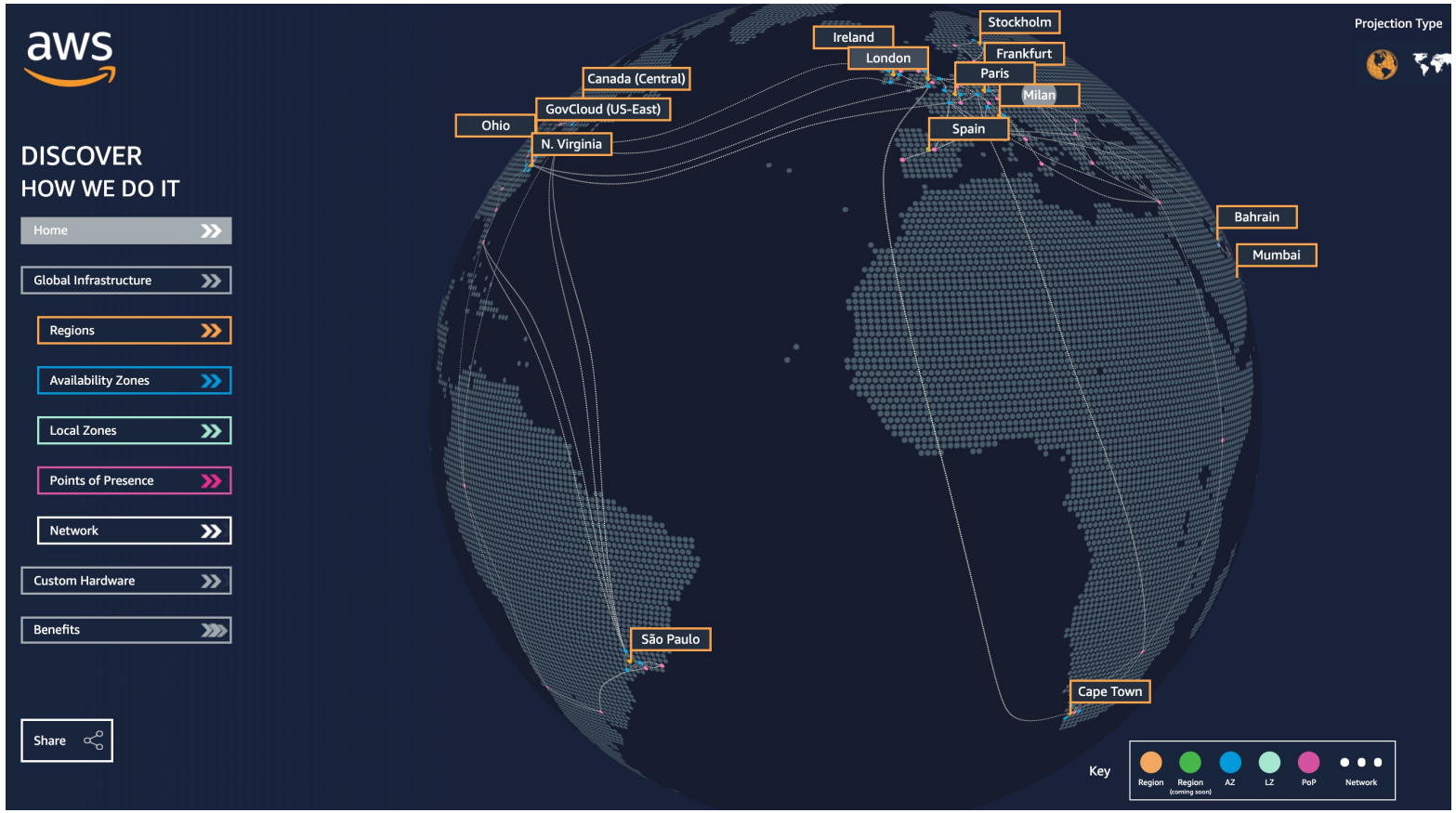
Global Infrastructure Section

Why make a global application?

- A **global application** is an application deployed in **multiple geographies**
- On AWS: this could be **Regions** and / or **Edge Locations**
- **Decreased Latency**
  - Latency is the time it takes for a network packet to reach a server
  - It takes time for a packet from Asia to reach the US
  - Deploy your applications closer to your users to decrease latency, better experience
- **Disaster Recovery (DR)**
  - If an AWS region goes down (earthquake, storms, power shutdown, politics)…
  - You can fail-over to another region and have your application still working
  - A DR plan is important to increase the availability of your application
- **Attack protection:** distributed global infrastructure is harder to attack

Global AWS Infrastructure

- **Regions:** For deploying applications and infrastructure
- **Availability Zones:** Made of multiple data centers
- **Edge Locations (Points of Presence):** for content delivery as close as possible to users
- More at: https://infrastructure.aws/



Global Applications in AWS

- Global DNS: Route 53
  - Great to route users to the closest deployment with least latency
  - Great for disaster recovery strategies

- Global Content Delivery Network (CDN): CloudFront
  - Replicate part of your application to AWS Edge Locations – decrease latency
  - Cache common requests – improved user experience and decreased latency

- S3 Transfer Acceleration
  - Accelerate global uploads & downloads into Amazon S3

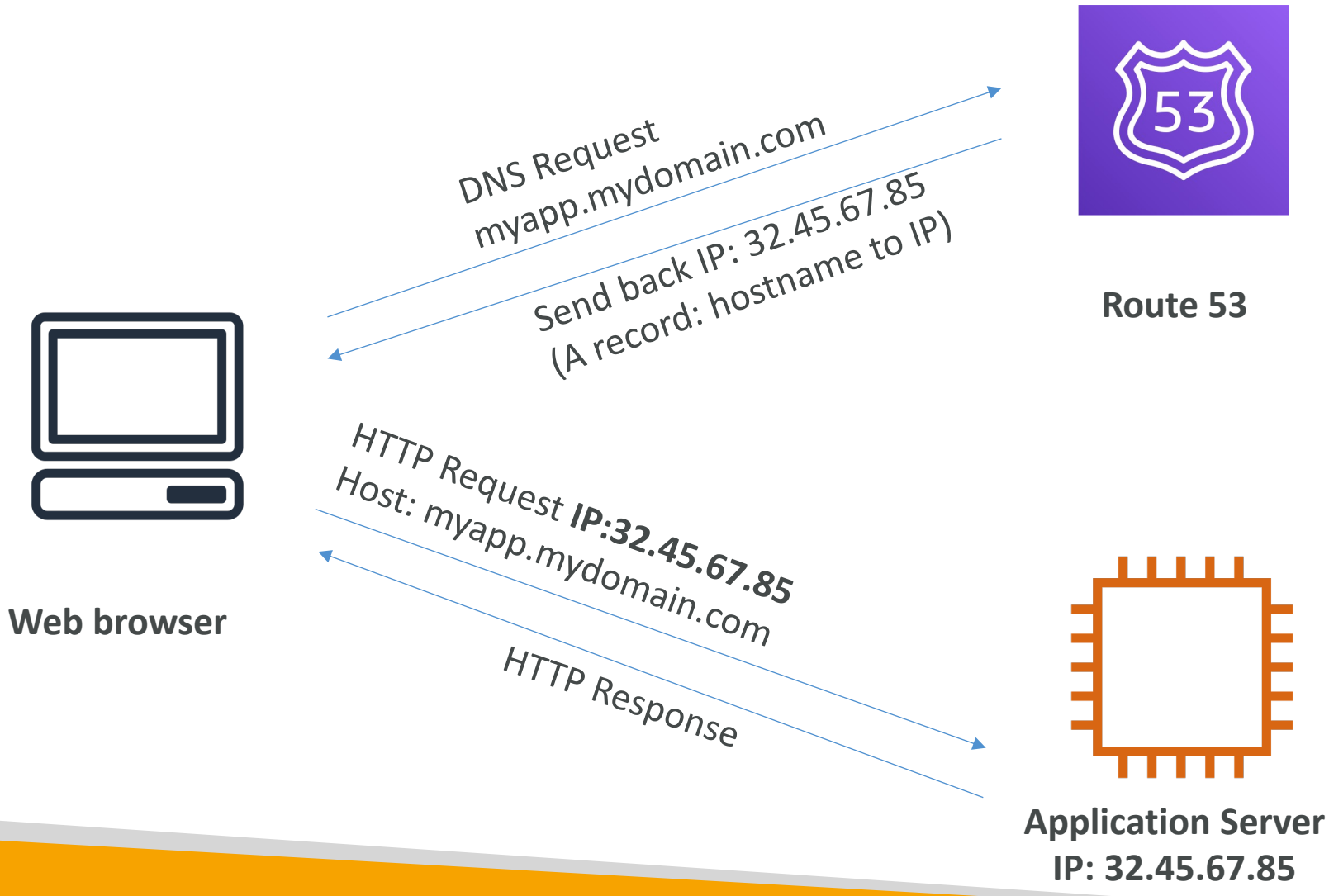
- AWS Global Accelerator:
  - Improve global application availability and performance using the AWS global network

