

# AWS re:Invent

NOV. 28 – DEC. 2, 2022 | LAS VEGAS, NV

ARC304

# Build for resilience using Amazon Route 53 Application Recovery Controller

Scott Wainstock

Software Development Manager, AWS Resilience  
Infrastructure & Solutions  
AWS

Stanley Su

Principal Product Manager, AWS Resilience  
Infrastructure & Solutions  
AWS



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

# Agenda

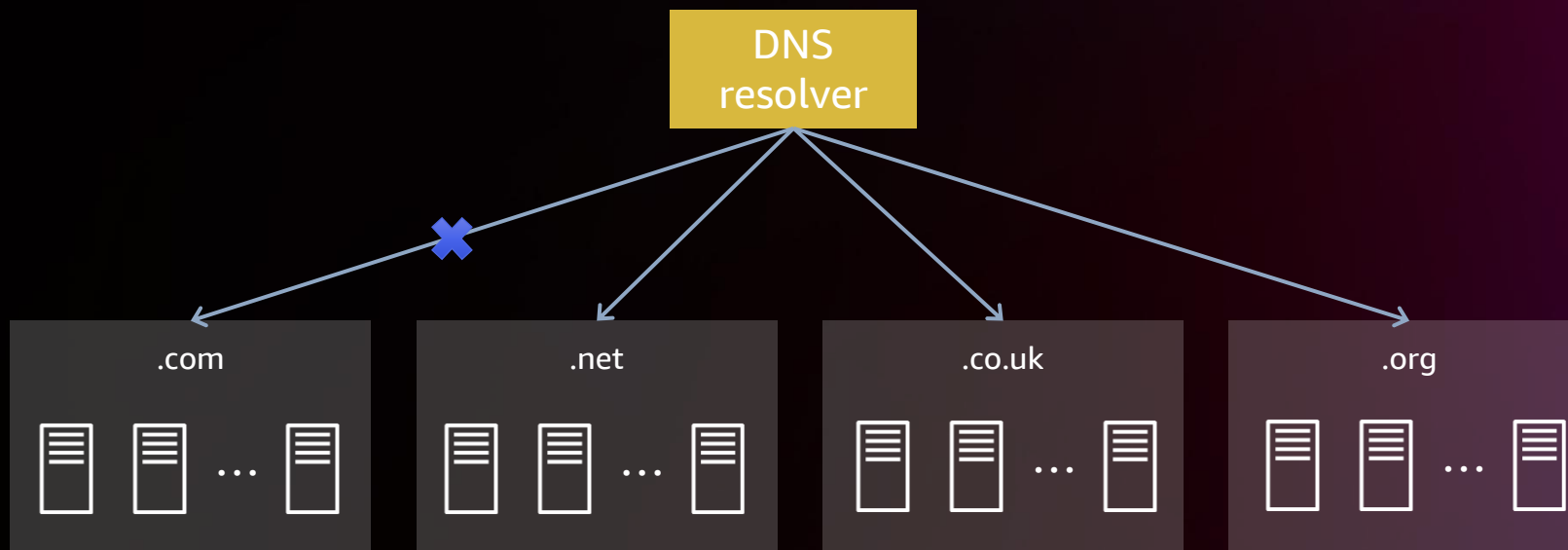
1. How AWS approaches high availability
2. Building resilient applications in the cloud
3. What is Amazon Route 53 Application Recovery Controller (ARC)?
4. Hands-on workshop on Route 53 ARC

