



Going Global with Serverless!

Adrian Hornsby, Cloud Architecture Evangelist





<https://xkcd.com/1428/>

JOBS I'VE BEEN FIRED FROM

FEDEX DRIVER
CRANE OPERATOR
SURGEON
AIR TRAFFIC CONTROLLER
PHARMACIST
MUSEUM CURATOR
WAITER
DOG WALKER
OIL TANKER CAPTAIN
VIOLINIST
MARS ROVER DRIVER
MASSAGE THERAPIST

“

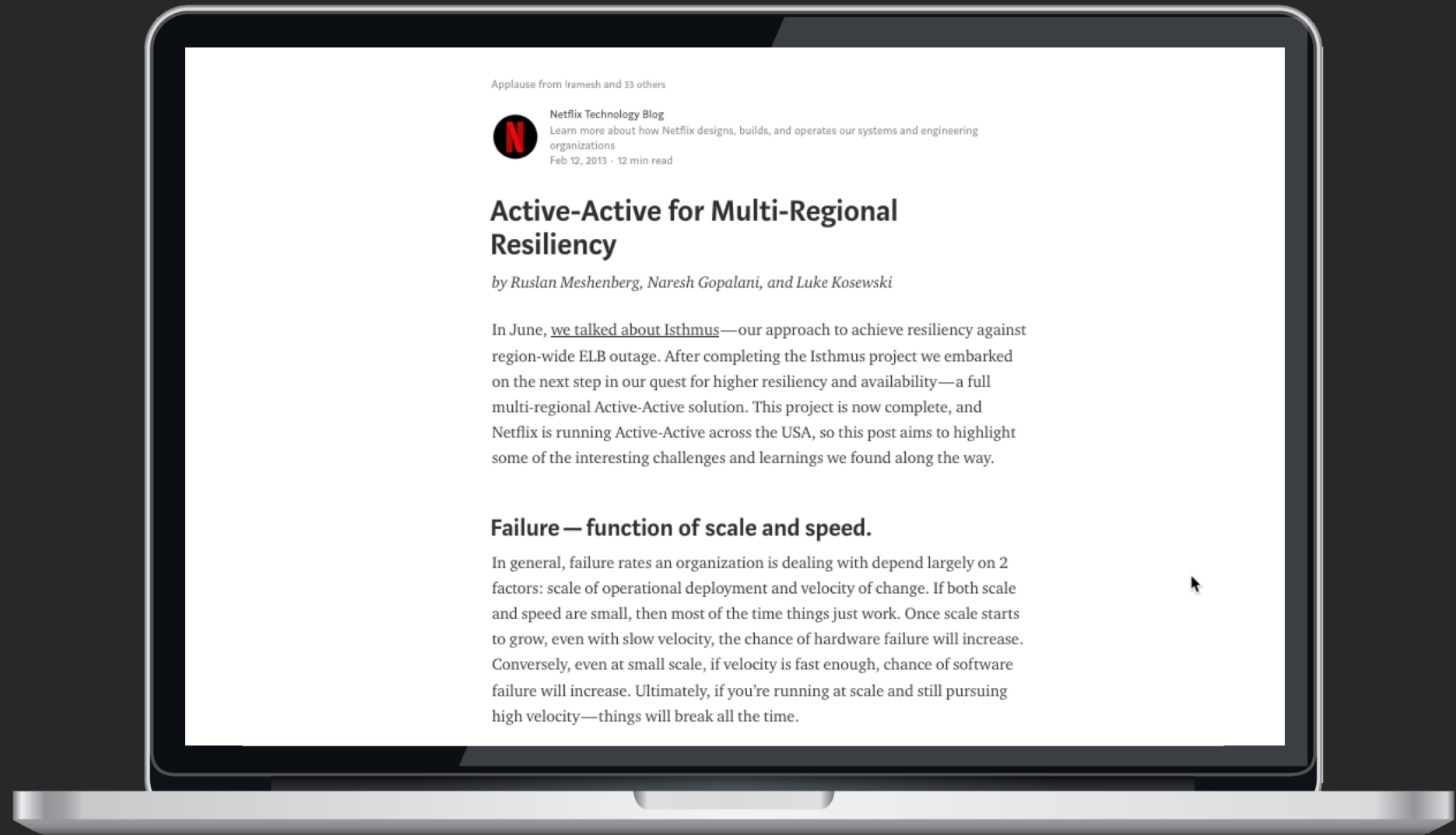
Failures are a given and
everything will eventually fail
over time.

”