Amazon Route 53 Overview

- Route53 is a Managed DNS (Domain Name System)
- DNS is a collection of rules and records which helps clients understand how to reach a server through URLs.

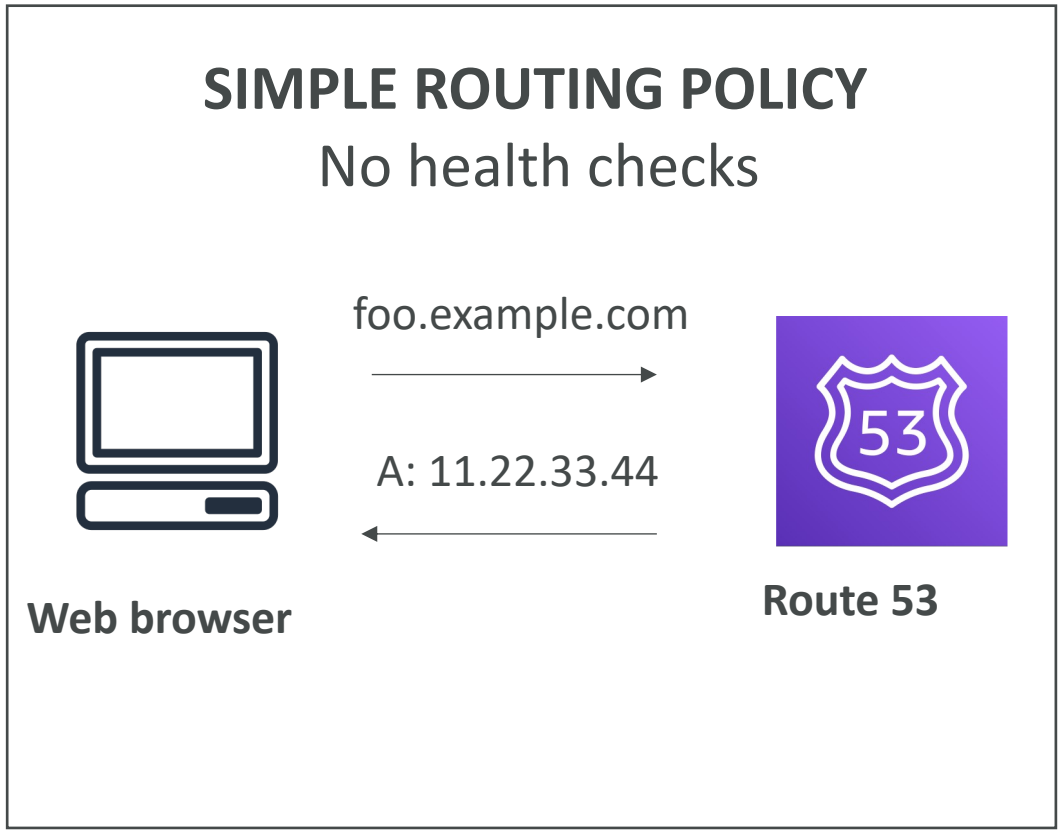
- In AWS, the most common records are:
  - www.google.com => 12.34.56.78 == A record (IPv4)
  - www.google.com => 2001:0db8:85a3:0000:0000:8a2e:0370:7334 == AAAA IPv6
  - search.google.com => www.google.com == CNAME: hostname to hostname
  - example.com => AWS resource == Alias (ex: ELB, CloudFront, S3, RDS, etc…)

