
AWS
re:Invent
NOV. 28 – DEC. 2, 2022 | LAS VEGAS, NV

API302-R

Building global event-driven applications

Marcia Villalba (she/her)

Principal Developer Advocate, AWS Serverless
AWS

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

Hola!

Marcia Villalba

Developer Advocate for Serverless

Serverless since 2016

Host of YouTube Channel
FooBar Serverless with over 300 video tutorials

@mavi888uy



aws

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

Agenda

Why do a multi-Region architecture?

Multi-Region business continuity

Architecting for multi-Region

Operating a multi-Region application

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

So you want a multi-Region architecture

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

Why not multi-Region?



Replication lag



Image generated by DALL-E

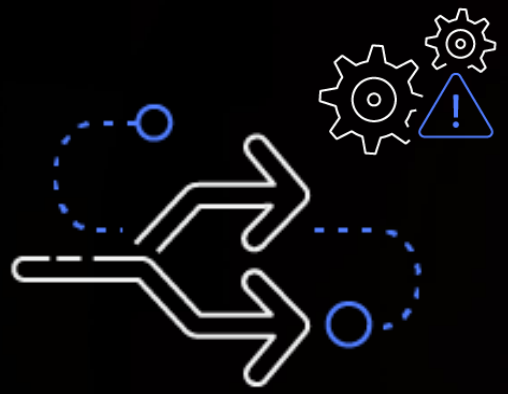
Complexity and cost



Testing

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

Category of failures



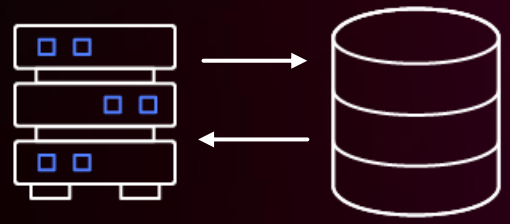
Code deployments/ configurations

E.g., bad deployments, credential expiration



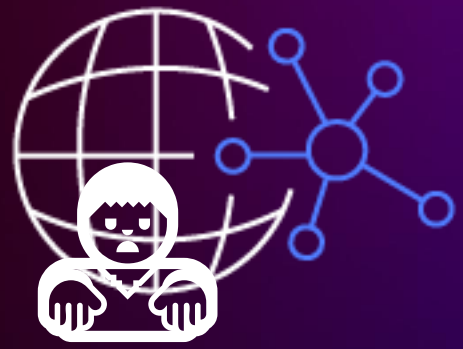
Core infrastructure

E.g., data center failure, host failure



Data and state

E.g., data corruption



Highly unlikely scenarios

E.g., natural disasters

Probable ← Likelihood → Rare

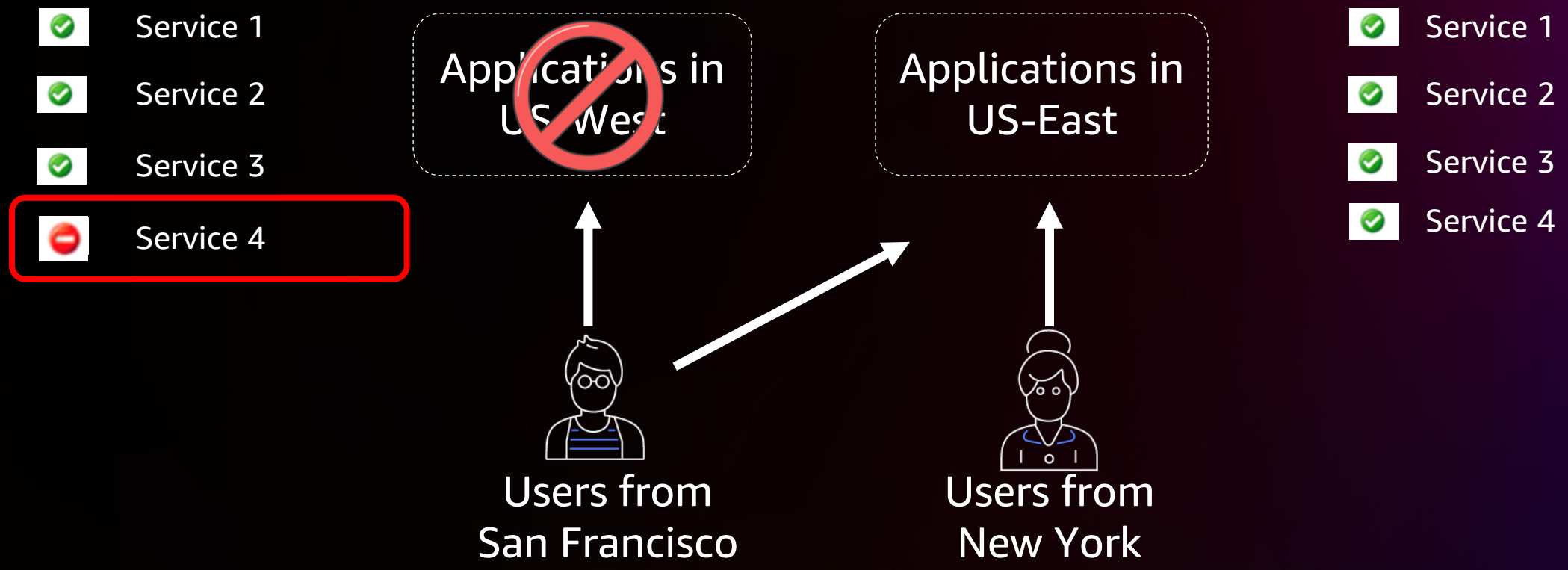
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Why multi-Region?

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

Why multi-Region?

1. Business continuity/disaster recovery



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

Why multi-Region?

1. Business continuity/disaster recovery
2. Geographically distributed customer base

US-West



Users from San Francisco

US-East



Users from New York

EU-West



Users from London

AP-Southeast



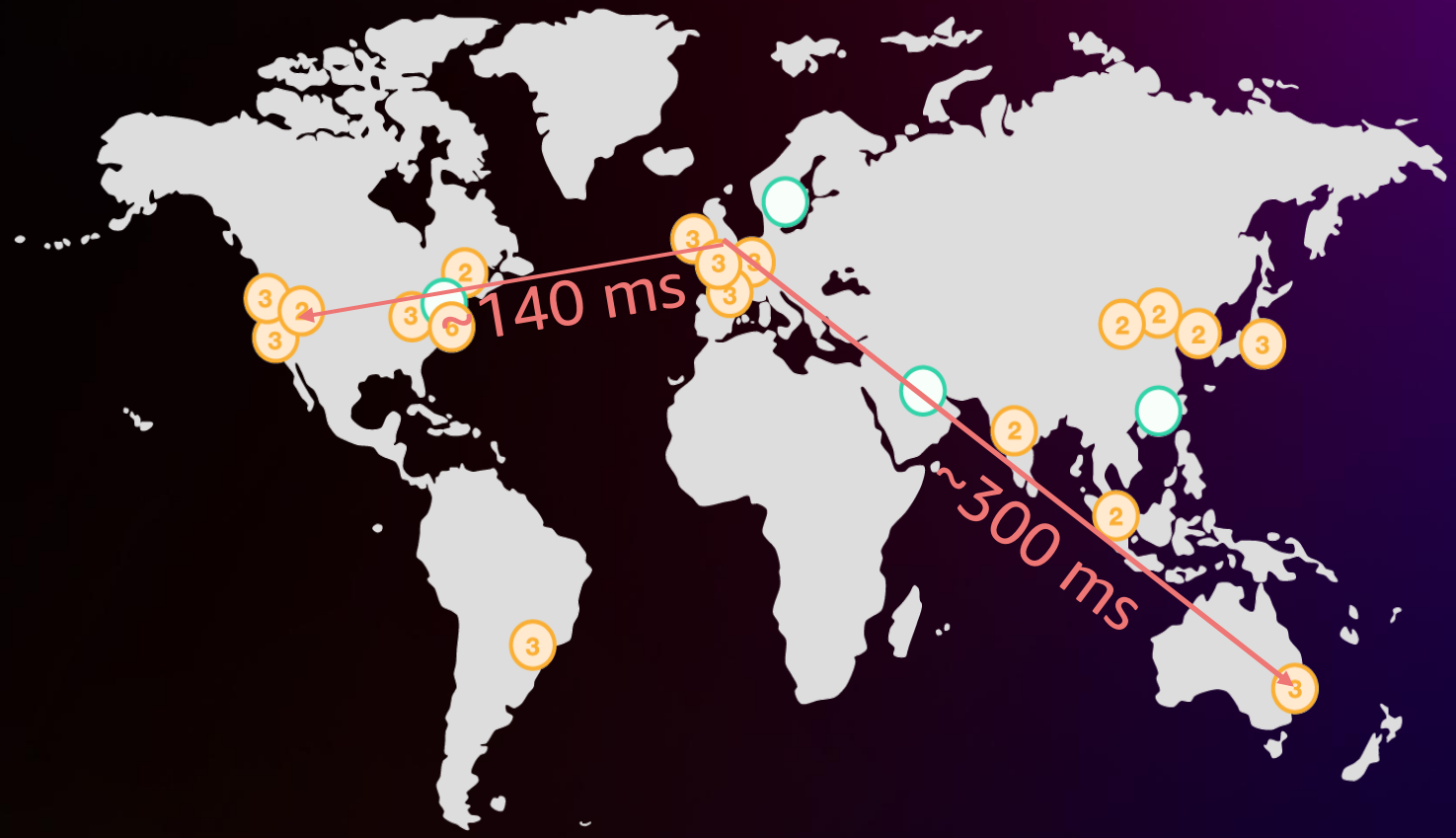
Users from Australia

aws

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

Why multi-Region?

1. Business continuity/disaster recovery
2. Geographically distributed customer base
    a. Improve latency for end users



* Latency numbers are only examples

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

Why multi-Region?

1. Business continuity/disaster recovery
2. Geographically distributed customer base
    a. Improve latency for end users
    b. Meet legal and data regulatory compliance



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

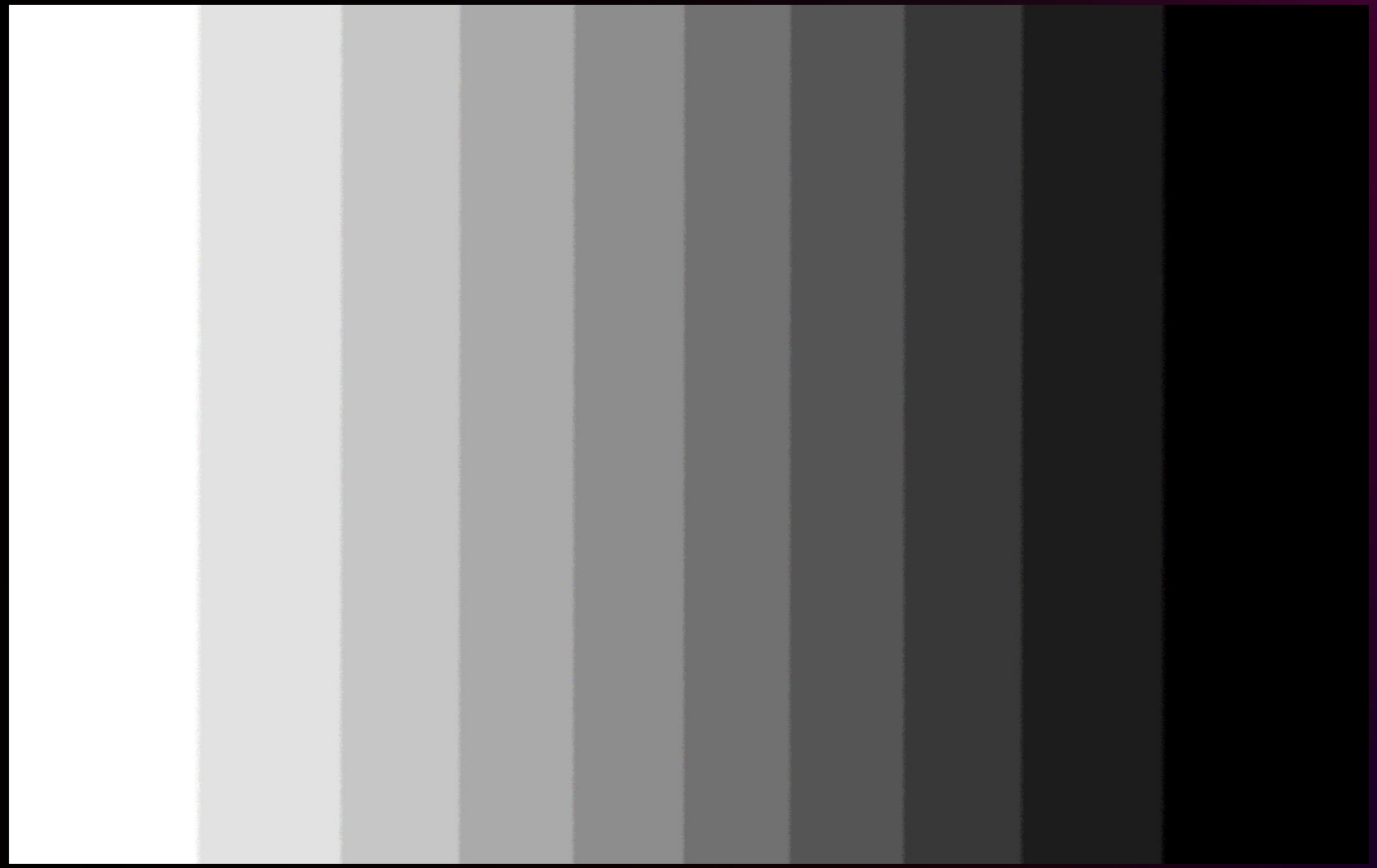
Does it need to be multi-Region?

- Can we be successful **without this service**? How much redundancy do we need?
- How does this service access **persistent storage**?
- How do I keep the **events** in sync?
- How we manage **infrastructure and configuration** in a multi-Region application?

aws

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

Deciding multi-Region is not black and white



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

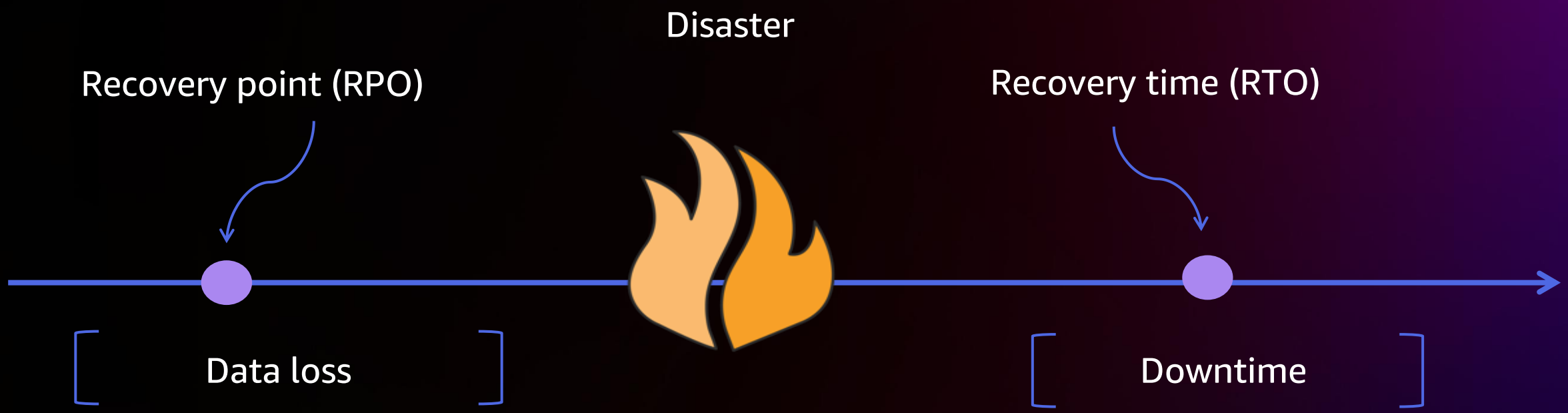
How do I design for multi-Region business continuity?

