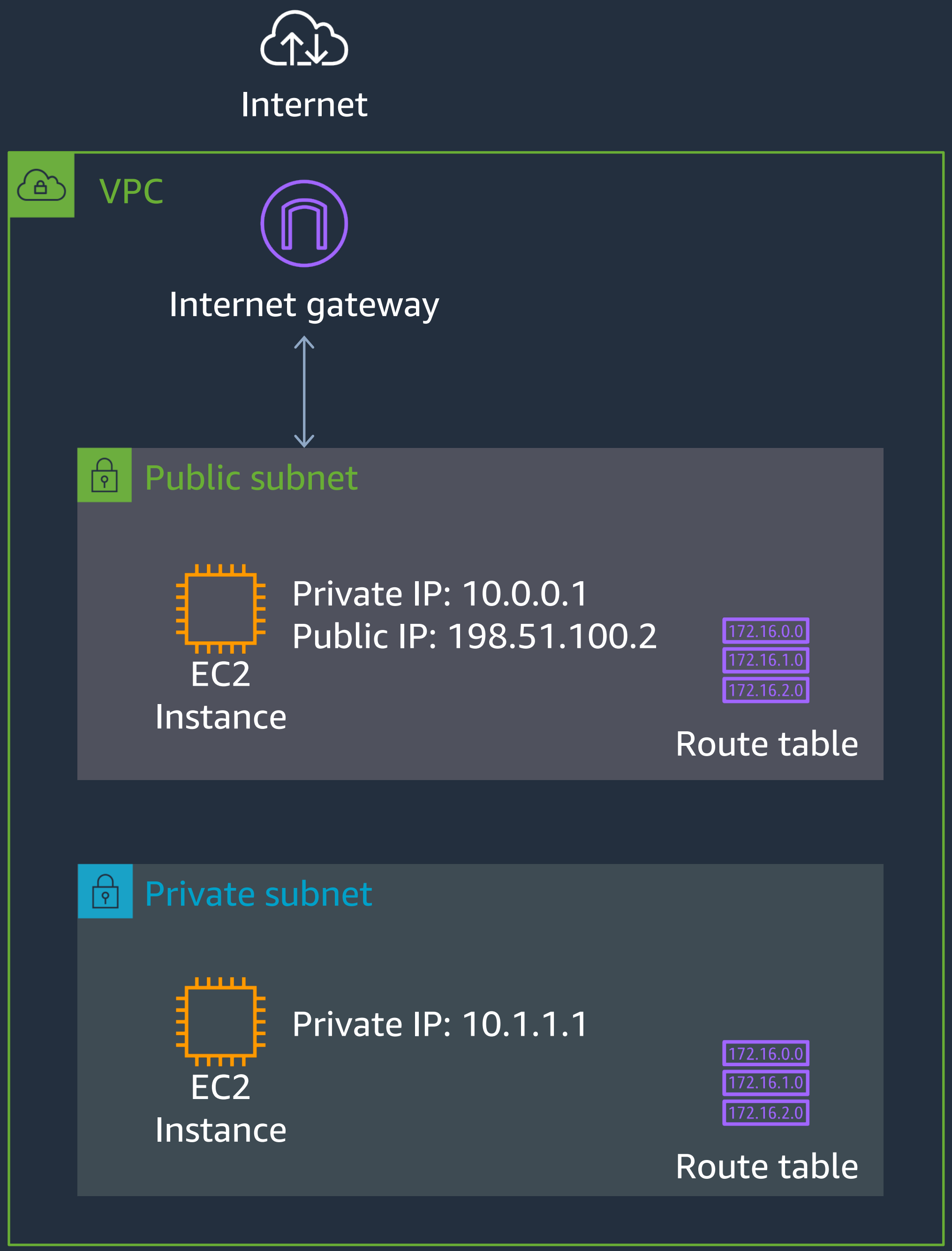
- Each subnet can have a unique Route Table
- Route Tables direct traffic out of the VPC, towards:
  - Internet Gateway
  - Virtual Private Gateway
  - VPC Endpoints
  - Direct Connect
  - VPC Peering
  - AWS Transit Gateway
- Subnets are named “Public Subnets” when connected to an Internet Gateway



How to connect my VPC to the Internet?

Internet Gateway

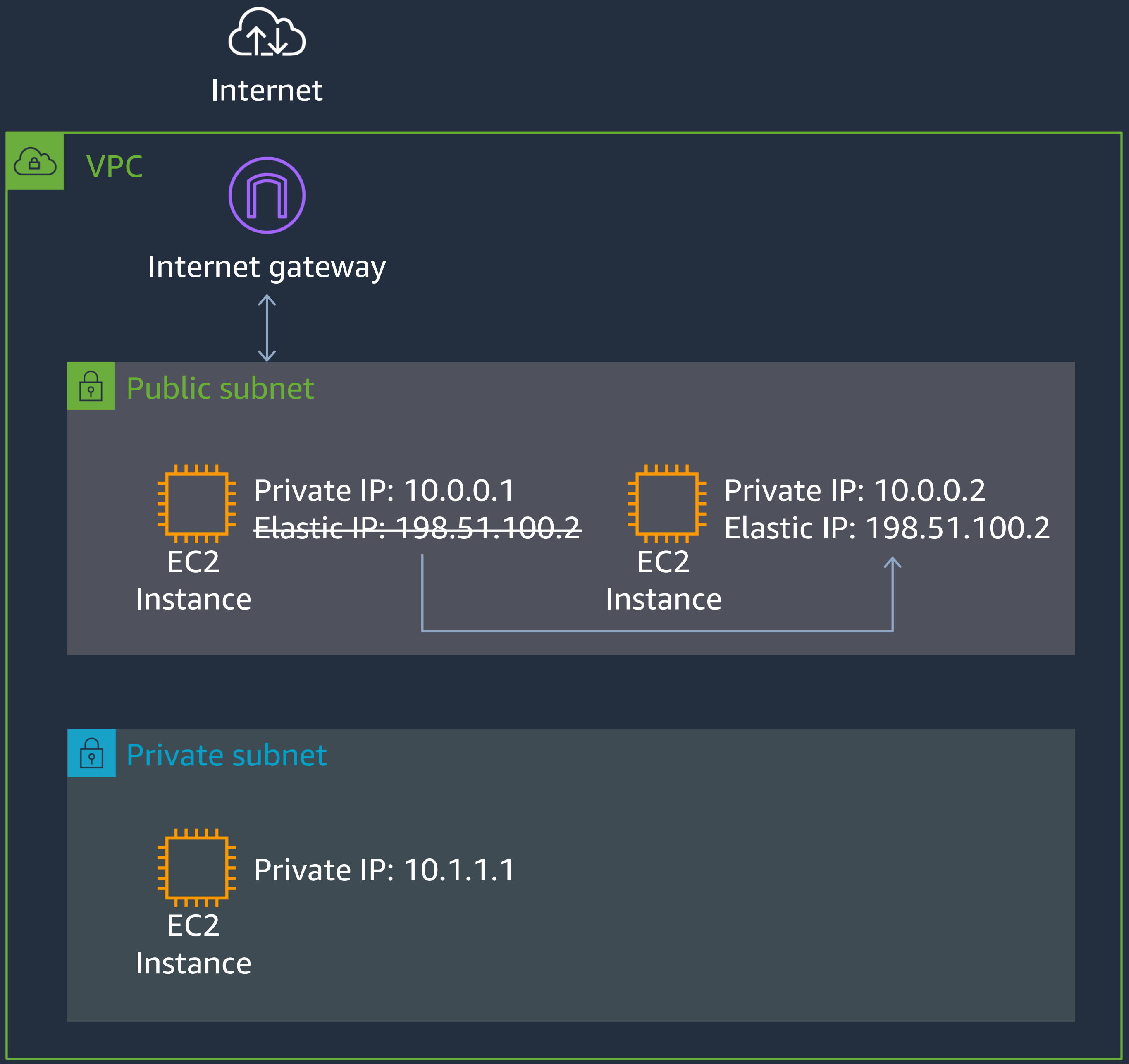
- Horizontally scaled, redundant, highly available VPC component
- Connect your VPC Subnets to the Internet
- Must be referenced on the Route Table
- Performs NAT between Public and Private IP Addresses



How does my instance get an IP address?