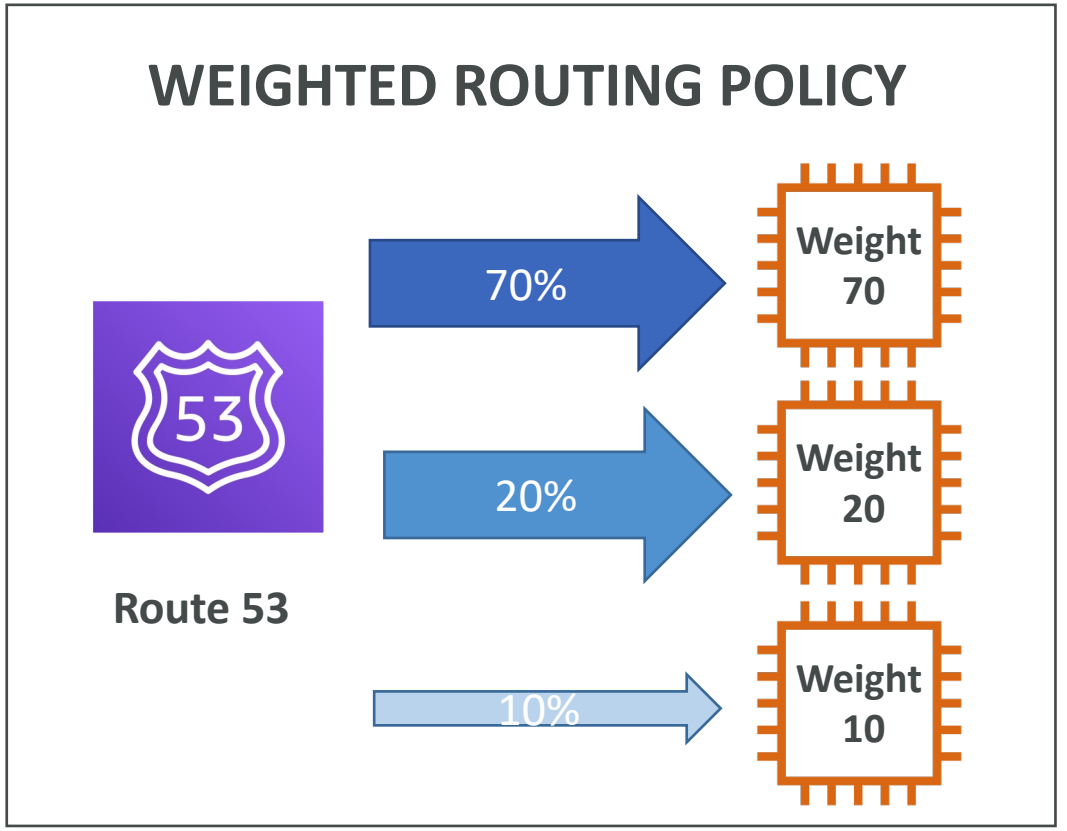
Route 53 – Diagram for A Record



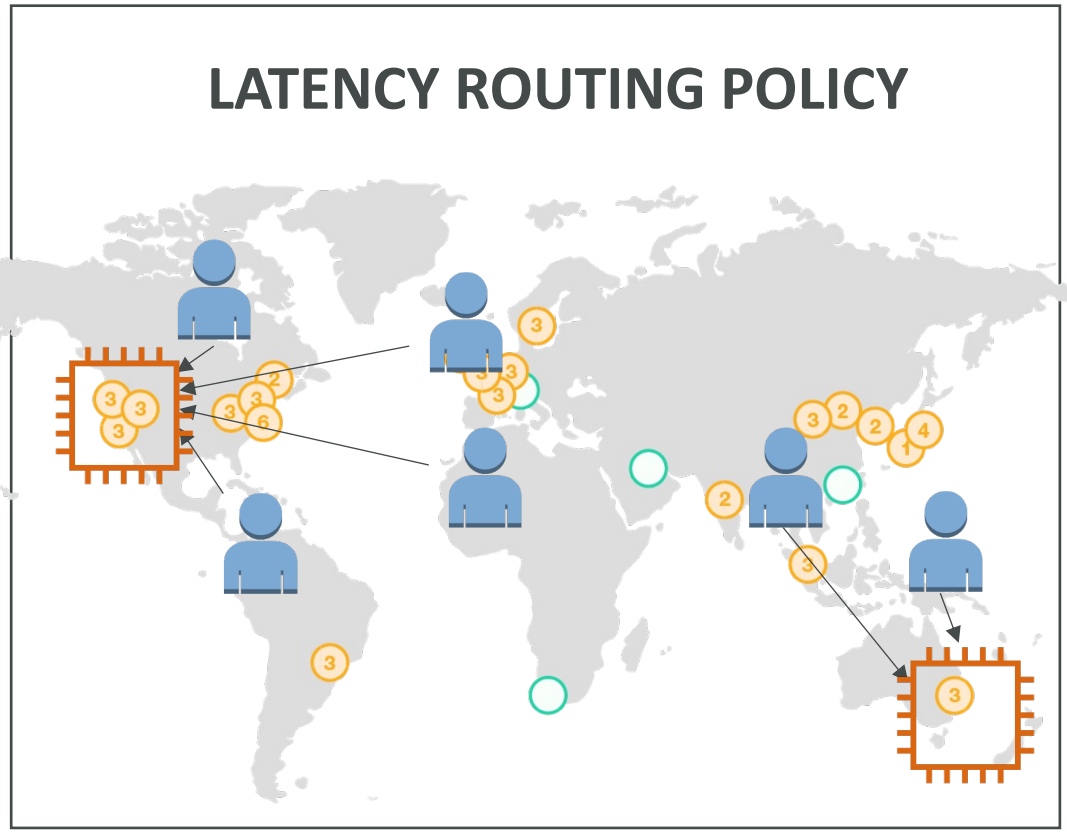
Route 53 Routing Policies

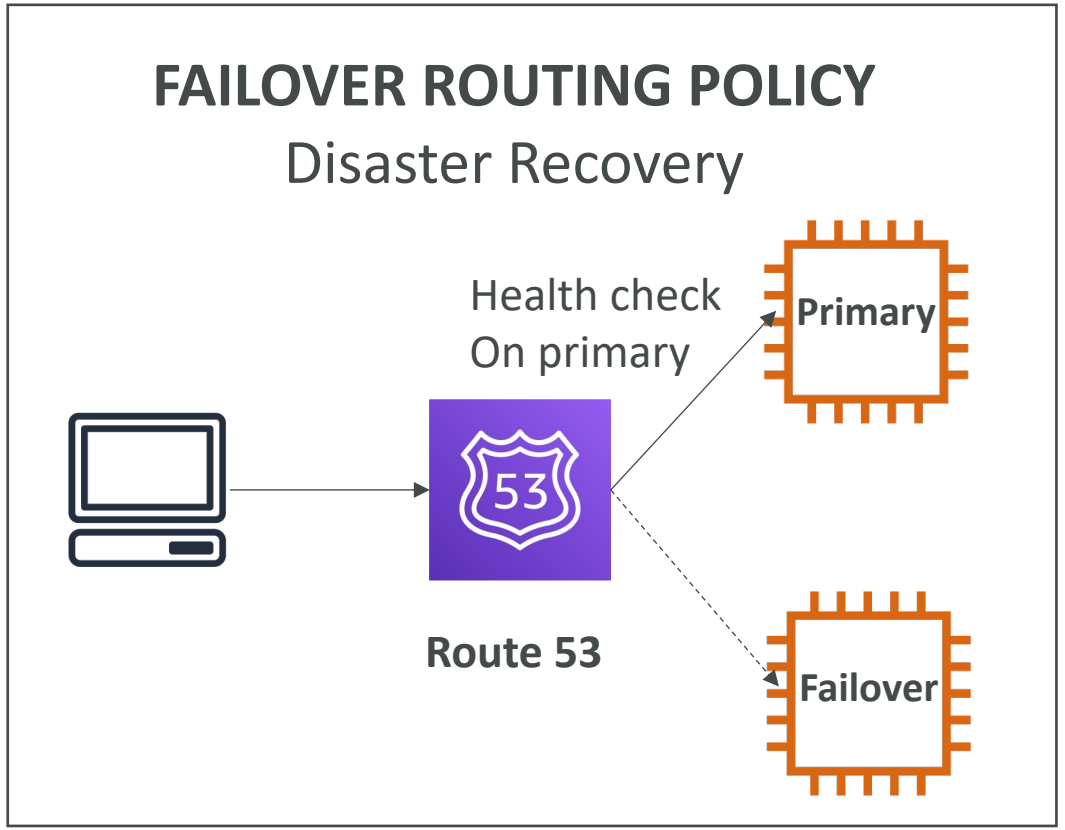
- Need to know them at a high-level for the Cloud Practitioner Exam





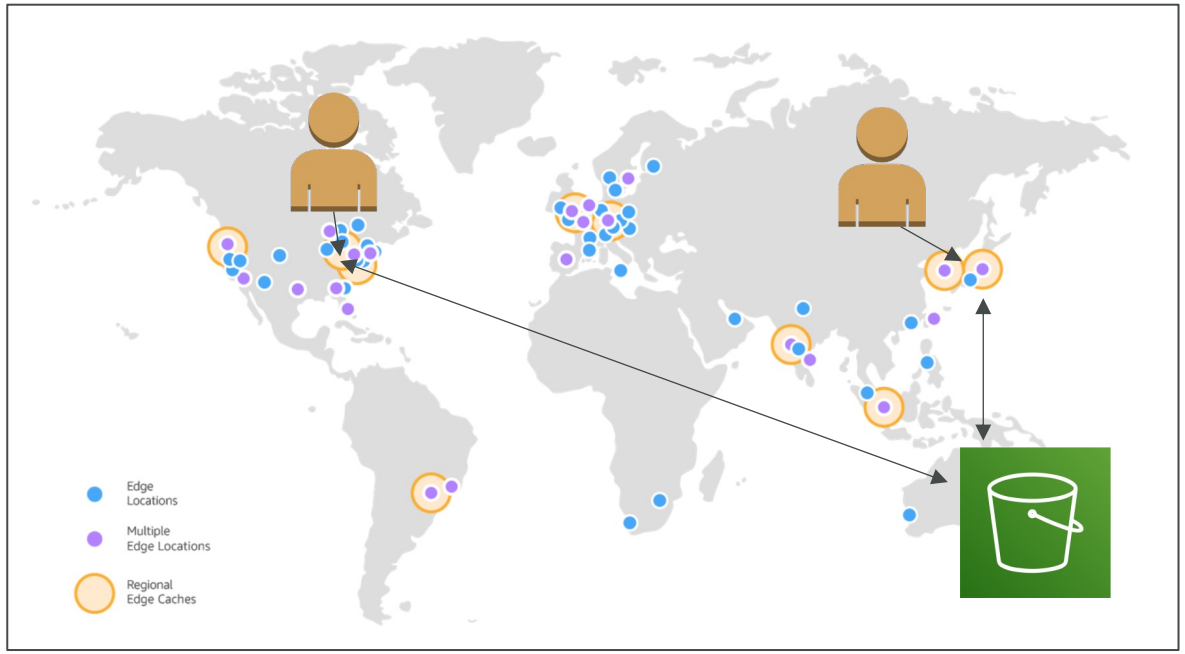
Route 53 Routing Policies





AWS CloudFront

- Content Delivery Network (CDN)
- Improves read performance, content is cached at the edge
- Improves users experience
- 216 Point of Presence globally (edge locations)
- DDoS protection (because worldwide), integration with Shield, AWS Web Application Firewall