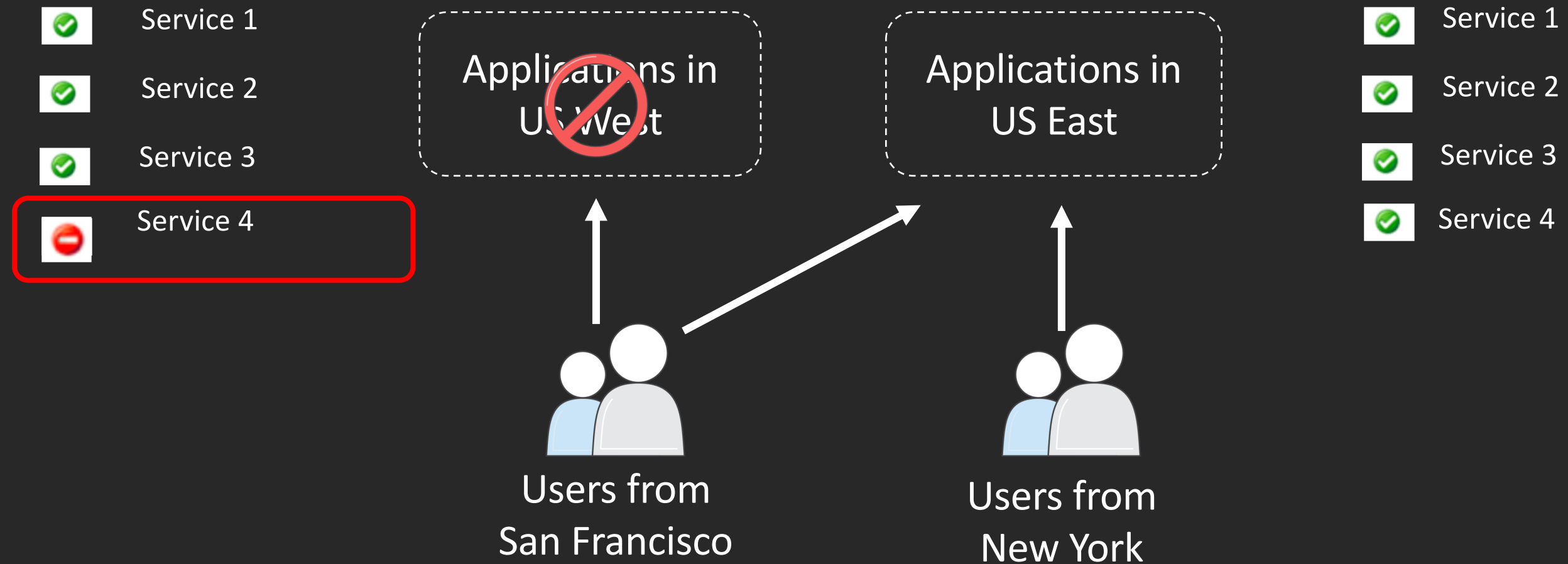
Werner Vogels
CTO – Amazon.com



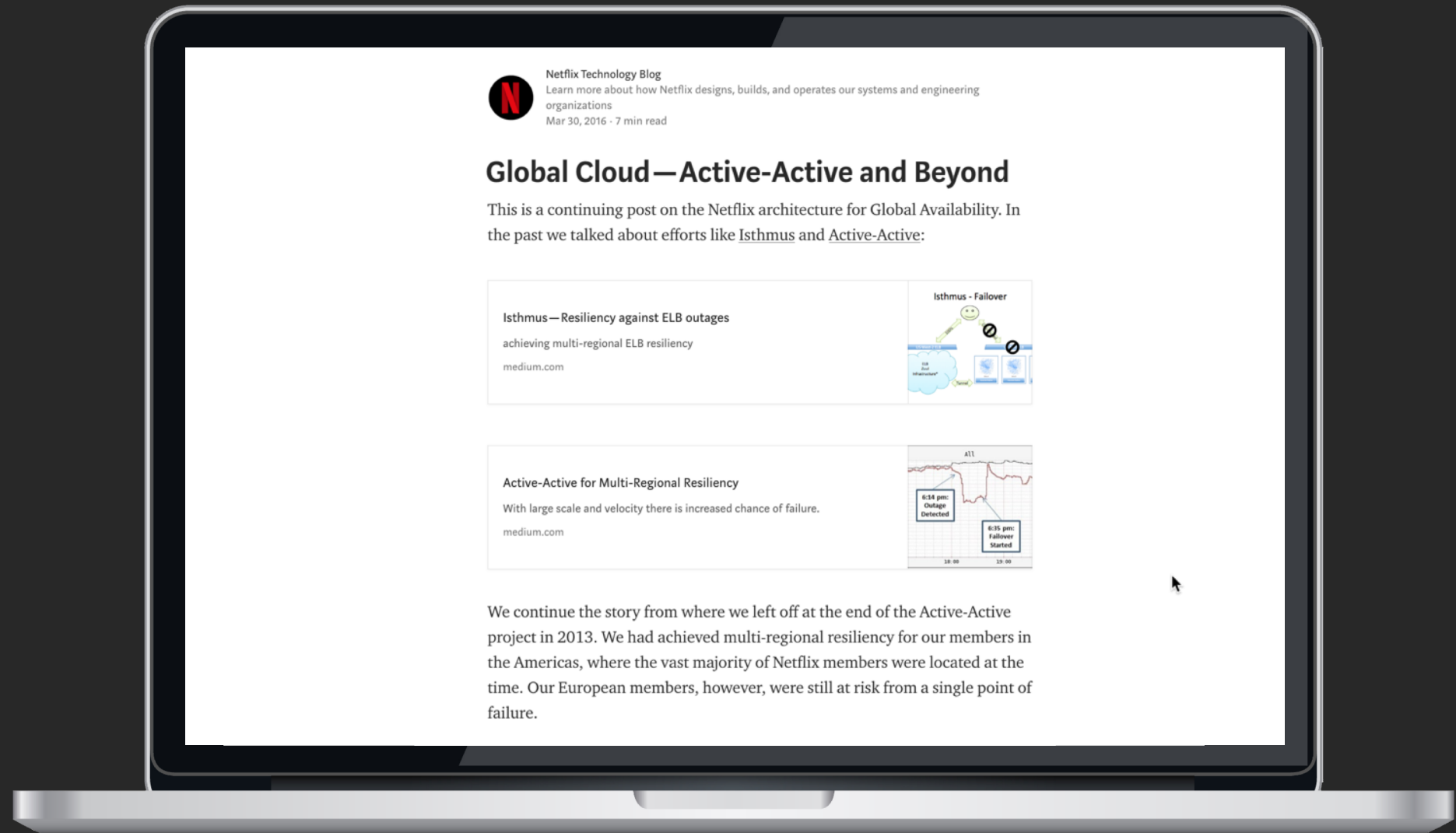
Netflix 2013



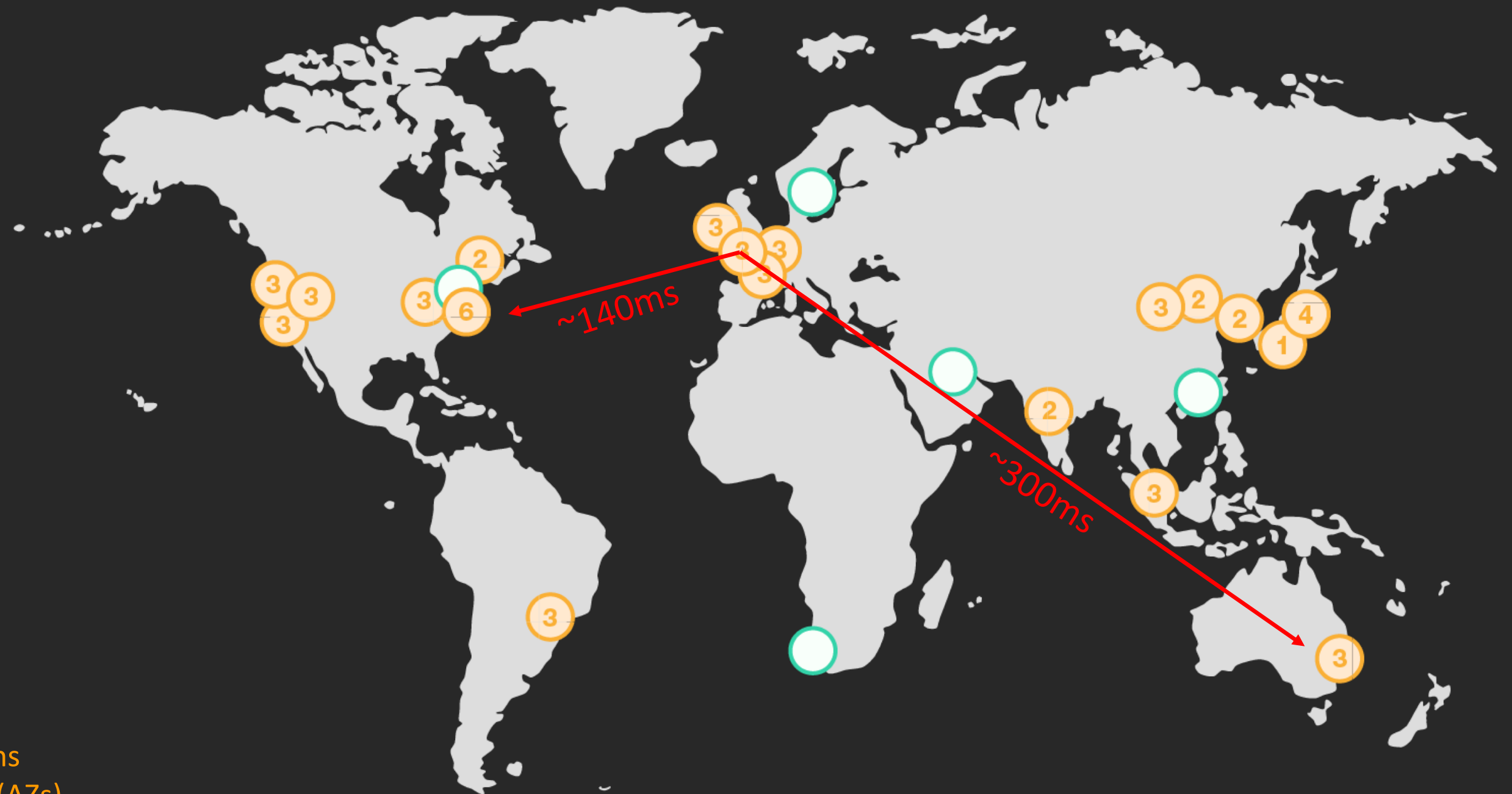
Disaster recovery



Netflix 2016



Improve latency for end-users



18 Geographic Regions
55 Availability Zones (AZs)
5 regions and 15 more Availability Zones announced

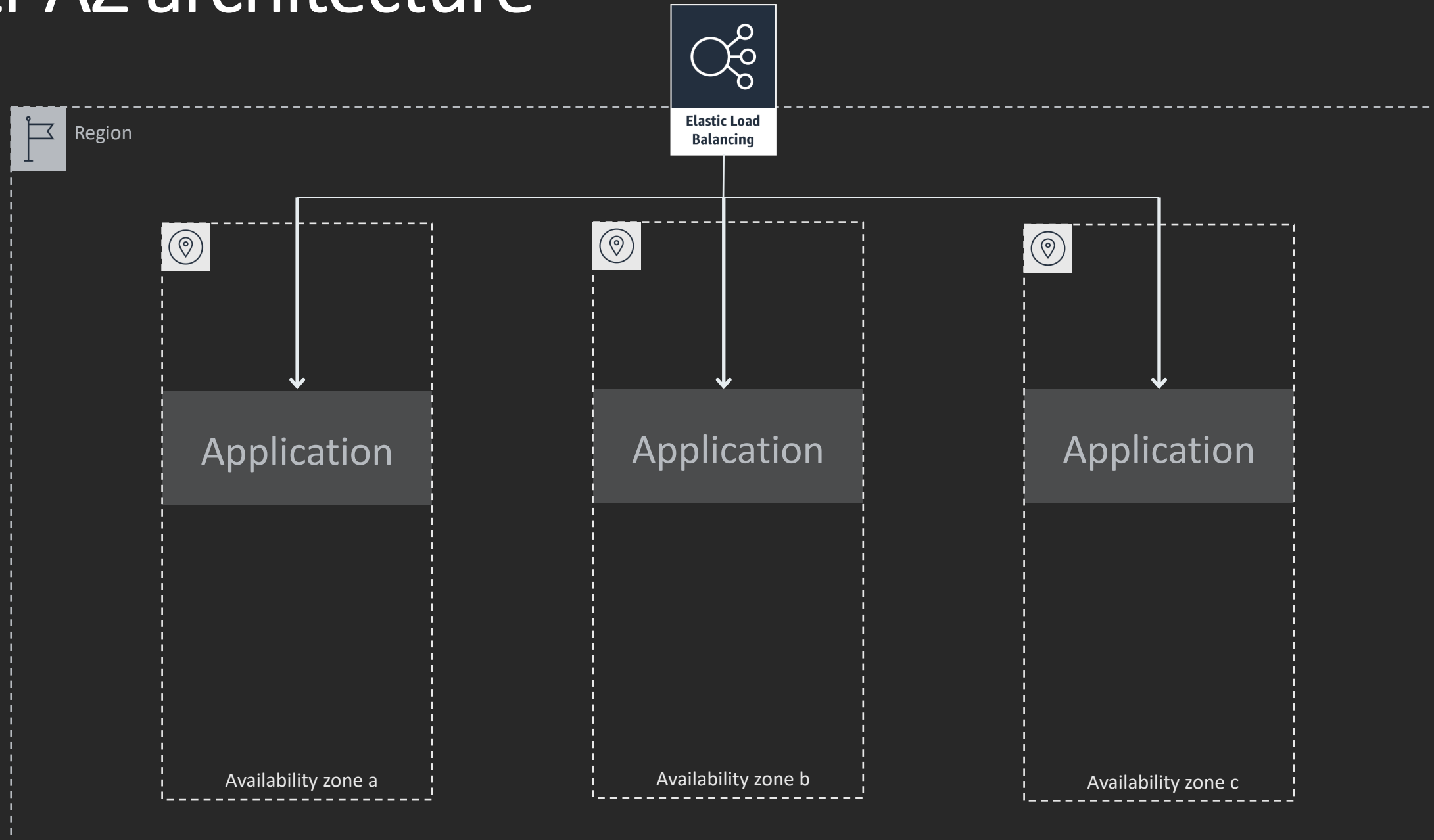
AWS Region and availability zones



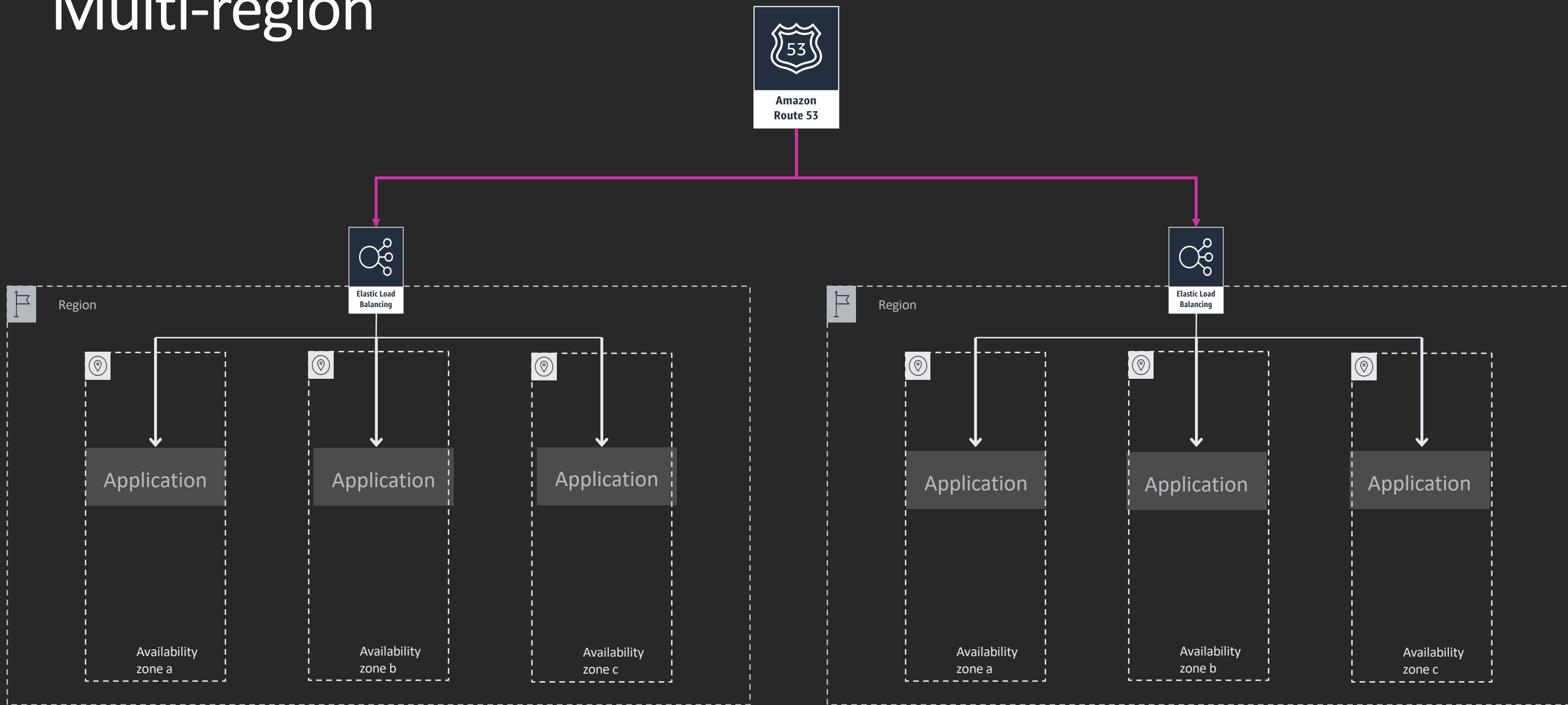
* n data center per AZ

** AZ per region: 2 to 6

Multi-AZ architecture



Multi-region



Why serverless components??



No servers to provision
or manage



Scales with usage

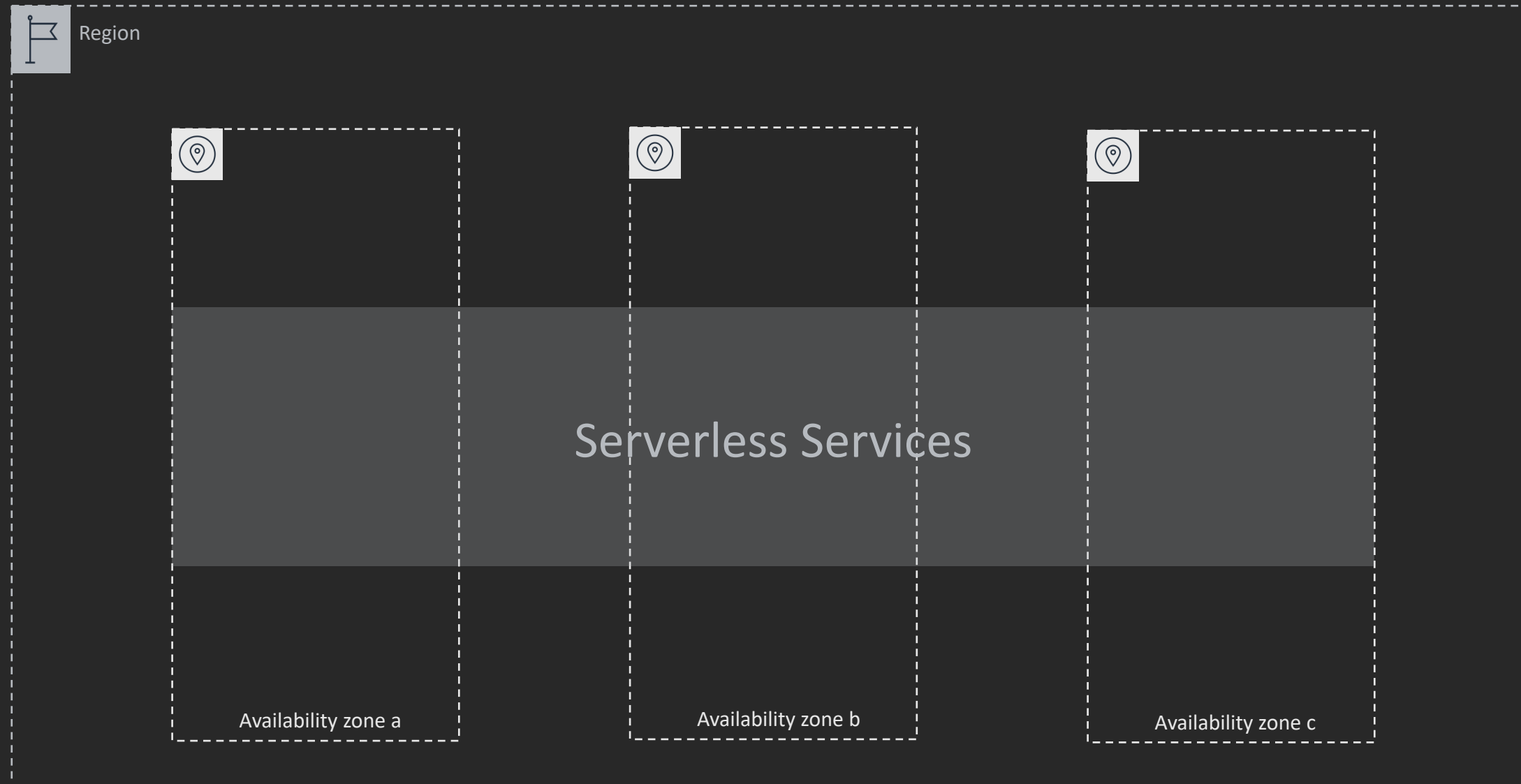


Never pay for idle



Availability and fault tolerance built in

Serverless components



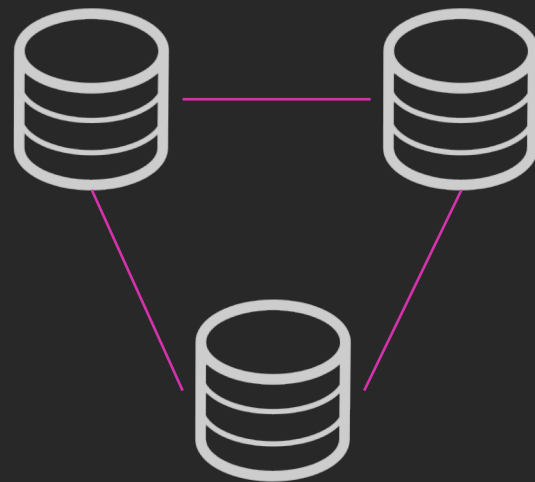
Prerequisites to building a multi-region architecture.

CAP Theorem

In the presence of a network partition, you must choose between consistency and availability!

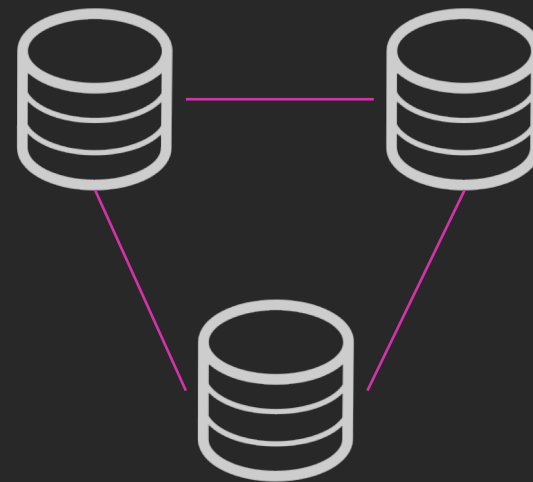
Consistency

Data is consistent.
All nodes see the same state.



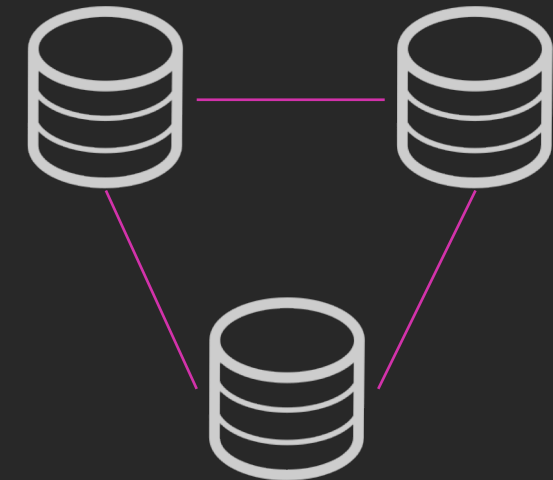
Availability

Every request is non-failing.



Partition Tolerance

Service still responds as expected
if some nodes crash.

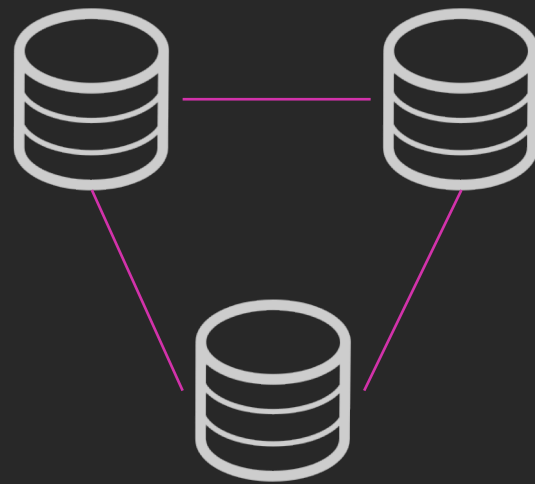


Distributed System

Embrace eventual consistency

Availability

Every request is non-failing.



Distributed System

... if no new updates are made to a given data item, eventually all accesses to that item will return the last updated value.