# “Everything fails, all the time”

Werner Vogels  
VP and CTO, Amazon.com



# Design for failure – Amazon Route 53

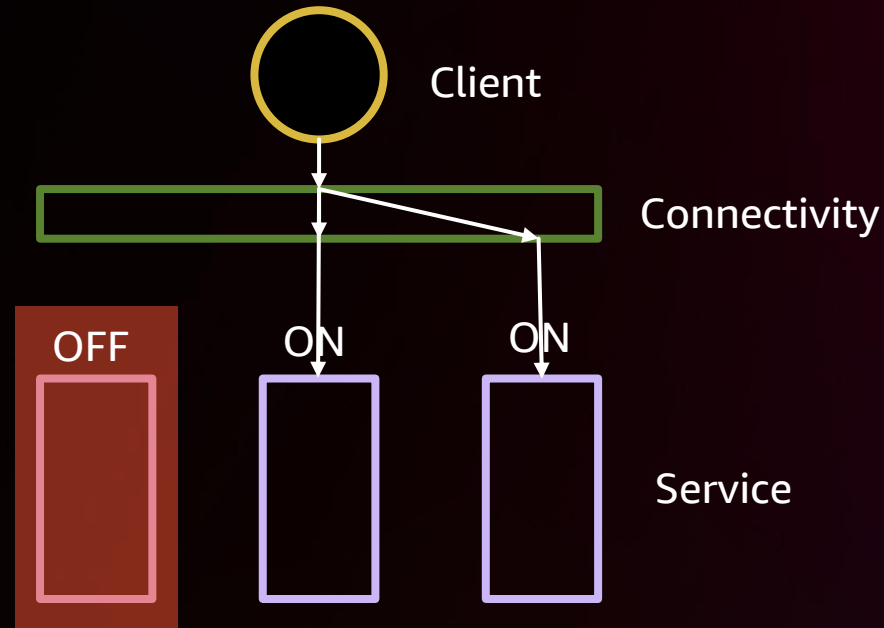


AWS Architecture Blog: “A Case Study in Global Fault Isolation”

<https://aws.amazon.com/blogs/architecture/a-case-study-in-global-fault-isolation/>

# Design for application failures

- Anticipate application failures
- Apply cellular architecture – Isolate and contain failures
- Build and leverage robust failure recovery mechanisms



# Design for application failures – Challenges

- Recovery mechanisms need to be reliable
- Cell replicas need to be properly scaled and configured
- Strict recovery time objective (RTO) and recovery point objective (RPO) require solid automation and processes

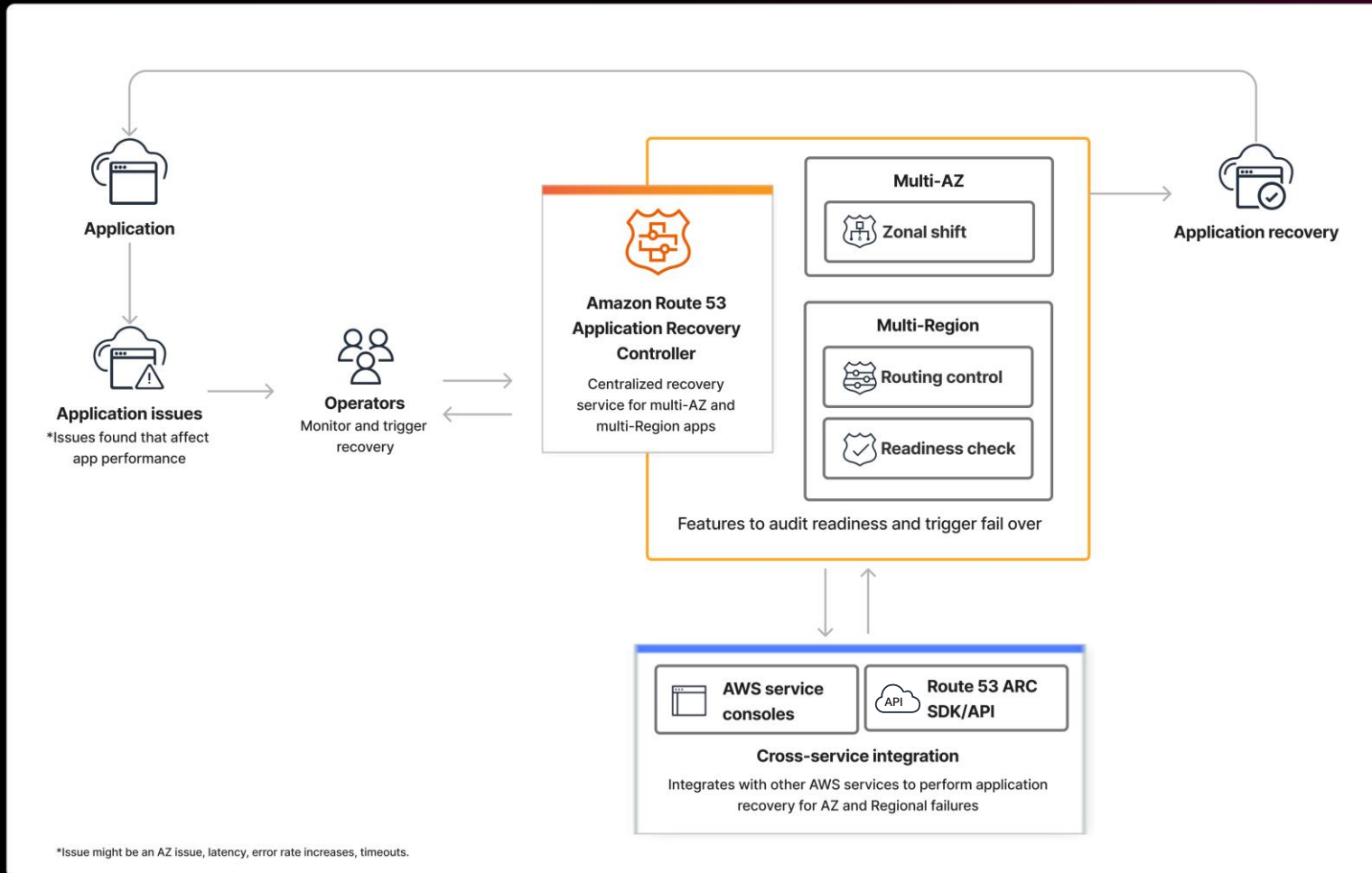
# Amazon Route 53 Application Recovery Controller



