

AWS re:Invent

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DAT205

Build your first graph application with Amazon Neptune

Kelvin Lawrence

Sr. Prin. Graph Architect
Amazon Neptune, AWS

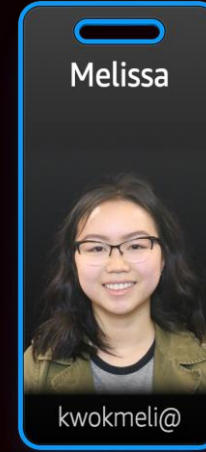
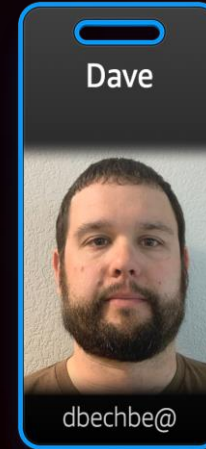
Taylor Riggan

Sr. Graph Architect
Amazon Neptune, AWS



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Meet the team



Agenda

- What are we building?
- Graph fundamentals
- Let's build!

What are we building?



Travel agency

You've just inherited a travel agency that helps vacationers decide on travel routes.

Vacation consultants for the travel agency provide customers with a set of routes that take them from one destination to another, sometimes including extra cities along the way and limiting routes based on total distances.



The challenge

Today, the consultants use a relational database to help them plan routes. So, queries that need to find different paths from Austin to Auckland, for example, look a little like this:

```
select a.code ,r.dist, a2.code, r2.dist,a3.code,  
r2.dist+r.dist as total from airports a  
join routes r on a.id = r."from"  
join airports a2 on a2.id = r."to"  
join routes r2 on a2.id = r2."from"  
join airports a3 on a3.id = r2."to"  
where a.code = 'AUS'  
and a3.code = 'AKL'  
order by total asc  
limit 4
```

airports table			
id	label	code	city
3	airport	AUS	Austin
8	airport	DFW	Dallas
13	airport	LAX	Los Angeles
23	airport	SFO	San Francisco
63	airport	AKL	Auckland

routes table			
id	from	to	dist
1010	3	8	190
1054	3	13	1230
1123	3	23	1500
1189	13	63	6512
1189	23	63	6525

Actually, this query doesn't give you variable length paths, only one-stop routes...

The challenge

This is the real SQL query using Common Table Expressions (CTE)

```
WITH RECURSIVE graphtraversal AS (  
    SELECT e.src, e.dest, 1 as depth, concat_ws('->',n1.iata,n2.iata) as path  
    FROM airports n1  
    INNER JOIN routes e ON n1.id = e.src INNER JOIN airports n2 ON n2.id =  
e.dest  
    WHERE n1.iata = 'AUS'  
    UNION  
    SELECT r.src, p.dest, r.depth + 1 as depth, concat_ws('->', r.path,  
n.iata)  
    FROM graphtraversal r INNER JOIN routes p ON p.src = r.dest  
  
    INNER JOIN airports n ON p.dest = n.id  
    WHERE r.depth < 4  
)  
SELECT r.depth as total_hops, r.dest as destination, r.path  
FROM graphtraversal r INNER JOIN airports n ON r.dest = n.id  
WHERE n.iata = 'AKL';
```


The objective

Your consultants are tired of writing and managing long, complex SQL queries.

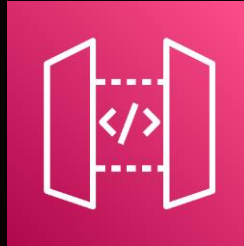
You've just learned about graph databases and believe they will be a better fit for the highly connected air routes data your consultants work with and the types of queries that they write.

So you decide to create a web application that is backed by Amazon Neptune.