Elastic IP Address

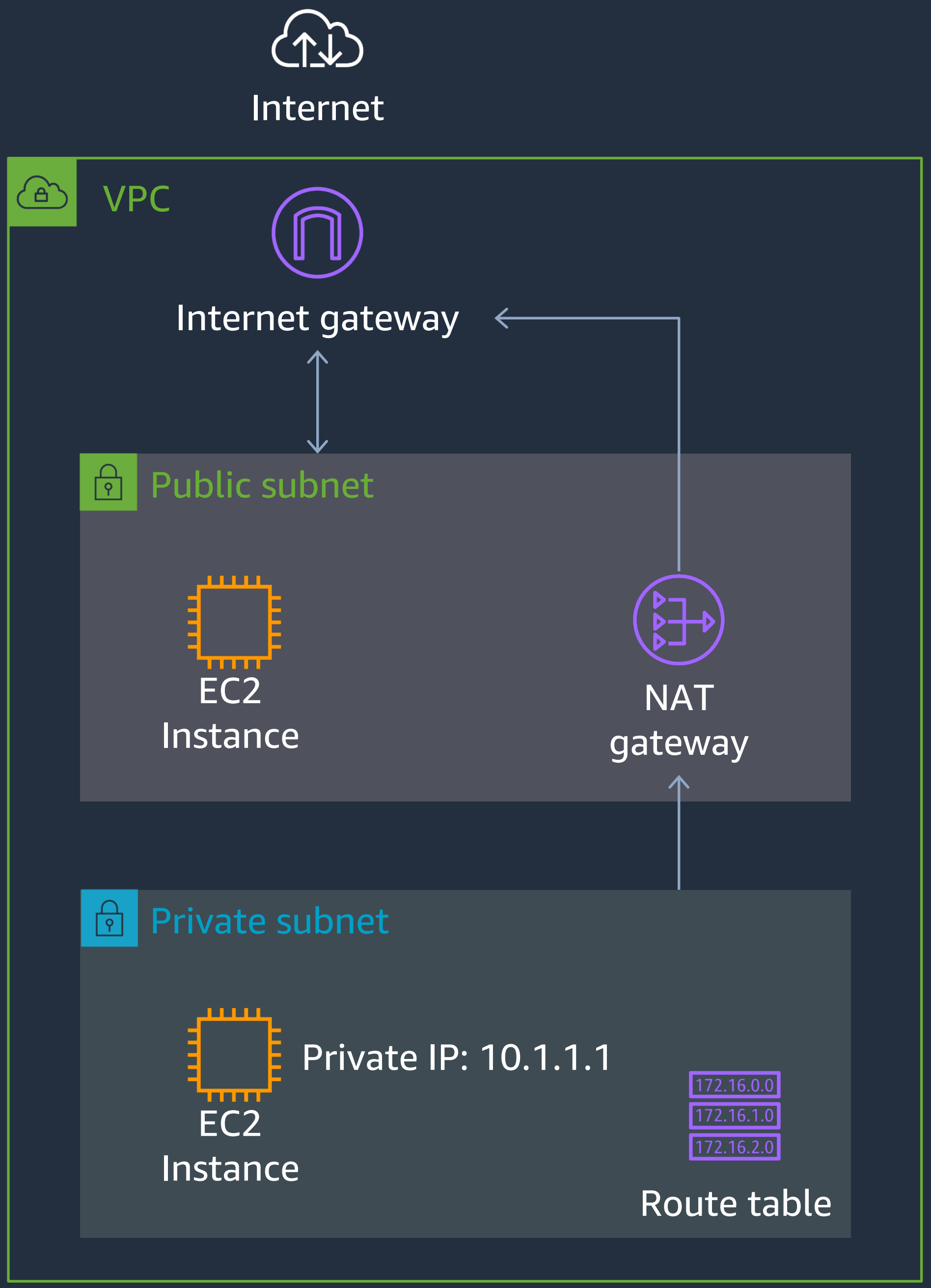
- Static, Public IPv4 address, associated with your AWS account
- Can be associated with an instance or network interface
- Can be remapped to another instance in your account
- Useful for redundancy when Load Balancers are not an option



Can I have outbound only Internet access?

NAT Gateway

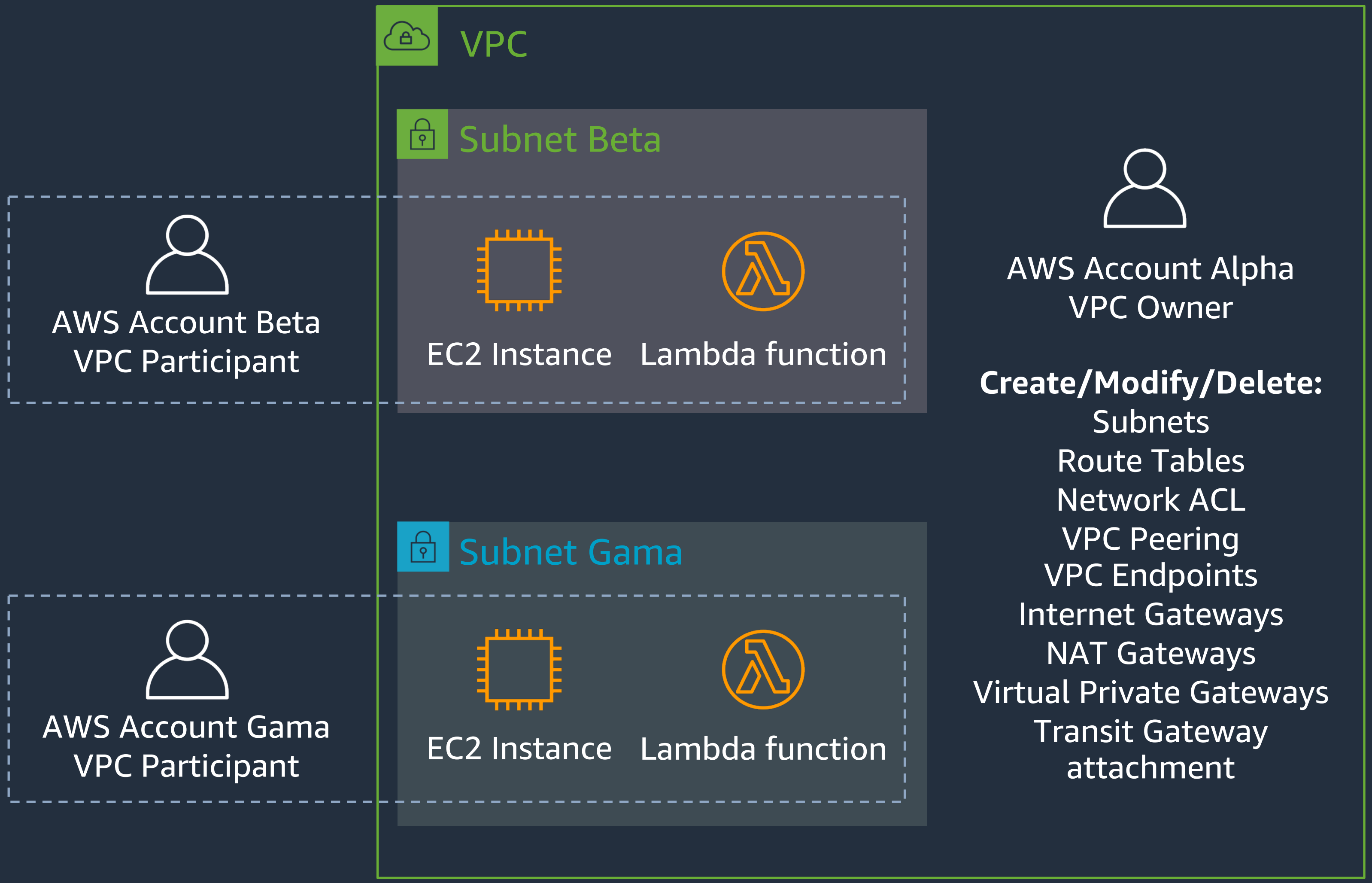
- Enable outbound connection to the internet
- No incoming connection - useful for OS/packages updates, public web services access
- Fully managed by AWS
- Highly available
- Up to 10Gbps bandwidth
- Supports TCP, UDP, and ICMP protocols
- Network ACLs apply to NAT gateway's traffic



Can I have one account owning the VPC, and other using it?

Shared VPC

- VPC Owner can create and edit VPC Components
- VPC Participants can launch resources in their assigned Subnets
- Each participant pays for their own resources and data transfer costs
- Based on AWS Resource Access Manager, under AWS Organizations



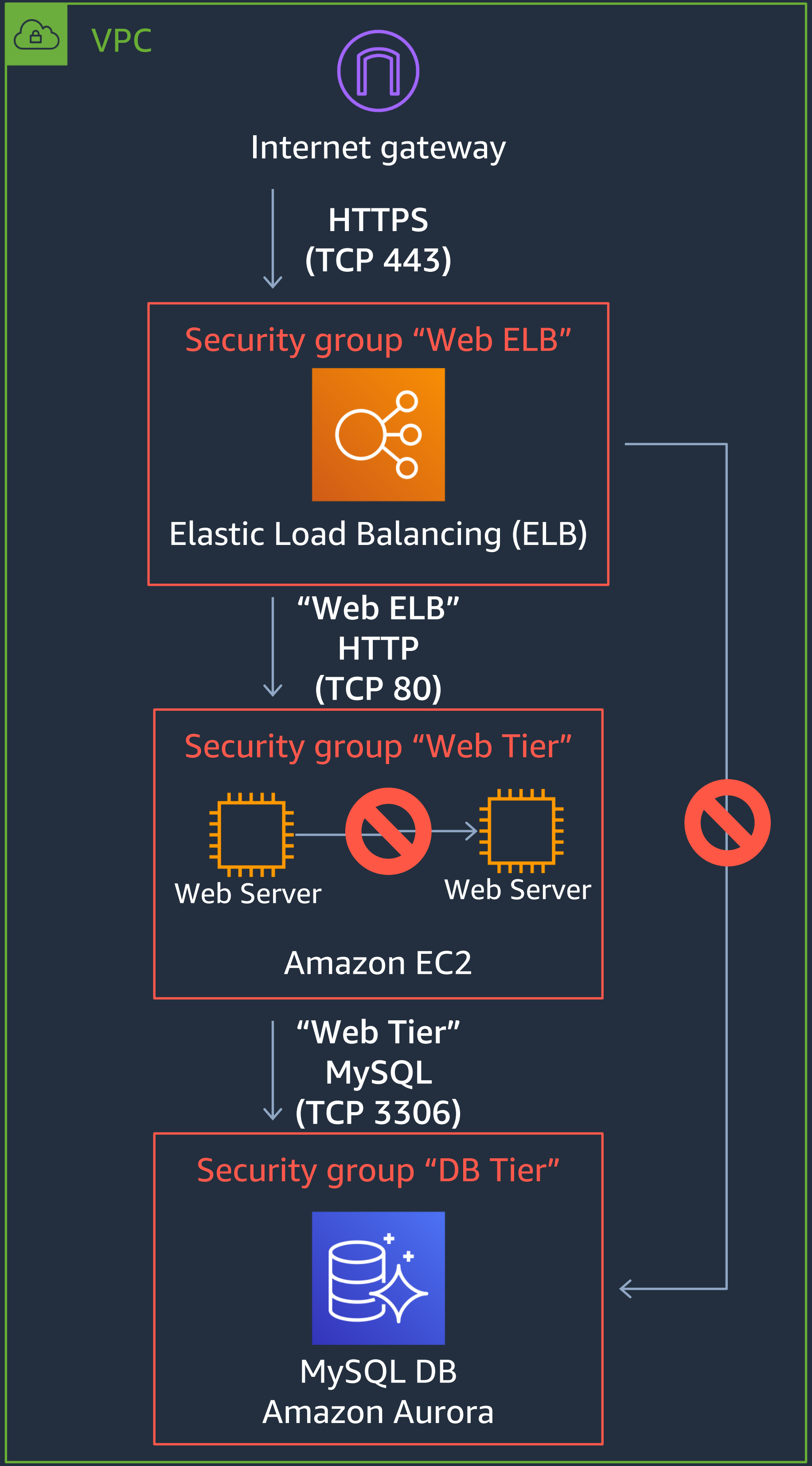
Create/Modify/Delete:
Subnets
Route Tables
Network ACL
VPC Peering
VPC Endpoints
Internet Gateways
NAT Gateways
Virtual Private Gateways
Transit Gateway attachment

VPC Security

Can I filter traffic reaching my instances?