Centralized, safe, and reliable way to manage cross-region  
and cross-AZ recovery



# How does Route 53 ARC work?



# Multi-AZ key capabilities

Zonal shift (in preview) is a capability that enables customer to reliably recover from an application failure in an AZ by temporarily shifting the application away from the AZ



# ARC zonal shift

- Grant access and go – Zonal shift is available for ALB and NLB with cross-zone load balancing off with no cost
- Built-in safety rule – Zonal shift prevents you from accidentally moving application traffic away from more than 1 AZ

# Key capabilities



## Zonal Shift

- Start/Update/Cancel zonal shift
- Resource level



## Auto Expiration

- Customizable auto expiration time for up to 3 days



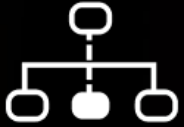
## Safety Rules

- Prevent disabling the same resource from more than one AZ

# How does a zonal shift work?



The health checks are passing but the synthetic monitoring on the ALB's or NLB's zonal endpoint indicates an increase in latency in a zone



Start zonal shift to move traffic out from the AZ



Investigate and fix issue in the AZ



Cancel zonal shift to resume the traffic to the AZ

# Zonal shift for AZ recovery



# Zonal shift for AZ recovery



# Zonal shift for AZ recovery





# Navigate to Route 53 Application Recovery Controller

aws

Services

Search for services, service features, Marketplace products, docs, and more

N. Virginia

MyRole/AWSUser @

Amazon Route 53 Application Recovery Controller

Get started

Multi-AZ New

Zonal shift

Multi-region

Routing control

Clusters

Readiness check

Resource sets

Readiness rules

Amazon Route 53 Application Recovery Controller > Zonal shift

Zonal shift Info

Active zonal shifts (0)

If you have active zonal shifts, for all resources or for individual resources in your account, they're listed here.

Update zonal shiftCancel zonal shiftStart zonal shift

Search

< 1 >

Zonal shift ID	Applied to	Away from	Expiration time	Last modified	Comment
No active zonal shifts					
No active zonal shifts to be displayed					
Start zonal shift					

Resources (7)

View your resources that are registered with Route 53 ARC. Sort by the zonal shift status column to view resources that have active zonal shifts.