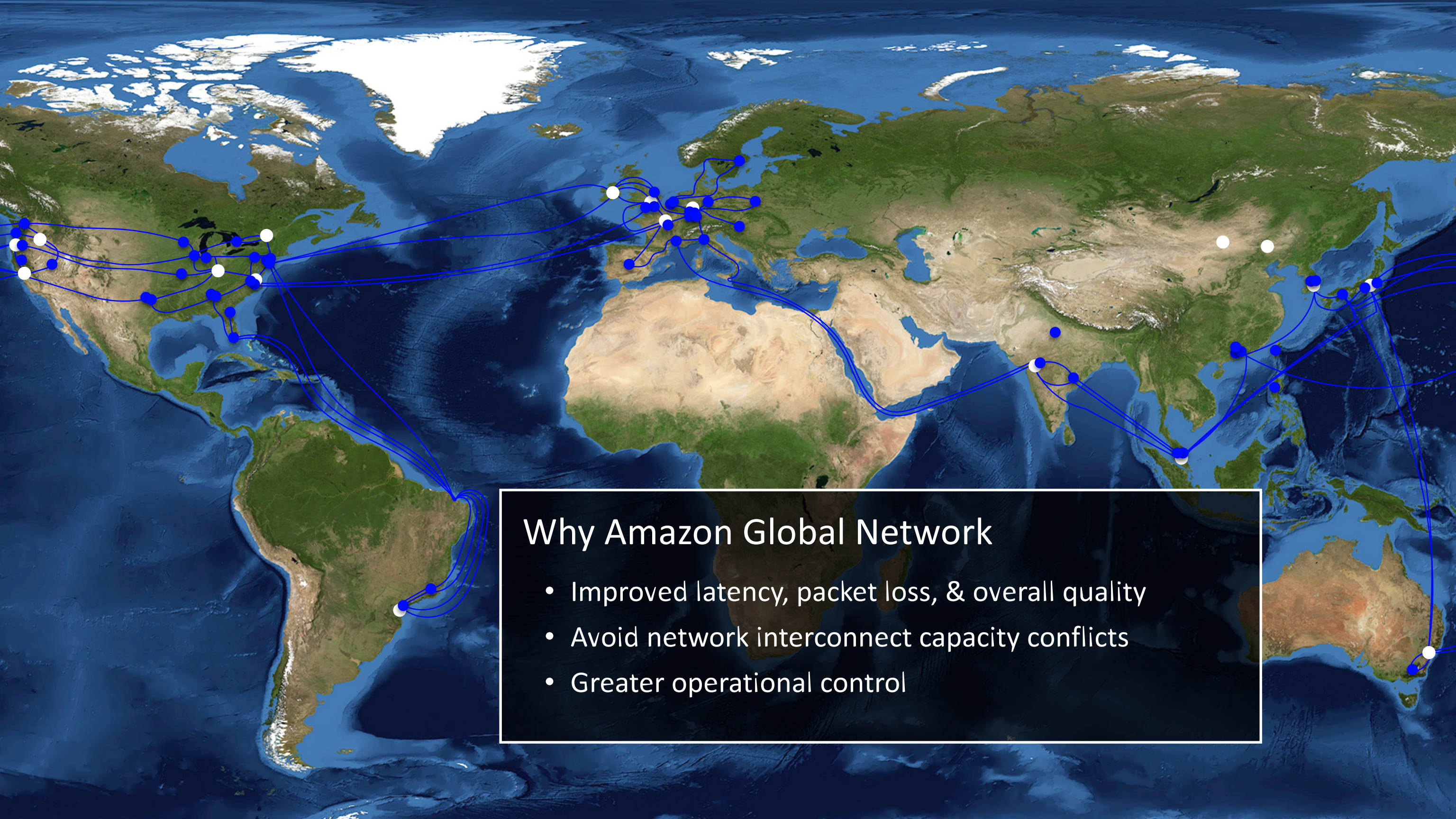
https://en.wikipedia.org/wiki/Eventual_consistency

An eventually consistent system can return any value before it converges!!

Secure and reliable global network

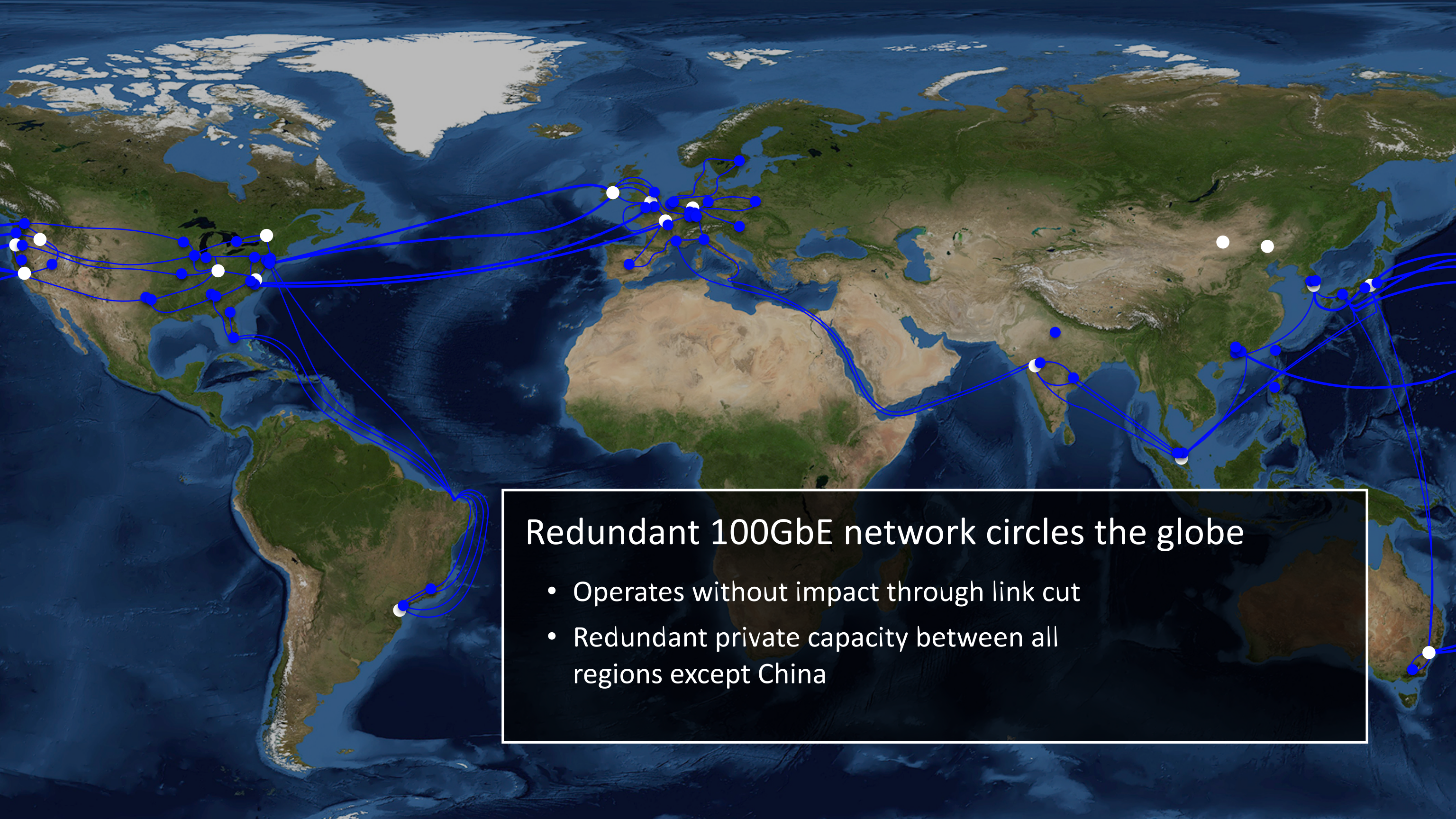


James Hamilton – reinvent 2016



Why Amazon Global Network

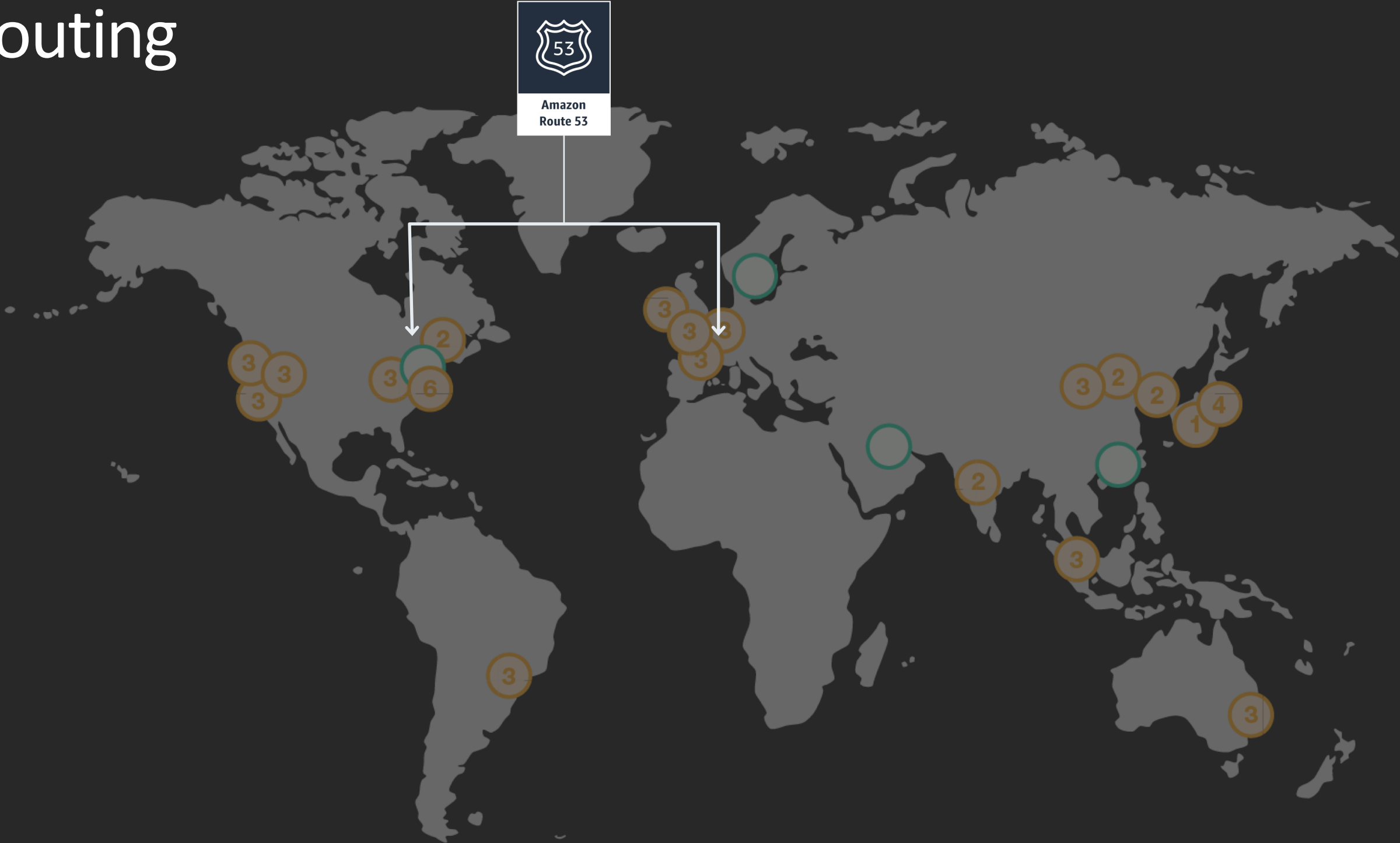
- Improved latency, packet loss, & overall quality
- Avoid network interconnect capacity conflicts
- Greater operational control



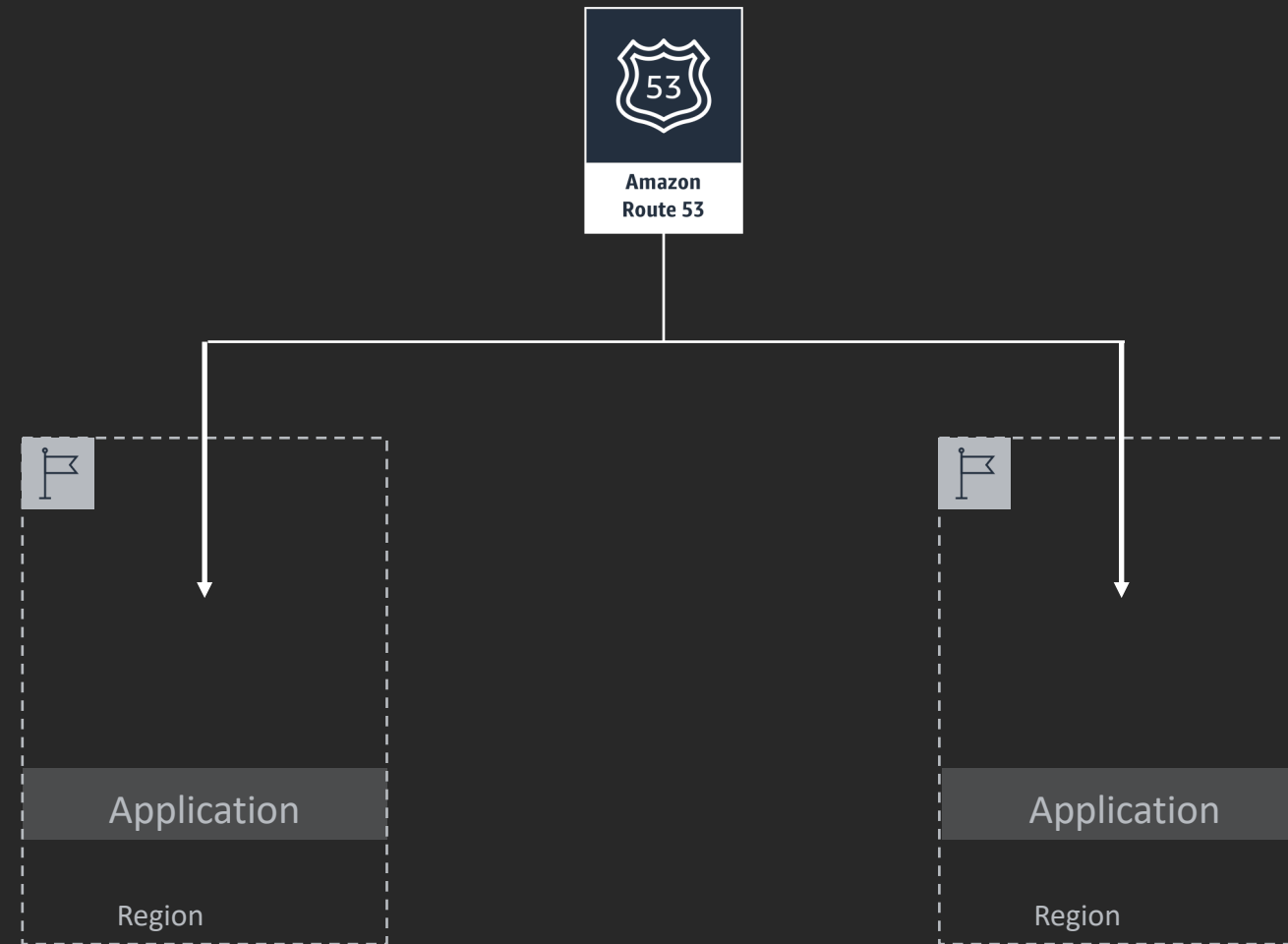
Redundant 100GbE network circles the globe

- Operates without impact through link cut
- Redundant private capacity between all regions except China