Security Groups

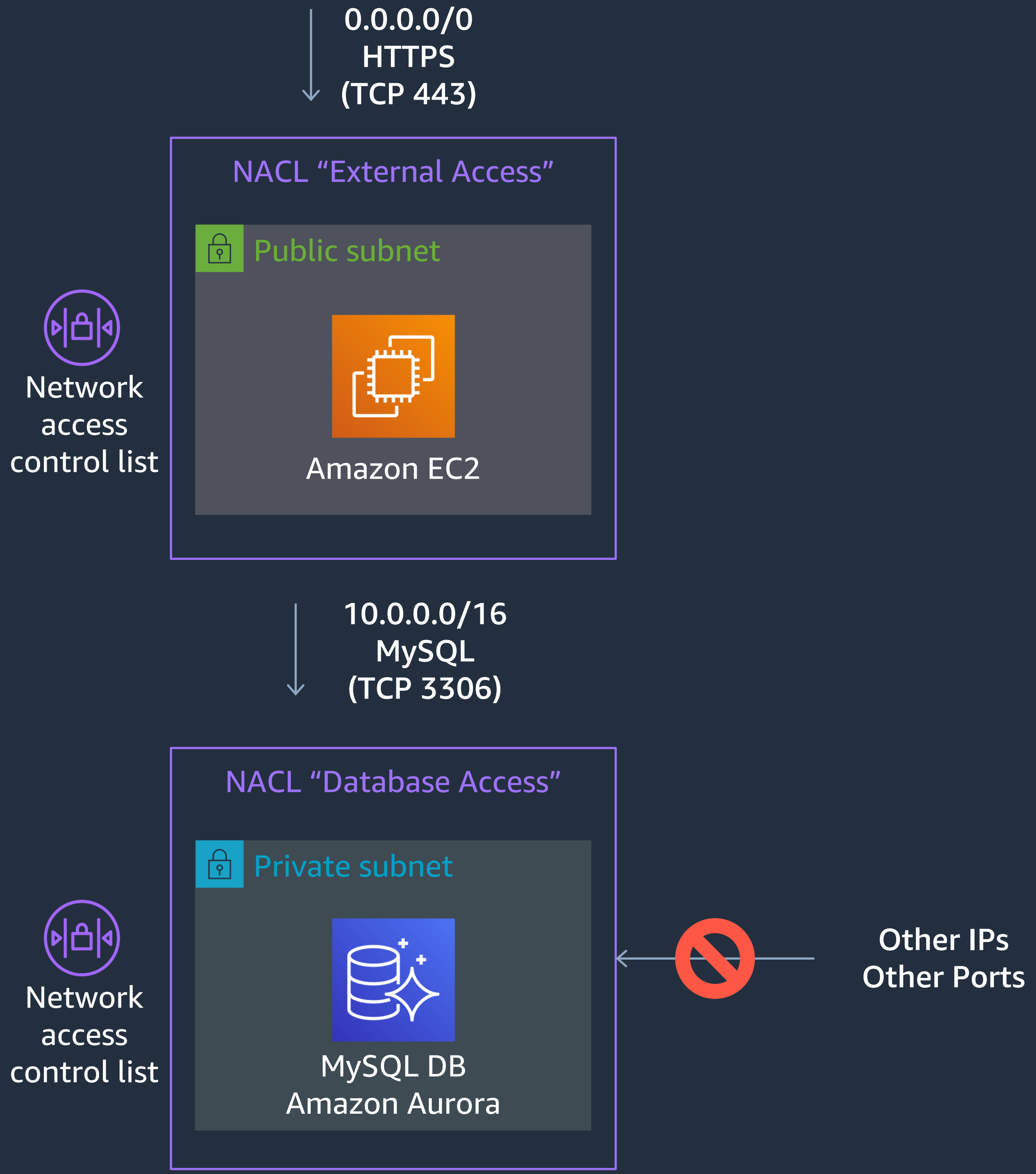
- Virtual stateful firewall
- Inbound and Outbound customer defined rules
- Instance/Interface level inspection
  - Micro segmentation
  - Mandatory, all instances have an associated Security Group
- Can be cross referenced
  - Works across VPC Peering
- Only supports allow rules
  - Implicit deny all at the end



Can I filter traffic on a subnet level?

Network Access Control List

- Inbound and Outbound
- Subnet level inspection
- Optional level of security
- By default, allow all traffic
- Stateless
- IP and TCP/UDP port based
- Supports allow and deny rules
- Deny all at the end

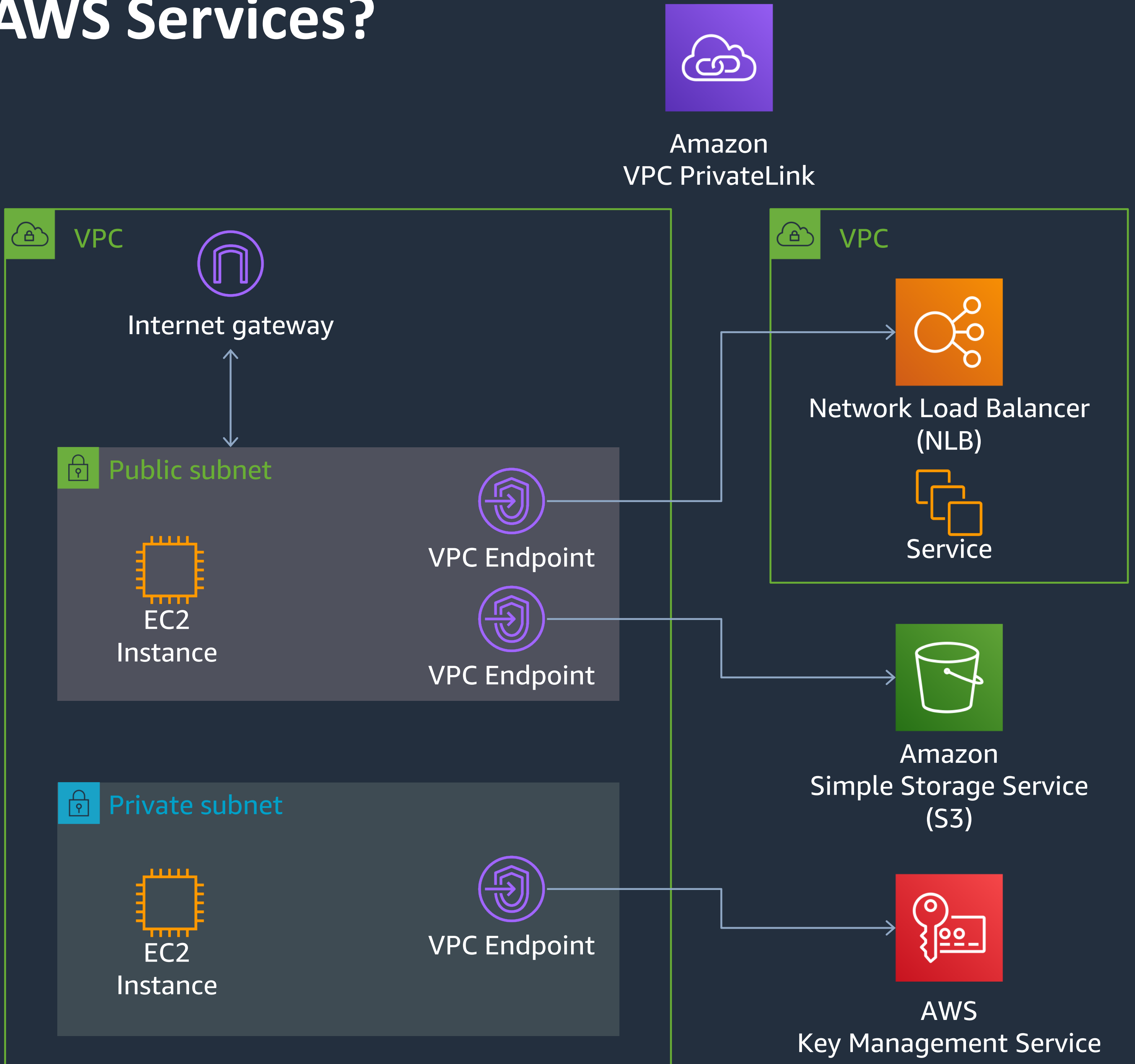


VPC Connectivity Options

How to connect privately to public AWS Services?

VPC Endpoints

- Connect your VPC to:
  - Supported AWS services
  - VPC endpoint services powered by PrivateLink
- Doesn't require public IPs or Internet connectivity
- Traffic does not leave the AWS network.
- Horizontally scaled, redundant, and highly available
- Robust access control



VPC Endpoints

There are two types of VPC endpoints:

Gateway: A gateway that is a target for a specified route in your route table, used for traffic destined to a supported AWS service.