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

Business continuity

How much data can you afford to recreate or lose?

How quickly must you recover? What is the cost of downtime?



It’s not about the data; it’s about the **mission**

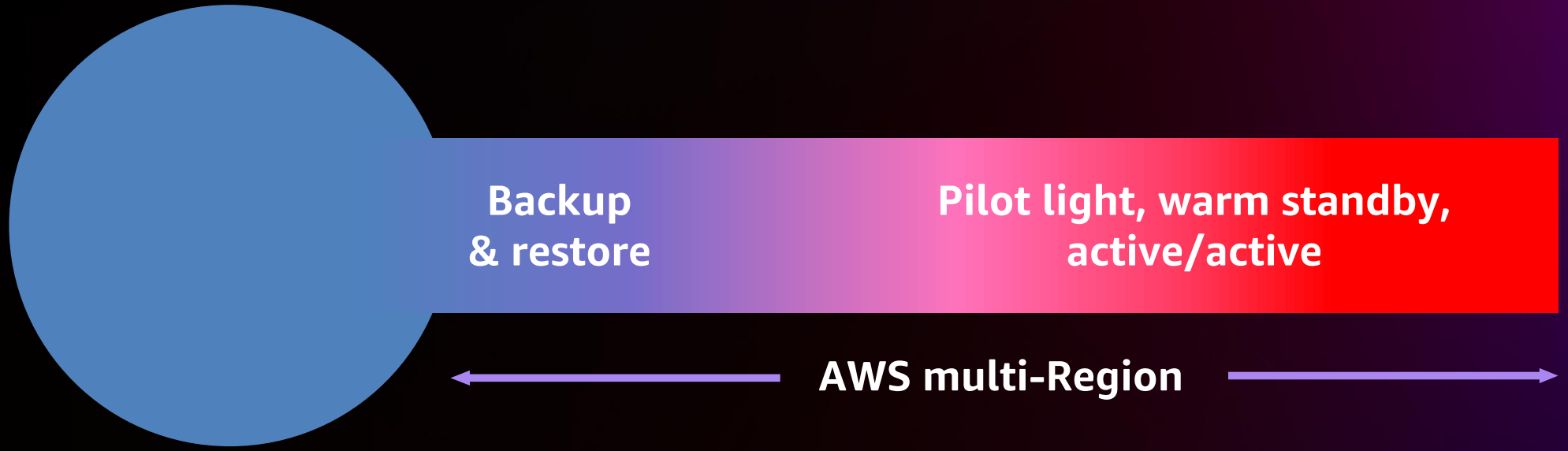
aws
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

The strategies for business continuity



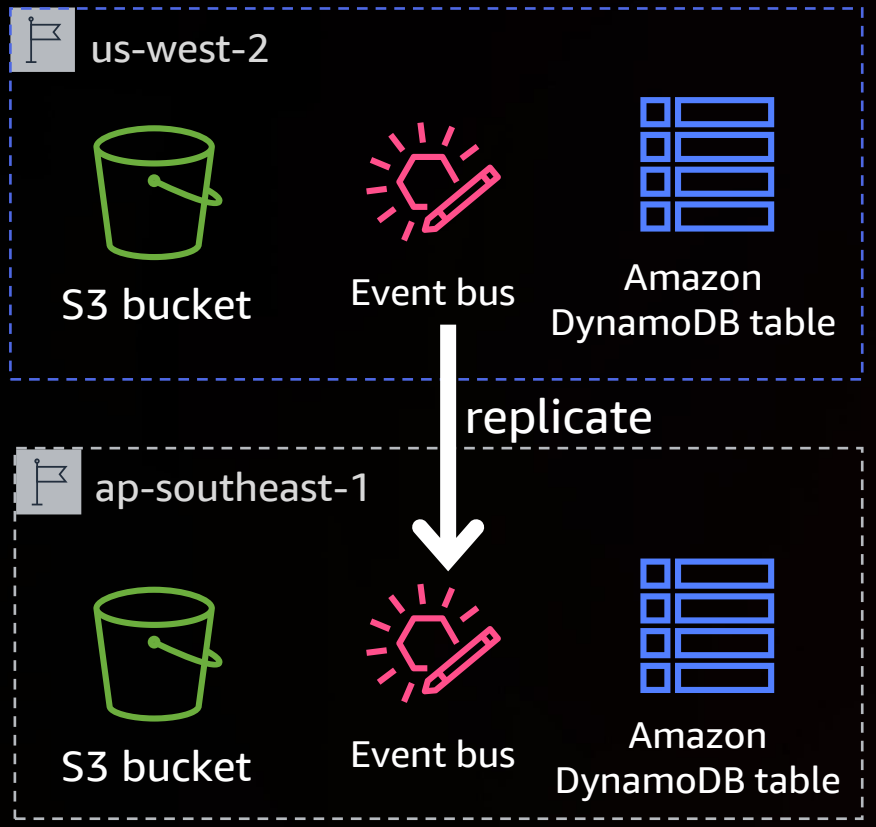
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

The strategies for business continuity with serverless



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

Strategy: Backup and restore



Back up to another Region

- Back up databases to Amazon S3
- Use Amazon S3 Cross-Region Replication (CRR)
- Data is stored with high durability in multiple locations
- Events can be archived in a secondary Region with Amazon EventBridge global endpoints
- Replicate tables with Amazon DynamoDB global tables

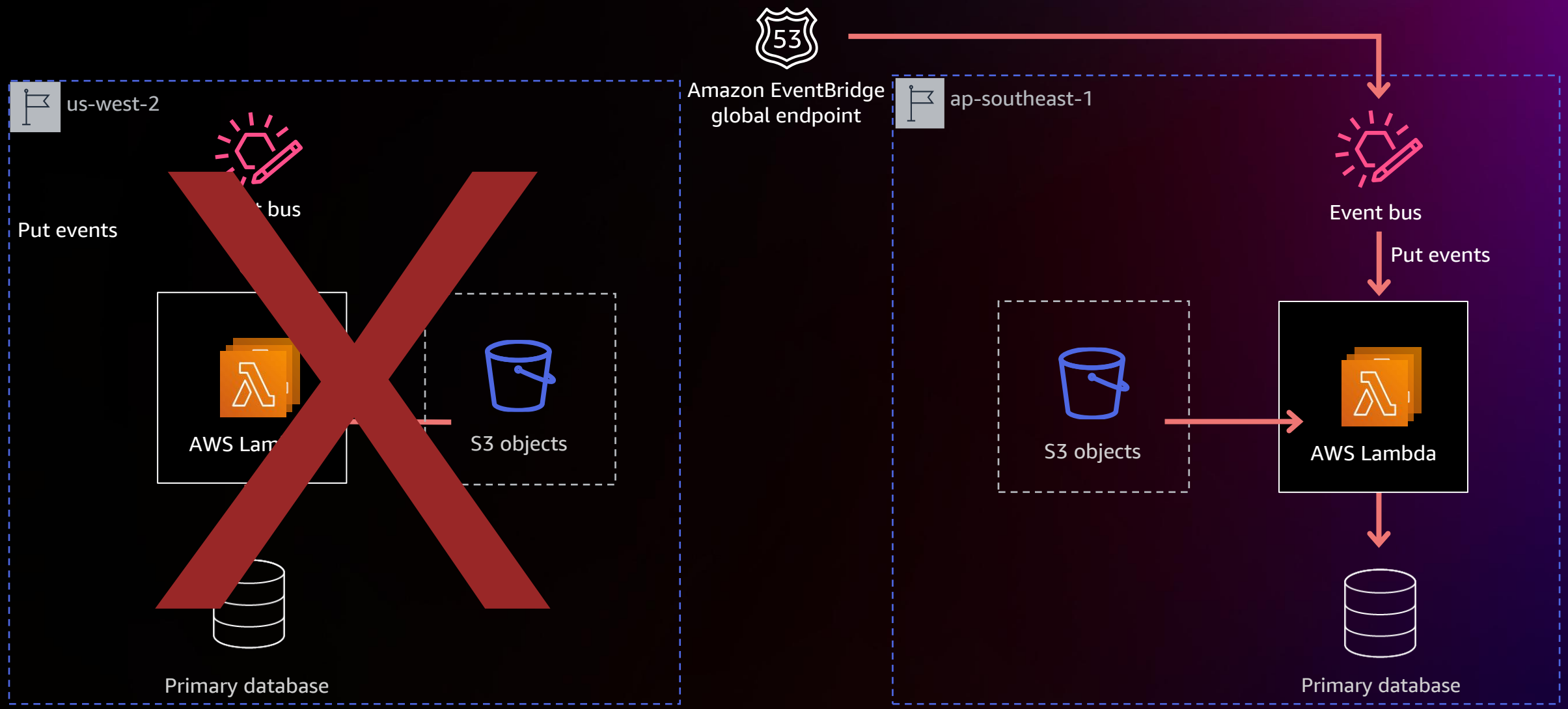
aws
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Strategy: Active/active



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

Strategy: Active/active

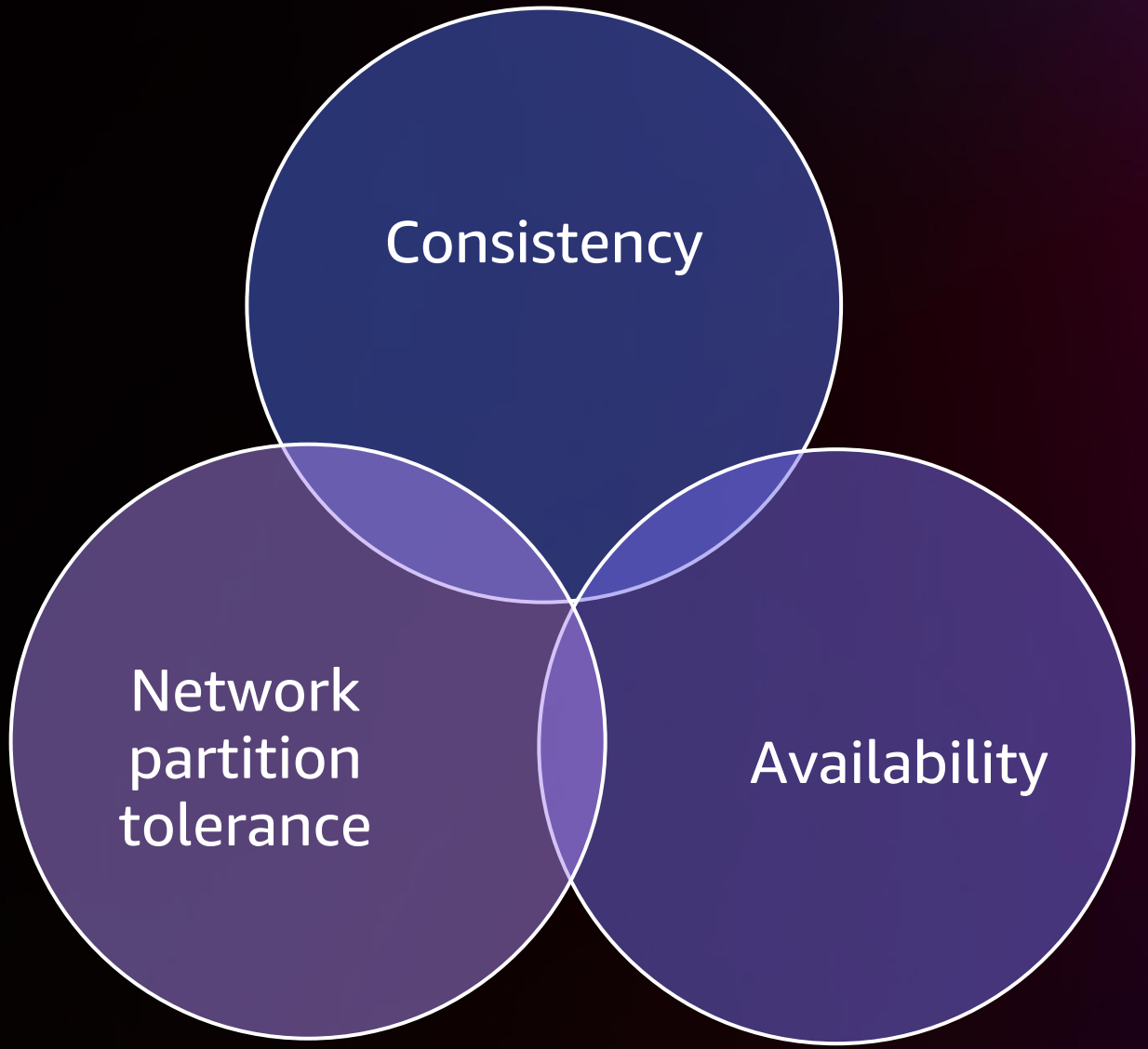


© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Architecting for multi-Region active/active

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

CAP theorem



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

Challenges when going multi-Region

- Databases and storage consistency and availability
- Events consistency and availability
- Secret data consistency and availability

Can you see the pattern?

All about data!