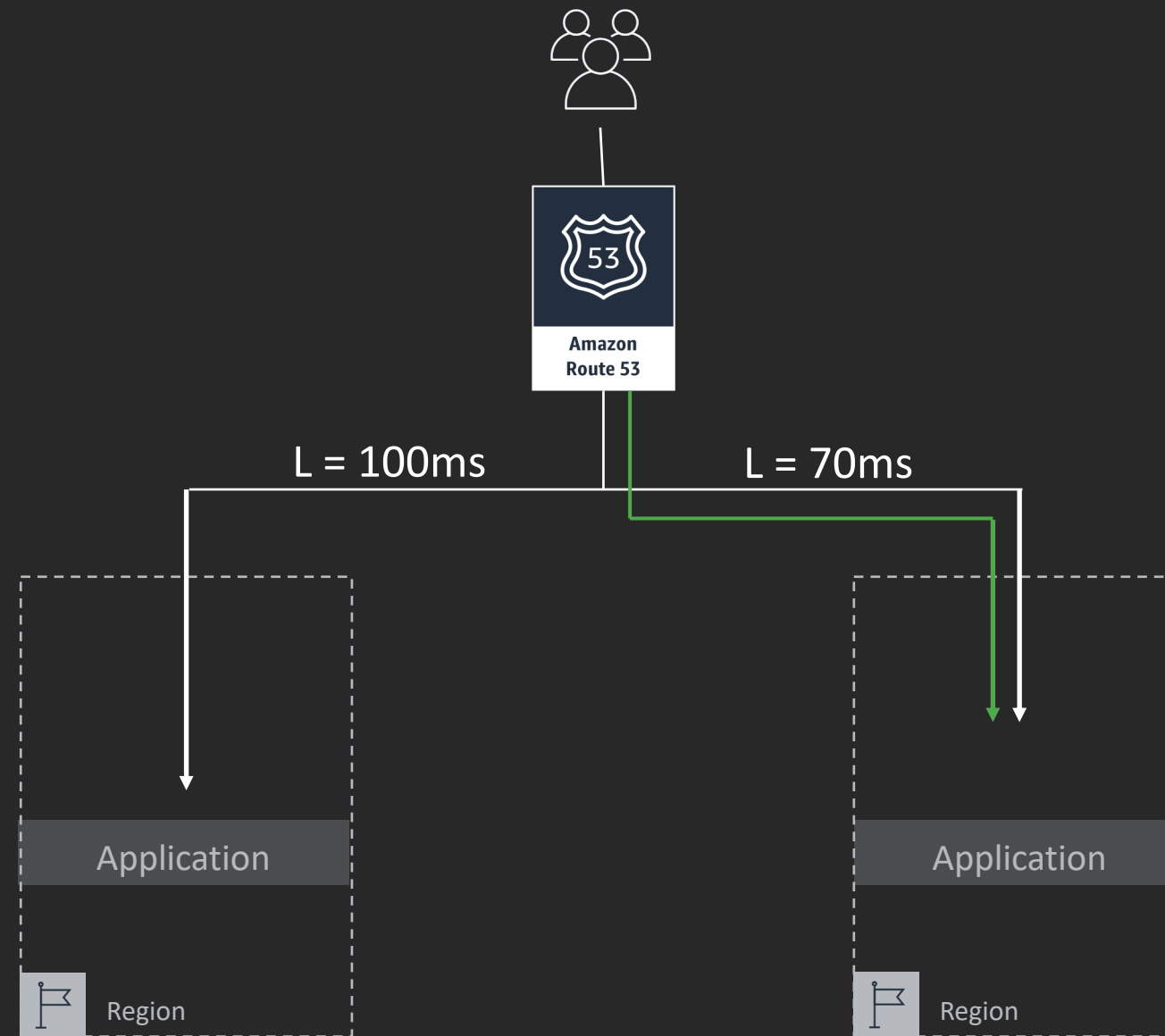
Global routing



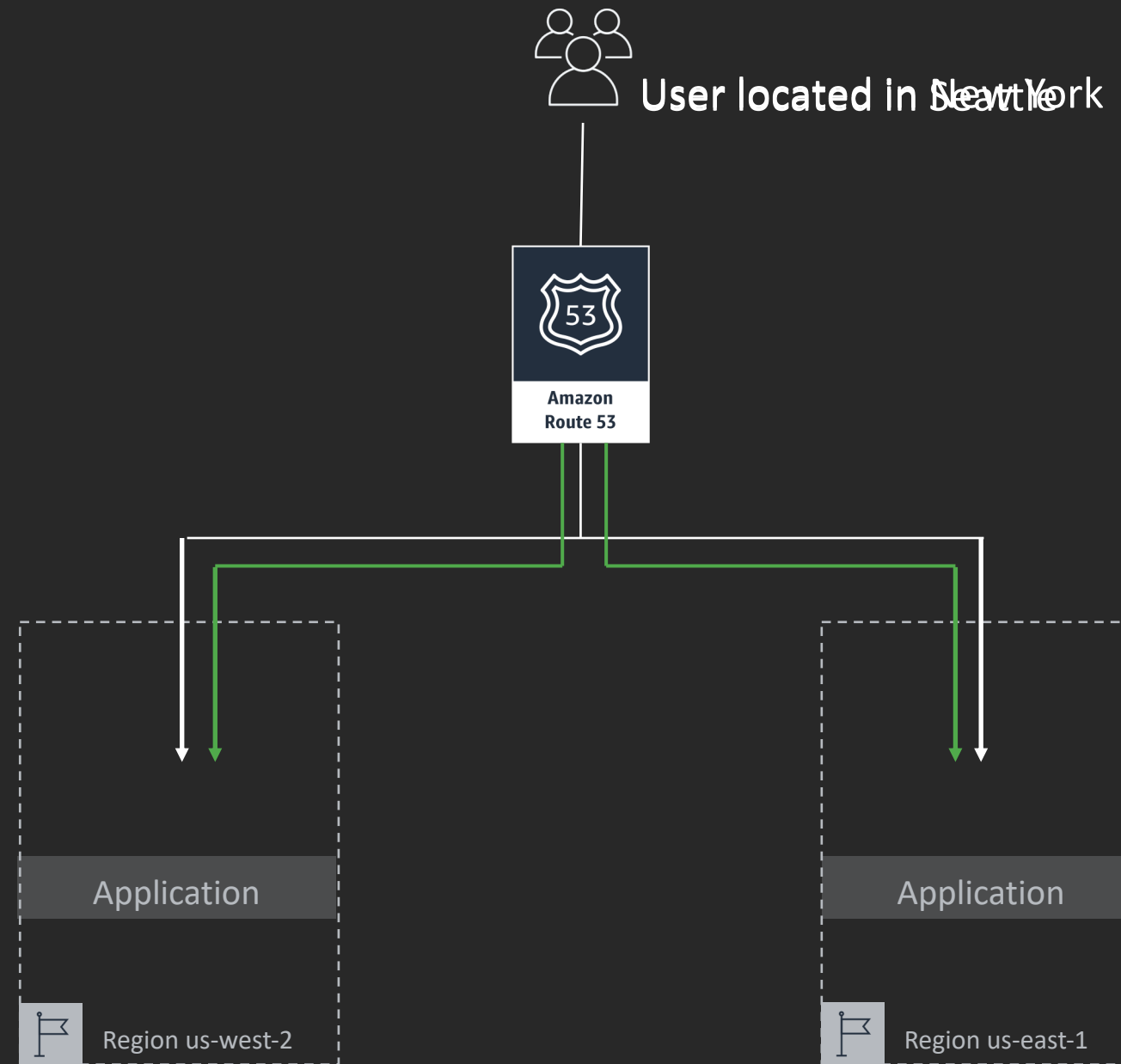
Routing policies with Route 53



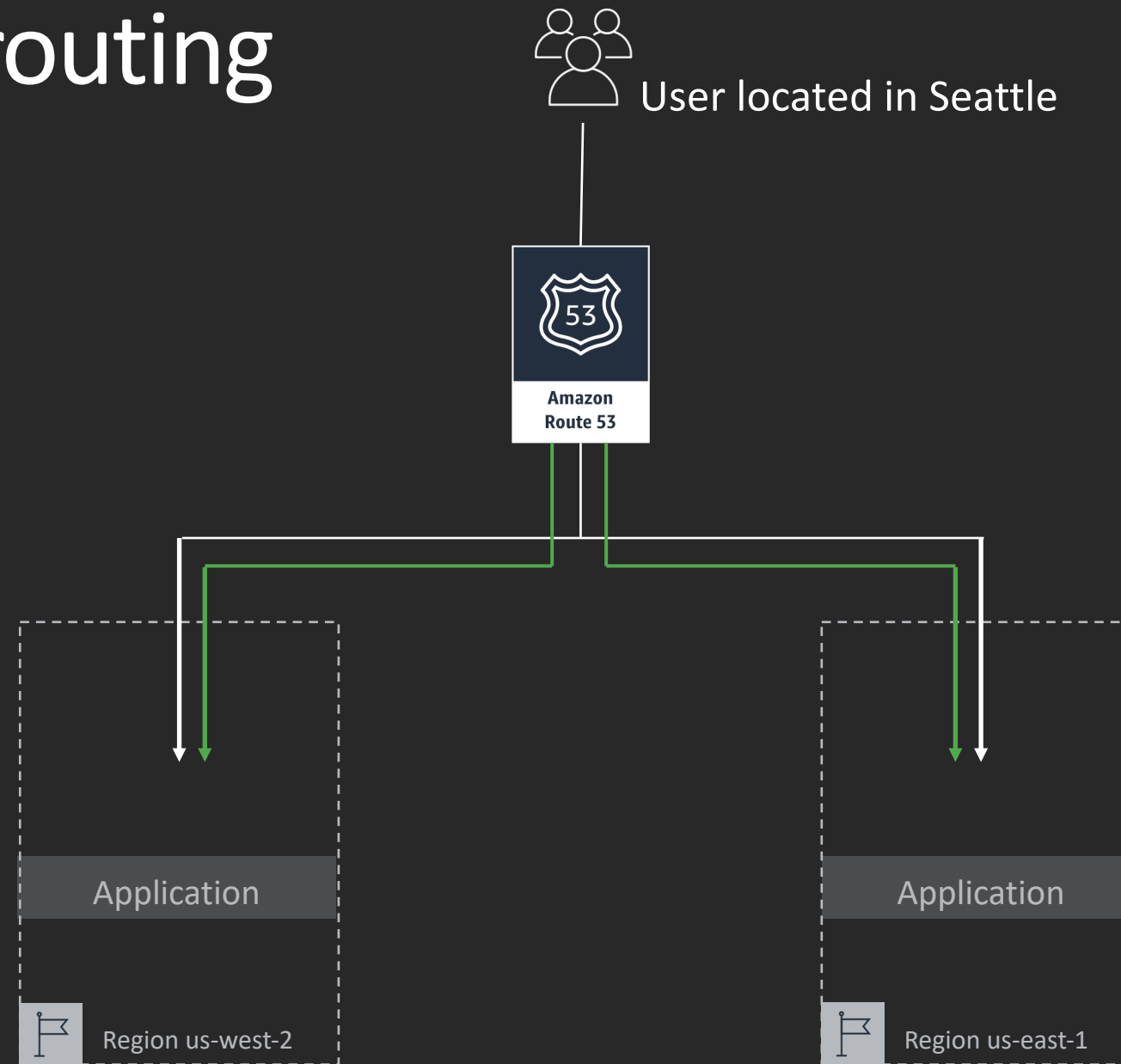
Latency based routing



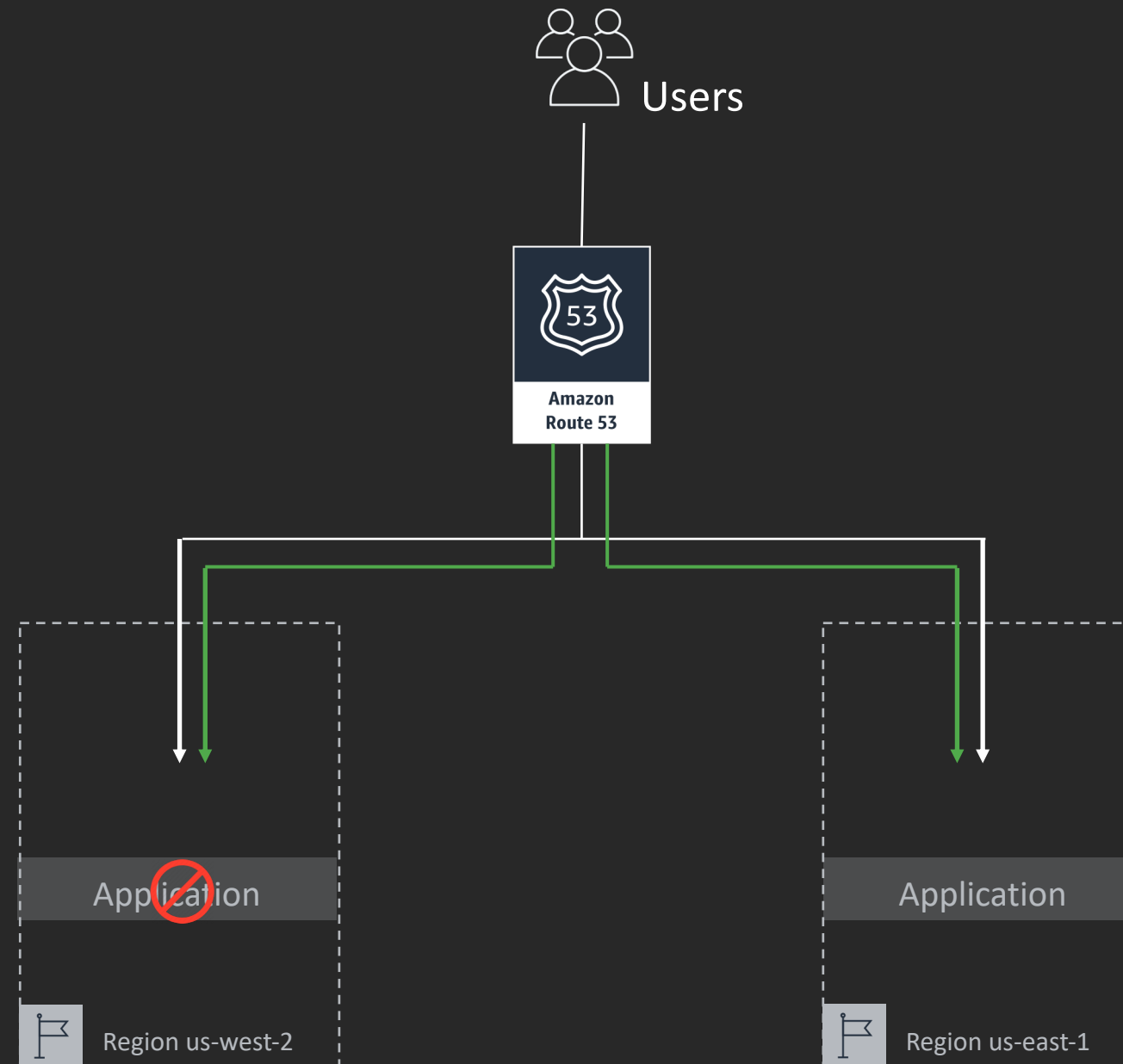
Geo-based routing



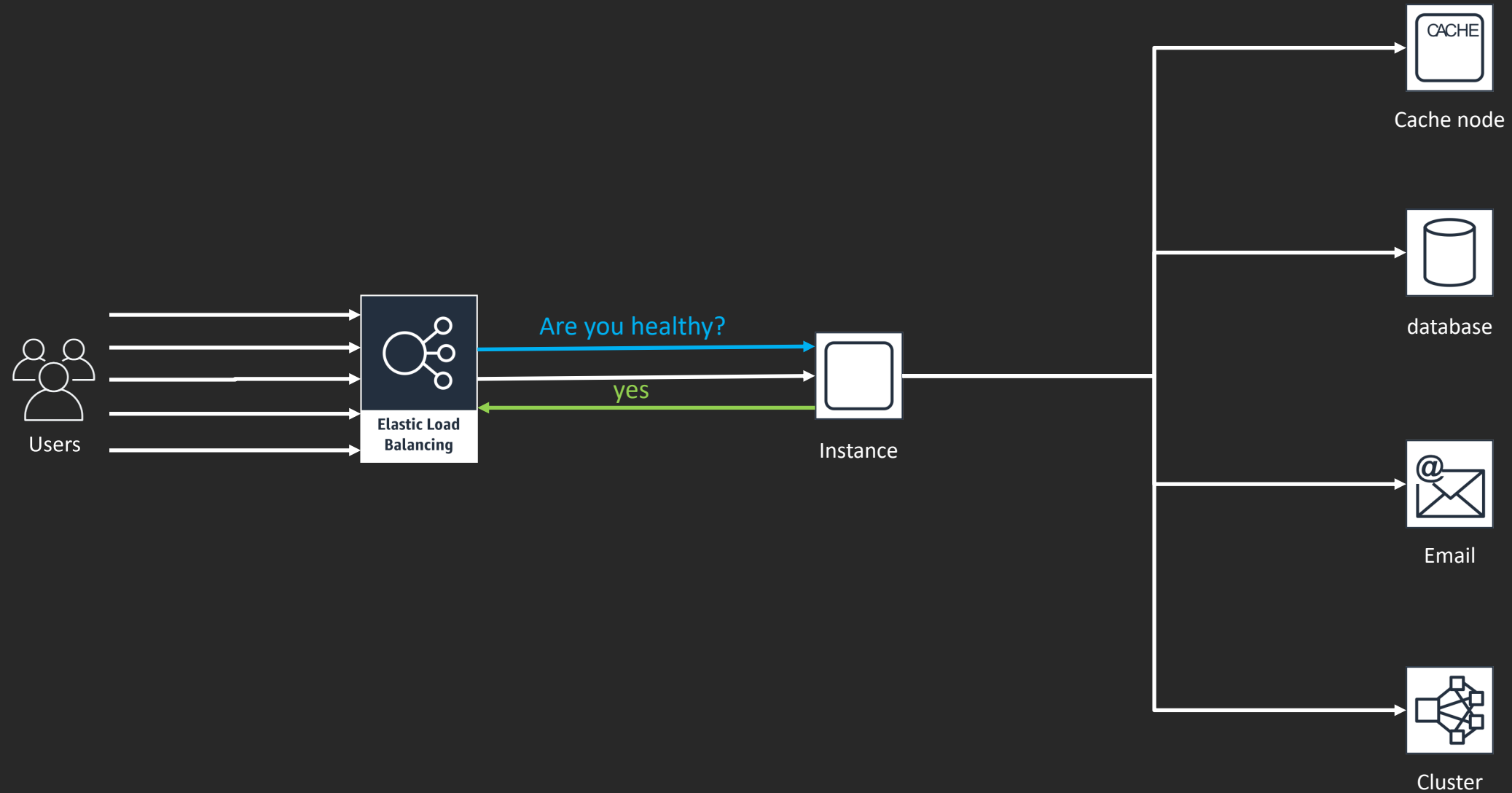
Weighted round robin routing



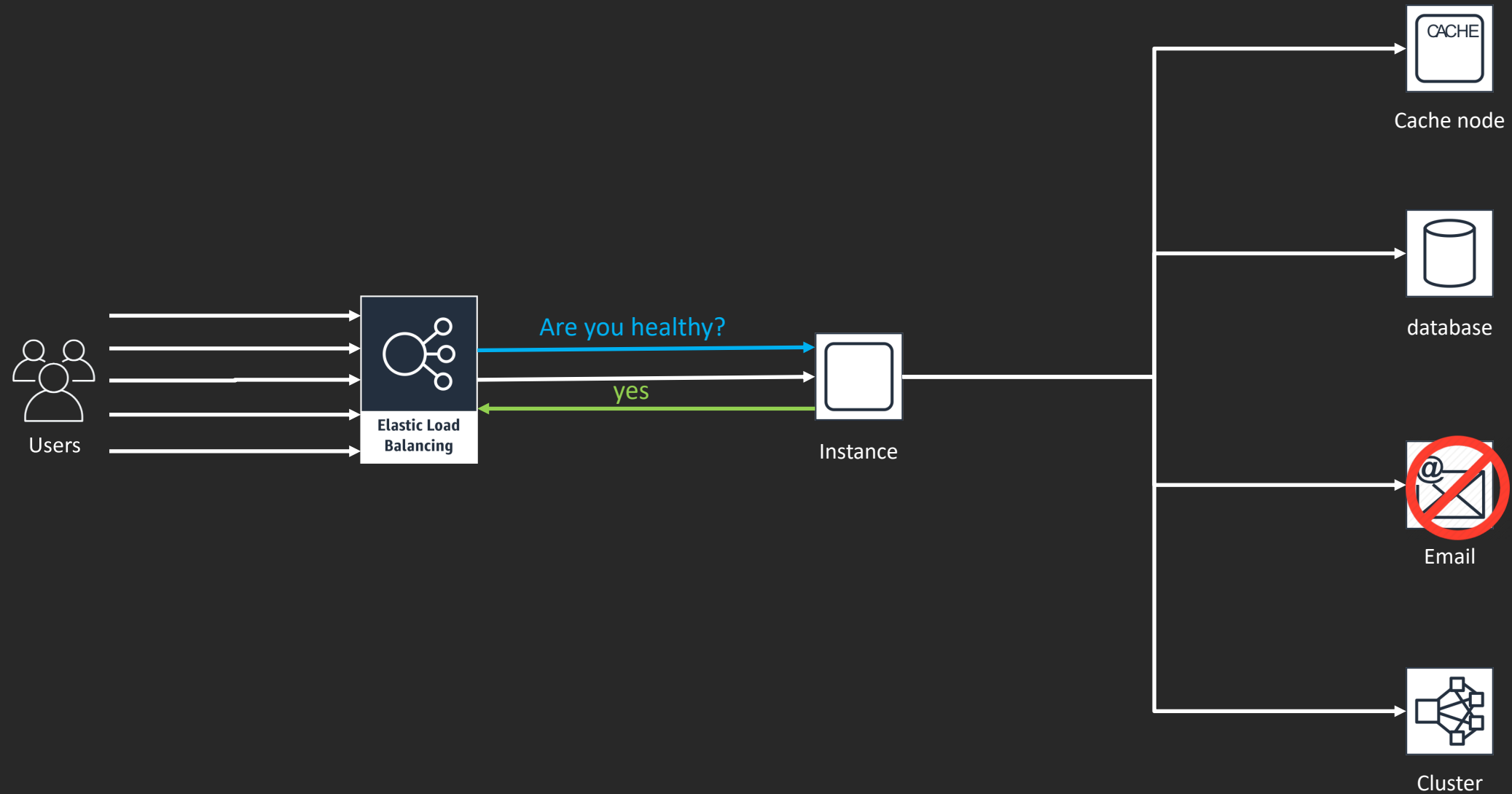
DNS failover



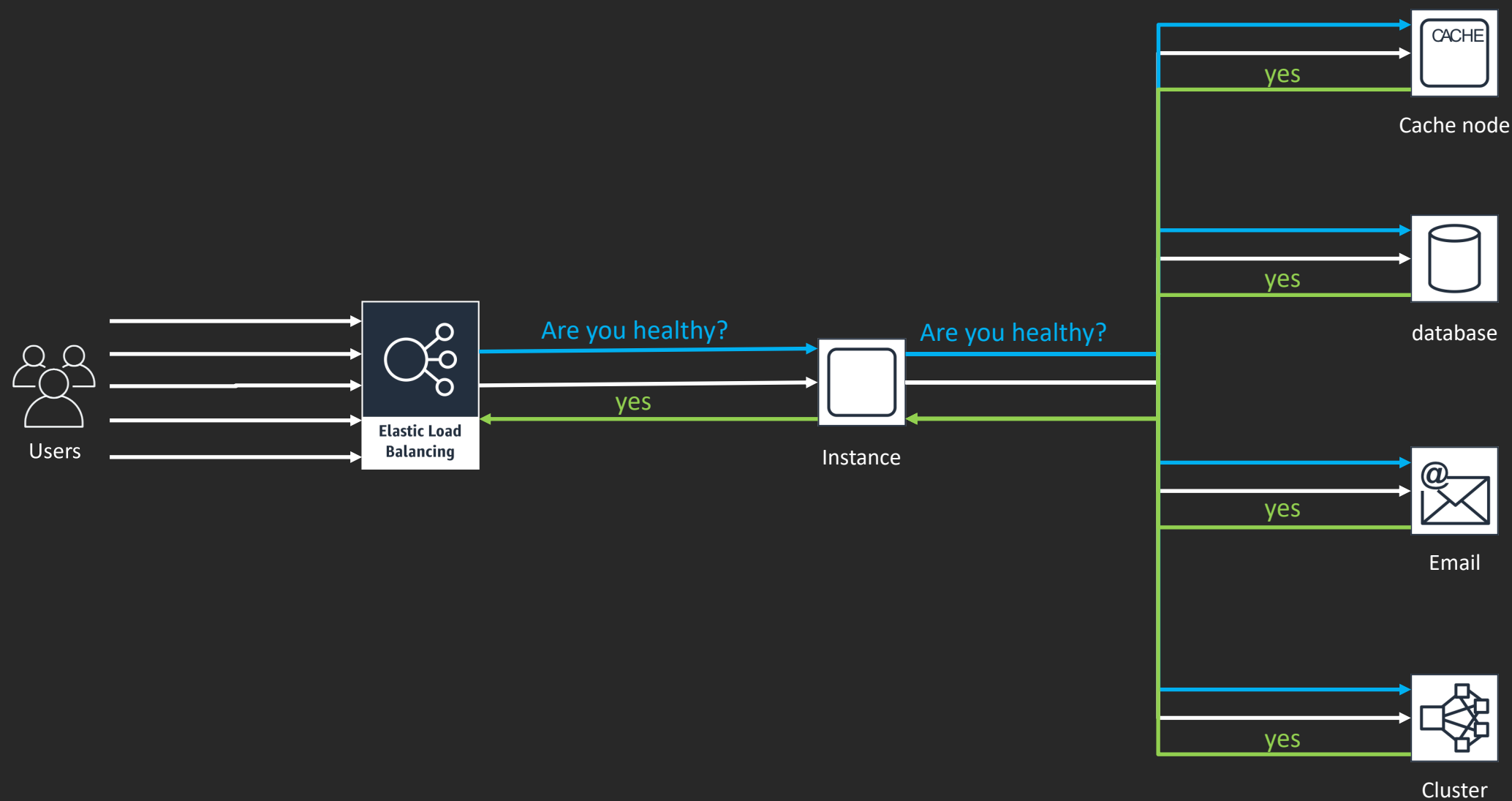
