

AWS re:Invent

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

Advanced multi-AZ resilience patterns: Mitigating gray failures

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AWS

Agenda

- Introduction to gray failures
- Detecting gray failures
- Mitigating AZ gray failures
- Hands-on

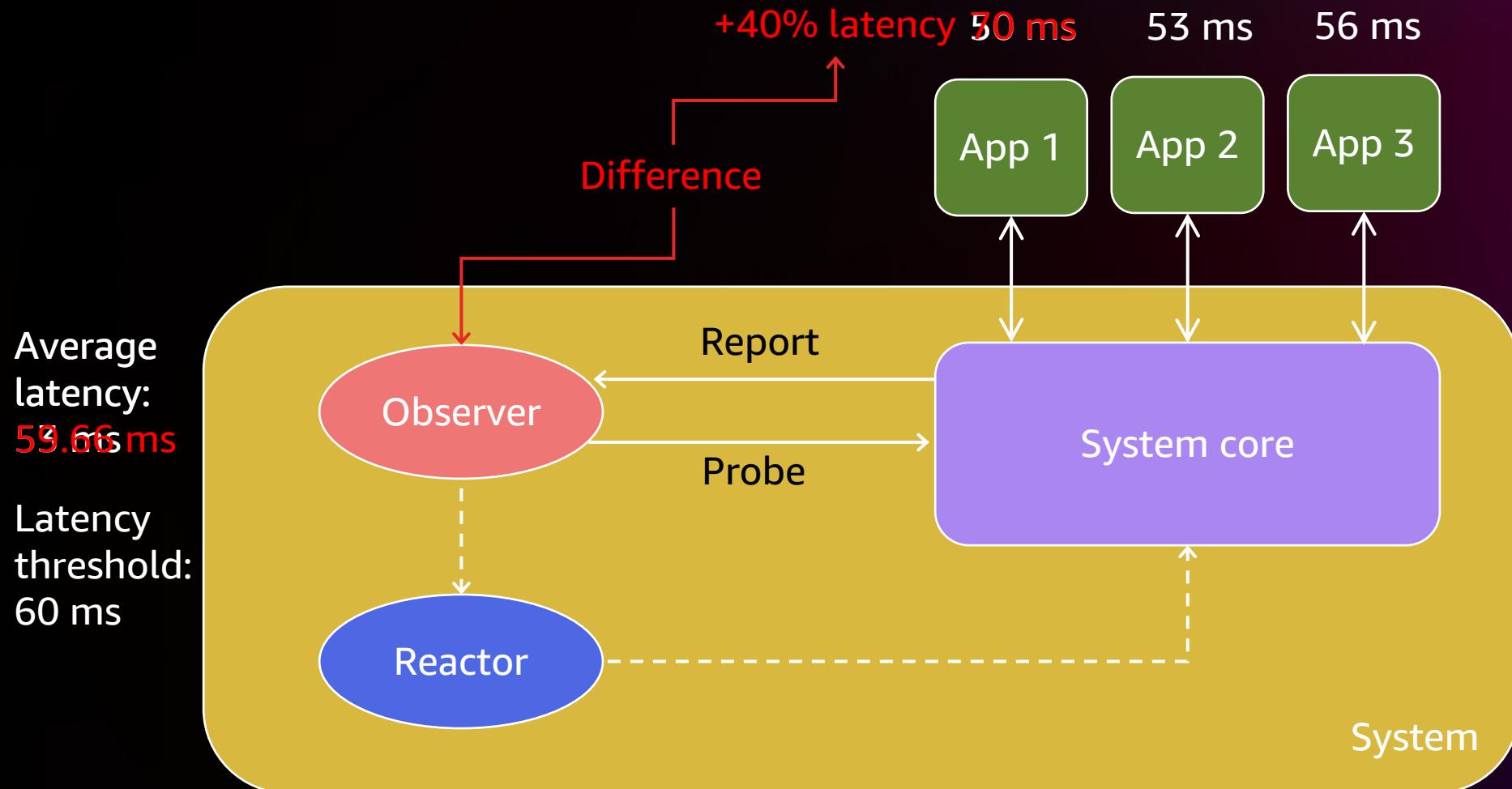
Introduction to gray failures



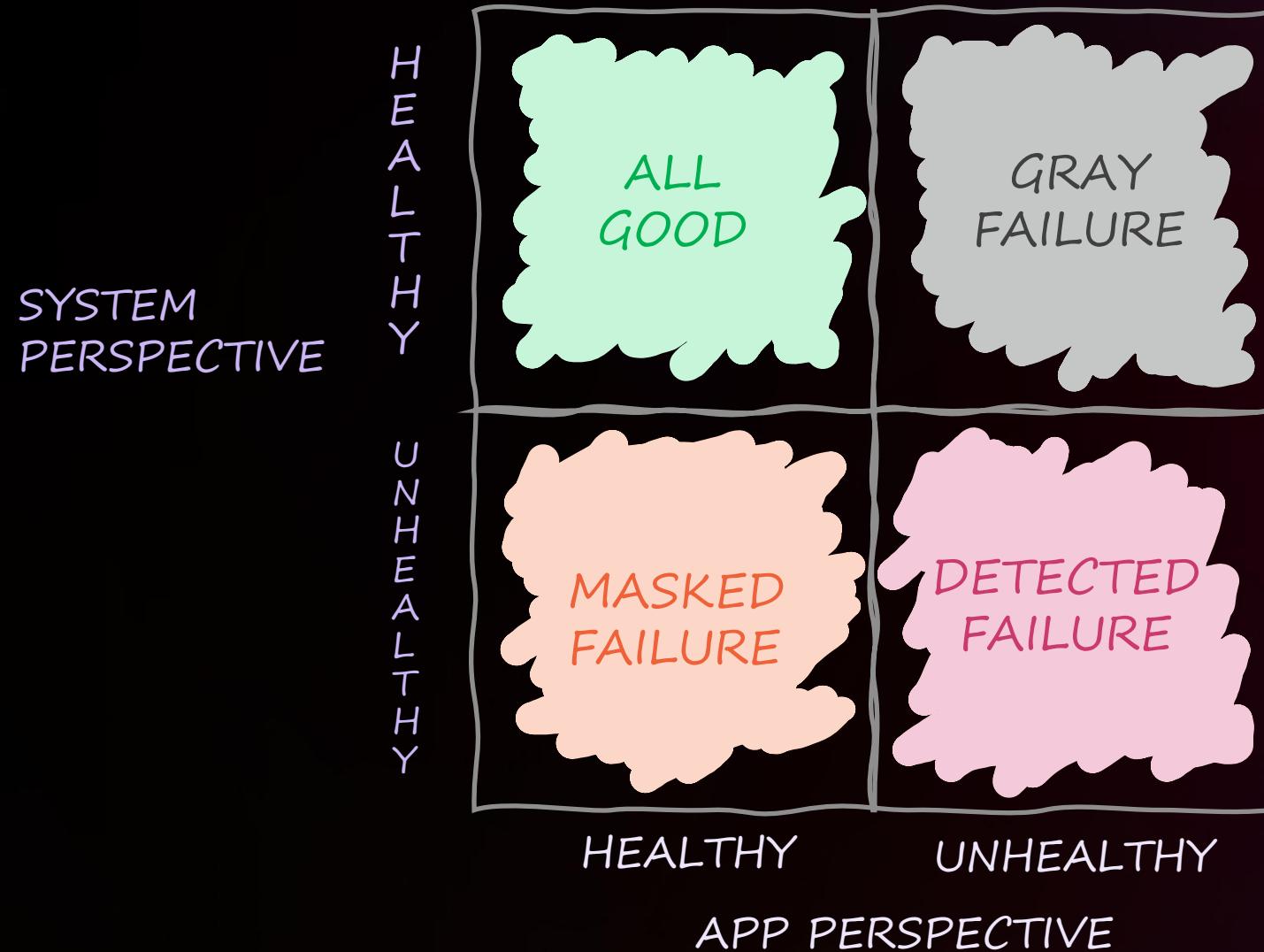
Differential observability

- 1 Observed differently from different perspectives
- 2 One system may not see impact at all or may not cross a threshold
- 3 Other systems may be disproportionately impacted
- 4 Can't rely on underlying systems to detect and mitigate the failure