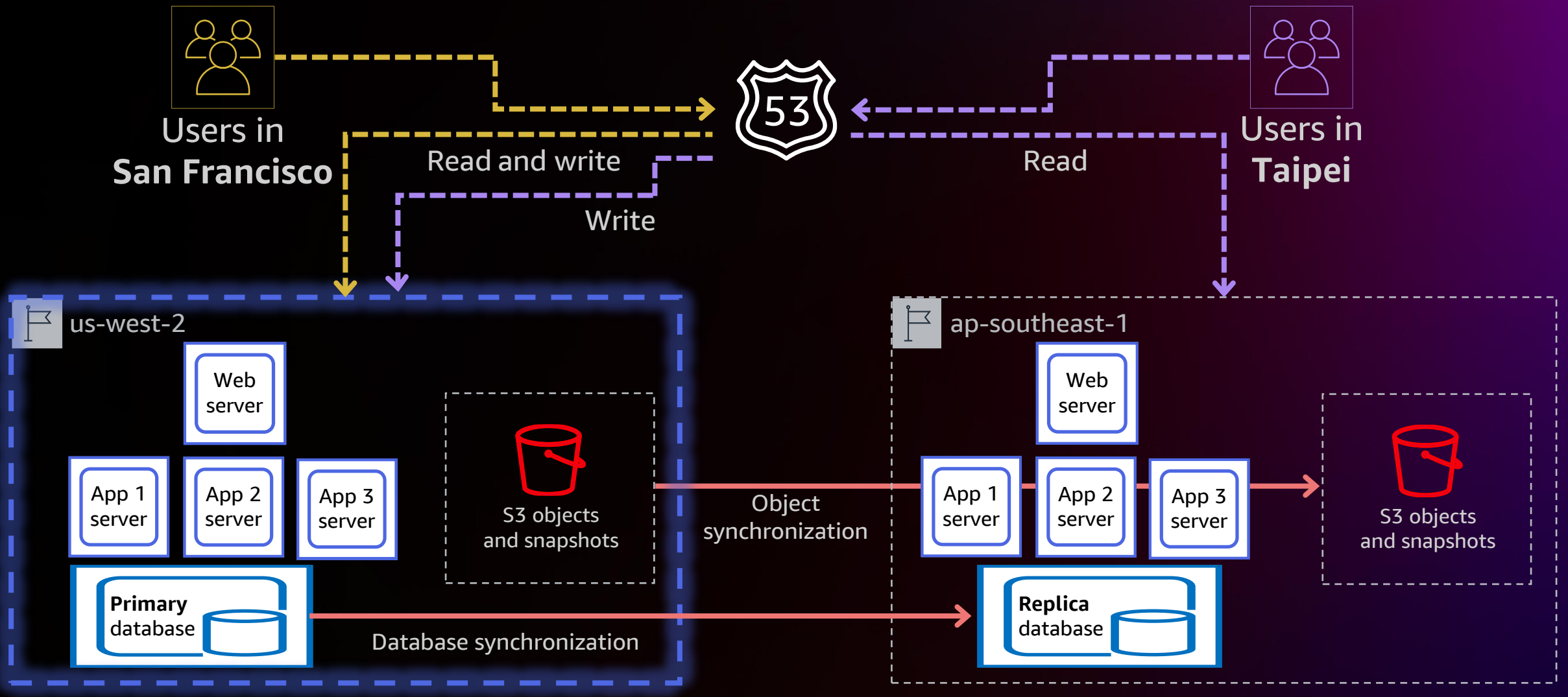
aws

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

Databases and storage

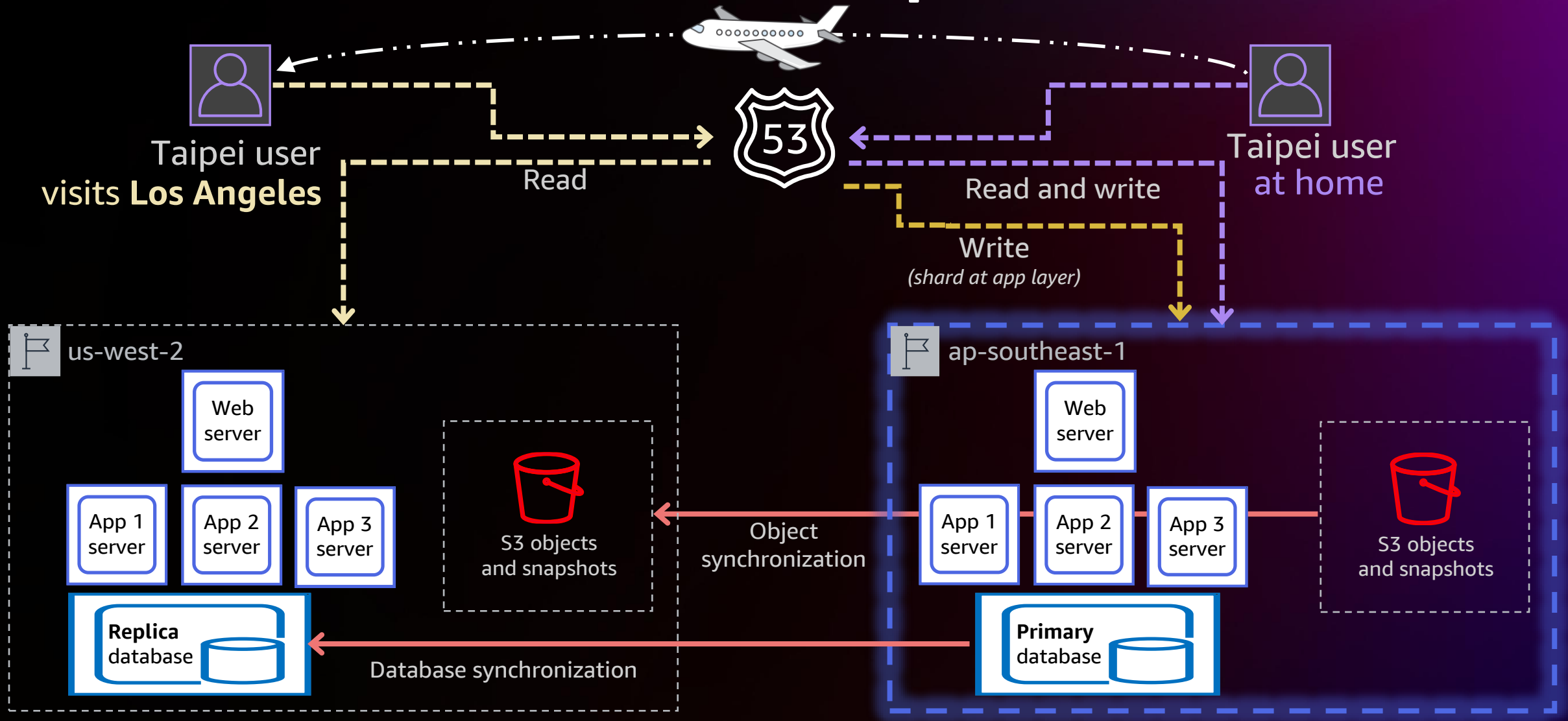
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Pattern 1: Read local, write global



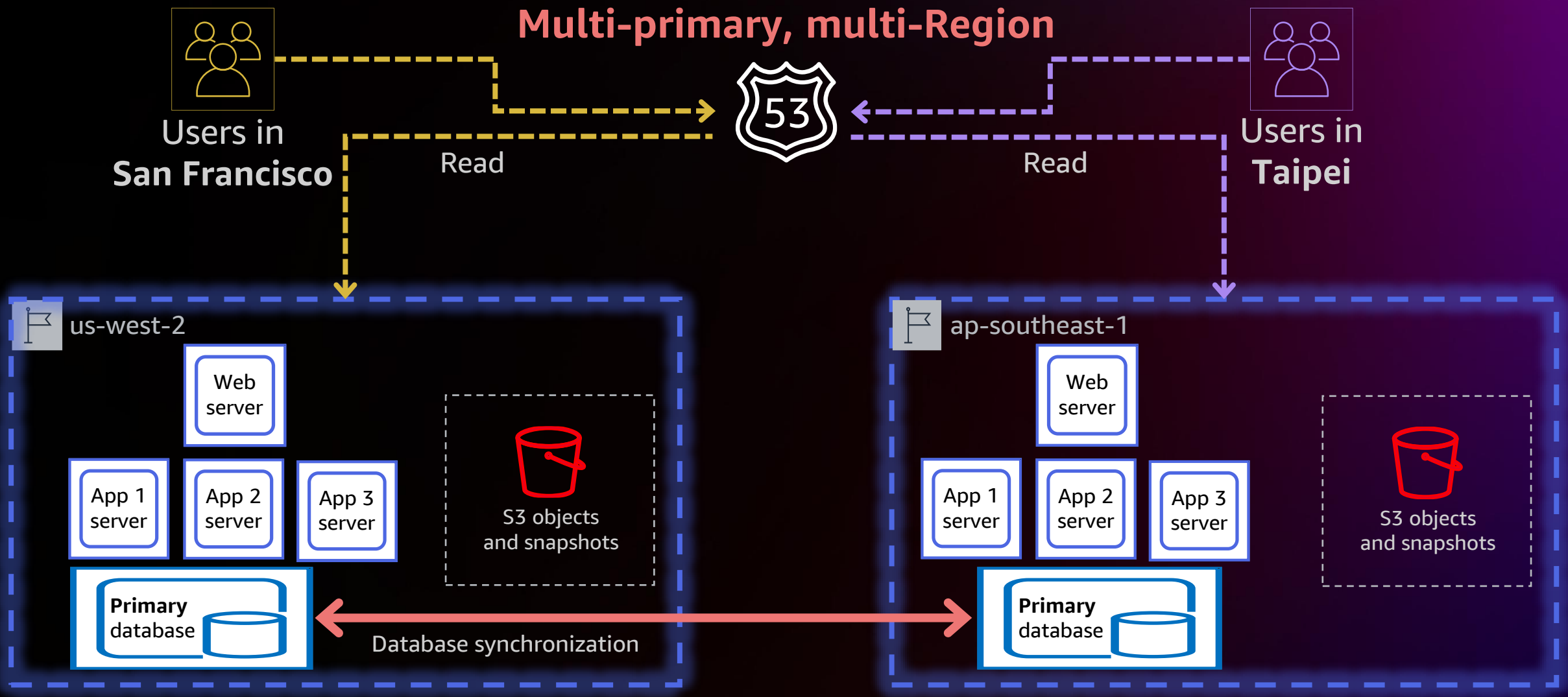
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Pattern 2: Read local, write partitioned



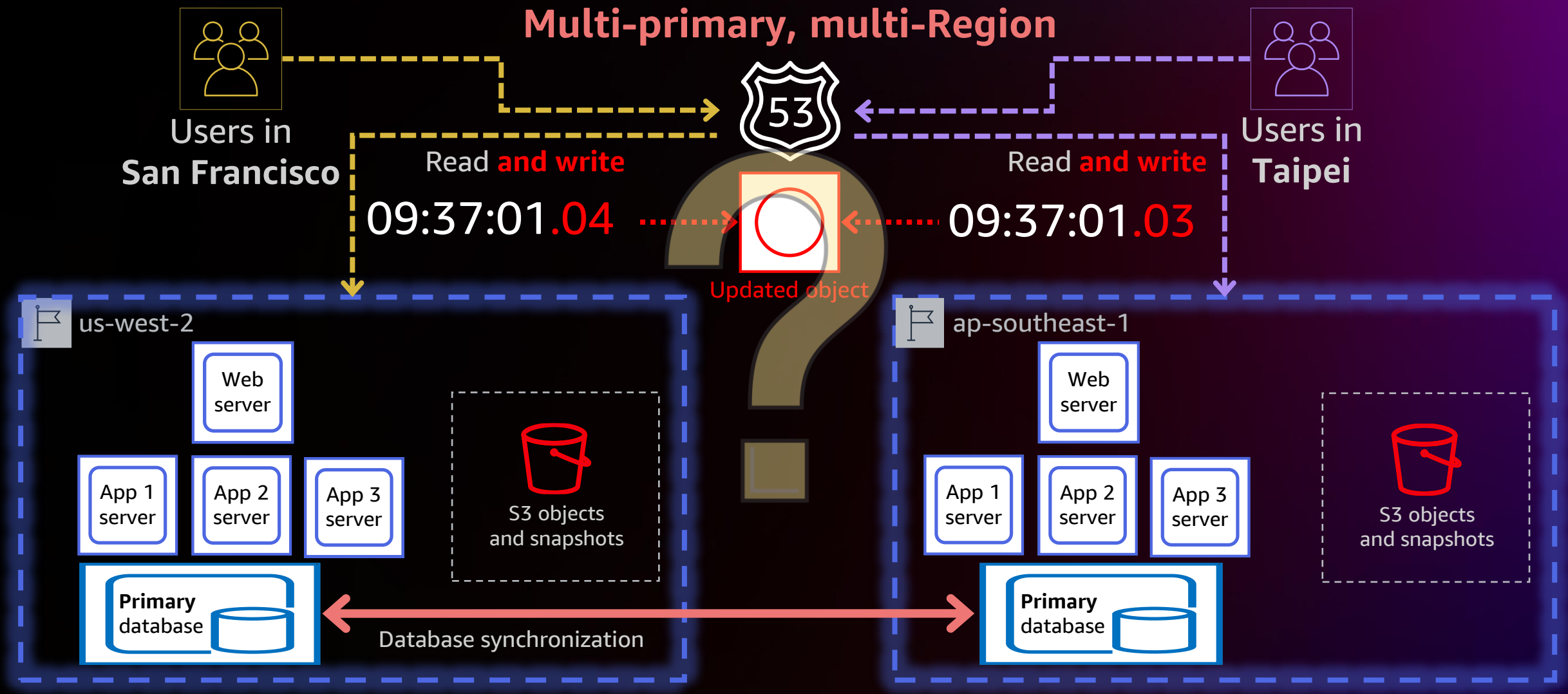
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Pattern 3: Read local, write local



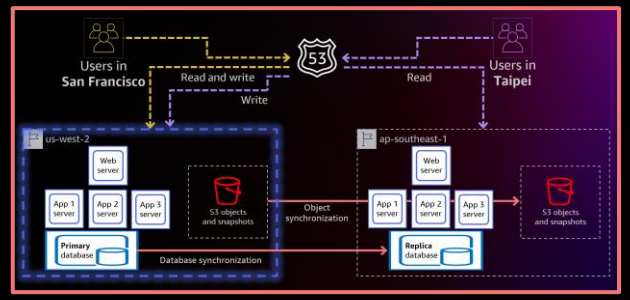
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Pattern 3: Read local, write local

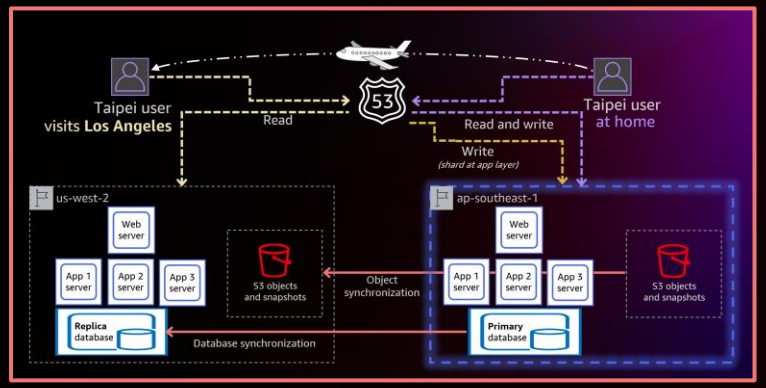


© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

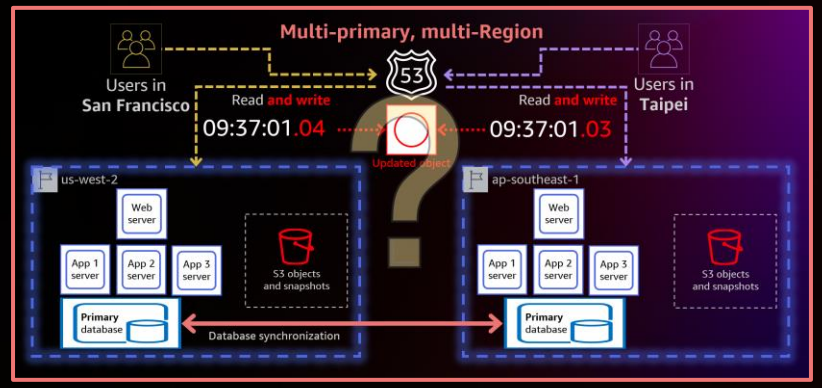
Multi-Region active/active patterns



Read local, write global



Read local, write partitioned



Read local, write local

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

Amazon S3 Cross-Region Replication (CRR)

AUTOMATICALLY REPLICATE DATA TO OTHER AWS REGIONS

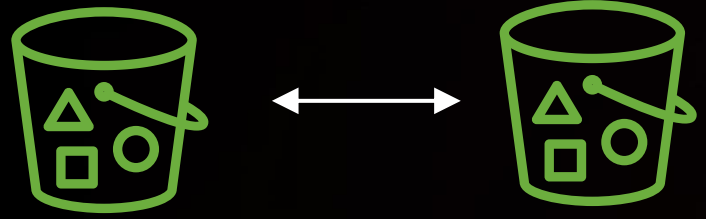
- Replicate by object, bucket, or prefix
- Support for server-side encryption on encrypted objects in AWS KMS
- Ownership overwrite
  - Change the object owner in the destination Region