Shallow health check



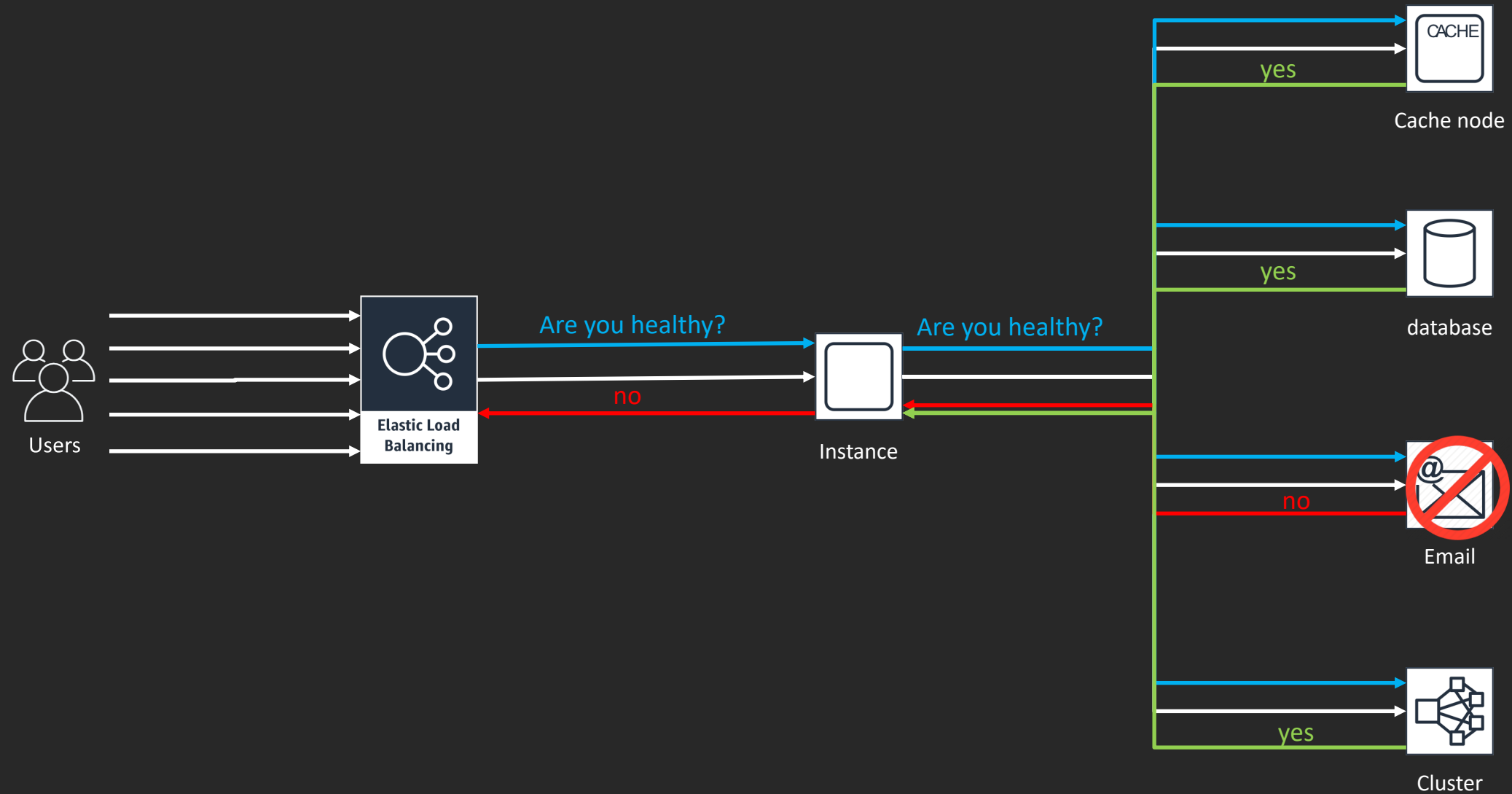
Shallow health check



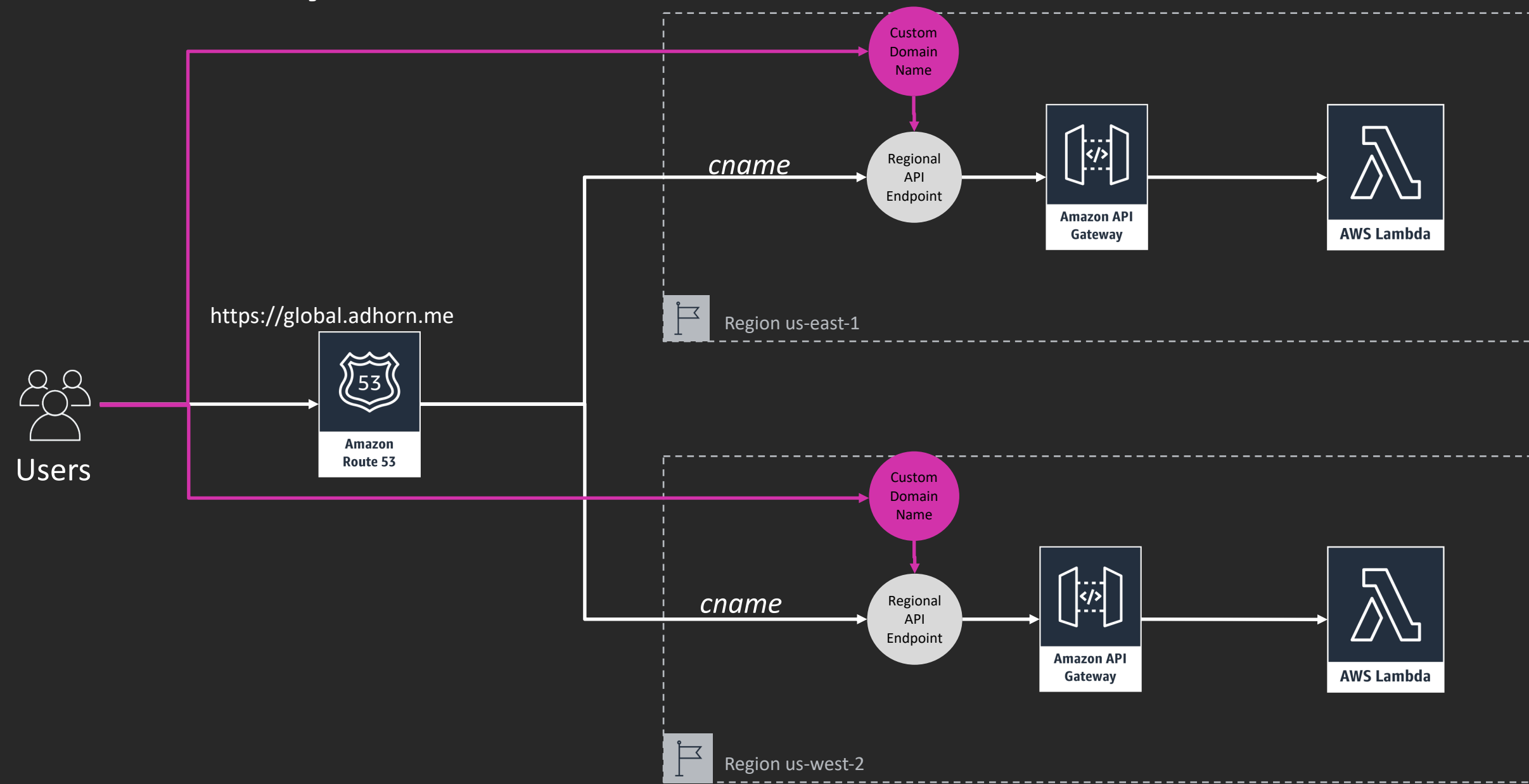
Deep health check



Deep health check

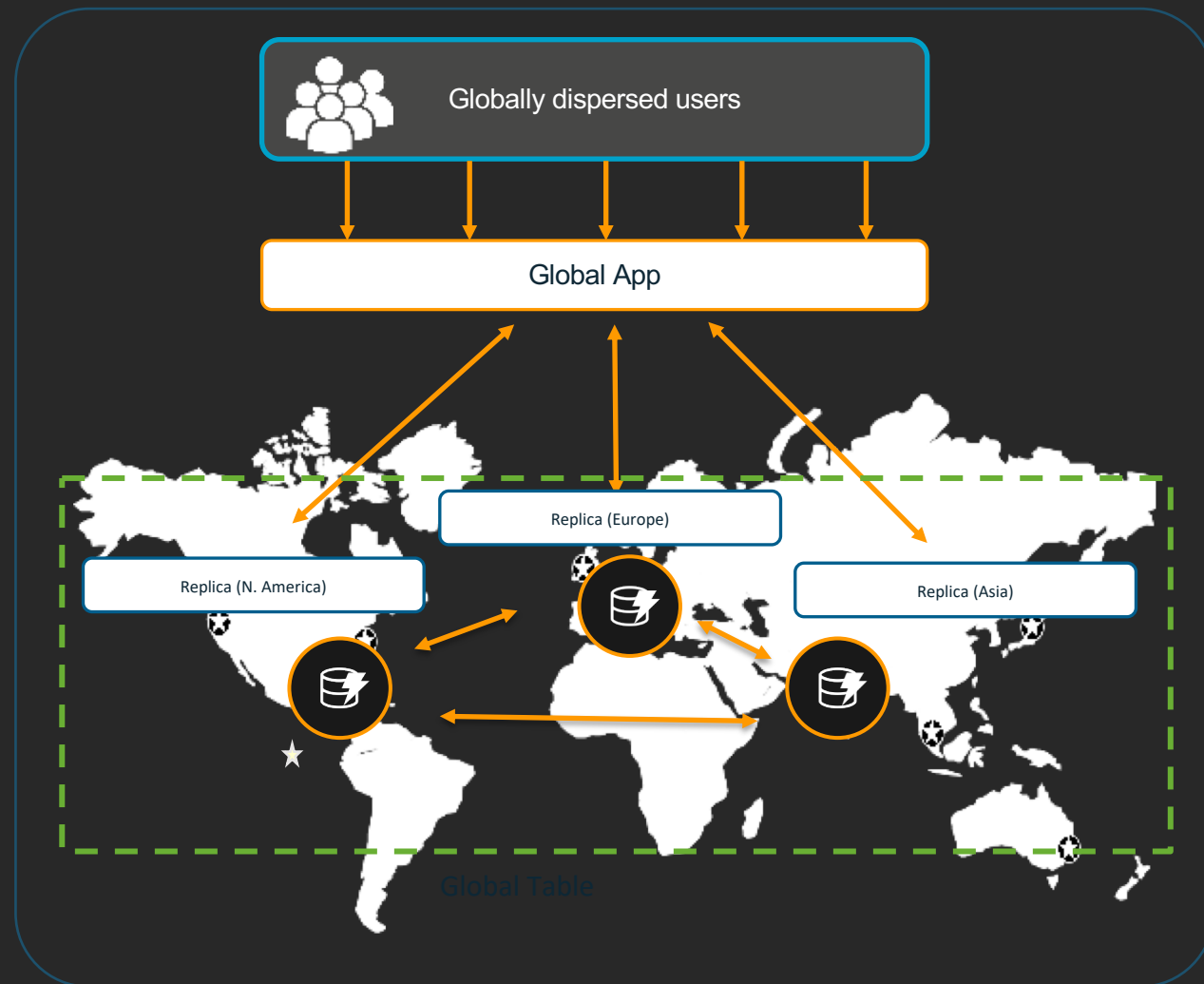


API Gateway



Amazon DynamoDB Global Tables

Fully managed, multi-master, multi-region database



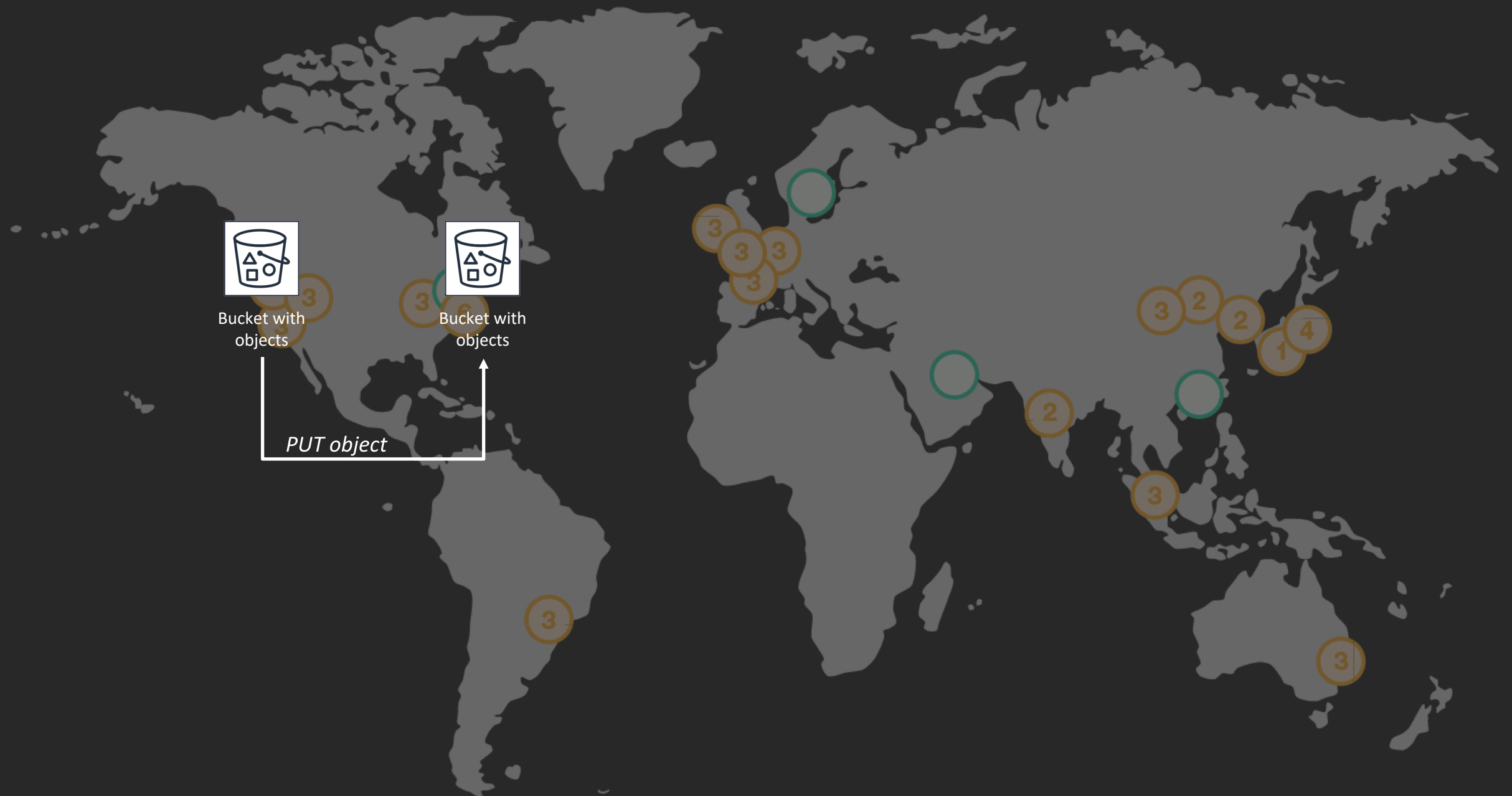
Build high performance, globally distributed applications

