

AWS re:Invent

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ARC201-R

Advanced multi-AZ resilience patterns: Mitigating gray failures

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Agenda

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

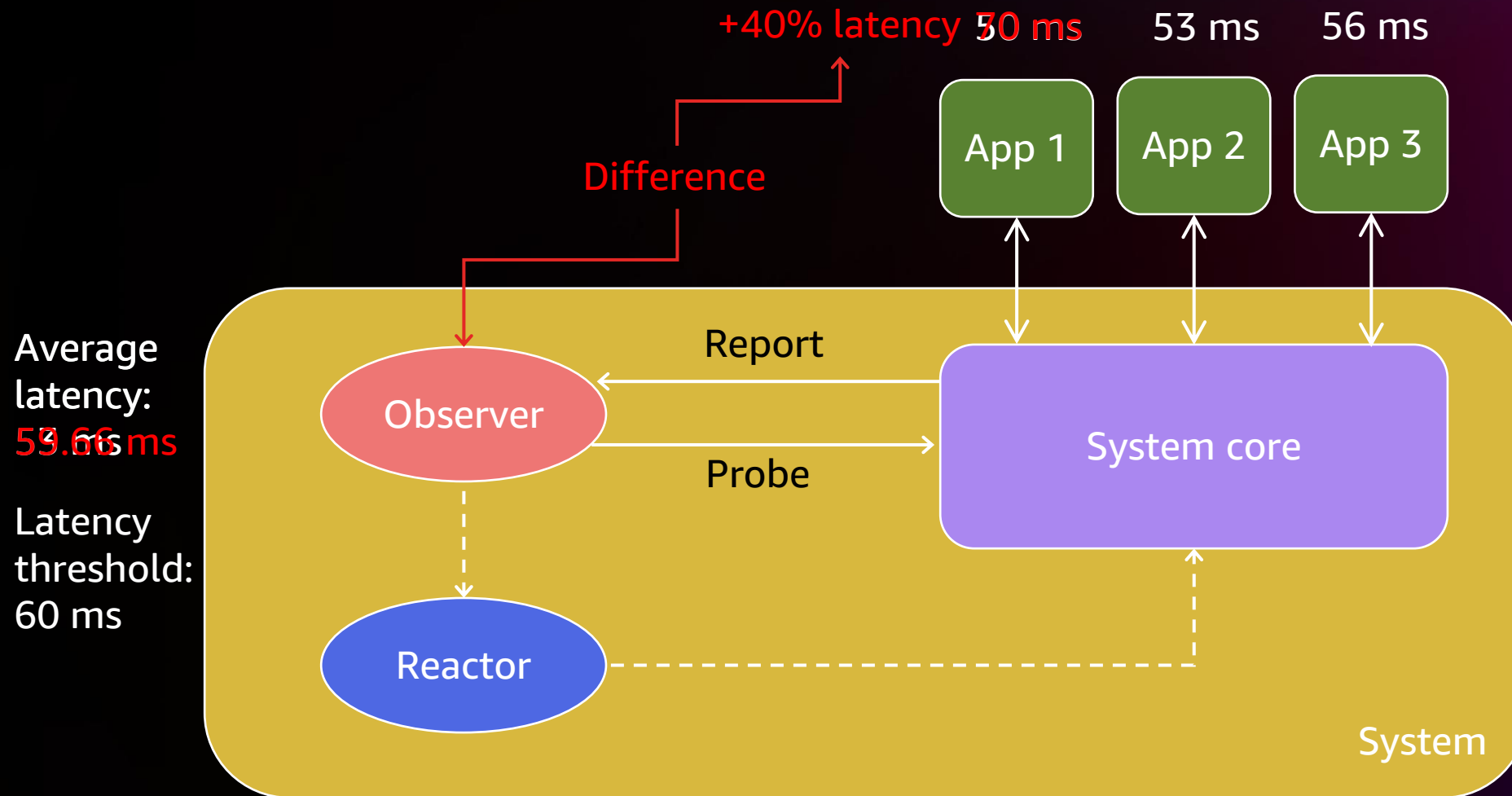
Introduction to gray failures