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

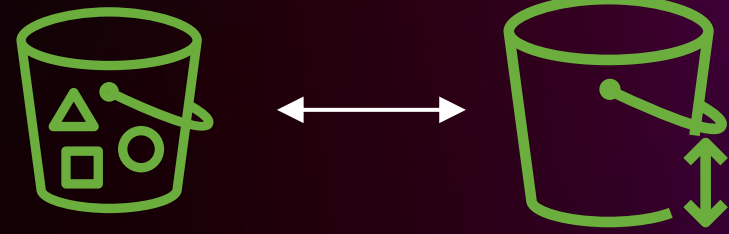
Amazon S3 Cross-Region Replication examples

S3 Standard



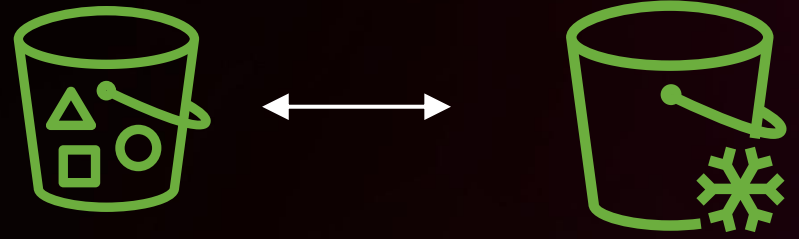
S3 Standard

S3 Standard



S3 Standard-IA

S3 Standard



Amazon S3 Glacier

aws

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

Amazon DynamoDB global tables

FULLY MANAGED, MULTI-PRIMARY, MULTI-REGION DATABASE



Build high-performance, globally distributed applications

Low latency reads and writes to locally available tables

Multi-Region redundancy and resiliency and 99.999% availability

Multi-active writes from any Region

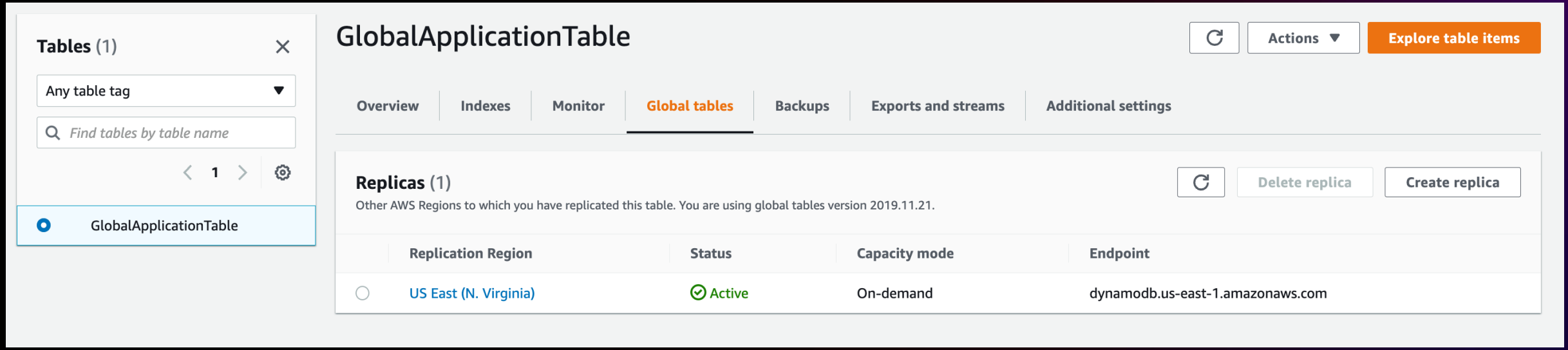
Last writer wins

aws

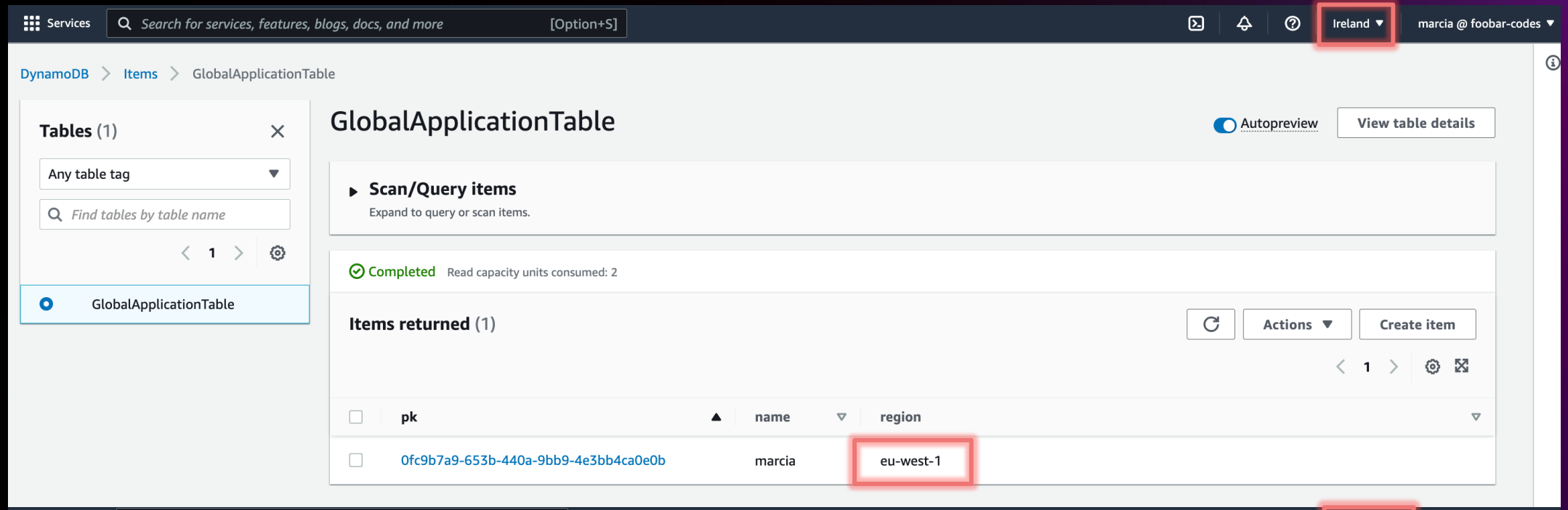
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

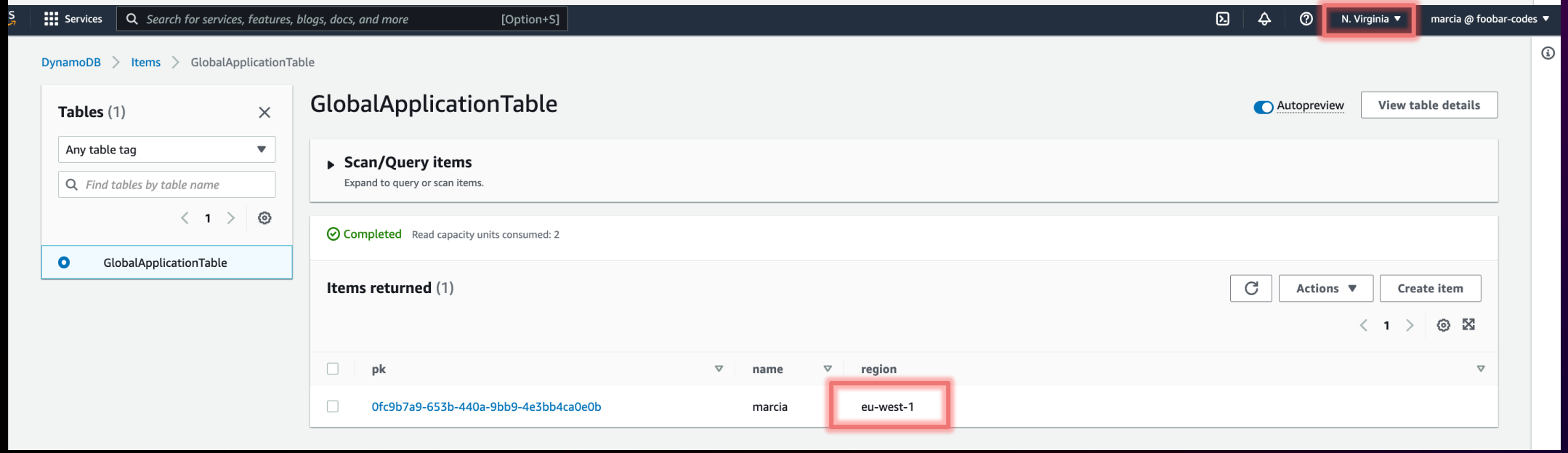
Amazon DynamoDB global tables with AWS CDK

```
const globalTable = new Table(scope, 'Table', {
  tableName: props.tableName,
  partitionKey: { name: 'pk', type: AttributeType.STRING },
  replicationRegions: props.replicationRegions,
});
```



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





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

Events

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

Amazon EventBridge global endpoints



Global endpoint



Failover
and recovery



Failover
flexibility

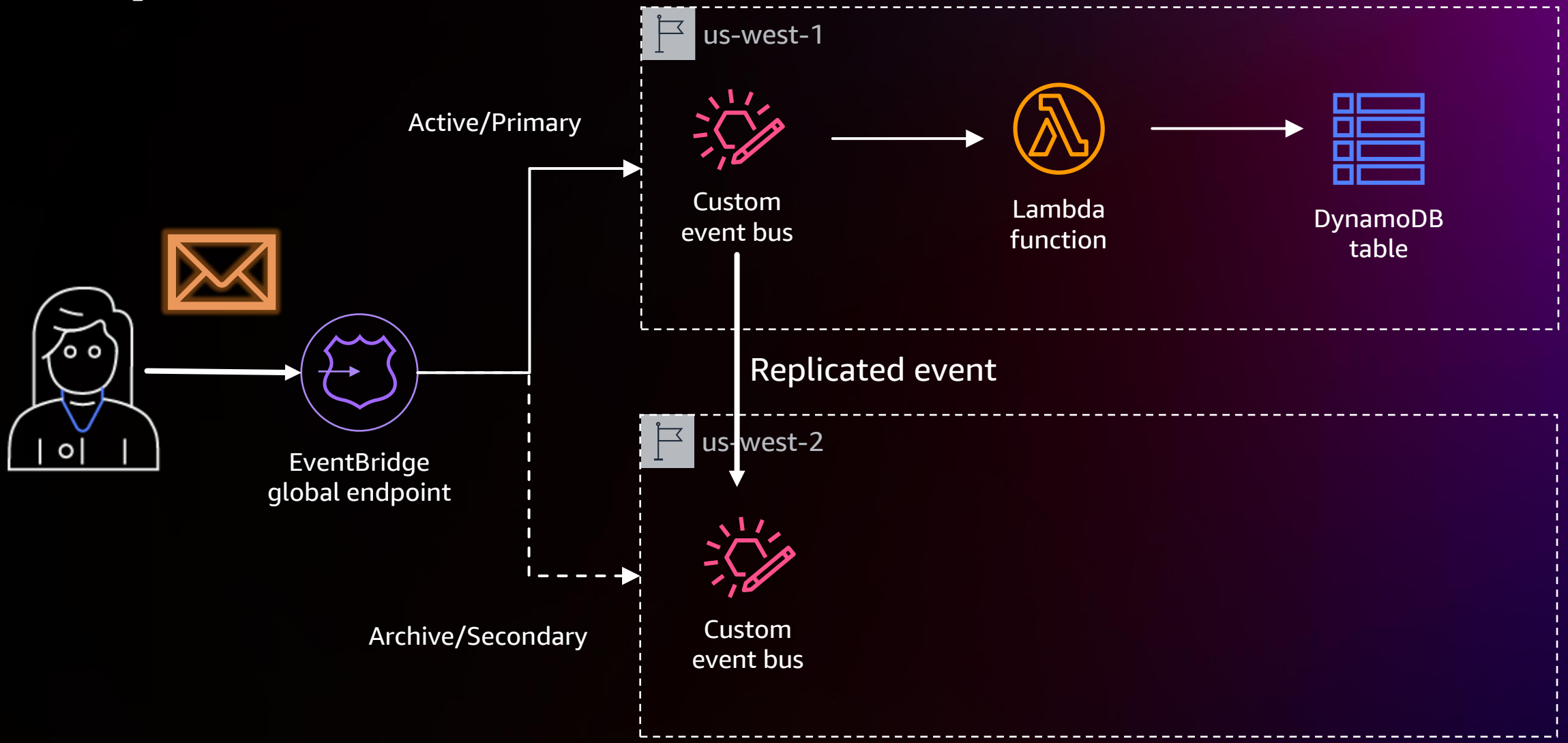


Managed
replication

aws

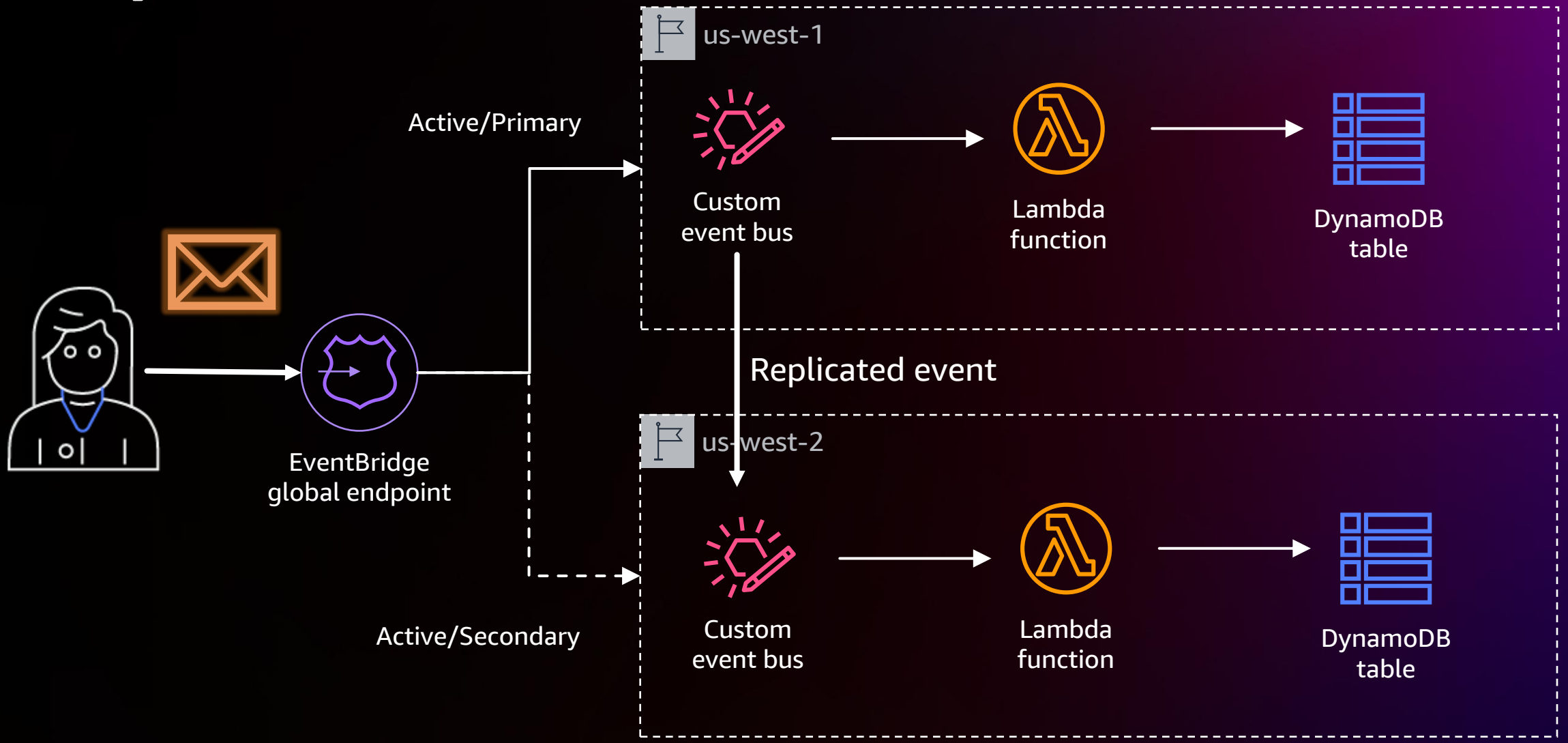
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Active/Archive



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

Active/Active



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

Amazon EventBridge global endpoints with AWS CDK

```
const endpoint = new CfnEndpoint(this, 'EventBridgeGlobalEndpoint', {
  name: 'EventBridgeGlobalEndpoint',
  eventBuses: [
   { eventBusArn: props.eventBusArn1 },
   { eventBusArn: props.eventBusArn2 },
  ],
  routingConfig: {
    failoverConfig: {
      primary: {
        healthCheck: healthCheckARN,
      },
      secondary: {
        route: props.replicatedRegion,
      },},},
  replicationConfig: {
    state: 'ENABLED',
  },
  roleArn:
   replicationRole.roleArn,
});
```

Buses in each of the Regions
Both buses should have the same name!