Low latency reads & writes to locally available tables

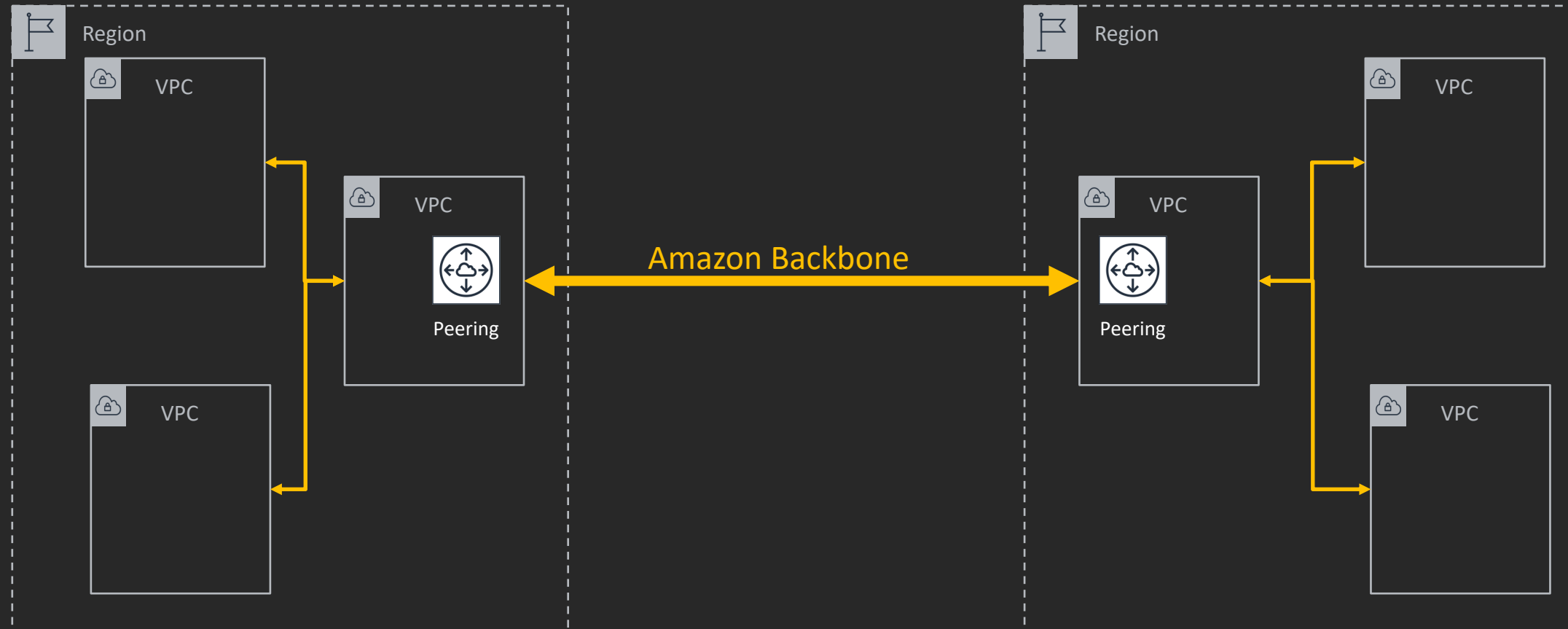
Disaster proof with multi-region redundancy

Easy to set up and no application rewrites required

Amazon S3 cross-region replication



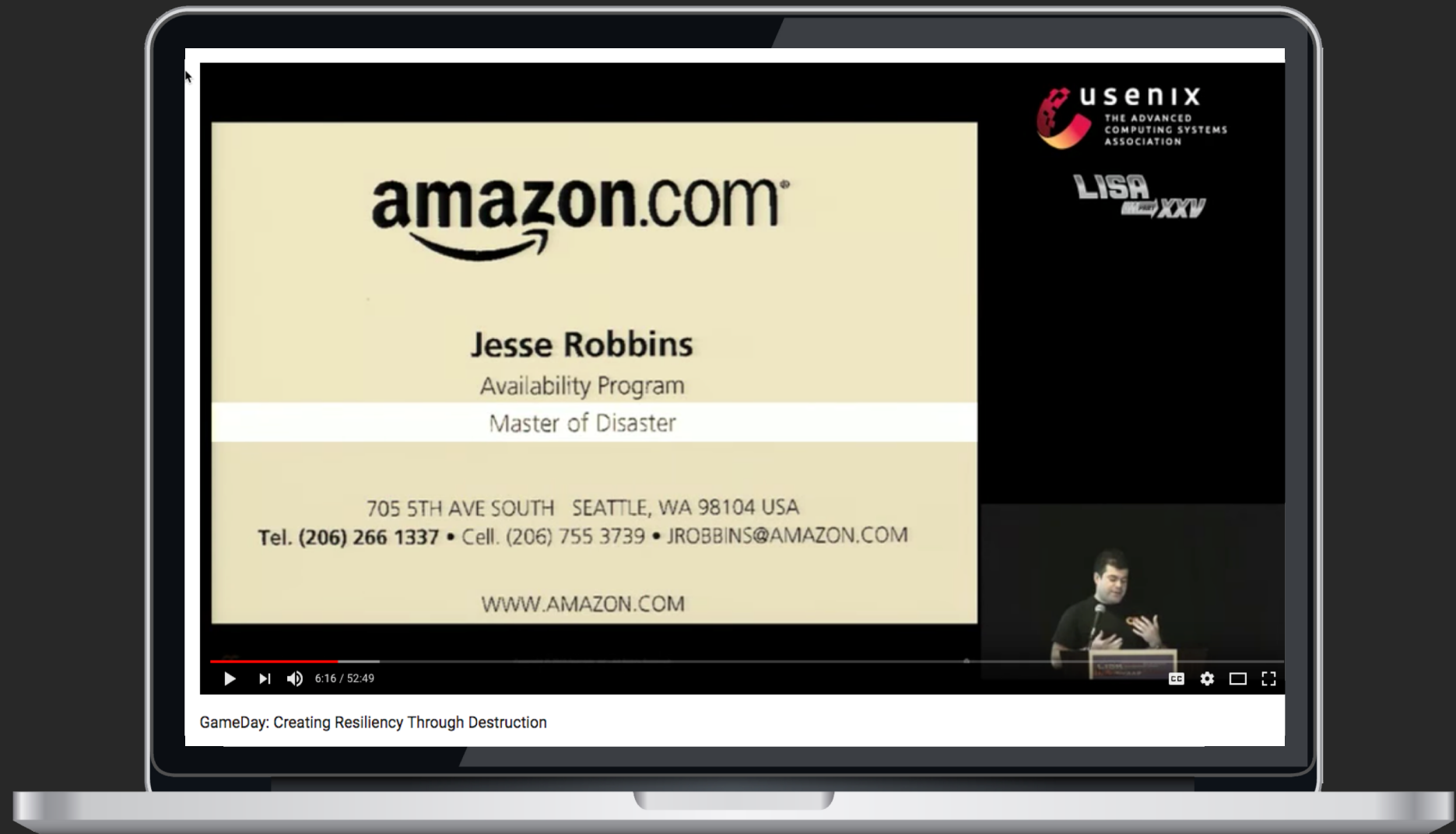
Multi-region multi-vpc connectivity



<https://aws.amazon.com/answers/networking/aws-multiple-region-multi-vpc-connectivity/>

Testing multi-region architecture.