AWS services you will be using today



Amazon CloudFront



Amazon API Gateway



AWS Lambda



Amazon
SageMaker



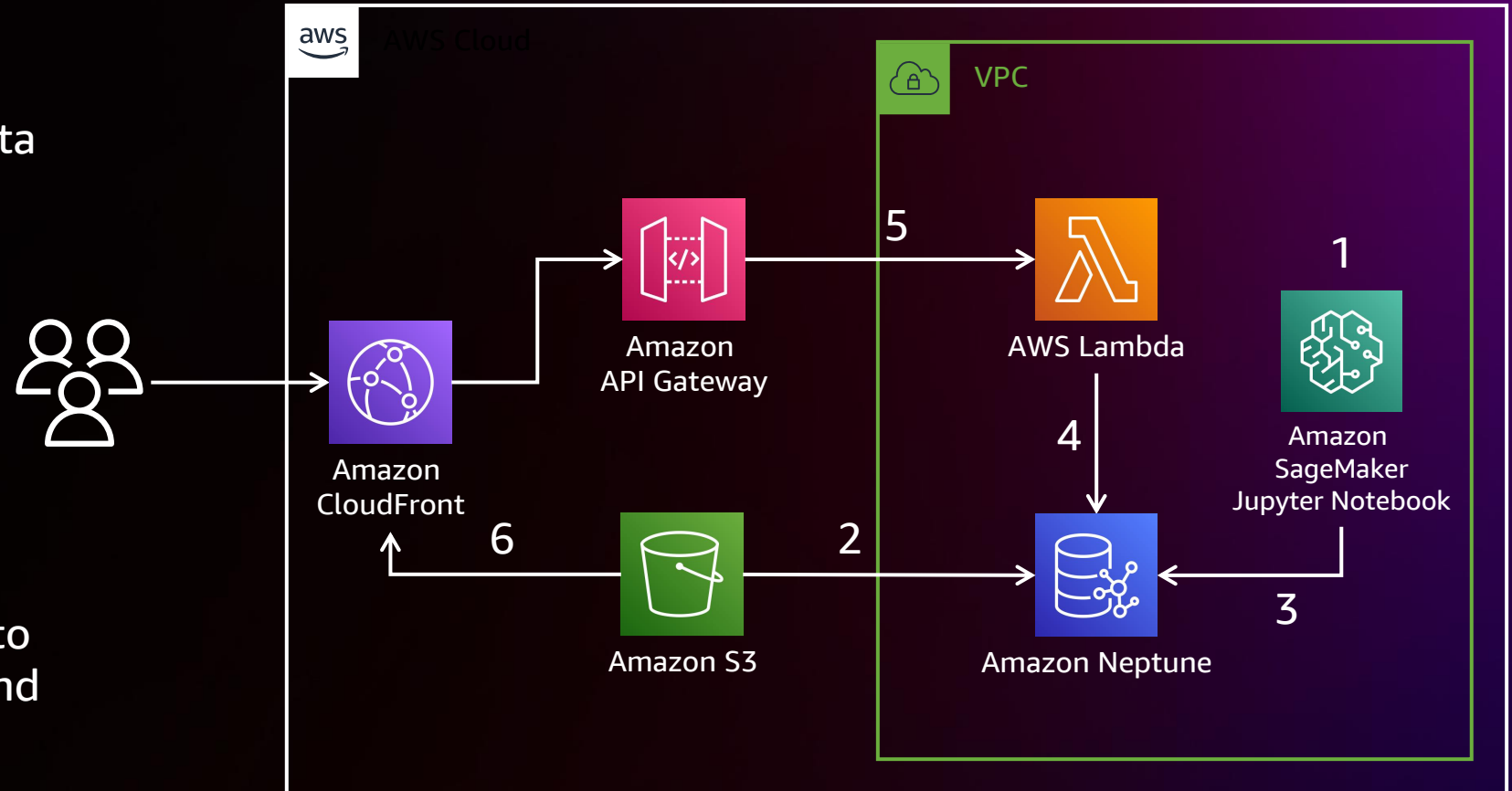
Amazon Neptune



Amazon S3

The architecture

1. Extract and transform the data
2. Bulk load the data
3. Design your queries
4. Configure AWS Lambda to submit queries
5. Configure Amazon API Gateway to add a “front door” to your back end from the front end
6. Layer on the front end