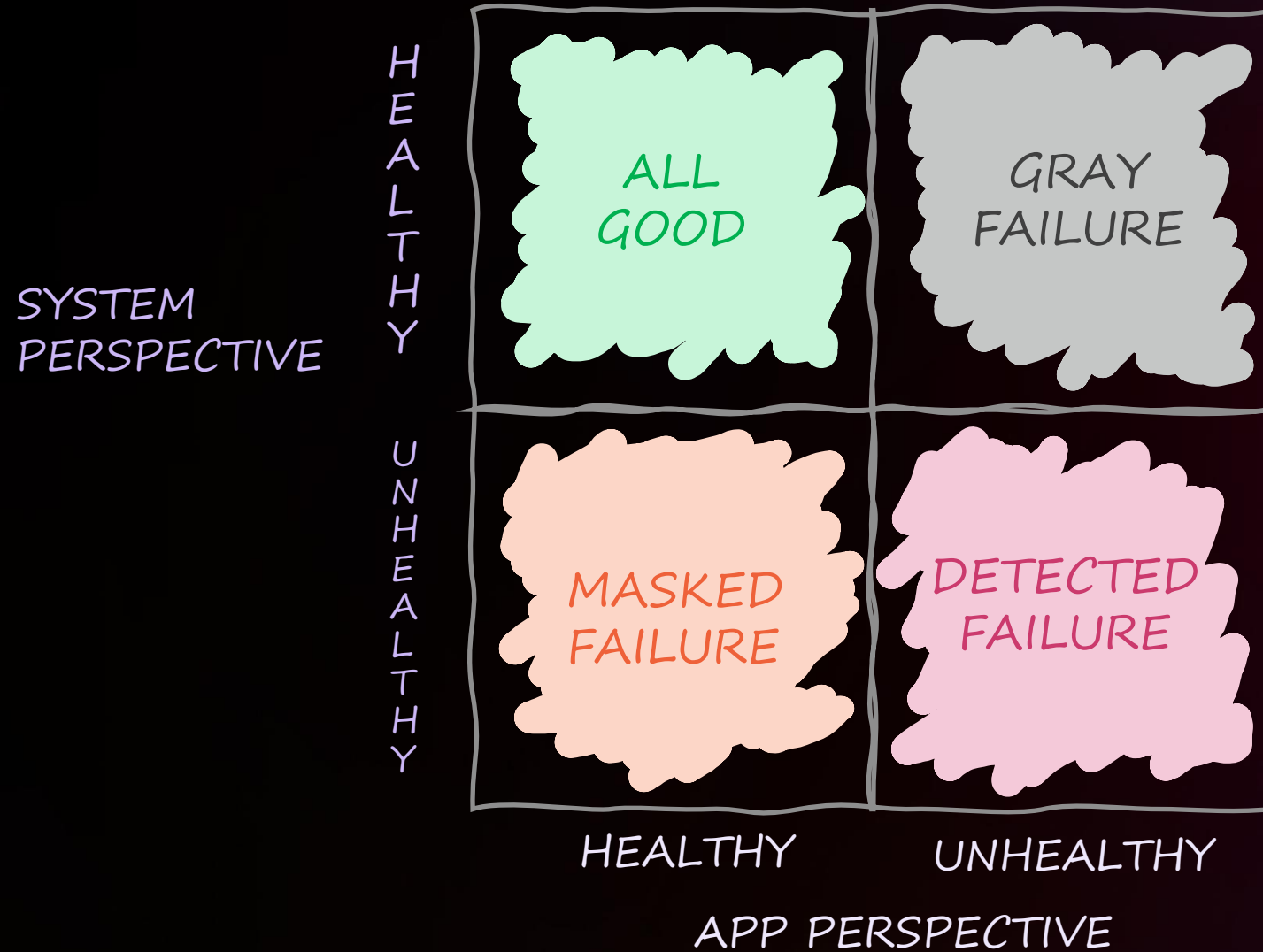
Differential observability

- 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



Region



Availability Zone

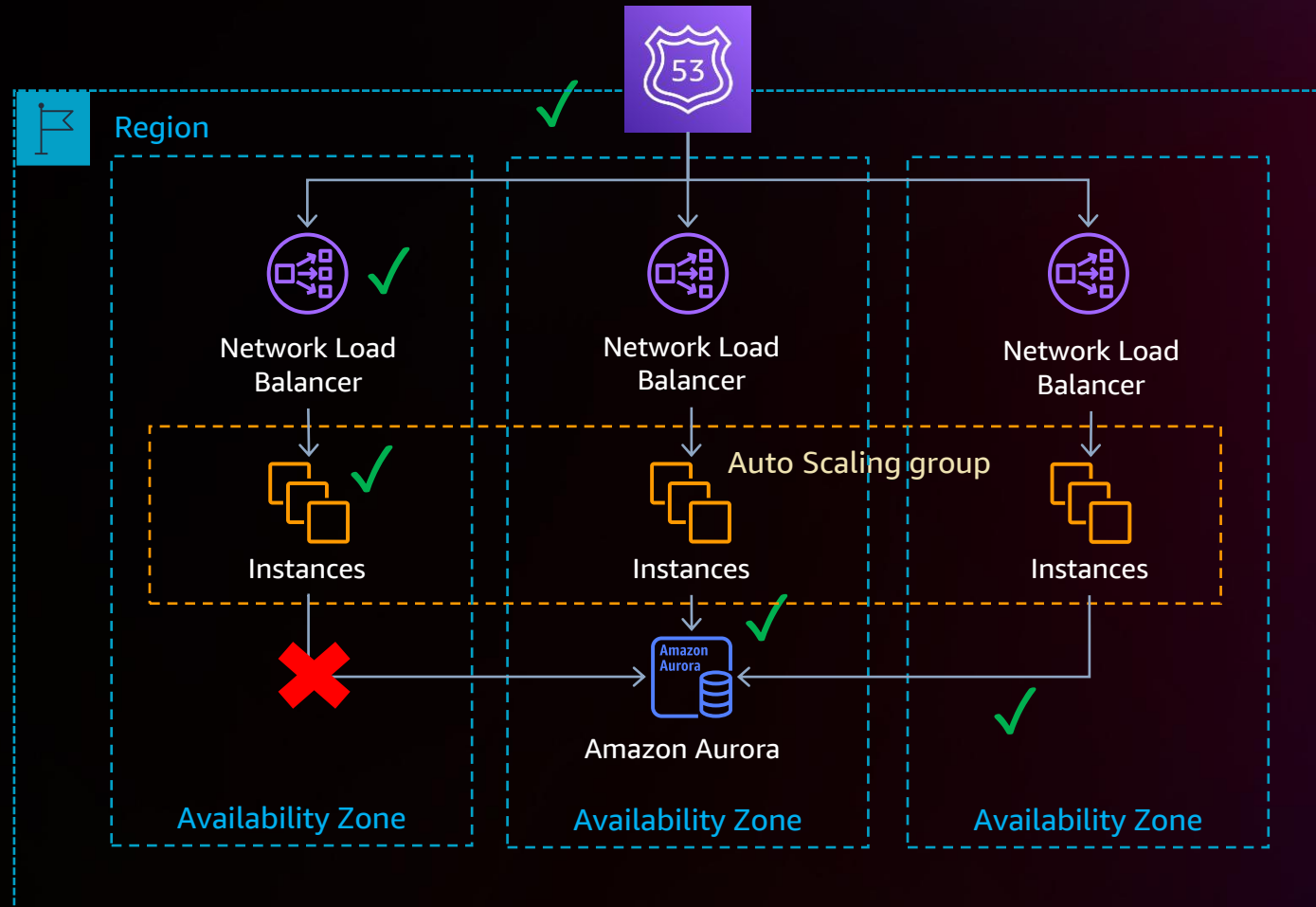


Instance/container



Software module or system component

Gray failure example



Detecting an AZ gray failure



Detection tools