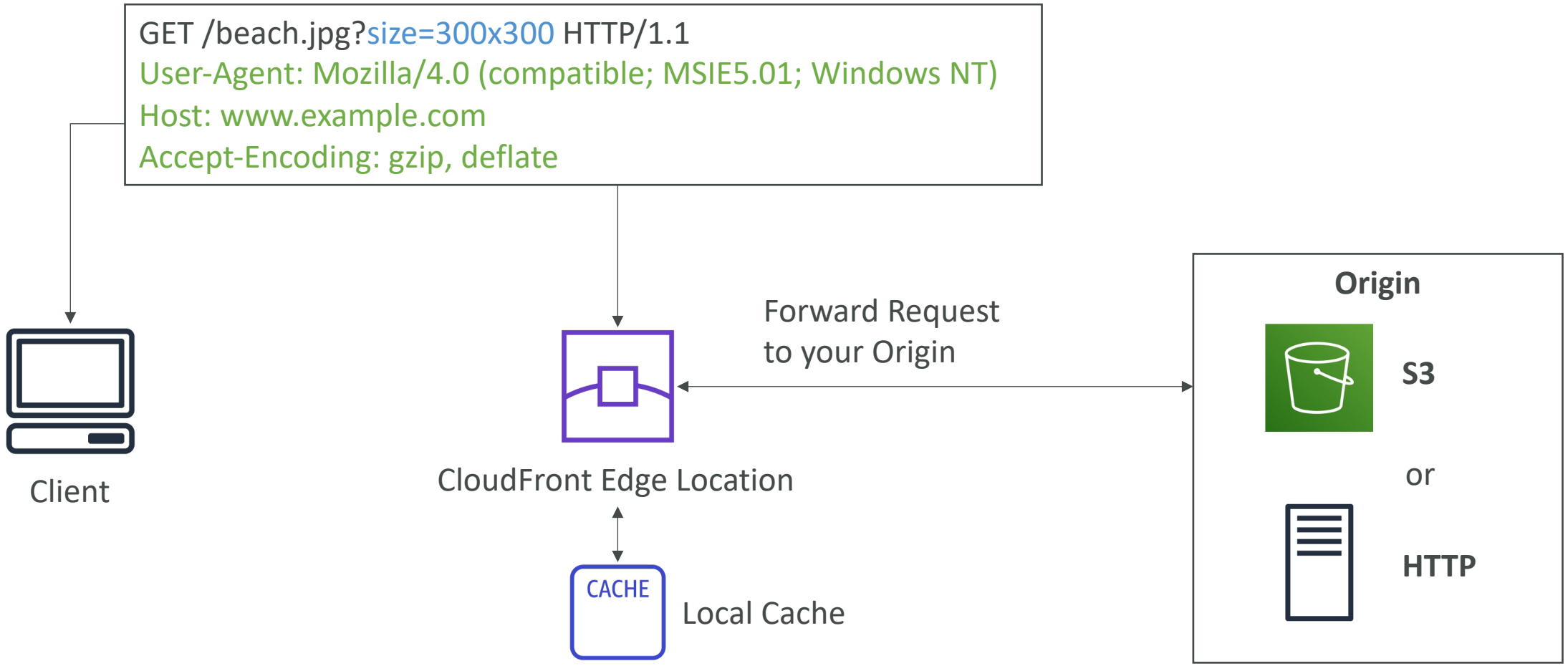
Source: https://aws.amazon.com/cloudfront/features/?nc=sn&loc=2

CloudFront – Origins

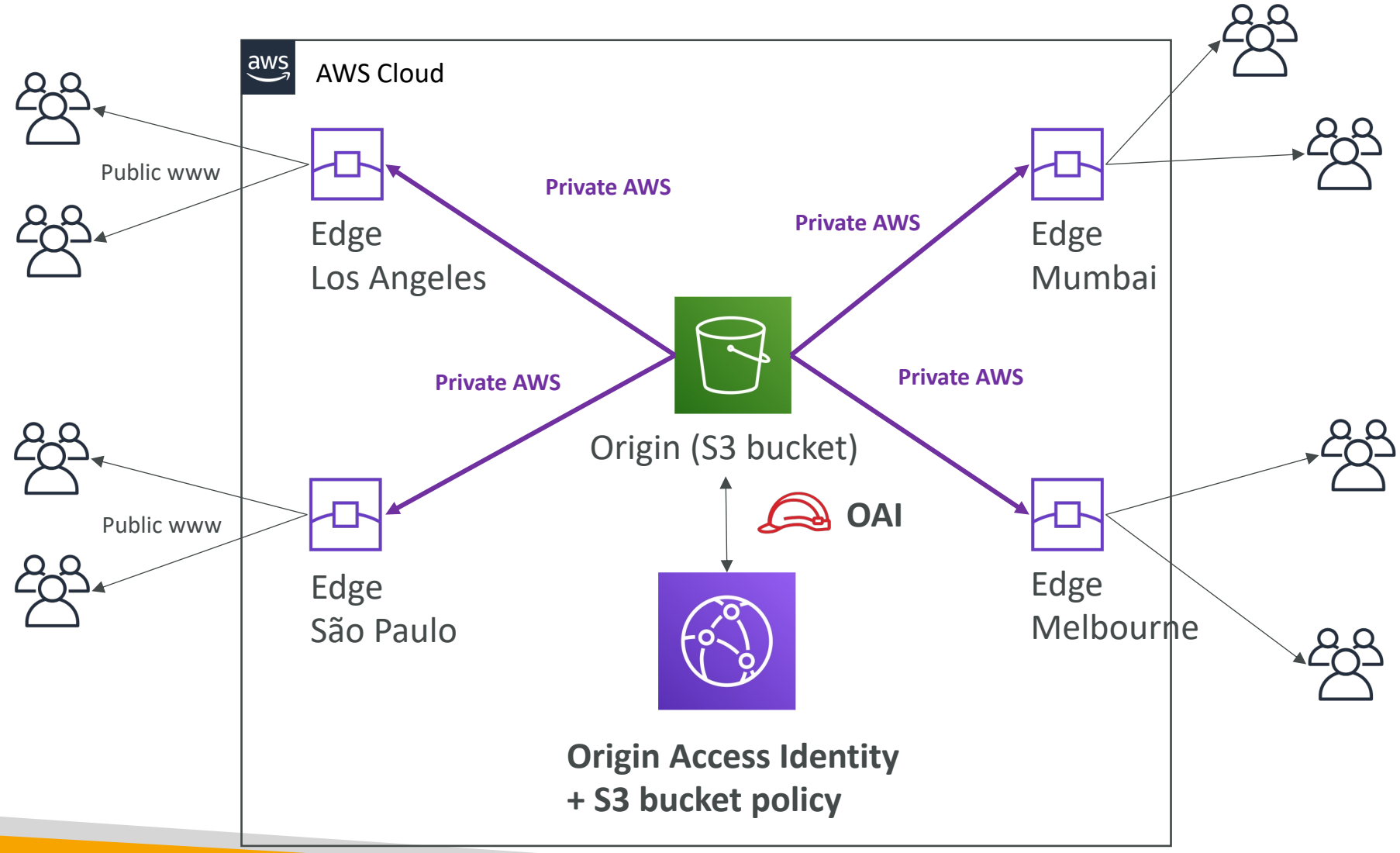
- S3 bucket
  - For distributing files and caching them at the edge
  - Enhanced security with CloudFront **Origin Access Identity (OAI)**
  - CloudFront can be used as an ingress (to upload files to S3)

- Custom Origin (HTTP)
  - Application Load Balancer
  - EC2 instance
  - S3 website (must first enable the bucket as a static S3 website)
  - Any HTTP backend you want