- Supported AWS Services: Amazon S3 and DynamoDB

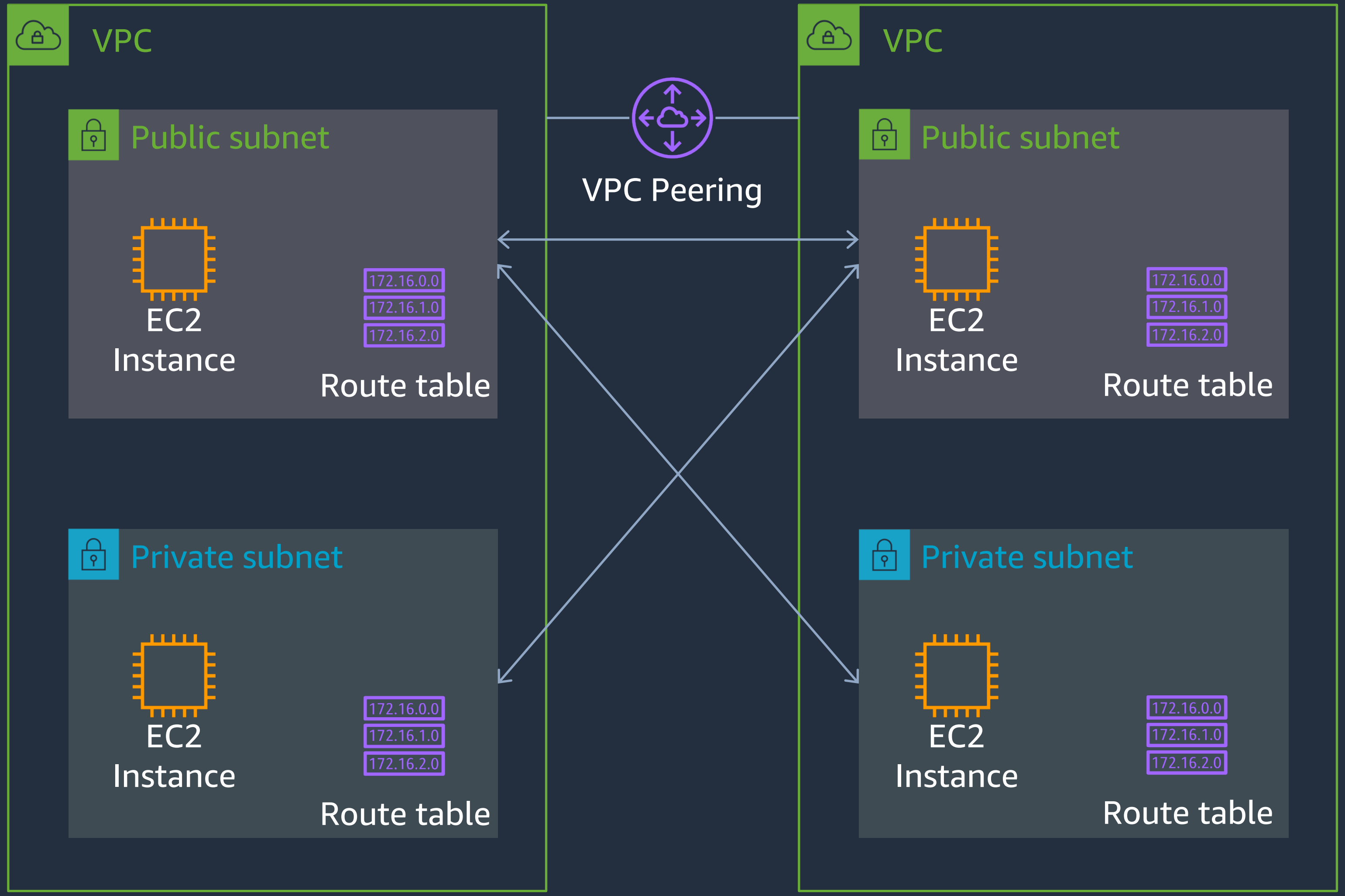
Interface: An elastic network interface with a private IP address that serves as an entry point for traffic destined to a supported service.

- Supported AWS Services: https://docs.aws.amazon.com/vpc/latest/userguide/integrated-services-vpce-list.html
- Endpoint Services hosted by other accounts
- AWS Marketplace Partner services

How to connect directly to other VPCs?

VPC Peering

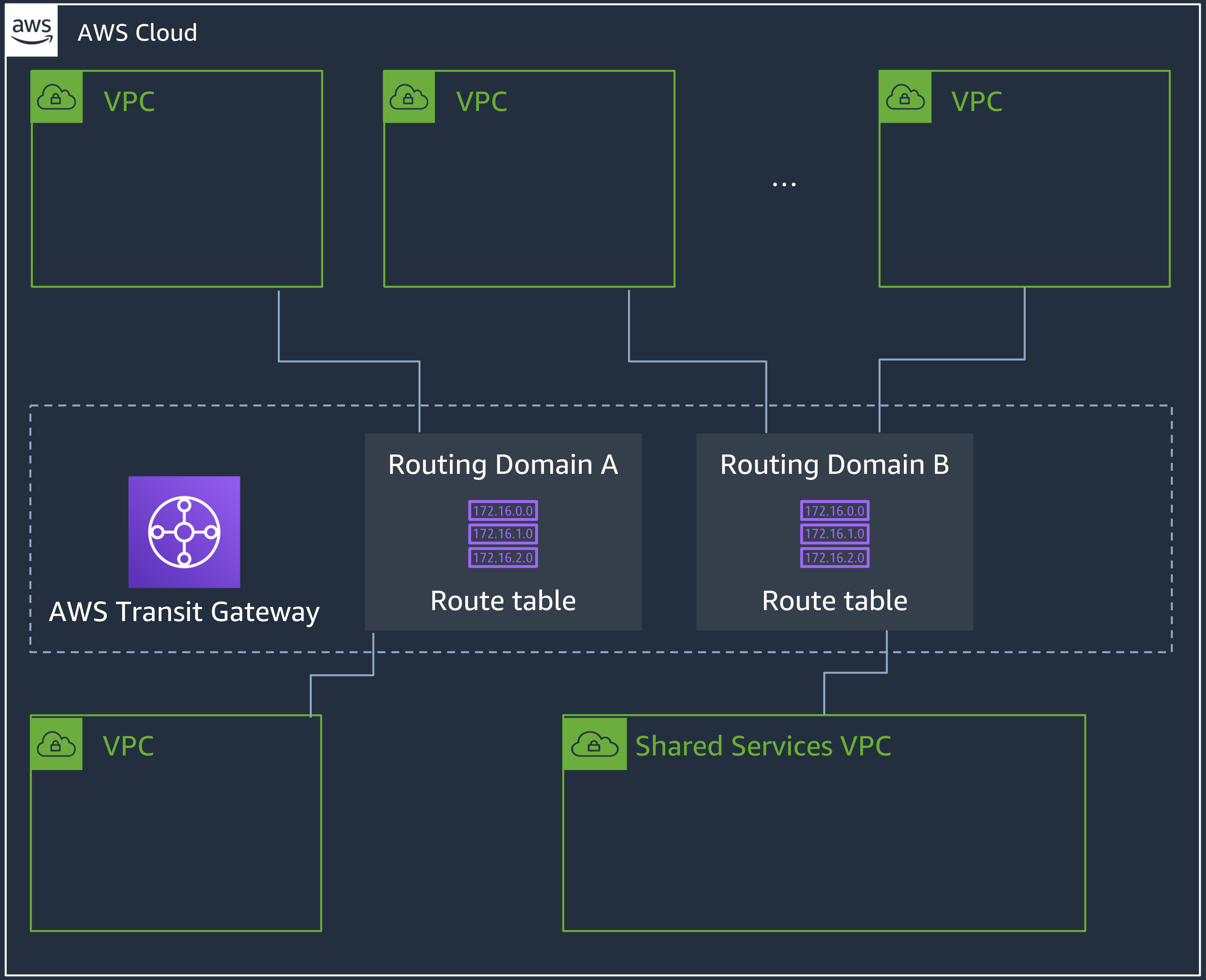
- Scalable and high available
- Inter-account peering
- Same or different AWS Regions
- Bi-directional traffic
- Remote Security groups can be referenced
- Routing policy with Route Tables
  - Not all subnets need to connect to each other
- No transitive routing, requires full-mesh to interconnect multiple VPCs
- No support for overlapping IP addresses



How to connect multiple VPCs together?

AWS Transit Gateway

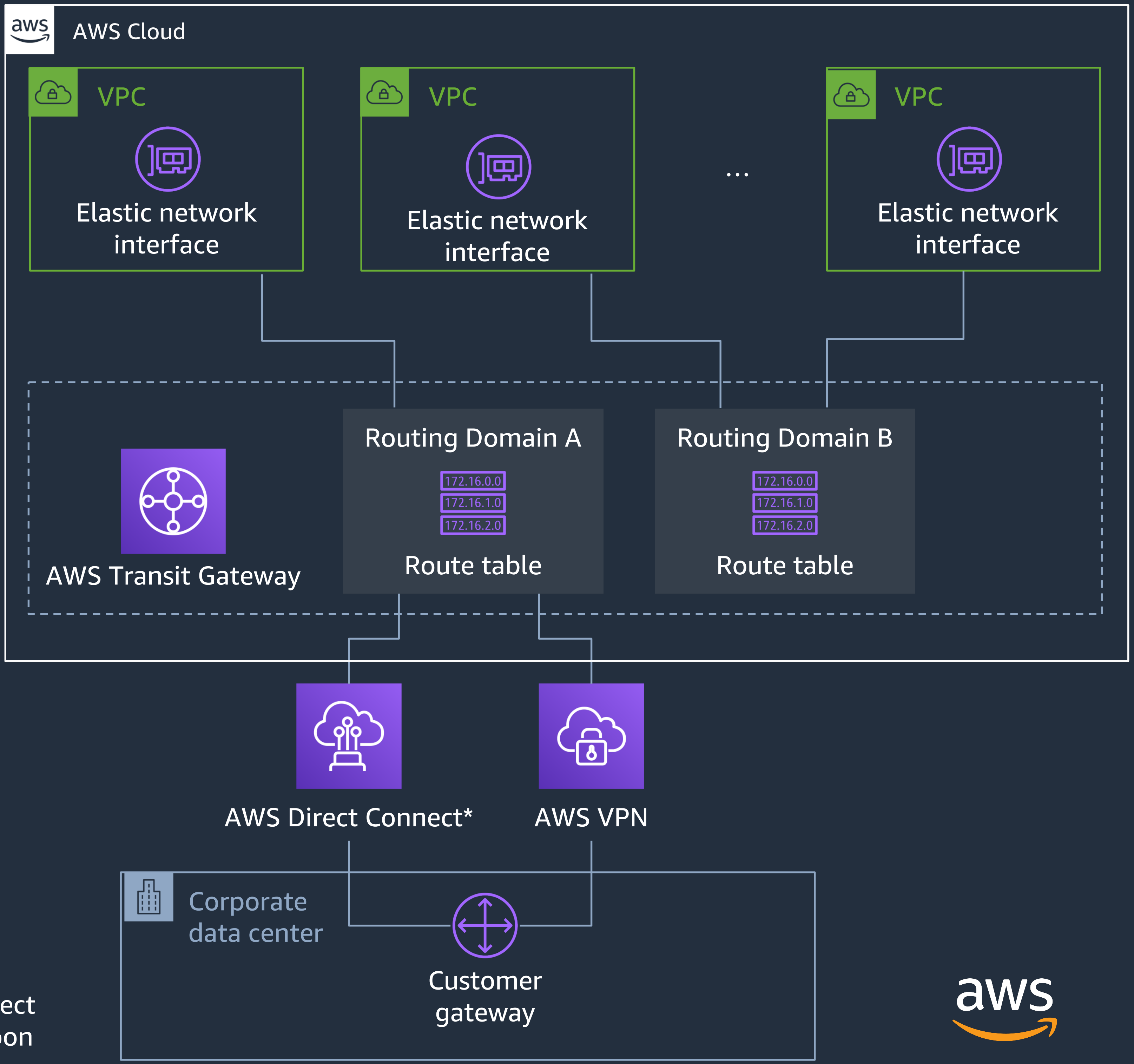
- Connect thousands of VPC across accounts
- Connect your VPCs and on-premises through a single gateway
- Centralize VPN and AWS Direct Connect connections
- Control segmentations and data flow with Routing Tables
- Hub and Spoke design
- Up to 50 Gbps per VPC connection (burst)