Amazon CloudWatch Contributor Insights

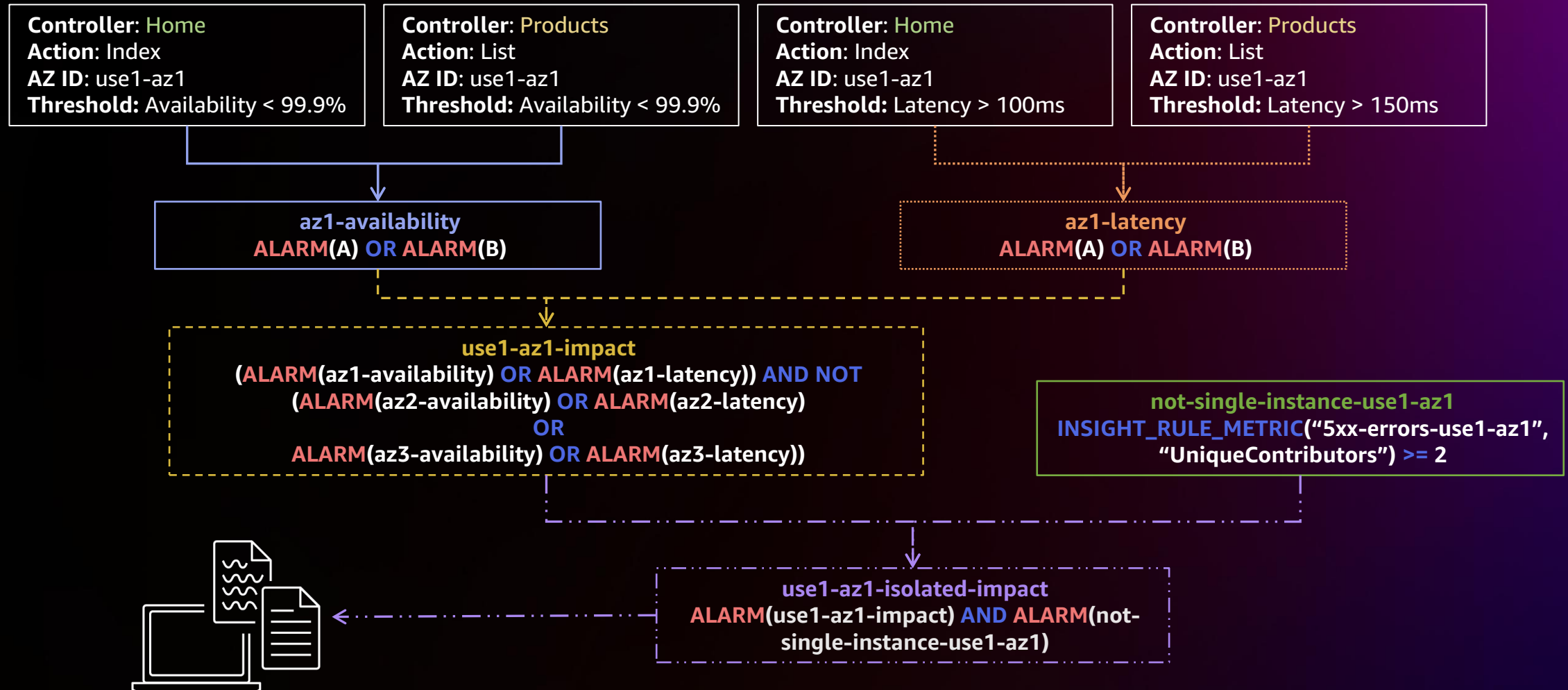
- Visualize metrics from the top-N contributors and see the total number of unique contributors
- Can find top talkers, bad hosts, heaviest network users, or resources with the most errors
- Can be used with CloudWatch metric math
- Compare logs against rules you define