GameDay at Amazon



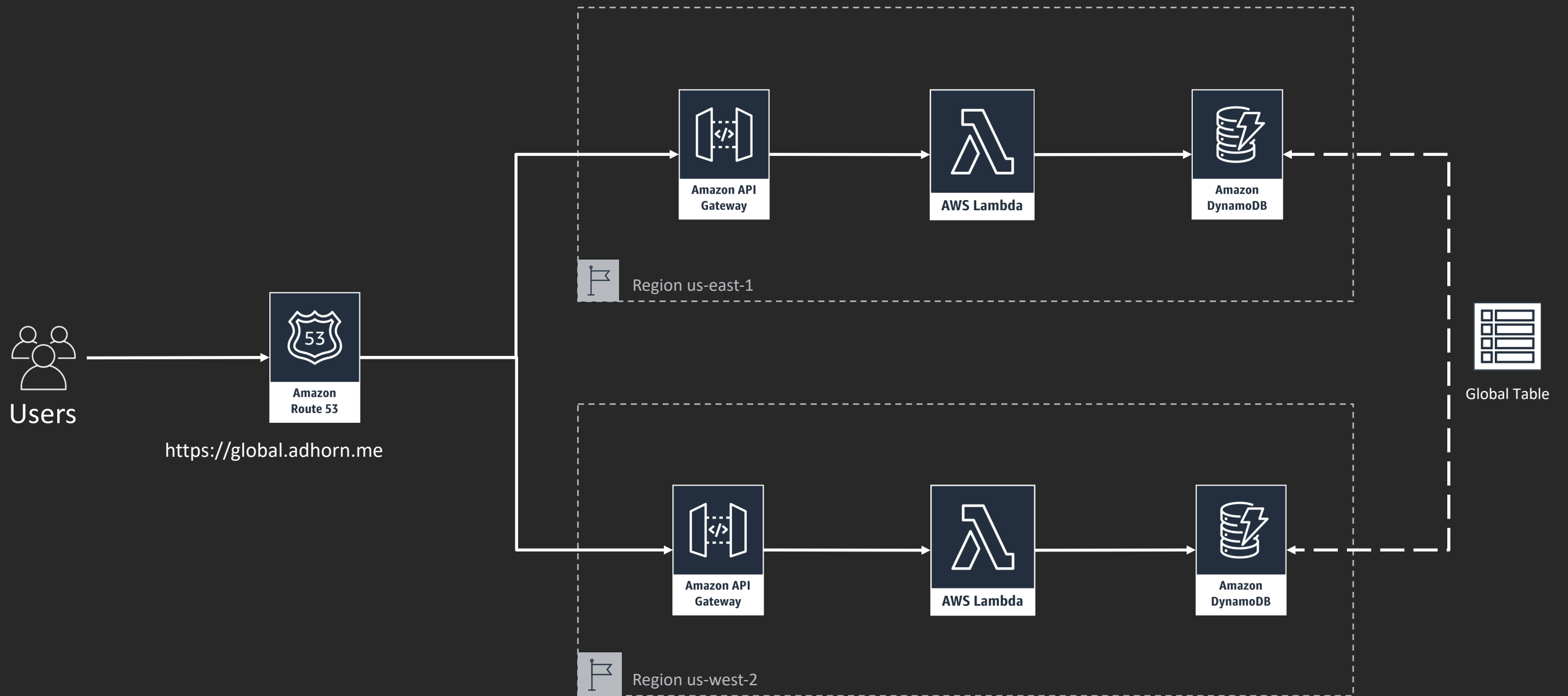
<https://www.youtube.com/watch?v=zoz0ZjfrQ9s>