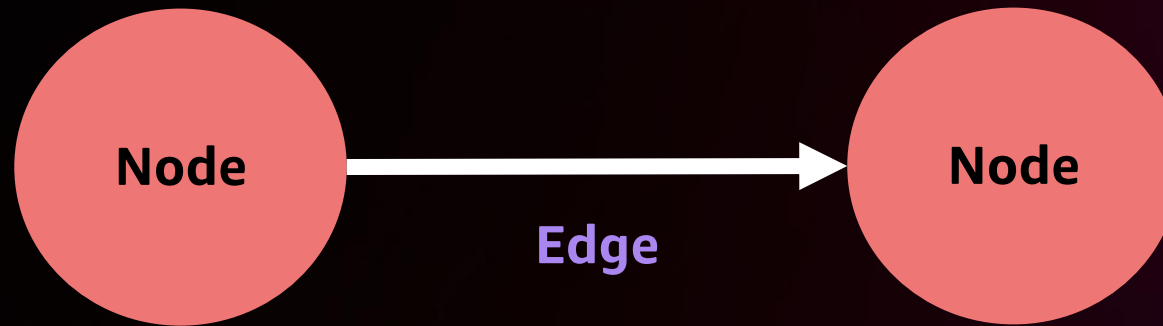


Graph fundamentals



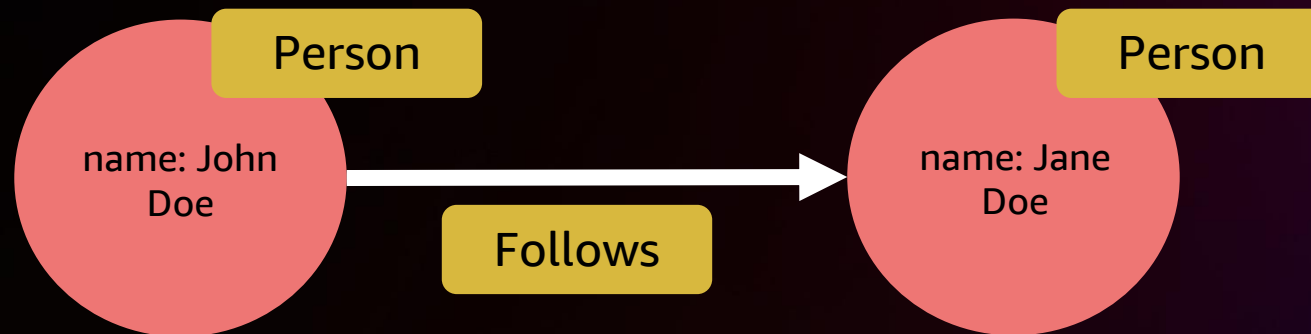
What is a graph?

- Graphs are purpose-built to store and navigate relationships
- Nodes represent real-world objects
- Edges store relationships between objects



What is a property graph?

- Each node or edge is like a “container” that can hold properties and label(s)
- Labels are used for categorizing types of entities
- Properties are used to specify attributes of a particular instance of a node or edge type



Why use a graph?



**Social
networking**



Recommendations



**Knowledge
graphs**



**Fraud
detection**



**Life
sciences**



**Network and
IT operations**

These use cases all:

- Have a highly connected data domain
- Navigate (variably) connected structures
- Filter or compute results based on the strength, weight, or quality of relationships

Let's build!