CloudWatch composite alarms

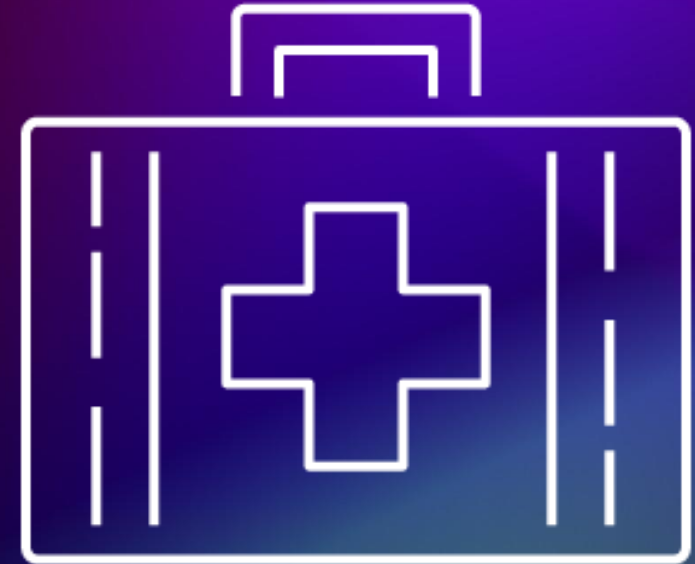
- Monitor the state of other alarms
- Can also monitor other composite alarms
- Simple logic alarm expressions, AND, OR, NOT

```
(  
  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

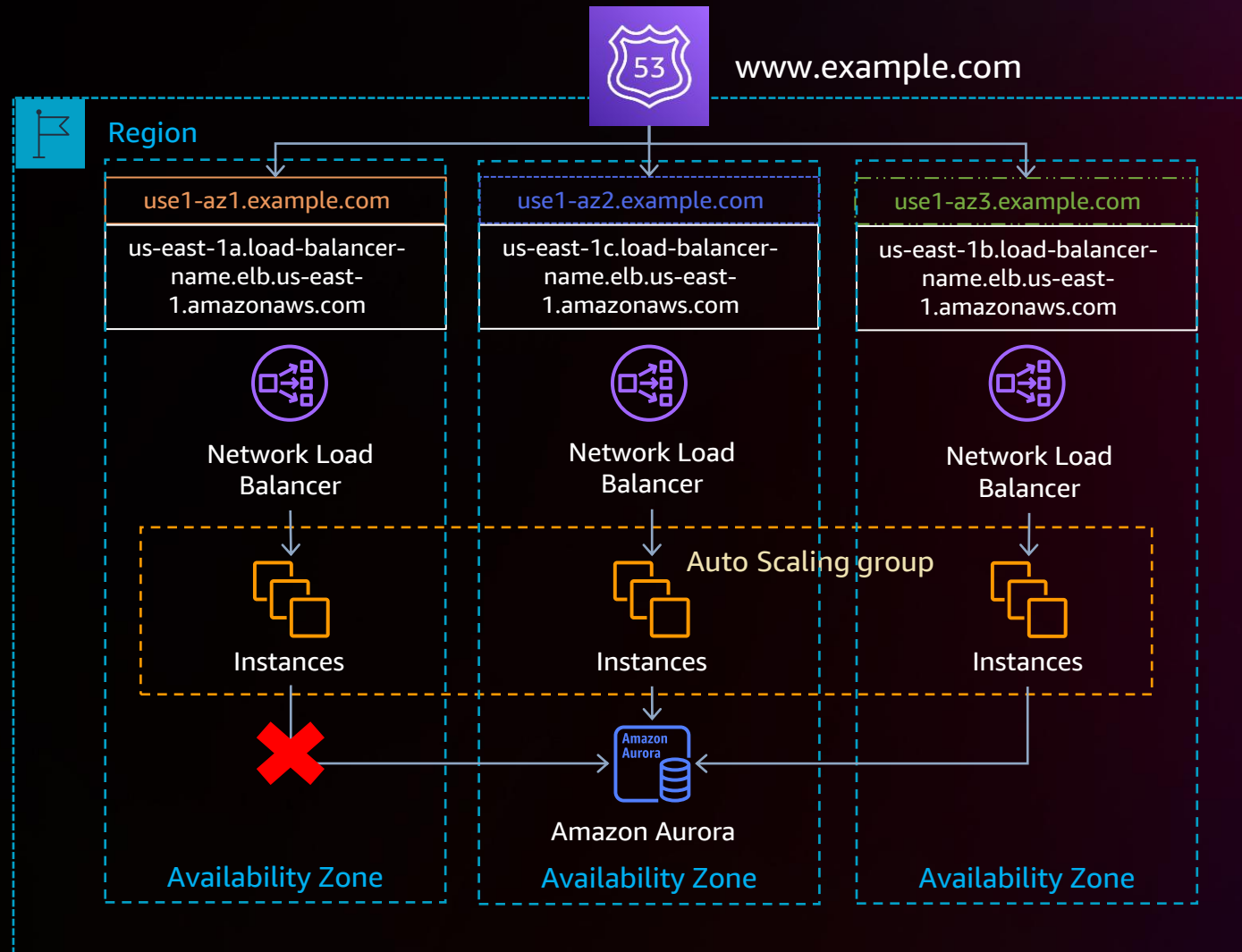
Control plane

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

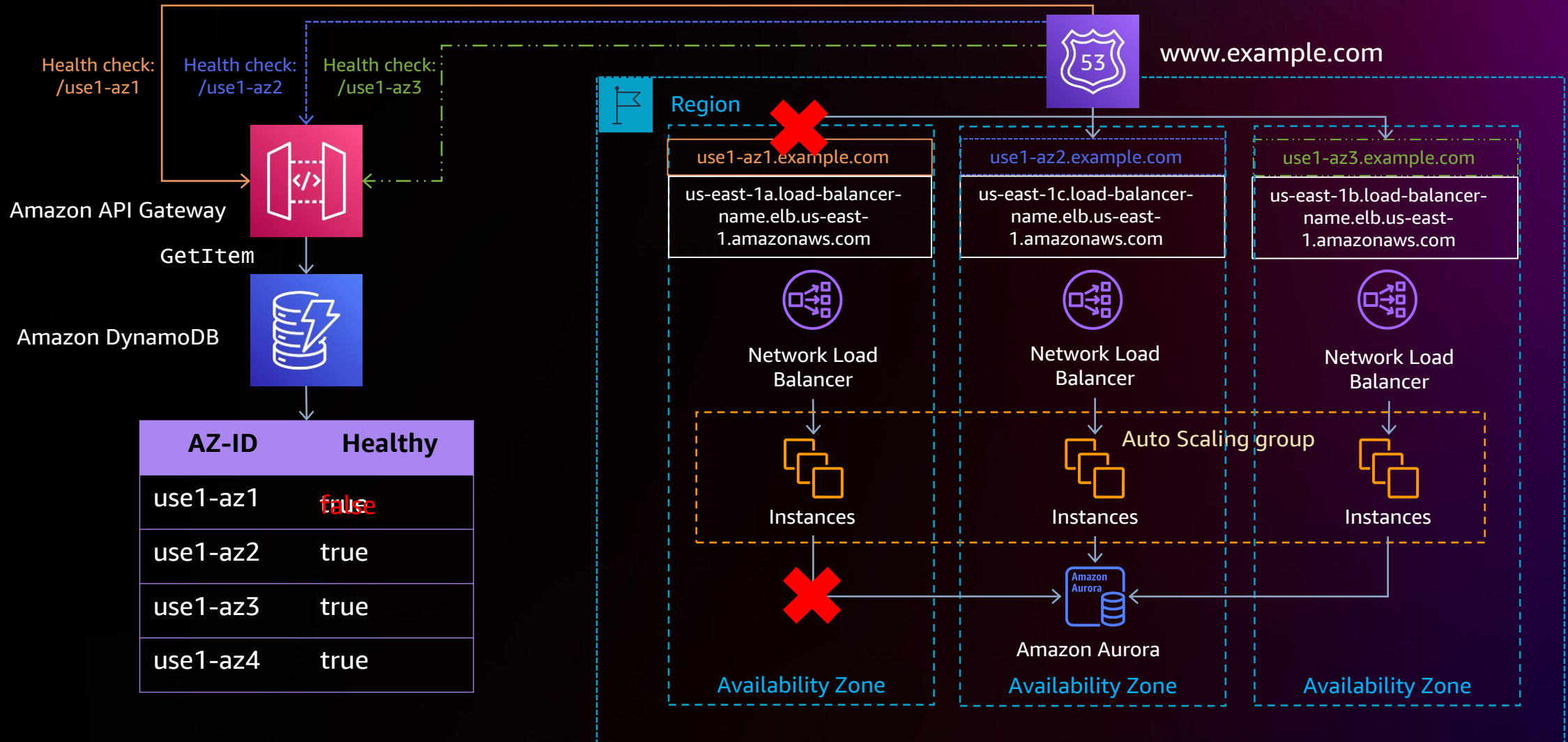
Data plane

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

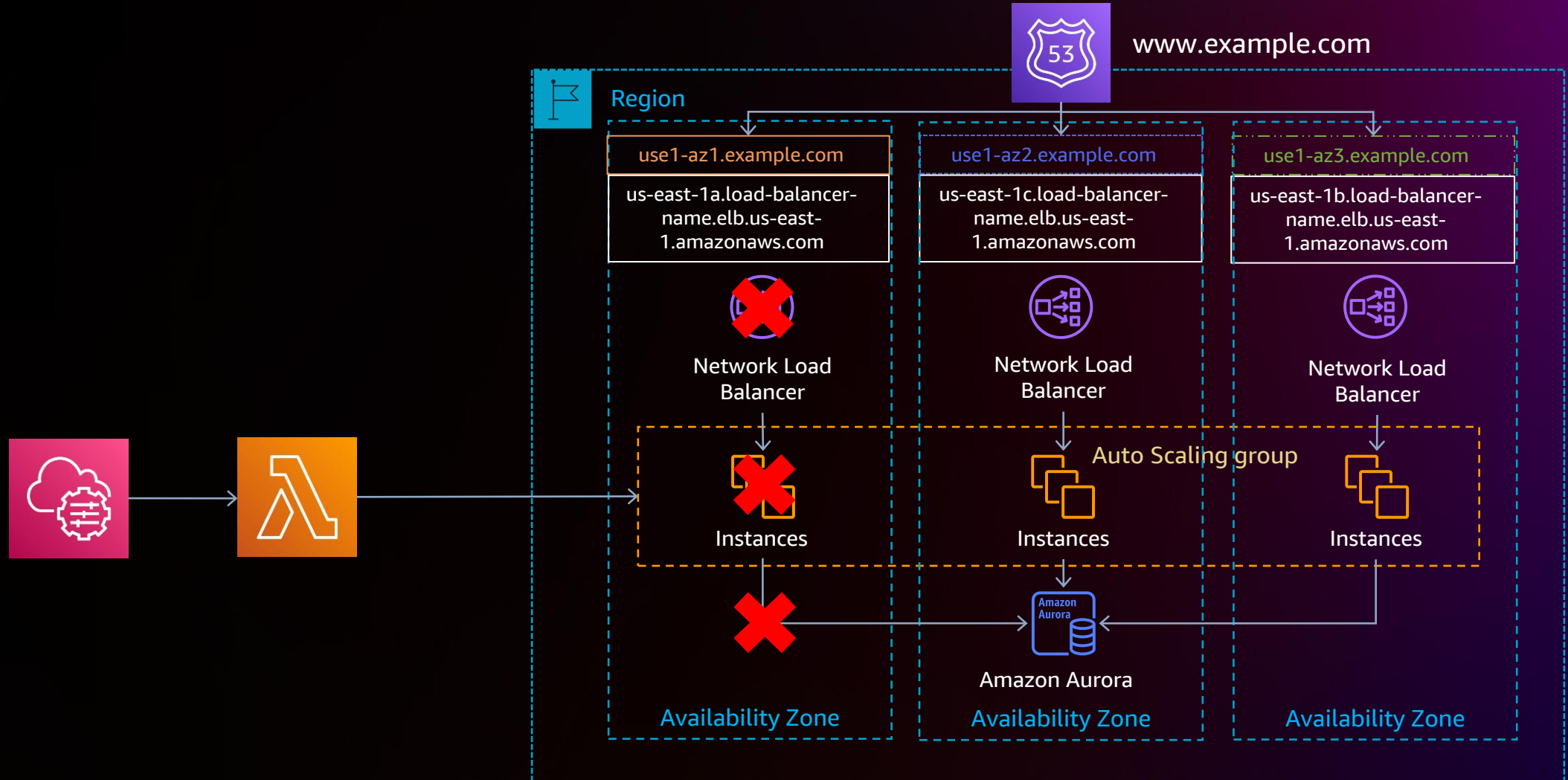
Workshop architecture



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>



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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