How to connect all my VPC and on-premises network?

AWS Transit Gateway

- Centralize VPN and AWS Direct Connect
- Thousands of VPC across accounts
- Spread traffic over many VPN Connections
- Network interfaces in Subnets
- Control segmentations and sharing with routing



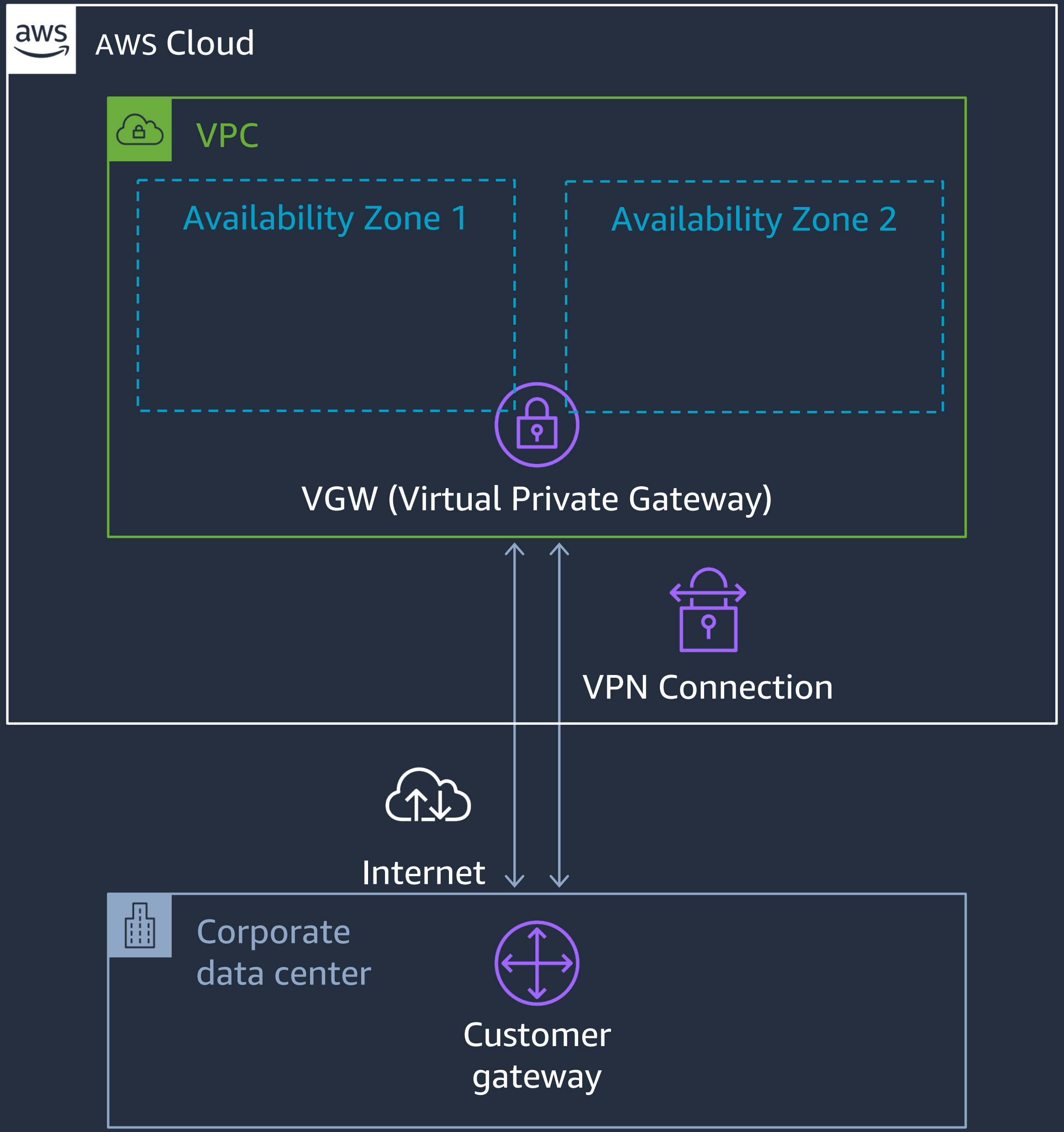
* AWS Direct Connect support coming soon

Connect Your Data Center to AWS

How to connect my Datacenter to AWS over the Internet?

AWS Virtual Private Network

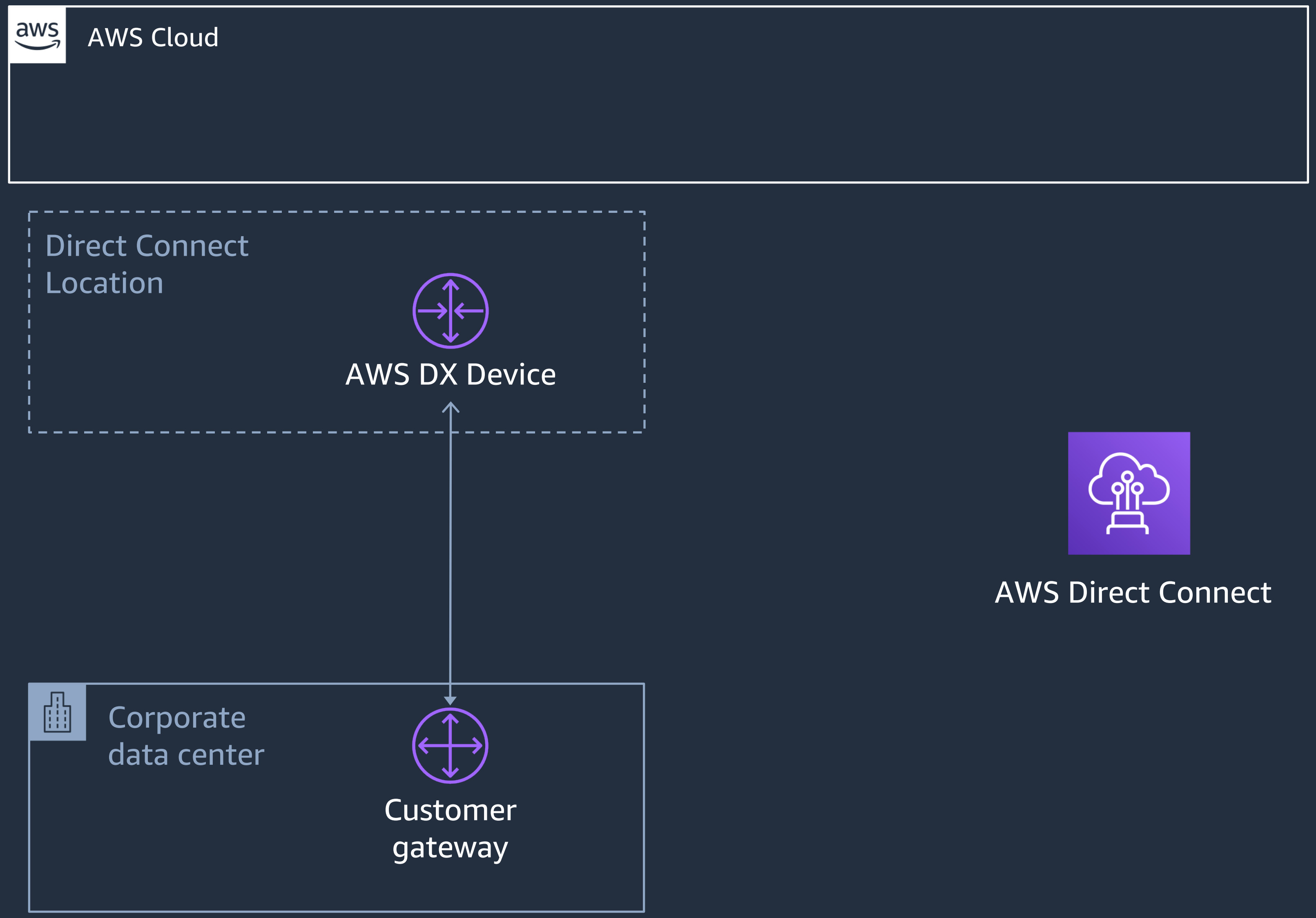
- One VGW (Virtual Private Gateway) per VPC
- Redundant IPSec VPN Tunnels
  - Terminating in different AZs
- IPSec
  - AES 256-bit encryption
  - SHA-2 hashing
- Scalable
- BGP or Static Routing



How to connect my Datacenter to AWS over dedicated circuits?