Health check for making sure that primary Region is okay

Secondary Region

Enabling replication

aws

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

EventBridgeGlobalEndpoint

Delete | Edit

Global endpoints details

Name
EventBridgeGlobalEndpoint

Description
EventBridgeGlobalEndpoint

Endpoint ARN
arn:aws:events:us-east-1:[redacted]:endpoint/EventBridgeGlobalEndpoint

Endpoint ID
8rlb54k0ue.veo

Endpoint URL
https://8rlb54k0ue.veo.endpoint.events.amazonaws.com

Endpoint state
ACTIVE

Status reason
-

Event replication
ENABLED

Failover and recovery triggered by
route-53 healthcheck
arn:aws:route53:::healthcheck/982e80c5-4d1c-475c-90e9-c92e537f6aff

Primary event bus
arn:aws:events:us-east-1:[redacted]:event-bus/CustomEventBus

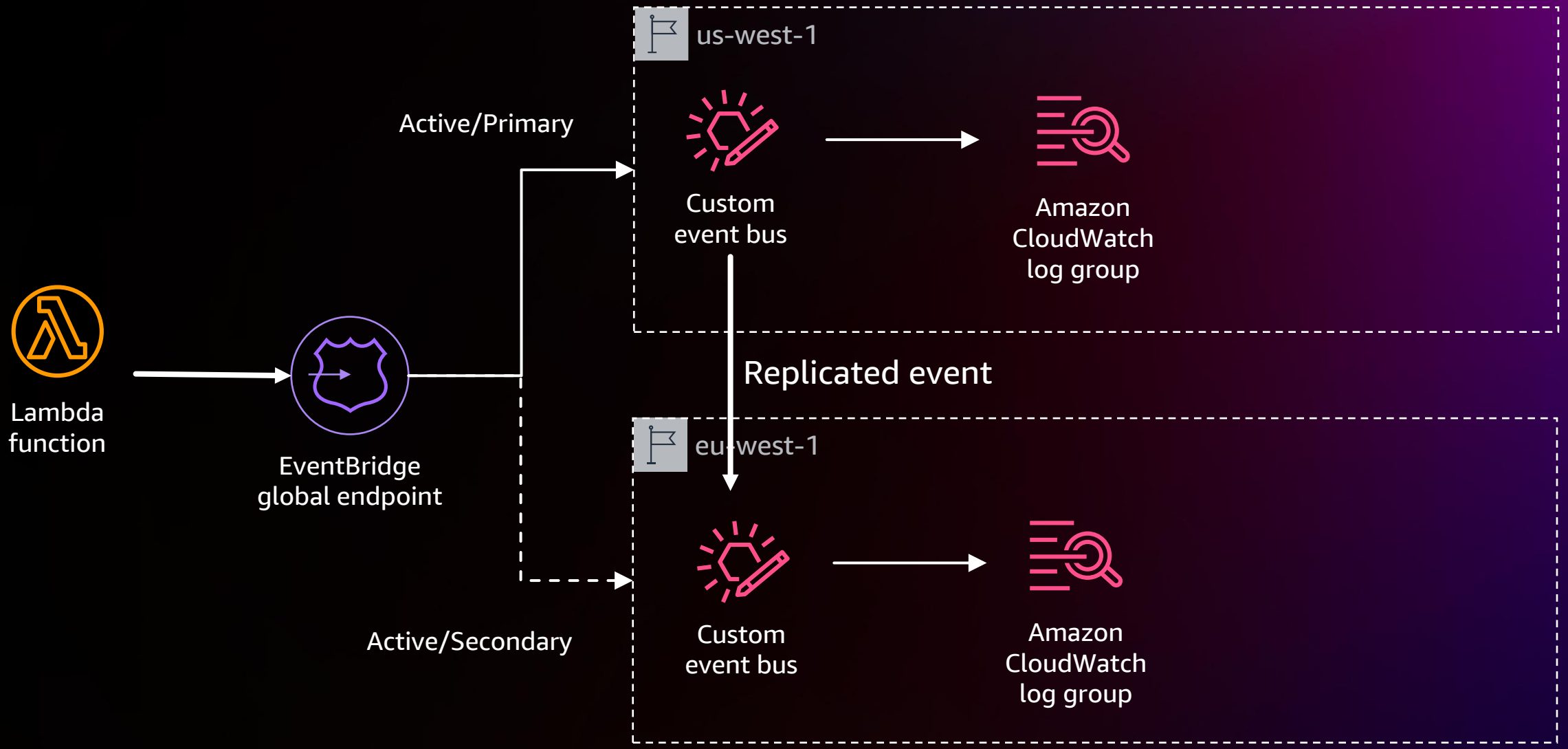
Secondary event bus
arn:aws:events:eu-west-1:[redacted]:event-bus/CustomEventBus

Role ARN
arn:aws:iam::[redacted]:role/service-role/Amazon_EventBridge_Invoke_Event_Bus_1692600113

Last modified
Sep 28, 2022, 02:27 PM GMT+3

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

Let’s build



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

Function that puts events to the endpoint

```
exports.handler = async (event) => {
  …
  const params = {
    Entries: [{
      Detail: JSON.stringify(detail),
      DetailType: 'test',
      EventBusName: 'CustomEventBus',
      Source: 'test',
    },
   ],
   EndpointId: '8rlb54kOue.veo',
 };

 try {
   await ebClient.send(new PutEventsCommand(params));
 } catch (e) {
   console.log(e);
 }
..
;
```

Name of the bus (both buses have the same name)

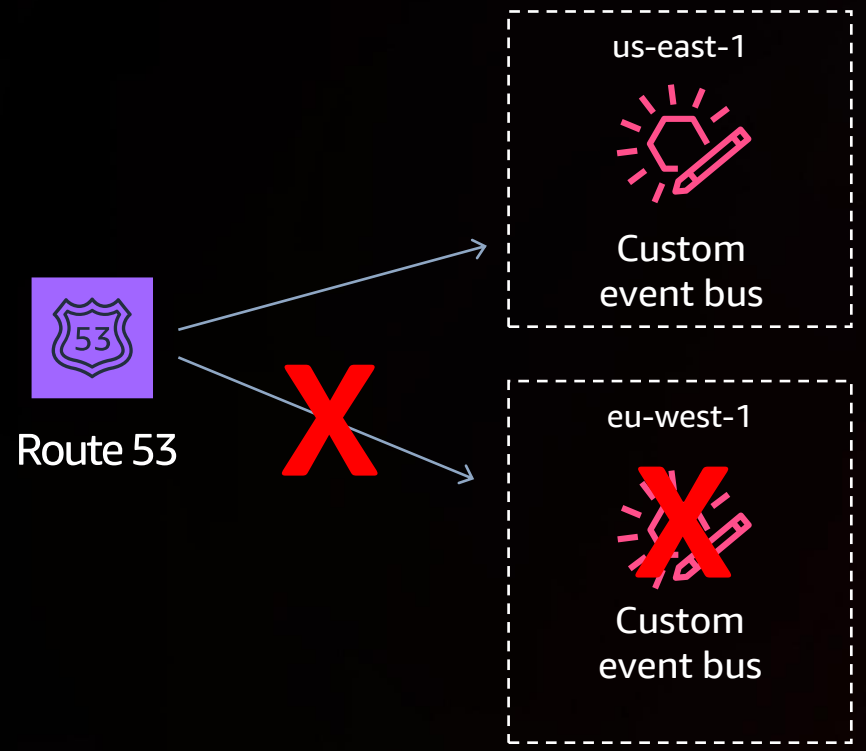
Add the endpoint ID

aws

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

Route 53 health checks

MONITOR THE HEALTH AND PERFORMANCE OF YOUR APPLICATION



Each health check that you create can monitor one of the following:

- The health of a specified resource, such as a web server
- The status of other health checks
- The status of an Amazon CloudWatch alarm

aws

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

Health check

```
const metric = new Metric({
  metricName: 'IngestionToInvocationStartLatency',
  namespace: 'AWS/Events',
  statistic: 'Average',
  period: Duration.seconds(60),
});
```

This exposes the time to process events from the point at which they are ingested by EventBridge to the point the first invocation of a target in your rules is made

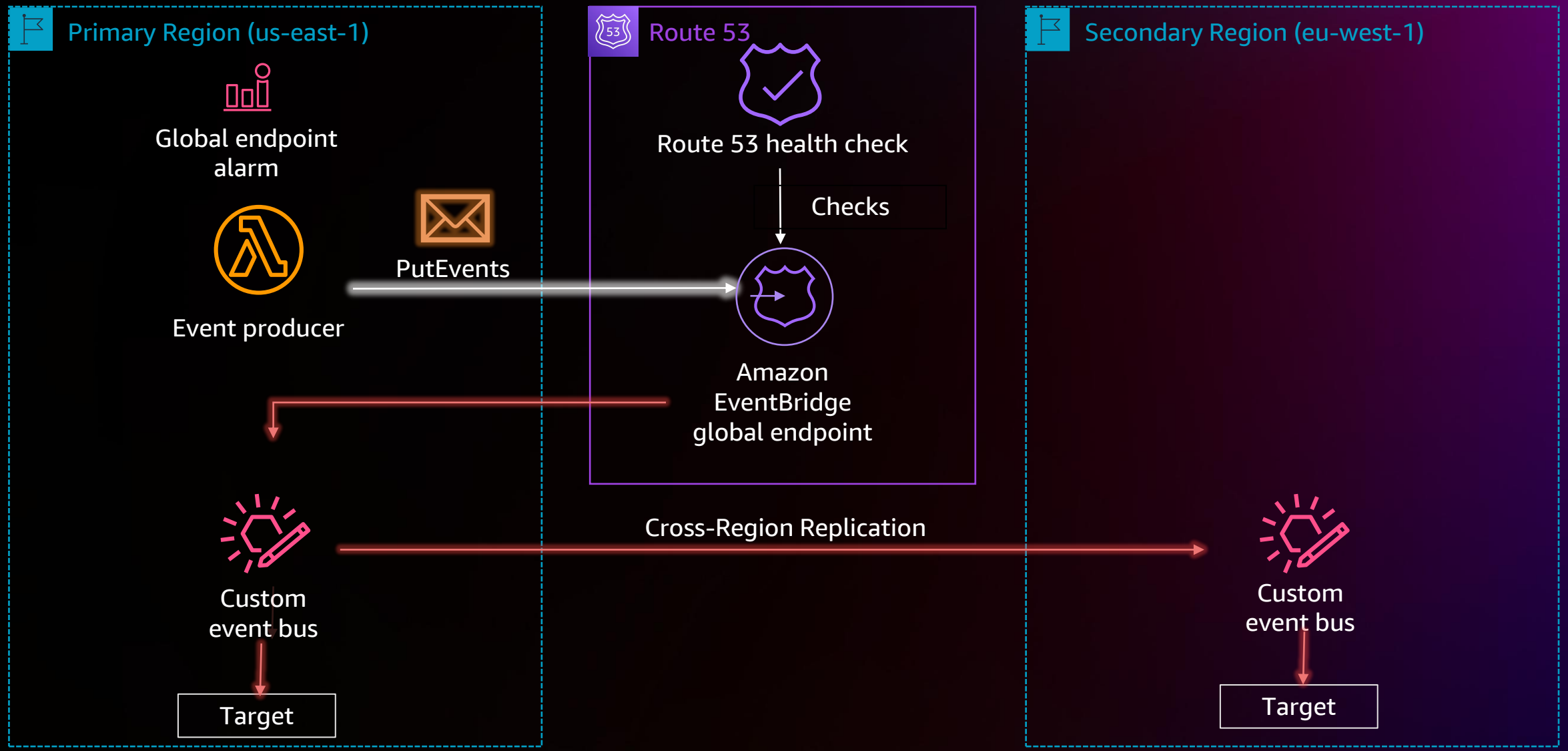
```
const healthCheck = new CfnHealthCheck(this, 'HealthCheck', {
  healthCheckConfig: {
    type: 'CLOUDWATCH_METRIC',
    alarmIdentifier: {
      name: alarm.alarmName,
      region: region,
    },
    insufficientDataHealthStatus: 'Unhealthy',
  },
});
```

Makes the check fail for the first minutes

aws

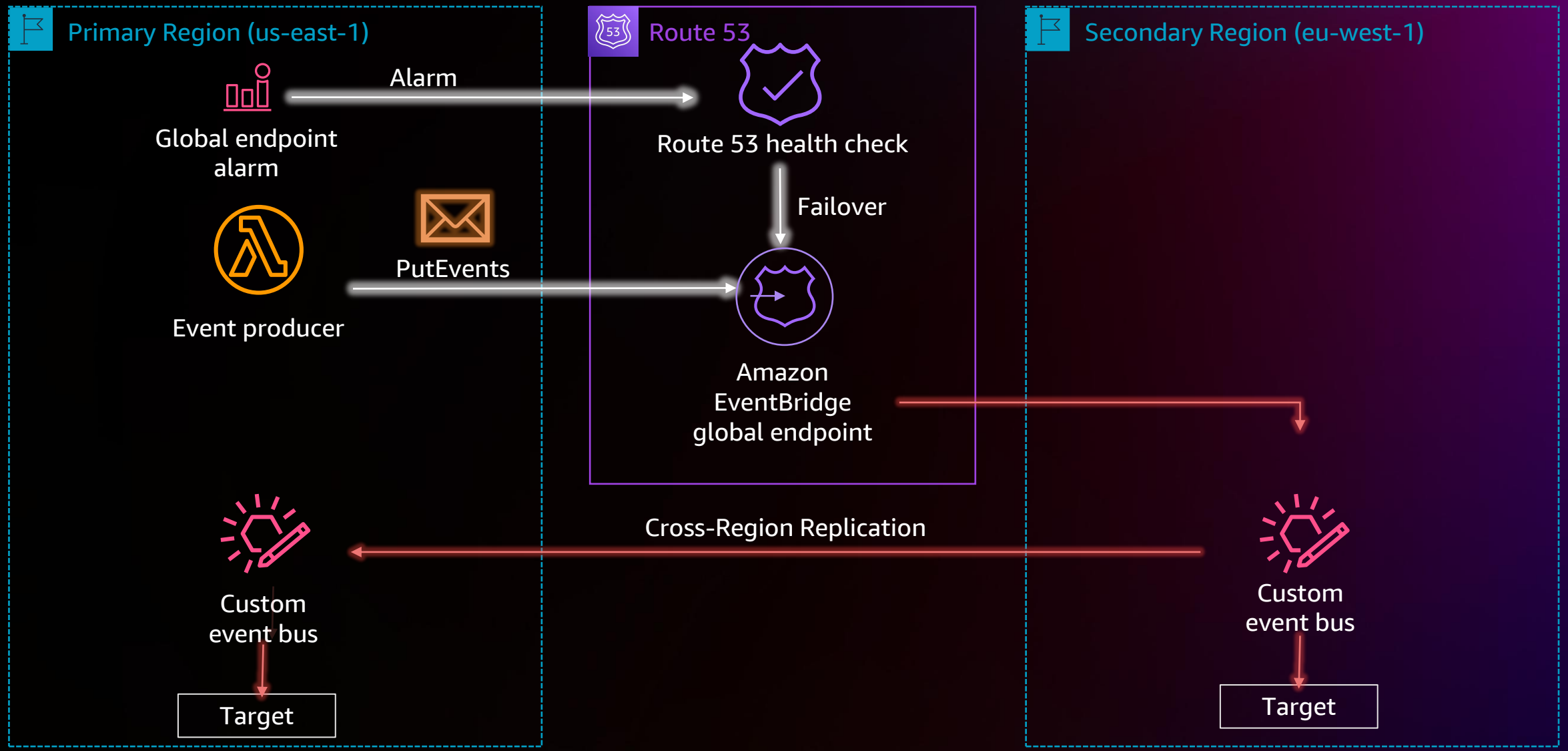
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

How it works?