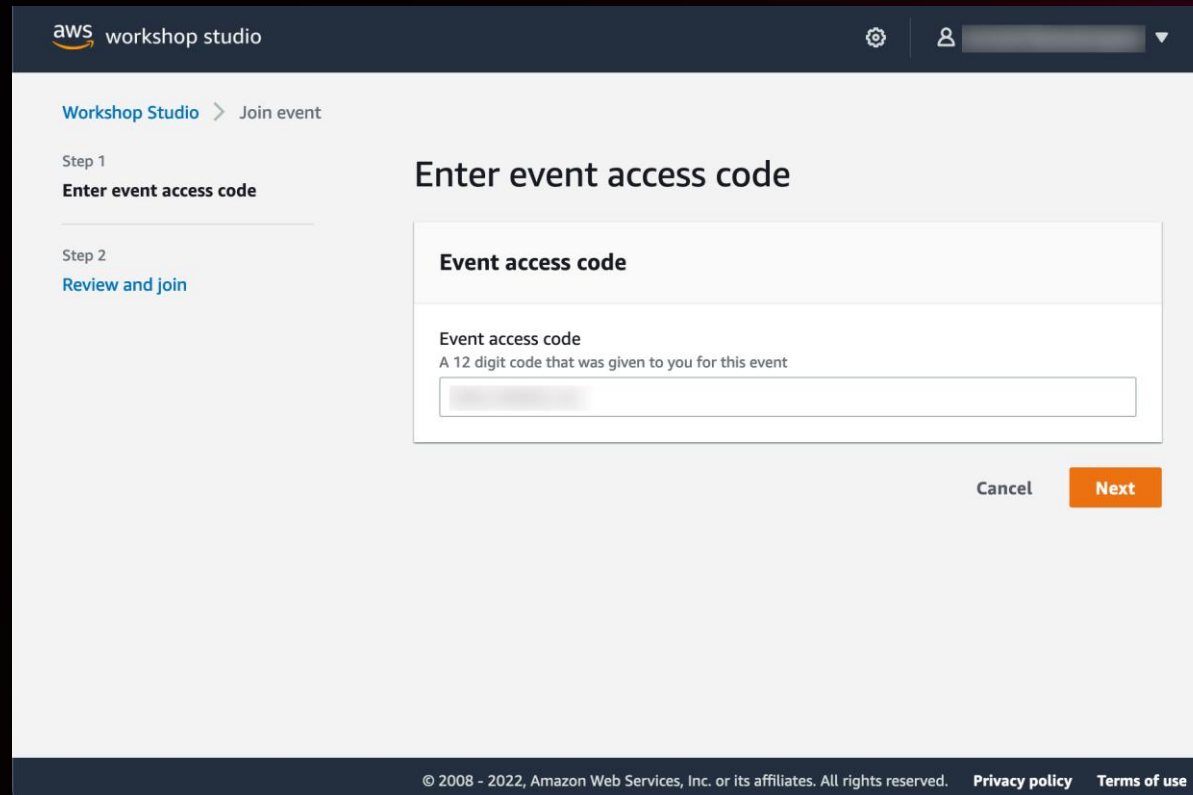
Login with your Amazon Corporate account. Only for Amazon Employees.

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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



The screenshot shows the AWS Workshop Studio interface for joining an event. The top navigation bar includes the AWS logo, 'workshop studio', a settings gear icon, a user profile icon, and a dropdown arrow. The breadcrumb trail reads 'Workshop Studio > Join event'. On the left, a progress indicator shows 'Step 1 Enter event access code' as the current step and 'Step 2 Review and join' as the next step. The main heading is 'Enter