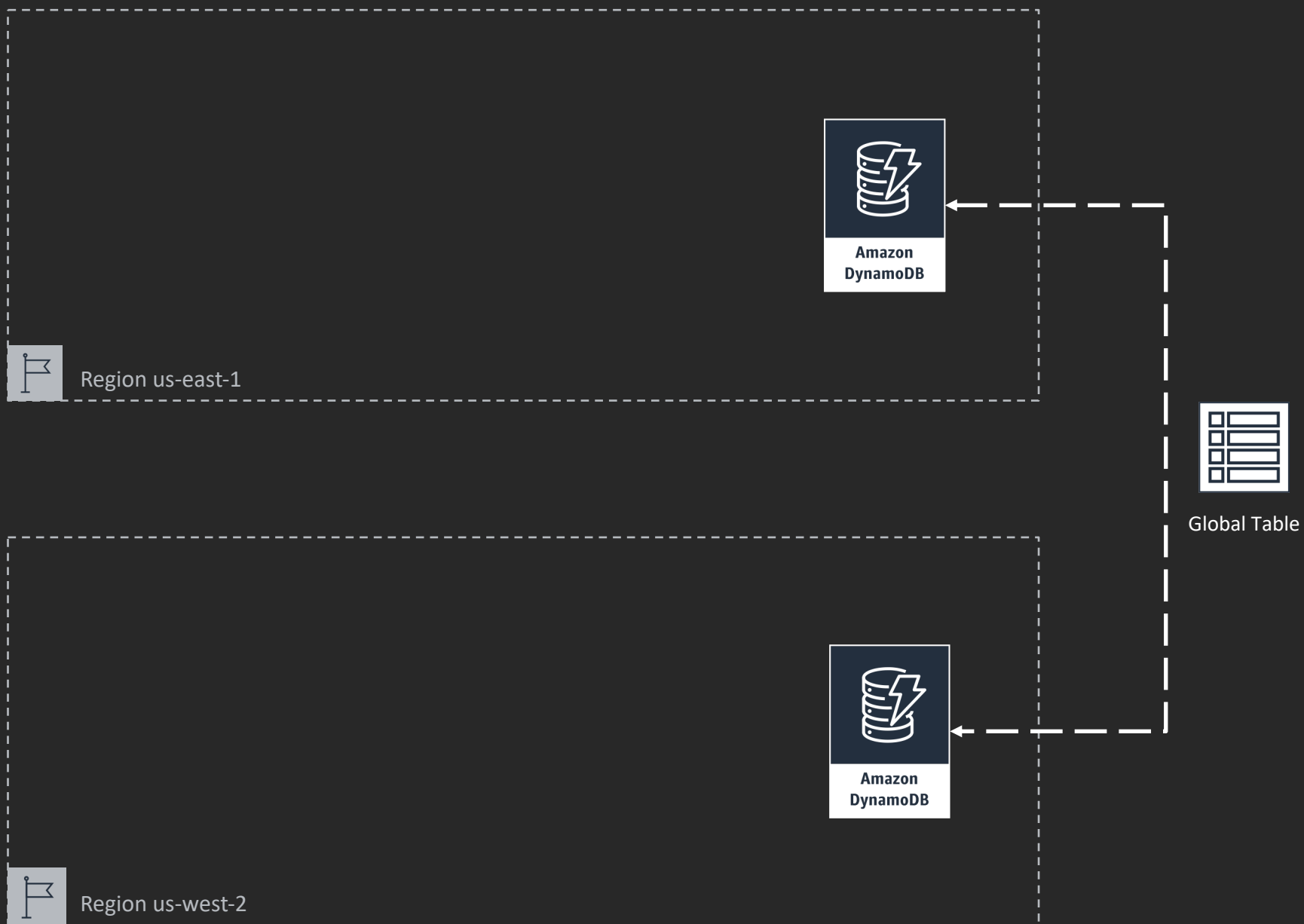
Chaos engineering

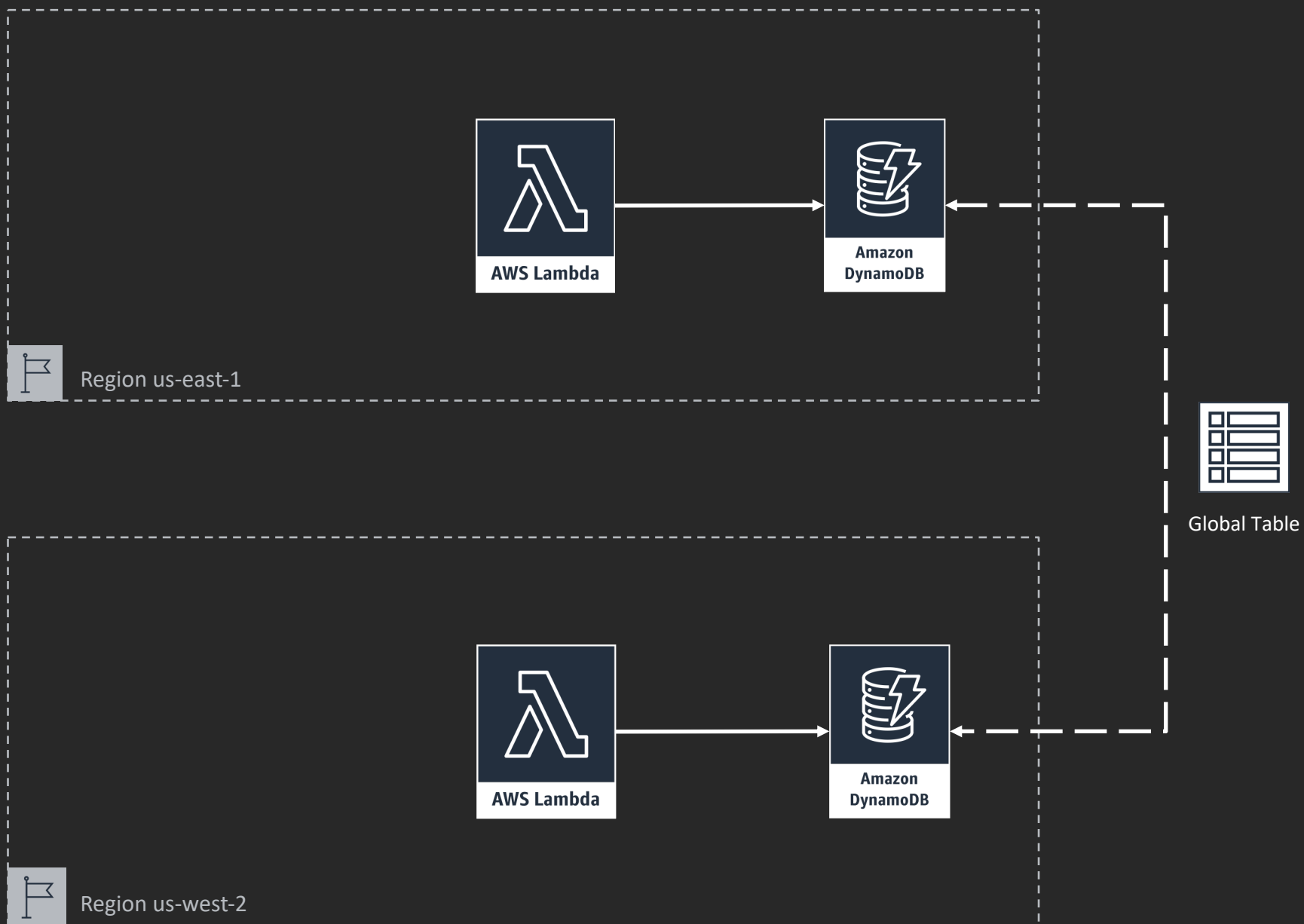


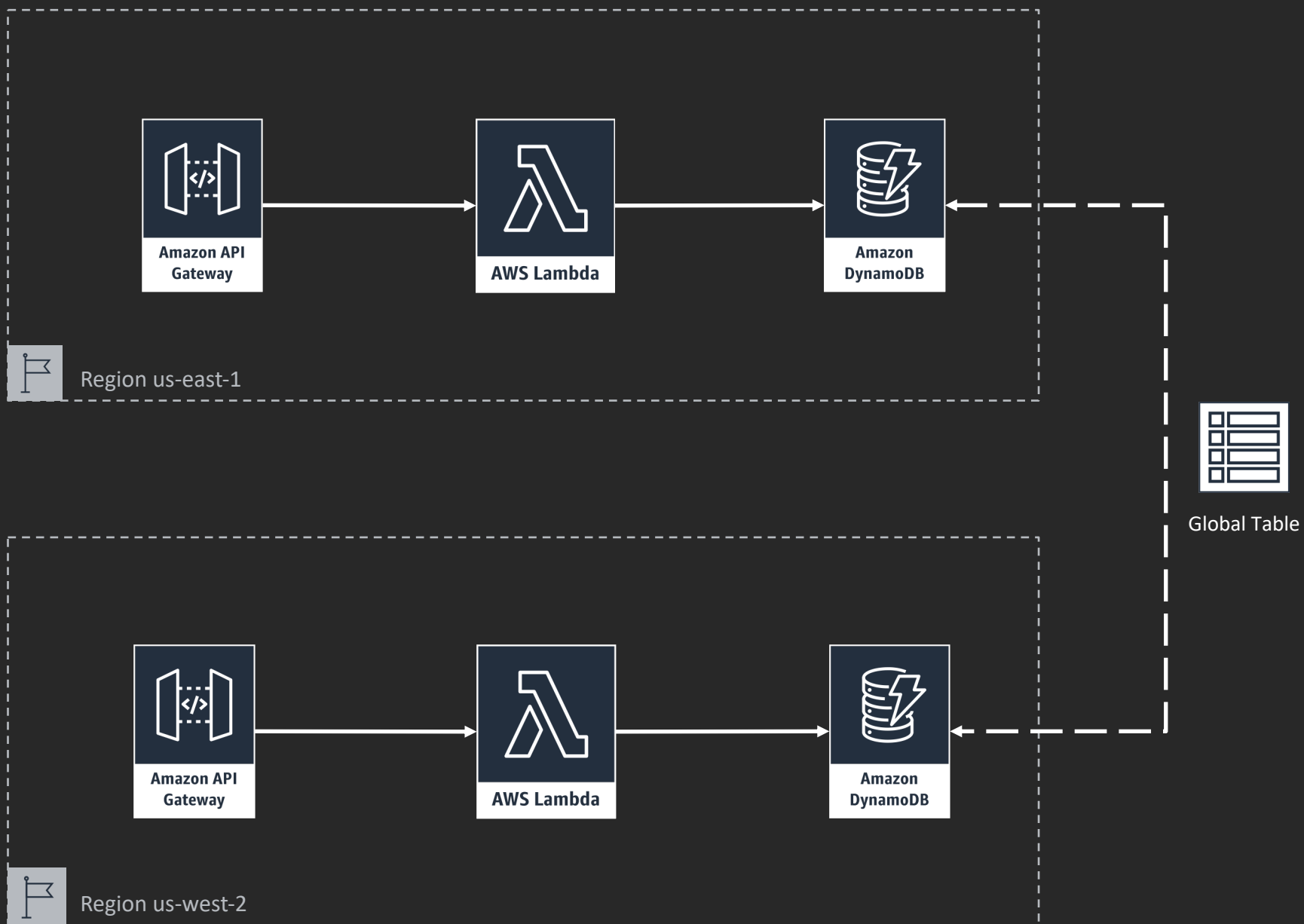
<https://github.com/Netflix/SimianArmy>

Hands-on demo

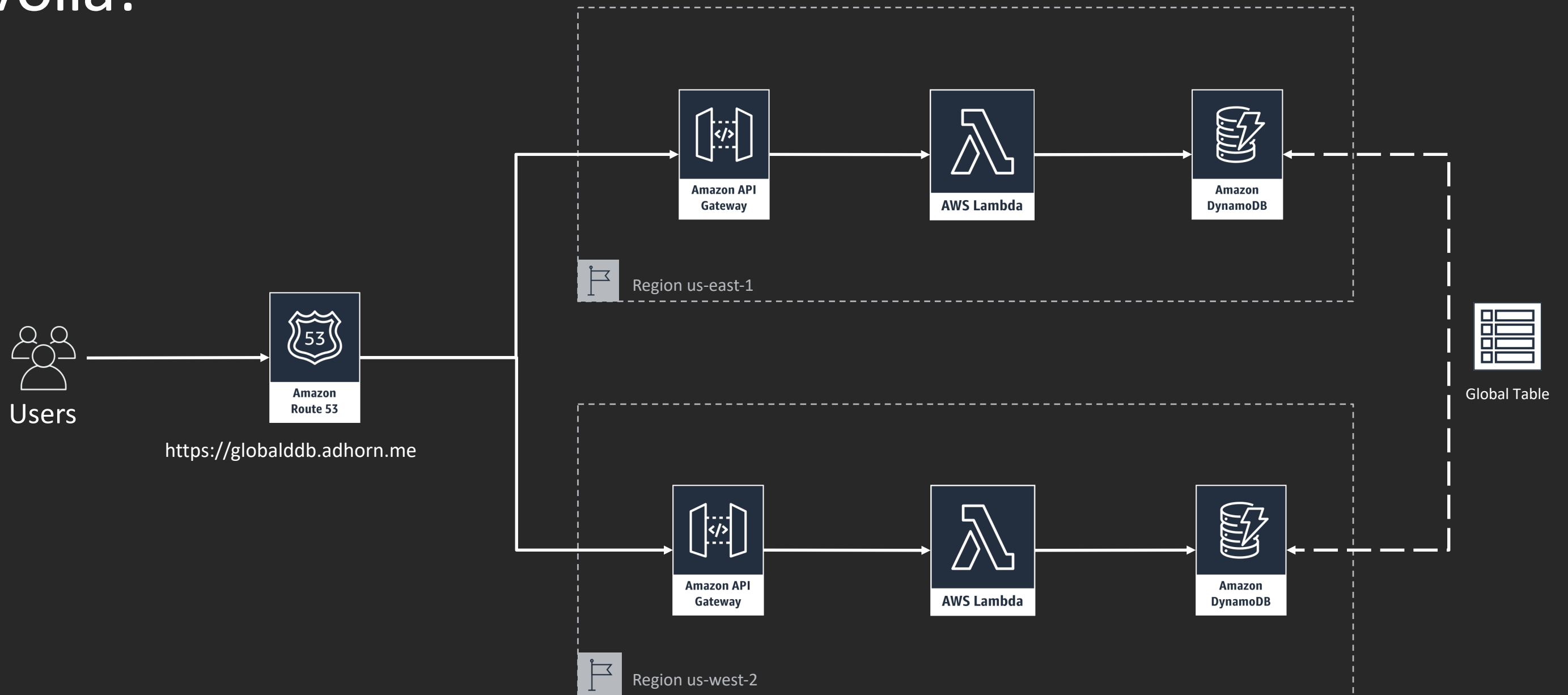








Voilà!



SERVERLESS

LIFE INSIDE AN AMAZON VPC

Build a serverless multi-region, active-active backend solution — within a VPC

A VPC improves privacy...

387



Adrian Hornsby in A Cloud Guru
Apr 26 · 8 min

serverless backend

multi-region active-active

Build a serverless multi-region, active-active backend solution in an hour

The solution is built using...

1K

5 responses



Adrian Hornsby in A Cloud Guru
Feb 25 · 11 min

RESILIENT ARCHITECTURE

Multi-Region and Active-Active

How to build a multi-region active-active architecture on AWS

Everything fails all the time — build...

1.2K

1 response

<https://medium.com/@adhorn>

Thanks you!



Create DynamoDB table

DynamoDB is a schema-less database that only requires a table name and primary key. The table's primary key is made up of one or two attributes that uniquely identify items, partition the data, and sort data within each partition.

Table name*

MyGlobalTable

i

Primary key*

Partition key

item_id

String

⬆️⬆️

i

☐ Add sort key

Table settings

Default settings provide the fastest way to get started with your table. You can modify these default settings now or after your table has been created.

- ☒ Use default settings
- No secondary indexes.
 - Auto Scaling capacity set to 70% target utilization, at minimum capacity of 5 reads and 5 writes
 - On-Demand Backup and Restore Enabled **NEW!**

Additional charges may apply if you exceed the AWS Free Tier levels for CloudWatch or Simple Notification Service. Advanced alarm settings are available in the CloudWatch management console.

- Overview
- Items
- Metrics
- Alarms
- Capacity
- Indexes
- Global Tables
- Backups
- Triggers
- Access control
- Tags

Global Tables enable you to use DynamoDB as a fully-managed, multi-region, multi-master database. [Learn more](#)



To create a global table, ensure that this table is empty and that DynamoDB Streams are enabled.

A table must meet the following requirements to become part of a global table.

Empty table: Yes

Streams: Disabled

Stream type: -

Enable streams

IAM role [AWSServiceRoleForDynamoDBReplication](#)
Automatically created on your behalf.

Global Table regions

We will create a replica table in another region. [Learn more](#)

Add region

Remove region



Region Name



Endpoint

You do not have a global table with this name. Click "Add region" to create one.

[Overview](#)[Items](#)[Metrics](#)[Alarms](#)[Capacity](#)[Indexes](#)[Global Tables](#)[Backups](#)[Triggers](#)[Access control](#)[Tags](#)

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[Enable streams](#)

IAM role [AWSServ](#)
Automatic

Global Table regi

We will create a replic

[Add region](#)[Remove region](#)

Region Name	Endpoint
-------------	----------

You do not have a global table with this name. Click "Add region" to create one.

Manage Stream



View type

☒ New and old images - both the new and the old images of the item

[Cancel](#)[Enable](#)

Overview

Items

Metrics

Alarms

Capacity

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Add re

Add region to global table



Choose a region.

Region

EU (Frankfurt)



We will create a replica table in your intended region. [Learn more](#)

You can expand your global table to more regions as long as each replica table contains zero items.

Region is ready. Click continue to proceed.

Cancel

Continue

Global Tables enable you to use DynamoDB as a fully-managed, multi-region, multi-master database. [Learn more](#)

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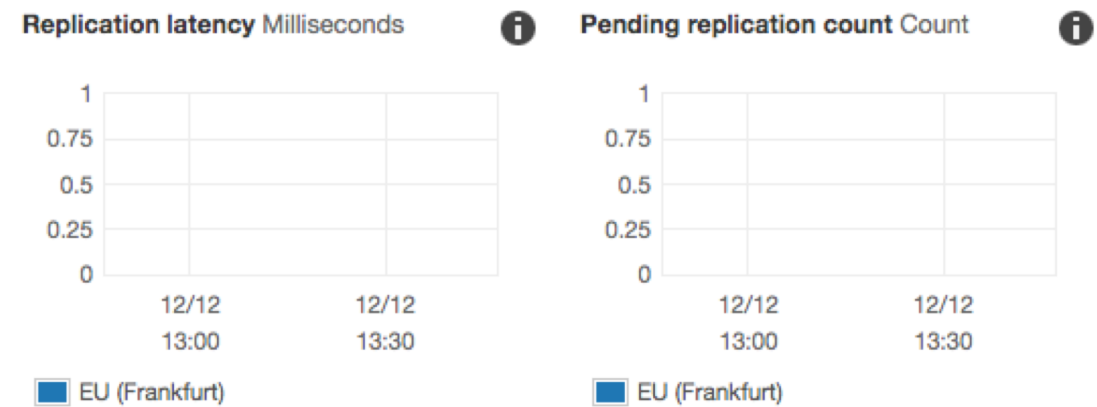
Remove region

↺

	Region Name	Endpoint
<input type="radio"/>	EU (Frankfurt)	dynamodb.eu-central-1.amazonaws.com
<input type="radio"/>	EU West (Ireland)	dynamodb.eu-west-1.amazonaws.com

[View all CloudWatch metrics](#) ↗

Global table metrics




```

import json
import logging
import boto3
import os
import uuid

log = logging.getLogger()
log.setLevel(logging.DEBUG)

region = os.environ["AWS_REGION"]

dynamodb = boto3.resource('dynamodb', region_name=region)
table = dynamodb.Table('dynamo_serverless')

def put_to_dynamo(event):
    log.debug("Received in put_to_dynamo: {}".format(json.dumps(event)))
    feedback_id = str(uuid.uuid4())

    table.put_item(
        Item={
            'feedback_id': feedback_id,
            'value': "This item is coming from {}".format(region),
        }
    )
    return feedback_id

```

Scan: [Table] dynamo_serverless: feedback_id ^

Scan



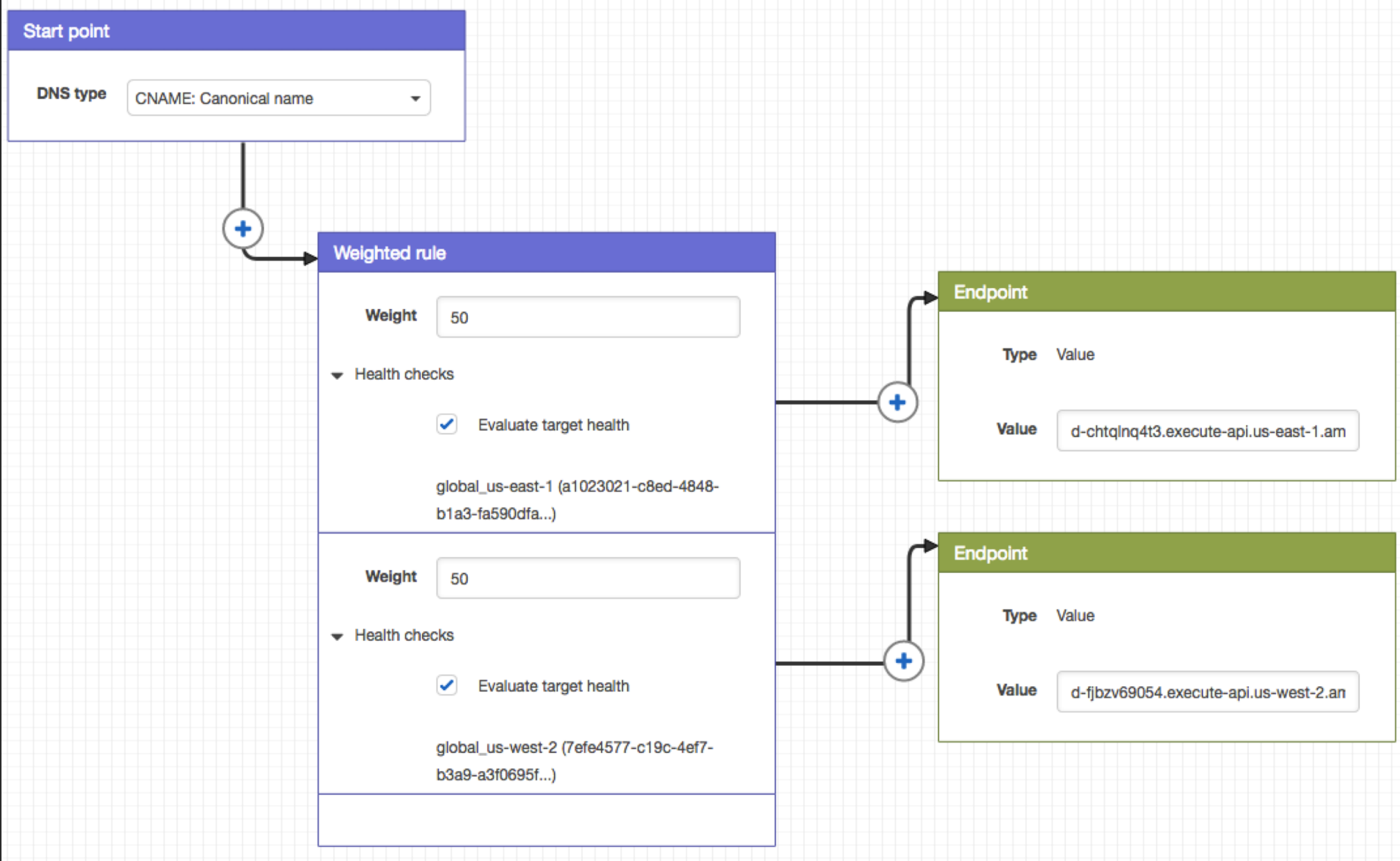
[Table] dynamo_serverless: feedback_id

+ Add filter

Start search

<input type="checkbox"/>	feedback_id	value
<input checked="" type="checkbox"/>	f04e4753-034c-4926-b22c-ab32eb5a2	This item is coming from eu-west-
<input type="checkbox"/>	5ad7c308-67eb-4f93-a4a0-0de25c98e	This item is coming from us-east-
<input type="checkbox"/>	0d840eed-0063-458f-8bb4-9007b91a	This item is coming from us-east-
<input type="checkbox"/>	0f5f844e-ce8c-4678-969d-963c1db9a	This item is coming from us-east-
<input type="checkbox"/>	968e4545-80a9-4981-b50b-fd60ab19f	This item is coming from us-east-
<input type="checkbox"/>	6bb6f5f41c7945c794c5abd2a0f1abca	This item is coming from us-east-
<input type="checkbox"/>	a288feed-11e6-446e-955f-34c13d61e	This item is coming from us-east-
<input type="checkbox"/>	018029a3-9542-45bd-9db8-fb377b1f3	This item is coming from eu-west-
<input type="checkbox"/>	51bd6619-37a4-42fd-8312-d94f4d984	This item is coming from us-east-
<input type="checkbox"/>	39f1fb90-da48-4b8f-a7ab-ce1dde105	This item is coming from us-east-
<input type="checkbox"/>	882abaa9-d883-4e28-b0dd-112502d6	This item is coming from eu-west-
<input type="checkbox"/>	36deeb95-4863-4ceb-9046-66284054	This item is coming from us-east-
<input type="checkbox"/>	58912e49-e74f-4837-8598-a9d2d6ec	This item is coming from us-east-
<input type="checkbox"/>	a845320f-f9d6-41b6-ae0f-2cbcd08d6	This item is coming from us-east-

Route53: Traffic Policy



Health checks with Route 53

Configure health check

Route 53 health checks let you track the health status of your resources, such as web servers or mail servers, and take action when an outage occurs.

Name

global_us-west-2

What to monitor

Endpoint

Monitor an endpoint

Multiple Route 53 health checkers will try to establish a TCP connection with the following resource to determine whether it's healthy. [Learn more](#)

Specify endpoint by

Domain name

Protocol

HTTPS

Domain name *

rsp6crm10i.execute-api.us-west-2.ai

Port *

443

Path

/dev/health

Advanced configuration

URL

https://rsp6crm10i.execute-api.us-west-2.amazonaws.com:443/dev/health

Create health checkDelete health checkEdit health check

Filter by keyword

	Name	Status	Description
<input type="checkbox"/>	global_us-west-2	<div><div>a day ago15 minutes ago</div><div>Unhealthy</div></div>	https://rsp6crm...
<input type="checkbox"/>	global_us-east-1	<div><div>a day ago15 minutes ago</div><div>Unhealthy</div></div>	https://3vox0rc...

Advanced configuration

Request interval

☒ Standard (30 seconds)☐ Fast (10 seconds)

Failure threshold *

3

String matching

☒ No☐ Yes

Latency graphs

☐

Invert health check status

☐

Health checker regions

☐ Customize☒ Use recommended

US East (N. Virginia)

US West (N. California)

US West (Oregon)

EU (Ireland)

Asia Pacific (Singapore)

Asia Pacific (Sydney)

Asia Pacific (Tokyo)

South America (São Paulo)