Search

All AZs

All services

All zonal shift status

< 1 >

Resource name	Service	Resource ARN	Zonal shift status
BackupLB	ELB	arn:...:loadbalancer/net/billing-lb/89ef606adbcbfb0	No zonal shift
BillingLB	ELB	arn:...:loadbalancer/net/frontend-lb/c78accb87e9fb8c7	No zonal shift
FrontendLB	ELB	arn:...:loadbalancer/net/backup-lb/2047afc8b89ed9a6	No zonal shift
InternalLB	ELB	arn:...:loadbalancer/net/internal-lb/ced872bd787325f2	No zonal shift
ProdPL	ELB	arn:...:loadbalancer/net/prod-lb/afc7890dbe879a81	No zonal shift
RecaLB	ELB	arn:...:loadbalancer/net/prod-lb/afc7890dbe879a81	No zonal shift
ZeLeLB	ELB	arn:...:loadbalancer/net/prod-lb/afc7890dbe879a81	No zonal shift

Feedback

English (US)

© 2008 - 2019, Amazon Web Services, Inc. or its affiliates. All rights reserved. Privacy Policy Terms of Use

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

# Shift resources away from an AZ

aws

Services

Search

[Option+5]

Select a Region

Admin-console @ 7587-7587

Route 53 Application Recovery Controller > Zonal shift > Start zonal shift

## Start zonal shift

Start a zonal shift to move traffic away from an Availability Zone for a resource. Start by selecting the Availability Zone, and then choose a resource for the zonal shift.

### Choose options for the zonal shift

Select an Availability Zone and resource for a zonal shift.

Select the Availability Zone

usw2-az2 (us-west-2b)

Select resource for zonal shift

One resource

Move application traffic for one resource.

### Resources in usw2-az2 (us-west-2b) (4)

View your managed resources in Route 53 Application Recovery Controller zonal shift.

Find resource

< 1 >

Resource name	Resource ARN	Applied zonal shift
ALB-1	arn:...e8363425d194	Resource zonal shift
NLB-2	arn:...b32eb4769e51	Resource zonal shift
ALB4	arn:...b41ccc211c3e	No applied zonal shift
NLB-1	arn:...a06e63e79f49	No applied zonal shift

### Set zonal shift expiration

Zonal shifts must be set to expire. You can extend them later, if needed.

Expires in

Choose zonal shift expiration

Comment

Enter a comment. You can edit it later, if you like.

Enter up to 128 characters.

Acknowledge

☐ I understand that starting a zonal shift reduces available capacity for my application.

Cancel

Start

Feedback

Looking for language selection? Find it in the new Unified Settings

© 2022, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

# Safety rule

aws

Services

Search for services, service features, Marketplace products, docs, and more

N. Virginia

MyRole/AWSUser @

Amazon Route 53

Applicaton Recovery Controller

Zonal shift

Resource: BillingLB

### BillingLB

A resource-level zonal shift is currently active in **usw2-az2**. You can't start a zonal shift on a resource in more than 1 Availability Zone at a time unless you cancel the one below.

Applied zonal shift

Info

Each resource can only have one active resource-level zonal shift at a time.

Update zonal shift

Cancel zonal shift

Start zonal shift

Zonal shift ID <b>12345678</b>	Expiration time Expires in about 6 hours	Comment Alarm in zone, weighing out while we root cause the problem.	Last modified time July 27, 2022 at 3:59:00 PM UTC-4
-----------------------------------	---	---	---

Resource details

Open in ELB console

Service  
ELB

Resource ARN  
arn:.....loadbalancer/net/billing-lb/89ef606adbecbfb0

AZs resource is deployed in (4)

Availability Zone	Zonal shift status
usw2-az1	No zonal shift
usw2-az2	Active resource-level zonal shift
usw2-az3	No zonal shift
usw2-az4	No zonal shift

Feedback

English (US)

© 2008 - 2019, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Privacy Policy

Terms of Use

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

# Best practices of zonal shift

- Turn off cross-zone load balancing for your ALB and NLB
- Provision sufficient capacity in each AZ to withstand the loss of capacity in one AZ
- Ensure all zonal replicas are healthy and taking traffic
- Test in advance
- Practice using the API/CLI