event access code'. Below this, a box titled 'Event access code' contains the label 'Event access code' and the description 'A 12 digit code that was given to you for this event'. A text input field is provided for the code. At the bottom right of the form are 'Cancel' and 'Next' buttons. The footer contains the copyright notice '© 2008 - 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.' and links to 'Privacy policy' and 'Terms of use'.

Step 3: Review terms and join event

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Workshop Studio > Join event

Step 1
[Enter event access code](#)

Step 2
Review and join

Review and join

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 derivate 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.
4. Your use of AWS Workshop Studio will comply with these terms and all applicable laws, and your access to AWS Workshop Studio will immediately and automatically terminate if you do not comply with any of these terms or conditions.

☒ I agree with the Terms and Conditions

Cancel

Previous

Join event

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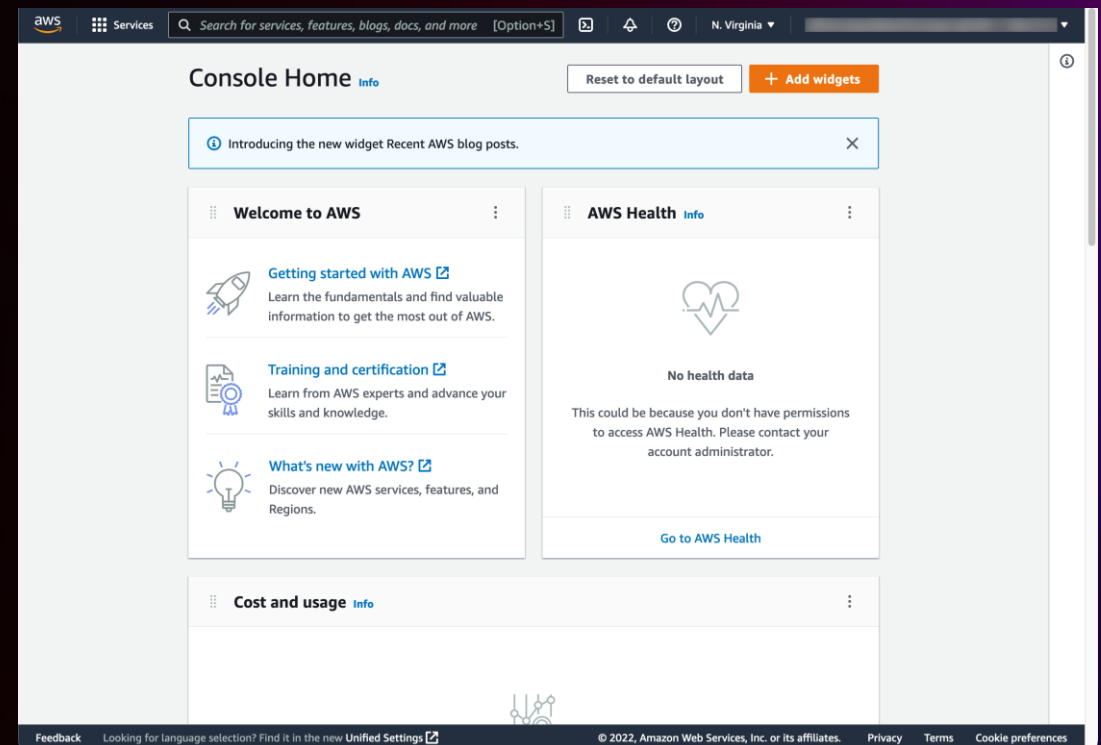
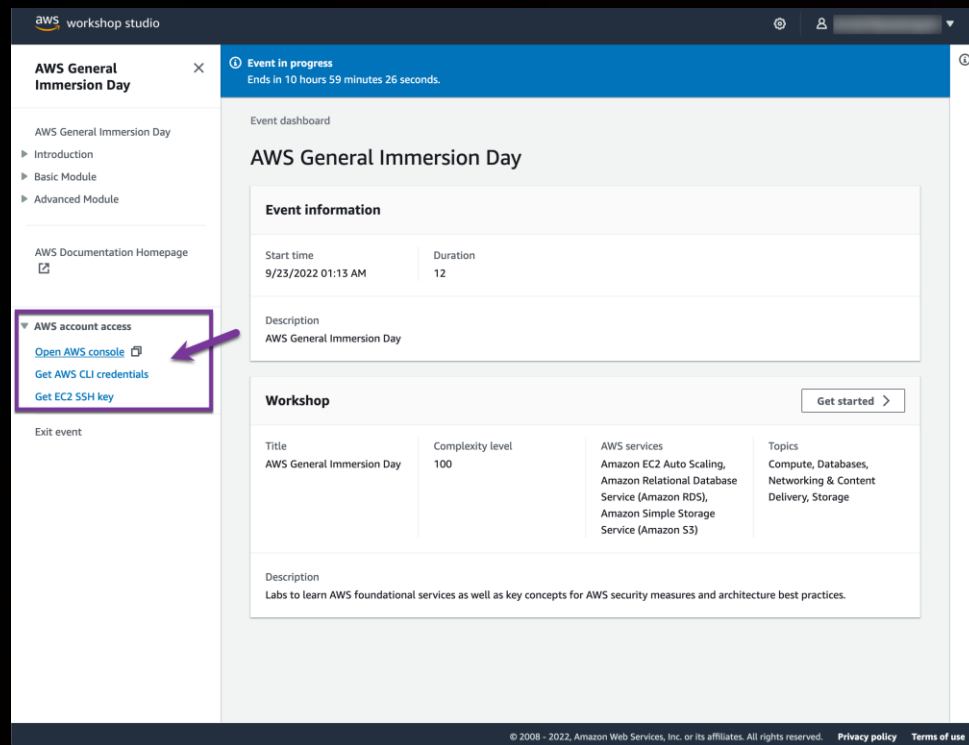
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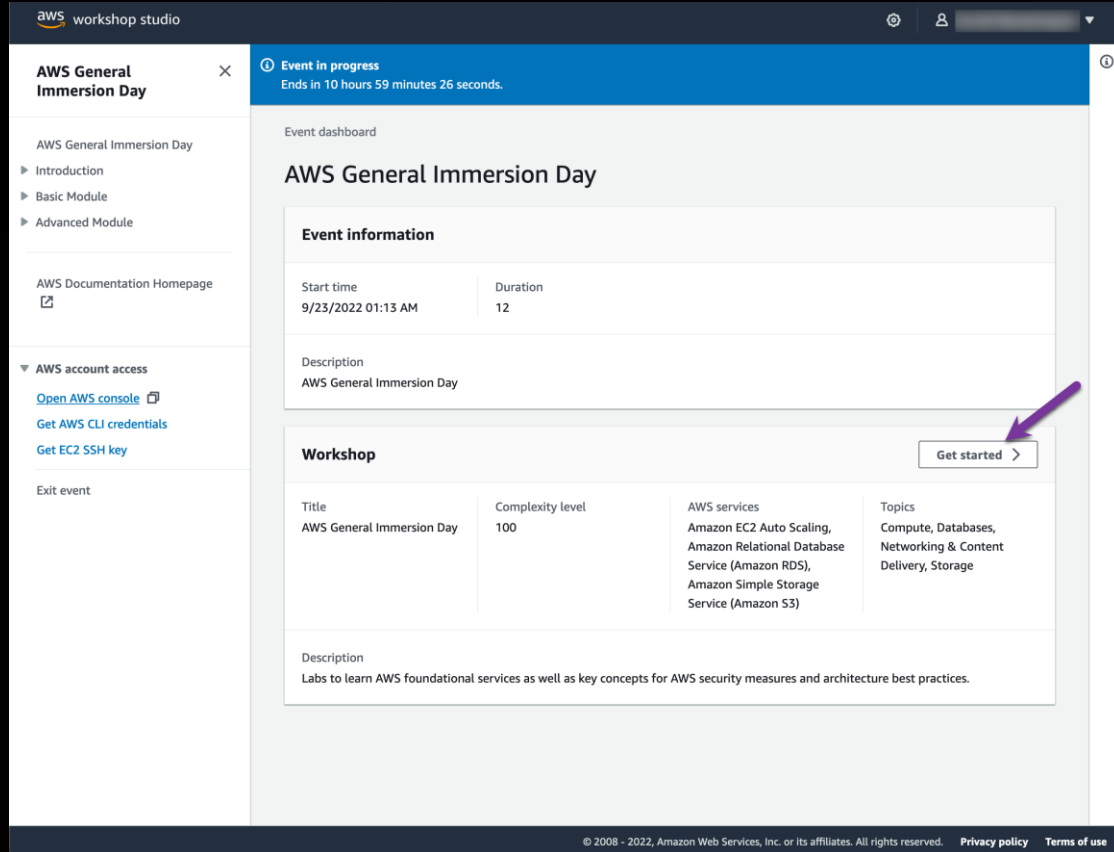


Step 4: Access AWS account

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