AWS Direct Connect

- Dedicated network connection from your premises to AWS
- Dedicated Connection (1/10 Gbps, Multiple VIFs)
- AWS Partner Hosted Connection (50 Mbps to 10 Gbps, Single VIF)
- Consistent Network Performance
- More consistent network experience
- Reduced egress data charges
- Connect to 90+ Direct Connection Locations across the globe

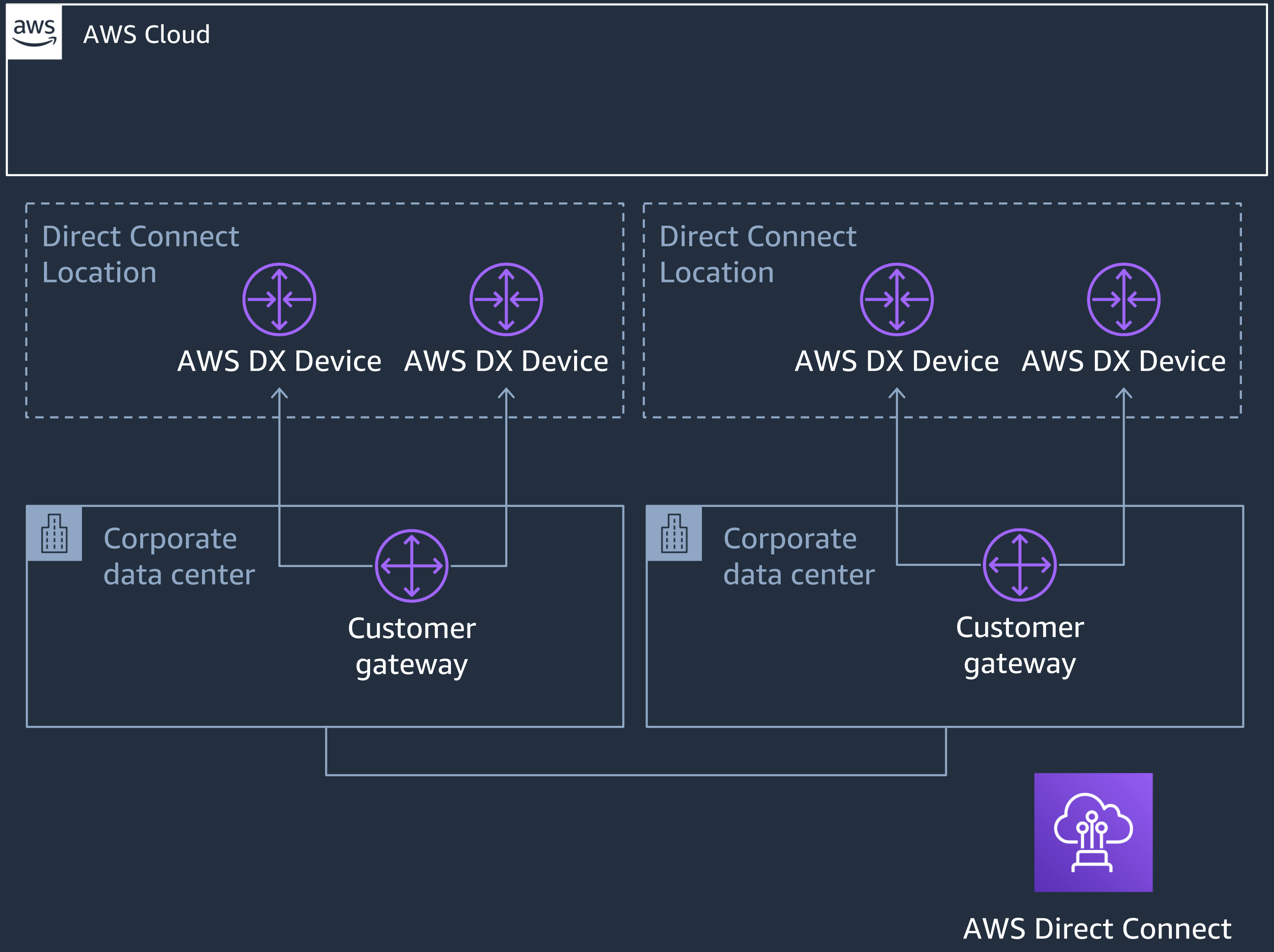


AWS Direct Connect

How to add redundancy to my dedicated circuits?

AWS Direct Connect

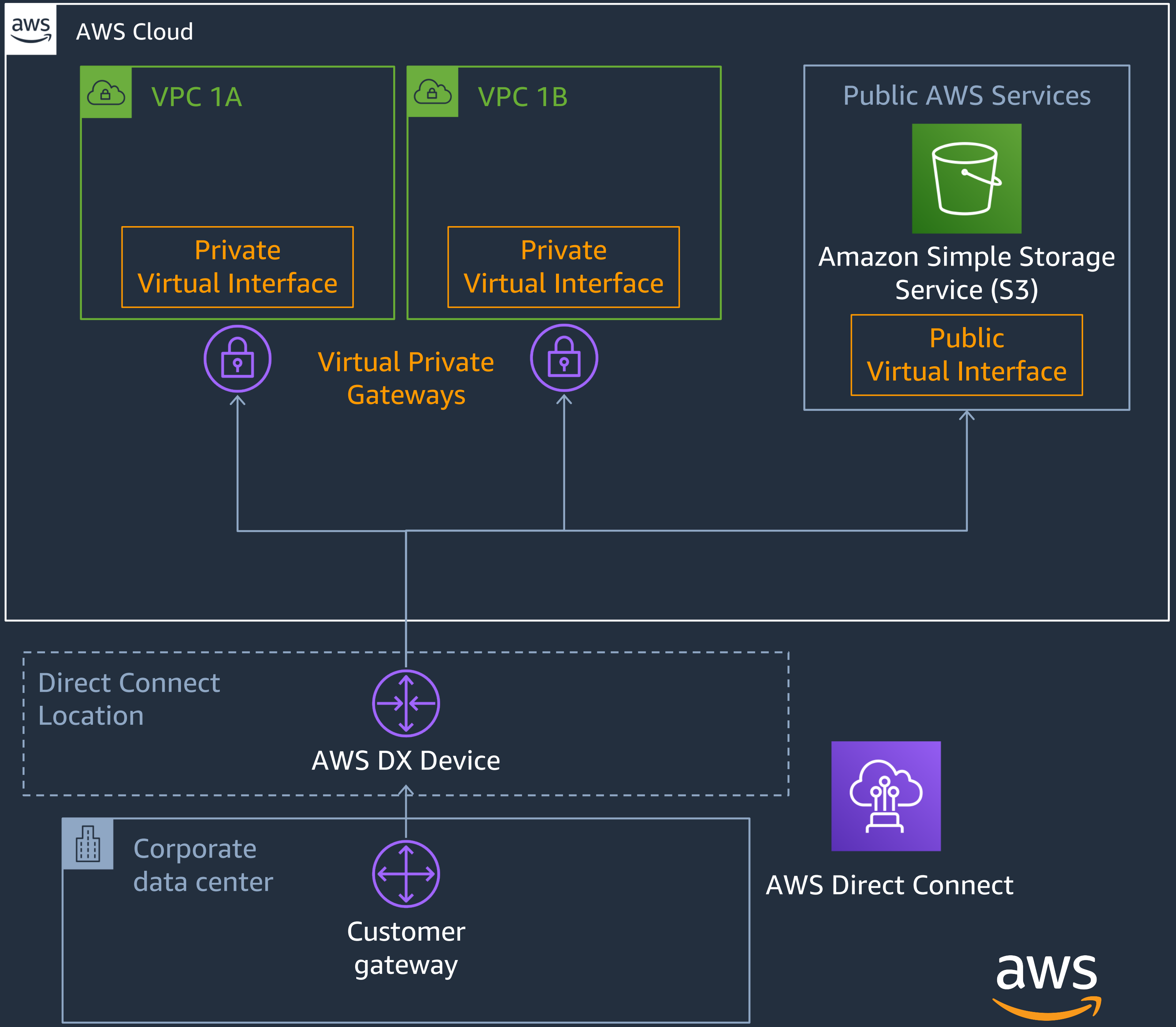
- For redundancy, DX can deployed with single or multiples:
  - Circuits
  - Providers
  - Customer Gateways
  - Direct Connect Locations
  - Customer data centers
- BGP Routing for redundancy
- AWS VPN can also be used as backup path



How to access my VPCs or AWS Public Services over my DX?