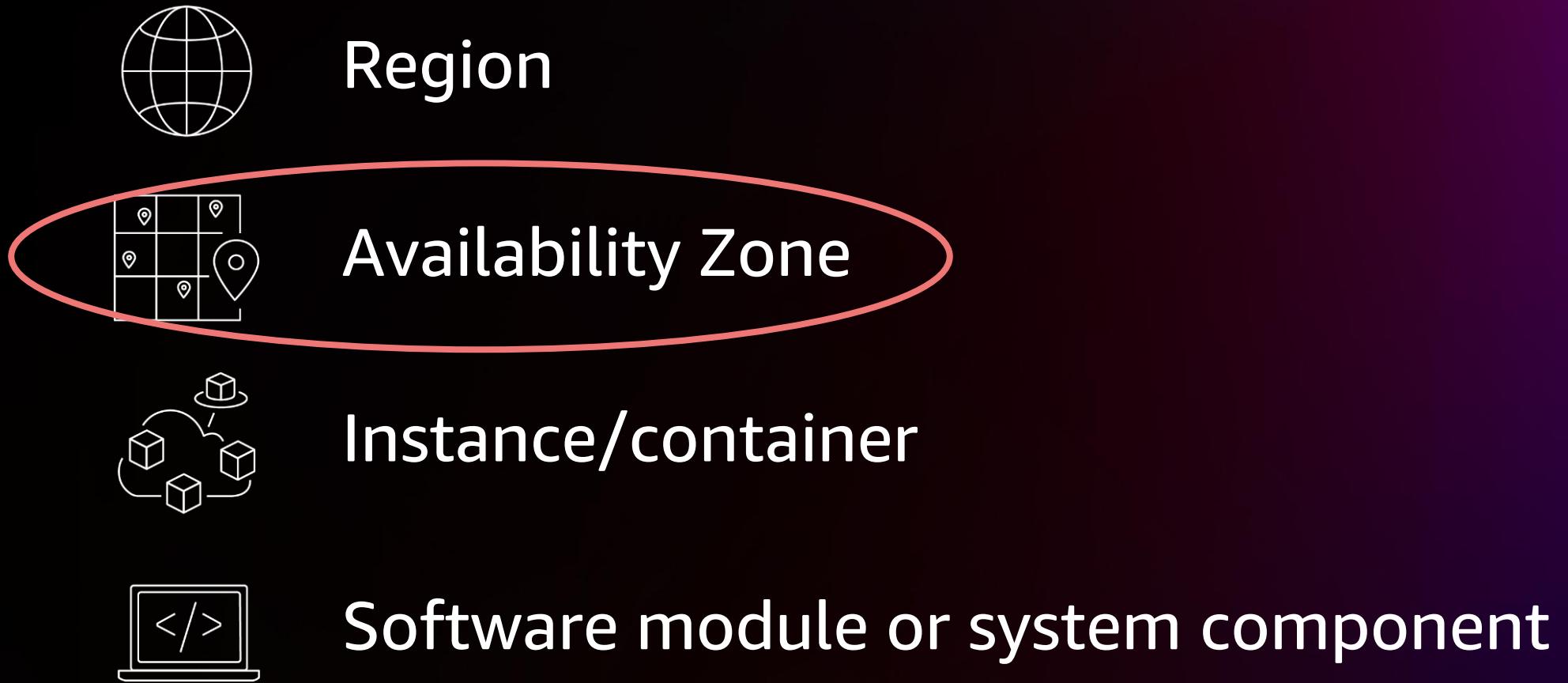
Abstract model



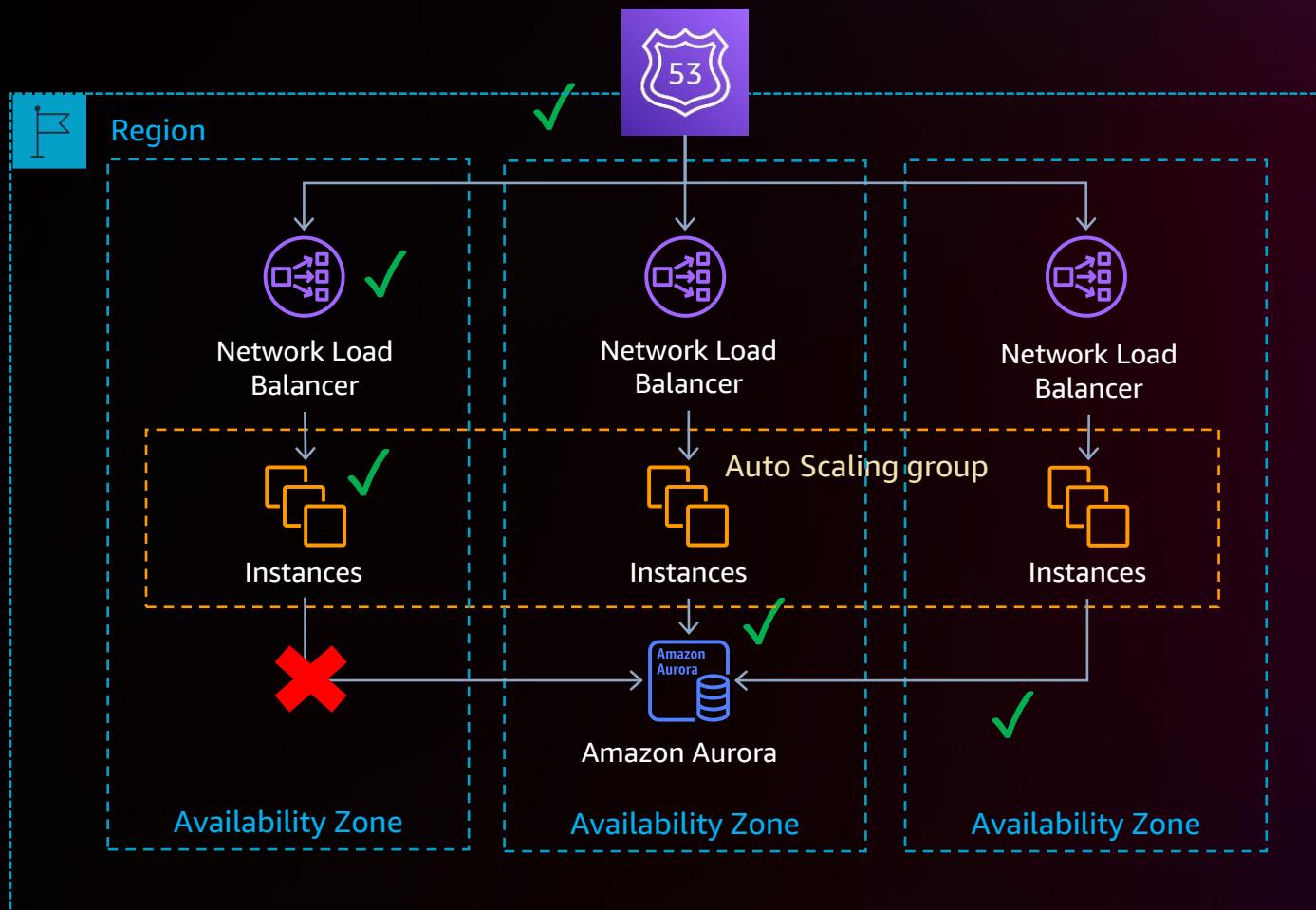
System versus customer perspective



Fault isolation boundaries



Gray failure example



Detecting an AZ gray failure



Detection tools

Amazon CloudWatch Contributor Insights

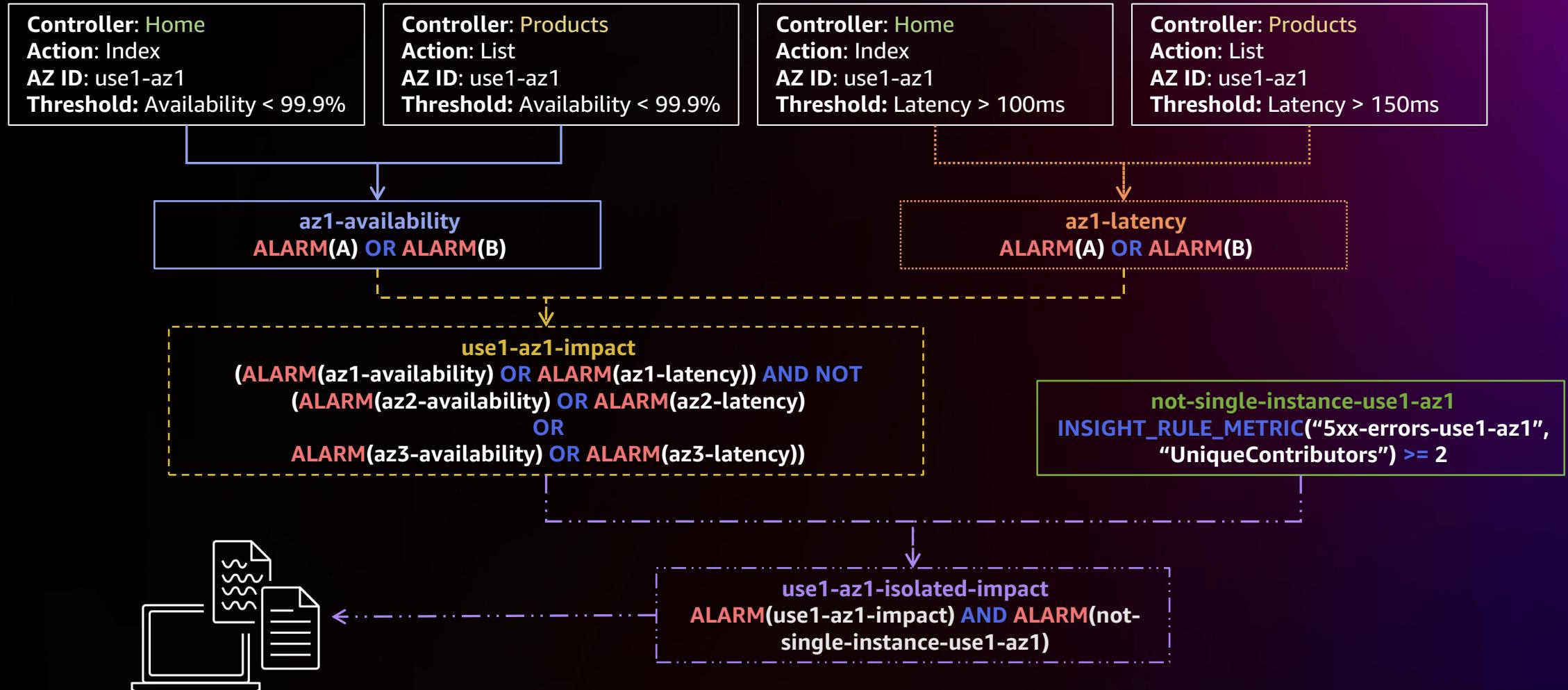
- Visualize metrics from the top-N contributors and see the total number of unique contributors