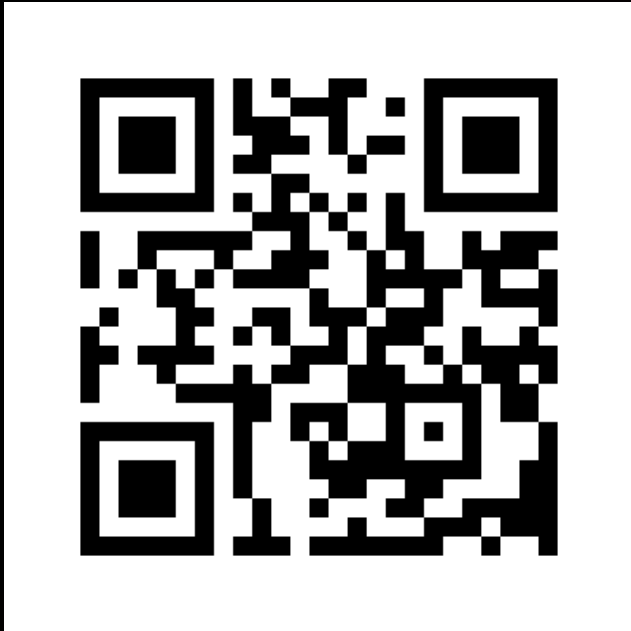
Getting started with this workshop

- As a participant, you will have access to an AWS account with pre-provisioned infrastructure and 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 pre-provisioned 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>

Or shortened: <https://s12d.com/dat205>



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

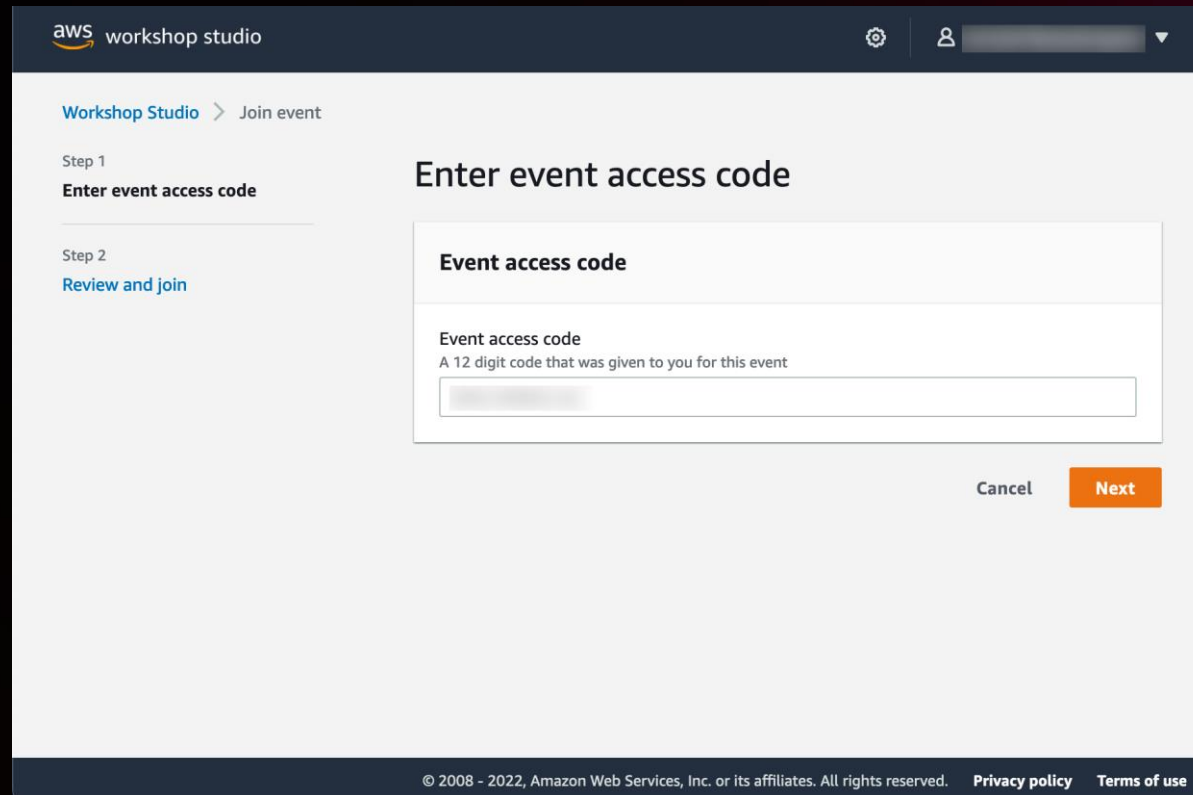
Amazon employee

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

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Step 2: Enter event access code