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

How it works?



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

CloudWatch > Logs Insights

Logs Insights

Select log groups, and then run a query or choose a sample query.

5m 30m **1h** 3h 12h Custom

Select log group(s)

TestingStackSecondary-cloudwatchlog7BFFDA07-mtdJjLJdGe51

```
1  fields region, detail.eventId, time
2  | sort detail.eventId desc
```

Run query | Cancel | Save | History

Queries are allowed to run for up to 15 minutes.

Logs | Visualization | Export results | Add to dashboard

Showing 2 of 2 records matched | Hide histogram

2 records (708 B) scanned in 2.5s @ 0 records/s (286.524 B/s)



#	region	detail.…	time
▶ 1	eu-west-1	7	2022-10-10T14:01:34Z
▶ 2	eu-west-1	1	2022-10-10T14:01:27Z

Secondary Region - Ireland

CloudWatch > Logs Insights

Logs Insights

Select log groups, and then run a query or choose a sample query.

5m 30m **1h** 3h 12h Custom

Select log group(s)

TestingStackMain-cloudwatchlog7BFFDA07-aamMKlFpe1C1

```
1  fields region, detail.eventId, time
2  | sort detail.eventId desc
```

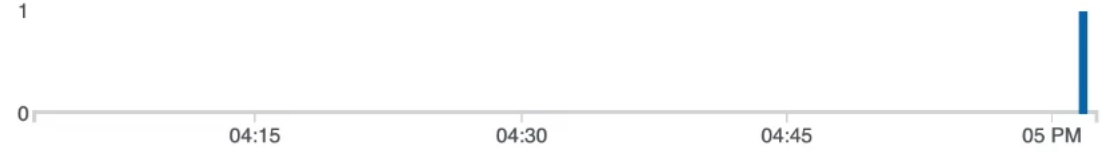
Run query | Cancel | Save | History

Queries are allowed to run for up to 15 minutes.

Logs | Visualization | Export results | Add to dashboard

Showing 9 of 9 records matched | Hide histogram

9 records (3.1 kB) scanned in 2.6s @ 3 records/s (1.2 kB/s)



#	region	detail.…	time
▶ 1	eu-west-1	39	2022-10-10T14:02:10Z
▶ 2	eu-west-1	29	2022-10-10T14:01:59Z
▶ 3	eu-west-1	27	2022-10-10T14:01:57Z
▶ 4	eu-west-1	15	2022-10-10T14:01:43Z
▶ 5	eu-west-1	10	2022-10-10T14:01:38Z
▶ 6	eu-west-1	7	2022-10-10T14:01:35Z

Primary Region - Virginia

CloudWatch > Logs Insights

Logs Insights

Select log groups, and then run a query or choose a sample query.

5m 30m 1h 3h 12h Custom

Select log group(s)

TestingStackSecondary-cloudwatchlog7BFFDA07-mtdJjLJdGe51

```
1  fields region, detail.eventId, time
2  | sort detail.eventId desc
```

Run query | Cancel | Save | History

Queries are allowed to run for up to 15 minutes.

Logs | Visualization | Export results | Add to dashboard

Showing 173 of 173 records matched | Hide histogram

173 records (60.0 kB) scanned in 3.0s @ 58 records/s (20.3 kB/s)



#	region	detail.…	time
1	us-east-1	148	2022-10-10T14:04:10Z
2	us-east-1	146	2022-10-10T14:04:08Z
3	us-east-1	144	2022-10-10T14:04:06Z
4	us-east-1	143	2022-10-10T14:04:04Z
5	us-east-1	142	2022-10-10T14:04:03Z
6	us-east-1	141	2022-10-10T14:04:03Z

Secondary Region - Ireland

Create health check | Delete health check | Edit health check

Filter by keyword

1 to 1 of 1 health

	Name	Status	Description
☐	LatencyFailuresHealthCheck	an hour ago — now: Unhealthy	CloudWatch alarm: BoilerPl

Info | Monitoring | Alarms | Tags | Health checkers | Latency

No health check selected.

No health check selected.

Primary Region - Virginia

CloudWatch > Logs Insights

Logs Insights

Select log groups, and then run a query or choose a sample query.

5m 30m 1h 3h 12h Custom

Select log group(s)

TestingStackSecondary-cloudwatchlog7BFFDA07-mtdJjLJdGe51

```
1  fields region, detail.eventId, time
2  | sort detail.eventId desc
```

Run query | Cancel | Save | History

Queries are allowed to run for up to 15 minutes.

Logs | Visualization | Export results | Add to dashboard

Showing 290 of 290 records matched | Hide histogram

290 records (100.6 kB) scanned in 2.5s @ 117 records/s (40.6 kB/s)



#	region	detail.…	time
1	us-east-1	180	2022-10-10T14:04:43Z
2	us-east-1	178	2022-10-10T14:04:42Z
3	us-east-1	176	2022-10-10T14:04:39Z
4	us-east-1	175	2022-10-10T14:04:38Z
5	us-east-1	174	2022-10-10T14:04:37Z
6	us-east-1	173	2022-10-10T14:04:36Z

Secondary Region - Ireland

Create health check | Delete health check | Edit health check

Filter by keyword

1 to 1 of 1 health

Name	Status	Description
LatencyFailuresHealthCheck	an hour ago — now Healthy	CloudWatch alarm: BoilerPl

Info | Monitoring | Alarms | Tags | Health checkers | Latency

Click on a graph to see an expanded view. View metrics in CloudWatch

Health checks LatencyFailuresHealthCheck

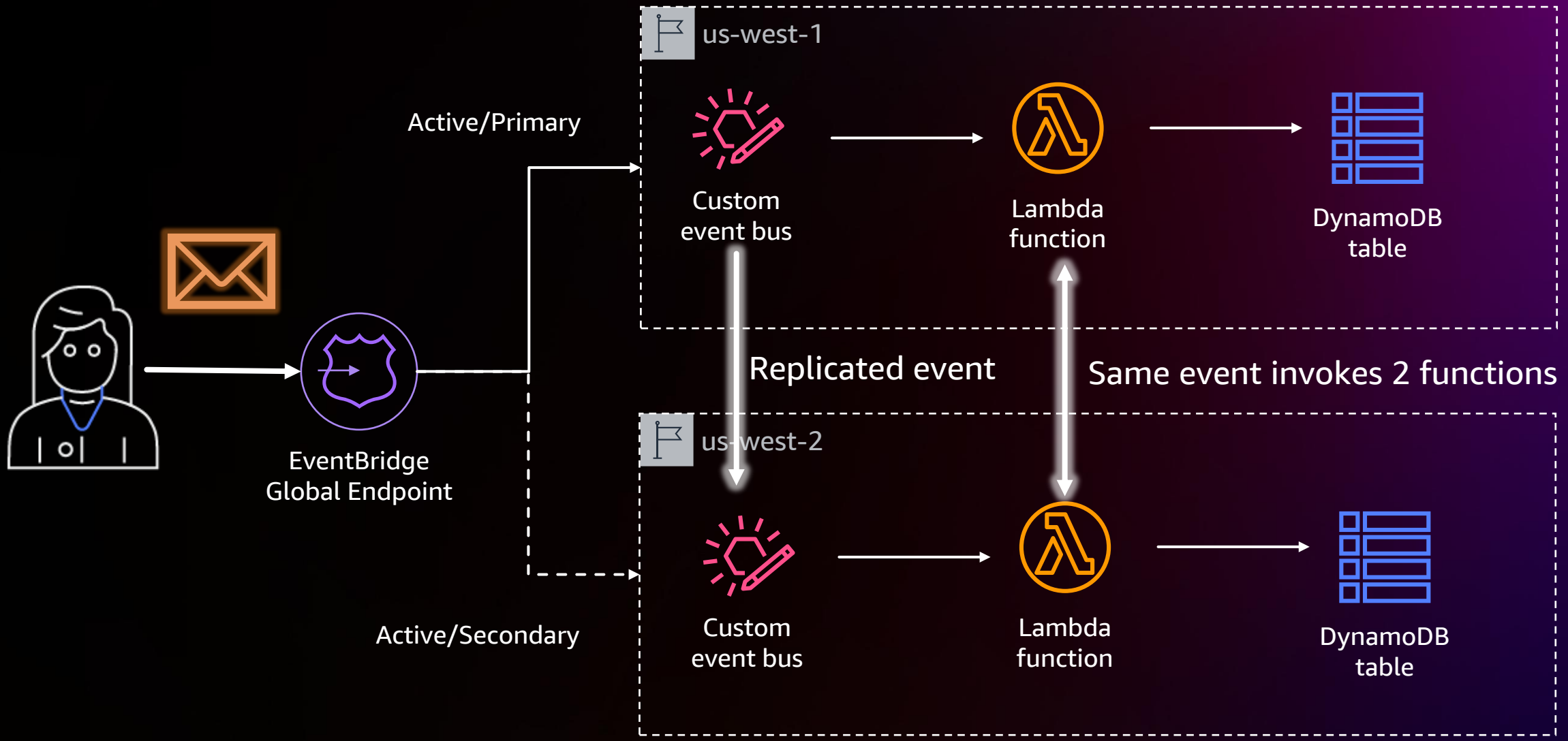
Time range Last hour | Refresh



To view latency graphs, select a health check that has a latency graphs enabled.

Primary Region - Virginia

Challenges of an active/active setup



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

```
data $aws events put-events --entries file://put-event.json --endpoint-id "y4bjda1urg.veo"
```

How to fix it

Create rules that, when the event comes from one Region, only invokes functions in that region

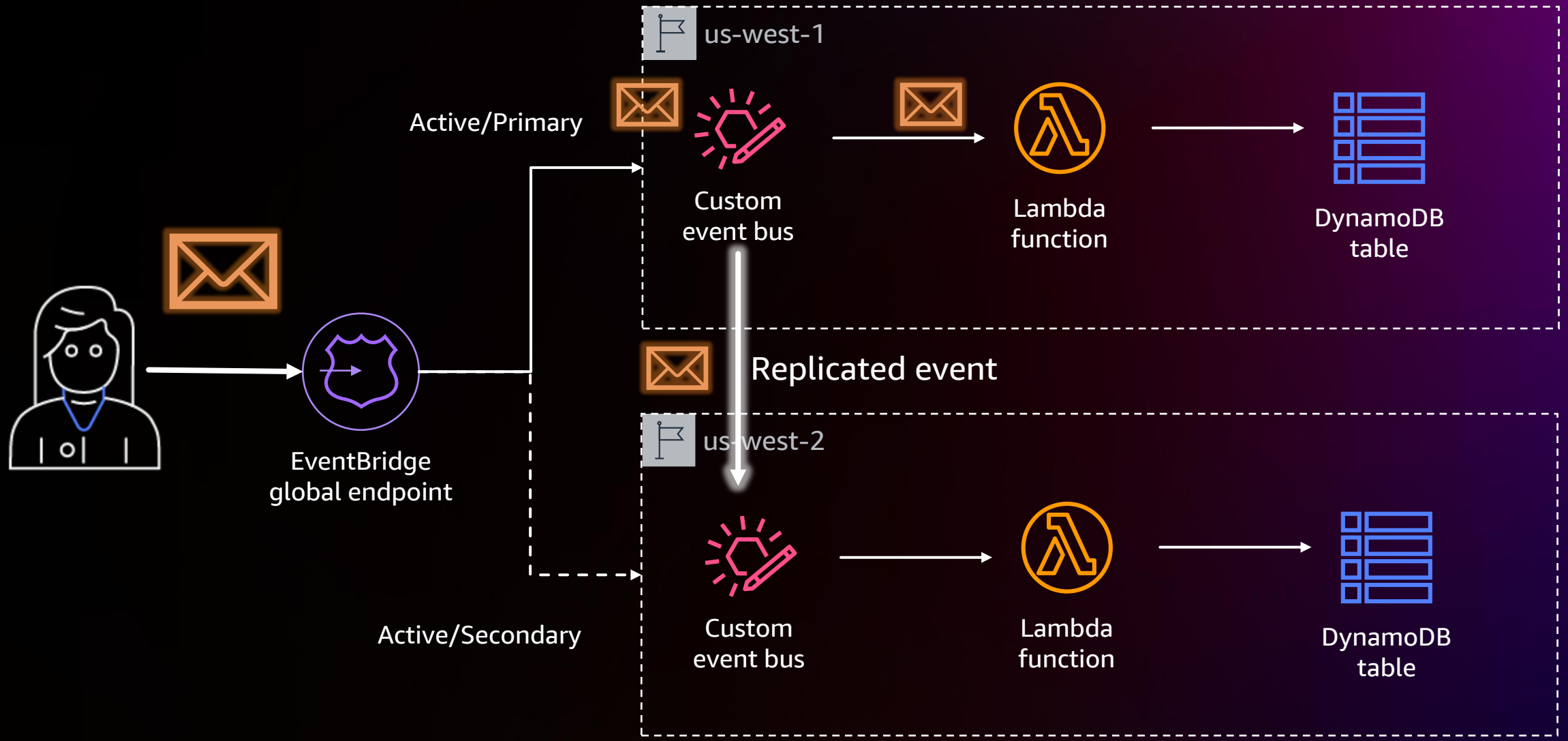
```
const InventoryEventRule = new Rule(scope, 'InventoryEventRule', {
  eventBus: props.appEventBus,
  eventPattern: {
   region: [props.region],
    detailType: [
      'OrderCreated’,
      'OrderCanceled’,
      'ItemReserved’,
      'PaymentMade’,
      'PaymentFailed’,
   ],
  },
});
```

Only events created in that Region can invoke the functions in that Region

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

```
data $aws events put-events --entries file://put-event.json --endpoint-id "y4bjda1urg.veo"
```