CloudFront at a high level



CloudFront – S3 as an Origin



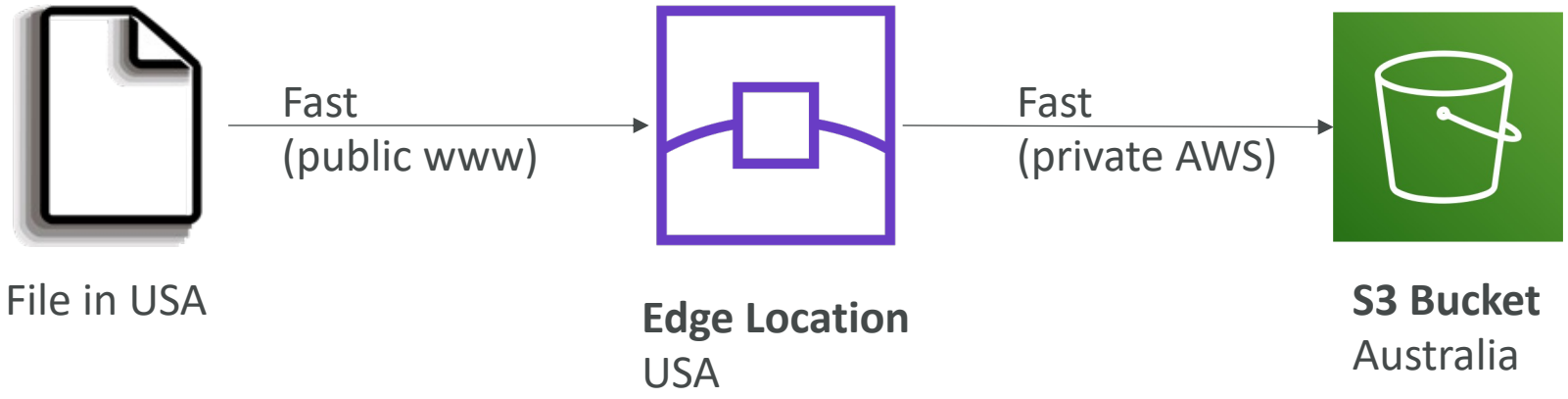
CloudFront vs S3 Cross Region Replication

- CloudFront:
  - Global Edge network
  - Files are cached for a TTL (maybe a day)
  - **Great for static content that must be available everywhere**

- S3 Cross Region Replication:
  - Must be setup for each region you want replication to happen
  - Files are updated in near real-time
  - Read only
  - **Great for dynamic content that needs to be available at low-latency in few regions**

S3 Transfer Acceleration

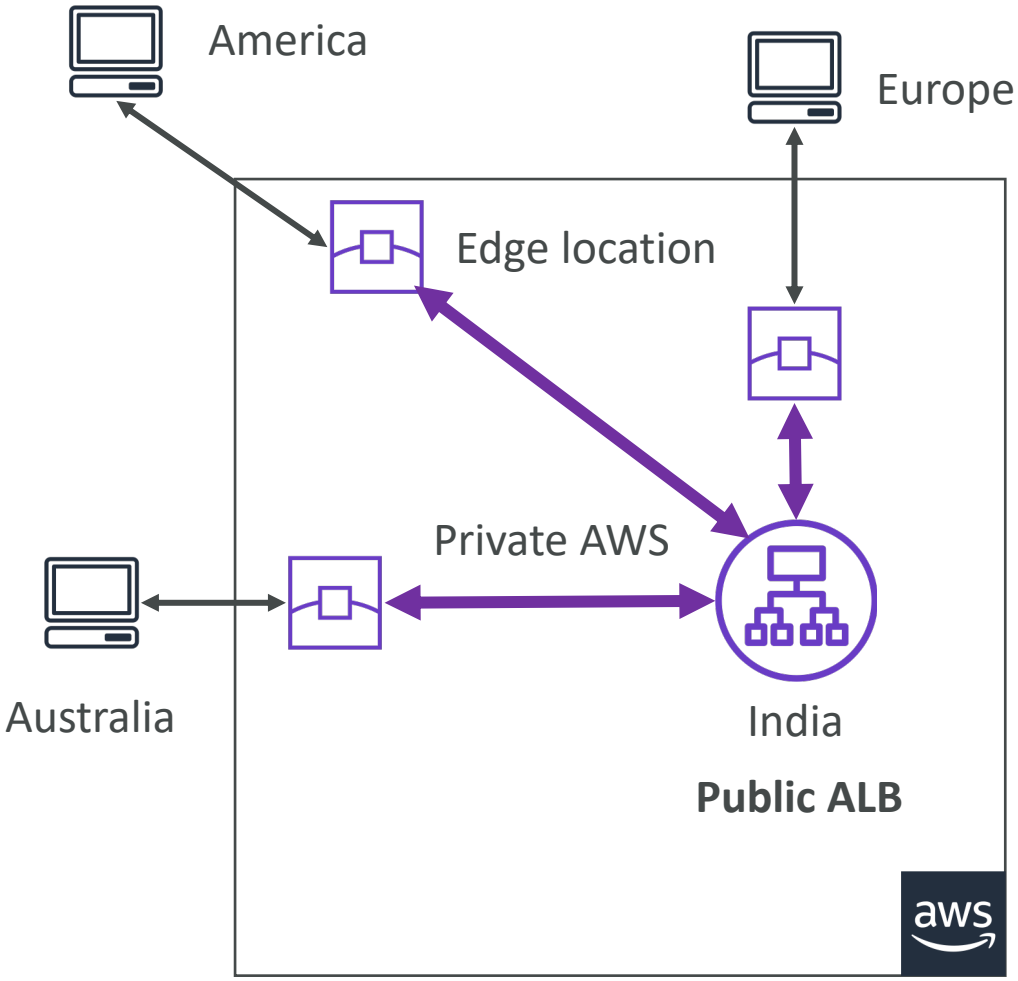
- Increase transfer speed by transferring file to an AWS edge location which will forward the data to the S3 bucket in the target region



Test the tool at: https://s3-accelerate-speedtest.s3-accelerate.amazonaws.com/en/accelerate-speed-comparsion.html

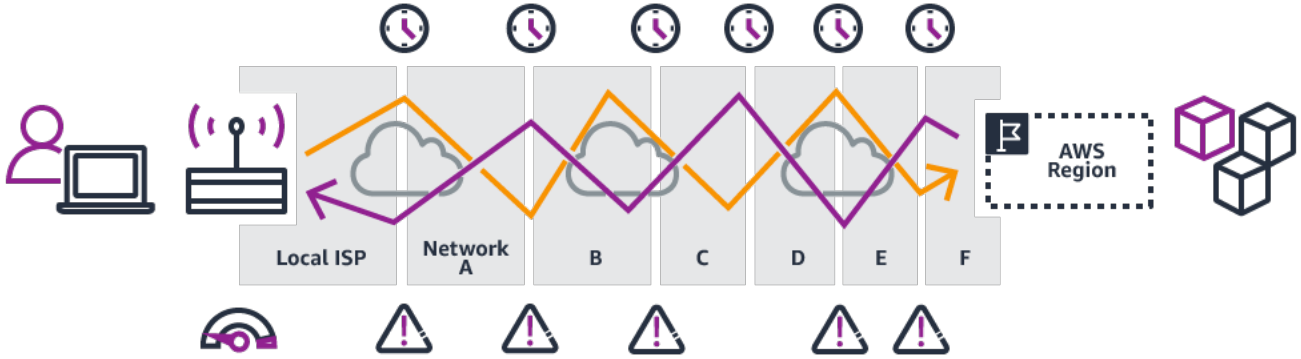
AWS Global Accelerator

- Improve global application availability and performance using the AWS global network
- Leverage the AWS internal network to optimize the route to your application (60% improvement)
- 2 Anycast IP are created for your application and traffic is sent through Edge Locations
- The Edge locations send the traffic to your application