- Can find top talkers, bad hosts, heaviest network users, or resources with the most errors
- Can be used with CloudWatch metric math
- Compare logs against rules you define

CloudWatch composite alarms

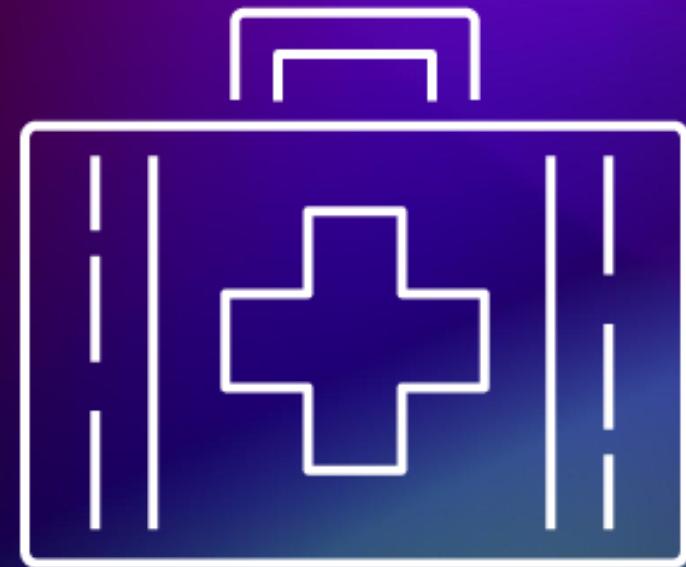
- Monitor the state of other alarms
- Can also monitor other composite alarms
- Simple logic alarm expressions, AND, OR, NOT

```
(  
  ALARM("CPUUtilizationTooHigh")  
  OR  
  ALARM("DiskReadOpsTooHigh")  
)  
AND OK("NetworkOutTooHigh")
```