# Multi-Region key capabilities



**Routing  
controls**



**Safety rules**



**Readiness  
check**

# Use cases

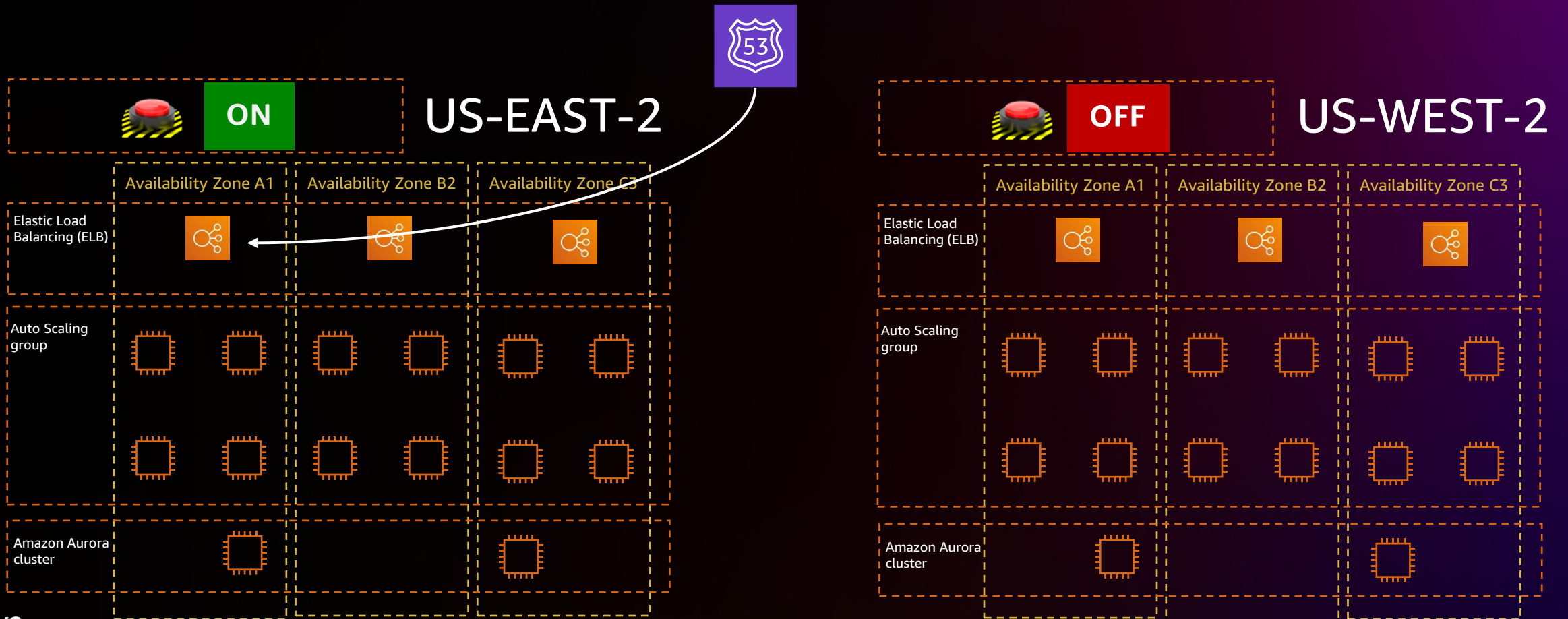
1. Mitigation of failures: Greater control over multi-Region recovery mechanisms
2. Recovery-oriented apps: Build and manage apps that can **recover within minutes** from almost all failures
3. Central control over application recovery operations across organizations

# Feature 1: Routing controls

1. Reliable – Your routing controls are durably stored in five AWS Regions and can be changed through any one of five unique Regional endpoints
2. Single tenant – Your routing controls are hosted on Amazon EC2; changes to your routing control effect changes through Route53 data plane (100% availability SLA)

# Feature 1: Routing control

On/off switches that can be used in place of health checks






# Routing controls stored in 5 different Regions

Route 53 > Application Recovery Controller > Routing control > Clusters > ExampleCluster

## ExampleCluster

[Refresh](#) [Delete](#)

### Details

ARN  
 arn:aws:route53-recovery-control::888985619221:cluster/4f95dd99-f080-4818-b3f9-84eb68f67f0b

Status  
Deployed

### Endpoints

API endpoint	Region
https://4db2db90.route53-recovery-cluster.ap-southeast-2.amazonaws.com/v1	ap-southeast-2
https://01b17431.route53-recovery-cluster.us-east-1.amazonaws.com/v1	us-east-1
https://30e5f662.route53-recovery-cluster.eu-west-1.amazonaws.com/v1	eu-west-1
https://8dac7183.route53-recovery-cluster.ap-northeast-1.amazonaws.com/v1	ap-northeast-1
https://78668518.route53-recovery-cluster.us-west-2.amazonaws.com/v1	us-west-2