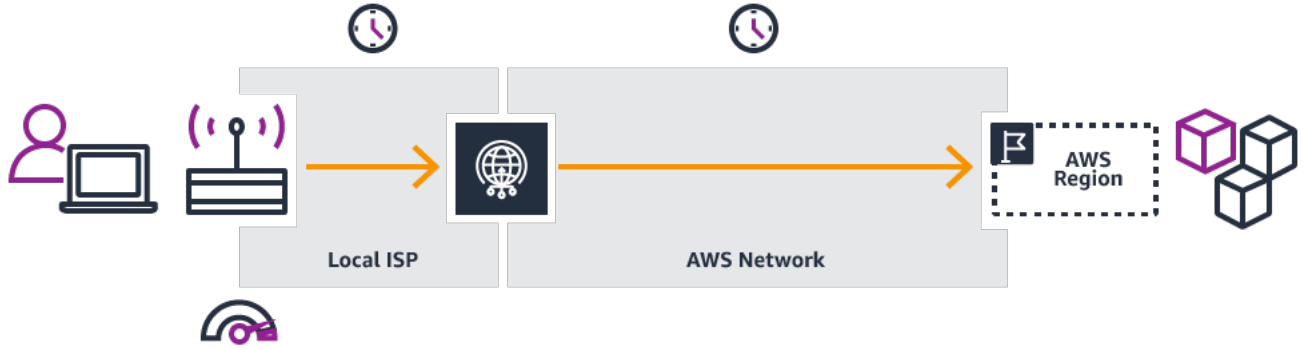


AWS Global Accelerator

Without Global Accelerator



With Global Accelerator



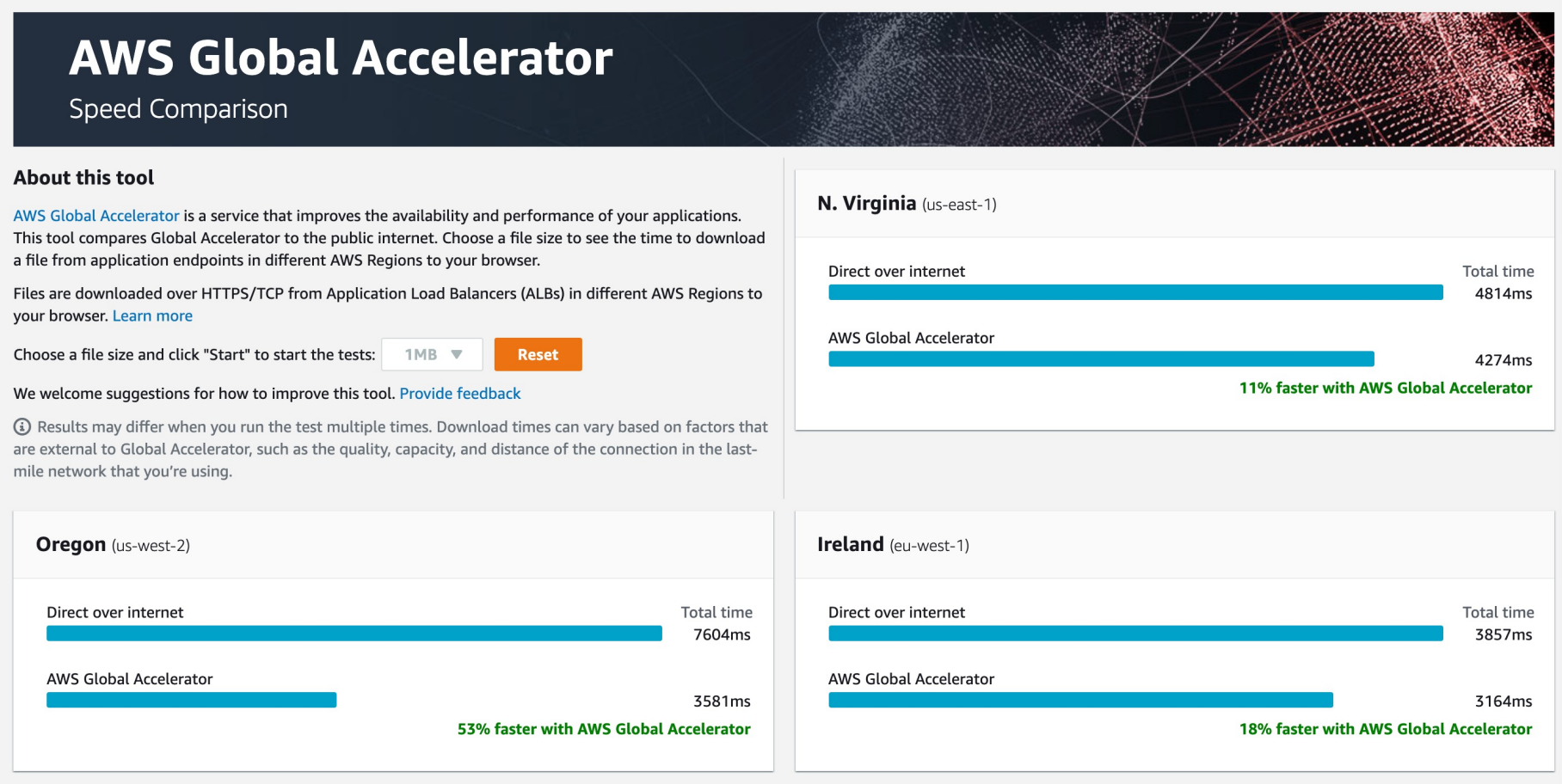
https://aws.amazon.com/global-accelerator

AWS Global Accelerator vs CloudFront

- They both use the AWS global network and its edge locations around the world
- Both services integrate with AWS Shield for DDoS protection.
- CloudFront – Content Delivery Network
  - Improves performance for your cacheable content (such as images and videos)
  - Content is served at the edge

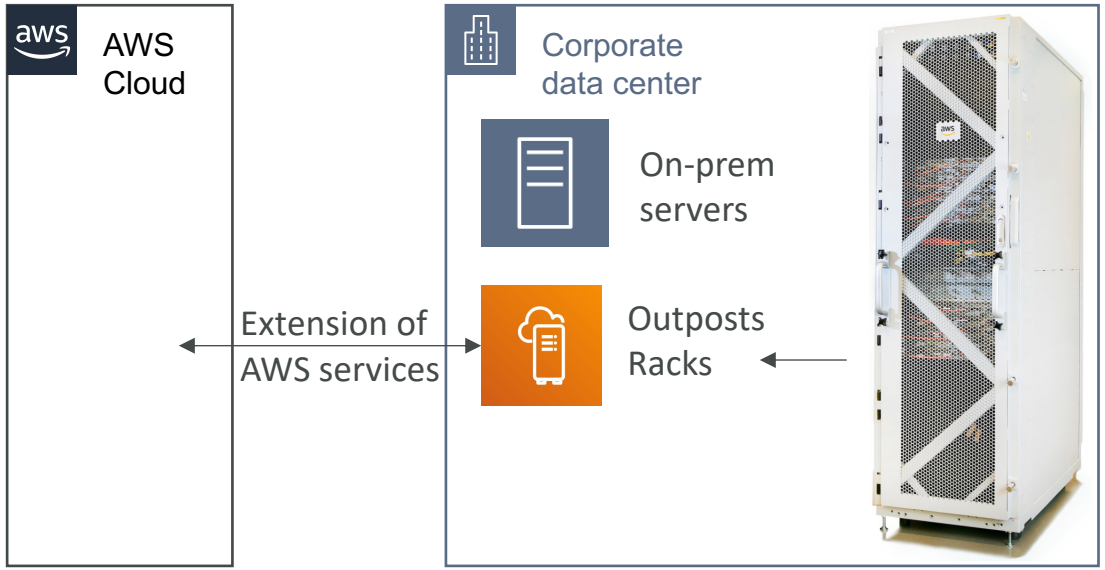
- Global Accelerator
  - No caching, proxying packets at the edge to applications running in one or more AWS Regions.
  - Improves performance for a wide range of applications over TCP or UDP
  - Good for HTTP use cases that require static IP addresses
  - Good for HTTP use cases that required deterministic, fast regional failover

https://speedtest.globalaccelerator.aws/#/



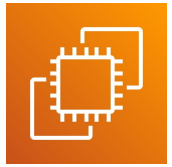
AWS Outposts

- **Hybrid Cloud**: businesses that keep an on-premises infrastructure alongside a cloud infrastructure
- Therefore, two ways of dealing with IT systems:
  - One for the AWS cloud (using the AWS console, CLI, and AWS APIs)
  - One for their on-premises infrastructure
- **AWS Outposts are "server racks"** that offers the same AWS infrastructure, services, APIs & tools to build your own applications on-premises just as in the cloud
- **AWS will setup and manage "Outposts Racks"** within your on-premises infrastructure and you can start leveraging AWS services on-premises
- You are responsible for the Outposts Rack physical security