Detecting a gray failure impacting a single AZ



Mitigating AZ gray failures



When a gray failure happens

1. You can wait out the impairment

2. If the impairment just affects a single AZ,
evacuate the AZ

3. If you have a multi-Region DR plan,
failover to another Region

Control planes and data planes

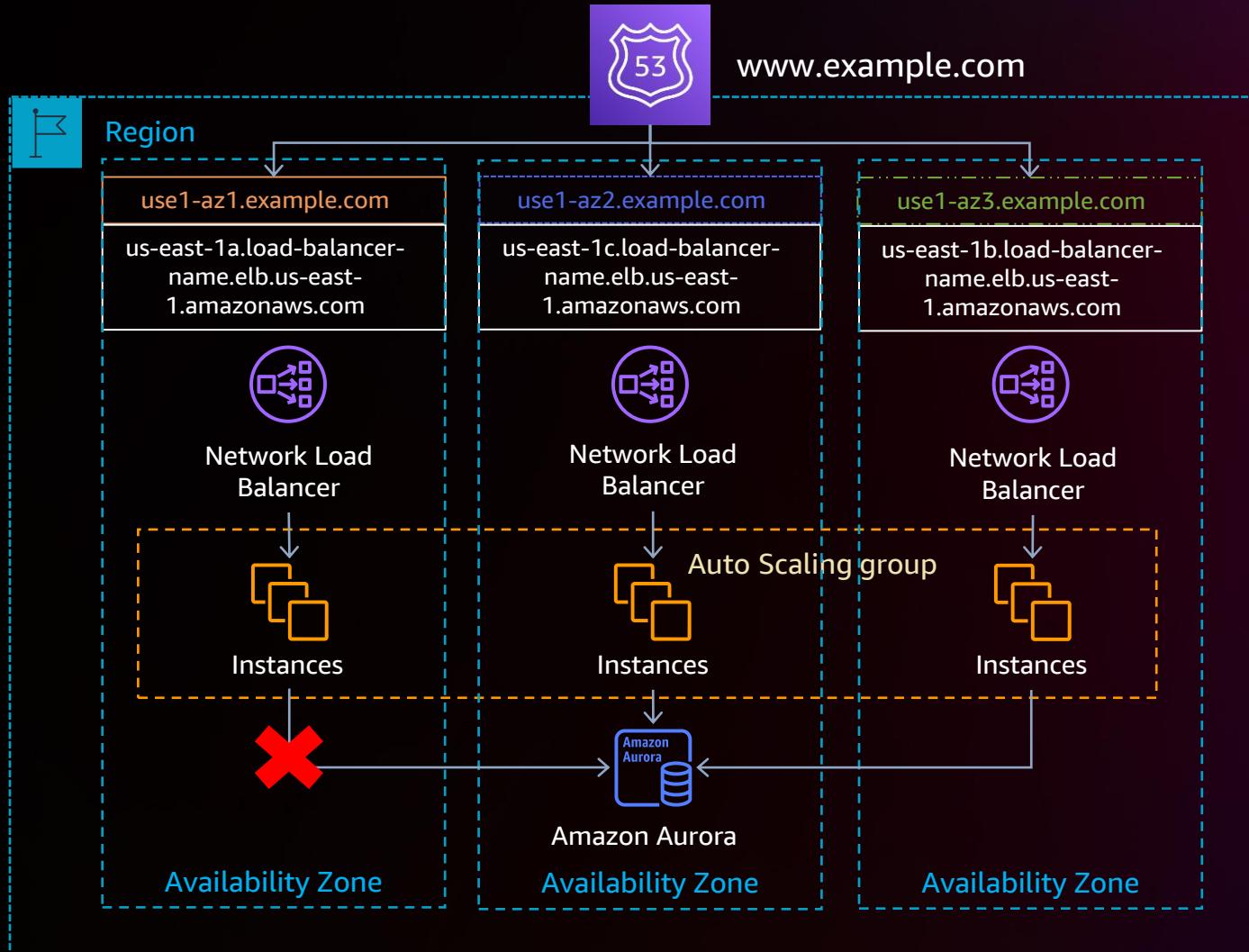
Control plane

- Create, read/describe, update, delete, list resources (CRUDL)
- Complex
- Lower volume