Enter the 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, and a user profile icon. The breadcrumb trail is '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 instruction 'Event access code: A 12 digit code that was given to you for this event' and a text input field. At the bottom right of the form area are 'Cancel' and 'Next' buttons. The footer contains copyright information and links to 'Privacy policy' and 'Terms of use'.

aws workshop studio

Workshop Studio > Join event

Step 1
Enter event access code

Step 2
Review and join

Enter event access code

Event access code




Event access code
A 12 digit code that was given to you for this event

Cancel Next

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Step 3: Review terms and join event

aws workshop studio

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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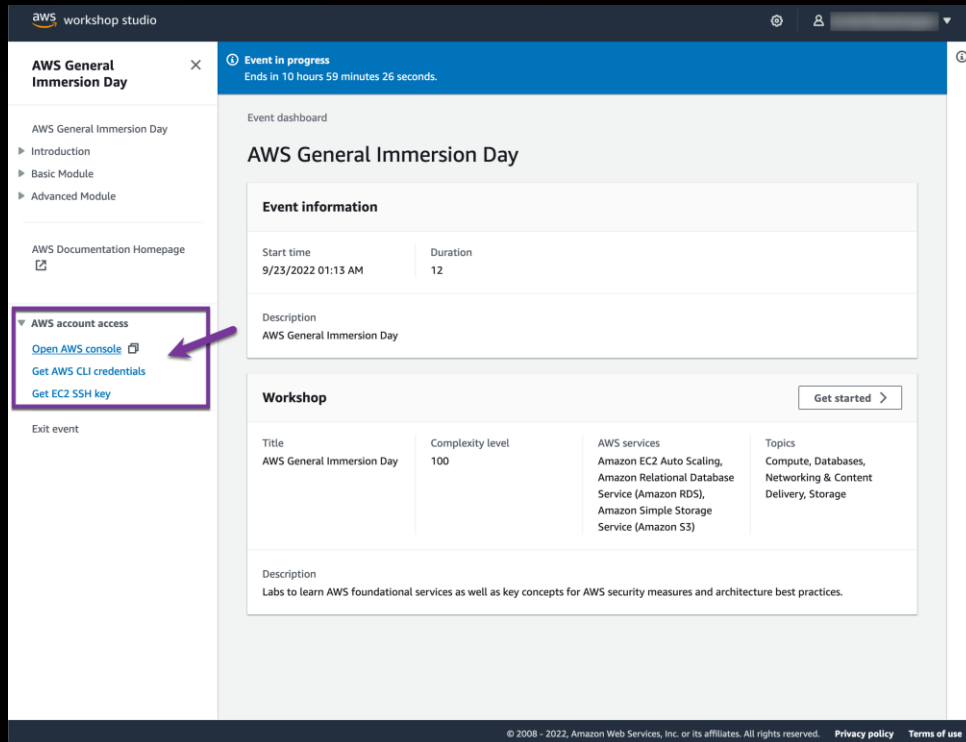
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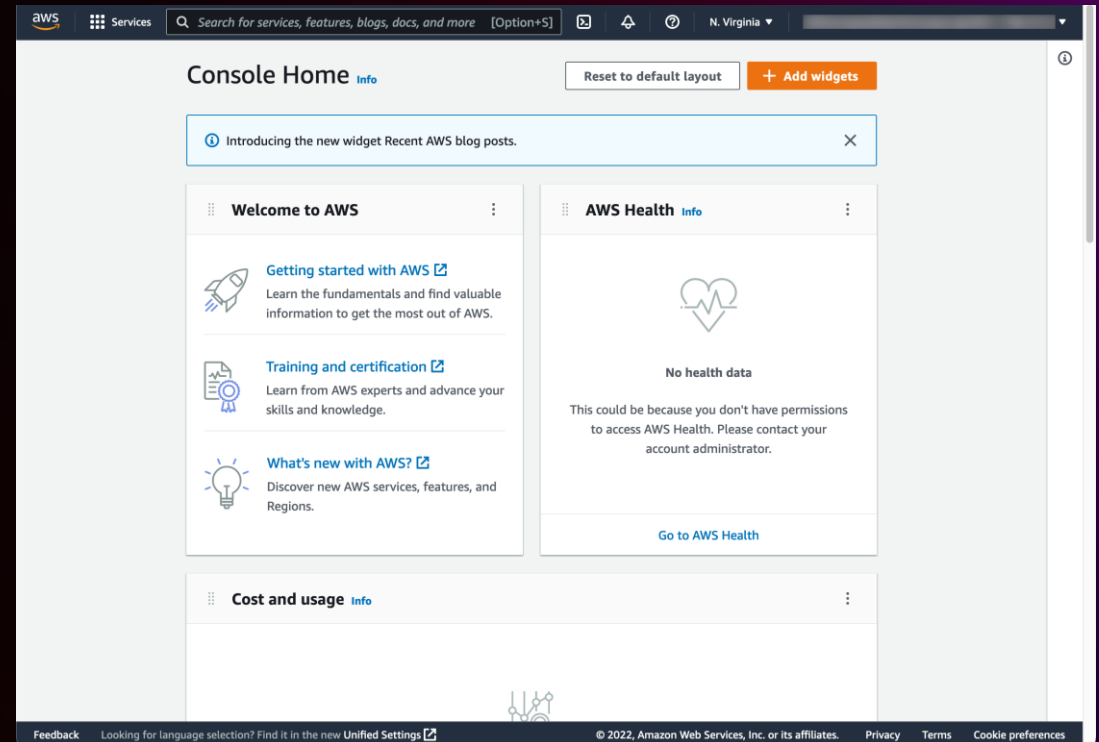