AWS Outposts

- Benefits:
  - Low-latency access to on-premises systems
  - Local data processing
  - Data residency
  - Easier migration from on-premises to the cloud
  - Fully managed service
- Some services that work on Outposts:


Amazon EC2


Amazon EBS


Amazon S3


Amazon EKS

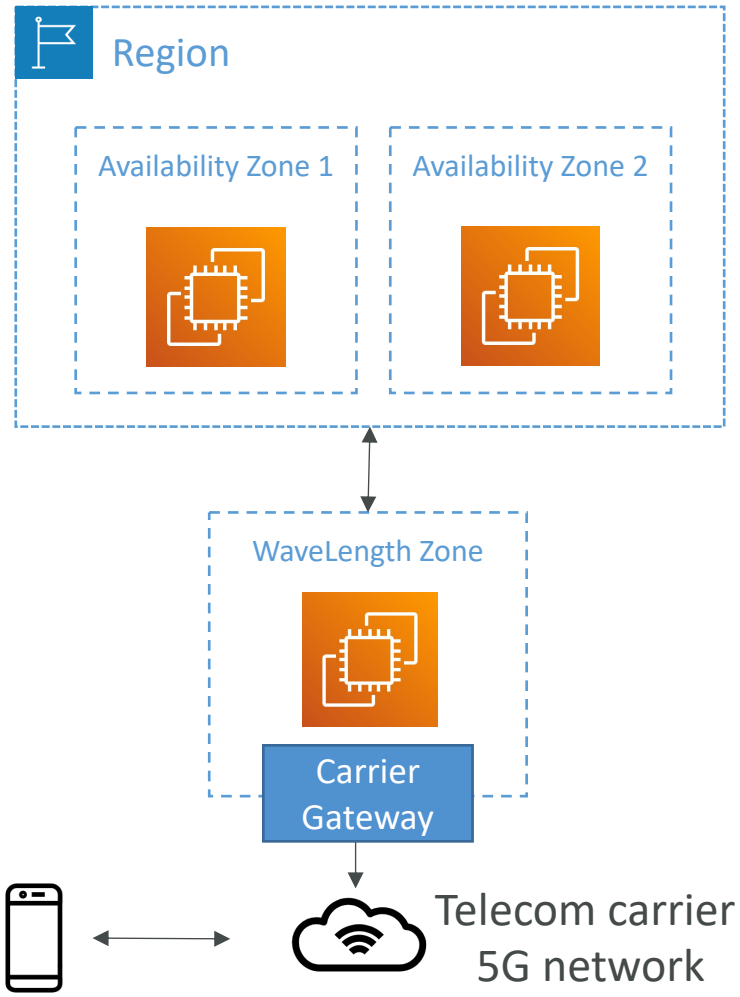

Amazon ECS


Amazon RDS


Amazon EMR

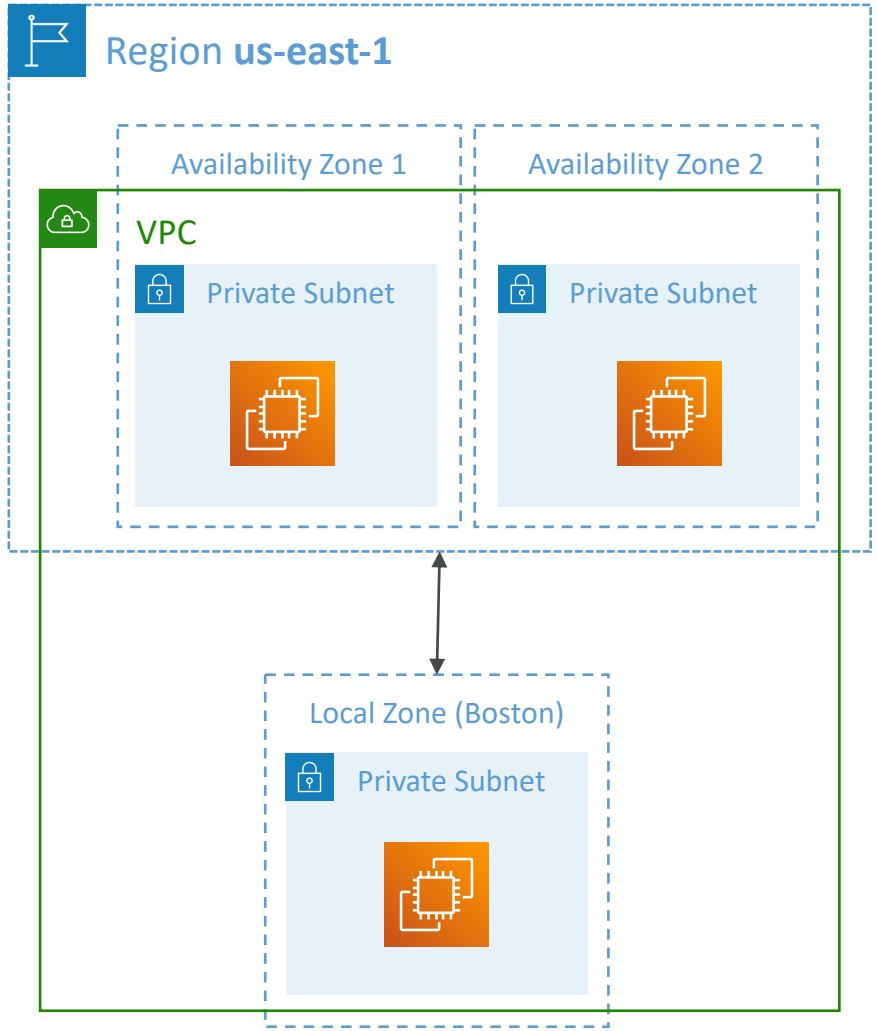
AWS WaveLength

- **WaveLength Zones** are infrastructure deployments embedded within the telecommunications providers' datacenters at the edge of the 5G networks
- Brings AWS services to the edge of the 5G networks
- Example: EC2, EBS, VPC…
- Ultra-low latency applications through 5G networks
- Traffic doesn't leave the Communication Service Provider's (CSP) network
- High-bandwidth and secure connection to the parent AWS Region
- No additional charges or service agreements
- Use cases: Smart Cities, ML-assisted diagnostics, Connected Vehicles, Interactive Live Video Streams, AR/VR, Real-time Gaming, …