Step 5: Get started with the workshop



aws workshop studio

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 |
|------------|--------------------|----------|----|

Description
AWS General Immersion Day

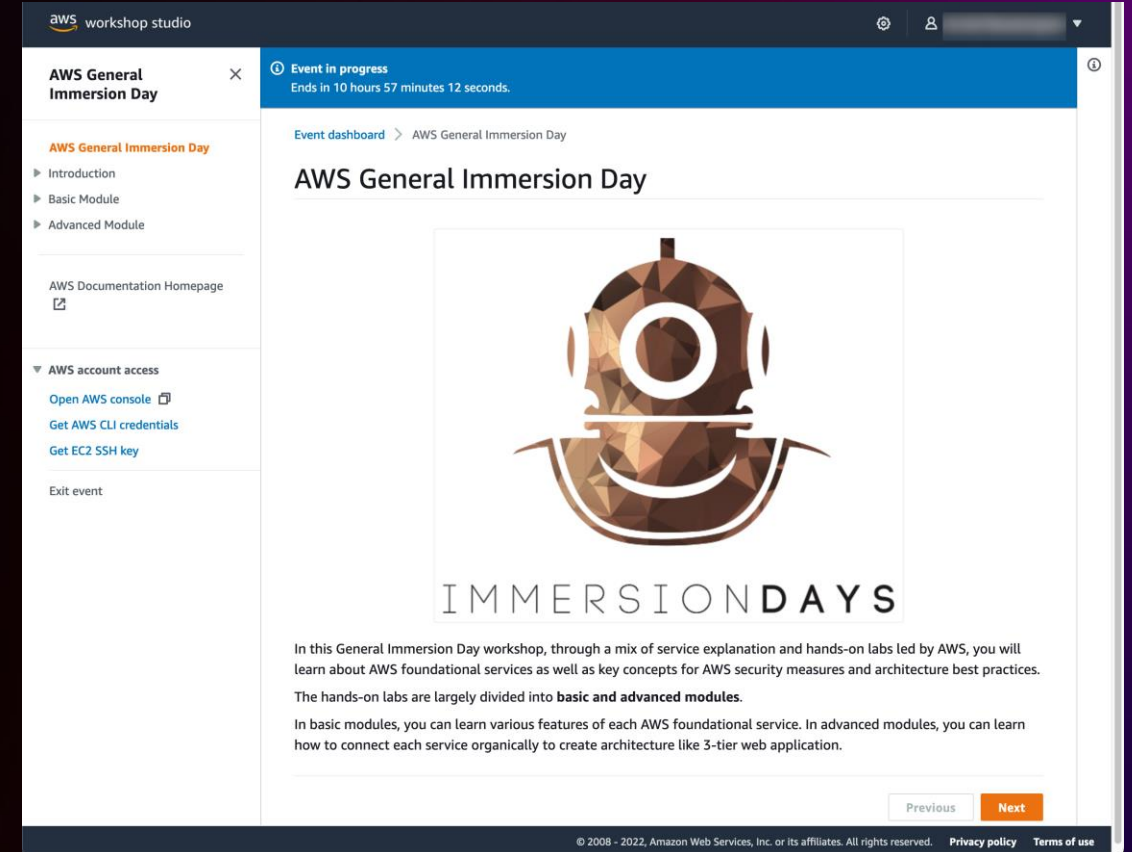
Workshop

| | | | |
|---------------------------|------------------|---|--|
| 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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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.

Previous Next

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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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