Step 4: Access AWS account

Access the AWS Console or generate AWS CLI credentials as needed.



The screenshot shows the AWS Workshop Studio interface. On the left sidebar, under the 'AWS account access' section, the 'Open AWS console' link is highlighted with a red box and a red arrow. The main content area displays the 'AWS General Immersion Day' event dashboard, including event information (start time, duration, description) and a workshop table listing various AWS services and topics.



The screenshot shows the AWS Console Home page. The 'Welcome to AWS' section contains links to 'Getting started with AWS', 'Training and certification', and 'What's new with AWS?'. The 'AWS Health' section displays 'No health data' with a message indicating that the user may not have the necessary permissions to access AWS Health. The 'Cost and usage' section is also visible at the bottom.

Step 5: Get started with the workshop

The screenshot shows the 'Event dashboard' for the 'AWS General Immersion Day' workshop. The left sidebar contains navigation links for the workshop modules (Introduction, Basic Module, Advanced Module), the AWS Documentation Homepage, and AWS account access options (Open AWS console, Get AWS CLI credentials, Get EC2 SSH key). The main content area displays event information: Start time (9/23/2022 01:13 AM), Duration (12), Description (AWS General Immersion Day), and a 'Workshop' section with details on title, complexity level (100), AWS services (Amazon EC2 Auto Scaling, Amazon Relational Database Service (Amazon RDS), Amazon Simple Storage Service (Amazon S3)), and topics (Compute, Databases, Networking & Content Delivery, Storage). A 'Get started' button is located at the bottom right of the workshop details, highlighted by a purple arrow.



The screenshot shows the workshop content page for the 'AWS General Immersion Day' workshop. The left sidebar is identical to the previous screenshot. The main content area features a large graphic of a helmet with the text 'IMMERSION DAYS' below it. Below the graphic, there is a paragraph of text: '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.' At the bottom right, there are 'Previous' and 'Next' buttons.

Thank you!

Kelvin Lawrence
lakelvin@amazon.com
@gfxman

Taylor Riggan
triggan@amazon.com
@triggan



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survey in the **mobile app**



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