Challenges of an active/active setup



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

Dashboard
Hosted zones
Health checks

IP-based routing
CIDR collections

Traffic flow
Traffic policies
Policy records

Domains
Registered domains
Pending requests

Resolver
VPCs
Inbound endpoints
Outbound endpoints
Rules
Query logging

DNS Firewall
Rule groups
Domain lists

Create health check | Delete health check | Edit health check

Filter by keyword

1 to 1 of 1 health check

Name	Status	Description	Alarms	ID
LatencyFailuresHealthCheck	a day ago — 3 minutes ago Healthy	CloudWatch alarm: BoilerPlateStack-Hig…	No alarms configured.	8a398a0d-c91b-4239-8d3e-f

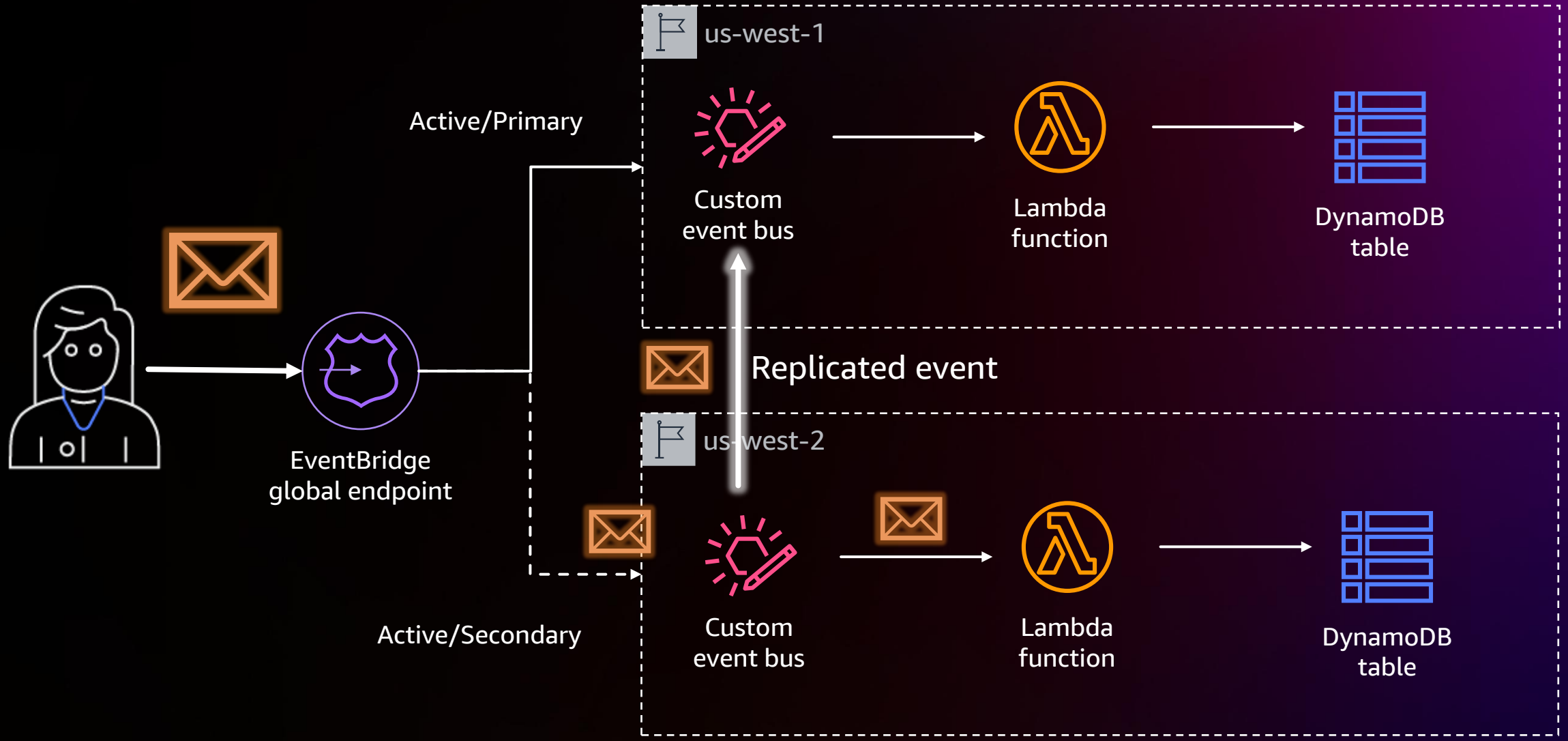
Info | Monitoring | Alarms | Tags | Health checkers | Latency

No health check selected.

No health check selected.

© 2022, Amazon Web Services, Inc. or its affiliates.

Challenges of an active/active setup



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

Secrets

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

Secret data

- Application secrets and parameters
- User data

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

Application secrets and configurations

AWS Secrets Manager and AWS KMS support for multi-Region

Learn more about replicating secrets: https://s12d.com/Uk-AKsi9

Learn more about multi-Region keys: https://s12d.com/OKzY_Qxn



More about creating a multi-Region app: https://s12d.com/dPvHhi7q

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

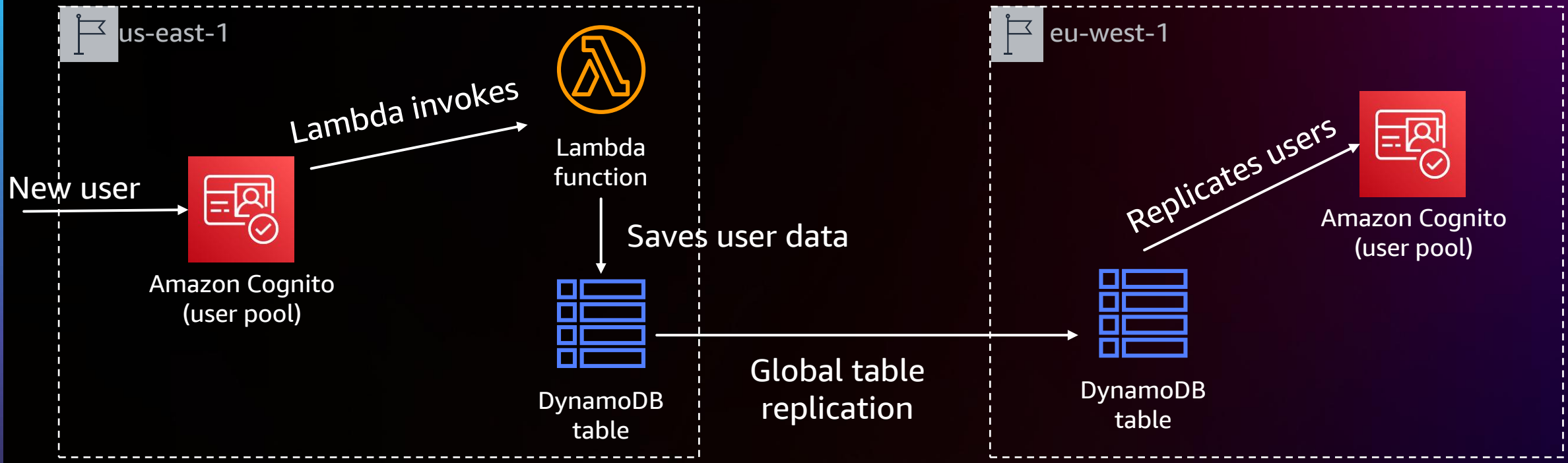
User data

- Amazon Cognito user pool doesn’t support multi-Region replication
- However, you can replicate everything but user passwords in a secondary Region for failover

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

User data

- Amazon Cognito user pool doesn’t support multi-Region replication
- However, you can replicate everything but user passwords in a secondary Region for failover



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

Example: https://s12d.com/Hr4rvqj5

User data

Third-party services

Learn more about how Auth0 does multi-Region: https://s12d.com/NfMz_IPl

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

Routing

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

Amazon Route 53

- DNS service
- Cost effective
- Secure
- Highly available
- Region independent
- AWS has an SLA in place for 100% availability of Route 53
- Health checks



aws

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

Traffic routing with Route 53

LATENCY-BASED ROUTING



* Latency numbers are only examples

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

Traffic routing with Route 53

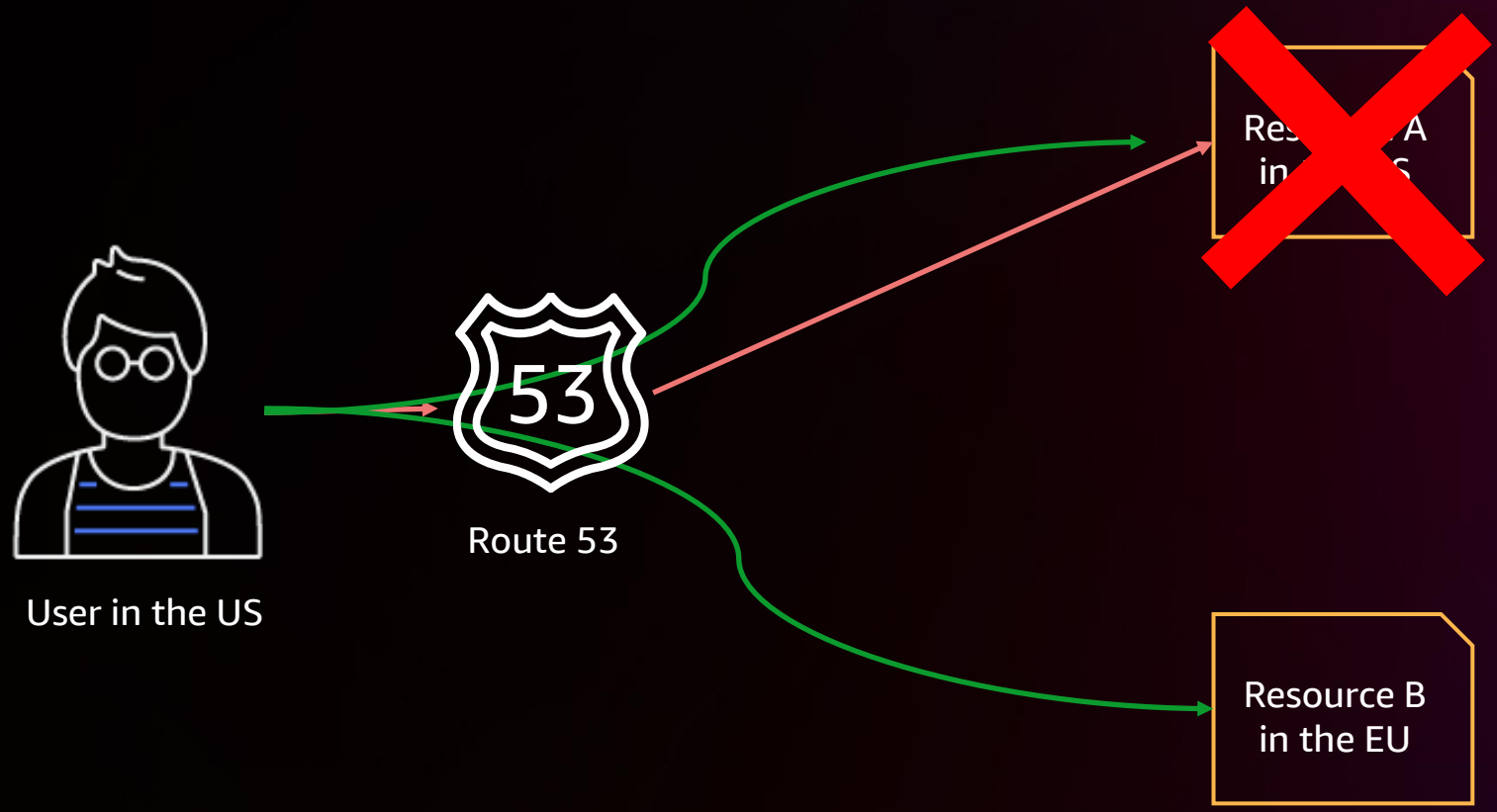
GEOLOCATION ROUTING



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

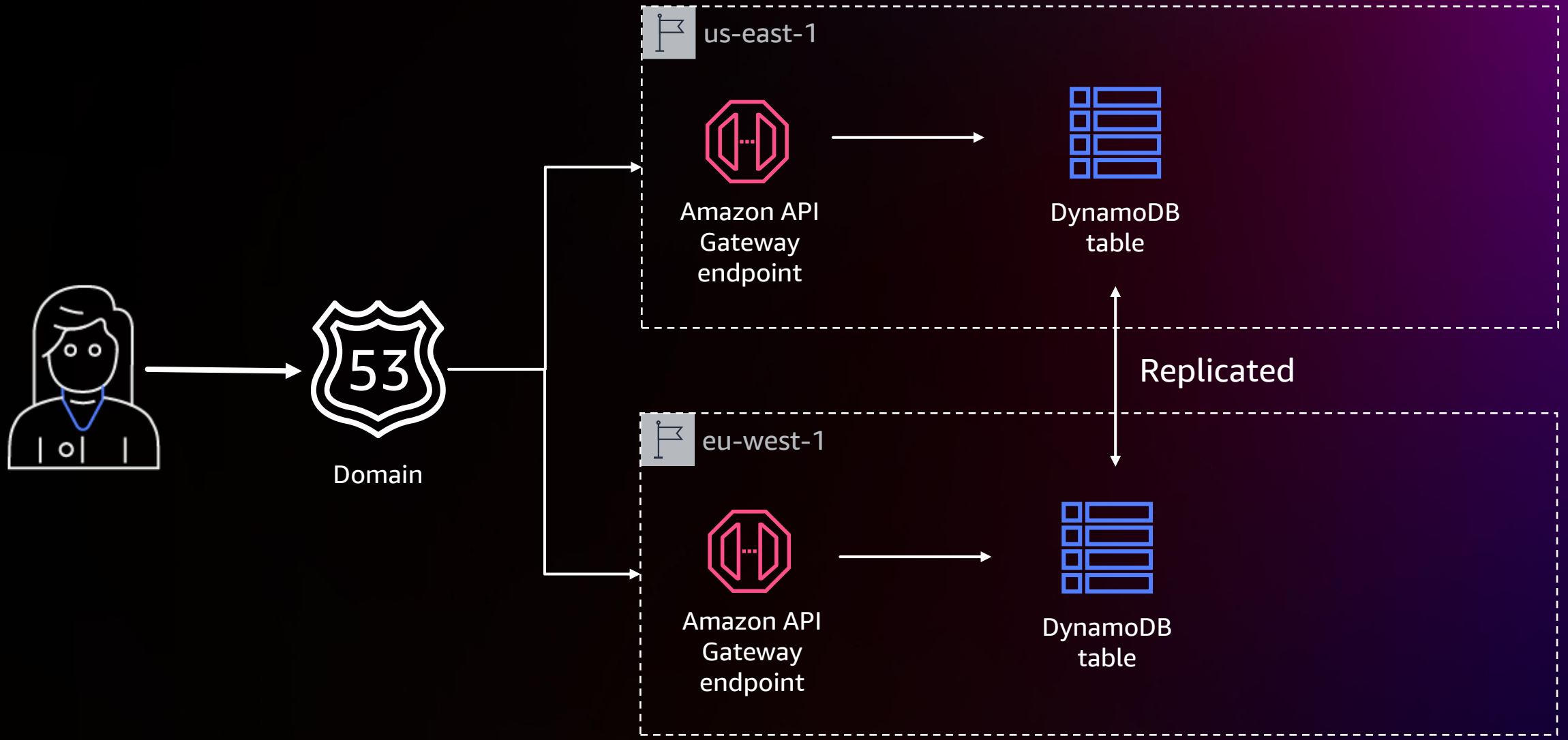
Traffic routing with Route 53

DNS FAILOVER



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

App that routes users based on latency



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

Public foobarcodes.cloud Info

Delete zone | Test record | Configure query logging

Hosted zone details

Edit hosted zone

Records (5) | DNSSEC signing | Hosted zone tags (0)