# Feature 2: Safety rules

## Safety rules

Customer-configurable rules that set pre-conditions when making changes to routing controls

## What are examples of safety rules?

Avoid turning off all the Regions for an application at the same time

# Feature 3: Readiness check

Recovery group		
Assessment criteria	Cell 1: Primary Region	Cell 2 : Standby Region
Provisioned capacity	500 RCU and 800 WCU	
Resource limits	DynamoDB read throughput limits not matched <b>Remediation in progress</b>	
Replication latency	RPO>30 seconds	
Custom readiness checks	<Custom CloudWatch alarm>	

Checks can also be used for migration between Regions and/or accounts

# Hands-on workshop

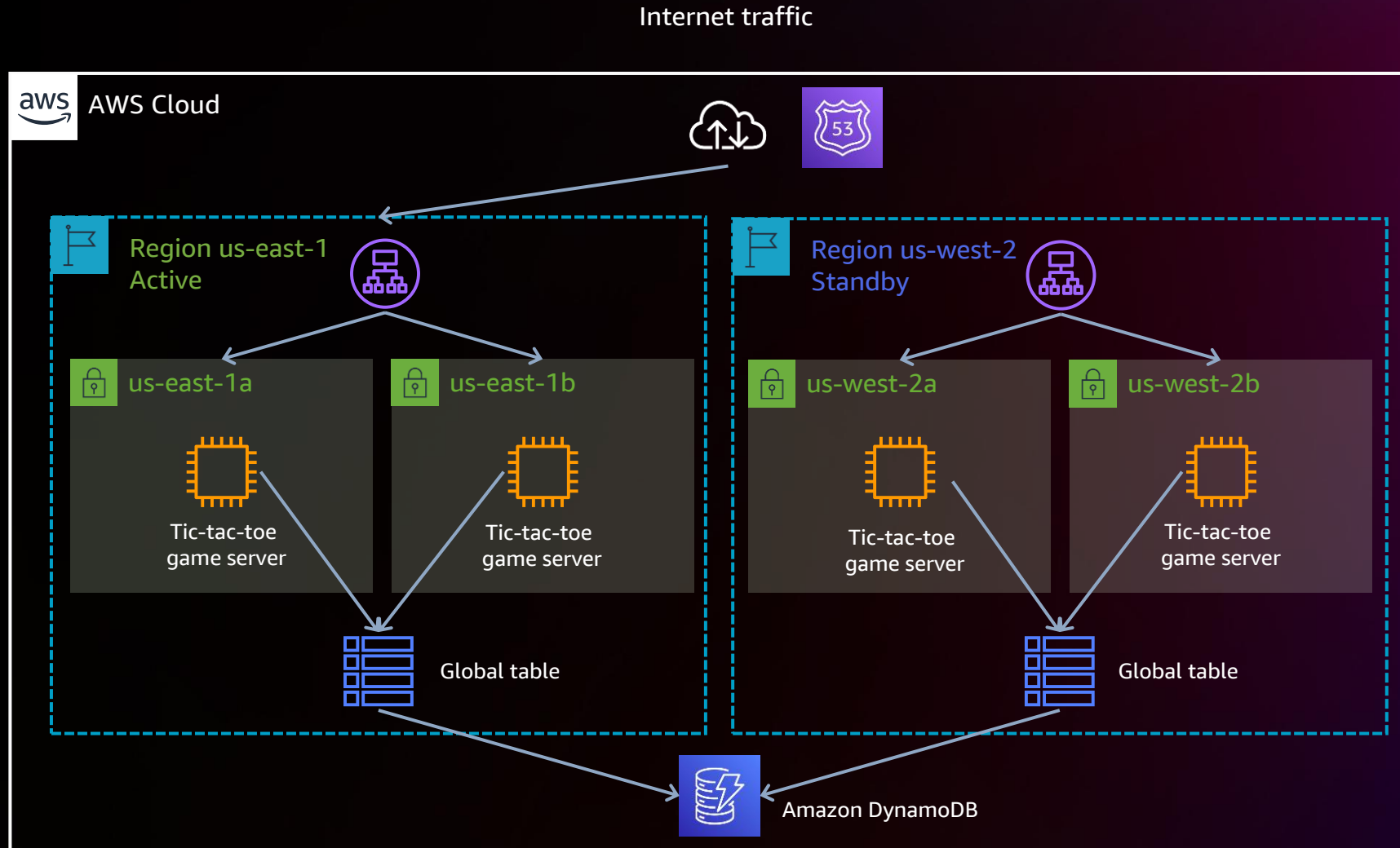


# Let's build!

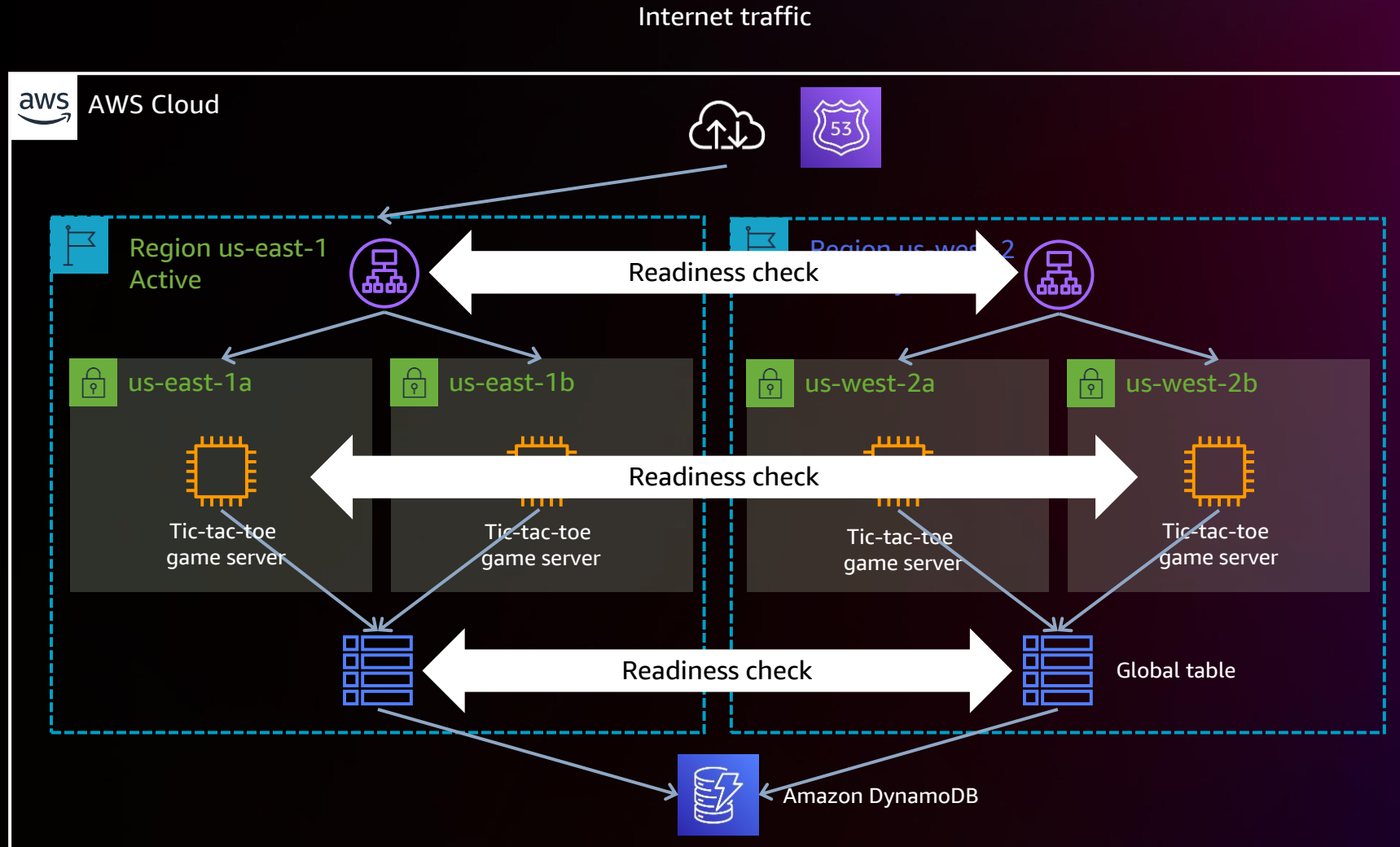
Download the code and instructions from <https://tinyurl.com/ya2kzb44>