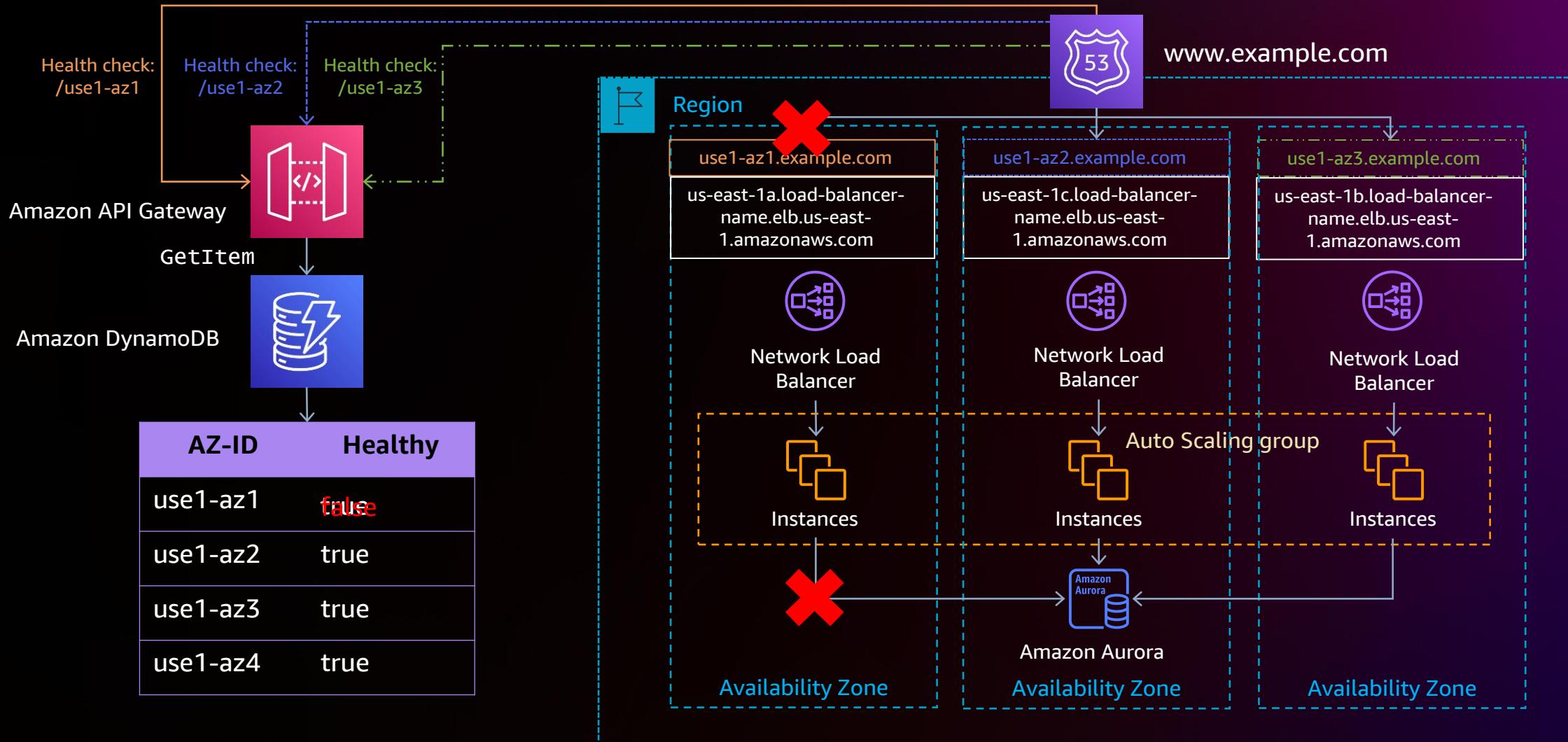
Data plane

- The day-to-day business of the resource
- Simpler
- Higher volume

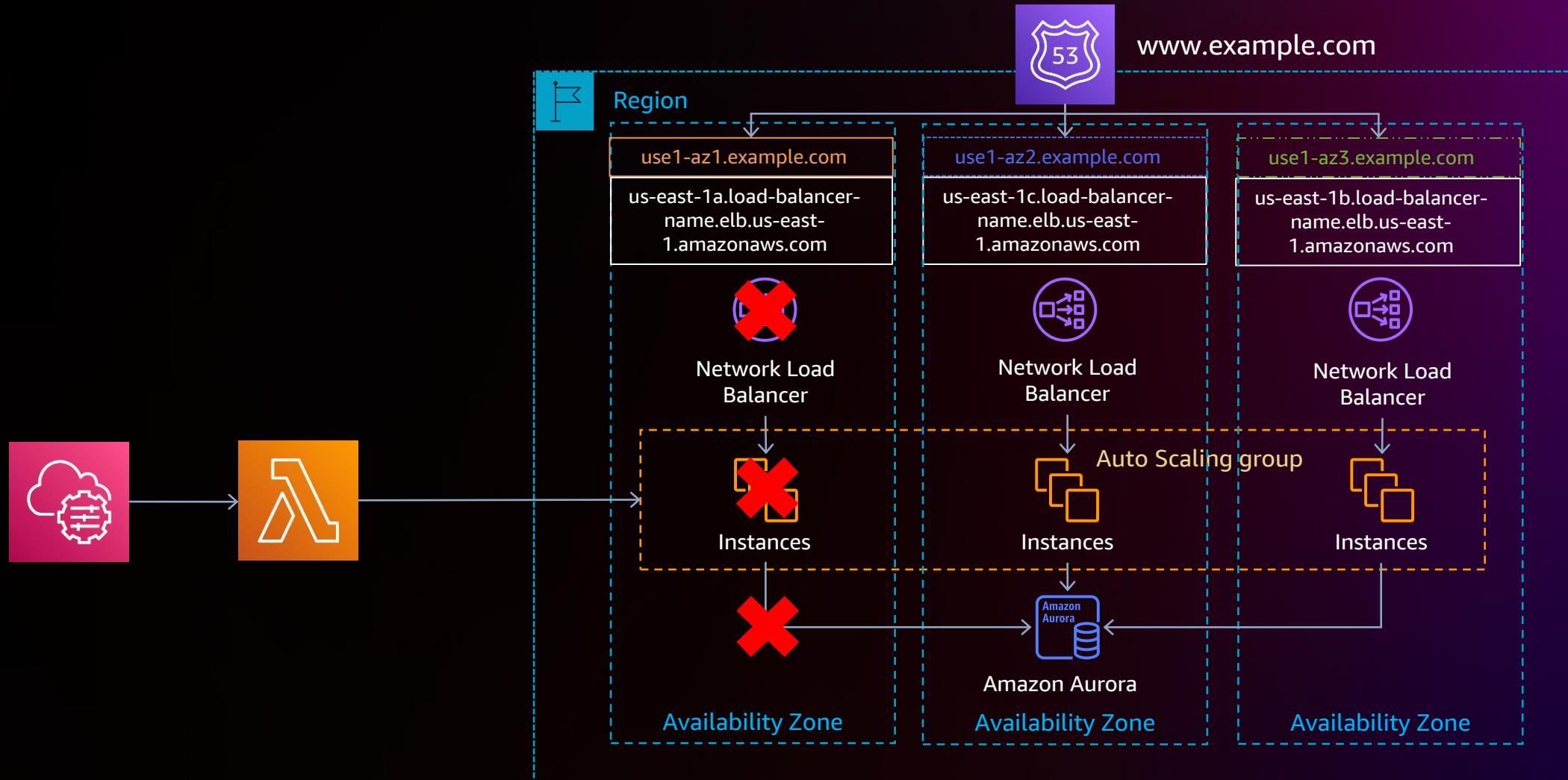
Workshop architecture



AZ evacuation pattern 1 – Data plane



AZ evacuation pattern 2 – Control plane



Gray failure mitigation summary

- Detect scope of impact to know what fault container to weight away from
- Create simple, reliable mechanisms; focus on data planes when possible
- Utilize automation and runbooks
- Practice your weight away mechanisms regularly

Workshop agenda

- Lab 1: Review operational metrics dashboard
- Lab 2: Simulate failure
- Lab 3: Mitigate impact part 1
- Lab 4: Mitigate impact part 2
- Lab 5: Recover

Getting started with this workshop

- As a participant, you will have access to an AWS account with any optional pre-provisioned infrastructure and AWS Identity and Access Management (IAM) policies needed to complete this workshop
- The AWS account will only be available for the duration of this workshop; you will lose access to the account thereafter
- The optional preprovisioned infrastructure will be deployed to a specific Region; check your workshop content to determine whether other Regions will be used
- Be sure to review the terms and conditions of the event; do not upload any personal or confidential information in the account