Records (5) Info

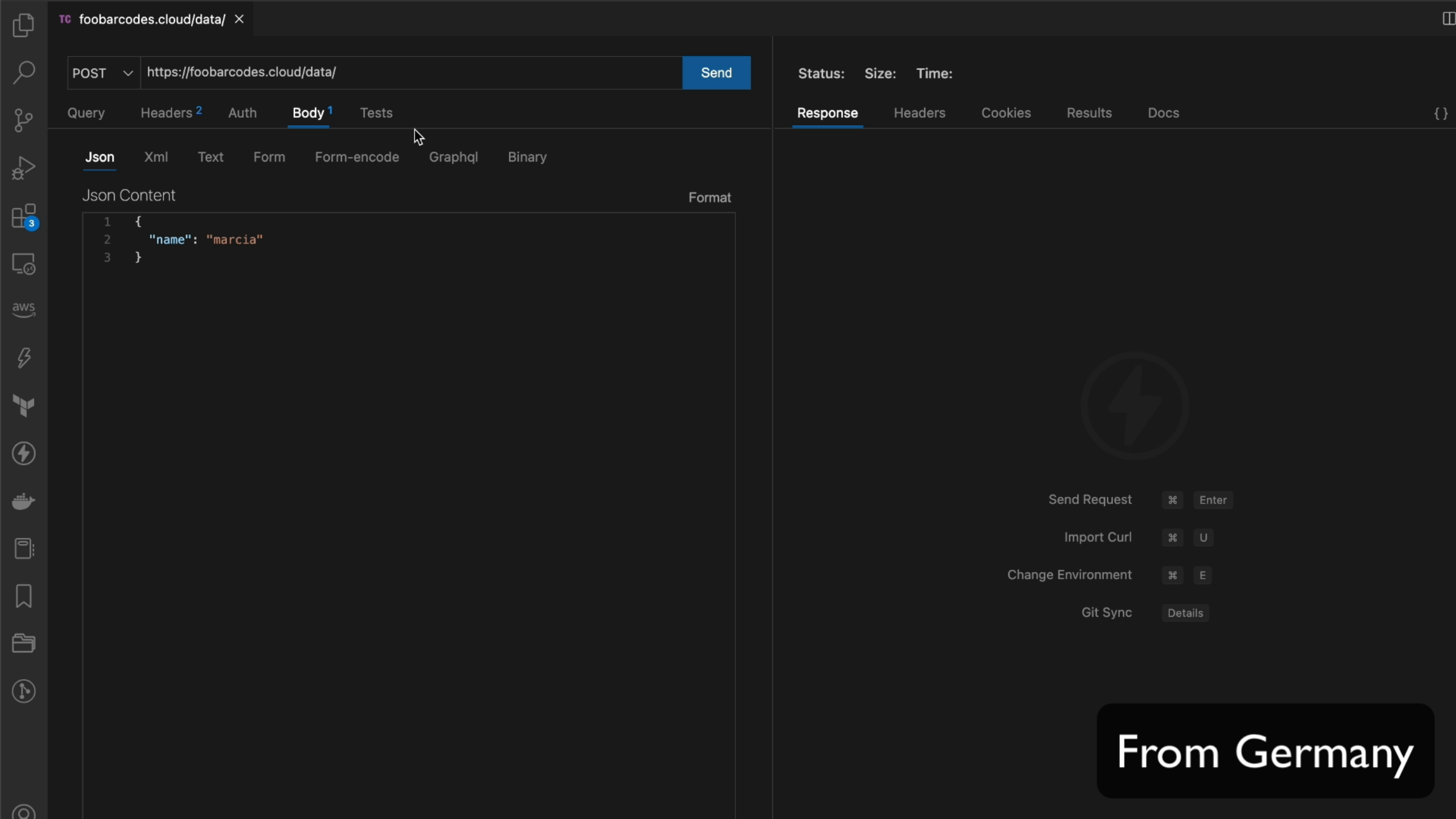
Automatic mode is the current search behavior optimized for best filter results. To change modes go to settings.

Delete record | Import zone file | Create record

Filter records by property or value | Type | Routing policy | Alias | 1

Record name	Type	Routin...	Differ...	Value/Route traffic to
foobarcodes.cloud	A	Latency	Europe (...	d-vwhemwz4s8.execute-api.eu-west-1.amazonaws.com.
foobarcodes.cloud	A	Latency	US East ...	d-865461qwfa.execute-api.us-east-1.amazonaws.com.

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


foobarcodes.cloud/data/
POST
https://foobarcodes.cloud/data/
Send
Status:
Size:
Time:
Query
Headers 2
Auth
Body 1
Tests
Response
Headers
Cookies
Results
Docs
Json
Xml
Text
Form
Form-encode
Graphql
Binary
Json Content
Format
{
"name": "marcia"
}
Send Request ⌘ Enter
Import Curl ⌘ U
Change Environment ⌘ E
Git Sync Details
From Germany

POST https://foobarcodes.cloud/data/ Send

Query Headers 2 Auth Body 1 Tests

Json Xml Text Form Form-encode Graphql Binary

Json Content Format

```
{
  "name": "marcia"
}
```

Status: 200 OK Size: 52 Bytes Time: 569 ms

Response Headers 7 Cookies Results Docs { }

```
{
  "requestId": "4644df7b-7ea2-4579-a25a-0768d299936f"
}
```

From US

How do I manage a multi-Region active/active environment?

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

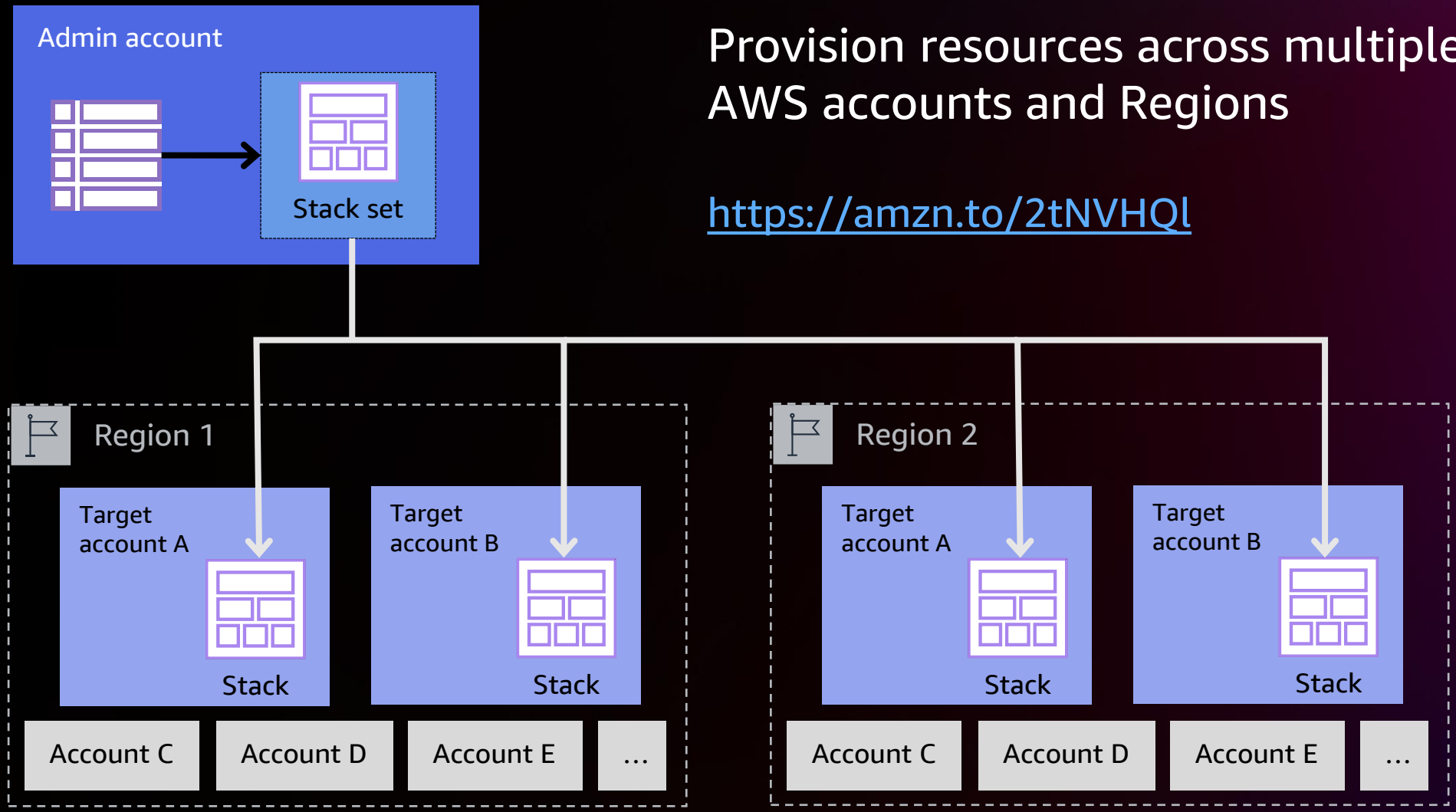
Deployments

- **Infrastructure as code** is a **must**
- Create **agnostic** templates
- Automate **everything**

- Pick a **Region** to do your deployments
- Deploy **one** Region at a time
- Deployment **windows**
- **Immutable** deployments

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

AWS CloudFormation StackSets



Provision resources across multiple AWS accounts and Regions

https://amzn.to/2tNVHQl

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

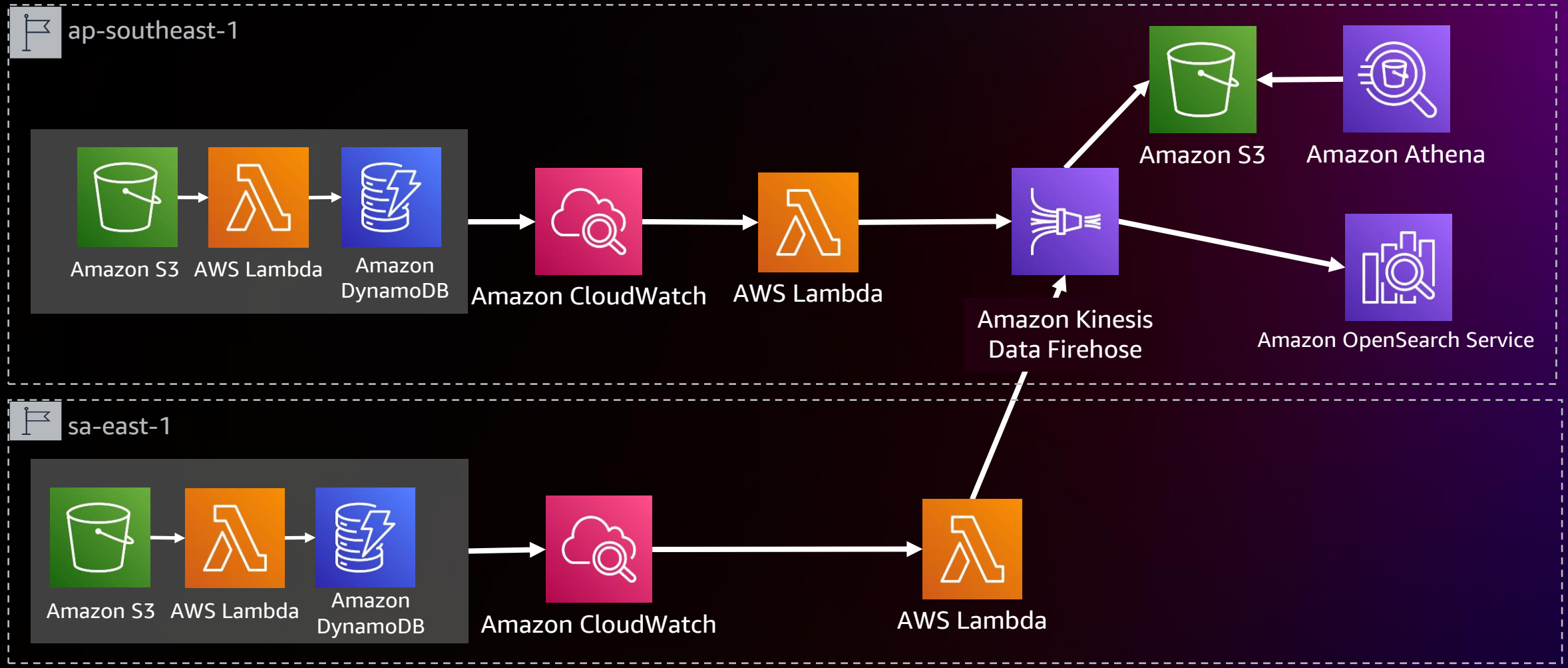
AWS Config rules

- Multi-account, multi-Region data **aggregation**
- Integrates with AWS Organizations
- Evaluates configuration over time against policies defined using AWS Config rules
- Alerts if configuration is noncompliant with your policies



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

Centralize Amazon CloudWatch Logs



https://amzn.to/2kcMew1

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

Testing failure modes

- Test regularly
- Automate testing
- Test it creatively
- Test health checks, networking failures, data corruption, dependencies, etc.
- Game days
- AWS Fault Injection Simulator (AWS FIS)

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

Takeaways

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

Takeaways

- Multi-Region active/active architectures add **significant complexity** to your stack – think carefully about your services and whether they need to be multi-Region at all
- Consider whether less complex multi-Region architectures, such as **multi-Region backup**, can meet your needs
- Design to **avoid race conditions** by using read local/write global or partitioned write

aws

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

Takeaways

- Use storage tools to **keep data synchronized**, including S3 Cross-Region Replication (CRR)
- Keeping data consistent across Regions is challenging; use **DynamoDB global tables** or **read replicas** with Amazon RDS and Amazon Aurora
- Synchronization of events is crucial; use **EventBridge global endpoints** to keep everything in sync

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

Takeaways

- Route 53 can perform failover checks, and **most operations can be automated** – but the service still needs to be monitored; create relevant metrics and set alarms on them
- Think about your **deployment strategies** for multi-Region
- Plan to manage the environment! Use **AWS CloudFormation StackSets, AWS Config rules**, and other DevOps tools
- If you don't **test**, it won't work in a crisis; **test a lot**

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

All the demos and links

https://s12d.com/geda



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

New Blogs Videos Learn Events Patterns About Search Search

Welcome to **Serverless** Land

This site brings together all the latest blogs, videos, and training for AWS Serverless. Learn to use and build apps that scale automatically on low-cost, fully-managed serverless architecture.

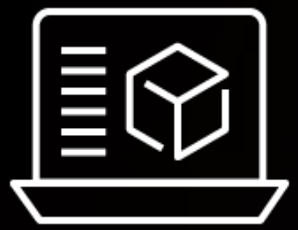
Learn More



For more serverless learning resources, visit https://serverlessland.com

Continue your AWS Serverless learning

Learn at your own pace



Expand your serverless skills with our learning plan on **AWS Skill Builder**

Increase your knowledge



Use our **Ramp-Up Guides** to build your serverless knowledge

Earn AWS Serverless badges



Demonstrate your knowledge by achieving **digital badges**

https://s12d.com/serverless-learning

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

Thank you!

Marcia Villalba
@mavi888uy



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

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