AWS Local Zones

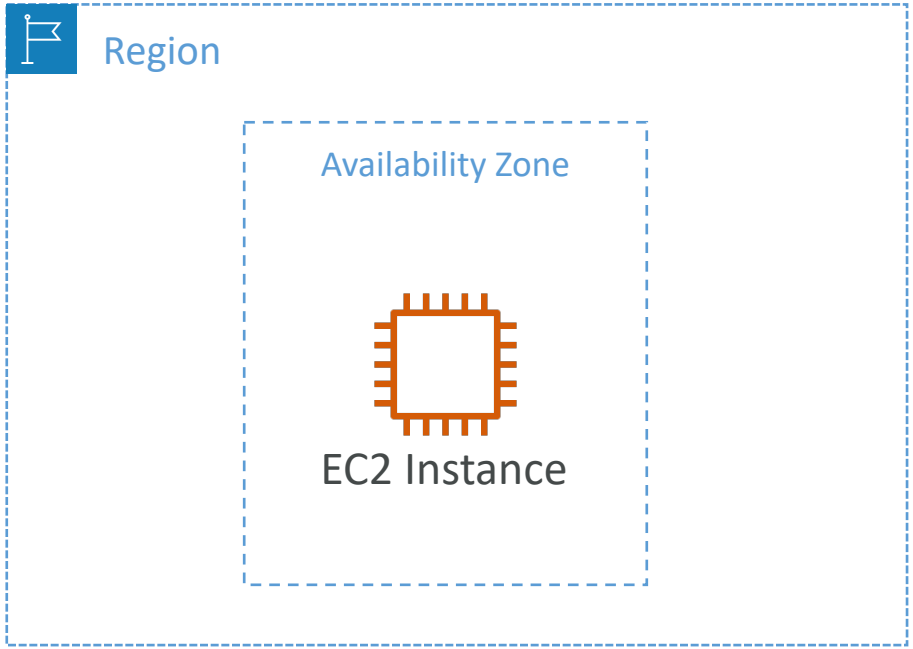
- Places AWS compute, storage, database, and other selected AWS services **closer to end users to run latency-sensitive applications**
- Extend your VPC to more locations – "**Extension of an AWS Region**"
- Compatible with EC2, RDS, ECS, EBS, ElastiCache, Direct Connect …
- Example:
  - **AWS Region:** N.Virginia (us-east-1)
  - **AWS Local Zones:** Boston, Chicago, Dallas, Houston, Miami, …



Global Applications Architecture

Single Region, **Single** AZ

- ✗ High Availability
- ✗ Global Latency
- Difficulty



Single Region, **Multi** AZ

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- ✗ Global Latency
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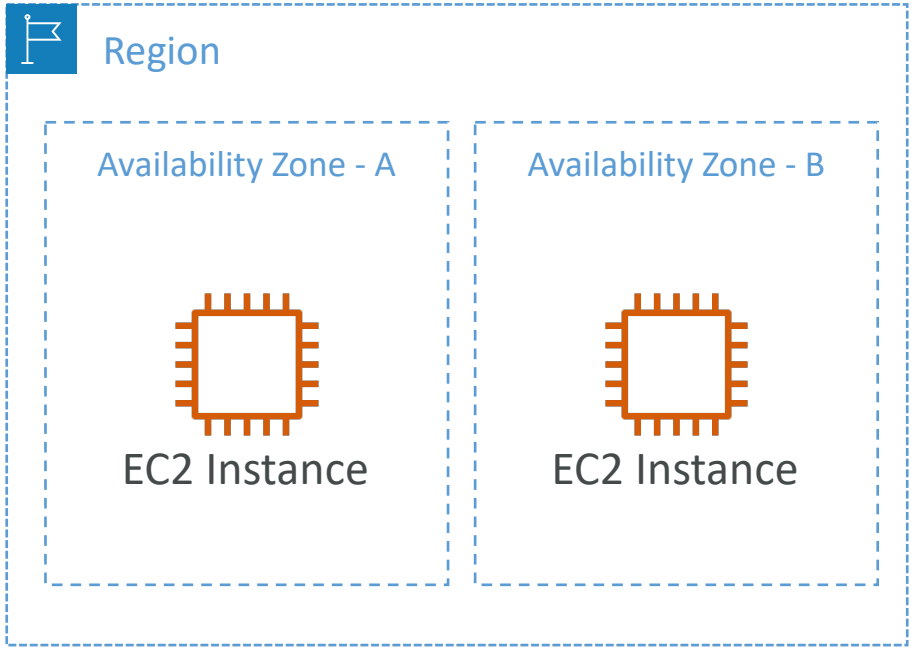

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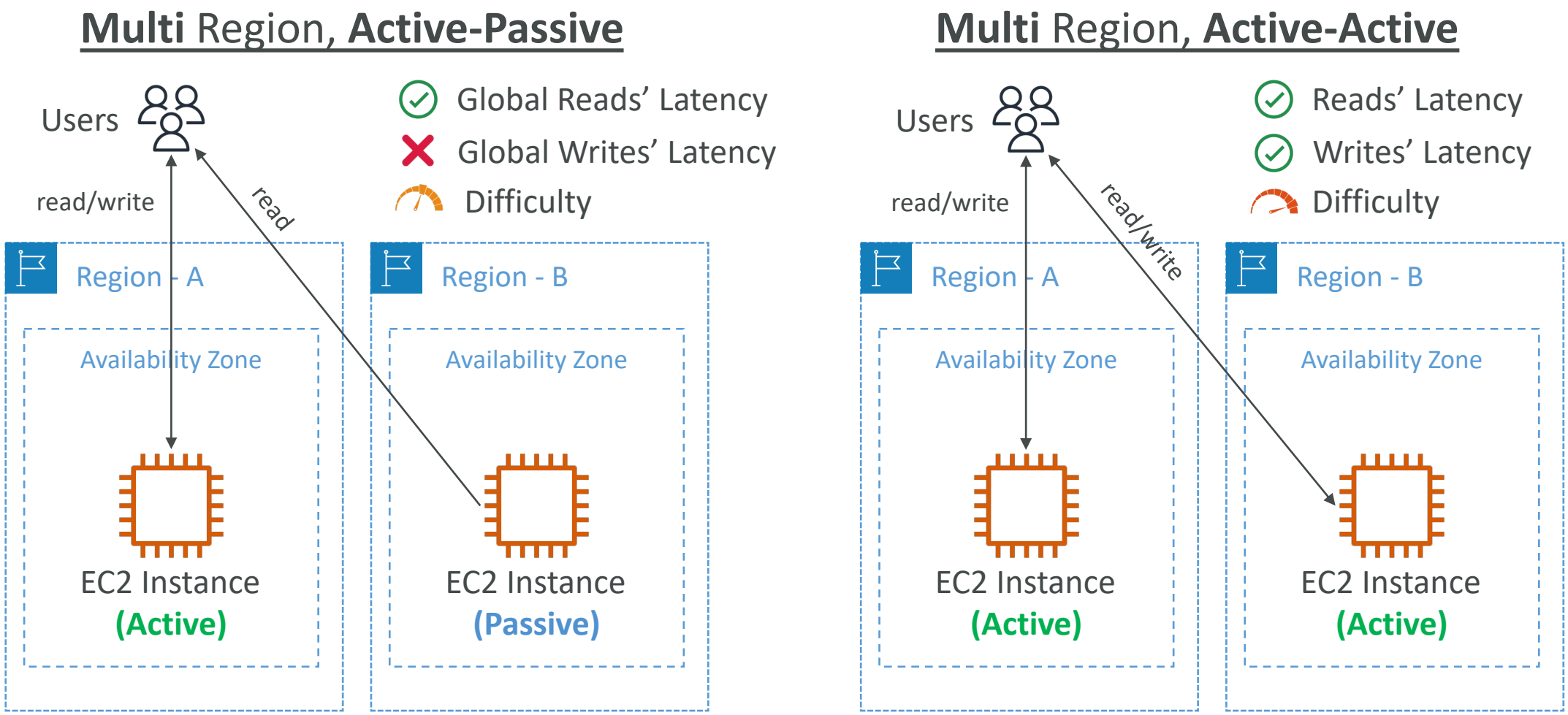
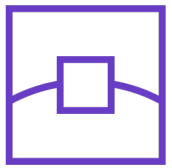


Global Applications in AWS - Summary



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Global Applications in AWS - Summary

- AWS Outposts
  - Deploy Outposts Racks in your own Data Centers to extend AWS services

- AWS WaveLength
  - Brings AWS services to the edge of the 5G networks
  - Ultra-low latency applications

- AWS Local Zones
  - Bring AWS resources (compute, database, storage, …) closer to your users
  - Good for latency-sensitive applications