AWS Direct Connect

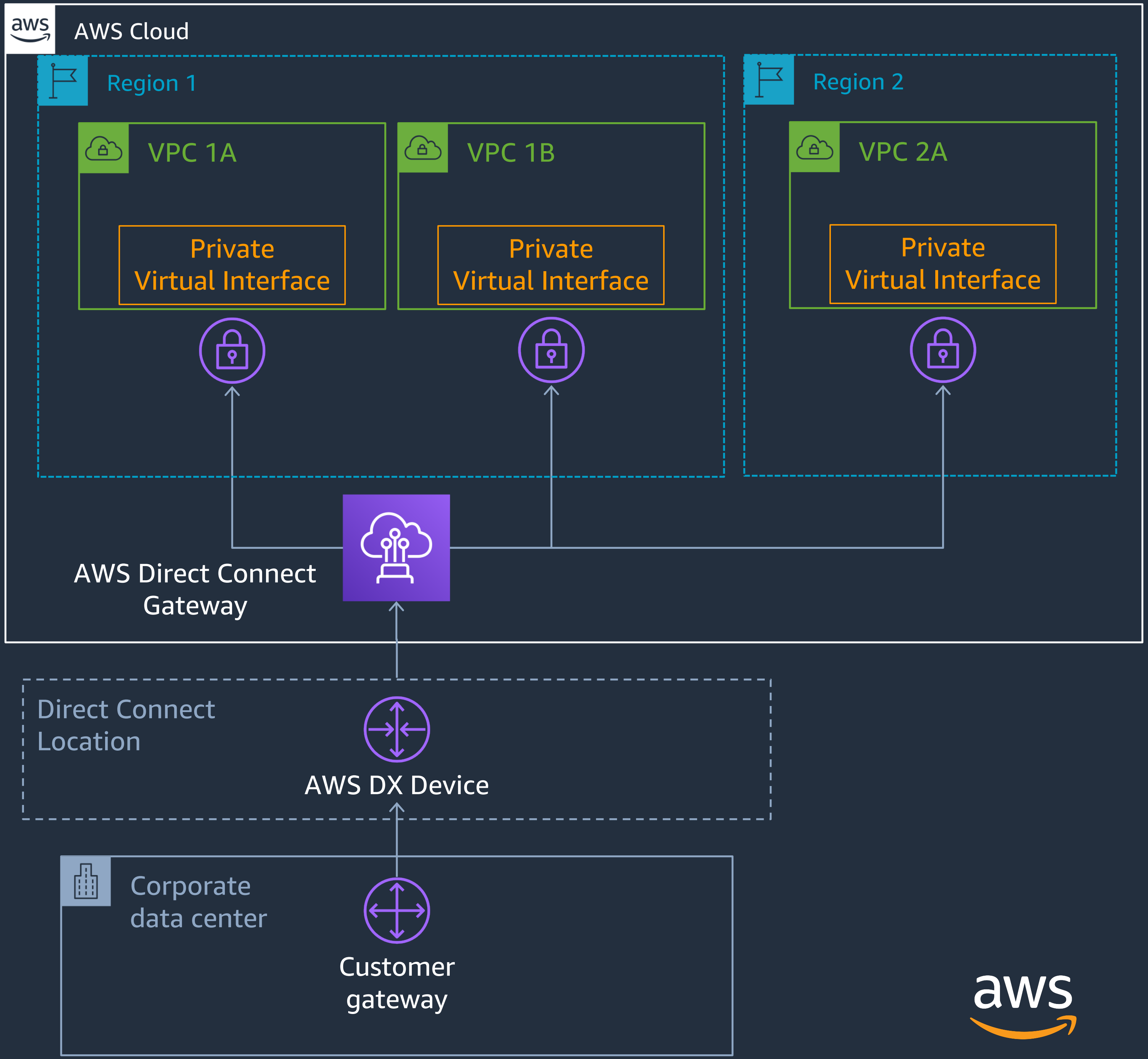
- VIFs: Virtual Interface
- Private VIFs
  - Access to VPC IP address
- Public VIFs
  - Access to AWS Public IP address space



How to connect to multiple AWS Regions/Accounts over DX?

AWS Direct Connect Gateway

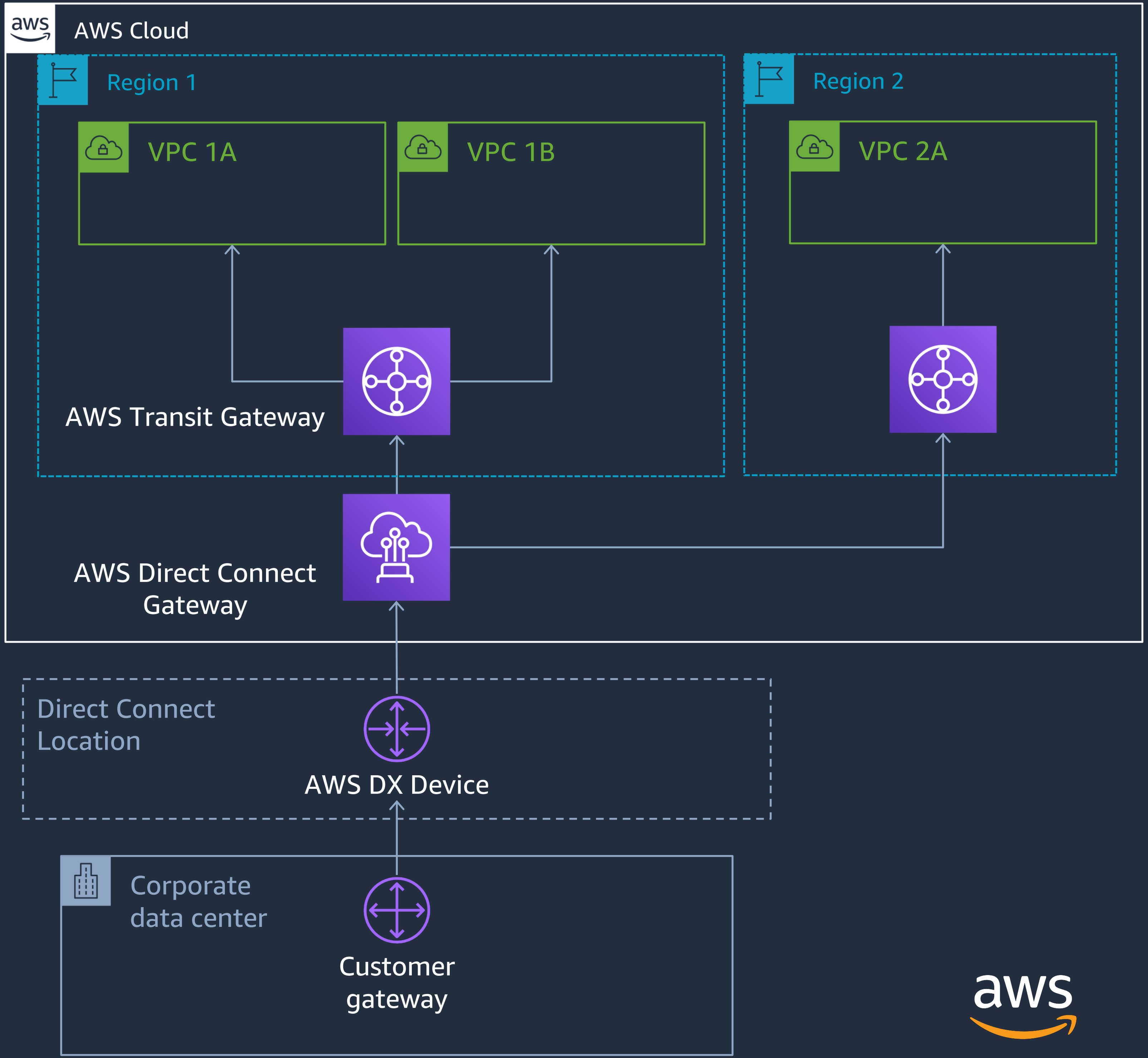
- Global resource
- Connect to multiple VPCs
- VPCs can be on same or different
  - Regions
  - Accounts (same Payer ID)
- Enables traffic flow from the VPC to the DX connection
  - For VPC to VPC Traffic, consider using AWS Transit Gateway



How to connect at scale across accounts/Regions?

AWS DX Gateway + AWS Transit Gateway

- Transit VIF
  - Connects to a AWS Transit Gateway
- Simplify your network architecture and management overhead
- Create a hub-and-spoke model that spans multiple
  - VPCs
  - Regions
  - AWS accounts

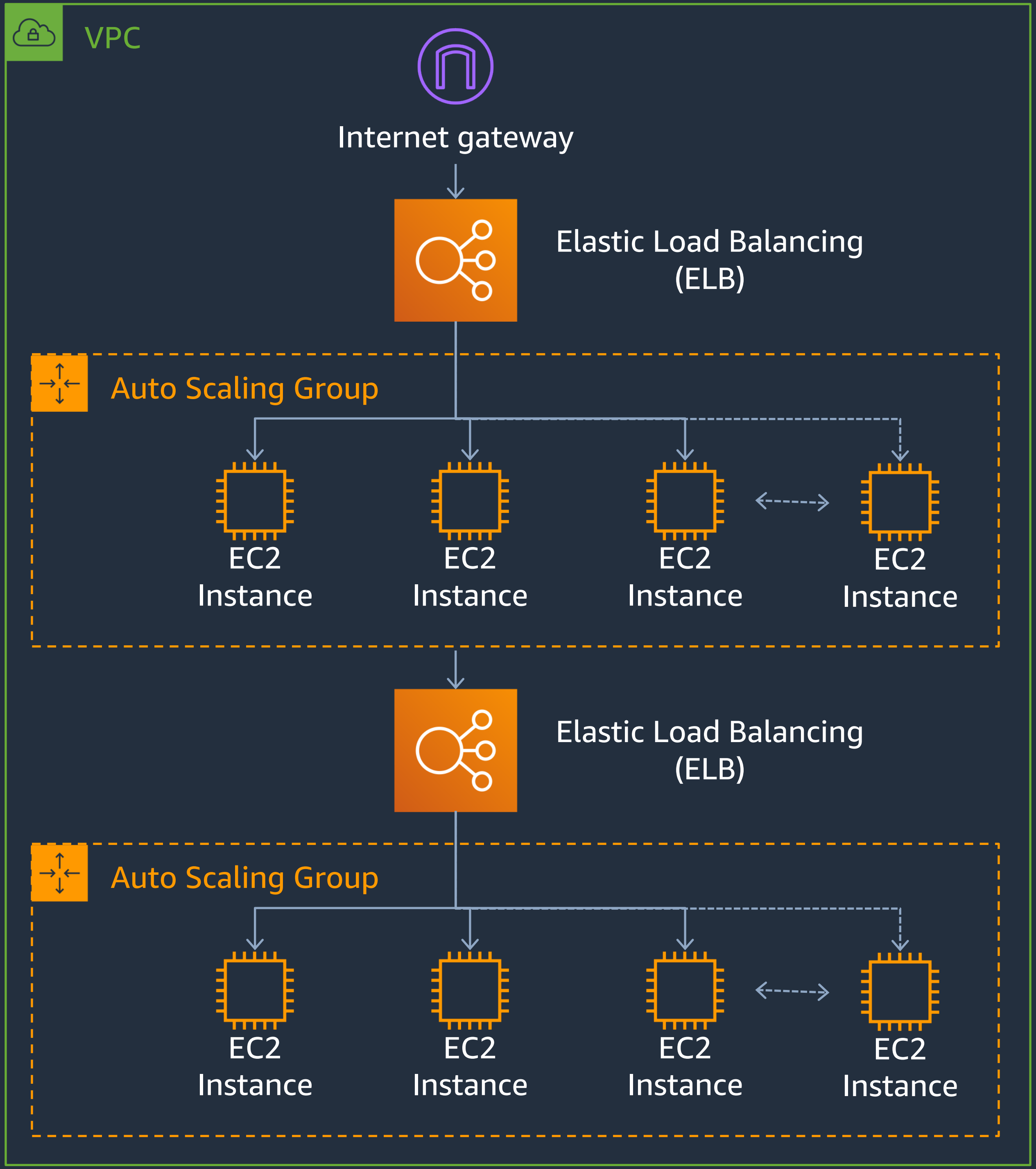


Traffic Distribution

How to scale my app horizontally inside my VPC?