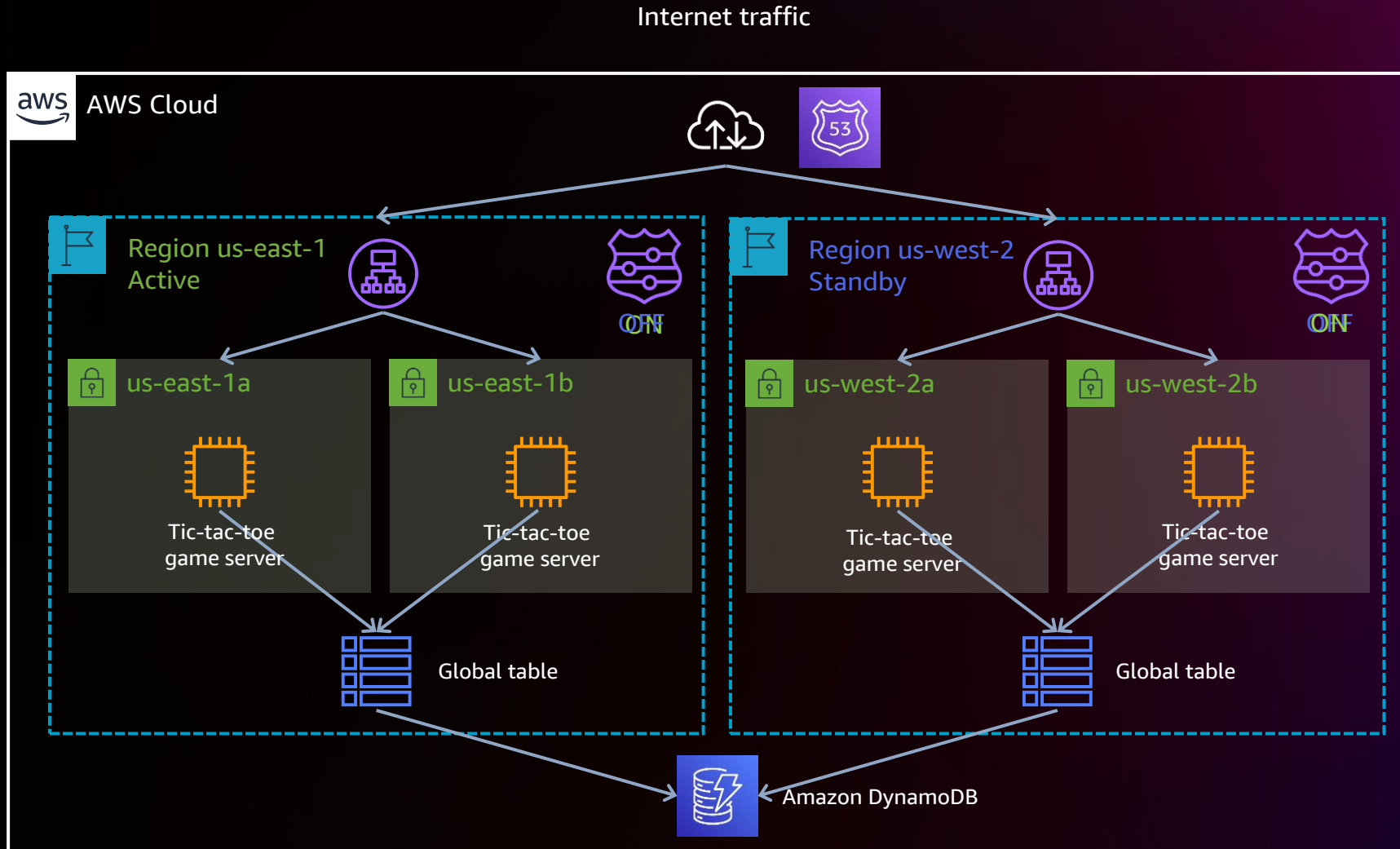
# 1. Set up a multi-Region application



## 2. Use readiness checks



# 3. Use routing controls and perform failover





# Thank you!

Scott Wainstock  
wainstoc@amazon.com

Stanley Su  
sustanle@amazon.com



Please complete the session  
survey in the **mobile app**