Step 1: Sign in via your preferred method

<https://catalog.us-east-1.prod.workshops.aws/join>



aws workshop studio

Workshop Studio > Sign in

Sign in
Choose a preferred sign-in method

Email one-time password (OTP)
Enter your personal or corporate email to receive a one-time password

Login with Amazon
Login with your Amazon.com retail account

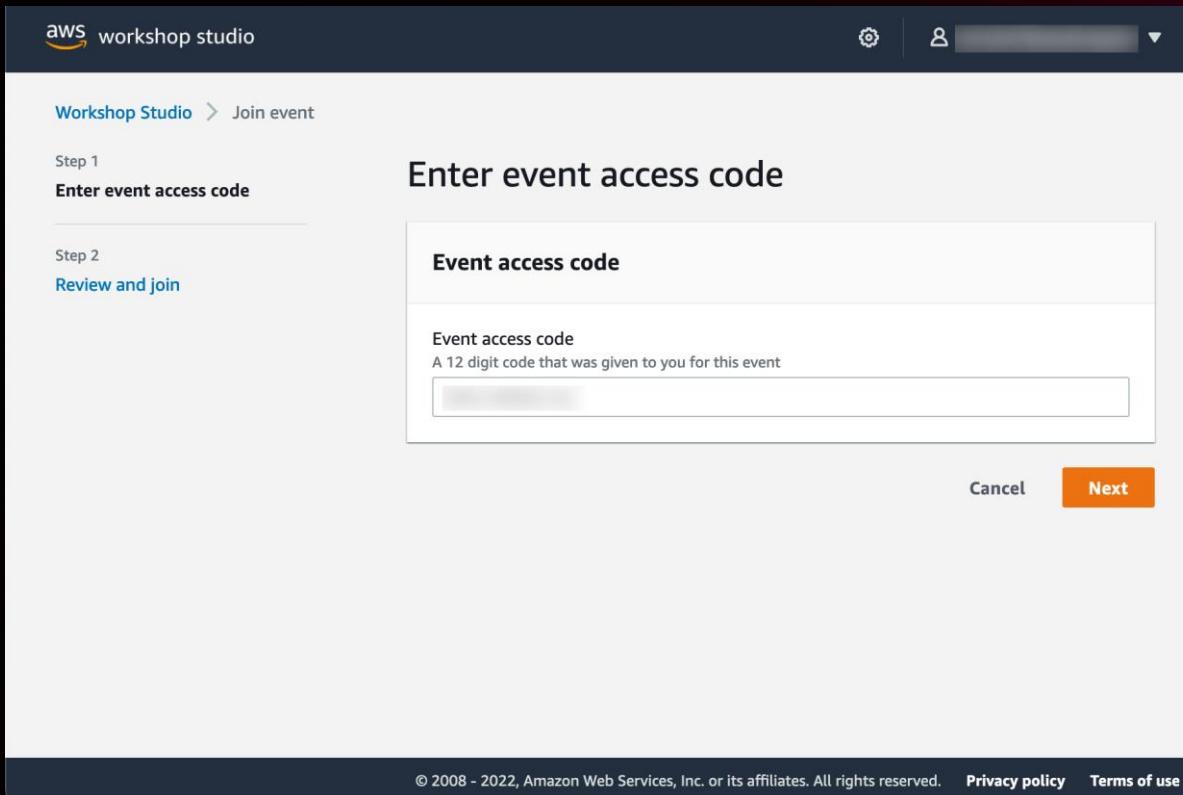
Amazon employee
Login with your Amazon Corporate account. Only for Amazon Employees.

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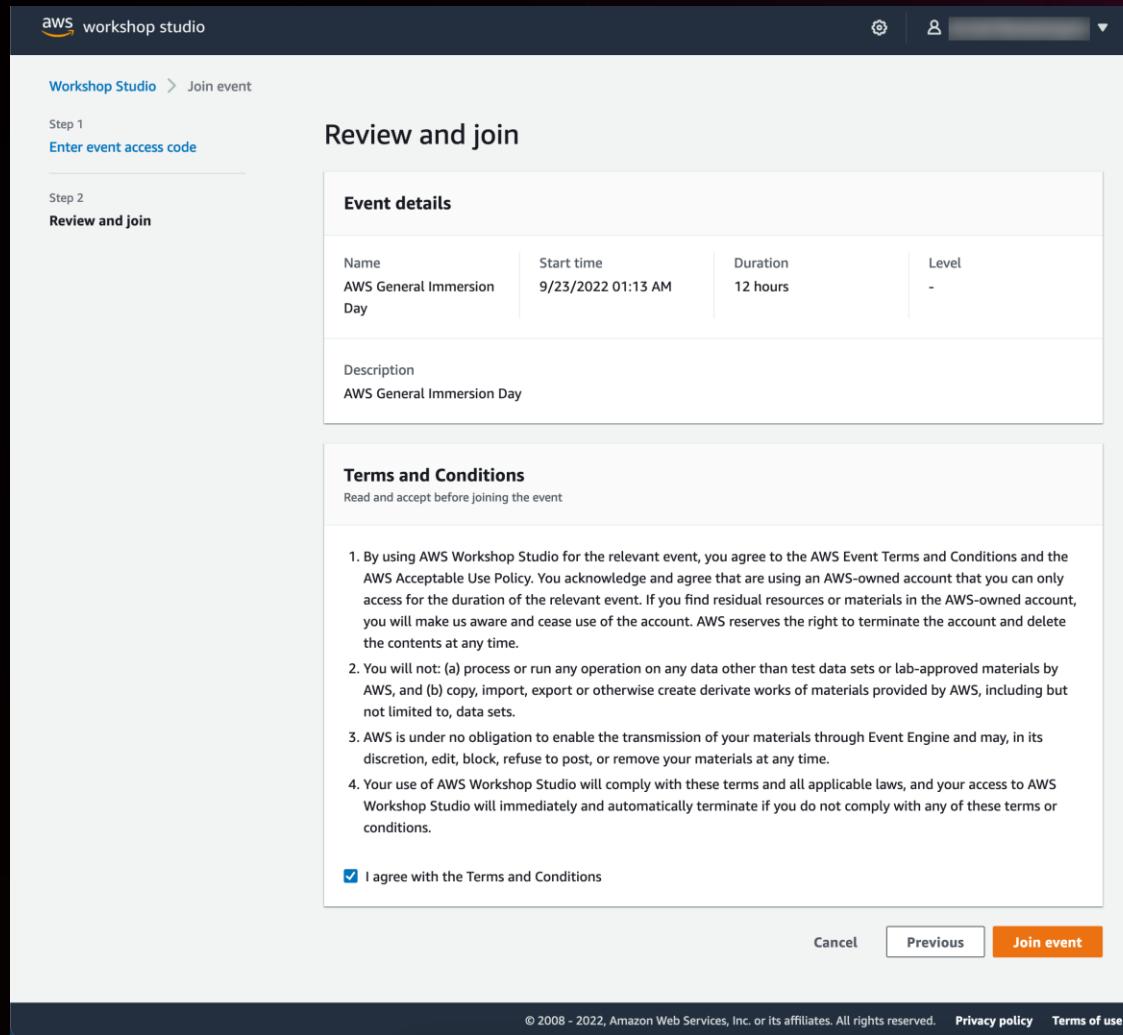
Step 2: Enter event access code

Enter 12-digit event access code

If you were given a one-click join link, you can skip this step



Step 3: Review terms and join event



The screenshot shows the 'Review and join' step of the AWS Workshop Studio 'Join event' process. The interface is divided into two main sections: 'Event details' and 'Terms and Conditions'.