Elastic Load Balancing

- Distributes incoming application or network traffic across multiple targets
  - EC2 instances
  - Containers
  - IP address
- Multiple Availability Zones
- Scales automatically
- Auto Scaling Groups can add or remove instances as required
  - Automatically register to the Load Balancer



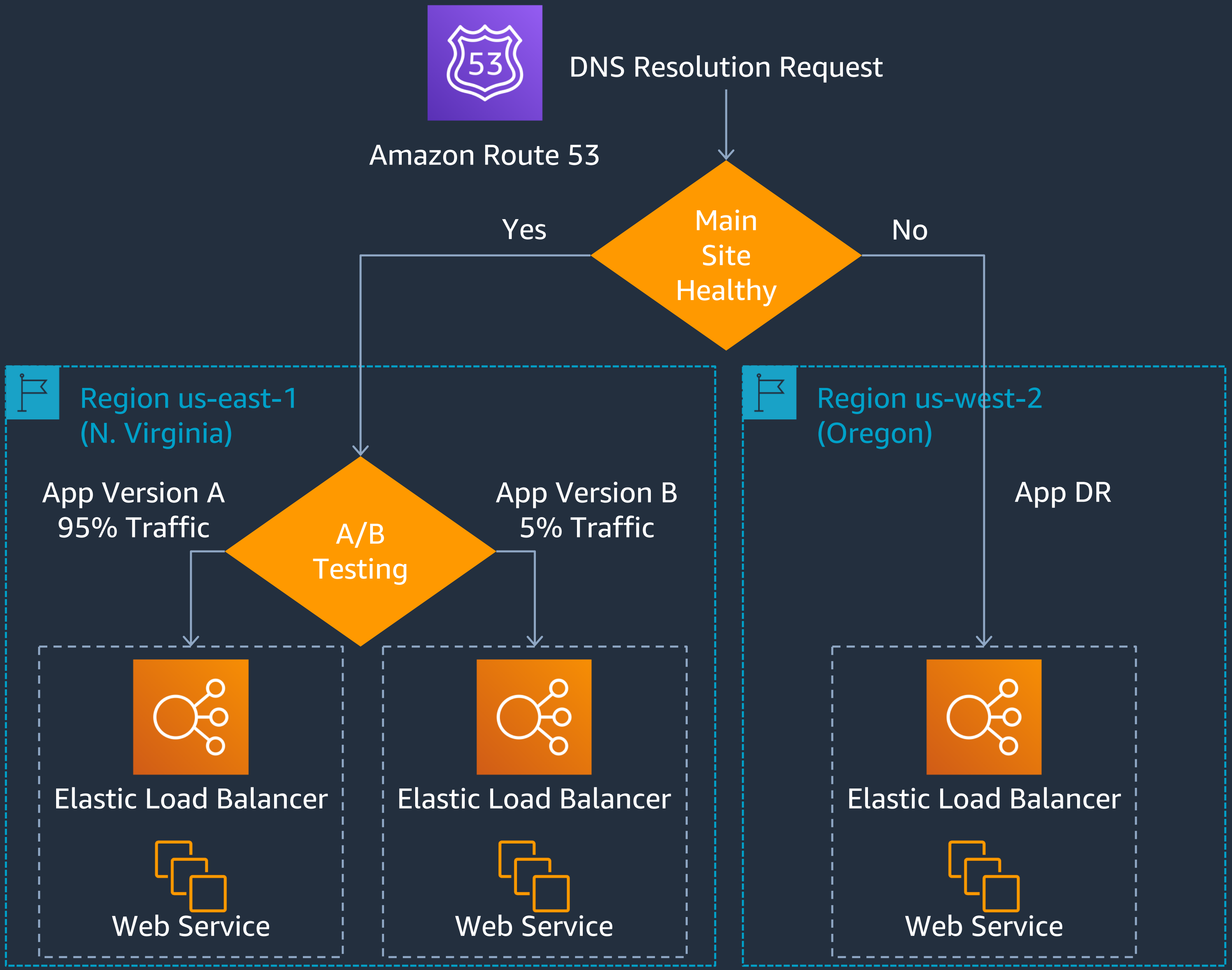
Elastic Load Balancing
Features Comparison

Feature	Application Load Balancer	Network Load Balancer
Protocols	HTTP, HTTPS	TCP
Platforms	VPC	VPC
Health checks	√	√
CloudWatch metrics	√	√
Logging	√	√
Path-Based Routing	√	
Host-Based Routing	√	
Native HTTP/2	√	
Configurable idle connection timeout	√	
SSL offloading	√	
Server Name Indication (SNI)	√	
Sticky sessions	√	
Back-end server encryption	√	
Static IP		√
Elastic IP address		√
Preserve Source IP address		√

How to solve my Domain Names to IP Address?

Amazon Route 53

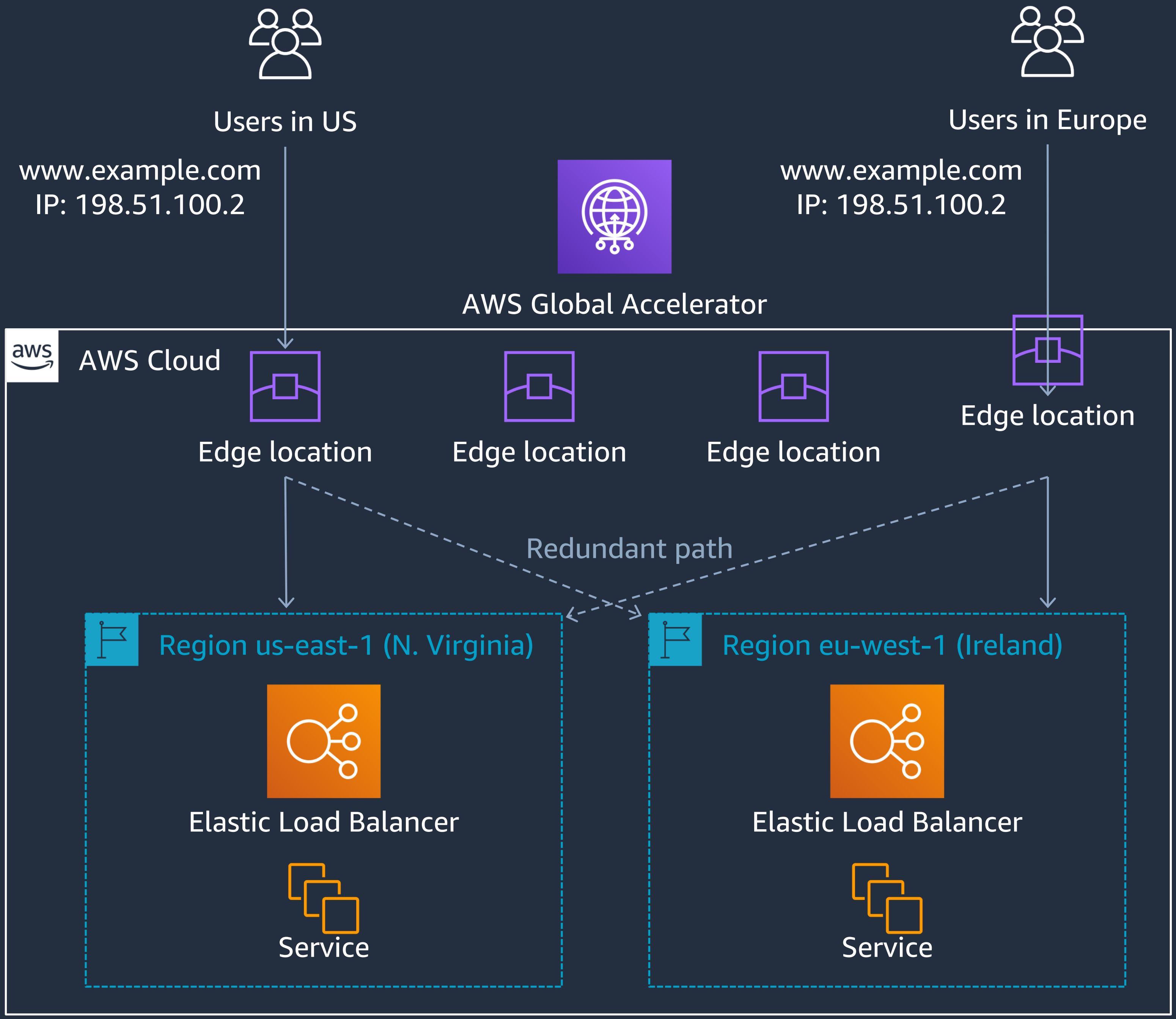
- AWS DNS service
- Domain Registration
- Domain name resolution
- 100% availability SLA
- Health Checks
- DNS Failover
- Latency Based Routing
- Geo Based Routing
- Weighted Round Robin
- Private DNS for VPC



Can I improve availability and performance of my global services?

AWS Global Accelerator

- Uses AWS Global Network from Edge to Region
- Client traffic ingresses via closes available Edge location
- Route client to closest healthy endpoint
- No DNS switchover required, same IP address globally
    - Static IP Anycast



Questions?