Event details

Name	Start time	Duration	Level
AWS General Immersion Day	9/23/2022 01:13 AM	12 hours	-

Description
AWS General Immersion Day

Terms and Conditions
Read and accept before joining the event

1. By using AWS Workshop Studio for the relevant event, you agree to the AWS Event Terms and Conditions and the AWS Acceptable Use Policy. You acknowledge and agree that are using an AWS-owned account that you can only access for the duration of the relevant event. If you find residual resources or materials in the AWS-owned account, you will make us aware and cease use of the account. AWS reserves the right to terminate the account and delete the contents at any time.
2. You will not: (a) process or run any operation on any data other than test data sets or lab-approved materials by AWS, and (b) copy, import, export or otherwise create derivative works of materials provided by AWS, including but not limited to, data sets.
3. AWS is under no obligation to enable the transmission of your materials through Event Engine and may, in its discretion, edit, block, refuse to post, or remove your materials at any time.
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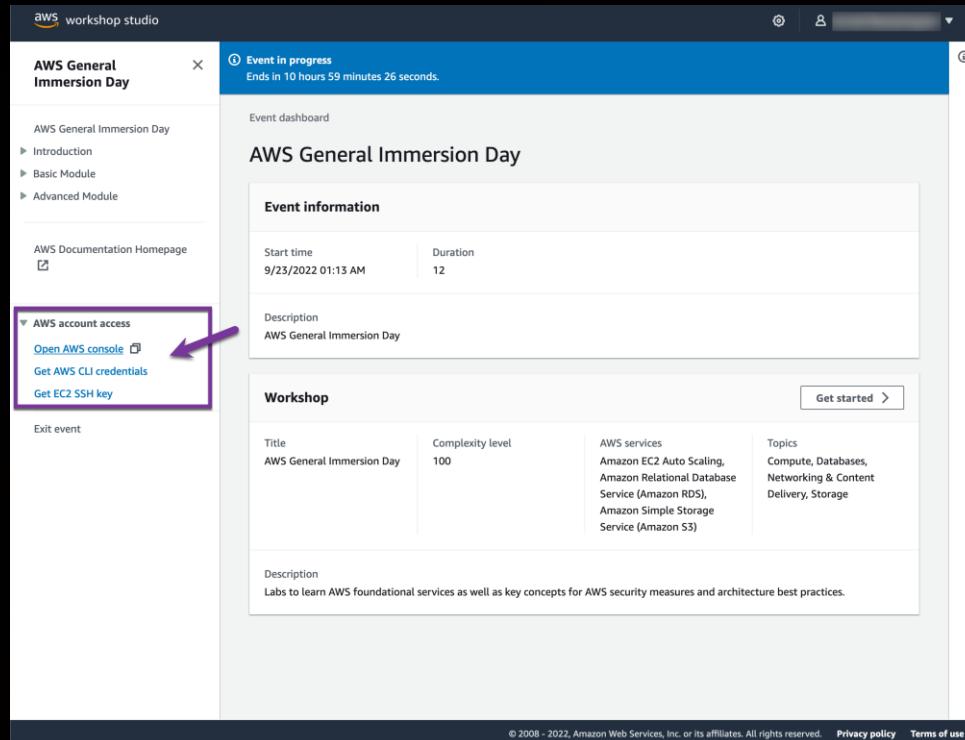
I agree with the Terms and Conditions

Cancel Previous **Join event**

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Step 4: Access AWS account

Access the AWS Management Console, or generate AWS CLI credentials as needed



AWS General Immersion Day

Event in progress
Ends in 10 hours 59 minutes 26 seconds.

Event dashboard

AWS General Immersion Day

Event information

Start time	9/23/2022 01:13 AM	Duration	12
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Description
AWS General Immersion Day

Workshop

Title	AWS General Immersion Day	Complexity level	100
AWS services	Amazon EC2 Auto Scaling, Amazon Relational Database Service (Amazon RDS), Amazon Simple Storage Service (Amazon S3)	Topics	Compute, Databases, Networking & Content Delivery, Storage

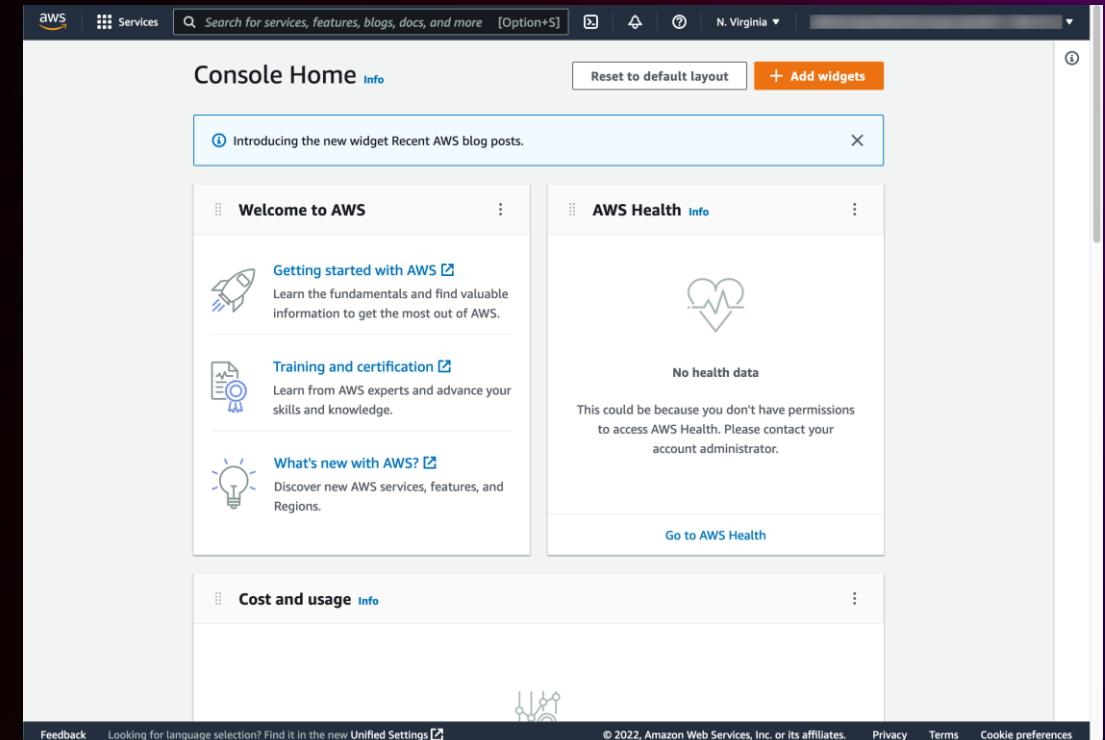
Description
Labs to learn AWS foundational services as well as key concepts for AWS security measures and architecture best practices.

AWS account access

- Open AWS console
- Get AWS CLI credentials
- Get EC2 SSH key

Exit event

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Console Home

Search for services, features, blogs, docs, and more [Option+S]

Console Home

Introducing the new widget Recent AWS blog posts.

Welcome to AWS

- Getting started with AWS
- Training and certification
- What's new with AWS?

AWS Health

No health data

This could be because you don't have permissions to access AWS Health. Please contact your account administrator.

Go to AWS Health

Cost and usage

Feedback

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

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Step 5: Get started with the workshop

AWS workshop studio

AWS General Immersion Day

Event in progress
Ends in 10 hours 59 minutes 26 seconds.

Event dashboard

AWS General Immersion Day

Event information

Start time	Duration
9/23/2022 01:13 AM	12

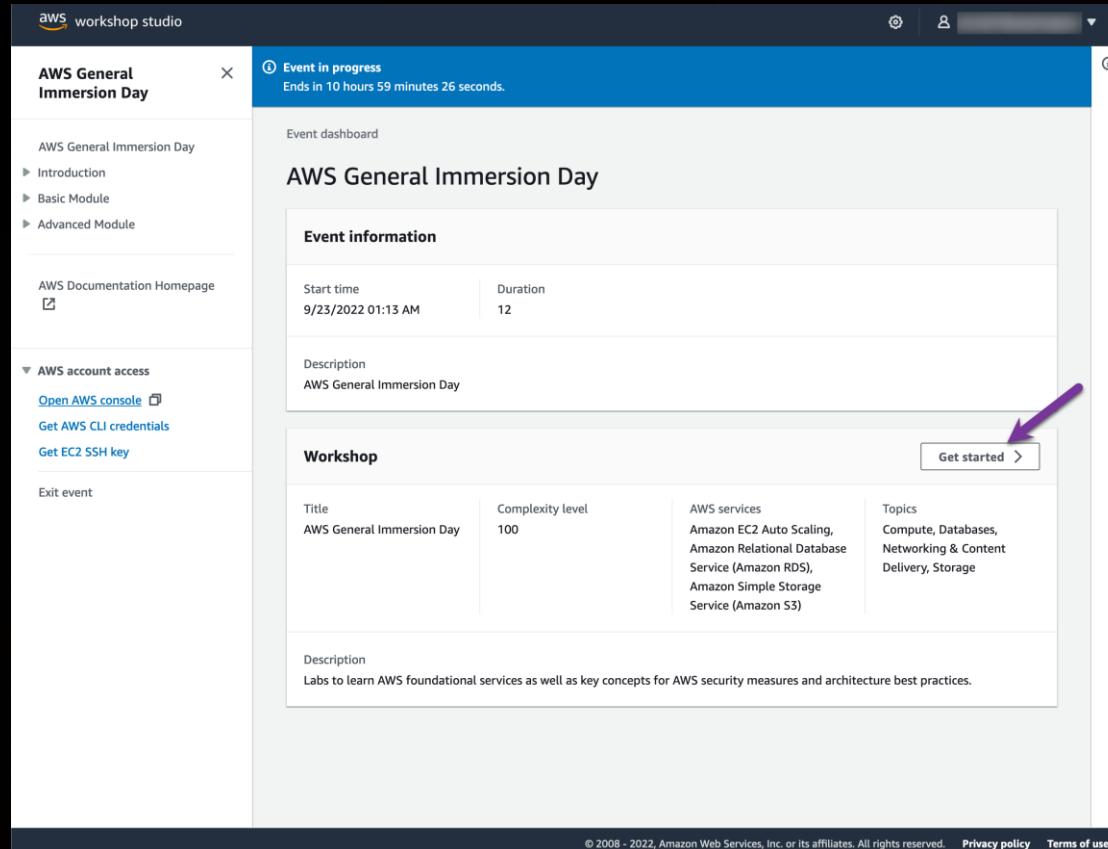
Description
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Workshop

Title	Complexity level	AWS services	Topics
AWS General Immersion Day	100	Amazon EC2 Auto Scaling, Amazon Relational Database Service (Amazon RDS), Amazon Simple Storage Service (Amazon S3)	Compute, Databases, Networking & Content Delivery, Storage

Description
Labs to learn AWS foundational services as well as key concepts for AWS security measures and architecture best practices.

Get started >



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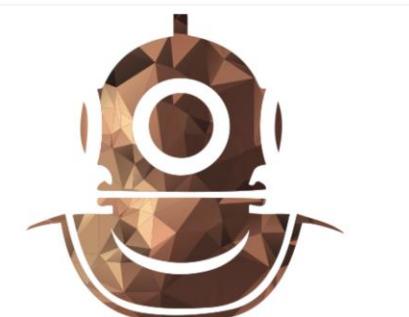
AWS workshop studio

AWS General Immersion Day

Event in progress
Ends in 10 hours 57 minutes 12 seconds.

Event dashboard > AWS General Immersion Day

AWS General Immersion Day



IMMERSION DAYS

In this General Immersion Day workshop, through a mix of service explanation and hands-on labs led by AWS, you will learn about AWS foundational services as well as key concepts for AWS security measures and architecture best practices.

The hands-on labs are largely divided into **basic** and **advanced** modules.

In basic modules, you can learn various features of each AWS foundational service. In advanced modules, you can learn how to connect each service organically to create architecture like 3-tier web application.

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Additional resources



<https://docs.aws.amazon.com/whitepapers/latest/advanced-multi-az-resilience-patterns/advanced-multi-az-resilience-patterns.html>

Advanced Multi-AZ Resilience Patterns whitepaper



<https://aws.amazon.com/blogs/networking-and-content-delivery/creating-disaster-recovery-mechanisms-using-amazon-route-53/>

Creating Disaster Recovery Mechanisms Using Amazon Route 53



<https://aws.amazon.com/blogs/aws/amazon-route-53-application-recovery-controller/>

Introducing Amazon Route 53 Application Recovery Controller

Thank you!

Michael Haken

mhaken@amazon.com



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